DEPARTMENT OF ENERGY
OFFICE OF SCIENCE
HIGH ENERGY PHYSICS

FY2020 RESEARCH OPPORTUNITIES IN ACCELERATOR STEWARDSHIP

DOE NATIONAL LABORATORY PROGRAM ANNOUNCEMENT NUMBER: LAB 20-2262

ANNOUNCEMENT TYPE: AMENDMENT 000001

Amendment 000001: This Amendment extends deadlines to accommodate disruptions from the COVID-19 outbreak

Announcement Issue Date:	**January 24, 2020**
Submission Deadline for Pre-Proposal:	**February 21, 2020, at 5 PM Eastern Time (A Pre-Proposal is required)**
Pre-Proposal Response Date:	**March 6, 2020, at 5 PM Eastern Time**
Submission Deadline for Proposals:	**April 9, 2020, at 5 PM Eastern Time**

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REGISTRATIONS

A. DOE Office of Science Portfolio Analysis and Management System (PAMS)

The Department of Energy (DOE) Office of Science (SC) performs many functions for DOE national laboratory proposals in the Portfolio Analysis and Management System (PAMS), which is available at https://pamspublic.science.energy.gov.

You must register in PAMS to submit a pre-proposal, letter of intent, or DOE national laboratory proposal.

To access PAMS, you may use the Internet Explorer, Firefox, Google Chrome, or Safari browsers.

Notifications sent from the PAMS system will come from the PAMS email address <PAMS.Autoreply@science.doe.gov>. Please make sure your email server/software allows delivery of emails from the PAMS email address to yours.

Registering to PAMS is a two-step process; once you create an individual account, you must associate yourself with ("register to") your institution. Detailed steps are listed below.

1. CREATE PAMS ACCOUNT:

To register, click the "Create New PAMS Account" link on the website https://pamspublic.science.energy.gov/.

- Click the "No, I have never had an account" link and then the "Create Account" button.
- You will be prompted to enter your name and email address, create a username and password, and select a security question and answer. Once you have done this, click the "Save and Continue" button.
- On the next page, enter the required information (at least one phone number and your mailing address) and any optional information you wish to provide (e.g., FAX number, website, mailstop code, additional email addresses or phone numbers, Division/Department). Click the "Create Account" button.
- Read the user agreement and click the "Accept" button to indicate that you understand your responsibilities and agree to comply with the rules of behavior for PAMS.
- PAMS will take you the "Having Trouble Logging In?" page. (Note: If you reviewed for or were listed as PI on a prior submission to SC but have not previously created an account, you may already be linked to an institution in PAMS. If this is the case, PAMS will take you to the PAMS home page.)

2. REGISTER TO YOUR INSTITUTION:

- Click the link labeled "Option 2: I know my institution and I am here to register to the institution." (Note: If you previously created a PAMS account but did not register to an

institution at that time, you must click the Institutions tab and click the "Register to Institution" link.)

- PAMS will take you to the "Register to Institution" page.
- Type a word or phrase from your institution name in the field labeled, "Institution Name like," choose the radio button next to the item that best describes your role in the system, and click the "Search" button. A "like" search in PAMS returns results that contain the word or phrase you enter; you need not enter the exact name of the institution, but you should enter a word or phrase contained within the institution name. (Hint: If your institution has an acronym, such as ANL for Argonne National Laboratory or UCLA for the Regents of the University of California, Los Angeles, you may search for the acronym under "Institution Name like." Many institutions with acronyms are listed in PAMS with their acronyms in parentheses after their names.)
- Find your institution in the list that is returned by the search and click the "Actions" link in the Options column next to the institution name to obtain a dropdown list. Select "Add me to this institution" from the dropdown. PAMS will take you to the "Institutions – List" page.
- If you do not see your institution in the initial search results, you can search again by clicking the "Cancel" button, clicking the Option 2 link, and repeating the search.
- All DOE National Laboratories have established profiles in PAMS, so please keep searching until you find your laboratory.

For help with PAMS, click the "External User Guide" link on the PAMS website, https://pamspublic.science.energy.gov/. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submissions and inquiries about this DOE National Laboratory Announcement should reference **LAB 20-2262.**

UPDATES AND REMINDERS

RECOMMENDATION

SC encourages you to register in all systems as soon as possible. You are also encouraged to submit pre-proposals and proposals before the deadline.

FREQUENTLY ASKED QUESTIONS

Applicants are strongly encouraged to review the "Frequently Asked Questions" document that accompanies this solicitation at https://science.osti.gov/hep/Funding-Opportunities.

DATA MANAGEMENT PLAN

The Office of Science Statement on Digital Data Management, published at https://science.osti.gov/funding-opportunities/digital-data-management/, governs proposals submitted under this Announcement. Compliance is detailed in Section IV of this Announcement.

ACKNOWLEDGMENT OF FEDERAL SUPPORT

SC published guidance about how its support should be acknowledged at https://science.osti.gov/funding-opportunities/acknowledgements/.

AVOIDING ERRORS

The following advice is compiled from actual experiences of applicants for SC awards.

- Please ensure that the research narrative is comprised of one and only one Portable Document Format (PDF) file, including all appendices, when it is uploaded.
- When using the PAMS website at https://pamspublic.science.energy.gov, please avoid using the back-arrow button in your web browser to navigate.
- Please ensure that the proposal contains no protected personally identifiable information (PII).
- Please ensure that the budget is calculated using the applicable negotiated indirect cost and fringe benefit rates.

Section I – DOE NATIONAL LABORATORY OPPORTUNITY DESCRIPTION

GENERAL INQUIRIES ABOUT THIS ANNOUNCEMENT SHOULD BE DIRECTED TO:

Technical/Scientific Program Contact:

Dr. Eric R. Colby
301-903-5475
Eric.Colby@science.doe.gov

Administrative Contact:

Questions about non-technical matters including program rules may be sent to:
SC.HEPfoa@science.doe.gov

SUPPLEMENTARY INFORMATION

The following program description is offered to provide more in-depth information on scientific and technical areas of interest to the High Energy Physics (HEP) Long-Term Accelerator R&D Stewardship ("Accelerator Stewardship") program.

Please note that this Announcement is only for opportunities within the Accelerator R&D Stewardship mission: HEP routinely issues a separate solicitation for research and development within its customarily-supported fields of study. This Accelerator Stewardship Announcement is for R&D activities that may impact HEP-sponsored scientific inquiry, but which *predominantly* impact other non-HEP applications.

The Accelerator Stewardship program's mission is to support fundamental accelerator science and technology development of relevance to many fields beyond HEP and to disseminate accelerator knowledge and training to the broad community of accelerator users and providers. Further information about the Accelerator Stewardship program may be found at https://science.osti.gov/hep/research/accelerator-stewardship/ .

Many federal agencies have a vested interest in the success of accelerator R&D. Beyond SC, stakeholders include the DOE National Nuclear Security Administration, the DOE Environmental Management Program Office, the NIH National Cancer Institute, the NSF Division of Physics, the DOD Office of Naval Research, the DOD Air Force Office of Scientific Research, the DHS Domestic Nuclear Detection Office, the NASA Radiation Effects & Analysis Group, and the NIST Ionizing Radiation Physics Division, among others.

Program Objective

Central goals of Accelerator R&D Stewardship are to:

- Engage the expertise and facilities of the existing U.S. accelerator R&D ecosystem in a manner that enhances the ability of SC specifically, and other federal agencies generally, to

conduct their missions;
- Enhance the accelerator technology capabilities of U.S. industry;
- Facilitate access to the accelerator R&D capabilities at the SC National Laboratories[1]
- Drive a limited number of specific accelerator applications towards practical, testable prototypes in a 5-7 year timeframe;
- Foster collaboration between developers of accelerator technology and experts who apply accelerator technology;
- Provide the basic R&D foundation necessary for sustained innovation across a broad range of accelerator applications.

This Announcement focuses on three distinct activities:

(1) applied research[2] that is focused on developing a prototype in response to a specific technical challenge,
(2) basic research that broadly impacts many accelerator applications, and
(3) facilitating access to accelerator R&D capabilities at SC-sponsored National Laboratories for academic research.

These activities are divided into three separate "Tracks" in this Announcement. Proposals must address a topic in one Track **only**. Topics may not be combined between Tracks as the application format, eligibility requirements, project duration, funding limitations, and merit criteria differ significantly.

Applicants are encouraged to review the Accelerator Stewardship awards made to date at the webpage: https://science.osti.gov/hep/research/accelerator-stewardship/awards/ .

Proposals that are intended to meet specific BES or NP programmatic fields of research should be submitted in response to the Announcements issued by those Offices.

Applications that are not in direct support of a topic under the Tracks below (e.g., conferences, experimental operations, specific project R&D or fabrication) must be submitted in response to a PAMS invitation.

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[1] SC sponsors ten of DOE's National Laboratories: Ames Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Lawrence Berkeley National Laboratory, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Princeton Plasma National Laboratory, SLAC National Accelerator Laboratory, and Thomas Jefferson National Accelerator Facility. The other DOE National Laboratories (Idaho National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, National Energy Technology Laboratory, National Renewable Energy Laboratory, Sandia National Laboratories, and Savannah River National Laboratory) are outside the scope of the HEP Accelerator Stewardship program.

[2] The term "applied research" is used here in a manner consistent with colloquial usage in the field of accelerator R&D, referring to research that is in the early stages of development (Technology Readiness Level [TRL] 0-4) and encompasses work leading to a first prototype that demonstrates scientific feasibility. It does not include R&D leading to a demonstration of suitability for a particular application nor does it include R&D supporting commercialization of a product. In the context of DOE's authorizing legislation all work supported here is of a basic or fundamental nature.

Track 1: Accelerator Stewardship Topical Areas

Accelerator Stewardship Topic Areas are focused R&D efforts aimed at solving a specific accelerator application problem in a specific area. The desired end goal after 1-2 grant cycles (e.g. 3-6 years) is a working prototype technology at TRL-4[3]. This Track has broad eligibility requirements, see Section III.A for more information. Teams, comprising at a minimum an accelerator technology partner and an application partner, are expected to apply in this area, and develop an application that clearly defines the technology development pathway, teaming and management plan, IP allocation, and market opportunity (where applicable).

Applicants **must** provide evidence of the Stewardship Customer's[4] commitment to the proposed activity. This commitment may take the form of uncompensated effort; the provision of surplus materials, supplies, or equipment; the provision of access to facilities at no or reduced cost; voluntary cost sharing; mentoring, training, or coaching of personnel; or other methods of involving the Stewardship Customer in the proposed activity. See Section III.B for more information.

There are four topic areas active in Track 1 of this Announcement:

a) Particle Therapy Beam Delivery Improvements
b) Ultrafast Laser Technology Program
c) High Power Electron Accelerator Technology for Industrial Applications
d) Compact Accelerator Technologies for Security and Medicine

Proposals submitted under Track 1 should address specific research goals in only **one** of these topical areas.

In addition to the standard merit criteria applied to all proposals, proposals submitted under Track 1 will be specifically reviewed for (1) the strength and breadth of the collaborative team and (2) the quality of the technology R&D plan. See Section V.A.2 for a description of the Merit Review Criteria, and Section V.B.2 for a description of the selection criteria.

(a) Particle Therapy Beam Delivery Improvements
Technical Contact: Eric Colby, 301-903-5475, Eric.Colby@science.doe.gov

Even with less than fully optimized treatment techniques, there have been reports of impressive local control rates using particle beam therapy for otherwise difficult-to-treat cancers. Although lower-cost proton beam options are starting to appear, today's proton beam facilities are costly to build and thus are not widely available. Based on their potential biological advantage, there is now increasing medical interest in exploring the use of other light ions for therapy; typically, beams up to carbon are considered.

[3] Technology Readiness Levels (TRLs) are defined in DOE G 413.3-4 (2009).
[4] "Stewardship Customer" is defined in section V.A.2.

While beam delivery ("gantry") systems for proton beams have been designed and constructed previously, they are typically large, massive, and costly. Accommodating heavier beams, up to carbon, with similar technology requires delivery systems that are even more massive.

Short dose deposition times, on the order of seconds, will require fast and efficient scanning in all three spatial dimensions. This will place new demands on the accelerator, beam line and detector systems to guide and verify dose placement.

Proposals in this topical area should address ideas for providing one or more of the following:

1. less massive and more compact beam delivery systems capable of delivering ion beams from protons up to carbon that are suitable for patient therapy;
2. technology that can provide for rapid (seconds) scanning of the beam over a tumor volume in three dimensions (that is: both transversely and longitudinally);
3. beam diagnostic technologies for ion beam therapy, with emphasis on increased readout speed and accuracy of position and dose.

To meet the teaming requirement, applications under this Track 1 topic area **are strongly encouraged to** include significant participation from all three of the following: (1) an institution with technical leadership in a relevant accelerator technology, (2) a medical institution with clinical experience in imaging and treatment for external beam radiotherapy (EBRT), and (3) a domestic company currently marketing EBRT products. Applications lacking significant participation from any of the three may score poorly under merit review.

