

HAROLD E. EDGERTON

PAPERS

MC 25

Series III

Laboratory Notebooks

Number 1

Dated Dec 8, 1948 to April 8, 1951

Book No.
December 8, 1948
April 8, 1951

COMPUTATION BOOK

EG&G

NAME	NUMBER
HAROLD E. EDGERTON	

M.I.T. CAMBRIDGE, MASS
~~MASS. AVE~~ 160 BROOKLINE AVE
Course BOSTON MASS

Used from DEC. 8, 1948, to April 8 1951.



DXS.

11-3431-14

112892 March 1948 024

SPRING 1948 U.S.S. ALBEMARLE FVINEYOK.

~~CONFIDENTIAL~~

David E. Edgerton

Dec, 8, 1948.

M.I.T. Cambridge, Mass.

DECLASSIFIED
Declassification Review Project 755038
By NND, NARA

~~CONFIDENTIAL~~

Notebook # Dec 8, 1948 - April 8, 1951

Filming and Separation Record

___ unmounted photograph(s)

___ negative strip(s)

7 unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page ___ and ___.
inside front cover

Item(s) now housed in accompanying folder.

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AS 300.4

15 February 1951

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1. The Commander, Joint Task Force THREE, is via the following named non-government employees of Gernsheimson & Grier, Inc., Boston, Mass., grade indicated, to proceed to Honolulu, Oahu, T.H., at such time that will enable them to arrive at Sobieski Pier, Honolulu, Oahu, T.H., between 8:00 A.M. and 9:00 A.M. on 2 March 1951, for processing and water shipment through the Commandant, Fourteenth Naval District, to Lutwotok Atoll, Marshall Islands on Temporary Duty for an indefinite period in connection with activities of Task Group 3.1, Joint Task Force THREE. Upon completion of this Temporary Duty the persons will return to Edgerton, Gernsheimson & Grier, Inc., Boston, Mass.

<http://libraries.mit.edu/archives/>

NAME, GRADE, PROJECT & EQUIPMENT R.F.K.	QUEEN CLEARANCE NO. DTR	DUTY STATION	EMERGENCY ADDRESSEE
BRATTLE, Benjamin Jay Civilian Project: 1.6 Company Grade	97077NY(SF) dtd 5-26-50 (Rein)	Edgerton, Gernsheimson & Grier, Inc., Boston, Mass.	Mrs. Rose Brattle, 71 Beacon Street, Boston, Mass. (Mother)
CARR, Leo Erickson Civilian Project: 1.6 Field Grade	20709 NY dtd 7-20-49	Edgerton, Gernsheimson & Grier, Inc., Boston, Mass.	Mrs. V. R. Carr, 60 Dwight Street, Brookline 46, Mass. (Wife)
DAVIS, Robert Nelson Civilian Project: 1.6 Field Grade	75589JT Rein 1-4-49	Edgerton, Gernsheimson & Grier, Inc., Boston, Mass.	Mrs. Cass L. Davis, 76 Spy Pond Parkway, Arlington, Mass. (Wife)
BLAKE, Arthur Klaven Civilian Project: 1.6 Company Grade	ASC 16199NY dtd 4-13-48	Edgerton, Gernsheimson & Grier, Inc., Boston, Mass.	Miss Virginia A. Drake (Daughter), c/o Mrs. William Chatfield, Sr., 699 Washington St., Dorchester, Mass.
EASTMAN, Irving Floyd Civilian Project: 1.6 Company Grade	NY 2759 dtd 9-2-48	Edgerton, Gernsheimson & Grier, Inc., Boston, Mass.	Mrs. Annie Eastman, R. R. #1, Methuen, New York (Mother)

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Hq TO 3.1 TO Orders OS-233 - Statement TO 3.1 - dtd 15 Feb 51 (Cont'd)

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Civilian dtd 5-6-47 son of Grier, Inc., Edgerton, 205 School St., Boston, Mass.

Project: 1.6
Field Grade
Fussall, 35 Elm St., Concord, Mass. (Wife)

GRIER, Herbert Earl
Civilian
Project: 1.6
Field Grade
dtd 5-2-47 son & Grier, Inc., Boston, Mass.
Mrs. Annifred D. Grier, 163 Country Club Road, Boston Centre, Mass. (Wife)

HARTLEY, Thomas Francis
Civilian
Project: 1.6
Company Grade
NY 9630
dtd 11-11-49 Edgerton, Germanshausen & Grier, Inc., Boston, Mass.
Mr. Stamford Hartley, Harvard, Mass. (Cousin)

MILLEN, Thomas Mathew
Civilian
Project: 1.6
Troop Class
NY 11287
dtd 6-5-50 Edgerton, Germanshausen & Grier, Inc., Boston, Mass.
Mrs. Della E. Millen, 437 Washington St., Brighton 35, Mass. (Other)

SMITH, Harry Lane
Civilian
Project: 1.6
Company Grade
8587 NY
dtd 5-25-47 Edgerton, Germanshausen & Grier, Inc., Boston, Mass.
Mrs. M. Janette Smith, 34 Park St., Newton 58, Mass. (Wife)

STRABALA, Francis Irving
Civilian
Project: 1.6
Field Grade
NY 4659
dtd 10-25-48 Edgerton, Germanshausen & Grier, Inc., Boston, Mass.
Mrs. Francis I. Strabala, 391 Winter St., Norwood, Mass. (Wife)

WYCKOFF, Charles Walter
Civilian
Project: 1.6
Field Grade
46961 NY
dtd 10-27-47 Edgerton, Germanshausen & Grier, Inc., Boston, Mass.
Mrs. Helen R. Wyckoff, 69 Valley Road, Needham, Mass. (Wife)

2. a. Travel by military or commercial aircraft, commercial rail, commercial bus, military and/or naval vessel is authorized. No expenses (other than transportation in kind) incident to this travel will be chargeable to Joint Task Force THREE funds. All expenses incident to this travel will be borne by the agency by which the employee is employed.

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Hq TO 3.1 TDI Orders OS-233 - Shipment TG 3.1 - dtd 15 Feb 51 (Cont'd)

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5. A duly authorized military carrier in TG 3.1, properly prepared and countersigned, will be in each individual's possession prior to departure for the Forward Area.

6. The persons listed above are required to possess an Immunization Record indicating the following immunizations prior to departure from the United States: Typhoid and Smallpox within the last twelve (12) months; Tetanus - Initial immunization, a stimulating dose within one (1) year after initial series and a stimulating dose every four (4) years following the last stimulating dose.

7. Explosives, inflammable or combustible materials, personally owned firearms or signal devices and drugs may not accompany individuals. Personally owned cameras and photographic equipment may not be carried to Eniwetok Atoll.

8. Upon arrival at Honolulu International Airport, Oahu, T.H., you will proceed to Helms and Harver, 1109 Bethel Street, Honolulu, Oahu, T.H. for the purpose of booking on military and/or naval vessel and obtaining clearance for entry into the Eniwetok Area.

9. Personal hand baggage will be stencilled or tagged with appropriate durable shipping tags giving full name and address as follows:

Mr. John J. Jones (Your own name)
c/o Commander, TG 3.1
APO 187 (HON), c/o Postmaster
San Francisco, California

10. Unaccompanied hold baggage, as defined in PCM, this Headquarters, shipped to the Port of Embarkation for further movement overseas by water shipment, independent of the individual, will be stencilled or tagged with appropriate durable shipping tags as follows:

TO: Naval Supply Center
Freight Trans-shipment Building 222
Oakland, California
ATTN: Captain O'Donnell

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12. The provisions of PAR with the exception of immunization requirements are waived in connection with this travel.

13. The provisions of CinCPac Letter Serial 0116 of 25 Oct 50 have been complied with. It is the estimate of the Commander, Task Group 3.1, Joint Task Force THREE, that the above named individuals are good security risks.

14. Dependents, relatives, friends, pets and privately owned conveyances will not accompany personnel to the Port of Ensenada.

15. Immediately upon arrival at Ebonok Atoll, Marshall Islands, each individual will report in person to the Adjutant General, Task Group 3.1, for the purpose of receiving quarters assignment and further instructions as may be issued by the Commander, Task Group 3.1, Joint Task Force THREE.

16. AUTHORITY: Ltr, Hq Joint Task Force THREE, dtd 1 Nov 50, Subj: "Delegation of Authority" to Commander, Task Group 3.1, Joint Task Force THREE.

BY ORDER OF THE COMMANDER:

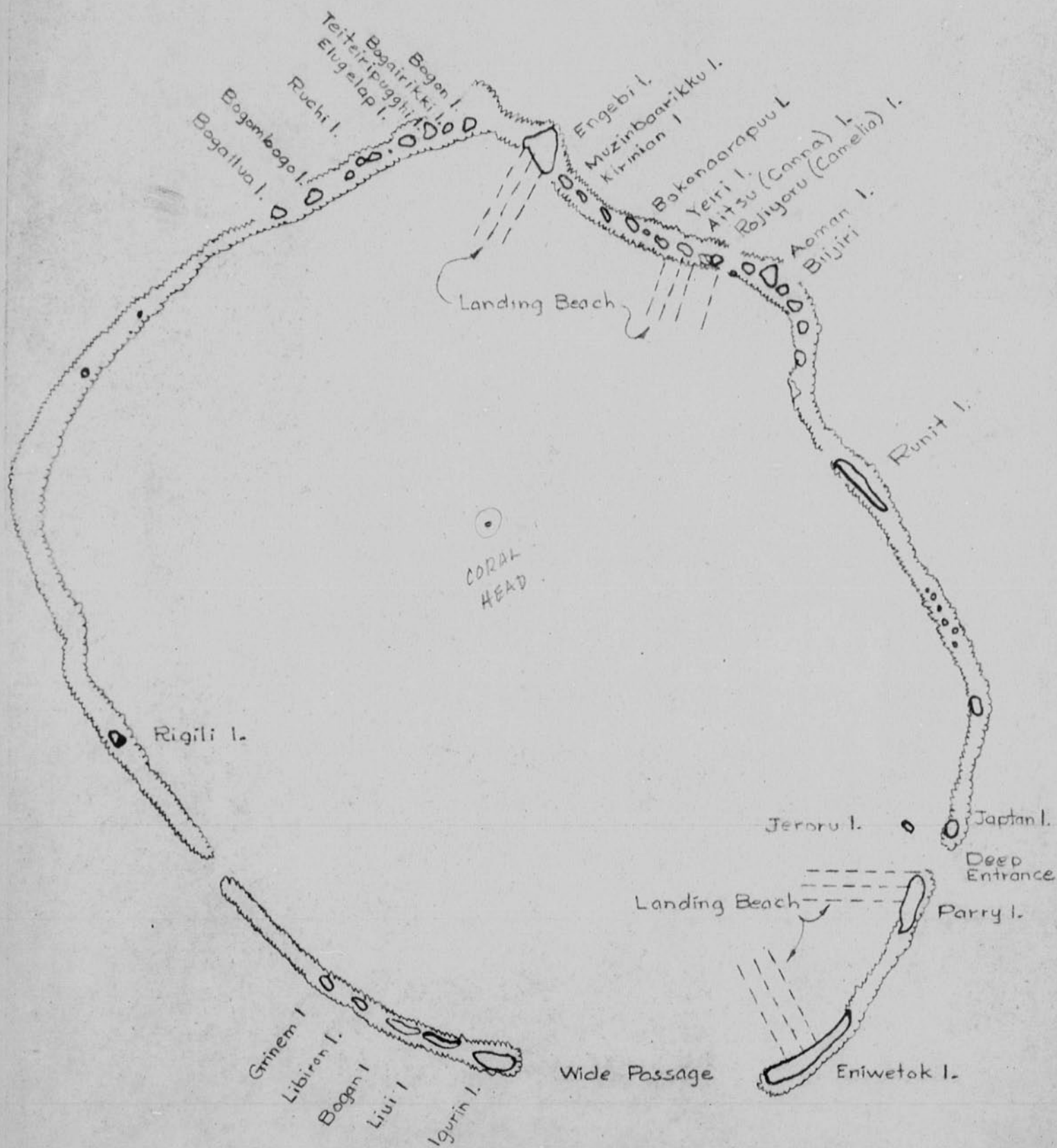
Arthur W. Foughty
ARTHUR W. FOUGHTY
Captain USN
Adjutant General

DISTRIBUTION:

- 30 cys each individual
- 2 cys AG, JTF-3, Washington 25, D. C.
- 2 cys Holmes & Kerver, 1109 Bethel Street, Honolulu, Oahu, T.H.
- 2 cys Capt O'Donnell, MSC, Oakland, California
- 2 cys CO, Troop Movement Sec., Bldg 209, Ft Mason, Calif.
- 1 cy Comptroller, JTF-3, Washington 25, D. C.
- 2 cys LCDR Doble, JTF-3 Liaison Officer, CinCPac
- 2 cys Commandant, Fourteenth Naval District, Pearl Harbor, Oahu, T.H.

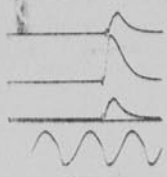
RESTRICTED

ENIWETOK ATOLL



5000

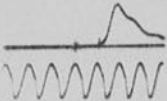
3 7 8 5
.08 x 10⁶ h.c.
.03



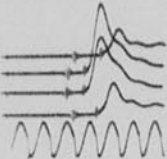
AIR GAP
LOW IND.

1 MC

0.38



GAP
ABERDEEN
1 MC

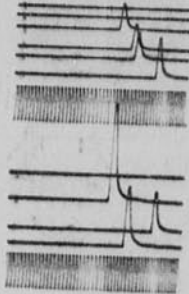


ABERDEEN
1 MC.

JULY 20 1950
P45 H.E.E.

5000
384

390 x 10⁶
90 x 10⁶
BEAM C

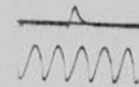


GR MICRO
FLASH

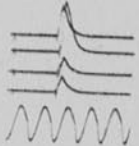
1 MC

GR MICRO
FLASH

1 MC



SPARK GAP
LOW IND.
1 MC



DITTO

1 MC

JULY 20 1950
P43 H.E.E.

5000
383

50 x 10⁶ b.c.p.
BEAM C

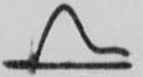


G.R.
MICROFLASH
NEW CIRCUIT



FT 130
2MF 2000 V

235. x 10⁶
BEAM C



FT-130
2MF 2000

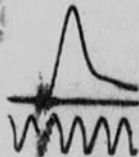


FT-130 2MF
2200 V.
2000
1500
1000

1 MC
JULY 20 1950
P41 H.E.E.

5000

3 7 0 2
38 x 10⁶
BEAM C.P



FT-125

1 MC

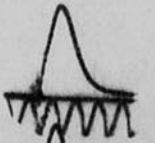
0.655



FT-230

1 MC

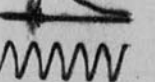
5.6



EGG MOVIE

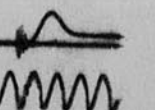
1 MC

5.0



GR MICRO
FLASH
NEW CIR.

2.0



FT-126.

1 MC

JULY 19 1950
P39 HEE

5000

3 8 0

12×10^6
b.c.p.



1 MC

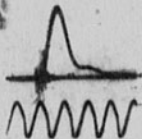
4 FT TO STROBOLUME
935 INTO 1000Ω 2000 V.

12×10^6 B.C.P.
PEAK

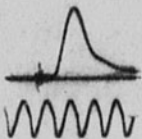
JULY 18 1950
P33 H.E.E.

5000

ARGON GAP

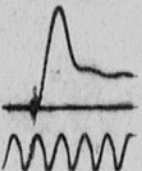
3 0 1
0.78 x 10⁶

0.31

MICROFLASH
NEW CIR

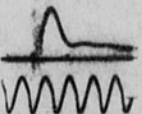
0.545

FT-110

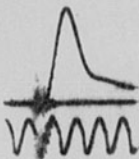
100.
BEAMFT-130
NEW CIR.

0.56

AIR GAP.

JULY 19 1950
P37 HEE

5000

38 X 10
BEAM C.P.

FT-125

IMC

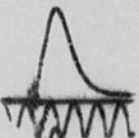
0.655



FT-230

IMC

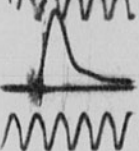
5.6



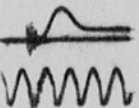
EGG MOVIE

IMC

5.0

GR MICRO
FLASH
NEW CIR.

2.0



FT-126.

IMC

JULY 19 1950

P39 HEE

CONFIDENTIAL

1

Dec. 8, 1948.

Harold Edgerton 155 mess ens

Conf with Bruce Billings yesterday

conf. with Dr Brian O'Brien on cameras
for next tests.

Dec 31 1948 meeting with Grier, Wychcroft, Davis, O'Keefe
Morris on photography.

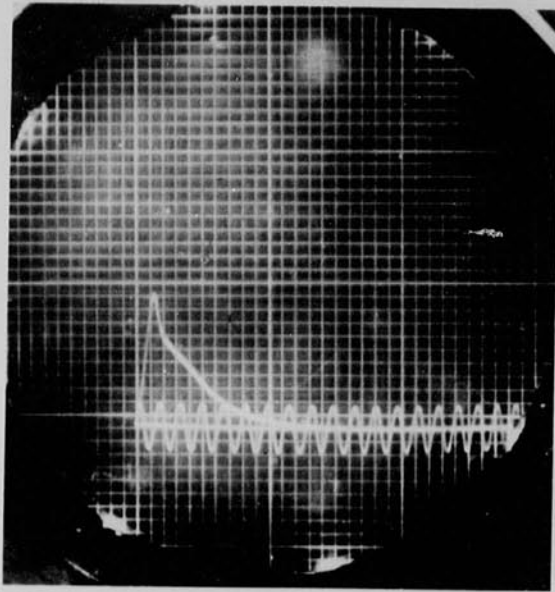
Jan 5 1949. Conf with Grier and O'Keefe ~~conf.~~^{on} Teller mess.

Work on spark source will start when
move to new quarters at 121
Brookline ave. is made.

