

# The Village Courier



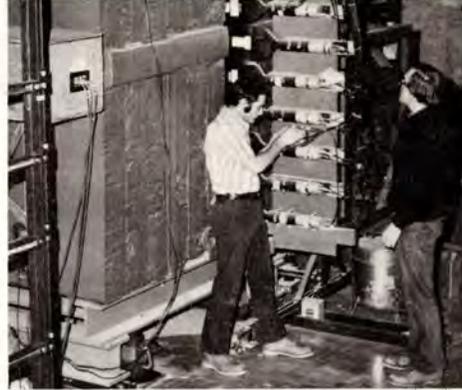
fermi national accelerator laboratory

Operated by Universities Research Association Inc.  
Under Contract with the United States Atomic Energy Commission

Vol. 7, No. 6

February 6, 1975

## FERMILAB EXPERIMENT STUDIES PSI PARTICLE



... (Photo at left) T. Wijangco, Columbia U., arranges electrical connection for a multiwire proportional chamber for Experiment 87; center, J. Knauer (L) U/Hawaii, and J. Sarracino, U/Illinois checking the muon identifier; and, right, G. Gladding (L), U/Illinois, and J. Peoples, Fermilab, adjust scintillation counters...

An experiment at Fermilab has revealed that the new psi or J particle is not a total stranger to the high energy physics community, but is rather a distant cousin just entering the family scene. The major characteristics of the particle, such as the mass and the lifetime, were identified by the discoverers at SLAC and Brookhaven. Experiment #87 in the Fermilab Proton Area has now produced the new particle at a rate during a recent run such that a few were produced each day. The Fermilab experimenters have found new information besides the weight and lifetime, information that is also vitally important about the relationship of the various members of the family of the psi to each other.

Experiment #87 has learned a few more things about the relationship of the new particle to the family of known particles. By observing the transitions of high energy gamma rays into psi particles they have established that the psi particle belongs to the family of hadrons which includes the mesons, the neutron, and the proton.

In order to produce as many events as were observed, it was necessary for the following process to occur: (1) A high energy gamma ray must change into the psi particle; (2) before the psi particle can change back into a gamma ray, the particle must collide with another hadron, transferring some of its momentum to the hadron. The experimenters used the nucleus of beryllium -- which consists of four protons and five neutrons -- as the hadron target for the gamma rays. The gamma rays, above 80 BeV or more in energy for the psi event to be detected, were produced in the broad band photon beam on the Fermilab Proton Line. Although the psi particles are moving at almost the speed of light when they are created, they usually travel only one hundred millionth of a centimeter, about the diameter of a hydrogen atom before they decay. These distances, while infinitesimally small on a human scale, are very long on the scale of nuclear distance, since the diameter of the beryllium nucleus in which the creation took place is 30,000 times smaller. Physicists would have expected that a particle this massive,  $3.105 \text{ BeV}/c^2$ , would have lived only long enough to travel a distance a few times larger than the diameter of the beryllium nucleus.

The particle is detected through its decay into either a  $\mu^+$  and  $\mu^-$  pair or an  $e^+$  and  $e^-$  pair. The latter process is the inverse of the process by which the particle was discovered at SLAC.

In September Experiment 87 began to search for events with  $\mu^+$  and  $\mu^-$  pairs produced

(Continued on Page 2

## FERMILAB EXPERIMENT (Continued)

by 250 BeV neutrons striking a beryllium nucleus. In November, when a group from Brookhaven announced their discovery of the new particle in proton-beryllium interactions, E-87 searched their data for this new particle and found four events. With a better understanding of their experiments, they found forty more events in a short run after Thanksgiving. This measurement establishes that the production cross section for the new particle rises by a factor of almost one hundred when the nucleon (proton or neutron) energy increases from 30 BeV at Brookhaven to 300 BeV at Fermilab.

The broad band photon beam is one of the most novel beams at Fermilab. It contains two long tubes filled with liquid deuterium. Each tube is a little more than an inch in diameter, and the total length of the two tubes is 103 feet. A mixed beam of photons and neutrons travels through the deuterium before it reaches the beryllium target. The deuterium selectively scatters out the neutrons, unwanted for this purpose, from the beam, without scattering the photons as much. This is the first time that a liquid deuterium beam purifier has been used in a high energy physics experiment, and it is the longest such vessel ever made. The device was designed and built by the Cryogenics group of Fermilab's Research Services, headed by physicist Ron Fast and Mike Otavka, cryogenics engineer.

