Nuclear Physics SBIR/STTR Program :

SBIR/STTR Exchange Meeting
November 6-7, 2013
Gaithersburg, MD

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Office of Nuclear Physics

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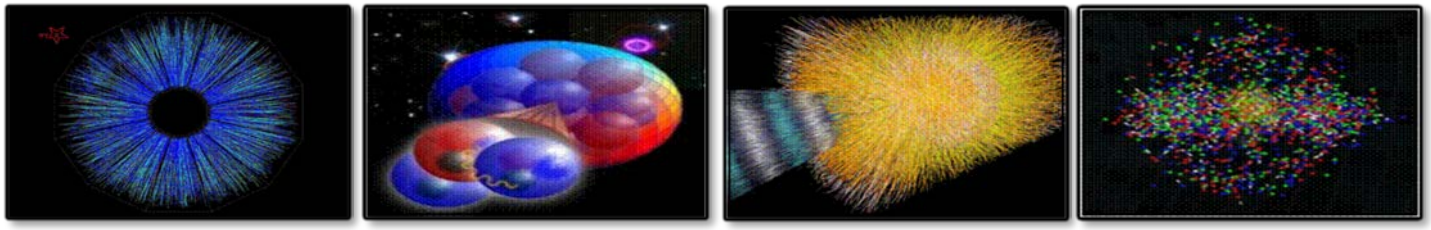
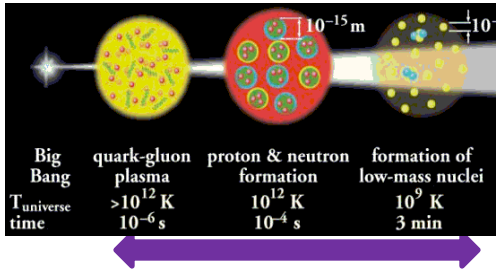
Mission Statement Office of Nuclear Physics

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.



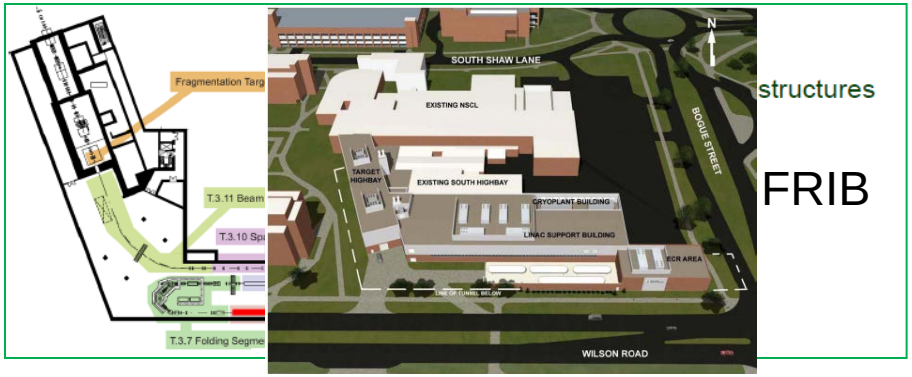


Nuclear Physics

RHIC collider at BNL.

CEBAF at TJNAF

ATLAS at ANL



structures

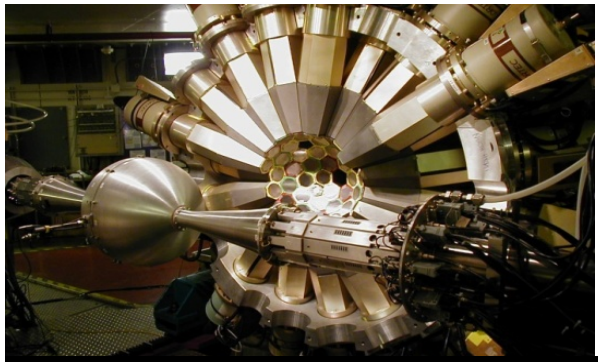
FRIB

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

In 2009 the Isotope Production Program from DOE Office of Nuclear Energy was transferred to the Office of Science's Office of Nuclear Physics.

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 year -2 ***(started in FY011) and awardees still active under "no cost extension" are invited. A total of 13 SBIR/STTR presentations will be given in 2 days. FY 2013 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.

Agenda (Day 1)

November 6-7, 2013

Hilton Washington, DC North, Gaithersburg, Maryland

Meeting Agenda-Day 1

Time	Dur.	Presentation Title	Speaker	Organization	NP SBIR/ STTR	Grant Status
Wednesday, November 6, 2013						
8:30 AM	10	Welcome and Introductory Remarks	Jehanne Gillo	DOE, Office of Nuclear Physics		
8:40 AM	35	NP SBIR/STTR Program Overview	Manouchehr Farkho	DOE, Office of Nuclear Physics		
9:15 AM	35	Numerical Tool Developments for Modeling Ion Sources (ECRIS/EBIS)	Jin-Soo Kim	FAR-TECH, Inc.	45d	Ending year 1
9:50 AM	30	STRAW - A Hydrogen-Specific Pressure Gauge for XHV	Gregory Mulhollan	Saxet Surface Science	46b	Ending year 2
10:20 AM	35	Coffee Break				
10:55 AM	30	GPU Acceleration of Spin Tracking in Colliding	Dan Abell	Tech-X Corporation	46b	Ending year 2
11:25 AM	35	RHIC Facility and the SBIR/STTR Program	Ilan Ben-Zvi	Brookhaven National Laboratory		
12:00 PM	15	Session Wrap up, Discussion, Q/A				
12:15 PM	70	Lunch Break				
1:25 PM	30	Growth of Large Diameter High-Purity Germanium Crystals for Nuclear Physics Research	Ethan Hull	PHDs Co.	48 c	Ending year 2
1:55 PM	35	TJNAF Facility and the SBIR/STTR Program	Roy Whitney	Thomas Jefferson National Accelerator Facility		
2:30 PM	30	Micromegas Particle Detector	Jae Ryu	Agiltron, Inc.	49 a	Ending year 2
3:00 PM	35	Coffee Break				
3:35 PM	35	Development of High Density Low Cost Readout Modules for Large Scale Radiation Detectors	Hui Tan	XIA, LLC	43a	Ending Year 1
4:10 PM	15	Session Wrap up, Discussion, Q/A				
4:25 PM		Adjourn				