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2021 320
26 nov date
Put in Jan 5 1949.
J.E. Ely

STROBOLIME UNIT SERIAL NO. 104 WITH FT 220 FLASHTUBE

Input voltage = 118 V A-C
Capacity in unit = 4.0 microfarads
D-C voltage on capacitor = 2500 D-C
Flashtube distance from photocell = 40 inches
Peak Light = 12×10^5 beam candle power
Timing oscillator = 100 Kc or 10 microseconds
Rise Time = 6 microseconds
Duration 1/3 of maximum value = 12 microseconds

320

CONFIDENTIAL

CONFIDENTIAL

Jan 20 1949.

CONFIDENTIAL

5

Hewlett Packard

155 main ave.

Correspondence with C D Miller Battelle Inst Columbus Ohio indicates that the Miller camera (40,000 to 1,000,000 frames per sec) might be useful for the bomb project. Wydraft has letter with data on resolution. at 500 ft diameter, 3 ft can be resolved.

O'Brien phoned on last Friday about a spectrogram on the type I camera. Resolution was 10^{-6} seconds. Subject a spark gap. (or 10^{-7})

O'Brien states the type II should give $2\frac{1}{2}$ times resolution of spectra.

He has a scheme that should give micro second exposures at several thousand frames per second on the 35 mm. G.K. cameras. More to come on this, later. the mirror will be either free running or gear driven.

Third item for discussion - Improved type II camera with image dissector should work ok at 10,000,000 f.p.s. O'Brien suggests this for the bomb job and will see Eastman about production of cameras.

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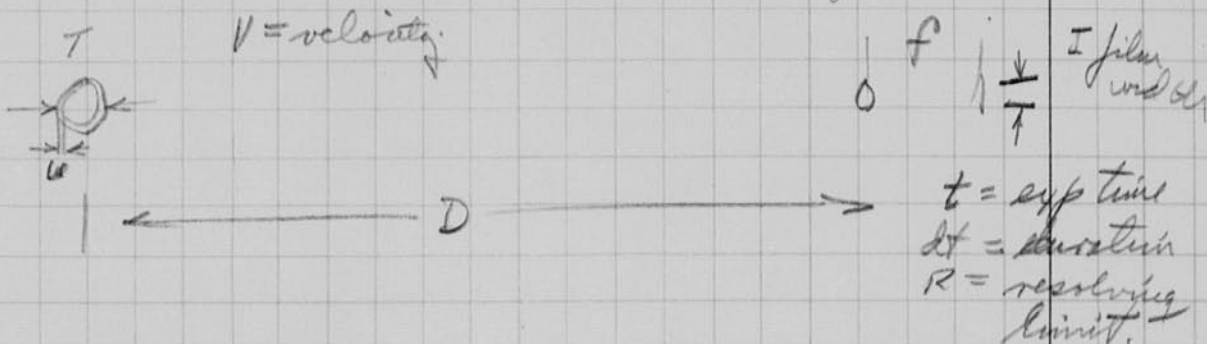
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July, 14, 1949. H. E. Edgerton

Conf with Grier, Wydroff, Davis regarding camera limitations and our measurements. A report is being written which will go to Osclamos with Grier etc this weekend.

Sept 5 1949. H. E. Edgerton

Photographic Report. Part 1 #1031 14 July 1949 Calc.
 Br. Davis.



v_s static uncertainty.

$$v_s = \frac{D}{f} \times \frac{1}{2R}$$

v_d dynamic uncertainty = $v dt$

Discussion of available cameras follow in report. One and 10 microsecond exposures are important for the initial phases of the event.

Trip Report E 9889 out 476. 8 Aug 1949
 July 25-30 trip.

Radar - out except for military experiments

Spectroscopy - now to be done at NRL. with cooperation.

Shock wave photos - great accuracy required.
 We are not to make the aerial plots of shock.

Discussed magnetoptic shutter with Herb & Ken.

CONFIDENTIAL

March 20 1950

CONFIDENTIAL

7

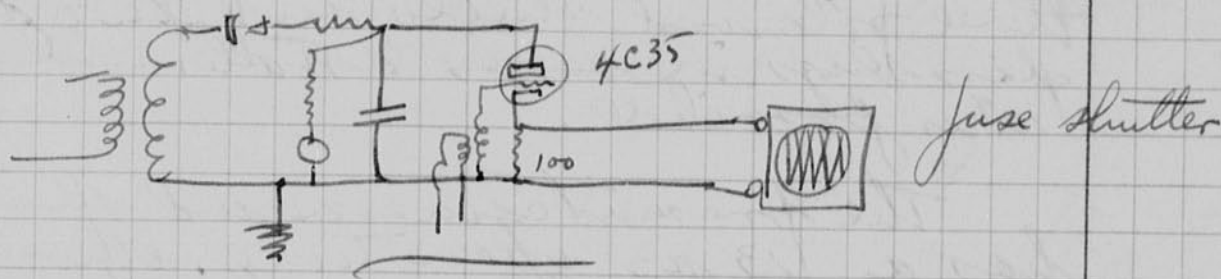
David E. Egerton

Considerable effort has been put into a rapid capping shutter of the following type.

Fuse wire vaporization into a glass lined volume. The lead vapor deposits on the walls and stops the light.

The operating time is about 50 μ s.

Present circuit 45 mf 3000 volts
4C45 thyatron for energy.



The rapatronic shutter with a single glass slug is being tested now. This has a ~~45~~ 5 ns. duration with 1/5000 off to on ratio.

A double glass slug is being made by Polaroid with an off to on ratio of 1/10⁶ or 1/10⁷.
Twice as much energy is required to fire this. Photos of stationary objects have been taken with both the single and the double slug.

Harry Smith & Bill Ward are working on the Rapatronic shutters.

Capt Hale Mason and Frank Strubbe worked on the fuse shutter.

Dr. Brian O'Brien from Polaris was here on Sat March 18 for a conference.

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W. J. Edgerton
July 10/1950
Monday.

CONFIDENTIAL

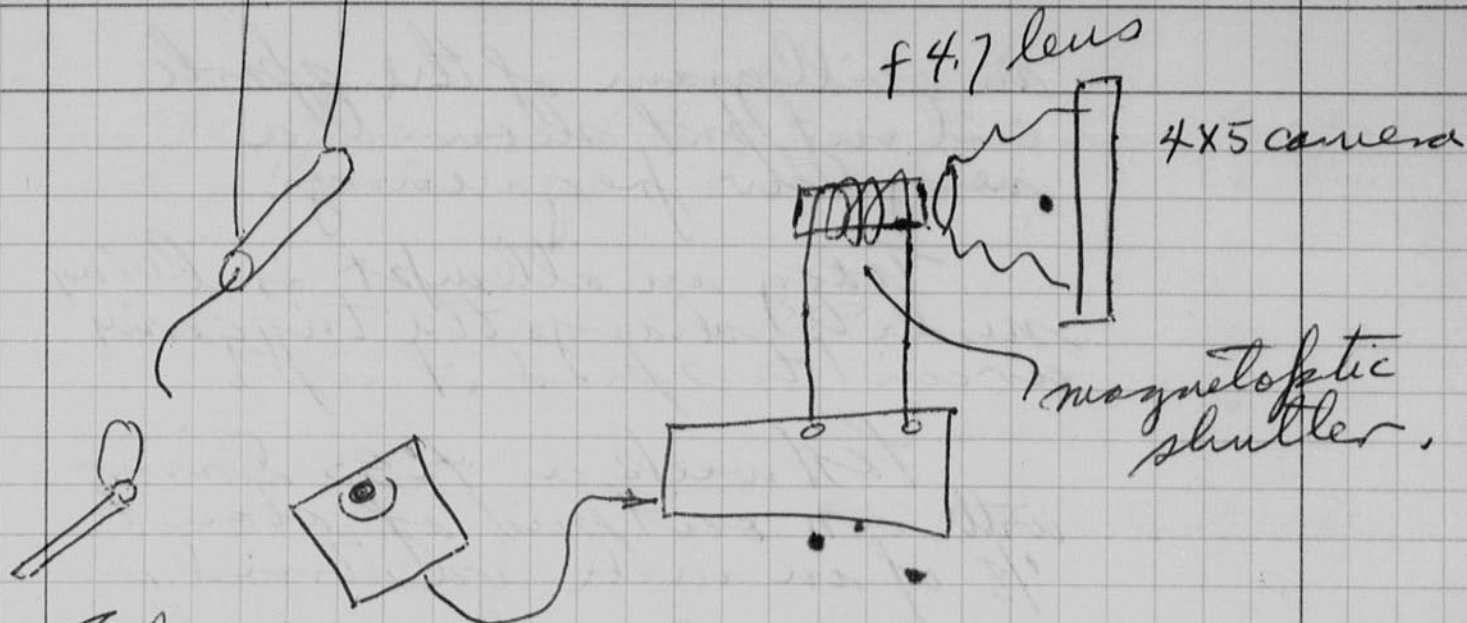
Tests have been made with the Papalomic camera during the past few weeks by Ward, Wyckoff, and ~~the~~ of various subjects such as fine craters.

The "Papalomic" camera (a new word) is a magneto-flic shutter device with a 4 mfd 8000 volt capacitor which discharges through a coil around a glass slug. The Jarrod effect rotation then causes the light to go through the shutter. By using three polaroid sheets and two heavy glass slugs in series an attenuation of 10^7 is possible.

The present camera and shutter has a 1/3 ns open time. Other coils can be used to change the time to other values. Ward has ~~to~~ made a study of this shutter and the information is available. Wyckoff, Smith, and others assisted with the development. Polaroid makes the slugs by cementing the polaroid sheet to the glass slugs as obtained from Bausch & Lomb. One cover glass is an infra red absorbing filter. This is necessary to absorb the infra red since it is not effected by the polaroid. The other cover glass is a filter that limits the light to the green portion of the spectrum.

A series of photos were taken on fine craters. A diagram of the set up is shown on the next page.

CONFIDENTIAL



Fiducial
marker as
designed by
Strabala

1. The firecracker integrated light output gives proper exposure through the shutter.
2. a 13 μ s exposure at an early stage gives a faint image with considerable motion due to high velocity of the incandescent gases from the explosion.
3. a strob light was used for supplementary lighting. It but still showed blur. This light was on FT-214 operated from a 3000 + supply and a 30 mf condenser. The rapatronic shutter accepted 13 μ s of the light. The supplementary light illuminated the gases from the explosion.
4. An attempt was made to use a microflash (GR Co.) as supplementary illumination. Terrible was experienced with jitter. A test of the microflash showed that the jitter was from 15 to 30 μ s.

An oscillogram of the spark coil output showed a very low frequency.

Today an attempt is being made to change the triggering circuit to speed it up.

Last week a 4035 driver with an output of about $\frac{1}{8}$ of an inch was tried.

This would not trigger the tube with a single turn on the lamp. When a loop at each end was used as

shown, the operation was

fast but erratic. If the tube operated, it started within a fraction of a microsecond.

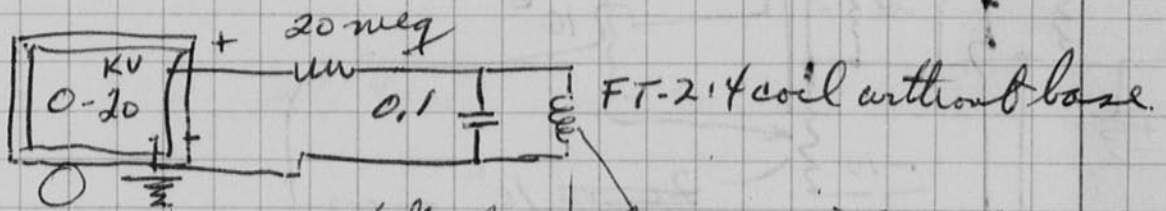
So Soviet is now wiring up a driver with a 2D 21 tube which I hope will give enough output to ignite the lamp.

I also have a collection of flash tubes of all sorts that I plan to study for output.

Louqago Gomerhanian suggested a series gap as a hold off device for operating a flash tube from a high voltage. I plan to get in further

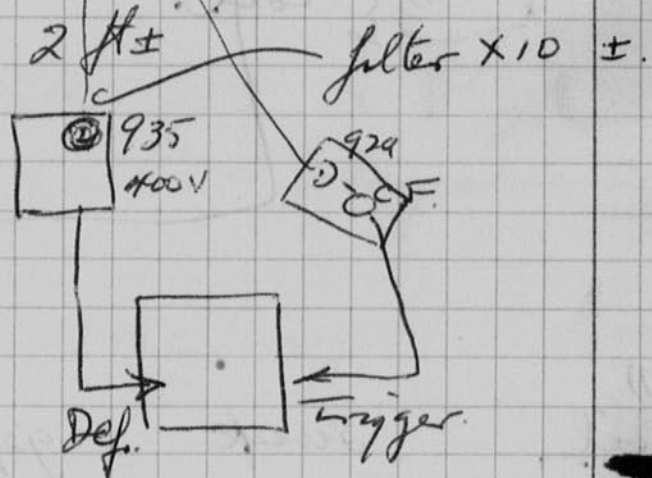
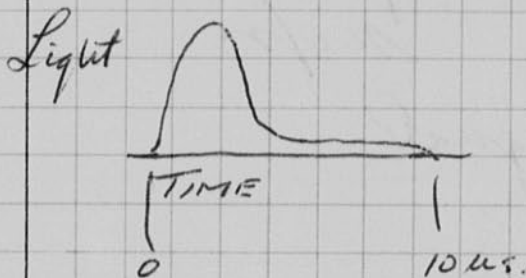
on the efficiency and duration of various lamps with a series gap, if necessary.

Setup in basement east end.



Set for 8 KV.

Self flashes at 1 sec intervals ±.



P.C. pickup

CONFIDENTIAL

Tube. V. Light

filter
Dist #
5354

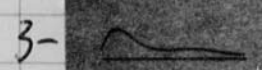
1. FT-214 0.1 8KV Self flash 400V. Sweep 7. X 2 3/4



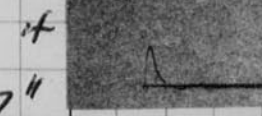
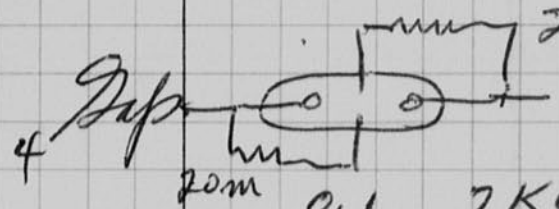
2. 1 mc timing wave. ~~X 1 3/4~~



3. FT-214 0.1 8KV Self flash 400V CF. X 1 3/4



4. Dip 20m 0.1 7KV± Self flash Sweep 7. Delay cable

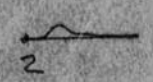


20' x .04
.8 us

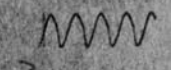
5. Sweep 7 1 mc timing.



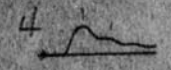
1. ~~N.B.~~ FT-220 Stroboscope 4" away from P.C. PC had a Justice filter



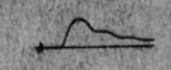
2. 0.5mf condenser Aberdeen with air gap with trigger on terminals.



air gap. 6000 KV ~~X 2 3/4~~ X 2 3/4 Air gap



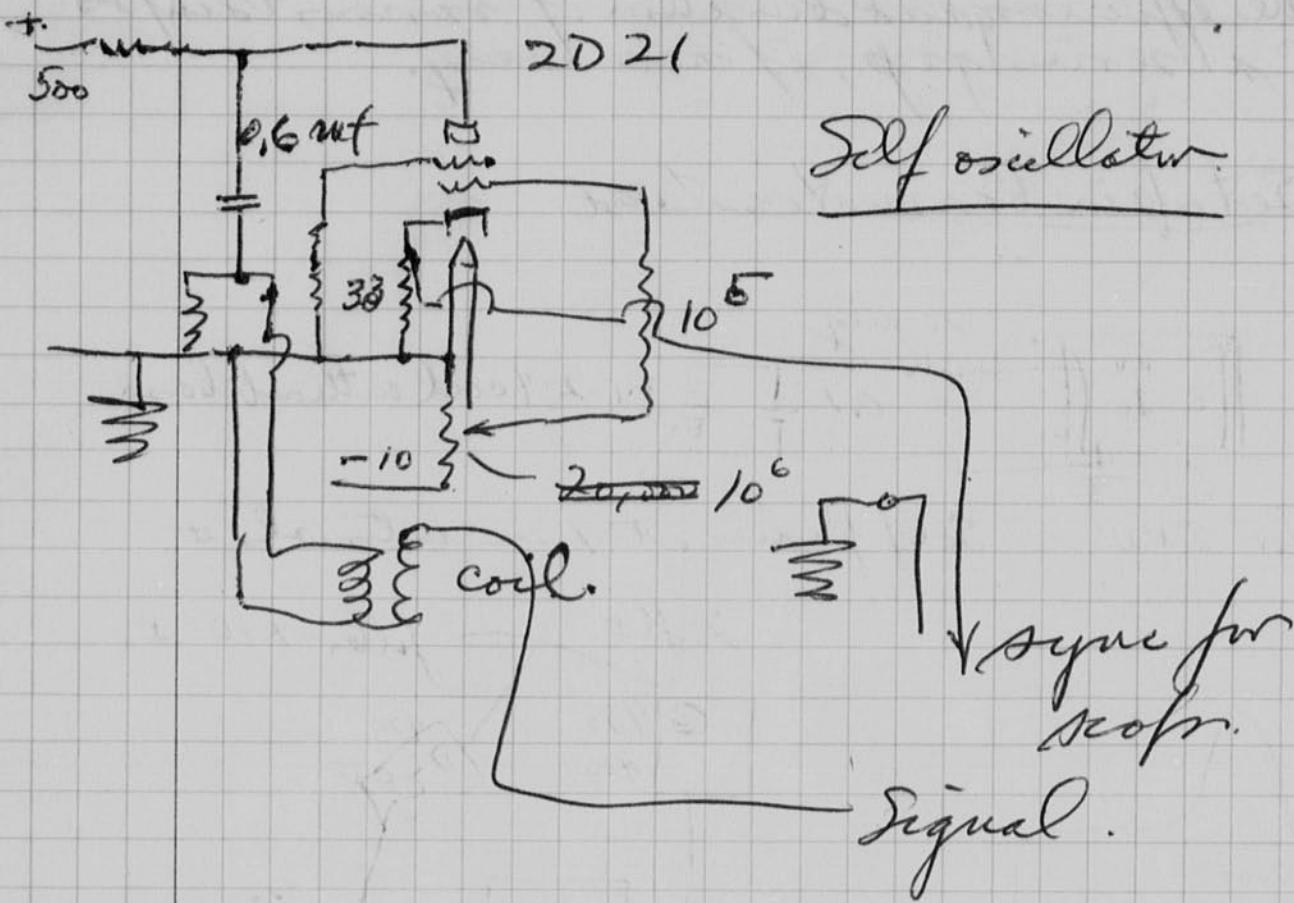
3. Timing 1 mc



4) Air Gap no filter cont same as above # 4
5) " " " " " " " " " "

CONFIDENTIAL

Coil test



Film pk no 27)

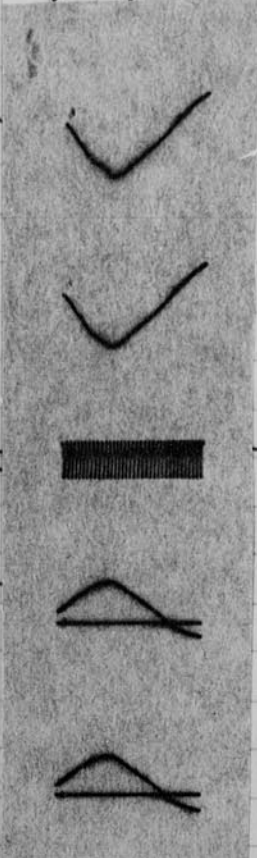
Coil

Sweep

gap length.

frequency. Film No. 5353

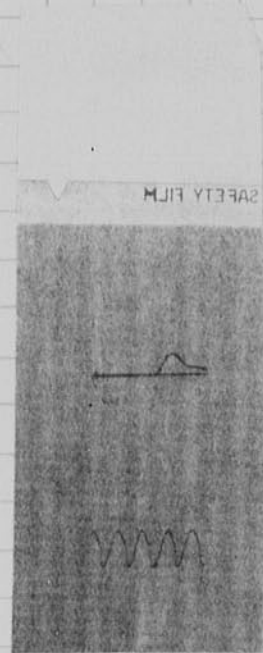
1	Thordarson	8	$1/4 \pm$
2	"	8	$1/4 \pm$
3	1 mc timing wave.		
4	Model Elect	8	$3/16 \pm$
5	" "	8	$3/16 \pm$



Thordarson coil tends to arc over.

