



An On-Board Receiver on EJSM for Jupiter Atmospheric Science and Satellite Surface Scattering Experiments

Antony Allen (1), Essam Marouf (2), Ingo Mueller-Wodarg (1), and Paolo Tortora (3)

(1) Imperial College London, SW7 2AZ, United Kingdom, (2) San Jose State University, San Jose, CA 95192-0084, USA, (3) University of Bologna, I-47121, Forlì, Italy

The Europa-Jupiter System Mission (EJSM) reference mission architecture consists of two flight elements, the ESA-led Jupiter Ganymede Orbiter (JGO) and the NASA-led Jupiter Europa Orbiter (JEO). The two spacecraft could operate independently in the Jovian system and the current radio systems on both spacecraft are designed to establish radio contact with the Earth, to generate two-way Doppler and ranging measurements, for navigation and gravity science, and one-way downlink measurements for atmospheric science. However, the exceptional opportunity offered by a two spacecraft mission in the Jupiter system motivates the proposal for a spacecraft-to-spacecraft radio link, which offers unique relative geometries to explore Jupiter's atmosphere and rings and icy satellites exospheres and surfaces. We show how enabling a spacecraft-to-spacecraft link, through an on-board RF receiver, yields, as a by-product, the possibility to carry out uplink one-way radio science observations, where very large power (> 20 kW) can be transmitted from an Earth-based station, potentially boasting achievable free-space SNR by orders of magnitude, comparable to the spacecraft-to-spacecraft case and much higher than the traditional downlink case. This talk focuses on the unique science objectives and achievable performance for the spacecraft-to-spacecraft and uplink configuration, compared to downlink configurations. In particular, for Jupiter radio occultations, currently planned to take place at X- and Ka-band, we quantify the achievable depth in probing the atmosphere, at different bands and with the different configurations (downlink, spacecraft-to-spacecraft and uplink), geometries and distances, in the various mission phases when JGO and JEO will be on tour in the Jupiter system or will be orbiting Ganymede and Europa, respectively.