



# **NP Accelerator R&D Principal Investigators Exchange Meeting**

**November 29, 2022**

**Manouchehr Farkhondeh  
DOE Office of Science, Nuclear Physics Program**



## *Outline:*

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- This Meeting
- NP Accelerator R&D
- FY 2020 Accelerator R&D FOA and awards
- FY 2022 Accelerator R&D FOA and awards
- A new Requirement for all FY2023 and beyond FOAs
- Communications and Presentation Guidelines



## DOE SC Statement of Commitment

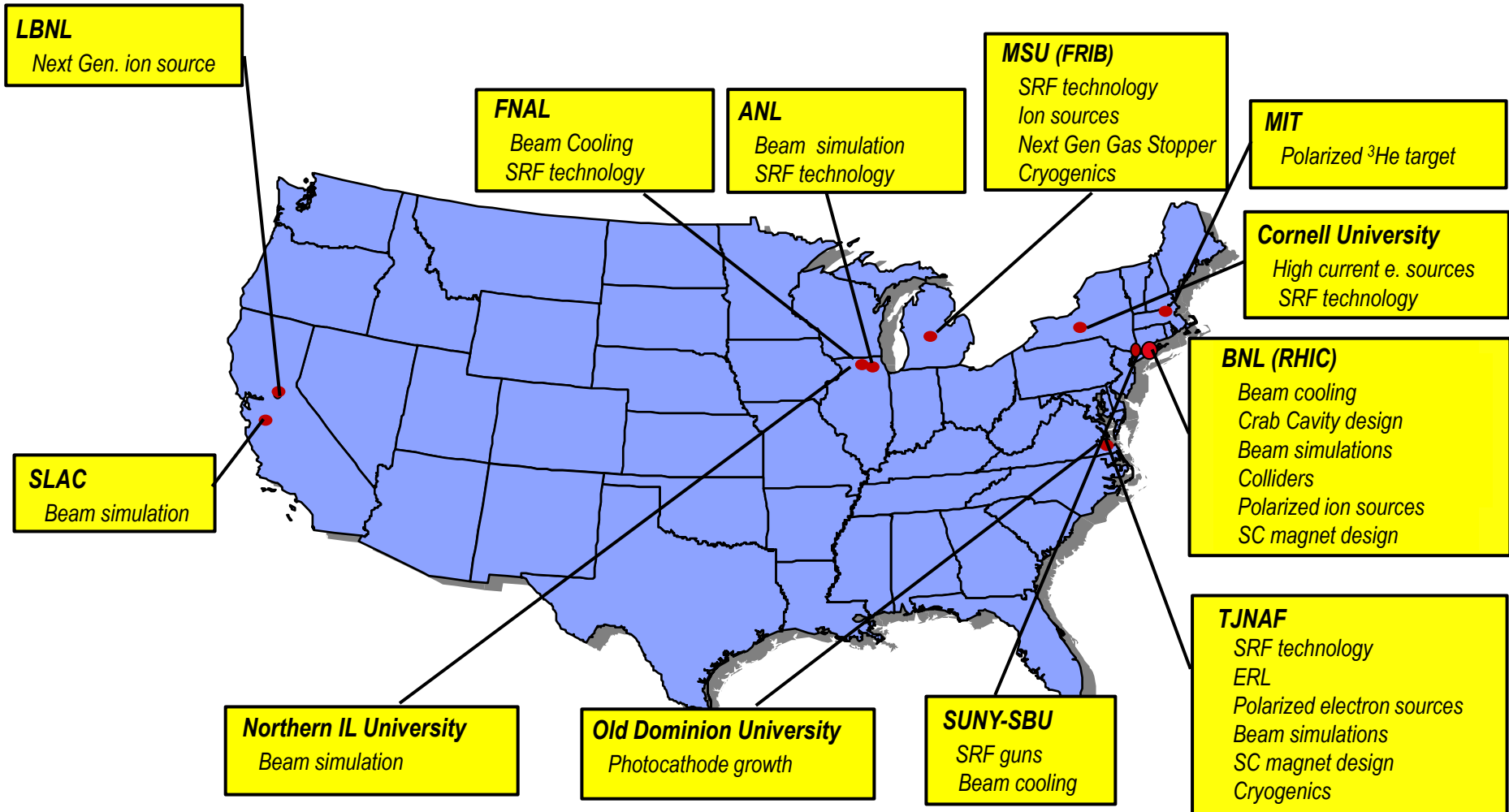
- *The DOE SC Diversity, Equity and Inclusion webpage:*
- *<https://science.energy.gov/sc-2/research-and-conduct-policies/diversity-equity-and-inclusion/>*
- *“The DOE Office of Science (SC) is fully committed to fostering safe, diverse, equitable, and inclusive work, research, and funding environments that value mutual respect and personal integrity. Effective stewardship and promotion of diverse and inclusive workplaces that value and celebrate a diversity of people, ideas, cultures, and educational backgrounds is foundational to delivering on the SC [mission](#). The scientific community engaged in SC-sponsored activities is expected to be respectful, ethical, and professional.*
- *The DOE SC does not tolerate discrimination or harassment of any kind, including [sexual or non-sexual harassment](#), bullying, intimidation, violence, threats of violence, retaliation, or other disruptive behavior in the federal workplace, including DOE field site offices, or at national laboratories, scientific user facilities, academic institutions, other institutions that we fund, or other locations where activities that we support are carried out...”*



