

**NASA SBIR/STTR Technologies**  
**Reconfigurable/ Reprogrammable Communication Systems**

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**Firm Name –Intelligent Automation Inc, MD**

**Proposal No.: 08-1 O1.03-9360**



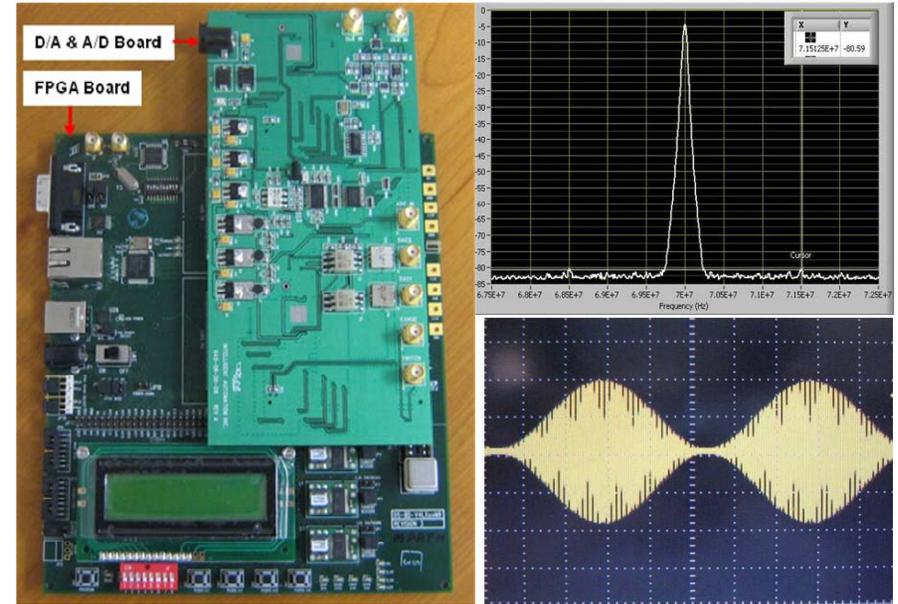
**Identification and Significance of Innovation**

Intelligent Automation Inc, (IAI) is currently developing a software defined radio (SDR) platform that can adaptively switch between different modes of operation for communication, by modifying both transmit waveforms and receive signal-processing tasks on the fly. High-speed analog-to-digital and digital-to-analog converters along with modern FPGAs and fast digital signal processors allow for maximum flexibility in digital radio design. The proposed software reconfigurable radio implementation technique and the system design will leverage IAI's vast experience in SDR, RF hardware design, signal processing and system level firmware design.

Key innovations of the proposed effort are

- Reconfigurable digital transceiver/ waveform synthesizer design using high speed FPGA.
- Multi-mode radio functionality and scalable architecture.
- Soft-processor based controller and flexible user control to enable on the fly radio configuration.
- Cognitive capabilities like Adaptive modulation and Automatic Modulation Recognition (AMR)
- Complex modulation and bandwidth efficient waveform implementation capability

**Expected TRL Range at the end of Contract (1-9): 6**



**Technical Objectives and Work Plan**

The key technical objectives for this proposal are:

- Generate justified system designs and engineering guidelines. This will be accomplished by arranging kickoff meetings with the NASA technical personnel
- Demonstrate transmit waveform diversity and implementation of several candidate digital receiver architectures.
- Demonstrate flexible user control and on the fly radio reconfiguration capabilities.
- Implementation of cognitive capabilities in the software radio. We visualize adaptive modulation and AMR to be of general interest in the software radio community. Hence we will explore these areas and demonstrate these capabilities in the proposed software radio.

**NASA and Non-NASA Applications**

The proposed technology is built upon the software defined radio expertise of IAI. The most promising commercial applications are:

- Arbitrary wideband waveform synthesizer
- Reconfigurable radar transceiver with multi-mode capabilities
- Cognitive radios
- Configurable telemetry and ranging radios
- Lab based software radio test-bed
- Extra Vehicular (EVA) radios for space applications

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**NON-PROPRIETARY DATA**