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REPORT ON SCOTCHLITE TESTS IN THE CERN H.L.B.C.

1. Introduction

Recently tests have been carried out to investigate the possible use of Scotchlite bright field illumination in the CERN H.L.B.C.

Scotchlite SPR 704 was used in the tests. This material has very good retro-directive properties (i.e. an angular width of $\sim 1^{\circ}$) and can be used with angles of incidence up to $\sim 55^{\circ}$. Moreover it is resistant to the heavy freon CF_3Br, and does not show any surface boiling.

The chamber is expanded by means of a 95 cm diameter plate suspended in front of a Vulkulan rubber membrane. For this test the expansion plate was wall-papered with Scotchlite using only its self-adhesive.

2. The Illumination System

The simplest way to use a Scotchlite illumination system is to place a small ring source around the aperture of the camera lens. The design of the cameras however did not allow this simple approach and a beam splitter had to be used. Fig. 1 shows schematically the bubble chamber and illumination system. Two U-shaped Xenon flash tubes, 3.5 cm high and 2.4 cm wide, were inserted through the camera end plate. The flash tubes illuminated the half-silvered mirror and gave essentially a 2.5 cm virtual disc at the lens aperture.

The lens was of 135 mm focal length and set at f/22. Agep 70 mm Documentary film, 12 DIN, was used throughout the test.

3. Results

Figures 2, 3 and 4 show photographs of cosmic rays obtained during the test with 400 Joules flash power.

The flash pulse was set 2 msec after the minimum in the pressure-time curve.

The photographs obtained have sufficient contrast for easy scanning. The bubbles are $\sim 1/3$ mm in diameter in space, which is the expected diffraction size for f/22. Thus no loss of accuracy will result from the use of the Scotchlite illumination system.

The tracks close to the Scotchlite are accompanied by a shadow image, and variation in illumination due to thermal turbulence is also apparent. The shadow is most probably due to a slight misalignment of the illumination system and should be easy to eliminate.

The thermal turbulence effect is a much more complex problem to solve. However, a large amount of effort is being devoted to the improvement of the temperature control systems and to find methods of mixing the chamber fluid effectively.

4. Conclusions

The tests have shown that photographs of good quality can be obtained in the CERN Heavy Liquid Chamber by means of a Scotchlite bright field illumination system.

However, as the present dark-field system is also of very good quality the modification of the illumination system would be envisaged if an experiment justified the change i.e. the use of a plate system within the chamber liquid.

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FIGURE CAPTIONS

Fig. 1 shows a cross section of the heavy liquid chamber and the illumination system used.

Fig. 2 Three cosmic rays can be seen traversing the chamber.
The shadow image can be seen clearly on two of the tracks. Also the mottling due to thermal turbulence can be seen at the top and bottom of the chamber.
The thick white band across the photograph is a pipe mounted for K_2^o experiment.

Fig. 3 shows a part of the central track on Fig. 2 enlarged to 1.2 x real space.

Fig. 4 shows a muon stopping and decaying in the chamber.

