Division of Physics of Beams newsletter

A Division of the American Physical Society February 2000

Election Results for the 2000 DPB Executive Committee

The election for the 2000 Division of Physics of Beams (DPB) Executive Committee were carried according to the DPB bylaws Article VII Section 3. The elections were announced by e-mail, web and by regular mail (to members whose e-mail returned as undeliverable). For the first time in DPB, the votes could be cast by a web form, by e-mail or by paper mail. The election has been completed on September 15, 1999. There were a total of 312 votes cast (275 by the web form) corresponding to 22.4% of the membership (1226 on June 1, 1999).

Chair
Alexander Chao, SLAC 2001
Chair-Elect
Ronald Davidson, PPPL 2001
Vice-Chair
Alex Dragt 2001
Divisional Councilor
Robert Siemann, SLAC 2001
Secretary-Treasurer
Ilan Ben-Zvi, BNL 2001
Past Chair
John Peolpes, FNAL 2001
Members-at-Large
Gerald Jackson, FNAL 2001
Shyh-Yuan Lee, IUCF 2001
Patrick Colestock, FNAL 2002
Ronald Ruth, SLAC 2002
Helmut Wiedemann, SLAC 2003
Chan Joshi, UCLA 2003

Each term of office, except for the office of Divisional Councilor and the Ex-officio members, begins in May 2000 on the last day of the Division's Regular Meeting and ends in April/May of the year indicated on the last day of the Division's Regular Meeting. The Chair-Elect will become Chair and the Vice-Chair will become Chair-Elect in the following year.

IN THIS ISSUE

Membership: 2000 DPB Committees and DPB-Related Committees

Executive Committee (4/00 – 6/01): (see "Election Results" section)

Nominating Committee (4/00 – 4/01): Ronal Davidson (chair), Jim Alessi, Richard York, Wim Leemans, Richard Briggs, Steve Holmes, Bruce Carlsten, David Whittum.

Fellowship Committee (4/00-6/01): Alex Dragt (chair), Victor Granatstein, Michael Harrison, Toshiki Tajima, Eric Esarey, Bill Weng, Henry Freund.

Publications Committee (4/00-6/01): Paul Schoessow (chair), Shyh-Yuan Lee (vice-chair), Swapan Chattopadhyay, Richard Temkin, Kwang-Je Kim, Robert Siemann.

Education Committee (4/00-6/01): Swapan Chattopadhyay (chair), George Gillespie, David Olsen, Hasan Padamsee, David Rubin, Jonathan Wurtele.

Wilson Prize Committee (5/00 - 5/01, for 2001Prize): Gerald Dugan (chair), Pief Panofsky (v- chair), Henry Blosser, Ronald Ruth, Robert Palmer.

Doctoral Research Award Committee (5/00 - 5/01, for 2001 Award): Richard Talman (chair), Robert Gluckstern (v-chair), James Rosenzweig, Martin Berz, Ronald Ruth.

Program Committee (for 2000 DPB Annual Meeting): Alex Chao (chair), Ron Davidson, Bill Herrmannsfeldt, Gerald Jackson, Chan Joshi, Kwang-Je Kim, Bill Weng,
John Irwin.

PAC'01 Organizing Committee: Yanglai Cho (chair).

PAC'01 Program Committee: Gerald Jackson (chair).

Report on Physical Review Special Topics

Robert Siemann, Editor

Volume 2 of Physical Review Special Topics – Accelerators and Beams, PRST-AB, has just closed. Volume 1 (1998) contained 24 papers totaling 174 pages, and Volume 2(1999) had 48 papers and 570 pages. The acceptance rate is 75%, and 40% of the publications are from outside the US. I am pleased with these numbers, the growth trend, and the increasing importance of PRST-AB to the accelerator community.

PRST-AB is distributed electronically and is available without charge at http://prst-ab.aps.org/. Expenses are covered by the generous support from our sponsoring institutions: Argonne National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Lawrence Berkeley National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Stanford Linear Accelerator Center, and Thomas Jefferson National Accelerator Facility.

