

## Development of KOSEN-1 CubeSat for Jupiter's decametric radio observation

# Kazumasa Imai[1]; Nobuto Hirakoso[2]; Taku Takada[3]; Kentarou Kitamura[4]; Masafumi Imai[5]; Kazumasa Imai KOSEN-1 Team[6]; Charles A. Higgins[7]; James R. Thieman[8]; Kazumasa Imai NASA Radio JOVE Team[6] [1] NIT, Kochi; [2] NIT, Gunma; [3] Kochi-CT; [4] NIT, Tokuyama College; [5] University of Iowa; [6] -; [7] Middle Tennessee State University; [8] University of Maryland Baltimore County

Since the discovery of Jupiter's decametric radio emissions in 1955, important details of its radiation mechanism have not yet been determined. In order to investigate the beaming structure of Jupiter's radio emission and to clarify aspects of the emission mechanism, we are developing a 2U-size CubeSat for observation of Jupiter's radio waves and observe simultaneously in outer space and on the Earth.

Our application was selected on Dec. 12, 2018, as a CubeSat candidate for JAXA's innovative satellite technology demonstration program. The 2U-CubeSat, named KOSEN-1, is planned to be launched by a JAXA Epsilon rocket at the end of 2020. After the launch of KOSEN-1, we will deploy a half-wave dipole antenna at 20.5MHz. The Software Defined Receiver (SDR) will be used to receive Jupiter radio waves over a 2MHz band width. An onboard GPS module will be used to maintain a time accuracy within 1 millisecond between the satellite and the ground station. Selected short duration radio data events (Jupiter S-bursts) will be saved to data storage by the onboard computer (Raspberry Pi Zero compatible Computer Module 1) and transmitted to the ground station at the communication speed of 9600bps by using the 430MHz Amateur radio band.

The measurement of the delay time between the CubeSat and ground observatories by the correlation analysis of Jupiter's S-bursts is proposed to reveal the beaming structure of Jupiter's radio emissions. The worldwide ground-based observations together with the KOSEN-1 satellite will be supported by the NASA Radio JOVE project, an education and outreach program for planetary radio astronomy. The elucidation of the radiation mechanism of Jupiter radio waves, which is the ultimate goal of Jupiter radio research, may lead to a better understanding of particle-wave energy generation mechanisms and their applications. This mission is believed to be significant based on the potential scientific contribution to this subject.

The KOSEN-1 project is supported by the Coordination Funds for Promoting AeroSpace Utilization of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), JAPAN.