- Annual direct NP investment in accelerator R&D through the competitive funding opportunity announcement (FOA) and National Laboratory Accelerator R&D for FY2022-23 is on the order of **\$15.5** M per year.
- NP is also investing in non-EIC accelerator R&D with focus on key technology areas and in core competencies at NP laboratories
- NP publishes biennial FOAs with 2-year duration awards last of which was in FY2022
- Accelerator science and technology (AST) is one of the current initiatives for SC with focused efforts and fundings. NP is actively participating in this initiative.



# Core Competencies at NP Labs and Universities





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# FY20: Accelerator R&D FOA (Topic of this Exchange meeting)

## *FUNDING OPPORTUNITY ANNOUNCEMENT (FOA)*

*Research and Development for Next Generation Nuclear Physics Accelerator Facilities*

*Funding Opportunity Number : DE-DE-FOA-0001230*

*ISSUE DATE: April 1, 2020*

*Application Due Date: May 1, 2020*

- *Accelerator R&D for this announcement was in the following general categories:*
  - *Accelerator R&D that significantly advances the state-of-the art accelerator capabilities of relevance to next generation machines for the study of nuclear physics.*
  - *Accelerator R&D that significantly advances the state-of-the art accelerator capabilities of relevance to improving the performance of existing facilities studying nuclear physics.*
- *In particular, proposals in the following areas were encouraged:*
  - *Transformative accelerator R&D in SRF technology for restoring cryomodule performance at SRF-based accelerator facilities.*
  - *Transformative accelerator R&D in next generation ion and electron sources.*
- *Artificial Intelligence and Machine Learning was not included in this FOA because of a standalone multi-office Laboratory call in this area.*



