SBIR

SMALL BUSINESS INNOVATION

RESEARCH PROGRAM

ABSTRACTS OF PHASE I and PHASE II

AWARDS FOR FISCAL YEAR 2015

INTRODUCTION

Abstracts of Awards for Fiscal Year 2015 SBIR Program

Note: Certain non-ASCII characters may not be represented accurately in this document. In cases where there may be doubt, please direct your questions to sbir@nist.gov.

Fiscal Year 2015 List of Awardees

Award Number	Company Name	Open Topics/Topic Areas	Phase
70NANB15H296	3DSIM	Advanced Manufacturing	Phase I
70NANB15H288	AdSem, Inc.	Advanced Manufacturing	Phase I
70NANB15H299	Advanced Research Corp.	Advanced Manufacturing	Phase I
70NANB15H294	Amethyst Research Inc.	Climate Change and Clean Energy	Phase I
70NANB15H289	Aztera, LLC	Advanced Manufacturing	Phase I
70NANB15H290	Categorical Informatics	Advanced Manufacturing	Phase I
70NANB15H298	Galois	Cybersecurity	Phase I
70NANB15H301	InfoBeyond Technology LLC	Cybersecurity	Phase I
70NANB15H365	Nodexus Inc.	Technology Transfer	Phase I
70NANB15H293	ObjectSecurity LLC	Cybersecurity	Phase I
70NANB15H300	Promia, Inc.	Technology Transfer	Phase I
70NANB15H292	Weinberg Medical Physics LLC	Advanced Manufacturing	Phase I
70NANB15H297	XSB, Inc.	Advanced Manufacturing	Phase I
70NANB15H291	Z-senz LLC	Technology Transfer	Phase I
70NANB14H289	Antara Teknik	Cybersecurity	Phase II
70NANB14H303	En'Urga, Inc.	Health Care	Phase II
70NANB14H290	Grier Forensics	Cybersecurity	Phase II
70NANB14H297	High Precision Devices	Health Care	Phase II
70NANB14H292	Management Sciences, Inc.	Cyber-Physical Systems	Phase II
70NANB14H300	Seacoast Science, Inc.	Technology Transfer	Phase II

FY 2015 PHASE I AWARD

Topic: Advanced Manufacturing

Subtopic: Predictive Modeling Tools for Metal-Based Additive Manufacturing

Title: Predictive Modeling Tools for Metal-Based Additive Manufacturing

OU: Engineering Laboratory

Firm: 3DSIM
1794 Olympic Parkway
Park City, UT 84098

Principal Investigator: Dr. Nachiket Patil
Phone: 502-619-4035
Email: nachiket.patil@3dsim.com

Award Amount: $100,000

Abstract: 3DSIM will provide a solution to additive manufacturing's lack of efficient, composable physics-based computational frameworks to predict quality and performance for arbitrary geometry, orientation, location and process parameter combinations. A new set of composable computational tools capable of accurately predicting the geometrical accuracy, residual stress and microstructure of the parts made using metal based AM will be developed. The tool(s) will demonstrate scaling and composability of models to support geometry-independent reusability while providing a range of parameter values (e.g. user-defined build orientation, laser power, scan speed, hatch pattern, recoat time, material properties, powder layer thickness, choice of mesh motifs, and more) supporting reliability and accuracy.

Commercial Applications: It is estimated that tens of thousands of dollars are wasted per machine per year in unnecessary support material costs, post manufacturing labor part finishing, and material lost due to failed builds. A composable set of simulation tools would help predict residual stress and strain data to identify the minimum amount per part. There is a significant demand for software simulation tools to optimize the economics of Additive Manufacturing.

Topic: Advanced Manufacturing

Subtopic: Tuning Germanium Crystal Reflectivity and Mosaic

Title: Tuning Germanium Crystal Reflectivity and Mosaic

OU: NIST Center for Neutron Research

Firm: AdSem, Inc.
855 Sevely Drive
Mountain View, CA 94041

Principal Investigator: Michael Kozhukh
Phone: 650-625-0642
Email: mkozhukh@sbcglobal.net

Award Amount: $99,997.00

Abstract: This project is devoted to development of a manufacturing technique of slow neutron Germanium mosaic monochromators with reflectivity exceeding reflectivity of pyrolytic graphite crystals. The manufacturing technique utilizes optimized high temperature plastic deformation of large single Germanium crystals to produce mosaic monochromators. Preliminary test on 70 mm diameter Ge samples with 111 orientation and mosaicity value 16 arc minutes demonstrated maximum neutron reflectivity 89% in the peak of a smooth rocking curve.

