U.S. DEPARTMENT OF ENERGY | Office of Science

Nuclear Physics SBIR/STTR Program :

SBIR/STTR Exchange Meeting
October 24-25, 2011
Gaithersburg, MD

M. Farkhondeh

Program Manager
Advanced Technology Research and Development
DOE Office of Science
Office of Nuclear Physics

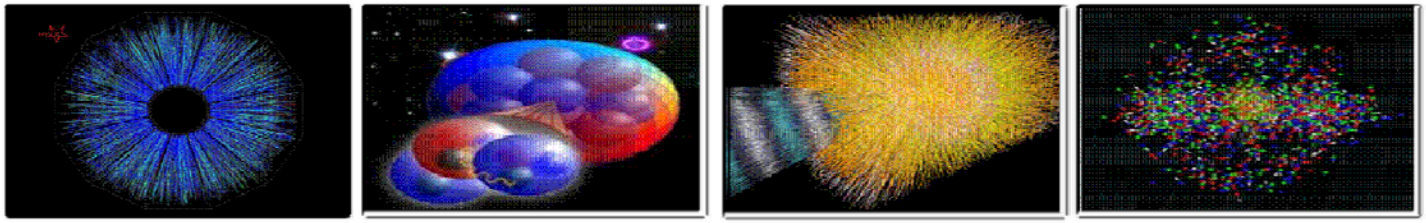
U.S. DEPARTMENT OF ENERGY | Office of Science

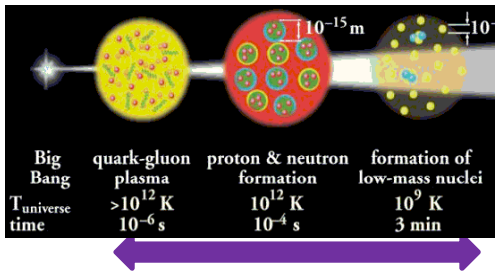
Contents:

U.S. DEPARTMENT OF ENERGY | Office of Science

Mission Statement Office of Nuclear Physics

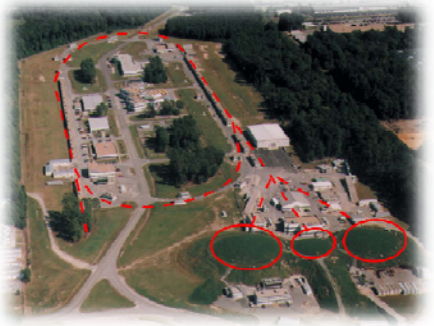
Mission: To discover, explore and understand all forms of nuclear matter; to understand how the fundamental particles, quarks and gluons, fit together and interact to create different types of matter in the universe, including those no longer found naturally.





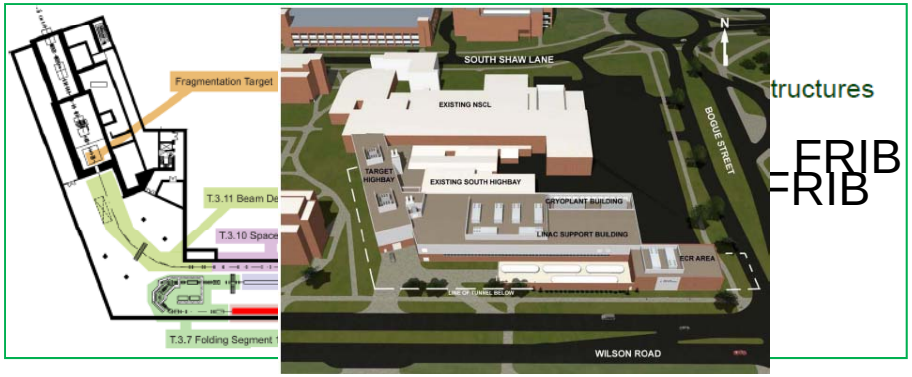
Nuclear Physics

RHIC collider at BNL.



TJNAF

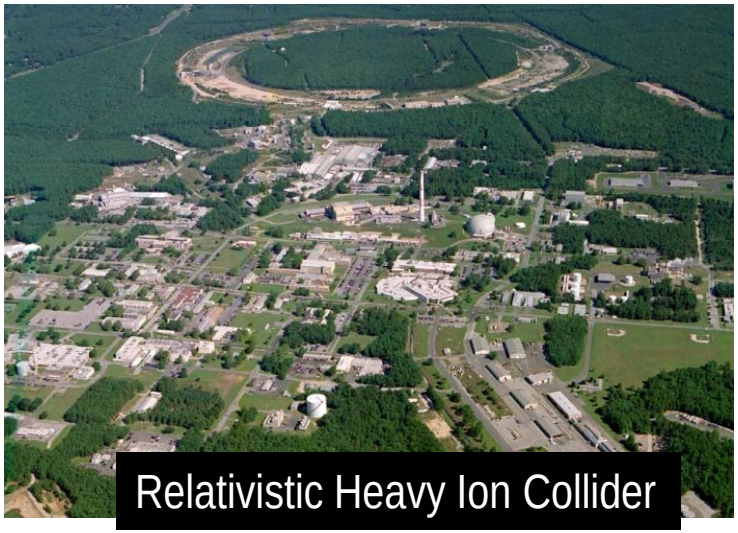
ATLAS at ANL



U.S. DEPARTMENT OF ENERGY | Office of Science

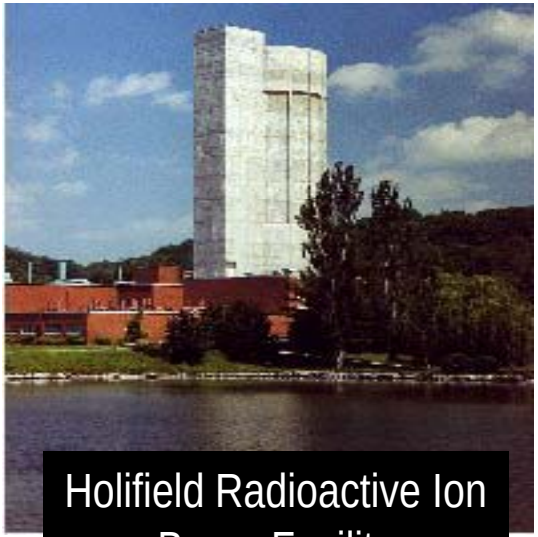
At Present NP Operates Four National User Facilities

