

Nuclear Physics SBIR/STTR Program :

SBIR/STTR Exchange Meeting
August 8-9, 2017
Gaithersburg, MD

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Industrial Concepts

DOE Office of Science
Office of Nuclear Physics



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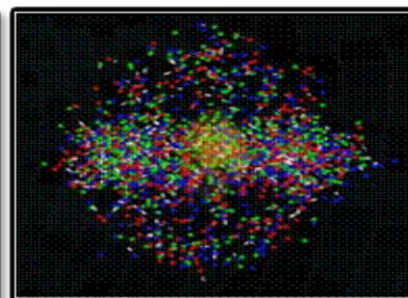
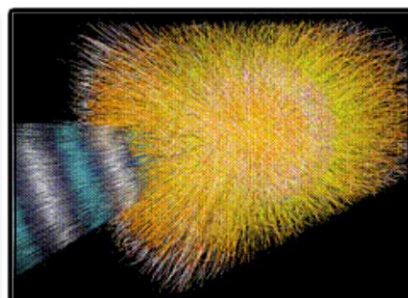
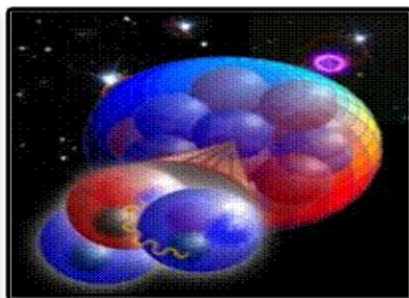
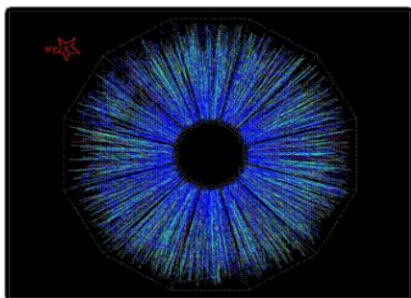
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Nuclear Physics' Mission

Discovering, exploring, and understanding all forms of nuclear matter

The Scientific Challenges

- The existence and properties of nuclear matter under extreme conditions, including that which existed at the beginning of the universe
- The exotic and excited bound states of quarks and gluons, including new tests of the Standard Model
- The ultimate limits of existence of bound systems of protons and neutrons
- Nuclear processes that power stars and supernovae, and synthesize the elements
- The nature and fundamental properties of neutrons and the neutrino and their role in the evolution of the early universe





At Present NP Operates 3 National Scientific User Facilities and is building a 4th

“Microscopes” capable of groundbreaking research



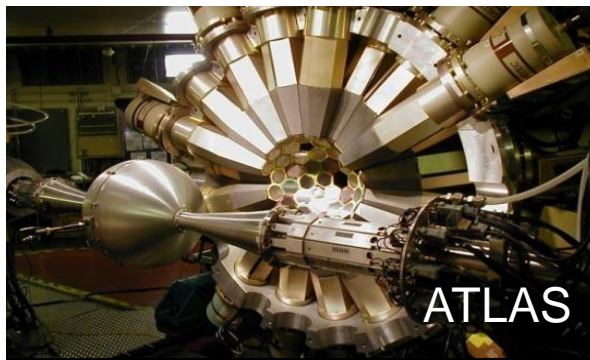
RHIC

Relativistic Heavy Ion Collider



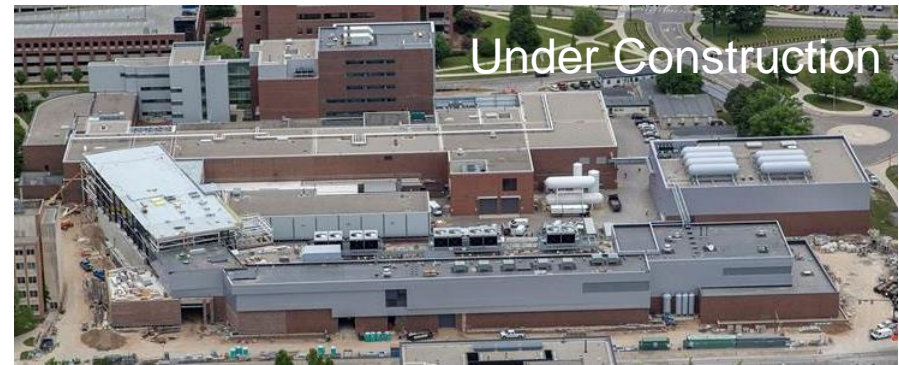
CEBAF

Continuous Electron Beam Accelerator Facility



ATLAS

Argonne Tandem Linac Accelerator System



Under Construction

Facility for Rare Isotope Beams at MSU

NP Isotope Program Mission

The **mission** of the DOE Isotope Program is threefold:

- Produce and/or distribute radioactive and stable isotopes that are in short supply, associated byproducts, surplus materials and related isotope services.
- Maintain the infrastructure required to produce and supply isotope products and related services..



Isotope Production Facility (LANL)



Brookhaven Linac Isotope Producer

- Conduct R&D on new and improved isotope production and processing techniques which can make available new isotopes for research and applications.

This can relate to the SBIR Isotope Topic
Attend Dr. Ethan Balkin's presentation for more details



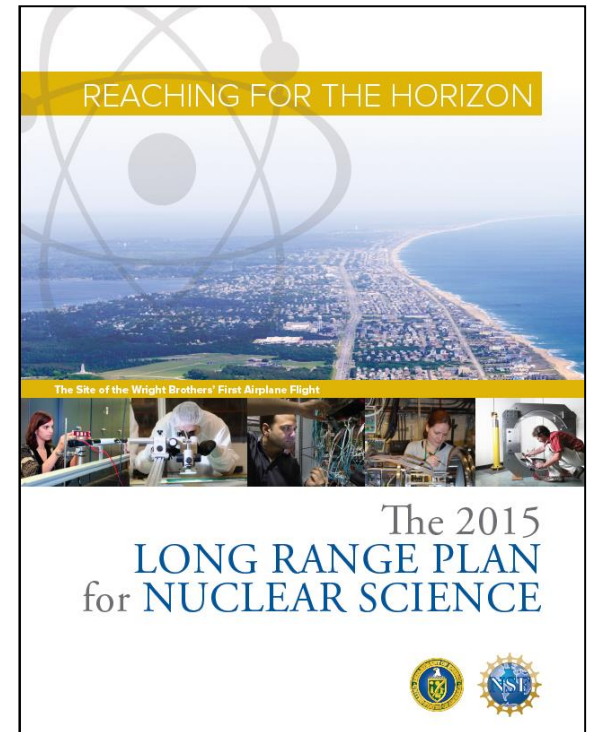
The 2015 Long Range Plan for Nuclear Science prioritizes our R&D

