

**Department of Homeland Security (DHS) Science and Technology Directorate (S&T)  
Chemical and Biological Defense Division (CBD) BAA 14-003/Call 0001**

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1. **Announcement Number:** BAA 14-003/Call 0001
2. **FBO Solicitation Number:** HSHQDC-14-R-B0009
3. **Solicitation Open/Close Dates:**
  - Opening Date – 24 July 2014
  - Closing Date – 25 August 2014

Full Proposals are due by 3:00 p.m. EST time on the closing date. There will be no exceptions to the time and date on which responses are due, unless determined otherwise by the Government. Proposals received after the closing date/time will not be considered.

**4. Research Opportunity Description:**

Chemical and Biological Research and Development CBD.02-Surveillance and Detection

**4.8. Research Opportunity Description**

**4.1.1. DHS S&T: Exploration of Advanced Detection Methodologies for Chemical and Biological Threats**

**Background**

The U.S. Department of Homeland Security (DHS) is committed to using cutting-edge technologies and scientific talent in its quest to make America safer. The DHS Directorate of Science and Technology (S&T) is tasked with researching and organizing the scientific, engineering, and technological resources of the United States and leveraging these existing resources into technological tools to help protect the homeland. The Chemical and Biological Defense Division of S&T supports this mission by identifying and developing technologies for the DHS operational components that are needed to reduce the probability and potential consequences of a biological pathogen or a chemical attack on the nation's civilian population, its infrastructure, or its agricultural system.

DHS's mission space includes preventing, detecting, responding to, and recovering from intentional or accidental introduction of biological and chemical agents which present a threat against the Nation's human population and critical infrastructure. To support this mission, DHS and its state and local partners have a need to quickly collect reliable information to enable a swift and confident response to a biological and chemical threat. The Chemical and Biological Defense (CBD) Division within DHS S&T is working toward developing and transitioning technologies that ***demonstrate significant improvements*** to current analytical approaches in sensing and identifying chemical or biological contaminants in all types of environmental samples (solid, vapor, liquid, serum, blood, growth media) with high confidence.

Several past efforts within DHS S&T have provided enhanced detection and identification systems for both chemical and biological targets of interest. The Autonomous Rapid Facility Chemical Agent Monitor (ARFCAM) Project developed a "detect-to-warn" facility system to monitor the presence of Chemical Warfare Agents (CWAs) and high priority Toxic Industrial Chemicals (TICs). This system can continuously and autonomously monitor, and detect dangerous levels of these chemicals with a response time that provides sufficient warning to enable effective response measures. The Lightweight Autonomous Chemical Identification System (LACIS) Project developed "detect-to-protect", hand-portable detectors, to monitor chemical vapor hazards such as CWAs and high priority TICs for first responders use.

The continuous collection of viable aerosol samples from the environment is needed for comprehensive analysis of bio-terrorism attacks. These viable aerosol samples will be analyzed in the laboratory for antibiotic

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resistance, among other functional tests, to augment the existing DHS Office of Health Affairs (OHA) BioWatch Program detection capabilities. The Viable Bioparticle Capture Project is developing collectors to be widely deployed in both indoor and outdoor environments, to collect aerosols continuously, and to store samples on-board in a viable state with minimal logistics and maintenance requirements. The collected samples will provide an archive in the event of a biological attack, as well as provide spatial resolution to determine the location and extent of contamination to support decontamination efforts. These systems will also be used to support attack characterization and restoration missions with OHA, the Center for Disease Control (CDC), the Environmental Protection Agency (EPA), and the Federal Bureau of Investigation (FBI).

Rapid bio-detection in indoor environments has been achieved via development of “detect-to-protect” sensors which monitor the elevation in biological material present in the air, acting as a trigger for in situ follow-on detection. This tiered architecture system yields early notice of the presence of a pathogenic agent inside a facility. The architecture includes lower specificity sensors that are continuously operated (referred to as “triggers”) to provide a rapid indication of the presence of a bioaerosol and to queue a higher specificity sensor (referred to as “confirmers”) to provide a higher confidence result. This multi-tiered detection approach lowers the cost of ownership and false alarm rate for the complete bio-detection network by reducing the number of samples required to be processed by the confirmation sensors.

