

# Successful Launch of University of Tokyo's Nano-satellite "PRISM" and Its First Voice from Kiruna Ground Station

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## (1) Overview of PRISM Launch

8kg Nano-satellite "PRISM" (Fig.1) developed by students of University of Tokyo was launched by H-IIA launch rocket from Tanegashima Space Center, Japan at 12:54 pm, January 23, 2009. The first CW beacon was captured by Kiruna Ground Station at the Department of Space Science, Lulea University of Technology, Sweden. This satellite operation was performed in the framework of an international project of collaborative ground station operations between the SpaceMaster Programme, Department of Space Science, Lulea University of Technology, and University of Tokyo. This result showed that international collaboration can contribute a lot to operation of amateur frequency university satellites. University of Tokyo is now preparing for the upcoming initial phase operation of PRISM, which will also be performed with the help of Kiruna ground station. PRISM is named "Hitomi" after launch, which means "pupil," symbolizing its remote sensing mission.

PRISM is the third satellite of Nakasuka Laboratory. In the past, Nakasuka laboratory launched two 1kg CubeSat named "XI-IV" and "XI-V" in 2003 and 2005 respectively (Fig.2), using Russian rockets in both cases. XI-IV has been surviving in space for more than 5 years, XI-V for more than 3 years, sending beautiful images of Earth from space such as in Fig.3. These photos have been distributed to general public freely as one activities of space outreach program. Kiruna Ground Station has also been helping the satellite operation of XI-IV and XI-V for 2 years.

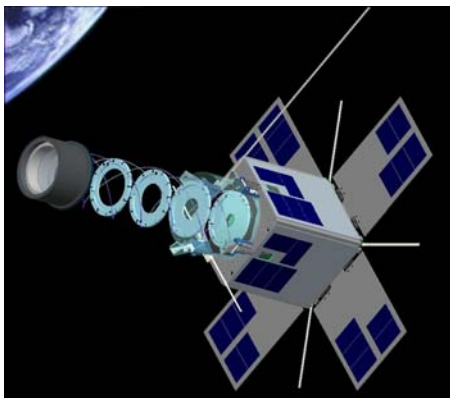


Fig.1 PRISM Outlook

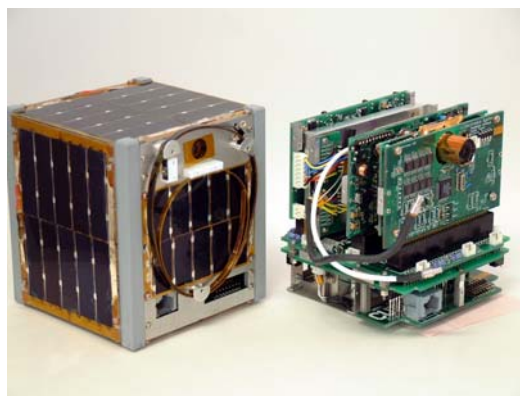


Fig.2 XI-IV (left) and Inside of XI-V



Fig.3 Photos Taken by XI-IV

PRISM has been developed on the basis of technologies and experiences obtained in the former two satellites XI-IV and XI-V, and is different from them in these aspects.

### 1) Aiming for practical mission

The most significant feature of PRISM is its extensible boom. It has a lens at the end, which constitutes 50cm focal-length optical system, which plans to obtain 30 m ground resolution Earth images. This resolution is near the performance of former LANDSAT series remote sensing satellites. In PRISM project, we are trying to extend the usage of Nano-satellites from education to practical missions. The bus system has also been improved in several points in order to deal with more advanced missions.

## **2) First domestic launch of our laboratory's satellite**

PRISM has been launched by Japanese domestic rocket "H-IIA". This is the first time when Japanese huge rocket carries nano-satellite as piggy-back passengers.

## **3) Improvement of Amateur Frequency communication service**

PRISM is an amateur satellite as XI series satellites. It will do message carrying service for radio amateurs for all over the world, with more improved functions.

## **(2) Specifications of PRISM**

### 1) Mission

- 30 m ground resolution Earth image captures using refraction optics with an extensible boom.
- In-orbit demonstration of improved bus technologies
- Improved amateur communication experiments

### 2) Size, Power

- Size: 18cm x 18cm x 40 cm (in rocket), 18cm x 18cm x 60cm (after deployment of the extensible boom)
- Weight: 8.5kg
- Averaged generated power: 3.5 W

### 3) Inserted orbit

- Sun-synchronous, 596 - 651km altitude, inclination:98 degree, orbital period:1hour and 38 minutes

### 4) Frequency

- uplink: 144 MHz band, downlink: 430MHz band, bit rate;1200 bps and 9600 bps

### 5) Attitude Control

- Gravity Gradient Stabilization and simple 3 axis control (sun, magnetic sensor, magnetic torquer)

### 6) Power System

- Solar cells: GaAs Triple Junction with 26% efficiency
- Battery: Li-Ion polymer Battery

### 7) Onboard Computer and Bus

- Main CPU: SH7145, Sub CPU: H8-3048, PIC16F877
- Information bus: CAN bus

## **(3) Development History**

PRISM's development started in 2001. During the development period, other projects have stopped the development of PRISM for some time, and the total net development period is about 3 years. 16 students are currently involved. Totally 30 students have been involved, some of which already graduated. PRISM was selected in summer of 2007 as one of piggy-back passengers to be onboard JAXA'S H-IIA rocket.

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