



... for a brighter future

Accelerator Institute Update

Not.....



Rod Gerig
SUF
May 10, 2007



U.S. Department
of Energy



A U.S. Department of Energy laboratory
managed by The University of Chicago

Institute Activities since last meeting

- Charter created, approved by Executive Committee
- Initial membership nominated and approved

	Physicist	Engineer	Chemist	Comp Sci	Other	Total
Fellow	29	7	1	2	0	39
Research Fellow	6	2	0	2	0	10
Graduate Fellow	4	4	0	0	0	8
Visiting Fellow	6	0	0	0	0	6
Staff	0	0	0	0	1	1
Total	45	13	1	4	1	64

Membership based on candidate doing Accelerator R&D that benefits Argonne beyond facility operations.

Heads, not FTEs

- Institute web page becoming active... linked from APS home page
- Other activities are primarily focused on ILC... more later

Upcoming Accelerator Events

- Presentation of Institute at Argonne Partnership Meeting on May 14
- Argonne-Fermilab Directors' Meeting on May 18 (by invitation)
 - Accelerator Education Task Force
 - SRF Materials Task Force
 - Detectors and Electronics Task Force
- USPAS at MSU, June 4-15 (only two registered from Argonne)
 - USPAS Winter School **University of California, Santa Cruz**
January 14-25, 2008
 - USPAS Summer School, **University of Maryland, Annapolis MD**
June 16-27, 2008
- PAC07 June 25-29, **Albuquerque, NM**
 - **2-3 year cycle survey (on-line)**
- Beams and Applications Seminar series for Accelerator Technical Talks

**USPAS sponsored by
Michigan State University
and held in Lansing, Michigan
June 4-15, 2007
Two-week courses: June 4-15, 2007:**

(each of the following full courses earns three MSU credits)

Fundamentals of Accelerator Physics and Technology with Simulations and Measurements Lab (undergraduate credit) Fernando Sannibale, Soren Prestemon and David Robin, Lawrence Berkeley National Lab

Accelerator Physics

Joseph Bisognano, SRC and the University of Wisconsin-Madison

Classical Mechanics and Electromagnetism in Accelerators

Gennady Stupakov and Zhirong Huang, SLAC

USPAS sponsored by Michigan State University

June 4-15, 2007

One-week courses: students must attend one half course each week to be eligible for credit from MSU)

One Week 1/2 courses: June 4-8, 2007	One Week 1/2 courses: June 11-15, 2007
Beam Experiments and Measurements at the NSCL Stan Schriber, Marc Doleans, Guillaume Machicoane, Walter Hartung and the NSCL staff, Michigan State University and Eduard Pozdeyev, Brookhaven National Lab <i>This course is limited to 15 students</i>	Accelerator Power Electronics Engineering Paul Bellomo and Antonio de Lira, SLAC
The Plasma Physics of Beams Patrick Colestock, Los Alamos National Lab	Accelerator X-Ray Sources Richard Talman, Cornell University
Superconducting Accelerator Magnets Soren O. Prestemon and Paolo Ferracin, Lawrence Berkeley National Lab and Ezio Todesco, CERN	System Safety and Safety Systems for Accelerators Kelly Mahoney, Jefferson Lab
Radiation Physics, Regulation, and Management Don Cossairt, Fermilab and Reginald Ronningen, NSCL/Michigan State University	Fundamentals of Low-beta Linear Accelerators with Simulation Lab John Staples (ret.) Lawrence Berkeley National Lab and George Gillespie, G.H. Gillespie Assoc. Inc.
Ion Sources and Low-Energy Ion Beams Martin Stockli and Baoxi Han, Oak Ridge National Lab	

**The US Particle Accelerator School
USPAS sponsored by
University of California at Santa Cruz
and held in Santa Rosa, California
January 14-25, 2008**

Two-week courses: January 14-25, 2008

(each of the following full courses earns four UCSC quarter units)

- | |
|--|
| <ul style="list-style-type: none">• Fundamentals of Charged Particle Optics in High Energy Accelerators (undergraduate credit)
Michael Syphers, Fermilab |
| <ul style="list-style-type: none">• Accelerator Physics
Vladimir Litvinenko, Brookhaven National Lab |
| <ul style="list-style-type: none">• Microwave Measurement and Beam Instrumentation Laboratory
Derun Li, Lawrence Berkeley National Laboratory, Robert Rimmer, Jefferson Lab and John Staples (ret.) |
| <ul style="list-style-type: none">• Synchrotron Radiation and Free Electron Lasers (title not confirmed)
Kwang-Je Kim, Argonne National Lab and Zhirong Huang, SLAC |

USPAS sponsored by University of California at Santa Cruz and held in Santa Rosa, California January 14-25, 2008

