

**SBIR Topic Number:**

AF04-042

**SBIR Title:**

User-Programmable, Radiation-Hardened, High-Speed Voltage Level Converter

**Contract Number:**

FA9453-05-C-0057

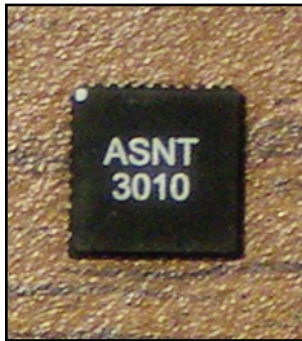
**SBIR Company Name:**

Advanced Science and Novel Technology Company (ADSANTEC), Rancho Palos Verdes, CA

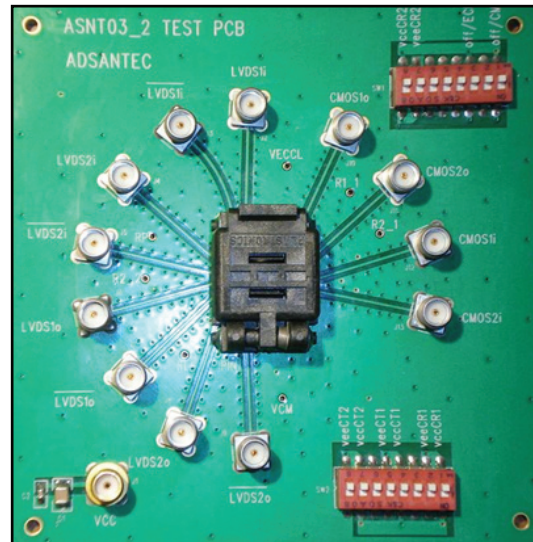
**Technical Project Office:**

AFRL Space Vehicles Directorate, Kirtland AFB, NM

This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR/STTR technology that met topic requirements and has outstanding potential for Air Force and DoD.



1Gbps LVDS/CMOS Converter



PCB designed to test the 3010 chip

# User-Programmable, Radiation Hardened, High-Speed Voltage Level Converter

- The Air Force has a requirement for universal programmable interfaces that can provide robust interconnect with a number of different input/output (I/O) devices
- Potential applications in next generation Air Force, Missile Defense Agency (MDA), and NASA systems
- This technology involves a novel concept for a single-chip universal electronic voltage level converter implemented in a radiation-hardened-by-design SiGe process
- These proprietary concepts, particularly the universal I/O devices, are being used to develop radiation tolerant (RT) products for NASA

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## Air Force Requirement

Existing and future complex command and control systems used in avionics and satellite electronics utilize radiation tolerant (RT) components from a number of logic families, each with different data rates and input/output (I/O) interfaces. This results in incompatibilities of blocks and subsystems that increases as modern electronics are migrated to lower power supply voltages in an attempt to reduce overall power consumption. Yet, higher power supply voltages need to be preserved for some existing systems in order to optimize the performance and cost of these systems. Therefore, the Air Force requires the development of universal programmable interfaces that are capable of providing robust interconnect with a number of different I/O standards.

## SBIR Technology

Funded by Phase I and Phase II SBIR contracts, ADSANTEC developed a novel concept of a single-chip universal electronic voltage level converter. This converter is based on the company's proprietary level shifting technique, radiation-hardened-by-architecture (RHBA) differential current mode logic (CML) cells, and reconfigurable I/O buffers controlled by a special tri-level switching logic. These are implemented in a radiation-hardened-by-design SiGe technological process. The unique combination of these features results in realization of a user-programmable, low-power, radiation-hardened universal converter application specific integrated circuit (ASIC). These ASICs have speed characteristics defined only by activated I/O devices.

## Potential Air Force Application

Universal, radiation-hardened, high-speed voltage level converters will become key components in providing maximum reconfigure and upgrade potential for next generation command and control systems. Interconnection flexibility provided by the proposed combination of CML, emitter-coupled logic (ECL), low-voltage differential signaling (LVDS), transistor-transistor logic (TTL), and complementary metal-oxide-semiconductor (CMOS) I/O devices, with the best achievable speed-power characteristics, will guarantee unprecedented reconfigure abilities. These also have upgrade potential for emerging high-performance electronic systems. This technology will help system designers to drastically reduce development cycle times in Air Force, Missile Defense Agency (MDA) and NASA applications alike.

## Company Impact

"This SBIR program has allowed the company to investigate, develop, fabricate and test single event upset (SEU) tolerant integrated circuits, implementing novel proprietary RHBA concepts. ADSANTEC is also using these concepts for the development of RT products to meet the needs of NASA. The developed intellectual property (IP), and universal input/output devices in particular, will be an important IP block which can be implemented in a variety of space programs performed by both NASA and DOD."

Vladimir Katzman  
President, ADSANTEC



# SBIR/STTR

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