Electronic publishing offers some unique opportunities, and they are starting to be realized. Movies can be an important advance in communication of scientific results, and we have published our first manuscript with a movie (S. Prabhakar et al, Phys. Rev. ST Accel. Beams 2 084401 (1999)). Other manuscripts with movies are under consideration.

Consolidated and special tables-of-contents are another possibility because a table-of-contents is just a set of links to manuscripts.

The PAC99 Special Edition (http://prst-ab.aps.org/specedtc.html), associated with the 1999 Particle Accelerator Conference, was the first. Authors were given an opportunity to expand upon and enhance work presented at PAC99 and to publish it in PRST-AB. Submitted manuscripts went through the same editorial process as every other paper. If and when it was accepted and published, it was added to both the monthly and special edition tables-of-contents. Special editions are planned or being considered for the following conferences in 2000: the European Particle Accelerator Conference, the International Linac Conference, and the International Computational Accelerator Physics Conference.

PRST-AB is a bargain. It offers peer review with its associated benefits, the Physical Review name, and unlimited availability at no cost to the author or reader. PRST-AB grew out of a DPB initiative to improve publication in accelerator science and technology. The full range of accelerator papers are welcome - if the subject area of your work is appropriate for PAC it is appropriate for PRST-AB. Please consider submissions to PRST-AB (and of course read it.)

DPB to join in Congressional Reception

In the November meeting of the DPB Executive Committee, Alex Dragt proposed exploring DPB participation in the annual reception for congressmen and staffers held by DPF and DNP. This meeting has been going on since before the SSC. It was started by PPF and DNP joined in last year. The purpose of this would be to explain who we are, how do we conduct our business and be ambassadors of science. The Executive Committee approved the idea and Alex followed up on this subject. This effort has been successful. We are very pleased that DPB will join DPF and DNP for the Congressional Reception. The reception will be on May 16 in Washington DC. For this year's reception the APS will coordinate the reception. It is our hope that a wide variety of physicists, working in universities, national laboratories, industry and elsewhere, will be able to attend this reception. Your presence will help communicate the excitement, importance and value of our work so that our representation in Congress can be knowledgeable and supportive of our community - particularly at budget time.

We welcome and encourage, most especially, graduate students and post-docs to attend this event. Our community can be most effective when its diversity is apparent and thereby representative of a broad spectrum of constituencies. Watch the DPB web site for more information to come. We thank Alex Dragt for helping move this reception forward.

Report on the APS Council

Robert Siemann, DPB Divisional Councilor

The APS Council is a large body that deals with a range of issues of interest to physicists. The APS News, published by the APS has excellent summaries of the Council activities.

The most recent Council meeting was in Seattle in November. Two items of special interest to the DPB were discussed. The first was approval of a constitutional amendment to reduce the size of the Council. Each division will have one councilor as opposed to the present system where large divisions have more than one councilor. It is important that the DPB keeps its membership at the 3% level so we can retain our Councilor.

The second issue was a statement of support for the Spallation Neutron Source. The Council passed the following statement: "The timely completion of the Spallation Neutron Source is an urgent national need. American scientists who study the structure of both physical and biological matter must have access to modern neutron facilities. Otherwise, our nation will be at a severe disadvantage in advancing new science and technology. The Council of the American Physical Society urges Congress to continue to provide necessary funding for completion of the project in a timely manner.

Future DPB Meetings

The next DPB Annual Meeting will take place at the 2001 Particle Accelerator Conference, PAC'01. PAC'01 is to be held in Chicago on June 18-22, 2001 at the Hyatt Regency hotel of Chicago.

Questions? Comments?

