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## The Guest Box

### From Malaysia (BIRDS-2)

**Introducing Putrajaya, Malaysia**

The streets are elegantly designed with a European feel, along with well-paved roads while the government buildings are a blend of modern architecture with Islamic arts. Commercial, authoritative and residential areas have been divided into precincts that blend into each other cohesively...  

Continued on Page 13

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BIRDS Project Newsletter – No. 27

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To all concerned parties:

Yesterday (20 March 2018), Kyutech received the **Space Development and Utilization Award** (from the Ministry of Foreign Affairs) in recognition of our DNST/PNST/SEIC activities toward capacity building and international collaboration. The official announcement is in Japanese only – it can be viewed here  
http://www.uchuriyo.space/taishou/

On behalf of Kyutech, I thank everybody who made our endeavor possible and look forward to working with you more in the future.

Thank you very much,
Mengu Cho
Dear Mengu and colleagues,

Congratulations for receiving this Award! It is yet another nice recognition of the important work Kyutech is doing and a confirmation that we were on the right path when we started the UN/Japan DNST/PNST in 2009.

Wishing you continued success with PNST/SEIC!

With best regards,
Werner

21 March 2018, Geneva

Kyushu Institute of Technology

http://www.uchuriyo.space/taishou/
祝 辞

第3回宇宙開発利用大賞を受賞された皆様に、心よりお祝い申し上げます。
近年、宇宙の開発利用の展開は目覚ましく、海外では、ベンチャー企業による低コストでのロケット打ち上げ、小型衛星から得られるビッグデータとAIを軸としたデータビジネスの進展など、民間活力によるイノベーションが進んでいます。我が国においても同様に、民間企業による革新的な挑戦が始まっており、世界最先端の舞台で熾烈な競争が繰り広げられています。

民間企業等の多様なプレイヤーの創出・育成は、我が国宇宙産業の厚みを増すだけでなく、宇宙基本計画で掲げられた「安全保障」「産業振興」「科学技術」の3本柱全ての進展につながるもので、GDP600兆円に向けた生産性革命の柱の1つとして宇宙産業の振興を図るべく、宇宙基本計画に沿った取組を着実に進めるとともに、宇宙開発利用大賞、宇宙データ利用モデル実証事業やビジネスアイデアコンテストなど、新たなプレイヤー振興の取組も迅速に進めてまいります。

今回の受賞案件は、小型衛星の礎を築いたバイオニクスから農業、健康食品関係者まで、多様性に富むものとなりました。こうした取組が、我が国の宇宙開発利用の深化へとつながっていくことを期待しています。今回、宇宙開発利用大賞を受賞されました皆様方の益々のご活躍と発展を祈念いたしまして、私の祝辞といたします。

平成30年3月20日 20 March 2018

http://www.uchuriyo.space/taishou/

内閣総理大臣 安倍晋三
This is the award that Kyutech received from the Minister of Foreign Affairs.

This is all BIRDS or SEIC related stuff.

CONTINUED ON THE NEXT PAGE
1. 宇宙開発利用の新たな領域創造への貢献

国連宇宙部と連携した衛星技術に関する学位取得に至る唯一の奨学金プログラム（JST/PIST）を、2011年から7年間にわたり実施。SEICには2013年から5年間で、20名の生徒が29名の職を得、2017年ジェネラル・パンアップでは、98名の149名が事前Web登録を行い、31名の128名からの選考が行われた。

また、アジア・アフリカ諸国と超小型衛星をを標高開発・運用する国際的な衛星開発プロジェクトであるBIRDSプロジェクトを実施しており、そのうち10月の参加国は、国際衛星開発実験機（H-2B）を超えた。国際宇宙部職員や宇宙局の専門家に招き、留学生に10年間の各国の宇宙開発を立案している。

2. 宇宙開発利用市場の拡大への貢献

途上国・新興国に宇宙インフラを輸出していく上で欠かせない人材育成とのパワーセッションにおいて、英語で学位取得できる大学院正規課程の受け立てが整備されている。

超小型衛星試験センターにて10ヶ国以内の衛星に対する試験を実施。また、途上国・新興国による利用拡大を目的に、日本の経済技術振興促進を目的とした衛星技術の応用を活用し、BIRDSプロジェクトで受けた衛星バスケットを企業が商品化、MakeSat.comにて販売。BIRDS衛星を利用するために、10国の地球局をベンチャー企業と共有しネットワーク化し、今後、IT業界のネットワークを活用し、世界の各地球局をつなげビジネスへの発展させる予定。

3. 産業、生活、行政の高度化及び効率化への貢献

CubeSatにより宇宙を利用した観測・観測を迅速に実現することで、途上国・新興国の産業・生活・行政の差し迫った課題を解決するとともに、それらの高度化・効率化に寄与。

4. 技術への貢献

SEICの留学生10名が参加した超小型衛星KORUS（2016年打ち上げ）では、世界で初めて軌道上でのラジオ映画の制作と電波変調の取得に成功。

BIRDSでは、単一大学による超小型衛星システムコンテストとしては世界最多の150名の大学が参加したCubseSatを打ち上げる。

さらに、LIF/HIFを用いてキューブサットコントロール（BIRDS-II）を、世界6ヶ国以上の地球局でネットワーク運用する実証実験を実施中。超小型衛星のデータ通信速度を数倍に増やすることで、衛星とのデータ通信を効果的に拡大させる効果が期待される。

