The BNL Accelerator Test Facility: 10 years of service.

- The ATF is a **proposal-driven, program / advisory committee reviewed**, **USER'S FACILITY** for **long-term** R&D in Accelerator and Beam Physics.
- The ATF features high-brightness electron beams synchronized to high-power lasers in 4 beam lines with state-of-the-art instrumentation.
- The ATF serves the whole community: Universities, industry, National Laboratories and international collaborations.
- The ATF is a great contributor to Graduate Education in Beam Physics.
- In-house R&D on photoinjectors, lasers, diagnostics, computer control and more.
- Support from DOE, (HEP and BES), BNL Directorate and our users.
- Great demand for our services.

Feature in Nature Physics Portal

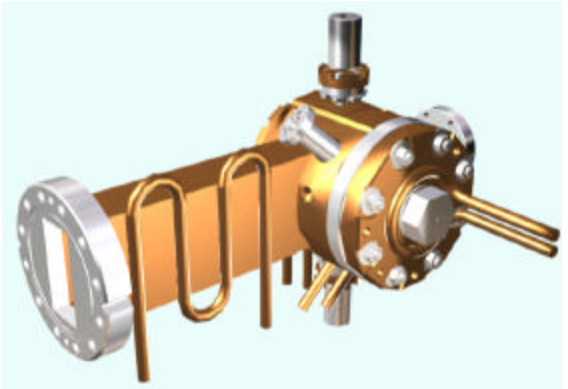
What is the purpose of the ATF?

- The long-term approach to accelerators: to explore revolutionary new methods of acceleration, generation of radiation and associated subjects.
- Provide everybody a place to carry out such R&D without having to invest in basics.
- Collaborate with universities and other national laboratories and help them carry out their mission.
- The success of this approach has been recognized, leading to initiatives on similar facilities:
  - ORION An Advanced Accelerator Research Facility at SLAC, February 2000 (Bob Siemann, SLAC)
  - NICADD, Northern Illinois Center for Accelerator and Detector Development, a forefront accelerator R&D user facility, February 2001(Helen Edwards, FNAL)

ATF Timeline

Initial concept, start R&D	**1987**
Start development of Gun Ia	**1987**
GPP construction of exp. Hall	**1988**
Start operations Gun Ia	**1989**
LDRD funding	**1989-1990**
First experiments approved	**1989**
ATF DOE users facility	**1990**
ATF operational, 45 MeV	**1992**
Laser - Beam Interactions	**1993**
Gun II (Industry)	**1993**
Inverse Cerenkov accelerator	**1993**
Gun III (BNL/SLAC/UCLA)	**1994**
First PRL from experiment	**1995**
IFEL laser accelerator	**1995**
Slice emittance measurement	**1996**
Ballistic compression	**1996**
Gun IV (BNL / KEK)	**1997**
First IR / visible SASE	**1998**
Femtosecond microbunching	**1998**
Magnesium cathode	**1998**
Phase-space tomography	**1998**
Single-shot spectral emission	**1999**
Microwave cavity BPM	**1999**
Thomson scattering X-rays	**1999**
HGHG Experiment	**2000**
STELLA experiment	**2000**
Saturation from VISA	**2001**
Development of LCLS gun	**2001**
CO_2 laser power upgrade	**2001**