Agenda (Day 2)

DOE-NP SBIR/STTR Exchange Meeting

Meeting Agenda-Day 2

Time	Dur.	Presentation Title	Speaker	Organization	NP SBIR/ STTR	Grant Status
Thursday, November 7, 2013						
8:30 AM	30	High-Performance ADC for Particle Accelerator Instrumentation Applications	Douglas Goodman	Ridgetop Group, Inc.	44g	Ending Year 1
9:00 AM	30	An Energy-Efficient RF Power Source for the Jefferson Laboratory CEBAF Linac	Jin-Soo Kim	FAR-TECH, Inc.	46b	No Cost Extension
9:30 AM	30	High-Performance Plasma Panel Based Micropattern Detector	Peter S. Friedman	Integrated Sensors, LL	45b	Ending Year 1
10:00 AM	35	1 - Thin-Window P-Type Point-Contact Germanium Detectors for Rare Particle Detection 2 - Segmented Rectifying and Blocking Contacts on Germanium Planar Detectors	Ethan Hull	PHDs Co.	45c	Ending Year 1
10:35 AM	25	Coffee Break				
11:00 AM	35	NP Isotope Program and Facilities and the SBIR/STTR Program	Dennis Phillips	DOE, Office of Nuclear Physics		
11:35 AM	30	High Specific Activity Sm-153 by Post Irradiation Isotope Separation	John D'Auria	IsoTherapeutics Grou	46b	Ending Year 1
12:05 PM	15	Session Wrap up, Discussion, Q/A				
12:20 PM	65	Lunch Break				
1:25 PM	35	NP Low Energy Facilities and the SBIR/STTR Program	Paul Fallon	Lawrence Berkeley National Laboratory		
2:00 PM	30	Chemical Free Surface Processing for High Gradient Superconducting RF Cavities	Linton Floyd	FM Technologies, Inc.	46a	No Cost Extension
2:30 PM	30	Device for In-Situ Multiple Coatings of Long, Small	Henry Joe Poole Jr.	Poole Ventura, Inc.	46d	No Cost Extension
3:00 PM	20	Coffee Break				
3:20 PM	35	Update on the Department of Energy SBIR/STTR Program	Manual Oliver	DOE, SBIR/STTR Office		
3:55 PM	10	Session Wrap up, Concluding Remarks-Adjorn				

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.

➢ These programs include competitions among small businesses that submit R&D grant applications in response to technical topics in an annual solicitation.

➢ To fund these Congressionally-mandated programs, a small percentage of the extramural R&D budget (~ 2.8% for SBIR, 0.40% for STTR) 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.</u>

Current SBIR/STTR Status

Phase I

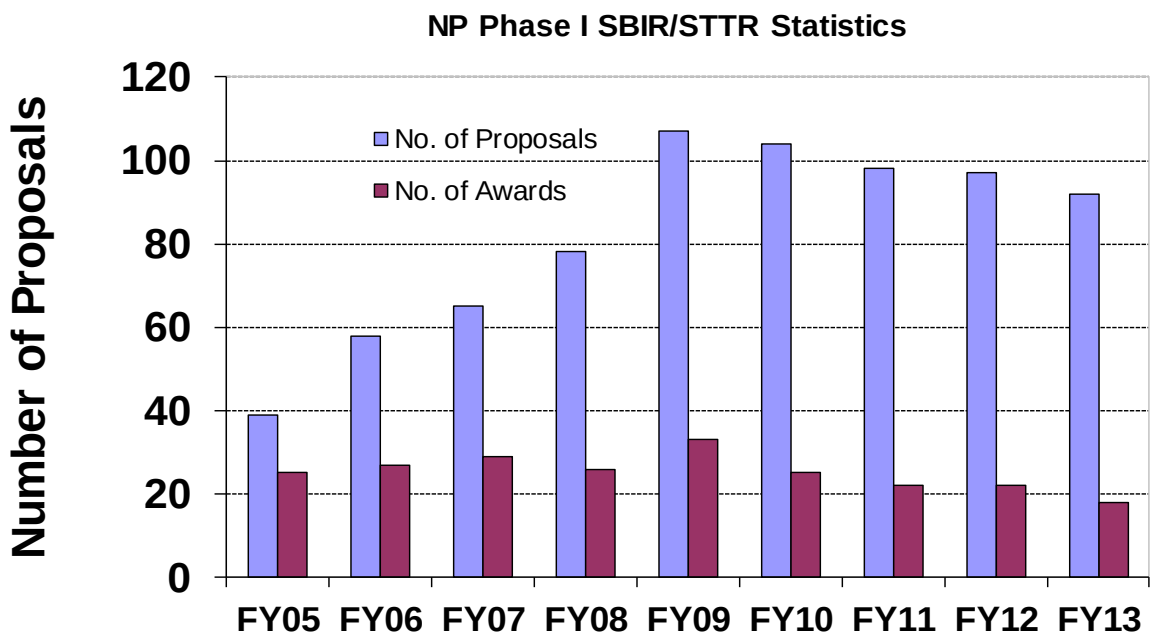
Grant	Max award ($k)	Small Business (Level of Effort)	Research Institution (Level of Effort)
SBIR	150	Min 66%	Optional
STTR	150	Min 40%	Min 30%

