Laboratory of Spacecraft Environment Interaction Engineering (LaSEINE) and Center for Nanosatellite Testing (CeNT)

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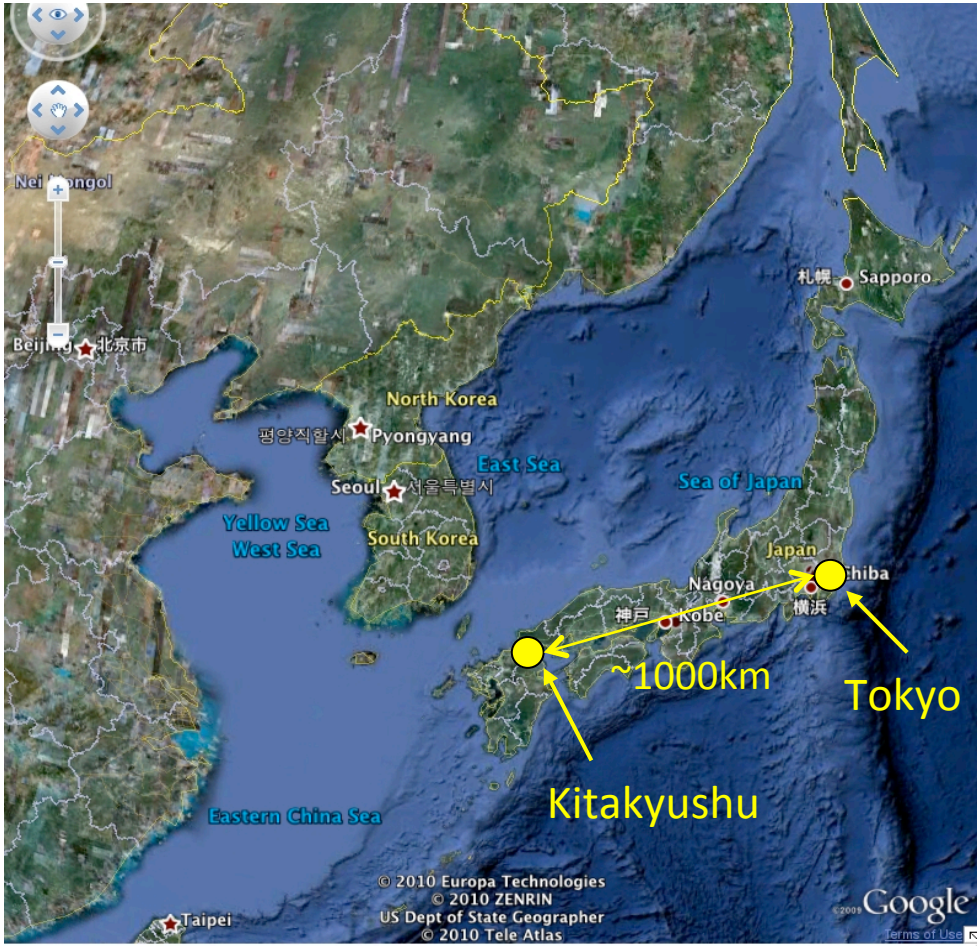
Tokyo, Japan

