

Expansion of the United Nations/Japan Long-term
Fellowship Programme on Nano-Satellite Technologies
Hosted by the
Kyushu Institute of Technology, Japan
~Post-graduate study on Nano-Satellite Technologies (PNST)~

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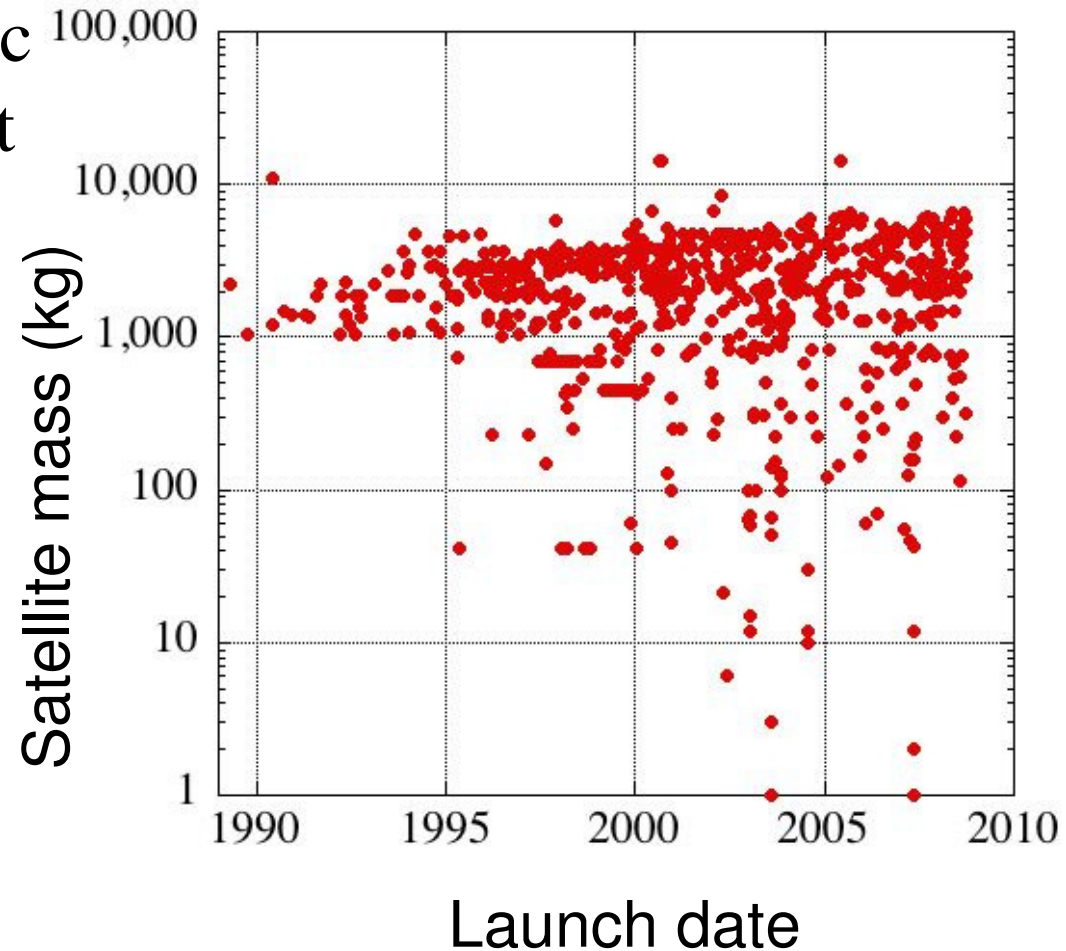


Background



Background

- Interest in capabilities for basic space technology development
- Satellites affordable even to universities and smaller institutions
- Small space enterprises from university-based satellite projects



Background

- Presentation of UN Basic Space Technology Initiative (BSTI) at 27th International Symposium on Space Technology and Sciences, Tsukuba, Japan in 2009
- **Mission**
 - To enhance access to space application tools for sustainable development through building capacity in basic space technology
- **Objectives**
 - Respond to the growing **interest in many countries to establish indigenous capacities in basic space technology**
 - Promote **international cooperation and information exchange** in capacity building in basic space technology
 - Others

