

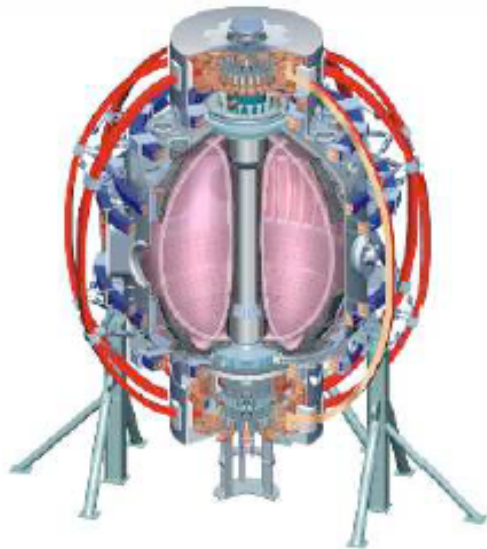
# NSTX Facility Overview, Governance and User Integration

## Masa Ono, PPPL

For the NSTX Research Team

**NSTX Facility Review**  
**Director's Conference Room, PPPL**  
**July 30 - 31, 2008**

College W&M  
Colorado Sch Mines  
Columbia U  
Comp-X  
General Atomics  
INEL  
Johns Hopkins U  
LANL  
LLNL  
Lodestar  
MIT  
Nova Photonics  
New York U  
Old Dominion U  
ORNL  
PPPL  
PSI  
Princeton U  
SNL  
Think Tank, Inc.  
UC Davis  
UC Irvine  
UCLA  
UCSD  
U Colorado  
U Maryland  
U Rochester  
U Washington  
U Wisconsin



Culham Sci Ctr  
U St. Andrews  
York U  
Chubu U  
Fukui U  
Hiroshima U  
Hyogo U  
Kyoto U  
Kyushu U  
Kyushu Tokai U  
NIFS  
Niigata U  
U Tokyo  
JAEA  
Hebrew U  
Ioffe Inst  
RRC Kurchatov Inst  
TRINITI  
KBSI  
KAIST  
POSTECH  
ASIPP  
ENEA, Frascati  
CEA, Cadarache  
IPP, Jülich  
IPP, Garching  
ASCR, Czech Rep  
U Quebec

# Talk Outline

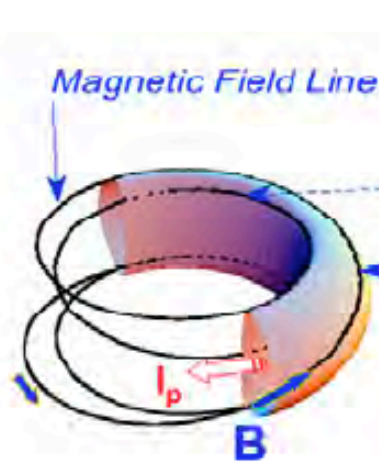
- **NSTX Facility Status Overview**
- **NSTX Organization and Governance**
- **NSTX Collaboration Process**
- **Facility Operations and Research Productivity**
- **Conclusions**

# Talk Outline

- **NSTX Facility Status Overview**
- NSTX Organization and Governance
- NSTX Collaboration Process
- Facility Operations and Research Productivity
- Conclusions

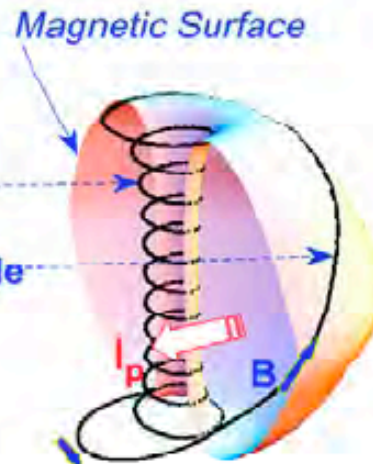
# NSTX is a Proof-of-Principle Spherical Torus (ST) Facility

**Tokamak**



$R/a=2.5-4, \kappa=1.5-2,$

**Spherical Torus**



$R/a=1.1-1.6, \kappa=2-3$

**Aspect Ratio  $A \equiv R / a$**

(plasma average major radius / plasma half-width)

**Elongation  $\kappa \equiv b / a$**

(plasma height / plasma width)

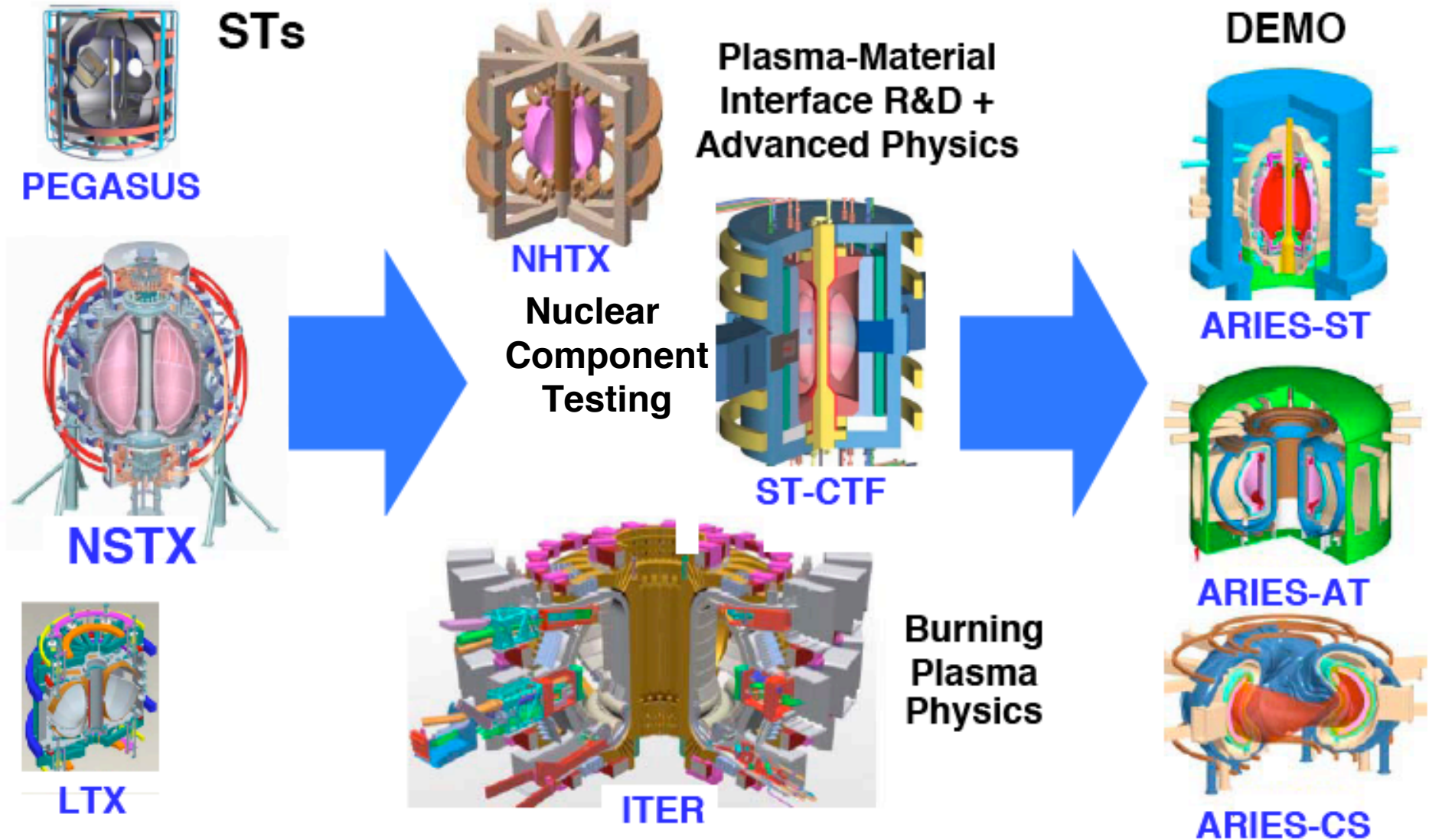
**$q_e \equiv$  magnetic safety factor at edge**

