

BIRDS Project Newsletter



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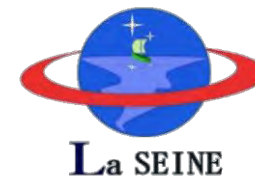
← This means "summer"

Issue No. 7 (11 August 2016)

Edited by:

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Kyushu Institute of Technology,
Kitakyushu, Japan.

Project website: <http://birds.ele.kyutech.ac.jp/>
All back issues are archived at this website.



Contents of this Issue

1. Official name of each BIRDS satellite
2. Antenna pattern test in anechoic chamber
3. Work begins on the BIRDS Ground Station
4. Tobata Gion Oyama-gasa Festival
5. Kukinoumi Fireworks Festival
6. Installation of hardware at the Tainan (NCKU) Ground Station
7. Thermal vacuum testing of multiple cubesats
8. Vibration testing: why and how?



1. Official name of each BIRDS satellite

These were the satellite names submitted for IARU documents. The names might change but for now these are the names.



- Japan: "BIRD-J"
- Bangladesh : "BRAC ONNESHA"
- Ghana: "ANUSAT-1"
- Mongolia: "NUMSAT-1"

2. Antenna pattern test in anechoic chamber

Antenna Pattern Test

This report prepared by:

Raihana Shams Islam Antara

on 01 August 2016.

Dates of pattern test (Year 2016):

Setup	July 7
Tests	July 8-10
Clean-up	July 11

Equipment for Antenna Test

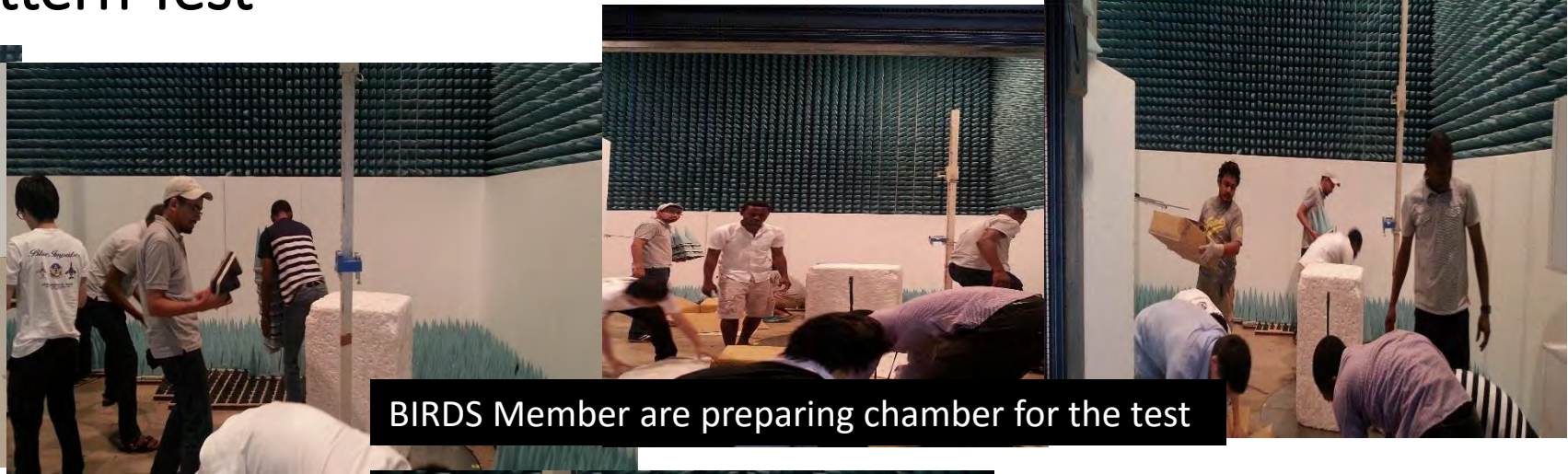
- After designing the BIRDS Antenna System, the next step is to test the antennas to ensure that the antenna will meet the specifications such as radiation pattern, gain, impedance, etc.
- For accurate results, the best choice is to perform the tests in an **Anechoic chamber** and with it we need a signal generator, a calibrated receiving antenna, and a receiving device such as a power meter or a spectrum analyzer.
- **Anechoic chamber** is a shielded room with RF absorber materials installed on the four walls and ceiling and on the floor which are designed to completely absorb reflections of sound or electromagnetic waves. Accordingly, this chamber is costly to construct.
- At Kyutech, we are fortunate to have this kind of chamber. It is equipped with all the necessary equipment and we tested our antennas in it.