KIT answered the call for collaborations made by UN



Needs of Long-term Fellowship for Capacity Building

- Reading books or attending lectures can not make a satellite
- Experience the complete cycle of designing, building and testing
 - Even better with launching and operating
 - Learn through the failures during the tests and the efforts necessary to correct the defects
- **Long-term** fellowship to support students studying abroad and gaining experience through *on-the-job training (OJT)*
- Learn to *think and be innovative*
 - Participate in a satellite project *as a team member not as a guest*
 - Experience necessary to *build a facility from scratch* in home country
 - **University-like environment** is more suitable than well-prepared comfortable institutions, such as space agencies or industries



Introduction of KIT



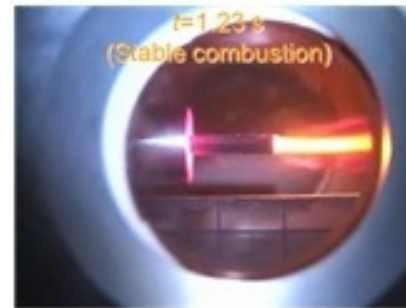
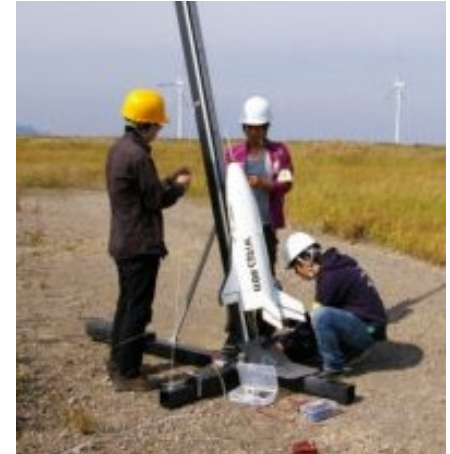
Kyushu Institute of Technology

- Founded in 1909
 - 4,400 Undergraduate students
 - 1,700 Graduate students
 - 370 Academic staff
 - Engineering, Computer science, Life-science
- Located in the Kitakyushu region
 - Population of more than 1million



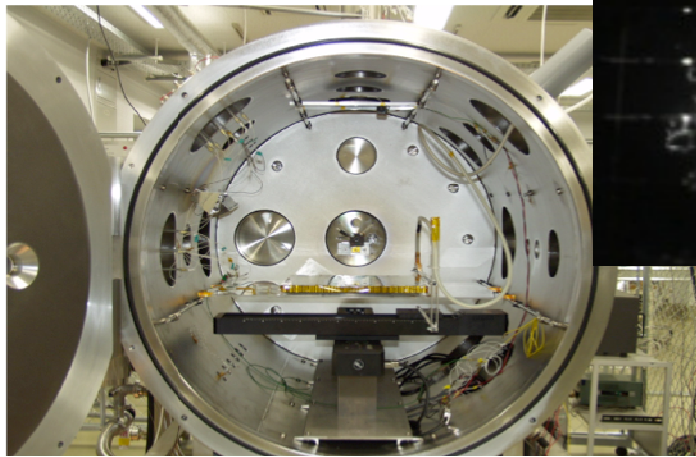
Space Engineering Research and Educations at KIT

- Space Engineering Education at Tobata Campus since 1993
 - Undergraduate (30 students/class) and graduate levels
- Laboratory of Spacecraft Environmental Interaction Engineering
 - Established in 2004
- Center for Nanosatellite Testing
 - Established in 2010
- Member of International Astronautical Federation (IAF) since 2011

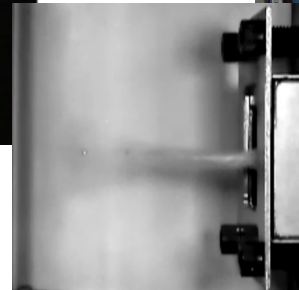


Laboratory of Spacecraft Environment Interaction Engineering

- Capability for various spacecraft environment tests
- Various joint researches with domestic/international industry and agencies
- Leading multiple international standardization (ISO) efforts



