Nuclear Physics SBIR/STTR Program :

SBIR/STTR Exchange Meeting
August 6-7, 2014
Gaithersburg, MD

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Office of Nuclear Physics

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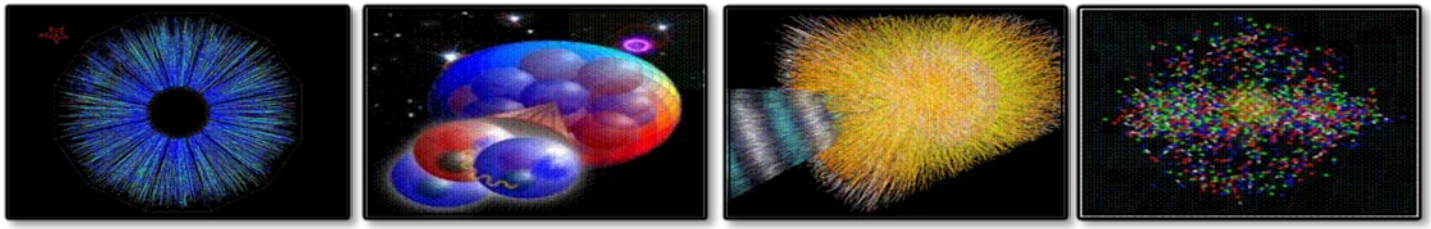
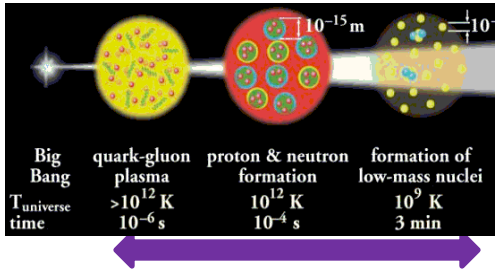
Mission Statement Office of Nuclear Physics

Mission: To discover, explore and understand all forms of nuclear matter; to understand how the fundamental particles, quarks and gluons, fit together and interact to create different types of matter in the universe, including those no longer found naturally.



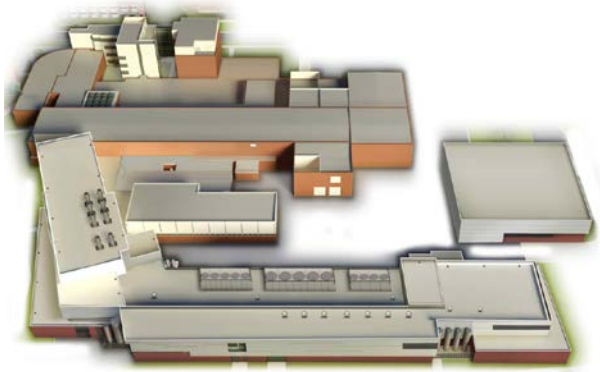


Nuclear Physics

RHIC collider at BNL.

CEBAF at TJNAF

ATLAS at ANL



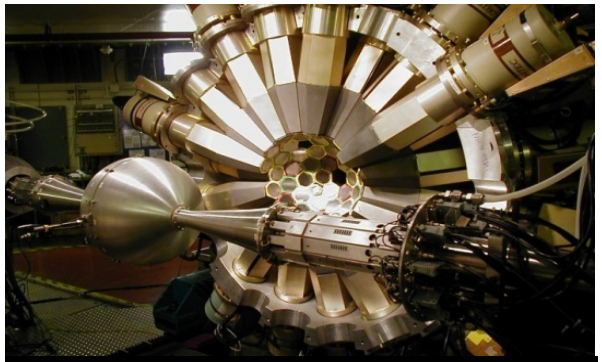
FRIB at MSU

At Present NP Operates three National User Facilities

"Microscopes" capable of groundbreaking research

Relativistic Heavy Ion Collider

Continuous Electron Beam Accelerator Facility



Argonne Tandem Linac Accelerator System

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..

- 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 SBIR Isotope Topic

Isotope Production Facility (LANL)

Brookhaven Linac Isotope Producer

SBIR/STTR Exchange Meeting

- The DOE Office of Nuclear Physics (NP) is seeking to effectively assess the performance of NP supported SBIR/STTR projects in contributing to the NP mission and goals. The meeting today 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 in at the end of Year -1,Year-2 ***(started in FY012 and 13) and awardees still active under "no cost extension" are invited. A total of 26 SBIR/STTR presentations will be given in 2 days. FY 2014 Phase II awardees will be invited in next year's meeting.***
- Also included are four talks related to the NP user facilities, their capabilities and needs in view of the NP SBIR program.
- A talk by DOE SBIR/STTR Program Director at the end of the meeting.