(number of field-line toroidal transits / poloidal transits)

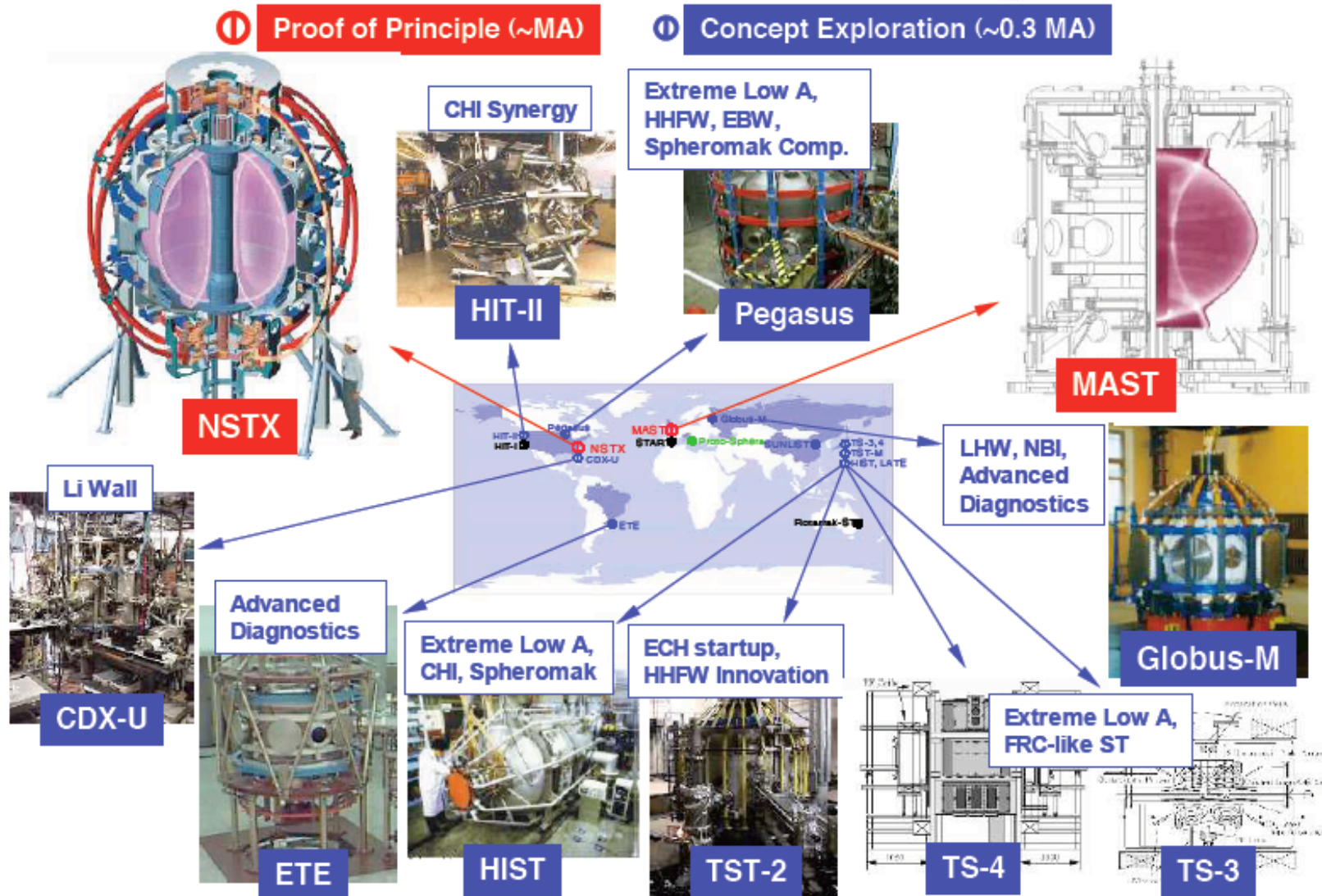
## Attractive Features of ST Configuration:

- Stable at high plasma pressure for a given magnetic pressure. More fusion power for given investment.
- Simple copper TF magnet for compactness and ease of remote maintenance
- Near term application for compact ST facilities for Plasma-Material Interactions and Nuclear Component Testing for Demo

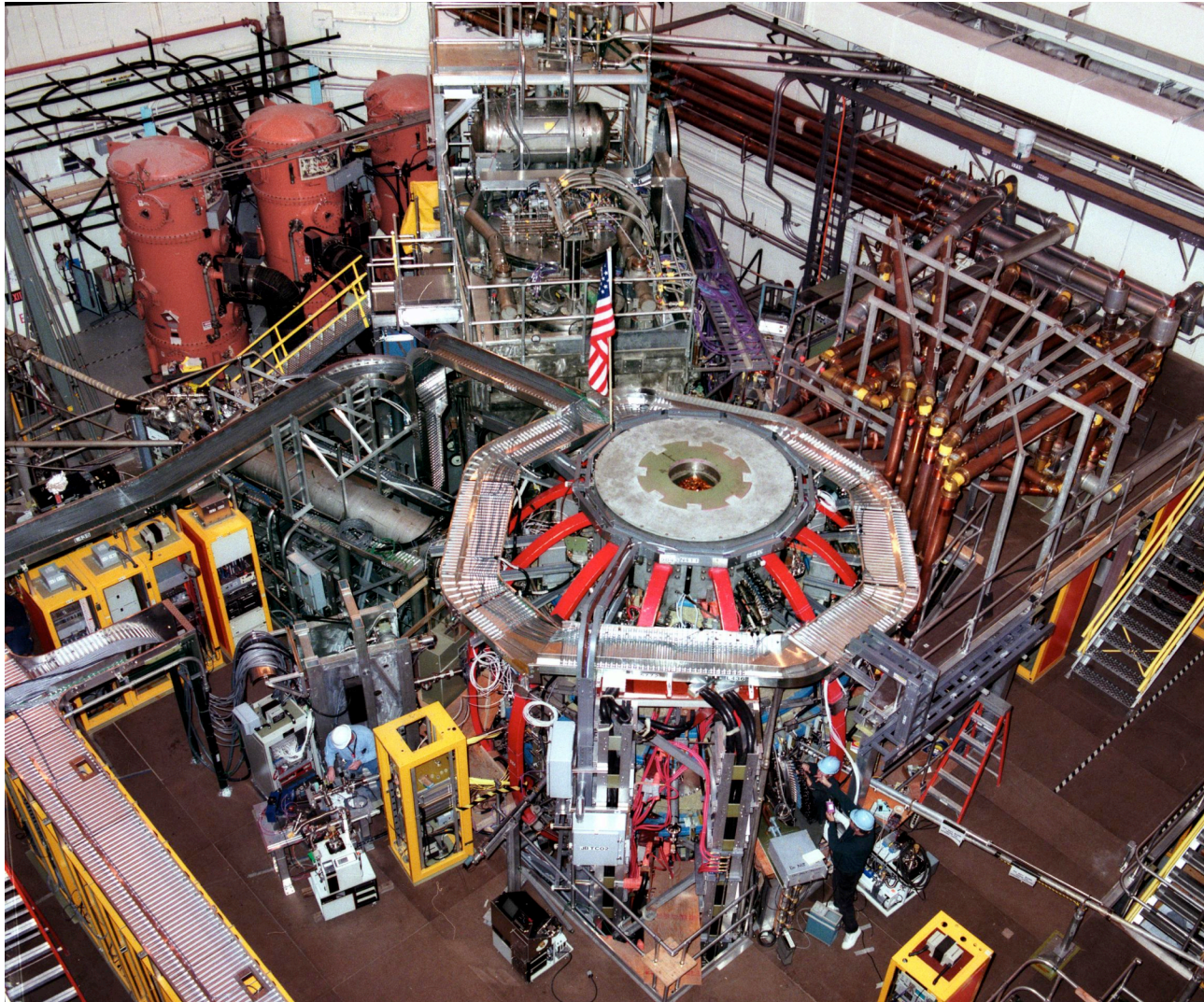
# Present and Future ST Complement ITER and Accelerate the Development Paths of all DEMO Concepts



