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LAMD-309

ADWD-136

FAMILY COMMITTEE
Minutes of Ninth Meeting
May 11, 1950

SAA 2000 6933 0000

A. Attendance.

The ninth meeting of the Family Committee was held Thursday, May 11, 1950 at 1:15 PM in Room B-117. Those present were

N. E. Bradbury	L. D. P. King
J. C. Clark	J. M. B. Kellogg
F. de Hoffmann	D. P. MacDougall
D. K. Froman	J. C. Mark
R. W. Goranson	L. Rosen
A. C. Graves	B. R. Suydam
D. B. Hall	R. F. Taschek
M. G. Holloway	E. Teller, Chairman
E. R. Jette	J. A. Wheeler

DEPARTMENT OF ENERGY DECLASSIFICATION REVIEW
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B. Minutes of the Eighth Meeting.

The Committee unanimously adopted the minutes of the Eighth Meeting reported in ADWD-1-133 with the following corrections:

(1) Under attendance add: M. G. Holloway. (Apologies of the secretary.)

(2) The forthcoming Family meetings mentioned under C should read May 25th and June 1st, 1950, instead of May 26th and June 2nd, 1950, respectively.

C. 14 Mev Neutron Experiments at Eniwetok.

At Teller's request, Froman agreed to chair the meeting. Froman outlined 14 mev neutron experiments which were now considered for the Spring '51 tests. A list of these is reproduced in Table 1. Appropriate abbreviations were chosen (as listed in Table 1) and these will be used throughout these minutes.

D. DINEX.

Hall emphasized that Figure 3 of the Eighth Minutes was only a very schematic arrangement of DINEX. Other ways of arranging the shield and equipment may be preferable. He recalled to the group that at present it was planned to use 2 or possibly 3 complete shielding "assemblies" with one or more magnets per assembly. This multiplicity of magnets is necessary due to both intensity and the requirement that there be two energy channels (7 and 14 mev). Merely dropping the 7 mev measurements would therefore not cut down the number of DINEX assemblies to one.

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Mark explained that the idea of measuring the two energies is due to the so-called "kigmy" effect. [redacted]

DOE b(3)

(1) Booster. [redacted]

DOE b(3)

(2) [redacted]

DOE b(3)

DOE b(3)

DOE b(3)

(3)

DOE b(3)

As stated in the Eighth minutes, there are two reasons why one would like a clean measurement of the region before point A. These are a measurement of the energy level (Experiment Ib of Table 1) and secondly, simply as a means of assuring oneself that one really knows that point A is shown on the record. Thus, a tying down of the kigmy effect by means of the 7 mev measurement would benefit largely the "energy level" portion of the DINEX experiment. The group therefore turned to a re-discussion of the importance of part (b) of the experiment

DOE b(3)

On the other hand, the X-ray experiments may fail and it may be valuable to have a measurement of the level from the DINEX experiment. Moreover, if the X-ray experiment is successful, one will want to calculate from it the energy level. The DINEX measurement of this level would therefore be of interest as a check of the functioning of the fission phase of the bomb, even though in the case of disagreement one may wish to rely more strongly on the X-ray data.

DOE b(3)

Teller pointed out some doubts connected with the detection of the recoil protons compared to response of the detector due to background. This background is due to two causes: (a) the neutron and gamma rays

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entering the hole in the shield, and (b) response of the detector to gammas formed toward the inner edge of the shield. These two background effects turned out to be of about equivalent magnitude. Moreover, very rough calculations indicate that the signal due to these two may be between 1/10th and equally as large as the proton recoil signal. Hall remarked that one could always place one or more additional detectors close to the main detector in order to get an experimental measurement of the background which can then be subtracted from the main counting rate.

Hall reported that Krause wanted to know the time resolution with which different portions of the DINEX experiment should be performed. Krause had suggested that with considerable effort the following time resolutions could be obtained:

In the constant alpha region -- 5×10^{-9} seconds

In the region around A -- 1.5×10^{-9} seconds

In the region above A -- $.3 \times 10^{-9}$ seconds

[redacted]

DOE b(3)

Hall remarked that the foregoing discussions were sufficient to guide J Division and Krause in proceeding with the design of equipment.