U.S. DEPARTMENT OF ENERGY | Office of Science

2014 Exchange Meeting Agenda (Day 1)

August 6-7, 2014

Hilton Washington, DC North, Gaithersburg, Maryland

Meeting Agenda-Day 1

Time	Dur.	Presentation Title	Speaker	Organization	NP SBIR/ STTR Topic	Grant Status
Wednesday, August 6, 2014						
8:30 AM	5	Welcome and Introductory Remarks	Jehanne Gillo	DOE, Office of Nuclear Physics		
8:35 AM	35	NP SBIR/STTR Program Overview	Manouchehr Farkhondeh	DOE, Office of Nuclear Physics		
9:10 AM	25	High-Performance Plasma Panel Based Micropattern Detector	Peter Friedman	Integrated Sensors, LLC	Instrument.	end year 2
9:35 AM	25	High Specific Activity Sm-153 By Post Irradiation Isotope Separation	Alan Ketring	IsoTherapeutics Group LLC	Isotope	end year 2
10:00 AM	25	Coffee Break				
10:25 AM	25	Integrated Modeling Tool for Electron-Beam Based Ion-Sources	Jin-Soo Kim	Far-Tech, Inc.	Accelerator	end year 2
10:50 AM	35	NP Low Energy Facilities and the SBIR/STTR Program	Georg Bollen	Michigan State University and FRIB		
11:25 AM	25	High Radiation Environment Nuclear Fragment Separator Magnet	Stephen Kahn	Muons, Inc.	Accelerator	end Year 2
11:50 AM	25	High Density Low Cost Readout Electronics for Large Scale Radiation Detectors	Peter Grudberg	XIA, LLC	Electronics	end Year 2
12:15 PM	60	Lunch Break				
1:15 PM	25	High-Performance ADC for Particle Accelerator Instrumentation Applications	Doug Goodman	Ridgetop Group, Inc	Electronics	end Year 2
1:40 PM	35	TJNAF Facility and the SBIR/STTR Program	Geoffrey Krafft	Thomas Jefferson National Accelerator Facility		
2:15 PM	25	Thin-Window P-Type Point-Contact Germanium Detectors for Rare Particle Detection	Ethan Hull	PHDs Co.	Instrument.	end year 2
2:40 PM	25	Novel Polishing Process to Fabricate Ultra Low Thickness Variation Diamond Substrates for Next Generation Beam Tracking Detectors	Arul Arjunan	Sinmat Inc.	Instrument.	end year 2
3:05 PM	25	Enhanced Quantum Efficiency of Photocathodes with Polarized Emission	Aaron Moy	SVT Associates, Inc.	Accelerator	end year 2
3:30 PM	20	Coffee Break				
3:50 PM	25	GaAsSb/AlGaAs Superlattice High-Polarization Electron Source	Yiqiao Chen	SVT Associates, Inc.	Accelerator	end year 1
4:15 PM	25	Solid Catcher Materials Development at InnoSense for a Variety of Rare Isotopes	Uma Sampathkumaran	InnoSense, LLC	Accelerator	end year 1
4:40 PM	25	Development at Argonne in Support of the Innonsense Solid Catcher for Energetic Radioactive Beams	Jerry Nolen	ANL /Innosense	Accelerator	end year 1
5:05 PM	20	Modular Planar Germanium (MPGe) Detector Systems for High Resolution Gamma-ray Spectroscopy and Tracking Arrays	Ethan Hull	PHDs Co.	Instrument.	end year 1
5:25 PM	20	SOI CMOS Process for Monolithic, Radiation-Tolerant, Science-Grade Imagers	George Williams	Voxtel, Inc.	Electronics	No Cost Extension
5:45 PM		Adjourn				

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Agenda (Day 2)

