

# SBIR/STTR Fiscal Year 2012 Phase I Awards

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## Arizona

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**Technical Topic:**

Nuclear Physics Electronics Design and Fabrication

**Company:**

Zipton Labs LLC 1475 N Scottsdale Road STE 200 Scottsdale, AZ 85257-3538

**Project Title:**

Wide Bandgap Gallium Phosphide Detectors

**Project Summary:**

This project will demonstrate the feasibility of avalanche photodiodes made from gallium phosphide grown on silicon virtual substrates. To increase material quality and decrease dark-current noise, gettering will be performed on the substrate and epilayer. The photodetectors will give superior UV quantum efficiencies to that of UV-sensitized silicon photodiodes at a price point much lower than other wider bandgap alternatives.

## California

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**Technical Topic:**

Instrumentation and Tools for Materials Research Using Neutron Scattering

**Company:**

Adelphi Technology, Inc. 2003 East Bayshore Rd. Redwood City, CA 94063-4121

**Project Title:**

Compound Magnetic Lens for Providing Focused, Polarized Neutrons

**Project Summary:**

The enhancement of neutron beam lines with the use of magnetic lenses as neutron focusing and imaging optics could benefit U.S. industrial, government, and academic R&D on these beam lines. Improving the R&D output of these beam lines is of important benefit to the U.S. economy and technology.

**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Advanced Rotorcraft Technology, Inc. 635 Vaqueros Avenue Sunnyvale, CA 94085-3524

**Project Title:**

High Fidelity Wind Turbine Analysis Tool Leveraging High Performance Computing (HPC)

**Project Summary:**

Under this SBIR, Advanced Rotorcraft Technology, Inc. will develop the Wind Turbine Comprehensive Analysis

System (WTCAS). WTCAS will provide turnkey wind turbine analysis functionality to allow the wind industry to better analyze and implement novel wind turbine designs that improve performance and reliability, reduce acoustic noise, and lower maintenance costs.

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**Technical Topic:**

Nuclear Physics Electronics Design and Fabrication

**Company:**

Advanced Science and Novel Technolog 27 Via Porto Grande Rancho Palos Verdes, CA 90275-4878

**Project Title:**

Multi-Channel Time-to-Digital Converter for Pulse Shape Analysis

**Project Summary:**

The proposed multi-channel time-to-digital converter provides highly accurate representation of time intervals in the form of binary codes. It features eight conversion channels with a possibility to deliver full information about eight sampling points on the input signal and is beneficial for the DOE experiments, as well as military and commercial applications in medical, space, aircraft, and automotive industries.

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**Technical Topic:**

Ancillary Technologies for Accelerator Facilities

**Company:**

Alameda Applied Sciences Corporation 3077 Teagarden Street San Leandro, CA 94577-5720

**Project Title:**

Nb Coatings for Bellows used in SRF Accelerators

**Project Summary:**

Alameda Applied Sciences Corporation proposes to use existing cathodic arc deposition hardware to provide a cost-effective upgrade for existing phosphor bronze accelerator bellows. AASC's commercial business will benefit from licensing this technology for upgrading many of today's cutting edge accelerators.

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**Technical Topic:**

Nuclear Physics Accelerator Technology

**Company:**

Alameda Applied Sciences Corporation 3077 Teagarden Street San Leandro, CA 94577-5720

**Project Title:**

MgB2 coatings for future SRF accelerators

**Project Summary:**

This project will increase the state of the art in MgB2 film deposition using a novel dual cathodic arc vacuum source to deposit MgB2 on Nb substrates in a single step.

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**Technical Topic:**

Nuclear Physics Isotope Science and Technology

**Company:**

Alameda Applied Sciences Corporation 3077 Teagarden Street San Leandro, CA 94577-5720

**Project Title:**

High Separative Power Vacuum Arc Centrifuge

**Project Summary:**

This project will demonstrate a robust, cost effective isotope separation technology to efficiently produce rare isotopes for medical diagnostics, research and industrial applications.

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**Technical Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

**Company:**

Alameda Applied Sciences Corporation 3077 Teagarden Street San Leandro, CA 94577-5720

**Project Title:**

Linear Gas Jet with Tailored Density Profile

**Project Summary:**

This project will demonstrate a test bed to reduce the cost of laser plasma accelerator development. Laser plasma accelerators have the potential to reduce the cost and size of particle accelerators for medicine, industry and science.

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**Technical Topic:**

Instrumentation for Electron Microscopy and Scanning Probe Microscopy

**Company:**

Anasys Instruments Corp 121 Gray Avenue Suite 100 Santa Barbara, CA 93101-1809

**Project Title:**

Resonance-Enhanced Infrared Nanospectroscopy (REINS) based on Atomic Force Microscopy

**Project Summary:**

This STTR project will provide nanoscale measurement and mapping of the chemical composition of a wide range of materials and biological samples. This project will have extensive applications in materials and life sciences, including accelerated development of novel materials including those for energy generation, storage and conservation.

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**Technical Topic:**

Carbon Cycle Measurements of the Atmosphere and the Biosphere

**Company:**

Applied Spectra, Inc. 46661 Fremont Blvd Fremont, CA 94538-6410

**Project Title:**

New Technology of Rapid Isotopic Measurement of Soil Organic Matter to Quantify Carbon Sequestration in Climate Change Studies

**Project Summary:**

This project will demonstrate and evaluate a new technology called LAMIS (Laser Ablation Molecular Isotopic Spectroscopy) which was developed to address the measurement of carbon and nitrogen isotopes. LAMIS provides isotope ratio measurements in real-time, at atmospheric pressure (no mass spectrometer) and without sample preparation.

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**Technical Topic:**

Instrumentation for Electron Microscopy and Scanning Probe Microscopy

**Company:**

Asylum Research Corporation 6310 Hollister Ave Santa Barbara, CA 93117-3115

**Project Title:**

High Throughput Ionic and Electronic Transport Probing System

**Project Summary:**

Nanoscale probing and testing is essential to rapid evaluation and development of candidate energy storage materials. This project will develop a High Throughput Ionic and Electronic Transport Probing System to quickly evaluate these materials for their potential for increasing battery and fuel cell energy density and efficiency.

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**Technical Topic:**

Advanced Network Technologies and Services

**Company:**

Aurrion, Inc. 130 Robin Hill Road STE 300 Goleta, CA 93117-3153

**Project Title:**

Integrated 100Gb/s Transmitter Chips

**Project Summary:**

This project will improve the performance of individual semiconductor chip-based components and also allow the integration of all of these components into a single chip enabling the power and size of a typical XFP module today. Wafer scale integration and foundry fabrication also will ultimately enable a significantly lower cost for these modules.

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**Technical Topic:**

Atmospheric Measurement Technology

**Company:**

Brechtel Manufacturing Incorporated 1789 Addison Way Hayward, CA 94544-6900

**Project Title:**

Development of a Compact Instrumentation Package for Characterization of Aerosols, Turbulence and Surface Characteristics in the Arctic from Unmanned Aerial Vehicles

**Project Summary:**

Brechtel Manufacturing Incorporated (BMI) proposes to develop a new air quality and climate change-relevant instrument suite to measure the size distribution of airborne nanoparticles. The device will be simple to use, inexpensive, easily deployable for remote operation, and offer sensitivity to a broad range of particles found in the air we breathe.

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**Technical Topic:**

Advanced Sources for Accelerator Facilities

**Company:**

Calabazas Creek Research, Inc. 690 Port Drive San Mateo, CA 94404-1010

**Project Title:**

Asymmetric Immersed Pole Undulators for Advanced Radiation Sources

**Project Summary:**

Calabazas Creek Research, Inc. (CCR) is proposing to develop a high-field, short-period magnetic undulator, the Asymmetric Immersed Pole (AIP) undulator, for applications in high-energy accelerator light sources. The AIP undulator will extend the performance of light sources and their applications to nano-materials, applied physics, chemistry, biology, and the commercial, medical, and military technologies they support.

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**Technical Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

**Company:**

Calabazas Creek Research, Inc. 690 Port Drive San Mateo, CA 94404-1010

**Project Title:**

Advanced Klystrons for High Efficiency Accelerator Systems

**Project Summary:**

This project will develop a type of klystron that will drive particle accelerators much more efficiently. The klystrons will be useful for research and medical accelerators, and other DoD and commercial applications.

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**Technical Topic:**

Advanced Concepts and Technology for High Intensity Accelerators

**Company:**

Calabazas Creek Research, Inc. 690 Port Drive San Mateo, CA 94404-1010

**Project Title:**

1300 MHz PPM Focused Klystron for Project X

**Project Summary:**

Calabazas Creek Research, Inc. (CCR) is proposing to develop a 0.5 MW – 1 MW PPM-focused klystron. The advanced design of this device is expected to result in system costs that are significantly lower than those possible with conventional klystrons. The klystron will be useful for research and medical accelerators and other DoD and commercial applications.

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**Technical Topic:**

Fusion Science and Technology

**Company:**

FAR-TECH, Inc. 10350 Science Center Drive, Suite 15 San Diego, CA 92121-1136

**Project Title:**

Fully Parallel MHD Stability Code

**Project Summary:**

FAR-TECH, Inc. plans to develop an effective numerical plasma stability analysis tool which will be used in examination of different plasma confinement approaches and in performance assessment of existing and proposed fusion experiments on the path to develop commercially feasible nuclear fusion reactor.

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**Technical Topic:**

Nuclear Physics Accelerator Technology

**Company:**

FAR-TECH, Inc. 10350 Science Center Drive, Suite 15 San Diego, CA 92121-1136

**Project Title:**

RF Heating Modeling Tools for Electron Cyclotron Resonance Ion Sources

**Project Summary:**

This project will develop software that will decrease the cost of operating sources of highly charged ions that are used in nuclear physics research as well as applications such as proton therapy.

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**Technical Topic:**

Ancillary Technologies for Accelerator Facilities

**Company:**

Gener8 Incorporated 535 Del Rey Ave. Sunnyvale, CA 94085-3514

**Project Title:**

Integrated 2.0 Micron Modelocked Laser for E-SASE Advanced Accelerator Applications

**Project Summary:**

We propose a novel new architecture for a mode-locked laser at 2.0 microns that is designed to achieve sub-100 fs pulse widths for application to free-electron laser (FEL)-based light sources that are using the enhanced self-amplified spontaneous emission (ESASE).

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**Technical Topic:**

Genomic Science and Related Biotechnologies

**Company:**

GigaGen Inc. 409 Illinois St San Francisco, CA 94158-2509

**Project Title:**

Massively Parallel Single Cell Transcriptomics

**Project Summary:**

Biofuel and ecology researchers want to understand this variation microorganisms single cell level, but conventional technology for single cell analysis is slow and expensive. We propose a new technology that will make single cell analysis much faster and cheaper, which has important applications in biofuels, ecology, and biomedicine.

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**Technical Topic:**

Advanced Clean Energy Research

**Company:**

Green Pacific Biologicals, Inc. 409 Illinois St San Francisco, CA 94158-2509

**Project Title:**

A Novel Oil Secretion Mechanism for Cost-Effective Algal Biofuel Production

**Project Summary:**

This project will develop novel bioengineering solutions that, if successful, will reduce production costs of renewable algae biofuels to around \$50/barrel.

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**Technical Topic:**

Nuclear Physics Accelerator Technology

**Company:**

InnoSense LLC 2531 West 237th Street Suite 127 Torrance, CA 90505-5245

**Project Title:**

Refractory Oxides with Tunable Porosity and Geometry as Versatile Fast-Release Solid Catchers for Rare Isotopes

**Project Summary:**

This project will support the DOE program objectives, which aim to develop refractory, solid catchers for the efficient production of rare isotopes of single-species molecular vapors. The proposed technology will help to promote understanding of how stars explode or how elements from iron to uranium are created.

