



**DRAFT**



---

**NDIA**  
**MDA SBIR Industry Day**

*28 July 2010*

**Space Technology**

**Kevin Slimak**

**MDA Space Technology Research Area Lead**  
**Tech Advisor, STSS Systems Engineering, Integration and Test**



# Agenda

---

- Disclaimer
- Research Area Objectives
- List of SBIR Topics
- SBIR Topic Overview
- Questions



# Disclaimer

- The published SBIR & STTR Solicitations take precedence over anything written, stated, or implied in this briefing.
- Anything in this briefing which conflicts with the published solicitations is an error and should be ignored.

**Follow the directions and respond to what is in the published solicitation!**



# Space Technology Research Area



## Objectives

- Solve Technical Issues/Problems/Limiters of BMDS System Concepts/Designs to Enable Space-Basing
  - Can Enable New System Concepts or Significantly Improve Existing Concept Performance/Cost/Producibility/Life
- Provide Subsystem or Component Suppliers to Our System Prime and Payload Contractors

## Scope of Research Area

- All Technologies Developed Must Be Capable of Long Term Operation in Space >>>>> **Radiation! Vacuum!**

## Relevance to the BMDS

- Space-Basing Provides Enhanced, Persistent, Pervasive Coverage while Minimizing the Geopolitical and Security Issues of Basing on Foreign Soil/Ports

**Transition Is Critical!**



# Space Technology SBIR Topics

---

- MDA10-030: Space Photonics Technology
- MDA10-031: Large Format Space Focal Plane Array Technologies
- MDA10-032: Radiation Hardened, Low Power, Variable Bandwidth/Resolution Sigma Delta Converters
- MDA10-033: Lightweight Components
- MDA10-034: Advanced Space Power Technologies
- MDA10-035: Enhanced Spacecraft Survivability

\* No topic 3



# Space Photonics Technology

---

## Objective

- Design, fabricate & demonstrate innovative approaches for intelligent broadband space based optical networks that include the network architectures, communication protocols and optoelectronic components for space systems applications

## Areas of Interest

- Intra-satellite optical communications networks based on existing broadband commercial protocols
- Optical photon counting receivers for laser communications
- Critical components required for the precision acquisition, tracking, & pointing of laser communication receivers & transmitters

## Key Performance

- Must be capable of 10 years operation in a space environment
  - $\geq 300$ Krad total dose of radiation (ionizing and proton)
- Minimum size, mass, & input power

## Phase I Goals

- Develop a preliminary design of the component or algorithm
- “Demonstrate” performance via modeling, simulation, & analysis
- Proof of concept hardware or software development & test is highly desirable



# Large Format Space Focal Plane Array Technologies

## Objective

- Develop innovative solutions to support the development of large format ( $>25\text{cm}^2$ ) focal plane arrays (FPAs) for space sensing

## Technology Areas of Interest

- Visible  $\rightarrow$  long wavelength infrared of greatest interest
  - Detector materials & processing leading to high quality devices w/low damage
  - Substrate growth, polishing, cleaning and reclamation techniques
  - Characterization tools & techniques that can non-destructively, readily assess step-wise processed material for damage
  - Low-loss hybridization techniques (temporary and permanent) & bump bond architectures
  - FPA planarization and substrate removal techniques
  - FPA butting techniques
  - Innovative approaches to anti-reflective (A/R) coatings
  - Read Out Integrated Circuit (ROIC) design, fabrication and testing

## Key Performance

- Meet performance goals post  $\geq 300\text{Krad}$  (both protons & ionizing radiation) exposure
- Performance  $>$  current sensor approaches & sufficient for BMDS strategic sensors

## Phase I Goal

- Produce proof-of-concept/principle demonstration articles for radiation testing by the government



# Radiation Hardened, Low Power, Variable Bandwidth/Resolution Sigma Delta Converters

## Objective

- Identify concepts and architectures for radiation hardened sigma delta DACs (digital to analog converters) and ADCs (analog to digital converters) for application in satellite control systems