Preparation for pattern Test

The Anechoic Chamber



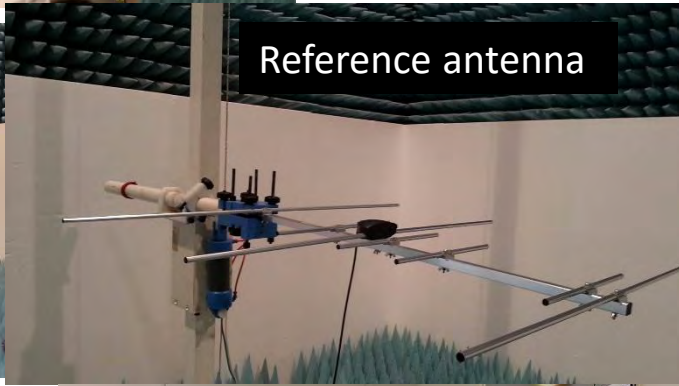
BIRDS Member are preparing chamber for the test



Chamber is prepared



Reference antenna



Preparing AUT (Antenna Under Test)



AUT (Antenna under test)



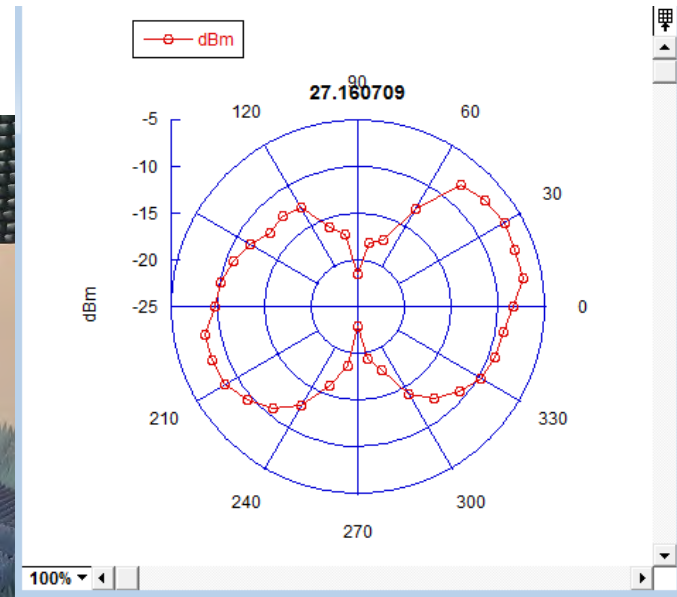
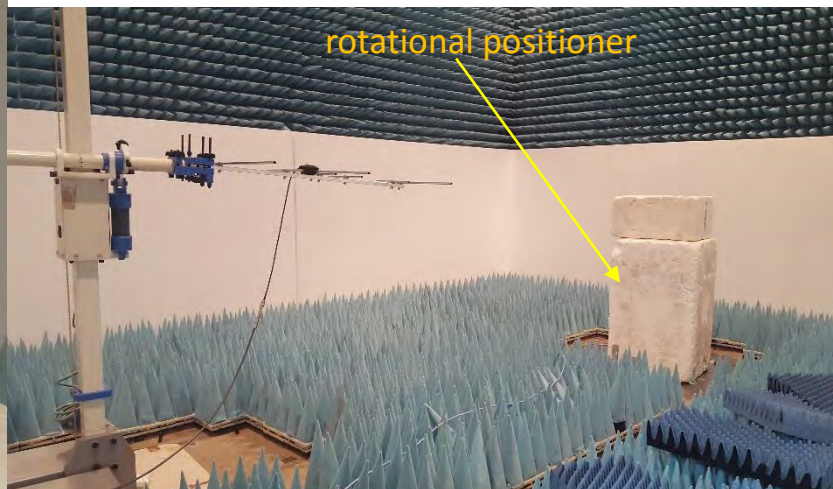
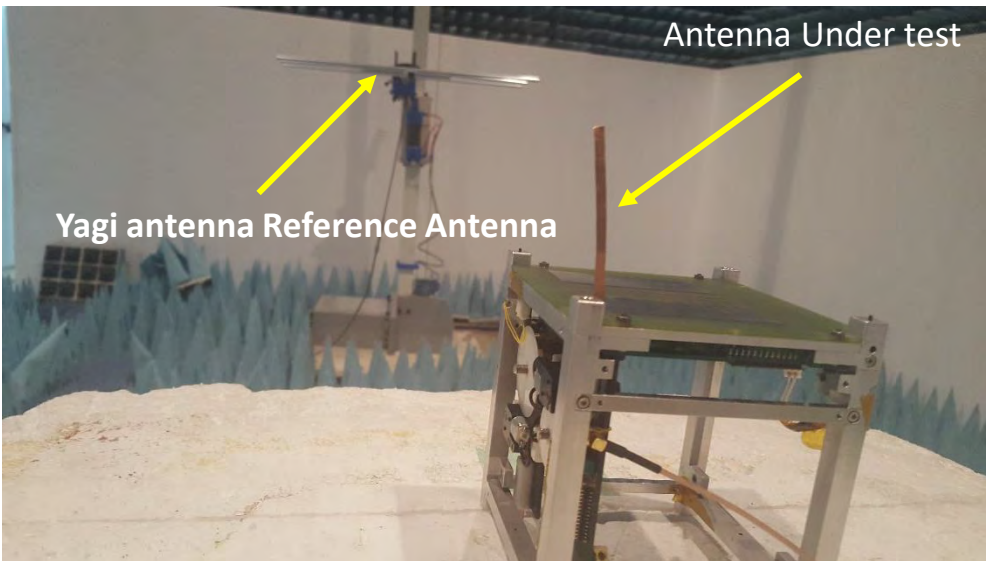
Operation Room



Test setup is done.
The tests can begin.

