

Multiband Photonic Phased-Array Antenna

For high data rate communication

A multiband phased-array antenna (PAA) can reduce the number of antennas on shipboard platforms while offering significantly improved performance. Crystal Research, Inc., has developed a multiband photonic antenna that is based on a high-speed, optical, true-time-delay beamformer. It is capable of simultaneously steering multiple independent radio frequency (RF) beams in less than 1,000 nanoseconds. This high steering speed is 3 orders of magnitude faster than any existing optical beamformer. Unlike other approaches, this technology uses a single controlling device per operation band, eliminating the need for massive optical switches, laser diodes, and fiber Bragg gratings. More importantly, only one beamformer is needed for all antenna elements.

Applications

NASA

- ▶ High data rate communications:
 - Lunar and planetary exploration
 - Landers
 - Probes
 - Lunar relay satellites
 - Lunar rovers and habitats
 - Suborbital vehicles
 - Sounding rockets
 - Balloons
 - Unmanned aerial vehicles
 - Expendable launch vehicles
- ▶ Remote sensing:
 - Radiometers
 - Passive radar interferometer platforms
 - Synthetic aperture radar platforms for planetary science

Commercial

- ▶ Mobile satellite communications
- ▶ Military electronics
- ▶ Broadband wireless communications



NASA rendering

Phase II Objectives

- ▶ Refine detailed architecture of the multiband photonic PAAs
- ▶ Develop modulation techniques for multichannel RF links
- ▶ Develop fiber-optic packaging for wavelength tunable lasers
- ▶ Fabricate electro-optic wavelength tunable lasers
- ▶ Fabricate electro-optic beamformers
- ▶ Develop system control and electronics module
- ▶ Integrate electrical, microwave, photonic, and mechanical functions
- ▶ Prepare and submit reports and deliver prototype

Benefits

- ▶ Wideband multibeam operation
- ▶ High-speed steering
- ▶ Microwave delay compatibility
- ▶ Small size
- ▶ Light weight
- ▶ Low power consumption
- ▶ Immunity to electromagnetic interference

Firm Contact

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Proposal Number: 09-2 01.02-9839