CONFIDENTIAL

Tube	C	V.	Condenser	Filter	Dist	5356	
1	Air gap	0.5	6000				
				Air gap double that of film 5355			
1	"	0.5	6000	X2	3ft		
2.	1 Mc. tuning wave.						



CONFIDENTIAL

H. Edgerton
S. Samuel
July 11, 1950.

Light flash tests.

Sweep

Tube C V Filter. Dist. 8 ft

micro flash
SR 0.5 7000 X10 3 ft. 8

1 mc.

FT-110 0.5 6000 X10

3 ft. 8
Self flasher.
7 KV.

FT-230 1/4"
argon gap
(Krypton?)

0.5 7000 X2

3 ft. 8
Ser
air
trig

FT-110 1/4"
gap in air

0.5/2 10,000 10 3 ft 8

↑ two sprague photo flash.
this shows a short flash with
a long tail.

0.75 mf 8 KV. Blow up micro flash tube.

0.5 mf 10 KV
First model micro flash tube 3 ft 8

H. Edgerton
S. Barrow
July 11, 1950.

CONFIDENTIAL

Light flash tests.

160 Brook
Boston
Sweet

Tube	C	V	Filter	Dist.	8 ft
micro flash SR	0.5	7000	X10	3 ft.	8

Film no
5358

1 mc.

FT-110	0.5	6000	X10	3 ft. 8	8
--------	-----	------	-----	---------	---

Self flasher
7 KV.

FT-230 "1/4" argon gap (Krypton?)	0.5	7000	X2	3 ft.	8 Ser air trip tr
---	-----	------	----	-------	-------------------------------

FT-110 "1/4" gap in series	0.5/2	10,000	10	3 ft	8
-------------------------------	-------	--------	----	------	---

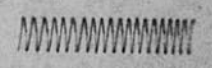
↑ two sprague photo flash.
this shows a short flash with
a long tail.

0.75 mf 8KV. Blow up micro flash tube.

0.5 mf	10 KV	10	3 ft	8
--------	-------	----	------	---

First model micro flash tube

CONFIDENTIAL



CONFIDENTIAL

H. Edgerton
S. Gabriel
July 11, 1950

Light flash tests.

160 Bro
Boston

Tube	C	V	Filter	Dist.	8
micro flash BR	0.5	7000	X10	3ft.	8

1 m.c.

FT-110	0.5	6000	X10	3ft.	8
--------	-----	------	-----	------	---

Self flasher.
7 KV.

5359

FT-230 "1/4" arg gap (Krypton?)	0.5	7000	X2	3ft.	8
---------------------------------------	-----	------	----	------	---

Jeri
air gap
trigg
8

FT-110 "1/4" gap in series	0.5/2	10,000	10	3ft	8
-------------------------------	-------	--------	----	-----	---

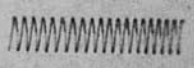
↑ two sprague photo flash.
this shows a short flash with
a long tail.

0.75 mf 8KV. Blow up micro flash tube.

0.5 mf	10 KV	10	3ft	8
--------	-------	----	-----	---

First model micro flash tube

CONFIDENTIAL



H. Edgerton
S. Gabriel
July 11, 1950.

CONFIDENTIAL

Light flash tests.

160 Bro
Boston

13
2

Sweet

Tube C V Filter. Dist. 8 ft

microflash
BR. 0.5 7000 X10 3 ft. 8

film no. 13

1 m.c.

FT-110 0.5 6000 X10

3 ft. 8
Self flasher.
7 KV.

FT-230 "1/4"
argon gap
(Krypton?)

0.5 7000 X2

3 ft. 8
Series
air gap
trigger

FT-110 "1/4"
gap in series

0.5/2 10,000 10 3 ft 8

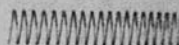
↑ two sprague photo flash.
this shows a short flash with
a long tail.

0.75 mf 8 KV. Blew up micro flash tube.

0.5 mf 10 KV

10 3 ft 8
First model micro flash tube

CONFIDENTIAL

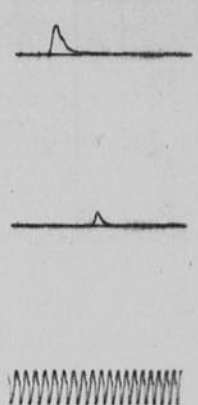
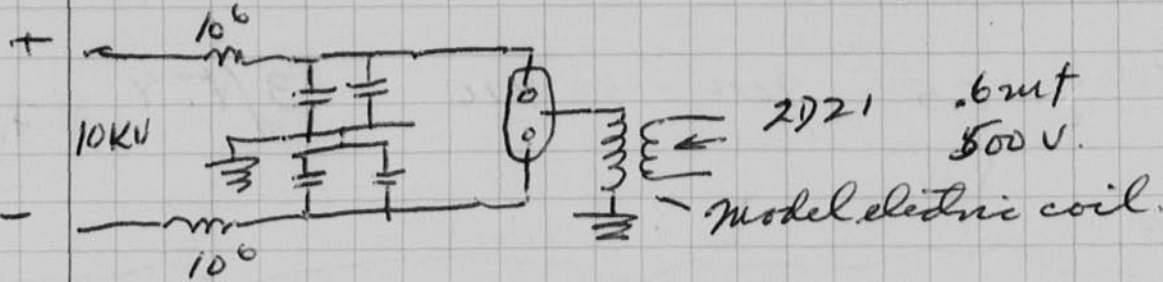


Tube. C V Filter Dist Sweep.

Film no.

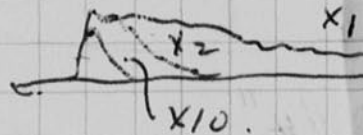
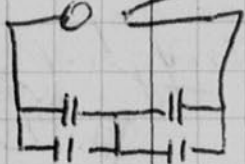
Mark 19. gap 0.5 10, KV. 2 3ft. 7.
 ↳ 4 0.5µf 4KV in ser parallel.

5366
5366

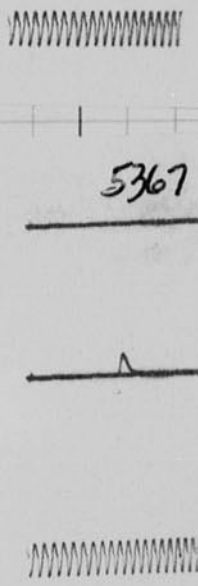


air gap 1/4" ± 0.5 10KV 10 3ft 7

Same as film 26 except open air gap.



5367



5368

Ditto

20 3ft. 7
10
2
1

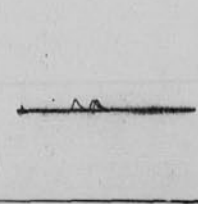
20 5 supermicro shots to show timing var



Air gap 1/4" ± cap 0.125µf 13 KV 3ft 7

- 1) NO Filter .3
- 2) " " 1
- 3) " " 1.3
- 4) No Filter
- 5) 1µc trace

Film no 5369



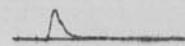
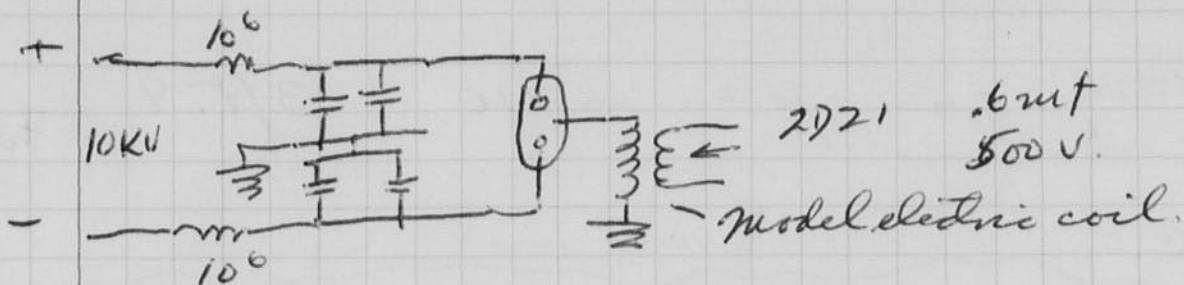
Tube. C V Filter Dist Sweep.

Film no.

Mark 19 gap 0.5 10, KV. 2 3ft. 7
 ↳ 4 0.5 ut 4KV in ser parallel.

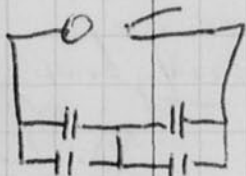
5366

5366



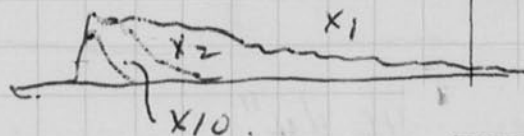
Air gap 1/4" ± 0.5 10KV 10 3ft 7

Same as film 26 except oper
 spark air gap.



Film no

5367



5368

Ditto

20 3ft. 7

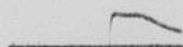
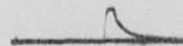
10

2

1

20

5 superimposed
 shots to show
 timing var



Air gap 1/4" ± cap 0.125µf 13KV 3ft 7

1) ND Filter .3

2) " " 1

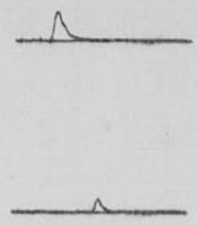
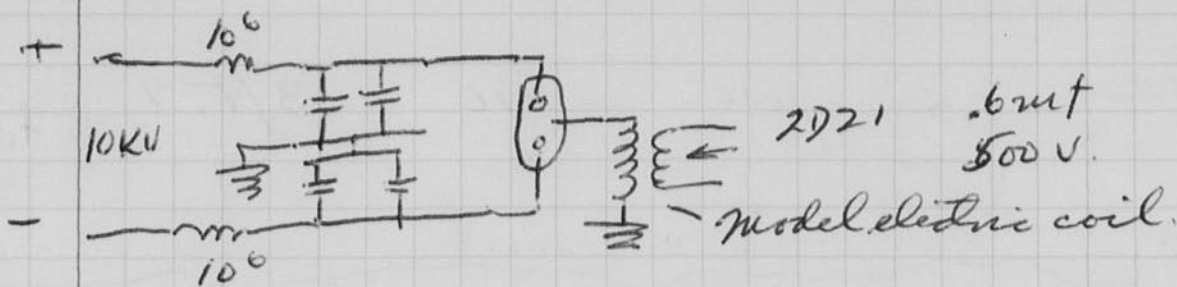
3) " " 1.3

4) No Filter

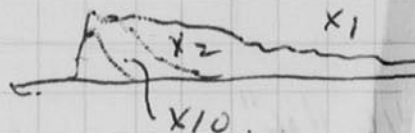
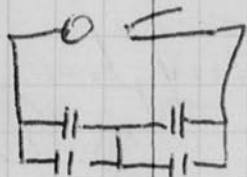
5) 1mc trace



Tube.	C	V	Filter	Dist Sweep.	Film No.
Mark 19	gap 0.5	10, KV.	2	3ft. 7	5366
	↳ 4 0.5µf 4KV in ser parallel.				5366



air gap $\frac{1}{4}'' \pm$ 0.5 10KV 10 3ft 7
 Same as film 26 except open
 spark air gap.



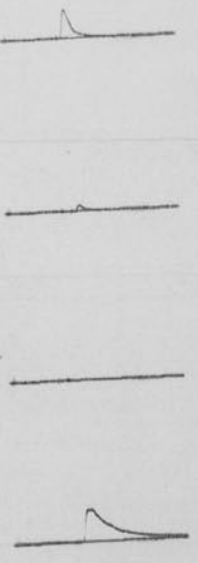
Ditto

20	3ft. 7
10	
2	
1	

20 5 supermicro
 shots to show
 timing var

Air gap $\frac{1}{4}'' \pm$ cap 0.125µf 13 KV 3ft sweep

- 1) NO Filter .3
- 2) " " 1
- 3) " " 1.3
- 4) No Filter
- 5) 1µc trace



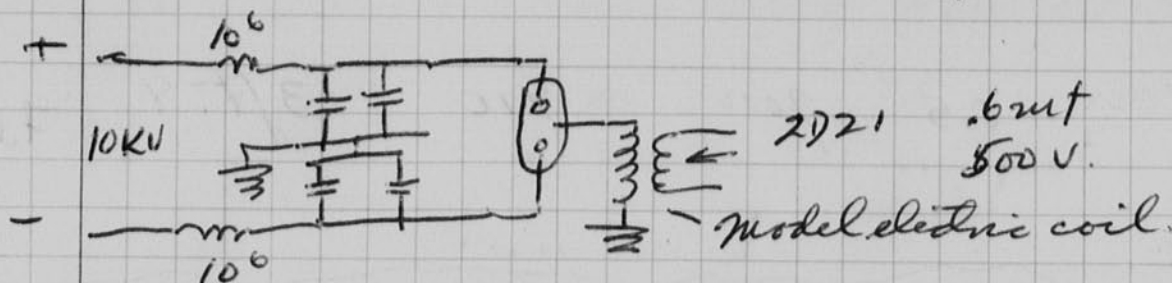
Tube. C V Filter Dist Sweep.

Film No.

Mark 19 gap 0.5 10, KV. 2 3ft. 7
 ↳ 4 0.5µt 4KV in ser parallel.

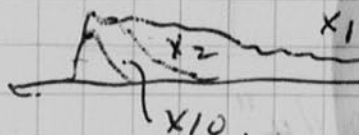
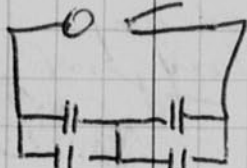
5366

5366



air gap 1/4" ± 0.5 10KV 10 3ft 7

Same as film 26 except oper
 spady air gap.



Ditto

20 3ft. 7

28

10
2
1

Film No

5368

20 5 superimposed
 shots to show
 timing variations

Air gap 1/4" ± cap 0.125µt 13 KV 3ft sweep 7 Film No

- 1) ND Filter .3
- 2) " " 1
- 3) " " 1.3
- 4) No Filter
- 5) 1µc trace

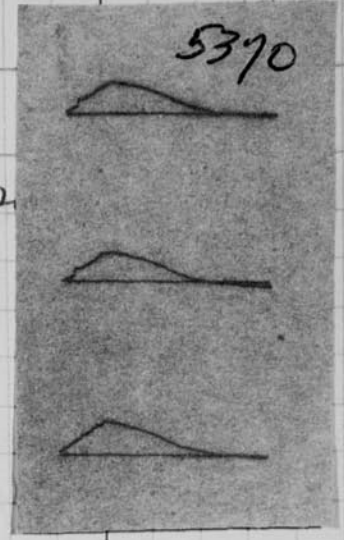
5369

5370

Polarity of Ignition coil & duration of pulse

- 1 Positive pulse polarity of Ignition
- 2 " " " "
- 3 " " " "
- 4 " " " "
- 5 " " " "

Sweep no 8



Mercur lamp.

0.1mf 5KV. X2 3ft.

Sweep.

7.

Film no

5371

4 x cum 2 H₂

1/4" spark coil from 2D21

Model flash.

Air gap: 1/8" triggered

0.1

6KV X2
X1



7

Air gap Do.

6 slots

6

(16)

Calib 1mc.

6.

FT-130

2mf 2KV

X10 4' with sealed beam Reflector!

7

CONFIDENTIAL

Polarity of Ignition coil & duration of pulse

- | | |
|---|-------------------------------------|
| 1 | Positive pulse polarity of Ignition |
| 2 | " " " " |
| 3 | " " " " |
| 4 | " " " " |
| 5 | " " " " |

Film no
5370

Sweep no 8

Movie lamp.

0.1mf 5KV.

X2

3ft.

Sweep.

7.

Film no
5371

4 x cum 2 #2

1/4" spark coil from 2D21

Model Elect.

Air gap 1/8" triggered

0.1

6KV X2
X1



7

Air gap Do.