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DPB Membership

The DPB membership has declined to below 3% of APS membership. The APS established a system where divisions are represented in the APS council in proportion to their membership. If a division's membership is above 3%, it is entitled to be represented in the APS council. However, if divisional membership falls below 3% of the total APS membership, the division may lose its councilor and may no longer be represented in the Council. Here are our membership numbers for the last five years, as measured on December 31 of the previous year (Except for 2000):

Year	DPB Membership	% of APS Membership
Dec 1996	1316	3.22%
Dec 1997	1272	3.19%
Dec 1998	1244	3.12%
Dec 1999	1240	2.97%
Jan 2000	1226	2.98%

We should strive to change this trend. Please help us to achieve this goal by encouraging your colleagues to join.

Members of DPB play a part in electing the division's officers and councilor and have a voice in the affairs of the division.

Joining is easy. The APS Membership Department: phone 301-209-3280, e-mail MEMBERSHIP@APS.ORGn and on the WWW at http://www.aps.org .

Prize Winners in Beam Physics and Accelerator Technology Announced

2000 APS Robert R. Wilson Prize to Recognize and Encourage Outstanding Achievement in the Physics of Particle Accelerators. A prize of the American Physical Society sponsored by the APS Division of Physics of Beams, the APS Division of Particles and Fields and the Friends of R.R. Wilson.

Awarded to *Maury Tigner,* "For notable contributions to the accelerator field as an inventor, designer, builder, and leader, including early pioneering developments in superconducting radio-frequency systems, inspiration and intellectual leadership for the construction of CESR, and leadership of the SSC Central Design Group."

2000 APS Award for Outstanding Doctoral Thesis Research in Beam Physics. An award of the American Physical Society sponsored by the Division of Beam Physics and Brookhaven Science Associates (BSA), Southern Universities Research Association (SURA) and Universities Research Association (URA)

Awarded to *Mei Bai,* "For her work in the theory, experimental demonstration, and clear explanation of a method using an RF dipole for overcoming intrinsic spin resonances in polarized proton acceleration".*Thesis Advisor: S.Y. Lee.*

2000 Annual Business Meeting

The DPB is actively participating in the April APS meeting. APS 2000 takes place on April 29-May 2, 2000 in Long Beach, CA brings together a number of APS divisions, including DPF, DNP, DAP, FEd, FPS and DPB. The scientific program of DPB has been prepared by a Program Committee chaired by Alex Chao. The committee included Ron Davidson, Bill Herrmannsfeldt, Gerald Jackson, Chan Joshi, Kwang-Je Kim, Bill Weng and John Irwin.

We will contribute one plenary talk on the Spallation Neutron Source. In addition, we plan to hold seven invited sessions (four jointly with other APS divisions) and 17 mini-symposia on various beam physics topics. The invited sessions are:

Saturday 4/29, 11:00-14:00 (DPB)
Future Directions for Light Source

Saturday 4/29, 14:30-17:30 (DPB/DPP)
Laser and Plasma Acceleration

Sunday 4/30, 11:00-14:00 (DPB/DPF)
Prize session

Sunday 4/30, 14:30-17:30 (DPB)
Beam Dynamics

Monday 5/1, 11:00-14:00 (DPB/DPF)
The Next Decade in Particle Physics

Tuesday 5/2, 8:00-11:00 (DPB/DNP)
Beams for Nuclear Physics

Tuesday 5/2, 11:00-14:00 (DPB)
High Intensity Proton Accelerator

The Division Business Meeting will take place on Monday, May 1, from 2:30 P.M. to 3:30 P.M.

A Note on Electronic Communications

To help us keep you updated with news and provide better opportunities to play a role in the life of the Division, please update your address in the APS Members Directory. It is easy to do by e-mail to units@aps.org, or write to

APS Membership Department
One Physics Ellipse
College Park, MD 20740
(301) 209-3280
(301) 209-0867 (fax)

Please visit our homepage on the web, http://www.aps.org/units/dpb/ and see information and deadlines for prizes and awards, fellowships, meetings and much more. For all other APS information, including membership and meeting forms, go to the APS homepage at http://www.aps.org

DPB Members Promoted to APS Fellows

The APS Council at its November 1999 meeting has elected to fellowship the following members recommended by the DPB:

Brau, Charles A.; Vanderbilt University, "For his contributions to the development of free-electron lasers, and his discovery of the rare-gas halide excimer lasers"

Hofmann, Ingo; GSI, Darmstadt, Germany, "For his pioneering research of collective instabilities in nonstationary high-current beams and for his scientific leadership role in developing accelerator systems for heavy ion inertial fusion"

Kimura, Yoshitaka; High Energy Accelerator Research Organization (DPB together with the APS Forum on International Physics), "For the design, construction, and operation of the TRISTAN storage ring; and for his leadership role in accelerator science research in Japan"

Neuffer, David Vincent; Fermilab, "For his many important contributions over the past two decades to advancing the concept of a muon collider"

Rubin, David L.; Cornell University, "For sustained guidance and leadership of the accelerator group at CESR, the Cornell Electron Storage Ring, and in achieving world record luminosities in a colliding beam machine"

Skrinsky, Alexander N.; The G. I. Budker Institute (DPB together with the APS Forum on International Physics), "In recognition of innovation and leadership in colliders for high-energy physics"

Smith, Todd I.; Stanford University, "For pioneering contributions in the development of the science and technology of superconducting radio frequency accelerators, free-electron lasers and their applications in various sciences"

Whittum, David H.; Stanford Linear Accelerator Center, "For experimental and theoretical contributions to the understanding of electron beam interactions with microwave structures and plasmas"

The Fellowship awards will be presented at the "prize Session" on Sunday 11:00-14:00at the 2000 Annual Meeting, in Long Beach, California. We congratulate the new DPB fellows for the well-deserved honor.

R&D News from Accelerator Centers

Collected and Edited by Bill Herrmannsfeldt

NEWS FROM THE BNL ACCELERATOR TEST FACILITY (ATF) Spokesperson: Ilan Ben-Zvi

The ATF is a proposal-driven Program-Committee-reviewed Users'-Facility dedicated for long-term R&D in Physics of Beams. The ATF core capabilities include a high-brightness photoinjector electron gun, a 70 MeV linac, high power lasers synchronized to the electron beam to a picosecond level, four beam lines (most with energy spectrometers) and a sophisticated computer control system.

ATF users, from universities, national labs and industry, are carrying out R&D on Advanced Accelerator Physics and are studying the interactions of high power electromagnetic radiation and high brightness electron beams, including Free Electron Lasers and the laser acceleration of electrons. Other topics include the development of electron beams with extremely high brightness , photo-injectors, electron beam and radiation diagnostics and computer controls.

Visit the ATF web site at http://www.nsls.bnl.gov/AccTest/Menu.html
Recent reports from ATF experiments:

1. Staged Electron Laser Accelerator Experiment
Spokespersons: Wayne Kimura and Arie van Steenbergen

The commissioning of the Staged Electron Laser Accelerator (STELLA) experiment is proceeding very well. All the subcomponents of the system have operated according to the scientific plan, including the generation of micron-sized electron bunches. For details see http://www.nsls.bnl.gov/AccTest/experiments/STELLA/STELLA.htm

2. Demonstration of High-Gain, Harmonic-Generation FEL (HGHG)
Spokesperson: Li-Hua Yu

In the experiment, a CO2 laser at a wavelength of 10.6 microns provided the seed radiation that modulated the electron beam. A two-meter long undulator magnet then produced the second-harmonic radiation at 5.3 microns with a power of between 11 and 40 MW. The radiated power from this HGHG device was more than a million times as powerful as the SASE radiation and saturation may have been reached. The radiated spectrum showed the expected narrow line width, about

a factor of four narrower than the SASE spectrum produced in the same system. The experimental results track the theoretical predictions.
For details see http://www.nsls.bnl.gov/AccTest/AEHG.html

3. Demonstration of the Optical Klystron effect in SASE:
Spokesperson: Xijie Wang

The experiment was done using the HGHG setup consisting of three magnets: first, a short modulator undulator, second, a dispersion device consisting of a three-magnet chicane, and third, a two-meter long undulator. For this study, there was no CO2 seed laser, the modulator was set on resonance at 5.3 um, and radiator was set at 10.6 um. The strength of the SASE output varied as much as an order-of-magnitude as a function of the currect in the dispersive section. We believe that this is the first observation of one order of magnitude SASE gain enhancement due to the optical klystron effect.