"Microscopes" capable of groundbreaking research

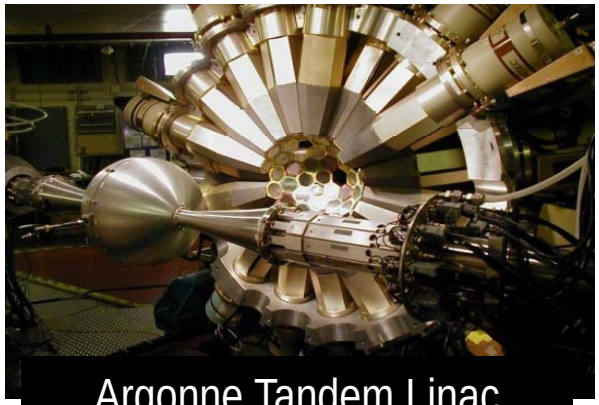


Relativistic Heavy Ion Collider

Continuous Electron Beam Accelerator Facility



Holifield Radioactive Ion Beam Facility



Argonne Tandem Linac Accelerator System

U.S. DEPARTMENT OF ENERGY | Office of Science

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.

Isotope Production Facility (LANL)

Brookhaven Linac Isotope Producer

U.S. DEPARTMENT OF ENERGY | Office of Science

SBIR/STTR Exchange Meeting

• The DOE Office of Nuclear Physics (NP) is seeking to assess effectively 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 (awarded in FY09) and awardees still active under "no cost extension" were invited. A total of 27 SBIR presentations will be given in 2 days. FY 2010 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.

U.S. DEPARTMENT OF ENERGY | Office of Science

Agenda (Day 1)

DOE-NP SBIR/STTR Exchange Meeting

October 24-25, 2011

Hilton Washington DC North/Gaithersburg - Montgomery Ballroom

Monday, October 24, 2011

Time	Dur.	Presentation Title	Speaker	Organization	NP SBIR/STTR Topic
8:30 AM	10	Welcome and Introductory Remarks	Tim Hallman/Jehanne Gillo	DOE, Office of Nuclear Physics	
8:40 AM	30	NP SBIR/STTR Program Overview	Manouchehr Farkhondeh	DOE, Office of Nuclear Physics	
9:10 AM	20	The development of an Inexpensive Compact Neutron Generator for Gamma Calibration and Other Applications	Melvin Arthur Piestrup	Adelphi Technology, Inc.	Instrum/Detectors
9:30 AM	20	Cryogenic CMOS Avalanche Diodes for Nuclear Physics Research	Erik Johnson	Radiation Monitoring Devices, Inc.	Instrum/Detectors
9:50 AM	20	Computational Models of Germanium Point Contact Detectors	Paul J. Mullowney	Tech-X Corporation	Instrum/Detectors
10:10 AM	20	Fast, Low Noise Photodetectors for Nuclear Physics	Kanai Shah/Mickel McClish	Radiation Monitoring Devices, Inc.	Instrum/Detectors
10:30 AM	**35**	**Coffee Break**			
11:05 AM	30	RHIC Facility and the SBIR/STTR Program	Wolfram Fischer	Brookhaven National Laboratory	NP User Facilities I (RHIC)
11:35 AM	20	High-Intensity Proton Accelerator	Jay Hirshfield/Michael LaPoint	Omerga-P, Inc.	Accelerator Technology
11:55 AM	20	The Orbiter Project Service Oriented Architecture Web service Components and Applications	Mark L. Green	Tech-X Corporation	Software/Data Managmnt
12:15 PM	20	Development of 500 MHz Multi-Channel Readout Electronics for Fast Radiation Detectors	Wolfgang Hennig/ Konstantin Sabourov	Xia, LLC	Electronics
12:35 PM	**65**	**Lunch Break**			
1:40 PM	20	CMOS Solid-State Photomultipliers for High Energy Resoulution Calorimeters	Erik Johnson	Radiation Monitoring Devices, Inc.	Electronics
2:00 PM	20	Energetic Condensation Growth of Thin Films for Future SRF	Mahadevan Krishnan	Alameda Applied Sciences Corp.	Accelerator Technology
2:20 PM	20	Integrated Multiple Effects Software for Nuclear Physics Applications	David N. Smithe	Tech-X Corporation	Accelerator Technology
2:40 PM	20	Development of SRF Multi-Spoke Cavities for Electron Linacs	Terry Grimm	Niowave, Inc.	Accelerator Technology
3:00 PM	**35**	**Coffee Break**			
3:35 PM	30	TJNAF facility and the SBIR/STTR Program	Charlie Reece	Thomas Jefferson Nat. Acceler. Facility	NP User Facilities II (TJNAF)
4:05 PM	20	Designing a Coherent Electron Colling System for High-Energy Hadron Colliders	David L. Bruhwiler	Tech-x Corporation	Accelerator Technology
4:25 PM	20	New Detector for Gamma Ray and Neutron Studies	Kanai Shah/Mickel McClish	Radiation Monitoring Devices, Inc.	Instrum/Detectors
4:45 PM	20	Magnetometer for the Neutron Electric Dipole Moment Experiment	David Christian Hovde	Southwest Sciences, Inc.	Instrum/Detectors
5:05 PM		**Adjourn**			

U.S. DEPARTMENT OF ENERGY | Office of Science

Agenda (Day 2)