DOE-NP SBIR/STTR Exchange Meeting

Meeting Agenda-Day 2

Time	Dur.	Presentation Title	Speaker	Organization	NP SBIR/ STTR Topic	Grant Status
Thursday, August 7, 2014						
8:30 AM	25	Development of MgB2 Superconducting Coils for Nuclear Physics Applications	Matthew Rindfleisch	Hyper Tech Research,Inc.	Accelerator	end year 1
8:55 AM	25	Commercial Superconducting Electron Linac for Radioisotope Production	Terry Grimm	Niowave, Inc.	Isotope	end year 1
9:20 AM	25	Production of Commercial High Specific Activity Sn-117M Radiochemical and Chelates	Nigel Stevenson	Clear Vascular, Inc.	Isotope	end year 1
9:45 AM	25	Ferroelectric Based High Power Components for L-Band Accelerator Applications	Alex Kanareykin	Euclid TechLabs, LLC	Accelerator	end year 1
10:10 AM	25	Digital SQUID Magnetometers for Read-out of Detectors and Magnetic Particles	Masoud Radparvar	Hypres, Inc.	Electronics	end year 1
10:35 AM	30	Coffee Break				
11:05 AM	35	RHIC Facility and the SBIR/STTR Program	Wolfram Fischer	Brookhaven National Laboratory		
11:40 AM	25	Advance Additive Manufacturing Method for SRF Cavities of Various Geometries	Pedro Frigola	RadiaBeam Technologies, LLC	Accelerator	end year 1
12:05 PM	25	Thin Diamond Time-of-Flight Detectors	Joseph Tabeling	Applied Diamond, Inc	Instrument.	end year 1
12:30 PM	60	Lunch Break				
1:30 PM	20	Chemical Free Surface Processing for High Gradient Superconducting RF Cavities	Linton Floyd	FM Technologies, Inc.	Accelerator	No Cost Extension
1:50 PM	30	NP Isotope Program and Facilities and the SBIR/STTR Program	Kevin John	Los Alamaos National Laboratory		
2:20 PM	20	Development of High-Efficiency Power Amplifiers for 704 MHz	Frederick Raab	Green Mountain Radio Research Co.	Accelerator	No Cost Extension
2:40 PM	20	Defect Free, Ultra-Rapid Thinning/Polishing of Diamond Crystal Radiator Targets (20um) for Highly Linearly Polarized Photon Beams	Arul Arjunan	Sinmat Inc.	Instrument.	No Cost Extension
3:00 PM	15	Coffee Break				
3:15 PM	15	Growth of large diameter high-purity germanium crystals for Nuclear Physics research	Ethan Hull	PHDs Co.	Instrument.	No Cost Extension
3:30 PM	20	GPU Acceleration of Spin Tracking in Colliding Beam Accelerators	Dan Abell	Tech-X Corporation	Accelerator	No Cost Extension
3:50 PM	35	Update on the Department of Energy SBIR/STTR Program, Q/A	Manny Oliver	DOE, SBIR/STTR Office		
4:25 PM	Adjourn					

SBIR/STTR

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

- SBIR: Set-aside program for small business (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, RI: optional)
- STTR: Set-aside program to facilitate cooperative R&D between small business and U.S. research institutions (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.

➢To fund these Congressionally-mandated programs, a small percentage of the extramural R&D budget (~ 2.9% for SBIR, 0.40% for STTR for FY 15) is set aside within each DOE technical program that participates.

➢ New reauthorization bill has provided funding for the program until September 2017

SBIR/STTR 2012 Reauthorization Bill

Highlights:

- Maximum SBIR and STTR award amounts are now at $150k and $1000k
- 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 metric.
- More detail on Dr Manny Oliver talk tomorrow afternoon <u>including on Sequential Phase II proposals.</u>

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

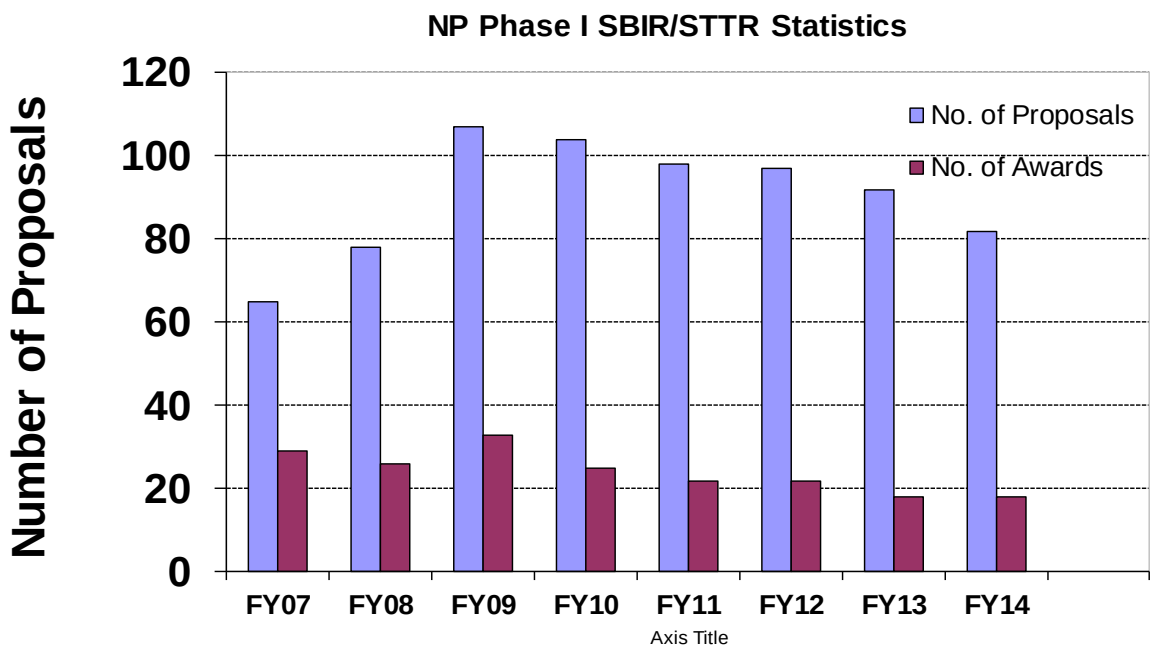
Grant	Max award ($k)	Small Business (Level of Effort)	Research Institution (Level of Effort)
SBIR	1000	Min 50%	Optional
STTR	1000	Min 40%	Min 30%

Fast Track

Combined Phase I and Phase II, submitted and Reviewed with Phase I competition.