One-week courses: (each one-week half course earns 2 UCSC quarter units)

One Week 1/2 courses: January 14-18, 2008	One Week 1/2 courses: January 21-25, 2008
<ul style="list-style-type: none"> •Energy Recovery Linacs (title not confirmed) Geoff Krafft and Ivan Bazarov, Jefferson Lab 	<ul style="list-style-type: none"> •Magnetic Systems: Insertion Device Design Ross Schlueter and Soren Prestemon, Lawrence Berkeley National Lab
<ul style="list-style-type: none"> •Fundamentals of Storage Ring Design Yannis Papaphilippou, CERN 	<ul style="list-style-type: none"> •Lattice Diagnostics and Correction (title not confirmed) Andrei Terebilo, SLAC
<ul style="list-style-type: none"> •High Brightness Electron Injectors for Light Sources David Dowell and John Schmerge, SLAC and Steven Lidia, Lawrence Berkeley National Lab 	<ul style="list-style-type: none"> •Accelerator-Based Sources of Coherent Terahertz Radiation John Byrd and Fernando Sannibale, Lawrence Berkeley National Lab
<ul style="list-style-type: none"> •Synchrotron Radiation Diagnostics: Theory and Practice Jeff Corbett, SLAC/SSRL 	<ul style="list-style-type: none"> •Timing, Synchrotronization and Phase Control Systems (title not confirmed) Russell Wilcox, Lawrence Berkeley National Lab and John Fox, SLAC

Accelerator Institute Technical Notes and Publications

- The Accelerator Institute is beginning two series of notes / publications.
- Publication series (**ANL-AAI-PUB-YYYY-NNN**)
 - The PUB series are for papers of qualities appropriate for publication in referred journals. Although most of these papers will be printed in journals, the PUB will be useful in advertising our research to outside community.
- Technical Notes (**ANL-AAI-TN-YYYY-NNN**)
 - The TN series are technical notes for recording useful experimental procedures, data, or theoretical ideas, etc. Although not as polished as the PUB papers, the notes should be reasonably self-contained for reading by colleagues. The TN notes will be useful for later referencing and also for incorporating into a full report at a later date.
- Please contact Anita for assignment of number (2-5305, alamillo@aps.anl.gov)

LDRD Update

- Accelerator Initiative has become a part of the
 “Large-scale Science User Facility Development Initiative”
 - Fundamentally the same project portfolio but formally recognizes detectors, development of techniques, etc. (which were included before)
 - Computing (code development) that was in the petascale initiative last year is integrated into other initiatives
 - Expect that multi-year projects will be renewed
 - Preproposals for new requests are due June 1
 - Denny Mills is initiative leader
 - AAI will oversee and manage the accelerator portion of the initiative

APS Upgrade

- APS Upgrade planning continues - ERL remains the most likely candidate
- R&D plans being formed
- BES has not set a timeline

Significant Events in the Evolution of the Nation's Plans for a Facility for Rare Isotope Beams

- **Dec 2006: Argonne and MSU present technical concepts to NSAC for Facility for Radioactive Ion Beams. MSU widely distributes proposal for a \$650M facility.**
- **Ray Orbach states a facility for Rare Isotope Beams is in the plan DOE is presenting to Congress for its future facilities.**
- **May 2007 NSAC Rare Isotope Beams Task Force releases draft report to Long Range Plan Working Group Committee enthusiastically endorsing 200 MeV/u heavy ion driver for rare isotope beams.**
- **May 2007: NSAC Long Range Working Group reaffirms exotic beam Facility as highest priority for new construction. (next slide...)**

Expected future schedule

- Summer 2007: A new Project Director will be announced for AEBL.
- Late 2007: Draft RIA Lite RFP
- 2008: RFP and Site Selection
- 2009/2010: CDR
- 2011: Project Engineering and Design funding

Recommendations for the 2007 NSAC Long Range Plan

- We recommend completion of the 12 GeV Upgrade at Jefferson Lab. The Upgrade will enable new insights into the structure of the nucleon, the transition between the hadronic and quark/gluon descriptions of nuclei, and the nature of confinement.
- We recommend construction of the Facility for Rare Isotope Beams, FRIB, a world-leading facility for the study of nuclear structure, reactions and astrophysics. Experiments with the new isotopes produced at FRIB will lead to a comprehensive description of nuclei, elucidate the origin of the elements in the cosmos, provide an understanding of matter in the crust of neutron stars, and establish the scientific foundation for innovative applications of nuclear science to society.
- We recommend a targeted program of experiments to investigate neutrino properties and fundamental symmetries. These experiments aim to discover the nature of the neutrino, yet unseen violations of time-reversal symmetry, and other key ingredients of the new standard model of fundamental interactions. Construction of a **Deep Underground Science and Engineering Laboratory** is vital to US leadership in core aspects of this initiative.
- The experiments at the Relativistic Heavy Ion Collider have discovered a new state of matter at extreme temperature and density—a quark-gluon plasma that exhibits unexpected, almost perfect liquid dynamical behavior. We recommend implementation of the **RHIC II luminosity upgrade**, together with detector improvements, to determine the properties of this new state of matter.