5. 他の開発への貢献

海外に1000以上の衛星実装を、途上国・新興国でも、自衛隊を開発して、自主の実験をニーズに応じて宇宙開発利用が可能であることを実証。また、国連宇宙空間利用委員会において、每年開催のテクニカルプレゼンテーションに参加し、13ヶ国が参加するBIRDSワークショップを2016年から毎年開催している。

平成30年度には、日本初の「宇宙システム工学科」（学部）を開講予定。

http://www.uchuriyo.space/taishou/
Award ceremony was in Tokyo on 20 March 2018

Prof. Nakao received the award on behalf of Kyutech
Winners of various categories
Congratulatory Telegram and Flowers from JAXA 「きぼう利用センター有志一同」

These were sent from the JAXA Kibo Team to Prof Cho and his laboratory on 27 March 2018.

Thank you, JAXA!
See here for English-language media coverage of our award:

http://www.spacetechasia.com/the-10-space-projects-that-won-japans-space-awards/

4. Foreign Minister’s Award: Kyushu Institute of Technology (Kyutech)
The Foreign Ministry’s award went to Kyutech for its work with the United Nations Office for Outer Space Affairs (UNOOSA). More specifically, the university was awarded for the Long-term Fellowship Programme on Nano-Satellite Technologies, which accepts 6 international students per year for a postgraduate course in nanosatellites and basic space technology.
A waterway cuts through the city, flowing into a large lake. The concrete landscape is balanced with lots of parks, greenery and wetlands but because the land is relatively flat, it does not look lush. There are several places that visitors can explore. Those coming from KLIA airport will only take minutes to reach Putrajaya.

Putrajaya is Malaysia's third and latest Federal Territory. Built on an expansive marshland and former oil palm estate in Selangor, the city spans an area of almost 5,000 hectares and lies 25 km from Kuala Lumpur. It is located around 30 km from Universiti Teknologi MARA (UiTM).

Putrajaya takes over the administrative functions of the capital city Kuala Lumpur and is part of the Multimedia Super Corridor project of the Malaysian government. Much organization and planning have gone into the development of Putrajaya as a modern city with the latest communication technologies and progressive infrastructure.

This Guest Box was prepared by Nur Nabila, a student under Assoc. Prof. Ir. Dr. Mohamad Huzaimy Jusoh - Director, Center for Satellite Communication Faculty of Electrical Engineering Universiti Teknologi MARA 40450, Shah Alam, Selangor, MALAYSIA
03. BIRDS-2: Long range radio test between Kyutech and a nearby mountain top

Long Range Communication Test Report

Prepared by:
Adrian C. Salces
28 March 2018
(BIRDS-2 member from the Philippines)
Purpose

The long range communication test on BIRDS-2 CubeSat as performed for the following objectives:

- Verify analyses of various uplink and downlink communication channels in a test setup emulating ground-satellite distance.
- Measure the approximate gain and radiation pattern of UHF and VHF antennas in a long-range test setup.
- Demonstrate the satellite’s proper execution of uplink commands and telemetry/mission downlink in a test setup emulating ground-satellite distance.
- Verify the communication performance and functionality of the APRS-DP and S&F missions in a test setup emulating ground-satellite distance.
Overview of Test Procedure

- **1. Calibration**
  - Determine the real path loss between the satellite and ground station in the test setup.
  - Would be the basis of attenuator value to use to achieve the total attenuation in ground-satellite distance in actual scenario.

- **2. Gain and Radiation Pattern Measurement for Antennas**
  - Measure the power received at the ground station from the satellite at different directions.
  - The result will tell us the far-field radiation pattern of the antennas and help compute the expected receivable power when the satellite is in orbit.

- **3. Satellite-Ground Station Operation**
  - Verify the communication between the satellite and ground station at a given attenuation by checking response to a few downlink and non-downlink commands.

- **4. APRS-DP and S&F functionality/communication tests**
Test Environment

Distance from the GS to the satellite is 5639 meters.

Latitude, longitude, and altitude of venues

<table>
<thead>
<tr>
<th>Venue</th>
<th>Latitude (°)</th>
<th>Longitude (°)</th>
<th>Altitude (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Venue 1: BIRDS GS @ Kyutech</td>
<td>33.893255</td>
<td>130.8375133</td>
<td>54</td>
</tr>
<tr>
<td>Venue 2: BIRDS-2 Satellite @ Sarakura Mountain</td>
<td>33.8547609</td>
<td>130.7981639</td>
<td>610</td>
</tr>
</tbody>
</table>

GS = ground station
Two-ray propagation model for calculating path loss of the long rate test setup:

\[
P_{RX} = \frac{\lambda^2}{(4\pi d_H)^2} \left[ 2 \sin \left( \frac{2\pi h_{SAT}h_{GS}}{\lambda d_H} \right) \right]^2 P_{TX} G_R G_T \tag{1}
\]

Calculated path losses: 93 dB (VHF), 98 dB (UHF)

For large propagation distance, the reflection coefficient tends to -1.

