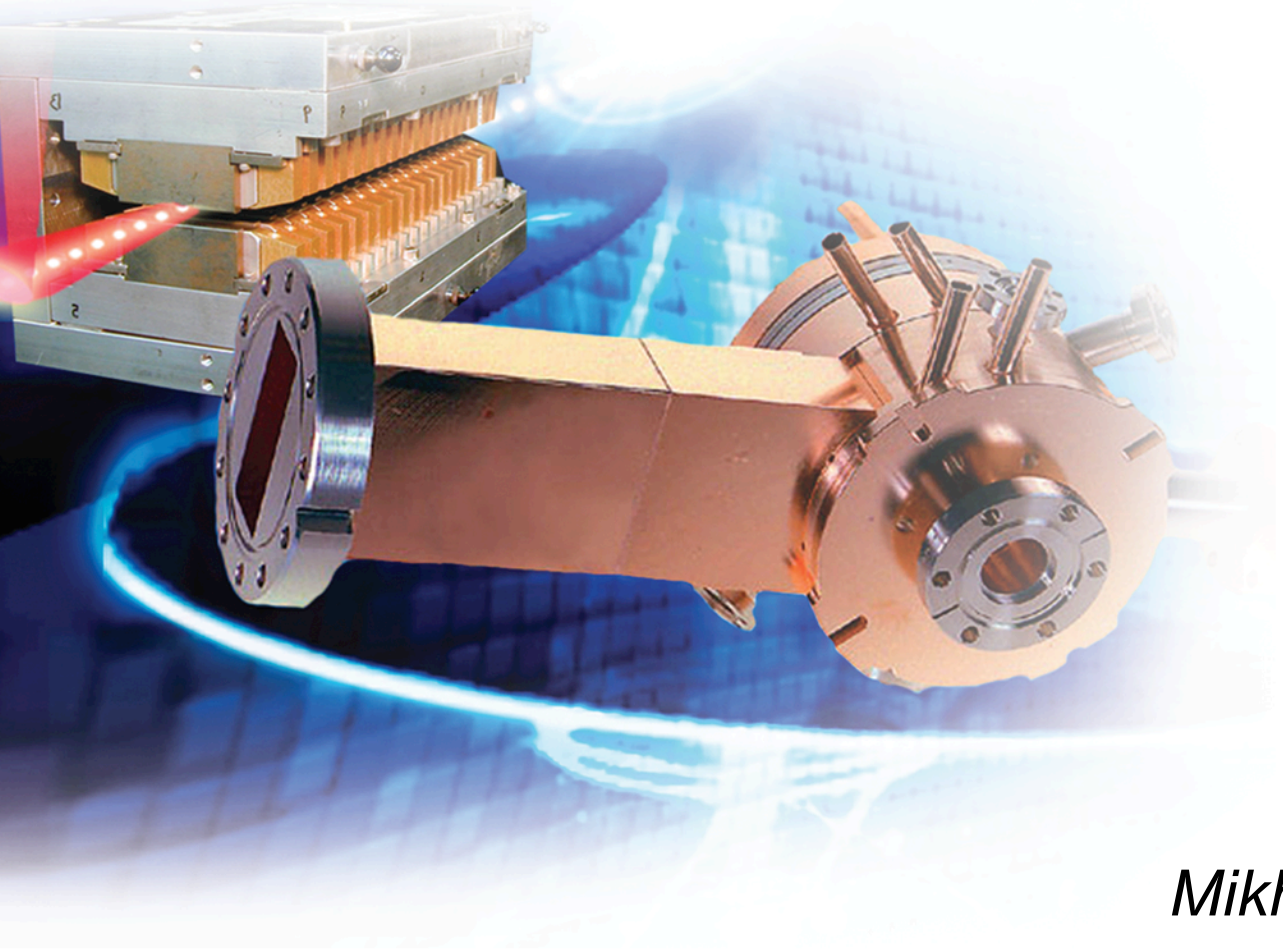

*Mikhail Fedurin*

# AE63 - Stony Brook accelerator laboratory course, CASE@ATF

BROOKHAVEN NATIONAL LABORATORY
a passion for discovery
U.S. DEPARTMENT OF ENERGY | Office of Science

# AE63, Accelerator Laboratory Course at ATF

**Proposal title:** Stony Brook accelerator laboratory course

**PI:** Vladimir Litvinenko

**CoPI:** Mikhail Fedurin, Dmitry Kayran

**Objective:** Training, growing and educating of the next generation of accelerator physics using unique advance accelerator capabilities at ATF

# AE63, Accelerator Laboratory Course at ATF

- CASE – The Center for Accelerator Science and Education has been established established as a Type I Institute within the University on November 19, 2008 as a Joint venture of BNL and SBU,
  - To train scientists and engineers with the aim of advancing the field of accelerator science;
  - To develop a unique program of educational outreach that will provide broad access to a research accelerator; and,
  - To attract Federal and industrial funding for an expanding interdisciplinary research and education program that utilizes accelerators.
- The Stony Brook University / BNL connection provides an ideal educational environment. The close proximity to BNL and the BSA connection provides for a superb combination of both university and national laboratory environment.

# AE63, Accelerator Laboratory Course at ATF

- The total of 14 graduated students classes planned for the semester will include:
  - one training class,
  - two classed for learning accelerator codes and ATF controls,
  - eleven experimental sessions using ATF equipment and control room
- Eleven experimental sessions include one back-up class in the case of failure
- one 3-hour class per week during this period, which will include up to 2 hours of using ATF control room, its accelerator diagnostics

# AE63, Accelerator Laboratory Course at ATF

Class-room established by CASE at ATF for graduate level accelerator laboratory course. The room is equipped by desks and computers sufficient for preparation for the measurements and data analysis.

# AE63, Accelerator Laboratory Course at ATF

## List of classes:

1. Learning about ATF: controls, equipment and diagnostics
2. Learn about basics accelerator simulating codes (MAD, Elegant)
3. Simulating e-beam trajectory in the basic accelerator beamline elements (dipoles, quadrupoles and sextupoles)
4. Magnetic measurements.
5. Quantum Efficiency of the Photocathode gun
6. The e-beam optical functions modeling (MAD, Elegant)
7. The e-beam propagation in the accelerator transport line
   a) monitor beam profile on BPM while varying quadrupole focal strength
   b) beam response on BPM by varying steering magnet and vary quad (phase advance)
   c) solenoid focal properties, helical trajectory in the solenoid (mask laser on cathode)
8. Dispersion beamline and Spectrometer
9. Mask techniques
10. Longitudinal bunch size measurements (use bolometer scans to measure the spectrum of coherent radiation)
11. Emittance measurements by 1) fitting beam size on BPMs; 2) vary quadrupole current
12. Wake Field Effect demonstration

# Summary

- ATF as facility with e-beam accelerator has unique capability to demonstrate students basic accelerator science principles, accelerator machine operation, equipment, demonstrate some ideas of advanced acceleration concepts
- ATF accelerator course provide graduate students hands-on training on real operational machine