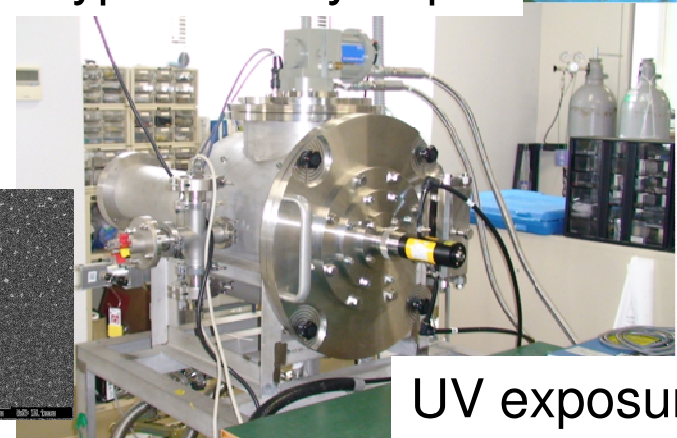
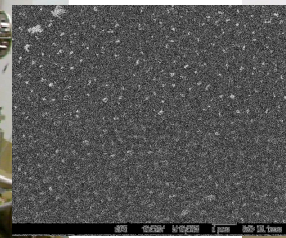
Spacecraft Charging and electrostatic discharge



Hypervelocity Impact



Atomic oxygen exposure

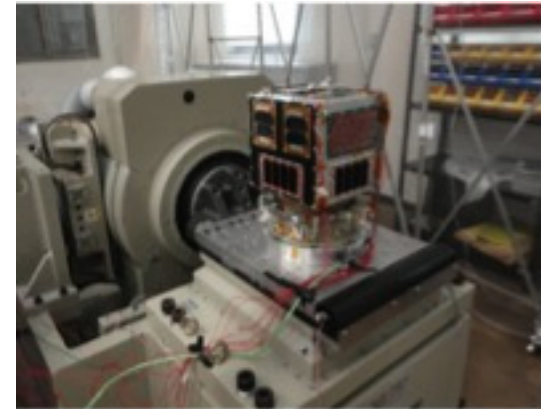


UV exposure

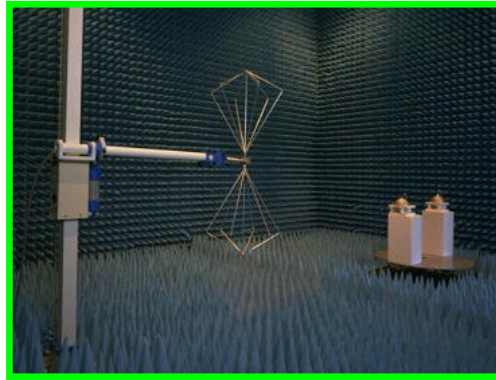


Nano-satellite environment tests

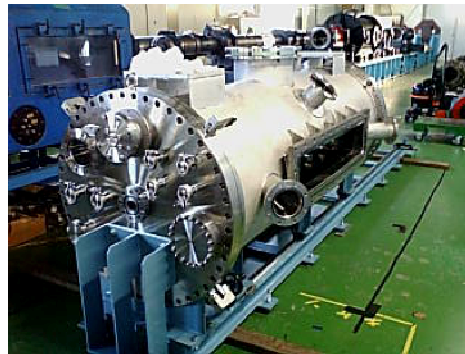
To be capable of doing all the tests for a satellite up to 50cm, 50kg