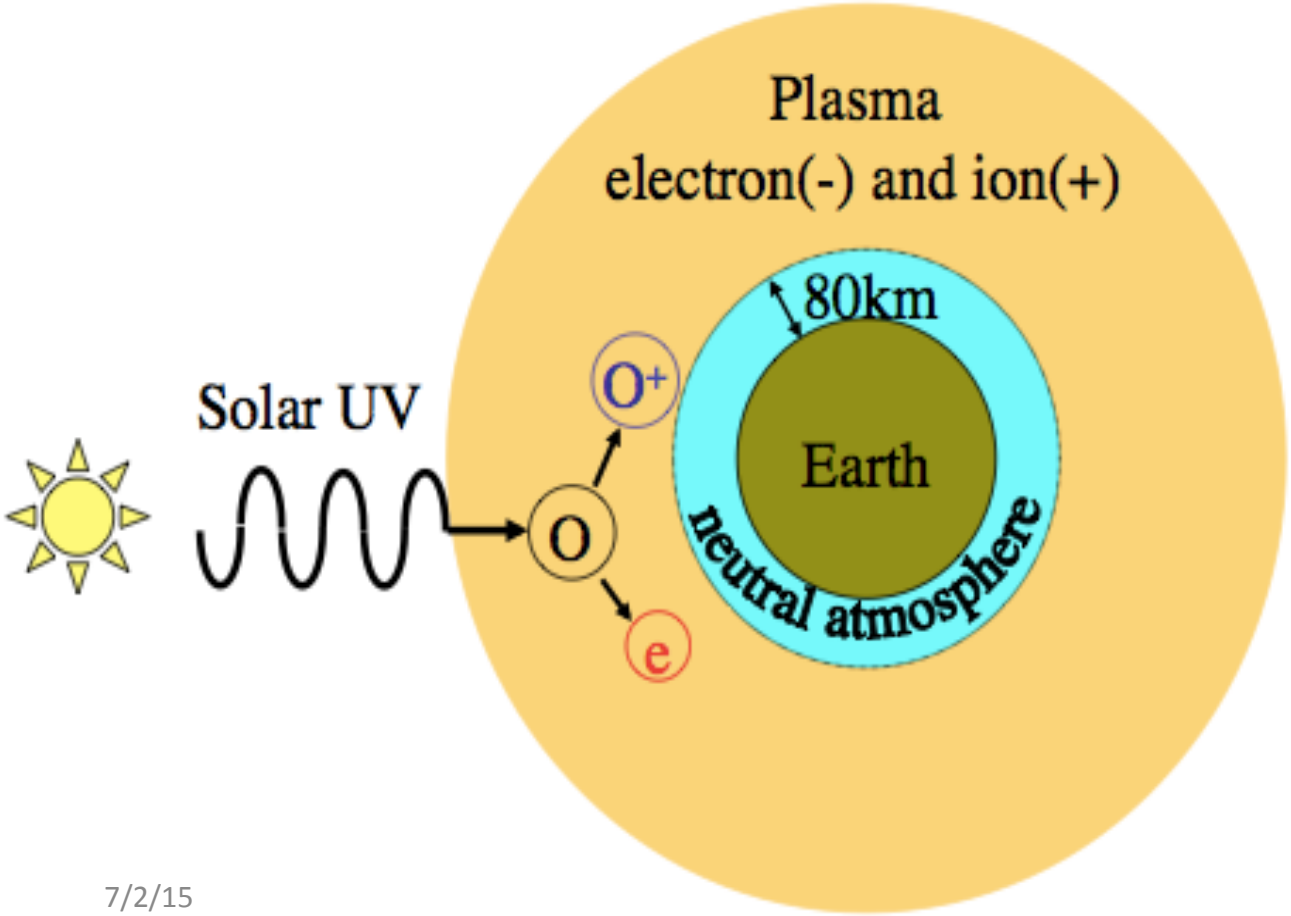
Kyushu Institute of Technology (Kyutech)