DOE-NP SBIR/STTR Exchange Meeting

October 24-25, 2011

Hilton Washington DC North/Gaithersburg - Montgomery Ballroom

Tuesday, October 25, 2011

Time	Dur.	Presentation Title	Speaker	Organization	NP SBIR/STTR Topic
8:30 AM	20	Compact and Efficient Cold and Thermal Neutron Collimators	W. Bruce Feller	NOVA Scientific, Inc.	Instrum/Detectors
8:50 AM	20	Advanced SQUID Sensors and Readout Electronics in Support of the nEDM Experiment and Commerical Applications	Robin Harold Cantor	Star Cryoelectronics, Llc	Instrum/Detectors
9:10 AM	20	Charged Fluid Centrifuge Separators	Alfred Y. Wong	Nonlinear Ion Dynamics, LLC	Instrum/Detectors
9:30 AM	**35**	**Coffee Break**			
10:05 AM	30	NP Isotope Program and Facilities and the SBIR Program	Robert Atcher	National Isotope Development Center	NP Isotope Facilities
10:35 AM	20	High-Purity Germanium Crystals for Low Background Counting Arrays	Ethan Hull	PHDs Co.	Instrum/Detectors
10:55 AM	20	An Approach to Chemical Free Surface Processing for High Gradient Superconducting RF Cavities	Frederick Mako	Fm Technologies, Inc.	Accelerator Technology
11:15 AM	20	Phase and Frequency Locked Magnetrons for SRF Sources	Michael Neubauer	Muons, Inc.	Accelerator Technology
11:35 AM	20	Status of the 8 kW Power Amplitier for CEBAF	Nikolai Barov	FAR-TECH, Inc.	Accelerator Technology
11:55 AM	**65**	**Lunch Break**			
1:00 PM	20	Development of a Tunable 28 MHz Superconducting RF Cavity for RHIC	Terry L. Grimm	Niowave, Inc.	Accelerator Technology
1:20 PM	20	High-Fidelity Modulator Simulations of Coherent Electron Cooling Systems	David L. Bruhwiler	Tech-x Corporation	Accelerator Technology
1:40 PM	20	Charged Particle Induced damage and Recovery of Photocathodes Employed as Nuclear Physics Injector Sources	Gregory Mulhollan	Saxet Surface Science	Accelerator Technology
2:00 PM	**35**	**Coffee Break**			
2:35 PM	35	NP Low Energy Facilities and the SBIR/STTR Program	David Radford	Oak Ridge National Laboratory	NP User Facilities III (Low En)
3:10 PM	20	Fast Data Acquisition Electronics: TDCs, ADCs and FPGAs	Lloyd W. Bridges	Blue Sky Electronics, LLC	Electronics
3:30 PM	20	Segmented Rectifying and Blocking Contacts on Germanium Planar Detectors	Ethan Hull	PHDs Co.	Instrum/Detectors
3:50 PM	20	Graphene Stripper Foil	Igor Pavlovsky	Applied Nanotech, Inc.	Instrum/Detectors
4:10 PM	**15**	**Closing Remarks**			
4:25 PM		**Adjourn**			

U.S. DEPARTMENT OF ENERGY | Office of Science

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.

➢ 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 (~ 2.5% for SBIR, 0.30% for STTR) is set aside within each DOE technical program that participates.

➢ Prior to FY 2010: maximum SBIR/STTR award limits were $100k for Phase I and $750k for Phase II.

➢ FY 2011: The Maximum SBIR awards were raised to $150k and $1000k.

➢ 2012: The maximum SBIR and STTR award amounts are now at $150k and $1000k.