Accelerator Physics – recent R&D results

- Continued major progress with superconducting niobium resonator development
 - Design completed for new electropolishing system for ILC cavities (to be installed in the new ANL-FNAL surface processing facility at Argonne)
 - Optimized EM designs of next-generation very low beta cavities with 1.5 & 3 times lower peak surface E- and B-fields, respectively, relative to E_{acc}
 - ANL-JLAB-LBNL collaboration verified very low microphonics of triple-spoke resonators in CW operation
- Continued development of parallel processing beam dynamics simulations: TRACK
 - Improved algorithms for space charge – excellent scaling
 - Progress towards the “model-driven accelerator” concept
- State of the art tools for advanced fragment separator design.
 - Nuclear physics effects integrated into high-order optics optimization code
- Thin-film liquid lithium charge stripping
 - High velocity ~10 micron thick film was demonstrated
- Extended intensity range of the gas catcher technology
 - New electrode geometry extended count rate capability to over $5E+8/s$ with excellent efficiency
- Prototype CW RFQ for the AEBL driver was successfully tested to full power

Argonne ILC Update (Gerig / Weerts Lab Leaders)

- ILC activities have been funded by Argonne LDRD since '03, and thus were coordinated internally through the Strategic Initiative Leader (via CARA). Activities spanned numerous Argonne divisions.
- This seed funding has led to direct ILC funding
 - FY06, Damping Ring, Positron Source
 - FY07, Damping Ring, Positron Source, Electropolishing, Controls

FY06 ILC Funding	
Damping Rings	\$150K
Positron Source	\$150K

- In FY06, Fermilab contributed \$250K of ILC money to the Electropolishing effort
- The institute now oversees the SI component of ILC R&D (ongoing), as well as the ILC funded portion, and handles the communication with ART and collaborating laboratories.

ILC FY07 Funding as of 3/23/07

	FY07 FTE	ILC FY07	Infra-FY07
Lab/Univ		Recommend	
SLAC	56.67	\$15,976	\$2,283
FNAL	47.03	\$17,039	\$16,217
ANL	6.09	\$1,731	\$179
Jlab	1.39	\$390	\$0
LANL	0.88	\$371	\$0
LLNL	2.13	\$950	\$0
LBNL	2.65	\$795	\$0
BNL	4.75	\$975	\$0
DOE	0.00	\$2,507	\$0
GDE	1.33	\$725	\$0
ART	2.25	\$542	\$0
TOTAL	125.15	\$42,000	\$18,679

Argonne first in funding and effort level after SLAC, FNAL

ILC funded Activity in FY07

WBS	Work Package Title	Manager	FY07 FTE	FY07 Direct M&S	FY07 Budget Total	Infra
1.4	Coordination of ILC Accelerator Effort at ANL	Gerig/Weert	0.25	\$8	\$49	\$0
2.2.3	Control System Design	Carwardine	0.85	\$15	\$187	\$0
2.4.2	End-to-end simulation of positron source- und to DR	Gai	1.00	\$15	\$170	\$0
2.5.6	Damping ring design and optimization	Kim/Emery	0.40	\$10	\$95	\$0
2.5.10	Damping Ring Beam Dynamics	Kim/Emery	0.40	\$8	\$90	\$0
3.2.3.1	Diagnostic Processor for power supply	Carwardine	0.19	\$26	\$71	\$0
3.2.4.2	High Availability Standard Modules for Instrumentation Systems	Carwardine	0.38	\$20	\$99	\$0
3.9.3.4	EP processing	Kelley	2.63	\$281	\$971	\$0
5.2.2.3	Control Systems Support for ILCTA		0.00	\$0	\$0	\$179
			6.09	\$383	\$1,731	\$179

On 4/19, an additional \$100K allocated from ILC FY07 Reserve!!