NP FY2020-21 Awards in Accelerator R&D FOA							
#	Proposal ID	Institution	Proposal Title	PI and Co-PI	FY2020 Funding (k\$)	Total Collab funding Y1 (k\$)	Total 2-year fundin (k\$)
1	254578	TJNAF	Using improved growth techniques such as CBE to grow high polarization strained superlattice GaAs/GaAsP photocathodes, including those with Distributed Bragg Reflector structure	Stutzman, Marcy	126.2	126.2	252.5
2	255054	Cornell	High current sources for spin polarized and un-polarized electron beams	Bazarov, Ivan	184.0	367.9	367.9
3	254811	TJNAF	Photocathodes with 90% polarization and QE greater than 1% for DOE NP	Poelker, Matthew	180.0	230.0	460.0
	254853	BNL		Wang, Erdong	50.0		
4	255032	MSU	Gas Stopper Developments for Improved Purity and Intensity of Low-Energy, Rare Isotope Ion Beams	Ringle, Ryan	178.0	356.0	356.0
5	254,943	ANL	Development of Practical Niobium-Tin Cavities for Ion Linacs	Kelly, Michael	450.5	675.6	1191.3
	254,946	RadiaBeam		Kutsaev, Sergey	80.0		
	349799	FNAL		Posen, Sam	65.2		
6	254442	TJNAF	High Voltage Insulators and Electrodes for 500 kV DC High Voltage Photogun with Inverted Insulator Design	Hernandez-Garcia, Carlos	269.4	269.4	538.9
7	255039	SUNY	Superconducting RF electron gun	Litvinenko, Vladimir	201.3	922.4	1442.1
	254801	FNAL		Yakovlev, Vyacheslav	139.1		
	254816	TJNAF		Poelker, Matthew	200.1		
	254881	BNL		Jing, Yichao	180.6		
8	254406	TJNAF	In Situ Plasma Processing of Superconducting Cavities	Powers, Tom	607.5	701.0	1402.0
	254781	ORNL		Doleans, Marc	93.5		
<b>Total year 1 Awards: \$3.65M</b>						<b>3649</b>	

Subject of this year's PI meeting (no significance to color codes in rows)

M. Farkhondeh, 2022 NP Accelerator R&D PI Exchange Meeting





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# FY22: Accelerator R&D FOA (Topic of this Exchange meeting)

## *FUNDING OPPORTUNITY ANNOUNCEMENT (FOA)*

*Research and Development for Next Generation Nuclear Physics Accelerator Facilities*

*Funding Opportunity Number : DE-DE-FOA-0002670*

*ISSUE DATE: February 10, 2022*

*Application Due Date: April 8, 2022*

- *Accelerator R&D for this announcement was in the following general categories:*
  - *Accelerator R&D that significantly advances the state-of-the art accelerator capabilities of relevance to next generation machines for the study of nuclear physics.*
  - *Accelerator R&D that significantly advances the state-of-the art accelerator capabilities of relevance to improving the performance of existing facilities studying nuclear physics.*
- *In particular, proposals in the following areas were encouraged:*
  - *Transformative accelerator R&D in SRF technology for restoring cryomodule performance at SRF-based accelerator facilities.*
  - *Transformative accelerator R&D in next generation ion and electron sources.*
- *Artificial Intelligence and Machine Learning was not included in this FOA because of a standalone AI and data science call in this area.*



# FY22: Accelerator R&D FOA Awards

#	Proposal ID	Institution	Proposal Title	Topic Area	New/ Existing Work	PI Name	Lead	Total Y1 + Y2 awards (\$k)
1	0000267565	LBLN- 88 Inch	Development of a MARS superconducting cold mass for future generations of ECRIS	Next Gen Ion Source	New	Xie, Daniel		\$1,998
2	0000267790	ODU/TJNAF	Enhancing the Design of Photocathodes with 90% polarization and QE > 1% for DOE NP	Pol Photocathode	Existing	Marsillac, Sylvain	ODU, TJ subcon.	\$499
3	0000267812	Cornell	Long lifetime spin-polarized electron sources: high current performance of alternative GaAs activation materials and novel spin-polarized sources via epitaxial growth	Pol Source	Existing	Bazarov, Ivan		\$410
4	0000267656	ANL	A Practical Niobium-Tin Cavity for the ATLAS Superconducting Linac	SRF	Existing	Kelly, Michael	Lead	\$930
	0000267831	FNAL	Collaboration			Posen, Sam		\$162
	0000267694	Radiabeam Technologies	Collaboration			Kutsaev, Sergey		\$170
5	0000267691	TJNAF	In situ plasma processing of superconducting cavities	Plasma Processing	Existing	Powers, Tom		\$1,253
6	0000267794	MSU	Development of Transformative Preparation Methods to Push up High Q&G Performance of FRIB Spare HWR Cryomodule Cavities	SRF Cryomodules	New	Saito, Kenji		\$704
7	0000267789	BNL	Development of high current highly charged laser ion source	Laser Ion Source	New	Okamura, Masahiro		\$800
8	0000267801	LBLN	Advanced Modeling of Beam Physics and Performance Optimization for Nuclear Physics Colliders	Beam dynamics modeling	New	Qiang, Ji	Lead	\$350
	0000267652	MSU	Collaboration			Hao, Yue		\$300
	0000267677	BNL	Collaboration			Gu, Xiaofeng		\$330
9	0000267811	TJNAF	1497 MHz Vertical Slice Test of Magnetron & Superconducting Cavity	RF sources		Jordan, Kevin		\$665
<b>Total AST funds in FY2022 (\$k)</b>				<b>\$4,615</b>		<b>Total funds FY22 and FY23</b>		<b>\$8,571</b>