U.S. DEPARTMENT OF ENERGY | Office of Science

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%

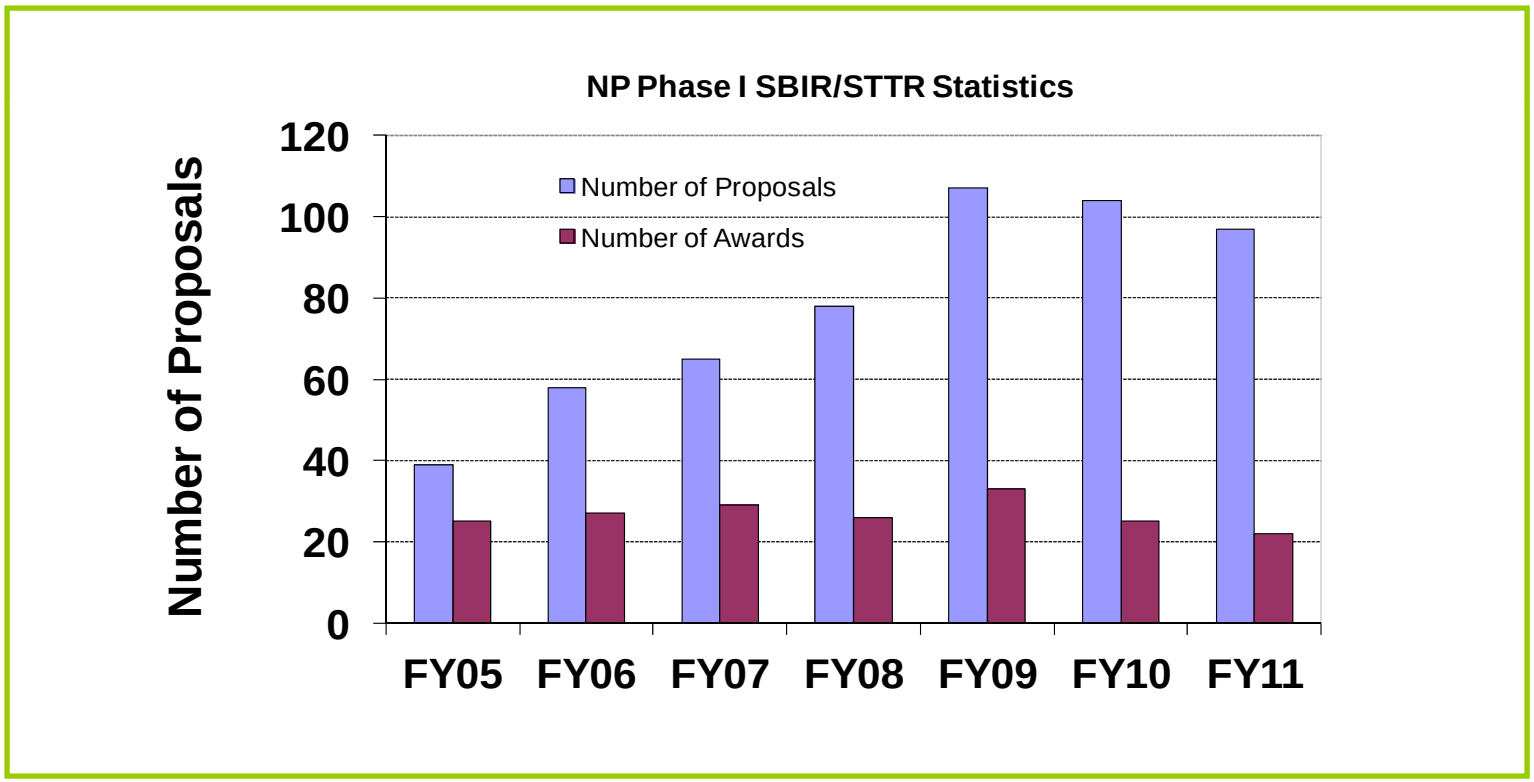
Phase II

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%

U.S. DEPARTMENT OF ENERGY | Office of Science

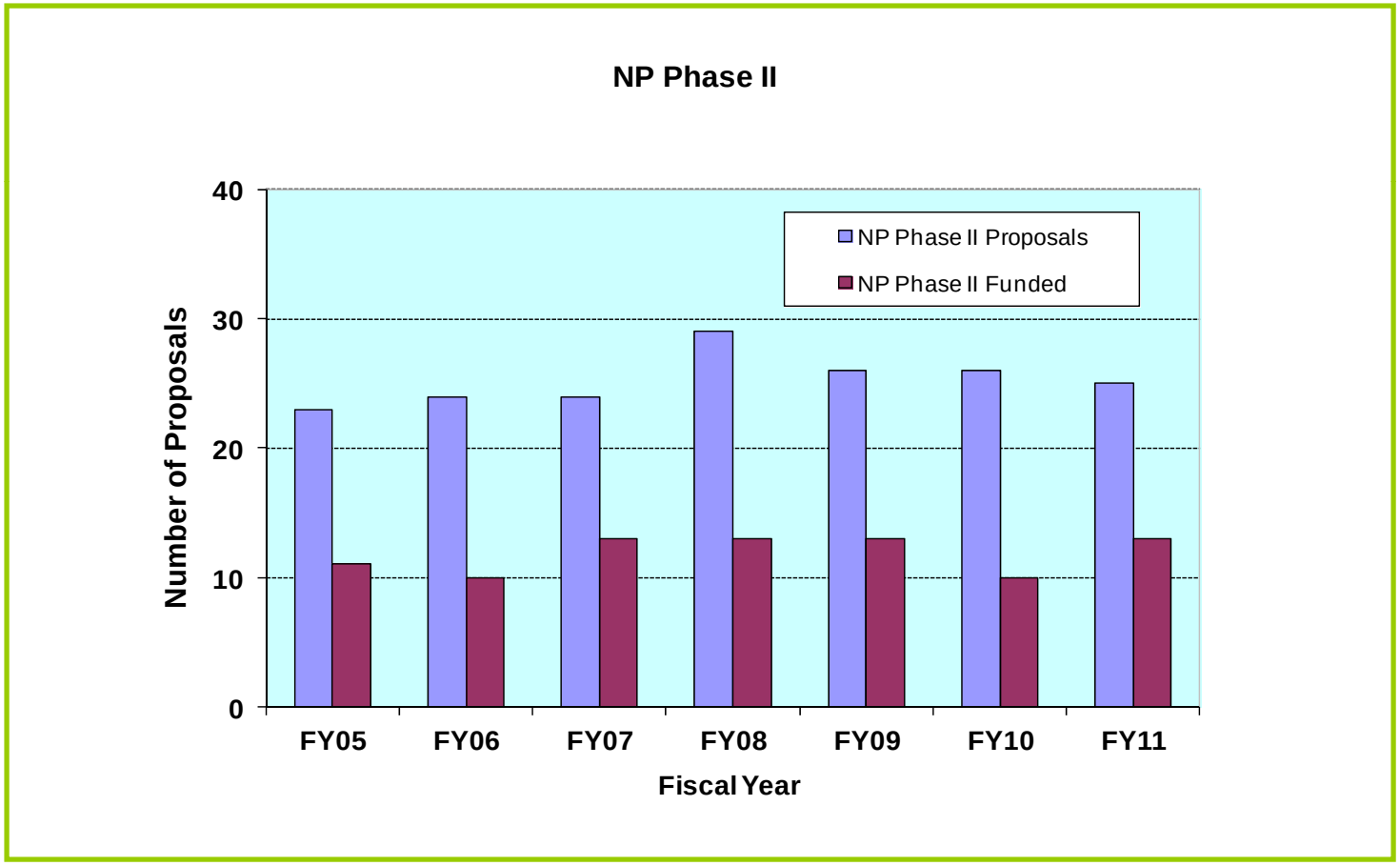
NP Phase I SBIR/STTR Applications and Awards

- NP received a Total of **97** phase I proposals in FY 2011, 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 2010 will also affect number of phase II awards that can be supported.



