National Aeronautics and Space Administration



LUNAR SURFACE PROPAGATION

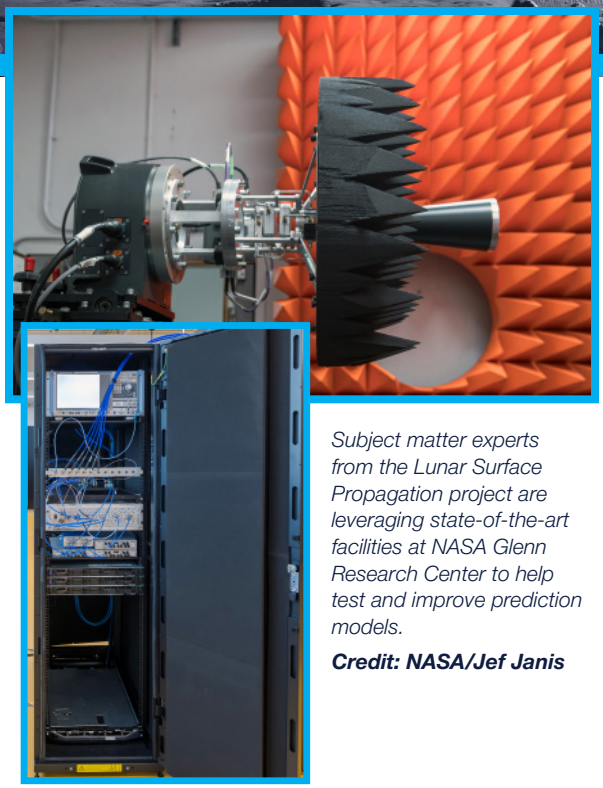
Understanding Signal Propagation on the Moon

Unlocking the Mysteries of the Moon

The same unique conditions that make the lunar South Pole valuable for discovery also make it one of the most demanding environments humans have ever attempted to explore. From rugged terrain to abrasive lunar dust, the location presents unique challenges for establishing robust, reliable lunar communications architecture, driving the development of new technologies, systems, and approaches to support a sustained human presence on the Moon.

Credit: NASA/Morgan Johnson





Subject matter experts from the Lunar Surface Propagation project are leveraging state-of-the-art facilities at NASA Glenn Research Center to help test and improve prediction models.

Credit: NASA/Jef Janis

Under Artemis, NASA will send astronauts on increasingly difficult missions to explore more of the Moon for scientific discovery, economic benefits, and to build on our foundation for the first crewed missions to Mars.

Unlike the Apollo missions, NASA will explore the lunar South Pole, a region of extreme conditions, including deep craters and mountainous terrain. Due to the low elevation of Earth and the unique characteristics of the terrain, radio signals reflect off the lunar surface and cause interference that degrades the signal before reaching Earth. These reflections, known as multipath, can compromise communications if not proactively accounted for.

To help overcome these challenges, the Space Communications and Navigation (SCaN) division is leveraging data generated by lunar missions during surface operations to develop mathematical models that predict multipath effects on Direct-to-Earth radio communications links. Establishing an early understanding of how the lunar environment affects these communications links will enable NASA and its partners to proactively improve the design of future communications systems, increasing data returns and unlocking new discoveries.

Partnering with Industry

NASA has partnered with Blue Origin to collect surface operations data during their MK1 lunar lander, also known as Endurance, to support and inform development of statistical models and lab emulations. The knowledge gained through public-private partnerships will help future missions design efficient, compact communications systems that can handle the unique conditions of the lunar surface.



An artist's concept of the Blue Origin MK1 Endurance mission.

Credit: Blue Origin

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