Commercial Applications: Large size Ge mosaic slow neutron monochromators with reflectivity reaching 89% in the peak of a rocking curve will significantly increase efficiency of the US research nuclear reactors for condensed matter research, improve quality of diffraction experiments and extend flexibility of neutron scattering measurements. They are well suited for focusing systems in astrophysics and for medical applications, where they can improve quality of x-ray images in oncology diagnostics.

Topic: Advanced Manufacturing

Subtopic: High-Throughput Manufacturing Methods for Engineered MRI Contrast Agents

Title: High-Throughput Manufacturing Methods for Engineered MRI Contrast Agents

OU: Engineering Laboratory

Firm: Advanced Research Corp.
4459 White Bear Parkway
White Bear Lake, MN 55110

Principal Investigator: Greg Wagner
Phone: 651-789-9000
Email: gwagner@arcnano.com

Award Amount: $99,329.00

Abstract: This project focuses on developing a magnetic resonance imaging (MRI) contrast agent that may increase the detection of tagged cells by a factor of 10-100. The ability to noninvasively track specifically labeled (tagged) cells, enables a researcher or medical treatment

professional to dynamically monitor the delivery and targeted application of medicinal and bio-reactive agents.

Commercial Applications: Applications include cell transplantations and therapies to treat neurodegenerative diseases, tumors, strokes, and brain injuries.

Topic: Climate Change and Clean Energy

Subtopic: Large-Area, Uniform Infrared Detector Development for 1 µm to 4.5 µm

Title: Large-Area, Uniform Infrared Detector Development for 1 µm to 4.5 µm

OU: Physical Measurement Laboratory

Firm: Amethyst Research Inc.
123 Case Circle
Ardmore, OK 73401-0643

Principal Investigator: Dr. Terry D. Golding
Phone: 580-657-2575
Email: admin@amethystresearch.com

Award Amount: $99,998.00

Abstract: Amethyst Research Inc. will design, fabricate and test a high uniformity, large area, low noise infrared trap-detector detector for the 1- 4.5 µm wavelength range. This state of the art detector will have a large area (e.g., 1-1.8 cm diameter active area) with a spatial variability of internal quantum efficiency of less than 0.1 % between 1 µm and 4.5 µm. In addition, the internal quantum efficiency of the detectors (i.e., the device efficiency after taking into account the radiation loss due to front-surface reflection) will be close to unity. The Phase I effort will consist of a proof-of-principle demonstration of large area, high-uniformity photodiodes that operate at 1 to 3 µm wavelengths.

Commercial Applications: Outside of standards measurement, the main commercial application of the infrared photodetector technology being developed in this program is in gas sensing. According to a report by WinterGreen, the mid infrared chemical sensor market is anticipated to reach $7 billion by 2019 as price of units from bench size devices to portable units makes them more useful across the board in every industry.

Topic: Advanced Manufacturing

Subtopic: Computer Aided Standards Development (CASD) – A Software Tool to Automate Standards Development Process

Title: Visual Ontological Language for Technical Standards (VOLTS)

OU: Engineering Laboratory

Firm: Aztera, LLC
2102 N. Forbes Blvd, Suite 101
Tucson, AZ 85745

Principal Investigator: Sean Whitsitt
Phone: 520-261-8378
Email: Sean.whitsitt@aztera.com

Award Amount: $99,803.10

Abstract: Current research shows that failures in the standardization process are often the result of a failure of the participants to communicate or organize. To this effect, NIST has developed a tool, NIST Ontological Visualization Interface for Standards (NOVIS), with an environment for visualizing, browsing, and querying standards. Aztera will create a Computer Aided Standards Development (CASD) framework based on concepts from NOVIS, Model Driven Engineering (MDE), Version Control Systems (VCSs), and Software Development. This framework will be a Visual Ontological Language for Technical Standards (VOLTS). VOLTS will help shepard standards through the development, deployment, and maintenance stages. In Phase I, Aztera will develop mechanisms by which existing standards can be imported into and exported from this information model using existing materials. In Phase II, Aztera will integrate tools for creating, linking, and versioning standards.