Antenna Pattern Test

- Antenna Under Test (AUT) placed on a rotational positioner
- This rotational positioner rotated about the azimuth to generate a two-dimensional polar pattern.
- This measurement is usually used an antenna as the reference antenna (RA).
- When we tested the VHF antenna, reference antenna used as transmitter and it connected with signal generator to transmit power and VHF antenna connected with spectrum analyzer to observe the received power
- During UHF antenna Test, reference antenna used as receiver by connecting with spectrum analyzer to see the transmitted power from UHF Antenna



2D polar pattern of antenna

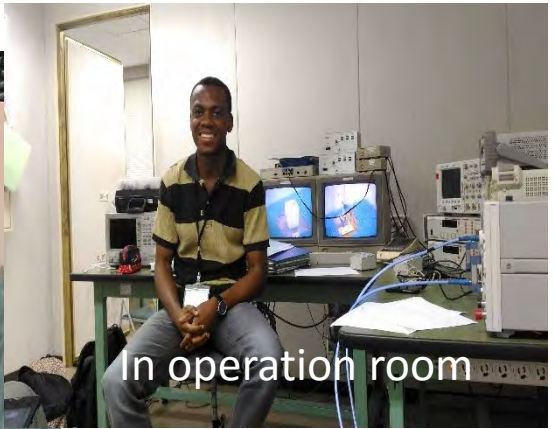
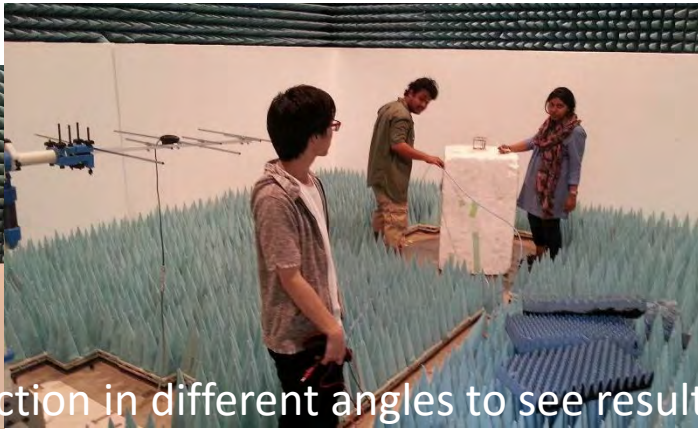
Photos of our Antenna Test



Monitoring anechoic chamber from



Changing antenna direction in different angles to see result



In operation room



In operation room



Monitoring from operation room and taking data



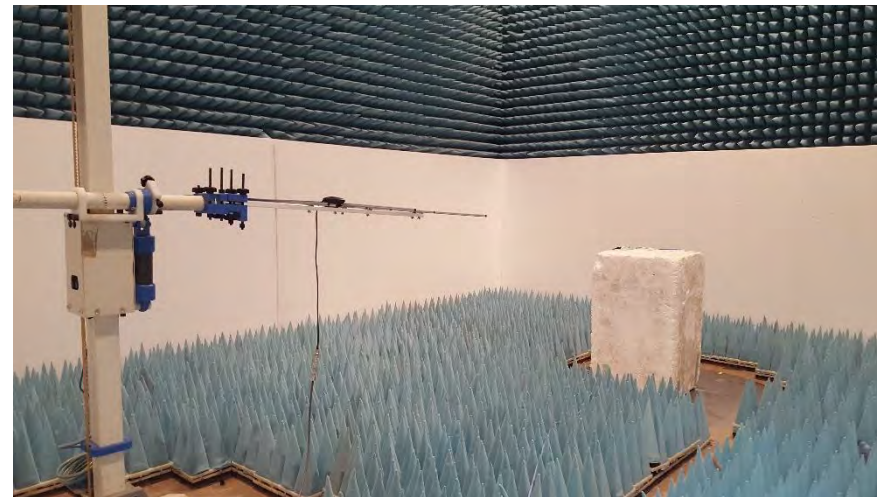
After finishing the test, clean-up occurs.

Though it was a tough work to prepare anechoic chamber with heavy bricks and after finishing the test reorganized the room by removing bricks, repack the bricks and keep it in right place. Together we, the BIRDS members did it, did the test, and analyzed the data. We made it.

Great Team Work!



Before the test



During Test



After the test

End of report by Antara.

3. Work begins on the BIRDS Ground Station

Ground Station Network Device testing at Kyutech Ground Station with Infostellar engineers

Written by

Apiwat Jirawattanaphol

2 August 2016

Preparation of Equipment on 31 July 2016 at Kyutech Ground Station, 8F of S-2 Building



