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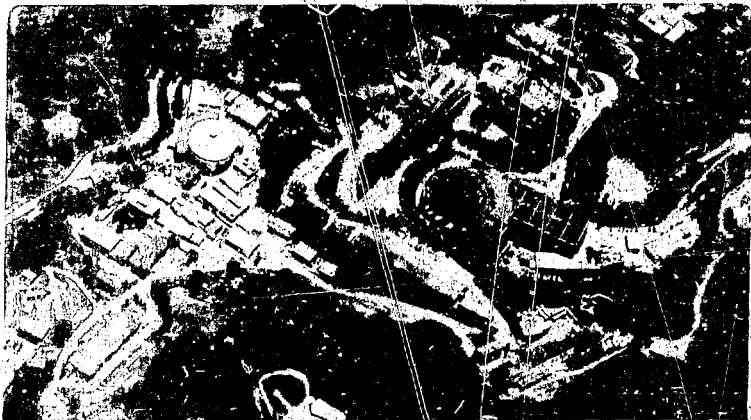
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(10/6/61)

A Multiplicity Detector Using a Glow Discharge Memory; T. Mulera, M. Eioia, V. Per-
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It has been proposed to eliminate the x-y correlation ambiguities introduced by multiple tracks in a wire chamber by using the chamber itself as a memory. Hits in the chamber itself ignite glow discharges storing the x-y location of the hits in a correlated fashion. Glow ignition may be achieved by employing a multi-step avalanche chamber above a memory gap. Correlation is maintained during readout by successively pulsing each hit wire in one coordinate and sensing transmissions through glows in the other coordinate. Prototypes constructed by the authors will be discussed along with the associated high voltage and readout systems.

* This work was supported by the U.S. Department of Energy Under Contract #W-7405-ENG-48

SUMMARY

Conventional wire chamber readout techniques are plagued by correlation ambiguities when more than one particle is detected simultaneously. In fact, to completely resolve all such ambiguities for n particles requires the reading out of $n+1$ separate coordinates. Clearly, resolution of the ambiguities involved in an event of multiplicity, say 50, by this method would be prohibitively expensive. Likewise, a "spot counter", in which each (x,y) pair is separately latched is an inelegant, expensive, brute-force solution to the problem. Various schemes have been proposed in the past,^{1,2} in which the ambiguities are resolved by employing the detector itself as a correlated event memory. We have attempted to realize these types of schemes by constructing several prototype detectors in which a sensitive ignition section is followed by a glow discharge gap to act as a memory. A schematic of such a device is shown in Figure 1.

The passage of charged particles through our apparatus is used to ignite a glow discharge at the points of passage. Ignition may be achieved through the use of conventional pulsed spark chamber techniques or through the use of some less cataclysmic method. In any case, the results are glow discharges which may be maintained by a DC potential of several hundred volts for an indefinite length of time. Figure 2 shows how the (x,y) position of each hit may be read out in a correlated fashion. Each wire of one coordinate, say x , which registers a hit, is successively interrogated by the

superposition of a voltage pulse over the DC holding voltage. The wires of the y-coordinate are then examined for the transmission of the pulse through the conductive glows. In this way the (x,y) position of each hit is read out in an unambiguous way.

In our several generations of prototypes we have developed a design for a glow memory gap which gives good glow stability and multiple track efficiency, and which minimizes the problem of "cross talk" between neighboring locations. Several ignition schemes have been studied, with the current choice being a multi-step avalanche chamber using pulsed high voltage.³ A readout system with pulse transmitters and receivers and an encoding system have been built. The performance of our current prototype and its associated high voltage and readout systems will be presented. Plans for future developments will be discussed.

* This work was supported by the Director, Office of Energy Research, Office of High Energy and Nuclear Physics, Division of High Energy Physics of the U.S. Department of Energy Under Contract W-7405-ENG-48.

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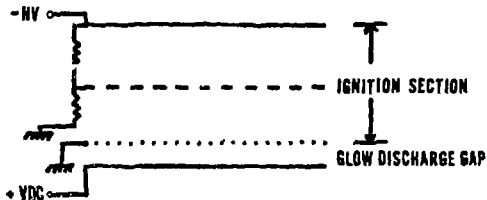


Figure 1: Schematic of Chamber

The ignition section shown here is a multistep avalanche chamber.

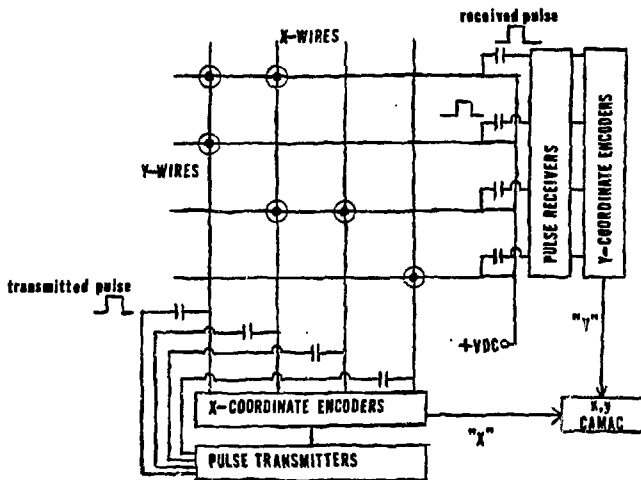


Figure 2: The Correlated Readout Scheme

The circles represent the locations of glow discharges.