

# Department of the Navy SBIR/STTR Transition Program

Statement A: Approved for public release, distribution is unlimited. (20

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Topic # N11A-T038

Scenario Based Radio Simulator and Analysis Tool

Toyon Research Corp.

## WHO

**SYSCOM:** SPAWAR

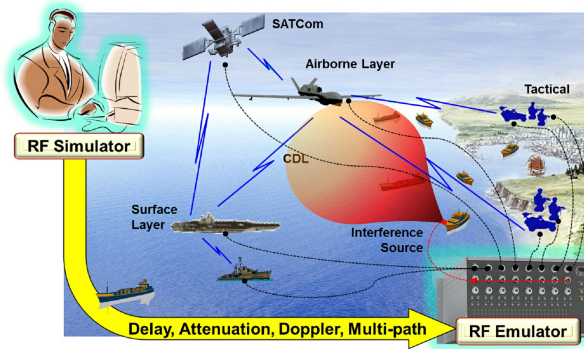
**Sponsoring Program:** PMA/PMW-101

**Transition Target:** SPAWAR Combined Testbed (CTB)

**TPOC:**  
(619)767-4626

**Other transition opportunities:** Research, Development, Test and Evaluation Applications at Army PEO C3T, Army Test and Evaluation (ATEC), Army CERDEC, Air Force SATCOM programs, and Naval Research Lab (NRL)

**Notes:** Concept of Operation: Use the virtual simulator to create a geo-specific scenario with interference sources - real location, virtual assets with dynamic flight and motion paths. Connect real radios to the hardware emulator and run nominal communication profile. Link simulator to the emulator to provide dynamic propagation parameters - attenuation, delay, Doppler fading. Virtual Environment for Radio Frequency Interference Testing (VERFIT)



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## WHAT

**Operational Need and Improvement:** A key goal of next-generation communication protocols is to enable greater spectral efficiency, reduced Inter-symbol Interference (ISI), resilience against interference, Multipath, and Doppler-shift distortions. Unlike legacy waveforms, newer Internet Protocol (IP) based protocols incorporate complex link adaptation algorithms that make spectrum and modulation decisions based on continuously-sensed link conditions. This scope presents a challenge to the development, test and deployment communities with respect to needing multiple channel emulation and channel simulation software solutions that covers a broad spectrum and in some cases large operational bandwidths.

**Specifications Required:** Simulate via a standalone software application with representations for terrain, foliage, maritime RF propagation environment and the ability to virtually attach radio to dynamic ground, surface, air, and space based assets. Support channel emulation for several hundred megahertz bandwidth coverage within the 2 MHz to 2.2 GHz spectrum using predefined characterization input (i.e delay, attenuation, doppler shift) and real-time configurable control

**Technology Developed:** The Virtual Environment for Radio Frequency Interference Testing (VERFIT) suite simulates environment impairments (terrain, foliage, buildings), platform dynamics (ships, vehicles, aircraft, satellites), RF propagation for real-time emulation of RF attenuation, delays, multi-path, Doppler shifts for full duplex Software Defined Radios across a wide bandwidth.

**Warfighter Value:** Allow development and test in a secure laboratory setting to reduce time and expense to field new warfighter capability.

## WHEN

**Contract Number:** N66001-12-C-5243 **Ending on:** February 3, 2016

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Simulator - Prototype	N/A	Demonstrate at SPAWAR Testbed	7	July 2015
Simulator - Initial Operating Capability (IOC)	Low	Operational at SPAWAR	8	January 2016
Emulator - Complete Prototype	Low	Demonstrate Prototype at relevant environment	6	June 2016
Emulator - Initial Operating Capability (IOC)	Med	Operational at SPAWAR Testbed	7	January 2017

## HOW

**Projected Business Model:** The Virtual Environment for Radio Frequency Interference Testing (VERFIT) software and hardware can be procured as a set or individually. The software is available through negotiable license agreement. The Hardware emulator is long lead order item. As we explore potential markets, Toyon is open to discussing a variety of business models.

**Company Objectives:** The ultimate customer is Government labs and industry partners who are looking for cost effective virtual alternatives to live outdoor Developmental and Operational Tests (DT & OT). Toyon would like to establish long term partnership relationships with these customers to provide technology, support, and analyses as requirements evolve with time.

**Potential Commercial Applications:** The RF impairment simulator and emulator technology can be used to test commercial cellular applications like Global System Mobile (GSM) communications, General Package Radio (GPR) Services, Enhanced Data rates for GSM Evolution (EDGE), Wideband Code Division Multiple Access (WCDMA), Code Division Multiple Access (CDMA), 3rd Generation Partnership Project (3GPP) Long-Term Evolution (LTE), and Worldwide Interoperability for Microwave Access (WiMAX). Other software only applications apply to optimal placement of remote sensors and communication relays (e.g. environmental monitoring sensors).

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