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%

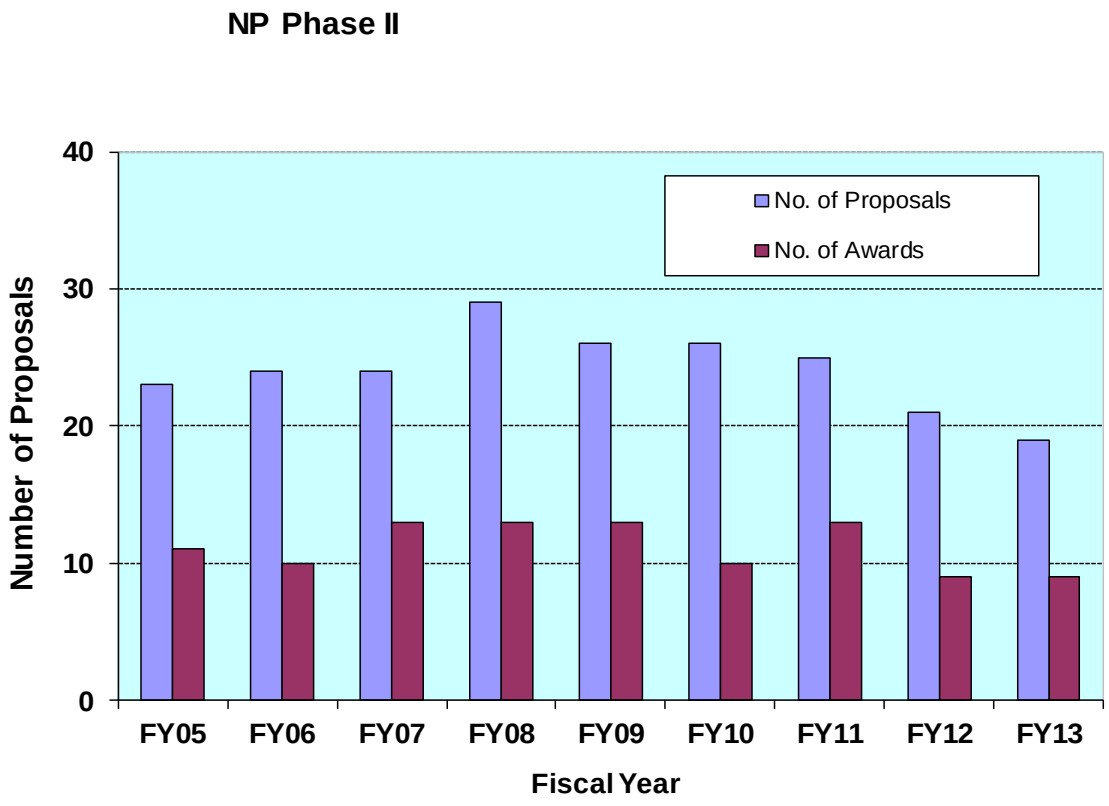
NP Phase I SBIR/STTR Applications and Awards

- NP received a Total of **92** phase I proposals in FY 2013, 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 2014

- 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

Phase I

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

FY12	SBIR	STTR	"Both"	Total
# of Applications	8	0	2	10
# of Awards	2	0	0	2

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

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

FY12	SBIR	STTR	"Both"	Total
# of Applications	12	1	1	14
# of Awards	2	1	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. Other

Phase I

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

FY12	SBIR	STTR	"Both"	Total
# of Applications	24	3	7	34
# of Awards	6	2	(3)	8

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. Technology Transfer Opportunity: Cross-strip CdZnTe detector with shared electrodes for medical imaging applications.
h. Technology Transfer Opportunity: Boron-Based Nano-proportional Counting System for Neutron Detection.
i. Other

Phase I

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

FY12	SBIR	STTR	"Both"	Total
# of Applications	20	0	4	25
# of Awards	5	0	0	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