Commercial Applications: The VOLTS Domain specific modeling platform will be built for the visualization of standards, helping Aztera's VOLTS customers, SDOs and large companies with internal standards processes, easily create, track, and manage new standards. Customers will have access to the product through a tiered licensing business model. In addition to a more streamlined process for standard creation, SDOs will find value in the ability to generate revenue through the sale of their standards documents through this additional vehicle.

Topic: Advanced Manufacturing

Subtopic: Category-Theoretic Tools to Support Manufacturing Information Integration

Title: Category-Theoretic Tool for Manufacturing-related Information

OU: Engineering Laboratory

Firm: Categorical Informatics
250 Main St., No. 426035
Cambridge, MA 02142

Principal Investigator: Ryan Wisnesky
Phone: 650-387-9782
Email: Ryan.wisnesky@categoricalinformatics.com

Award Amount: $100,000.00

Abstract: Categorical theory has recently been successfully applied to translate information from one computer system to another. Researchers at MIT have developed a prototype software tool based on category theory for solving information-integration programs. The tool has successfully solved small-scale information-integration problems including a problem identified by NIST about enriching the manufacturing service capability of a distributed supply chain with additional 3rd party information. The goal of this Phase I is to transition MIT's tool from an academic project to a commercial software project and to demonstrate that the enhanced tool can be used to solve manufacturing-related information-integration problems identified by NIST.

Commercial Applications: The market for information-integration tools is many billions of dollars a year and growing at around 10% annually. An industrial-strength version of the tool has the potential to both compete directly with existing information-integration tools, as well as reach new users who find existing tools ill-suited to their needs.

Topic: Cybersecurity

Subtopic: A Verifier for Multicore C11 or C++11 Code

Title: A Verifier for Multicore C11 or C++11 Code

OU: Information Technology Laboratory

Firm: Galois
421 SW Sixth Ave., Suite 300
Portland, OR 97204

Principal Investigator: Joe Kiniry
Phone: 503-626-6616
Email: kiniry@galois.com

Award Amount: $99,909.92

Abstract: Galois will build a practical, efficient, modular, deductive code verifier and verification methodology for multithread C11 software. The verifier will take code written to the C11 standard, suitably annotated with function contracts, assertions, program/data invariants, ghost data/code, and any platform-specific assumptions beyond those guaranteed by the standard, and will prove that the code meets its specifications in any suitable concurrent context. The most innovative aspect of the verifier lies in the method for reasoning about C11 weak memory atomics, the most important feature of C11.

This approach allows the use of traditional forms of program reasoning using assertions about the global state (e.g. in pre/postconditions, loop and data invariants, etc.). This is done with the help of separation logic, which provides a natural approach to guaranteeing that threads interact with each other in a reasonable way. If our software is going to be used to verify high-assurance programs, the system should be high assurance as well. Therefore, the verifier will be written in the Coq proof assistant language, using the proof assistant to show the correctness of the implementation.

Commercial Applications: The verifier would enable new modes of engineering and commerce. Because verification is static and modular, software components can be written and verified separately, in parallel, using only the specifications of the shared data structures and hardware they use and the external functions they call. Verification eliminates the need for traditional software trust relationships, making it safe to use code provided by untrusted vendors, or to subcontract code verification to untrusted verification engineers.

Topic: Cybersecurity

Subtopic: Improving Robustness and Security in Home Routers

Title: ACPT (Access Control Policy Tool): A User-friendly, Efficient, Reliable, and Generic Access Control Policy Modeling, Verification, and Testing Tool

OU: Information Technology Laboratory

Firm: InfoBeyond Technology LLC
320 Whittington Pkwy.
Louisville, KY 40222

Principal Investigator: Dr. Bin Xie
Phone: 502-371-0907
Email: Bin. Xie@InfoBeyondtech.com

Award Amount: $100,000.00

Abstract: InfoBeyond Technology advocates the development of a user-friendly, efficient, reliable, and generic Access Control Policy modeling, verification, and Testing (ACPT) Tool. InfoBeyond Technology's ACPT enhances NIST's ACPT design and adds several advanced features for achieving high security confidence AC levels such that it can be commercialized. It provides user-friendly GUI templates for users to compose attributes, enable property test by a model checker, and perform combinatorial test. It specifically improves the NIST ACPT design to provide a robust, unified, and generic model checker while static and dynamic attribute constraints are integrated for an Attributed-based Access Control framework. It enables effective policy test for test generation and execution and provides APIs to support third party deployment. In addition, ACPT has the web service design to facilitate the ACPT webification and evolution in a distributed computing environment.