# NSTX is the World's Most Powerful ST Facility



# NSTX: A Major OFES Facility Located at PPPL



## Device Capabilities

Major Radius 0.85 m

Minor Radius 0.68 m

Elongation 1.8 - 3.0

Triangularity 0.2 - 0.8

Plasma Current

1 MA (1.5 MA peak)

Toroidal Field

0.35 - 0.55 T

Heating and CD

7 MW NBI (2 sec)

5 MW NBI (5 sec)

6 MW HHFW (5 sec)

0.2 MA CHI

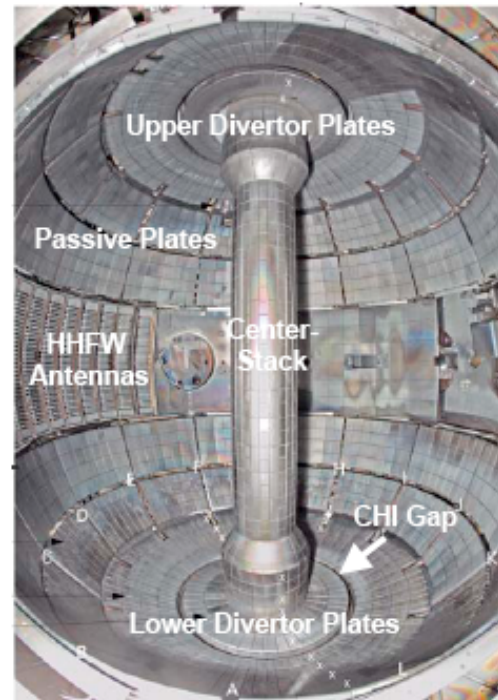
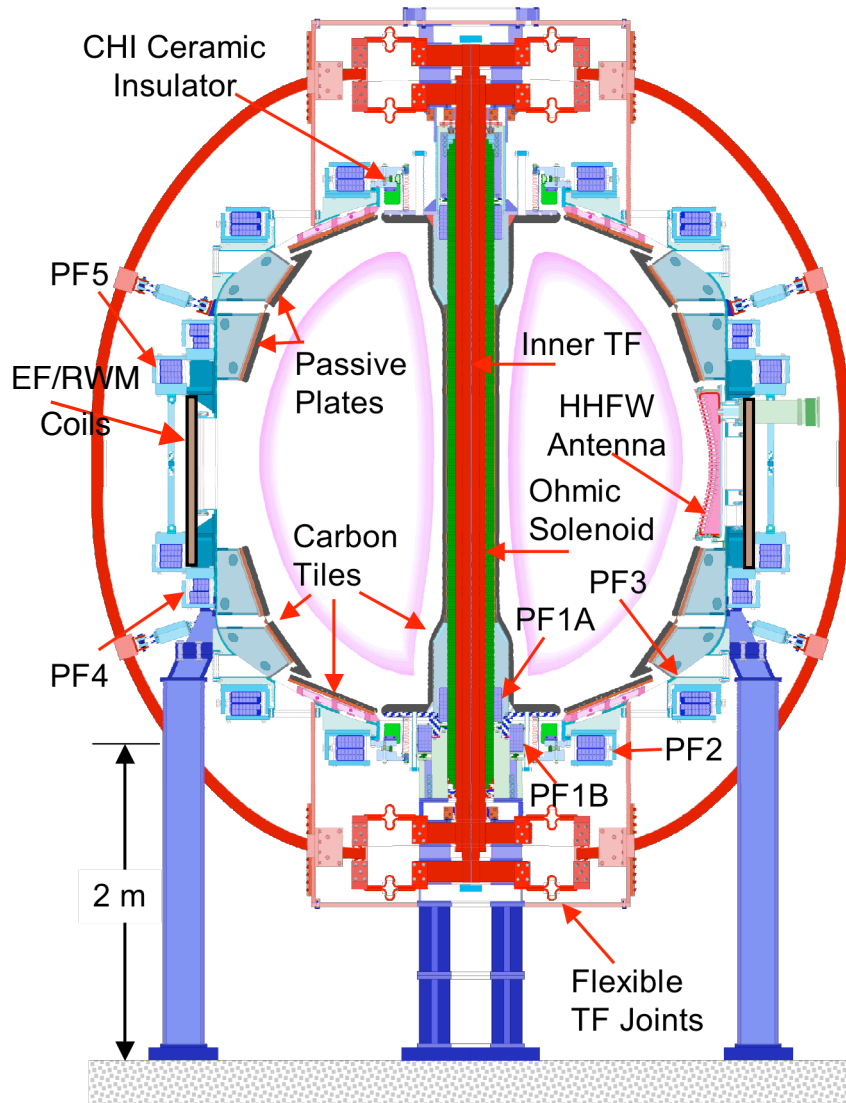
Pulse Length