The Particle Therapy Beam Delivery Improvements program of this Announcement does **not** request designs for accelerators themselves, but covers only ancillary devices that work in conjunction with an accelerator. Applications to design an accelerator or accelerator complex are outside the scope of this call, and such application will be declined without review. Designs that are independent of the proton or ion beam accelerator, such that they can work with more than one type of accelerator, are preferred.

Further, the call for applications on beam diagnostic technologies for ion beam therapy is limited to diagnostics applied to the charged particle beam prior to its exit from the nozzle. Applications for imaging technologies downstream of the nozzle will be declined without review.

Interested applicants are strongly encouraged to review the report of the workshop on Ion Beam Therapy, held January 9-11, 2013. The report provides an overview of the technical issues and required R&D to develop accelerator technologies for ion beam treatment of cancer. The report is available online at https://science.osti.gov/~/media/hep/pdf/accelerator-rd-stewardship/Workshop_on_Ion_Beam_Therapy_Report_Final_R1.pdf .

(b) Ultrafast Laser Technology Program
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Lasers are used or proposed for use in many areas of accelerator applications: as drivers for novel accelerator concepts for future colliders; in the generation, manipulation, and x-ray seeding

of electron beams; in the generation of electromagnetic radiation ranging from THz to gamma rays; and in the generation of neutron, proton, and light ion beams. In many cases, ultrafast lasers with pulse lengths well below a picosecond are required, with excellent stability, reliability, and beam quality. With applications demanding ever-higher fluxes of particles and radiation, the driving laser technology must also increase in repetition rate—and hence average power—to meet the demand.

These applications have some general technological requirements in common:

- Ultrafast pulses (<1 ps)
- High average powers (>1 kW up to 100 kW or more)
- Diffraction limited beams
- Good (ps) to excellent (fs) pulse timing
- Robust and reliable operation

Many important applications also require, or can benefit from:

- High pulse energy (>0.01 J up to 1 kJ)
- High pre-pulse power contrast (better than10^{-9})
- High wall plug efficiency (>20% with a goal of 30% or higher)
- Longer laser wavelengths (>1.5 μm out to 10 μm)

The primary goals of the Ultrafast Laser Technology Program are to develop the enabling technologies that will ultimately lead to construction of demonstration prototypes for one or more of the principal types of ultrafast lasers needed for accelerator applications, and to enhance industry's capability to produce the necessary technologies.

Ultrafast lasers for accelerator applications fall into four broad laser types:

- Type I laser systems are used both to directly power laser-driven accelerators-on-a-chip, and as subassemblies of coherently combined fiber arrays used to generate higher pulse energies.
- Type II laser systems are used to excite plasma waves for particle trapping and high gradient acceleration, and for the generation of x-rays through Compton backscattering.
- Type III laser systems are used for generating high repetition rate radiation pulses through nonlinear processes, particularly high-harmonic generation (HHG).
- Type IV laser systems are used for plasma-based sources of protons, light ions, and neutrons.

The target performance parameters for each of the four ultrafast laser types are summarized in Table 1 below.

Table 1. Target performance parameters for the four principal types of ultrafast lasers

	Type I	**Type II**	**Type III**	**Type IV**
Wavelength (μm)	1.5-2.0	0.8-2.0	2.0-5.0	2.0-10.0
Pulse Energy	3 μJ	3 J	0.03–1 J	300 J
Pulse Length (fs)	300	30–100	50	100–500
Repetition Rate	1–1000 MHz	1 kHz	100 kHz	100 Hz
Average Power (kW)	Up to 3	3	3 and up	30
Energy Stability	<1%	<0.1%	<1%	<1%
Beam Quality	M^2<1.1	Strehl>0.95	M^2<1.1	M^2<1.1

Wall-plug Efficiency	>30%	>20%	>20%	>20%
Pre-Pulse Contrast	N/A	$>10^{-9}$	N/A	$>10^{-9}$
CEP-capable	Required	N/A	Required	N/A
Optical Phase Noise	$<5^{o}$	N/A	$<5^{o}$	N/A
Wavelength Tunability Range	0.1%	0.1%	10%	0.1%

This initial phase of the Laser Technology Program will concentrate on basic research and engineering design studies to produce the breakthroughs in technology and design architecture necessary to make each of the four laser types practical. Grant applications are sought in these five topical areas:

(1) **Ultrafast gain materials capable of very high average power.** Development of materials suitable for fiber or bulk usage, supporting amplification of <100 fs pulses, with excellent thermal conductivity, low thermal lensing, low saturation fluence, high damage threshold and small quantum defect will be key to increasing average power capabilities of ultrafast lasers. Materials must be scalable to average powers in the kilowatt range and above while maintaining excellent beam quality.
(2) **Increased robustness and reduction in size of optical components.** Each will reduce the cost of ultrafast laser systems. Development of ultrafast optical coatings and materials capable of supporting <100 fs laser pulses with significantly increased damage threshold, excellent thermal stability, and low loss and low scatter will permit more compact, higher reliability ultrafast lasers to be developed.
(3) **Innovations in laser architectures, cryogenics, other advanced thermal management techniques.** Direct diode pumping, coherent combination, hybrid fiber/bulk systems, and the use of advanced cryogenic systems will be needed to significantly increase the average power performance of ultrafast lasers.
(4) **Wavelength extension further into the infrared.** The development of efficient, robust, cost-effective ultrafast laser systems out to 10 microns in wavelength will enable new applications such as solid-state seeding for ultrafast CO_2 lasers and driving HHG hard x-ray generators, as well as open new opportunities in plasma acceleration and high harmonic generation. Significant increases in repetition rate are needed to achieve high average power.
(5) **Improvements in laser quality.** Advances in pulse contrast, optical phase noise, flexible pulse shaping (both transverse and longitudinal), and precision synchronization to external references will directly impact both the quality and capability of the laser-based sciences.

The Ultrafast Laser Technology Program of this Announcement includes initial R&D to identify promising technical avenues for developing ultrafast lasers of the four types discussed above. It does **not** include the engineering and construction of full-scale demonstration laser systems for any of the four types during this initial phase. Proposals to develop full-scale demonstration laser systems are out of the scope of this Announcement and will be declined without review.

To meet the teaming requirement, applications under this Track 1 topic area **are strongly encouraged to** include significant participation from each of the following: (1) an institution with technical leadership in a relevant laser technology, and (2) an institution with technical leadership in the application of laser technology to accelerators and/or (3) a domestic company currently marketing related laser products. Applications lacking significant participation from a

laser technology or accelerator technology partner, or an industry partner, may score poorly under merit review.

Interested applicants are strongly encouraged to review the report of the workshop on Laser Technology for Accelerators, held January 23–25, 2013. The report provides an overview of the technical issues and required R&D to develop ultrafast laser technology for accelerator applications. The report is available online at https://science.osti.gov/~/media/hep/pdf/accelerator-rd-stewardship/Lasers_for_Accelerators_Report_Final.pdf

(c) High Power Electron Accelerator Technology for Industrial Applications
Technical Contact: Eric Colby, (301)-903-5475, Eric.Colby@science.doe.gov

Particle accelerator technologies have been applied to solve a range of issues in the energy & environmental arena including: treating potable and waste water, removing pollutants from stack gases, increasing the energy efficiency of industrial material processing, remediating water-borne and soil-borne contaminants, and replacing radioactive sources in sterilization applications. In many cases the use of accelerator technology for these applications offers important performance advantages. Some of these energy and environmental applications are currently served by existing non-accelerator-based technologies; however, continued improvements in accelerator technology has lowered the cost and increased the reliability of this technology, opening the possibility of broader use in energy and environmental applications.

These applications have some general technological requirements in common:

- The need to expose significant mass streams to kGy-class radiation fields, requiring:
  - Very high average beam powers (>500 kW up to 10 MW)
  - High wall plug efficiency (>50%)
- The need to operate economically in harsh industrial environments:
  - Low capital and operating costs
  - Robust, reliable, turn-key operation

The primary goals of the High Power Electron Accelerator Technology program are to develop the enabling technologies that may ultimately lead to construction of demonstration prototypes for one or more of the principal types of high power electron accelerators needed for energy & environmental (E&E) applications, and to enhance industry's capability to produce the necessary technologies.

The general requirements for high power electron accelerators for energy & environmental applications were identified at a workshop (see references below) and can be divided into four basic types of accelerator, summarized in Table 2 below.

Table 2. Target performance for high power electron accelerators for E&E applications:

	Type 1 Demo/Small Scale	**Type 2 Medium Scale Low Energy**	**Type 3 Medium Scale High Energy**	**Type 4 Large Scale High Energy**
Example	*R&D,*	*Flue Gas,*	*Wastewater,*	*Sludge, Medical*

Applications	*Sterilization, industrial effluent streams*	*Waste water*	*sludge, medical waste*	*waste, Env. remediation*
Electron Beam Energy	0.5-1.5 MeV	1-2 MeV	10 MeV	10 MeV
Electron Beam Power (CW)	>0.5 MW	>1 MW	>1 MW	>10 MW
Wallplug Efficiency	>50%	>50%	>50%	>75%
Target Capital Cost*	<$10/W	<$10/W	<$10/W	<$5/W
Target Operating Cost†	<1.0M$/yr	<1.5M$/yr	<1.5M$/yr	<12M$/yr

*Total cost of the accelerator, including all supporting systems (e.g. power, cooling, control, safety).
†Total operating cost including all labor, supplies, repairs and electricity costs.

- Demo or Small Scale Systems are used for processing low-density material streams (gas or liquid) in moderate quantities, such as industrial effluent streams at flows of order 0.1-0.2 MGD, depending on dose. (1 MGD=1 million gallons per day).
- Medium Scale Low Energy Systems are used for processing low-density material streams (gas or liquid) in high volumes, such as for electron beam treatment of flue gases at flow rates of 100,000-200,000 Nm^3/hr, and wastewater treatment at flows of 1-1.5 MGD.
- Medium Scale High Energy Systems are used for processing high-density materials (solids and sludges) in moderate volumes, such as for medical waste sterilization and sludge treatment at mass flow rates of 20-70 kg/s.
- Large Scale High Energy Systems are proposed for use in processing large volumes of high-density materials, such as for environmental remediation of contaminated soil, medical waste sterilization, and sludge treatment at mass flow rates of 0.2-0.7 metric ton per second.

The High Power Electron Accelerator Technology Program has completed a set of feasibility studies, and will focus in this next phase on achieving the necessary advances in efficient Radio Frequency (rf) power production and low cost accelerator structures. Proposals are sought for enabling research and development. Proposals submitted under this topic are to be for multi-year use-inspired R&D concepts leading to achievement of the stated performance metrics. Proposals which do not directly address all the metrics of the subtopic area will be declined without review.

a. **High Efficiency High Average Power RF Sources.** The very high power accelerators required for energy and environmental applications will require highly efficient, low-cost sources of radiofrequency power. R&D to significantly improve the power efficiency of high-average-power (CW or high duty factor) radiofrequency tubes is sought. Net tube power efficiency (including focusing magnet power) must exceed 80%, and *average* tube power must exceed 250 kW, with a pulse format (peak power, pulse length) that is appropriate for either normal conducting or superconducting accelerators, and an output that is stably phase locked to an external reference. The proposed device must provide an economical route to producing 1 MW or more of average power by scaling, coherent combination, or both, at an

rf tube cost that does not exceed $1.50 per watt of average power output. *A detailed estimate of the tube's production cost must be included in Appendix 7 to support claims that the cost metric will be met.* There is particular interest in rf power sources operating at frequencies that are in widespread use at the large SC accelerators[5].

b. **Economical Accelerator Structures for Megawatt-Class Beams.** Providing low-cost very high power accelerators for energy and environmental applications will require advances in the design and manufacture of accelerator structures to increase performance and reduce cost. R&D applications are sought for accelerator structures that are optimized for very high power transfer efficiency into high beam currents, and optimized for low production cost and low operation cost for industrial use. Proposed R&D must lead to an accelerator design and a single-unit prototype structure that meets one of the following sets of requirements:
    i. Superconducting radiofrequency, 1 MeV total voltage gain, 1 MW total power coupled to beam, 90% minimum rf-to-beam-power coupling efficiency, costing less than $1.50/watt fully dressed (including couplers, cryostat, cryocoolers, magnetic and thermal shields); or
    ii. Superconducting radiofrequency, 10 MeV total voltage gain, 1 MW total power coupled to beam, 90% minimum rf-to-beam-power coupling efficiency, costing less than $3.00/watt full dressed (including couplers, cryostat, cryocoolers, magnetic and thermal shields); or
    iii. Normal conducting radiofrequency, 1 MeV total voltage gain, 1 MW total power coupled to beam, 90% minimum rf-to-beam-power coupling efficiency, costing less than $0.50/watt fully dressed (including couplers, vacuum enclosure, cooling systems).

