Submitted to the 1982 Nuclear Science Symposium,
Washington D.C., October 20-22, 1982.
May 13, 1982

BNL 31347
Conf-821011--1

BNL--31347

DE82 016143

THE MPS II DRIFT-CHAMBER SYSTEM

A. Etkin, S. Eiseman, K.J. Foley, R.S. Longacre,
W.A. Love, T.W. Morris, S. Ozaki, E.D. Platner,
V.A. Polychronakos, A.C. Saulys, C.D. Wheeler
Brookhaven National Laboratory
S.J. Lindenbaum, Brookhaven National Laboratory and
City College of New York
M.A. Kramer and Y. Teramoto
City College of New York

A description of a very compact drift chamber system, in which the electronics for the individual channels is mounted on the chambers, will be given. These high resolutions and dead-time free chambers achieve excellent performance by utilizing digital electronics that eliminates channel-by-channel corrections. This approach is suitable for very large drift chamber systems since it requires an average of less than one integrated circuit per channel. In addition to a description of the system, results from beam tests and actual use in an experiment will be presented.

Submitted by: Dr. Asher Etkin
Department of Physics, 510A
Brookhaven National Laboratory
Upton, New York 11973

THE MPS II DRIFT-CHAMBER SYSTEM

A. Etkin, S. Eiseman, K.J. Foley, R.S. Longacre, W.A. Love,
T.W. Morris, S. Ozaki,# E.D. Platner, V.A. Polychronakos,
A.C. Saulys, D.C. Wheeler
Brookhaven National Laboratory*

S.J. Lindenbaum
Brookhaven National Laboratory*
and
City College of New York+

M.A. Kramer and Y.Teramoto
City College of New York+

SUMMARY

A new system of detectors (MPS II) has been installed and operated in the Brookhaven National Laboratory Multiparticle Spectrometer (MPS), consisting of short drift distance drift chambers. These chambers contain several innovations that will find widespread use in the High Energy Physics Community, because they permit one to construct good resolution, high rate drift chambers at a reasonable cost.

The chambers are arranged in modules (presently there are 7 modules with ∿ 12,000 wires total) that have 3X (momentum measuring), 2Y, U and V (±30° to the Y direction) planes mounted on an alignment plate along with all the electronics associated with the individual anode wires. In order to incorporate all this electronics in a small space at low cost (∿ $25.00 per wire) three custom integrated circuit chips were developed; a four-channel transresistance amplifier chip, a four-channel discriminator chip, and a four-channel 256 bit, 250 MHz shift register used to delay, in digitized time bins, the discriminator output without dead-time. In addition the shift register stores the data to be read out when a trigger is generated. It is expected that the long term reliability of the electronics

will be good because an average of less than one integrated circuit per wire is used.

In beam tests and in an experiment, the system gives good efficiency at high beam rates and spacial resolution of the order of 200 microns. Beam rates of approximately three million particles per second have been used and multi-track events have been reconstructed with high efficiency. In a very short period of time it was possible to commission the MPS II system and use it to study double ϕ production. It should be noted that this system does not require any channel-by-channel digitizer calibration and that the resolution was obtained without the need for any wire-by-wire propagation delay corrections.

In conclusion, the MPS II system of drift chambers achieves good resolution, high efficiency, high beam rate capability and good event reconstruction efficiency in a compact, reliable and relatively inexpensive design.

Presently on leave to the National Laboratory for High Energy Physics, KEK, JAPAN.

* This research was supported by the U.S. Department of Energy under Contract No. DE-AC02-76CH00016.

+ Work supported by the National Science Foundation, and the U.S. Department of Energy.