

Topic: N11A-T038

Toyon Research Corp.

Scenario Based Radio Simulator and Analysis Tool

The Virtual Environment for Radio Frequency Interference Testing (VERFIT) joins two products, a software simulator and a hardware emulator, offering unprecedented comprehensive virtual communications for next generation mobile, multi-protocol, wideband, tactical radios and software defined waveforms spanning large dynamic operational ranges. The Scenario-Based Tactical Radio Channel Simulator, currently integrated in SPAWAR's Combined Testbed (CTB), places radios in a virtual context producing signal path attenuation, delay, and Doppler fading. The Scalable Wideband Impairment Propagation Emulator (SWIPE) couples directly with radios under test to offer a virtual operational environment. VERFIT supports geo-specific development and operational testing (DT&OT). Toyon provides software analytics and radio frequency hardware systems for DoD customers, including MIDS JTRS to support RDT&E in a virtual setting. Our goal is to be a long-term solution provider for RDT&E labs and industry.

**Technology Category Alignment:**

Networks

Software Defined Radio

Real-time sensing, assessment and optimization of Electronic Attack (EA)

Navigation

Nanoelectronics & Microelectronics: mixed signal, digital processing, emerging architectures

Preemptive / Proactive Effects (real-time sensing, assessment and optimization of EA effectiveness)

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**SYSCOM:** SPAWAR

**Contract:** N66001-12-C-5243

 Corporate Brochure: [https://navystp.com/vtm/open\\_file?type=brochure&id=N66001-12-C-5243](https://navystp.com/vtm/open_file?type=brochure&id=N66001-12-C-5243)

# Department of the Navy SBIR/STTR Transition Program

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

January 2016)

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## WHO

**SYSCOM:** SPAWAR

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

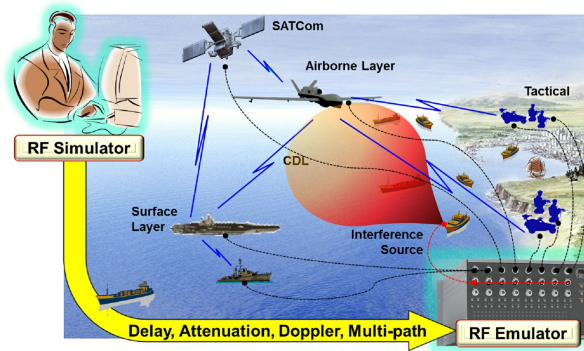
**Transition Target:** SPAWAR Combined Testbed (CTB)

**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 different 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 Packet 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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