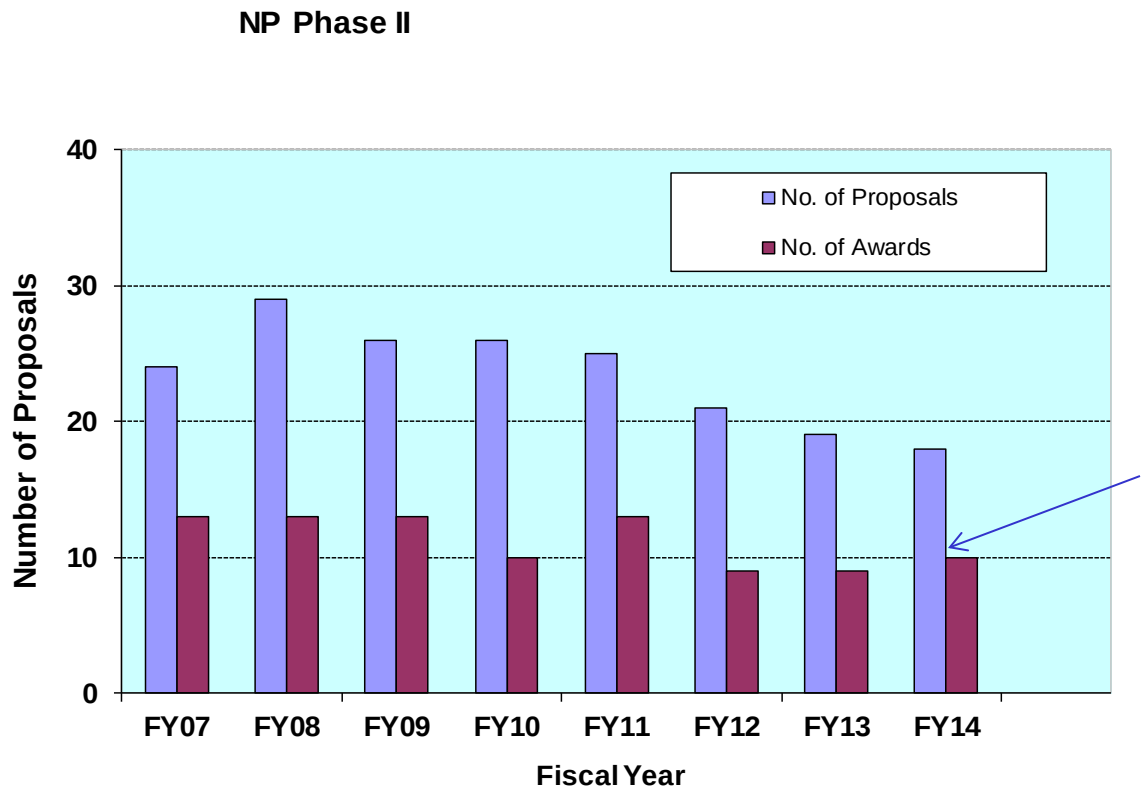
NP Phase I SBIR/STTR Applications and Awards

- NP received a Total of **88** phase I proposals in FY 2014, with over 350 reviews.
- Increases of max SBIR award amounts in FY 2011 are to provide adequate funding of grants. These increases will also result in a reduction in number of Phase I grants that can be funded each year.



NP Phase II SBIR/STTR Applications and Awards

The increases in maximum SBIR award amounts started in FY 2011 has affected number of phase II awards that can be supported.



NP SBIR/STTR Topics for FY 2015

- Software and Data Management
- Electronics Design and Fabrication
- Accelerator Technology
- Instrumentation, Detection Systems and Techniques
- Isotope Science and Technology

- In 2013 we completely rewrote the Instrumentation topic with a panel of experts from the NP Community. The new version is better organized and it is easier to find technical items in the text.

- Funding Notes: There is no fixed set aside for each topic. Proposals from all 5 topics compete with each other and highly ranked applications are funded .