First responders and public health officials require validated detection assays to analyze suspected biothreat samples and enable them to take appropriate actions in the interest of public safety (e.g., evacuating a building) and public health (e.g., distributing antibiotics). The BioAssays Project enables capabilities to rapidly screen and detect high consequence biological pathogens and toxins that can have a significant Public Health impact. The project develops, tests, evaluates and validates nucleic acid detection assays (TaqMan PCR), antigen detection assays (immunoassays) and rapid antimicrobial susceptibility assays (based on microculture and PCR), using the Government Unique Standards for the Implementation of Public Health Actionable Assays for deployment and employment through the Centers for Disease Control and Prevention Laboratory Response Network and other federally-sponsored laboratory response networks. These assays are intended to be dual use assays that can be used for environmental sample analysis as well as clinical specimen analysis. This project encompasses developing bio-informatics resources, reference strain repository, antibody repository, and the appropriate standards. Finally, the BioAssays Project will also evaluate novel approaches to recognize and identify emerging, advanced, and enhanced threat agents.

This project seeks to build on this legacy of successful DHS S&T detection and assay development projects. The objective of this BAA Call is to explore the feasibility, performance potential, and development roadmap of innovative, novel sensing technologies or approaches that demonstrate significant improvements to current sensing capabilities. This new concept should be capable of both detection and identification of chemical and/or biological contaminants in a variety of environmental samples with high confidence. Ultimately approaches are desired that can be manufactured to be small, robust (durable, long shelf life), inexpensive, sensitive (at levels well below those dangerous to life or health, below parts-per-million), with rapid response times (minutes or less) to multiple analytes or classes of analytes ultimately configured to reduce false alarm rates.

It is envisioned that the most promising detector concepts identified from this feasibility study will inform longer term technology and system development efforts that represent high payoff investments to yield next generation chemical and/or biological detect-to-warn or detect-to-protect tools. Thus, the purpose of this BAA Call is to identify future enabling technological approaches and evaluate initial feasibility and likelihood of applications of these sensors to chemical and/or biological materials and to identify the remaining challenges toward development of next generation detectors and detection systems that would then be the topic of a separate, future Broad Agency Announcement.

#### **4.1.2. Description of Technical Topic Areas**

There are two technical topic areas being solicited under this BAA Call: Advanced Detectors Exploration and Commodity Anomaly Detection. The first technical topic area is broadly focused, exploring the full scope of future detection technologies aiming to capitalize on recent advancements in novel sensing materials or technological approaches. The second technical topic area is focused on a specific customer and application, namely, the U.S. Customs and Borders Protection (CBP). CBP agricultural specialists are trained to inspect people, packages, and cargo shipments entering the U.S. to prevent the introduction of harmful organisms that could be used for biological warfare or terrorism. This BAA Call seeks detection solutions to assist agricultural specialists in the fulfillment of these duties.

An Offeror may submit a full proposal to one or both technical topic areas but it is requested that an approach which may be applicable to both technical topic areas not be co-mingled into a single proposal since it is anticipated that the review panel will be different for each technical topic area.

Note also that the emphasis with respect to funding considerations for the first technical topic area will be on chemical detection versus biological detection, although Offerors are encouraged to submit novel ideas in either (or both) areas. Our overall funding emphasis is on advanced detectors exploration versus commodity anomaly detection.

The Government has established preliminary metrics for assessing technologies in each area. Given that the feasibility of achieving all of these capabilities in a single sensor system is unknown and anticipated to be high risk, the Government has established the following priority order for achieving the performance metrics:

1. The concept must be able to detect multiple chemical or biological targets;
2. The concept must demonstrate necessary limits of detection or probability of detection within desired sample size;
3. The concept must demonstrate acceptable specificity or false alarm rate;
4. The concept must detect and identify within desired response time or time to detect;
5. The concept must demonstrate reversibility or be inexpensive enough to be disposable;
6. The end device should be envisioned to have minimal consumable costs, power requirements, and weight;
7. The end device should be able to operate under the environmental conditions depicted in the tables below (if applicable).

The goal at the end of this feasibility assessment phase is to demonstrate the potential to achieve the metrics in at least 4 areas to be competitive in the future anticipated follow-on Broad Agency Announcement.

