Air Force SBIR/STTR

Air Force SBIR/STTR Transition Story

Transition

An example of Air Force supported SBIR/STTR technology that has been transitioned into an Air Force or other DoD system or subsystem or used by Air Force test ranges and facilities or maintenance depots.

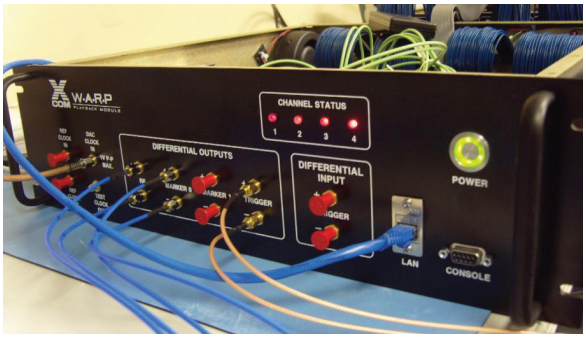
SBIR Topic Number:
AF071-247

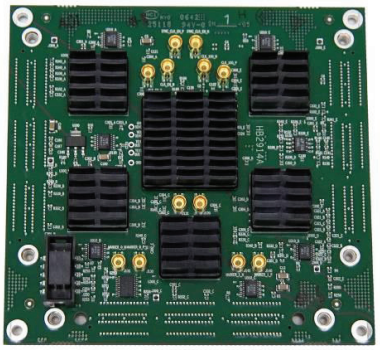
SBIR Title:
Wideband Radio Frequency Data Recorder and Playback System

Contract Number:
FA8650-08-C-1420

SBIR Company Name:
X-COM Systems, LLC, Reston, VA

Technical Project Office:
AFRL Sensors Directorate, Wright-Patterson AFB, OH





Left: Wideband Acquisition, Record and Playback (WARP™) Playback Module Front Panel.
Right: WARP Playback Module Digital to Analog Converter.

Wideband Radio Frequency (RF) Data Recorder and Playback System

- The Air Force needs a data acquisition system capable of sampling and recording RF emissions with high fidelity and capable of reproducing captured RF signals with an instantaneous RF bandwidth up to 6 GHz
- X-COM Systems, LLC, developed a comprehensive system for acquisition, storage, and playback of wideband RF signals known as the Wideband Acquisition, Record and Playback (WARP™) system
- WARP system consists of ultra-high speed RF to digital converters and miniature memory controllers capable of handling 12 GSPS with compact size and low power, making the system robust enough to be used for mobile applications
- Even before the full WARP system was delivered to the Air Force Research Laboratory, X-COM was contacted by a major defense prime contractor with a request to procure the RF playback module
- WARP makes it possible to capture a virtually unlimited variety of very precise RF signals simply and quickly, resulting in both cost and time savings when developing advanced electronic warfare and communication systems

Commercialization Pilot Program Series

01-26JUL10/AF071-247/SS

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Air Force Requirement

The objective of this research effort is to design and develop a data acquisition system capable of sampling and recording radio frequency (RF) emissions with high fidelity and capable of reproducing the captured RF signals. The system needs to be able to collect large amounts of data (>5 Terabytes) in digital form capable of offline analysis and future playback of the same data. The system should be suitable for laboratory and field test uses (mobile van or aircraft).

SBIR Technology

X-COM Systems, LLC, developed a comprehensive system for data acquisition, storage, and playback of wideband RF signals known as the Wideband Acquisition, Record and Playback (WARP™) system. The developmental process produced technology meeting multiple areas of this SBIR requirement, to include:

• Adapting commercial leading edge analog to digital converter devices that are capable of up to 12 Giga-samples per second rates, which are used in leading edge commercial RF test equipment, for use in military high-fidelity data RF data recorder applications. Applying this technology required developing high-speed, field-programmable-gate-array (FPGA) based circuits that can handle very high continuous data rates, and support military requirements such as precise time and Global Positioning System (GPS) location tagging to the individual sample level.

• Development of miniature memory controllers capable of handling the high data rates with a compact size and low power. Using solid state high-speed memories dramatically reduce power consumption and make the system robust enough to be used for mobile applications.

• Development of the technology required to access signal data stored in these very large memories and to replay information at the full speed that it was recorded so it can be used to recreate, with high fidelity, the original RF signals or any selected part.

• Development of innovative high-data rate techniques to allow off-loading of these very large signal files to an external workstation for detailed analysis or archive purposes. For files of the size created by the WARP system, traditional data transmission methods (such as Ethernet) are time intensive.

Transition Impact

Recent advances in the areas of very high speed analog to digital converters and high speed digital signal processing devices provide the technology needed to most effectively monitor, record, analyze and exploit the RF spectrum. However, currently available RF recording devices can have limited bandwidth, limited storage, and other limitations that reduce their effectiveness. The WARP system being developed under this SBIR effort is intended to address many of these limitations by providing a single system that has much greater bandwidth, storage capability, and the ability, which few systems have, to playback all or portions of the recorded spectrum for detailed analysis.

Even before the full WARP system was delivered to the Air Force Research Laboratory (AFRL), X-COM was contacted by a major defense prime contractor with a request to procure the RF playback module of the system. This playback module has the capability to reproduce an up to a 6 GHz RF bandwidth RF signal from a digital representation of the desire waveform. This capability makes it possible to create a virtually unlimited variety of very precise RF signals simply and quickly. Signals can be rapidly and easily modified based on test results to improve system performance. This results in both cost and time savings when developing advanced electronic warfare and communication systems.

Company Impact

This SBIR program allowed X-COM to respond to a major prime contractor's requirement in a timely manner, created additional sales opportunities, and established the company's expertise in the area of high-speed digital-to-RF converter systems. X-COM is currently in discussions with another firm which has expressed interest in an even higher performance converter system, as well as with a Department of Defense agency that has an immediate need for a system with the capabilities that the technology can provide. The WARP system also has significant commercial potential with companies involved in wireless networks and systems.

U.S. AIR FORCE

SBIR/STTR

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