

Performance, Operation and their Feasibilities for Jupiter and Icy Moons: High Frequency Receiver of Radio & Plasma Wave Investigation (RPWI) aboard JUICE during the Flight Model Test campaign

*Yasumasa Kasaba¹, Hiroaki Misawa¹, Fuminori Tsuchiya¹, Tomoki Kimura¹, Hajime Kita², Atsushi Kumamoto¹, Yuto Katoh¹, Yoshizumi Miyoshi³, Yoshiya Kasahara⁴, Satoshi Yagitani⁴, Hirotsugu Kojima⁵, Baptiste Cecconi⁶

1. Tohoku University, 2. Tohoku Institute of Technology, 3. Nagoya University, 4. Kanazawa University, 5. Kyoto University, 6. Obs. de Paris

Flight models of Radio & Plasma Wave Investigation (RPWI) aboard the ESA JUICE mission were joined to the flight model test going in Europe, and is going toward the launch in mid 2022. RPWI provides an elaborate suite for electromagnetic fields and plasma environment around Jupiter and icy moons, with 4 Langmuir probes (LP-PWI; 3-axis E-field up to 1.6 MHz, and cold plasmas), a search coil magnetometer (SCM; 3-axis B-field up to 20 kHz), and a tri-dipole antenna system (RWI; 3-axis E-field 0.08-45 MHz, 2.5-m tip-to-tip length).

In the final test campaign, we have confirmed that RWI with High Frequency (HF) Receiver have enough sensitivity reaching the galactic background for the highly-resolved Jovian radio emissions from magnetosphere (aurora etc.), atmosphere (lightning), and icy moons. Its direction and polarization capabilities enable us to identify the source locations and characteristics. Their developments are under the collaboration of Japan, France, Poland and Sweden.

In this paper, we provide the performance and operation concepts with their feasibilities, including the test and emulation results on the ground, planned activities in commissioning and cruise phases, and the full observations around Jupiter and icy moon system. One of the most key parts is the sensing of the ionospheres, surface, and subsurface of icy moons during the flybys and on the orbit around Ganymede. The ionospheres under the spacecraft can be remotely sensed by the occultation (and reflection) of Jovian radio signals, which has a capability to detect the highest ionospheric density in usual status and expected plume ejection events. The surface and subsurfaces are challenging topics. It is based on the passive subsurface radar (PSSR) concept which sounds the icy crusts of Galilean satellites by the reflections of Jovian radio emissions (HOM/DAM). We are looking forward to see real data and support the JUICE studies with RPWI and other payload teams members.

In this paper, we will show the recent performance evaluations and operation plans which are rapidly going in the team and JUICE Science Working Team.

Keywords: Jupiter, JUICE, Radio & Plasma Wave Investigation (RPWI)