

RECENT PAPERS PUBLISHED

The following are Refereed Papers based on work performed at the Synchrotron Radiation Center, University of Wisconsin-Madison during September, 1980:

S.M. Kelso, D.E. Aspnes, C.G. Olson, D.W. Lynch, and D. Finn, "Electron-Core-Hole Interaction in GaAsP," Phys. Rev. Lett. 45, 1032 (1980).

L.J. Brillson, G. Margaritondo, N.G. Stoffel, R.S. Bauer, R.Z. Bachrach, and G. Hansson, "Measurement and Modulation of Atomic Interdiffusion at Au-Al/GaAs (110) Interfaces," J. Vac. Sci. Technol. 17, 880 (1980).

F.J. Himpsel, D.E. Eastman, and J.F. van der Veen, "Summary Abstract: Electronic Surface Properties and Schottky Barriers for Diamond (111)," J. Vac. Sci. Technol. 17, 1085 (1980).

M.M. Traum and D.P. Woodruff, "Time-of-Flight Measurements with a CMA for Simultaneous Energy and Mass Determinations of Desorbed Ions," J. Vac. Sci. Technol. 17, 1202 (1980).

F.J. Himpsel, P. Heimann, T.C. Chiang, and D.E. Eastman "Geometry-Dependent Si(2p) Surface Core-Level Excitations for Si (111) and Si (100) Surfaces", Phys. Rev. Lett. 45, 1112 (1980).

CONFERENCES

ED ROWE will be attending the "Synchrotron Radiation Laboratory Users Group Meeting" in Stanford on October 23 and 24. The meeting is very similar to our own SRC Users Conference.

(Conferences cont.)

CHARLIE PRUETT will be visiting Japan from October 27 - 31 to attend "A Joint U.S.-Japan Seminar on the Production and Application of High Power Levels in the Extreme Ultra-Violet". The seminar will be held in Sendai, Japan and there will be 13 participants from the U.S., 25 participants from Japan plus observers from other countries.

Some of the topics of discussion will be: Synchrotron Radiation Sources and Instrumentation; Laser Sources; and various Optical Materials for use with XUV.

Charlie will be visiting some Synchrotron Radiation Centers and the Photon Factory in Tsukuba.

JOHN WEAVER will be giving an invited paper for the American Chemical Society "Symposium on Hydrogen in Metals" on November 12 in Pittsburgh.

COMINGS AND GOINGS

The Physical Sciences Lab. regrets to announce that we are losing 2 staff members, Carlos Cortez - Programmer and Pete Armstrong - Support Shop. Also, Masa Aono will be returning to Japan. Masa has been a visiting investigator at the Storage Ring for 2 years working with the IBM group.

We are pleased to announce that 3 new staff members have joined us. Jorgen Hansen will be working with the PSL staff for four to six months on the Microbeam Project. Paul Haeberli joined the staff as an electrical engineer and Lois Blackburn is the new Administrative Secretary. Lois replaces Joanne Edwards.

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CUTTING COSTS

To cut the cost of producing our newsletter, we have redesigned our format. Future newsletters will be of this general design and will include project reports and general information concerning the lab's activities and those of its users. We hope you find it interesting and informative.

NOTES ON THE ALADDIN PROJECT

The construction phase of the Aladdin 1 GeV electron storage ring is nearing completion. That project was undertaken with funding from the National Science Foundation and the University of Wisconsin in January of 1978 with a target date for turn-on of ~30 months later.

The Aladdin facility represents a major enhancement of the radiation facilities of the Synchrotron Radiation Center, University of Wisconsin - Madison. Aladdin further represents a natural expansion of the existing radiation laboratory Tantalus. Aladdin will be considerably larger (circumference approximately 90 m instead of approximately 10 m for Tantalus), will store electrons at a higher energy (1 GeV instead of 240 MeV), and will make it possible to conduct experiments which require photons of higher energy than presently available from Tantalus (~200 eV with Tantalus, ~6000 eV with Aladdin).

Aladdin will be, and Tantalus has been, a national facility supported by the National Science Foundation and the University of Wisconsin to provide radiation (i.e. in-

tense "light" emitted by the orbiting electrons in the storage ring) for a wide range of scientific and technological studies. In any given year, Tantalus serves as a source for roughly 40-50 different User groups (~100 scientists, ~50 publications annually) who are affiliated with universities and research laboratories throughout the U.S. and abroad. These include solid state and gas phase physicists, chemists, materials scientists, and anyone who needs a highly intense, wavelength-tunable radiation source for studies from the infrared to the x-ray portion of the electromagnetic spectrum. With the advent of Aladdin and enhanced access to its intense x-ray radiation, an even wider range of studies will be possible; it is anticipated, for example, that there will be interest from the biological sciences to complement the physical sciences research.

During the last two years, the Physical Sciences Laboratory has provided the administrative and technical support needed for the construction of Aladdin, a multimillion dollar project. Much of the electrical and mechanical engineering needed has been handled by PSL engineers and most of the fabrication has been expertly done in the PSL shops. As the project is nearing completion, the personnel of PSL are deservedly proud of their contributions.

Technical Progress

The Aladdin electron storage ring is, of course, a complex instrument made up of a host of components. These include the source of the electrons themselves (a



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(Aladdin cont.)