##### ***4.1.2.1. Technical Topic Area 1: Advanced Detectors Exploration***

The goal of Technical Topic Area 1 is to explore innovative, novel sensing technologies and provide evidence that these technological approaches have the potential to provide significant improvements over current approaches in sensing and identifying chemical or biological contaminants in various environmental samples with high confidence. Above is a prioritized list of performance metrics. For Technical Topic Area 1, more specific metrics are provided in Table 1. These metrics are presented in the context of a chemical or biological detection system that would incorporate the detection technologies being solicited in this BAA Call.

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Table 1. Summary of Performance Metrics for Advanced Detectors Exploration.

| Sample Type                                | Limit of Detection  | Response Time                       | False Alarm Rate                       | Cost  | Power/Weight   | Operating Conditions  |
|--|---|-------------------------------------|--|---|--|---|
| Chemical Vapor and Aerosol (CWAs and TICs) | <AEGLE 2 30 minute (goal)<br>< IDLH (threshold)                       | <1 min (goal)<br><2 min (threshold) | <1/year (goal)<br>< 5/year (threshold) | <\$2k/unit<br>Consumable costs<br><\$100/year (goal)<br><\$500/year (threshold)<br>Maintenance costs<br><\$500/year | 9V alkaline<br>Battery (goal)<br>If hardwired (110/120 v)<br><1lb (goal) | Temp = -20°C to 50°C<br>Humidity = 0% to 95%<br>Time = 24hours/365days/continuous/hardwired; Battery = 8 hours continuous |
| Bio (aerosols or cfu's)                    | <10 spores;<br><50 cfu (goal)<br><100 spores;<br><100 cfu (threshold) | <2 min (goal)<br><5 min (threshold) | <1/year (goal)<br>< 5/year (threshold) | <\$2k/unit<br>Consumable costs<br><\$100/year (goal)<br><\$500/year (threshold)<br>Maintenance costs<br><\$500/year | 9V alkaline<br>Battery (goal)<br>If hardwired (110/120 v)<br><1lb (goal) | Temp = -20°C to 50°C<br>Humidity = 0% to 95%<br>Time = 24hours/365days/continuous/hardwired; Battery = 8 hours continuous |

**4.1.2.2. Technical Topic Area 2: Commodity Anomaly Detection**

The goal of Technical Topic Area 2 is explore field-deployable technologies that can augment the current Customs and Borders Patrol targeting capability used at the Ports of Entry (POE) to identify biomarkers and other biochemical signatures associated with the presence of pathogens and diseases on agricultural commodities entering the United States. Desired technology metrics for Technical Topic Area 2 are provided in Table 2. These metrics are presented in the context of a commodity anomaly detection system that would incorporate the detection technologies being solicited in this BAA Call.

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Table 2. Summary of Performance Metrics for Commodity Anomaly Detection