- 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 Plasma and charging

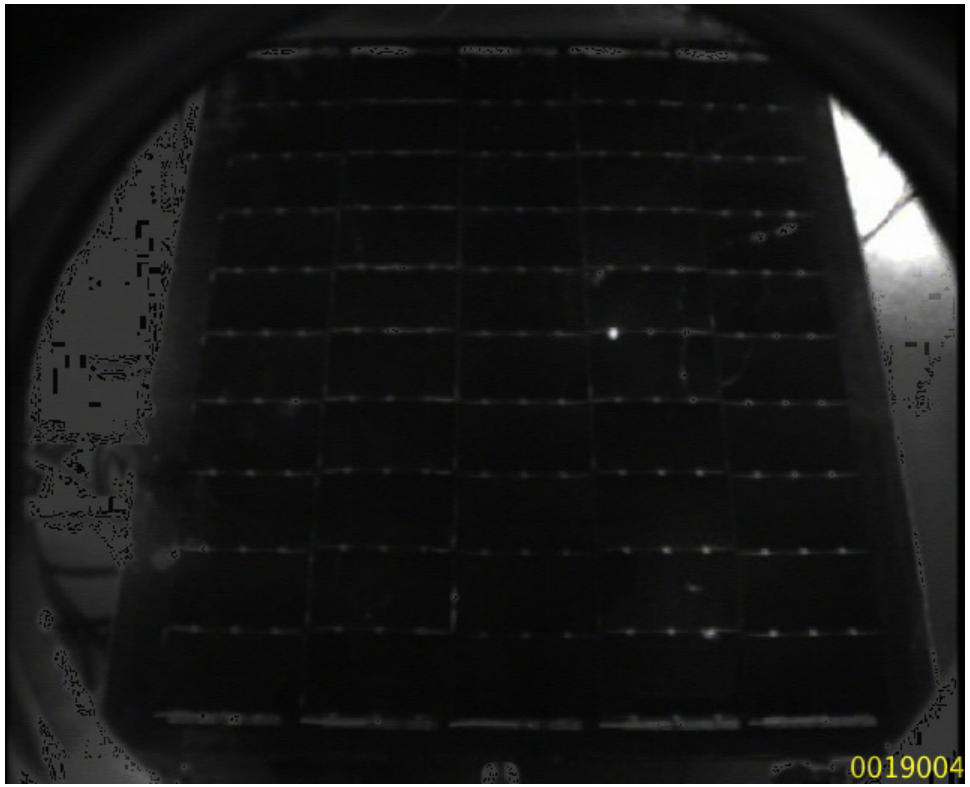
- Space is filled with plasma (ions and electrons)
- Stars, solar wind, planetary exospheres, etc.
- Electrical resistivity in LEO similar to sea water (~ 0.1 Ω•m)

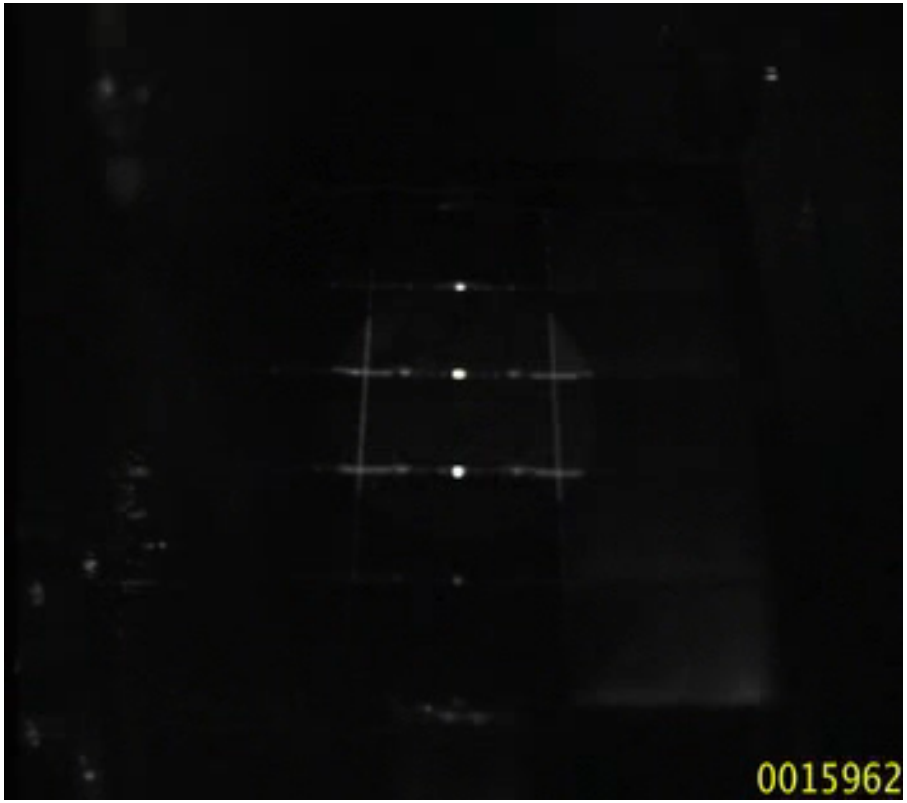


Spacecraft charging will occur in space plasma environment

Charging and Arcing in Plasma

- Arcing videos:





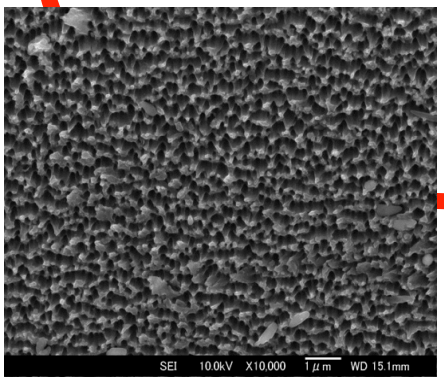
Laboratory of Spacecraft Environment Interaction Engineering (LaSEINE)

La SEINE

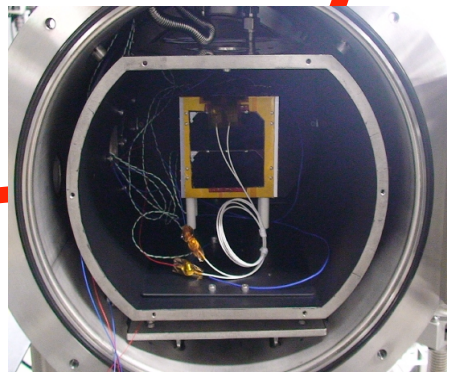
- Inauguration: December 2004
- 11 academic staff
- Partners
  - Space agencies
  - Space industries
  - Local small industries
  - International institutions

Electrostatic Discharge

Hypervelocity impact



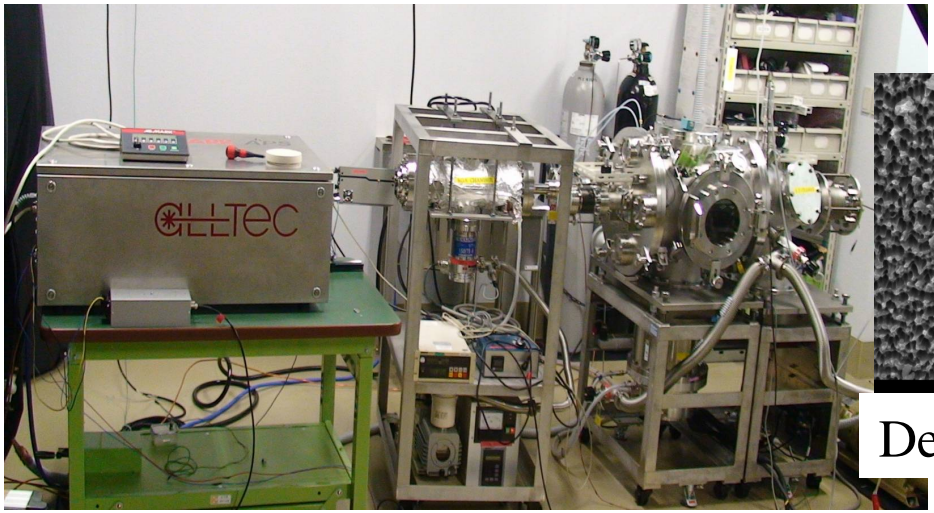
Material degradation



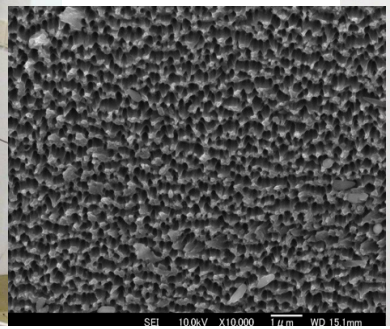
Nanosatellite environment test

Material degradation

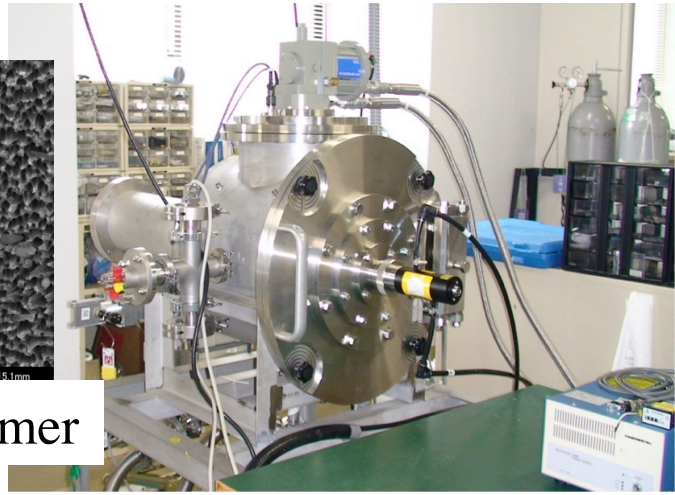
One of three spacecraft material research facilities in Japan



