

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
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THE RADIO FREQUENCY TELECOMMUNICATIONS SYSTEM OF THE NASA EUROPA CLIPPER  
MISSION

**Abstract**

The Europa Clipper mission, a partnership between the NASA Jet Propulsion Laboratory (JPL) and the Johns Hopkins University Applied Physics Laboratory (JHUAPL), is currently in Phase B and scheduled for launch in 2022. A Jupiter orbiter, it will perform repeated flybys of the moon, Europa, to assess the icy moon's structure and habitability. The spacecraft's dual X/Ka-band radio frequency telecommunications subsystem has four primary functions: provide spacecraft command capability, provide spacecraft telemetry and science data return, provide radiometric capability for navigation, and provide suitable link coverage to support the Europa gravity science investigation. Currently, it is also being designed to serve as a backup communications relay asset for a future Europa Lander mission, which is currently in formulation. The primary link to the Earth is via the NASA Deep Space Network, with backup links through the Universal Space Network (to support launch activities) and potentially the ESA and JAXA

ground networks for additional coverage robustness. The on-board RF system heavily leverages the NASA Solar Probe Plus communications architecture, featuring the same X/Ka-band Frontier Radio modified to perform the proposed relay functionality as well as interface to the JPL command and data handling (CDH) system. The communications system also includes a 3-m dual X/Ka-band HGA to enable the high data volume from the mission's science payload, along with a robust X-band antenna suite including two low gain antennas, three fanbeam antennas, and one medium-gain antenna to support launch and early operations, maneuvers, cruise operations, gravity science, and safe modes. Two sets of redundant traveling wave tube amplifiers and an RF switching network round out the on-board flight RF system. As part of the JPL/APL collaboration, APL is responsible for delivering an integrated RF Module and integrated Propulsion Module, for subsequent spacecraft and payload integration activities at JPL. To simplify interfaces, the RF Module will be directly integrated to the Propulsion Module. This paper will discuss the RF telecommunications system of the Europa Clipper Mission, including its requirements, components, concept of operations and operational modes, mechanical interfaces, and integration and test approach.