LCLS 120 Hz
Photoinjector

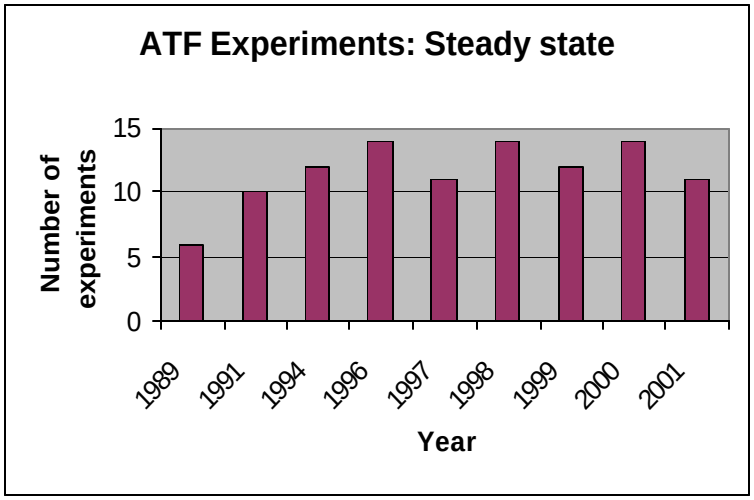


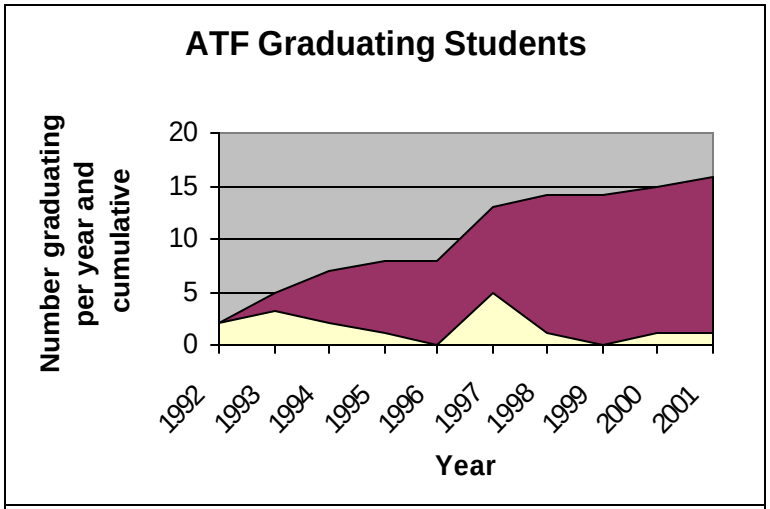
Making a better facility:

- Continuous brightness improvement.
- Continuous stability improvement
- Computer control system upgrade.
- New amenities for users.
- Terawatt picosecond CO_2 laser.
- High safety standards.
- Ultra-short bunch generation and diagnostics.
- Energy upgrade: Up to 72 MeV now, 100 MeV near future.
- Communications with users: Long-range schedule, web-based information, e-mail newsletter, training...

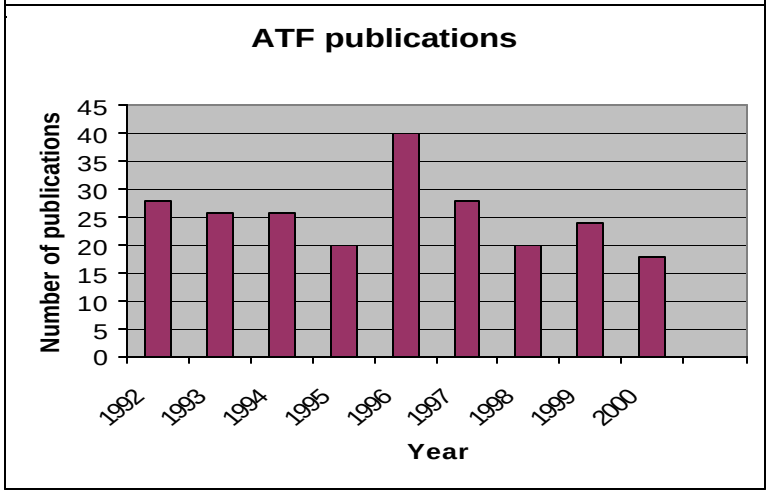
HAL 8500

ATF Statistics

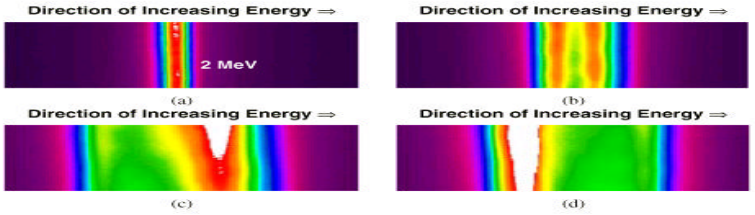




Run time: ~ 1100 hour / year
(much more last year)
Graduated students: 16
Current number of experiments: 12
Staff members: 8
Phys Rev X: > 2 / year