NP Topic 1

Software and Data Management

a. Large Scale Data Storage
b. Large Scale Data Processing and Distribution
c. Grid and Cloud Computing
d. Software-driven Network Architectures for Data Acquisition
e. Heterogeneous Computing
f. Other

First Fast Track grant by NP

Phase I

FY14	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	6	0	1	7	14
# of Awards			1	1	

FY13	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	3	1	1	5	12
# of Awards		1		1	

NP Topic 2

Electronics Design and Fabrication

a. Advances in Digital Electronics
b. Circuits
c. Advanced Devices and Systems
d. Active Pixel Sensors
e. Manufacturing and Advanced Interconnection Techniques
f. Other

Phase I

FY14	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	8	0	0	8	22
# of Awards	1			1	

FY13	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	10	0	1	11	23
# of Awards	2			2	

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. Other

Phase I

FY14	SBIR	STTR/ Both	Fast Track	Total	LOI
# of Applications	28	8	0	36	50
# of Awards	6	1		7	

FY13	SBIR	STTR/ Both	Fast Track	Total	LOI
# of Applications	35	6	1	42	50
# of Awards	8	1		9	

NP Topic 4: Instrum., Detection Sys. and Techniques

a. Advances in Detector and Spectrometer Technology
b. Position Sensitive Charge Particle and Gamma Ray Tracking Devices
c. Technology for Rare Particle Detection
d. Large Band Gap Semiconductors, New Bright Scintillators, Calorimeters, and Optical Elements
e. Specialized Targets for Nuclear Physics Research
f. Technology for High Radiation environment of Rare Isotope Beam Facility.
g. Other

Phase I

FY14	SBIR	STTR/ Both	Fast Track	Total	LOI
# of Applications	19	5	1	25	38
# of Awards	6	2		8	

FY13	SBIR	STTR/ Both	Fast Track	Total	LOI
# of Applications	18	6	2	26	43
# of Awards	4	1		5	

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

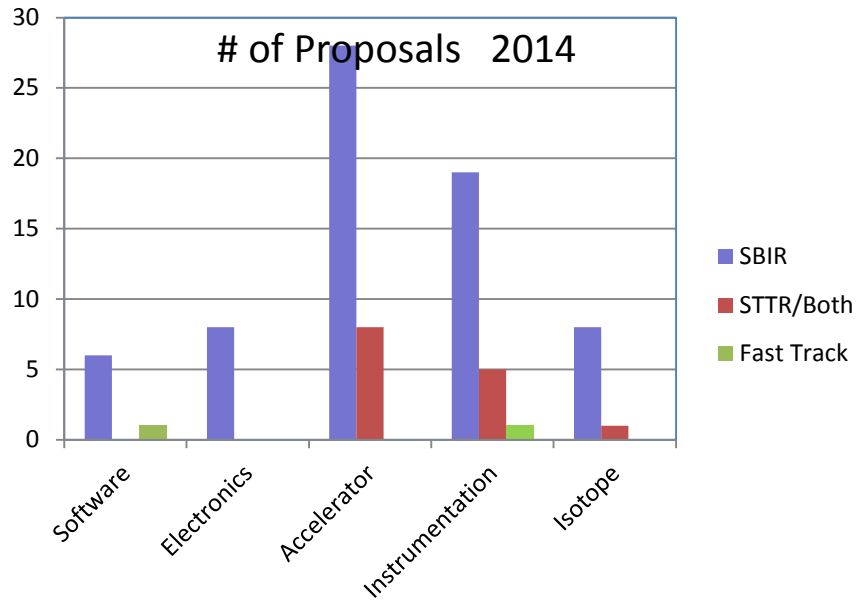
Phase I

FY14	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	8	1	0	9	16
# of Awards	1	0		1	

FY13	SBIR	STTR /Both	Fast Track	Total	LOI
# of Applications	7	1	0	8	21
# of Awards	1			1	1

