UN/Japan Long-Term Fellowship Programme on Nano-Satellite Technologies

An update on:

Post-graduate study on Nano-Satellite Technologies (PNST)
at Kyushu Institute of Technology

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Presented on 10 June 2016, in Vienna, Austria

Outline of this talk

- Our UN collaboration: UNOOSA Programme Mandate and Activities
- Our university: Kyushu Institute of Technology
- Our group: Laboratory of Spacecraft Environment Interaction Engineering (**LaSEINE**)
- A training method: HORYU Series Legacy at Kyutech
- Our new training method: the BIRDS Project
- Innovative education scheme: SEIC (Space Engineering Int'l Course)
- UN + Kyutech: PNST (Post-graduate study on Nano-sat Technologies)

UNOOSA Programme Mandate and Activities

(United Nations Office for Outer Space Affairs)

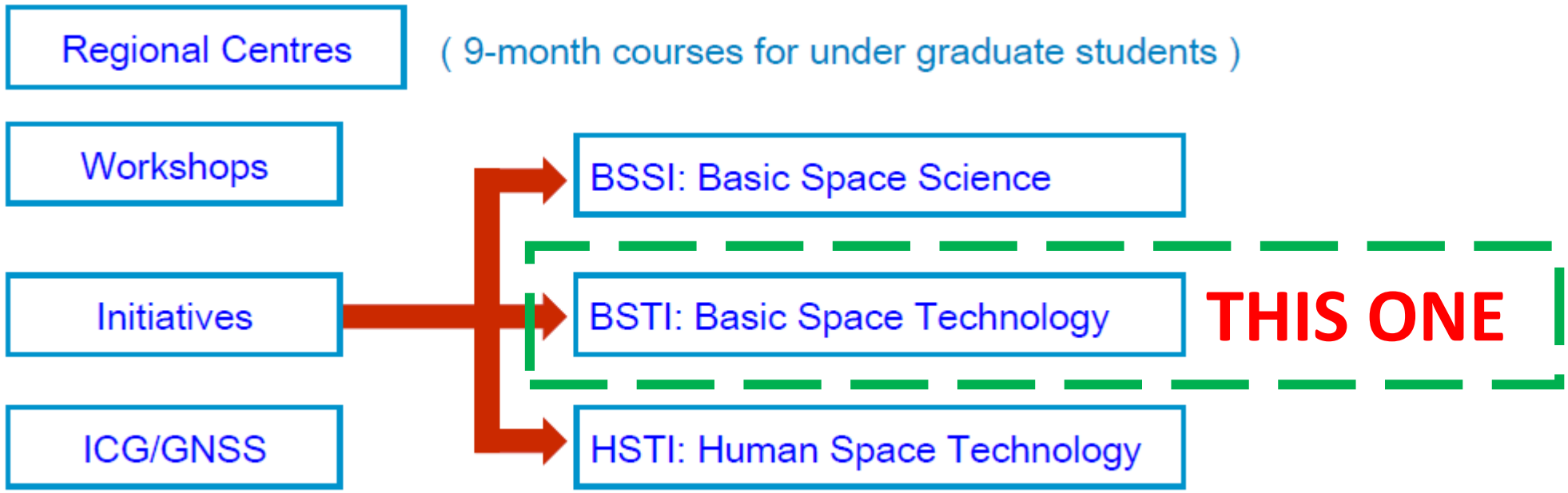
Mandate

A. International Cooperation
B. Capacity Building
C. Dissemination of Information
D. Technical Advisory Services

UNOOSA Programme Mandate and Activities

Activities

UNITED NATIONS
Office for Outer Space Affairs



United Nations General Assembly Resolution 37/90 (§7), http://www.unoosa.org/oosa/en/SAP/mandate.html

UNOOSA Programme Mandate and Activities

Fellowship Programmes

http://www.unoosa.org/oosa/en/ourwork/psa/fellowships.html

Today's talk is about this

UN/JAPAN LONG-TERM FELLOWSHIP PROGRAMME ON NANO-SATELLITE TECHNOLOGIES

Kitakyushu, Japan

UN/ITALY LONG-TERM FELLOWSHIP PROGRAMME ON GNSS AND RELATED APPLICATIONS

Torino, Italy

FELLOWSHIP PROGRAMME FOR THE DROP TOWER EXPERIMENT SERIES (DROPTES)

Bremen, Germany

Kyushu Institute of Technology ("Kyutech")

- **Founded in 1909**
  - 4,400 Undergraduate students
  - 1,700 Graduate students
  - 370 Academic staff
  - Engineering, Computer science, Life-sciences

The Main Gate
for the Tobata Campus

Our laboratory
(LaSEINE) is in this building.

