SSC Pacific T2 TECHNOLOGY TRANSFER

SPAWAR Systems Center PACIFIC

COMMERCIALIZATION OPPORTUNITY

Wideband Antenna with Extended Frequency Range

The U.S. Navy seeks to commercialize a compact, broadband, narrow-profile antenna for airborne and general purpose applications.

Background

Airborne and general-purpose communications systems could benefit from a compact antenna that operates over a wide frequency range (e.g., 200 MHz to 2 GHz). Existing blade antennas have a compact and narrow profile, but lack omnidirectional patterns over an extended frequency range. Existing bicone antennas perform well over a wide frequency range, but are not compact enough for certain applications.

The Technology

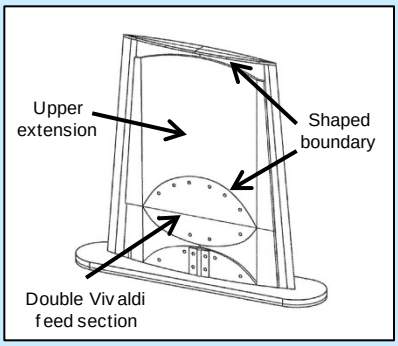
Engineers at SSC Pacific developed a compact, omnidirectional blade antenna that can operate continuously over the 200-MHz to 2-GHz frequency range at a low voltage standing wave ratio (VSWR). The antenna consists of a double Vivaldi element feed section, an upper extension of resistive film, and a shaped boundary between the feed and upper extension. These features provide several benefits: the Vivaldi element enables a narrow, aerodynamic profile; the upper extension increases the antenna's frequency range, improves performance at lower frequencies, and provides antenna pattern integrity over all bands; and the shaped boundary minimizes antenna reflections. The antenna can be enclosed in a housing capable of withstanding high wind speeds. Without the housing, the antenna has higher gain, more uniform patterns, and lower VSWR. The antenna could be used in air-, land-, and sea-based applications where a compact, wideband, omnidirectional antenna is desired.

Key Benefits

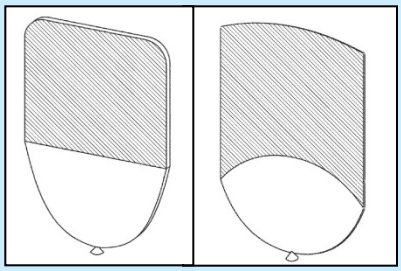
- Low VSWR (2:1 or less) over the entire 200-MHz to 2-GHz band demonstrated
- Broad patterns in azimuth & elevation with frequency bandwidth of 8:1 or greater
- Nulling at the horizon
- Omnidirectional radiation pattern
- Compact size (9.74" high x 6.68" wide) compared to antennas covering the same frequency range
- Narrow, aerodynamic profile able to withstand high wind speeds
- Can be modified for different frequency ranges by adjusting antenna dimensions

Development Status

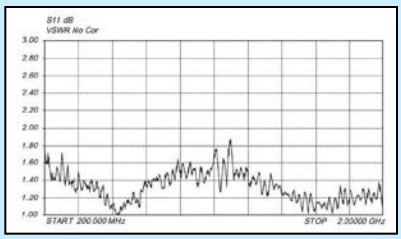
- U.S. Patent issued: 8736506; related U.S. Patent 8654025 discloses a biconical antenna with similar performance
- Total R&D: $50K over 2 years
- Technology Readiness Level 3: Analytical and experimental critical function and/or characteristic proof of concept
- Modeled several Vivaldi antenna designs in Computer Simulation Technology (CST) Microwave Studio
- Conducted extensive R&D to eliminate gaps in antenna gain patterns
- Evaluated physical prototype using a network analyzer, anechoic chamber, and outdoor antenna range. Prototype met antenna performance specifications.
- Antenna housing needs to be further developed for aircraft applications
- Licensing and collaboration opportunities available



Wideband antenna in a housing. The antenna consists of a double Vivaldi feed section, an upper extension, and a shaped boundary.



Several antenna designs were investigated, including these two boundary shape designs.



This chart shows the antenna's voltage standing wave ratio (VSWR) significantly below 2 from 200 MHz to 2 GHz, indicating good VSWR performance across the entire frequency band.

Space and Naval Warfare Systems Center Pacific (SSC Pacific) leads the U.S. Navy from concept to capability through research, development, delivery, and support of integrated C4ISR (command, control, communication, computers, intelligence, surveillance, and reconnaissance), cyber, and space systems across all warfighting domains.

www.public.navy.mil/spawar/Pacific/TechTransfer

For more information, contact the Technology Transfer Office at (619) 553–5118 or email ssc_pac_t2@navy.mil

SD 1404. May 2015. SSC Pacific, San Diego, CA 92152–5001
Approved for public release.