(http://www.wirelesscommunication.nl/reference/chaptr03/pel/pel.htm)
Test Setup at Ground Station Side (Kyutech)

- Spectrum Analyzer
- RF cable leading to GS antenna outside
- IC9100 (Radio)
- GS PC running operation software
Test Setup at the Satellite Side (atop Sarakura Mountain)

- Satellite with antennas facing toward the GS

Satellite positioning (in the picture is Cheki from Bhutan)

Checking of satellite functionality (in the picture is Cheki and Dr. Kim who supervised the test)
Test Setup at the Satellite Side (atop Sarakura Mountain)

Good view from the Sarakura mountain. The GS at Kyutech could be seen with the aid of a telescope.

Photo of calibration procedure. Joven (left) is measuring the received power from the GS.
Calibration Procedure

Measuring received power at GS side for determining the real downlink path loss in the test setup, which was about 113 dB (UHF) and 100 dB (VHF).

Measuring received power at satellite side for determining the real uplink path loss in the test setup, which was about 115 dB (UHF) and 96 dB (VHF).
Antenna Gain and Radiation Pattern Measurement

X-axis rotation

For VHF Z-axis rotation, shown at $\Phi = 180^\circ$
Satellite Operation Test Setup

Satellite Side (Sarakura Mountain)

H8 Main serial

Laptop (for emergency debugging)

GS antenna

Attenuator

>30 dB

IC9100

GS Side (Kyutech)

TNC

GS PC
Satellite Operation – Some Outputs

CW beacon audio signal – still clear at 38 dB attenuator

Downloaded latest housekeeping data from the satellite during operation
Satellite Operation – Some Outputs

Downloaded camera file database showing 3 new images captured during the test.

Reconstructed image file at the GS (File 0004, 256x320, 6285 bytes). This shows the view from Sarakura Mountain, as captured by the satellite.
APRS-DP Functionality Test

Pooja (Bhutan) performing functionality test using Yagi antenna and handheld radio

ACK received from payload after handheld radio had transmitted beacon
Store-and-Forward Functionality Test

GST=ground station terminal

GST setup at the rooftop involving Yagi antenna

GST setup at the rooftop involving Eggbeater antenna

End of the report (by Adrian) about BIRDS-2 long range communication test
04. Superb 9-min. video by our SEIC-PNST student from Kenya

Cosmas, our SEIC student from Kenya, produced an excellent video (targeted at an audience in Kenya) about space engineering studies at Kyutech.

You are invited to view it.

https://www.youtube.com/watch?v=Idn_YcPrfJA&feature=youtu.be
Cosmas explains the various satellite test machines of Kyutech.

Above: Dr Faure explains the facilities to Prof Mbuthia of Kenya
SEIC is a mix of lectures and hands-on lab work

Above:
The flight model of Bhutan BIRDS-2 in the clean room.

END OF ARTICLE ABOUT COSMAS’ VIDEO
05. Lecture by G. Maeda in Kenya to promote space engineering

G. Maeda delivers two lectures on 20 March 2018 before the College of Engineering, University of Nairobi, Kenya

**How Japan Started its Space Program**

Presented at the University of Nairobi, Kenya  
March of 2018

**Introduction to the BIRDS Project and the BIRDS-4 proposal for Kenya**

Presented at the University of Nairobi, Kenya  
March of 2018

The first lecture.  
The second lecture.
Chandaria Centre
[central lecture hall at the Univ. of Nairobi]
GM’s lecture on Tuesday makes the top news of the Home Page of the University of Nairobi on 22 March 2018. During this lecture the video by Cosmas was also shown.
Kenyan urged to Build their own Satellites

In a passionate public lecture about the ‘Value of space’ delivered by Prof. George Maeda of Kyutech, Japan, Kenyans were urged to build, test and launch their own satellite into space that will help the country solve its needs.

"To fully exploit space for national profit, it is necessary to design, build, test and launch your own satellite. Buying satellite does not develop your workforce,” said Prof. Maeda.

During the Tuesday lecture at Chandaria auditorium, March 20, 2018, Prof. Maeda challenged Kenyan scientists to develop tailor made satellites citing that the technical competence of Kenya’s workforce can only be enhanced when they unite and build their own device.

"Japan took its first few steps from universities laboratories and I think Kenya should do the same,” he noted that the team that builds a satellite is multi-disciplinary. He urged Kenyans to engage with systems; anyone who has worked with and understood how a system and applications works can participate in the building of satellites.
Kenyans urged to Build their own Satellites

Prof. George Maeda, from KYUTECH, Japan, Chandaria Auditorium on Tue, Mar 20, 2018

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“To fully exploit space for national profit, it is necessary to design, build, test and launch your own satellite. Buying a satellite does not develop your workforce,” said Prof. Maeda.

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He noted that the team that builds a satellite is multi-disciplinary. He urged Kenyans to engage with systems; anyone who has worked with and understood how a system and applications works can participate in the building of satellites.

While giving his opening remarks, Prof. Mwangi Mbuthia, Dean, School of Engineering, UoN, challenged the students to participate in developing an application that will be used to capture audio in the first Kenya University Nanosatellite device to be launched in May. This follows a competition that the University of Nairobi in partnership with University of Rome won to send a 1U cubesat from KiboCube into space.