~ 1 sec at 0.55 T

~ 2 sec at 0.38 T

# NSTX Device Cross-Section and VV Internal Components

## Removable Center-Stack Design



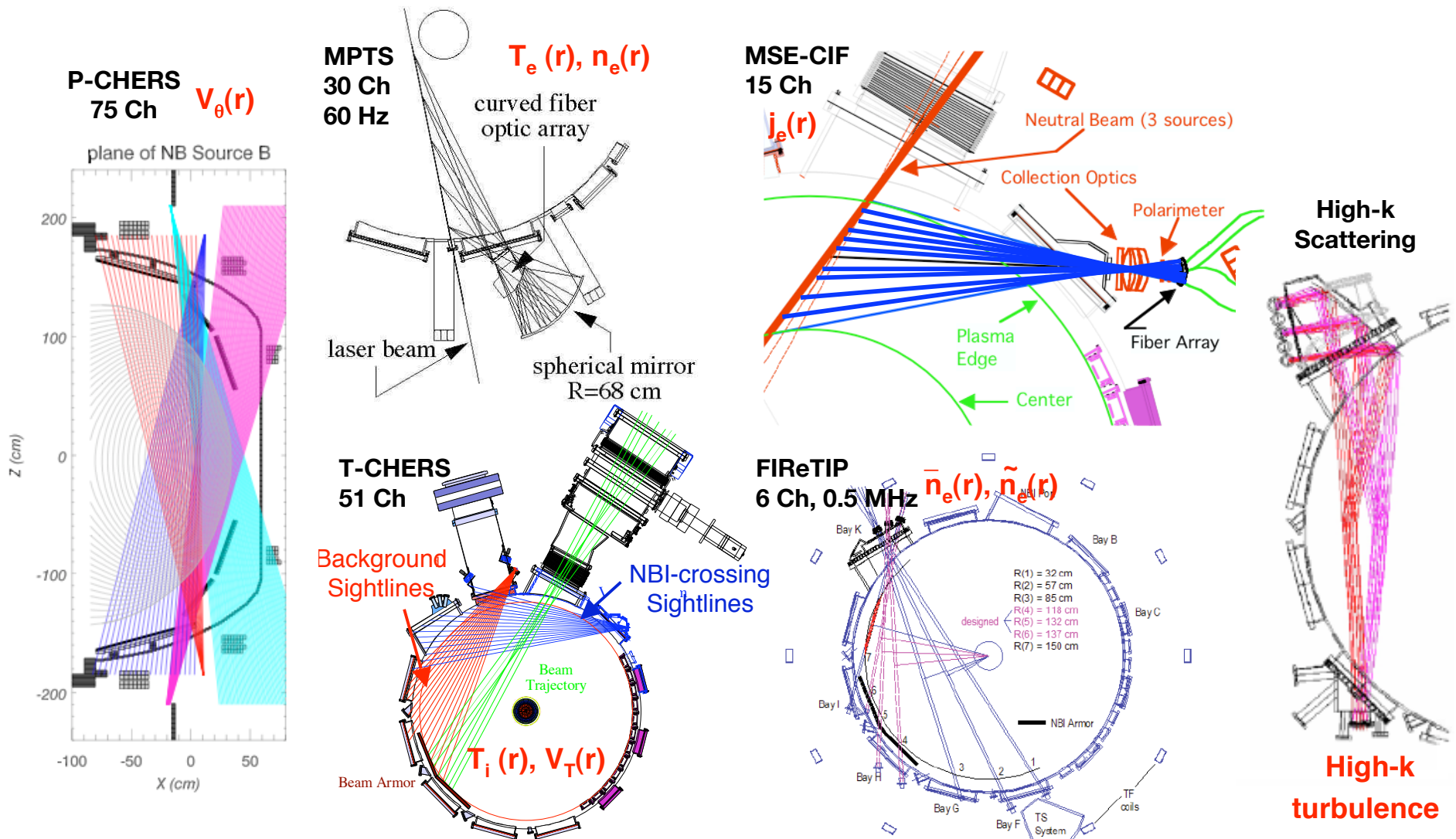
**NSTX center-stack magnets lifted out of device for maintenance**

**Tall VV ~ 3.5 m  
Elect. Insulated CS  
350°C Tile Bakeout**





# NSTX has Excellent Diagnostic Access and State-of-the-Art Profile Diagnostics



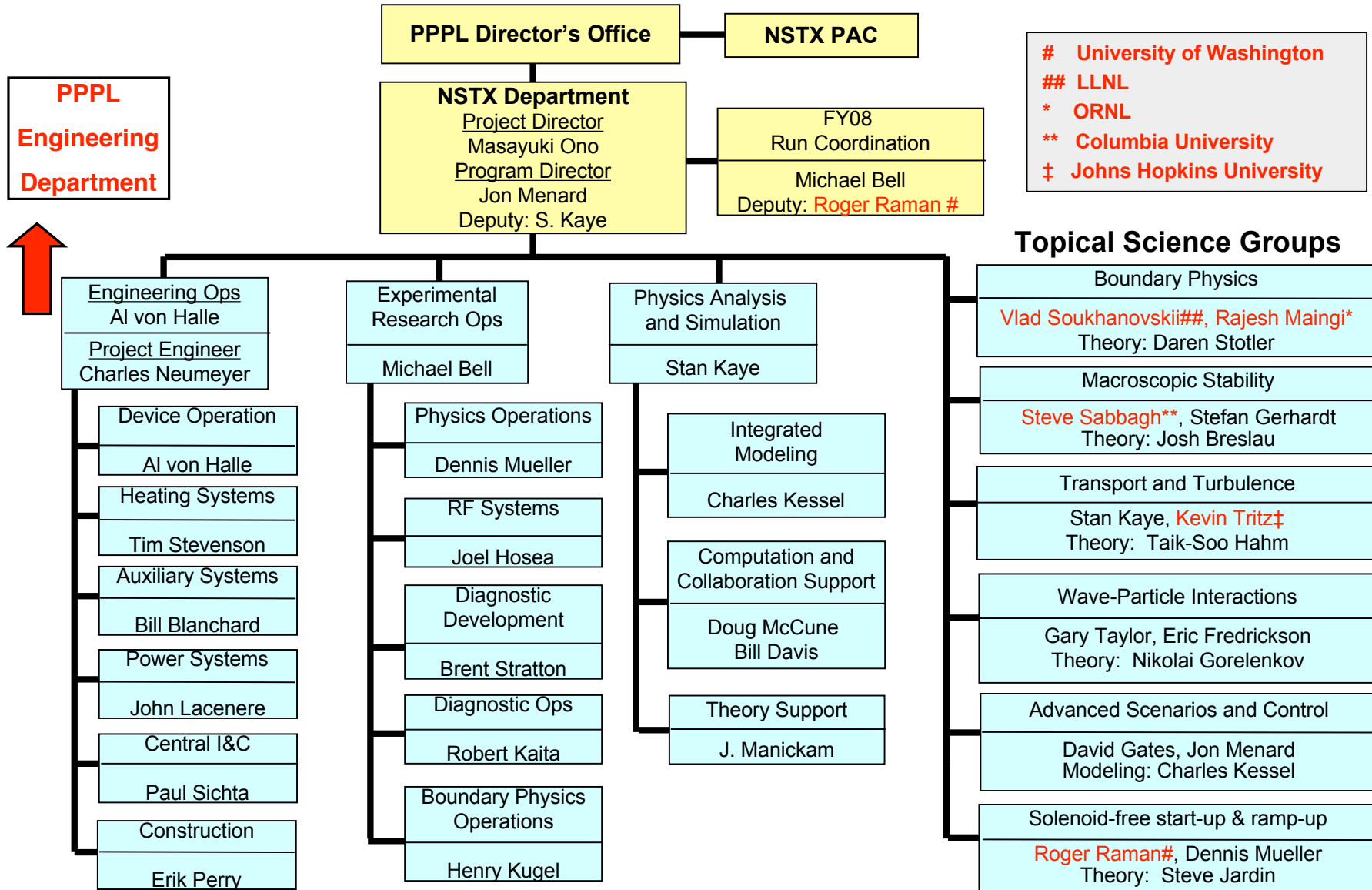
Over half of the NSTX diagnostic systems have strong collaboration contributions

# Talk Outline

- NSTX Facility Status Overview
- **NSTX Organization and Governance**
- NSTX Collaboration Process
- Facility Operations and Research Productivity
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# NSTX Facility is Managed by PPPL

## Research Team however is Well Integrated and Seamless



## NSTX Program is Aided by Advises from NSTX Program Advisory Committee and U.S. ST Coordinating Committee(STCC)

### NSTX Program Advisory Committee

#### Members:

Michael E. Mauel (Columbia University) – chair  
Riccardo Betti (University of Rochester)  
Jeffrey Brooks (Purdue University)  
Ronald H. Cohen (LLNL)  
Donald L. Hillis (ORNL)  
Jiangang Li (ASIPP, Hefei, China)  
Bruce Lipschultz (MIT)  
Brian Lloyd (UKAEA Culham)  
Richard P. Majeski (PPPL)  
T. K. Mau (University of California, San Diego)  
Takashi Ozeki (Japan Atomic Energy Agency)  
John S. Sarff (University of Wisconsin)  
Paul W. Terry (University of Wisconsin)  
Mickey Wade (General Atomics)  
Harmut Zohn (Max-Plan Institute, Germany)  
James W. Van Dam (University of Texas)

#### Ex-officio:

Stephen A. Eckstrand (DOE OFES)  
Jon Menard (PPPL)  
Masayuki Ono (PPPL)

### ST Coordinating Committee:

Organized by OFES and report to ST Program Manager (Steve Eckstrand). Its charge includes "Devlop, support, and promote the evolving roles of ST in the US fusion program."