NSAC and APS DNP partnered to tap the full intellectual capital of the U.S. nuclear science community in identifying exciting, compelling, science opportunities

Recommendations:

- The progress achieved under the guidance of the 2007 Long Range Plan has reinforced U.S. world leadership in nuclear science. ***The highest priority in this 2015 Plan is to capitalize on the investments made.***
- The observation of neutrinoless double beta decay in nuclei would...have profound implications.. ***We recommend the timely development and deployment of a U.S.-led ton-scale neutrinoless double beta decay experiment.***
- Gluons...generate nearly all of the visible mass in the universe. Despite their importance, fundamental questions remain.... These can only be answered with a powerful new electron ion collider (EIC). ***We recommend a high-energy high-luminosity polarized EIC as the highest priority for new facility construction following the completion of FRIB.***
- ***We recommend increasing investment in small-scale and mid-scale projects and initiatives that enable forefront research at universities and laboratories.***

http://science.energy.gov/~media/np/nsac/pdf/2015LRP/2015_LRPNS_091815.pdf



NP is implementing these recommendations which are supported in the FY 2017 budget.



SBIR/STTR Exchange Meeting

- NP is seeking to effectively assess the performance of NP supported SBIR/STTR projects in contributing to the NP mission and goals. Started in FY2010, the Exchange meeting is designed to serve that purpose and to achieve the following goals:
 - To **provide a platform** for small businesses to present the status of NP-supported Phase II grant work to the NP community and Federal Program Managers.
 - To offer an opportunity to **exchange information** regarding the **companies' capabilities** and the technical needs of the NP programs.
 - To **strengthen the ties** of the SBIR/STTR businesses **with the community** and enhance the possibilities for commercialization.
- For this year's meeting, all Phase II awardees at the end of Year -1, Year-2 (started in FY015 and 16) and awardees still active under "no cost extension" are invited. A total of **22** SBIR/STTR presentations will be given in 2 days.
- FY 2017 Phase II awardees are invited as participants only and will be invited to present in the next two year's meetings.
- Also included are four keynote talks related to the NP user facilities, their capabilities and needs in view of the NP SBIR program.
- A talk by the DOE SBIR/STTR Program office's AD will be at the end of the meeting.
- Abstracts for the PI presentations are available:
[http://science.energy.gov/~media/np/pdf/sbir%20sttr/SBIR_STTR_2017/Presentation_A
bstracts.pdf](http://science.energy.gov/~media/np/pdf/sbir%20sttr/SBIR_STTR_2017/Presentation_Abstracts.pdf)



2017 Exchange Meeting Agenda (Day 1)

Meeting Agenda-Day 1

Time	Dur. (min)	Grant Title	Speaker	Organization	NP SBIR/ STTR Topic	Grant Status
Tuesday, August 8, 2017						
8:30 AM	5	Welcome and Opening Remarks	Gillo, Jehanne	DOE, Office of Nuclear Physics		
8:35 AM	5	Introductory Remarks	Farkhondeh, Manouchehr	DOE, Office of Nuclear Physics		
8:40 AM	35	NP SBIR/STTR Program Overview	Shinn, Michelle	DOE, Office of Nuclear Physics		
1	9:15 AM	25	Design and manufacture of tunable permanent magnet based quadrupole for next generation electron-ion colliders	Choi, Heeju	Electron Energy Corporation, PA	Accelerator Year 1/FastTrack
2	9:40 AM	25	Data Processing Electronics for Silicon Photomultipliers	Skulski, Wojciech	SkuTek Instrumentation, NY	Electronics End Year 1
	10:05 AM	25	Coffee Break			
3	10:30 AM	25	GaN Class F Power Amplifier for Klystron Replacement	Smirnov, Alexei	RadiaBeam Systems, CA	Accelerator End Year 1
	10:55 AM	35	NP Low Energy Facilities and the SBIR/STTR Program			
4	11:30 AM	25	A CW L-Band Micro-Pulse Klystron	Mako, Frederick	FM Technologies, Inc., VA	Accelerator End Year 1
5	11:55 AM	25	Multi-scale modeling for beam-beam depolarization	Cowan, Benjamin	Tech-X Corporation, CO	Accelerator End Year 1
	12:20 PM	75	Lunch Break (on your own)			
6	1:35 PM	25	Radiation Hard High Speed Camera System for Accelerator Beam Diagnostics	Levy, Andrew	Alphacore Inc, DE	Instrumentation End Year 1
	2:00 PM	35	Jefferson Lab and its SBIR/STTR Program			
7	2:35 PM	25	A novel injection-locked amplitude-modulated magnetron at 1497 MHz	Neubauer, Michael	Muons, Inc., Batavia, IL	Accelerator End Year 1
8	3:00 PM	25	Design and Implementation of Digital Electronics for Fast Readout and Processing of Multi-Channel Experimental Data	Sadwick, Larry	InnoSys Inc., UT	Instrumentation End Year 1
9	3:25 PM	25	Charge collection physics in very large diameter germanium crystals	Hull, Ethan	PHDs Co., Knoxville, TN	Instrumentation End Year 1
	3:50 PM	25	Coffee Break			
10	4:15 PM	25	Novel Position-Sensitive Particle Tracking Gas Detector	Friedman, Peter	Integrated Sensors, OH	Instrumentation End Year 1
11	4:40 PM	25	100W Mode Locked Green Laser for GaAs Photoemission Guns	Geng, Jihong	AdValue Photonics Inc, AZ	Accelerator End Year 2
12	5:05 PM	25	Nb-on-Cu Cavities for 700-1500 MHz SRF Accelerators	Krishnan, Mahadevan	Alameda Applied Sciences Corporation, San Leandro, CA	Accelerator End Year 2
13	5:30 PM	60	Informal Discussion on Challenges and Best Practices for Commercialization			

Given the positive feedback, we are continuing the informal discussion between interested participants on best practices for commercialization at the end of the first day.



