Department of Energy
Office of Science
Washington, DC 20585

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MEMORANDUM FOR DISTRIBUTION

FROM: JIM SIEGRIST
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FOR HIGH ENERGY PHYSICS

SUBJECT: FY 2021 SBIR/STTR Solicitation

The Office of High Energy Physics (HEP) is preparing its FY 2021 Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) solicitation, and we invite you and your staff to make suggestions on research topics. Your input will assist HEP invest the available SBIR/STTR funds in projects which most strongly benefit the high energy physics mission and simultaneously enable new commercially viable products.

The SBIR/STTR Program has been an effective vehicle for developing the new instrumentation and technology necessary for high energy physics research. There has been substantial synergy between the small businesses and the National Laboratories via various collaborations and Cooperative Research and Development Agreements (CRADAs).

By law, a fixed percentage of annual appropriated extramural R&D funds are allocated to the Department of Energy (DOE) SBIR and STTR programs. In FY21 the rates remain unchanged at 3.2 percent for SBIR and 0.45 percent for STTR. Each year, DOE funds about 250 Phase I grants, which can be up to $250,000 over a twelve-month period, to carry out feasibility studies of proposed concepts. Success rates for applicants have been approximately 15 percent in Phase I and 40 percent in the subsequent competition for continuation into Phase II. Phase II is the principal research and development stage, which is funded at up to $1.6M over a subsequent two-year period. In FY 2020, HEP has 37 Phase I and 37 Phase II active awards with approximately $25M in total funding.

In the FY 2020 SBIR/STTR solicitation, HEP invited applications in the seven broad topics listed below. Note that in FY18 a new added topic was devoted to Quantum Information Science. In FY20 we funded 3 Phase I and a single Phase II award in QIS. Detailed descriptions for each topic can be found at the following website:

https://science.osti.gov/-/media/sbir/pdf/TechnicalTopics/FY2020_Phase_I_Release_2_Topics.pdf?la=en&hash=935C6CA9A54809788F388CAC3E8A8A1E2B626C10

Feel free to submit ideas to add to this topic list or to suggest alternate topics or subtopics. Often the best topics relate to early-stage projects and/or projects that are in formation. Please keep in mind the following guidelines:

- Please ensure that your topics permit a small business the opportunity to submit applications with commercial potential—a requirement of the SBIR and STTR programs. Recent changes in how applications are evaluated place increased importance on successful commercialization of SBIR and STTR funded technologies.
- Labs should view the SBIR/STTR program as a strategic investment, with an expected return in 3 years or more, and plan topics accordingly. If the lab will not be interested in the resultant product in 3 or more years, it should not request it as an SBIR topic.
- While we seek topics that directly benefit the HEP mission, the Federal Government (including National Labs) cannot be the primary beneficiary of the technology. There must be a clear, non-government commercial market. It will be helpful to indicate the lab's view of non-government commercial potential for each sub-topic submitted.
- HEP makes a deliberate choice to limit the number of subtopics in an effort to control the number of submissions. Please provide all strategically important ones, but it will be helpful to indicate the lab's view of priority of topic ideas submitted.
- Topic descriptions should be complete and specific. Give references to the literature where possible, and define quantitative metrics wherever possible (e.g. "at least a 10% improvement in…", "must be scalable to power beyond XXX kW…", "result in cost reduction of more than 25%...", "…must withstand YY GRad dose with no more than 1% dimension change", etc.). Such details provide the small business with targets for products that address specific needs.
- The SBIR/STTR program funds R&D and is not for the procurement of equipment.
- Consider SBIR/STTR topics that will result in a new, qualified vendor for lab services. For example, performing R&D that results in an improved measurement technique and apparatus for qualifying superconducting material. Performing R&D that results in improved methods and apparatus for ultrafast laser damage testing. In each case two outcomes result—a new technique, and a new vendor

capability that labs can subsequently use.

Please email your topic suggestions to Ken Marken at ken.marken@science.doe.gov. In order to meet the SBIR/STTR office schedule, we would very much appreciate receiving your suggestions by close of business ET September 25, 2020. Your help in formulating an SBIR/STTR Program that directly supports the current HEP mission would be a great contribution and much appreciated.

FY20 HEP TOPICS Table of Contents as published at the link included above

ADVANCED CONCEPTS AND TECHNOLOGY FOR PARTICLE ACCELERATORS

a. Permanent Magnetic Optics at Cryogenic Temperatures
b. High strength, high conductivity alloys for particle accelerators
c. Novel high-gradient microwave accelerating structures
d. Space charge modeling in high intensity hadron beams
e. Computation and simulation of residual gamma dosage in accelerator enclosures
f. Accelerator simulation workflow optimization
g. Accelerator machine learning and controls
h. Other

RADIO FREQUENCY ACCELERATOR TECHNOLOGY

a. Low Cost Radio Frequency Power Sources for Accelerator Application
b. High Efficiency High Average Power RF Sources
c. Other

LASER TECHNOLOGY R&D FOR ACCELERATORS

a. Ceramic-Based Optical Materials
b. Aperture-Scalable High Performance Diffraction Gratings
c. End-to-End Systems Modeling of Large Ultrafast Laser Systems
d. Large format Faraday isolators for high power ultrafast laser systems
e. Other

SUPERCONDUCTOR TECHNOLOGIES FOR PARTICLE ACCELERATORS

a. High-Field Superconducting Wire and Cable Technologies for Magnets
b. Superconducting Magnet Technology
c. Superconducting RF Cavities and Components
d. Ancillary Technologies for Superconducting Magnets
e. Other

HIGH-ENERGY PHYSICS ELECTRONICS

a. Radiation Hard CMOS Sensors and Engineered Substrates for Detectors at High Energy Colliders
b. CCD and CMOS Imagers for Dark Matter and Astrophysics Research
c. Characterization of Semiconductor Materials for Dark Energy and Dark Matter Detectors

d. High Density Chip Interconnect Technology
e. Radiation-Hard High-Bandwidth Data Transmission for Detectors at High Energy Colliders
f. Electronics and Frequency Multiplexed DAQ Systems for Low-Temperature Experiments
g. High-Channel Count Electronic Tools for Picosecond (ps) Timing
h. Other

HIGH ENERGY PHYSICS DETECTORS AND INSTRUMENTATION

a. Lower Cost, High Performance Visible/(V)UV Photon Detection
b. Scintillating Detector Materials and Wavelength Shifters
c. Cost-Effective, Large-Area, High-Performance Dichroic Filters
d. Ultra-Low Mass, High-Rate Charged Particle Tracking
e. Ultra-Low Background Detectors and Materials
f. Advanced Composite Materials
g. Additive Manufacturing
h. Other

QUANTUM INFORMATION SCIENCE (QIS) SUPPORTING TECHNOLOGIES

a. Development of Optimal SRF Cavity Geometries for Quantum Information Systems
b. Optimization of Fabrication Techniques for Scalable 3D SRF Structures for Quantum Information Systems
c. Development of Low-Temperature Technologies for QIS Systems
d. Photodetectors for Optical to Microwave Transduction of Quantum Information
e. Other