



# Rutherford Laboratory

## Technical Leaflet

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C1

### FILM PROCESSING LABORATORY

This Laboratory is devoted to the extraction of data recorded on photographic film during Bubble Chamber runs.

The exposed film from the Bubble Chamber is first put into the developing machine which is able to process cine film at the maximum rate of 3,000 feet per hour. In the darkroom end of the machine new reel of film is spliced onto the film already being drawn through the machine where it is developed, fixed and dried in a continuous operation; the dried film is wound onto bobbins ready for viewing on the scanning machines.

When the three lengths of film for each frame number have been processed they are put onto the scanning machine which consist of three channel projectors adjusted so that the images of the three views can be superimposed on the white table screen. To enable the scanner to decide whether a track is running towards the back or front of the chamber the projection lenses of the two outer projectors are individually movable to obtain stereo coincidence. In order that the end of the picture furthest from the scanner can be studied more closely the whole lens assembly moves in the direction of the length of the film so shifting the picture bodily. Since only a few seconds may be needed to decide that a given frame contains nothing of interest fast film transport is provided. The frame numbers of events of interest are noted at this stage so when the film is passed on they can be measured.

There are two types of Measuring machine which record the x-y co-ordinates of selected points on bubble chamber tracks. The results are punched on computer tape together with the co-ordinates of the fiduciary marks and a large amount of book-keeping information.

In the larger measuring machine designed at Imperial College the film moves on a carriage parallel to its length for the x - co-ordinate and the projection lenses move transversely for the y - co-ordinate. There are three film channels and three separate optical systems and photo electric detectors. A stationary view of the whole frame is projected in tungsten light by the 9 x lens. The measuring channel uses a mercury lamp, a small area round the measured point is projected at a magnification of 30 x. The beam is split by a dichroic beam splitter which transmits the blue and violet lines onto the detector, the green and yellow lines are reflected onto the display screen. The display screen has a cross on it representing the measured point which can be rotated to line an arrow up with the direction of the track. The x and y movements are actuated by oil hydraulic rams controlled by electromagnetic valves and moire fringe digitizers are used. The detectors can be used for auto following the tracks.

The other measuring machines designed at University College has a fixed optical system, the table on which the film is mounted being moved in both the



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x and y directions by electric motors, digitizing with rotary encoders. The measured point is represented by a cross illuminated by a tungsten lamp, the image of the film is projected using a mercury lamp. The high and low magnification are projected onto the same screen using a shutter to obscure the one not required.

After being measured the film is put into store and the paper tape produced by the measuring machine is fed with the required programme into the computer for analysis.

Another measuring machine which was designed here is at present under construction, this one will feed the information directly into and be controlled by the computer.