

An example of Air Force supported SBIR/STTR technology that has been transitioned into an Air Force or other DoD system or subsystem or used by Air Force test ranges and facilities or maintenance depots.

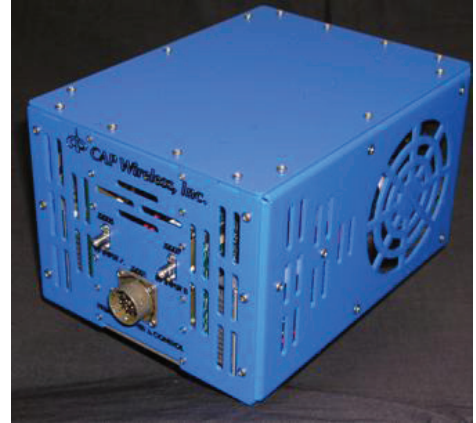
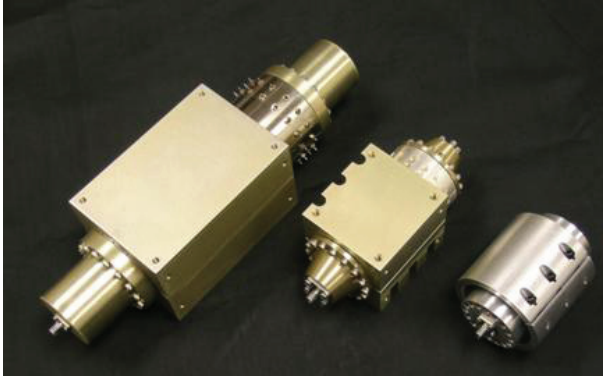
SBIR Topic Number:
AF04-218

SBIR Title:
Efficient High Frequency
Electromagnetic Source
for Communication
Devices

Contract Number:
FA8650-05-C-1829

SBIR Company Name:
CAP Wireless, Inc.,
Newbury Park, CA

Technical Project Office:
AFRL Sensors
Directorate, Wright-
Patterson AFB, OH



Left: CAP Wireless' Spatium™ family currently includes three platforms that span 2-40 GHz. **Right:** This Line Replaceable Unit (LRU), which is intended for pod applications, incorporates two-phase and gain matched 50 watt X Band Spatium amplifiers.

Gallium Nitride Spatial Power Combiner chosen for B-1B ALQ-161A Transition Program

- The Air Force needed a new approach to manufacture high-power and high-frequency electromagnetic source generation that would enhance or replace Traveling Wave Tube (TWT) technology
- CAP Wireless produced an innovative prototype, successfully demonstrating a Gallium Nitride (GaN) Solid-State Power Amplifier (SSPA) with 150W continuous wave (CW) power and 35% power added efficiency (PAE) covering the X-Band
- This technology has high potential to meet an established requirement for the B-1B Bomber Defensive Self-Protection Avionics Subsystem (the AN/ALQ-161A Radio Frequency Surveillance/Electronic Countermeasures Subsystem, or RFS/ECMS)
- The planned and ongoing transition program is a four-year multi-million dollar effort involving CAP Wireless, the Air Force Research Laboratory, and the Warner Robins Air Logistics Center

Commercialization Pilot
Program Series

01-18NOV09/AF04-218/SS

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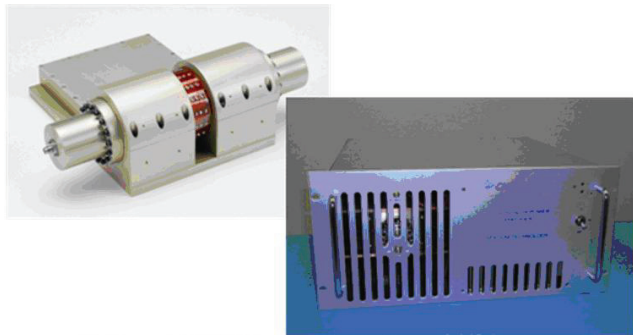
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Air Force Requirement

The Air Force needed a new approach to manufacture high-power and high-frequency electromagnetic source generation that would enhance or replace Traveling Wave Tube (TWT) technology.

SBIR Technology

In this Phase II SBIR project, CAP Wireless produced an innovative prototype, successfully demonstrating a Gallium Nitride (GaN) Solid-State Power Amplifier (SSPA) with 150W continuous wave (CW) power and 35% power added efficiency (PAE) covering the X-Band. The prototype was tested in a laboratory environment and thereby matured to technology readiness level (TRL) 4.



X-Band 150W GaN Spatial Power Combiner

This technology has high potential to meet an established requirement for the B-1B Bomber Defensive Self-Protection Avionics Subsystem (the AN/ALQ-161A Radio Frequency Surveillance/Electronic Countermeasures Subsystem, or RFS/ECMS). However, the AN/ALQ-161A Program Office has indicated that TRL 8 (qualified and tested in a relevant environment) is necessary to facilitate transition into the B-1B. This ongoing transition effort will bridge the gap from TRL 4 to TRL 8 and establish the transition path (including manufacturing and sustainment) into the B-1B AN/ALQ-161A system. In 2009, the Air Force SBIR Commercialization Pilot Program (CPP) initiated a SBIR Technology Transition Plan (STTP) to facilitate the transition process

Transition Impact

Managed by Warner Robins Air Logistics Center (WR-ALC), the AN/ALQ-161A system is degraded by diminishing sources of supply, waning original equipment manufacturer (OEM) engineering support, and comparatively inefficient

technologies. For these reasons, AN/ALQ-161A subsystem management sustainment personnel prefer replacement of the legacy equipment in lieu of repairs. Solid state technologies, such as those utilized in this SBIR project, are the logical replacement for Vacuum Electron Devices (VEDs) and will enhance the AN/ALQ-161A system performance, increase reliability, and reduce life-cycle costs by hundreds of millions of dollars.

A prototype (TRL 8) form, fit, and function replacement for the AN/ALQ-161A power amplifier line replaceable unit (LRU) is expected to be available by fiscal year 2012. The planned program is a four-year multi-million dollar effort involving CAP Wireless, the Air Force Research Laboratory, and WR-ALC. The program structure will mature and implement SBIR-developed High Frequency Electromagnetic Source technology in band 6 and 7 Solid State Power Amplifiers (replace obsolete VED technology) on the B-1B Bomber AN/ALQ-161A system.

Company Impact

"In combination with the Air Force SBIR funds used to support the development of this novel technology, CAP has invested and continues to invest in improvements to the size, weight, performance and manufacturability of the spatially combined power amplifier platform," states Paul Daughenbaugh, President and Chief Executive Officer of CAP Wireless. "With Air Force support, we have successfully demonstrated a broadband, solid state, high power microwave amplification platform that can advantageously replace Traveling Wave Tubes in numerous applications. We are now further developing the technology as a cost effective platform, scalable in frequency and power level that can quickly leverage emerging semiconductor devices to achieve new benchmarks in power, bandwidth and efficiency."

"CAP has designed, developed, and built several commercial models of its Spatium™ amplifier, primarily for test and measurement applications. Several commercial OEM opportunities also continue to gain momentum. We are expanding our manufacturing capability to support increased throughput. This includes investing in specialized test equipment and fixturing, collaboration with our valued semiconductor device suppliers to obtain the necessary devices, and further development of our subcontracted processes to increase yields and performance."



SBIR/STTR

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