6 shots

6

(16)

Calib 1mc.

6.

FT-130

2mf 2KV

X10

4'

7

with sealed beam

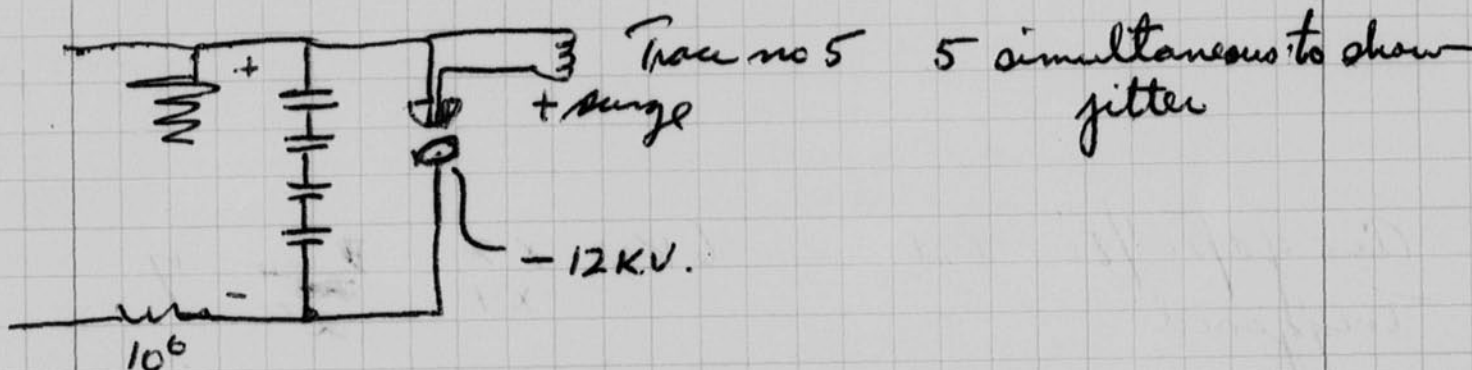
CONFIDENTIAL Reflector!

(16) FT-126 ~~0.5mf~~ 8KV. X10 4' 7
0.125

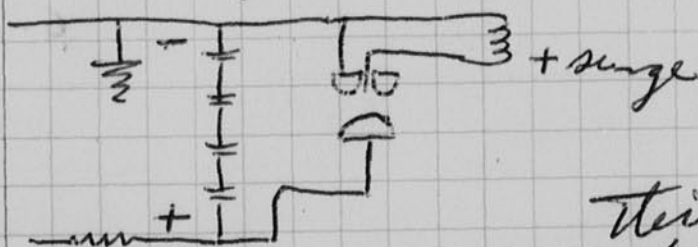
Air gap. 0.125 8KV no filter
Trace no 1

Air gap 0.125 12.5KV 4ft no filter sweep no 5
Trace no 3 1mc timing wave

P. Trace no 4 1mc timing wave



I then reversed the polarity of the main gap as shown below.

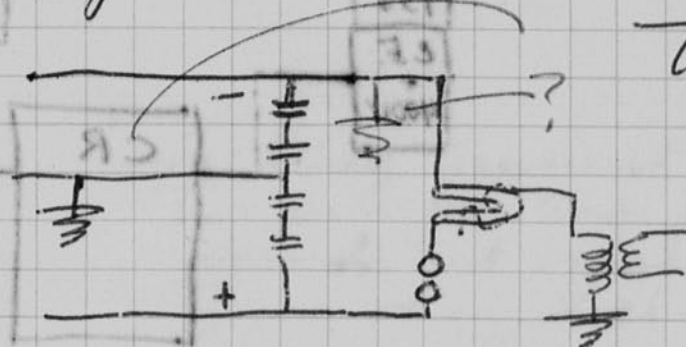


The gap distance (spacing) had to be increased to hold off the 12KV. This is due to the cathode roughness caused by the starter.

I then reversed the starter pulse and found that the scope could not record the light since the spark went

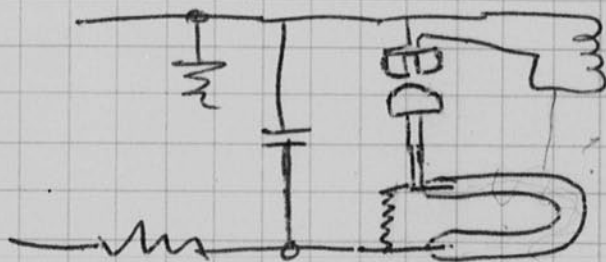
off and was over before the scope got started. Just before leaving for the day, Soc put in a 1/2 in (±) of delay cable to overcome the scope starting delay. Photos were not made before we left for the day.

By decreasing the voltage of the main gap to 7000 volts from 12,000, the delay in starting was enough to allow the scope to record.

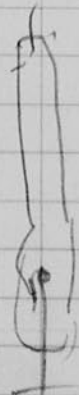


Try this tomorrow.

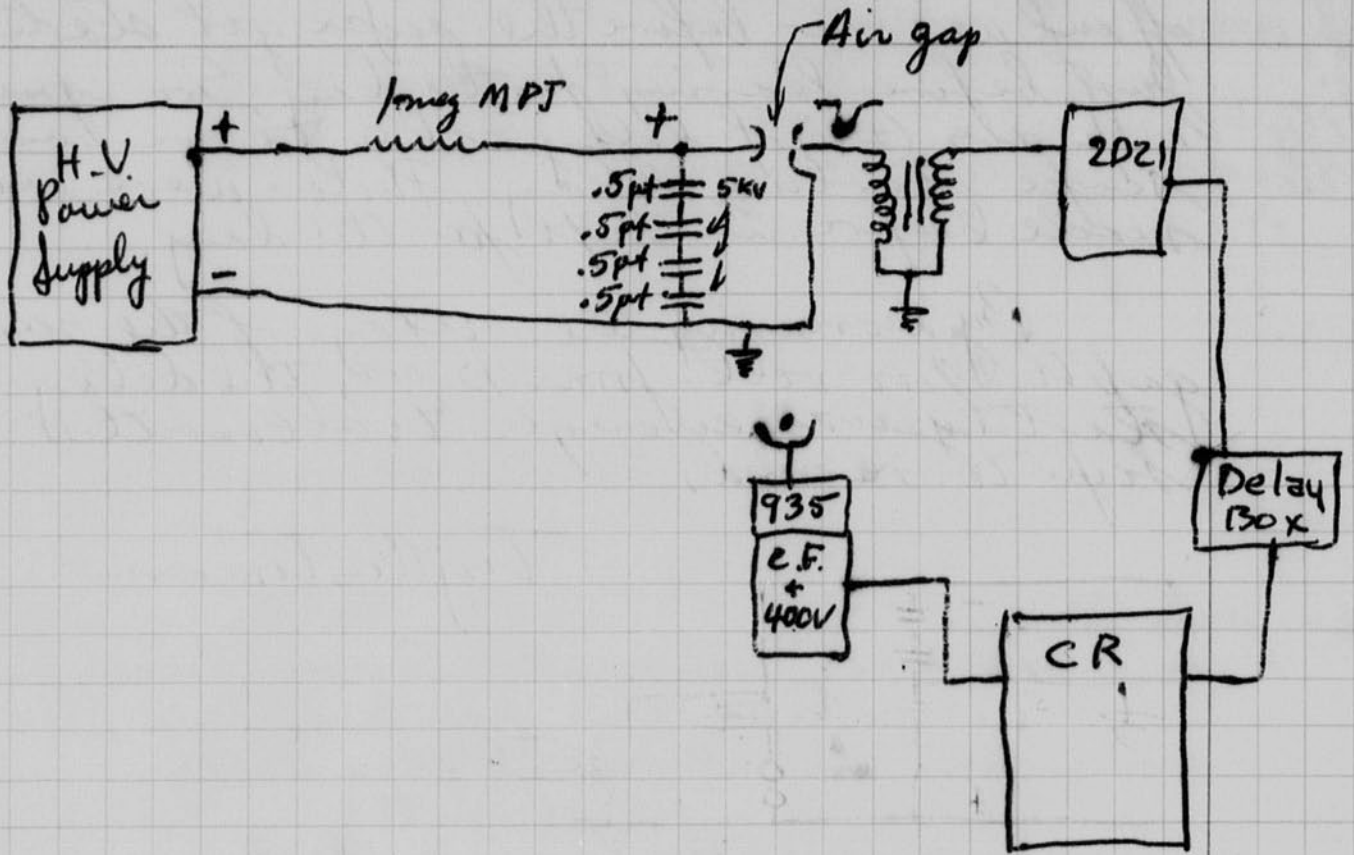
If trouble is experienced with the single gap try two, one on each side.



Try. Microflash tube
FT-110
Double FT-110
and other tubes.



July 13 1950
H.E. Clayton
S.H. Lavin



July 13/1950

H. E. Clifton
A. N. Lawrie

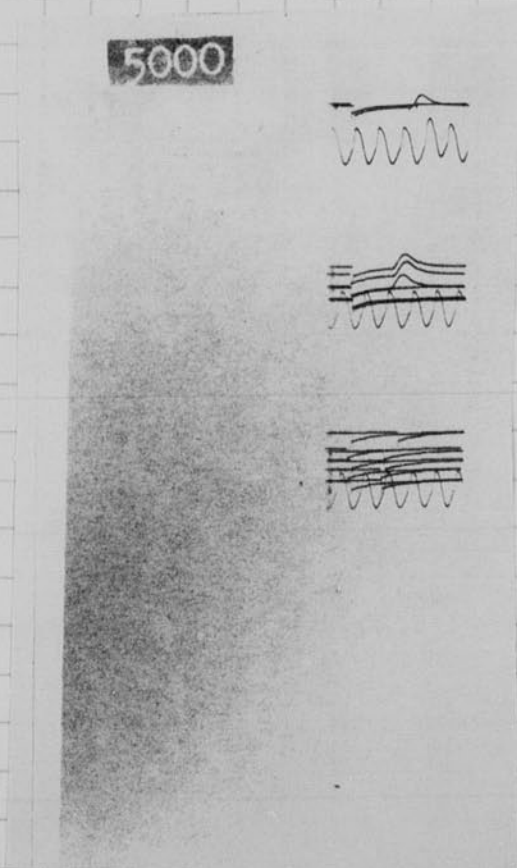
C V F D Sweep.

1) air gap 0.125 10KV. x2 4' 6 1mc.

Film no
5373

2) 1) 0.125 12KV x2 4' 6 1mc ~~3 discharges~~
3 discharges with axis moved

3. Scope delay transient. Several traces with two sweeps. One from sweep trigger, the other from initial signal plus delay. These should show the delay in the sweep starting.



July 1948
H.C. Wright
M. J. ...

G
V
F
D
Graphs

2373
Folios

1) Graphs 6.152 12K. X2 4' 6 line

2) 6.152 12K. X2 4' 6 line
Sketches you with this series

3) These sketches show the
three sketches above the
from the first sketch from sketch
two sketches. One from sketch
Three sketch transmission. Several traces with

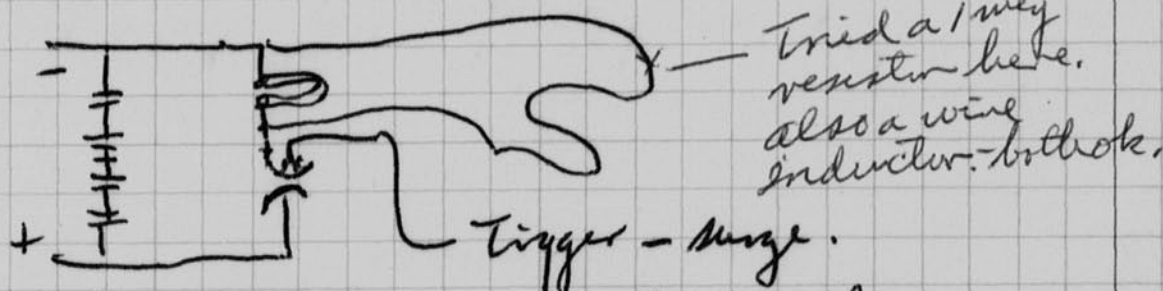
FT-110 .125 12KV. X 2 D 4' Sweep 1

Film no
5374

" .125 12KV. X 2 4' 7

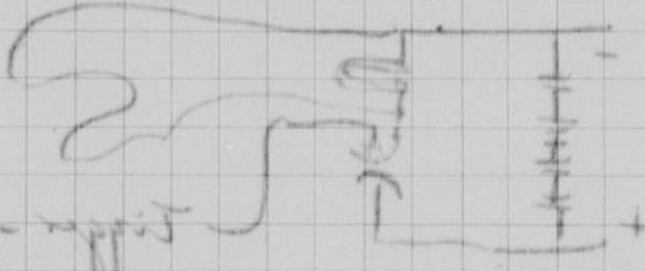
" .125 13KV X 10 4' 7

FT 110
and gap .125 13 X 10 4' 7



note polarity on ignition coil was reversed from negative to positive delay is greater.
Polarity back to negative on ignition coil.

Figure 23.4
 FT-110
 15KV X 2 4' 6 swab 1mc
 15KV X 2 4' 5 swab 1mc
 13KV X 2 4' 5 swab 1mc
 13KV X 2 4' 5 swab 1mc
 FT-110
 15KV X 2 4' 5 swab 1mc



Pulse back to negative on input coil
 negative to positive delay is greater
 rate pulse on input coil was removed from

13.5

- ④ air gap 0.125 ~~10KV~~ X 2 4' 6 swab 1mc
 check!
- 0.125 12KV X 2 4' 5 swab 1mc

with 3C45 and pulse trans.

air gap. 0.125 13KV. X2 4'
 Trigger 3C45 800 V. pulse trans
 Mark IV.

①

Delay is quite small in air
 app.

The trigger polarity was reversed
 this increasing the delay some.

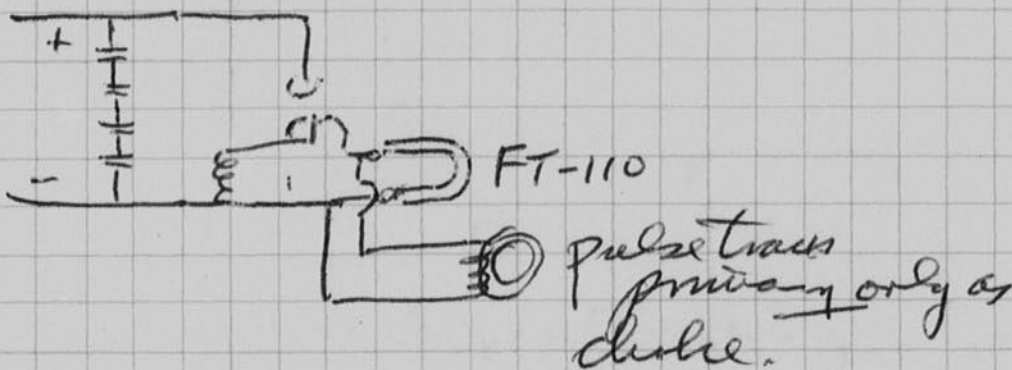
July 15 1950

air gap and 0.125 13KV X10 4' 6
 FT-110 X2 4' 6
 1 m.c. beam 6

Film no
 5375

②

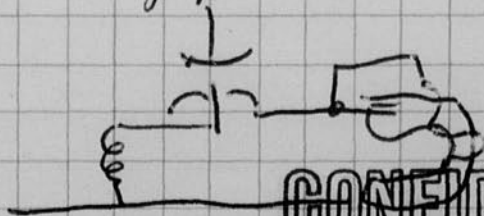
3C45 800V pulse trans
 used as shown.



The oscillograms show light from gap
 and FT-110. By covering each in
 sequence, it appears that the FT-110
 supplies 90% or more of the light.

③

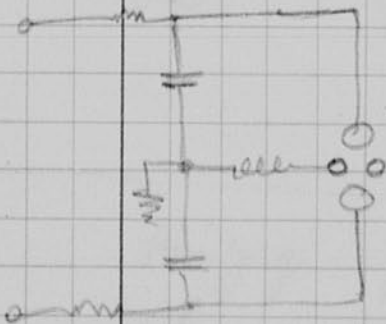
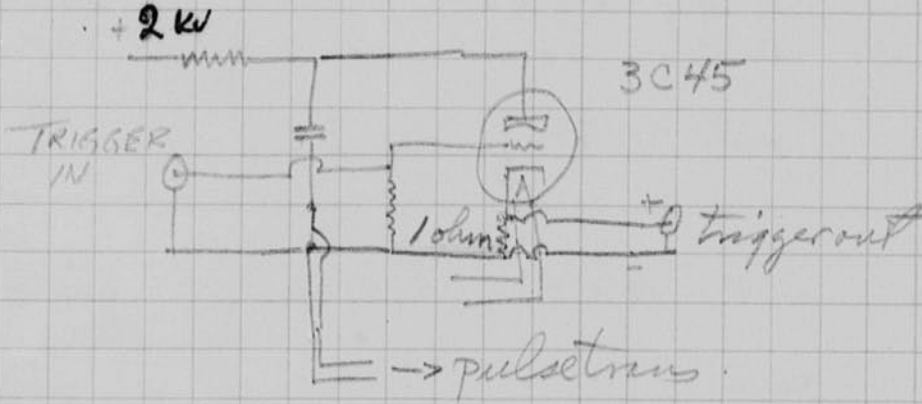
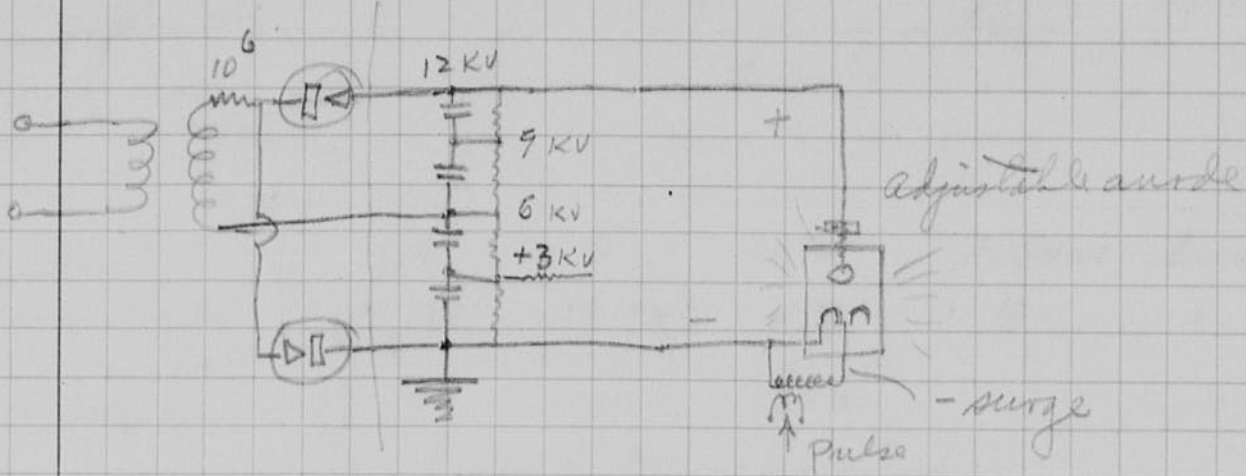
Ditto of ② except the FT-110 X2 4' 6
 trigger was connected to X10 4' 6
 the gap cathode



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The top of the page is very faint and contains several lines of illegible handwriting. The text is mirrored across the page, suggesting bleed-through from the reverse side.