Atomic oxygen exposure



Degraded polymer



UV exposure

Thermal cycle exposure

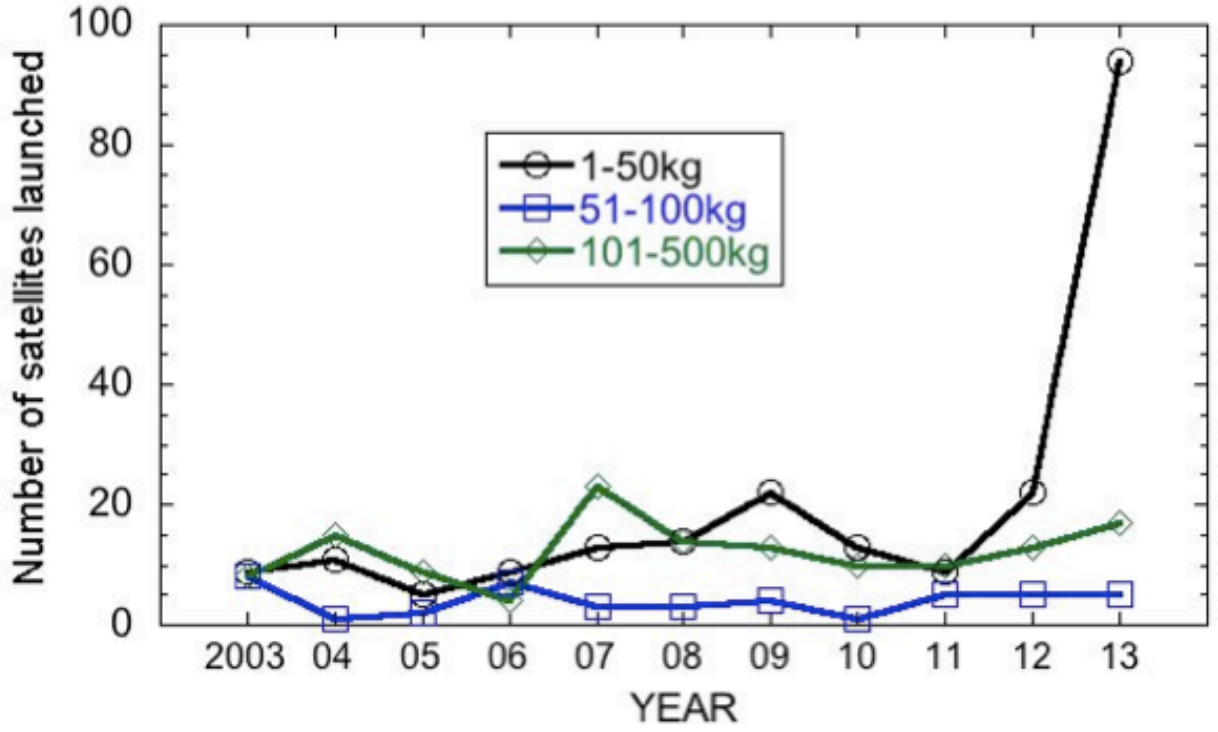
Thermo-optical property

Electron emission property measurement

Mechanical property measurement

Increasing launch demand

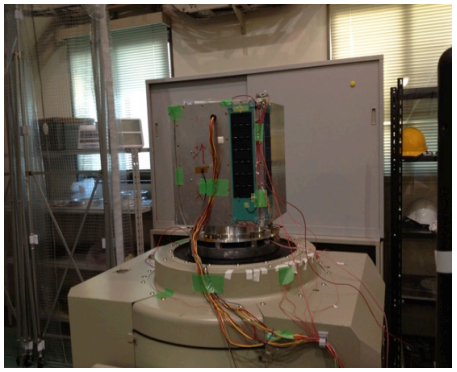
- Growing demand for capabilities for basic space technology development
- Satellites affordable even to universities and smaller institutions