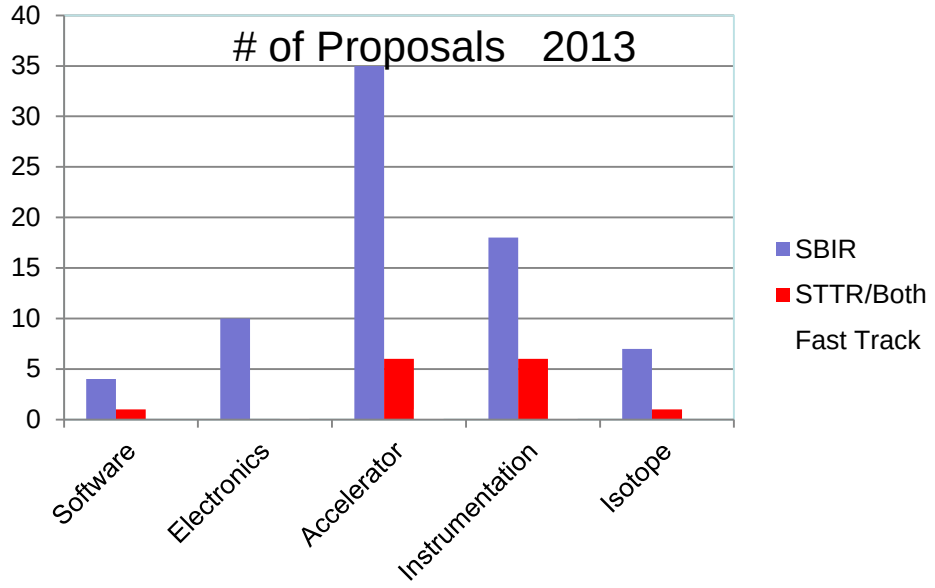
Phase I

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

FY12	SBIR	STTR	"Both"	Total
# of Applications	9	1	2	13
# of Awards	4	0	(1)	4

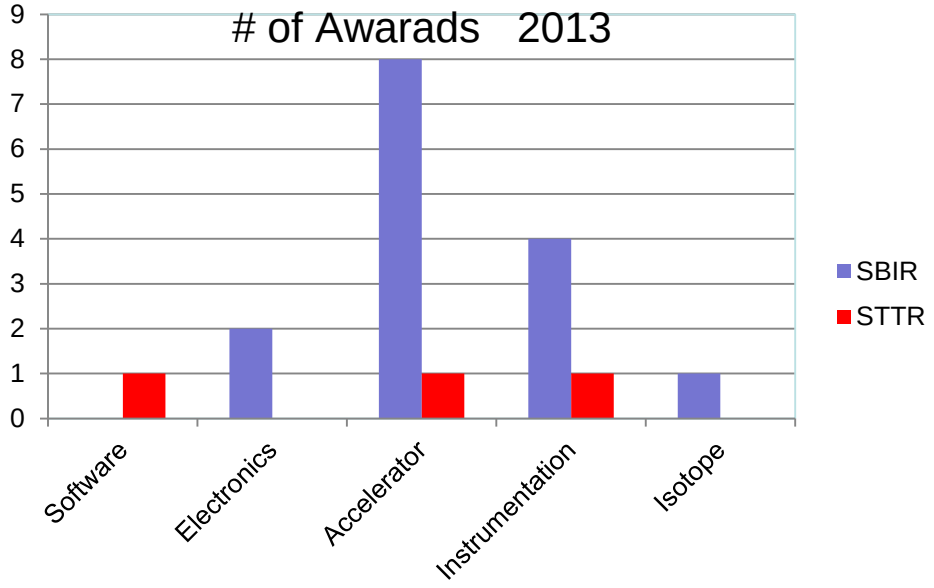
NP SBIR/STTR Statistics 2013

2013 Proposals



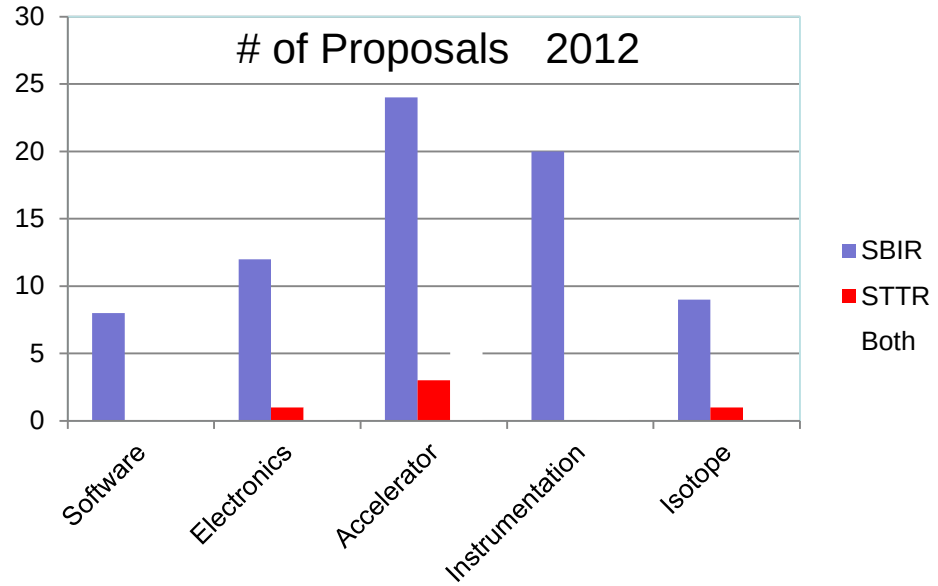
Phase I

2013 Awards



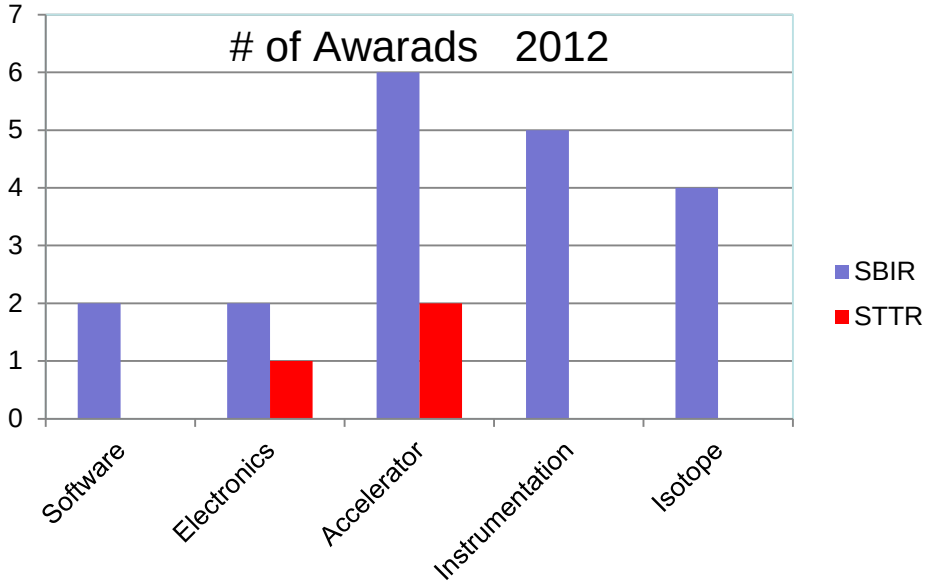
NP SBIR/STTR Statistics 2012

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.