Vibration



EMC & Antenna pattern



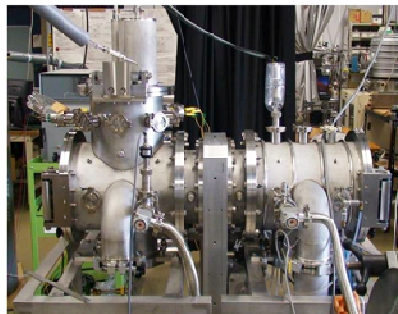
Pressure & Leak



Thermal vacuum



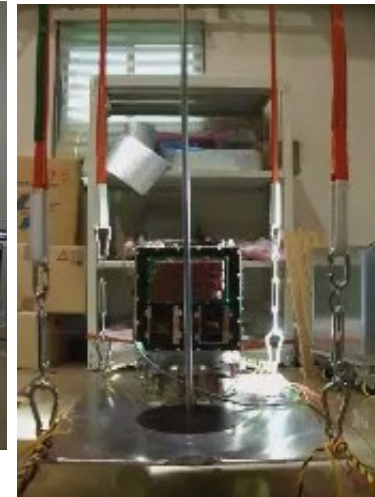
Assembly & Integration



Vacuum thermal shock



Thermal cycle



Shock



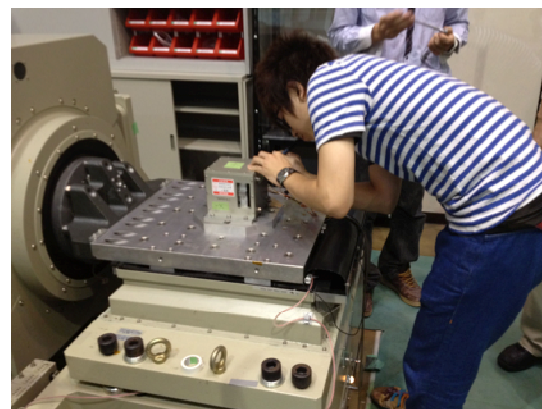
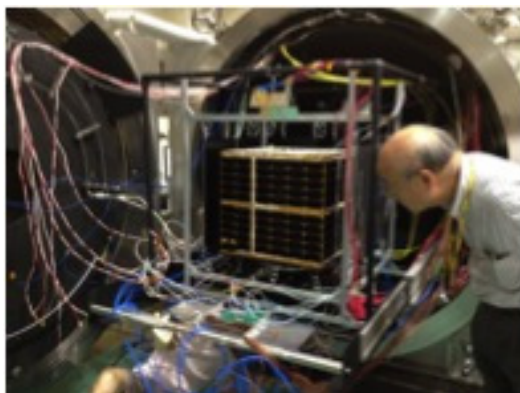
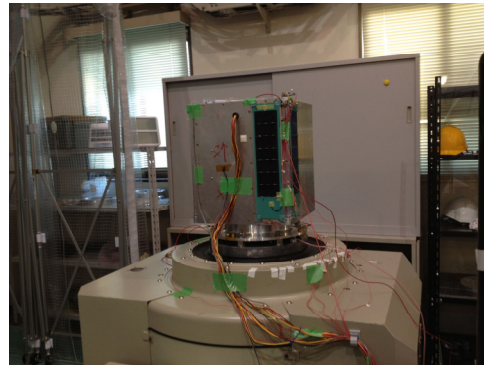
Outgas
(ASTM E595)



α & ϵ measurement

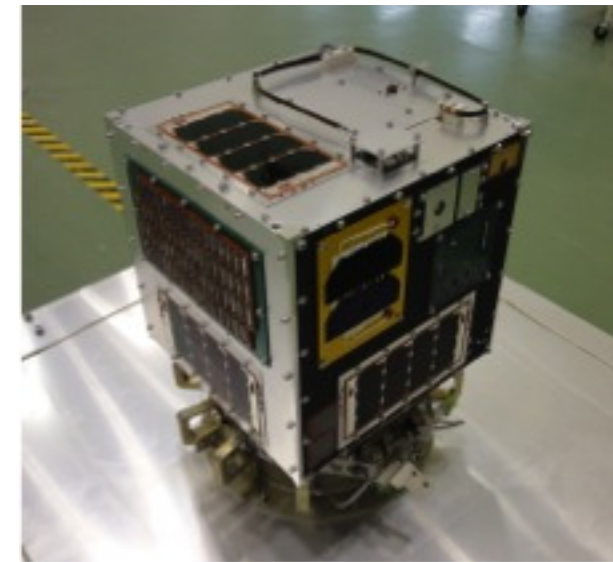
Center for Nanosatellite Testing

- Established in 2010
- Provides all the environmental test services except radiation for :
 - Nanosatellites up to 50cmx50cmx50cm and 50kg
 - Equipment worth more than 2 million US\$
- Tested or testing 15 nano-satellites for Japanese universities or industries



KIT satellite project

- KIT nanosatellite project
 - 25 graduate and undergraduate students working together
 - Responsible for all the processes
 - Conceptual study, design, fabrication, testing and operation
- Official educational program for graduate students
 - Learn systems engineering and project management
 - Writing a Ph.D thesis
 - Extract a state-of-the-art research element from the project work



HORYU-II

(Launched on May 18, 2012)