Preliminary FY08 Funding projection (4/8/07)

	FY08 FTE	FY08 Direct Labor K\$	FY08 Direct M&S K\$	FY08 Total Indirect k\$	FY08 Total k\$
Fermilab	110.55	\$14,310	\$17,689	\$8,168	\$40,166
SLAC	64.71	\$9,059	\$6,834	\$4,468	\$20,361
Argonne	8.11	\$1,614	\$665	\$724	\$3,268
Berkeley	4.29	\$815	\$383	\$501	\$1,699
Brookhaven	4.15	\$519	\$628	\$655	\$1,801
Jefferson Lab	1.85	\$191	\$265	\$183	\$1,014
Livermore	2.61	\$615	\$219	\$455	\$1,288
Cornell	0.95	\$99	\$210	\$146	\$505
GDE	1.33	\$0	\$0	\$0	\$787
ART	2.25	\$0	\$0	\$0	\$646
Michigan	0.00	\$0	\$0	\$0	\$590
Los Alamos	2.50	\$325	\$250	\$321	\$896
Detectors				\$0	\$7,000
Reserve					\$3,378
	203.29	\$27,547	\$27,142	\$15,619	\$83,400

FY08 Projected Funding by Work Package

WBS Description	WBS(WP)	Lab	Description	WP Ldr	FY08 FTE	FY08 Direct Labor K\$	FY08 Direct M&S K\$	FY08 Total Indirect k\$	FY08 Total k\$
Program Management	1.1.1.3	ANL	ANL program management	Gerig	0.3	\$50	\$10	\$20	\$80
	1.2.1	ANL	Program management	Carwardine	0.2	\$40	\$10	\$16	\$66
	1.9.4	ANL	Program management	Kelley	0.2	\$40	\$10	\$16	\$66
Global Systems design	2.2.2.1	ANL	Global Controls design and Level-3 topic leadership	Carwardine	0.75	\$149	20.0	\$57	\$226
	2.2.4.3	ANL	Instrumentation design (collaboration) (ANL)	Carwardine	0	\$0	10.0	\$2	\$12
	2.2.5.3	ANL	Alignment model design (collaboration) (ANL)	Carwardine	0	\$0	10.0	\$2	\$12
Positron Source Design and Engineering	2.4.2.2	ANL	Sys. Engr and Design	Gai	0.5	\$100	\$8	\$37	\$144
	2.4.4.1	ANL	System Modeling	Gai	0.8	\$149	\$15	\$56	\$220
Damping Ring design and engineering	2.5.1.1	ANL	Damping Ring Lattice Design and Optimization	Kim	0.37	\$74	\$4	\$27	\$104
Global Systems R&D	3.2.1.3	ANL	Diagnostic Processor for power supplies (collaboration)	Carwardine	0.25	\$50	25.0	\$23	\$98
	3.2.2.1	ANL	Control system high availability (WP Lead)	Carwardine	0.75	\$149	\$50	\$64	\$263
	3.2.2.4	ANL	Electronics platform development for ILC applications (collaboration)	Carwardine	0.25	\$50	25.0	\$23	\$98
	3.2.2.6	ANL	Control system architecture (collaboration)	Carwardine	0.25	\$50	15.0	\$21	\$86
	3.2.4.2	ANL	Cold L-Band Cavity BPMs (collaboration)	Carwardine	0.25	\$50	\$25	\$23	\$98
	3.2.4.5	ANL	Advanced beam monitors (collaboration) (Argonne)	Carwardine	0.00	\$0	\$10	\$2	\$12
	3.2.6.6	ANL	RF reference generation and distribution (collaboration)	Carwardine	0.25	\$50	\$50	\$29	\$129
Positron Source R&D	3.4.1.2	ANL	<i>Measurement and Testing</i>		0.0	\$0	\$0	\$0	\$0
	3.4.3.2	ANL	<i>DC prototype</i>		0.0	\$0	\$0	\$0	\$0
			Orbit and Coupling Correction and Tuning Studies with 2pm vertical emittance demonstration in APS	Kim	0.09	\$18	\$4	\$7	\$29
Damping Ring R&D	3.5.4.2	ANL							
Cavity and Cryomodule Research and development	3.9.3.3	ANL	Cavity EP Processing @ANL	Kelley	1.5	\$299	\$180	\$148	\$626
	3.9.3.4	ANL	Cavity HPR Processing @ANL	Kelley	0.5	\$100	\$60	\$49	\$209
	3.9.4.2	ANL	Single Cell Processing R&D ANL	Kelley					\$65
Global systems infrastructure	5.2.2.2	ANL	Control System support for ILCTA (collaboration)	Carwardine	0.5	\$100	50.0	\$47	\$196
Cavities and cryomodules	5.9.2.2	ANL	Cavity HPR at ANL	Kelley					\$200
	5.9.3.1	ANL	PLC Control for EP System	Kelley	0.50	\$100	\$75	\$53	\$227
									\$3,268

Agenda for remainder of meeting

- **ILC update by area leaders**
 - Positron Source, Wei Gai
 - Damping Rings, Louis Emery
 - Controls and Global Systems, John Carwardine
 - EP facility, Mike Kelly
- **Accelerator Activities of the Office of Naval Research, Sandra Biedron**