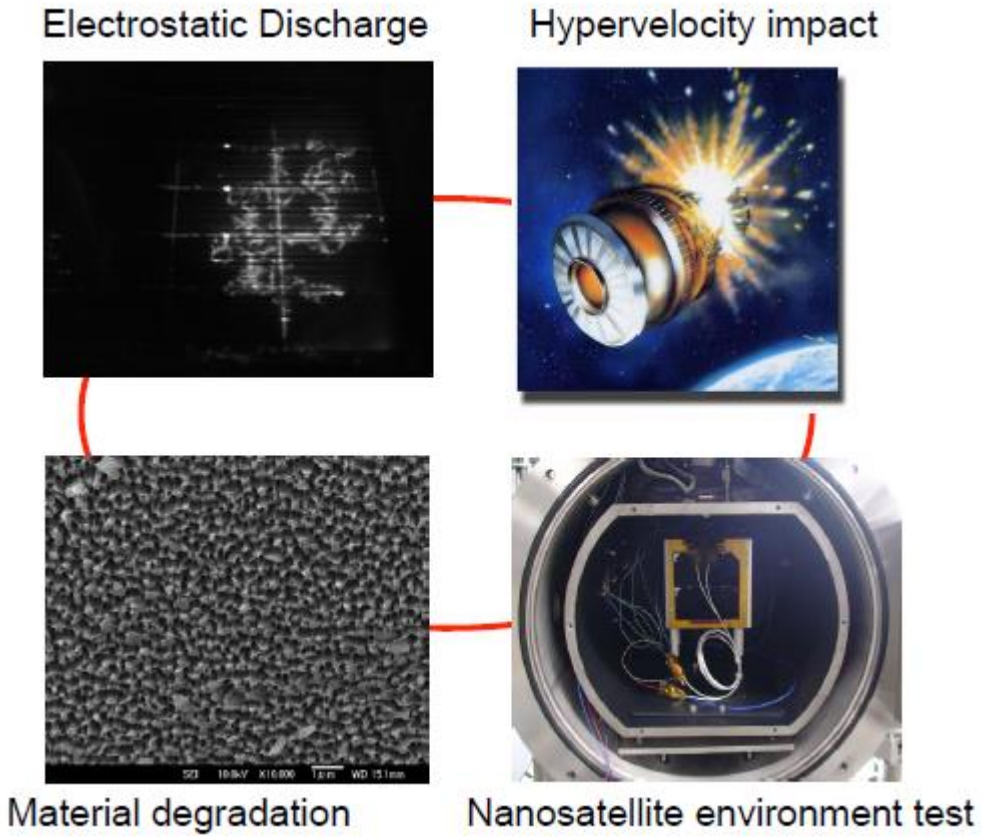
Kyutech
Kyushu Institute of Technology

Our logo

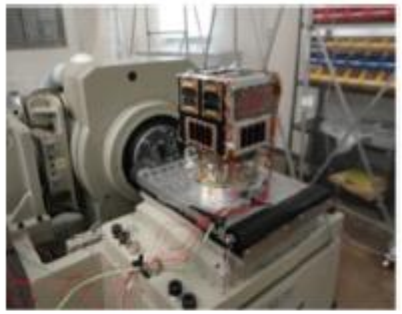
Laboratory of Spacecraft Environment Interaction Engineering