For details see http://www.nsls.bnl.gov/AccTest/R0/Jan_14.htm

4. Record peak power from a Laser Synchrotron Source
Spokesperson: Igor Pogorelsky

First results of high-intensity x-ray generation using Laser Thomson scattering were obtained. This experiment was carried out by a US-Japan collaboration at the ATF in September 1999. The 3.5 ps x-ray pulse at 6.5 keV, containing ~10**7 x-ray photons, was generated by interacting 60 MeV, 0.5 nC electron bunches and CO2 laser pulses with the peak power of 600 MW. The next stage of the experiment will lead to 10**10 photons up to 10 KeV in 300 femtosecond pulse length.
See http://www.nsls.bnl.gov/AccTest/experiments/Compton/compton.htm

5. Fast electro-Optical Detector
Spokesperson: Jannis Semertzidis.

The experiment observed a charged particle beam by means of the electro-optical effect induced in a LiNbO_3 modulator crystal at the ATF. The team saw the anticipated polarization-dependent transmitted-light modulation whose rise time was consistent with the time resolution and a polarization-independent signal with a significantly longer decay time. The latter has been demonstrated to occur when the beam was incident on the optical material whether it was an LiNbO_3 crystal, a poled fiber or a polarization maintaining fiber. It is thought to arise from a plasma-cutoff effect in the ionized optical medium.
For details see http://www.picosec.bnl.gov/

6. Beam position monitors for linear colliders
Spokesperson: Vladimir Balakin.

A prototype of a beam position monitor (BPM) for next linear colliders developed and constructed by the Budker Institute of Nuclear Physics have been tested in the BNL Accelerator Test Facility using a 45 MeV, 0.5 nC single bunch beam. The test set-up consisted of three BPMs which were mounted on three precision movers with 0.3 mm resolution in both (horizontal and vertical) directions for displacement calibration. The detection electronics allowed us to take and process pulse-to-pulse data independently in horizontal and vertical positions in each BPM. Tests of BPMs and detection electronics in the lab showed that the potential resolution of the BPM system on the BNL ATF beam was less then 0.1micron. Raw data shows 0.16microns before analysis.
For details see http://www.nsls.bnl.gov/AccTest/experiments/BPM/BPM.htm

7. The Visible SASE experiment (VISA)
Spokesperson: Claudio Pellegrini.

The VISA undulator has been installed and beam tests begun. VISA is a Free Electron Laser (FEL) experiment to study the physics of Self Amplified Stimulated Emission (SASE). The experiment is carried out at the ATF as a collaboration of BNL, UCLA, SLAC, LLNL, LANL. Intense electron bunches produced by the ATF photoinjector and accelerated by the ATF linac to energies of 72 - 82 MeV will pass through the 4 meter-long VISA undulator to produce saturated intense pulses of light in the infrared to visible wavelength regime.
For details see http://www-ssrl.slac.stanford.edu/visa/

SLAC ADVANCED ACCELERATOR RESEARCH NEWS Spokesman: Robert Siemann

Efforts to combine the strengths of universities, national laboratories, and scientists outside the traditional accelerator physics community are taking place at SLAC. A workshop to promote discussion of the design and use of a new facility, based in part on the existing NLCTA (NLC Test Accelerator), is being held at SLAC, February 23-25, 2000.
Possible experiments for the facility could involve high frequency power generation, laser acceleration, coherent synchrotron radiation, single bunch dipole signal measurements, photocathode and polarimeter development, plasma acceleration, and accelerator instrumentation, among others. Anyone who would like to have input into the design and use of this facility is welcome to participate in the forthcoming Orion Project Workshop. Visit the Orion web site at http://www.slac.stanford.edu/conf/orion

