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LUNAR SPECTRUM PLANNING: INTERNATIONAL TECHNICAL COLLABORATION AND ARCHITECTURE DEVELOPMENT

Abstract

As of writing, 2024 has already seen three missions launch for the Moon. As cislunar activity increases, the radio frequency (RF) requirements in the cislunar environment will continue to increase in complexity. Effective RF spectrum planning and regulatory considerations can only successfully enable the exciting and groundbreaking missions envisioned with early, open and frequent information sharing between mission planning and spectrum planning communities. This paper will discuss four key spectrum planning efforts and organizations that Artemis and other cislunar missions should be aware of as cislunar mission and service concepts continue to mature. NASA's Lunar Human Spaceflight Spectrum Manager (LHSM) is responsible for managing the use of radio frequency spectrum for lunar and human spaceflight missions sponsored and/or operated by NASA. The LHSM advocates for these missions through technical coordination and regulatory means, to protect performance integrity and improve mission success. NASA also invites other entities, both domestic and foreign, to voluntarily work with the LHSM on frequency selection and coordination to ensure the efficient and appropriate use of RF spectrum on and around the Moon for all. Following World Radio Conference (WRC) 2023, studies are already underway within the International Telecommunication Union Working Party 7B (Space radiocommunication applications) to consider frequency-related matters for future development of cislunar communications. NASA participates in this process as part of the US delegation. NASA is also a member of the Space Frequency Coordination Group (SFCG), where civil space agency members discuss and study spectrum issues for space activities. The SFCG is currently conducting studies to inform possible updates to their recommended list of frequencies for member agencies' cislunar missions. SFCG member space agencies work with relevant partners within their countries' space communities to achieve mutual goals in space. These studies will also inform inputs representing civil space agency positions as they work within their administrations to participate in the WRC study process. Furthermore, NASA is collaborating with the European Space Agency (ESA) and the Japan Aerospace Exploration Agency (JAXA) on the LunaNet Interoperability Specification, which defines a framework for a robust and interoperable communication and navigation network, including a lunar spectrum architecture. These kinds of international collaborations, across a diverse range of stakeholders involved in cislunar activities, will be critical to the successful development of an architecture that enables the kind of reliable and fully interoperable connectivity that humanity has come to expect in the 21st century – at the Moon.