2017 Exchange Meeting Agenda (Day 2)

Meeting Agenda-Day 2

	Time	Dur. (min)	Grant Title	Speaker	Organization	NP SBIR/ STTR Topic	Grant Status
Wednesday, August 9, 2017							
14	8:30 AM	25	Templated Micro-Channel Thermal Control System	Kimble, Michael	Reactive Innovations, LLC, MA	Electronics	End Year 2
15	8:55 AM	25	Compact Gamma Ray Source for On-Site Calibration of Radiation Detectors	Yu, David	DULY Research Inc., CA	Instrumentation	End Year 2
16	9:20 AM	25	Acid-Free Electropolishing of SRF Cavities	Taylor, E. Jennings	Faraday Technology, Inc., OH	Accelerator	End Year 2
17	9:45 AM	20	Low Cost, High-Density Digital Electronics for Nuclear Physics	Skulski, Wojciech	SkuTek Instrumentation, NY	Electronics	End Year 2/PH IIB
18	10:05 AM	25	Diamond sensor for the neutron electric dipole moment experiment	Hovde, David	Southwest Sciences, Inc., NM	Instrumentation	End Year 2
	10:30 AM	30	Coffee Break				
	11:00 AM	35	The Relativistic Heavy Ion Collider Facility and the SBIR/STTR Program	Wu, Qiong	Brookhaven National Laboratory		
19	11:35 AM	25	Low Z Thin Film Stripper Foils, Targets and X-Ray Windows	Kumar, Nalin	UHV Technologies, Inc., TX	Instrumentation	End Year 2
20	12:00 PM	25	Solid-State Neutron Detectors with Integrated Electronics for Nuclear Physics	Christian, James	Radiation Monitoring Devices, Inc., MA	Accelerator	End Year 2
	12:25 PM	75	Lunch Break (on your own)				
	1:40 PM	35	DOE Isotope Program and Facilities and the SBIR/STTR Program	Balkin, Ethan	DOE Office of Nuclear Physics & DOE Isotope Program		
22	2:15 PM	25	Flat Field Emitter Based on Ultrananocrystalline Diamond (UNCD) Film for SRF Technology (Topic Nuclear Physics)	Jing, Chunguang	Euclid Techlabs, LLC, OH	Accelerator	End Year 1
	2:40 PM	25	Coffee Break				
23	3:05 PM	25	Thermo-Mechanically Stable Tungsten Powders as Solid Catchers for the Fast Release of Stopped Rare Isotopes	Sampathkumaran, Uma	InnoSense LLC, Torrance, CA	Instrumentation	End Year 2
24	3:30 PM	25	Ferroelectric Based High Power Components for L-Band Accelerator Applications	Kanareykin, Alexei	Euclid Techlabs, LLC, OH	Accelerator	No Cost Extension
25	3:55 PM	35	Update on the Department of Energy SBIR/STTR Program, Q/A	Oliver, Manny	DOE, SBIR/STTR Office		
25	4:30 PM	0	Adjourn				

SBIR/STTR

SBIR: Small Business Innovation Research **STTR:** Small Business Technology TRansfer.

- **SBIR:** Set-aside program for U.S. small businesses (SB) to engage in Federal Research and Development (R&D) with potential for commercialization. (Participations: **SB: minimum 66 % for Phase I and 50% for Phase II, Research Institution (RI): optional**)
- **STTR:** Set-aside program to facilitate cooperative R&D between SB and U.S. RI with potential for commercialization. (Participations: **SB: minimum 40%, RI: minimum 30%**)
- **“Both”:** submitted for consideration as SBIR or STTR (both). Must satisfy the minimum participation requirements listed above for both SBIR and STTR.
- **Fast Track:** A combined and accelerated Phase I and Phase II grant. **Eliminated since FY2017**
- Congressionally-mandated programs, funded by a small percentage of the extramural R&D budget set aside within each DOE technical program that participates.
- **2016 reauthorization bill has provided funding for the program until September 2022**



	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	----	FY2021
SBIR	0.0270	0.028	0.029	0.0300	0.0320	0.0320	----	0.0320
STTR	0.0035	0.004	0.004	0.0045	0.0045	0.0045	----	0.0045
Total	3.05%	3.20%	3.30%	3.45%	3.65%	3.65%	----	3.65%

Current SBIR/STTR Status

Phase I

Grant	Max award (\$k)	Small Business (Level of Effort)	Research Institution (Level of Effort)
SBIR	150	Min 66%	Optional
STTR	150	Min 40%	Min 30%

Phase II

Grant	Max award (\$k)	Small Business (Level of Effort)	Research Institution (Level of Effort)
SBIR	1000	Min 50%	Optional
STTR	1000	Min 40%	Min 30%