12 currently active experiments:
12 experiments completed: **Steady state**



STELLA spectra

- Nonlinear-Compton Scattering
- Smith-Purcell Radiation
- Photocathode R&D
- Beam Position Monitors for Linear Colliders
- Stimulated Dielectric Wakefield Accelerator
- Staged Electron Laser Accelerator
- Compton Scattering of ps Electron and CO2 Beams
- Ultra-fast Optical Detection of Charged particles
- A SASE-Free Electron Laser Experiment
- Laser Driven Cyclotron Autoresonance Accelerator
- Electron Beam Compression Based Physics at the ATF
- Structure-based Laser Driven Acceleration in a Vacuum

DOE Comments on ATF

- **Iran L. Thomas**, Director, Division of Material Sciences, BES, wrote in April 3, 1996 to Michael Hart the following: "... **The Accelerator Test Facility is becoming recognized as a unique and valuable resource for the country**." This is even before HGHG, VISA, Compton and recent gun brightness records.
- **John R. O'Fallon**, Director, Division of High energy Physics, wrote on October 30, 2000 to Thomas Kirk the following: "**Brookhaven's ATF is widely recognized as a unique and highly valuable resource for accelerator R&D efforts, which has not only produced fundamental research in accelerator physics and technology, but also has provided an excellent training ground for many young physicists**."

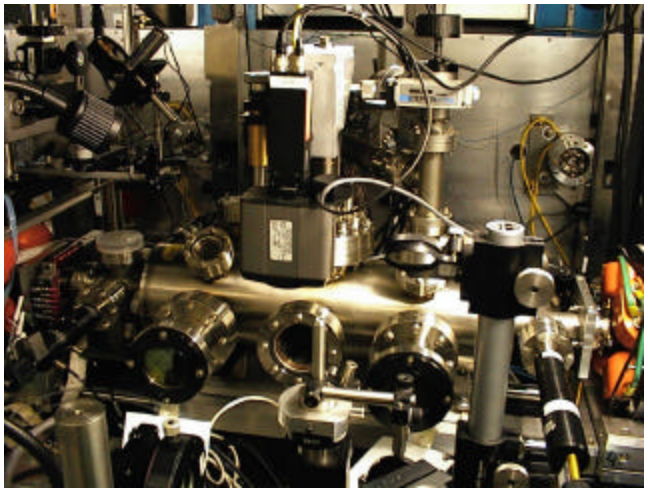
Our Staff 7.75 FTEs. Surprisingly small!

CAP
R. Palmer, Head
I. Ben-Zvi, Deputy
K. Tuohy, Secretary

NSLS
S. Dierker, Chair
N. Gmur, ES&H Coordinator
ES&H, training, administration

ATF
I. Ben-Zvi, Head
(25% HEP support)
X.-J. Wang, Deputy

- **R. Malone**
  Software and control
- **I. Pogorelsky**
  CO2 laser and laser accelerators
- **M. Babzien**
  Nd:YAG laser and timing
- **V. Yakimenko,**
  Beam Lines and e-optics
- **A. Rodrigues**
  Electronic Engineer
- **Open (D. Davis)**
  Mechanical / Laser Tech.
- **K. Kusche**
  50% STELLA & 50% ATF Systems



Compton chamber

Front Cover on Control System

BUDGET CONCERNS

- Support does not keep up with inflation – reduction of staffing level.
- Staffing level is inconsistent with needs.
- Aging equipment.
- No spares for critical systems.
- The facility is underutilized. Add 7 FTE's to double the operational time from ~1100 hours/year to ~2200 hours/year AND increase turnover rate.

