

CASE STUDY

NASA LUNAR EXPLORATION GROUND SITES SIGNAL ANALYSIS AND RF CHAIN DESIGN

NASA's Lunar Exploration Ground Sites (LEGS) are a set of planned ground terminals intended to support Lunar missions and augment existing NASA Near Space Network (NSN) and Deep Space Network (DSN) capabilities by providing direct-to-earth (DTE) communication and navigation services in the cis-Lunar region and beyond. The design of these ground stations involves numerous tradeoffs in architecture and component selection to achieve performance thresholds.

As subject-matter experts in signal analysis, the Kurtek team was responsible for ensuring that the design of the LEGS signal processing subsystems met key functional and performance requirements, such as the capability to simultaneously provide services for multiple independent vehicles in view of the aperture. Kurtek engineers developed high-fidelity models of the LEGS RF chains to evaluate component performance and were able to identify a number of potential challenges, such as differences in the local oscillator frequencies of the up- and down-converters that could cause unplanned IF frequency translations, potential IF interference between signals that had sufficient frequency separation at the transmitted and received RF frequencies, and limitations in the sensitivity of the high-rate modems that could prevent processing of certain low-power signals that were expected to reach the antenna.

KEY RESULTS

- Developed high-fidelity signal chain models for the LEGS antennas and signal processing subsystems.
- Identified and mitigated component performance limitations and potential sources of interference to ensure successful mission link closure.

The identification of these challenges prior to the start of the LEGS test campaign enabled the program to effectively plan and execute mitigation strategies without significant re-work in the ground station or flight hardware, minimizing cost and schedule impacts and ensuring that the project was on track for completion as scheduled.

To learn more about our capabilities, email us at info@kurtek.io or call our team at **703-943-7236**.

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