    The voltage gain and coupled power requirements may be met by using multiple accelerating cavities, but the cost metric then applies to the entire system. *A detailed estimate of the accelerator structure's production cost must be included in Appendix 7 to support claims that the cost metric will be met.* Note that in all cases, the cost metric does not include the cost of rf power generation and transmission to the accelerator, nor does it include peripheral systems such as the electron source, beam focusing and delivery, controls and diagnostics, shielding enclosures, etc. At a minimum, the prototype accelerator structure must be experimentally demonstrated to work at the required duty factor, at full accelerating voltage, without beam, but with performance characteristics that are consistent with accelerating 1 MW of beam. There is particular interest in rf accelerators operating at frequencies that are in widespread use at the large SC accelerators[6].

The High Power Electron Accelerator Technology program of this Announcement includes initial R&D to identify promising technical avenues for developing very high power electron accelerators of the four types discussed above. It does **not** include the engineering and construction of full-scale accelerator installations for any of the four types during this initial phase. Proposals to develop a full-scale accelerator installation are out of the scope of this Announcement, and will be declined without review.

[5] See https://science.energy.gov/user-facilities/user-facilities-at-a-glance/
[6] See https://science.energy.gov/user-facilities/user-facilities-at-a-glance/

To meet the teaming requirement, applications under this Track 1 topic area **are strongly encouraged to** include significant participation from each of the following: (1) an institution with technical leadership in a relevant accelerator technology, (2) an institution with technical experience in applying accelerator technology to the energy or environmental application proposed, and/or a domestic company currently marketing related technology. Proposals lacking significant participation in either of these two areas may score poorly under merit review.

References

As background, HEP has conducted workshops to identify the accelerator technology research directions with the potential for high impact in energy & environmental applications. Workshops relevant to this topic area include:

- *Workshop on Energy and Environmental Applications of Accelerators*, Edited by Stuart Henderson and Thomas Waite, (2015). https://science.osti.gov/~/media/hep/pdf/accelerator-rd-stewardship/Energy_Environment_Report_Final.pdf
- *Accelerators for America's Future*, Edited by Walter Henning and Charles Shank, (2009). https://science.osti.gov/~/media/hep/pdf/accelerator-rd-stewardship/Report.pdf

(d) Compact Accelerator Technologies for Security and Medicine
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Accelerators are used as sources of high-energy x-rays and electrons for a variety of applications in security and medicine. Many of these applications can be significantly impacted in the near term by translating advanced component and system technologies from scientific research labs towards commercial applications and by developing use-inspired benchtop demonstrators in the next 3-6 years. For some applications, the adjustability of an accelerator source (in energy, energy spectrum, beam current, and power) could offer important performance gains. Similarly, the time structure of such a source could allow noise reduction and/or time resolved measurements. For some applications the presently available source is a radioactive isotope-filled capsule, which poses a security risk.

This group of applications have some general technological requirements in common:

- Compactness of the source
  - Often 10cm x 10cm x 30cm or less (including the electron source, accelerator, target/convertor, but not including supporting equipment)
- Primary (electron) beam energies in the <10 MeV range
  - Although some applications call for much more
- A wide range of energy adjustability
  - Typically by at least a factor of 2, often by a factor of 10 or more
  - Often on a shot-by-shot basis
- A wide range of current adjustability
  - Typically by 2 to 4 orders of magnitude
  - Often on a shot-by-shot basis
- Moderate primary beam power
  - Many applications are in the 50 W-500 W range, but some battery-powered

applications require 1 W, and several other applications require 1 kW or more

- Robustness and reliability
  - Most applications need a source that can be used for thousands of hours without expert intervention
- Cost Competitiveness
  - Most applications require an overall source cost (including power supplies, cooling, controls, etc.) of less than $1 M, some applications require total source cost < $100 k.

The general requirements for high power electron accelerators for security and medical applications were identified at a 2019 workshop (see references below) and can be grouped into four basic types of accelerator, summarized in Table 3 below.

Table 3. Four types of compact electron accelerators to drive advanced security and medical applications

	Type I	Type II	Type III	Type IV
General Type	Ultra-low Power Portable	Low- to Moderate-Power	Moderate- to High-Power	VHEE[7]
Example Applications	Emergency Response	Portable Conventional Radiotherapy, Radiography, Down well (DW), Chip & Circuit Inspection (CCI), Electronic Brachytherapy (eB), Pre-clinical RT Machine (PCRT)	Secondary Screening (SS), High Energy Density Physics (HEDP), Non-Destructive Testing (NDT)	FLASH-RT
Energy Tuning Range	0.3-4 MeV	0.1-14 MeV	0.1-10 MeV	6-250 MeV
Beam Power	1 W	eB: 50 W FRT, CCI, DW: 100 W Others: 300-500 W	HEDP: 500 W NDT, SS: 1000 W	100 W
Desired Maximum Size (accelerator only)	10x10x30 cm	eB: 1x1x1 cm NDT, DW:10 Dx22 L cm PCRT 20x20x25 cm Others: 10x10x60 cm	SS, HEDP:10x10x60 cm	20x20x50 cm
Special Features	LER: <12 kg, battery power, <300 W HER: <50 kg, line power, <1.2 kW	eB: Can be sterilized Inspection: 50 micron spot size Down well: 200 C operation	Inspection: Spot size <1 micron	
Target Capital Cost	<$100k	eB: < $600k NDT, Down well: <$200k Others: <$1M	<$1M	FLASH-RT: <$1M

[7] VHEE – Very High Electron Energy, referring to the use of high energy electrons for cancer therapy

- **Ultra-low Power Portable** systems – designed primarily for emergency response to perform radiography on either moderate density or high-density objects. These systems must be person-portable, rely on either battery power or limited line power, and be low cost. Beam energies range from a few hundred kilovolts to 4 MeV at less than a watt of beam power to provide broadband (i.e. bremsstrahlung) photons from 300 kVp-4 MVp.

- **Low- to Moderate-Power systems** – designed to provide either electron beams up to 250 MeV for cancer therapy, or to provide higher fluence photon sources in the 100 kVp-14 MVp range. Beam power requirements range from 50 Watts to more than 500 W to provide the necessary fluence. Some uses require ultracompact formats—for example electronic brachytherapy sources must fit in an endoscope, and down-well source must fit in a 10 cm bore. For cancer therapy dose control must be very precise (2%), for still other applications spectral agility is important.

- **Moderate- to High-Power systems** – designed to provide high- to very-high-flux photon sources for high speed inspection of dense objects, sterilization of medical devices, food, and sterilize harmful insects. Photon energies in the 300 kVp-10 MVp range are needed, with beam powers ranging from 500 Watts to more than 1 kW to provide the necessary fluence.

- **High Energy systems** – designed to provide extremely narrowband and/or coherent sources of photons. These devices are typically not bremsstrahlung sources but require more complex radiation generation processes such as inverse Compton scattering or undulator radiation to produce photons in the required energy range and narrow bandwidth. These systems typically require energies on the order of 1 GeV and while beam power requirements are modest, beam quality becomes critical.

The primary goals of the Compact Accelerator Technology program are to (1) develop the enabling technologies that may ultimately lead to demonstration prototypes of one or more of the principal types of compact electron accelerator needed for security and medical applications, and to (2) enhance domestic industrial capability to produce the necessary technologies.

This initial phase of the Compact Accelerator Technology program will concentrate on use-inspired basic research to produce the breakthroughs in technology necessary to make each of the four compact accelerator types practical. Grant applications are sought in these three topical areas:

a. High gradient radiofrequency accelerator technology. Proposals for significant advances in normal conducting radiofrequency accelerator technology meeting the challenging Space Weight and Power (SWaP) and cost requirements in Table 3 are sought. The proposal must clearly define the R&D milestones and technical pathway to meeting the energy, beam power, and SWaP requirements defined for one of the accelerator types identified in Table 3 within 3-6 years. *A detailed estimate of the accelerator's expected production cost must be included in Appendix 7 to support claims that the cost metric will be met.*

b. **Efficient x-ray generation techniques.** Innovations in electron-driven photon generating technologies usable in the 60 kVp to 14 MVp range with significantly improved electron-to-photon conversion efficiency (as compared to optimized bremsstrahlung production) and improved spectral selectivity (e.g. <20% BW) are sought in a compact device that will withstand the required input electron beam power for one of the four types identified in Table 3.

c. **Design principles for "expert" accelerator control systems.** Proposals to advance the design methodology for accelerator control systems are sought. Innovations in the systems integration of diagnostics, controls, data archiving, real-time simulation, data processing, and feedback are sought which incorporate modern data-science methods (e.g., machine learning, artificial intelligence) and support rigorous verification and validation. Please note that while portions of an example control system may be built to demonstrate design principles and methodology, the primary goal of this topic is to advance the underlying design principles and methodology.

The Compact Accelerator Technologies program of this Announcement includes initial R&D to identify promising near-term technical avenues for developing compact electron accelerators of the four types discussed above, and advanced radiation generating techniques. It does **not** include the engineering and construction of full-scale accelerators for any of the four types at this time. Proposals to develop a full-scale accelerator are out of the scope of this Announcement and will be declined without review. Applications to develop longer-term compact accelerator technologies (e.g., plasma wakefield accelerators, laser-driven accelerators, two-beam accelerators, THz accelerators) will be declined if submitted to Track 1. Eligible PIs may submit such proposals to Track 2.

To meet the teaming requirement, applications under this Track 1 topic area **are strongly encouraged to** include significant participation from **all three** of the following: (1) an institution with technical leadership in a relevant accelerator technology, (2) an institution with technical experience in applying accelerator technology to the security and/or medical application proposed, and (3) a domestic company currently marketing closely related security and/or medical technology. Applications lacking significant participation in any of these three areas may score poorly under merit review.

References

As background, HEP has conducted workshops to identify the accelerator technology research directions with the potential for high impact on security and medical applications. Workshops relevant to this topic area include:

- *Accelerators for America's Future*, Edited by Walter Henning and Charles Shank, (2009). https://science.osti.gov/~/media/hep/pdf/accelerator-rd-stewardship/Report.pdf.
- Additional information may become available in the forthcoming report: *Basic Research Needs Workshop on Compact Accelerators for Security and Medicine*, Edited by Mike Fazio, (2019). When available, the report may be found on the webpage at https://science.osti.gov/hep/Research/Accelerator-Stewardship/Workshop-Reports.

Track 2: Long-Term Generic Accelerator R&D
Technical Contact: Eric Colby, 301-903-5475, Eric.Colby@science.doe.gov

DOE National Laboratories are not eligible to submit a Track 2 proposal but may collaborate with an eligible institution as a subawardee.

Track 3: Accelerator Stewardship Test Facility Program
Technical Contact: Eric Colby, 301-903-5475, Eric.Colby@science.doe.gov

Track 3 is the continuation of the "Accelerator Stewardship Test Facility Pilot Program" (ASTFPP), initiated in 2015. Awards made under this Track provide assistance to non-DOE entities seeking to make short-term use of the accelerator R&D capabilities available at the DOE SC National Laboratories that are not otherwise available as SC User Facilities.

A wide array of test stands and facilities for microwave, laser, magnet, superconducting RF, and particle beam testing exist, along with specialized expertise in high-accuracy accelerator modeling, engineering, fabrication and measurement. A web portal to the SC accelerator R&D capabilities may be found at http://www.acceleratorsamerica.org/working-with-labs/index.html.

The intent of Track 3 awards is to enable non-DOE entities to gain access to and use these unique capabilities for **short-term engagements**. Track 3 awards may be up to 12 months in duration and are **not renewable**. There must be a distinct achievement at the end of the performance period which on its own justifies the resources being requested. Long-term R&D challenges requiring more than 12 months to address should not be submitted to Track 3. If the proposed work scope will not fit within 12 months, consider applying to Track 2 (if eligible).

The non-DOE entity must clearly "own" the work and be the principal beneficiary of the outcome: Applications may not be structured such that the DOE lab is the prime beneficiary of the work. Such applications cannot be selected for financial assistance awards. Further information about the program intent and goals may be found at https://science.osti.gov/hep/research/accelerator-stewardship/test-facility-pilot-program/

Applicants **must work closely** with an SC National Laboratory (the "Host Lab") when preparing the application to ensure the compatibility of the work with the Lab's mission and capabilities, the availability of the resource, and an accurate budget. A **collaborative proposal** must be filed, with the lead proposal originating from the non-DOE entity, and a collaborative proposal being submitted by the Host Lab in response to LAB 20-2262.

Activities must meet the following requirements:
1. The activity must be research & development only.
2. The R&D must be non-proprietary, and the results must be published.
3. The activity must involve an accelerator R&D facility or core competence at the Host Lab. The activity **must not request funds to use an SC User Facility**, as access to these Facilities is already provided at no cost to non-proprietary users.
4. The work scope must be for short-term use of a facility or capability and must complete

within the project period, which is limited to 12 months and **is not renewable.** Work requiring multiple years to complete should not be proposed through Track 3.