It was recognized that the large bulk of the DINEX shield may give rise to trouble in some of the other 14 mev neutron experiments. This is discussed at appropriate places below.

E. ANEX.

Graves reported on Ogle's plans for this experiment. The time integral for neutrons of various energies is to be measured by means of threshold detectors. The threshold detectors to be used in the uncollimated system are as follows:

[redacted]

DOE b(3)

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[redacted]

b(3)

The samples will be put out on supports, probably wooden tables, such that they are about five feet above the ground. The possibility of increasing the height above the ground to decrease ground scattering corrections was discussed. The very near samples, however, that is, those within three or four hundred yards, will probably be put directly on the ground in order to reduce the shock due to the blast wave.

[redacted] The other samples will be put out at 100 yard intervals, starting at the tower and going out to 1100 yards from the tower. At that point the activity to be expected decreases to such a small value that it would probably not be observable.

DOE b(3)

It should be emphasized that at present satisfactory detectors for the 11 to 14 and above 14 mev region have not yet been chosen.

The DINEX shield will cause some trouble with regard to the time integral threshold measurements. In particular, 14 mev neutrons will wander into the DINEX shield and be degraded to about 3 mev. Thus, the sulphur will record these. It is particularly unfortunate that the sulphur measurement should be effected since measurements on sulphur will to some extent be the most reliable ones because intercalibrations go back as far as the Trinity test. [redacted] The Committee agreed that as far as information concerning the thermonuclear portion of the tests were concerned, there was no need to plan on such experiments.

DOE b(3)

F. PHONEX.

Rosen reported the present ideas concerning this experiment. Figure 2 shows a general view of an individual assembly to be used for the experiment and Figure 3 shows the details of the neutron camera. The neutrons which are incident upon one of the radiators give rise to a recoil proton (at a varying angle depending upon the uncertain energy) and recorded upon an appropriately placed photographic plate. The 3 radiators vary in thickness such that each assembly (consisting of 3 radiators and a

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total of 24 plates, can cover the entire spectrum. For the various tests, it is planned to distribute between 4 and 6 of these assemblies at distances of 200 to 1200 yards (spaced approximately 200 yards apart).

The weight of an individual assembly is about 25 tons and it is planned to recover all assemblies save the nearest one at 200 yards. Some comment was made that one may wish to redesign the assembly so as to eliminate bolting in order to make it more certain that the assembly stays together in spite of the large pressure exerted upon it. The 200 yard stage was designed primarily to provide for the possibility of a fizzle in which case the intensity may be so low that only the 200 yard stage will yield the desired data. The original plan was that in case of a success the 200 yard stage would simply be blown to bits and no data obtained from it. However, the discussion developed that the 200 yard stage may well be the most interesting of the lot. This is so because at the stages further out, ground scattering may give rise to considerable corrections. At 200 yards it may be possible to bury the camera below the ground and have it point at a fairly respectable angle toward the gadget on the tower. It is a very unlikely event that a neutron will be scattered off the ground and still find its way into the camera in this case.

The reason for placing assemblies at varying distances all the way to 1200 yards is determined by two factors: to provide for a spread in expected intensity and possibly to calculate corrections due to air and ground scattering from the variation of the spectrum with distance.

Rosen mentioned that the expected accuracy in measuring the spectrum of neutrons incident upon an assembly can essentially be limited by the accuracy to which the (n,p) cross-sections are known.

Corrections due to ground scattering of the [14 mev] neutrons could be eliminated if static tests with a strong [14 mev] neutron source at the top of the test tower could be performed. [redacted]

DOE b(3)

As in the case of ANEX, the DINEX shield will cause trouble by degrading some of the [14 mev] neutrons. It should be pointed out, however, that if the DINEX shields could be moved even a distance of 10 yards away from the gadget, the collimators at the 200 and 400 yard stations for PHONEX would not look at the DINEX shield. This would decrease the interfering effect of the DINEX shields. Of course, it was recognized that this could not be done in practice since the tower cab is not large enough to permit the DINEX shield to be 10 yards away from the gadget.