Subject of this year's PI meeting (no significance to color codes in rows)

M. Farkhondeh, 2022 NP Accelerator R&D PI Exchange Meeting



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➤ ***A new Requirement for all FY2023 SC FOA applications:***

- *All new and renewal applications must provide a Promoting Inclusive and Equitable Research (PIER) Plan as an appendix to the research narrative.*

➤ As a result, a new criteria (PIER) is added to the four existing SC Merit Review criteria

- *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;*
- *Reasonableness and Appropriateness of the Proposed Budget; and*
- *Quality and Efficacy of the Promoting Inclusive and Equitable Research (PIER) Plan.*

➤ ***PIER Criterion Questions:***

- *Is the proposed Promoting Inclusive and Equitable Research (PIER) Plan suitable for the size and complexity of the proposed project and an integral component of the proposed project?*
- *To what extent is the PIER plan likely to lead to participation of individuals from diverse backgrounds, including individuals historically underrepresented in the research community?*
- *What aspects of the PIER plan are likely to contribute...*



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# Communications between NP and PI for Accelerator R&D work

Two modes of communications between PIs and NP office: Quarterly reports and an annual face to face meeting with all PI in one place.

➤ Quarterly Reports

- PIs are asked to submit quarterly reports to NP in a “Small Project” format. The FY2020 4<sup>th</sup> quarter request was sent on **October 3rd, 2021**. Quarterly reports are reviewed by the Division (they are not just filed away).

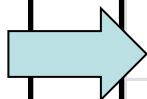
➤ PI Exchange Meeting:

- **Accelerator R&D:** Since 2015, NP conducts annual “PI Exchange” meetings with presentations on current status of work by all Principal Investigators who received awards under previous fiscal year funds.
- **AI/ML:** We will have a separate AI/ML exchange meeting that will cover years 3 of Lab awards and the 6 awards for the FY2021 FOA

# NP Matrix for Quarterly Report Review and Assessment.

*Include brief and clear responses to these NP Matrix questions in your quarterly reports.*

- *NP matrix for Quarterly Report and progress assessment.*
- *Make sure your quarterly reports addresses elements of this matrix for our evaluation*
- *Continue to use the NP “small Project” template Ms. Saryna Camron sends you.*



<b>1-</b>	<b>PI’s performance during the quarter</b>
a	Progress made
b	Milestones met
c	Any breakthrough
<b>2-</b>	<b>Assessment of risk mitigation</b>
a	Issue comunicated?
b	appropriate mitigation strategies
<b>3-</b>	<b>Likelihood of achieving project goals</b>
a	Will they meet cost and schedule
b	Will they deliver the promised scope
<b>4-</b>	<b>Recommendation on need for action</b>
a	Are there any actions you need to take in response to points above





- Presentations on current status of work by all Principal Investigators (PIs) who received awards
  - under FY20 FOA [DE-FOA-0001230](#) for Accelerator R&D
- This is not a review, and no review panel is involved. Presentations will be made to NP Office Program Managers and Division Directors, and possibly a few PMs from HEP and BES Program Offices.
- To facilitate exchange of information between PIs and the NP Office and among PIs and institutions on all current NP Accelerator R&D.
- A continuation of yearly meetings on NP supported Accelerator R&D for next generation NP facilities.