| Bioagent/Toxin         | Target Sample/Size  | Time to Detect                    | Detection Probability         | False Alarm Rate  |
|------------------------|---|-----------------------------------|-------------------------------|---|
| <b>Anthrax</b>         | < 1 billionth (10 <sup>-6</sup> ) of a gram of anthrax or 100,000 spores (goal)<br>(10 <sup>-4</sup> ) of a gram of anthrax (threshold) | 1 min (goal)<br>5 min (threshold) | 90% (goal)<br>70% (threshold) | 1 per 100 packages (goal)<br>5 per 100 packages (threshold) |
| <b>Tularemia</b>       | 5-10 organisms (goal)<br>10-50 organisms (threshold)  | 1 min (goal)<br>5 min (threshold) | 90% (goal)<br>70% (threshold) | 1 per 100 packages (goal)<br>5 per 100 packages (threshold) |
| <b>Ebola filovirus</b> | 0.8-1.2 µm droplets (goal)<br><3 µm droplets (threshold)  | 1 min (goal)<br>5 min (threshold) | 90% (goal)<br>70% (threshold) | 1 per 100 packages (goal)<br>5 per 100 packages (threshold) |
| <b>Rickettsia</b>      | < 10 particles (goal)<br><20 particles (threshold)  | 1 min (goal)<br>5 min (threshold) | 90% (goal)<br>70% (threshold) | 1 per 100 packages (goal)<br>5 per 100 packages (threshold) |
| <b>Botulinum toxin</b> | 10 <sup>-2</sup> µg kg <sup>-1</sup> (goal)<br>10 <sup>-3</sup> µg kg <sup>-1</sup> (threshold)   | 1 min (goal)<br>5 min (threshold) | 90% (goal)<br>70% (threshold) | 1 per 100 packages (goal)<br>5 per 100 packages (threshold) |
| <b>Abrin</b>           | 0.03 µg kg <sup>-1</sup> (goal)<br>0.04 µg kg <sup>-1</sup> (threshold)   | 1 min (goal)<br>5 min (threshold) | 90% (goal)<br>70% (threshold) | 1 per 100 packages (goal)<br>5 per 100 packages (threshold) |
| <b>Ricin</b>           | 3.0 µg kg <sup>-1</sup> (goal)<br>6.0 µg kg <sup>-1</sup> (threshold)   | 1 min (goal)<br>5 min (threshold) | 90% (goal)<br>70% (threshold) | 1 per 100 packages (goal)<br>5 per 100 packages (threshold) |
| <b>Microcystin</b>     | 50.0 µg kg <sup>-1</sup> (goal)<br>100 µg kg <sup>-1</sup> (threshold)  | 1 min (goal)<br>5 min (threshold) | 90% (goal)<br>70% (threshold) | 1 per 100 packages (goal)<br>5 per 100 packages (threshold) |

\* The bioagents/toxins listed are just some of the few select agents/toxins of interest

5. **Number of Awards:** It is anticipated that multiple awards will be made depending on the quality of the proposals, individual funding requests, and total availability of funds.
6. **Anticipated Ceiling:** Although subject to official fiscal appropriation and availability, it is anticipated that approximately \$1.6 million of Fiscal Year (FY) 2014 funds are available for multiple awards under this

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BAA Call. **The Government reserves the right to incrementally fund contracts awarded from this BAA Call as provided by the FAR 52.232-22, “Limitation of Funds.”** Contracts or other agreements that obligate funds will not have an initial period of performance that exceeds 12 months from the date of contract award. However, Offerors can propose a base year effort with additional option years.

7. **Anticipated Award Type:** Award type is anticipated to be in the form of Cost Reimbursement type contracts. However, the Government reserves the right to award Fixed Price or Interagency Agreements (IAs) to appropriate parties should the situation warrant.
8. **Anticipated Award Dates:**  
The 4th Quarter of Fiscal Year 2014 is when the government anticipates making awards. However, the award date for each contract may vary based on the quality of the proposals and the availability of funds.
9. **Proposal Instructions:** Offerors shall submit their proposals in accordance with BAA 14-003, Section 5 - Application and Submission Information.
10. **Evaluation Criteria:** Proposals will be evaluated in accordance with the evaluation criteria contained in the BAA 14-003, Section 6 – Evaluation Information.
11. **Foreign Concerns:** Foreign persons are advised that their participation may be subject to Export Control restrictions. Any such restrictions shall be reviewed on an individual award basis.
12. **Questions:** Any questions concerning this call must be submitted via email to the Contract Specialist at [tanisha.walcott@hq.dhs.gov](mailto:tanisha.walcott@hq.dhs.gov) and copy the Contracting Officer at [Michael.Jones@hq.dhs.gov](mailto:Michael.Jones@hq.dhs.gov) no later than **August 10, 2014, 3:00 PM EST** in the following format:

| Question # | Reference  | Contractors' Question |
|------------|--|-----------------------|
| 1          | General (if there is no specific document reference)                         |                       |
| 2          | (Example) BAA 14-003, page 15, Section 5.2, first paragraph, second sentence |                       |
| 3          | (Example) BAA 14-003/Call 0001, page 2, Section 9, first sentence            |                       |

Please include “Questions for BAA 14-003/ Call 0001” in the subject line. All questions and responses will be posted on the Federal Business Opportunities website <http://www.fbo.gov> and <https://baa2.st.dhs.gov> . Questions will only be accepted or answered electronically.