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**Technical Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

**Company:**

INTA 2281 Calle de Luna Santa Clara, CA 95054-1002

**Project Title:**

High Power S-Band Vacuum Dry Load for SLAC Linac using Innovative Highly Conductive Materials and Novel Manufacturing Technologies.

**Project Summary:**

High peak power RF loads are employed to terminate the remaining energy of RF sources in high-energy linear particle accelerators. The proposed project will develop high power loads that can reliably terminate the increased power of modern RF sources.

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**Technical Topic:**

High Energy Density Plasmas and Inertial Fusion Energy

**Company:**

JANX Service 1530 Grand Ave Piedmont, CA 94611-4330

**Project Title:**

Study of Implosion Physics of High-Energy z-Pinches

**Project Summary:**

The project is aiming to make breakthroughs in the driver technology for Inertial Confinement Fusion, which could be a major component of the next generation of the cheap and green energy.

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**Technical Topic:**

Genomic Science and Related Biotechnologies

**Company:**

Kultevat, LLC 2692 E Street San Diego, CA 92102-2717

**Project Title:**

Rapid Impedance Methods for Assaying Hydrocarbons and Fermentable Sugars in Plant Materials

**Project Summary:**

The goal of this project is to develop tools and methods which shorten the time, and reduce the cost, of breeding new, improve bioenergy crops, and enhancing their yield traits.

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**Technical Topic:**

Carbon Cycle Measurements of the Atmosphere and the Biosphere

**Company:**

KWJ Engineering Incorporated 8440 Central Avenue Suite 2D Newark, CA 94560-3453

**Project Title:**

High Performance Low Power Electrochemical CO<sub>2</sub> Gas Sensor

**Project Summary:**

This SBIR program will develop a novel sensor that will support the acquisition of high quality data to support carbon cycle management throughout the United States. This sensor will provide reliable data on CO<sub>2</sub> ambient changes in a wide variety of locations.

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**Technical Topic:**

Technologies for Subsurface Characterization and Monitoring

**Company:**

Los Gatos Research 67 East Evelyn Avenue Suite 3 Mountain View, CA 94041-1518

**Project Title:**

Site-Specific Nitrous Oxide Isotope Analyzer for Measuring Bioremediation

**Project Summary:**

Los Gatos Research proposes to develop a field-deployable analyzer to monitor bioremediation of contaminated soil and groundwater by measuring the emitted nitrous oxide and its isotopes. Such measurements are critical to monitoring and improving bioremediation at contaminated DOE sites.

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**Technical Topic:**

Carbon Cycle Measurements of the Atmosphere and the Biosphere

**Company:**

Los Gatos Research 67 East Evelyn Avenue Suite 3 Mountain View, CA 94041-1518

**Project Title:**

Portable System for the Measurements of Concentration, Isotopic Composition and Flux of Ambient CH<sub>4</sub> and CO<sub>2</sub> Released from Soil and Water

**Project Summary:**

Los Gatos Research proposes to develop a field-deployable analyzer to monitor greenhouse gases (e.g. methane and carbon dioxide) emitted from the soil. Such measurements are critical to better understanding the Earth's carbon balance and developing unconventional energy sources (e.g. shale gas deposits).

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**Technical Topic:**

High Performance Materials for Nuclear Application

**Company:**

MATECH / GSM 31304 Via Colinas, Suite 102 Westlake Village, CA 91362-6731

**Project Title:**

High Temperature SiC/SiC CMCs Tailored for Nuclear Environments

**Project Summary:**

MATECH seeks to demonstrate high purity stoichiometric SiC/SiC composites using USA's first low cost, domestic SiC ceramic fibers for use in advanced nuclear reactors. This technology could not only improve America's energy self-reliance, but generate significant high wage domestic manufacturing jobs.

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**Technical Topic:**

Nuclear Physics Electronics Design and Fabrication

**Company:**

Pacific Microchip Corp. 3916 Sepulveda Blvd. #108 Culver City, CA 90230-4650

**Project Title:**

Transceiver ASIC for 100Gbps Detector Data Link

**Project Summary:**

This project will develop a low power radhard wide temperature range 100Gbps transceiver ASIC. This ASIC will be compliant with the 100Gbps Ethernet (100GbE) standard and will satisfy the data throughput needs of most demanding detector interfaces of nuclear physics instruments such as those required at FRIB.

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**Technical Topic:**

High-Field Superconductor and Superconduction Magnet Technologies for High Energy Particle Colliders

**Company:**

Particle Beam Lasers, Inc. 18925 Dearborn Street Northridge, CA 91324-2807

**Project Title:**

Magnet Coil Designs Using YBCO High Temperature Superconductor (HTS)

**Project Summary:**

This SBIR will advance the use of an exciting new technology for generating magnetic fields. Immediate applications in particle physics are expected and numerous areas of technology could benefit if the work is successful. Young researchers will have the opportunity to contribute significantly to the work of this SBIR.

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**Technical Topic:**

Carbon Cycle Measurements of the Atmosphere and the Biosphere

**Company:**

Physical Optics Corporation 20600 Gramercy Place, Bldg. 100 Torrance, CA 90501-1821

**Project Title:**

## Carbon Sensor Network System

### **Project Summary:**

Measurement technology is needed to quantify annual net changes of carbon in terrestrial vegetation, and in emissions from various sources, over large areas. A network of all-weather, miniaturized, high-accuracy optical sensors will be developed for simultaneous monitoring of carbon dioxide, carbon monoxide, and methane concentrations distributed over large areas.

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### **Technical Topic:**

Technology to Support BES User Facilities

### **Company:**

PolarOnyx, Inc. 2526 Qume Drive Suites 17 & 18 San Jose, CA 95131-1870

### **Project Title:**

Mid-Infrared High Energy Ultrafast Fiber Laser for X-Ray Science

### **Project Summary:**

A high energy mid-infrared ultrafast fiber laser system will be developed for next generation long wavelength pumped X-ray sources. It will enable high energy (10 mJ), short pulse (100 fs), and compact high energy study.

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### **Technical Topic:**

Advanced Concepts and Technology for High Energy Accelerators

### **Company:**

Radiabeam Technologies, LLC. 1717 Stewart Street Santa Monica, CA 90404-4021

### **Project Title:**

The Next Generation Photoinjector

### **Project Summary:**

This project will develop industrially the next generation electron source, an important tool for advancing future scientific discoveries and American scientific leadership in the world.

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### **Technical Topic:**

Advanced Sources for Accelerator Facilities

### **Company:**

Radiabeam Technologies, LLC. 1717 Stewart Street Santa Monica, CA 90404-4021

### **Project Title:**

Laser-Free RF-Gun as a Powerful THz Source

### **Project Summary:**

This project will develop an intense, compact terahertz (T-ray) source. Applications include small container and personnel screening, cancer diagnosis and fundamental research.

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### **Technical Topic:**

Nuclear Physics Accelerator Technology

### **Company:**

Radiabeam Technologies, LLC. 1717 Stewart Street Santa Monica, CA 90404-4021

### **Project Title:**

Advance Additive Manufacturing Method for SRF Cavities of Various Geometries

### **Project Summary:**

This project will manufacture a superconducting accelerator with innovative additive fabrication techniques. This

promises to be a less-expensive, more reliable device for imaging and analysis applications of interest to homeland security as well as industrial and academic programs.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Radiabeam Technologies, LLC. 1717 Stewart Street Santa Monica, CA 90404-4021

**Project Title:**

Sub-Femtosecond Bunch Length Diagnostic

**Project Summary:**

This project will develop an ultrafast diagnostic with an unprecedented timing resolution of sub-femtoseconds, the natural time-scale of atomic motion. Such a device will find numerous applications in the areas of medicine, industry, security, and basic research.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Radiabeam Technologies, LLC. 1717 Stewart Street Santa Monica, CA 90404-4021

**Project Title:**

Inverse Compton Source for Extreme Ultraviolet Lithography

**Project Summary:**

This project will develop an extremely bright source of extreme ultraviolet and X-ray radiation, which can be used for semiconductor manufacturing, medical imaging, and homeland security.

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**Technical Topic:**

Nuclear Physics Instrumentation, Detection Systems and Techniques

**Company:**

Tungsten Heavy Powder, Inc. 7430 Trade Street San Diego, CA 92121-2410

**Project Title:**

Development and Testing of New Tungsten Based Absorber Materials with Accordion Geometries for Nuclear Physics Applications

**Project Summary:**

The proposed research effort would fabricate custom accordion shaped tungsten sheets. In the future, these preformed absorber plates will provide a simple and inexpensive material for the construction of large scale particle detectors in nuclear, high energy and space physics experiments, and for shielding purposes. It may also find commercial applications in x-ray instrumentation, medical imaging, baggage and container inspection, and material analysis.

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**Technical Topic:**

Advanced Network Technologies and Services

**Company:**

Ultra Communications, Inc. 990 Park Center Drive, Suite H Vista, CA 92081-8352

**Project Title:**

Embedded Photonic Components for 100 Gbps Data Transport

**Project Summary:**

This program will develop technology for integrating optical interconnections within high performance ASIC

packaging. This innovation to fiber optic component technology increases the performance, reduces the size and reduces the power consumption of optical communications within dense network systems, such as advanced distributed computing systems and data centers. This technology will address the evolution of data transmission requirements, as the trend continues to implement optical components in close proximity to the data source/sink.

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**Technical Topic:**

Catalysis

**Company:**

UltraCell LLC 399 Lindbergh Avenue Livermore, CA 94551-9291

**Project Title:**

Integrated Reformer with an Electrochemical Separator using a High Temperature Solid Acid Membrane

**Project Summary:**

A new reactor will be designed and fabricated to perform hydrogen generation, purification, and compression simultaneously. The new reactor can be used as a standalone hydrogen generator or integrated into a fuel cell system.

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**Technical Topic:**

Advanced Technologies and Materials for Fusion Energy Systems

**Company:**

Ultramet 12173 Montague Street Pacoima, CA 91331-2210

**Project Title:**

Robust Cellular Solid Breeder Material for Enhanced Tritium Production

**Project Summary:**

Nuclear fusion offers a technically viable means of generating energy consistent with current consumption levels and environmental preservation. Establishing the commercial viability of fusion requires the development of advanced materials and structures that allow reliable operation in the demanding reactor environment.

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**Technical Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

**Company:**

Ultramet 12173 Montague Street Pacoima, CA 91331-2210

**Project Title:**

Advanced Manufacturing and Testing of Seamless High-Purity Niobium Superconducting Radio Frequency Cavities

**Project Summary:**

Large quantities of high-purity niobium radio frequency cavities are needed for particle accelerators in fields as diverse as high-energy physics and airport security. Advanced chemical vapor deposition processing is being developed for economical fabrication of seamless high-purity niobium cavities.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Xradia, Inc. 4385 Hopyard Road Pleasanton, CA 94588-2758

**Project Title:**

Development of Optimized Controls and Hardware for Synchrotron Hard X-Ray Microscopes with Advanced Spectroscopic Capabilities

**Project Summary:**

Xradia Inc. and Stanford Accelerator Laboratory are jointly developing a solution for elemental and oxidation state

analysis in 3-D at nanometer length scale. Key applications for this technology are the development of new, reliable energy conversion and storage solutions based on nanotechnology.

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**Technical Topic:**

Genomic Science and Related Biotechnologies

**Company:**

Zachary Apte DBA EvolveMol 1442A #444 Walnut St. Berkeley, CA 94709-1405

**Project Title:**

A Microfluidic Platform for the Discovery and Functional Annotation of Metagenomic Enzymes

**Project Summary:**

This project will develop a high-throughput, microfluidic platform technology to identify genes and metabolic networks involved in producing enzymes with specific activity. This technology will take a enzyme substrate and rapidly find metagenomic sequences involved in its conversion. The method allows quick sampling of the enormous functional reservoir of novel genes from a metagenome for applications in bioenergy, biosequestration, bioremediation and beyond.