NP SBIR/STTR Topics

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

U.S. DEPARTMENT OF ENERGY | Office of Science

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 (new)
e. Other

FY10	SBIR	STTR	"Both"	Total
# of Applications	4	1	1	6
# of Awards	0	0	0	0

FY11	SBIR	STTR	"Both"	Total
# of Applications	5	0	0	5
# of Awards	1	0	0	1

U.S. DEPARTMENT OF ENERGY | Office of Science

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

FY10	SBIR	STTR	"Both"	Total
# of Applications	19	1	4	24
# of Awards	5	1	0	6

FY11	SBIR	STTR	"Both"	Total
# of Applications	15	0	0	15
# of Awards	2	0	0	2

U.S. DEPARTMENT OF ENERGY | Office of Science

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. Novel acceleration methods for ions (new)
i. Other

FY10	SBIR	STTR	"Both"	Total
# of Applications	34	3	5	42
# of Awards	11	1	1	13

FY11	SBIR	STTR	"Both"	Total
# of Applications	31	1	7	39
# of Awards	9	0	3 as STTR	12

U.S. DEPARTMENT OF ENERGY | Office of Science

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

FY10	SBIR	STTR	"Both"	Total
# of Applications	20	4	4	28
# of Awards	4	0	1	5

FY11	SBIR	STTR	"Both"	Total
# of Applications	27	0	1	28
# of Awards	6	0	0	6

U.S. DEPARTMENT OF ENERGY | Office of Science

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

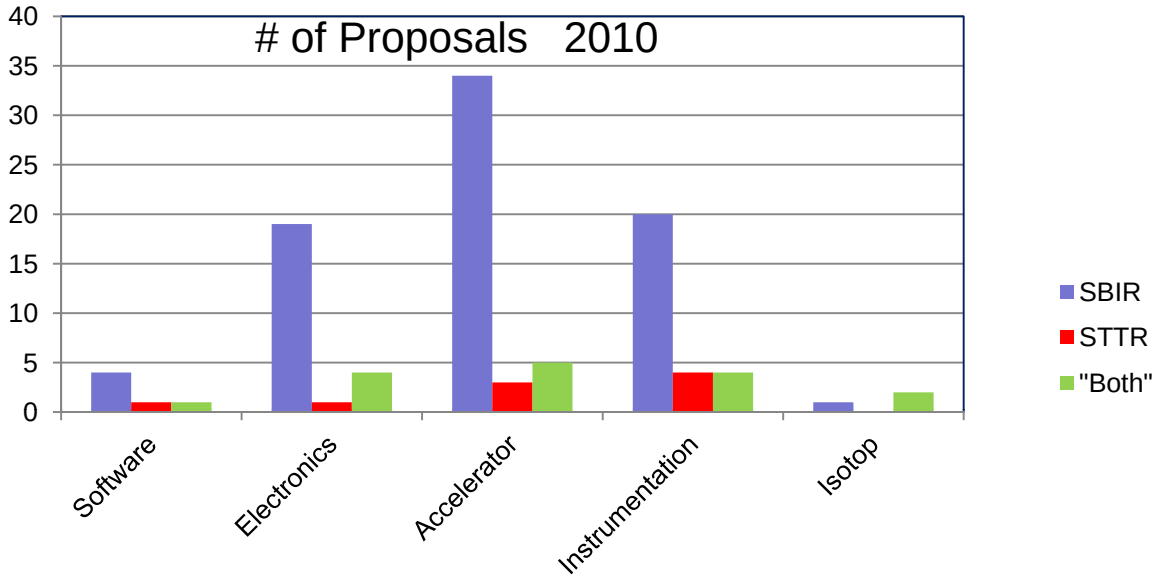
c. Other

FY10	SBIR	STTR	"Both"	Total
# of Applications	1	0	2	3
# of Awards	0	0	1	1

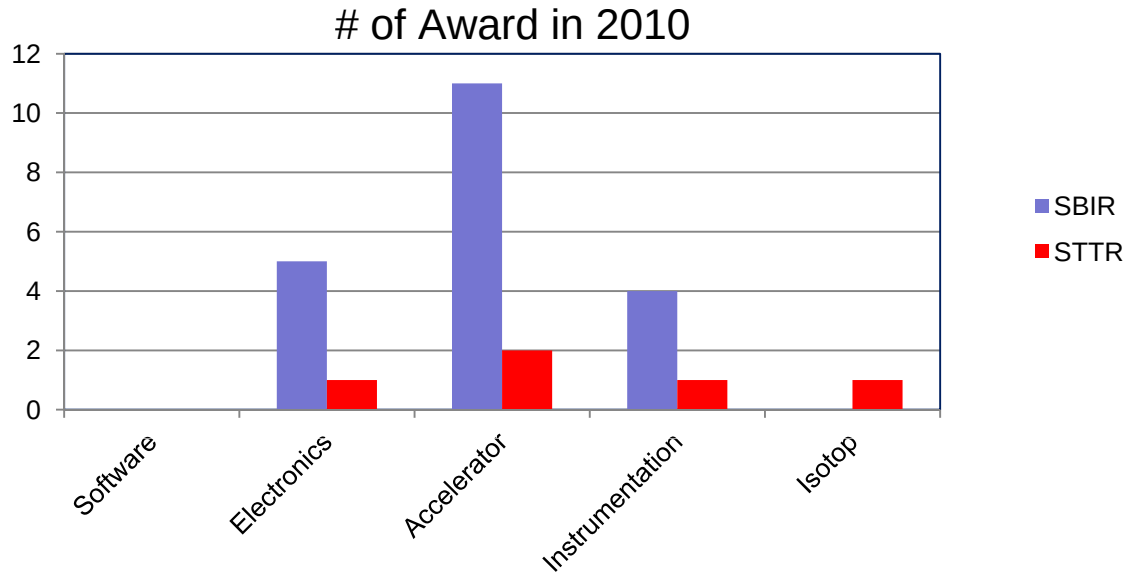
FY11	SBIR	STTR	"Both"	Total
# of Applications	10	0	1	11
# of Awards	1	0	0	1