#### Membership selected to represent major R&D components

- Three ST experiments: NSTX (Jon Menard), PEGASUS (Aaron Sontag), LTX (Dick Majeski)
- ST R&D on diagnostics (Fred Levinton) and theory-modeling-simulation (Bill Dorland), and by universitites (Steve Sabbagh), national laboratories (Don Hills), and GA (Rob LaHaye)
- Chaired by Martin Peng

# Developing the NSTX Research Program

- **Guided by NSTX mission**
  - Provide the physics basis for future ST-based devices
  - Broaden the basis for ITER, participating in ITPA and USBPO
  - Advance the understanding of toroidal magnetic confinement and evolving device and diagnostic capabilities
- **Research Milestones and plans for upgrades are**
  - developed by NSTX leadership in discussion with NSTX Topical Science Group leaders
  - reviewed by the NSTX Program Advisory Committee and
  - agreed with DOE as part of the FWP process based on available budget
  - complemented by Facility and Diagnostic Milestones

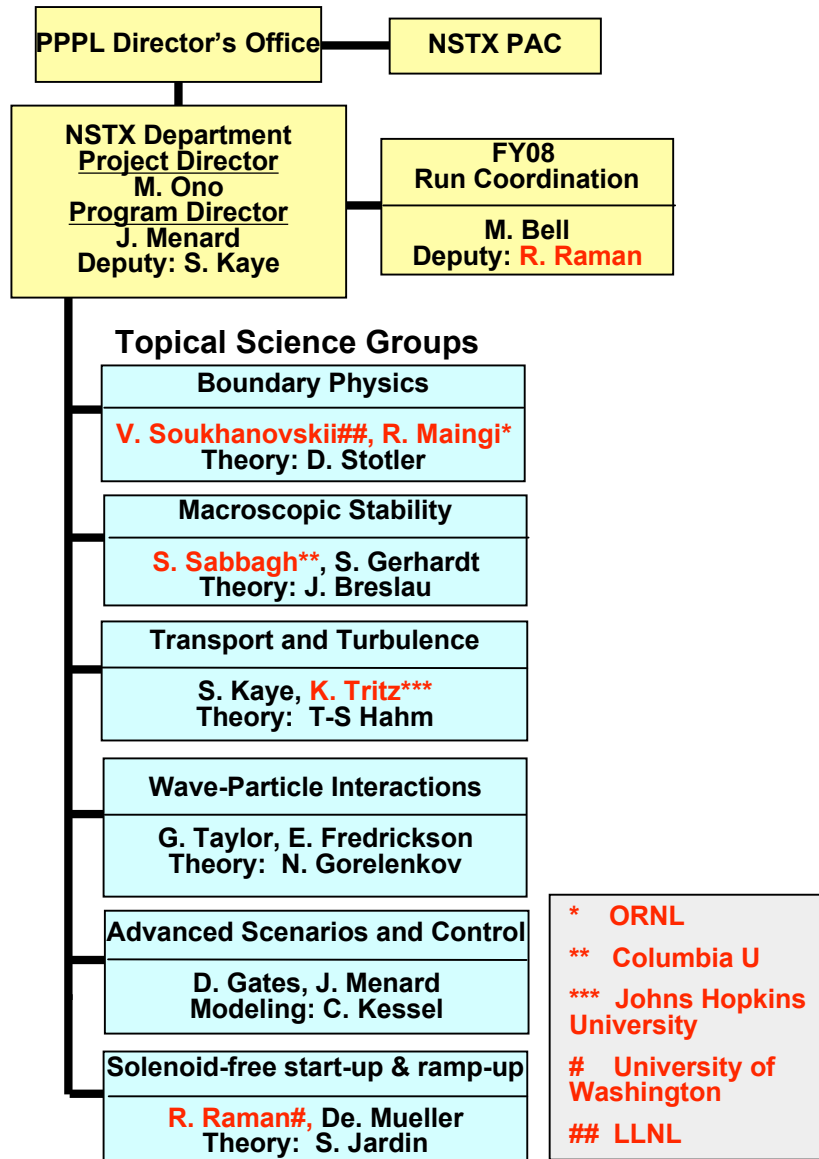
# **NSTX research plans formulated through annual meetings**

**Collaborators well integrated and remote participation supported**

- **NSTX Results Review meeting** to go over the research results after the run (for this year, Aug. 6 - 7, 2008)
- **Run Assessment meeting** to discuss the issues and improvement areas after the run (for this year, Aug. 8, 2008)
- **NSTX Research Forum** to develop the research run plan (experimental proposals) (for this year to be held in Dec. 2008)
- **NSTX Program Advisory Committee meeting** is held annually in Jan. - Feb time frame to review the NSTX run results and plans for upcoming run. Also to review the Field Work Proposals. (By the PPPL Director's Office)
- **NSTX Program Advisory Committee** also hold a telephone conference call meeting in the summer time to review and recommend adjustments to the NSTX Program Letter concerning prospective collaboration proposals from national laboratories (By the PPPL Director's Office)

**In addition, NSTX Team members including collaborators are updated and given chance for discussions by open web access, e-mails, daily (8:30, 5:00) meetings, weekly (Physics and Program-Op), and monthly team meetings.**

# Leadership of NSTX Topical Science Groups Plays a Major Role in Governing the Research Program



- Determine and address highest priority scientific issues within a topical area through discussion and consensus at open meetings
- Organize the NSTX Research Forum sessions for the TSG
- Draft scientific milestones utilizing expertise of the TSG
- Propose and execute experiments to achieve milestones and address priorities
- Define facility and theory resources to achieve research goals
- Aid dissemination of results with Physics Analysis & Simulation Division - *Journal publications, invited talks, seminars, colloquia, conferences, ITPA, BPO*
- Provide summaries of scientific progress at NSTX monthly team meetings and other venues to promote discussion
- Assist and report to the NSTX Program and Project directors

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## Since Its Inception, NSTX has Involved Collaborators Extensively

- **Collaborations involve a broad group of domestic and international users**
  - Collaborators were involved in originally proposing, designing NSTX
  - Many diagnostic systems are built and operated by collaborators
- **Of 195 researchers (including students & post-docs) associated with NSTX:**
  - 59 are from PPPL and PU,
  - 91 are from 22 US institutions (~60% personnel, ~40% FTE of US effort)
    - 18 of these are located at PPPL long-term ( $\geq 1$  year)
  - 45 are from institutions in other countries
  - Additional 53 US associated research users
- **DOE annually solicits proposals for collaboration with NSTX**
  - Both new proposals and renewal of existing collaborations
  - Collaborations are competitively peer-reviewed on a three-year cycle
- **Collaborators participate fully in the research program**
  - Meetings of research team to plan upgrades and research
  - Proposing, developing and executing experiments
  - Reviewing, analyzing and discussing results
  - Publishing and presenting the results of their work