Director
Professor Mengu Cho

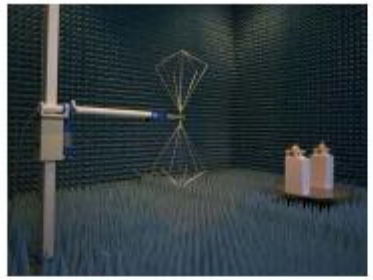
- Inauguration: December 2004
- 11 academic staff
- Partners
  - Space agencies
  - Space industries
  - Local small industries
  - International institutions



Center for Nanosatellite Testing (CeNT)



Vibration



EMC & Antenna pattern

Pressure & Leak

Thermal vacuum

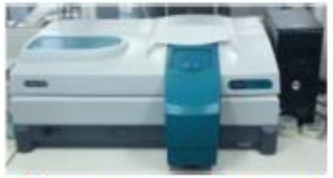
Assembly & Integration

Vacuum thermal shock

Thermal cycle

Shock

Outgas (ASTM E595)



α&ε measurement

Center for Nanosatellite Testing (CeNT)

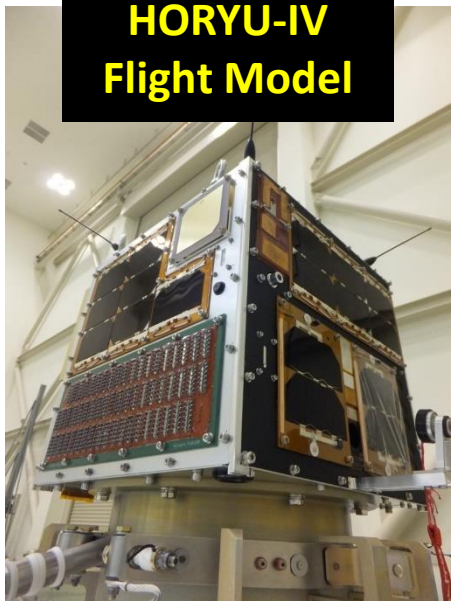
- ✓ Capable of all tests up to satellite size 50 cm, satellite mass 50 kg

- ✓ Of all the nano-satellites (under 50 kg) produced in Japan each year, CeNT tests around 70 percent of them

HORYU Series Legacy at Kyutech

As a university, our main mission is to educate young people – so that in the future they will expand the frontiers of space technology/exploitation as innovative engineers and as dynamic leaders.

Our belief is that the best way to achieve the above is to have students engage in actual satellite development – from design, to construction, to testing, to on-orbit operation. At LaSEINE, we developed the HORYU Series of nano-satellites for that purpose.