Prof. Mbuthia gave a history of how space exploration opportunities developed in Kenya since 1962. How these opportunities and partnerships have grown to the extent that Kenya now awaits a launch of the first nanosatellite into space.

Prof. Mbuthia concluded by saying, “exciting times are ahead of us. I ask all of you who are interested to come forward and participate in this emerging industry.”
GM’s lecture was timed to occur just before the launch of **1KUNS-PF**. The launch is due in early April, with ISS deployment a few weeks after that. This lecture explains to the public what needs to be done next (and, of course, that is **BIRDS-4**).

Deployment of 1KUNS-PF into space by astronauts of ISS is set for the 11th of May 2018. “Irazu” satellite of Costa Rica will also be deployed at that time, via the ISS.

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This presentation about **1KUNS-PF** was given at the following event:

**The First Kenya University NanoSatellite**

**1KUNS-PF: capacity building using the KiboCube launch opportunity**

John Kimani, Kenya Space Agency
Mwangi Mbuthia, University of Nairobi
Fabio Santoni, DIAEE, Sapienza University of Rome
Fabrizio Piergentili, DIMA, Sapienza University of Rome

This presentation about **1KUNS-PF** was given at the following event:

**United Nations / Austria Symposium**

**Access to Space: Holistic Capacity Building for the 21st Century**

Graz, 3-7 September, 2017
BIRDS Project Newsletter – No. 27

06. BIRDS Project requires the use of a solar simulator

The following report is reprinted in this newsletter with the permission of the author of the report. He recently replaced the lamp of Kyutech’s solar simulator. This device is needed to shine light on satellites to simulate the light it would receive from the sun when it is in orbit around the earth.

Solar simulator test report

(New lamp)

by Dmytro Faizullin

Laboratory of Space Dynamics
Laboratory of Spacecraft Environment Interaction Engineering
Kyushu Institute of Technology
Kitakyushu, Japan
30.03.2018
Introduction

• Solar simulator lamp was degraded after 4 years of usage and needed to be changed

• A new lamp was mounted in the simulator on 28.03.2018

• Spectrums and irradiance powers of the solar simulator with old and new lamps were measured

• Near to AM0 specter irradiated by the solar simulator with a new lamp was found
Mounting a new lamp
Test setup

Solar simulator: SML-2K1MV1
Spectrum Analyzer: S-2440C (measuring range 300-1100nm)
Pyranometer: MS-802

Tests with an **old** and a **new lamps** were performed on 28.03.2018
• **Distance** between the solar simulator and a measurement point was **60 cm**
• **Powers** of the solar simulator were set to: **10%, 30%, 35%, 50%, 65%, 70%, 90%, 100%**
Irradiance of the solar simulator with a new lamp taken from calibration report (2014)

The report was provided by the solar simulator manufacturer (approx. 2014)

Conditions for the calibration:
• Distance to the solar simulator: 60 cm
• Power of the solar simulator: 35%

Obtained irradiance power:
• 300-2500nm: 1416 W/m²
  • 300-1100nm: 73%
  • 1100-2500nm: 27.0%

Sun light irradiance power in space (AM0):
• 280-4000nm: 1367 W/m²

Irradiance of the solar simulator (SML-2K1MV1) and AM0 where, AM-0 is a sun light intensity in orbit
Irradiance powers of the solar simulator with different power of the simulator

Specter of the solar simulator with old and new lamps measured by the spectrum analyzer

<table>
<thead>
<tr>
<th>Power of the solar simulator, %</th>
<th>10</th>
<th>30</th>
<th>35</th>
<th>50</th>
<th>65</th>
<th>70</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyranometer, W/m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old lamp</td>
<td>849.9</td>
<td>991.5</td>
<td>1133.1</td>
<td>1274.8</td>
<td>1558.1</td>
<td>1558.1</td>
<td>1699.7</td>
<td>1699.7</td>
</tr>
<tr>
<td>New lamp</td>
<td>991.5</td>
<td>1274.8</td>
<td>1274.8</td>
<td>1416.4</td>
<td>1628.9</td>
<td>1699.7</td>
<td>1841.4</td>
<td>1841.4</td>
</tr>
</tbody>
</table>

Irradiance power of the solar simulator with old and new lamps measured by the pyranometer

![Specter of the solar simulator with old and new lamps measured by the spectrum analyzer](image-url)
Irradiance powers of the solar simulator with 50% power of the simulator

Specter of the solar simulator with old and new lamps measured by the spectrum analyzer

Irradiance power of the solar simulator with old and new lamps measured by the pyranometer

<table>
<thead>
<tr>
<th>Power of the solar simulator, %</th>
<th>10</th>
<th>30</th>
<th>35</th>
<th>50</th>
<th>65</th>
<th>70</th>
<th>90</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyranometer, W/m^2</td>
<td></td>
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</tr>
</tbody>
</table>
Recommendations

• **Distance 60cm** and the solar **simulator power 50%** should be used for getting near to **AM0** irradiance

• The lamp should be **changed after 2000 hours** usage

• **Don’t press a button** near a power regulator on the solar simulator. It is for resetting a counter of the simulator operation time

End of solar simulator article by Dr. Dmytro Faizullin
07. You are encouraged to use the material found in this newsletter

All the material you find in this newsletter (this issue as well as all past issues) can be used for your needs -- however please always give credit to this newsletter when such material is used.