NLC WORK AT SLAC
Rounded Damped Detuned Structure
Spokesman: Roger Jones

In the Next Linear Collider (NLC), it is envisaged that multiple bunches of electrons within a single bunch train will be accelerated through several thousand X-band accelerator structures. In practice, the cells that make up each individual structure will have finite errors in dimensions and misalignments in individual structures and misalignment in the beam from the axis. These errors will give rise to transverse wakefields. These wakefields can drive the beam into a Beam BreakUp (BBU) mode leading to a highly unstable beam, or at best to a significant dilution in the beam emittance and hence to a degraded beam luminosity.
The advanced Rounded Damped Detuned Structure (RDDS) structure is designed to rapidly damp down the wakefield by almost two orders of magnitude at the first trailing bunch in the train. This reduction in the wakefield is achieved through detuning the natural resonance frequencies of each cell such that the modal density is approximately Gaussian in shape, and by coupling out the wake into four waveguide-like manifolds which lie collinear with the structure. The manifolds are required because the accelerator structure consists of a finite number of cells and this gives rise to a wakefield which will constructively recohere. The radiation coupled out of the manifold allows the position of the beam and the structure alignment to be monitored and the manifolds also serve as vacuum pump ports for the accelerator. Roger Jones has been modeling the individual structures using a circuit model and simulating the progress of the beam through 10 km of structures utilizing the LIAR code. Use of these models has allowed him to model new distributions of cell frequencies which enhance the decay of the wakefields. A thorough investigation of errors associated with the fabrication of the structures has revealed that the emittance is not diluted, provided the errors in the geometry of the cells are random from structure to structure. The emittance found with the randomized errors is actually improved over that achievable with an error-free structure! Roger Jones presented results of these studies at the last International Study Group (ISG) at KEK. The structure profiles may be incorporated in a forthcoming design for a structure to begin to be fabricated over the summer of 2000. He has also presented invited talks on progress of the damping of wakefields at both the University of Osaka and Spring-8 in Kobe.

Jones particularly enjoyed inspecting the University of Osaka's L-band accelerator. He is looking forward to returning to Japan to work with Prof. Higo on precise modeling of wakefields and to participate in experiments dealing with fabrication and stack measurements of groups of cells.
Contact Roger Jones: rmj@slac.stanford.edu

NLC Klystron and Modulator News
Spokesperson: Albe Larsen

The new solid-state Induction Modulator, which uses the Insulated Gate Bipolar Transistors (IGBT) power transistors, (identical to those used to drive electric trains) was built in collaboration with LLNL. It is aimed at major improvements in reliability, energy efficiency, and cost for modulators which are one of the major NLC cost drivers. Prototype designs tested at SLAC support the feasibility, but high voltage pulsed operation at 500 kV and 2000 A, pose major design hurdles for internal cooling, klystron protection under fault conditions, in unprecedented power density. The collaboration with LLNL has demonstrated the basic cell design at full design voltage stresses, modified the design to reduce cost further by using a 1:3 transformer, and in November '99 successfully tested the first stack of five IGBT cells. The five-cell stack was tested at double the original design power using a 3 microsecond-long pulse, which can cut the number of units required by half. This prototype is being extended to drive a live klystron test load in the SLC linac to gain operating reliability experience. In FY00 a complete new 72-cell prototype modulator will be commissioned on diode loads up to full power, then tested on live loads in FY01 and 02 as X-band klystrons become available. The new pulsed permanent magnet (PPM) X-band klystons operate at four times the frequency of SLAC's S-band klystrons. Operation to date at 72 MW and 3.1 microsecond-long pulses has been limited by by the performance of the modulators available for the test. The goal for NLC klystrons is 75 MW at a 2.5 (mu)s pulse. These klystrons provide twice the energy of conventional klystrons so that only half as many tubes would be required for the NLC, providing another large cost savings. Contact Albe Larsen, amlarsen@slac.stanford.edu

