



Computational Accelerator Physics at Tech-X Corporation

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Tech-X is a computational physics research company located in Boulder, Colorado



- Founded in 1994, Tech-X is an employee-owned computational science firm, currently 30 employees (15 PhD physicists, 4 PhD comp. sci.)
- We leverage cross-disciplinary science skills with strong laboratory collaborations to help solve computational physics problems



Tech-X has expertise in a cross-disciplinary range of computational physics research areas

- Tech-X researchers come from fusion (OFES), accelerators (HEP, ONP), scientific data management (ASCR), electromagnetics (AFRL)
- This cross-disciplinary collection of people is a strength of the company.
- *Example: the Synergia project at FNAL is using a software tool developed for OFES in part by Tech-X researchers.*
- Other areas of computation where Tech-X has experience: parallel computing, large-scale data management, data visualization, mixed-language programming, legacy code reuse



Tech-X is involved in computational accelerator physics with user interfaces, modeling and data management

Office of High Energy Physics

- SciDAC/Beam Dynamics:
 - Supporting the FNAL work with SYNERGIA interface (Spentzouris, FNAL)
 - *Adding electron cooling modeling to SYNERGIA (pending Phase I, FNAL)*
- SciDAC/Advanced Accelerators:
 - Laser/beam-driven wakefield modeling with VORPAL code (Leemans, LBNL)
- Argonne Wakefield Accelerator:
 - Modeling of dielectric waveguides by P. Schoessow (Gai, Power, ANL)
- SLAC and FNAL Data Analysis
 - Remote reduction/local analysis of large data sets for CMS (P. Sheldon, Vanderbilt)
 - Remote analysis/local visualization of large data sets (T. Johnson, SLAC)



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Office of Nuclear Physics

- Electron cooling of ion beams:
 - Simulation of the proposed RHIC electron cooler (Ben-Zvi, BNL)
- Self-consistent beam modeling at RHIC:
 - Particle tracking including space charge (Ryne, LBNL)
- Gamma-ray detector modeling for RIA:
 - Efficient numerical reconstruction routines (D. Radford, ORNL)

Tech-X and LBNL research for the SciDAC made the cover of Nature last September

- A VORPAL simulation by C. Geddes, et. al., of the laser-driven wakefield experiments at LBNL showed the excellent beam quality that researchers have recently measured.





The SBIR program is an opportunity for lab researchers to bring external funding to their projects

Case Study: Tech-X/FNAL collaboration

- I read the 2004 SBIR solicitation and noticed an intriguing topic (improving user interfaces for accelerator codes)
- I asked among my colleagues for lab researchers with a common interest (Spentzouris)
- Panagiotis provided a letter of support for my proposal and sponsored a computer account for me
- We were awarded the Phase I (\$100k/9 months for proof-of-concept)



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Case Study: Tech-X/FNAL collaboration

- I visited Panagiotis and Jim, and we outlined work relevant to FNAL (improved interfaces to Python for Fortran 90 code)
- The Phase I was successful, and we are now in Phase II (\$750k/2 years for complete development) of our project to develop user-friendly interfaces for accelerator modeling codes
- As a result of the successful Phase II, Doug Dechow of Tech-X Corp. is working on-site at FNAL as part of the collaboration (Tech-X also has an employee working at SLAC)



Tech-X relies critically on support from colleagues at the national labs

- From our lab colleagues, Tech-X researchers get
 - Suggestions to DoE grant monitors for SBIR topics
 - Letters of support
 - In-kind contributions
 - Kind words about Tech-X to DoE grant monitors!
- *In exchange for this, Tech-X provides a mechanism for lab researchers to bring additional, external funding to their computational physics research projects*



Can Tech-X and FNAL form a closer collaboration?

- Idea: we help FNAL develop something that FNAL needs but that may have commercial applications as well.
- Example: Varian and SLAC worked together to develop klystrons
- Is there something similar for Tech-X and FNAL? Something beyond just accelerator modeling?