In order to make the experiment yield reliable quantitative data, one would have to be able to do away with the following sources of error, or else be able to correct for them in a reliable manner: scattering from the DINEX shield or other large masses of material close to the gadget, air scattering, and ground scattering. The group recognized that it would be valuable to have such quantitative information and it was suggested that efforts be made to correct for the above errors and obtain quantitative data.

Rosen briefly reported on the proposed part b of PHONEX (that is, to measure the time dependence of the spectra to within about 1 microsecond). Rosen reported that he doubted the practicability of collimating for 1 microsecond resolution by means of rotating a split cylinder. The Committee agreed that as far as the thermonuclear part of the tests was concerned there was no need to perform part b of PHONEX.

G. FLUNEX.

This scheme was briefly discussed in the Eighth minutes. Teller emphasized that the reason for thinking of this experiment is in the nature of insuring against failure of the DINEX experiment. If the DINEX experiment is successful, it will give more complete information. On the other hand, if it turns out that FLUNEX can be performed in a simple manner it would be well to do it in order to have some insurance in case of failure of DINEX. Figure 3 shows the schematic of the experiment. The fluorescent crystal has an area of about 10 square centimeters and is focused through the telescope onto a 1 millimeter spot. The fluorescent light from this spot can then be detected by means of a photocell. Several telescopes with different absorbers or an electronic arrangement may be used to provide in part for the necessary sensitivity range. Furthermore, depending on how elaborate one would wish to make this experiment, one would plan to put fluorescent crystal assemblies at 2, 5, and 10 meters distance from the gadget, respectively. The lead shield insures that the neutron flux is favored by about a factor 10 compared to the gamma ray flux so that the fluorescence will be due largely to the neutrons. One may wish to make the gamma shield out of a substance other than lead, such as perhaps tungsten, in order to prevent premature heating of the crystal.

In general, it is believed that fluorescent crystals respond fairly fast to a signal i.e. have a quick rise time (perhaps of the order of a 10th of a shake) but that their fall time is very slow. In consequence, as long as the pulse is rising, the resulting signal should be a fair reproduction of the change in neutron intensity. Thus, one may expect to obtain the shape on the ascending side of the neutron intensity (i.e. before point B of Figure 1) with very good accuracy but to measure the shape on the descending side with very poor accuracy--perhaps of the order of 1 shake time resolution. Hence, one will know the total time which it has taken for the DT to react in only a rough way. If the gadget fizzles but the fizzle is not poorer than 1% of expected yield, one would still expect to get some data from this experiment. It will give a rough indication of the energy level.

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Some difficulties concerned with the experiment were discussed by the group. These included scattering in the air of the fluorescent light before it reaches the telescope, scatter in the optical system, response of crystals, etc. It was agreed that these would have to be looked into in some detail before it could be decided what scale program this should involve. However, there was unanimous agreement that whatever arrangements are made, these should not interfere with the work proceeding on DINEX. Teller and Graves were requested to examine the details of FLUNEX and the possibilities of enlisting groups outside of the Laboratory (particularly Charlie Baker at Brookhaven and P. R. Bell at Oak Ridge) and to report to the Family Committee at the next meeting on their findings.

H. <u>TENEX</u>.

Time did not permit taking up this item and discussion of TENEX was postponed until the next meeting.

I. <u>Miscellaneous</u>.

[redacted]

DOE b(3)

[redacted]

DOE b(3)

It was agreed that a mockup of tower cab and an approximately 25' adjoining section of the tower should be erected at TA33.

J. <u>Next Meeting</u>.

The agenda for the next meeting will be as follows:

(1) Report on TENEX and FLUNEX.

