UCRL-18227
SLAC-PUB-547
(EXPI)

WIRE CHAMBER SPECTROMETER*

S. H. Williams,** L. Kaufman, V. Perez-Mendez and A. W. Stetz
Lawrence Radiation Laboratory
University of California, Berkeley, California

F. Bulos, W. Busza, R. R. Larsen and D. Leith
Stanford Linear Accelerator Center
Stanford University, Stanford, California

ABSTRACT

A wire chamber missing-mass spectrometer is described. The data from four magnetostrictive readout chambers is digitized immediately after each event and stored in a 72-word buffer which can be read by a digital computer.

(For presentation at the IEEE 15th Nuclear Science Symposium on the Expanding Nuclear World, Hotel Bonaventure, Montreal, Canada, October 1968.)

---

*Work done under the auspices of the U.S. Atomic Energy Commission.

**Not a member of IEEE; telephone: 843-2740, ext. 5051.

UCRL-18227
Summary

UNIVERSITY OF CALIFORNIA

Lawrence Radiation Laboratory
Berkeley, California

AEC Contract No. W-7405-eng-48

WIRE CHAMBER SPECTROMETER

S. H. Williams, L. Kaufman, V. Perez-Mendez, and A. W. Stetz

F. Bulos, W. Busza, R. R. Larsen and D. Leith

May 1968

WIRE CHAMBER SPECTROMETER

S. H. Williams,* L. Kaufman, V. Perez-Mendez and A. W. Stetz
Lawrence Radiation Laboratory
University of California
Berkeley, California

*(Not a member of IEEE; telephone: 843-2740, ext. 5051)

F. Bulos, W. Busza, R. R. Larsen and D. Leith
Stanford Linear Accelerator Center
2575 Sand Hill Road
Menlo Park, California 94305

SUMMARY

A missing-mass spectrometer is used to detect charged decay products in the photoproduction of strongly decaying mesons. The system consists of a production target, beam stopper, analyzing magnet, trigger counters, spark chambers, and a counter hodoscope. An IBM 1800 computer records data on magnetic tape, monitors the operation of several components, and analyzes the data from the spark chambers to give the physicist-operator immediate results about the physical parameters of the interaction he is studying.[1,2]

In particular the spectrometer has been used to observe the $\pi^+\pi^-$ decay of ρ^0 mesons photoproduced in a 9 BeV monochromatic photon beam at SLAC. The pions decay in the target with an opening angle large enough to get around a five-inch wide tungsten beam stopper. The remaining beam is stopped in 15-in. of tungsten to avoid flooding the spark chambers. The two pions are bent back toward each other by a 20 kG field 1.5 meters long. The pions emerge from the magnet and pass through a system of counters which trigger the spark chambers.

Since the spark chambers are sensitive to charged particles for more than one-half microsecond before and after the event, other tracks may be found. The counter hodoscope eliminates these tracks in most cases because it requires a short 16 nsec coincidence window with the event trigger in order that a flag be registered.

Each spark chamber consists of two gaps driven by a single capacitor-inductor arrangement which approximates a charged transmission line yielding a rectangular voltage pulse of 25 nsec rise time and 150 to 200 nsec duration. Both planes of each gap are comprised of wires at different angles. The planes of the two chambers are at 0, +30, -30, and 90 deg with respect to the vertical. The other two chambers consist of two sets of 0 and 90 deg planes. The wire planes are backed up by aluminized Mylar planes to aid in making the field uniform across the chambers and to enable the planes to be terminated in 16 Ω resistance. The active areas of the chambers are 30- by 60-in. and 17- by 48-in. (two each).

Readout for the wire chambers is 16 magnetostrictive wands. The readout electronics consist of 16 channels of four 13-bit scalers each. The scalers are started by the first fiducial pulse from the wand and count pulses from a 20 Mhz clock. Each successive scaler in a channel is stopped by the successive pulses after the fiducial pulse for a maximum of four coordinates per plane. The 64 scalers are then read into the 1800 computer one by one via a single 16-bit digital input.

The fast logic is set up to monitor the beam and trigger the spark chambers when a proper coincidence signature has been satisfied. The event trigger also strobes the

the 32 hodoscope counters with a 16 nsec pulse to register flags which give the temporal and rough spatial resolution of the spark chamber tracks. The hodoscope and trigger counter buffers are read into another 1800 digital input along with the spark chamber data after each event.(1) A number of other instrument readings are also recorded on magnetic tape at the beginning and end of each run and at ten-minute intervals during the run.(1)

Work done under the auspices of the U.S. Atomic Energy Commission.

For presentation at the IEEE 15th Nuclear Science Symposium on the Expanding Nuclear World, Hotel Bonaventure, Montreal, Canada, October 1968.

[1] Paper to be presented at this conference by R. D. Russell.

[2] Paper to be presented at this conference by M. J. Beniston.