Please mention the following:

- Page number(s)
- Issue Number
- “BIRDS Project Newsletter”
- ISSN 2433-8818

Your cooperation is appreciated.
- The Editor.
08. How to download the 33-page Kyutech “Handbook for International Students”

Kyutech’s 2018 Handbook for International Students

Please go to this website to download various Kyutech publications that can assist new students.

http://www.kyutech.ac.jp/english/about/publications/
These are the TV stations that were invited:
1. TV3 http://www.tv3network.com
2. Ghana Live TV http://www.ghanalive.tv
3. Multi TV
   - Joy TV
   - Adom TV
https://www.multitvworld.com/newworld/live/
4. HomeBase TV http://hbtvghana.com

Most showed up.

The journalists from radio stations that attended the workshop shared the news to their listeners right after the workshop. Radio stations invited are listed below:

1. Joy FM ..............99.7MHz
2. Starr FM ...........103.5MHz
3. Eastern FM ...... 105.1MHz
4. Bryt FM............. 99.1MHz
5. Oman FM......... 107.1MHz
6. Citi FM............... 97.3MHz
7. Okay FM............ 101.7MHz
8. Adom FM.......... 106.3MHz
9. HITz FM............. 103.9MHz

The information shown on this page are courtesy of Benjamin Bonsu (BIRDS-1, Ghana)
The Symposium 2018 was held at the National Museum of Emerging Science and Innovation (Miraikan) on March 10-11. The purpose of symposium is sharing knowledge among members of JAMSAT and people who interested in amateur radio satellites.

This year, Apiwat and Kishimoto represented the BIRDS Project.

Report by Apiwat Jirawattanaphol (BIRDS-1) and Makiko Kishimoto (BIRDS-3)

Miraikan
First day of symposium

The symposium was started at 13.30 in Miraikan 7th floor. About 60 participants attended on the first day. Presentation on the first day are include:

- Satellite radio reception of amateur radio band
- NEXUS Satellite project
- OMOTENASHI ultra-small Moon landing satellite
- RYMANSAT satellite project
- Es 'hail-2 (P4-A) satellite from AMSAT Germany

Welcome Speech by President of JAMSAT
Presentation on first day

Satellite reception of amateur radio by Kurahara Naomi, Infostellar Inc.

NEXUS Satellite project by Kiyoshi Yamaguchi, Nihon University

RYMANSAT satellite project by Takafumi Shimamura

Es'hail-2 (P4-A) satellite by Peter Guelzow from AMSAT Germany. The P4-A project planned to put amateur radio transponder onboard Es'hail-2 which is geostationary satellite.

OMOTENASHI ultra-small Moon landing satellite by Wataru Torii, JAXA Ham radio club
Kampai (Cheers)

End of the first day, the reception was held at the restaurant near by Miraikan. There 38 people attended the reception and most of topics were about satellite communication and amateur radio.

Kishimoto with JAMSAT president and member of NEXUS satellite team from Nihon University
Presentation on second day

ISS TV Reception
By Katsumi Morita

SDR Satellite Ground Station
by Noritsuma Imamura, Shizuoka U.

AMSAT NA’s Fox-1 and GOLF projects by Paul Stoetzer

Enjoy Satellite Communication with dipole Ant. by Eiji Nakamura

BIRDS satellite project
by Apiwat J. and Makiko Kishimoto

OrigamiSat-1 project
by Sakamoto Hiroshi, Tokyo Tech
BIRDS Project Presentation

Presentation about BIRDS project by Apiwat and Kishimoto

Latest News from Kyutech
BIRDS Satellite Project Status
and BIRDS-2 APRS-Digipeater

March 11th, 2018
JAMSAT Symposium

Apiwat Jirawattanaphol
HS4SCI/JR6RJA

Makiko Kishimoto

The presentation is includes overview of BIRDS project, BIRDS-1, 2 and 3 project status. Also, APRS mission of BIRDS-2 presented in this presentation.
BIRDS Project Presentation (2)

Apiwat introduced APRS mission of BIRDS-2 to JAMSAT symposium participants.

Kishimoto presented on overview and mission of BIRDS-3 satellite project.

Picture show satellites delivery date to JAXA and on other slides show status of BIRDS-1 satellites.

End of Report
11. Take note: Image sensors are getting better and better

The Canon 35MMFHDXS is a new high-sensitivity image sensor. You can view its promotional video.

https://www.youtube.com/watch?v=mZNWt-GRD7s

This information came from Dr Kim of LaSEINE
In Japan, the academic year starts in April – which is 6 months out of phase with most of the world. So at SEIC, the Japanese students generally start in the spring and the international students generally start in the fall.

On 5 April 2018, as shown in this photo, Prof Cho, Program Director of SEIC, did a 15-minute presentation outlining the merits of joining SEIC.

To highlight SEIC’s remarkable diversity, he presented a map of the world indicating where SEIC students come from – see the next page.
The fantastic diversity of SEIC of Kyutech:

71 foreign students from 26 countries enrolled in 5 years

Graduated 71 students from 26 countries

Current (as of October 2017)

SEIC = Space Engineering International Course
The BIRDS Project is conducted by LaSEINE, Laboratory of Spacecraft Environment Interaction Engineering, whose director is Prof. Mengu Cho.