# National and International Collaboration Team Members

## An Integral Part of NSTX Program

### NSTX National Institutions\*

<i>Colorado Sch Mines</i>	<i>MIT</i>	<i>Think Tank, Inc.</i>
<i>Columbia U</i>	<i>Nova Photonics</i>	<i>UC Davis</i>
<i>Comp-X</i>	<i>New York U</i>	<i>UC Irvine</i>
<i>General Atomics</i>	<i>Old Dominion U</i>	<i>UCLA</i>
<i>INEL</i>	<i>ORNL</i>	<i>UCSD</i>
<i>Johns Hopkins U</i>	<i>PPPL</i>	<i>U Colorado</i>
<i>LANL</i>	<i>PSI</i>	<i>U Maryland</i>
<i>LLNL</i>	<i>Princeton U</i>	<i>U Rochester</i>
<i>Lodestar</i>	<i>SNL</i>	<i>U Washington</i>
		<i>U Wisconsin</i>

### NSTX International Institutions

<i>Culham Sci Ctr</i>	<i>Niigata U</i>	<i>POSTECH</i>
<i>U St. Andrews</i>	<i>U Tokyo</i>	<i>ASIPP</i>
<i>York U</i>	<i>JAEA</i>	<i>ENEA, Frascati</i>
<i>Chubu U</i>	<i>Hebrew U</i>	<i>CEA,</i>
<i>Fukui U</i>	<i>Ioffe Inst</i>	<i>Cadarache</i>
<i>Hiroshima U</i>	<i>RRC Kurchatov</i>	<i>IPP, Jülich</i>
<i>Hyogo U</i>	<i>Inst</i>	<i>IPP, Garching</i>
<i>Kyoto U</i>	<i>TRINITI</i>	<i>ASCR, Czech</i>
<i>Kyushu U</i>	<i>KBSI</i>	<i>Rep</i>
<i>Kyushu Tokai U</i>	<i>KAIST</i>	<i>U Quebec</i>
<i>NIFS</i>		

### \*NSTX National Team

#### Supported by:

- DOE NSTX Competitive Grants and Contracts
- Innovative Diagnostic Initiatives
- Theory / Scidac
- Technology
- Small business grants

	PPPL Research	National Collaborators	Foreign Collaborators	Associated Researchers
Researchers *	59	91	45	53
Post Doc	1	9	1	
Grad Students	8	8	5	1
Undergrads	10			

\* Include Post Doc and Graduate Students

- 33 Graduate students and post docs

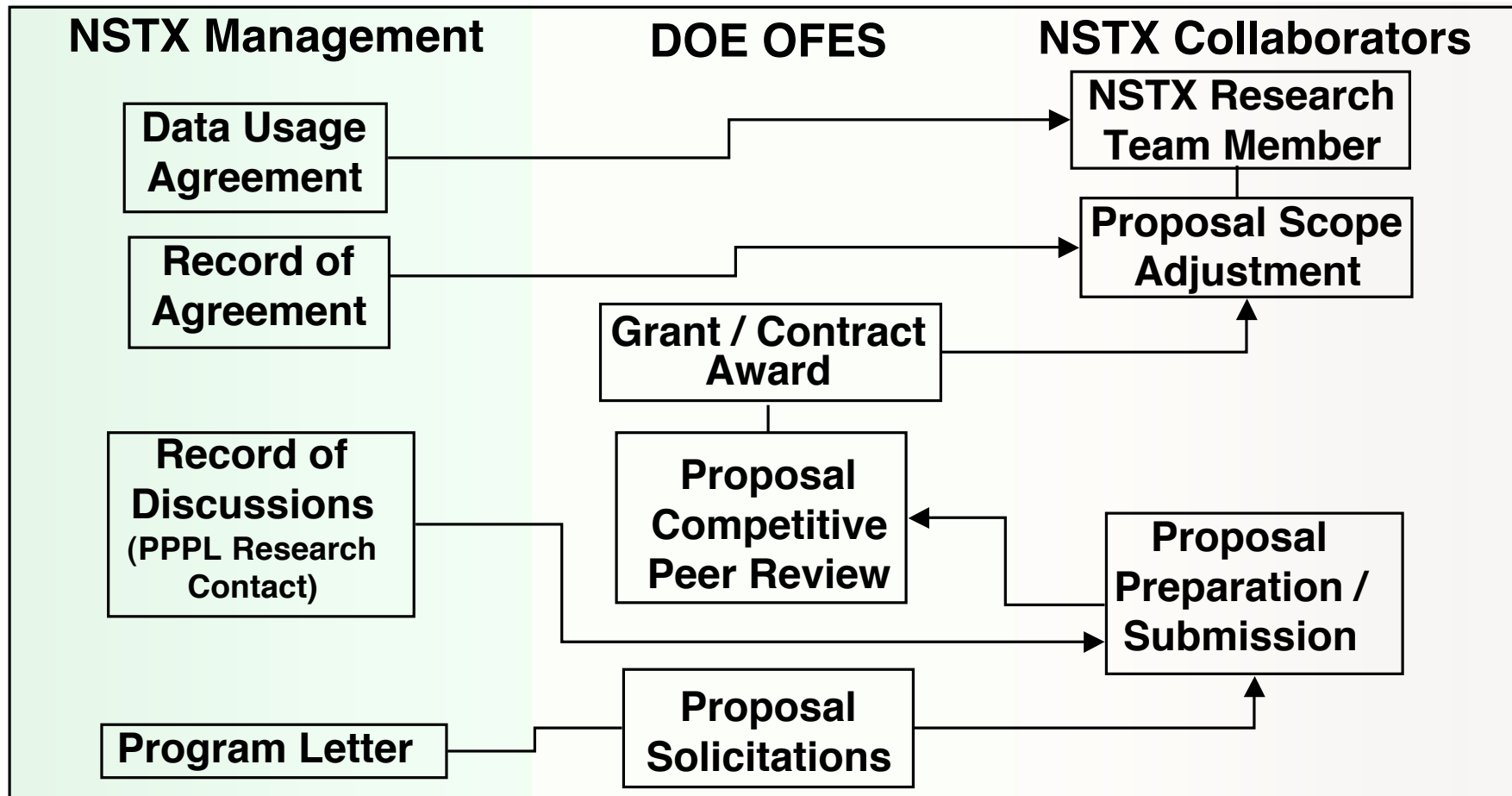
# NSTX Collaborations are Governed by Formal Arrangements

- **Record of Discussion**
  - Results of discussions between prospective collaborators and an NSTX Research Contact in support of proposals submitted to DOE
  - Includes goals of research, describes on- and off- site components of work involved and estimates of support required from NSTX
- **Record of Agreement**
  - Describes agreed commitments of resources, equipment and facilities by a collaborating institution and NSTX
- **Data Usage Agreement**
  - Governs access to and publication of data
  - Provides for project and peer review of external publications
  - Policies for access to, use and publication of NSTX data are the same for PPPL staff and collaborators

# DOE annually solicits proposals for collaboration with NSTX

## Both new proposals and renewal of existing collaborations

NSTX Collaborations are competitively peer-reviewed on a three-year cycle:  
1. University/Industry Diagnostics, 2. Laboratories, & 3. University/Industry Physics