# PI Meeting Presentation Guidelines:

Each presentation should include the following information:

- Description of the project and the current status;
- The main goal of the project for which you received the **FY 2020- 21 Accelerator R&D awards**,
- A table showing annual budget and the total received to date (see below);
- A table showing major deliverables and schedule; and
- There will be no written report or follow up actions required for this meeting.
- Summary of expenditures by fiscal year (FY):
- All talks will be posted on PI Exchange meeting page on NP website.
- **35 min talks should allow 7 min for Q/A and 30 min talks 5 min for Q/A**

	FY20	FY21	Totals
<b>a) Funds allocated</b>			
<b>b) Actual costs to date</b>			



# FY2022 PI Meeting Agenda for Awards in FY 20-21

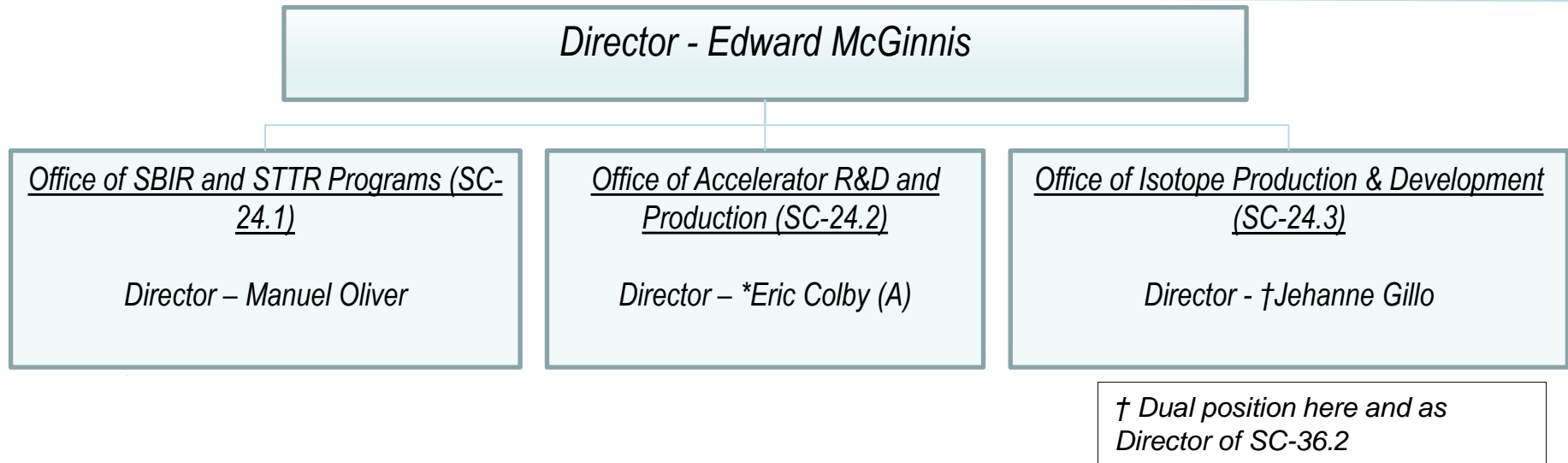
<b>DRAFT AGENDA : 2022 NP Accelerator R&amp;D PI Exchange Meeting, Tuesday, November 29, via Zoom</b>							
Work #	Time (E.S.T)	Dur. (min)	Principal Investigator	Institution	R&D Area	Presentation Title	Speaker(s)
	10:00	5	-	DOE NP	-	Introductory Remarks	Mantica
	10:05 AM	35	-	DOE NP	-	NP supported Accelerator R&D and AI/ML	Farkhondeh
1	10:40 AM	30	Stutzman, Marcy	TJNAF	Polarized Sources	Using improved growth techniques such as CBE to grow high polarization strained superlattice GaAs/GaAsP photocathodes, including those with Distributed Bragg Reflector structure	Stutzman
2	11:10 AM	30	Bazarov, Ivan	Cornell	Electron Sources	High current sources for spin polarized and un-polarized electron beams	Andorf/ Bazarov
	<b>11:40 AM</b>	<b>15</b>	<b>Break</b>				
3	11:55 AM	35	Poelker, Matthew Wang, Erdong	TJNAF BNL	Polarized Sources	Photocathodes with 90% polarization and QE greater than 1% for DOE NP	Poelker
4	12:30 PM	30	Ringle, Ryan	MSU	Gas Stoppers	Gas Stopper Developments for Improved Purity and Intensity of Low-Energy, Rare Isotope Ion Beams	Ringle
5	1:00 PM	35	Kelly, Michael Kutsaev, Sergey Posen, Sam	ANL RadiaBeam FNAL	SRF	Development of Practical Niobium-Tin Cavities for Ion Linacs	Kelly
	<b>1:35 PM</b>	<b>55</b>	<b>Lunch</b>				
6	2:30 PM	30	Hernandez-Garcia, Carlos	TJNAF	Electron Sources	High Voltage Insulators and Electrodes for 500 kV DC High Voltage Photogun with Inverted Insulator Design	Hernandez-Garcia
7	3:00 PM	35	Litvinenko, Vladimir Yakovlev, Vyacheslav Poelker, Matthew Jing, Yichao	SUNY FNAL TJNAF BNL	SRF Electron Source	Superconducting RF electron gun	Litvinenko
8	3:35 PM	35	Powers, Tom Doleans, Marc	TJNAF ORNL	SRF	In Situ Plasma Processing of Superconducting Cavities	Powers
	4:10 PM	5	Closing Remarks				
	<b>4:15 PM</b>		<b>Adjourn</b>				