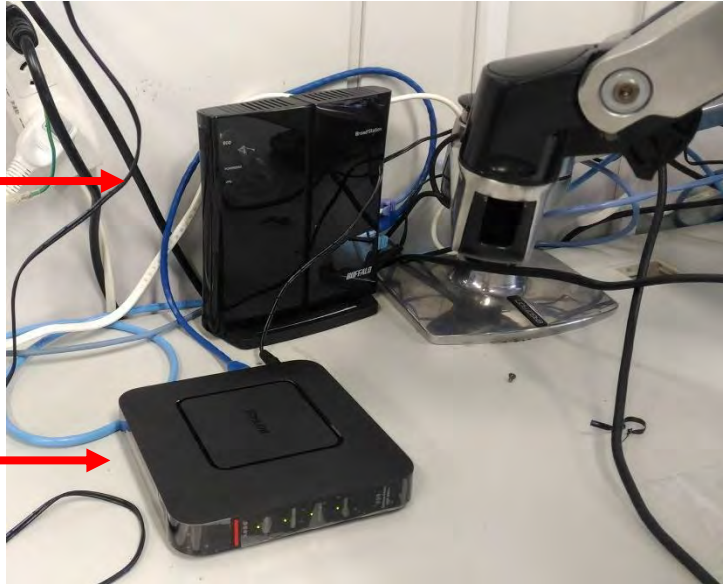
Kurahara-san and Akashi-san (both with Infostellar) work with Apiwat (Thailand) and Fukuda-san (Kyutech Phd student) to connect GS Network device to the Kyutech GS system.



Kurahara-san

01 August 2016

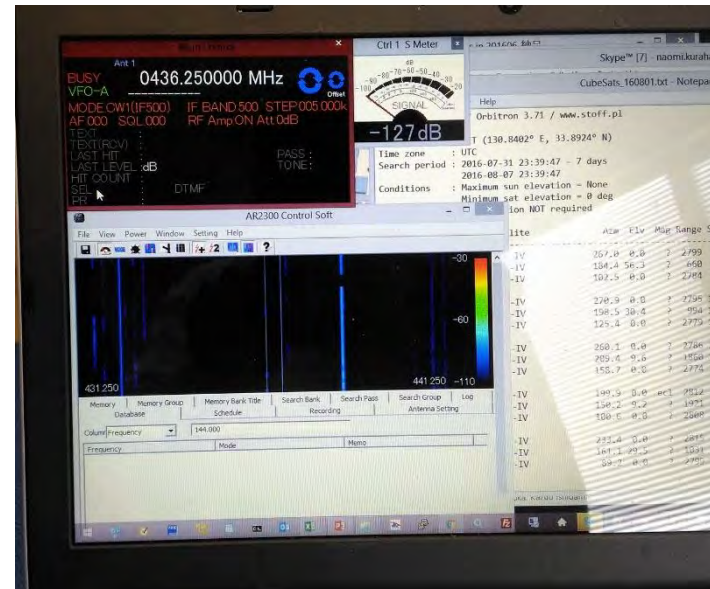
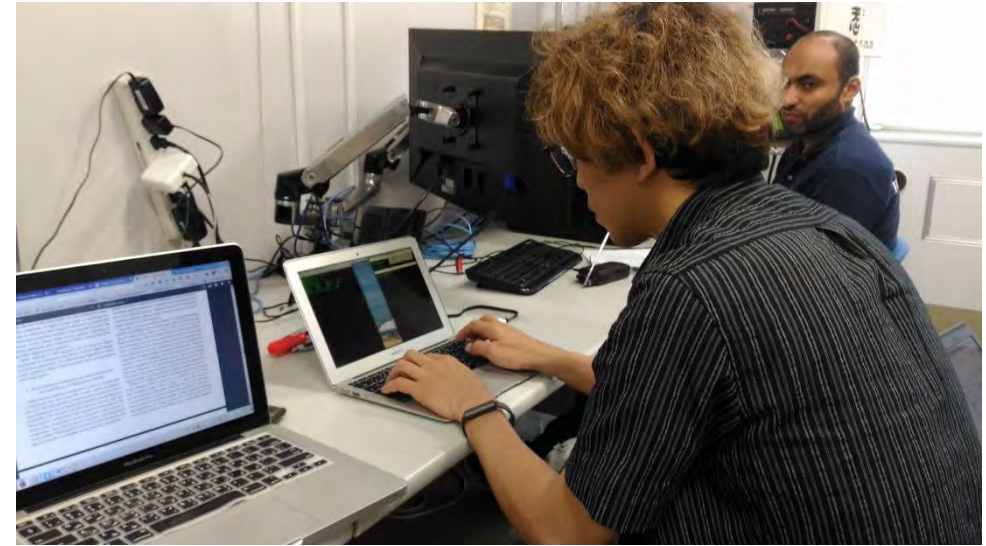
New LAN
router



WIFI
Router

New LAN router installed to
provide internet connection to
Data Transfer Module

Network
configuration
setup by
Akashi-san,
Infostellar
engineer



AR2300
Software Defined Radio
(SDR)
operating software

4. Tobata Gion Oyamagasa Festival

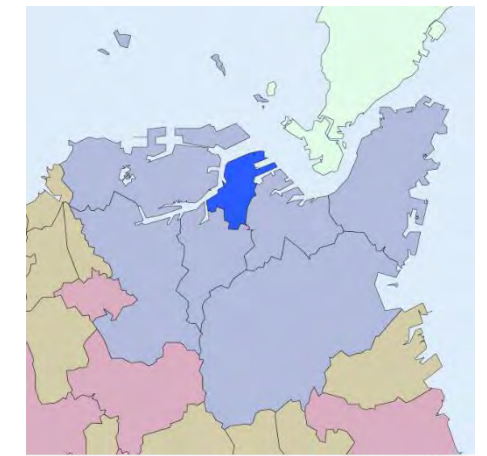
22-24 July 2016

by Antara



Experiencing things in Japan:
Part of the SEIC experience.