Experiment 87 is now searching for the other particles discovered at SLAC, identified by the mass numbers 3.695 and 4.15 BeV/c<sup>2</sup>, with the hope that they can determine how these particles interact with matter. The search does not end there for many physicists are asking whether this new cousin has a few brothers and sisters. During the coming weeks, when the accelerator will operate at 380 BeV/c, the members of E-87 hope to find out the answer to this question. They hope that the 300 BeV photons which will be produced by the 380 BeV/c protons will produce particles which have not been discovered before.

The results from the observation of the mu<sup>+</sup> and mu<sup>-</sup> decay mode in the Experiment 87 results were presented by Tom O'Halloran of the University of Illinois at the American Physical Society meeting last week at Anaheim, California.

Experiment 87 is a collaboration of scientists from Fermilab, Columbia University, Cornell University, and the Universities of Hawaii and Illinois. Professor Wonyong Lee of Columbia is spokesman for the group, and participants include B. Knapp, W. Lee, P. Leung, D. Smith, T. Wijangco, all from Columbia University, New York; D. Nease, Cornell University, Ithaca, N.Y.; M. Binkley, R. Orr, J. Peoples, L. Read, Fermilab; J. Knauer, D. Yount of the University of Hawaii, Honolulu; J. Bronstein, R. Coleman, L. Cormell, G. Gladding, M. Gormley, R. Messner, T. O'Halloran, J. Sarracino, A. Wattenberg, D. Wheeler from the University of Illinois, Urbana.

Fermilab's Proton Area has again hosted an experiment with significant results before the area has reached final completion. The Proton Area was built to carry out experiments requiring the very intense proton beams directly from the accelerator and also to produce special purpose secondary beams from targets struck by the protons. The areas are all below ground level using the earth for shielding due to the intense beams. Roy Rubinstein, who heads the Proton Area, commented on the E-87 results, "The Proton Department is, of course, very pleased to have been part of E-87's discoveries. Almost all members of the Department have at one time or another been involved in E-87 and its beam line. Singling out anyone is difficult, but particularly involved in this work have been Rick Bailey, Bob Bennett, Brad Cox, Ron Currier, Al Guthke, Ed LaVallie, Bob Shovan, Bill Strickland, Age Visser, and also the Belding rigging crew under Claude Fletcher."



...(L-R) R. Coleman, M. Gormley, J. Bronstein, D. Nease, T. Wijangco, J. Peoples, J. Knauer, L. Read, W. Lee, M. Binkley, D. Smith of E-87...



...When Professor Burton Richter of SLAC visited Fermilab in January, this "psi cake" was served, commemorating the discovery of the new particle. The pitchfork-like symbol is the greek letter psi. The graph inside the ring is a picture of the sharp resonant-like nature of the particle that appeared in the announcement of the discovery. The ring is a view from above of the storage rings, the instrument where the new particles were produced. Mae Riggs of Fermilab's cafeteria is the culinary artist...

...Kenneth A. Walker (center), mechanical engineer at the ERDA Fermilab office, recently received a certificate of appreciation for his continuous service to the U.S. Atomic Energy Commission during the 28 years of AEC existence. Mr. Walker continues his work as a member of the Energy and Research Development Administration (ERDA). Awarding the certificate is Robert H. Bauer (R), manager of the ERDA Chicago Operations Office, and Donald L. Bray (L), manager of the Fermilab ERDA Office, looks on...



...Fermilab's Fire Protection Department recently tested Janet deGrazia in her bid to become New York State's first female auxiliary firefighter. A student at Columbia University, New York City, Janet (whose father is an aide to Governor Walker of Illinois) majors in chemistry and is planning to be a heart surgeon. She prepared to take the qualifying tests before reporting to the Fermilab Fire Protection Department for examination, which she successfully passed on January 17. "It's not the thought of fighting fires that I like, but the other rescue operations," Janet remarked to her Fermilab colleagues, (L-R) J. Wolsfelt, L. Grimstead, and W. Markgraf...