(2)

(3)

(4)

Frederic de Hoffmann

Executive Secretary

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39A J. M. Keller
40A R. W. Spence
41A A. C. Graves

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TABLE 1

Proposed 14 Mev Neutron Experiments at Eniwetok -- Spring 1951

Experiment Number	Description and Alias	New Code	To be done by
I	Energy-alpha, diagnostic 14 Mev, Reines-Ogle, Hall-Krause, NRLK (a) Time dependence of TD reaction (b) Energy levels in fission bomb when produced.	DINEX	Hall, Krause
II	Time integral of Neutrons by Threshold Detectors	ANEX	Ogle
III	Time integrated neutron spectrum by photographic emulsions (a) Time integral (b) Time dependence with 1μ second resolution	PHONEX	Rosen
IV	Fluorescent Crystal	FLUNEX	?
V	Temperature of DT Source by energy spread in fission chamber at several hundred meters	TENEX	?

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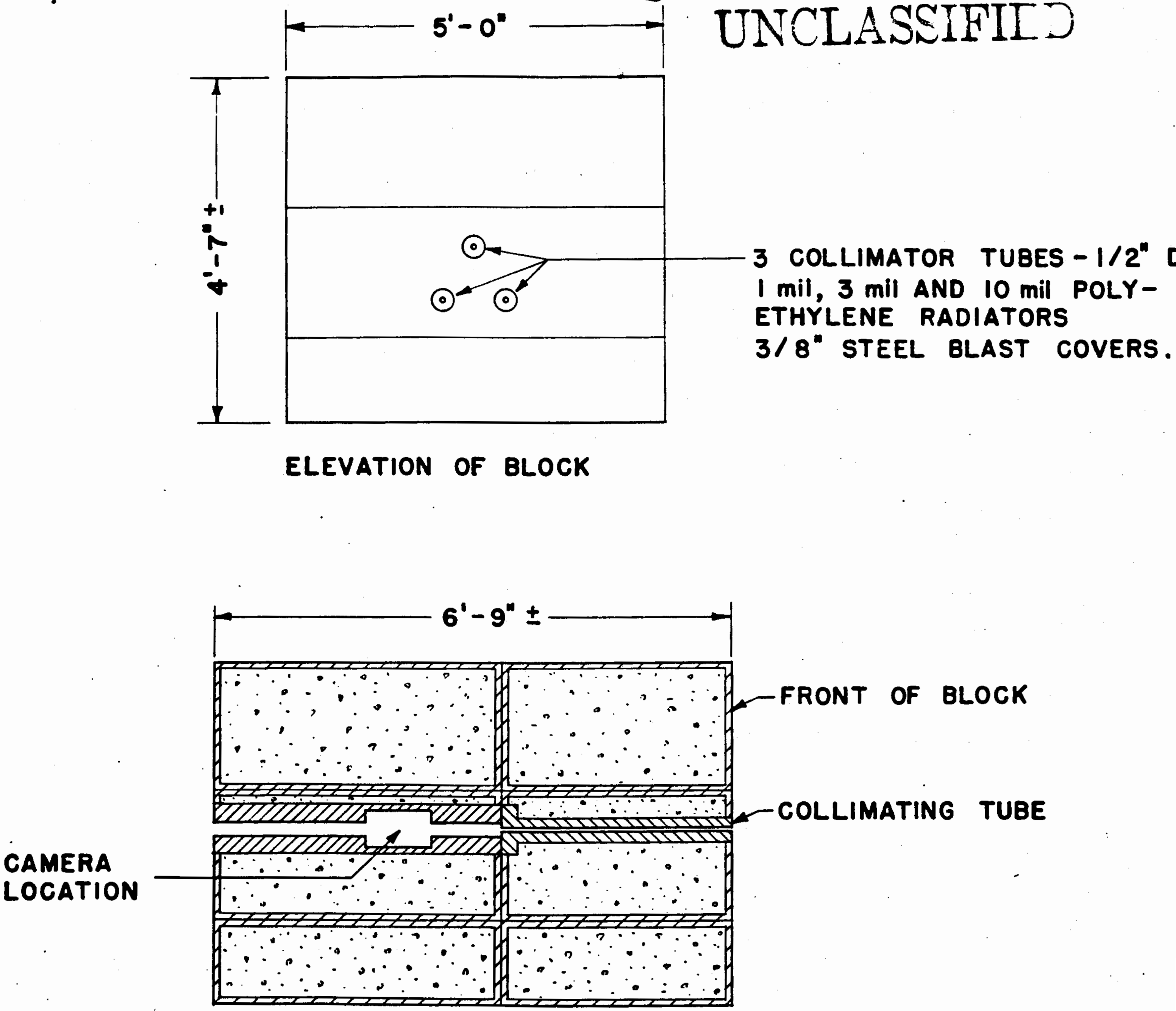

