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Mr. H. Anderson

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K. T. Bainbridge

O. R. Frisch

Gamma ray Pinhole Cameras for Trinity

, 1981

1. Purpose - Gamma rays are essentially emitted by two processes.

(a) By the capture of a few percent of the prompt neutrons in the H.E.; this stops after a few microseconds when the H.E. has expanded to say 10 times its original volume.

(b) From the fission fragments, decaying roughly like 1/t.

A picture of the gadget taken by the gamma rays emitted under (a) indicates the expansion of the H.E. up to the point where the absorption of neutrons in it becomes negligible. If the explosion should show marked asymmetries, these may also show up in this picture.

By using the gamma rays under (b) one can get a picture of the way in which the fission products are thrown out and how their radiation is obscured by dirt thrown up.

If the explosion happens more or less as predicted, these pictures may not tell much of interest, except that nobody seems to know at present how the active material moves inside the ball of fire, and this may be important for the sampling. On the other hand, if something unexpected happens the pictorial information yielded by the pinhole photographs may be very valuable.

2. Proposed Cameras

(a) To utilise the capture gamma rays a camera of high resolving power is needed, but the field of vision can be very small. The proposed camera is about 2½ ft. long and 1 ft. in diameter at the rear where the film is located, tapering to about 6" diameter in front. The pinhole is a tapered channel of lead, 0.3 mm diameter at the narrowest point. Placed at 600 m from the gadget it will resolve details of about 1 ft. in size. No shutter is required since all subsequent radiations have much less brightness than the capture gamma rays. Two such cameras should be used, 90° apart.

(b) To photograph the fission products a wide field of view is needed. For this we propose a somewhat shorter camera (about 2 ft. long) with a slightly greater diameter and a pinhole made of tuballoy of 2 mm diameter. Details of about 15 ft. will be resolved. It is proposed to set up 3-6 cameras with differently timed shutters. With spring operation times of about 10 msec. can be achieved; shorter times may be possible by the use of explosives or propellents. To trigger the shutters the radiation from the gadget can be used so that no wiring is required.

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Gamma ray Pinhole Cameras for Trinity (continued)

3. Work Involved

Casting one camera (lead) takes 18 man hours. Making the patterns for one type of camera takes 9 man hours. The most comprehensive program would require 2 patterns and 8 cameras = 162 man hours. The tuballoy pin holes and pieces for shutters will mean about 17 man hours.

The rest of the equipment (shutters, trigger circuits, film holders, and assembly) we propose to build in the Omega shop ourselves.

4. Installation

The finished and loaded cameras will be shipped to Trinity and set on earth mounds. A 6-ton truck with crane and 3 men could do it in one day.

cc: H. L. Anderson
E. Fermi
L. H. Hempelmann
J. E. Mack
J. H. Manley
Meteorologist c/o Bainbridge
W. G. Penney
E. Segre
B. Waldman
V. Weisskopf
J. H. Williams
R. R. Wilson
File

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