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23

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July 14 50
H. E. G. G. G.

Tube
Microflash
in series
with air gap. 0.125 13.5 KV X2 4' 6
1 mic. Film no
5376

Tube	pt	E	Fitter	Distance	Sweep	Timing	Film no
Microflash in series with air gap	1	0.125	13.5 KV	X 2	4	6	1 mic. 5377
	"	"	"	X 10	"	"	
Probe of microflash tied							

Tube FT-110 in series with Air gap	2	0.125	13.5 KV	X 2	4	6	1 mic.
	"	"	"	X 10	"	"	
Probe of FT 110 tied							

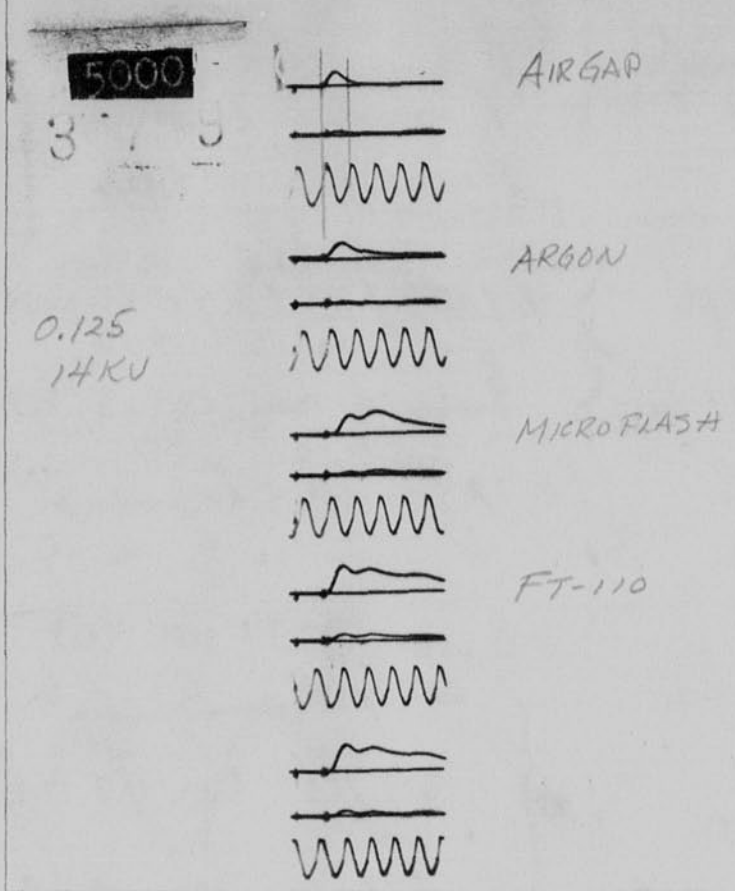
Tube Argon in series with Air gap	3	0.125	13.5 KV	X 2	4	6	1 mic
	"	"	"	X 10	"	"	

Air gap only	4	0.125	13.5 KV	X 2	4	5	5 mic.
	"	"	"	X 10	4	5	

Air gap + lamp with RG 54 / AU	1	0.125	13.5 KV	X 2	4	5	Film no 5378
	1 mic.						

Air gap no RG 54 / AU	2)	0.125	13.5 KV	X 2	4	5
--------------------------	----	-------	---------	-----	---	---

MJF YTEFAZ 002M 2



air gap
FT-110
air gap
air gap
air gap

air gap
air gap
air gap
air gap
air gap

air gap	0.152	132KV X 5	2
air gap	"	" X 10	2
air gap + lamp with	0.152	132KV X 5	2
air gap	0.152	132KV X 5	2

Cont.
July 14 1950

	0.125 μ f	13.5KV	Filter	Distance	Sweep	Timing
Air gap only	"	"	x2	4	6	1mc
Probe pulse negative	①	"	x10	4	6	↓
	1 mc		Timing wave.			Film no

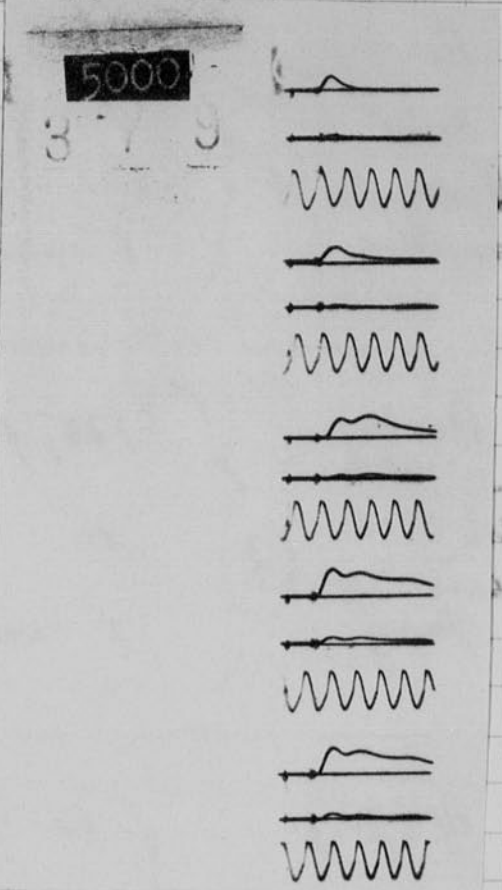
Air gap in series with Argon lamp	②	0.125 μ f	13.5KV	x2	4	6	5379
		"	"	x10	4	6	
		1 mc	Timing trace				

Air gap in series with micro flash	3	0.125 μ f	13.5KV	x2	4	6	
		"	"	x10		6	
		1 mc	Timing				
			Probe tied to negative ground				

Air gap in series with FT 110 lamp	4	0.125 μ f	13.5KV	x2	4'	6	
		"	"	x10	4'	6	
		1 mc	Timing				
			Probe tied to negative ground				
	5		Same as above				

Cont
July 14/1952

132KV X 5 " 4
 132KV X 10 " 4
 132KV X 5 " 4
 132KV X 10 " 4
 132KV X 5 " 4
 132KV X 10 " 4



Probe tried to ~~investigate~~
 1 more training

Probe tried to ~~investigate~~
 1 more training

done as above

FT 110 group
 in series with
 Air gap

July 18, 1950

Harold G. Egerton

CONFIDENTIAL

31

An equipment for short-time flash photography is being built by B. Barriel and the writer for field use. A circuit will be put in this book when the equipment is finished. Construction was started on Friday. By working Sat and yesterday Monday it is nearly finished.

The discharge circuit consists of a 0.125 mf 17KV capacitor and a series triggered air gap. Provision is made for an external series gap or a gas filled lamp. The performance will be as shown in the oscillograms on page 284-29. The micro flash lamp and the FT-110 flash tube as well as others can be used in this circuit.

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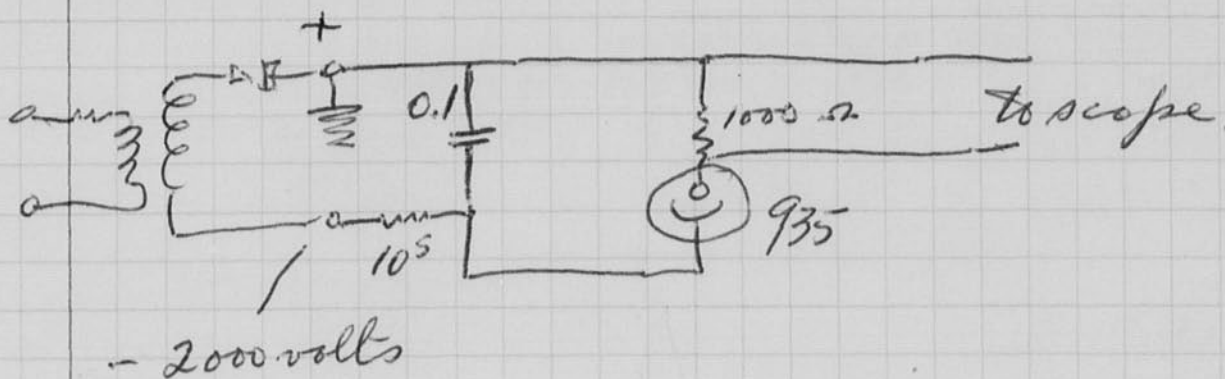
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July 18 1950
W.C. Egerton

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33

a phototube pickup for fast light pulses was built yesterday according to the following circuit.



Calibration of above with Stroboscope

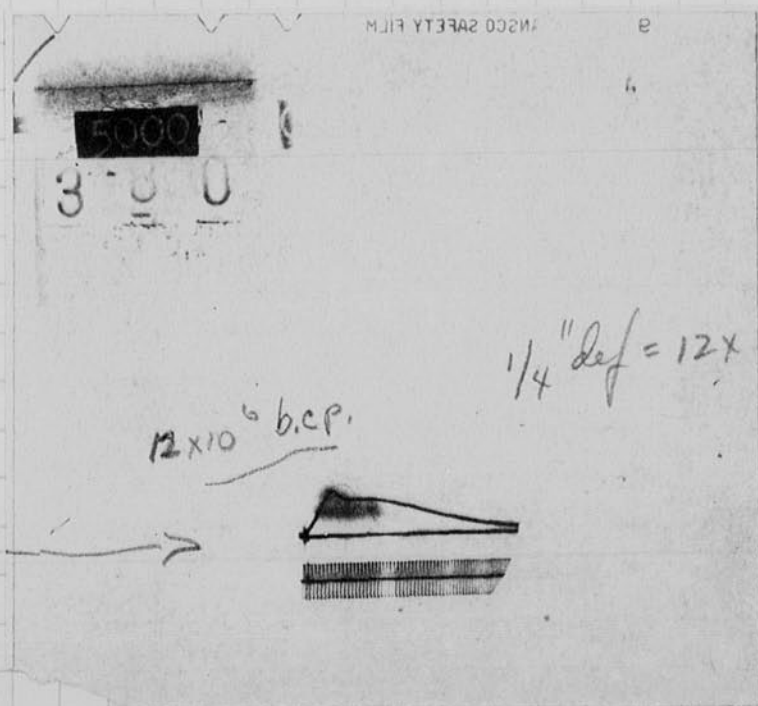
Distance 4 ft from FT-229 to 935 phototube cathode.

1 mc tuning wave or osc.

380

Assume peak
light output
= 12×10^6 b.c.p.

48×10^6 b.c.p./inch



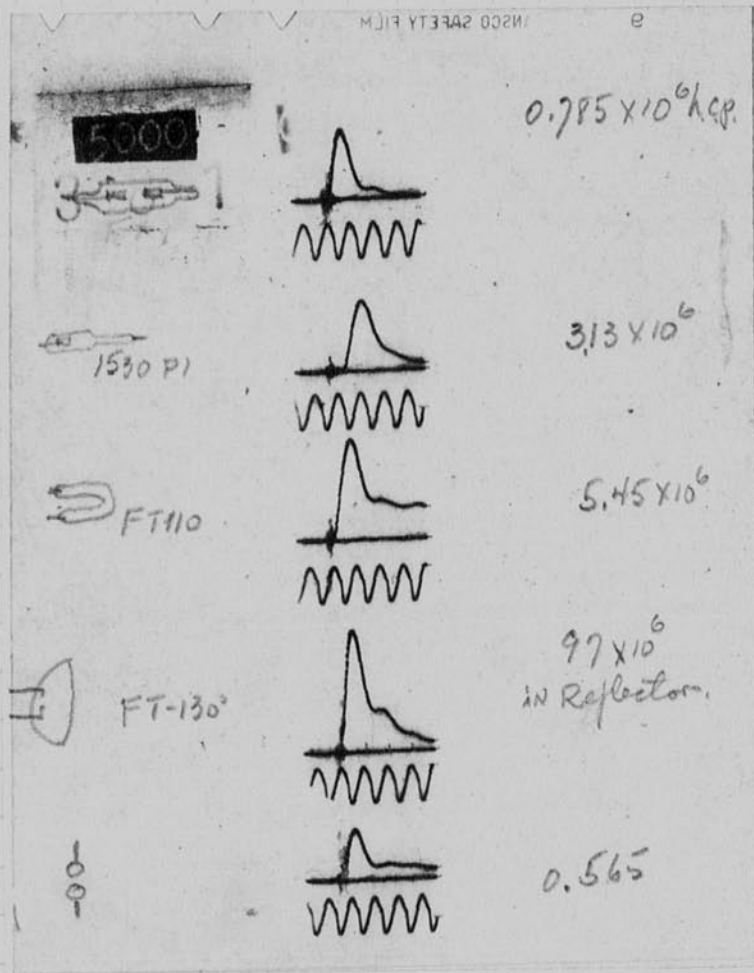
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1000 = 1000
1000 = 100
1000 = 100

$$0.1 \times 200 = 200 \text{ N.S.}$$

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July 19 1950
H. E. G. Jr.

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37

381

air gap $\frac{1}{4}$ "
atmospheric press.
in series with
air gap.

$C = 0.125$ $V = 12 + KV.$ $D = 10'' \times 1$
1 MC.

microflash
lamp in
series with
air gap

0.125

12KV

$D = 20'' \times 1$

FT-110 in
series with
air gap.

0.125

12KV.

$D = 20 \times 1$

FT-130 in
Reflector

Series gap.

0.125

12KV

$D = 60'' \times 2$

P.C. was in the beam
which was a 6" diameter spot at 5 ft.

Series gap $\frac{1}{4}$ "
in series with
control gap.

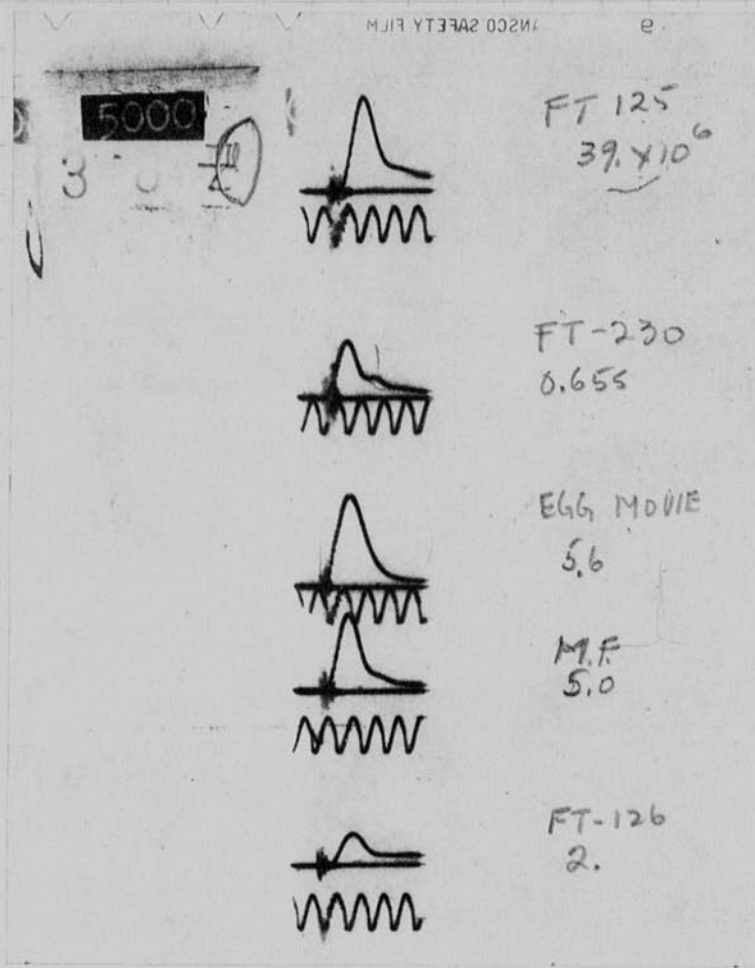
0.125

12KV

$10'' \times 1$

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382

FT-125.

air gap 0.125 12KV.

D=60" x 1

1 Reflector type flash bulb.
1 m.c.

A₁

(Krypton)

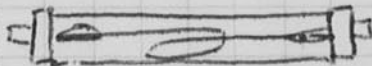
argon gap FT-230

2 old from television station
air gap series. Dillo c2V

D=10" x 1

3. New monitor lamp.
Genes lens

D=24" x 1



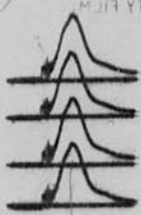
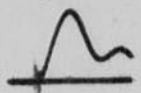
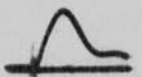
4 microflash tube
new. 1530 P-1

D=24" x 1

5 FT-126 old from
nuclear group

D=24 x 1

CONFIDENTIAL

5000
38350x10⁶ b.c.p.
BEAM CG.R.
MICROFLASH
NEW CIRCUITFT 130
2MF 2000 V235x10⁶
BEAM CFT-130
2MF 2000FT-130 2MF
2200 V.
2000
1500
10001MC
JULY 20 1950
P41 H.E.E

CONFIDENTIAL

July 20 1950

David E. Egerton

CONFIDENTIAL

Continued tests of flash tubes.