The Laboratory issues an annual report (mainly in Japanese) each year in March – the cover of the March 2018 issue is shown at the left. It covers fiscal year 2017 (which ended 31 March 2018).

All back issues are available as pdf. Please go to this web link to download any one of them:

http://laseine.ele.kyutech.ac.jp/download/download.html

-- The BIRDS Project Newsletter Editor
14. Bhutan students are interviewed for radio program in Bhutan
This interview for radio was recorded on 27th March 2018, and aired on 30th March 2018. It was aired again on 31th March.

This section was submitted by Cheki (BIRDS-2, Bhutan)
15. GEDC Airbus Diversity award is written up in Kyutech periodical

Spring 2018 issue of “Kyutech Times” (Vol. 51) describes the Airbus award that the BIRDS Project received last year. It is a big feather in our cap.
16. Dates of 3rd BIRDS International Workshop, in Mongolia

16-19 August 2018

http://sas.num.edu.mn/birds2018/
17. Prime Minister of Bhutan meets the President of JAXA on 11 April 2018

Bhutan’s first satellite (BIRDS-2) will be deployed from the ISS this summer.

平成30年4月11日、JAXA山川理事長は、ブータン王国のツェリン・トブゲー首相と会談を行いました。両者は、夏頃に予定されているブータン初の超小型衛星（九州工業大学のBIRDSプロジェクト※1の枠組みで開発）の「きぼう」からの放出を通じて、宇宙分野における協力関係がさらに深まることに期待を示しました。また両者は、人材育成などの今後の協力可能性についても意見交換を行い、今後のブータンの宇宙プログラムが拡大されることに期待を表明しました。

[text from JAXA website]

Continued next page

© JAXA

www.jaxa.jp/projects/int/index_j.html
日本の超小型衛星を世界が活用へ -- ブータン首相がJAXAを表敬訪問

小林行雄

関連キーワード: 宇宙 JAXA 人工衛星 天文学

日本から途上国・新興国に宇宙インフラの輸出を目指すことを掲げ、九州工業大学(九工大)が進めている1辺10cmの超小型衛星(キューブサット:CubeSat)をアジア・アフリカ諸国と共同で開発・運用することを目指す国際的な衛星開発プロジェクト「BIRDS」。その参加国の1つであるブータンの衛星フライトモデルが2018年2月に完成した。

JAXAの山川理事長(左)とブータン王国のトブゲー首相(右)による会談の様子。会談内容の詳細は明らかにされていないが、今後、ブータンが宇宙を活用していくにあたっての、人間交流や二国間での連携の強化などが話し合わせた模様だ (写真は編集部撮影)

https://news.mynavi.jp/article/20180411-615130/
NEPAL: TOUCHDOWN

I was back in the capital of Nepal, Kathmandu to support and facilitate NAST’s payment of BIRDS-3 fund for Nepal to Kyutech from March 12 to April 2, 2018. The capital city is bustling metropolis of 2.5 million and is located inside Kathmandu Valley where cities such as Lalitpur and Bhaktapur are also located. During that time, a lot of events were happening including a very interesting Nepal-Japan cultural exchange that I got to witness in passing.
Nepal Academy of Science and Technology (NAST) is the stakeholder of NepaliSat-1 for BIRDS-3 Project. It was essential that NAST was briefed on the situation and progress of BIRDS-3, released the fund to Kyutech on time and created budget for sustainable space development in Nepal through NAST. Hari Ram Shrestha of NAST will also be joining Kyutech on October 2018 and will play an important part in BIRDS-3.

Presentation about BIRDS-3 Project Progress at NAST
From the very start, Nepal Government’s Ministry of Finance (MOF) has been strongly supportive of the BIRDS-3 Project. Both Secretaries as well as the advisor has been briefed on the Project and it’s long term sustainable objectives. Prime on the agenda was to allocate budget from the next financial year for indigenous space development. The Ministry is very positive to support any such initiatives.
After elections on late 2017, the Ministry of Education and Ministry of Science and Technology has combined to form Ministry of Education, Science & Technology. Since BIRDS-3 proposal was submitted last year, the Ministry has undergone three different Ministers. Current Hon. Minister Giriraj Mani Pokharel has given the project a priority after he was briefed on the project on March 2018.

First Presentation back in April, 2017 with Prof. Maeda

Ex-State Minister for Science and Technology Hon. Biraj Bahadur Bista. He was crucial in the initial push back in September, 2017

(1.) Hon. Minister Giriraj Mani Pokharel

Meeting at the Ministry on March, 2018
Nepal Rastra Bank, the Central Bank of Nepal is responsible of overseeing all the capital outflow from the country. In case of BIRDS-3 for Nepal, NAST has to transfer the payment to Kyutech located in Japan. For that, the only bank in Nepal which has the legal jurisdiction to do so is the Rastra Bank. Deputy Governor, Shiba Raj Shrestha, understood the importance of the project and pushed the process into fast track so that NAST could transfer the funds before the CRA was terminated.

