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MISSION RESULTS OF HIGH VOLTAGE TECHNOLOGY DEMONSTRATION SATELLITE
“HORYU-2”**Abstract**

The World's largest spacecraft is the International Space Station (ISS) with a bias voltage of 160V. We have investigated a power bus able to handle higher voltage than the ISS. Electro-static discharges (ESDs) are more likely to occur when a satellite generates power at a high voltage in low Earth orbit (LEO). However, high voltage generation is essential for building larger space systems. Therefore, Kyushu Institute of Technology (Kyutech) is developing a high voltage generation technology that could counteract ESDs. This could be considered as a key technology for next generation spacecraft.

Nano-satellites are useful and less risky tools for technology demonstration since they are faster and less expensive to develop than large satellites. Therefore, we focused on nano-satellites development to demonstrate Kyutech's advanced high voltage generation technology.

All of the on-orbit high voltage tests have been demonstrated by using a DC/DC converter to adapt the high voltage generated by the solar array. This was a World premiere since no high voltage tests have ever been performed in space by using solar array.

To demonstrate the feasibility of on-orbit high voltage generation, we developed the High Voltage Technology Demonstration Satellite named HORYU-2. The mission consists in generating 300V without causing arcing, and to contribute to the practical development of 1MW class spacecraft. A following shows the missions on-board of HORYU-2.

Main Mission

- High on-orbit voltage generation ($> 300 \text{ V}$)

Sub-Missions

- Demonstrate charging mitigation by using electron emitting film (ELF)

- Demonstrate on-orbit the commercial off-the-shelf (COTS) components used for surface measurement (Trek)
- Take images of the Earth by using SCAMP camera
- Count and estimate size of impacting space debris (debris sensor)

On May 18, 2012, HORYU-2 was launched by the H-2A rocket number 21. HORYU-2 has been operated from Kyutech's ground station, and HORYU-2's orbit was confirmed as well as the well-functioning of the missions. For the first time in the World, 350V have been generated on-orbit without arcs creation. The latter were mitigated by using two specially designed solar arrays. Regarding the sub-missions, ELF was proven to work well on-orbit, Trek is currently under investigation, SCAMP camera took images of the Earth, and debris sensor did not yet monitor debris impact. During the conference, we will present the results of all missions' analysis in further details.