Commercial Applications: Once the ACPT is developed, it can revolutionize new AC mechanisms and generate new revenues. It has governmental and civilian markets. At first, the ACPT will be matured as the AC products that can be used for NIST, Department of Commerce, Department of Homeland Security, Department of Defense, and other federal and state agencies for flexible and robust AC capabilities. Secondly, the civilian market includes enterprise, financial, and other private systems. The ACPT product can be widely used for privacy and security protection in financial and stock companies, hospitals, insurance organizations, and many other business domains.

Topic: Technology Transfer

Subtopic: NIST Tech Transfer

Title: New Manufacturing Processes for Next-generation Microfluidic Screening Tools

OU: Innovation and Industry Services

Firm: Nodexus Inc.
2150 Shattuck Ave.
Berkeley, CA 94704

Principal Investigator: Karthik Balakrishnan
Phone: 573-263-1345
Email: karthik@nodexus.com

Award Amount: $100,000.00

Abstract: Nodexus is commercializing next-generation bioinstrumentation for researchers, clinicians, and the biotech industry at large. As development challenge involves a material switch to polymer-based microfluidics to improve robustness and reproducibility of measurements. Nodexus will develop new manufacturing processes for their microfluidic product suite that preserves surface functionalization while enabling robust, non-thermally bonded polymer-based microfluidics.

Commercial Applications: Commercial applications includes biological screening by researchers, clinicians, and the biotech industry (pharmaceutical companies, molecular diagnostics facilities, etc.). Ultimately, the technology can be utilized for clinical diagnostics through the detection of rare cells in clinical samples, e.g. circulating tumor cells in blood as a 'liquid biopsy'.

Topic: Cybersecurity

Subtopic: Access Control Policy Tool

Title: Automated Access Control Policy Testing System (A-ACPTS)

OU: Information Technology Laboratory

Firm: ObjectSecurity LLC
1855 First Ave., Ste 103
San Diego, CA 92101

Principal Investigator: Dr. Ulrich Lang
Phone: 650-515-3391
Email: ulrich.lang@objectsecurity.com

Award Amount: $98,995.00

Abstract: This Automated Access Control Policy Testing System (A-ACPTS) project extends and transitions NIST's Access Control Policy Tool (ACPT) toward commercialization. The core challenge is to research and develop an ACPT-based tool and a method of automating as many of the inputs into the model checking as possible, with the goal of making the testing more usable, less error-prone, and more efficient. A-ACPTS will enable the specification of properties and policies at a generic, "undistorted" level of abstraction, and by feeding existing information sources into the tool with a high degree of automated and semantic consistency, so that the policy testing can be fast, easy, and correct.

Commercial Applications: There are few usable AC policy testing tools available, which makes the implementation of AC policy tools error-prone, costly and difficult. The A-ACPTS solution addresses a significant gap in the fast-growing cyber security market. A-ACPTS enables AC policy testing, while at the same time being manageable, easy-to-use, and partially automated. A-ACPTS can be used by most organizations that use/operate large, interconnected IT landscapes, in particular organizations which critically rely on IT for their operation, process confidential information, are safety-critical or critical infrastructure, and/or are regulated.

Topic: Technology Transfer

Subtopic: NIST Tech Transfer

OU: Innovation and Industry Services

Title: Attack Graph Generation Integration with Promia RAVEN (AGGIWPR)

Firm: Promia, Inc.
101 The Embarcadero, Ste 200
San Francisco, CA 94105

Principal Investigator: William Reynolds

Phone: 609-252-1853
Email: breynolds@promia.com

Award Amount: $88,625.27

Abstract: Promia will integrate the technology described in U.S. Patent #8,566,269 (Interactive Analysis of Attack Graphs (IAAG) Using Relational Queries) into the Promia Raven Security Information and Event Management (SIEM) and security operations appliance. Promia intends to use the asset information that it already collects – both passively and actively – about nodes on the networks it monitors and open source threat information as the source data needed for the IAAG technology. Promia anticipates that successful integration will provide Promia Raven customers with exciting new capabilities for more effectively visualizing and mitigating threats to their protected cyber and cyber-physical network systems.

Commercial Applications: In addition to enhancing traditional network security operations, the Promia Raven being positioned as the C4ISR hub in several Smart City and Smart Port solutions. In this cyber-physical environment, there may be a compelling opportunity to validate the IAAG technology patent claims that the technique could be applied to a hybrid cyber-physical system. The IAAG technology might be particularly helpful identifying combinations of cyber and physical event sequences that would indicate complex cascade failures for which both cyber and physical first responder should be prepared.

