

Topic: N131-049

Daico Industries, Inc.

High Power Solid State Amplifiers

This technology is a scalable SSTx architecture able to deliver high RF power reliably and supports technology upgrades to provide longer service life. The architecture achieves high power levels, comparable to legacy Klystron and Tube technologies, and achieves specified reliability. The SSTx technology can be integrated into shipboard, ground-based and airborne applications requiring high power and high reliability. With 50 years experience, Daico has a well established reputation for high-performance, high-quality products in rugged environments. With more than 6 years of continuous real-world transmitter operation, without critical failure, the architecture proves flexible and compatible with GaN, LDMOS and other technologies. As a transmitter manufacturer, we look to partner with an installer(s) and share depot services and are targeting SPS-49, SPY-1 and other legacy tube-based applications.

### Technology Category Alignment:

Advanced Electronics

Electronics Integration

RF Components for sensing, transmission and communication

Air Platforms

Ground and Sea Platforms

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**SYSCOM:** NAVSEA

**Contract:** N00024-16-C-4034

 Corporate Brochure: [https://navystp.com/vtm/open\\_file?type=brochure&id=N00024-16-C-4034](https://navystp.com/vtm/open_file?type=brochure&id=N00024-16-C-4034)

# Department of the Navy SBIR/STTR Transition Program

Statement A: Approved for Release. Distribution is unlimited.

NAVSEA #2016-626

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High Power Solid State Amplifiers

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## WHO

**SYSCOM:** NAVSEA

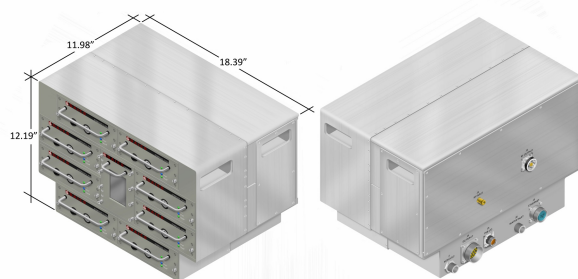
**Sponsoring Program:** PEO IWS

**Transition Target:** AN/SPS-49  
Radar Technology Refresh

**TPOC:**  
(812)854-5264

**Other transition opportunities:**  
AN/SPY-1 Radar Technology  
Refresh

**Notes:** The Combined High Power Amplifier (CHPA) technology can be integrated into Shipboard, Ground Base and Airborne Solid State High Power Amplifier applications requiring high power level and high reliability.



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## WHAT

**Operational Need and Improvement:** There is a need for high power solid state amplifiers to replace existing troublesome and diminishing manufacturing source Klystron and Cross-Field Amplifier tubes in radar applications to increase Mean Time Between Critical Failure (MTBCF), minimize maintenance intervention and maximize operational availability.

**Specifications Required:** The Combined High Power Amplifier (CHPA) technology is a reliability-oriented design architecture, achieving 99.999% operational availability in the mission critical applications. This technology is a hatchable modular design and scalable in power; hundreds of kilowatts can be achieved by combining multiple CHPAs with various redundancy configurations. The CHPA architecture proves flexible and compatible with GaN, LDMOS and other technologies. Implementation of the innovative thermal removal configuration and cableless Divider Switching Combiner Unit (DSCU) combining scheme demonstrate its ultra high power density capability and cost effectiveness. The technology reduces the transmitter's physical size by 50 percent, reduces its overall weight by 20 percent and reduces its cost by 38 percent.

**Technology Developed:** Fully Solid State Combined High Power Amplifier (CHPA) Architecture capable of delivering scores of kilowatts of RF power with graceful degradation, higher reliability, maintainability with lower total cost of ownership. Multiple CHPAs can be combined to achieve hundreds (or thousands) of kilowatts of coherent RF power.

**Warfighter Value:** This technology can deliver solid state transmitter performance with zero downtime during a 6-month deployment and graceful power degradation with multiple Power Amplifier Unit (PAU) failures.

## WHEN

**Contract Number:** N00024-16-C-4034 **Ending on:** November 17, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Refined 4.5kW PAU	Low	>4.2kW@36W per cubic inch PAU achieved	TRL7	September 2016
Cableless (7+1)DSCU	Low	2 Prototype Cableless Units Complete	TRL7	September 2016
29kW (7+1)CHPA Demo	Med	Cabled (9+1)CHPA Demonstrated	TRL7	March 2017
>55kW SSTx Demo by Combining two (7+1)CHPAs	Low	>40kW Power Level Achieved with single CHPA during DEMO	TRL7	October 2017

## HOW

**Projected Business Model:** Daico Industries can begin low initial rate production of our high RF power output solid state SPS-49 transmitters in Q4 of 2018; with full rate production of fully qualified transmitters to start with the fifth deployed transmitter. Full rate production will be 5 transmitters per year minimum.

**Company Objectives:** As a transmitter manufacturer, we look to partner with an installer(s) and share depot services and are targeting SPS-49, SPY-1 and other legacy tube-based high reliability transmitter applications.

**Potential Commercial Applications:** Airport Surveillance Radar

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