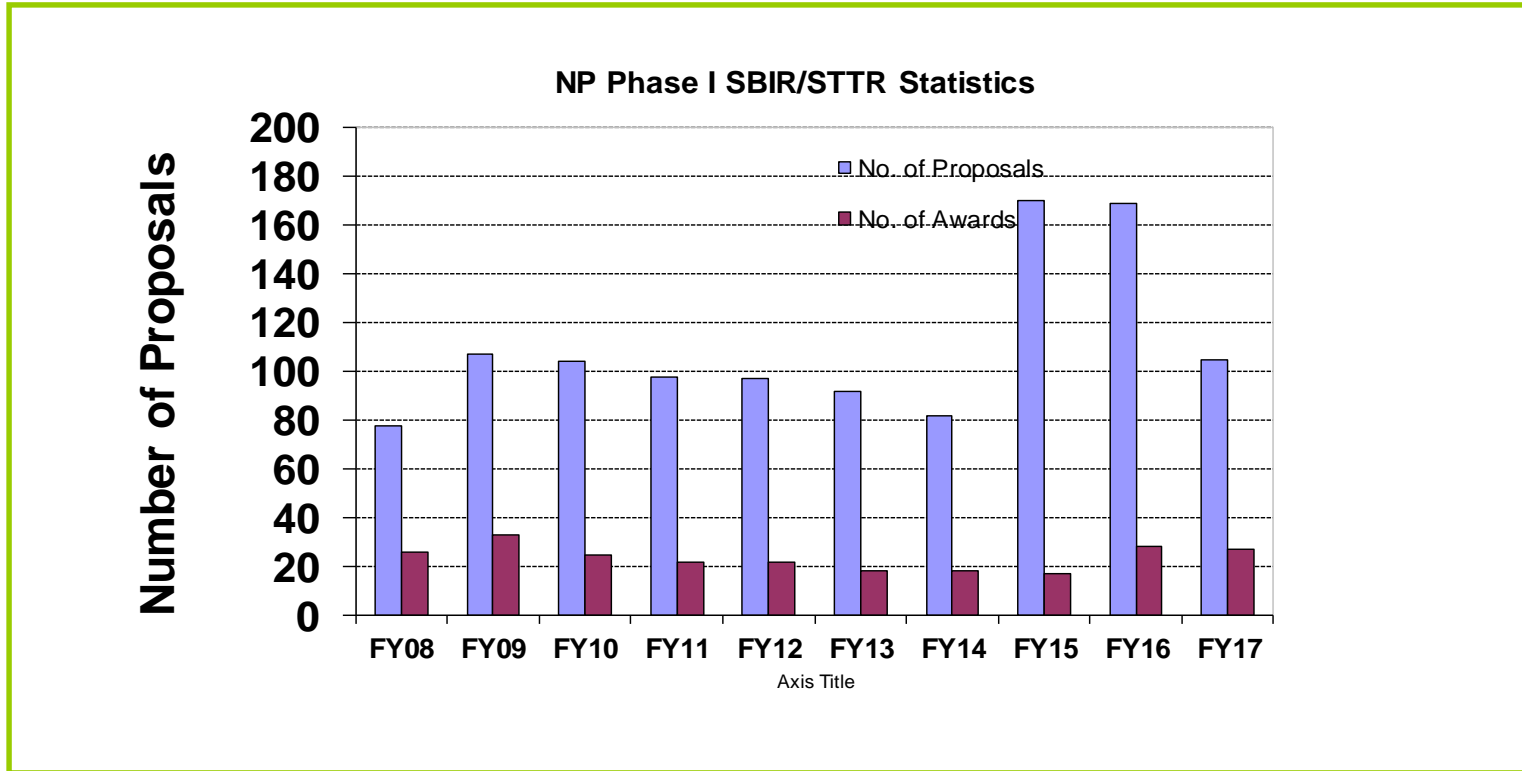
Highlights: SBIR/STTR 2016 Reauthorization Bill

- Not much different than the changes enacted with the 2012 reauthorization bill
- Maximum SBIR and STTR award amounts are now at \$225k and \$1500k for Phase I and II, respectively. NP has retained the lower amounts \$150k and \$1000k
 - This allows us to fund more companies with the available funds
- Increases the SBIR program allocation from 2.5 to 3.2 percent and the STTR allocation from 0.3 percent to 0.45 percent over the course of the reauthorization,
- Reauthorization legislation allows companies to switch between SBIR and STTR programs when they apply for Phase II
- Requires most agencies to **complete their review process for applicants within 90 days** (or 180 days if the agency is granted an extension by the SBA).
- More emphasize on commercialization and performance metrics
- More detail on **Dr. Manny Oliver's** talk tomorrow afternoon



NP Phase I SBIR/STTR Applications and Awards

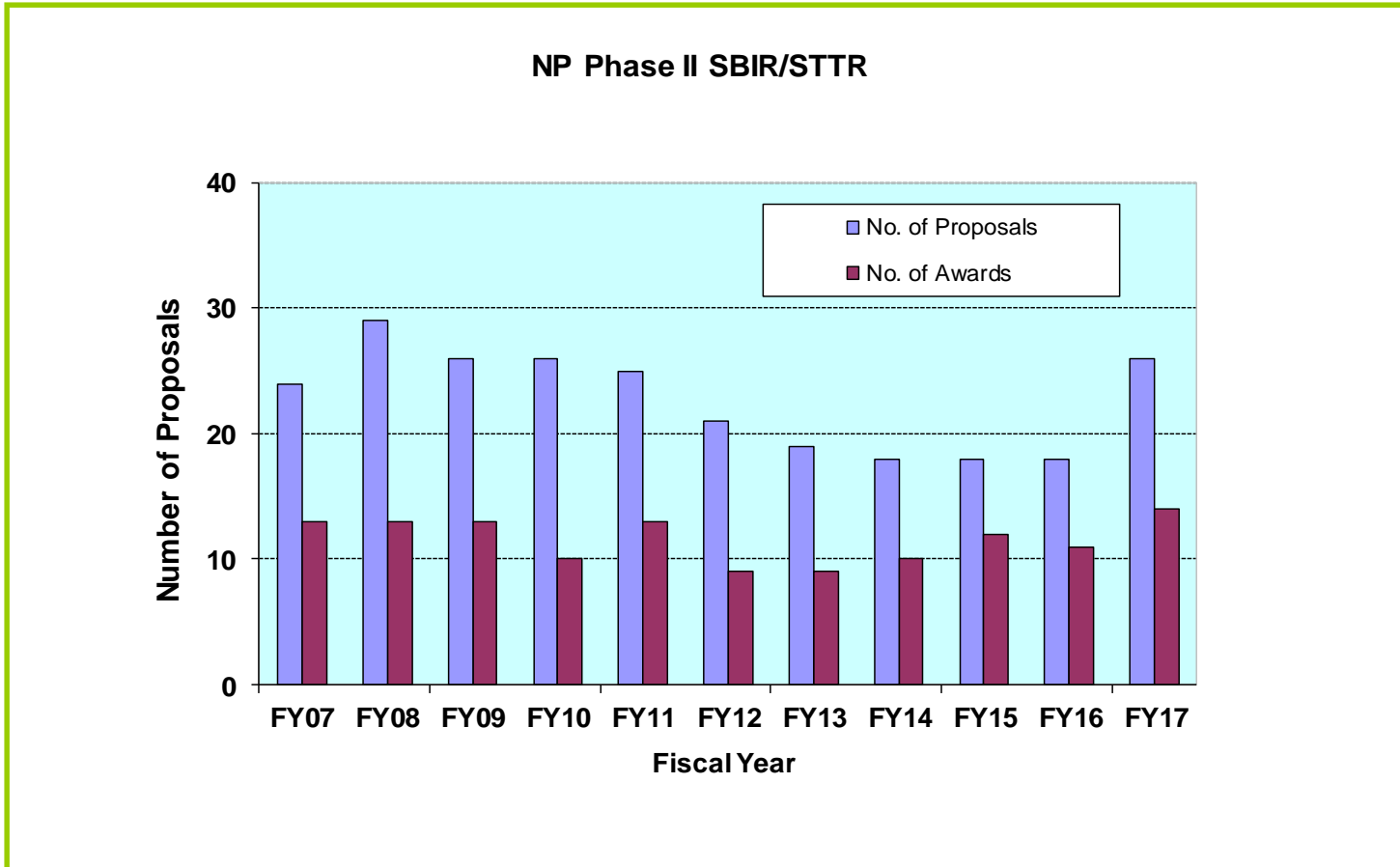
- NP received a Total of **271** LOI and **105** phase I proposals in FY 2017, with **516** review requests for a total of **~ 315** mail reviews. Total of **27** proposals funded. (cf 28 in FY16)
- Processing the number of LOIs and proposal review process requires the full-time involvement of a Program Manager, with continued assistance from the Portfolio Manager and the Topic Associates (TA).