383

Microflash tube
in specular 8" reflector.
Series air gaps before.

Oscilloscope also shows
pulse that starts the
new circuit, this shows
delay time.

4 photos
showing delay
5ft x 2

FT-130 Sealed Beam
in argon. Gap without
a series air gap.

Self fired at 2400-2600 volts.

2mf. 2100 volts.

5ft x 2 but 6" off the
center of the
Beam, the
beam spot is
about 8" in
diam at 5ft.

Ditto above but with
photo tube at center
of beam

2mf 2100

5ft x 10

4 shots of FT-130 as above
but with

- 2200 v
- 2000
- 1500
- 1000

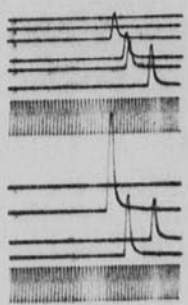
} all on same
record.

CONFIDENTIAL

INSCO SAFETY FILM 2

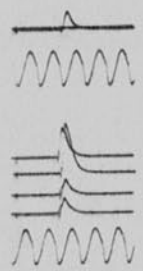
5000
384

390 x 10⁶
90 x 10⁶
BEAM C



GR MICRO
FLASH
IMC

GR MICRO
FLASH
IMC



SPARK GAP
LOW IND.
IMC

DITTO
IMC

JULY 20 1950
P43 H.E.E.

Regular microflash circuit

384

Sweep 8 was used to get the light trace on the screen.

PC. was in the beam hot spot

5 A. X 10
+3"

340 x 10⁶ max.
93.5 x 10⁶ min

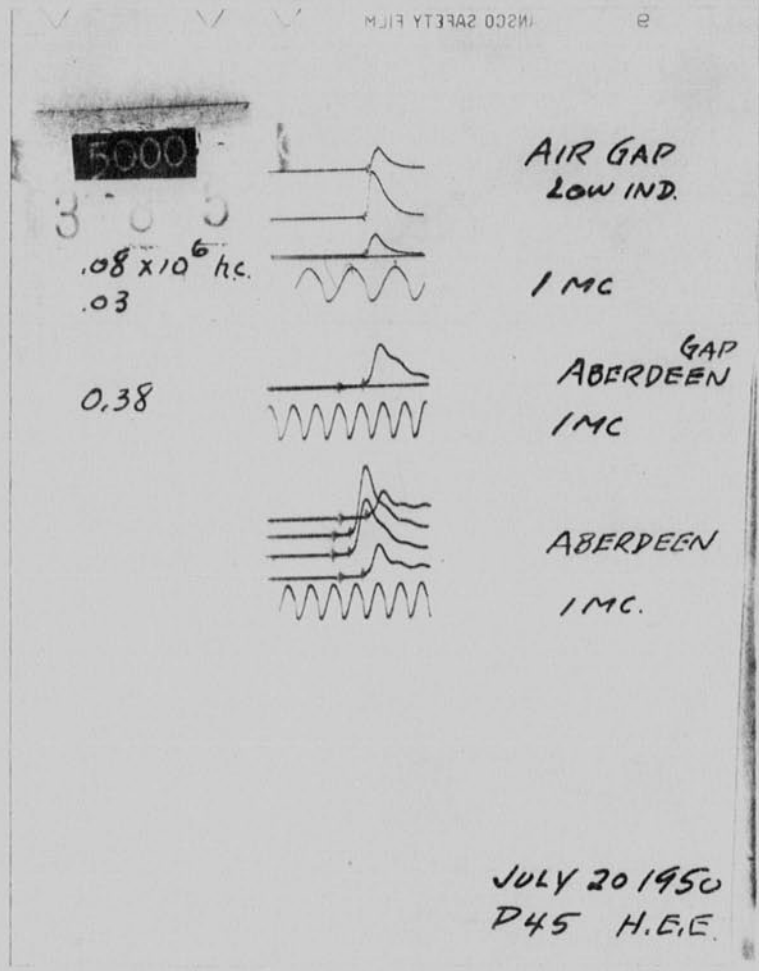
1. Several records were made to show starting delays.

2. Ditto.

3. Spark gap short 4" X 1.
5KV.

max 0.188 x 10⁶
min 0.0628 x 10⁶

4. 5.3 KV. 4" X 1.



File 5000
no 385

Demuslauer's central gap
assembly - same as p148
except sweep changed from
6 to 5 position.

3 waves.

4" x 1

1 mc. timing

peaks

0.188×10^6

2. aberrant air gap
Seen through the small
hole in the anode

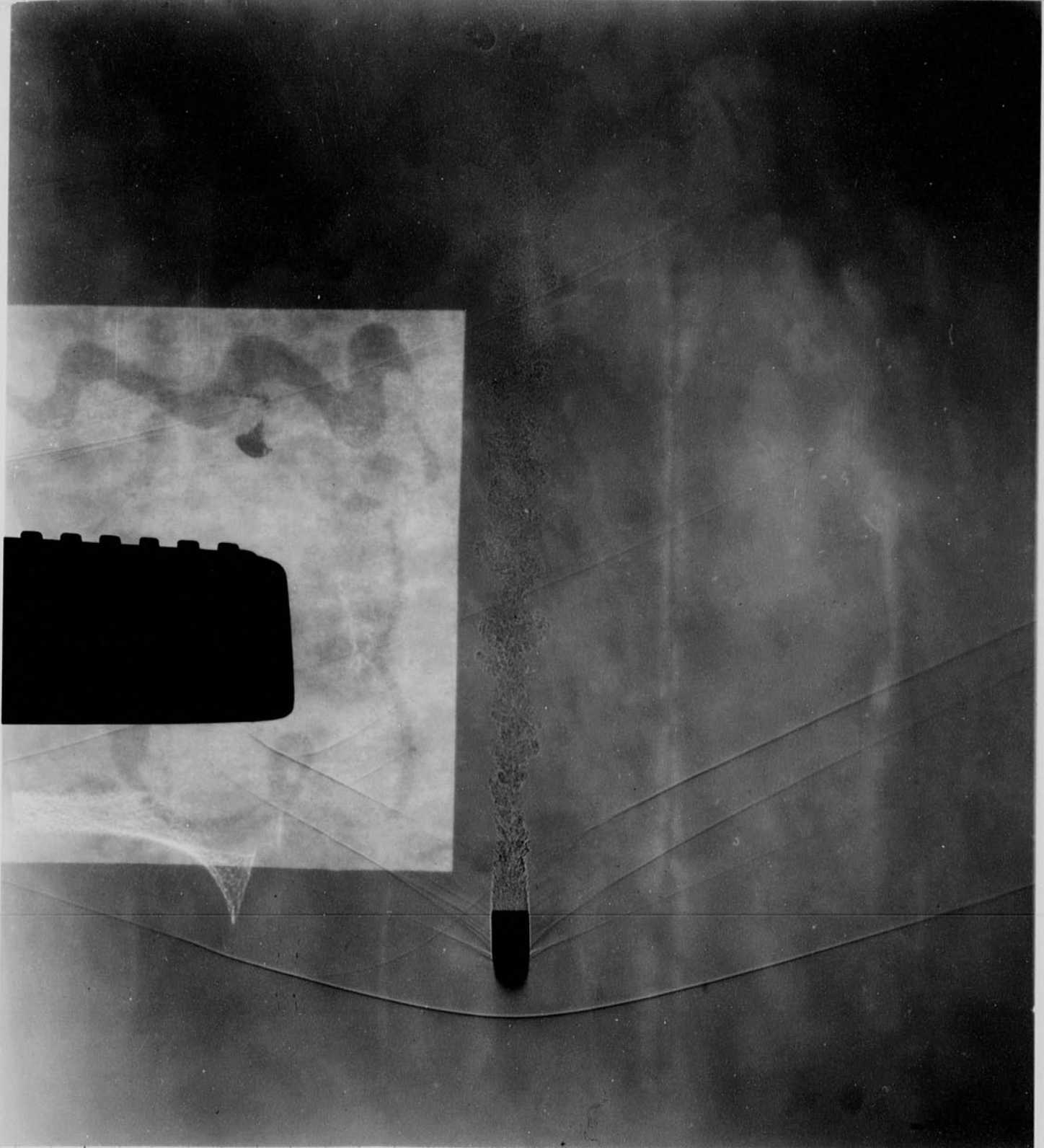
.5 mf 7000v

1/8" gap.

7" x 1

3. Dills #2 but with 4 shots
to show variation in
start up and light output.

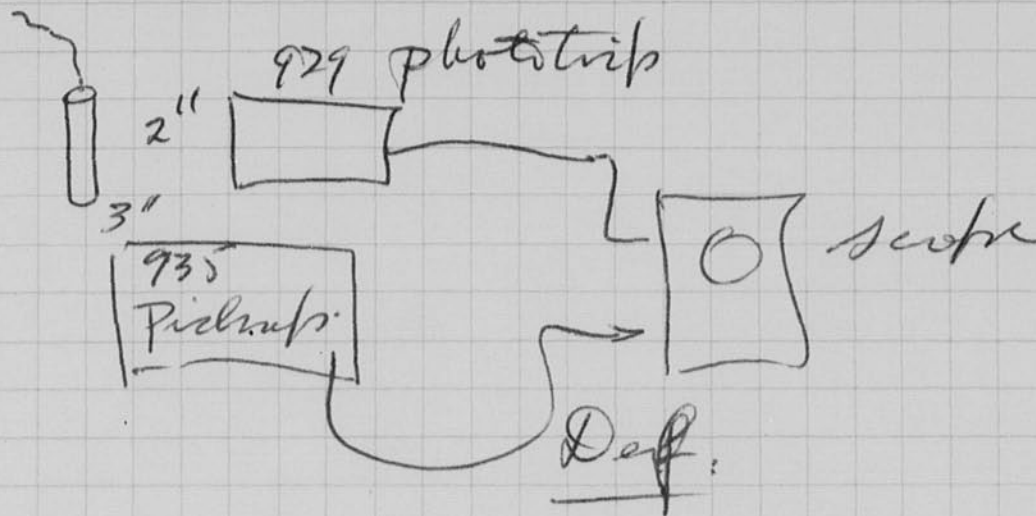
CONFIDENTIAL



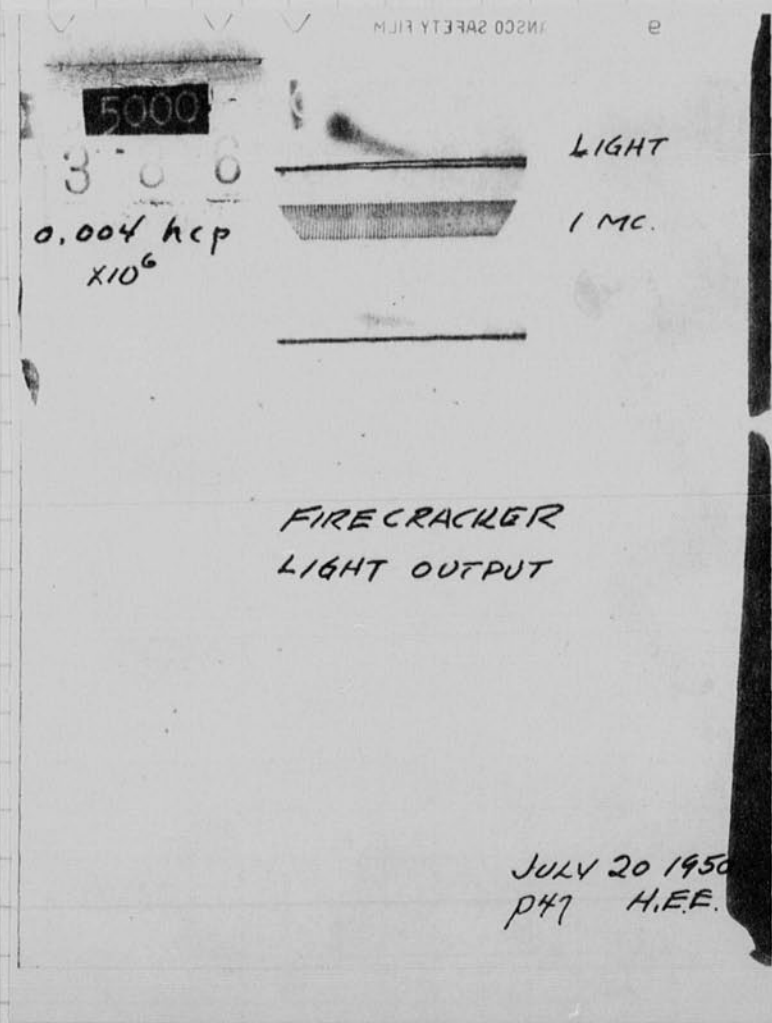
CONFIDENTIAL

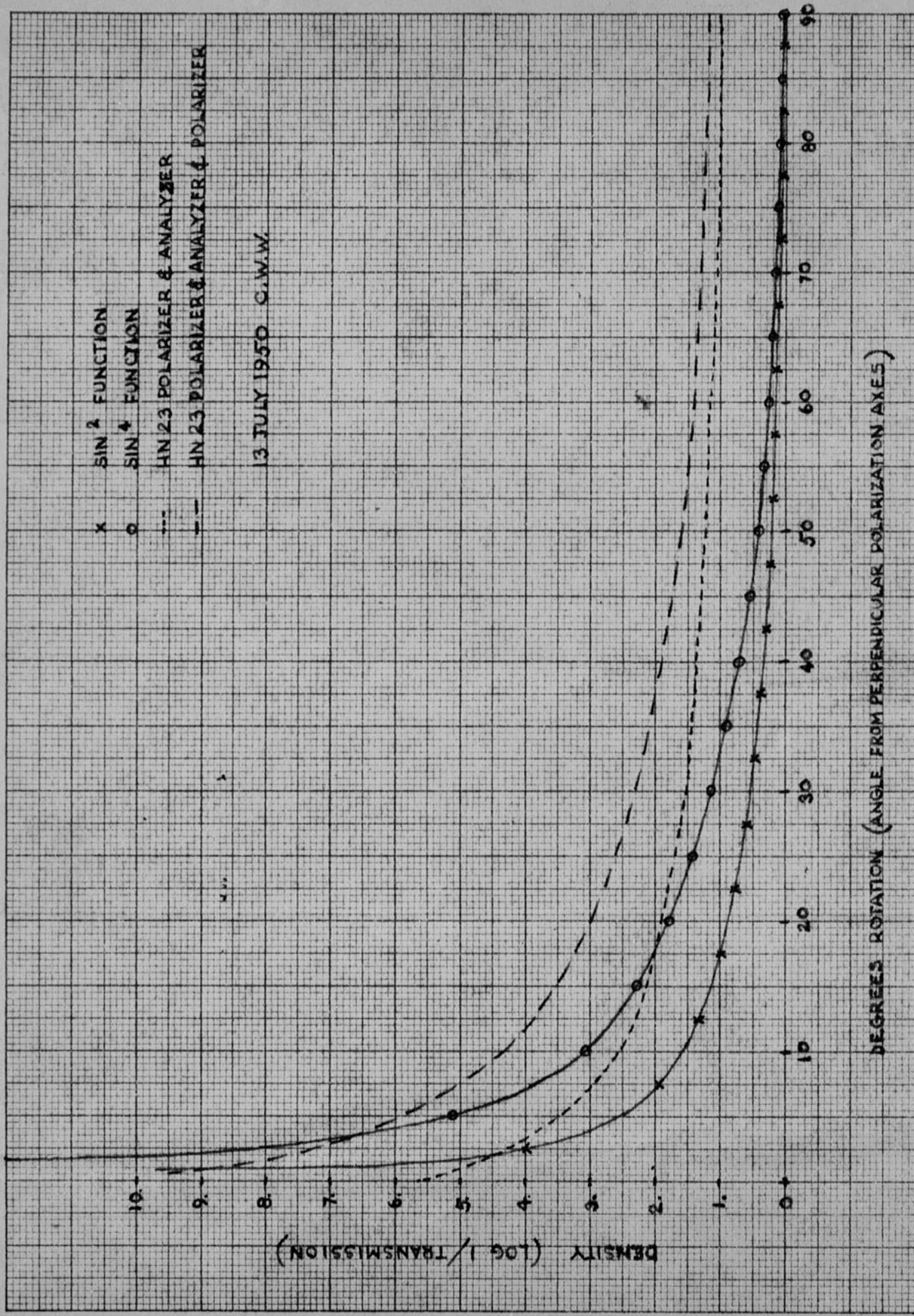
Exp with fire cracker.

5200
386



Sweep 8. 1 mc.