5. The activity must meet the requirements of DOE Order 481.1C "Strategic Partnerships Projects", in particular section 4(c):
    a. The activity must be consistent with or complementary to the mission of the DOE laboratory and the facility at which the work will occur,
    b. The activity must not adversely impact other programs assigned to the facility,
    c. The activity must not place the facility in direct competition with the domestic private sector, and
    d. The activity must not create a detrimental future burden on DOE resources.
6. The provisions of DOE Order 522.1 "Pricing of Departmental Materials and Services" must be followed if funds are requested to cover the Host Lab's incremental cost of operating the facility.

Awards are intended for the *utilization* of *existing* accelerator R&D capabilities for a specific basic R&D purpose. Grant applications that focus primarily on upgrading a DOE capability will be declined without review.

Grant applications that do not include a collaborative proposal submission from the Host Lab will be declined without review.

Applicants are advised that requests for capabilities will be reviewed by the specific SC program that is the steward of the capability. Resources that are critical to the operation of a National User Facility may not be approved for use.

APPLICATION REQUIREMENTS

All proposals submitted to this Announcement must address one of the research topic areas described in the previous section. Further, all applications must conform to the format specified in Section IV of this Announcement; each proposal will be pre-screened for responsiveness to the research area descriptions and for compliance with the application requirements.

Open Science

SC is dedicated to promoting the values of openness in Federally-supported scientific research, including, but not limited to, ensuring that research may be reproduced and that the results of Federally-supported research are made available to other researchers. These objectives may be met through any number of mechanisms including, but not limited to, data access plans, data sharing agreements, the use of archives and repositories, and the use of various licensing schemes.

The use of the phrase "open-source" does not refer to any particular licensing arrangement, but is to be understood as encompassing any arrangement that furthers the objective of openness.

Collaboration

Research collaborations involving multiple institutions are encouraged under this FOA. The precise method of submitting an application involving multiple institutions will vary by the Track being applied for:

- Applications under Track 1 and Track 2 must be submitted as a single application from the institution employing the Lead PI with other institutions included as subawardees.
- Applications under Track 3 must include both a non-DOE entity and a DOE SC Host Laboratory with a collaborative application being submitted and the non-DOE entity being designated as the lead institution of the collaboration.

Additional details are provided below:

Collaborative teams are strongly encouraged. Merit reviewers are asked to specifically score the strength of the collaborative team (see Section V.A.2 for more information). Note carefully that the type of application depends on the Track.

For Track 1, team efforts involving different institutions must be submitted as a ***single application from the institution of the Lead PI***. If successful, the collaboration will be funded through a single award to the lead institution, with sub-awards to collaborators as necessary and appropriate.

Collaborations led by a DOE National Laboratory should note that proposals must be submitted in response to the companion announcement (**LAB 20-2262**) through the PAMS website at https://pamspublic.science.energy.gov.

For Track 3, team efforts must include both a non-DOE entity and a DOE SC Host Laboratory, and a ***collaborative proposal must be submitted, with the non-DOE entity designated as the lead institution.*** If successful, the collaboration will be funded in accordance with Section II.H.

Collaborative applications submitted from different institutions must clearly indicate they are part of a collaborative project/group. Every partner institution must submit an application through its own sponsored research office. Each collaborative group can have only one lead institution. Each application within the collaborative group, including the narrative and all required appendices and attachments, must be identical with the following exceptions:

- Each application must contain a correct SF-424 (R&R) cover page for the submitting institution only.
- Each application must contain a unique budget corresponding to the expenditures for that application's submitting institution only.
- Each application must contain a unique budget justification corresponding to the expenditures for that application's submitting institution only.A DOE SC National Laboratory serving as a "Host Lab" must submit a collaborative proposal in response to the companion announcement (**LAB 20-2262**) through the PAMS website at https://pamspublic.science.energy.gov.

SC's intent is to create from the various proposals associated with a collaborative group one document for merit review that consists of the common, identical proposal materials combined with a set of detailed budgets from the partner institutions. Thus, it is very important that every

proposal in the collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

Section II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT

DOE anticipates awarding laboratory work authorizations under this DOE National Laboratory Program Announcement

Any awards made under this Announcement will be subject to the provisions of the contract between DOE and the awardee National Laboratory.

DOE will consider funding multi-institution collaborations under Track 3 of this Announcement only.

B. ESTIMATED FUNDING

It is anticipated that approximately $5,000,000 will be available for all Accelerator R&D Stewardship new and renewal awards in FY 2020, subject to the availability of appropriated funds. The number, duration and size of awards will depend on the number of applications selected for award, and the actual amount of funds available in FY 2020. Out of the approximately $5,000,000 in FY 2020 funding, approximately $2,000,000 may be awarded in the Track 2 topic area of Long-Term Generic Accelerator R&D, and approximately $450,000 may be awarded in the Track 3 Accelerator Stewardship Test Facility Program.

DOE anticipates that the total value of awards made under this announcement will be approximately $5 million. DOE expects that, subject to the availability of future year appropriations, an additional $5 million will be used to support grants and interagency awards under the companion FOA to this program announcement.

DOE is under no obligation to pay for any costs associated with preparation or submission of proposals. DOE reserves the right to fund, in whole or in part, any, all, or none of the proposals submitted in response to this announcement.

C. MAXIMUM AND MINIMUM AWARD SIZE

Track 1: Maximum award size $3,000,000. Minimum award size $75,000.
Note: the ceiling and floor given above for Track 1 proposals represent historical experience. Past practice is not an obligation to stay within the historic ceiling and floor.

Track 3: Maximum award size $300,000. Minimum award size $75,000.

D. EXPECTED NUMBER OF AWARDS

The exact number of awards will depend on the number of meritorious applications, the results of merit review, the program policy factors, and the availability of appropriated funds.

E. ANTICIPATED AWARD SIZE

The anticipated award size will depend on the number of meritorious applications, the results of merit review, the program policy factors, and the availability of appropriated funds.

F. PERIOD OF PERFORMANCE

The period of performance will depend on the number of meritorious applications, the results of merit review, the program policy factors, and the availability of appropriated funds.

Track 3 applications must not have a period of performance that is longer than 12 months.

G. TYPE OF PROPOSAL

DOE will accept new DOE National Laboratory Proposals under this DOE National Laboratory Announcement. Please only submit a PAMS lab technical proposal in response to this Announcement; do not submit a DOE Field Work Proposal (FWP) at this time. SC will request FWPs later from those selected for funding consideration under this Announcement.

Section III – ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS AND TOPICS

This is a DOE National Laboratory-only Announcement. FFRDCs from other Federal agencies are not eligible to submit in response to this Program Announcement. FFRDCs from other federal agencies may submit in response to the companion FOA, DE-FOA-0002262.

B. COST SHARING

Cost sharing is not required.

A demonstration of institutional commitment to the proposed activity **is strongly encouraged** for all applications, especially for Track 1 and Track 3 applicants.

Examples of non-Federal contributions that may be considered as demonstrating institutional commitment include, but are not limited to, the following:

- The provision of space, facilities, equipment, or resources as no or reduced charge;
- The provision of release time for faculty;
- The provision of scholarship support for students; or
- The waiver of facilities and administrative costs, in whole or in part.

The institutional commitment is not to be documented on the application's budget: It is not a formal cost-sharing, but it must be described in the budget justification.

Institutional commitments may not include the following:

- Revenues or royalties from the prospective operation of an activity beyond the time considered in the award;
- Proceeds from the prospective sale of an asset of an activity; or
- Other Federal awards.

Reviewers will be asked to evaluate the degree of institutional commitment; for Track 1 and Track 3 applications, the demonstration of institutional commitment will be taken as evidence of the Stewardship customer's interest in the outcome. See sections V.A.2 and V.B.2.

C. ELIGIBLE INDIVIDUALS

Eligible individuals with the skills, knowledge, and resources necessary to carry out the proposed research as a Principal Investigator (PI) are invited to work with their organizations to develop a proposal. Individuals from underrepresented groups as well as individuals with disabilities are always encouraged to apply.

Section IV – PROPOSAL AND SUBMISSION INFORMATION

A. ADDRESS TO REQUEST PROPOSAL PACKAGE

Proposal submission instructions are available in this Announcement on the DOE SC Portfolio Analysis and Management System (PAMS). Screenshots showing the steps in DOE National Laboratory proposal submission are available in the PAMS External User Guide, accessible by navigating to https://pamspublic.science.energy.gov and clicking on the "PAMS External User Guide" link.

Proposals submitted outside of PAMS will not be accepted.

B. LETTER OF INTENT AND PRE-PROPOSAL

1. Letter of Intent

No letter of intent is required.

2. Pre-proposal

PRE-PROPOSAL DUE DATE

See Section IV, Part E.

ENCOURAGE/DISCOURAGE DATE

See Section IV, Part E.

A pre-proposal is required and must be submitted by **February 21, 2020, at 5 PM Eastern Time**.

Please note that ALL pre-proposals are submitted through PAMS, regardless of whether you are responding to the FOA or the LAB announcement. Please ensure that your pre-proposal is submitted to the correct solicitation.

In the case of a collaborative proposal (Track 3 only), the lead institution must submit a pre-proposal. Collaborating institutions are encouraged to submit a matching pre-proposal, but this is not required.

Pre-proposals will be reviewed for responsiveness of the proposed work to the research topics identified in this Announcement. DOE will send a response by email to each applicant encouraging or discouraging the submission of an proposal by **March 6, 2020, at 5 PM Eastern Time**. Applicants who have not received a response regarding the status of their preproposal by this date are responsible for contacting the program to confirm this status.

The pre-proposal attachment should include, at the top of the first page, the following

information:

Title of Pre-Proposal
Principal Investigator Name, Job Title
Institution
PI Phone Number, PI Email Address
Funding Opportunity Announcement Number: LAB 20-2262
Proposal Type: [New or Renewal]
Track # / Topic #

This information should be followed by a clear and concise description of the objectives and technical approach of the proposed research, organized into the following required sections:

Proposed Research: What will be accomplished? What methods will be used? Why is the approach superior to existing approaches?
Stewardship Customer: Who, specifically, is the Stewardship Customer? What specific evidence is there that the proposed work addresses a priority need of the Customer? (See section V.A for the definition of "Stewardship Customer", and examples of evidence of Customer need.)
Statement of Work: At a high level, what are the main tasks to be accomplished?
Description of results, products: What scientific and/or technical advances will result? How will the results be a significant advance over existing knowledge or techniques? How will the results be captured? (scientific papers, prototypes, patents, software packages, etc.)?
Teaming and Management Plan: With whom do you plan to team? What unique advantages does your group or team have? How do the group/team participants reflect the range of skills needed to complete the proposed research? How will the effort be managed?
Cost, Schedule, Milestones: Provide a high-level description of the cost, schedule, and major milestones of the proposed work. Include a table similar to the following:

Institution	**Task Lead**	**Main Tasks & Milestones**	**Yr 1 [k$]**	**Yr 2 [k$]**	**Yr 3 [k$]**
University X	R. Doe	Complete design simulations of widget. Simulation support during testing.	30	10	10
	S. Jones	Engineer and build widget.	170	120	10
Laboratory Y	T. Smith	Consult during design phase. Test prototype widget at test facility Q.	10	50	120
Company Z	U. Brown	Consult during design phase. Design initial marketable version of widget.	20	50	130
Total			**230**	**230**	**270**

The pre-proposal may not exceed two pages, with a minimum text font size of 11 point and margins no smaller than one inch on all sides. Figures and references, if included, must fit within the two-page limit. Do not include a cover page.

The pre-proposal must also include a list of the names and institutional affiliations of all participating investigators, including collaborators and consultants on the proposed project. For each funded investigator, provide a list of collaborative co-investigators including co-authors of the past 48 months, co-editors of the past 24 months, graduate and postdoctoral advisors/advisees, and close associations. This list of participants and collaborators will not count toward the page limit for the pre-proposal.

PRE-PROPOSAL REVIEW

Those pre-proposals that are encouraged will be used to help SC begin planning for the full proposal peer review process. SC's intent in discouraging submission of certain full proposals is to save the time and effort of applicants in preparing and submitting full proposals not responsive to this Announcement.

The PI will be automatically notified when the pre-proposal is encouraged or discouraged. The DOE SC Portfolio Analysis and Management System (PAMS) will send an email to the PI from PAMS.Autoreply@science.doe.gov, and the status of the pre-proposal will be updated at the PAMS website https://pamspublic.science.energy.gov/. Notifications are sent as soon as the decisions to encourage or discourage are finalized.

It is important that the pre-proposal be a single file with extension .pdf, .docx, or .doc. The pre-proposal must be submitted electronically through the DOE SC Portfolio Analysis and Management System (PAMS) website https://pamspublic.science.energy.gov/. The Principal Investigator and anyone submitting on behalf of the Principal Investigator must register for an account in PAMS before it will be possible to submit a pre-proposal. All PIs and those submitting pre-proposals on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to avoid submission delays.