Topic: Advanced Manufacturing

Subtopic: High-Throughput Manufacturing Methods for Engineered MRI Contrast Agents

Title: High-Throughput Manufacturing Methods for Engineered MRI Contrast Agents

OU: Engineering Laboratory

Firm: Weinberg Medical Physics LLC

5611 Roosevelt Street
Bethesda, MD 20817

Principal Investigator: Lamar Mair, Ph.D.
Phone: 202-568-1608
Email: Lamar.mair@gmail.com

Award Amount: $99,619.00

Abstract: Scalable manufacturing of micro-engineered MRI contrast agents has the potential to increase the specificity and resolution of imaging techniques, while reducing morbidity. Currently, techniques used for making such particles are expensive and labor intensive. In Phase I, Weinberg Medical Physics will validate techniques for rapid, massively parallel fabrication of

microscale contrast agents (including shells, disks, and doubledisks). In order to demonstrate the utility of the proposed approach, they will build three different contrast agents (with shapes similar to those reported in NIST publications), demonstrate contrast agent monodispersity, mechanical stability (during processing steps typically encountered in clinical dose preparation), NMR shift uniformity, and feasibility of automated manufacturing.

Commercial Applications: Gadolinium-based imaging contrast agents are currently regarded as clinical standard, however recent research has revealed that over time the gadolinium accumulates in the brain after repeated administration. In the short term, researchers perceive the need for particles that can tag individual cells. Eventual replacement of gadolinium with shape-engineered particles would qualify for entry into the contrast market, currently valued at one billion dollars worldwide. This market could be augmented further if cell-tagging applications were approved for clinical use.

Topic: Advanced Manufacturing

Subtopic: Computer Aided Standards Development (CASD) – A Software Tool to Automate Standards Development Process

Title: A Tool for Building Semantically Interoperable Specification and Standards

OU: Engineering Laboratory

Firm: XSB, Inc.
21 Bennetts Road, Suite 100
Suffolk, NY 11733

Principal Investigator: Dr. David F. Winchell
Phone: 631-371-8117
Email: d.winchell@xsb.com

Award Amount: $99,743.12

Abstract: Standards and specifications are widely used in government and industry to define requirements for products and processes and insure interoperability, safety, and quality of industrial and domestic products. Specifications and standards documents almost always cross-reference other standards and specification. Taken together, the web of interdependent standards forms an immensely important knowledge base. However, this knowledge is not structured in a way the enables potential enhancements.

In order to develop a structured, model-based view of the web of standards, XSB will extend the NIST Ontological Visualization Interface for Standards (NOVIS) system to work with an existing knowledge base and existing test extraction and classification technology, and with existing requirements management tools. XSB will investigate the feasibility of combining these

into an application that helps users create structured models for new and existing specifications that use a consistent ontology.

Commercial Applications: At the end of Phase I, the taxonomy editor will be socialized with 10 potential users from three industry sectors. Features will have been refined and an initial set of prospects identified. This process will generate specific, actionable leads with actual enterprise while defining the product sufficiently to enable a broader market strategy to be developed during Phase II.

Topic: Technology Transfer

Subtopic: NIST Tech Transfer

Title: High Performance Beam Scanning Using a Resonant Scan Lens

OU: Innovation and Industry Services

Firm: Z-senz LLC
67 Oak Shade Rd.
Gaithersburg, MD 20878

Principal Investigator: Christopher Brown
Phone: 209-963-7522
Email: seebrown@gmail.com

Award Amount: $100,000.00

Abstract: The objective of this project is to demonstrate a resonant scan lens (RSL) that increases the uniformity of beam scans projected from resonant optomechanical systems. While resonant optomechanical systems generate high-speed beam scans, large mechanical displacements, and robust operation from miniature form factors, scans projected from such systems lack uniformity across the field-of-view (FOV). In these systems, light projected from the scanner is focused by a scan lens and the outer, non-uniform portion of the scanned FOV is typically clipped or blanked. Z-senz will research and develop a resonant scanner and RSL to create a more uniform scan projected from the scan lens, thus improving system performance.