$2 \times 10^6 \left(\frac{D}{f}\right)^2 = F \text{ def.} =$

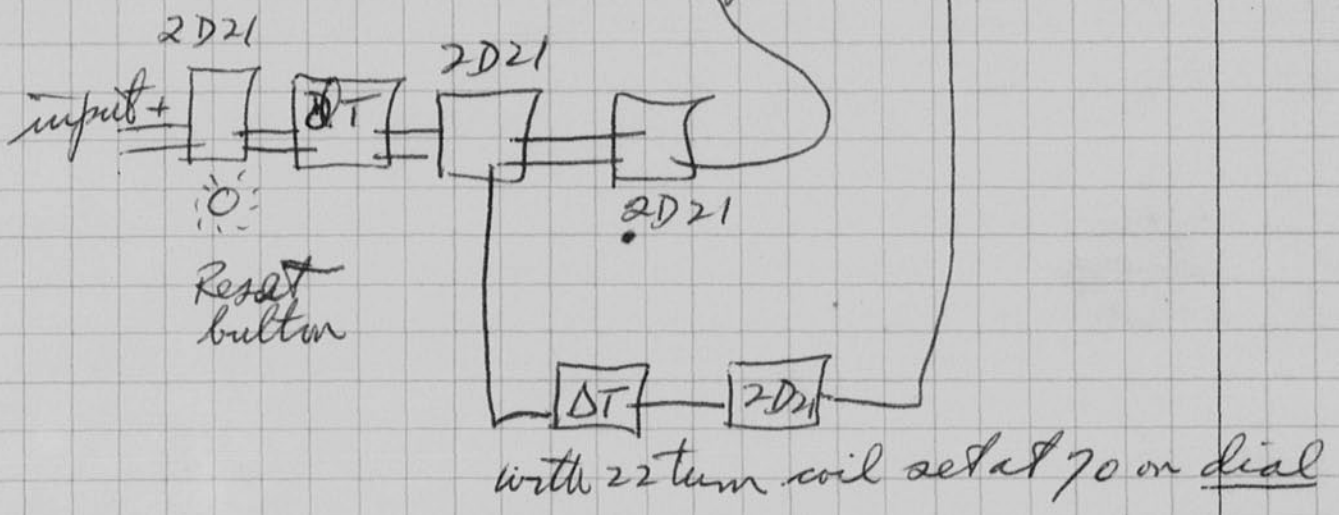
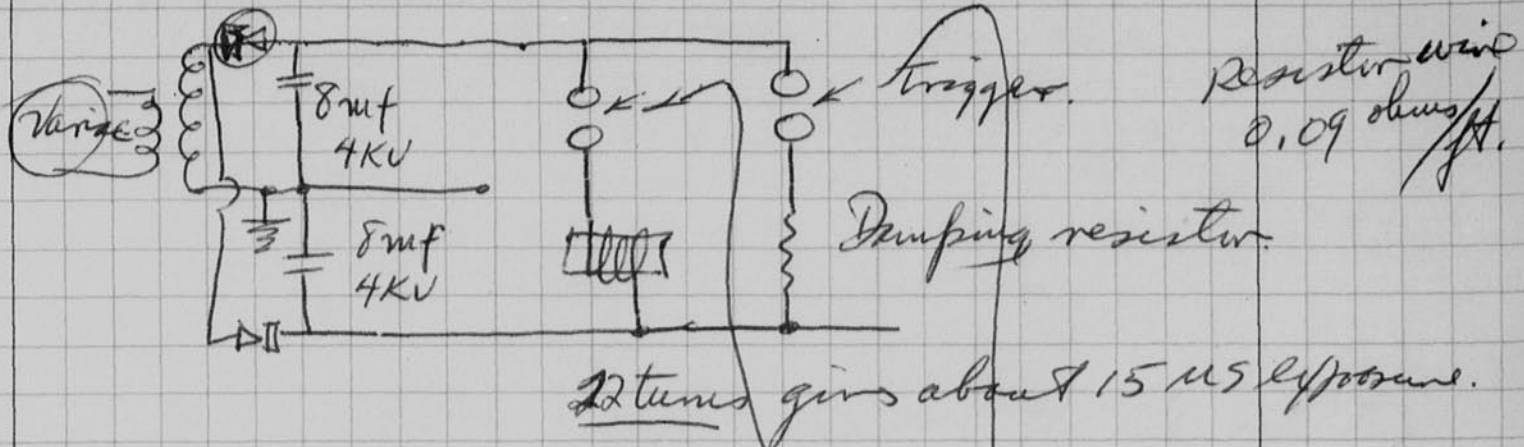
Tube	D	F	def mm	Light h.c.p.	b.c.p. / mm	Peak h.c.p.	12 mg / f
Strobline	48"	1	6	12×10^6	2×10^6	12×10^6	33
Argon	10"	1	9	$\left(\frac{10}{48}\right)^2 = .0435$		$.785 \times 10^6$	37
M.F.	20	1	9	$\left(\frac{20}{48}\right)^2 = .174$	2×10^6	3130 "	37
FT-110	20	1	1.3	$\left(\frac{20}{48}\right)^2 = .174$		5.45 "	37
air gap.	10	1	6.5	$\left(\frac{10}{48}\right)^2 = .0435$.565	37
FT-230	10	1	7.5	$\left(\frac{10}{48}\right)^2 = .0435$.655	39
EGG MOVIE	24	1	11.2	$\left(\frac{24}{48}\right)^2 = .25$		5.6	39
MF	24	1	10	" = .25		5.0	39
FT-126	24	1	4	" = .25		2.0	43
Low I gap.	4"	1	6 mm	$\left(\frac{4}{48}\right)^2 = .0069$.0825	45
"	4"	1	2 min	$\left(\frac{4}{48}\right)^2 = .0069$.0276	45
abandon gap.	4"	1	9.	$\left(\frac{7}{48}\right)^2 = .0213$.382	45
12KV	FT130	60"	2	156	$\left(\frac{60}{48}\right)^2 = 1.56$	$97. \times 10^6$	37
12KV	FT125	60"	1	12.5	1.56	$38. \times 10^6$	39
NEW MICRO FLASH	8" Ref.	60"	2	8.0	$\left(\frac{60}{48}\right)^2 = 1.56$	$50. \times 10^6$	41
2mf 2000	FT-130	60"	10	7.5	$\left(\frac{60}{48}\right)^2 = 1.56$	$235. \times 10^6$	41
OLD MICRO FLASH	1530	60	10	12.5	" 1.56	390×10^6	43
"	"	"	3	"	"	93.5×10^6	43
Firecracker	3"	1	.5	$\left(\frac{3}{48}\right)^2 = \left(\frac{1}{16}\right)^2 = .0039$		$.0039 \times 10^6$	47

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July 21 1950
 H. G. Shorter
 H. de Mason

Repatronic tune up.



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Aug 2 1950
H. E. Edgerton


July 25 left noon for Aberdeen - arrived
July 26 Wed about 1:30. Went to see Miller
first in pur. dept. then Dr. Paul
Dewey about DR. munition equipment.
Set up Papatron and shot explosive
Pentolite at f 11 - 5 us. with no
delay. Photo trip 6 to 8 ft away with
10 K into a ~~SN~~ 6SN7 tube as a
cathode follower.


P.C.
929

July 27 ditto explosions. With TNT
the resistivity in the P.C. was
increased to 100 K. for trip. Exposure
was weak on the film.

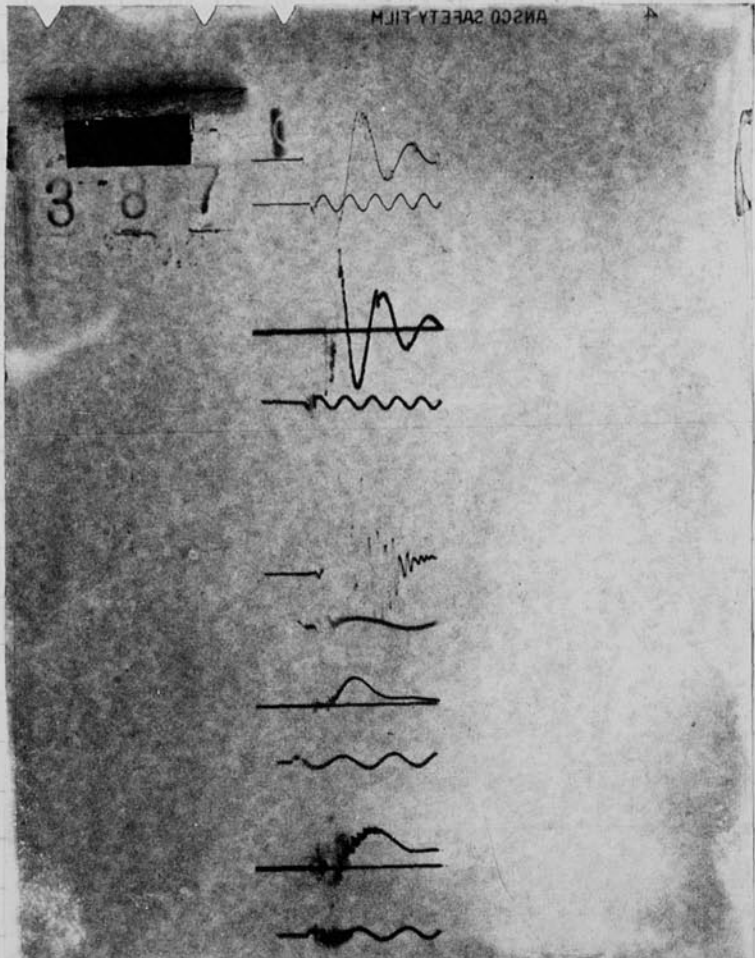
Pentolite (?) spheres were
photographed both with a
single exposure and 3 exposures
on the same plate. This was done
with Sultanoff who is now using with
a grid type ultra high speed camera.
In afternoon set up in Durrant's
lab next door also in the terminal
ballistic lab. The problem was to
photograph a ball at 4000 fps
before it hit a plate of aluminum

ANSCO SAFETY FILM

standard  1mc.
 stag osc.

standard  1mc.

per sec
 $\frac{1.53}{.87} \mu s$
0.65 μs



Exc No.

Test of no new scope # 5 E. J. B.

670 Sweepspeed Op. KV timing

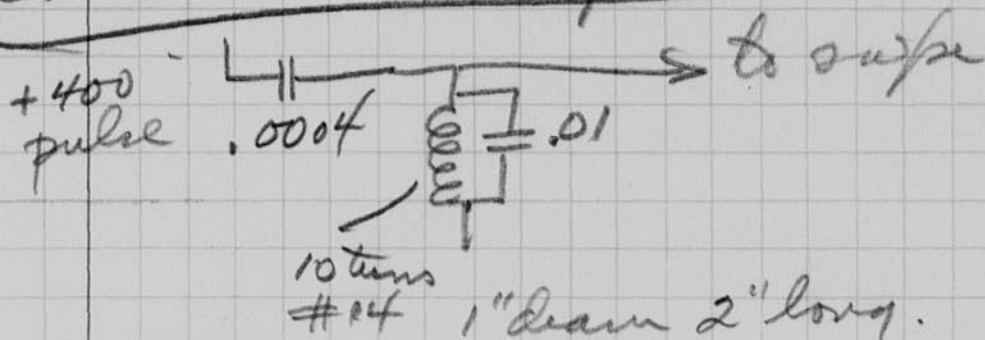
670 1 1 24 1mc.

Exposure test.

935 phototube pickup with 1000 ohm load resistor into scope with 2000 volts on the plate.

Back to old scope no camera

Film no
5387



calibrated against 1 mc. on sweep 5.

0.26" = 1 cycle.

1. Current in gap alone on Mview film

2. Ditto but with series resistor to cut out high freq component.

$$5 \times \frac{5.5}{.19} \times \frac{.5}{53} = 45$$

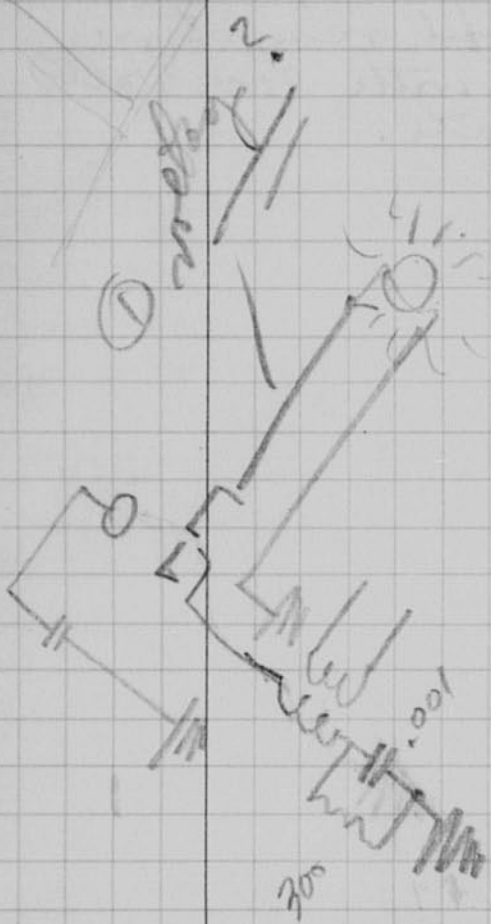
3. Spark pulse

22.5 mc.

4. Light output 1 1/2 ft ± to P.C.

5. " " series spark 8" 1/16" gap.

shows large afterglow. ?



① meth
 2.

② Cable
 airg
 alyan.

0.65 μ s/cycle.

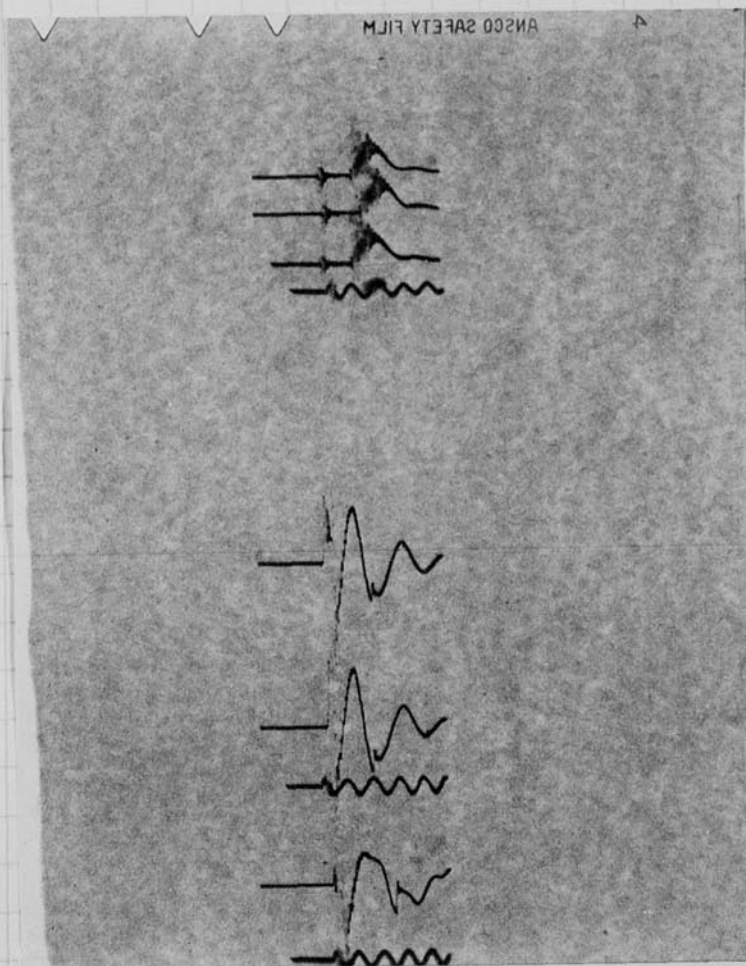
① Oxygen 3 traces + ~~1~~ mc.

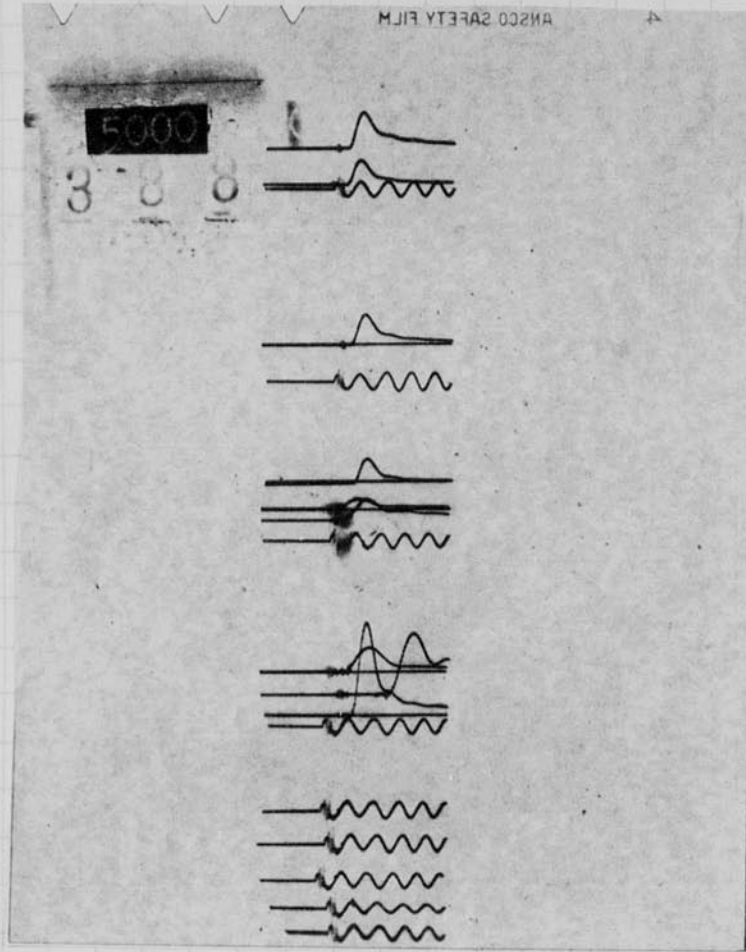
2.

3

4. - ac current with external leads shorted, spark gap.

5. Ditto but with 4 ft RG54 cable





Aug 3 1950

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Light-time curves.

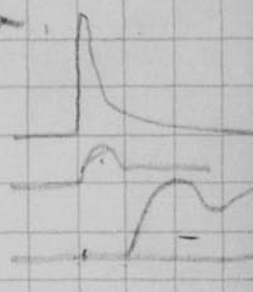
Film no. 5388

Film no.	D.	C	V	Sweep	calib	traces	
1	2'	0.25	12KV	6	0.65us	2 traces	
2	2'	"	"	"	"	with zero line.	
3	2'	"	"	"	"	with 4ft RG54 cable and 1/16" gap in series	
	a.	open gap no series gap					
	b.	2" " with series gap cable and gap. Light from open gap only.					
	c.	1' 1/16" gap in series with cable. Light Light from small 1/16" gap					
d.	0.65 us/cycle tuned wave.						

4 4'? Argon movie lamp. GR 1501 center.

1' Gaps (triggered) (above in series). top

1' " without series lamp. bottom



5. Tuning waves showing trigger start

70 } on position dial.

