CMS Construction Approved

In June of 1998 the National Science Foundation and the Department of Energy approved construction of the U.S. portion of the Compact Muon Solenoid particle detector to be located at the CERN accelerator. The CMS experiment will be one of several detectors on the Large Hadron Collider (LHC) soon to be built at CERN.

The LHC is designed to smash particles together at about one trillion volts of energy. Physicists hope that collisions at such high energies will create the theoretical Higgs particle and thereby verify the Standard Model in physics. The CMS detector will not only look for evidence of the Higgs particle, but will hopefully be able to recognize other particles that might function as alternatives to the Higgs within the Standard Model. In order to distinguish among many different kinds of particles, the CMS detector will have the largest magnet ever created to bend the particles into different paths dependent on their electrical charge.

Because the CMS experiment is such a large undertaking, there are many American universities and laboratories concentrating on specific pieces of the project. PSL is designing the endcaps of the detector which consist of muon detection chambers sandwiched in between radiation-absorbing steel disks.

After several years of design work, UW-Madison and PSL got the go-ahead to proceed with overseeing the construction of the endcaps.

The largest part of the project in which PSL is involved is the procure-

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ADR Salt Pill

PSL has been intimately involved in building the ADR salt pill which is part of an x-ray telescope under construction jointly through NASA and the Japanese space program, ISAS.

The detectors in the telescope are x-ray microcalorimeters. They monitor the temperature of a tiny piece of silicon, and measuring the temperature rise that results when it absorbs an x-ray photon. In order for the telescope to work, the x-ray detectors have to be kept cold. The ADR (Adiabatic Demagnetization Refrigerator) is part of a complex cryogenics system that involves liquid helium and solid neon to keep the x-ray detectors extremely cold (65 milliKelvin).

"The ADR works by first using a large magnet to align the magnetic poles (spins) of all the molecules in a block of salt (called the salt pill). The salt pill is then connected to a liquid helium bath via a heat switch, allowing it to cool to the temperature of the liquid helium (about 1.5 Kelvin). Once it has reached equilibrium with the helium, the heat switch is opened.

"At this point the magnetic field is reduced nearly to zero, allowing the spins of the salt molecules to flop around in random directions. They go into a more random state because it has more entropy, but since the magnetic field is not exactly zero, it also requires energy to move the

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Carl Baumann Retires

PSL wishes a happy retirement to Carl Baumann. Carl retired 41 years to the day after he began working with the Midwestern Universities Research Association, PSL's precursor. Over the years he worked on almost every project in which the laboratory was involved, from the MURA models, the Tantalus storage ring, the Aladdin Synchrotron, and Fermilab, to the recent work PSL has done with AMANDA and the renovation of the NIST storage ring. His favorite project was the cosmic ray experiment on Mt. Evans in Colorado.

Throughout his many working years, he made numerous friends among his colleagues and clients. Over 150 of these friends attended his retirement party on October 12 in Oregon, WI. Surrounded by his family, Carl listened to homilies praising his dedication, skill, friendship and enthusiasm, as well as some good-natured ribbing. He received a variety of gifts and mementos, along with the well wishes of all the attendees.

Carl plans on keeping busy in his retirement with the numerous volunteer activities with which he is involved. He will be more involved with the Girl Scouts and Boy Scouts as well as joining Retired Senior Volunteer Program, a group of Senior Citizens involved with youth. He would like to spend more time traveling, visiting family and pursuing his hobbies. He will also probably become involved with the day care business his wife operates.

Carl will be seen around PSL on Fridays when he joins the retirees group for lunch.

CMS

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ment of the endcap yokes. PSL finished the design of the 14 meter diameter, 2,200 ton steel yokes in December of 1997. This past spring, the UW solicited quotes for construction of the yokes from 50 of the largest industrial companies in the world. These estimates were included in the review approved by the NSF and DOE.

A team from UW-Madison and CERN, including PSL Associate Director Farshid Feyzi, spent the summer visiting the bidding companies and evaluating their technical capabilities. The final contract with Kawasaki of Japan will be signed in December. The smaller parts will be built at PSL or contracted out to smaller manufacturing facilities.

Construction is expected to take two years. All of the elements of the endcaps are scheduled to be delivered to CERN by January 2001. PSL will participate in assembling and testing the endcaps.