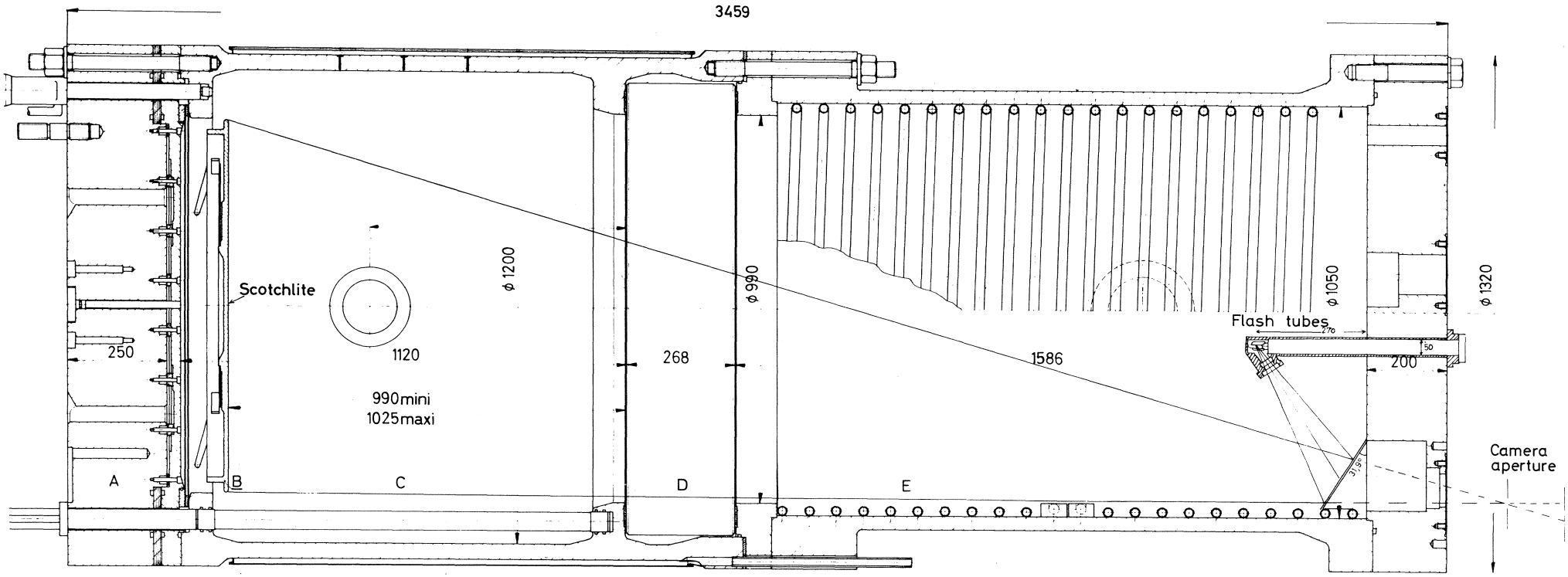

Fig. 1

SCEMATIC DRAWING OF THE ILLUMINATION