Commercial Applications: As the world-wide optical imaging market is valued at over $900 million in 2014, a company that develops RSL systems to improve the performance of imaging and display products would have significant commercial potential. RSL systems can speed biomedical research as scan lenses are ubiquitous components of beam scanning microscopes, improve clinical diagnostic capability by reducing endoscope size and increasing imaged FOV, increase utility of head-mounted display systems, and enhance throughput of laser manufacturing instrumentation.

FY 2015 PHASE II AWARD

Topic: Cybersecurity

Subtopic: Cryptographic Acceleration for Border Gateway Protocol Security (BGPSEC)

Title: Cryptographic Acceleration for Border Gateway ProtocolSecurity (CaBGPSEC)

OU: Information Technology Laboratory

Firm: Antara Teknik
5233 Castlereigh Ct.
Granite Bay, CA 95746

Principal Investigator: Mehmet Y. Adalier
Phone: 916-622-6960
Email: madalier@antarateknik.com

Award Amount: $299,950.70

Abstract: Antara Teknik will develop and commercialize a comprehensive line of low-cost, high performance Software Defined Network Solutions in order to accelerate the deployment and adoption of Border Gateway Protocol with Security (BGPSEC). The innovative *tara*EosTM Open Architecture BGPSEC compliant edge-router and crypto offload devices featuring the NIST SRx will improve the safety of the Internet critical infrastructure while reducing the Total cost of Ownership.

Commercial Applications: Currently deployed router engines will not be able to support BGPSEC's additional security requirements. Thus, there exists a significant commercial opportunity and available market for a BGPSEC protocol capable economically feasible router. The Phase II work will drive the product development and enable the commercialization of low power, high performance and cost effective BGPSEC capable edge-routers. These Software Defined Network devices will provide FIPS 186-4 compliant cryptographic capabilities at almost line speed in order to secure a key component of the Internet critical infrastructure.

Topic: Health Care

Subtopic: Instrument to Detect Aerosolized-Droplet Dose Delivery of Vaccines

Title: Combined Extinction/Fluorescence Absorption Diagnostics for Sprays

OU: Material Measurement Laboratory

Firm: En'Urga, Inc.
1201 Cumberland Ave., Ste. R
West Lafayette, IN 47906

Principal Investigator: Yudaya Sivathanu
Phone: 765-497-3269
Email: sivathan@enurga.com

Award Amount: $300,000.00

Abstract: This Phase II project will continue the prototype development of a pharmaceutical spray quality audit system. The spray quality audit system will estimate the planar mass distribution, mass flux, and drop size of pharmaceutical sprays that are used in functional coating applications and inhalers. A prototype tomography system will be designed and fabricated and evaluated using various fluorophore.

Commercial Applications: There are two commercial applications for the fluorescence tomography system. The first application is in the quality audit of spray nozzles used in the pharmaceutical industry, primarily in the tablet coaters, spray dryers and inhalers. The second application is in estimating the mass distribution of fuel in automotive injectors and aero-engine nozzles.

Topic: Cybersecurity

Subtopic: Secure Email Agent Using the Domain Name System (DNS) as a Trust Infrastructure

Title: Secure Email Agent Using the Domain Name System (DNS) as a Trust Infrastructure

OU: Information Technology Laboratory

Firm: Grier Forensics
708 Lakeview Drive
Lakewood, NJ 08701

Principal Investigator: Jonathan Grier
Phone: 410-220-0962
Email: jgrier@grierforensics.com

Award Amount: $300,000.00

Abstract: Although protocols for securing email have been available for over twenty years, these protocols, by nature of their use of asymmetric cryptography, require users to have the public key or certificate of the correspondents. Grier Forensics will develop technology to use the Domain Name System (DNS) to distribute certificates and keys, making email secure,

authenticated, and confidential, curbing the losses from phishing attacks and allowing people to use email as a simple, readily available means of trustworthy communication.

Commercial Applications: Losses due to phishing attacks are estimated to be between $2.4 and $5.9 billion dollars yearly worldwide. Waste due to inability to use email for sensitive communications that must remain private, such as health and financial information, are likewise estimated in the billions. As email is already one of the most ubiquitous and critical means of modern communications, providing means to secure it can potentially create billions in prevention of losses, new value and productivity.