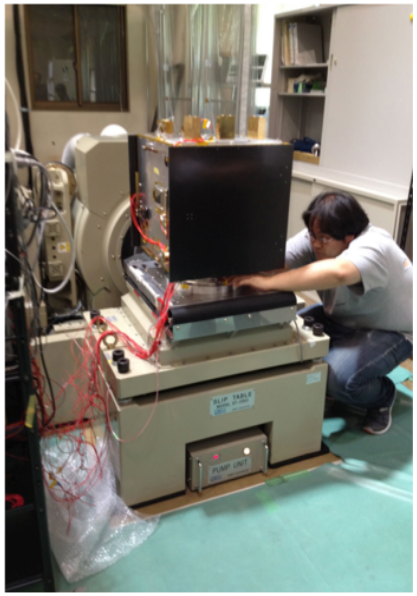


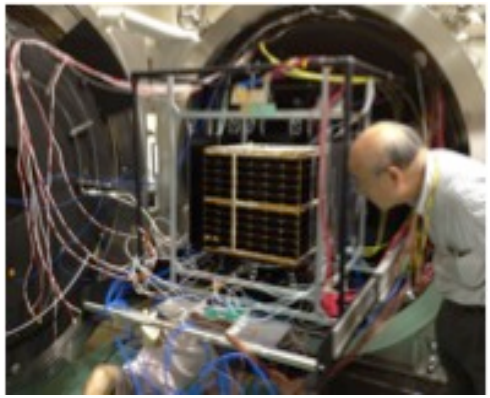
Satellites less than 50kg launched per year has spiked dramatically

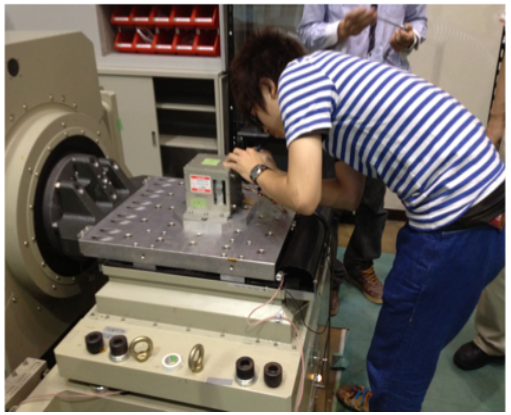
Center for Nanosatellite Testing (CeNT)

- 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 20 nano-satellites for Japanese universities or industries



