

SLAC WOMEN'S ASSOCIATION

SSRP NEWS: THE WIGGLER WORKSHOP

April Activity

On April 13, Sally Kladnick of the Institute of Professional Development will speak in the Orange Room, Central Laboratory, at noon. Her topic will be an accelerated route to the Bachelor's Degree in Business Administration. If you are unable to attend at that time, she will repeat the discussion on April 20 at the Medical Center.

On April 18, Nancy Martin, Assoc. Professor of Computer Sciences at the University of New Mexico, will be talking on "Women in Science and Technology--An Historical Approach." This talk will also be in the Orange Room at noon.

Film Reviews

On March 7 and 8, we sponsored two films that proved to be entertaining, informative and inspiring. *Pack Your Own Chute* dealt with many kinds of fears that people experience. It suggested that many of these fears were "self-inflicted," and that the growth and nurturing of these fears is propagated in the greenhouse of one's own mind. Meeting these fears head-on, particularly in business situations, often proves that they were unfounded or at least unreasonably intense.

51% was a less professionally polished film, but nevertheless provided a certain amount of impetus to use in our business roles. It was nicely paired with *Chute*, each film addressing a different aspect of business goals, problems and needs.

On March 28, we sponsored another film, *Other Women, Other Work*, which dealt with women working in non-traditional jobs. The film covered a spectrum of working situations, from a woman roofer to a woman commercial pilot, from a woman truck driver to a woman veterinarian. Each woman in the film spoke about her reasons for doing what she was doing, the particular problems associated with doing it, what she gained personally, and her motivations. After the film, four women from SLAC who hold (or have held) non-traditional jobs spoke briefly about their jobs, their problems, their motivations, and support and encouragement/discouragement from their friends and families. A very special acknowledgement and thank you to Michelle Bondi, PS&E Technician; to Jackie Huntzinger, truck driver emeritus; to Mary James, Accelerator Physics Engineer; and to Cherrill Spencer, Physicist. Their openness and willingness to share their experiences was very much appreciated.

--Vicki Bosch

Stan Stamp has recently been appointed as Director of ERDA's newly established SLAC Site Office.

A three-day workshop on the subject of Wiggler magnets was held at SLAC on March 21-23, 1977, and was attended by about 60 scientists from 17 laboratories around the world. The objective of the workshop was to provide a forum for study, discussion and exchange of information about Wiggler magnets among those promoting their use for synchrotron radiation research and other applications and those concerned with storage ring design and operation.

This is the first time that a large group of accelerator physicists and others have concentrated their attention on increasing and enhancing the production of synchrotron radiation. In the past, their aim has generally been the reduction of synchrotron radiation losses--hence the large radius and low magnetic field of PEP.

Wiggler magnets are devices which produce particularly intense synchrotron radiation from high energy electrons. Those interested in utilizing this radiation in research, at SSRP and in similar programs elsewhere, are planning to install Wigglers in existing storage rings and in new machines now being constructed or planned. Also, the designers of colliding-beam storage rings, such as PEP, plan to use the effects of the extra synchrotron radiation produced by Wigglers to control the damping rates and cross-sectional area of stored beams with a resultant improvement in luminosity.

Simple Wigglers consist of a few sections (3 or more) of alternating polarity magnets that produce a relatively strong (16-50 kilogauss) transverse magnetic field. Such magnets are fitted into a straight section of a storage ring, and they produce no net deflection or displacement of the circulating beams. Because their magnetic field is considerably stronger than that of the normal ring bending magnets, they produce intense synchrotron radiation, which extends up to higher photon energies.

Wigglers with a large number of alternating poles, or with a rotating helical field, are also being considered for producing interference effects, which can result in very high intensity radiation at certain particular wavelengths or energies.

The Workshop began with a general survey of Wiggler magnets and their applications by Andy Sessler, Director of the Lawrence Berkeley Laboratory. Part of the Workshop was devoted to presentations of magnet designs that are being developed at several laboratories, and analyses of the effects of these magnets on the behavior of stored beams. Wigglers for SPEAR were discussed by Bill Brunk and Dick Helm of SLAC, and by Klaus Halbach of LBL. The PEP Wiggler design

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was described by Helmut Wiedemann of SLAC. John Blewett and Bill Sampson of Brookhaven National Laboratory described the superconducting Wiggler magnets that are being considered for use in the synchrotron radiation storage rings proposed for Brookhaven. Sergio Tazzari presented the plans for the Italian ring ADONE, and Vic Suller and Elwyn Baynham described the Wiggler planned for the Daresbury (England) 2 GeV synchrotron radiation source now under construction. Jim Spencer of Los Alamos discussed alternative Wiggler designs which also produce some focusing of the beams. Terry Martin of SLAC and Sam Krinsky of Brookhaven outlined the severe problems of handling the high power densities than can be produced by Wigglers.

Another part of the Workshop was devoted to the exciting possibilities of interference and coherence effects. Albert Hoffman of CERN discussed the intense peaks that are expected at certain wavelengths from magnetic structures with many periods. Coherent radiation by very short electron bunches and the production of coherent X-rays were discussed by Hans Motz of Oxford and by Paul Csonka of the University of Oregon and SSRP. As a matter of historical interest, Motz was the first to produce radiation from a Wiggler structure. He observed interference peaks in the millimeter-wavelength region in the early 1950's, using 100-MeV electrons from the Stanford Mark III accelerator and an array of alternating polarity permanent magnets.

In related talks, the Free Electron Laser was described by John Madey, Dave Deacon and Bill Colson. They covered the theory of its operation, the recent experimental results (which demonstrated lasing) utilizing a 43 MeV beam from the superconducting linear accelerator at HEPL (Stanford), and the possibility of including the device in a small (100-200 MeV) high current storage ring to produce a very powerful tunable laser extending into the ultraviolet region of the spectrum.

After these talks, the participants divided into several smaller groups for more detailed analyses of various subjects. These groups met

in the office space that has recently been completed, but not yet occupied, on the mezzanine of the Electronics Building at SLAC. Our thanks go to Glenn Tenney and to Dorothy Ellison for making this space available.

The Workshop closed with summary talks presented by spokesmen for each of the individual working groups. There was considerable optimism that Wiggler magnets could be made to work in storage rings with little or no adverse effects on the ring performance. Part of this optimism is based on the successful use of a pair of damping-magnet Wigglers at the Cambridge Electron Accelerator to permit beam storage in the alternating-gradient structure of that ring. However, some problems still remain to be solved (particularly the handling of high power densities), and detailed analysis will be needed to optimize the designs of particular Wigglers for particular machines, and to minimize and compensate for their effects upon the beams.

Also, the use of structures with many periods to produce interference and coherence effects, as demonstrated by the work of Motz and Madey with linear accelerators, has not yet been tried in storage rings. One of the conclusions of the Workshop was that cross-coupling, thought to be unavoidable in helical Wigglers, can probably in fact be avoided. The Free Electron Laser in a high current storage ring is capable in principle of producing enormous power levels (perhaps one megawatt) of tunable ultraviolet radiation. Achieving this, however, will certainly not be an easy task.

The Wiggler Workshop was sponsored jointly by Brookhaven National Laboratory, the Energy Research and Development Administration, the Stanford Synchrotron Radiation Project, and the Synchrotron Radiation Center of the University of Wisconsin at Madison. The Workshop was organized by Herman Winick, SSRP, Chairman; John Blewett of Brookhaven; Albert Hoffman of CERN; Phil Morton of SLAC; Claudio Pelligrini of Frascati; Ed Rowe of Wisconsin; and Andrew Sessler of LBL.

--Herman Winick

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