

# Department of the Navy SBIR/STTR Transition Program

Distribution Statement A: Approved for public release, distribution is unlimited.

NAVAIR 2016-739

Topic # N122-127

CROSSED FIELD AMPLIFIER TRANSMITTER

H6 Systems, Inc.

## WHO

**SYSCOM:** NAVAIR

**Sponsoring Program:** Navy SBIR

**Transition Target:** Patuxent River Naval Electromagnetic Radiation Facility (NERF)

**TPOC:**  
(301)757-3612

**Other transition opportunities:** Government test facilities at Dahlgren, White Sands, Redstone Arsenal, Blacktail Canyon, Point Mugu, China Lake and Lakehurst may also need this transmitter.

**Notes:** The system has passed its final test at the Naval Electromagnetic Radiation Facility and is due to be installed in October. It will be in full use testing aircraft and ordnance for high power RF susceptibility.



Copyright 2016 H6 Systems Inc.

## WHAT

**Operational Need and Improvement:** An update of MIL-STD-464 and MIL-HDBK-235 has lowered the Peak E-field and raised the average E-field requirements for susceptibility testing of aircraft. The equipment presently used for testing was not designed to cover both peak and average power to this extent. While it might be possible to achieve coverage by adding multiple devices, it would be more convenient and economical to achieve coverage with a single device at each frequency range.

Present MIL-STD-454C testing methods are lacking in the coverage of power for frequencies from 3.0 - 3.3 GHz. E- Band testing for 3.0 GHz is currently done at 2.94 GHz, 310 V/m avg. It needs to be done at 3 GHz, 1280 V/m. F1- band testing at 3.30 GHz is currently done at 306 V/m avg. and needs to be done at 534 V/m. A single transmitter to provide those field strengths and frequencies would facilitate accuracy and ease of testing.

**Specifications Required:** A solution must meet both the peak and average E-field levels at each of the four standard environments given within the MIL-STD-464 and MIL-HDBK-235. An additional desired, but not mandatory, requirement is to provide an illumination area of at least two foot by two foot illumination area on target at not less than ten feet separation distance.

**Technology Developed:** A TWT amplifier that provides 3.0 - 3.3 GHz, 140 Kilowatts at 2.5% duty. The amplifier is based on a coupled cavity TWT that has been modified to combine the ranges of two separate TWTs into a single tube. This reduces size and cost of the completed transmitter.

**Warfighter Value:** More comprehensive susceptibility testing will ensure proper functioning of aircraft and ordnance in the field.

## WHEN

**Contract Number:** N68335-15-C-0049 **Ending on:** August 31, 2016

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Research on a CFA/TWT based amplifier	Low	POC review	TRL 1	April 2013
Design of a TWT amplifier system	Med	POC review	TRL 2	February 2014
Construction of the TWT amplifier	Med	POC review	TRL 5	July 2016
Testing of the TWT amplifier	Med	On site test/data	TRL 8	August 2016
Installation of the TWT amplifier	Med	On site test/data	TRL 9	October 2016

## HOW

**Projected Business Model:** H6 Systems has been building high power transmitters based on magnetrons, klystrons, tetrodes, triodes, and traveling wave tubes for thirty years. The company has full capability to manufacture these systems at its site in Nashua, New Hampshire. High voltage and high power RF components will be integrated to construct complete transmitters. Because the need for these systems is specialized, production volume is expected to be manageable.

**Company Objectives:** H6 Systems hopes to find further customers at government test facilities such as Dahlgren, White Sands, Redstone Arsenal, Blacktail Canyon, Point Mugu, China Lake and Lakehurst. H6 hopes to develop contacts at more of these facilities.

**Potential Commercial Applications:** Government facilities are the sole users of test equipment this high in power. H6 will continue to supply those customers.

So far, there have been no requirements for high power susceptibility testing in the commercial arena. The expertise at H6 Systems in high voltage and high power RF components, however, is transferrable to commercial applications. It is also transferrable to mid-power RF applications such as 200 - 300 Watt TWTs.

**Contact:** Michael Hunter, President  
[mhunter@h6systems.com](mailto:mhunter@h6systems.com) 603-880-4190