*Thank You*



## Office of Engineering & Technology (SC-24)



- **ARDAP (SC-24.2) will**
  - Develop and maintain a long-term accelerator science & technology (AS&T) strategy
  - Help to coordinate and maximize the synergy of the individual SC Programs' AS&T investments.
  - Invest in R&D and public-private partnerships to help rebuild the U.S. supply chain
  - Invest in use-inspired basic R&D to transition technology into broader applications in medicine, security, and industry.



## ARDAP Mission

*...is to coordinate and make accelerator R&D and production investments that are aimed at addressing Accelerator Science & technology (AS&T) gaps to help ensure that future U.S. accelerator-based physical science R&D priorities will be met.*

▪ **ARDAP will fulfill its mission by:**

- Maintaining a strategic picture of AS&T needs and worldwide competition;
- Facilitating coordination of Programmatic AS&T R&D investments across SC;
- Investing in selected cross-cutting AS&T areas;
- Providing a system engineering perspective for SC facility projects;
- Supporting workforce development, when needed;
- Maturing key AS&T technologies and developing capable U.S. vendors;
- Transitioning accelerator technology to broader uses.

**Objective: Ensure a robust pipeline of next-generation AS&T to support physical sciences research while providing technology advances and industrial strength that position the U.S. to lead the world for decades to come.**



# FY 2022-23 NP Planned/issued FOAs

FOA Title	Planned Release date	Eligible Institutions
Accelerator R&D for next generation NP facilities	2022 Issued Feb. 10 and awards selected	Universities and SC/NSSA Labs
AI/ML for NP Accelerators, Experiments, simulations and theory	2023 released this month	Universities and SC/NSSA Labs

- **For Accelerator R&D FOA:** *R&D for next generation NP facilities or improving capabilities of current NP Facilities. Specific interests includes but not limited to Next generation ion sources, Polarized electron photocathodes and in situ plasma processing of cryomodules. May also includes components of high priority NP related “SC Accelerator Initiatives”.*
- **For AI/ML FOA:** *In support of technical development at the intersections between real-time ML and the control and optimization of accelerator systems operation and detector design using AI models. **General approach:** Use of AI/ML tools and methods for experiments, simulation, theory and accelerator operation to expand scientific outreach*