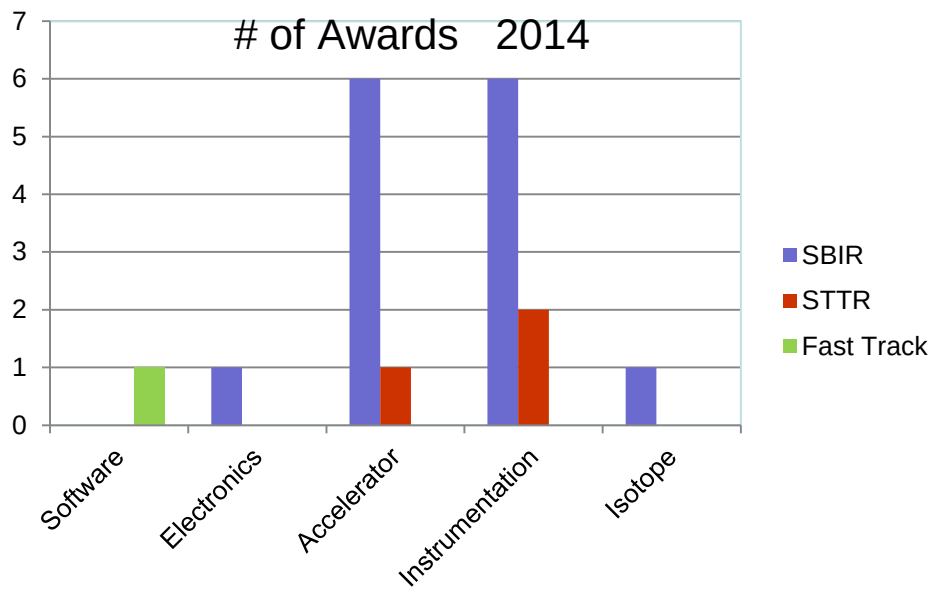
NP SBIR/STTR Statistics 2014

2014
Proposals



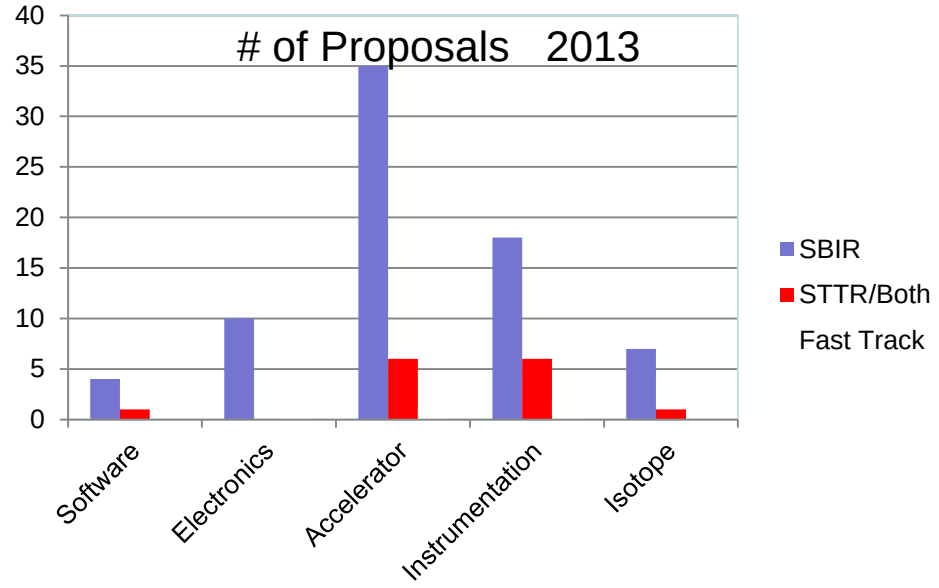
Phase I

2014
Awards



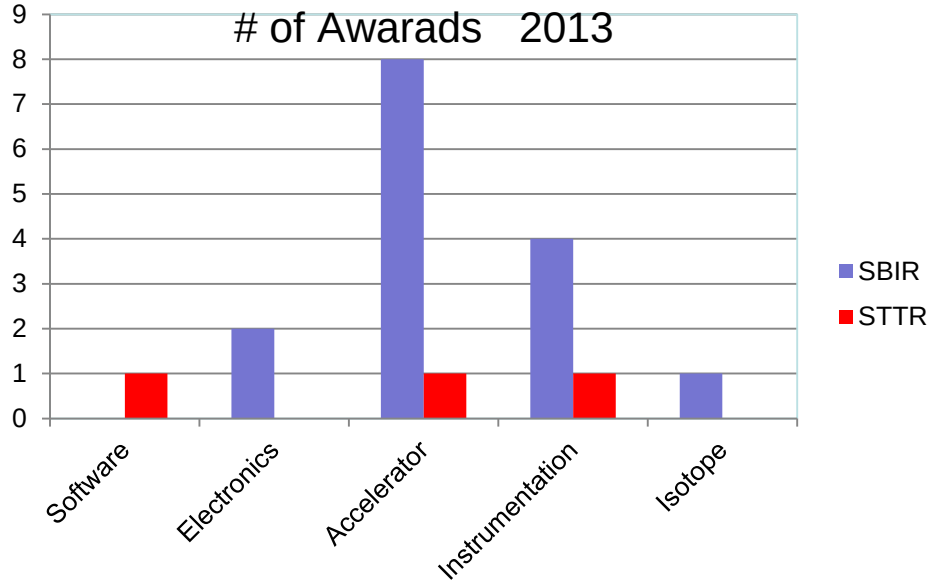
NP SBIR/STTR Statistics 2013

2013 Proposals



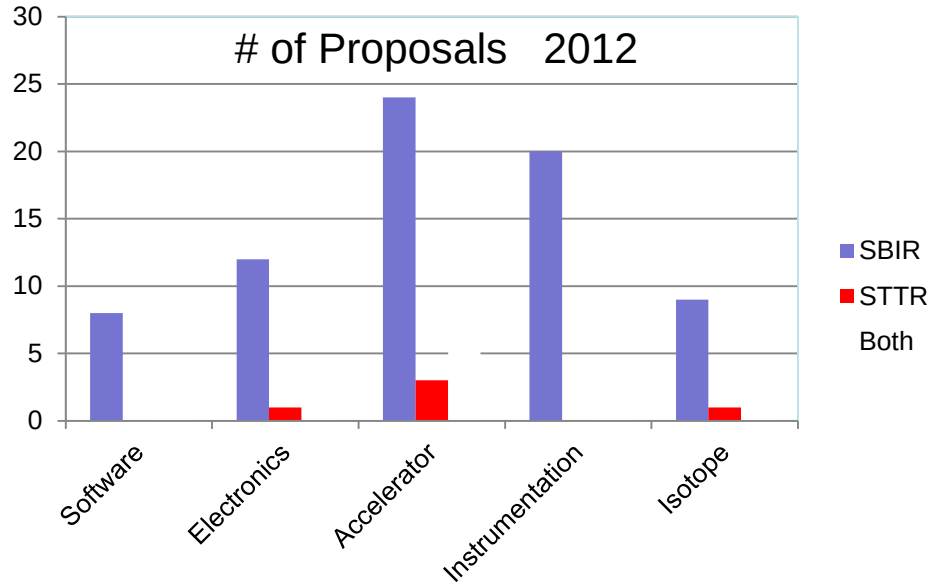
Phase I

2013 Awards



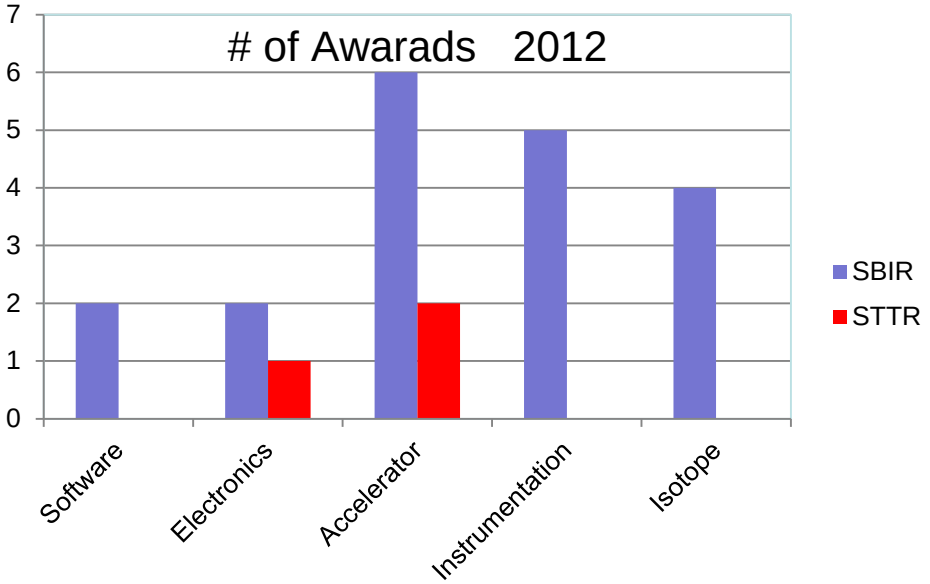
NP SBIR/STTR Statistics 2012

2012
Proposals



Phase I

2012
Awards



NP yearly SBIR/STTR topic development process

- Start with current year published topic document and make initial revisions based on year-round NP community input and Program Manager observations,
- Request input for each topic from individuals within the NP community,
- Collect and implement all inputs on existing subtopics. Add and/or delete subtopics as necessary,
- Submit the revised topics to DOE SBIR/STTR office; and
- After further iteration with the SBIR/STTR office, the solicitation is published as a Funding Opportunity Announcement (FOA) around the beginning of September

- Starting in FY13, we intend to rewrite one topic per year. In 2013 we completely rewrote the Instrumentation topic with a panel of experts from the NP community. Either the Electronics and Circuit topic or the Accelerator Technology topic is next.

Sequential II A and IIB

SBIR/STTR Reauthorization (December 31, 2011) 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

Phase IIA: For certain prototype, product, or process that need more than a single Phase II award. start 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))*