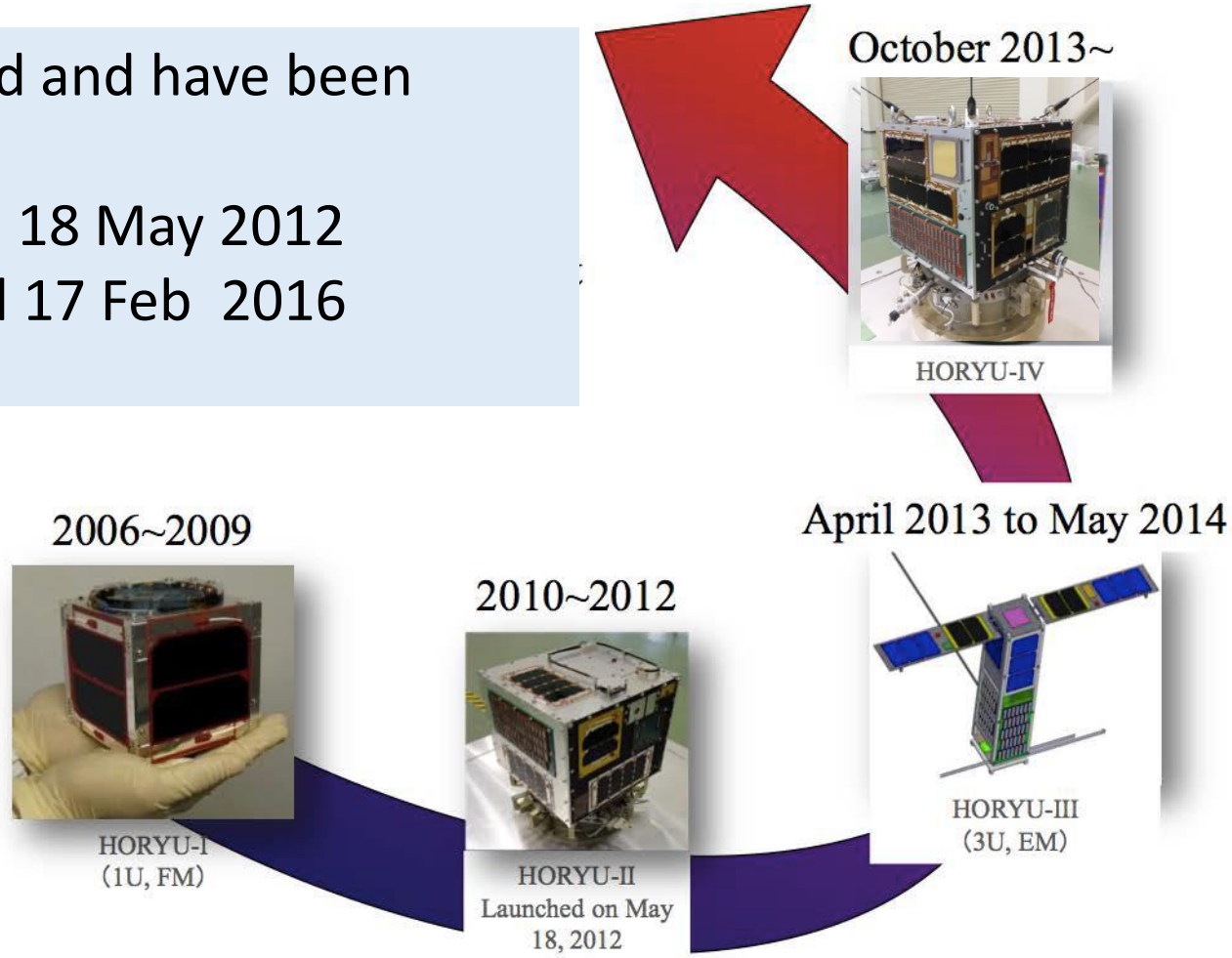


HORYU Series Legacy at Kyutech

Two have been launched and have been successful:

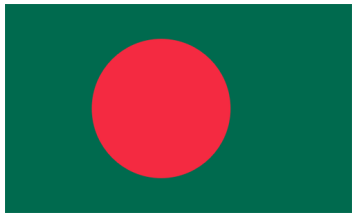
HORYU-II Launched 18 May 2012

HORYU-IV Launched 17 Feb 2016



Mission results have been published in globally-recognized journals such as AIAA and IEEE.

Bangladesh

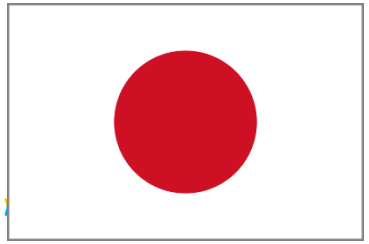


Nigeria

Mongolia

Ghana

Japan



The BIRDS Project

The world's first constellation of multi-national university CubeSats.

Main purpose: To train engineering graduate students of four non-space-faring nations (plus Japan) to design, build, test, launch, and operate, the first space-borne satellites of their respective countries.