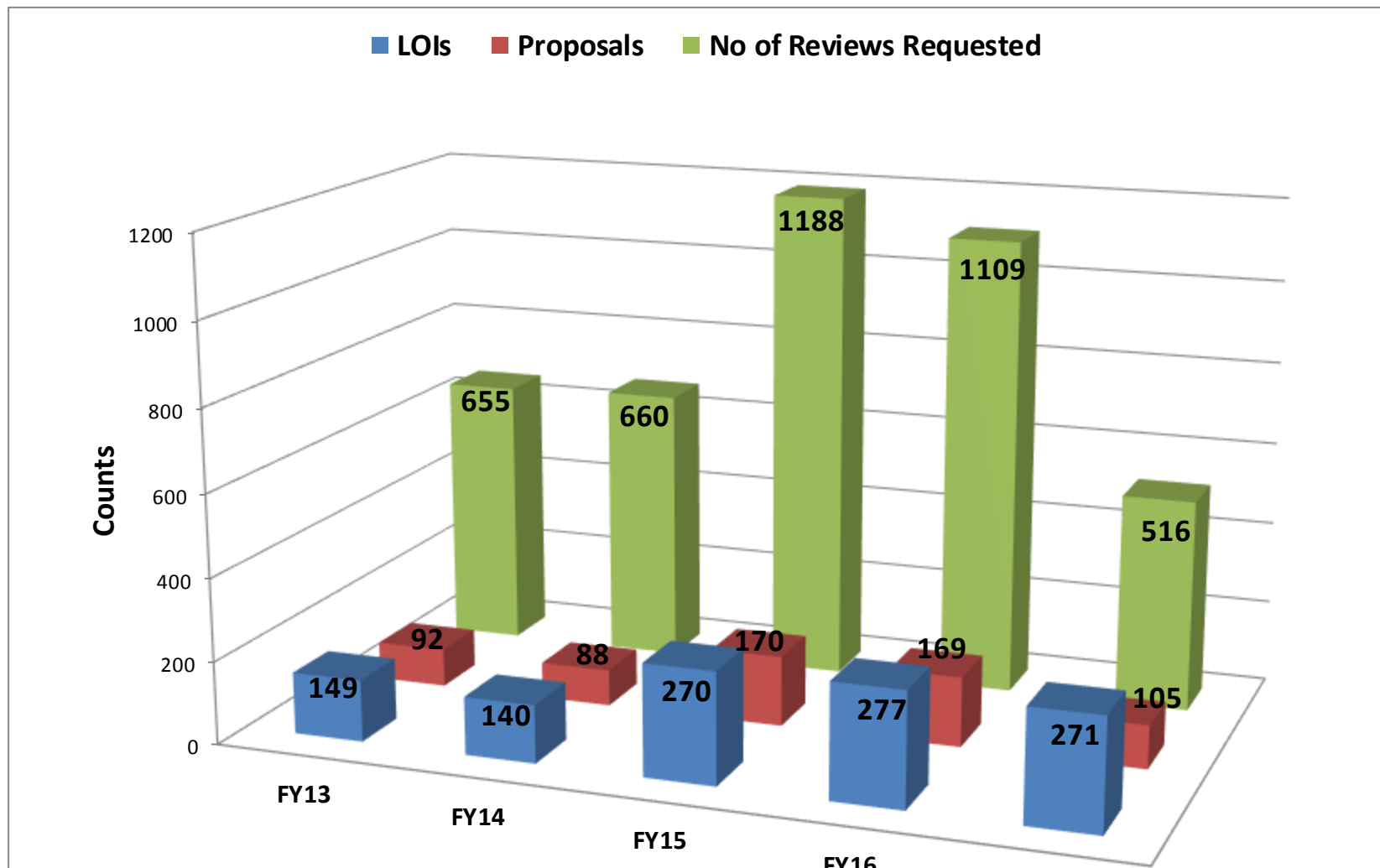


NP Phase II SBIR/STTR Applications and Awards

The increased set aside level over the last 3 years has offset the decrease in awards that occurred after the FY 2011 change in maximum SBIR award amounts from \$750K to \$1M.