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

For FY 2014 Phase II cycle: NP received 3 Phase IIB applications, peer reviewed and none were funded.

NP SBIR/STTR Org Chart

More Notes: DOE SBIR/STTR Program changes in FY12 -15

Motivation: Started to implement reauthorization bill, improve commercialization rate, and improve administration of the programs.

- **Publishing Phase I solicitation twice a year**
  - **Release 1**: Office of Science call for proposal August-September (FY15: w/o HEP)
  - **Release 2:** Rest of DOE call for proposal December-January (FY15: and HEP)

- **Speeding up of processing of applications:**
  - Early posting of topics
  - 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 plan
  - Phase II applications with poorly rated commercialization plans, independent of their technical merit review scores, may not be eligible for funding

- **Fast Track Proposals:**
  - Programs now can elect to accept Fast Track Proposals for any topics. Fast Track is a combined Phase I and Phase II with a nominal maximum funding of $1,150k

More Notes: DOE SBIR/STTR Program changes for FY 2014

➢ Implementation of Office of Science PAMS system

Portfolio Analysis and Management System (PAMS):

- Office of Science began using PAMS to receive Grants.gov proposals in October 2011.
- The external PAMS site was launched in May 2012.
  https://pamspublic.science.energy.gov/
- The review functionality was launched March 2013.
- All mail and panel reviews for FY14 Phase I cycles were done through PAMS.