## Colorado

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**Technical Topic:**

Advanced Technologies and Materials for Fusion Energy Systems

**Company:**

Advanced Conductor Technologies LLC 3271 Big Horn St Boulder, CO 803013246-

**Project Title:**

REBCO Coated Conductor Cables for Fusion Magnets

**Project Summary:**

The development of high-performance magnet cables made from high-temperature superconductors is necessary for the US to maintain their leadership position in superconductivity research, materials science, and fusion research.

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**Technical Topic:**

Advanced Technologies and Materials for Fusion Energy Systems

**Company:**

Composite Technology Development, In 2600 Campus Drive, Suite D Lafayette, CO 80026-3359

**Project Title:**

High-Shear-Strength, Radiation-Resistant Electrical Insulations for Plasma Confinement Magnets

**Project Summary:**

High-performance magnets are a key component of the fusion energy programs under development by the U.S. Department of Energy. This work seeks to extend the state of the art in magnet technology to ensure the reliable operation of these future machines.

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**Technical Topic:**

Atmospheric Measurement Technology

**Company:**

Droplet Measurement Technologies 2545 Central Avenue Boulder, CO 80301-2865

**Project Title:**

A Compact, Low Power Depolarization Backscattering Cloud Spectrometer for Water and Ice Discrimination

**Project Summary:**

An ultra-light, low power instrument is being developed to make airborne measurements of the properties of aerosol and cloud particles, in particular water droplets and ice crystals in Arctic Clouds. This instrument is highly sensitive to particle shape and has immediate applications on commercial aircraft for detecting volcanic ash, dust and ice crystals, all particles that impact engine performance.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Kapteyn-Murnane Laboratories Inc. 1855 S 57th Ct Boulder, CO 80301-2811

**Project Title:**

Advanced Technologies for Compact 100 W-class Ultrafast Ti:sapphire Lasers to Support DOE Facilities Needs

**Project Summary:**

We propose to develop a high power ultrafast Ti:Sapphire amplifier system whose performance is well beyond the capabilities of current state of art technologies. This system will have very wide applicability in both science and industry, including for new science at the Advanced Photon Source at Argonne National Laboratory.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Light Foundry, LLC 2920 Bluff Street #214 Boulder, CO 80301-1269

**Project Title:**

User-Centered, Collaborative, Web and Radiance-Based Lighting Simulation, Visualization, and Analysis

**Project Summary:**

This proposed research effort will create innovative, collaborative lighting analysis and visualization tools based on the Radiance simulation software, which will help a variety of people formulate, manage, and solve complex environmental problems. These tools will help people design green-buildings that are both beneficial to the environment and its occupants.

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**Technical Topic:**

Atmospheric Measurement Technology

**Company:**

Seaforth, LLC Campus Delivery - 1320 Engineering Research Center - CSU Fort Collins, CO 80523-1320

**Project Title:**

Versatile Instrument for Broadband Measurements of Aerosol Extinction and Absorption

**Project Summary:**

Optical properties of aerosols play a key role in air quality, visibility, and potential effects of climate change. The proposed instrument provides new and improved capability in terms of measuring aerosol optical properties to address these challenges.

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**Technical Topic:**

Low Temperature Plasmas

**Company:**

Symbios Technologies, LLC 116 North College Avenue Suite 7 Fort Collins, CO 80524-4425

**Project Title:**

## Elimination of Biological Matter in Power Plant Cooling Water using Low Temperature Plasma

### **Project Summary:**

The cooling water used in power plants is an ideal breeding ground for bacteria and algae that decrease plant efficiency, drive up operating costs, and sometimes harm human health. We are developing a system that kills these organisms using an low temperature electrical plasma, without the need for added chemicals.

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### **Technical Topic:**

High Performance Materials for Nuclear Application

### **Company:**

TDA Research, Inc. 12345 W. 52nd Ave. Wheat Ridge, CO 80033-1916

### **Project Title:**

Crack-free, Oxidation-Immune Coatings for Carbons

### **Project Summary:**

This project will develop coatings that protect advanced materials used in nuclear reactor cores from degrading during both normal operation and accidents, increasing the safety of advanced reactor designs.

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### **Technical Topic:**

Advanced Sources for Accelerator Facilities

### **Company:**

Tech-X Corporation 5621 Arapahoe Ave Boulder, CO 80303-1379

### **Project Title:**

Software for Modeling and Design of Diamond Amplifier Cathodes

### **Project Summary:**

Novel high-current, high-brightness, low emittance electron sources are required for operation and major upgrades of existing and future DOE user facilities. High-fidelity software is being developed to enable new capabilities to design advanced, diamond amplifier cathodes.

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### **Technical Topic:**

Ancillary Technologies for Accelerator Facilities

### **Company:**

Tech-X Corporation 5621 Arapahoe Ave Boulder, CO 80303-1379

### **Project Title:**

Integrated Modeling of Beam Dynamics, Pulse Propagation and Lasing to Design Next-Generation Free Electron Lasers

### **Project Summary:**

Free electron lasers are a key technology for scientific research, with emerging applications in the industrial processing of materials, and with future applications in shipboard self defense and homeland security. State-of-the-art software will be developed for this growing market.

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### **Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

### **Company:**

Tech-X Corporation 5621 Arapahoe Ave Boulder, CO 80303-1379

### **Project Title:**

Packaging PETSc for Commercialization

**Project Summary:**

Computer-aided engineering is crucial to U.S. manufacturer's ability to maintain an innovative edge over competitors. We will enable a DOE-funded software library to be more easily used by U.S. manufactures and software vendors in order to strengthen their ability to innovate.

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**Technical Topic:**

Advanced Concepts and Technology for High Energy Accelerators

**Company:**

Tech-X Corporation 5621 Arapahoe Ave Boulder, CO 80303-1379

**Project Title:**

Modeling tools and techniques for dielectric laser accelerators

**Project Summary:**

Future generations of high-energy particle accelerators, used to study the fundamental nature of matter, will likely be powered with lasers. Designs are being developed to enable powerful, efficient laser-driven structures, which can significantly reduce the cost and size of accelerator systems.

## Arizona

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**Technical Topic:**

Advanced Concepts and Technology for High Intensity Accelerators

**Company:**

Omega-P, Inc. 258 Bradley Street New Haven, CT 06510-1106

**Project Title:**

Electron Gun and Beam Collector for a 650-kW, 1.3-GHz Low-Voltage Multi-Beam Klystron for the Project-X Pulsed Linac

**Project Summary:**

The quest for understanding the origin of the universe requires continued search for elementary particles, for which high-energy accelerators are necessary tools. This project is to develop the electron gun and electron beam collector for a high-power microwave amplifier with simplified design and thus allow improved performance and cost savings.

## Connecticut

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**Technical Topic:**

Advanced Concepts and Technology for High Intensity Accelerators

**Company:**

Omega-P, Inc. 258 Bradley Street New Haven, CT 06510-1106

**Project Title:**

RF Cavity Chain and Magnetic Circuit for a 650 kW, 1.3-GHz Low-Voltage Multi-Beam Klystron for the Project -X Pulsed Linac

**Project Summary:**

The quest for understanding the origin of the universe requires continued search for elementary particles, for which high-energy accelerators are necessary tools. This project is to develop the cavity chain and magnetic circuit for a high-power microwave amplifier with simplified design and thus allow improved performance and cost savings.

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**Technical Topic:**

Catalysis

**Company:**

Proton Energy Systems 10 Technology Drive Wallingford, CT 06492-1955

**Project Title:**

Economical Production of Hydrogen Through Development of Novel, High Efficiency Electrocatalysts for Alkaline Membrane Electrolysis

**Project Summary:**

Proton OnSite manufactures hydrogen generation systems which can be integrated with renewable energy sources to generate hydrogen fuel while producing minimal carbon footprint. This project aims to reduce the cost of this technology through development of improved electrode materials designed to reduce raw material cost and improve electrical efficiency.

## Delaware

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**Technical Topic:**

Nuclear Physics Instrumentation, Detection Systems and Techniques

**Company:**

Applied Diamond, Inc. 3825 Lancaster Pike Wilmington, DE 19805-1559

**Project Title:**

Thin Diamond for Time-of-Flight Detectors

**Project Summary:**

Man-made diamond quality has improved sufficiently to allow the manufacture of high performance radiation and particle detectors. This project will investigate thin film diamond preparation techniques to further expand potential applications for this radiation hard material.

**Technical Topic:**

Membranes for Industrial Applications

**Company:**

Compact Membrane Systems, Inc. 335 Water Street Newport, DE 19804-2410

**Project Title:**

Novel Membrane Systems for Olefin/Paraffin Separation

**Project Summary:**

This project will result in a process that will reduce the cost of manufacturing two widely used polymers, polyethylene, and polypropylene, by increasing the feedstock usage efficiency of the polymerization process.

**Technical Topic:**

Instrumentation For Ultra-bright or Ultra-fast X-Ray Sources to Enable Materials Research

**Company:**

Delaware Diamond Knives, Inc. 3825 Lancaster Pike Wilmington, DE 19805-1558

**Project Title:**

Diamond Refractive Focusing Optics

**Project Summary:**

Diamond provides the thermal qualities needed to improve the performance of beam lines in advanced photon light

sources. This project will develop the manufacturing techniques for producing diamond optics for applications that see the highest heat load while improving the quality of the transmitted beam.

## Florida

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**Technical Topic:**

Advanced Network Technologies and Services

**Company:**

Accelerated Data Works, Inc. 2831-A NW 41st Street Gainesville, FL 32606-6690

**Project Title:**

Holistic Operations Planning System (HOPS)

**Project Summary:**

Large-scale computer network planning is a difficult task with limited management-tool support. This software integrates with existing network management systems to provide operators the tools and high level reports needed to reduce costs, make better decisions, and communicate the status of their network with stakeholders.

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**Technical Topic:**

Enhanced Availability of Climate Model Output

**Company:**

IENTECH LLC 1780 Corsica Drive Wellington, FL 33414--104

**Project Title:**

A Watershed Based Web Tool Enhancing Climate Model Output Usage

**Project Summary:**

This watershed based web tool system investigates climate change impacts by animated visualization and readily usable information required for watershed hydrological assessment, drought/flood management, agriculture management, pollution control management and land use planning.

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**Technical Topic:**

High Energy Physics Detectors and Instrumentation

**Company:**

Sinmat Inc. 1912 NW 67th Place Gainesville, FL 32653-1649

**Project Title:**

Novel Rapid Chemical Mechanical Polishing (CMP) Process for Fabrication of High Performance CVD Diamond Particle Detectors

**Project Summary:**

The ultra-smooth CVD diamond crystals based radiation detectors will represent a significant advancement in the fields of high energy physics, X-ray physics and nuclear physics, nuclear power industry and home land security. Ultra-smooth diamonds will help the miniaturization of computer process and other electronic appliances.

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## Georgia

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**Technical Topic:**

Enhanced Availability of Climate Model Output

**Company:**

Climate Forecast Applications 845 Spring ST. NW #129 Atlanta, GA 30308-1043

**Project Title:**

Application of Global Weather and Climate Model Output to the Design and Operatio of Wind-Energy Systems

**Project Summary:**

CFAN's proposed wind-energy forecasting decision support tool will resolve limitations of existing forecast solutions to provide improved ability to incorporate wind based power supply into the national energy mix and assist in the proper expansion of capacity in both inland and offshore locales.

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**Technical Topic:**

Advanced Clean Energy Research

**Company:**

PhosphorTech Corporation 351 Thornton Rd, Suite 130 Lithia Springs, GA 30122-4122

**Project Title:**

Nanowires for CO2 reforming into fuels by sunlight

**Project Summary:**

In this phase I SBIR project, we propose to develop a new type of photo-catalyst nanowire structure for high yield CO2 reforming into fuels and useful chemicals by sunlight energy.