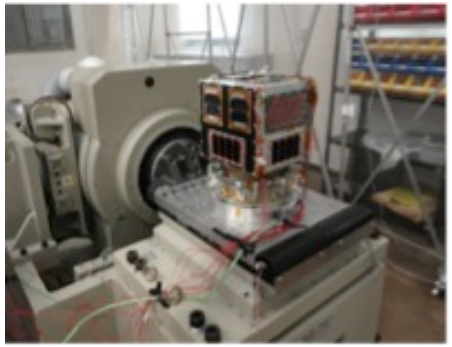




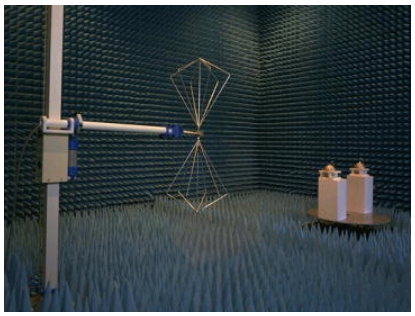


CeNT Test Equipment

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



Vibration

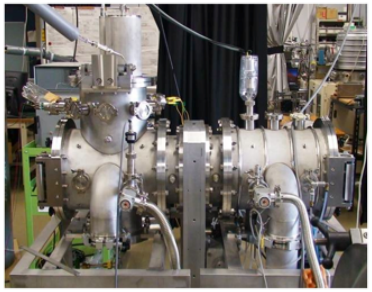


EMC & Antenna pattern

Pressure & Leak

Thermal vacuum

Assembly & Integration



Vacuum thermal shock

Thermal cycle

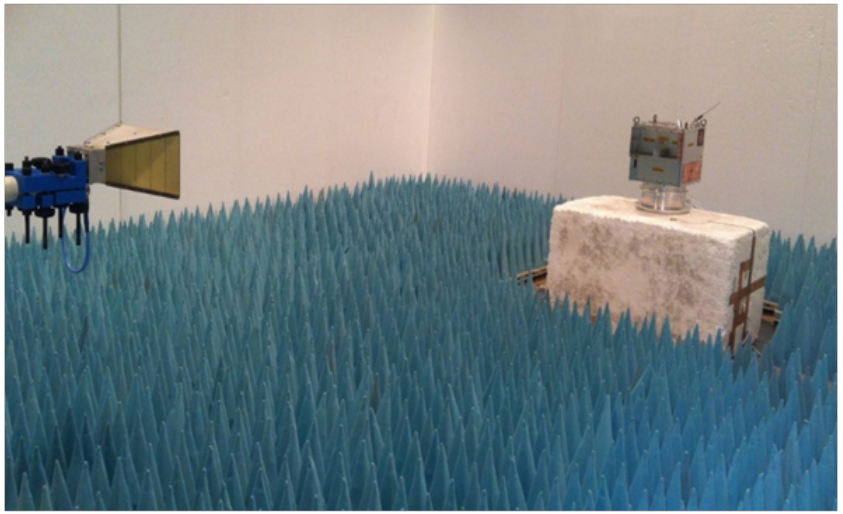
Shock

Outgas (ASTM E595)

α&ε measurement

Joint Research

1. Space environment research: Ground-based or Space-based
   a. Charging and ESD
   b. Hypervelocity impacts
   c. Material degradation
   d. Others



HORYU-IV antenna pattern testing

2. Satellite testing: Based on NETS ISO project
   a. Small-scale satellite test standard and handbook
   b. Certification small satellite components and products
   c. Others

Human Resource Development

1. Short-term
   a. Staff exchange
   b. Student exchange (internships)

2. Long-term
   a. PNST (Post-graduate study on Nano-Satellite Technologies) applicants for Ms and PhD
   b. SEIC (Space Engineering International Course) for all Ms and PhD
   c. Double-degree programs

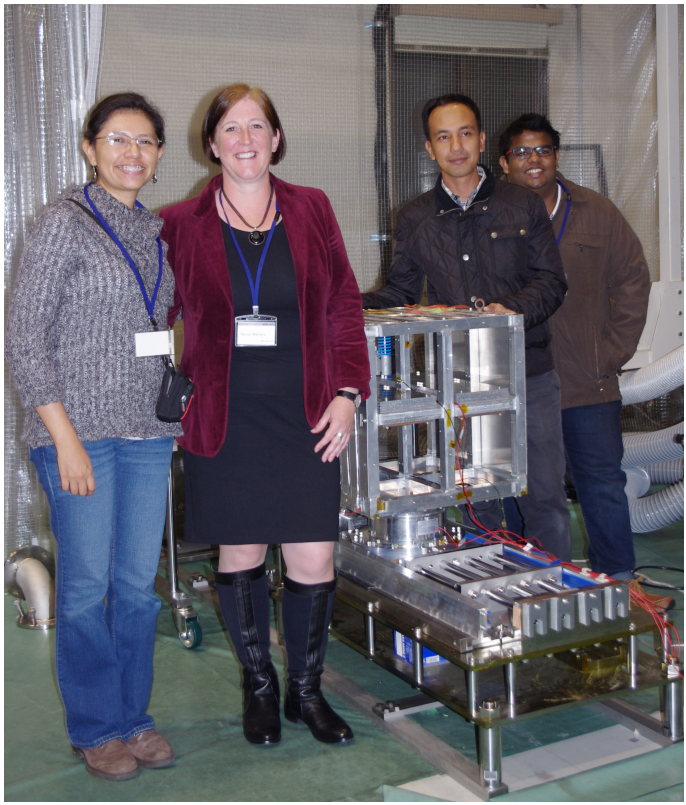
Kyutech PNST students

PNST: http://www.unoosa.org/oosa/en/SAP/bsti/fellowship.html
SEIC: http://cent.ele.kyutech.ac.jp/seic_web.html

Staff Training

1. Weekly or monthly
   a. Staff/engineers come to Kyutech
   b. Dedicated training with dummy satellite
   c. Fixed training cost for ~1-10 people
   d. Transportation/living cost not included