The BIRDS Project – Team Members

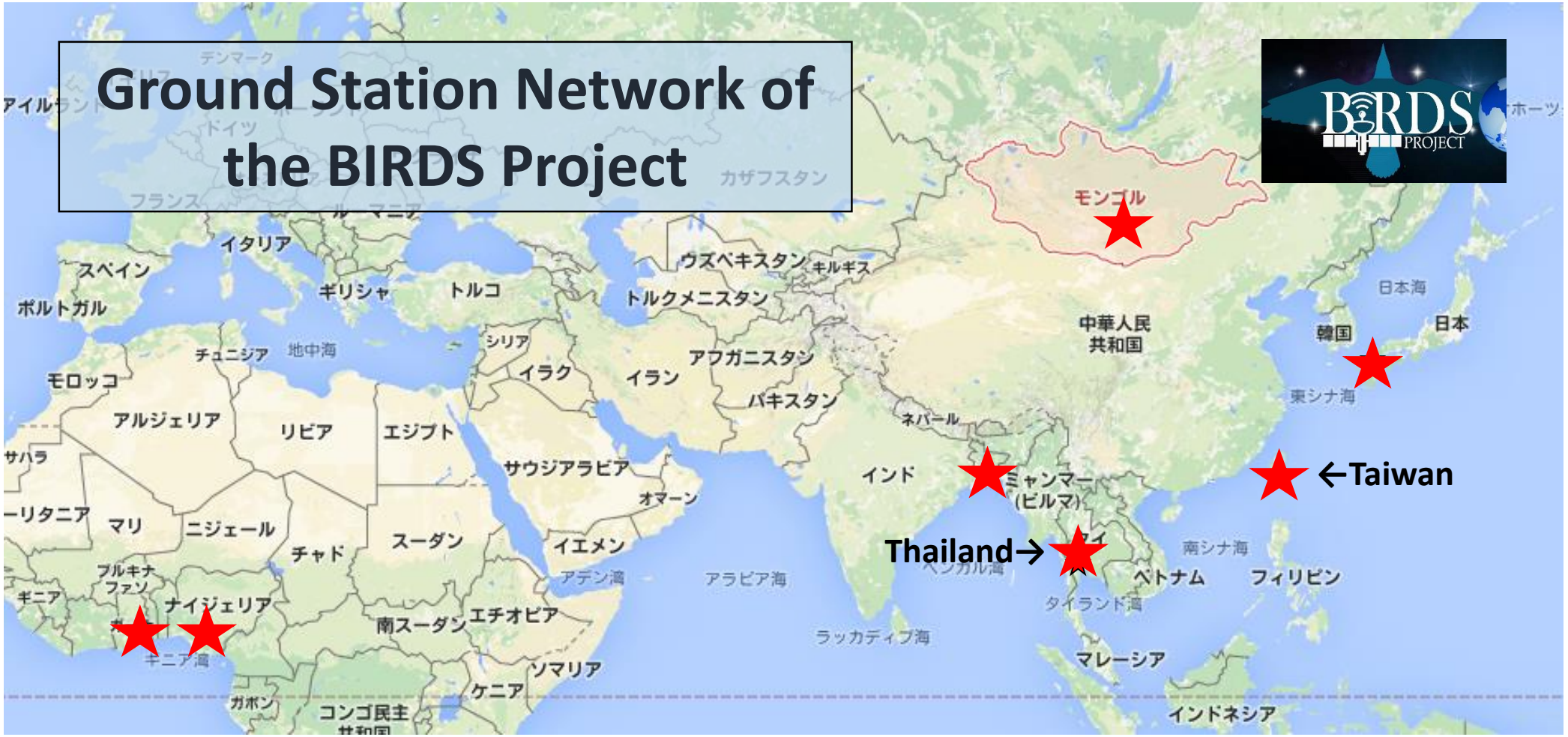
Country	Members
Japan	Nakamura, Shigyo, Tokunaga
Ghana	Benjamin, Ernest, Joseph
Mongolia	Erka, Turo, Amar
Nigeria	Taiwo (Project Manager), Ibukun
Bangladesh	Maisun, Antara, Kafi
S T A F F	Cho, Masui, Kim, Khan, Maeda

A lean and mean fighting machine.

The BIRDS Project – Key Traits

- Kick-off to On-orbit operation must be under 2 years (to fit into the two-year program of a Master's degree)
- Very low-cost launch (via International Space Station)
- The students come up with a common design, which is confirmed at CDR (end of June 2016)
- With the common design, each national team builds their own CubeSat
- Their respective home universities install and operate a BIRDS ground station
- There are two non-BIRDS nations providing ground stations: Taiwan and Thailand – this network is shown in the next slide

Ground Station Network of the BIRDS Project



The **red stars** designate the ground stations. From West to East :
Ghana, Nigeria, Bangladesh, Thailand, Mongolia, Taiwan, and Japan

These are the multi-nation engineering students of the BIRDS Project ….

