Initial check out and experiment plan of Very Small Optical Transmitter (VSOTA) on board a micro satellite RISESAT for Space-Ground Optical Communication

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A 1 kg class optical transmitter on board a 50 kg class satellite Rapid International Scientific Experiment Satellite (RISESAT) launched by Epsilon rocket #4 in January 18, 2019. The transmitter named Very Small Optical Transmitter (VSOTA) has heritage from NICT space optical communication development over 2 decades and most recently the Small Optical Transponder (SOTA) equipped on board a micro satellite SOCRATES which NICT conducted demonstration from 2014 to 2016 between satellite and optical ground station in Japan and international partners.
VSOTA has 2 wavelengths laser diodes for optical downlink with no gimbal tracking function. The communication speed can be selected in the range from 10 kbps to a 6 Mbps. A retro reflector is located to assist satellite pointing and orbit prediction as well.
It is the most compact and lightweight optical communication device onboard for satellite developed in Japan so far. It narrowed down its function to the simplest form to adapt limited resource on satellite in size, weight and power consumption, aiming to expand its downlink capability for micro sat at the same time with lower cost. The goal of the mission is to acquire optical communication technology in micro satellites to apply an on-demand type remote sensing with featuring the high attitude control system such as target pointing needed as well for the optical communication to target ground station.
The orientation to the ground is based on satellite attitude control. It has a function of performing the guide beam for laser ranging from the ground using a camera for science such as High Precision Telescope (HPT) on board.
On January 21 and February 13, we confirmed that the electrical parts including Laser Diode (LD) was turned on and it operated normally by checking telemetry of power and temperature sensors built in LD circuit board.
We describe the features of communication and ranging experiment plan and initial check out result for the satellite as well as for the ground station.

Keywords: Micro satellite, Optical Space Communication, Satellite Laser Ranging