## Hawaii

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**Technical Topic:**

Advanced Network Technologies and Services

**Company:**

Referentia Systems Incorporated 155 Kapalulu Place, Suite 200 Honolulu, HI 96819-000

**Project Title:**

LiveMap: A Multi-domain Network Flow Visualization and Analysis Tool

**Project Summary:**

Referentia Systems will develop an intelligent network management solution for troubleshooting network performance. The tool, called LiveMap, will create situational awareness of the network in real time to enable IT operators to peer into any portion of the network from end-to-end and mitigate issues over multiple domains.

## Illinois

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**Technical Topic:**

Low Temperature Plasmas

**Company:**

Eden Park Illumination, Inc. 903 N. Country Fair Dr. Champaign, IL 61821-3259

**Project Title:**

Low Temperature Microplasma UV Lighting Tiles for Water Purification and Sterilization

**Project Summary:**

Eden Park Illumination, Inc. will perform research for the development and commercialization of large arrays of

microcavity plasmas capable of generating light in the wavelength range of UVB and UVC in a slim and flat form factor.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Materials Development, Inc. 3090 Daniels Court Arlington Heights, IL 60004-0000

**Project Title:**

Manipulation of Samples at Extreme Temperatures for Fast in-situ Synchrotron Measurements

**Project Summary:**

Advanced materials research using x-rays is critical in making technological advances in areas such as pharmaceuticals, “smart materials” for energy storage, transportation and security technologies. This project will have a strong impact on US capabilities in advanced materials, energy technology and overall manufacturing competitiveness

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**Technical Topic:**

Radio Frequency (RF) Devices and Components for Accelerator Facilities

**Company:**

Muons, Inc. 552 N. Batavia Ave Batavia, IL 60510-0000

**Project Title:**

High Power S-Band Vacuum Load

**Project Summary:**

A high-peak-power RF load will be developed for use in an ultra-high vacuum.

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**Technical Topic:**

Nuclear Physics Accelerator Technology

**Company:**

Muons, Inc. 552 N. Batavia Ave Batavia, IL 60510-0000

**Project Title:**

Ribbon Electron Beam Profile Monitor for Bunched Beam Tomography

**Project Summary:**

New beam tomography systems are being developed to diagnose intense proton beams for the Spallation Neutron Source and other scientific and commercial accelerators.

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**Technical Topic:**

Advanced Technologies and Materials for Fusion Energy Systems

**Company:**

QuesTek Innovations LLC 1820 Ridge Avenue Evanston, IL 60201-3621

**Project Title:**

Computational Materials Design of Tungsten Alloys with Improved Fracture Toughness and a Lowered Ductile to Brittle Transition Temperature (DBTT)

**Project Summary:**

Fusion energy is potentially a safe, environmentally-friendly energy source that relies on low-cost fuel readily available to the US. In order to realize the potential of fusion energy, a number of scientific and engineering hurdles must be overcome. To this end, QuesTek Innovations LLC proposes to develop a new class of tungsten alloys with improved material properties for use in high-temperature, high radiation environments present in fusion energy

reactors.

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**Technical Topic:**

High Energy Physics Detectors and Instrumentation

**Company:**

Vega Wave Systems 1275 West Roosevelt Road, Suite 104 West Chicago, IL 60185-4815

**Project Title:**

An Optical Bus for Level 1 Trigger Designs in Particle Physics Detectors

**Project Summary:**

This project will develop very high speed optical communications links based on radiation-tolerant external optical modulators for the next generation of high energy physics particle detectors. Spin-offs are expected to have significant commercial value by improving data transfer and network traffic for large computer network systems, including the internet.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Ziena Optimization LLC 1801 Maple Avenue Evanston, IL 60201-3149

**Project Title:**

High-Performance Nonlinear Optimization Software for Power Applications

**Project Summary:**

The results of this project will enable electric utilities and power grid operators to optimize their power distribution efforts over a much larger scale than at present, with the aim of making a substantial contribution to the energy efficiency of the U.S. economy.

## Massachusetts

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**Technical Topic:**

Carbon Cycle Measurements of the Atmosphere and the Biosphere

**Company:**

Aerodyne Research, Inc. 45 Manning Road Billerica, MA 01821-3976

**Project Title:**

Compact High Precision Field Instrument for all Major Greenhouse Gases

**Project Summary:**

We will design a highly sensitive trace gas monitor that is unique in simultaneously and rapidly measuring the atmospheric concentrations of the three most important greenhouse gases: carbon dioxide, methane and nitrous oxide. This instrument will quantify the sources and sinks of the gases which primarily drive global climate change.

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**Technical Topic:**

Atmospheric Measurement Technology

**Company:**

Aerodyne Research, Inc. 45 Manning Road Billerica, MA 01821-3976

**Project Title:**

LED-Based Photoacoustic Particle Optical Absorption Monitor

**Project Summary:**

Ambient atmospheric aerosols generated through human activities can exert an influence on the earth's radiation budget (and thus the 'greenhouse effect') comparable in magnitude with greenhouse gases such as carbon dioxide and methane. This device will enable scientist to measure critical optical properties of such aerosols in a routine fashion in order to provide better predictions of climate change.

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**Technical Topic:**

Ancillary Technologies for Accelerator Facilities

**Company:**

Agiltron, Inc. 15 Presidential Way Woburn, MA 01801-1040

**Project Title:**

Mode Locked Fiber Ring Laser Based High Power Oscillator System

**Project Summary:**

High pulse energy mode lock fiber laser with high repetition rate are a long sought goal of optical laser technology, useful for a broad range of research and commercial applications ranging from defense countermeasures to laser surgery. The proposed research will lead to the practical high pulse energy fiber laser to be used as the seeding laser for free electron laser.

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**Technical Topic:**

High Energy Physics Detectors and Instrumentation

**Company:**

Arradiance, Inc. 142 North Road Suite F-150 Sudbury, MA 01776-1142

**Project Title:**

Novel Event Counting Microchannel Plate Detectors Capable of Operation at Cryogenic Temperatures

**Project Summary:**

Arradiance proposes development of novel event counting Microchannel Plates (MCPs) capable of operation at cryogenic temperatures. These devices will be capable of unique single photon/electron/alpha/ion detection with very high spatial and temporal resolution.

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**Technical Topic:**

Membranes for Industrial Applications

**Company:**

Aspen Products Group, Inc. 184 Cedar Hill St. Marlborough, MA 01752-3017

**Project Title:**

Permselective Membrane for Separation of Aromatic-Aliphatic Mixtures

**Project Summary:**

Current methods for separating aromatic and aliphatic hydrocarbons in petrochemical plants are energy intensive and complex. Aspen Products Group, Inc. will develop a highly permeable and selective membrane that will achieve this separation in a more cost-effective manner.

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**Technical Topic:**

Fusion Science and Technology

**Company:**

Bridge 12 Technologies, Inc. 37 Loring Drive Framingham, MA 01702-8768

**Project Title:**

A Novel High Efficiency 1.5 MW, 110 GHz Gyrotron with HE11 Output for Plasma Heating

**Project Summary:**

In this Phase I work, we propose to design a novel magnetic system, a new cavity and a novel internal mode transformer to mitigate the ACI effect to achieve ~60% efficiency. The novel internal mode launcher will result in direct HE11 output from the gyrotron in a corrugated waveguide thus avoiding the need for a large and expensive Matching Optics Unit (MOU) which is necessary for coupling the output power from current generation of gyrotrons (with TEM00-like output) to the HE11 mode in a corrugated waveguide transmission line. A successful achievement of the goals of this project in the proposed Phase I and a future Phase II will lead to the establishment of an alternative source in the United States for high power gyrotrons.

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**Technical Topic:**

Membranes for Industrial Applications

**Company:**

Clean Membranes, Inc. 100 Waltham Street Lexington, MA 02421-5413

**Project Title:**

Fouling Resistant Membranes for Efficient Oil Well Wastewater Treatment

**Project Summary:**

This project will develop efficient, high flux, fouling resistant filtration membranes formed with self-organizing polymers for treating oil well produced water. This will provide energy and cost savings to the industry, decrease materials use, and increase effluent quality, thereby reducing the discharge of contaminated water and enabling wastewater reuse

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**Technical Topic:**

High Energy Physics Detectors and Instrumentation

**Company:**

Coating Technology Solutions Inc. 36 B Munroe Street Somerville, MA 02143-1009

**Project Title:**

High Efficiency Diamond Detectors

**Project Summary:**

Recently, CTS Inc achieved near state of the art performance of diamond detectors in both single crystal and polycrystalline forms. This project will develop microwave plasma CVD deposition methods targeting commercially viable diamond detectors by addressing both detector performance and overall deposition rates.

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**Technical Topic:**

Advanced Concepts and Technology for High Intensity Accelerators

**Company:**

Diversified Technologies, Inc. 35 Wiggins Ave Bedford, MA 01730-2345

**Project Title:**

Integrated Resonant Cavity Combined Solid-State Transmitter

**Project Summary:**

The novel integrated resonant cavity solid-state amplifier will reduce the cost of RF and microwave power by allowing solid-state circuitry to replace the very large vacuum tubes which are progressively becoming obsolete.

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**Technical Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

**Company:**

Diversified Technologies, Inc. 35 Wiggins Ave Bedford, MA 01730-2345

**Project Title:**

High-Energy-Density Storage Capacitors

**Project Summary:**

Increasing the energy density of available high voltage storage capacitors will reduce the burdensome volume of capacitor banks in pulsed power systems, as well as enable longer and more easily regulated pulsing for klystron modulators.

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**Technical Topic:**

Low Cost, Optimized Redox Flow Battery Electrolytes, Novel Solid Ionic Conducting Membranes, and Rechargeable Air-Breathing Cathodes for Bat

**Company:**

EIC Laboratories, Inc. as Dharmasena 111 Downey Street Norwood, MA 02062

**Project Title:**

Nanocatalytic Rechargeable Lithium Air Cathodes

**Project Summary:**

The goal of this program is to develop a revolutionary battery with very high energy density suitable for electric cars and also load leveling of the electrical grid. The Li-Air battery is the only battery that has the potential of meeting the energy demand of a fully electric vehicle with a range comparable to the present gas-driven automobile.

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**Technical Topic:**

Technologies for Subsurface Characterization and Monitoring

**Company:**

Giner, Inc. 89 Rumford Avenue Newton, MA 02466-1311

**Project Title:**

Field Monitor to Measure Chromium and Cobalt in Subsurface Water and Soil

**Project Summary:**

Giner, Inc. proposes to develop a field-deployable electrochemical sensor with near-real-time response for monitoring chromium and cobalt pollution. The proposed sensor will improve monitoring capabilities by providing fast, reliable, and sensitive on-site quantification of these metals in groundwater, surface water, and soil.

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**Technical Topic:**

Catalysis

**Company:**

Giner, Inc. 89 Rumford Avenue Newton, MA 02466-1311

**Project Title:**

Carbon Nitride Supported Iridium Oxide (IrO<sub>2</sub>) Catalyst for Proton Exchange Membrane Electrolysis

**Project Summary:**

The proposed innovation aims to develop an advanced catalyst for proton exchange membrane water electrolysis that is inherently active and economically feasible. This effort will make water electrolysis more efficient and competitive compared to other hydrogen production technologies.

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**Technical Topic:**

Advanced Concepts and Technology for High Energy Accelerators

**Company:**

Incom Inc. 294 Sturbridge Road Charlton, MA 01507-5238

**Project Title:**

Drive Systems for Photonic Bandgap (PBG) Accelerators

**Project Summary:**

High-energy physics needs shorter wavelengths and higher energies at much lower cost to probe the fundamental structure of matter. Miniature photonic-bandgap accelerators have potential to increase power and performance while drastically reducing machine size and cost, enabling breakthroughs in high-energy physics, industrial measurement, medical research and diagnostic technology.