NP SBIR/STTR Statistics 2010

2010 Proposals

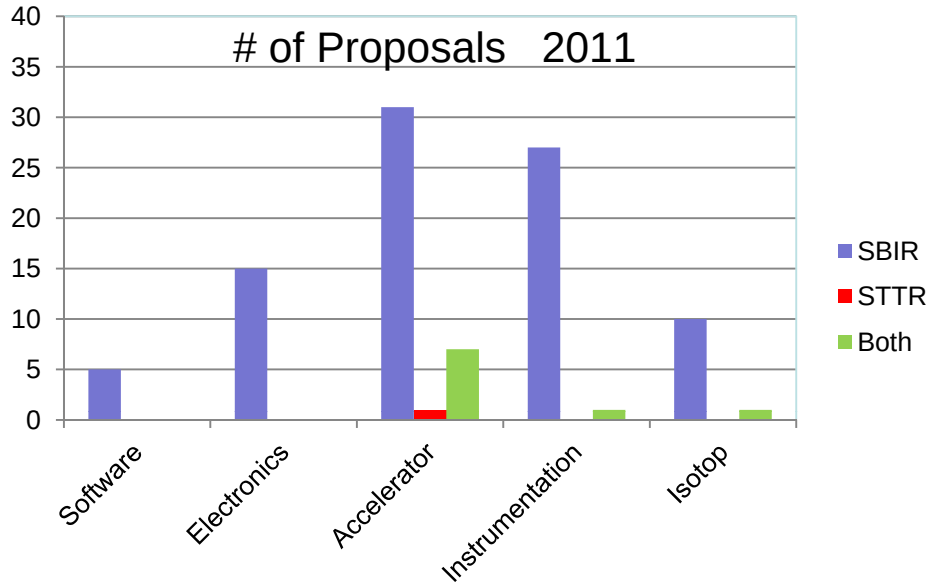


2010 Awards

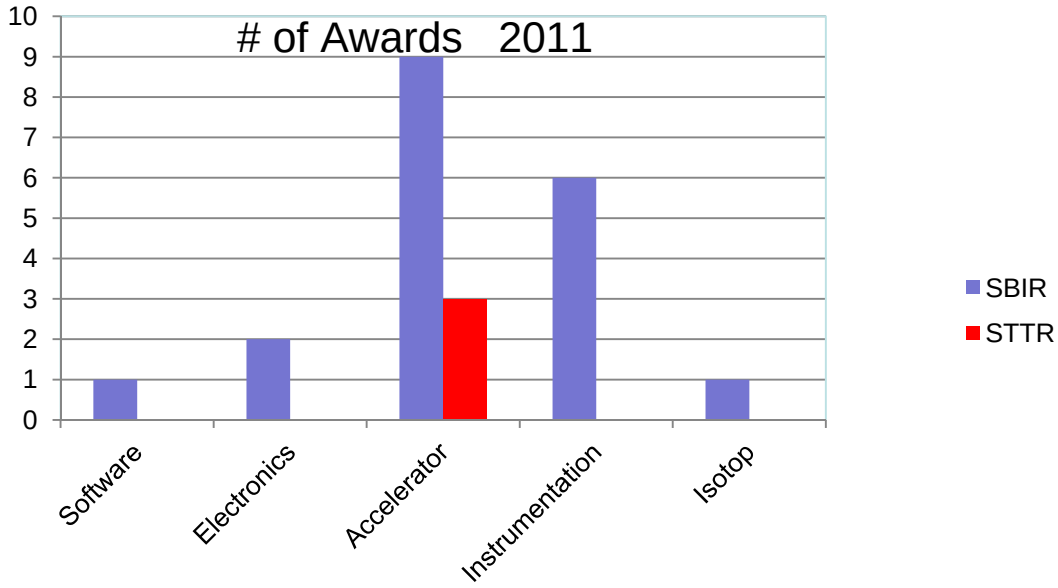


NP SBIR/STTR Statistics 2011

2011 Proposals



2011 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 the 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 third week of September (This year will be published later).

U.S. DEPARTMENT OF ENERGY | Office of Science

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

U.S. DEPARTMENT OF ENERGY | Office of Science

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.

U.S. DEPARTMENT OF ENERGY | Office of Science

Presentation Notes

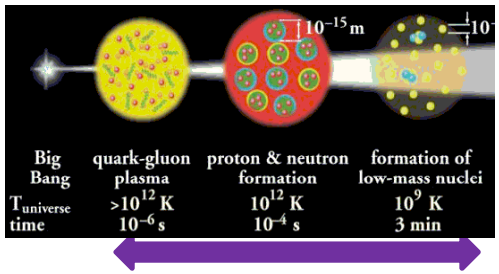
- We have a tight and busy agenda and must stay on time for each presentation.
- Sessions will start sharply at the time stated on the agenda. Please take your seat few minutes before the start of each session to allow the first presentation to begin on time.
- Make sure your presentation file is uploaded 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)
30	20	10	15 and 18
25	18	7	13 And 16
20	14	6	9 and 12

Back up Slides

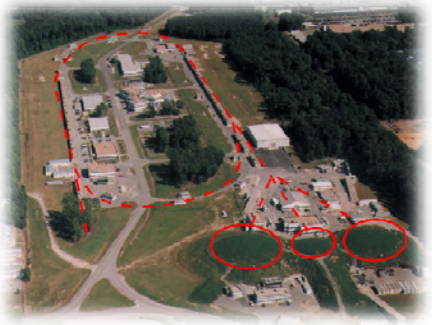
Mission Statement Office of Nuclear Physics

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.



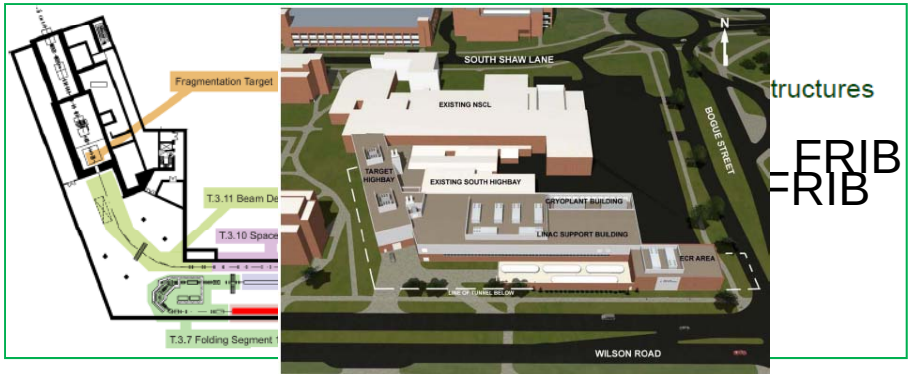
Nuclear Physics

RHIC collider at BNL.