More Notes: DOE SBIR/STTR Program changes in FY12 -14

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
  - **Release 2:** Rest of DOE call for proposal December-January
- **Speeding up of processing of applications:**
  - Early posting of topics
  - Letter of intent required (for process of identifying reviewers) (collaboration…)
- **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 reviews for the current FY14 Phase I is being 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

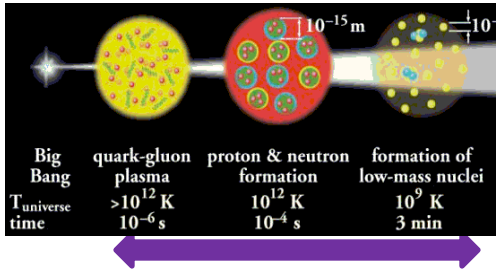
- We have a tight agenda and must stay on time for each presentation.
- Sessions will start sharply at the time stated on the agenda. Please take your seat a few minutes before the start of each session to allow the first presentation to begin on time.
- Make sure your presentation file is uploaded on 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

Mission Statement Office of Nuclear Physics

The mission of the Nuclear Physics (NP) program is to discover, explore, and understand all forms of nuclear matter. The fundamental particles that compose nuclear matter - quarks and gluons - are relatively well understood, but exactly how they fit together and interact to create different types of matter in the universe is still not fully explained. To solve this mystery, NP supports experimental and theoretical research - along with the development and operation of particle accelerators and advanced technologies - to create, detect, and describe the different forms and complexities of nuclear matter that can exist in the universe, including those that are no longer found naturally.



Nuclear Physics

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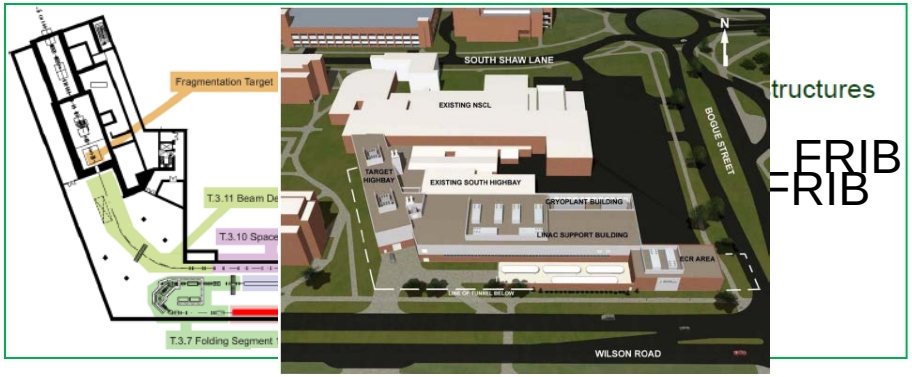
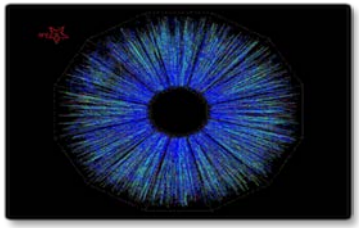
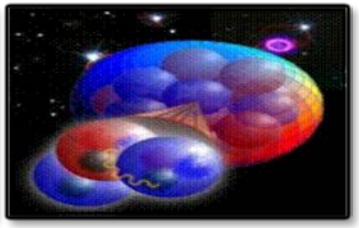
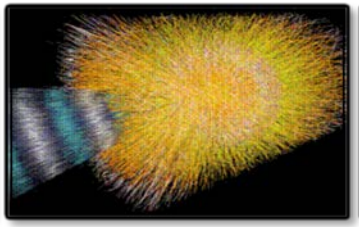
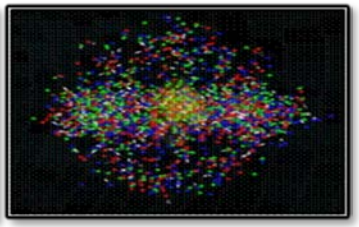


Nuclear Physics Program Mission

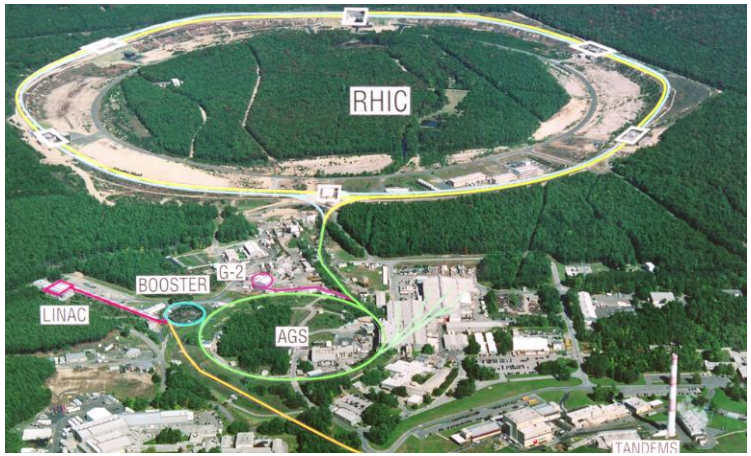
Mission: To discover, explore and understand all forms of nuclear matter; to understand how the fundamental particles, quarks and gluons, fit together and interact to create different types of matter in the universe, including those no longer found naturally