SECTION THRU BLOCK

NOTE — BLOCK MADE UP OF SIX SECTIONS BOLTED TOGETHER
EACH SECTION IS 1" STEEL SHELL FILLED WITH
LIMONITE CONCRETE.

FIG. 2
SCHEMATIC OF PHONEX ASSEMBLY

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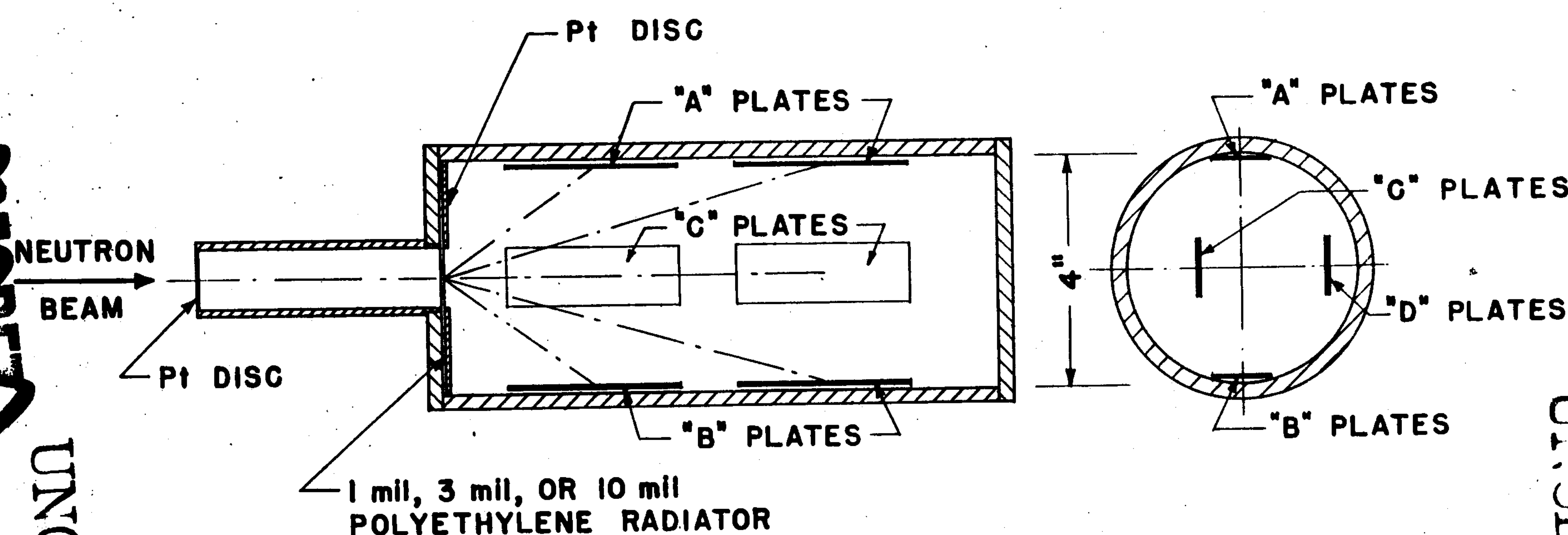

FIG. 3
PHONEX CAMERA

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FIG. 4
ARRANGEMENT OF FLUNEX

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