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**Technical Topic:**

Ancillary Technologies for Accelerator Facilities

**Company:**

MagiQ Technologies, Inc. 11 Ward Street Somerville, MA 02143-4214

**Project Title:**

Synchronization System for Next Generation Light Sources

**Project Summary:**

MagiQ Technologies is teamed with top scientists from Lawrence Berkeley Laboratory to develop a fiber optic-based synchronization and communication system for control of next-generation light sources.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Newton Energy Group LLC 47 Huntington Rd Newton, MA 02458-2416

**Project Title:**

pCloud: A Cloud-Based Power Market Simulation Environment

**Project Summary:**

The project will use cloud computing to develop a new generation of simulators to model the operation of electrical grids. These simulators will be fast and relatively inexpensive to use by industry stakeholders. The technology will improve design and analysis of the U.S. electrical grid and will contribute to improved efficiency of markets for electric energy.

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**Technical Topic:**

Low Temperature Plasmas

**Company:**

Physical Sciences Inc. 20 New England Business Center Andover, MA 01810-1077

**Project Title:**

RF Microplasma Arrays for Singlet Delta Oxygen Generation

**Project Summary:**

This project will develop a novel, low-power oxygen microplasma device for treatment of cancer and destruction of harmful biological organisms.

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**Technical Topic:**

Atmospheric Measurement Technology

**Company:**

Physical Sciences Inc. 20 New England Business Center Andover, MA 01810-1077

**Project Title:**

Networkable Automated Water Vapor Lidar for Tropospheric Profiling

**Project Summary:**

This project will produce a new sensor that, when assembled into networks, could help to increase the predictive capability of both weather forecasts and climate change models.

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**Technical Topic:**

Ancillary Technologies for Accelerator Facilities

**Company:**

Q-Peak 135 South Road Bedford, MA 01730-2307

**Project Title:**

High Power Mid-IR Laser System for ESASE

**Project Summary:**

Revolutionary advances in the fundamental studies of atoms, molecules, and solids have been made possible by development of ultra-high-power, ultra-short pulse lasers, and associated optics. Spin-off applications of the advances cover a wide and diverse area, ranging from diagnostic medicine to remote detection of hidden explosives and other weapons of mass destruction. Our program will make significant progress in the laser technology needed for the next generation of ultrafast X-ray systems, and will also reduce their cost and complexity.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Q-Peak 135 South Road Bedford, MA 01730-2307

**Project Title:**

High-Average Power, High-Energy, 2-um Laser Source for High-Harmonic Generation

**Project Summary:**

High pulse energy, high rate, picosecond, pulsed drive lasers to be developed in this program are essential for implementation of a new generation of table-top X-ray sources, with early applications in science and long-range uses in medical diagnostics, providing improved resolution over present X-ray systems.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Radiation Monitoring Devices, Inc. 44 Hunt Street Watertown, MA 02472-4699

**Project Title:**

Low Noise, High Rate X-Ray Spectrometer for Synchrotron Applications

**Project Summary:**

The proposed project aims to investigate a new detector design that will have far reaching implications in fundamental scientific studies as well as commercial applications. It will be useful in diverse fields such as materials studies, health care and space research.

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**Technical Topic:**

High Energy Physics Detectors and Instrumentation

**Company:**

Radiation Monitoring Devices, Inc. 44 Hunt Street Watertown, MA 02472-4699

**Project Title:**

Low Radioactivity NaI for Dark Matter Studies

**Project Summary:**

The proposed research will investigate the promising high purity scintillator material, NaI, that will have a major impact in scientific studies, nuclear non-proliferation, medical imaging, scientific studies as well as commercial applications.

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**Technical Topic:**

Nuclear Physics Instrumentation, Detection Systems and Techniques

**Company:**

Radiation Monitoring Devices, Inc. 44 Hunt Street Watertown, MA 02472-4699

**Project Title:**

Multi-Modality Nuclear Spectroscopy

**Project Summary:**

The proposed research will develop a nuclear detector that will find wide use in nuclear and particle physics, homeland defense, oil well logging, non destructive testing, nuclear treaty verification and environmental remediation.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Radiation Monitoring Devices, Inc. 44 Hunt Street Watertown, MA 02472-4699

**Project Title:**

Manufacturing High Efficiency, yet High Resolution, Scintillator for Wide-Band X-Ray Analysis

**Project Summary:**

The development of the proposed scintillator will allow exploitation of the full potential of current state-of-the-art X-ray detectors used for synchrotron applications, medical imaging, scanning equipment for border patrol and homeland security, and small animal research (essential to the rapid and cost-effective development of new drugs).

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**Technical Topic:**

High-Field Superconductor and Superconduction Magnet Technologies for High Energy Particle Colliders

**Company:**

Supercon, Inc. 830 Boston Turnpike Shrewsbury, MA 015545-338

**Project Title:**

A Ta Doped ITT Type Nb<sub>3</sub>Sn Conductor with Improved Fabrication Characteristics

**Project Summary:**

The magnets for the next generation of high energy physics and fusion machines will require the development of superconducting wire capable of high performance at very high magnetic fields. This project seeks to develop a method for improving the manufacture of Nb<sub>3</sub>Sn superconductor that will produce a lower cost and high performance product

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**Technical Topic:**

Advanced Technologies and Materials for Fusion Energy Systems

**Company:**

Supercon, Inc. 830 Boston Turnpike Shrewsbury, MA 015545-338

**Project Title:**

Development of Joint Methods for 2G HTS Tape High-Current Cables

**Project Summary:**

This project attempts to demonstrate the feasibility of a new superconducting cable in order to attain the required

high magnetic fields.

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**Technical Topic:**

Low Cost, Optimized Redox Flow Battery Electrolytes, Novel Solid Ionic Conducting Membranes, and Rechargeable Air-Breathing Cathodes for Bat

**Company:**

TIAX, LLC 35 Hartwell Avenue Lexington, MA 02421-3102

**Project Title:**

Sodium Intercalation Battery for Stationary Storage

**Project Summary:**

This DOE award will enable TIAX to develop a rechargeable battery for stationary electrical energy storage applications that will facilitate and expand the penetration of renewable energy generating technologies such as wind and solar, thus increasing the energy and environmental security of the United States.

## Maryland

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Argo Navis Technologies, LLC 999 Windcroft Pl Annapolis, MD 21401-6578

**Project Title:**

A Scalable Targeted Debugger for Scientific and Commercial Computing

**Project Summary:**

Programmer productivity is a key to economic development in IT environments. The larger the computer system or data center, the harder it is to find bugs in the software and the more costly is the delay in not finding the bugs. The Swat project will produce a cost effective and efficient software tool that can help even the least experienced programmer develop correctly running programs in such environments.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Argo Navis Technologies, LLC 999 Windcroft Pl Annapolis, MD 21401-6578

**Project Title:**

SpeedShop Ease of use Performance Analysis for Heterogeneous Processor Systems

**Project Summary:**

Supercomputing applications can better utilize hardware resources when performance bottlenecks within software are identified and eradicated; tools that allow a developer to find these problem areas typically require an expert to perform the analysis. This project seeks to allow a non-expert user to employ such tools by providing unified intuitive performance analysis on systems where all the processors are not of the same type.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Dynaflow, Inc 10621-J Iron Bridge Road Jessup, MD 20791-9381

**Project Title:**

Development of an Acoustic Instrument for Bubble Size Distribution Measurement in Mercury

**Project Summary:**

This project will develop an acoustic diagnostic tool that can meet all the bubble sizing requirements for Spallation Neutron Source (SNS) applications. It will build on the technology of the present state-of-the-art acoustic bubble sizing instrument, the ABS ACOUSTIC BUBBLE SPECTROMETER®©, which works well for void fractions of the order of 0.1% and for bubbles between 20 and 500 µm in diameter.

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**Technical Topic:**

Nuclear Physics Instrumentation, Detection Systems and Techniques

**Company:**

Technology Assessment and Transfer, 133 Defense Hwy, Suite 212 Annapolis, MD 21401-8907

**Project Title:**

Nanostructured Ceramic LSO Scintillators Using Dynamic Powder Compaction

**Project Summary:**

The goal of this project is develop a polycrystalline scintillator material (Lu<sub>2</sub>SiO<sub>5</sub>) for nuclear physics applications. Such a process methodology would enable more cost effective manufacturing method for this important scintillator material and open up new avenues of design for both nuclear accelerator facilities and medical scan applications.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Vorcat, Inc. 14 Freas Court North Potomac, MD 20878-2586

**Project Title:**

Extension of the Vorcat Technology to Moving Boundaries

**Project Summary:**

This project will develop reliable and efficient strategies for simulating the complex turbulent flows produced by moving boundaries associated with a wide range of next generation energy-related technologies such as wind turbines, ground vehicles, and wave and ocean current power generators.

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**Technical Topic:**

Nuclear Physics Isotope Science and Technology

**Company:**

Weinberg Medical Physics LLC 5611 Roosevelt Street Bethesda, MD 20817-6739

**Project Title:**

Semi-automated Lab-on-a-Chip for Dispensing Ga-68 Radiotracers

**Project Summary:**

This project will solve a technical problem that is hindering American progress in molecular medicine, and restricting US citizens from receiving optimal diagnostic care. Specifically, the project deals with a mother/daughter generator of positron-emitting radiotracers (Ge-68/Ga-68).

## Michigan

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**Technical Topic:**

Radio Frequency (RF) Devices and Components for Accelerator Facilities

**Company:**

Niowave, Inc. 1012 N. Walnut Street Lansing, MI 48906-5061

**Project Title:**

Development of a Superconducting RF Crabbing System based on a Quarter Wave Resonator for Ultrashort Pulses at Light Sources

**Project Summary:**

This SBIR project will build a novel “crabbing” cavity that rotates the electron beam in a storage ring x-ray source to produce short pulses of x-ray light – close to one trillionth of one second – for a variety of research purposes.

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**Technical Topic:**

Radio Frequency (RF) Devices and Components for Accelerator Facilities

**Company:**

Niowave, Inc. 1012 N. Walnut Street Lansing, MI 48906-5061

**Project Title:**

Continuous Wave Thermionic Copper RF Gun for Compact FELs

**Project Summary:**

Compact Free Electron Lasers are a new class of tunable high power lasers that offer an economical option for isotope production, novel x-ray sources and other applications. Niowave proposes to develop the high power electron source required to operate the compact Free Electron Laser.

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**Technical Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

**Company:**

Niowave, Inc. 1012 N. Walnut Street Lansing, MI 48906-5061

**Project Title:**

400 MHz LHC Crab Cryomodule with HOM Dampers, Tuners and Couplers

**Project Summary:**

Recent accelerator upgrades require novel superconducting cavities that deflect the beam to increase the efficiency of the system. This proposal will develop the key components that allow these new deflecting cavities to operate at superconducting temperatures nearly 450 degrees below zero.

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**Technical Topic:**

Nuclear Physics Isotope Science and Technology

**Company:**

Niowave, Inc. 1012 N. Walnut Street Lansing, MI 48906-5061

**Project Title:**

Commercial Superconducting Electron Linac for Radioisotope Production

**Project Summary:**

There is critical need for a domestic supply of radioisotope production for medical and research uses. This project will develop a superconducting electron linear accelerator for use as a cost effective isotope producer.

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**Technical Topic:**

Low Cost, Optimized Redox Flow Battery Electrolytes, Novel Solid Ionic Conducting Membranes, and Rechargeable Air-Breathing Cathodes for Bat

**Company:**

Vinazene, Inc. 2853 Daleview Dr Ann Arbor, MI 48105-9864

**Project Title:**

A Single Substance Organic Redox Flow Battery

**Project Summary:**

This project will advance the state of energy storage by improving the energy density of redox flow batteries. These new batteries will be useful in smoothing the fluctuations in energy supplied by solar or wind power.

## Minnesota

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**Technical Topic:**

Atmospheric Measurement Technology

**Company:**

MSP Corporation 5910 Rice Creek Parkway Suite 300 Shoreview, MN 55126-5025

**Project Title:**

Real-Time Size-Distributed Measurement of Aerosol Mass Concentration

**Project Summary:**

This technology will enable the rapid measurement of particles in any atmospheric, outdoor, or work-place environment. The ease and speed of these instruments will substantially increase the soundness of decisions related to protecting human health, protecting US military deployments, and mitigating the effect of energy development on the environment.