You may use the Internet Explorer, Firefox, Google Chrome, or Safari browsers to access PAMS.

Please see Registrations, DOE Office of Science Portfolio Analysis and Management System (PAMS), above, for instructions about how to register in PAMS.

Submit Your Pre-Proposal:

- Create your pre-proposal (called a preproposal in PAMS) outside the system and save it as a file with extension .docx, .doc, or .pdf. Make a note of the location of the file on your computer so you can browse for it later from within PAMS.
- Log into PAMS and click the Proposals tab. Click the "View / View / Respond to DOE National Laboratory Announcements" link and find the current announcement in the list. Click the "Actions/Views" link in the Options column next to this announcement to obtain a dropdown menu. Select "Submit Preproposal" from the dropdown.
- On the Submit Preproposal page, select the institution from which you are submitting this preproposal from the Institution dropdown. If you are associated with only one institution in the system, there will only be one institution in the dropdown.

- Note that you must select one and only one Principal Investigator (PI) per preproposal; to do so, click the "Select PI" button on the far right side of the screen. Find the appropriate PI from the list of all registered users from your institution returned by PAMS. (Hint: You may have to sort, filter, or search through the list if it has multiple pages.) Click the "Actions" link in the Options column next to the appropriate PI to obtain a dropdown menu. From the dropdown, choose "Select PI."
- If the PI for whom you are submitting does not appear on the list, it means he or she has not yet registered in PAMS. For your convenience, you may have PAMS send an email invitation to the PI to register in PAMS. To do so, click the "Invite PI" link at the top left of the "Select PI" screen. You can enter an optional personal message to the PI in the "Comments" box, and it will be included in the email sent by PAMS to the PI. You must wait until the PI registers before you can submit the preproposal. Save the preproposal for later work by clicking the "Save" button at the bottom of the screen. It will be stored in "My Preproposals" for later editing.
- Enter a title for your preproposal.
- Select the appropriate technical contact from the Program Manager dropdown.
- To upload the preproposal file into PAMS, click the "Attach File" button at the far right side of the screen. Click the "Browse" (or "Choose File" depending on your browser) button to search for your file. You may enter an optional description of the file you are attaching. Click the "Upload" button to upload the file.
- At the bottom of the screen, click the "Submit to DOE" button to save and submit the preproposal to DOE.
- Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the preproposal.

You are encouraged to register for an account in PAMS at least a week in advance of the preproposal submission deadline so that there will be no delays with your submission.

> **WARNING**: The PAMS website at https://pampspublic.science.energy.gov will permit you to edit a previously submitted preproposal in the time between your submission and the deadline. If you choose to edit, doing so will remove your previously submitted version from consideration. If you are still editing at the time of the deadline, you will not have a valid submission. Please pay attention to the deadline.

For help with PAMS, click the "External User Guide" link on the PAMS website, https://pamspublic.science.energy.gov/. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9 AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this Funding Opportunity Announcement should reference **LAB 20-2262.**

Preproposals submitted outside PAMS will not be considered. Preproposals may not be submitted through grants.gov or www.FedConnect.net.

C. CONTENT AND PROPOSAL FORMS

PROPOSAL DUE DATE

See Section IV, Part E.

Files that are attached to the forms must be PDF files unless otherwise specified in this announcement. Attached PDF files must be plain files consisting of text, numbers, and images without editable fields, signatures, passwords, redactions, or other advanced features available in some PDF-compatible software. Do not attach PDF portfolios.

> **WARNING**: The PAMS website at https://pampspublic.science.energy.gov will permit you to edit a previously submitted proposal in the time between your submission and the deadline. If you choose to edit, doing so will remove your previously submitted version from consideration. If you are still editing at the time of the deadline, you will not have a valid submission. Please pay attention to the deadline.

RESUBMISSION OF PROPOSALS

Proposals submitted under this Announcement may be withdrawn from consideration by using SC's PAMS website at https://pamspublic.science.energy.gov. Proposals may be withdrawn at any time between when the Laboratory submits the proposal and when DOE makes the proposal available to merit reviewers. Such withdrawals take effect immediately and cannot be reversed.

After a proposal is withdrawn, it may be resubmitted, if this Announcement is still open for the submission of proposals. Such resubmissions will only count as one submission if this Announcement restricts the number of proposals from an applicant.

SC will usually consider the last submission, according to its timestamp, to be the intended version. Please consult with your program manager to resolve any confusion about which version of a proposal should be considered.

IMPROPER CONTENTS OF PROPOSALS

Proposals submitted under this Announcement will be stored in controlled-access systems, but they may be made publicly available if an award is made, and they will be made available to merit reviewers. As such, it is critical that Laboratories follow these guidelines:

- Do not include information subject to any legal restriction on its open distribution, whether classified, export control, or unclassified controlled nuclear information.
- Do not include sensitive and protected personally identifiable information, including social security numbers, birthdates, citizenship, marital status, or home addresses. Pay particular attention to the content of biographical sketches and curriculum vitae.
- Do not include letters of support from Federal officials.
- Do not include letters of support on Federal letterhead. Letters that are not letters of support (such as letters confirming access to sites, facilities, equipment, or data; or letters from cognizant contracting officers) may be on Federal letterhead.
- Clearly mark all proprietary or trade-secret information.

LETTERS

Letters of support may be included with applications.

1. Summary of Proposal Contents and Information about PAMS

Each DOE National Laboratory proposal will contain the following sections:

- Budget, entered into PAMS as structured data using the PAMS budget form
- Abstract (one page), entered into PAMS as a separate pdf
- Budget justification, entered into PAMS as a separate pdf
- Proposal, combined into a single pdf containing the following information:
    - Proposal Cover Page
    - Table of Contents
    - Project Narrative (main technical portion of the proposal, including background/introduction, proposed research and methods, timetable of activities, and responsibilities of key project personnel)
    - Appendix 1: Biographical Sketch(es)
    - Appendix 2: Current and Pending Support
    - Appendix 3: Bibliography and References Cited
    - Appendix 4: Facilities and Other Resources
    - Appendix 5: Equipment
    - Appendix 6: Data Management Plan
    - Appendix 7: Other Attachments (optional)

SUBMISSION INSTRUCTIONS

Completed proposals must be submitted into the DOE SC Portfolio Analysis and Management System (PAMS). For help with PAMS, click the "External User Guide" link on the PAMS website, https://pamspublic.science.energy.gov/. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9:00 AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free number) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submissions and inquiries about this Program Announcement should reference **LAB 20-2262.** Full proposals submitted in response to this Program Announcement must be submitted to PAMS no later than Posting Date + 70, at 5 PM Eastern Time, at 5:00 PM Eastern Time.

All PIs and those submitting on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to ensure timely submissions**.** To register, click "Create New PAMS Account" on the website https://pamspublic.science.energy.gov/ and follow the instructions for creating an account.

The following information is provided to help with proposal submission. Detailed instructions and screen shots can be found in the user guide. To find the user guide, click the "External User Guide" link on the PAMS home page. Onscreen instructions are available within PAMS.

- Log into PAMS. From the proposals tab, click the “View DOE National Laboratory Announcements” link and find the current announcement in the list. Click the “Actions/Views” link in the Options column next to this Announcement to obtain a dropdown menu. Select “Submit Proposal” from the dropdown.
- Note that you must select one and only one Principal Investigator (PI) per proposal; to do so, click the “Select PI” button on the far right side of the screen. Find the appropriate PI from the list of all registered users from your institution returned by PAMS. (Hint: You may have to sort, filter, or search through the list if it has multiple pages.) Click the “Actions” link in the Options column next to the appropriate PI to obtain a dropdown menu. From the dropdown, choose “Select PI.”
- If the PI for whom you are submitting does not appear on the list, it means he or she has not yet registered in PAMS. For your convenience, you may have PAMS send an email invitation to the PI to register in PAMS. To do so, click the “Invite PI” link at the top left of the “Select PI” screen. You can enter an optional personal message to the PI in the “Comments” box, and it will be included in the email sent by PAMS to the PI. You must wait until the PI registers before you can submit the proposal. Save the proposal for later work by selecting “Save” from the dropdown at the bottom of the screen and then clicking the “Go” button. It will be stored in “My Proposals” for later editing. As a minimum, you must complete all the required fields on the PAMS cover page before you can save the proposal for the first time.
- The cover page, budget, and attachments sections of the lab proposal are required by PAMS before it can be submitted to DOE.
- Complete the sections in PAMS one at a time, starting with the cover page and following the instructions for each section.
- Click the “+View More” link at the top of each section to expand the onscreen instructions. On the budget section, click the “Budget Tab Instructions” link to obtain detailed guidance on completing the budget form.
- Save each section by selecting either “Save” (to stay in the same section) or “Save… and Continue to the Next Section” (to move to the next section) from the dropdown menu at the bottom of the screen, followed by clicking the “Go” button.
- If you save the proposal and navigate away from it, you may return later to edit the proposal by clicking the “View My Existing Proposals” or “My Proposals” links within PAMS.
- You must enter a budget for each annual budget period.
- You must also enter a budget for each proposed sub-award. The sub-award section can be completed using the same steps used for the budget section.
- In the attachments section of the lab proposal, the abstract, the budget justification, and the proposal narrative are required and must be submitted as separate files.
- You must bundle everything other than the budget, abstract, and budget justification into one single PDF file to be attached under “Proposal Attachment.”
- Do not attach anything under “Other Attachments.”
- To upload a file into PAMS, click the “Attach File” button at the far right side of the screen. Click the “Browse” (or "Choose File" depending on your browser) button to search for your file. You may enter an optional description of the file you are attaching. Click the “Upload” button to upload the file.

- Once you have saved all of the sections, the "Submit to DOE" option will appear in the dropdown menu at the bottom of the screen.
- To submit the proposal, select "Submit to DOE" from the dropdown menu and then click the "Go" button.
- Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the proposal.
- The proposal will also appear under My Proposals with a Proposal Status of "Submitted to DOE."

Please only submit a PAMS lab technical proposal in response to this Announcement; do not submit a DOE Field Work Proposal (FWP) at this time. SC will request FWPs later from those selected for funding consideration under this Announcement.

For help with PAMS, click the "External User Guide" link on the PAMS website, https://pamspublic.science.energy.gov/. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9:00 AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free number) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submissions and inquiries about this Program Announcement should reference **LAB 20-2262.**

2. Detailed Contents of the Proposal

BUDGET AND BUDGET EXPLANATION

The budget must be submitted into PAMS using the PAMS budget form. Research proposed under this Announcement may only have one annual budget period.

PAMS will calculate the cumulative budget totals for you.

A written justification of each budget item is to follow the budget pages. The budget justification should be placed in a separate, single pdf document and attached on the appropriate screen in PAMS. Further instructions regarding the budget and justification are given below and in the PAMS software.

PROJECT SUMMARY/ABSTRACT (NO MORE THAN ONE PAGE)

The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the Principal Investigator (PI), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (i.e., benefits, outcomes). This document must not include any proprietary or sensitive business information as the Department may make it available to the public. The project summary must not exceed 1 page when printed using standard 8.5" by 11" paper with 1" margins (top, bottom, left and right) with font not smaller than 11 point. The one-page project summary/abstract should be placed in a separate, single pdf document and attached on the appropriate screen in PAMS.

The abstract may be used to prepare publicly accessible reports about DOE-supported research.

DOE COVER PAGE
(PART OF PROJECT NARRATIVE)

The following proposal cover page information may be placed on a plain page. No form is required. This cover page will not count in the project narrative page limitation.

- The project title:
- Applicant/Institution:
- Street Address/City/State/Zip:
- Postal Address:
- Administrative Point of Contact name, telephone number, email:
- Lead PI name, telephone number, email:
- DOE National Laboratory Announcement Number: **LAB 20-2262**
- DOE/SC Program Office: High Energy Physics
- DOE/SC Program Office Technical Contact: Eric.Colby@science.doe.gov
- PAMS Pre-Proposal Tracking Number**:**
- Research Track as identified in Section I of this Announcement:
- Topical Area as identified in Section I of this Announcement:
- Include a table modeled on the following chart providing summary budget information from all collaborating institutions. Provide the total costs of the budget request in each year for each institution and totals for all rows and columns. Include the value of any institutional commitment being offered. If necessary, modify the table below for the correct number of years.

Name and Yearly Budget for Proposals with Multiple Institutions							
	Name	**Institution**	**Year 1 Budget**	**Year 2 Budget**	**Year 3 Budget**	**Total Budget**	**Institutional Commitment**
Lead PI							
Co-PI							
Co-PI							
Co-PI							

Example budget table ($ in thousands)

COVER PAGE SUPPLEMENT FOR TRACK 3 COLLABORATIVE PROPOSALS
(PART OF PROJECT NARRATIVE)

APPLICABLE ONLY TO TRACK 3 PROPOSALS.
DO NOT INCLUDE THIS COVER PAGE SUPPLEMENT FOR A TRACK 1 PROPOSAL.