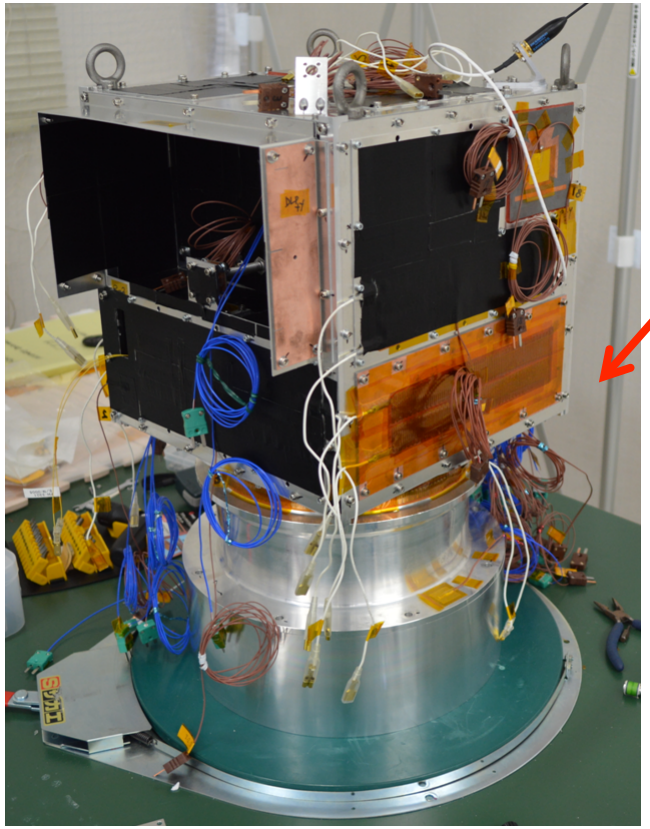
2. Satellite Testing Tutorials
   a. Held periodically
   b. Open to applicants



Tutorial November 2014

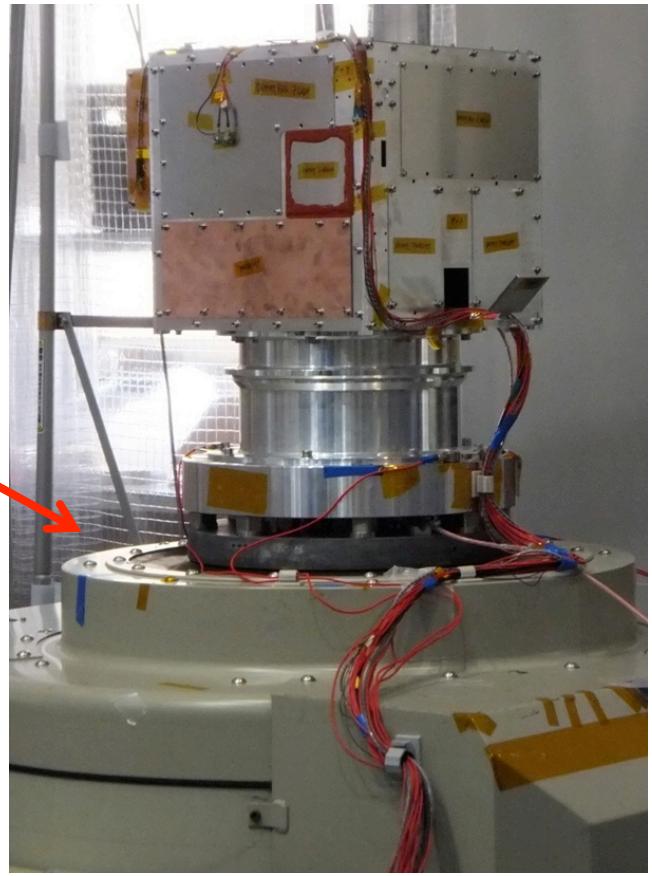
Nanosatellite Test Services

- Itemized or comprehensive services (may include launch opportunities)
- Contact Dr. Polansky for full price list: polansky.john260@mail.kyutech.jp



Thermal balance

Vibration



Recap

1. Test your satellite
2. Train your engineers/staff
3. Educate your students
4. Assist your satellite program (consult, possible launch)

5. Joint research on ESD, material degradation, space environment

Questions?

For further details, please contact

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