- The Tobata Gion Oyamagasa Festival has over 210 years of history and it is designated as Important Intangible Japanese Folk-cultural Heritage
- It is one of the three large summer festivals in Fukuoka Prefecture
- It takes place every year in the Tobata ward of [Kitakyushu](#) in [Fukuoka prefecture, Kyūshū, Japan](#)
- This festival originated in 1803 as thanksgiving for stopping an epidemic in Tobata Area.
- People who involved in this festival wear traditional coats(Happi) and Headbands(Hachimaki) and walk through the town shouldering the giant 10 meter float with 12 tires of lantern
- To keep their steps in time and together they shout out “Yoitosa! Yoitosa”.
- The four floats are decorated with 12 flags during the day, but become “Pyramids of Light” with 309 paper lanterns for the night parade.
- As it is very near to Kyutech, Many Japanese students and foreign students attend there every year to see the summer festive look of Japan. Some of them also wear traditional dresses of Japan and enjoy the food there.



10km

Tobata Ward 戸畑区

Area 16.61 km²

Population 58,896


Density 3,550 persons/km²

Summer
of 2016





5. Kukinoumi Fireworks Festival by Antara



Date and Time: July 30th (Sat.) 8:00 p.m. to 8:40 p.m.
Place: Dokai Bay, around the Wakato Bridge.

- The kukioumi firework display is a summer event that lights up the skies over Dokai Bay, around the wakato bridge.
- It is one of the significant display of "sea festival of fireworks of Kuki" which represents Kitakyushu.
- A total of around 4,000 fireworks are launched, attracts around 300,000 visitors every year. And of course Kyutech students I including in this visitors list because it is just 5-minute walk from JR Tobata Station.
- Every year on July 30, 20:00 to 20:40, this fireworks lighten up the summer night.
- Music fireworks is the unique fireworks attraction of this festival.
- The magnificent music flows in the venue, with that fireworks fired beautifully.
- There is more. There is another attraction. The name of the last attraction of this festival is "Niagara Falls." As it looks like a gigantic fall of lights when it explodes.
- You can hear the opera through the speaker which will flow around you and with that you will see Niagara from the the Wakato Bridge like the light of the curtain.
- The beauty of this Niagara fall with opera in background is impressive.



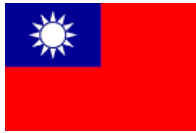
Kyutech students



Niagra Falls from Wakato Bridge

6. Installation of hardware at the Tainan (NCKU) Ground Station

Trip to Tainan -- Work and Experience



My trip to Tainan, Taiwan, 19-22 July 2016,
to install ground station hardware for the BIRDS Project,
and to explain it to the station operators

by Apiwat Jirawattanaphol

BIRDS Team Member from Thailand

5 August 2016



Kyutech presentation at NCKU Space Lab



Prof. Maeda made a presentation for SEIC program



About 10 graduate students attended the presentation



Members of PaceLab



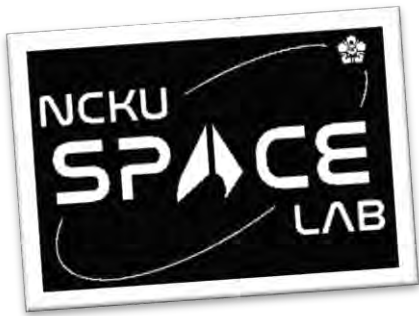
Prof. Maeda and Prof. Juang



GS Team: Kevin, me, and Rita



Apiwat explains the BIRDS GS Network



Space Lab. Clean Booth, which has PHOENIX CubeSat inside



Dr. Jordan (of France) introduced his company "Odysseus Space" to Prof. Maeda



RF Instruments



PHOENIX Team

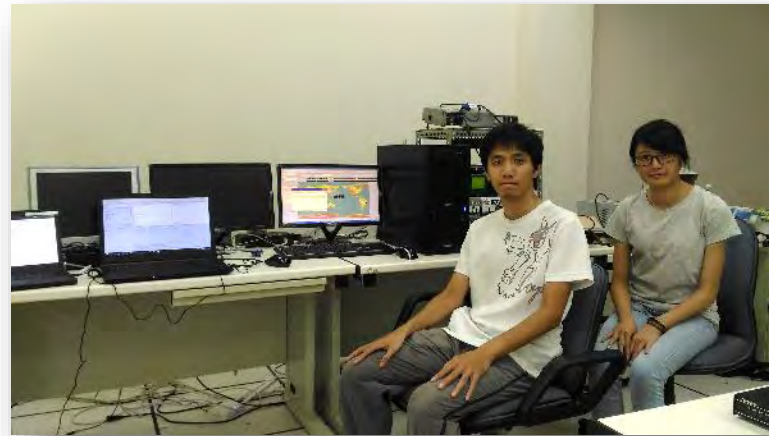
Photo from QB50 Twitter



NCKU Ground Station (GS)