Collaborative proposals submitted from different institutions must clearly indicate they are part of a collaborative project/group. Every partner institution must submit a proposal through its own sponsored research office. Each collaborative group can have only one lead institution. Each proposal within the collaborative group, including the narrative and all required appendices and attachments, must be identical with one exception:

- Each proposal must contain the correct "cover-page" information for the submitting institution only.
- Each proposal must contain a unique budget corresponding to the expenditures for that proposal's submitting institution only.
- Each proposal must contain a unique budget justification corresponding to the expenditures for that proposal's submitting institution only.

SC will use the multiple proposals associated with a collaborative group to create one consolidated document for merit review that consists of the common, identical proposal materials combined with a set of detailed budgets from the partner institutions. It is very important that every proposal in the collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

If the project is a collaboration, provide the following information on a separate page as a supplement to the cover page.

- List all collaborating institutions by name with each institution's principal investigator on the same line.
- Indicate the lead PI who will be the point of contact and coordinator for the combined research activity.
- Provide a statement explaining the leadership structure of the collaboration.
- Include a description of each collaborating institution's facilities, equipment, and resources that will be made available to the collaborative group.
- Include a table modeled on the following chart providing summary budget information from all collaborating institutions. Provide the total costs of the budget request in each year for each institution and totals for all rows and columns.

* Note that collaborating proposals must be submitted separately.

PROJECT NARRATIVE (NO MORE THAN 16 PAGES LONG)

The project narrative **must not exceed 16 pages for Track 1 proposals, and must not exceed 5 pages for Track 3 proposals** of technical information, including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right). The font must not be smaller than 11 point. Merit reviewers will only consider the number of pages specified in the first sentence of this paragraph. This page limit does not apply to the Cover Page, Budget Page(s), Budget Justification, biographical material, publications and references, and appendices, each of which may have its own page limit.

- For each senior investigator, clearly indicate the fraction of total research time during the

academic year as well as summer that will be spent on the proposed research.
- References needed to cite the research described in the narrative can be listed in the Appendix material described below.

Merit reviewers will only consider the number of pages specified in the above requirement. Applications exceeding the page limit will not be reviewed and, therefore, won't be considered for funding.

Do not include any Internet addresses (URLs) that provide supplementary or additional information that constitutes a part of the proposal. Merit reviewers are not required to access Internet sites; however, Internet publications in a list of references will be treated identically to print publications. See Part VIII.D for instructions on how to mark proprietary proposal information. To attach a Project Narrative, click "Add Attachment."

Narrative Format for Track 1: Accelerator Stewardship Topical Areas

Track 1 grant applications must not exceed **16 pages** and must include the following sections, with a recommended page length for each section indicated in braces:

A. {1 page} Background/Introduction. Explanation of the importance and relevance of the proposed work as well as a review of the relevant literature. A brief description of research activities conducted by the primary team members and their R&D groups, including accomplishments and impacts made during the recent past (typically the past three years), is also encouraged.

B. {6 pages} Proposed Research, Innovative Claims, Technical Rationale, and Approach. If appropriate, identify the hypotheses to be tested and details of the methods to be used. This section should describe the scientific and technical challenges, unique approach(es), and potential anticipated technical solutions in the topical area that will be addressed. Applications should clearly explain the technical approach(es) that will be employed and provide ample justification for their feasibility. This section should demonstrate that the proposer has a clear understanding of the state-of-the-art, and it should provide sufficient technical details to permit complete evaluation of the feasibility of the approach. Additionally, comparison with other ongoing research efforts should be provided indicating advantages and disadvantages of the proposed effort.

C. {2 pages} Program Plan & Risk Assessment. A narrative explaining the explicit timelines, milestone achievements, and quantitative metrics by which progress toward the goals can be evaluated. The proposed period of performance of the overall program, and each program phase, should be clearly stated. The narrative should include a specific plan detailing how all program metrics will be accurately assessed. This section should also identify major technical risk elements specific to the proposed approach, estimate the risk magnitude for each such element, and describe specific plans to mitigate risk.

D. {1 page} Statement of Work. Clearly and concisely define the technical work to be performed on a task-by-task basis, listing the durations and the dependencies among the

tasks. The statement of work **must** include a table defining the program metrics to be applied.

For each task, provide:

- A general description of its objective;
- A detailed description of the approach to be taken to accomplish it;
- Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.);
- The completion criteria for each task/activity – a product, event, or milestone that defines its completion.

E. {2 pages} Description of the results, products, transferable technology, and expected technology transfer path. Summarize the objectives associated with the proposed research and, where appropriate, the plans and capability to accomplish technology transfer and commercialization. If this application has a commercial product as the end goal, clearly describe the market opportunity. If intellectual property rights will be reserved and assigned, describe the expected assignment of such rights, the measures to be used to protect proprietary information, and include relevant agreements in Appendix 7. See also Section VIII. "Intellectual Property" for instructions on marking proprietary information in the application.

F. {2 pages} Teaming and Management Plan. A clearly defined organization chart for the program team that includes, as applicable: (1) the programmatic relationship of the primary team member; (2) the unique capabilities of the primary team members; (3) the task responsibilities of the primary team members; (4) the teaming strategy among the team members; and (5) the key personnel along with the amount of effort to be expended by each person during each year. Please include in APPENDIX 7: OTHER ATTACHMENT any formal teaming agreements that are required to execute this plan.

G. {2 pages} Cost, schedule, and measurable milestones for the proposed research, including estimates of cost for each task in each year of the effort, broken down by the primes and major subcontractors, total cost, and any cost sharing. (Note: Measurable milestones should capture key development points in tasks and should be clearly articulated and defined in time relative to start of effort.) Where the effort consists of multiple portions which could reasonably be partitioned for purposes of funding, these should be identified as options with separate cost estimates for each. Describe the institutional commitment being offered (see section III.B).

Narrative Format for Track 2: Long-Term Generic Accelerator R&D

DOE National Laboratories are not eligible to apply to Track 2.

Narrative Format for Track 3: Accelerator Stewardship Test Facility Program

Track 3 awards are considerably shorter in duration and smaller in scope, and consequently have an abbreviated application format that is similar to a Track 1 application. Track 3 grant

applications must not exceed **5 pages** and must include the following sections, with a recommended page length for each section indicated in braces:

A. {0.5 page} Background/Introduction. Explanation of the importance and relevance of the proposed work as well as a review of the relevant literature. A brief description of research activities conducted by the primary team members and their R&D groups, including accomplishments and impacts made during the recent past (typically the past three years), is also encouraged.

B. {1.5 pages} Proposed Research, Innovative Claims, Technical Rationale, and Approach. If appropriate, identify the hypotheses to be tested and details of the methods to be used. This section should describe the scientific and technical challenges, unique approach(es), and potential anticipated technical solutions in the topical area that will be addressed. Applications should clearly explain the technical approach(es) that will be employed and provide ample justification for their feasibility. This section should demonstrate that the proposer has a clear understanding of the state-of-the-art, and it should provide sufficient technical details to permit complete evaluation of the feasibility of the approach. Additionally, comparison with other ongoing research efforts should be provided indicating advantages and disadvantages of the proposed effort.

C. {1 page} Statement of Work. Clearly and concisely define the technical work to be performed on a task-by-task basis, listing the durations and the dependencies among the tasks. This section must clearly define the role of the requested National Laboratory capabilities. Details about the specific National Laboratory facilities and expertise required should be included in Appendix 4 and an explanation of the requested costs to use these capabilities should be provided in the Budget Explanation.

For each task, provide:

- A general description of its objective;
- A detailed description of the approach to be taken to accomplish it;
- Identification of the primary organization responsible for task execution (prime, sub, team member, by name, etc.);
- The completion criteria for each task/activity – a product, event, or milestone
- that defines its completion.

D. {1 page} Description of the results, products, transferable technology, and expected technology transfer path. Summary of objectives associated with the proposed research and, where appropriate, the plans and capability to accomplish technology transfer and commercialization. If this application has a commercial product as the end goal, clearly describe the market opportunity. If intellectual property rights will be reserved and assigned, describe the expected assignment of such rights, the measures to be used to protect proprietary information, and include relevant agreements in Appendix 7: Other Attachments.

E. {1 page} Cost, schedule, and measurable milestones for the proposed research, including estimates of cost for each task in each year of the effort, broken down by the primes and major subcontractors, total cost, and any cost sharing. (Note: Measurable

milestones should capture key development points in tasks and should be clearly articulated and defined in time relative to start of effort.) Describe the institutional commitment being offered (see section III.B).

> **For Collaborative Track 3 Proposals Only**: Each collaborating institution must submit an identical common narrative. The common narrative must identify which tasks and activities will be performed by which of the collaborating institutions in every budget period of the proposed project. The budget and the budget justification—which are unique to each collaborating institution—may refer to parts of the common narrative to further identify each collaborating institution's activities in the joint project. There should be no ambiguity about each institution's role and participation in the collaborative group.
>
> SC will use the multiple applications associated with a collaborative group to create one consolidated document for merit review that consists of the common, identical application materials combined with a set of detailed budgets from the partner institutions. It is very important that every application in the collaborative group be identical (including the title) with the exception of the budget and budget justification pages.

General Instructions That Apply to Track 1, Track 2, and Track 3 Grant Applications

It is important that the project narrative section provide a complete description of the proposed work, because reviewers are not obliged to read the last Appendix in any detail. Applications exceeding the page limits will be declined without review. The page count limitation does not include the Cover Page and Budget Pages, the Title Page, the biographical material and publication information, or any Appendices.

APPENDIX 1: BIOGRAPHICAL SKETCH

Provide a biographical sketch for the PI and each senior/key person as an appendix to your technical narrative.

As part of the sketch, provide information that can be used by reviewers to evaluate the PI's potential for leadership within the scientific community. Examples of information of interest are invited and/or public lectures, awards received, scientific program committees, conference or workshop organization, professional society activities, special international or industrial partnerships, reviewing or editorship activities, or other scientific leadership experiences.

- Provide the biographical sketch information as an appendix to your project narrative.
- Do not attach a separate file.
- The biographical sketch appendix will not count in the project narrative page limitation.
- The biographical information (curriculum vitae) for each person must not exceed 2 pages when printed on 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right) with font not smaller than 11 point and must include:

SC does not require a particular format for a biosketch. Applicants may use a format developed for other agencies or generated by any software package, including SciENcv, a cooperative venture maintained at https://www.ncbi.nlm.nih.gov/sciencv/. The biographical information (curriculum vitae) must include the following items within its page limit:

- **Education and Training**: Undergraduate, graduate and postdoctoral training, provide institution, major/area, degree and year.
- **Research and Professional Experience**: Beginning with the current position list, in chronological order, professional/academic positions with a brief description.
- **Publications**: Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights and software systems developed may be provided in addition to or substituted for publications.
- **Synergistic Activities**: List no more than 5 professional and scholarly activities related to the effort proposed.

In addition, the biographical sketch must include information to permit DOE to identify individuals who are conflicted with or potentially biased (favorably or unfavorably) against the investigator. Include a section entitled "**Identification of Potential Conflicts of Interest or Bias in Selection of Reviewers**" that will not count in a page limit: Provide the following information in this section:

- **Collaborators and Co-editors**: List in alphabetical order all persons, including their current organizational affiliation, who are, or who have been, collaborators or co-authors with you on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of this application. For publications or collaborations with more than 10 authors or participants, only list those individuals in the core group with whom the Principal Investigator interacted on a regular basis while the research was being done. Also, list any individuals who are currently, or have been, co-editors with you on a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of this application. If there are no collaborators or co-editors to report, state "None."
- **Graduate and Postdoctoral Advisors and Advisees**: List the names and current organizational affiliations of your graduate advisor(s) and principal postdoctoral sponsor(s). Also, list the names and current organizational affiliations of your graduate students and postdoctoral associates.

Personally Identifiable Information: Do not include sensitive and protected personally identifiable information including social security numbers, birthdates, citizenship, marital status, or home addresses. Do not include information that a merit reviewer should not make use of.

This appendix will not count in the project narrative page limitation.

APPENDIX 2: CURRENT AND PENDING SUPPORT

Provide a list of all current and pending support (both Federal and non-Federal) for the PI and

senior/key persons, including subawardees, for ongoing projects and pending applications. List all sponsored activities or awards requiring a measurable commitment of effort, whether paid or unpaid. SC does not require a particular format for current and pending support. Applicants may use a format developed for other agencies or generated by any software package, including SciENcv, a cooperative venture maintained at https://www.ncbi.nlm.nih.gov/sciencv/.
wFor every activity, list the following items:

- The sponsor of the activity or the source of funding
- The award or other identifying number
- The title of the award or activity
- The total cost or value of the award or activity, including direct and indirect costs. For pending proposals, provide the total amount of requested funding.
- The award period (start date – end date).
- The person-months of effort per year being dedicated to the award or activity
- Briefly describe the research being performed and explicitly identify any overlaps or synergies with the proposed research.