# **NSTX Collaborators are Directly Funded by OFES/DOE**

## **Through DOE NSTX Competitive Grants and Contracts**

### **University and Industry - Diagnostics:**

- Nova Photonics, Levinton: The Motional Stark Effect Diagnostic and a Turbulence Visualization Diagnostic for NSTX
- Nova Photonics, Maqueda: Tangential 2-D Edge Imaging for GPI and Edge/Impurity Modeling
- UC Davis, Luhmann: Tangential 2-D Edge Imaging for GPI and Edge/Impurity Modeling
- UC Irvine, Heidbrink: Fast-Ion D-Alpha Diagnostic for NSTX
- UCLA, Peebles: Cross-Cutting Research Studies on NSTX Using mm-wave Reflectometry
- UCSD, Boedo: Edge Physics Studies on the NSTX Spherical Tokamaks
- Johns Hopkins, Finkenthal: USXR Based MHD, Transport, Equilibria and Current Profile Diagnostics for NSTX

### **Laboratories - Physics, Facilities, Diagnostics**

- LLNL: Boundary Physics
- LANL: Predictive Modeling of CHI on NSTX
- SNL: Liquid Lithium Divertor
- ORNL: HHFW, EBW, Boundary Physics

### **University and Industry - Physics**

- Columbia University, Sabbagh: MHD, EFIT, RWM, NTM
- MIT, Bonoli: HHFW modeling
- GA, La Haye: NTM, Plasma Control
- University of Washington, Jarboe: Coaxial Helicity Injection
- UC Irvine, Heidbrink: Energetic Particle Physics
- Purdue University, Hassanein: LLD modeling
- Purdue University, Allain: Lithium-Material Interaction
- University of Illinois: LLD physics
- UCSD, Pigarov: Boundary Modeling
- Lodestar, Myra: Edge-Scrape-Off Modeling
- University of Colorado, Munsat: Edge Turbulence Visualization

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# NSTX Facility Operation Efficiency has Improved Every Year for Last 5 Years

	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
Run weeks planned / achieved	20/21	17/18	11/12.7	12/12.6	15/16.6
Hours of operation planned / achieved	800/844	680/720	440/508	480/504	600/664
Total Plasma Shots	2460	2221	1617	1879	2571
Plasma Shots per Run Week	117	123	128	149	155

- **Facility operations have exceeded all the facility operations Joule milestone goals for the last Five Year Plan Period.**
- **Facility operations efficiency has been steadily rising during the period**
  - **Plasma shots per week increased by 33% over the period**
- **Facility provide remote control room access and remote experimentation**
- **Facility operated safely with no lost time accidents ever. Has been receiving safety awards from the State of NJ every year since 1999.**

# NSTX has Excellent Record of Research and On-Schedule Milestone Completion

## FY 2008

- Measure poloidal rotation at low A and compare with theory (Target: Sept. 2008 - on track)
- Couple inductive ramp-up to CHI plasmas (Target: Sept. 2008 - on track)
- Study variation and control of heat flux in SOL (Target: Sept. 2008 - on track)

## FY 2007

- Variation of local high-k turbulence with plasma conditions (Completed on schedule)
- Closed-loop RWM control at low rotation using ITER-like control coils (Completed on schedule)
- Measure, identify and characterize modes driven by super-Alfvénic ions (Completed on schedule)

## FY 2006

- Perform highly localized measurement of magnitude of high-k turbulence (Completed on schedule)
- Characterize closed-loop Error Field control with ITER-like EF/RWM coils (Completed on schedule)
- Assess closed-flux generation using transient Coaxial Helicity Injection (CHI) (Completed on schedule)
- Characterize effects of lithium wall coating on recycling (Completed on schedule)

## FY 2005

- Effects of magnetic shear and  $T_e$  gradients on electron transport in low-A plasmas (Completed on schedule)
- Strongly shaped, rotating, low A plasmas near wall limit with EF correction (Completed on schedule)
- Supra-Alfvénic fast ion driven instabilities on driven current in the plasma core (Completed on schedule)
- Plasma edge pedestals and SOLs of low A, high confinement, high P/R plasma (Completed on schedule)
- Sustained strongly shaped low A plasmas with high j-boot fractions (Completed on schedule)

## FY 2004

- Confinement and stability of high beta H-mode regimes (Completed on schedule)
- Measure long wavelength turbulence in spherical torus plasmas (Completed on schedule)
- Measure plasma current profile modifications by rf, NBI, j-boot (Completed on schedule)
- Initial tests to achieve solenoid-free initiation to substantial plasma currents (Completed on schedule)
- Electron Bernstein Wave (EBW) emissions to assess heating and CD requirement (Completed on schedule)



# NSTX has Completed Facility Upgrades on Schedule

## FY 2008

- Design and fabricate the components for the symmetric end-feed HHFW antenna system. (Target - Sept. 2008 - on track)

## FY 2007

- Complete design of 200 kW EBW/ECH system (Target - September 2007, Completed - August 2007)

## FY 2006

- Conduct first experimental test of partially coated plasma facing components using lithium evaporator. (Target - June 2006, Completed April 2006)

## FY 2005

- Implement Resonant Field Correction system (Target - June 2005, Completed - June 2005)
- Commission a new pair of PF1A poloidal-field coils to produce high-triangularity, high-elongation plasma equilibria (Target - April 2005, Completed April 2005)

## FY 2004

- Fabricate Resonant Field Correction Coil System (Target- September 2004, Completed - Sept. 2004)
- Implement Capacitor Bank for Transient-CHI Start-Up (Target - May 2004, Achieved July 2004)

# NSTX has Completed Diagnostic Upgrades on Schedule

## FY 2008

- Upgrade the poloidal rotation diagnostic using charge-exchange recombination emission spectroscopy (PCHERS) to achieve its full spatial resolution and coverage. (Target - September 2008, Completed - April 2008)

## FY 2007

- Install and commission an interim poloidal rotation diagnostic using charge-exchange recombination emission spectroscopy (PCHERS). (Target - September 2007, Completed - July 2007)

## FY 2006

- Complete the shop fabrication of new port flanges, shutters, and divertor plates for an interim poloidal rotation diagnostic using charge-exchange recombination emission. (Target - September 2006, Completed April 2006)

## FY 2005

- Install an additional 10 channels for the multi-pulse Thomson scattering system (Target - September 2005, Completed - June 2005)

## FY 2004

- Install and operate a 10 ch Motional Stark Effect (MSE) diagnostic based on the collisionally induced fluorescence (CIF) from heating neutral beams (Target - September 2004, Achieved 8 ch in September 2004)
- Install a fast camera system to provide two dimensional images of the soft x-ray emission viewed along tangential sightlines (Target - April 2004, Achieved - Feb. 2004)
- Assemble and test microwave sources and other components for a diagnostic system to measure short-wavelength plasma turbulence by scattering from the plasma density fluctuations (Target - September 2004, Achieved - Sept. 2004)

# NSTX Team Achieved High Research Productivity

- **Highly experienced research team ~ 200 national and international researchers responsible for exploiting the scientific opportunities by taking advantage of**
  - **New unique plasma regimes and**
  - **New tools and sophisticated diagnostics**

## NSTX Refereed Journal Publication Record for 2004 - 2007

<b>Fiscal Year</b>	<b>04</b>	<b>05</b>	<b>06</b>	<b>07</b>
<b># Published</b>	<b>43</b>	<b>54</b>	<b>35</b>	<b>51</b>
<b># of PRLs</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>

## Productive Research Team:

- **More than half of publications led by a collaborator as the first author.**
- **Increasing Physical Review Letter Publications: 4 PRLs in FY 07 in key research topics (Error-field, Transport Scaling, Electron energy transport + CTF-relevant solenoid-free start-up with CHI)**
- **32 graduate students and post docs making strong contributions**
- **41 APS Fellows**