GS Equipment



GS Team: Kevin and Rita



GS UHF/VHF Antenna

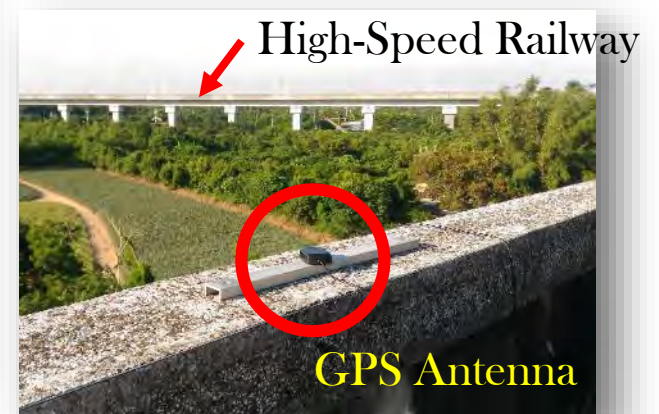


NSPO satellite dish viewed from GS



I stand with the NCKU team

NCKU GS Located near Tainan HSR Station



High-Speed Railway

GPS Antenna

TAINAN Special Scoop



Food Alley in NCKU



Post Card Shop near NCKU



TAINAN View from NCKU



Ke-bab



Green Curry Noodle



Tofu Shaved ice



Taiwan
Fast
Food
action



Dain-Dain Hamburger

Rita
and
Kevin



The TAINAN Night market

End
of the
Tainan
Report

7. Thermal vacuum testing of multiple cubesats

Development of thermal vacuum testing
method for *multiple* nano-satellites

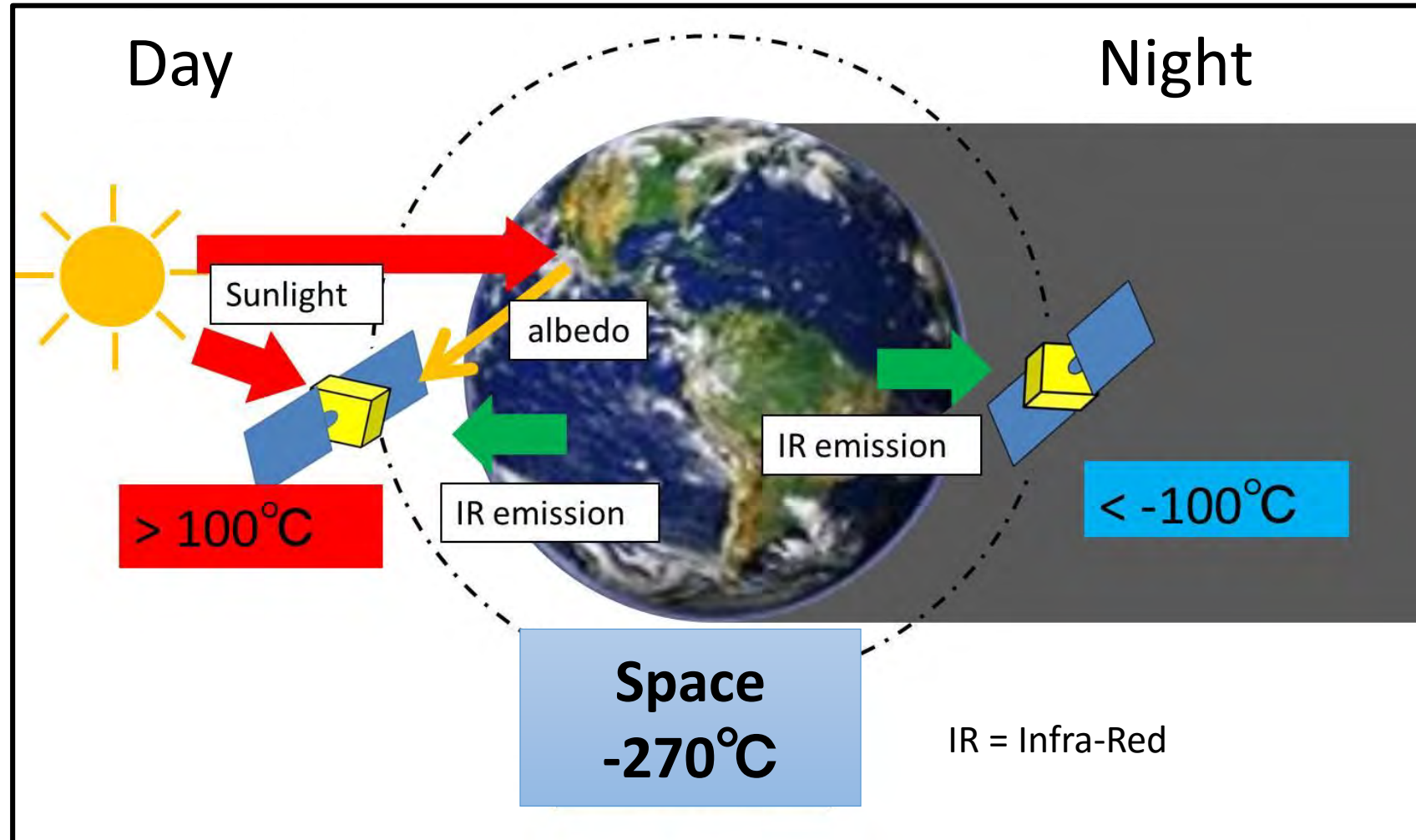
2016年8月3日

Cho Lab

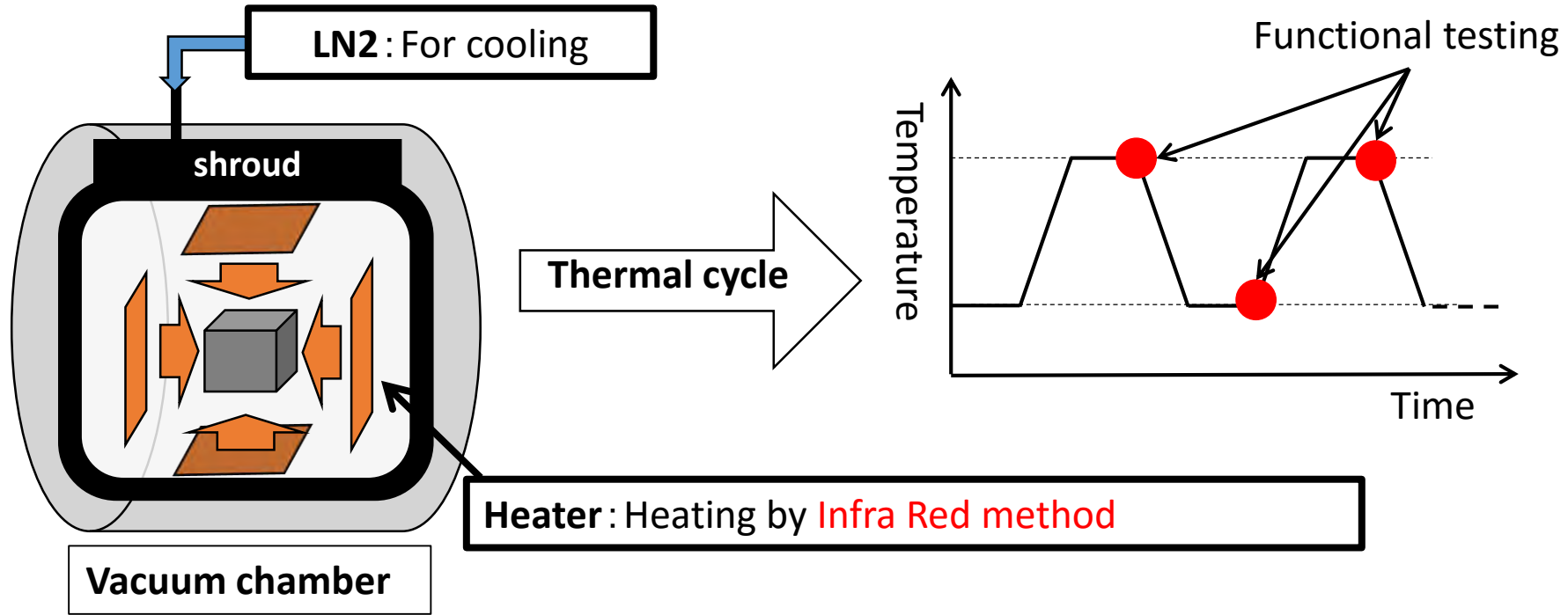
Nakamura Naoki

This is the problem we face in space

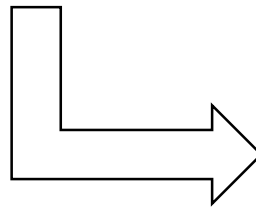
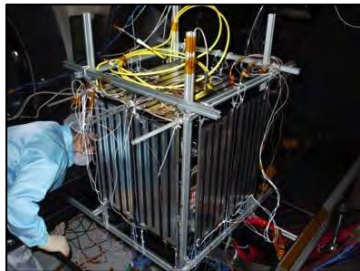
A Severe Thermal Environment



Thermal vacuum testing (for one unit)



Thermal vacuum testing of HORYU-4



One satellite takes one week of testing !

Motivation for another way . . .

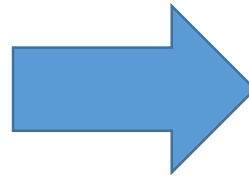
If many satellites can be tested simultaneously for thermal vacuum (TV) testing

 then significant time is saved

Ex) Schedule of TV

	October				Nov,
	1	2	3	4	1
Birds1					
Birds2					
Birds3					
Birds4					

Serial TV testing of each satellite



	October			
	1	2	3	4
Birds1				
Birds2				
Birds3				
Birds4				

Parallel TV testing

Viability or not ?

Agenda

We have some critical tasks at hand:

Devise a new thermal system

- We need to configure the heaters and satellites so that the temperature can be well controlled
- Operation should be done manually to allow careful treatment of the equipment

Devise method for functional testing

- Functional testing should be done under automatic program control. This testing is too repetitious for humans to perform.

