

Conference: Joint Ka-band and ISSC – October 2022
SCaN NSD paper submittal

Proposed Title: NASA's Evolving Ka-band Network Capabilities to Meet Mission Demand

Abstract text:

Space missions are increasingly demanding higher data rates to support the growth in information-intensive mission operations. This growth is reflected in planned and operational missions from low Earth orbit, such as the upcoming NASA-Indian Space Research Organization (ISRO) Synthetic Aperture Radar (NISAR) and Plankton, Aerosol, Cloud and Ocean Ecosystem (PACE) missions, to the future Artemis lunar campaign, and the recently launched James Webb Space Telescope orbiting at the Sun-Earth L2 Lagrange point. JWST was the first L2 mission to be defined as a high data rate mission transmitting at 8 Mbps, or 270 gigabits of science data per day. ISRO and PACE anticipate achieving data throughputs of 5-40 terabits per day. These data rates exceed the capabilities of S-band and X-band frequency allocations and are a key driver for migrating to the 26 GHz Ka-band frequency allocation.

The NASA Space Communications and Navigation (SCaN) program has been preparing the networks to support this demand by pursuing critical Ka-band infrastructure. The status of current and evolving network capability, including the Near Space Network's Initiative for Ka-band Advancement (NIKA), and the Deep Space Network's Lunar Exploration Upgrades (DLEU), as well as profiling mission usage of Ka-band services, are discussed in detail. The push toward Ka-band, is not only an opportunity for increased performance, but alleviates current challenges with contentious and cluttered spectrum access in S- and X-band. The paper provides an overview of these advantages and advanced techniques that optimize its use before the transition to optical communications becomes an imperative. The challenges and potential mitigations for missions considering selection of Ka-band network services are also discussed.