TJNAF

ATLAS at ANL



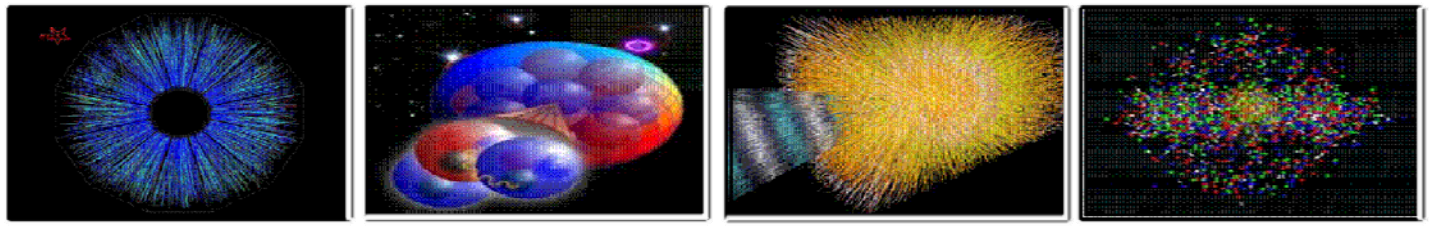
U.S. DEPARTMENT OF ENERGY | Office of Science

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

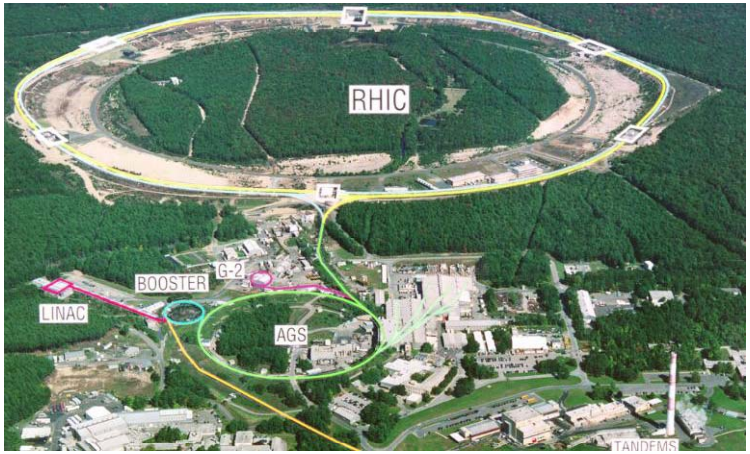
Priorities:

- 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

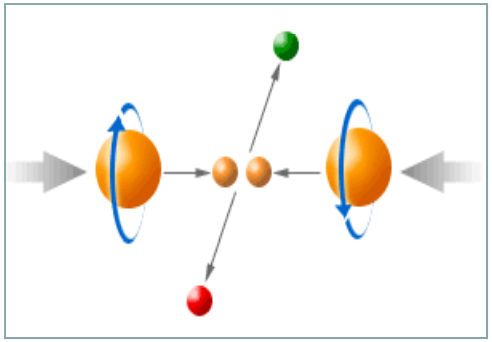


U.S. DEPARTMENT OF ENERGY | Office of Science

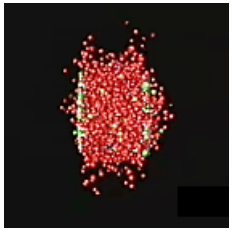
Relativistic Heavy Ion Collider (RHIC)

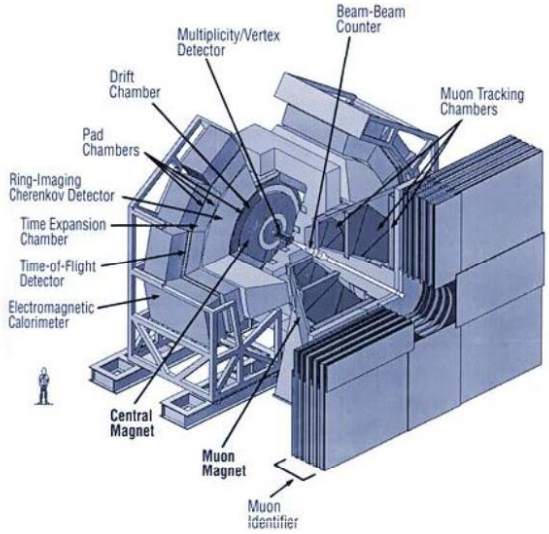


500 Gev P-P or 200 GeV/n Gold-Gold collider.



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.

U.S. DEPARTMENT OF ENERGY | Office of Science

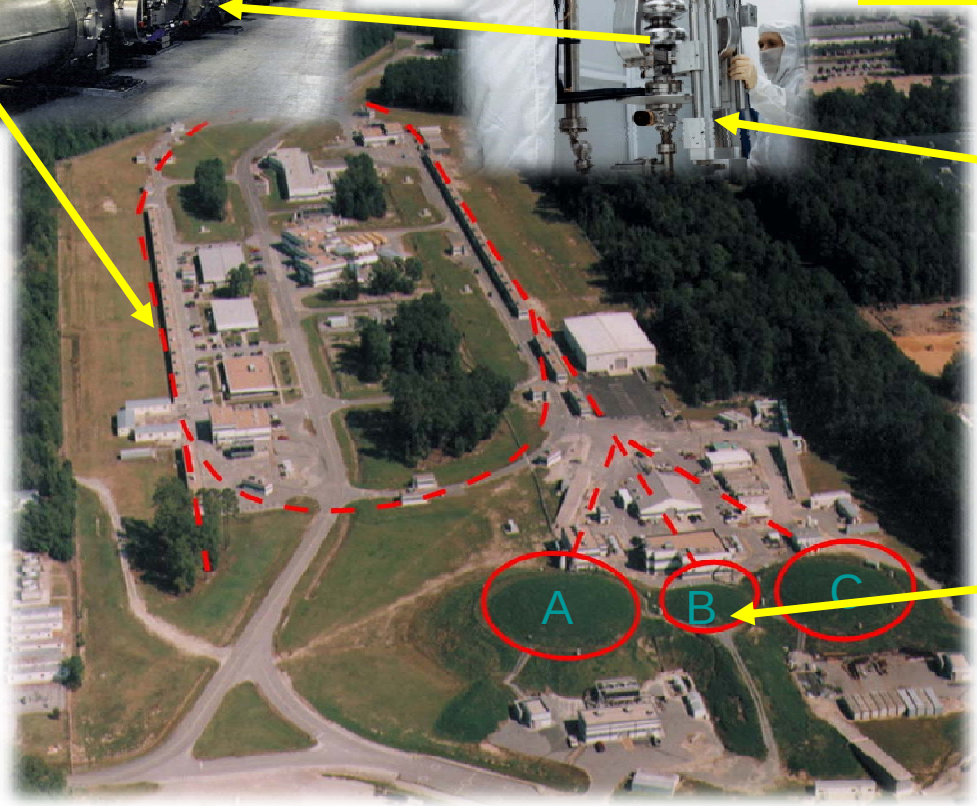
CEBAF at Jefferson Lab, a 6 GeV Electron Accelerator for Nuclear Physics with 12 GeV upgrade