This morning:

9:50 - 10:10 The ATF Operations, Performance and Upgrades

X. Wang

10:10 - 10:40 * Coffee Break *

10:40 - 11:00 The ATF Lasers

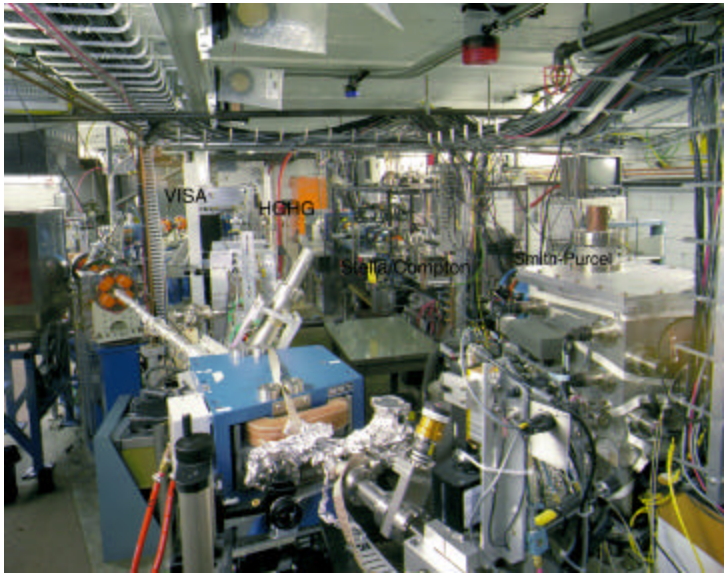
I. Pogorelsky

11:00 - 11:20 The ATF Computer Control System

R. Malone

11:20 - 11:40 Small Beams and High Brightness

V. Yakimenko



ATF Experiment Hall

11:40 - 12:00 Surface Roughness / Emittance vs. Uniformity

F. Zhou

Afternoon, before coffee

1:00 - 1:15 VISA Experiment C. Pellegrini

1:15 - 1:30 Staged Electron Laser Acceleration (STELLA), K. Kusche

1:30 - 1:45 High-Gain Harmonic-Generation FEL (HGHG), L-H. Yu

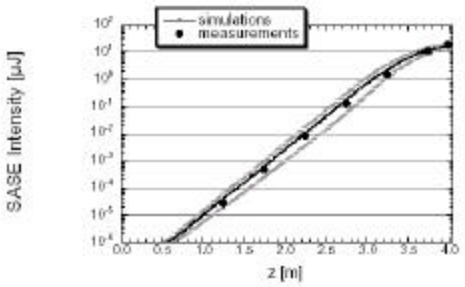
1:45 - 2:00 Ultrafast Detection of Relativistic Charged Particles by Optical Techniques, Y. Semertzidis

2:00 - 2:15 Structure-Based Laser Driven Acceleration in a Vacuum, Y.-C. Huang

2:15 - 2:30 MINOS Beam Monitoring Detectors, M. Diwan

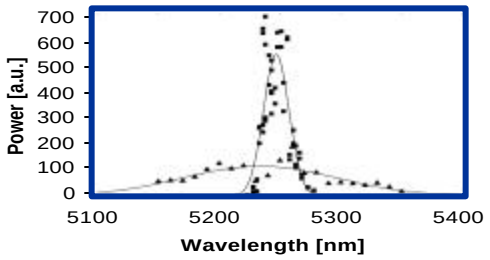
2:30 - 2:45 Stimulated Dielectric Wakefield Acceleration, T. Marshall