50 keV electron gun), the accelerator which increases the energy of those electrons to injection energy of 100 MeV (a race-track microtron accelerator), a transport and injection line which guides the 100 MeV electrons into the main storage ring itself, the ring in which the electrons are boosted to final energy and stored in stable orbit, and the radio frequency cavity which supplies the orbiting electrons with energy to compensate what they lose as they emit synchrotron radiation. Once all of these parts are together and working, there is the second major technical project of taking the light (photons) emitted by the stored electrons, dispersing it according to wavelength, and guiding it to the experimental station at the end of a beamline.

The electron gun source for Aladdin has now been tested and run successfully at 30 kilovolts. The microtron itself has been assembled and its power supplies are ready. There remains the final debugging of the linear accelerator component of the microtron and the final hooking up before the complete system can be tested.

Electrons leaving the microtron (at energies of 100 MeV with velocities approaching the speed of light, $v \approx 0.9998 c$) are focused and deflected into the main ring vacuum chamber by several magnets (transport line, kickers, inflector). The transport line magnets are in position and their power supplies are on hand. Cabling and final precision positioning remains to be done before the transport line is complete and ready for test. Construction of the kickers (fast bending magnets) and inflector magnet (the last deflection of the electron beam which inserts the bunch into the main ring) is underway in the PSL shop.

The main ring itself is nearing completion. Already the 12 large dipole bending magnets are in place. These are the actual radiation source points. Since the electrons accelerated within these magnets emit the desired synchrotron radiation; these magnets provide the circular acceleration or deflection which gives the electron trajectory its arc-like appearance. The many quadrupole and sextupole magnets which serve as lenses and focus the electron beams are

also completed and many are in position. The water cooling lines and power lines for the bending magnets are completed. Finally, the vacuum tank, or tube, in which the electrons circulate is under construction.

As the electrons orbit and emit radiation, they naturally lose energy. The radio frequency cavity runs at 50 Mhz and boosts the energy of the electrons as each passes through the cavity. Were it not for this boost, the bunch of electrons would lose energy and the electrons would be lost. The radio frequency transmitter for Aladdin (rated for 250 kilovolts and 100 kilowatts of power) has been tested with a dummy load, is presently installed, and is ready to be connected to the RF cavity itself. The latter is now under construction in the shop.

Finally, these many components of Aladdin must somehow be operated by the machine operators. Operation must be done from the control room because radiation levels during injection preclude personnel in the experimental hall. For the control system, the main cables linking the PDP 11/34 control computer with the three Omnibyte slave computers have been installed. The software needed for the communication between the PDP 11/34 and the Omnibytes is completed and tested. The connection of cabling to the many elements (the big dipole magnets, the focusing magnets, etc.) is underway now.

THIRTEENTH ANNUAL SRC USERS CONFERENCE

The Thirteenth Annual Synchrotron Radiation Center Users Group Meeting will be held at the Physical Sciences Laboratory on Monday, October 20 and Tuesday, October 21.

Talks will be presented by members of the following User Groups:

UW-PSL/SRC staff
University of Tennessee
UW-Madison-Chemistry
UW-Madison-Physics
Oak Ridge Laboratory
University of Nebraska
University of Southern California
Daresbury Laboratory
SSRL

(SRC Conference presentations cont.)

University of Western Ontario
Bell Laboratories
SRI International
Ames Laboratories
Exxon Research Laboratories
University of Illinois
University of Pennsylvania
Cornell University
IBM
Montana State University
Northern Illinois University
Brookhaven National Laboratory

There will be a social hour and dinner following the Monday session.

TERMINAL FAIR

This year's Terminal Fair (sponsored by the UW-Madison Academic Computing Center) will be held on November 12 and 13 in Room 109 at the Union South.

Art Penpek, Mark Werner and Paul Anderson will be representing the Physical Sciences Laboratory this year. They plan to demonstrate the Optical Isolator System and the One-Way Line Graphics System (see summaries of the two systems below).

You may contact Art, Mark or Paul for handouts and answers to any questions you may have.

PSL GENERAL PURPOSE OPTOISOLATOR P.C. BOARD

This general purpose Optoisolator board has been redesigned and fabricated in P.C. form. The board will hold up to 12 isolators. Twenty-three different types of isolators will fit in the board, giving the customer several options. A choice of four Input/Output options is available: RS 232, RS 422, TTL, and Direct Drive.

The Input/Output can be controlled in four-bit increments. The maximum bit width is 244 with the use of a rack-mountable chassis. The chassis will hold 12 cards and contains the power supplies necessary to power any configuration.

If you are interested in this board or a configuration that may fit your needs, please contact John Hicks, Art Penpek, or

(Terminal Fair cont.)

Murray Thompson.

ONE-WAY SYSTEM

Mark Werner is designing a one-way line graphics communication system for the UWEX group. The system will be a prototype replacement for the existing "electrowriter". The send and receive sites will be connected via a telephone line capable of 120 characters per second data rate.

The system will enable written data, graphical data, and alphanumeric characters to be translated. The transmitting and receiving site will have 23 inch TV monitors to display the data.

If you are interested in this system, please contact Art Penpek or Mark Werner for more information.

NCC HEALTH PHYSICS SOCIETY MEETING

The Physical Sciences Laboratory was the site of the Fall, 1980 meeting of the North Central Chapter of the Health Physics Society on Friday, October 17.

Topics of discussion were "Health Physics operations at a Fast Neutron Facility"; Experiences of the Committee to revise the Beir Report" and "Effects of Fallout from Hydrogen Bomb Testing on the Marshallese People". This was followed by their regular business meeting.