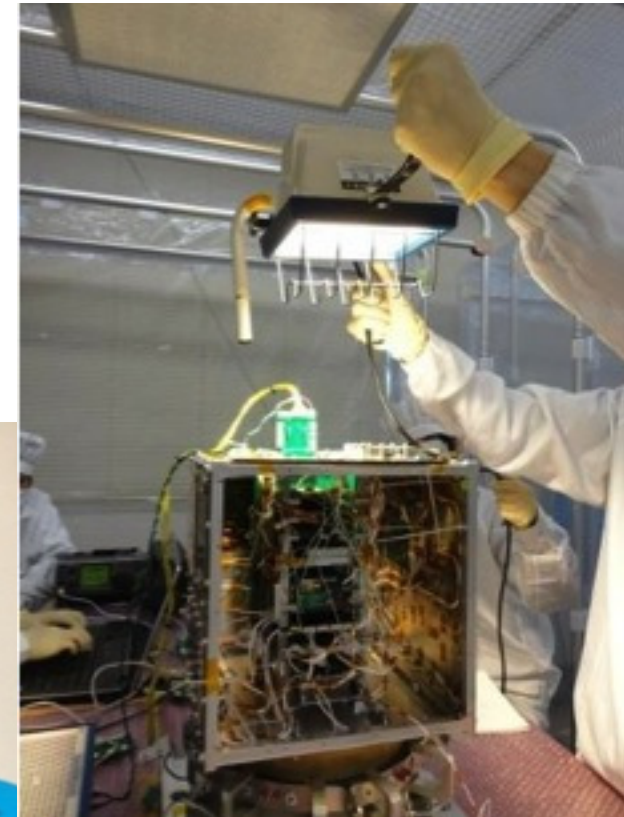
Motivation

- KIT's motivation for UN/Japan Long Term Fellowship
 - Contributing to humanity through space engineering education for international students and promotion of peaceful use of outer space
 - Recruiting excellent students from all over the world
 - Providing a multicultural learning environment to Japanese students
 - Strengthening Space Engineering research



On-the-Job Training

KIT can offer on-the-job training opportunities to those who want to start their own space program in their home country



Introduction of Post-graduate study on Nano-Satellite Technologies (PNST) program



DNST Fellowship(2011, 2012)

- United Nations/Japan Long-term Fellowship Programme on nano-satellite technologies
 - Doctorate in Nano-satellite Technologies (DNST)
 - **2 students** accepted every year since October 2011
- KIT provides financial support to students entering Doctorate programme (3 years)
 - Living expense 80,000 yen/month
 - Exemption from the tuition and entrance fees
- Extensive research opportunities in core technologies for nanosatellite system development
 - **Especially infrastructure, such as testing**



DNST fellowship (2011, 2012)

- September, 2010
 - Exchange of diplomatic documents between Japan and UN
- Selection for the class of 2011
 - 36 applications from 18 countries**
 - Mongolia (Vibration Testing)
 - Egypt (Onboard Computer)
- Selection for the class of 2012
 - 39 applications from 25 countries**
 - Nigeria (Power System)
 - Thailand (Orbital Dynamics)
- DNST students are engaged in Ph.D. research and the satellite project



Program Expansion (2013~)

- **Post-graduate study on Nano-satellite Technologies (PNST)**
- Number of fellowships
 - 2 → 6 (2 for Master and 4 for Doctor course)
- MEXT (Japanese government) fellowship
 - Support of living expense
 - 80,000yen/month → approx. 145,000 yen/month
- Exemption from the tuition and entrance fees by KIT
- Space Engineering International Course (SEIC)
 - Post-graduate curriculum in English
 - Master (2 years) and Doctorate (3 years)

These changes apply from the class of 2013 (starting Oct. 2013)



Space Engineering International Course (SEIC)

- To be started in April 2013 at Graduate School of Engineering, KIT
- Research toward a Master or Doctoral degree
- On-the-job training such as space environment testing workshop
- Project Based Learning (PBL) through a space project
- Lectures in English
 - Space Systems Engineering, Satellite Engineering, Space Environment, Environment Testing, Power System, Structure and Material, Dynamics, Propulsion, Plasma, Semi-conductor, and more



How to apply?

Application package:

<http://www.unoosa.org/oosa/en/SAP/bsti/fellowship.html>

or google “BSTI fellowship”

The application deadline is February 28, 2013

For further details, please contact

cho@ele.kyutech.ac.jp (KIT)

werner.balogh@unoosa.org (UN)



Conclusions

- United Nations/Japan Long-term Fellowship Programme on nano-satellite technologies
 - Provides hands-on experience necessary to build capabilities in basic space technology, especially infrastructure building through testing of nano-satellites
 - Furthers worldwide nano-satellite development efforts
- The classes of 2011 and 2012 have been quite successful
 - Strong worldwide interests proven (nearly 40 applications)
 - The programmes will be expanded from the class of 2013
 - **The application is due February 28, 2013**

Goal

Promote the peaceful and innovative use of outer space with the participation of a larger number of countries for the benefit