Priorities:

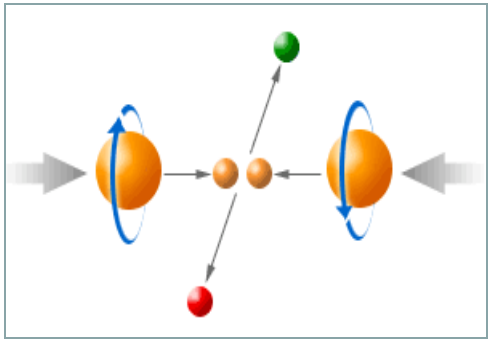
- To understand how quarks and gluons assemble into the various forms of matter and to search for yet undiscovered forms of matter
- To understand how protons and neutrons combine to form atomic nuclei and how these nuclei have emerged during the 13.7 billion years since the origin of the cosmos
- To understand the fundamental properties of the neutron and develop a better understanding of the neutrino
- To conceive, plan, design, construct, and operate national scientific user facilities; to develop new detector and accelerator technologies
- To provide stewardship of isotope production and related technologies to advance important applications, research and tools for the nation
- To foster integration of the research with the work of other organizations in DOE

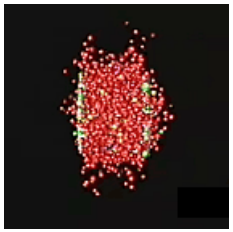
Relativistic Heavy Ion Collider (RHIC)

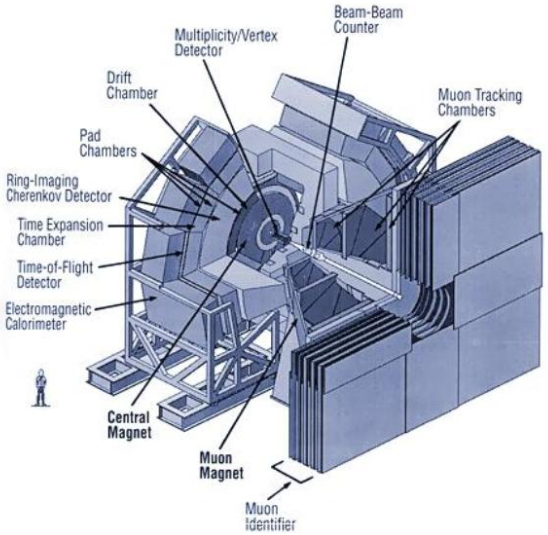


500 Gev P-P or 200 GeV/n Gold-Gold collider.



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.

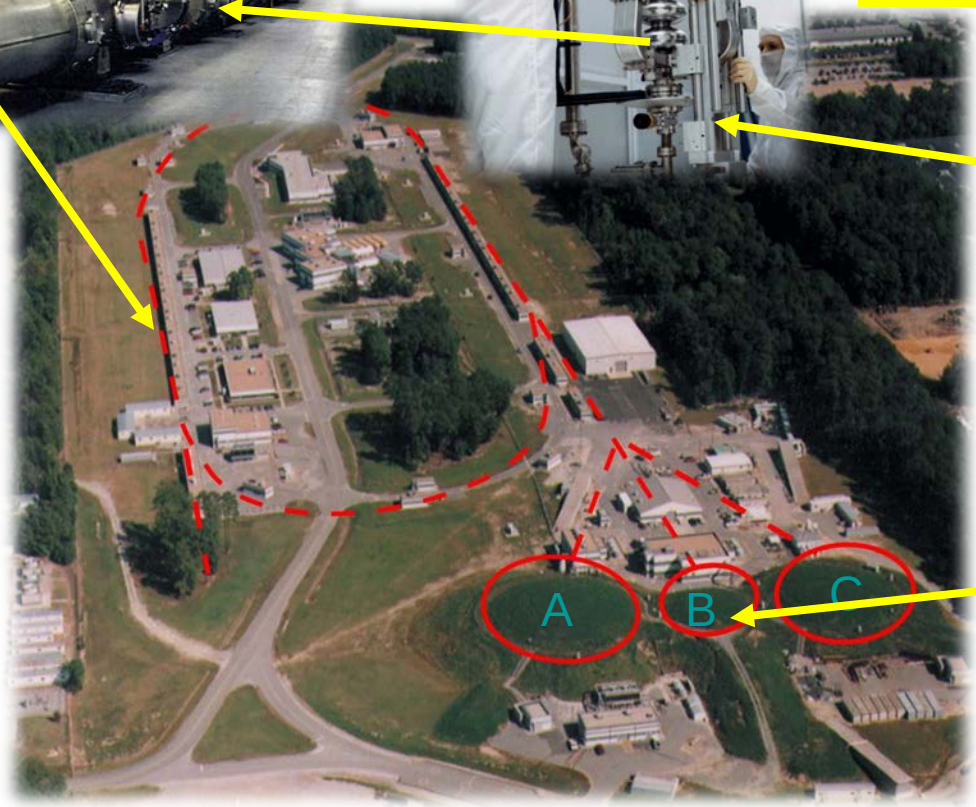
CEBAF at Jefferson Lab, a 6 GeV Electron Accelerator for Nuclear Physics with 12 GeV upgrade