**Technical Topic:**

High Energy Physics Detectors and Instrumentation

**Company:**

SVT Associates, Inc. 7620 Executive Drive Eden Prairie, MN 55344-3677

**Project Title:**

Large Area GaN-Based Avalanche Photodiodes for Operation in Extreme Environments

**Project Summary:**

Wide bandgap GaN-based materials are the most promising semiconductors for solar-blind ultraviolet (UV) detectors, particularly in those applications where the UV components of light needs to be analyzed in the presence of large visible and/or infrared background. This project will develop GaN-based avalanche photodiodes (APDs) as a lower cost, robust and compact alternative to bulky photomultiplier tubes for sensitive and fast detection of light in many applications. Other advantages of the proposed GaN-based APDs include capability to operate in harsh environments, including very high temperatures and high radiation levels, and relative immunity to high magnetic fields, both of which are essential for future DOE high energy physics experiments.

**Technical Topic:**

Nuclear Physics Accelerator Technology

**Company:**

SVT Associates, Inc. 7620 Executive Drive Eden Prairie, MN 55344-3677

**Project Title:**

GaAsSb/AlGaAs Superlattice High-Polarization Electron Source

**Project Summary:**

Polarized electron emitters isolate and enhance one of the two naturally occurring forms of the electron subatomic

particle. This program will create a new, highly efficient source of polarized electrons for use in high energy particle physics research.

## New Jersey

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**Technical Topic:**

High-Field Superconductor and Superconduction Magnet Technologies for High Energy Particle Colliders

**Company:**

HJC Enterprise LLC 5 Badgley Dr New Providence, NJ 07974-2501

**Project Title:**

On The Use of Highly Densified Bi-2212 Wire for Superconducting Magnet Application

**Project Summary:**

High-field magnets are essential components of devices used in a number of advanced fields of science, such as NMR and ICR (widely used in drug discovery), and particle accelerators used in high energy physics. This study seeks to determine how to achieve good quality powder packed filaments in cables and magnets.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

JMSI Inc. DBA Intelligent Light 301 Route 17N, 7th Floor Rutherford, NJ 07070-2575

**Project Title:**

FieldView-VisIT : A Modern Engineering Post-Processing System for Ultra-Scale Physics Based Simulations

**Project Summary:**

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**Technical Topic:**

Fusion Science and Technology

**Company:**

Nova Photonics, Inc. One Oak Place Princeton, NJ 08540-4701

**Project Title:**

Measurement of the Radial Electric Field in the Plasma Edge of the Lithium Tokamak Experiment

**Project Summary:**

A new diagnostic will be developed to support an experiment at the Princeton Plasma Physics Laboratory. This will enable the study of a new regime in plasmas and bring us closer to achieving fusion energy as a clean, safe, and abundant energy source.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Optimal Solutions, Inc. 17 Kershaw Ct Bridgewater, NJ 08807-2595

**Project Title:**

Optimization-Based Production Scheduling for Complex Manufacturing Plants Delivered as a Service using High Performance Computing Architecture & Algorithms

**Project Summary:**

This project will address the problem of dimensionality in today's optimization based approaches to scheduling jobs

in manufacturing, which often results in inferior solutions that cannot be scaled to real manufacturing environments. It is expected to result in increased efficiency and global competitiveness in this sector and lead to the creation of new manufacturing jobs.

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**Technical Topic:**

Fusion Science and Technology

**Company:**

Princeton Scientific Instruments, Inc 7 Deer Park Drive Suite C Monmouth Junction, NJ 08852-1921

**Project Title:**

U.S. ITER Diagnostics, X-ray Imaging Spectrometer

**Project Summary:**

The U.S participation in ITER, a full-scale experimental fusion energy device that will pave the way for clean energy, includes a high resolution core imaging x-ray spectrometer. The proposed effort will assess the ability of existing x-ray detector arrays to perform and survive in ITER's extraordinarily intense radiation environment and where they need improvement.

## New Mexico

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**Technical Topic:**

Instrumentation for Advanced Chemical Imaging

**Company:**

Mesa Photonics, LLC 1550 Pacheco St. Santa Fe, NM 87505-3914

**Project Title:**

High Spatial Resolution Coherent Ultrafast Spectroscopy

**Project Summary:**

This project will develop low-cost, high precision instrument to improve medical research, homeland security, and nanomaterials.

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**Technical Topic:**

Technologies for Subsurface Characterization and Monitoring

**Company:**

Southwest Sciences, Inc. 1570 Pacheco Street, Suite E-11 Santa Fe, NM 87501-3993

**Project Title:**

Micro-Fluidic Spectrometer for Measuring Groundwater Contamination

**Project Summary:**

Southwest Sciences proposes to develop a micro-fluidic sensor for measuring heavy metals in groundwater by measuring their uv-visible spectra. High sensitivity will be obtained using cavity enhanced spectroscopy.

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**Technical Topic:**

Advanced Technologies and Materials for Fusion Energy Systems

**Company:**

TPL, Incorporated 3921 Academy Parkway North NE Albuquerque, NM 87109-4416

**Project Title:**

Explosive Bonding of Plasma Facing Components

**Project Summary:**

TPL proposes to explosively clad high-temperature metal layers to steel or copper support structures that will make longer lasting plates for use in hot fusion energy reactors because they will better resist hot plasma erosion. This will enable lower cost electricity to be generated by this technology due to the efficiency of extremely hot plasmas and improving the ability to contain them.

## New York

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**Technical Topic:**

Advanced Sources for Accelerator Facilities

**Company:**

Advanced Energy Systems, Inc. 27 Industrial Blvd Unit E Medford, NY 11763-2286

**Project Title:**

Development of a Field Emitter Array Based High-Current Electron Injector

**Project Summary:**

The National Academies has identified this as an area of critical importance to the development of high-power free-electron lasers. Should the program prove successful, not only would the cathodes provide improved economic and reliability performance for existing user facilities such as light sources and FELs, but could also allow penetration into markets presently restricted to thermionic cathodes such as environmental remediation systems for water remediation and flue gas scrubbing.

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**Technical Topic:**

Advanced Concepts and Technology for High Energy Accelerators

**Company:**

American Undulator as Alexander Mikh 909 Triphammer Rd Ithaca, NY 14850-2508

**Project Title:**

Accelerator Design that can Provide Very High Gradient with Acceleration Structures Fabricated with integrated Circuit Technology

**Project Summary:**

The far-term goal of this research is in development and design of accelerator able to provide  $>1$  GeV/m for electrons. This goal will be reached by usage of Si micro-structure made with Lithographic technology common in micro-circuit fabrication. In this project we optimized the dimensions of micro-structure in a view of real technology available at mostly Nano-factories located around. Numerical 3D calculations of swept laser beam illuminated micro-structure will be performed. Design will be ready for fabrication in a Second phase, if awarded.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

BUILDlab, LLC 56 Mill Street Dryden, NY 13053-9715

**Project Title:**

Tools for Auto-Calibration of Building Energy Models and Predictive Control

**Project Summary:**

The goal of this proposal is to advance energy modeling software and full building sensor networks, optimizing energy-efficiency and performance in the design and operation of buildings.

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**Technical Topic:**

Ancillary Technologies for Accelerator Facilities

**Company:**

EPIC Consulting 101 Mountain Ridge Drive Mount Sinai, NY 11766-1413

**Project Title:**

EPICS-Large-Scale High-Performance Integrated Data Storage for Accelerator and Beamline Experiments

**Project Summary:**

EPICS is an open-source control and data acquisition system that is a de-facto standard at DoE laboratory research facilities in the US. Through SBIR grant funding, a new generation of this software has been released to support physics applications and scientific data representation. This project prototypes the ability to archive these data at rates needed by our nation's energy and biological scientists to take advantage of the latest XRay lights sources and the state of the art detectors coming available for scientific research.

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**Technical Topic:**

Nuclear Physics Instrumentation, Detection Systems and Techniques

**Company:**

HYPRES, Inc. 175 Clearbrook Road Elmsford, NY 10523-1109

**Project Title:**

Digital SQUID Magnetometers for Read-out of Detectors and Magnetic Particles

**Project Summary:**

Ultra-low noise and extremely sensitive superconducting sensors developed under this program can be used as high-resolution imaging sensors. These digital sensors in multi-channel systems have applications in non-invasive biomedical instruments such as magnetocardiograms, magnetoencephalograms, and in non-destructive evaluation for detection of corrosion and cracks in metals.

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**Technical Topic:**

High Energy Physics Computational Technology

**Company:**

Kitware Inc. 28 Corporate Drive Clifton Park, NY 12065-8688

**Project Title:**

In-Situ Analysis of Cosmological Simulations

**Project Summary:**

Cosmological simulations play a very important role in the DOE High Energy Physics Cosmic Frontier program. Critical challenges facing such simulations include workflow I/O and lack of domain-specific data analysis algorithms. To address this, we propose the development of a cosmology analysis framework for in-situ analysis and data-reduction of cosmological simulations paving a way forward toward the analysis of exascale datasets that are expected within the coming decade.

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**Technical Topic:**

Genomic Science and Related Biotechnologies

**Company:**

Kitware Inc. 28 Corporate Drive Clifton Park, NY 12065-8688

**Project Title:**

Cloud Computing and Visualization Tools for KBase

**Project Summary:**

Genetics and biology researchers are being inundated with data that must be processed with complex computer

algorithms. We intend to produce a new open source architecture for systems biology researchers to produce, share, and run their algorithms using scalable cloud computing platforms.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Kitware Inc. 28 Corporate Drive Clifton Park, NY 12065-8688

**Project Title:**

Graphical HPC Application Suite for Supporting the Product Simulation Lifecycles

**Project Summary:**

This project will enable wider adoption of advanced HPC functionality by small and medium size manufacturing firms by providing a suite of applications that can address the complete simulation lifecycle. The suite will be built using existing Open Source HPC Toolkits and will be dynamically customizable in order to address the specific needs of targeted vertical markets.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Nutonian Inc. 641 Highland Rd. Ithaca, NY 14850-1411

**Project Title:**

The Data Genome Project

**Project Summary:**

This project will develop a new HPC Turnkey system that can automatically find mathematical invariants in large datasets, and then use those invariants to identify new relationships between datasets of different users.

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**Technical Topic:**

Nuclear Physics Software and Data Management

**Company:**

SkuTek Instrumentation 410 Linden Street Rochester, NY 14620-2442

**Project Title:**

Time-synchronized Network Architecture for Data Acquisition

**Project Summary:**

This project will advance digital signal processing electronics which will be cheaper and more flexible than current solutions. Future applications of our products will include basic science, astrophysics, Homeland Security, and education.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Sydor Instruments, LLC 291 Millstead Way Rochester, NY 14624-5101

**Project Title:**

Beam Position, Timing and Flux Monitors

**Project Summary:**

Sydor Instruments will collaborate with BNL to advance a Diamond-based beam monitor for synchrotron beamlines. These machine diagnostics will enable scientists to measure 3rd generation synchrotron “white beams” in terms of how many x-rays there are and where the beam is, to optimize the beam for the intended science goal.

# OHIO

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

AltaSim Technologies, LLC 130 East Wilson Bridge Road Suite 140 Worthington, OH 43085-2327

**Project Title:**

CMC Manufacturing Technology

**Project Summary:**

New design tools for advanced materials developed for the US Air Force are too complex and computational intensive for use by small to medium sized businesses. The proposed work will extend access and availability of these design tools to businesses that serve the automotive, chemical processing and energy production sectors.

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**Technical Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

**Company:**

Euclid TechLabs, LLC 5900 Harper Rd. #102 Solon, OH 44139-1866

**Project Title:**

Complete Multipacitor Suppression in Dielectric Loaded Accelerators using a Solenoid Field

**Project Summary:**

Dielectric based particle accelerators offer the possibility of reduced cost and higher efficiency for applications in industry, medicine, and scientific research. We propose to study ways to eliminate an undesirable form of energy absorption that is currently the main obstruction to widespread use of these devices.