8. Vibration Testing: Why and How?

by Adebolu Ibukun (Nigeria)



The Launch Vehicle as Design Driver

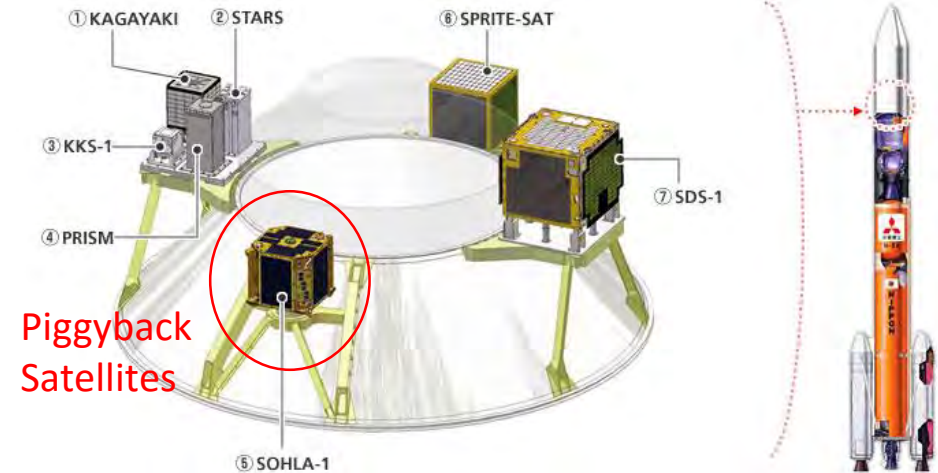
In a typical satellite project, countless resources are spent on developing a functional system and in verifying the system performance against certain set indices.

It may take as much as 5 – 7 years to develop a fully functional satellite (conventional) from the mission conception to Launch phase. A cube sat usually takes 1 – 2 years to complete.

The satellite is then delivered to the launch provider for the ride to space. *The selection of launch vehicle does not only drive the design of satellite interfaces, it also influences the strength of satellite structure and how sub-system components are arranged within the satellite*



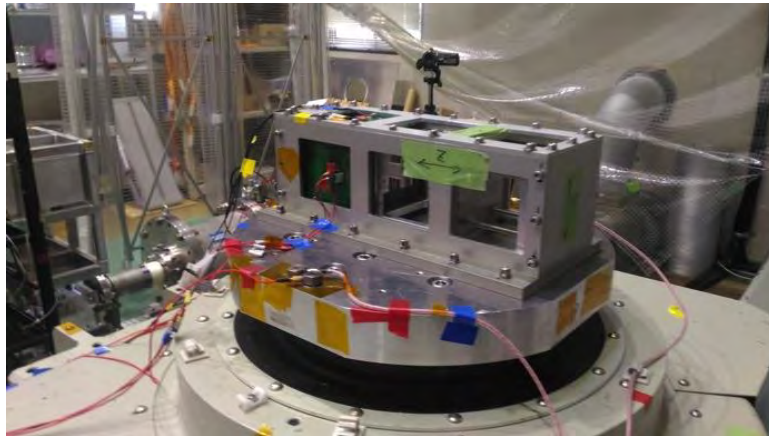
<http://global.jaxa.jp/projects/rockets/h2a/>



http://global.jaxa.jp/countdown/f15/overview/sub_payload_e.html

Vibration Testing: Why it must be done

BIRDS
Engineering
Model being
tested at
Kyutech



The launch vehicle may carry a single payload (satellite) or the main payload and smaller satellites referred to as piggybacks. Most small satellites get the ride to space as piggy backs.

A number of forces act on the payload during launch causing vibrations of different magnitude and frequencies.

The satellite is usually designed to withstand these forces with sufficient margin.

Each launch provider provides the satellite designer with a profile of loads impacted by the launch vehicle, so that the satellite can be designed to withstand such load.

Although mechanical analysis is done, mechanical (vibration) testing still remains the most reliable way of telling that the satellite will survive the launch forces

Vibration Testing: How it is done



Masui Sensei Cross-checks the test plan



Inoue San Explains Shaker Handling



BIRDS team observes the random vibration



Ghana Team Configure the DAQ

The severity of the load (vibration) applied to the satellite depends on the purpose of the test. Acceptance test levels usually apply loads representative of the launch condition. Qualification test levels however apply a reasonable margin of safety (overload) to the test article.

In order to appropriately test a satellite, it is important to first develop a test plan. The test plan is a document that shows detail test procedure, the test set-up, needed tools and equipment and test sequence.

Next, the necessary tools such as torque wrenches, drivers, accelerometers (pick-ups) and adhesives are collected for easy reach. All pick-ups are connected to the satellite body and other designated spots and the data acquisition device is configured.

The operator checks that all pick-ups work as desired and then applies a pre-programmed load profile through the control computer.

Vibration Testing: various implications

- Satellite functional test is done before and after vibration testing.
- If satellite functions normally, then it is safe to say the satellite can successfully withstand launch forces
- Very low natural frequencies (below requirement) implies very low rigidity. This means there is a high chance satellite will be broken before it gets to space. This may jeopardize the whole mission and is a safety concern for launch providers
- If satellite structure is broken or cracked, then the structure does not have sufficient strength and must be redesigned
- Loose bolts, nuts and other fasteners imply that insufficient torque was applied. Care should be taken to apply required torque when tightening fasteners
- Broken fasteners imply insufficient fastener strength. Alternative fastener should be used
- Loose joints imply insufficient fasteners used. More fasteners should be used or supplementary joining process such as use of adhesives should be implemented



END OF ISSUE NO. 7