RUTGERS UNIVERSITY FREE ELECTRON LASER

Spokespersons: Earl D. Shaw and Jing Su

Earl D. Shaw led a group at Bell Labs (now Lucent Technologies, Inc.) to build a prototype Microtron based Free Electron Laser starting about 1983. A microtron accelerator was received from Scanatronics in 1983. After many design upgrades, a compact positron source was built using the microtron output (Nuclear Instruments and Methods in Phys. Res. B56/57 (1991) 568-571) In 1991 the Free Electron Laser prototype was demonstrated to lase continuously tuneable from 160 microns to 280 microns(Nucl. Inst. And Methods in Phys. Res. A318, (1992) 47). This facility was moved to the Newark campus of Rutgers, The State University of New Jersey in 1992 for further upgrades and hopefully applications in biological research. Dr. Jing Su and Prof. Shaw anticipate

having the laser working in the Spring of 2000. The parameters of the accelerator are:

Energy:	38 MeV
Energy spread	0.1%
Peak Current	1.4A
Average current	70mA
Emittance (x-direction)	8 mm mrad
Emittance (y-direction)	3 mm mrad
Micropulse length	5-7 mm
RF frequency	3 GHz
RF wavelength	10 cm
Macropulse length	16 microsecond

For informantion, contact sujph@andromeda.rutgers.edu or look at http://andromeda.rutgers.edu/~sujph

TEACHING TOOLS
Particle Accelerator Tutorials from WhistleSoft
Spokesperson: Dick Silbar

WhistleSoft, Inc., has developed a set of computer-based tutorials on particle accelerator physics. These award-winning tutorials, published by Physics Academic Software, can now also be purchased (at a 10% discount) directly from the WhistleSoft web site. The programs were developed under an SBIR Grant from the DOE's Office of High Energy and Nuclear Physics.

At the present time, there are five separate self-paced tutorials. They each cover five or six subtopics with content pages, self-testing questions, and interactive laboratories. (For example, "What happens if you increase the field in this magnet?") The material ranges from introductory (accessible to lower undergraduates and technicians) to, advanced (upper undergraduate physics and engineering majors, requiring some knowledge of Maxwell's equations). They are also suitable for use as demonstrations in classroom lectures. In order of increasing complexity, the five tutorials are:

"Vectors": This is a mathematical prerequisite to the other tutorials, but it also stands alone as a tutorial in its own right on how vectors are used in physics.

"Forces": This covers basic material, such as Newton's laws, with emphasis on electromagnetism, the force of interest to accelerator physics. Its five sub-sections are Fundamental Quantities, History and Tour of the Forces, Forces and Motion. Electrostatic Forces, and Electromagnetic Forces.

"Motion in Electromagnetic Fields": This tutorial covers Circular Motion in a Uniform Field, Magnetic Rigidity and Spectrometers, the Wien Filter, Cyclotrons, and Magnetrons.

"Dipole Magnets": The sub-sections here are Uniform Bending Magnets, Non-Uniform Bends, Fringe Fields, the Kerst-Serber Equation, and the Double-Focusing Spectrometer.

"Quadrupole Magnets": This is the latest entry in the series and it covers Quadrupole Singlets, Matrix Notion, Quad Systems, Special Topics (such as harmonic analysis), Repeated Arrays, and Stability of Beams.

More details are at http://www.whistlesoft.com/~silbar.

SF6 SEPARATION BY CARBOM MEMBRANES
Spokesperson, Danny Englander

Carbon Membranes Ltd., is a hi-tech company commercializing a novel technology for gas separation based on hollow fiber carbon molecular sieve membranes (CMSM). One of the most significant achievements of this technology is the separation of fluoride gases from mixtures. SF6, CF4 and C2F6 are strongly retained by the Carbon Membrane. This unique trait enables highly efficient separation of these gases from mixtures. Thus it can separate air from the SF6, reducing the concentration in the mixture. The unit will run during the operation of an accelerator, continuously reducing the air concentration. It will maintain the mixture at the desired quality, with no loss of SF6

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