The transfer of the fund actually takes place at a branch office located in Kathmandu. The branch office only completes the transaction if the head office of Nepal Rastra Bank has no objection for the money to be transferred to Japan. The picture on the right shows NAST’s Accounting Division, led by Head Accountant Mr. Pundit going to one of the department inside the bank. NAST continued to push on to complete the payment of Nepal’s first satellite on time.
Government Releases Fund to NAST

Ministry of Finance (अर्थ मन्त्रालय) → Financial Comptroller General Office (महालेखा नियन्त्रक कार्यालय) → Accounting Branch (कोष तथा लेखा नियन्त्रक कार्यालय)

Remittance procedure from NAST to Kyutech for BIRDS-3 Nepal

Kyutech, Japan → Nepal Rastra Bank Branch Office

Kyutech, Japan → Internal Revenue Office

Nepal Rastra Bank Head Office (नेपाल राष्ट्र बैंक)

Internal Revenue Office → Nepal Rastra Bank Head Office

Financial Comptroller Branch Office

NAST

Ministry of Education, Science & Technology

BIRDS Project Newsletter – No. 27
Because no such project had ever come through to this stage, the Internal Revenue Department had to make a decision regarding whether to 1) tax or not tax 2) if to tax, by how much 3) do apply VAT? The department called BIRDS-3 project a “peculiar” project. Top officials from the department sat down, discussed and issued a 10% Tax with a 13% VAT on the payment NAST was making to Kyutech.
Under the new federal structure of Nepal, it is not yet clear what the role of National Planning Commission (NPC) is. However, during the initial stages for the push of BIRDS-3 satellite project for Nepal, the NPC was instrumental with the help of then Hon. Vice Chairperson Dr. Swarnim Wagle and Member Dr. Sunil Babu Shrestha. During a meeting again in March 2018, with Dr. Shrestha, he expressed his support to the project.

End of Trip Report by Abhas – good job Abhas!
19. Media Watch: BIRDS-3 described on television in Nepal

In Nepal Academy of Science and Technology (NAST)’s weekly program on national television, Nepal TV, Prof. Jibaraj Pokharel gave an interview about NAST-Kyutech Cooperative Research Agreement to build Nepal’s first satellite. He gave a short introduction about the BIRDS project, Nepal’s involvement in BIRDS-3 to build the first satellite and also a short history about city of Kitakyushu. The program was aired on March 10, 2018.

This page was provided by Abhas.
BIRDS-3 DATA COLLECTION MISSION

By: Tharindu Dayarathna (BIRDS-3, Sri Lanka)
Mission Statement and Objective

Mission Statement
Satellite based data collection system is necessary for participating countries, specially Sri Lanka and Nepal, for better early disaster warning system (ex. Floods, GLOF) in the future.

Mission Objective
To demonstrate the use of a CubeSat constellation-based data collection system for remote data collection by using remote stations with low power transmitter.
Introduction

- BIRDS-3 Satellite will have LoRa receivers operating in two different frequencies. Dedicated receiver will only be turned on when the satellite passes over particular region (for Japan 920 MHz, for Nepal and Sri Lanka 433 MHz).

- Every participating country will have remote station with LoRa transmitters and they will be sending water level data of selected rivers.
Data Collection Mission Block Diagram

- **Reset PIC** (PIC16F1787)
  - UART
  - SPI
  - COM PIC (PIC16F1787)
    - UART
    - SPI
    - COM Board
    - UHF Transceiver (GMSK)
      - D IO
      - UART
- **FM-1**
- **Main PIC** (PIC18F67J94)
  - UART
  - D IO
- **Data Collection MCU** (Atmega32u4)
  - SPI
  - INT0
  - INT1
  - SPI
  - Receive-1 (RFM98W, 433MHz)
  - Receive-2 (RFM95W, 920MHz)
- **Monopole Ant-1**
  - 435-438 MHz
  - (RX-9600 bps)
  - (TX-9600 bps)
- **Monopole Ant-2**
  - 433 MHz
  - (RX-49 bps)
- **Monopole Ant-3**
  - 920 MHz
  - (RX-49 bps)
- **FM – Flash Memory**
LoRa modules used for BIRDS-3 Data Collection mission

RFM98W (433MHz Module)  RFM95W (920MHz Module)

Key Parameters of modules

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Frequency</th>
<th>Spreading Factor</th>
<th>Bandwidth</th>
<th>Effective Bitrate</th>
<th>Est. Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFM95W</td>
<td>920 MHz</td>
<td>6 - 12</td>
<td>7.8 - 500 kHz</td>
<td>0.018 - 37.5 kbps</td>
<td>-111 to -148 dBm</td>
</tr>
<tr>
<td>RFM98W</td>
<td>433 MHz</td>
<td>6 - 12</td>
<td>7.8 - 500 kHz</td>
<td>0.018 - 37.5 kbps</td>
<td>-111 to -148 dBm</td>
</tr>
</tbody>
</table>
# Remote station and onboard receiver properties

## Remote station transmitter

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Frequency</th>
<th>920MHz or 433MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulation</td>
<td>LoRa</td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>3.3 V, 100 mA</td>
<td></td>
</tr>
<tr>
<td>RF transmission power</td>
<td>20 mW</td>
<td></td>
</tr>
<tr>
<td>Bit rate</td>
<td>49 bps</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>RS-232</td>
<td></td>
</tr>
</tbody>
</table>