World's Premier Facility for studies of:

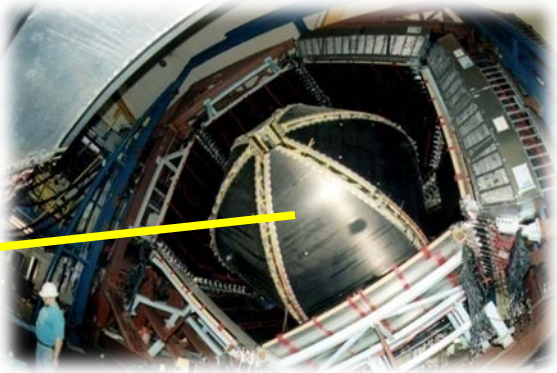
- Quark structure of matter
- Nuclear structure and weak interactions with polarized electrons

Cryomodules in the accelerator tunnel

Superconducting radiofrequency (SRF) cavities vertical testing.



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

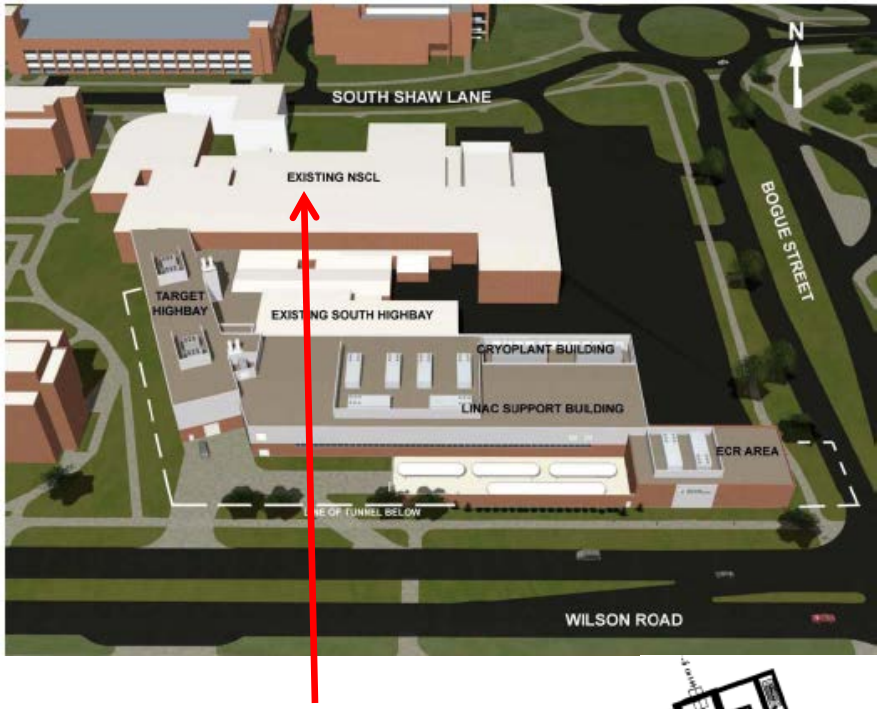


CEBAF Large Acceptance Spectrometer (CLAS) in Hall B

Curtsey, TJNAF

Facility for Rare Isotope Beams at MSU

A New "Microscope" to Study the Structure of Nuclei

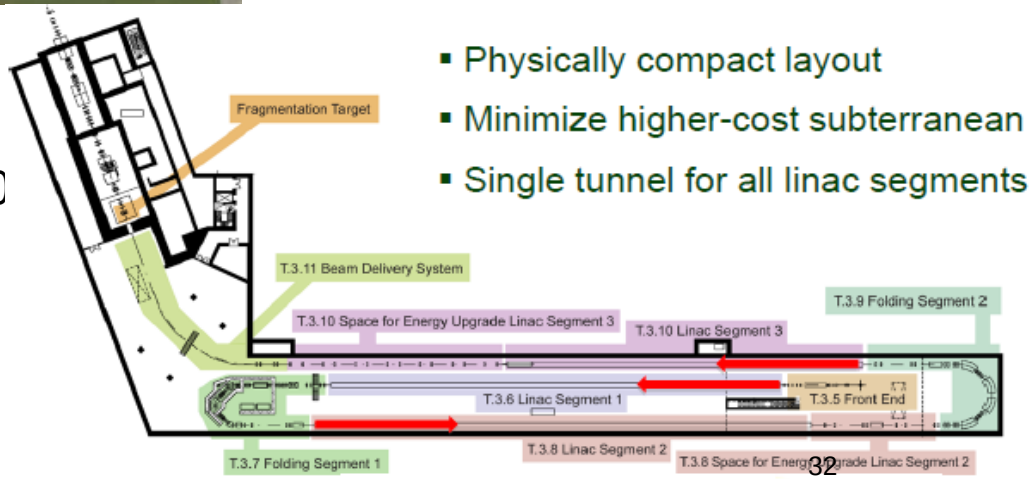


Existing NSCL Laboratory

- A 200 MeV/u, 400 kW super conducting accelerator
- A national user facility, to study the physics of nuclei, nuclear astrophysics, fundamental interactions, and **applications for society**

- Will cost approximately $600 M to establish. Construction is anticipated to begin in 2012 and completed by 2020

- Critical Decision-1, September 2010
- Steady progress towards Critical Decision-2 (performance baseline)



- Physically compact layout
- Minimize higher-cost subterranean structures
- Single tunnel for all linac segments

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Changes in the DOE SBIR/STTR Program in FY2012

Motivation: to improve the commercialization outcomes for DOE's SBIR/STTR program and also to improve the administration of the programs.