## Technology of Interest

- ADCs & DACs with
  - High resolution (16 to 22 bits)
  - Low bandwidth ( $\leq 10\text{Mhz}$ )
  - High signal-to-noise ( $\geq 114\text{db}$ )
  - Minimum size, weight & power

## Key Performance

- Radiation hardness  $\geq 300\text{Krad}$  (both protons & ionizing radiation)
- Highly resistant to single event effects

## Phase I Goal

- Develop an architecture for a DAC or ADC that meets established requirements
- Demonstrate effectiveness of the proposed architecture by simulation



# Lightweight Components

## Objective

- Design, develop and demonstrate miniaturized, lightweight, space qualified components to support future MDA space

## Technology Areas of Interest

- 2 prime areas of interest
  - Lightweight deployment mechanism and structures
  - Robust, single chip GPS receiver
- Other technologies that meet overall objective will also be considered
  - Strongly suggest talking to authors before proposing

## Key Performance

- Proposed solutions must demonstrate they meet government near-term goals
- Must demonstrate path to space qualification
- Operational life  $\geq 10$  years;  $\geq 300$  Krad (Si) total dose
- Reduce mass, volume, & cost, &/or increase precision (compared to current state of the art)

## Phase I Goals

- Develop preliminary design of concept
- Proof of concept hardware development and testing to prove concept feasibility highly desirable



# Advanced Space Power Technologies

---

## Objective

- Develop advanced space power technologies for MDA satellite applications

## Technology of Interest

- Aerospace-grade rechargeable lithium battery
  - New or improved materials for all cell components
  - Cell balancing electronics
  - Simulation models and software that provides high-confidence prediction of battery life and performance

## Key Performance

- Radiation hardness  $\geq 300\text{Krad}$  (both protons & ionizing radiation)
- Hours to days of operation @  $\leq 20\text{C}$  without unacceptable damage or loss of battery capacity
- $\geq 50\text{K}$  cycles @ 50% nominal DoD, but capable of variable DoD & pulsing operation

## Phase I Goal

- Design, develop, and demonstrate representative proof of concept hardware



# Enhanced Spacecraft Survivability

## Objective

- Develop (design, fabricate and demonstrate) innovative approaches to enhance the survivability of MDA Space Systems to spacecraft anomalies occurring from either natural or manmade events

## Capabilities Desired

- Sensors and algorithms to detect, characterize (i.e., provide attribution), and report, in near real time, mission critical effects arising from natural and/or manmade origins
- Innovative mechanisms or algorithms to enhance the survivability of optical sensors
- Hardware/algorithm concepts to enable continued operations through anomalies and/or the fast recovery of the system afterward

## Key Performance

- Must be capable of 10 years operation in a space environment
  - $\geq 300$ Krad total dose of radiation (ionizing and proton)

## Phase I Goals

- Preliminary design of the hardware/software
- Modeling, Simulation, and Analysis (MS&A) of the concept/design demonstrating how near-term goals will be met
- Proof of concept hardware/software development and test is highly desirable
  - Subscale, non-rad hard (with traceability) acceptable



# Helpful Hints

- Respond to solicitation!
  - Address all evaluation criteria!
- Transition is as important as innovation!
  - Do your homework on the BMDS problem/system you are proposing against
  - To solve a BMDS problem, you have to get your product into a BMDS system
- Watch out for ITAR problems!
  - Do your homework on ITAR!
  - Foreign persons will, in almost all cases, be prohibited from working on critical BMDS space technologies
    - When in doubt, don't use foreign nationals
    - Establish citizenship status of key personnel in proposal
- Where a topic is broader/multiple concepts/technologies are of interest, focus a proposal on one concept
  - > 1 award/contractor in A topic RARE
- Target your audience (the evaluators)!
  - Proposal is not a scientific paper or journal article



# Questions?