## Receiver onboard

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Frequency</th>
<th>920MHz or 433MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulation</td>
<td>LoRa</td>
<td></td>
</tr>
<tr>
<td>Power consumption</td>
<td>Both receivers – 3.3V, 38mA receiving</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Only one receiver – 3.3V, 28mA receiving</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>-145 dBm</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>RS-232</td>
<td></td>
</tr>
</tbody>
</table>
Data Collection Mission BBM Board

- 433 MHz Helical antenna (Gain 2 dBi)
- 920 MHz Mono Pole antenna (Gain 2.14 dBi)
- 433 MHz LoRa Receiver
- 920 MHz LoRa Receiver
- MCU (Atmega32u4)

BBM - Bread board model
Data Collection mission
BBM Board testing

Transmitter BBM

Receiver (Satellite side)

BBM - Bread board model
OBC - On board computer
DCM - Data Collection Mission

End of report by Tharindu
-- good summary!
Cheki Dorji and Pooja Lepcha, members of BIRDS-2 Project from Bhutan visited one of the remote weather stations located in Kabesa, Thimphu. One of the missions of BIRDS-2 is demonstration of remote data collection using satellite based Store and Forward system. On Bhutan’s side, the data collection system (GST) will be implemented in collaboration with the National Centre for Hydrology and Meteorology (NCHM) using the data from sensors already in place for weather forecasting used in the county.
The officials of NCHM expressed their interest in coming up of the nano-satellites for data collection since the expenditure incurred in using the services of IRIDIUM was expensive. They said they looked forward for the success of the country’s first satellite and the mission.

The remote station has various sensors to measure temperature, humidity, wind speed, wind direction, is solar powered and operates independently. The station sends the data to the central station using the IRIDIUM satellite.

The GST will be developed in Kyutech and sent to Bhutan for implementation in one of these remote stations.
22. BIRDS-3: Structure and glue

By Sasaki (佐々木悠二)

Structure

BIRDS3の構体を設計しました。ベースはBIRDS2をもとに改良しました。図からわかるようにアンテナが2つから3つに増えました。他にもバックプレーンの配置が変わりました。フレームの設計はほとんど同じにして設計の時間を短くすることで開発期間を短くすることを目的としています。

Glue

宇宙用の接着剤に代わる民生品の接着剤を選定してコストの削減、納期の短縮を図ります。選定した接着剤を宇宙で使用可能か確認するために熱サイクル試験とランダム振動試験を実施した。試験後のサンプルに変化はあまり見られなかった。これから他の試験を実施して選定をしていく。
私は、BIRDS-3で姿勢制御担当だったものの、紆余曲折ありOBCに転向した柿本です。

OBCは各サブシステムへ指令を出したり、ミッションデータ、センサデータ等を受け渡したりと、システムの中枢に位置する部分になります。

現在は各サブシステムのマイコン（PIC）との通信を確認している段階です。私はPICプログラミング初心者であるため、PICの様々な機能を勉強しながら開発を進めています。

今後はフローを考え、それに基づいてOBCを設計していきたいです。
24. A short video showing how solar cells are glued to satellite surface

This one-minute video was provided by Dr. Kateryna Aheieva (Project Manager of SPATIUM) to illustrate roughly how it is done. After placement, you need to wait at least one day to let the glue cure.

https://drive.google.com/open?id=1YBKj8Xyx-8zeXdTmCpBrKC7Myv1zEx5f
BIRDS-2 Members’ Bowling Competition!

Prepared by:
Adrian C. Salces (BIRDS-2 member from the Philippines)

Credit for the photos:
Cheki Dorji (BIRDS-2 member from Bhutan)
Date and Venue:

- April 18, 2018, Korona Amusement Center, Kitakyushu City, Japan
The Players

- Team A: Cheki Dorji, Daiki Yamaguchi, Adrian Salces, Hasif Azami
- Team B: Kiran Pradhan, Tomoki Uemura, Joven Javier, Akmal Rasheeq (Syazana’s husband)
Games before the bowling competition
Photos during bowling competition – everyone was competitive!

Adrian’s turn

Joven’s turn

Cheki’s turn (the best player!)

At stake: The winners had to pay only 600 yen while the losing team members had to pay 1000 yen.
Photos during bowling competition – everyone was competitive!

Uemura’s turn

Yamaguchi’s turn

Kiran’s turn

At stake: The winners had to pay only 600 yen while the losing team members had to pay 1000 yen.
Teams’ Scores

Round 1

Team A: 411; Team B: 406
Team A won the 1st round – but only by a small margin.

Round 2

Team A: 467; Team B: 435
Team A also won the 2nd round – this time by a large margin. 😊

END OF BOWLING REPORT BY ADRIAN

. . . . nice report, thanks. The Editor.
End of this **BIRDS Project Newsletter**  
(ISSN 2433-8818)  
– Issue Number Twenty-Seven

This newsletter is archived at the BIRDS Project website:  
[http://www.birds-project.com/birds1/newsletter.html](http://www.birds-project.com/birds1/newsletter.html)

When a new issue is entered into 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.