2:45 - 3:00 LACARA Experiment, J. Hirshfield



VISA Saturation

HGHG spectra



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Brookhaven National Laboratory
Accelerator Test Facility

BROOKHAVEN NATIONAL LABORATORY
Operated by Brookhaven Science Associates for the U.S. Department of Energy

Afternoon, after coffee

3:30 - 3:45 Compton Scattering of ps Electron & CO2 Beams T. Hirose

3:45 - 4:00 Beam Position Monitors for Linear Colliders V. Yakimenko

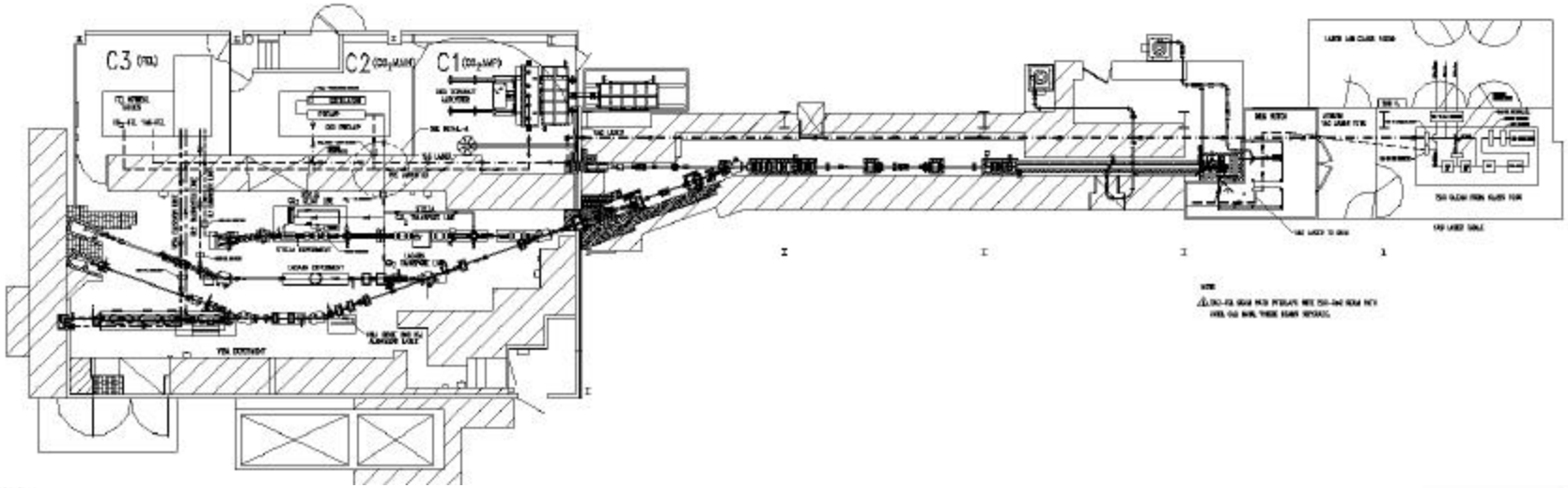
4:00 - 4:15 Smith Purcell Experiment H. Brownell

4:15 - 4:30 Pulse Compression Based Physics J. Rosenzweig

4:30 - 4:45 Photocathode R&D T. Srinivasan-Rao

5:00 - 6:30 ATF Tour

The experiments cover subjects relevant to both HEP, BES missions,



Friday: New proposals

8:30 - 9:00 Particle Acceleration by Stimulated Emission of Radiation, L. Schachter

9:00 - 9:30 Atto-Second Electron Bunches Production Experiment, M. Zolotorev

9:30 - 10:00 Optical Diffraction-Transition Radiation Interferometry Diagnostics for Low Emittance Beams, R. Fiorito

10:30- 11:00 In Vacuum Laser Acceleration of Electrons at BNL's ATF, V. Yakimenko

1 International / Univ., 2 National Labs, 1 University / small business