Provide the Current and Pending Support as an appendix to your project narrative. Concurrent submission of an application to other organizations for simultaneous consideration will not prejudice its review.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 3: BIBLIOGRAPHY & REFERENCES CITED

Provide a bibliography of any references cited in the Project Narrative. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. For research areas where there are routinely more than ten coauthors of archival publications, you may use an abbreviated style such as the Physical Review Letters (PRL) convention for citations (listing only the first author). For example, your paper may be listed as, “A Really Important New Result,” A. Aardvark et. al. (MONGO Collaboration), PRL 999. Include only bibliographic citations. Applicants should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the proposal. Provide the Bibliography and References Cited information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 4: FACILITIES & OTHER RESOURCES

This information is used to assess the capability of the organizational resources, including subawardee resources, available to perform the effort proposed. Identify the facilities to be used (Laboratory, Animal, Computer, Office, Clinical and Other). If appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Describe only those resources that are directly applicable to the proposed work. Describe other resources available to the project (e.g., machine shop, electronic shop) and the extent to which

they would be available to the project. For proposed investigations requiring access to experimental user facilities maintained by institutions other than the applicant, please provide a document from the facility manager confirming that the researchers will have access to the facility. Please provide the Facility and Other Resource information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 5: EQUIPMENT

List major items of equipment already available for this project and, if appropriate identify location and pertinent capabilities. Provide the Equipment information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 6: DATA MANAGEMENT PLAN

Provide a Data Management Plan (DMP) that addresses the following requirements:

1. DMPs should describe whether and how data generated in the course of the proposed research will be shared and preserved. If the plan is not to share and/or preserve certain data, then the plan must explain the basis of the decision (for example, cost/benefit considerations, other parameters of feasibility, scientific appropriateness, or limitations discussed in #4). At a minimum, DMPs must describe how data sharing and preservation will enable validation of results, or how results could be validated if data are not shared or preserved.
2. DMPs should provide a plan for making all research data displayed in publications resulting from the proposed research digitally accessible to the public at the time of publication. This includes data that are displayed in charts, figures, images, etc. In addition, the underlying digital research data used to generate the displayed data should be made as accessible as possible to the public in accordance with the principles stated in the Office of Science Statement on Digital Data Management (https://science.osti.gov/funding-opportunities/digital-data-management/). This requirement could be met by including the data as supplementary information to the published article, or through other means. The published article should indicate how these data can be accessed.
3. DMPs should consult and reference available information about data management resources to be used in the course of the proposed research. In particular, DMPs that explicitly or implicitly commit data management resources at a facility beyond what is conventionally made available to approved users should be accompanied by written approval from that facility. In determining the resources available for data management at SC User Facilities, researchers should consult the published description of data management resources and practices at that facility and reference it in the DMP. Information about other SC facilities can be found in the additional guidance from the sponsoring program.
4. DMPs must protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; avoid significant negative impact on innovation, and U.S. competitiveness; and otherwise be consistent with all

applicable laws, regulations, and DOE orders and policies. There is no requirement to share proprietary data.

DMPs will be reviewed as part of the overall SC research proposal merit review process. Applicants are encouraged to consult the SC website for further information and suggestions for how to structure a DMP: https://science.osti.gov/funding-opportunities/digital-data-management/

- This appendix should not exceed 2 pages including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5" by 11" paper with 1 inch margins (top, bottom, left, and right)

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 7: OTHER ATTACHMENT

If you need to elaborate on your responses to questions 1-6 on the "Other Project Information" document, please provide the Other Attachment information as an appendix to your project narrative. Information not easily accessible to a reviewer may be included in this appendix, but do not use this appendix to circumvent the page limitations of the proposal. Reviewers are not required to consider information in this appendix.

- Do not attach a separate file.
- Include here the required detailed cost estimates to support claims that the cost metrics of Track 1 Topic C or Track 1 Topic D can be met.
- This appendix will not count in the project narrative page limitation.

2. Detailed Instructions for the Budget

Budgets are required for the entire project period. A budget form should be completed for each budget period of the award, and a cumulative budget form for the entire project period will be populated by PAMS. A detailed budget justification narrative should be included after the budget pages. The justification should cover labor, domestic travel, equipment, materials and supplies, and anything else that will be covered with project funds.

To edit a section on the budget, click the edit icon ( ) for each section on the page. Remember to save all budget periods before moving on to the next section. You can save the budget periods by selecting "Save All Budget Periods" from the dropdown on the lower right corner of the PAMS budget entry screen and then clicking the "Go" button. You can also save any data entry page in PAMS using the blue diskette icon ( ) in the floating toolbar on the bottom of the screen.

Section A. Senior/Key Person (Required)
For each Senior/Key Person, enter the appropriate information. List personnel, salary funds, and the number of months that person will be allocated to the project. Also include a written narrative in the budget justification that fully justifies the need for requested personnel.

Section B. Other Personnel
List personnel, salary funds, and the number of months that person will be allocated to the project. Also include a written narrative in the budget justification that fully justifies the need for requested personnel.

Section C. Equipment Description
For the purpose of this budget, equipment is designated as an item of property that has an acquisition cost of $5,000 or more and an expected service life of more than one year. (Note that this designation applies for proposal budgeting only and differs from the DOE definition of capital equipment.) List each item of equipment separately and justify each in the budget justification section. Allowable items ordinarily will be limited to research equipment and apparatus not already available for the conduct of the work. General-purpose office equipment, such as a personal computer, is not eligible for support unless primarily or exclusively used in the actual conduct of scientific research.

Section D. Travel
In the budget justification, list each trip's destination, dates, estimated costs including transportation and subsistence, number of staff traveling, the purpose of the travel, and how it relates to the project. Indicate whether travel cost estimates are based upon quotes from travel agencies; upon past experience of similar number of trips to similar travel destinations; or something else (describe). To qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results.

Section E. Participant/Trainee Support Costs:
If applicable, submit training support costs. Educational projects that intend to support trainees (precollege, college, graduate and post graduate) must list each trainee cost that includes stipend levels and amounts, cost of tuition for each trainee, cost of any travel (provide the same information as needed under the regular travel category), and costs for any related training expenses. Participant costs are those costs associated with conferences, workshops, symposia or institutes and breakout items should indicate the number of participants, cost for each participant, purpose of the conference, dates and places of meetings and any related administrative expenses. In the budget justification, indicate whether trainee cost estimates are based upon past experience of support of similar number of trainees on similar projects; past experience of support of similar number of participants attending similar conferences/workshops/symposia; or something else (describe).

Section F. Other Direct Costs:
Enter Other Direct Costs information for each item listed.

- **Materials and Supplies:** Enter total funds requested for materials and supplies in the appropriate fields. In the budget justification, indicate general categories such as glassware, and chemicals, including an amount for each category (items not identified under "Equipment"). Categories less than $1,000 are not required to be itemized. In the budget justification, indicate whether cost estimates are based upon past experience of purchase of similar or like items; quotes/catalog prices of similar or like items; or something else (describe).

- **Publication Costs:** Enter the total publication funds requested. The proposal budget may request funds for the costs of documenting, preparing, publishing or otherwise making available to others the findings and products of the work conducted under the award. In the budget justification, include supporting information. In the budget justification, indicate whether cost estimates are based upon past experience of purchase of similar or like items; vendor quotes of similar publication services; or something else (describe).
- **Consultant Services:** Enter total funds requested for all consultant services. In the budget justification, identify each consultant, the services he/she will perform, total number of days, travel costs, and total estimated costs. In the budget justification, indicate whether consultant cost estimate is based upon previous experience/quotes for similar or like services; or something else (describe).
- **ADP/Computer Services:** Enter total funds requested for ADP/Computer Services. The cost of computer services, including computer-based retrieval of scientific, technical and education information may be requested. In the budget justification, include the established computer service rates at the proposing organization if applicable. In the budget justification, indicate whether cost estimates are based upon quotes/past experience of purchase of similar computer services; established computer service rates at the proposing institution; or something else (describe).
- **Subawards/Consortium/Contractual Costs:** Enter total costs for all subawards/consortium organizations and other contractual costs proposed for the project. In the budget justification, justify the details.
- **Equipment or Facility Rental/User Fees:** Enter total funds requested for Equipment or Facility Rental/User Fees. In the budget justification, identify each rental/user fee and justify. In the budget justification, indicate whether cost estimates are based upon past experience with similar or like items; vendor quotes of similar items; or something else (describe).
- **Alterations and Renovations:** Enter total funds requested for Alterations and Renovations.
- **In the budget justification**, itemize by category and justify the costs of alterations and renovations, including repairs, painting, removal or installation of partitions, shielding, or air conditioning. Where applicable, provide the square footage and costs.
- **Other:** Add text to describe any other Direct Costs not requested above. Enter costs associated with "Other" item(s). Use the budget justification to further itemize and justify.

Section G. Direct Costs
This represents Total Direct Costs (Sections A thru F) and will be calculated by PAMS.

Section H. Other Indirect Costs
Enter the Indirect Cost information for each field. Only four general categories of indirect costs are allowed/requested on this form, so please consolidate if needed.

Section I. Total Direct and Indirect Costs
This amount will be calculated by PAMS (Sections G + H)

D. SUBMISSIONS FROM SUCCESSFUL APPLICANTS

If selected for award, DOE reserves the right to request additional or clarifying information.

E. SUBMISSION DATES AND TIMES

1. Letter of Intent Due Date

Not applicable.

2. Pre-proposal Due Date

February 21, 2020, at 5pm Eastern Time.
You are encouraged to submit your pre-proposal well before the deadline. Pre-proposals may be submitted at any time between the publication of this Announcement and the stated deadline.

3. Proposal Due Date

April 3, 2020, at 5pm Eastern Time.

You are encouraged to transmit your proposal well before the deadline. Proposals may be submitted at any time between the publication of this Announcement and the stated deadline.

4. Late Submissions

Delays in submitting letters of intent, pre-applications, and applications may be unavoidable. DOE has accepted late submissions when applicants have been unable to make timely submissions because of widespread technological disruptions or significant natural disasters. DOE has made accommodations for incapacitating or life-threatening illnesses and for deaths of immediate family members. Other circumstances may or may not justify late submissions. Unacceptable justifications include the following:

- Failure to begin submission process early enough.
- Failure to provide sufficient time to complete the process.
- Failure to understand the submission process.
- Failure to understand the deadlines for submissions.
- Failure to satisfy prerequisite registrations.
- Unavailability of administrative personnel.

You are responsible for beginning the submission process in sufficient time to accommodate reasonably foreseeable incidents, contingencies, and disruptions.

Applicants must contact the Program Office/Manager listed in this Announcement to discuss the option of late submission.

DOE notes that not all requests for late submission will be approved.

F. FUNDING RESTRICTIONS

Funding for all awards and future budget periods are contingent upon the availability of funds appropriated by Congress and the availability of future-year budget authority.

G. OTHER SUBMISSION AND REGISTRATION REQUIREMENTS

1. Where to Submit

Proposals must be submitted through PAMS to be considered for award.

Please only submit a PAMS lab technical proposal in response to this Announcement; do not submit a DOE Field Work Proposal (FWP) at this time. SC will request FWPs via the Searchable FWP system later from those selected for funding consideration under this Announcement.

2. Registration Process

ONE-TIME REGISTRATION PROCESS

You must complete the one-time registration process (all steps) before you can submit your first proposal through PAMS. Registration instructions appear in the front matter of this Announcement.

For help with PAMS, click the "External User Guide" link on the PAMS website, https://pamspublic.science.energy.gov/. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this DOE National Laboratory Program Announcement should reference **LAB 20-2262.**

3. Proposal Receipt Notices

Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the proposal.

4. Viewing Submitted Proposals

Upon submission, the proposal will appear under My Proposals for the PI and the Submitter with a Proposal Status of "Submitted to DOE."

Section V - PROPOSAL REVIEW INFORMATION

A. CRITERIA

1. Initial Review Criteria

Prior to a comprehensive merit evaluation, DOE will perform an initial review to determine that (1) the applicant is eligible for the award; (2) the information required by the Program Announcement has been submitted; (3) all mandatory requirements are satisfied; (4) the proposed project is responsive to the objectives of the Program Announcement, and (5) the proposed project is not duplicative of programmatic work. Proposals that fail to pass the initial review will not be forwarded for merit review and will be eliminated from further consideration.

Applications submitted without a pre-application having been previously submitted by the pre-application deadline of **February 21, 2020, at 5 PM Eastern Time** will be declined without review.

Applications submitted after the deadline of **April 9, 2020, at 5 PM Eastern Time** will be declined without review.

2. Merit Review Criteria

Proposals will be subjected to scientific merit review (peer review) and will be evaluated against the following criteria, listed in descending order of importance.

- Scientific and/or Technical Merit of the Project;
- Appropriateness of the Proposed Method or Approach;
- Competency of Applicant's Personnel and Adequacy of Proposed Resources; and
- Reasonableness and Appropriateness of the Proposed Budget.