Space Engineering International Course

Where SEIC students have come from since April 2013

Country	Number of Students		Country	Number of Students	
	Total	Current Students		Total	Current Students
Japan	24	16	Philippine	1	1
Vietnam	6	4	Peru	1	1
Nigeria	5	4	Palestine	1	1
Mongolia	3	3	Malaysia	1	1
Ghana	3	3	Indonesia	1	1
Bangladesh	3	3	Costa Rica	1	1
Ukraine	2	2	Columbia	1	1
Mexico	2	2	Algeria	1	1
Egypt	2	2	France	1	0
Turkey	1	1	Sudan	1	0
Thailand	1	1	Singapore	1	0
Romania	1	1			

※ Current students (February 2015)

Currently: 34 students from overseas, and 16 students from Japan

Space Engineering International Course

- Anyone with a bachelor's degree in engineering or physics is eligible
- Should have a profound interest in space-related affairs
- SEIC is taught in English
- SEIC leads to a masters degree or a Phd in a field related to space engineering
- Training is done by "hands on" approach through projects and lab work
- *Kyutech desires that SEIC graduates go back to their homelands and start national satellite programs in their respective countries – in line with the* **UNOOSA Programme Mandate**.

Space Engineering International Course

Masters Degree: takes 2 years.

Doctoral Degree: takes 3 years.

Cost: about US$25,000 per year.

(half for living costs; half for misc., such as tuition)

However, we have a joint Kyutech/UN fellowship program called PNST. PNST fellows have all their expenses covered by this special program that targets students from non-space-faring nations.

Post-graduate study on

Nano

Satellite

Technologies

UNITED NATIONS
Office for Outer Space Affairs

P N S T

The application season runs from September to January – extensively promoted by UNOOSA and Kyutech through various international networks. Application is entirely web-based. **Just do a Google search on "UNOOSA PNST".**

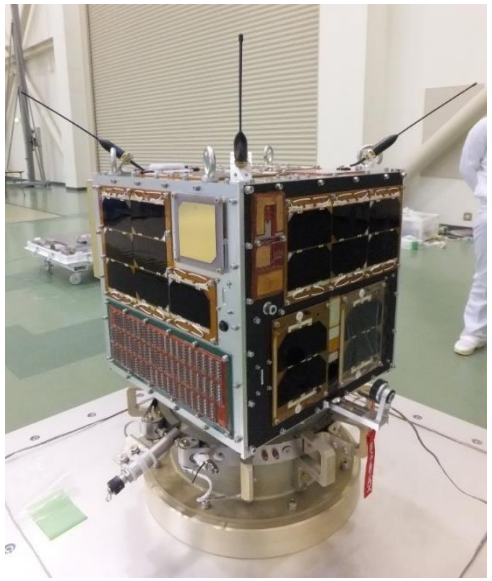
Through a time-tested screening process,
each year,
6 applicants are accepted as PNST Fellows.

(Four for Phd, and two for Masters)

P N S T

What we look for:

- *Passion* to be engaged in space technology (determined through original essay at the first stage, and through Skype interview at the second stage)
- Good English skills
- Must be under age 35
- Must be from a non-space-faring nation
- Strong background in engineering – any field is OK



HORYU-4 of Kyutech; launched 17 Feb 2016 and now performing well in space.

P N S T

Today, immediately after my talk, a PNST graduate from Sudan will talk about her PNST and Kyutech experiences. She graduated last year September, and now works at **ISRA (Institute of Space Research and Aerospace)** in Khartoum, Sudan.

Hala Almubarak
(2015 PNST Graduate)

Conclusion – what we hope to achieve

- Enable more nations to become space-faring nations – so that they can participate in the exciting world of space exploration and space exploitation
- The first essential step is **Capacity Building** (train their engineers)
- The next step is to support them when they return to their homelands
- One form of sustainable support is an *alumni network* – then, they can help each other

Thank you for your attention.

UNOOSA Officer (Dr. W. Balogh) with Kyutech PNST students on 25 January 2016.
Location: Kyutech.