NP Phase I SBIR/STTR LOIs and Applications (FY13 – FY17)



In FY15: HEP moved out of DOE Release 1's FOA

- The # of LOIs and proposals nearly doubled
- In FY17, proposals reviewed dropped due to a reduction in number of proposals and a desire to reduce duplication



NP yearly SBIR/STTR topic development process

- Start with last year's published topic document and make initial revisions based on a year-round observation of needs by Program Managers and NP community input as well as,
- Request input for each topic from subject matter experts within the NP community,
- Collect and implement all inputs on existing subtopics. Add and/or delete subtopics as necessary,
- Review HEP and BES Topics to insure we don't unnecessarily duplicate-fund companies,
- Submit the revised topics to the DOE SBIR/STTR office and,
- After further formatting iterations with the SBIR/STTR office, the topics are published in mid-July
- The solicitation is published as a Funding Opportunity Announcement (FOA) around the middle of August
- Letters of Intent to submit a proposal are due the day after Labor Day
- Proposals are due around the middle of October



NP SBIR/STTR Topics for FY 2017/2018

- Software and Data Management
 - Electronics Design and Fabrication
 - Accelerator Technology
 - Instrumentation, Detection Systems and Techniques
 - Isotope Science and Technology
-
- Once again there was a considerable amount of subtopic revision.
 - Funding Notes: There is no fixed set aside for each topic. Proposals from all 5 topics compete with each other and highly ranked applications determined to have the most impact are funded.

Sequential II A and IIB

2012 SBIR/STTR Reauthorization permitted agencies to issue **sequential Phase II awards**

• 15 USC 638 (ff) Additional SBIR and STTR awards. (1) Express authority for awarding a sequential Phase II award. A small business concern that receives a Phase II SBIR award or a Phase II STTR award for a project remains eligible to receive 1 additional Phase II SBIR award or Phase II STTR award for continued work on that project.

- Only Phase II awardees are eligible
- Only 1 additional Phase II award may be made per Phase II project

Invitation needed →

Phase IIA: For certain prototypes, products, or processes that need more than a single Phase II award. Starts immediately upon completion of the Phase II.

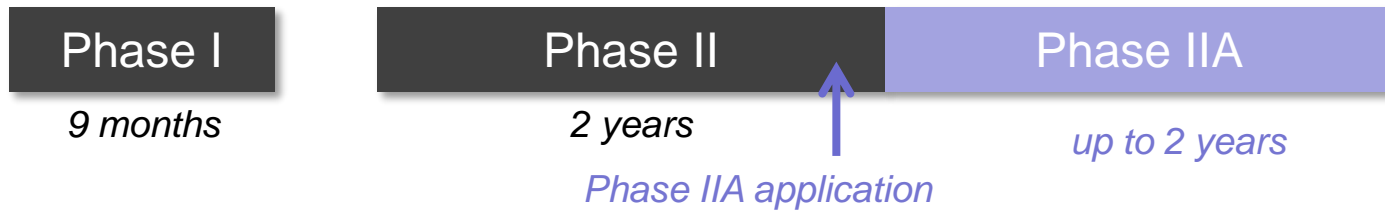
- *DOE Program Managers will select the topics/subtopics for which Phase IIA applications will be accepted (By subtopic invitation only)*

No Invitation needed →

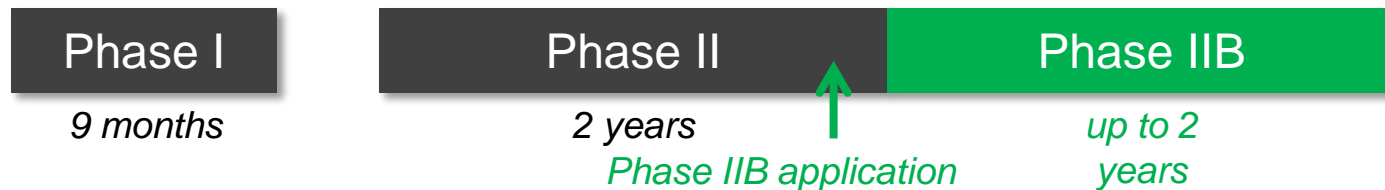
Phase IIB: For R&D funding required to transition an innovation towards commercialization. Starts immediately after completing a Phase II or up to 1 year later.

In the FY 2017 Phase II cycle: NP received 6 Phase IIB applications, peer reviewed all and 1 was funded. We received 2 Phase IIA applications and funded none of them. Sequential IIA and B compete with new Phase II applications.

