

Communications

Cup Cylindrical Waveguide Antenna

A novel short 2GHz backfire antenna

NASA Glenn's cup cylindrical waveguide antenna (CCWA) is a short backfire microwave antenna capable of simultaneously supporting the transmission or reception of two distinct signals having opposite circular polarizations. Short backfire antennas are widely used in mobile satellite communications, tracking, telemetry, and wireless local area networks because of their compactness and excellent radiation characteristics.

Achieving simultaneous dual-circular polarization usually requires integrating a network of hybrid components, which introduces significant losses and reduces reliability. In contrast, the CCWA integrates the polarizer and an orthomode transducer with the antenna and thus delivers a significant savings in mass, size, and complexity as compared to existing technology.

BENEFITS

- Compact: Substantially smaller than comparable existing technology
- Flexible: Can be scaled for use at other frequencies
- Advanced: Offers simultaneous circular polarizations
- Durable: Provides excellent radiation characteristics
- Enhanced: Provides relatively low losses

technology solution

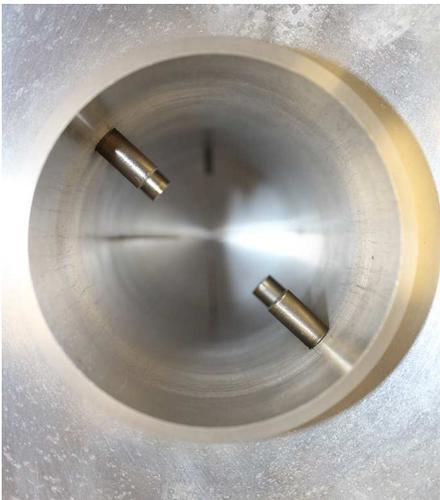


THE TECHNOLOGY

A typical prior short backfire antenna contains a half-wavelength dipole excitation element for linear polarization or crossed half-wavelength dipole elements for circular polarization. In order to achieve simultaneous dual circular polarization, it would be necessary to integrate into the antenna feed structure a network of hybrid components, which would introduce significant losses. NASA Glenn's CCWA uses an alternate approach that entails relatively low losses and affords the additional advantage of compactness.

The CCWA includes a circular cylindrical cup, a circular disk sub-reflector, and a circular waveguide that serves as the excitation element. The components that make it possible to obtain simultaneous dual circular polarization are integrated into the circular waveguide. These components are a six-post polarizer and an orthomode transducer with two orthogonal coaxial ports. The overall length of the OMT and polarizer is about 11 inches. This is substantially more compact than the 32 inches needed for a commercially available orthomode transducer and polarizer for the same frequency.

The Glenn CCWA was designed for a nominal middle frequency of 2.25 GHz. The design optimizes overall directivity, axial ratio, return loss, and isolation. It can be scaled for use at other frequencies.



Strategic placement of post polarizers inside the waveguide cause circular polarization of the 2 GHz wavefront



Short backfire antennas are widely used in wireless local area networks because of their compactness

APPLICATIONS

The technology has several potential applications:

- Mobile satellite communications
- Wireless local area networks
- Tracking
- Telemetry

PUBLICATIONS

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