Cryomodules in the accelerator tunnel

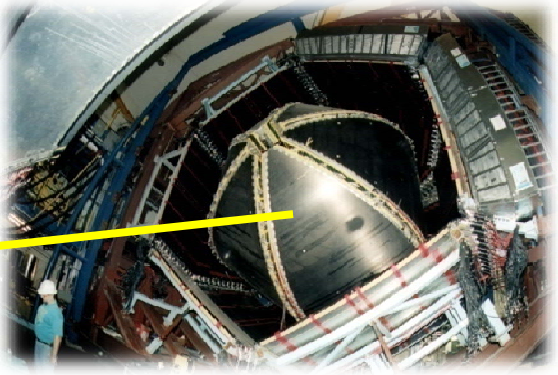
Superconducting radiofrequency (SRF) cavities vertical testing.

World's Premier Facility for studies of:

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



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



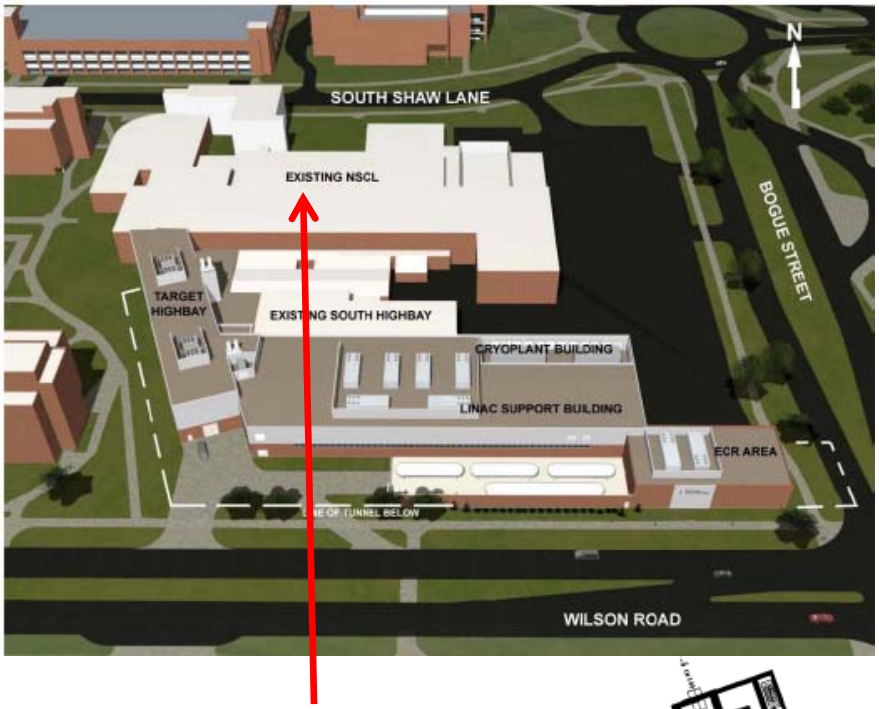
CEBAF Large Acceptance Spectrometer (CLAS) in Hall B

Curtsey, TJNAF

U.S. DEPARTMENT OF ENERGY | Office of Science

Facility for Rare Isotope Beams at MSU

A New "Microscope" to Study the Structure of Nuclei

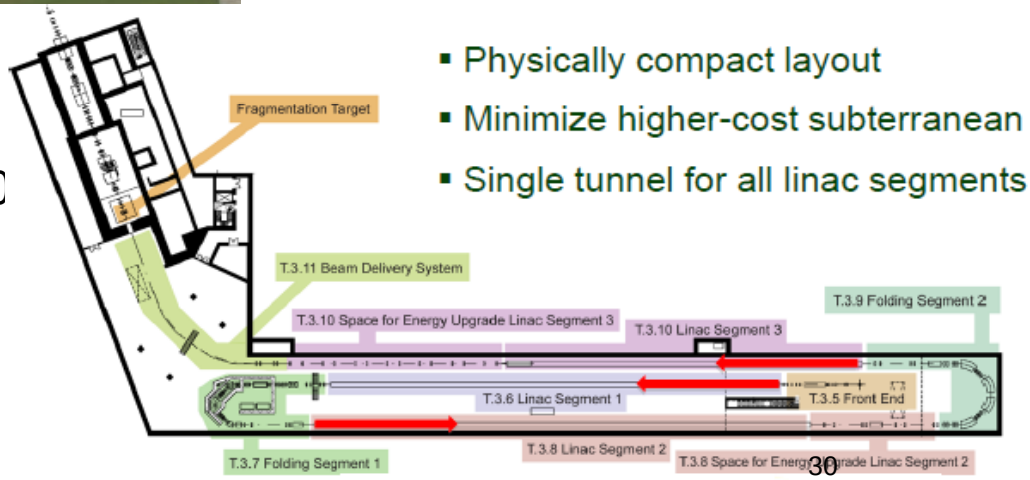


Existing NSCL Laboratory

- 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

30

U.S. DEPARTMENT OF ENERGY | Office of Science

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.