

# A CASE STUDY: HARRIS CORPORATION DEMONSTRATES FIRST LARGE REFLECTOR UPLINK ARRAYING WITH REAL-TIME ATMOSPHERIC COMPENSATION

## Solution | Electronic Systems

### Challenge:

Demonstrate Harris' advanced proprietary communications algorithms, technology innovation and expertise in the areas of uplink arraying and signal processing within the context of specific dynamic mission scenarios.

### Solution:

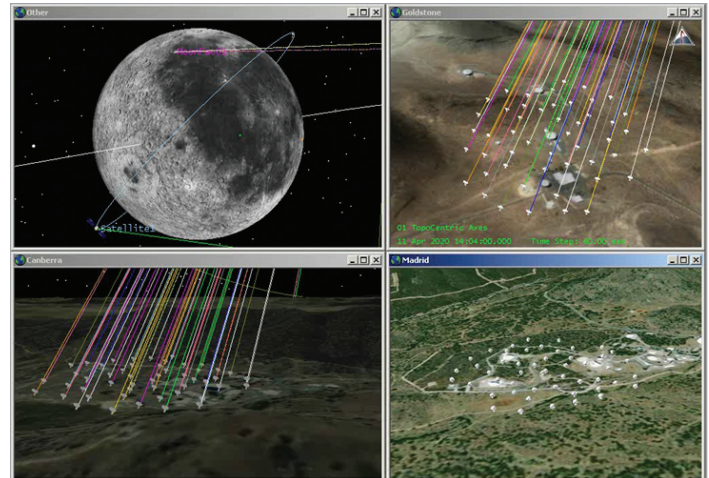
Harris' ArrayLab, a Simulation to Prototype Suite, is integrated with STK, simulating widely spaced large reflector uplink arraying with atmospheric compensation.

### Results:

Harris won a multi-million dollar NASA study which culminated in a successful real-time prototype demonstration of this unique new technology.

With the help of AGI software, Harris Corporation successfully completed its Transmit Aperture Combining Demonstration; a multi-million dollar, two-year effort to array three widely separated large (12m) reflector antennas. The effort utilized ArrayLab, an internally developed package that analyzes and demonstrates adaptive phased-array communications system performance within custom mission scenarios. By integrating STK with ArrayLab, Harris saved time adopting AGI's existing capabilities while adding new functionality to its product. ArrayLab together with STK has been used for internal research and development, proposals and program-deliverable analysis tools. The combination has mitigated risk as the technology progresses from simulation to prototype, demonstrated on the ORION crew exploration vehicles uplink arraying and the recently completed large reflector uplink arraying programs.

Initially, Harris debated developing its own STK-like orbit propagator to model planetary and platform motion; range and range rate between targets; line-of-sight angles between targets; and target availability with respect to obscuration. The organization also needed 3D visualization and manipulation of both sides of the communications links during the mission for analysis and troubleshooting of array designs. By incorporating STK into ArrayLab via the STK Integration module, Harris was able to focus on its own areas of expertise:



Using AGI's proven technology enabled Harris Corporation to develop dynamic simulations of proposed communication systems and capture new business.

advanced adaptive array algorithms and designs, innovative signal processing techniques including blind signal sorting, real-time atmospheric compensation and unique array self-calibration methods.

ArrayLab provides realistic array performance analysis of complex communication systems in a realistic environment and simplifies design trades for quick turnaround for programs, proposals and pursuits. ArrayLab was successfully used on NASA's Large Reflector Uplink Arraying program to demonstrate model-based transmit uplink arraying with three 12m widely spaced antennas. Harris proprietary algorithms demonstrated included: model-based adaptive arraying on Tx; blind signal sorting adaptive aperture combining on Rx; continuous self-calibration of all circuitry and fiber optic lines; and real-time atmospheric compensation.

The use of STK with Harris' ArrayLab promotes the company's communication systems expertise to end customers while leading to new business and successful demonstrations.

**"We were able to efficiently achieve a Technical Readiness Level (TRL) 6 while reducing risk by using STK's orbit propagation and integration modules together with Harris' ArrayLab comm system ... "**

— Kathy Minear, Senior Mathematician  
HARRIS CORPORATION, Palm Bay, FL



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