Sequential Phase IIA



Sequential Phase IIB



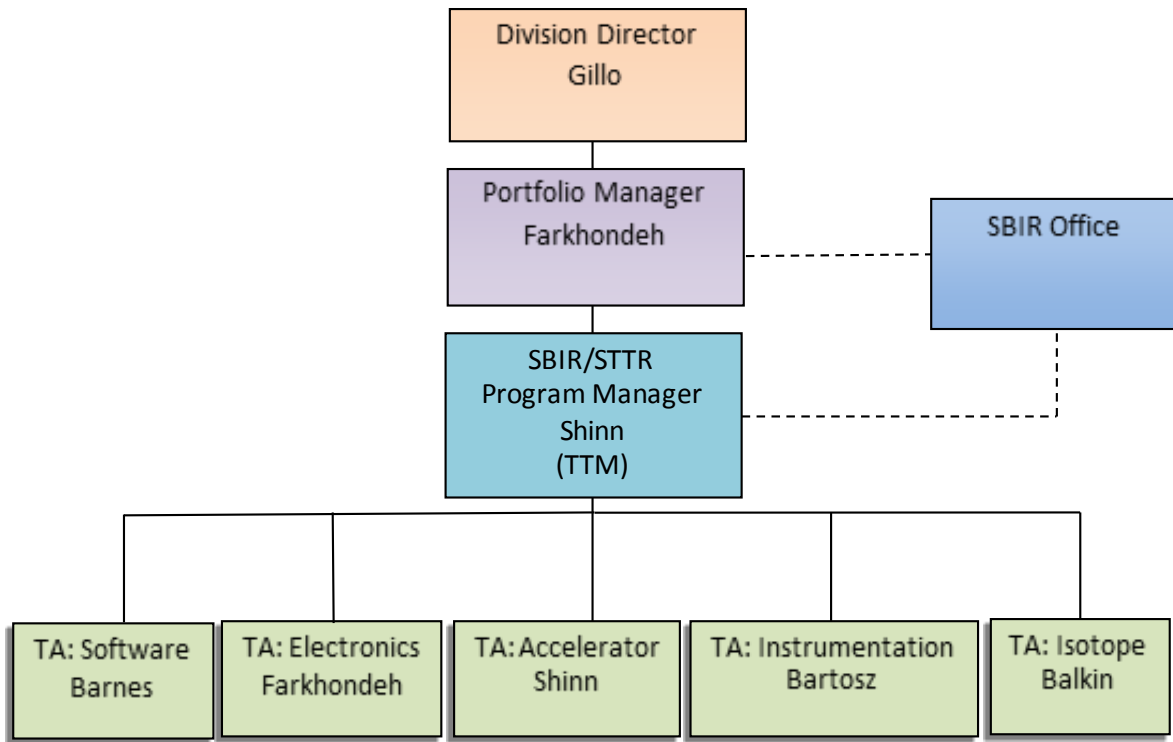


No Fund Extensions and Sequential Phase II Eligibility

- A company can only receive a Sequential Phase II award if their Phase II project has completed.
 - Phase IIA applicants should not request no fund extensions
 - Phase IIB applicants should not request no fund extensions if they are still working on their Phase II project at the time of application.



NP SBIR/STTR Org. Chart: (10/27/2016)



Technical Topic Manager (TTM)

Activities

- Communicate w/ SBIR Office
- Prepare annual solicitation
- Chair 1st step panel review
- Rank proposals
- Recommend funding
- Visit companies
- Read progress and final reports
- 2nd year continuation

Topic Associate (TA)

Activities for Assigned Topics

- Provide input to annual solicitation
- *Assign reviewers
- *Assess proposals
- Manage assigned grants
- Read reports assigned

*Time Sensitive tasks



DOE SBIR/STTR Program Changes in FY12 -17

- **DOE Publishing Phase I solicitation twice a year**
 - **Release 1:** Office of Science call for proposals August-September (FY15→: w/o HEP)
 - **Release 2:** Rest of DOE call for proposals December-January (FY15 → HEP, FES, etc.)

- **Speeding up of processing of applications:**
 - Early posting of topics (in July, a month before the FOA is issued)
 - Letter of intent required ([for process of identifying reviewers](#))

LOI: List all potential Collaborations / Subcontracts /Consultants

- **Increased emphasis on commercialization**
 - Declination of Phase I application lacking a commercialization or data management plan
 - Phase II applications with poorly rated commercialization plans, independent of their technical merit review scores, may not be eligible for funding



NP SBIR/STTR Program Changes in FY17

- We wish to better connecting businesses to the NP community.
- To do this, we provided the link to the SBIR/STTR Office awards page to all reviewers, as well as Lab managers and Center points of contact.
- Implemented Phase I project kickoff meetings by request. Specifically reached out to PIs who were new to the NP SBIR/STTR Program.
- We have an email list you can join: NP-SBIR-STTR@science.doe.gov
 - You will receive only a few emails a year,
 - Announcement of SBIR/STTR Calendar
 - Announcement and link that SBIR/STTR Topics are available
 - Announcement of grants

Notes on “Final Reports”

➤ When preparing the “Final Report” for your grant, make sure the following items are included in addition to what the instruction explicitly asks for.

- a. **List the original tasks** with brief description of each as they were originally proposed in the grant application.
- b. **A short description of accomplishments** for each task indicating the degree to which each task was accomplished. Include a short description if a listed task was not accomplished or was modified.
- c. Add to the cover page the phrase "**Grant supported by DOE Office of Nuclear Physics**".

➤ These items should add only a few pages to the report but provide a valuable reference and structure in the report by connecting the original tasks to the accomplishments.

➤ Reports are normally returned for revisions if above items not included.

Presentation Notes

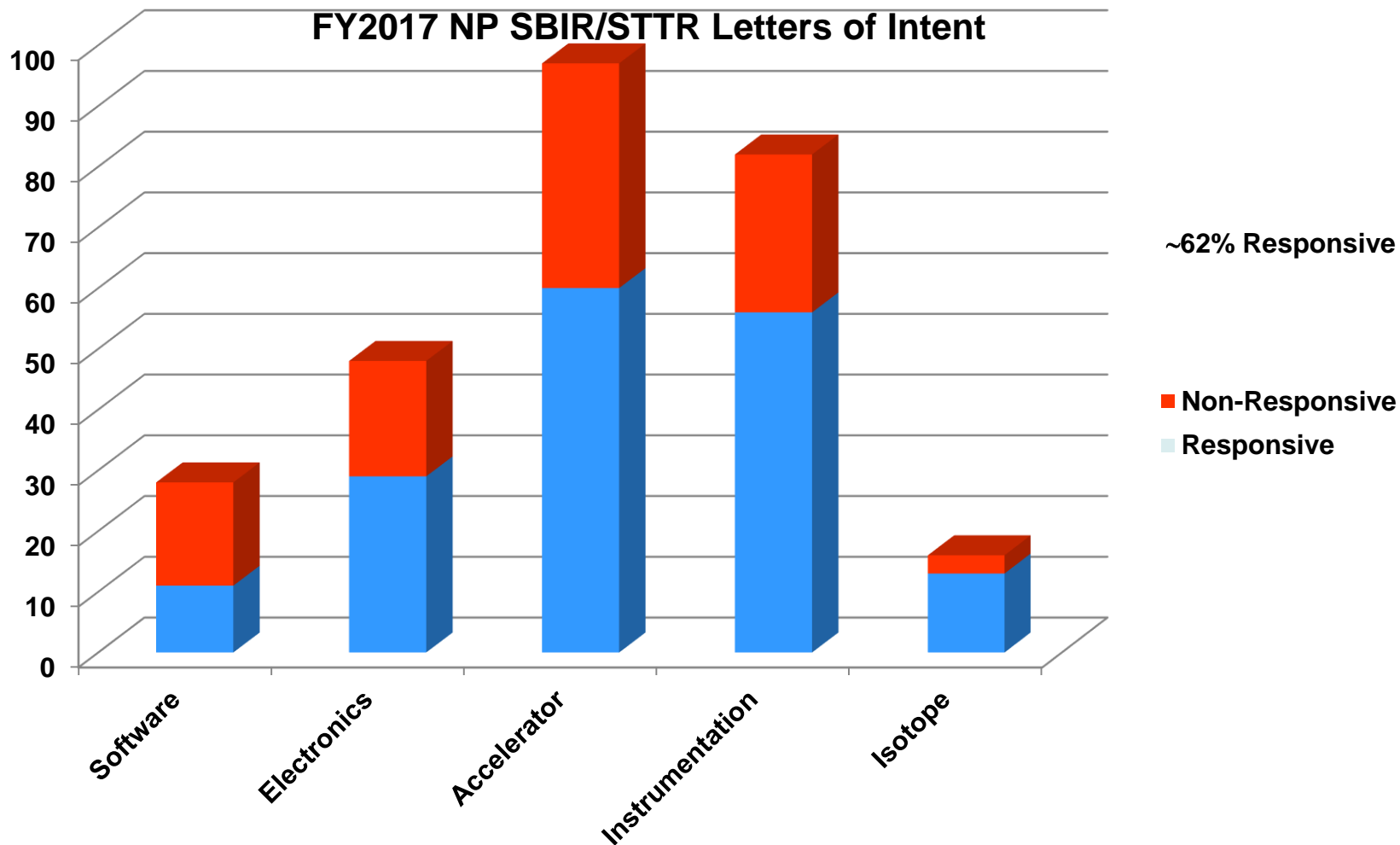
- We have a tight agenda and must stay on time for each presentation.
- Sessions will start sharply at the time stated on the agenda. Please take your seat a few minutes before the start of each session to allow the first presentation to begin on time.
- Make sure your presentation file is uploaded on the display laptop before the start of your session. We do not want you to use your own computer.
- For Q&A sessions, please make your comments /questions short and use the coffee and lunch breaks for follow ups.