- Publishing Phase I solicitation twice a year
  - **Release 1**: Office of Science call for proposal August-September
  - **Release 2:** Rest of DOE call for proposal December-January

- Speeding up of processing of applications:
  - Early posting of topics
  - Letter of intent required (for process of identifying reviewers)

- 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, will not be eligible for funding

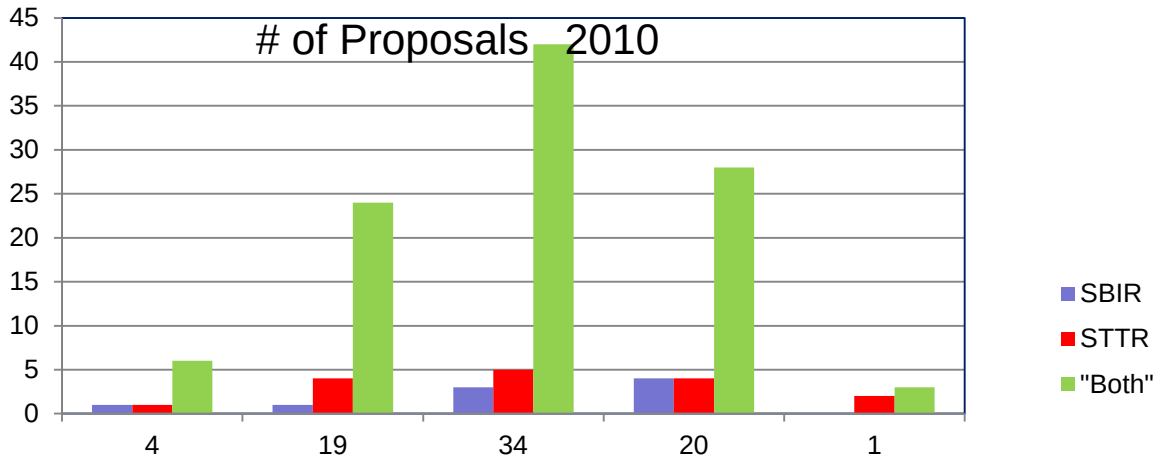
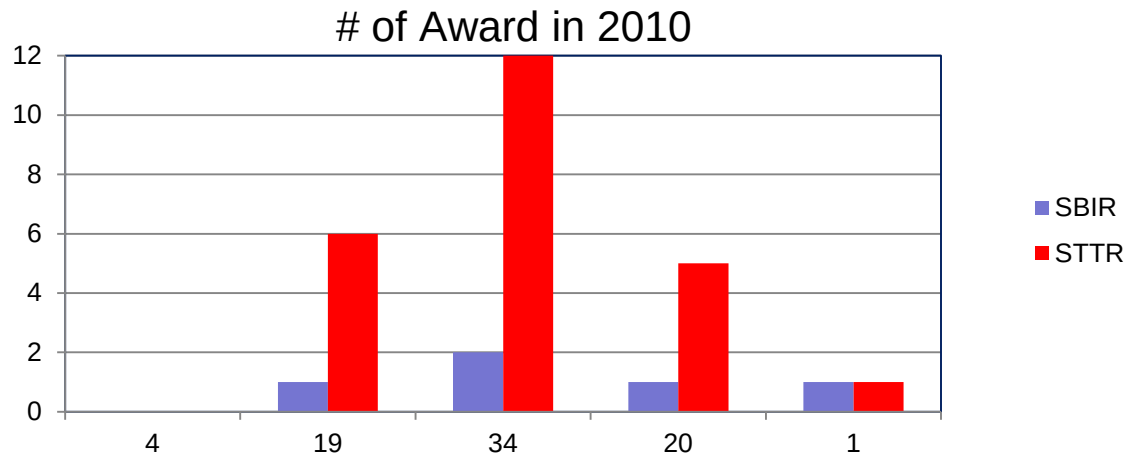
- Other changes:
  - Increase in the STTR maximum award amounts for Phase I and II ($150k and $1000k)
  - Limit of 10 applications by a small business to each Phase I FOA

Examples of current Phase II Grants relevant to NP Major Item of Equipment (MIE)

- **nEDM** (neutron Electric Dipole Moment):
  - Magnetometer for nEDM Exp. by Southwest Sciences, Inc.
  - Next-Generation Readout Electronics for nEDM, by STAR Cryoelectronics, LLC
- **Majorana:**
  - ^{76}Ge Isotope purification using plasma technique by Nonlinear Ion Dynamics LLC.
  - High-Purity Germanium crystals for low Background counting arrays, PHDs Co.
- **Double-beta decay**:
  - Neodymium-containing (^{150}Nd) for neutrinoless 2-β decay detection (cryogenic bolometer: DUSEL) by Integrated Photonics.
- **PRIMEX-TJNAF**:
  - Optical detector with integrated ADC for digital readout by Radiation Monitoring Devices.
- **Electron Ion Collider:**
  - Designing a coherent electron cooling system for high-energy hadron colliders by Tech-X Co.
- **SRF cavity:**
  - Development of a superconducting RF multi-spoke cavities for electron linacs, by Niowave Inc.

NP SBIR/STTR Statistics 2010

2010 Proposals



2010 Awards