SYSTEM

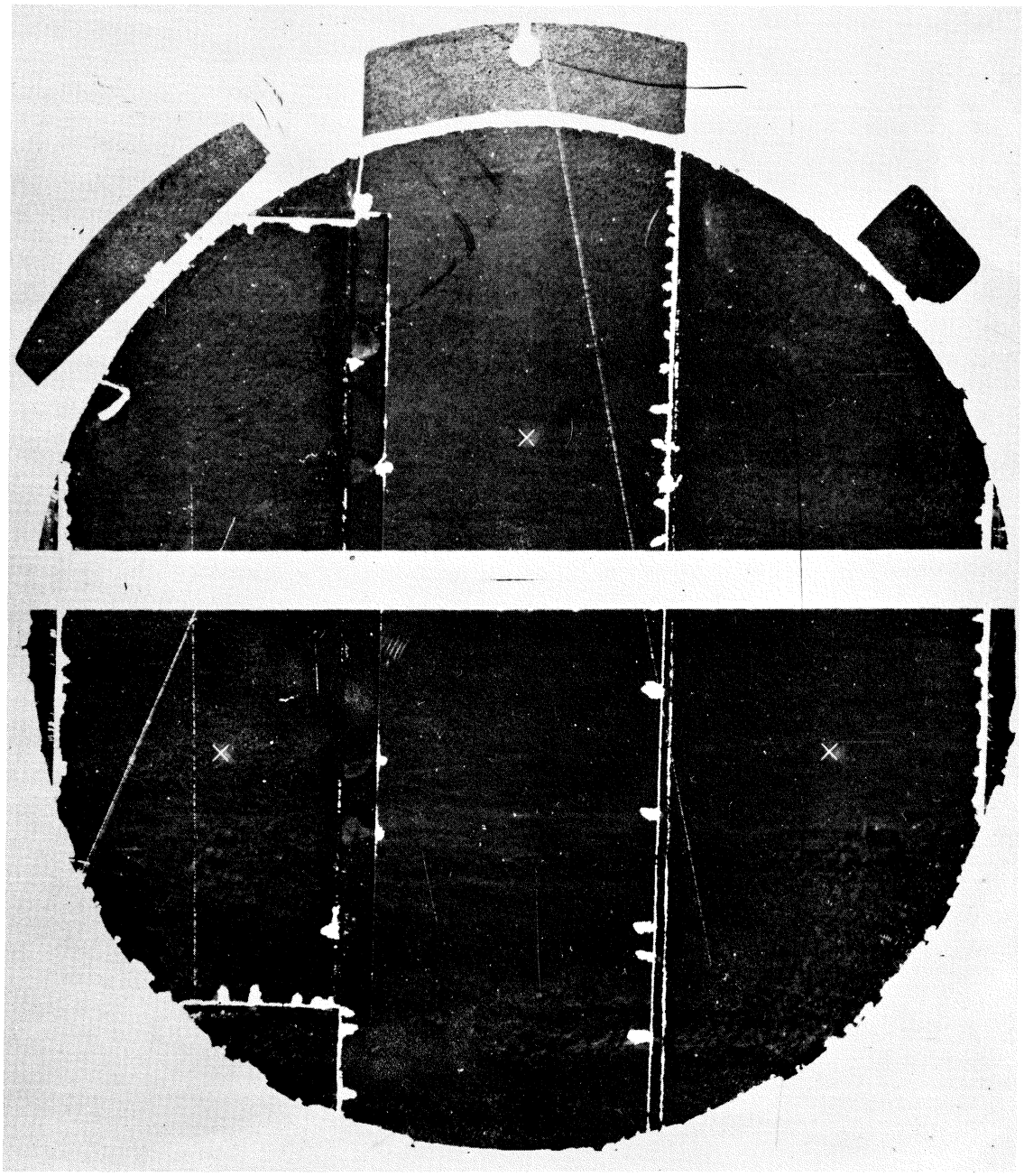

Fig. 2