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**Technical Topic:**

Nuclear Physics Accelerator Technology

**Company:**

Euclid TechLabs, LLC 5900 Harper Rd. #102 Solon, OH 44139-1866

**Project Title:**

Ferroelectric Based High Power Components for L-Band Accelerator Applications

**Project Summary:**

This project will develop a new electronic device to optimize the power in particle accelerators. The key component is a bar of a “smart” material that changes its properties with an applied electric field.

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**Technical Topic:**

Low Cost, Optimized Redox Flow Battery Electrolytes, Novel Solid Ionic Conducting Membranes, and Rechargeable Air-Breathing Cathodes for Bat

**Company:**

Faraday Technology, Inc. 315 Huls Drive Clayton, OH 45315-8983

**Project Title:**

Flow Battery Structures to Improve Performance and Reduce Manufacturing Cost

**Project Summary:**

This program is developing a rapid, robust manufacturing process for redox flow battery components to lower

manufacturing costs while improving performance. Lowering manufacturing costs of redox flow batteries could enable commercial applications in energy storage for utilities, grid service providers and equipment suppliers and create manufacturing jobs in the U.S.

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**Technical Topic:**

Advanced Sources for Accelerator Facilities

**Company:**

Hyper Tech Research, Inc 539 Industrial Mile Road Columbus, OH 43228-2412

**Project Title:**

Improvement on Short Period Planer Undulator

**Project Summary:**

The research is directed towards the development of improved superconducting undulators, the devices that convert the energy of a dedicated synchrotron's electron beam into short wavelength light or x-rays. The research will lead to the emergence of improved light (or "photon") sources for use in materials research, industry, and medicine. For example, this includes the processing of semiconductor chips for computers, determining the age of materials through radiocarbon dating, sterilizing medical equipment and food products and the diagnosing and treatment of cancer.

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**Technical Topic:**

High-Field Superconductor and Superconduction Magnet Technologies for High Energy Particle Colliders

**Company:**

Hyper Tech Research, Inc 539 Industrial Mile Road Columbus, OH 43228-2412

**Project Title:**

Gun-Drilled Tube Type Nb<sub>3</sub>Sn with non-Cu J<sub>c</sub> values over 3000 A/mm<sup>2</sup> (12T-4.2K)

**Project Summary:**

This project will develop a much improved Nb<sub>3</sub>Sn superconductor wire for next generation High Energy Physics accelerator magnets, and for commercial applications such as MRI, NMR and accelerators for medical applications.

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**Technical Topic:**

Nuclear Physics Accelerator Technology

**Company:**

Hyper Tech Research, Inc 539 Industrial Mile Road Columbus, OH 43228-2412

**Project Title:**

Development of MgB<sub>2</sub> Superconducting Coils for Nuclear Physics Applications

**Project Summary:**

This program pursues the improvement of magnesium diboride superconducting coils for nuclear physics magnet systems. It can improve and reduce the cost of these systems. The R&D will also help progress the use of magnesium diboride superconductor magnets for commercial MRI's, superconducting fault current limiters, and offshore wind turbine generators.

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**Technical Topic:**

Advanced Sources for Accelerator Facilities

**Company:**

IAP Research, Inc. 2763 Culver Avenue Dayton, OH 45429-3723

**Project Title:**

Magnets for Cryogenically-Cooled Permanent Magnet Undulators (CPMU)

**Project Summary:**

The project will deliver high performance PrFeB permanent magnets that will be suitable for use in cryogenic permanent magnet undulators (CPMU). Such undulators will enable generation of brilliant beams of photons with energies of 50 keV that are currently unavailable in modern Synchrotron Light Sources.

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**Technical Topic:**

Advanced Technologies and Materials for Fusion Energy Systems

**Company:**

MesoCoat, Inc. 24112 Rockwell Drive Euclid, OH 44117-1211

**Project Title:**

Fused Coatings for Plasma Facing Components in Fusion Reactors

**Project Summary:**

The phase I SBIR program will develop a series of nano-/micro-composite coating materials to be applied to Plasma Facing Components using MesoCoat's high energy density fusion cladding process, CermaClad™. The high-temperature, corrosion resistant coatings and low cost manufacturing process will enable further development of fusion energy devices such as ITER.

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**Technical Topic:**

High-Field Superconductor and Superconduction Magnet Technologies for High Energy Particle Colliders

**Company:**

MetaMateria Technologies, LLC 1275 Kinnear Road Columbus, OH 43212-1155

**Project Title:**

High Tc Bi<sub>2</sub>Sr<sub>2</sub>CaCu<sub>2</sub>O<sub>x</sub> superconducting powder and wires for high field magnets

**Project Summary:**

This SBIR program will develop improved process methods for preparing Bi 2212 powder synthesized using solution based techniques production of high temperature superconducting wire.

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**Technical Topic:**

Membranes for Industrial Applications

**Company:**

Mound Laser & Photonics Center, Inc. 965 Capstone Drive, Suite 308 P.O. Box 223 Miamisburg, OH 45343-0223

**Project Title:**

Micro-Hole Membrane for Solid-Liquid Separation of Micron-Scale Particulate

**Project Summary:**

Polymer membranes with laser drilled micro-holes will enable wider and more efficient use of low pressure solid-liquid separation techniques that vastly reduce domestic energy usage in consumer product industries, while also facilitating key techniques for alternative energy production.

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**Technical Topic:**

Advanced Clean Energy Research

**Company:**

Powdermet, Inc. 24112 Rockwell Drive Euclid, OH 44117-1252

**Project Title:**

Multilayered Ytria-Stabilized Zirconia Coating for Improved Thermal Abrasion Resistance

**Project Summary:**

This project improves turbine efficiency through the application of a strong, temperature-resistant ceramic film to the turbine blades. The increased turbine efficiency results in reduced energy usage, environmental impact, and costs.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

RNET Technologies, Inc. 240 West Elmwood Drive Suite 2010 Dayton, OH 45459-4248

**Project Title:**

Catalytic Converter Modeling on Emerging Personal Computers and Small Clusters

**Project Summary:**

Computer Simulation of catalytic converters is very expensive in terms of high performance computing resources and also takes several days to get the final results. Software design and engineering targeting state-of-the-art computer architectures enables simulation on desktop workstations and generates the results in overnight turnaround time.

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**Technical Topic:**

Advanced Clean Energy Research

**Company:**

Sem-Com Company, Inc. 1040 N. Westwood Ave. Toledo, OH 43607-3263

**Project Title:**

Stable Glass-Ceramic Nanocomposites as Compliant Seals for SOFCs

**Project Summary:**

Over the years many applications have been abandoned because the mismatch between the sealing components was too great to be of practical consequence or because no high CTE glasses were available. A compliant seal technology will open up at least some of these applications to hermetic seal technology. The high CTE hexacelsian glass, especially with the addition of the nano-scale materials will allow a new family of high CTE sealing glasses to be developed that do not exist today. These high CTE glasses would be especially useful in glass-to-metal applications.

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**Technical Topic:**

Advanced Network Technologies and Services

**Company:**

The Samraksh Company 5980 Venture Drive, Suite 1B Dublin, OH 43017-2237

**Project Title:**

Programmable, Extensible and Secure perfSONAR Appliance for Multi-domain Enterprise Monitoring

**Project Summary:**

Multi-domain enterprise network monitoring solution that aids Network Operators in improving the programmability, extensibility and security of perfSONAR.

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## Oregon

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**Technical Topic:**

Catalysis

**Company:**

Trillium FiberFuels, Inc. 720 NE Granger Ave. Bldg B Corvallis, OR 97330-9660

**Project Title:**

Advanced Recombinant Manganese Peroxidase for Synthesis of Lignin Bioproducts.

**Project Summary:**

Biomass is composed of up to 30% lignin, which is not fermentable. To enable lignin usage to make high-value chemicals, this research will develop a scalable method for producing the lignolytic enzyme manganese peroxidase (MnP). Products from MnP action on lignin will be investigated for potential use in a biorefinery.

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**Technical Topic:**

Technology to Support BES User Facilities

**Company:**

Voxtel, Inc. 15985 NW Schendel Avenue Suite 200 Beaverton, OR 97006

**Project Title:**

Picosecond Rate X-Ray Photon Counting Detector

**Project Summary:**

A novel pixelated detector array will be developed that enables the realization of the improved time-resolving capabilities of modern synchrotrons. This will enable the study of complex and dynamic processes that occur in biological systems.

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**Technical Topic:**

Fusion Science and Technology

**Company:**

Voxtel, Inc. 15985 NW Schendel Avenue Suite 200 Beaverton, OR 97006

**Project Title:**

Rad-Hard Dual-Threshold High Count Rate Silicon Pixel Array Detector

**Project Summary:**

A detector is being developed for x-ray pulse-probe and crystal spectroscopy measurements that include flexible x-ray photon counting modes of operation.

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**Technical Topic:**

High Energy Physics Detectors and Instrumentation

**Company:**

Voxtel, Inc. 15985 NW Schendel Avenue Suite 200 Beaverton, OR 97006

**Project Title:**

Large Area, Low Dark Count VIS-UV Solid State Photomultipliers

**Project Summary:**

A new photodetector is being developed. The detector has greater sensitivity and lower noise than current silicon based photodetectors. The innovation allows large high performance photon counting detectors to be made at low cost.

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## Pennsylvania

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**Technical Topic:**

Catalysis

**Company:**

EverNu Technology LLC 306 Camars Drive Warminster, PA 18974-3874

**Project Title:**

Production of Methacrylic Acid and Other Oxygenated Chemicals Solely from Renewable Non-food Biomass Derived Feedstocks

**Project Summary:**

The most predominant conventional process is the ACH process, which not only requires large volumes of fossil fuel-based feedstocks, but also consumes large amount of energy and produces large quantity of toxic wastes. Thus, there are strong needs and significant benefits to develop a novel process to enable the production of MAA and other oxygenated chemicals solely from renewable non-food biomass derived feedstocks. In addition to the potential of replacing billion pounds per year of fossil fuel-based feedstocks with ones solely derived from non-food biomasses, the proposed innovation by EverNu also offers two other potentially very significant public benefits by completely eliminating the serious environmental problems and greatly reducing the intensive energy consumption, both of which are inherent of the ACH process.

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**Technical Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

**Company:**

Silicon Power Corporation 275 Great Valley Parkway Malvern, PA 19355-1308

**Project Title:**

MegaWatt Power Electronic Switching Modules with Breakthrough Advances in Stray Inductance, Switching Speed and Energy Density, for Applications with Pulse Widths Down to the Sub-Microsecond Range

**Project Summary:**

The industry of high voltage power electronic semiconductor switches, created and once dominated by the US, is now almost entirely controlled by foreign interests. We propose to develop a device that will displace all others in many applications and eliminate significant waste of electric energy in large power electronic converters.

## Tennessee

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**Technical Topic:**

Instrumentation and Tools for Materials Research Using Neutron Scattering

**Company:**

ORDELA, Inc. 1009 Alvin Weinberg Drive Oak Ridge, TN 37830-8012

**Project Title:**

Characterization and Application of a Novel Neutron Detection Method to Replace Helium-3 in Advanced Neutron Detectors.

**Project Summary:**

Available detector technology limits full utilization of intense neutron beams for advanced materials research at facilities such as the Spallation Neutron Source (SNS) at ORNL. Boron-10 lined pixel-cell detectors would remove limitations on neutron-scattering experiments and could be useful for applications in locating fissile materials for national security applications.

## Texas

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**Technical Topic:**

Nuclear Physics Isotope Science and Technology

**Company:**

Clear Vascular, Inc. 21 Waterway Avenue, Suite 225 The Woodlands, TX 77380-3099

**Project Title:**

Production of Commercial High Specific Activity Sn-117M Radiochemical and Chelates

**Project Summary:**

This project will provide new methods for producing commercial quantities of radiochemicals that will have broad applications for and greater efficiency in the treatment of various cancers, vulnerable plaque, autoimmune and other diseases.