Merit reviewers will be asked to evaluate stewardship applications based on an additional criterion:

- Quality of the Accelerator R&D Stewardship Opportunity.

The evaluation process will also include program policy factors such as the relevance of the proposed research to the terms of the DOE National Laboratory Announcement and the agency's programmatic needs, the balance of activities within the program, and the utility of the proposed activities to the broader scientific community. Note that external peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Both Federal and non-Federal reviewers may be used, and submission of an proposal constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

The questions below are provided to the merit reviewers to elaborate the criteria:

SCIENTIFIC AND/OR TECHNICAL MERIT OF THE PROPOSED RESEARCH (30% WEIGHT)

- What is the scientific and/or technical innovation of the proposed research?
- How might the results of the proposed work impact the direction, progress, and thinking in relevant scientific fields of research?
- What is the likelihood of achieving valuable results?
- Does the proposed work have the potential to significantly impact the Stewardship use described by the PI?
- How does the proposed work compare with other efforts in its field, both in terms of scientific and/or technical merit and originality?
- Does the proposed work have synergy with the HEP mission?
- Is the Data Management Plan suitable for the proposed research and to what extent does it support the validation of research results?

- Additional question, only applicable to Track 3 proposals:
    - Does the non-DOE entity "own" the work? Who is "driving" this proposal? Who benefits the most if the work succeeds?

APPROPRIATENESS OF THE PROPOSED METHOD OR APPROACH (20% WEIGHT)

- For Track 1 proposals:
    - Does the plan clearly describe the current technology state, and the technical gaps that must be addressed, to realize the application?
    - Does the proposal clearly describe specific technical milestones that can be used to evaluate the progress of the R&D?
    - Does the Program Plan and Risk Assessment correctly identify the primary risks, and appropriate mitigations for each?
    - If intellectual property protection is required, has a clear plan been spelled out?
    - If the application could result in a commercial product, has the market opportunity been clearly assessed and described? How good is the market opportunity?

- For Track 2 proposals:
    - Does the proposed effort employ innovative concepts or methods?
    - How logical and feasible are the approaches?
    - Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions?
    - Does the applicant recognize significant potential problems and consider alternative strategies?

- For Track 3 proposals:
    - Does the plan clearly describe the current technology state, and the technical advances that will result from the R&D?
    - Does the proposal clearly describe specific technical milestones that can be used to evaluate the progress of the R&D?

- Are the proposed technical milestones achievable within the brief duration (no more than 12 months) of a Track 3 award?
- Can the proposed R&D goals be accomplished effectively by other means that do not require the use of a DOE National Laboratory's facilities?

COMPETENCY OF APPLICANT'S PERSONNEL AND ADEQUACY OF PROPOSED RESOURCES (15% WEIGHT)

- Does the proposed work take advantage of unique facilities and capabilities?
- What is the past performance of the leading members of the collaboration?
- Are the proposed plans for recruiting any additional scientific and/or technical personnel including new senior staff, students and postdocs reasonable, justified, and appropriate?
- Are the environment and facilities adequate for performing the proposed effort?
- Are the senior investigator(s) or any members of the research group that are being reviewed leaders within the proposed effort(s) and/or potential future leaders in the field?

- Additional questions for Track 1 proposals:
  - Does the Teaming and Management Plan clearly define the roles and responsibilities of all key participants?
  - Does the collaborative team have an appropriate balance of accelerator-technology-side experts and application-side experts?
  - If the application could result in a commercial product, does the team include an appropriate industrial partner?

- Additional questions for Track 2 proposals:
  - No additional questions.

- Additional questions for Track 3 proposals:
  - Does the Teaming and Management Plan clearly define the roles and responsibilities of all key participants?
  - Does the collaborative team have an appropriate balance of accelerator-technology-side experts and application-side experts?
  - If the application could result in a commercial product, does the team include an appropriate industrial partner?
  - Is the proposed work an effective use of DOE National Laboratory resources?
  - Are you aware of specific private sector resources that could be used to accomplish this R&D instead?

REASONABLENESS AND APPROPRIATENESS OF THE PROPOSED BUDGET (5% WEIGHT)

- Are the proposed budget and staffing levels adequate to carry out the proposed work?
- Are all travel, student costs, and other ancillary expenses adequately estimated and justified?
- Is the budget reasonable and appropriate for the scope?

- Additional questions for Track 1 and Track 3 proposals:

- Has the applicant listed institutional commitment?
- Does the amount and type of institutional commitment provide evidence of substantial material participation and risk sharing by the institution?

AS INDICATED ABOVE, THE FOLLOWING QUESTIONS ARE ALSO PROVIDED TO MERIT REVIEWERS WHEN EVALUATING THE ADDITIONAL CRITERION:

QUALITY OF THE ACCELERATOR R&D STEWARDSHIP OPPORTUNITY (30% WEIGHT)

In the questions that follow, the term "Stewardship customer" is used broadly to refer to any and all non-HEP organizations with a history of financial, intellectual, or physical support for research in the proposed subject matter. Stewardship customers may be other SC programs (e.g., BES, NP, FES), other DOE program offices (e.g., NNSA, EERE, ARPA-E), other Federal agencies (e.g., NIH, DoD), or industries that use accelerator technology.

- Does the proposed work provide significant scientific or technical advances of accelerator-related science and technology? (Accelerator-related technology includes such things as: superconducting magnets and RF cavities, RF and magnet power systems, specialized laser systems, specialized diagnostics and controls, and so on.)
- Will the proposed work result in substantial impact on the Stewardship customer's needs **and** result in some synergy with the HEP mission? (synergies might include: developing additional expertise or facilities relevant to present or future HEP-supported work).
- For the primary participating institution(s), is the activity reasonably consistent with the institution's primary mission? (e.g., if a National Laboratory is involved, is the activity consistent with that Laboratory's primary mission?)
- Is the PI/collaboration arguably the best performer/provider for the Stewardship activity? Are other entities capable of providing a substantially similar (or superior) capability?
- What evidence is there that the goal is important to the Stewardship customer? Does this proposal address issues that have been identified in writing (e.g., advisory committee reports, workshop reports, white papers, roadmaps) by the Stewardship customer? Does the Stewardship customer participate substantially and materially in this effort (e.g., by co-funding, cost-sharing, in-kind donation or equipment, donation of effort)?

B. REVIEW AND SELECTION PROCESS

1. Merit Review

Proposals that pass the initial review will be subjected to a formal merit review and will be evaluated based on the criteria above.

2. Program Policy Factors

The Selection Officials may consider the following items, listed in order of decreasing significance:

- Scientific and technical merit of the proposed activity as determined by merit review, using the criteria set out in Section V.A.2;
- The advice of other federal agencies with specific expertise and interest in the accelerator R&D topics listed in this solicitation:
    - At the pre-application phase, and again
    - At the application review phase;
- Availability of funds;
- Amount of institutional commitment offered;
- Synergistic potential between the proposed activity and other activities supported by SC;
- Ensuring an appropriate balance of activities within SC programs;
- Previous performance;
- Extent to which the proposed work will:
    - Engage the expertise and facilities of the existing U.S. accelerator R&D ecosystem in a manner that enhances the ability of SC specifically, and other federal agencies generally, to benefit the Nation within their mission-spaces;
    - Enhance the accelerator technology capabilities and economic competitiveness of U.S. industry;
    - Foster collaboration between developers of accelerator technology and experts who apply accelerator technology;
- Degree to which the proposed work is synergistic with, but not duplicative of, existing awards;
- Other available advice and information.

3. Selection

The Selection Official will consider the findings of the merit review and may consider any of the Program Policy Factors described above.

4. Discussions and Award

The Government may enter into discussions with a selected applicant for any reason deemed necessary. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the applicant.

C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES

DOE strives to make awards within six months of the receipt of applications.

Section VI - AWARD ADMINISTRATION INFORMATION

A. AWARD NOTICES

1. Notice of Selection

Selected Applicants Notification: DOE will notify applicants selected for award. This notice of selection is not an authorization to begin performance.

Non-selected Notification: Organizations whose proposals have not been selected will be advised as promptly as possible. This notice will explain why the proposal was not selected.

2. Notice of Award

A work authorization/contract modification issued by the contracting officer is the authorizing award document.

B. REPORTING

Annual progress reports from the award investigator will be required and will be due 90 days before the end of each budget year.

C. OTHER CONDITIONS

1. Publications

Researchers are expected to publish or otherwise make publicly available the results of the work conducted under any authorization resulting from this Announcement. Publications and other methods of public communication describing any work based on or developed under an authorization resulting from this Announcement must contain an acknowledgment of SC support. The format for such acknowledgments is provided at https://science.osti.gov/funding-opportunities/acknowledgements/. The author's copy of any peer-reviewed manuscript accepted for funding must be announced to DOE's Office of Scientific and Technical Information (OSTI) and made publicly available in accordance with the instructions contained in the Reporting Requirements Checklist incorporated in all Assistance Agreements.

2. Environmental, Safety and Health (ES&H) Performance of Work at DOE Facilities

With respect to the performance of any portion of the work under this award which is performed at a DOE-owned or controlled site, the recipient agrees to comply with all state and Federal ES&H regulations, and with all other ES&H requirements of the operator of such site.

Prior to the performance on any work at a DOE-Owned or controlled site, the recipient shall contact the site facility manager for information on DOE and site specific ES&H requirements.

The recipient shall apply this provision to all subawardees at any tier.

4. Federal, State, and Local Requirements

With respect to the performance of any portion of the work under this award, the recipient agrees to comply with all applicable local, state, and Federal ES&H regulations. The recipient shall apply this provision to all sub awardees at any tier.

Section VII - QUESTIONS/AGENCY CONTACTS

A. QUESTIONS

For help with PAMS, click the "External User Guide" link on the PAMS website, https://science.osti.gov/funding-opportunities/acknowledgements/. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this DOE National Laboratory Program Announcement should reference **LAB 20-2262.**

Please contact the PAMS help desk for technological issues with the PAMS system.

Questions regarding the specific program areas and technical requirements may be directed to the technical contacts listed for each program within the DOE National Laboratory Program Announcement or below.

Please contact the program staff with all questions not directly related to the PAMS system.

B. AGENCY CONTACTS

PAMS Customer Support	855-818-1846 (toll-free) 301-903-9610 sc.pams-helpdesk@science.doe.gov
Administrative Contact	For questions about non-technical matters, including program rules, please contact sc.hepfoa@science.doe.gov
Program Manager Scientific Contact	For questions about specific program areas and/or technical requirements, please contact Eric.Colby@science.doe.gov

C. DEPARTMENT OF ENERGY, OFFICE OF INSPECTOR GENERAL HOTLINE:

The Office of Inspector General (OIG) maintains a Hotline to facilitate the reporting of allegations of fraud, waste, abuse, or mismanagement in DOE programs or operations. If you wish to report such allegations, you may call, send a letter, or email the OIG Hotline ighotline@hq.doe.gov. Allegations may be reported by DOE employees, DOE contractors, or the general public. OIG contact information is available at http://energy.gov/ig/services.

Section VIII - OTHER INFORMATION

A. MODIFICATIONS

Notices of any modifications to this DOE National Laboratory Announcement will be posted on the Grants and Contracts website (https://science.osti.gov/grants/).

B. GOVERNMENT RIGHT TO REJECT OR NEGOTIATE

DOE reserves the right, without qualification, to reject any or all proposals received in response to this DOE National Laboratory Announcement and to select any proposal, in whole or in part, as a basis for negotiation and/or award.

C. COMMITMENT OF PUBLIC FUNDS

The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by other than the Contracting Officer, either explicit or implied, is invalid.

D. PROPRIETARY PROPOSAL INFORMATION

Patentable ideas, trade secrets, proprietary or confidential commercial or financial information, disclosure of which may harm the applicant, should be included in a proposal only when such information is necessary to convey an understanding of the proposed project. The use and disclosure of such data may be restricted, provided the applicant includes the following legend on the first page of the project narrative and specifies the pages of the proposal which are to be restricted:

"The data contained in pages _____ of this proposal have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes."

To protect such data, each line or paragraph on the pages containing such data must be specifically identified and marked with a legend similar to the following:

"The following contains proprietary information that (name of applicant) requests not be released to persons outside the Government, except for purposes of review and evaluation."

E. EVALUATION AND ADMINISTRATION BY NON-FEDERAL PERSONNEL

In conducting the merit review evaluation, the Government may seek the advice of qualified non-Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its proposal, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign a conflict of interest and a certificate of confidentiality prior to reviewing a proposal. Non-Federal personnel conducting administrative activities must sign a non-disclosure

agreement.

F. AVAILABILITY OF FUNDS

Funds are not presently available for this award. The Government's obligation under this award is contingent upon the availability of appropriated funds from which payment for award purposes can be made. No legal liability on the part of the Government for any payment may arise until funds are made available to the Contracting Officer for this award and until the awardee receives notice of such availability, to be confirmed in writing by the Contracting Officer.