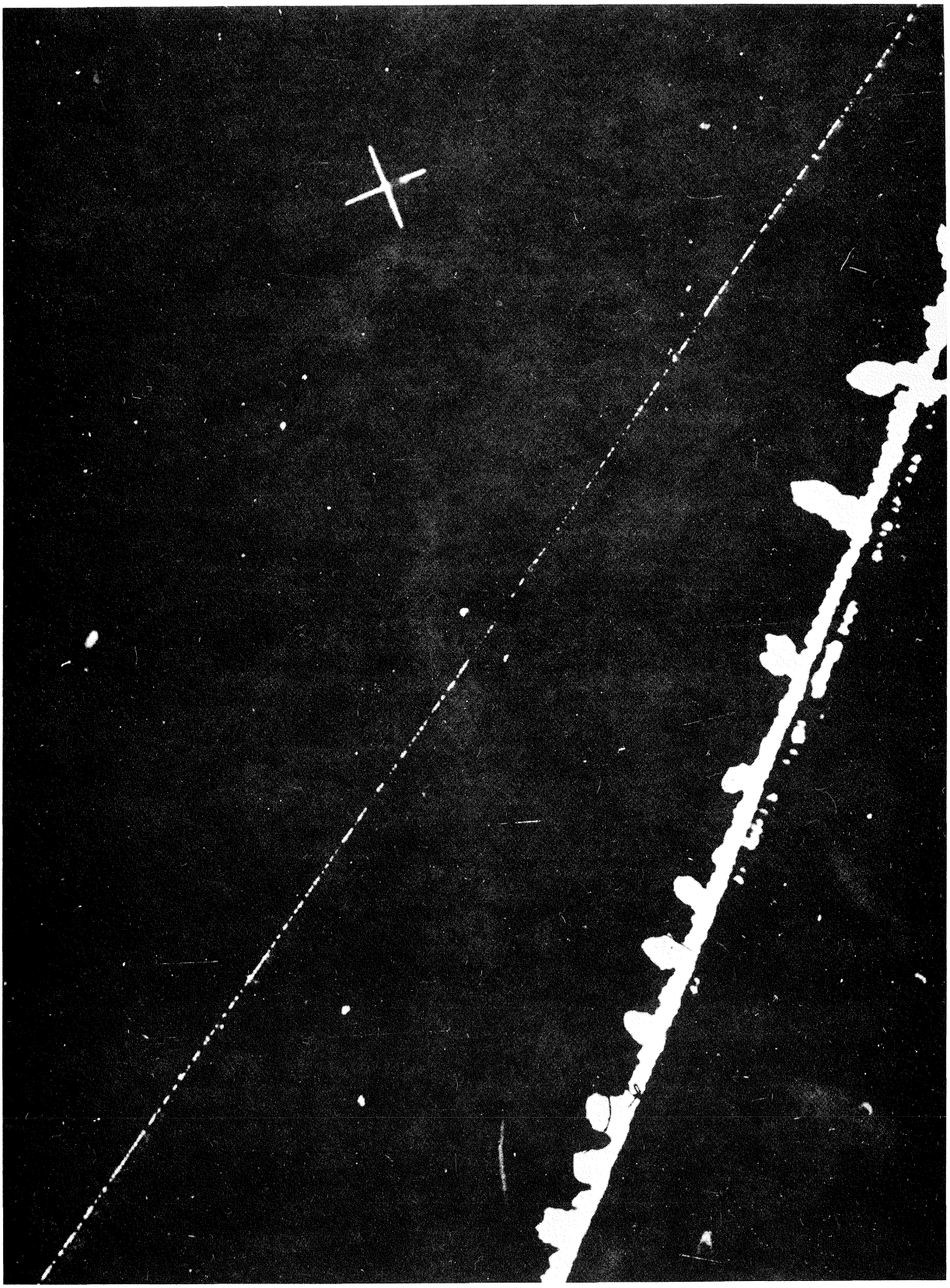

Fig. 3

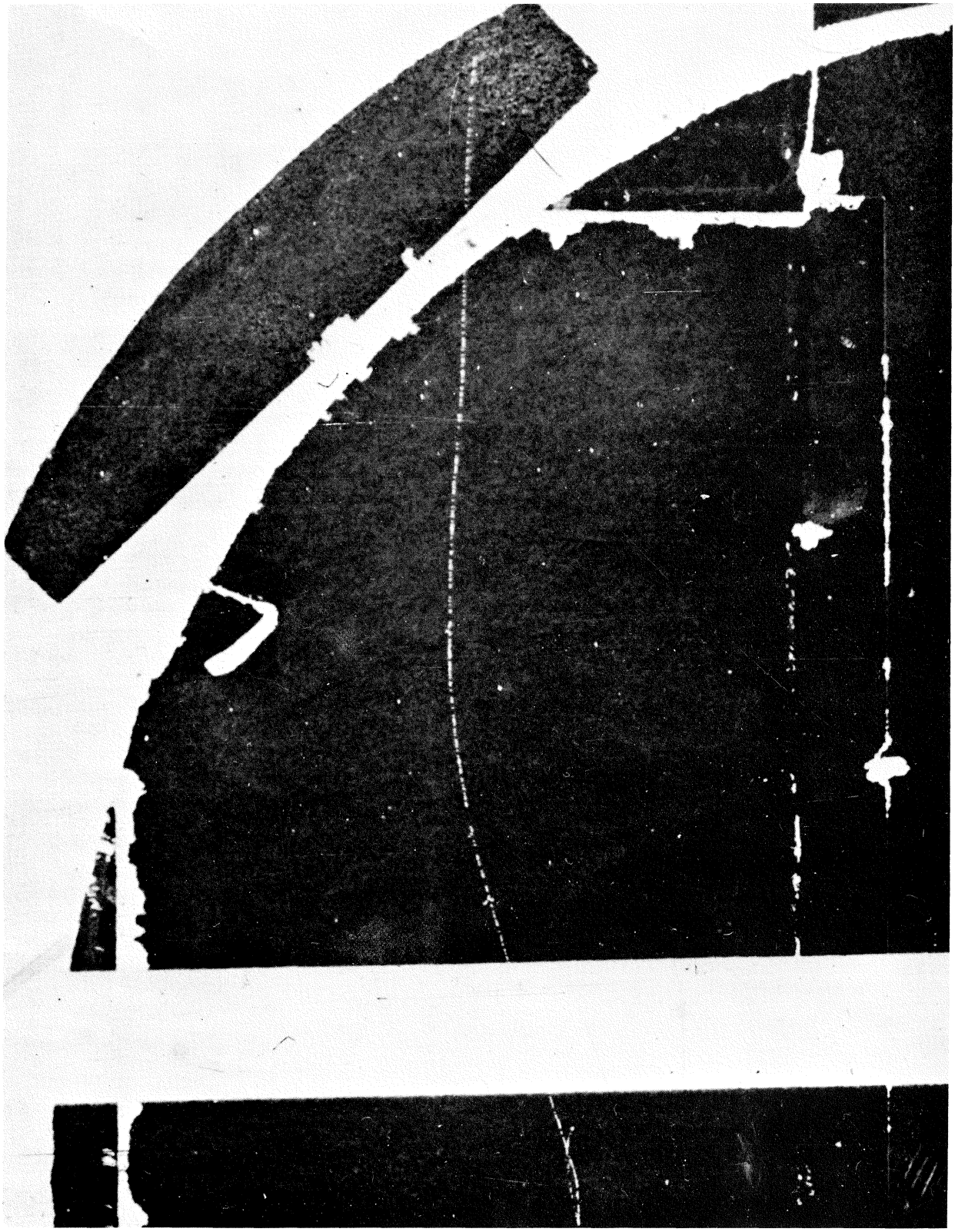

Fig. 4