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 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.
- For Q&A sessions, please make your comments /questions short and use the coffee breaks 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
20	14	6	9 and 12

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

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

OR

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

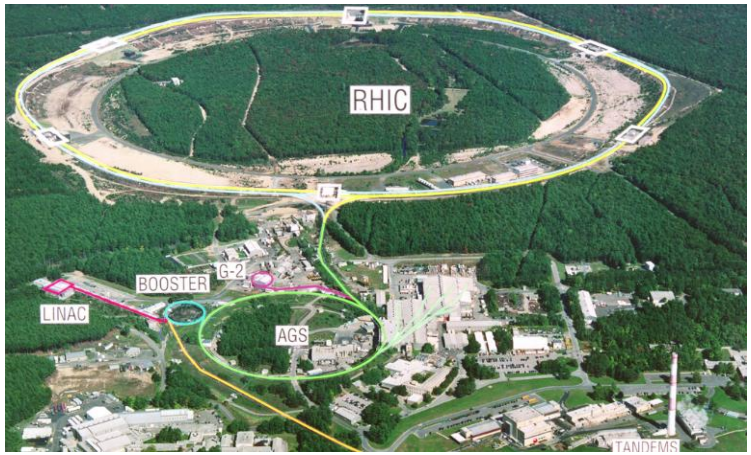
Transition Rate Metrics

- 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

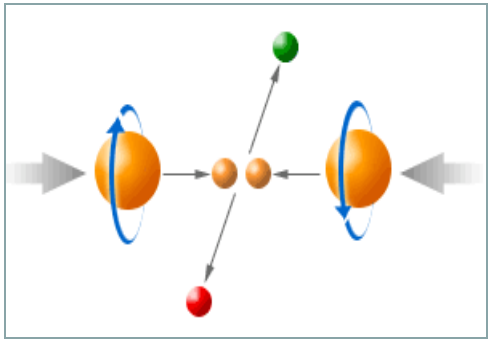
Back up Slides

Back up Slides

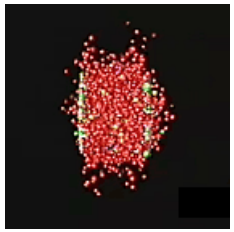
Relativistic Heavy Ion Collider (RHIC)

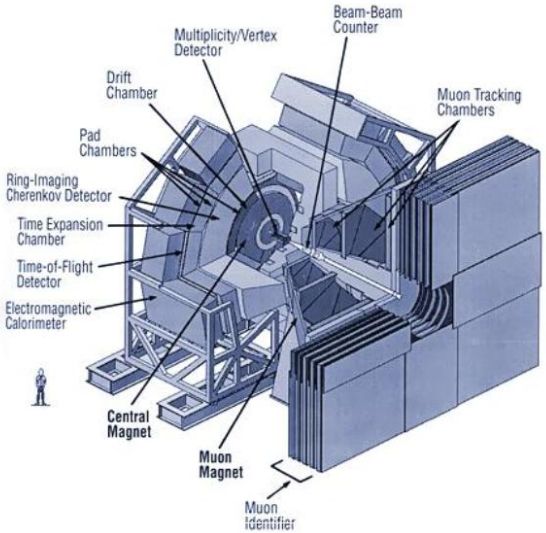


500 Gev P-P or 200 GeV/n Gold-Gold collider.



Polarized p-p collision



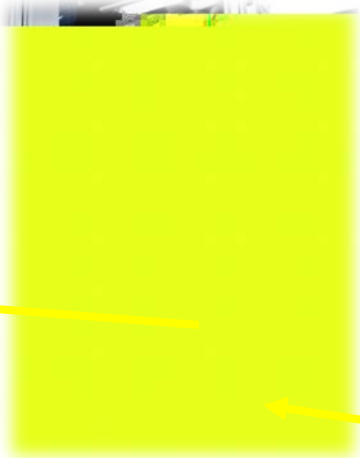


Inside the STAR Detector

PHENIX detector data

- 1st facility to clearly probe transition to quark-gluon matter; world's only polarized collider .
- To study the existence and properties of nuclear matter under extreme conditions, including that which existed at the beginning of the universe.

CEBAF at Jefferson Lab, a 6 GeV Electron Accelerator for Nuclear Physics with 12 GeV upgrade



World's Premier Facility for studies of:

- Quark structure of matter
- Nuclear structure and weak interactions with polarized electrons

Cryomodules in the accelerator tunnel

Superconducting radiofrequency (SRF) cavities vertical testing.

An aerial view of the recirculating linear accelerator and 3 experimental halls.

A B C

CEBAF Large Acceptance Spectrometer (CLAS) in Hall B

Curtsey, TJNAF