# Large Number of IAEA & Invited Talks at Major Conferences

## Collaborators presented nearly half of them

<b>IAEA</b>	<b># of presentations</b>	<b>PPPL</b>	<b>Collaborator</b>
<b>2008</b>	<b>16</b>	<b>10</b>	<b>6</b>
<b>2006</b>	<b>14</b>	<b>6</b>	<b>8</b>
<b>2004</b>	<b>8</b>	<b>4</b>	<b>4</b>
<b>Total</b>	<b>38</b>	<b>20</b>	<b>18</b>

<b>APS-DPP</b>	<b># of invited talks</b>	<b>PPPL</b>	<b>Collaborator</b>
<b>2008</b>	<b>7</b>	<b>4</b>	<b>3</b>
<b>2007</b>	<b>8</b>	<b>5</b>	<b>3</b>
<b>2006</b>	<b>5</b>	<b>1</b>	<b>4</b>
<b>2005</b>	<b>6</b>	<b>4</b>	<b>2</b>
<b>2004</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>Total</b>	<b>29</b>	<b>15</b>	<b>14</b>

<b>HTPD</b>	<b># of invited talks</b>	<b>PPPL</b>	<b>Collaborator</b>
<b>2008</b>	<b>1</b>	<b>1</b>	<b>0</b>
<b>2006</b>	<b>3</b>	<b>1</b>	<b>2</b>
<b>2004</b>	<b>2</b>	<b>0</b>	<b>2</b>
<b>Total</b>	<b>6</b>	<b>3</b>	<b>4</b>

- Total of 73 IAEA papers and APS/HTPD invited papers presented
- Nearly half were led by collaborators
- Nine presentations were given by students
- Over twenty invited talks given by the team members at other conferences

# Princeton University Contribution

<i>Princeton University Contribution to PPPL</i>	Annual Contribution
<b>Director's Non-Contract Funds</b>	<b>\$150k</b>
<b>Lease Discount</b>	<b>\$275k</b>
<b>Director's Salary Support</b>	<b>\$205k</b>
<b>Employee Children's Tuition Support</b>	<b>\$615k</b>
<b>Employee Mortgage Support Program</b>	<b>\$165k</b>
<b>Salary Support for Two Tenured Faculty</b>	<b>\$160k</b>
<b>First Year Grad. Student Support</b>	<b>\$300k</b>
<b>Total</b>	<b>\$1,870k</b>

## Impact of Contributions:

- **Director's Non-Contract Funds used to support outreach and science education. and to cover unallowable costs necessary for the operation of the Laboratory (e.g., unallowable legal costs, inadvertent use of foreign-flag airlines, payment of interest on late invoice payments, reimbursement for lost equipment)**
- **Lease Discount and Director's Salary Support decreases indirect costs.**
- **Employee Children's Tuition Support, Equity Participation Program and Employee Mortgage Support Program support recruitment and retention of staff.**

# NSTX Budget Summary

## SCIENCE & OPERATIONS (\$000) FY2006-2010

	<u>FY2006</u>	<u>FY2007</u>	<u>FY2008</u>	<i>5 Yr Plan Base Budget Case</i>	
				<u>FY2009'</u>	<u>FY2010'</u>
<b><u>NSTX TOTAL</u></b>	<b>\$32,921</b>	<b>\$33,801</b>	<b>\$38,824</b>	<b>\$46,187</b>	<b>\$47,083</b>
SCIENCE	\$14,213	\$14,548	\$16,310	\$17,279	\$17,625
FACILITY OPS	\$18,708	\$19,253	\$22,515	\$28,908	\$29,458
RUN WEEKS	12.7	12.6	15	15	15
<b><u>SCIENCE</u></b>	<b>\$14,213</b>	<b>\$14,548</b>	<b>\$16,310</b>	<b>\$17,279</b>	<b>\$17,625</b>
PPPL Science	\$9,213	\$9,548	\$10,410	\$11,079	\$11,301
Collaborators	\$5,000	\$5,000	\$5,900	\$6,200	\$6,324
<b><u>FACILITY OPS</u></b>	<b>\$18,708</b>	<b>\$19,253</b>	<b>\$22,515</b>	<b>\$28,908</b>	<b>\$29,458</b>
PPPL Operating	\$17,383	\$18,444	\$19,845	\$20,308	\$20,714
PPPL Upgrades	\$1,325	\$809	\$2,669	\$8,600	\$8,744

SCIENCE: Physics, Collaborations and Collaborator Support  
 OPERATIONS: Machine Operations including Facility and Diagnostic Upgrades

***'FY2009 & FY2010 reflect NSTX 5 Year Plan Base Budget Case (15% Increment)***

# NSTX PPPL Personnel Summary

## SCIENCE & OPERATIONS (PPPL FTEs) FY2006-2010

	<u>FY2006</u>	<u>FY2007</u>	<u>FY2008</u>	<i>5 Yr Plan Base Budget Case</i>	
				<u>FY2009'</u>	<u>FY2010'</u>
<b><u>NSTX TOTAL</u></b>	<b>97.7</b>	<b>97.5</b>	<b>103.6</b>	<b>127.5</b>	<b>127.7</b>
Scientists	23.8	23.7	23.8	24.8	24.8
Engineers	27.8	26.8	27.7	33.5	33.3
Technicians	43.1	44.1	49.5	66.5	67.0
Admin	3.0	2.9	2.7	2.7	2.7
<i>RUN WEEKS</i>	<i>12.7</i>	<i>12.6</i>	15	15	15
<b><u>SCIENCE</u></b>	<b>29.2</b>	<b>29.7</b>	<b>29.1</b>	<b>30.0</b>	<b>30.0</b>
Scientists	23.8	23.7	23.8	24.8	24.8
Engineers	3.4	3.7	3.1	3.5	3.5
Technicians	1.1	1.3	1.4	0.8	0.8
Admin	0.9	0.9	0.9	0.9	0.9
<b><u>FACILITY OPS</u></b>	<b>68.5</b>	<b>67.9</b>	<b>74.5</b>	<b>97.5</b>	<b>97.7</b>
Engineers	24.4	23.1	24.6	30.0	29.8
Technicians	42.0	42.8	48.1	65.7	66.2
Admin	2.1	2.0	1.8	1.8	1.8

**Facility Ops includes Facility and Diagnostic Upgrades**

*'FY2009 & FY2010 reflect NSTX 5 Year Plan Base Budget Case (15% Increment)*

# Summary

- **NSTX is a major collaborative DOE Fusion Energy Science facility at PPPL and it is the most powerful Spherical Torus in the world.**
- **NSTX benefits both from extensive PPPL resources and very strong DOE-OFES led collaborative research program.**
- **NSTX Collaborators are an integral part of the NSTX research program contributing very strongly to the facility capability and the research output.**

**NSTX has worked hard and will continue to work hard to:**

- Improve Operations**
- Assure Effective Collaboration**
- Deliver quality science for Spherical Torus, ITER, and Fusion Development Path**



# Facility Review Presentations / Tour / Sessions

## Presentations:

- **Scientific Goals, Mission and Objectives** J. Menard
- **Research Operations and Upgrade Plan** M. Bell
- **Facility Effectiveness, Support Infrastructure and Cost/Efficiency** A. Von Halle
- **NSTX Environmental, Health, and Safety** J. Levine
- **Training and Access**
- **NSTX Cyber Security Status and Plans** S. Baumgartner

## Tour and Interview Sessions:

- **Tour of the NSTX Facility** A. Von Halle
- **Session with NSTX Facility Ops Staff**
- **Session with NSTX-PPPL research staff**
- **Session with NSTX collaborator research staff**