\* \* \* \* \*

THIS WEEK AT FERMILAB.....Cocktail hour at the Users Center, Friday, February 7, 5-7 p.m. Special prices...International Folk Dancing, Friday, February 7, 8 p.m., Village Barn. No charge. Everyone welcome.

\* \* \* \* \*

## URA SCHOLARSHIP APPLICATIONS DUE FEBRUARY 14

Applications for the scholarships to be awarded by Universities Research Association in the fall of 1975 are now being received by Ruth Thorson, Personnel Services, CL 6E, Ext. 3324. The awards of up to \$1,200 per year for four years, are open to children of Fermilab and URA employees. Students interested must be entering a baccalaureate program in the fall of 1975. For further information, contact Miss Thorson, Ext. 3324.

.....DON'T FORGET those specials now running in the Fermilab cafeteria! Free lunch to every tenth taxi rider coming to the Central Laboratory during the lunch hour -- 11:30 a.m. to 2:00 p.m. -- on February 10 and 12. Or maybe you'll get the lucky number on the cash register. Valentine's Day special on the serving line on Friday, February 14.

\* \* \* \* \*

### ALL MOZART CONCERT IN ELGIN

Centuries of Music presents a concert of Mozart choral music under the direction of Thomas S. Wikman on Sunday, February 9 at 8 p.m. at Hemmens auditorium, Civic Center, Elgin. Works being performed are Mass in C K337, Regina Coeli K276, Litany in E flat K243, and Ave Verum Corpus. Tickets are \$3.00 adults (\$3.50 at door), \$1.50 students and senior citizens. For further information, call Bob Goodwin, Ext. 3724.

\* \* \* \* \*

...Special parking accommodations for loading and unloading purposes now exist near the northwest entrance to the ground floor of the Central Laboratory. Three 30-minute parking spaces have been marked on one side of this entrance. On the other side, four spaces are reserved for loading of vehicles with special decals issued with the permission of section heads. For further information, contact Dave Sauer, Ext. 4079...

\* \* \* \* \*

### TAKE CARE

Some special precautions are necessary in using the trash chute in the southwest corner of the Central Laboratory Building. Chemicals, for example, should not be disposed of in this chute. A recent incident involving a broken bottle of ammonia in the trash compactor became a safety threat to Fermilab personnel. For special disposal problems or for further information call Fred Moore, Ext. 3824.

\* \* \* \* \*

\*\*\*REMEMBER, CREDIT COSTS LESS AT YOUR LOCAL CREDIT UNION\*\*\*

### CLASSIFIED ADS

FOR SALE - 2 Mint Condition Winchester Model 94 Rifles w/consecutive serials numbers. Also 1 Ruger 6mm Rifle, Model 77, Serial #77. Make Offer. Paul Neeson, Ext. 3019 or 897-9391.

FOR RENT - Share 6 rm. house in Warrenville w/Lab employee. Room for 1 or 2, Kitchen & garage available. Reasonable. R. J. Houkal, Ext. 3420 or 393-1077.

FOR SALE - Sears Elec. Dryer & 14 lb. washer, 4 mo. old, 2 yr. serv. cont., \$400. Tony, X3535.

WANTED - Used Gas Range & Refrigerator. Call J. Ticku, Ext. 3734.

FOR RENT - 3 rm. partly furn. apt., close to downtown Aurora. Utilities pd., \$35. wk. Call J. Ticku, Ext. 3734 or 897-7519.

WANTED - Roommate(s) to share 2 or 3 bedroom apt. or house. Also need rides to Madison, WI. area, split gas. Call Mike Hilden, Ext. 3535 or 898-3509 after 6 p.m.

FOR SALE - Snow Tires, B-78-13. Used one month. \$35. Call Ed Tilles, Ext. 3697.

FOR SALE - 72 Nova, 30,000 mi., 2 dr. Automatic, P/B/S., A/C, AM-FM tape in dash. Clean. \$2200. Call Art Streccius, Ext. 3580 or 584-0712.

FOR SALE - 1970 Yamaha 250 cc, street bike, helmet included., \$300. K. Schmidt, Ext. 4044.

FOR SALE - Brand new twin bed w/extra firm mattress. \$50. Marie Nelson, Ext. 3154.

HELP! - Know any children who can read and are not yet in kindergarten? Researcher wishes to study such a group and needs 25 subjects. Please call Steve Ellis, Ext. 3755.