

Antenna Deployment and oPtimization Technologies (ADaPT)

Conformal Phased Array Antenna Technologies for Enhanced Aircraft Communications

Challenge

- Increased airspace density from AAM and other new initiatives will result in more potential for RF interference.
- Increased interference lowers reliability and security of the communications link, requiring mitigation strategies to support a larger number of users.

Expected Impacts

- Enables safe and efficient aviation operations by reducing communication interference.
- Enables high performance and low interference beyond line-of-sight communications.

Solution

- Development of phased array antenna technologies that can mitigate interference through spatial separation and electronic beamforming.
- Development of conformal phased arrays made of aerogel material that can be mounted on aircraft surfaces.
- Investigation of novel calibration techniques to increase effectiveness of phased array antenna beamforming when coupled to aircraft structures.

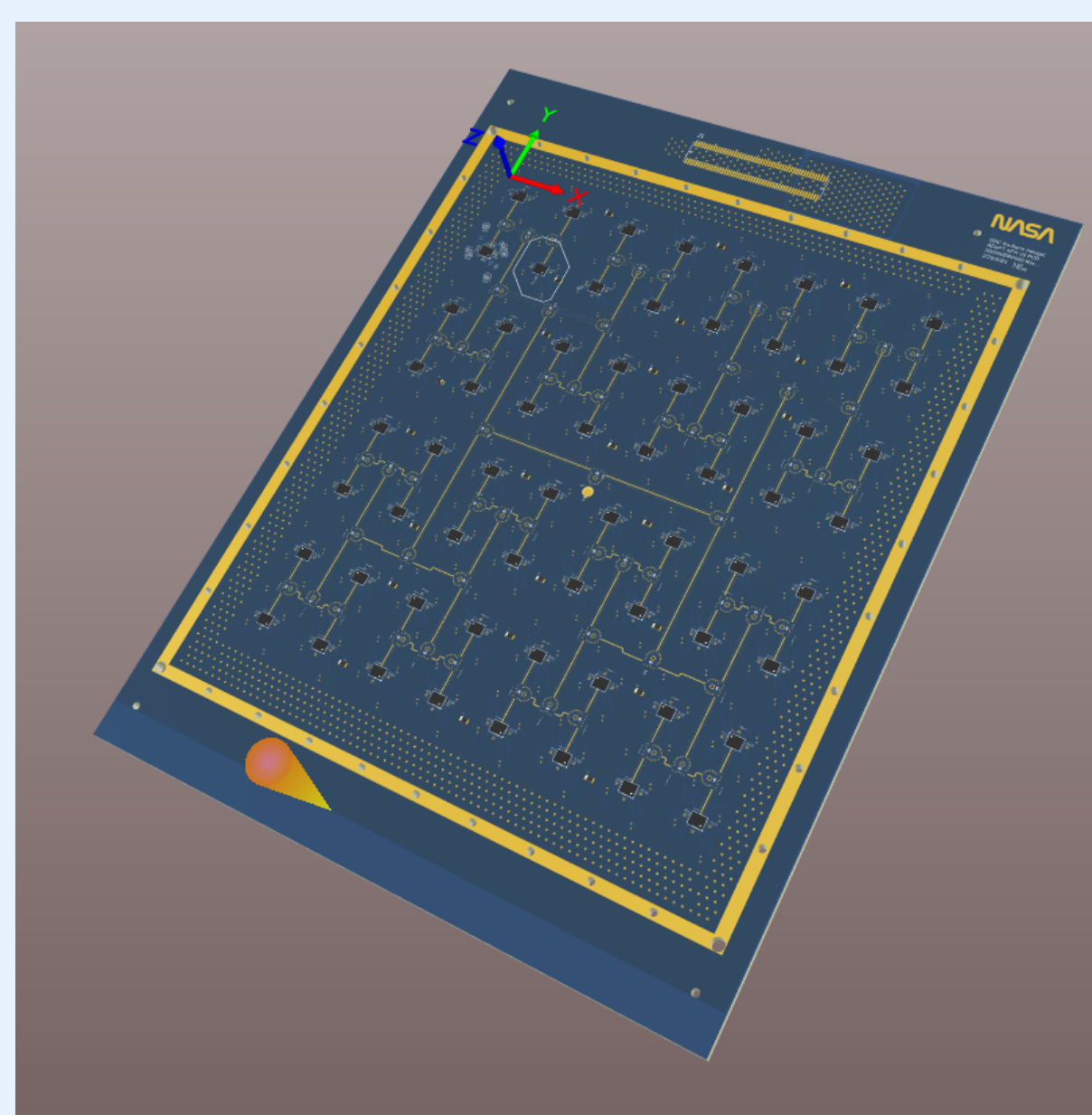
Interference Mitigation Enables Reliable and Secure Communications