Topic: Health Care

Subtopic: Production of NIST/UCSF Breast Phantom for Magnetic Resonance Imaging (MRI)

Title: Optimization of the NIST/UCSF Breast Phantom

OU: Physical Measurement Laboratory

Firm: High Precision Devices
1668 Valtec Lane, Suite C
Boulder, CO 80301

Principal Investigator: Michael Snow
Phone: 303-447-2558
Email: msnow@hpd-online.com

Award Amount: $300,000.00

Abstract: Magnetic resonance imaging (MRI) has become a primary diagnostic tool in scientific research and clinical imaging. Despite the excellent image quality that can be obtained with today's MRIs, images acquired using different MRI systems and during longitudinal studies are not reproducible, and hence can be difficult, if not impossible, to compare. To address this issue, a standardized test of the performance characteristics of each installed MRI system, detection coils, and operational protocols is necessary. High Precision Devices, Inc. (HPD) will continue the development and commercialization of a cost effective, shelf-stable NIST-designed MRI breast phantoms for calibration of MRI systems used in breast cancer research studies and clinical settings.

Commercial Applications: Currently there are approximately 12,000 MRI units in the U.S, with expected sales of 500 units per annum. Of the sites with MRI capabilities, 55% are capable of performing breast diagnostics equating to over 1 million procedures performed each year. Over 150 clinical research trials involving the use of MRI to investigate the various aspects of breast cancer are currently being conducted. To ensure that new breast cancer treatments and procedures are properly conducted in medical settings, it will be necessary to provide a cost effective and shelf-stable breast phantom as a calibration tool.

Topic: Cyber-Physical Systems

Subtopic: Residential Heat Pump Fault Detection and Diagnostic Datalogger

Title: Cognitive Residential Heat Pumps Fault Detection and Diagnostic Datalogger

OU: Engineering Laboratory

Firm: Management Sciences, Inc.
6022 Constitution Ave., NE
Albuquerque, NM 87110

Principal Investigator: Kenneth Blemel
Phone: 505-255-8611
Email: Kenny_Blemel@mgtsciences.com

Award Amount: $299,986.85

Abstract: During Phase I, Management Sciences, Inc. (MSI) proved feasibility of adapting their current technology into a product capable of improving performance resulting in increased efficiency and extended life cycles of heat pumps. The resultant product is a tool named the Heat Pump Sentient (HP-Sentient). The HP-Sentient will improve performance and reduce maintenance costs through aggressive goal-seeking control and simultaneous real time monitoring for stresses, degradation, and equipment faults using deductive modeling. In Phase II, MSI will produce an easy-to-install, plug-and-play kit that connects to existing heat pumps that will sell for about $100 in production quantities.

Commercial Applications: MSI sees a major commercial opportunity to provide continuous "Internet of Things" monitoring and management of efficiency and operating costs with HP-Sentient reporting to an internet service for residential air source heat pumps that provide year-round heating and cooling for homes and recreational vehicles around the world. Another is licensing of the patented technologies to original equipment manufacturers and to developers of "smart" facilities.

Topic: Technology Transfer

Subtopic: NIST Tech Transfer

Title: Thermo-focusing Chromatography - High Sensitivity Chromatography for Chemical Analysis

OU: Innovation and Industry Services

Firm: Seacoast Science, Inc.
2151 Las Plamas Drive, Suite C
Carlsbad, CA 92011

Principal Investigator: William Tolley, Ph.D
Phone: 760-268-0083
Email: btolley@seacoastscience.com

Award Amount: $300,000.00

Abstract: Seacoast Science has licensed, for the purpose of technology transfer, the NIST patent "Recirculating Temperature Wave Focusing Chromatography," with the goal of implementing the technology into a unique environmental monitor. Seacoast believes the NIST technology can improve Seacoast's environmental monitor, allowing for an order of magnitude cost reduction for long-term monitoring at remediation sites. In the U.S., the EPA has identified over 425,000 brownfields and 1,320 Superfund sites where hazardous chemicals have been used and unhealthy levels of these chemicals may remain in the soil and subterranean water. Seacoast will develop an environmental monitor, with emphasis toward petrochemicals and chlorinated solvents, to install at these remediated sites to assure a healthy environment.

Commercial Applications: Seacoast will commercialize the Vapor Intrusion Monitor (VIM) as a tool for comprehensive remediation programs to assure that noxious vapors are gone following reoccupation of remediated areas. Additionally, VIM will allow restoration teams to perform long-term soil vapor and vapor intrusion studies. Market research estimates a market for approximately 10,000 such low-cost instruments generating gross revenues of $50MM. the lower monitoring cost possible through VIM will assure the effectiveness of remediation efforts as well as allow remediation experts to track pollutant plumes and remediation progress in real time.