In addition to the steel endcap yokes, PSL is in charge of the mechanical design and integration of the muon detection chambers that will sit inside the yokes. PSL produced the mechanical structures for the six different prototype chambers, the system for mounting and aligning the chambers within the yokes. All of this was made possible by using Autocad solid modeling in three-dimensions. Close attention to detail and dedication to constant upgrading of hardware and software have made PSL somewhat unique in its ability to successfully carry out these kinds of projects.

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Computing Staff

The PSL computing staff oversees the maintenance and upgrading of the network and computers at PSL.

Bonnie Weisel started working with PSL in 1984. She manages the PSL/SRC shared administration computers and software applications. As part of her administrative duties, she evaluates and implements software solutions, and plans budgets for future purchases and upgrades. Bonnie ensures that data is collected, backed up and archived. She maintains the financial accounting software and email system on a VAX/VMS cluster. She enjoys the opportunities to write programs and develop solutions, in addition to those times when installations and setup go smoothly. In her spare time, Bonnie likes to play tennis, bike, ski and work on the PSL/KRC oak savannah restoration project.

Ken Kriesel has split his time between mechanical engineering and computer support since he began working at PSL in 1981. He is the NT network administrator and the information systems manager. As manager, he proposes budgets for hardware, software, training and supplies. His main duties include choosing applications for PSL, deciding which programs and systems are going to be supported, fixing system bugs and setting security policy. As the network gets bigger and more complex, Ken performs capacity planning for the workstations and the server. He particularly enjoys helping to set the direction of PSL computing. When not at work, Ken spends his time volunteering with the Madison Diocese, biking, hunting and spending time with his teenage son.

Information processing consultant Eric Espe began working at PSL in 1996. He performs the software and hardware upgrades, computer troubleshooting and daily maintenance for the workstations and network. He oversees the system backups and upgrades the servers on a regular basis. He claims that the most challenging aspects of his job are keeping up with the changing hardware and software. However, he enjoys solving the problems and challenges arising from the new installations. Eric spends his free time working on the eight-acre hobby farm which he and his wife moved to in June.

Salt Pill

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spins. This energy is absorbed from the salt pill's heat, cooling it.

"By carefully adjusting the strength of the magnetic field, the temperature of the salt pill can be kept constant for many hours. Eventually the spins are all completely random and no more heat can be absorbed. Then the magnetic field is increased, heating up the salt pill, and the cycle is repeated." (From the ADR website http://lheawww.gsfc.nasa.gov/docs/xray/astroe/xrs/adr.html)

PSL built the prototype of the ADR from which a working model was produced. After the modifications had been implemented, PSL built the flight unit - the unit which is actually going up on the Japanese satellite. A third unit was also built as backup. The work was a shared project between PSL and the Space Sciences and Engineering Center.

Apprenticeship Awarded

Jay Johnson received a Certificate of Apprenticeship from the State of Wisconsin Department of Workforce Development in May of 1998. This is a four year program in the machinist trade. Jay is now a Journeyman Machinist. He is the first person to go through this program at the Physical Sciences Laboratory.
Current Events:

The Synchrotron upgrade at NIST is complete. Testing of the control system software was finished in November and all systems are performing to specifications. PSL and SRC will be involved in the final commissioning phase which will take place in December or January.

Two spherical grating monochromators for SRRC in Taiwan are under construction and are expected to be finished in May.

PSL is currently designing a new double crystal monochromator for UNICAT. It will be similar to previous DCMs but with many design enhancements such as extended range, and added features. Construction is expected to begin early next year.

1998 was not a construction year for AMANDA, but in 1999 PSL will build 330 optical modules and will do a redesign and refurbishment of the hot water drills.

Construction of the multi-leaf collimator is under way for the tomotherapy project as well as construction of the electronics circuits.

The PSL electronics department is testing and characterizing a new type of photomultiplier tube for the Center for Integrated Microscopy.

PSL has finished construction and testing of the polarizers for the Advanced Light Source in Berkeley. They will be shipped in December.

Design and construction continue on the HSX experiment. PSL is involved with the coils mounting system, the vacuum chamber, and overall structural support.

PSL is involved in the ongoing upgrade of the CDF detector at Fermilab. As part of that project, PSL designed and constructed a new machine for making electrodes.