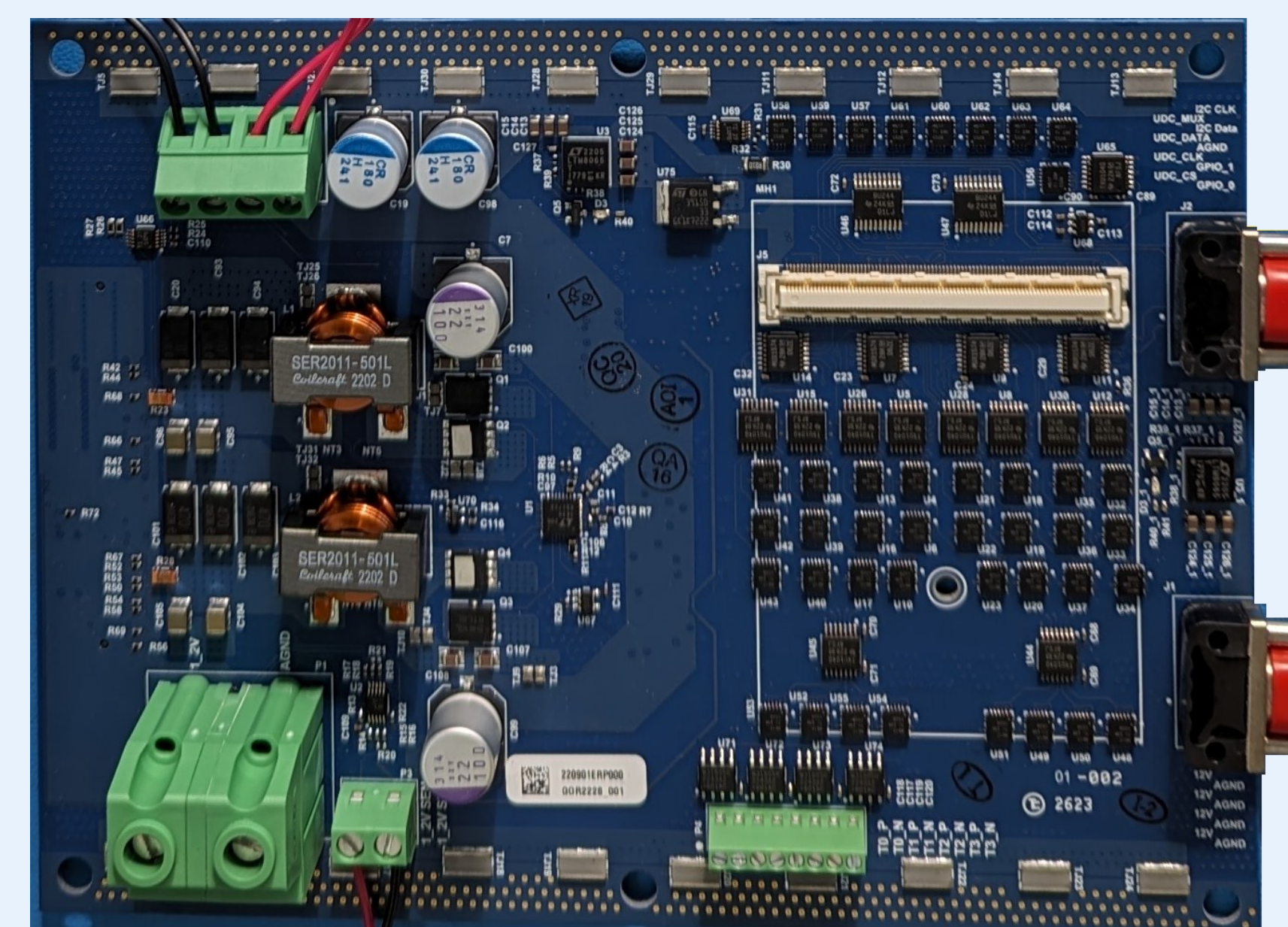
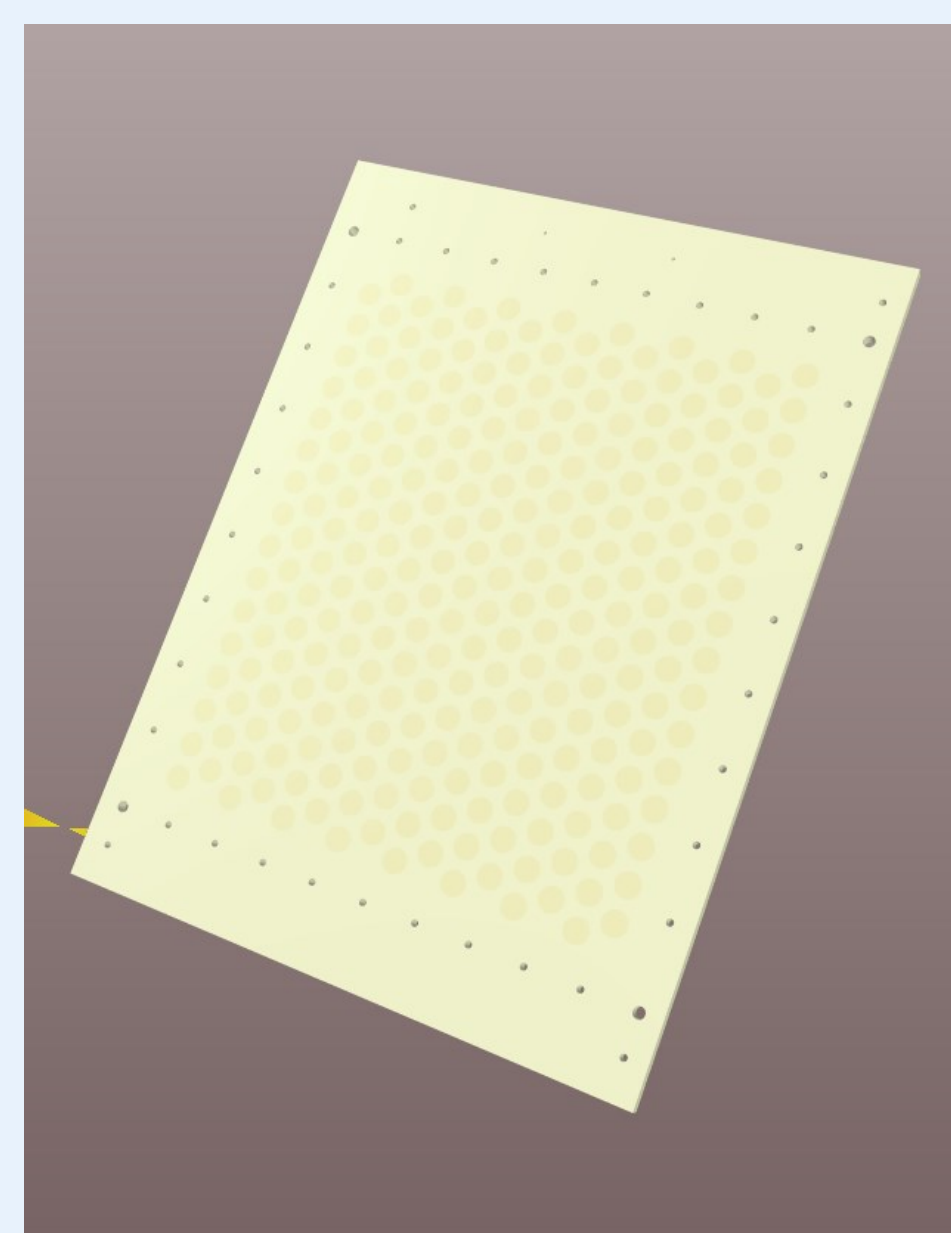
Gen I Conformal Phased Array Antenna on Aircraft



Antenna Calibration using the Portable Laser-Guided Robotic Metrology (PLGRM) System



Gen II Conformal Array (in fabrication)



Gen II Array Controller Board

Results

Gen II improvements over Gen I array:

- 50% improvement in overall power efficiency
- Dual polarization and improved chipset calibration

Improvements to overall antenna performance due to on-aircraft calibration:

- Improved antenna pointing accuracy (~2 degrees)
- Reduced radiated side lobes (~ 8 dB) that may cause interference
- Improved balance of radiated side lobes

Next Steps

- Complete Gen II Aerogel Phased Array Antenna
- Conduct ground demonstrations of Gen II array
- Conduct flight demonstrations of Gen II array

Partners and/or Participants

- Eutelsat America Corp - Ground Demos
- Naval Air Warfare Center Aircraft Division - Flight Demos
- Kepler Communications - Flight Demos
- UC San Diego and Extreme Waves, Inc - Antenna Calibration