



Rutherford Laboratory

Technical leaflet

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BUBBLE CHAMBER DATA REDUCTION

Charged particles passing through a bubble chamber leave visible tracks, which are photographed by three independent cameras. The film produced is projected and scanned visually for interesting events. The events are measured on a machine which records coordinates of points along each track, in coded form on paper tape. This tape is processed on an IBM 360/75 computer, under the control of bubble chamber analysis programs.

The paper tape is read, interpreted and checked by the computer, which writes good events on to a magnetic tape, to be read as data by the GEOMETRY program.

The GEOMETRY program takes the coordinates measured in two dimensions on the three separate films and calculates the three-dimensional tracks in the bubble chamber. For each track a set of points is obtained and a helix generated on which all the points lie (as closely as possible). From this helix the curvature (and therefore momentum) and direction of the track in the chamber are found. This information is used as data by the KINEMATICS program.

Each interaction between particles in the bubble chamber is known to satisfy certain "conservation" laws, (e.g. energy and momentum must balance). The KINEMATICS program first allots a certain hypothesis to the event, assigning a particle of known mass to each track. A check is made that the conservation laws are satisfied with the particular mass assignment chosen, and in doing so the measured quantities (momentum and direction) are adjusted within the experimental errors in order to satisfy the laws. Several hypotheses may be tried on each event and the best hypothesis found.

If a hypothesis can satisfy the laws further physical quantities are calculated and written to another magnetic tape as input data for the STATISTICS program. This program can search the data for interesting correlations between the particles making up an event, and apply the same tests for a large batch of events. In this way, significant irregularities may show up, which the physicist may be able to attribute to a previously unknown particle.