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**Technical Topic:**

Nuclear Physics Software and Data Management

**Company:**

Crossfield Technology LLC 9390 Research Blvd Suite I200 Austin, TX 78759-7366

**Project Title:**

Software Architecture for High-Speed Synchronous Network Instrumentation

**Project Summary:**

This project will develop a distributed network instrumentation system that provides high-speed, low-latency data transfer from detectors to a computer or data storage system, and is scalable from one to thousands of channels. The innovative architecture uses commodity network components, and IEEE standards for time synchronization and detector plug-and-play.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Enthought, Inc. 515 Congress Ave. Suite 2100 Austin, TX 78701-3555

**Project Title:**

A Python Interface to Trilinos/Tpetra for High-Level Access to HPC Solvers

**Project Summary:**

Software originally developed for the NNSA will be made much more user friendly to enable scientists and engineers throughout industry and academia to easily benefit from its robust performance in HPC computing.

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**Technical Topic:**

Radio Frequency Accelerator Technology for High Energy Accelerators and Colliders

**Company:**

Shear Form, Inc. 207 Dellwood St. Bryan, TX 77801-2520

**Project Title:**

Seamless Nb Tubes for SRF Cavities

**Project Summary:**

Increased deformability in high RRR Nb tube for superconducting radio frequency (SRF) cavities in linear accelerators will be achieved by an improved materials processing method to refine the microstructure. The improved microstructure will be produced by severe plastic deformation processing methods applied to reduce the average grain size, improve microstructural uniformity and texture, improve material ductility, improve SRF cavity performance, and lower SRF cavity manufacturing costs.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Z-Terra Inc. 16225 Park Ten Place, Suite 370 Houston, TX 77084-5089

**Project Title:**

## Enterprise Software for Interactive and Super Efficient Processing of Large Multi-Dimensional Datasets

### **Project Summary:**

This research project combines current research from U.T. Austin with oil and gas state-of-the-art 3-D seismic imaging technology from Z-Terra Inc., to develop super-efficient enterprise software for accurately creating 3-D subsurface images of geologically complex areas. Such imaging technology allows oil-and-gas companies to create 3-D images of the earth and reduce development costs, increase the amount of hydrocarbons recovered and increase the amount of national oil reserves.

## Utah

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### **Technical Topic:**

Advanced Clean Energy Research

### **Company:**

HiFunda, LLC 2150 South 1300 East, Suite 500 Salt Lake City, UT 84106-4375

### **Project Title:**

Ultra-High Temperature Thermal Barrier Coatings

### **Project Summary:**

The new coating technology developed through this STTR program can help to increase energy efficiency of gas turbines, reduce energy costs, maintain US leadership in the gas turbine equipment, and reduce greenhouse emissions

## Virginia

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### **Technical Topic:**

High Performance Materials for Nuclear Application

### **Company:**

Aeroprobe Corporation 2200 Kraft Drive, Suite 1475 Blacksburg, VA 24060-6164

### **Project Title:**

Near Net Shape Consolidation of Oxide Dispersion Strengthened Alloy Powders

### **Project Summary:**

Fabrication of ODS alloy structures is problematic due to 1) the inability to utilize any liquid-phase process such as casting, welding, laser cladding, etc. 2) grain coarsening caused by traditional heat treatment processes, 3) lack of geometric flexibility with current solid-state fabrication methods such as extrusion, 4) the need for coating and joining of dissimilar metals in the solid phase. Traditional thermal processing increases grain size dramatically which both reduces creep strength as well as decreases radiation resistance.

Aeroprobe proposes a solid-phase, near net shape consolidation process, friction stir-fabrication (FSF), for ODS alloys and structures that will overcome these current challenges.

### **Technical Topic:**

Advanced Network Technologies and Services

### **Company:**

Fusion Factors LLC 1400 Technology Dr. Harrisonburg, VA 22802-2542

### **Project Title:**

Low-Cost Fiber Optic Network Reflectometer

### **Project Summary:**

This program develops new telecommunications testing equipment to enable monitoring and maintenance of sophisticated optical networks at 10x lower cost and enhanced performance than current equipment. This development effort will address the emerging need for massive deployment of optical network infrastructure with new, much cheaper instruments to test optical signal quality and network faults.

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**Technical Topic:**

Catalysis

**Company:**

Gate Fuels Inc. 3107 Alice Dr Blacksburg, VA 24060-1600

**Project Title:**

High-yield Production of Fumarate from Cellulosic Biomass by Recombinant Cellulolytic *Bacillus subtilis*

**Project Summary:**

This project will provide a low-cost route for high-yield fumarate production from pretreated non-food cellulosic biomass mediated by recombinant cellulolytic *Bacillus subtilis*. The cellulose fraction of biomass feedstock contains more than one half oxygen by weight, making it a good starting material for the production of oxygen-containing polymeric monomers. The goal of this project is to develop an industrially-safe recombinant cellulolytic *Bacillus subtilis* strain that can produce high-yield fumarate from cellulosic materials in a two- step fermentation.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Harmonia Holdings Group, LLC 2020 Kraft Dr, Suite 1000 Blacksburg, VA 24060-6492

**Project Title:**

HPC Auto-Assistant: Making HPC Software and Tools Easier to Use for the Experienced (Not Expert) User

**Project Summary:**

Widespread use of HPC makes the U.S. more competitive and improves profits; when lower tier companies use HPC they improve their own profitability, and that of companies they support as sub-contractors. HAA allows smaller companies to use HPC, assisting in economic recovery and in turn the creation of jobs.

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**Technical Topic:**

Advanced Sources for Accelerator Facilities

**Company:**

MuPlus, Inc. 45 Jonquil Lane Newport News, VA 23606-

**Project Title:**

High Brightness Superconducting RF Photo Injector Gun Cavity

**Project Summary:**

A novel design concept is being developed for a superconducting RF gun, which is a key component of next generation light sources that require high brightness electron beams.

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**Technical Topic:**

Advanced Concepts and Technology for High Energy Accelerators

**Company:**

MuPlus, Inc. 45 Jonquil Lane Newport News, VA 23606

**Project Title:**

Complete Muon Collider Cooling Channel Design and Simulations

**Project Summary:**

This project will develop the theoretical principles and numerical simulation tools that are needed for the optimization of beam cooling systems for an energy-frontier muon collider that would complement and eventually overtake the LHC.

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**Technical Topic:**

Technologies for Subsurface Characterization and Monitoring

**Company:**

NanoSonic, Inc 158 Wheatland Drive Pembroke, VA 24136-3645

**Project Title:**

Integrated Metal Rubber™ Sensors for Subsurface Monitoring

**Project Summary:**

The proposed integrated Metal Rubber sensor network for subsurface monitoring is of help for the advanced management of remediation. The system can identify potential transfers on a real-time basis, allowing field sites to establish models concerning water transport, chemical migration, mass transfer and microbiologic activity.

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**Technical Topic:**

Increasing Adoption of HPC Modeling and Simulation in the Advanced Manufacturing and Engineering Industries

**Company:**

Nimbus Services Inc. 1616 Anderson Road McLean, VA 22102-1602

**Project Title:**

Manufacturing Expertise as a Service Portal

**Project Summary:**

Technical expertise solution that matches computing, software, and expertise resources from labs, specialists and universities to assist industry.

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**Technical Topic:**

Catalysis

**Company:**

SuGanit Systems Inc 10903 Hunt Club Rd. Reston, VA 20190-3912

**Project Title:**

Direct Catalytic Conversion of Lignin to Aromatic Compounds

**Project Summary:**

A renewable, cost-effective method is proposed for production of aromatic chemicals (monomeric phenols) using lignin, currently a waste stream in biorefineries. This novel method employs homogeneous catalysis of lignin in ionic liquids (low melting temperature salts) with inexpensive catalysts at mild operating conditions.

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## Washington

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**Technical Topic:**

Technologies for Subsurface Characterization and Monitoring

**Company:**

Brooks Rand Labs 3958 6th Ave NW Seattle, WA 98107-5058

**Project Title:**

An Automated, Atomic Fluorescence-Based, Field Deployable Groundwater Mercury Monitoring System

**Project Summary:**

Brooks Rand Labs proposes to design an automated, field deployable system to measure mercury concentrations in water. This will greatly reduce the cost of measuring mercury in the environment and could lead to a large increase in the availability of data, especially real-time data.

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**Technical Topic:**

Membranes for Industrial Applications

**Company:**

Eagle Engineering & Testing Services 4110 York St. Bellingham, WA 98229-5010

**Project Title:**

Development of a Fatty Acid Esterification Catalytic Membrane Reactor

**Project Summary:**

This project will develop a solid catalytic membrane reactor to eliminate the acid neutralization requirement and the methanol vaporization / distillation steps before proceeding to the transesterification step. The use of Biodiesel in the U.S. is presently hampered by a lack of suitable feedstocks that do not compete with the food industry.

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**Technical Topic:**

Technologies for Subsurface Characterization and Monitoring

**Company:**

Freestone Environmental Services, In 1100 Jadwin Avenue, Suite 250 Richland, WA 99352-3425

**Project Title:**

Real-Time, In Situ Measurement of Hexavalent Chromium in Groundwater

**Project Summary:**

The U.S. Department of Energy is seeking a remote sensor for measuring chromium contamination in groundwater wells. Laboratory methods based on spectrochemical analysis are being adapted for remote, submerged, long-term measurement.

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**Technical Topic:**

Instrumentation for Electron Microscopy and Scanning Probe Microscopy

**Company:**

Hummingbird Precision Machine Co, db Hummingbird 8300 28th Ct. NE Units 200/300/400 Lacey, WA 98516-7126

**Project Title:**

Liquid and Full Pressure Range Gas Environmental TEM Specimen Holders for High-Resolution Elemental Analysis

**Project Summary:**

This project proposes to develop and commercialize electron microscope environmental gas and liquid specimen holders to give researchers radically improved methods for studying energy storage and generation processes and materials at the nanometer scale. This should facilitate improvement of batteries and fuel cells and increase efficiency of catalytic processes.

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**Technical Topic:**

Instrumentation for Electron Microscopy and Scanning Probe Microscopy

**Company:**

Hummingbird Precision Machine Co, db Hummingbird 8300 28th Ct. NE Units 200/300/400 Lacey, WA 98516-7126

**Project Title:**

Cross-Correlative Double-Tilt Nano-Mechanical Testing Platform for The Transmission and Scanning Electron Microscopes

**Project Summary:**

Mechanical properties of nano-scale materials are important for ensuring the reliability of new generations of nano-scale electrical and mechanical devices. This proposal focuses on the development of a tool to enable electron microscopy studies of the mechanical properties of materials and their correlation with the atomic structure of the materials.

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**Technical Topic:**

Instrumentation for Electron Microscopy and Scanning Probe Microscopy

**Company:**

Nion Company 1102 8th Street Kirkland, WA 98033-5666

**Project Title:**

Ultra High Energy Resolution Electron Spectrometer for Atomic Resolution Studies

**Project Summary:**

A research instrument that will open a fundamentally new window on the properties of materials at the atomic scale will be designed and built. The instrument will provide a better understanding of the role of key atomic constituents in devices such as efficient batteries and fuel cells. This will help with the design of energy conversion and storage devices of increased efficiency, and bring us closer to a green economy entirely based on renewable resources.

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**Technical Topic:**

Advanced Concepts and Technology for High Energy Accelerators

**Company:**

STI Optronics, Inc. 2755 Northup Way Bellevue, WA 98004-1495

**Project Title:**

1-Meter Capillary Discharge for Laser Wakefield Acceleration

**Project Summary:**

A new type of capillary discharge will be developed for advanced high-energy electron accelerators. Applications for these accelerators include industrial processing, medicine, homeland defense, and high-energy physics.