Total presentation (min)	Presentation (min)	Q&A (min)	5 and 2 minutes warning @ (min)
35	25	10	20 & 23
30	20	10	15 & 18
25	18	7	13 & 16

Supplemental Material



NP Phase I SBIR/STTR LOIs Responsiveness (FY2017)





NP Topic 1 Software and Data Management

- a. Large Scale Data Storage
- b. Software-driven Network Architectures for Data Acquisition
- c. Data Science/Distributed Computing Applications
- d. Heterogeneous Concurrent Computing
- e. Other

FY17	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	6	0	0	6	12
# of Awards	1	0	0	1	

Phase I

FY16	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	15	0	0	15	24
# of Awards	1	0	0	1	



NP Topic 2 Electronics Design and Fabrication

- a. Advances in Digital Processing Electronics
- b. Front-End Application-Specific Integrated Circuits
- c. Advanced Devices and Systems
- d. Next Generation Pixel Sensors
- e. Manufacturing and Advanced Interconnection Techniques
- f. Other

FY17	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	25	0	0	18	48
# of Awards	5	1	0	6	

Phase I

FY16	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	18	0	0	18	43
# of Awards	3	0	0	3	



NP Topic 3 Accelerator Technology

- a. Materials and Components for Radio Frequency Devices
- b. Radio Frequency Power Sources
- c. Design and Operation of Radio Frequency Beam Acceleration Systems
- d. Particle Beam Sources and Techniques
- e. Polarized Beam Sources and Polarimeters
- f. Rare Isotope Beam Production Technology
- g. Accelerator Control and Diagnostics
- h. Magnet Development for Proposed Future Electron-Ion Colliders (EIC)
- i. Accelerator Systems Associated with the Capability to Deliver Heavy-Ion Beams to Multiple Users
- j. Other

Phase I

FY17	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	33	5	0	38	97
# of Awards	12	1	0	13	
FY16	SBIR	STTR/B oth	Fast Track	Total	LOI
# of Applications	77	8	3	85	123
# of Awards	13	2	1	16	



NP Topic 4 Instrum. Detection Sys. and Techniques

- a. Advances in Detector and Spectrometer Technology
- b. Development of Novel Gas and Solid-State Detectors
- c. Technology for Rare Decay and Rare Particle Detection
- d. High Performance Scintillators, Cherenkov Materials and Other Optical Components
- e. Specialized Targets for Nuclear Physics Research
- f. Technology for High Radiation environments
- g. Other

Phase I

FY17	SBIR	STTR/ Both	Fast Track	Total	LOI
# of Applications	22	4	0	26	75
# of Awards	6	1	0	7	

FY16	SBIR	STTR/ Both	Fast Track	Total	LOI
# of Applications	39	6	3	45	75
# of Awards	7	1	0	8	

NP Topic 5 Isotope Science and Technology

- a. Novel or Improved Production Techniques for Radioisotopes or Stable Isotopes
- b. Improved Radiochemical Separation Methods for Preparing High-Purity Radioisotopes
- c. Other

FY17	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	5	3	0	8	13
# of Awards	0	0	0	0	

Phase I

FY16	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	3	3	0	6	12
# of Awards	0	0	0	0	

Back up Slides



Transition Rate Metrics

- Phase II → Phase III success rate
 - Applies to companies that have received > 15 Phase II awards during the last 10 fiscal years, excluding the two most recently completed fiscal years
 - Metric calculation example for FY 2012

$$\frac{\text{Total Investment + Revenue from Phase II Awards FY 2000 – 2009}}{\text{Number of Phase II Awards FY 2000 – 2009}} \geq \$100,000$$

OR

$$\frac{\text{Number of Patents from Phase II Awards FY 2000 – 2009}}{\text{Number of Phase II Awards FY 2000 – 2009}} \geq 0.15$$





Transition Rate Metrics

- Companies that fail to meet the either metric will be ineligible to apply for any Phase I awards for 1 year.
- Companies can see if they fail to meet either metric by checking the SBA company registry (SBIR.gov)
- Implementation
 - Phase I → II Transition Rate metric will be included in the FY 2014 and future Phase I Funding Opportunity Announcements
 - Phase II → III Transition Rate metric will be included in the FY 2015 and future Phase I Funding Opportunity Announcements

