

# NAVY Transition Assistance Program

"Approved for public release; distribution is unlimited."

## NEED & CUSTOMER REQUIREMENT

**Need:** Current amplifiers offer minimal performance operating in harsh weather, snow density terrain and special surveillance situations. An ultra-wide band, highly integrated, high power transmitter is desired to strengthen communications

**Value to the Warfighter:** Smaller footprint, enhanced duration of operation, and extended range with higher fidelity of coverage provides superior communications systems used by Warfighter in battlefields.

**Operational Gap:** Conventional analog systems are based on the generation of analog signals which are distributed through power splitters and provided in analog form to each of the elements in an array (or subarray). Analog beamforming is accomplished by use of phase shifters or time delay units which are provided to each element (or subarray). For microwave frequency of operation it is often necessary to perform up conversion of baseband signals via use of analog mixers, filters and preamplifiers. For arrays of 1k-10k elements this conventional process can be costly due to the relatively high part count and power consumption.

**Customer Specifications:** A highly linear, ultra wideband transmitter with >50% power output efficiency at the mm-Wave band.

**Technology Description:** The system designed by TiaLinx has a transmitter chip (Tx) composed of a voltage-controlled oscillator (VCO), pulse generator circuit, and a pre-loaded signal sequencer is multiplied to the pulse generator output. The multiplier implementation is a double balanced mixer design, wide-band power amplifier addresses the bandwidth of few GHz at the mm-Wave, antenna matching circuit. Spatial combining has been proposed to design a sub- array of a 2 x 2 and eventually an 8 x 8 of such sub-arrays integrated in the transmitters with effective radiation power of 40 dBm.

## TECHNOLOGY DEVELOPMENT MILESTONES (SBIR/STTR)

Milestone	TRL	Risk	Measure of Success	TRL Date
Design, Manufacturing, Lab. Test of the TX, 1st Iteration	5	Moderate	Functional VCO+ Mixer + PA	10/28/2009
Design, Manufacturing, Lab. Test of the TX, 2nd Iteration	7	Moderate	Functional VCO+ Mixer + PA + Output Power of >80 mW TX	7/28/2010
Design, Manufacturing, Lab. Test of 2 x 2 TX array	7	Moderate	Output Power of >300mW	7/28/2011
Design, Manufacturing, Lab. Test of 4 x 4 TX array	7	Moderate	Output Power of >1.5 W	12/28/2012
Design, Manufacturing, Lab. Test of 16 x 16 TX array	7	High	Output Power of >20 W	7/28/2014

**Open contract:** N00014-09-C-0154 ending 2010-01-28

N07-083 - TiaLinx, Inc.

Affordable Signal Distribution and Drivers for Highly Efficient Switched-Mode Amplifiers in ESA Transmitters

## SPONSORSHIP of original SBIR/STTR Topic

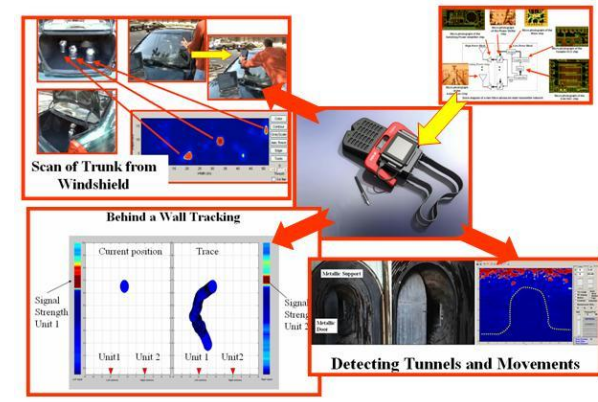
**SYSCOM:** ONR - SBIR

**Transition Target:** TBD

**Original Sponsoring Program:** CGX radar suites

**TPOC Phone Number:** (703) 588-1920

## High Efficiency mm-Wave UWB Transmitter Chip



## TECHNOLOGY TRANSITION OPPORTUNITIES (PHASE III)

### Other Potential Applications:

SATCOM, Micro-UAV, Counter IED/EFP, Fiber replacement with Gbps wireless link, Security and Surveillance (detection of concealed weapon), Enabler for advanced situation awareness systems, border protection (tunnel detection), unauthorized intrusion (virtual fence), pirate boat detection.

### Business Model:

Design and oversee manufacturing and test of the units by qualified outsource outlets for direct sales, and private labeling the product to the Primes. Attract acquisition program decision makers to ensure successful technology transfer for full commercialization.

### Objective:

Outsourced manufacturing + revenue sharing with a prime and availability of distribution channel. Internal use for Eagle UWB RF imaging systems for IED defeat as well as motion detection behind a premise and tunnels.