72.5 }

75 }

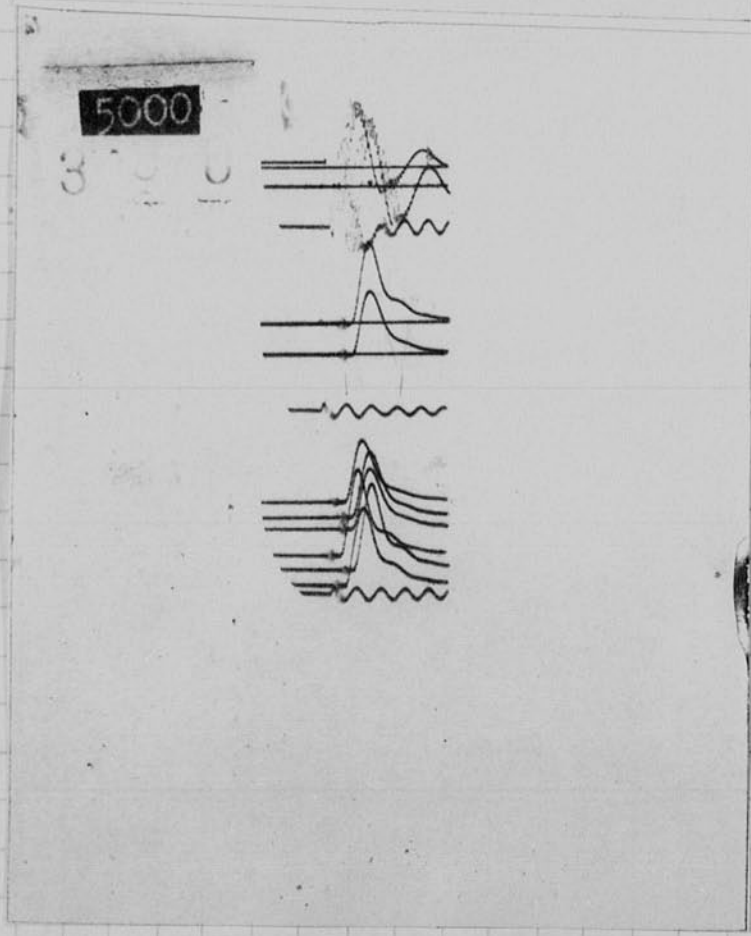
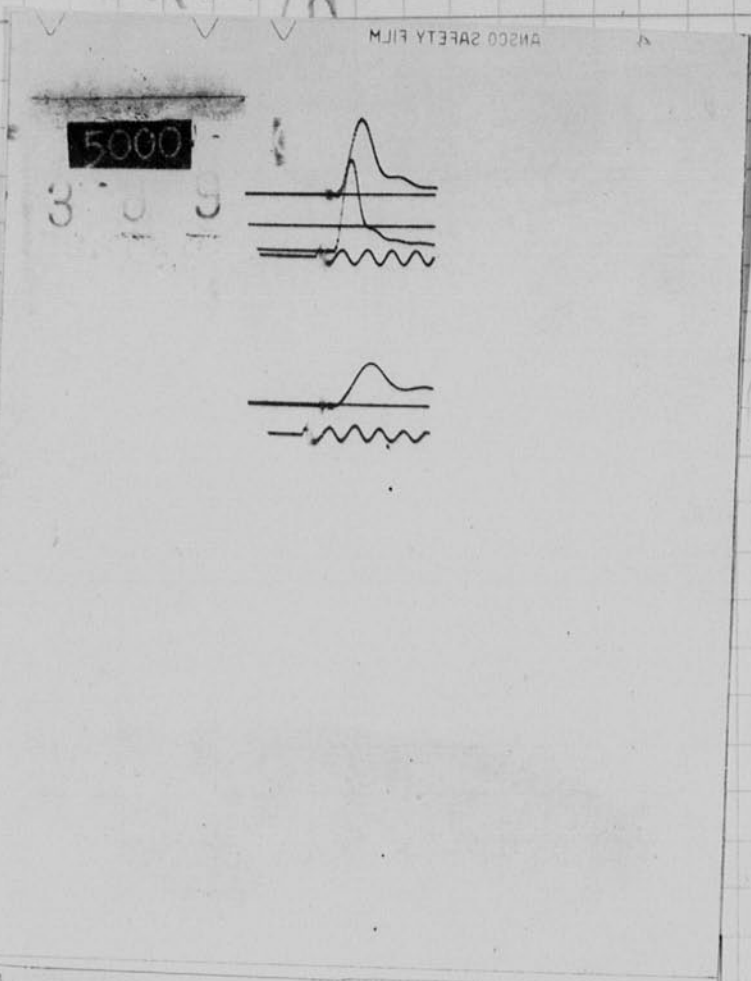
77.5 }

80.0 }

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54 cable

.089 uh/lf.



Cont.

5389.

① 1' Gap clone.

Film on

1' Gap light (with FT-130 in series)

5389

4' (with cloth?) FT-130 - 4 ft RG 54.

2. a RG 54

FT-130.

Do not compare max.

b Twin X 4 ft

FT-130

300 Ω line.

5390

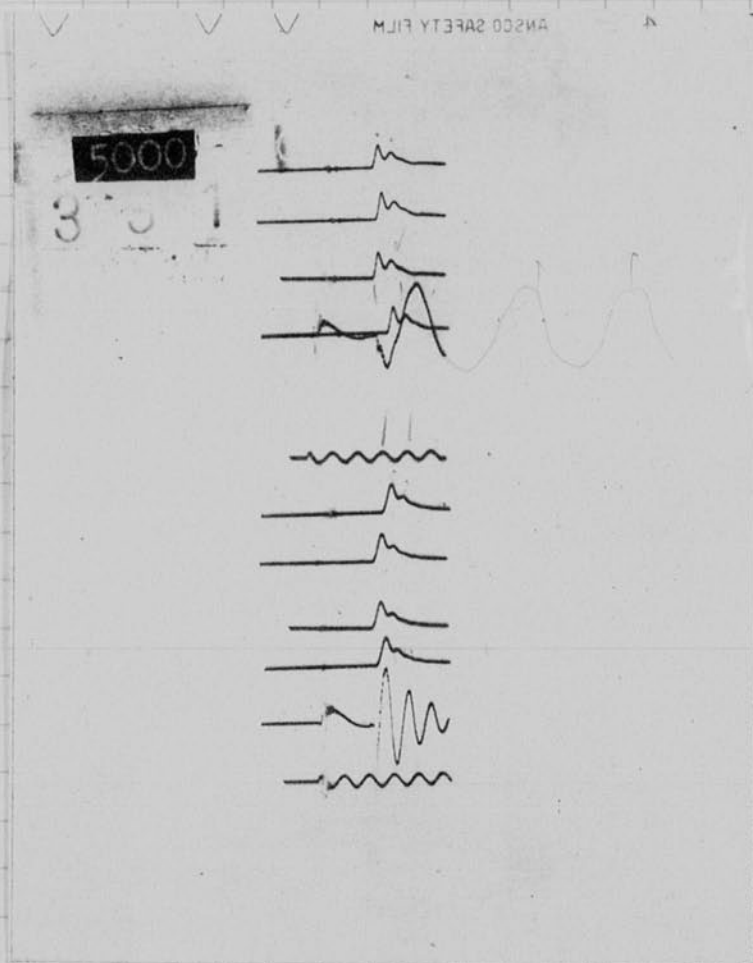
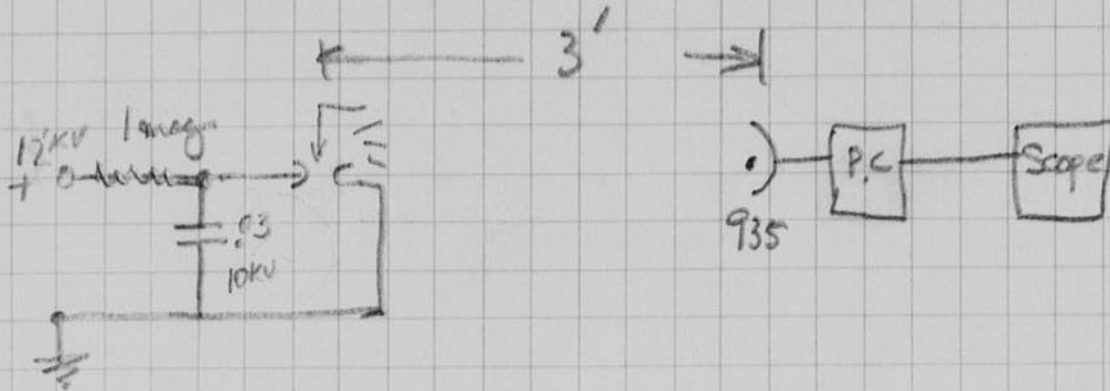
1. Layer FT-130 with 1 1/2 ft lead.

~~539~~

4' x 2 filter. ($\frac{7}{12} \times 0.4$ ohms in and out.)

2. Ditto $\frac{18}{12} \times 0.4$ ohms in and out.

Schematics new Condenser
Data on page 63



.65 μ s/cycle

Aug 3 1950 Cont:-

Using new condenser .03 μ f @ 10 KV Film no 5391
 making an air gap ($\frac{3}{8}$ ") on the condenser
 trigger from unit and High Voltage approx: 12 KV
 obtained from unit. Sweep no 6 old scope

- 1) Light output from air gap
 " " " "
 " " " "
- 2) Light output from air gap
 Resonant freq of air gap
 Calibration 0.65 μ s/in
- 3) 1) Light output from air gap 6-.03 μ f
 with filter x10 @ ps. 3' away from gap
 2 " " " "
 3 " " " "
- 4) Same as above.
 Resonant Frequency of air gap (6-.03 μ f)
 Calibration 0.65 μ s/in

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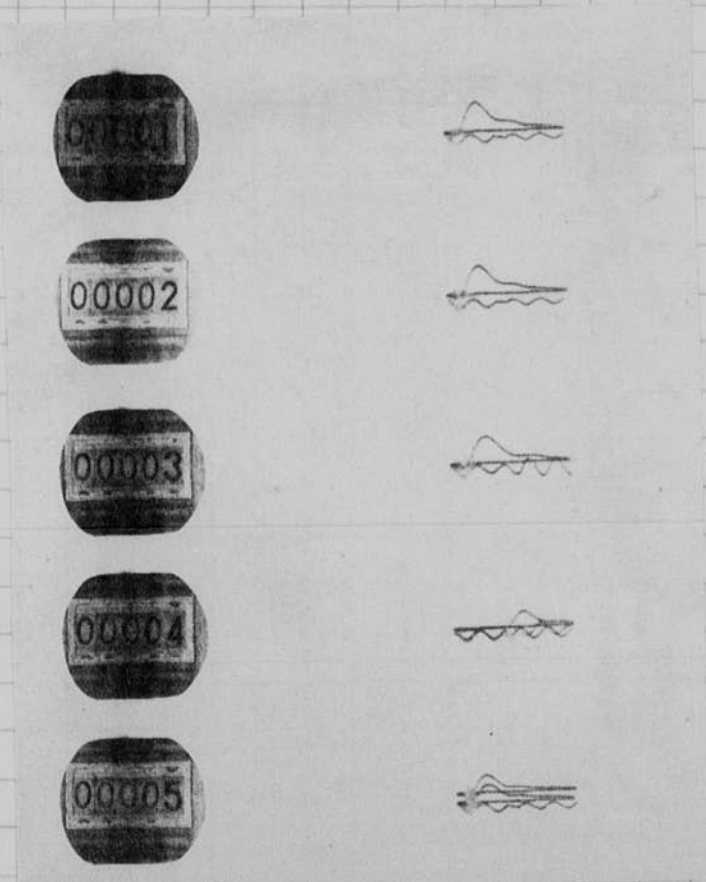
Aug 4, 1950

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~~A. E. Dyer~~

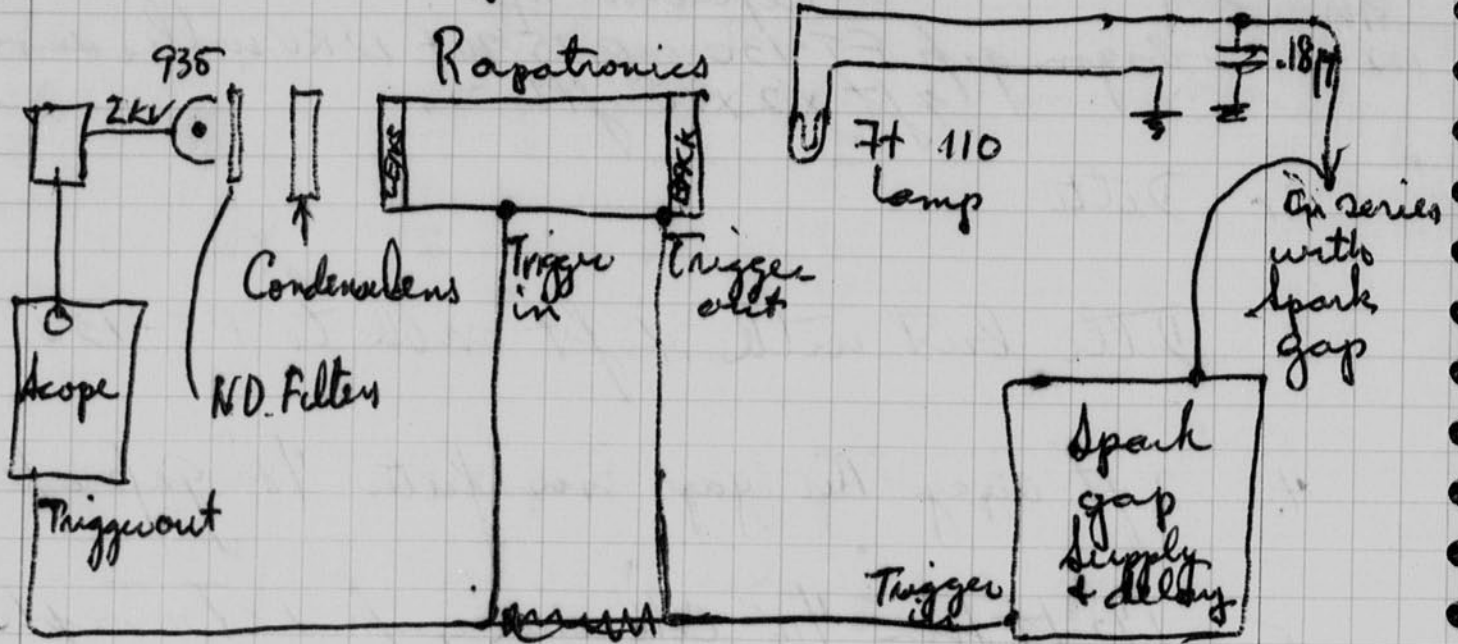
new 29.75
Scope 102
24KV

- Reflector type.
- 102-1 Argon gap FT-130 0.25 μ f 12KV with series gap.
4 ft x 2 x 10 plates.
 2. Ditto
 3. Ditto but with 4 ft cable to FT-130.
 4. 2 ft away Air gap no filter 1/8" gap open
 5. 1 1/2 ft from 1/16" Chlorine gap 1 atmosphere.



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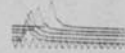
Schematic of set up



For data on page 67



Film no 6



Film no 7



Film no 8



Aug 4 1952

Tuning of Rapatronics

H. E. Edgerton
W. W. Wood
J. N. Gauriel

Film no 6

Setting of	Trigger delay setting of	spark gap	Unit
1)	100	2.6	μs
2)	75	1.3	μs
3)	50	0.5	μs
4)	25	0	μs
5)	0	0	μs

From Analyzing film

Film no 7

1) Slug from Rapatronics was pulled up and flashed with 110 lamp on photo cell with condenser lens. It required a V.D. Filter of 1.6. Slug pulled out.

2) { Slug in with delay setting of

No Filter	80	in spark gap unit
	85	" "
	90	" "
	75	" "

Film no 8

1	slug in with delay setting of	80	in spark gap unit
2	" " " "	75	" " " "
3	" " " "	70	" " " "
4	" " " "	65	" " " "

Film no 9

Inventory of Repetitive

SEP 19 1954

Handwritten notes on the left margin.

100	for printing	(1)
72	"	(2)
25	"	(3)
22	"	(4)
0	"	(5)

Handwritten note: I am not...

Handwritten note: I am not... (circled)

Handwritten note: I am not... (circled)

Handwritten note: I am not... (circled)

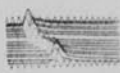
Handwritten notes	for printing
Handwritten notes	"
Handwritten notes	"
Handwritten notes	"



Film no 9



Film no 10



Handwritten notes	for printing
Handwritten notes	"
Handwritten notes	"
Handwritten notes	"

Handwritten notes	Handwritten notes	Handwritten notes	Handwritten notes	Handwritten notes
Handwritten notes	Handwritten notes	Handwritten notes	Handwritten notes	Handwritten notes

Handwritten note: I am not...

Aug 4 1950
H. E. Egerton
W. Ward
J. Samuel

Cont. Tuning of Rapatronics

Film no 9

Using same set up as described on page 66 the following pictures were taken:

Film no 9

- | | | | | | | |
|-----|----------------------------|------------------------------------|---------------------|---|-----|-----|
| 1. | Timing trace | .65 μ s/cycle | | | | |
| 2. | Light calibration standard | with slug out | and 1.6 N.D. Filter | | | |
| 3. | slug in | Delay setting of spark unit to 20. | Sensitivity set 0 | | | |
| 4. | " | " | " | " | 40 | " " |
| 5. | " | " | " | " | 60 | " " |
| 6. | " | " | " | " | 70 | " " |
| 7. | " | " | " | " | 80 | " " |
| 8. | " | " | " | " | 90 | " " |
| 9. | " | " | " | " | 100 | " " |
| 10. | Timing trace | .65 μ s/ \sim | | | | |

Film no 10

same set up as above:

- | | | | | | | |
|-----|-----------------|---------------------------------------|------------|---|-----|-----|
| 1. | Timing trace | .65 μ s/ \sim | | | | |
| 2. | slug pulled out | delay setting of spark unit set to 0. | Filter 1.6 | | | |
| 3. | " | " | " | " | 10 | " " |
| 4. | " | " | " | " | 20 | " " |
| 5. | " | " | " | " | 30 | " " |
| 6. | " | " | " | " | 40 | " " |
| 7. | " | " | " | " | 50 | " " |
| 8. | " | " | " | " | 60 | " " |
| 9. | " | " | " | " | 70 | " " |
| 10. | " | " | " | " | 80 | " " |
| 11. | " | " | " | " | 90 | " " |
| 12. | " | " | " | " | 100 | " " |
| 13. | " | " | " | " | 105 | " " |
| 14. | " | " | " | " | 110 | " " |
| 15. | " | " | " | " | 100 | " " |
| 16. | Timing trace | .65 μ s/ \sim | | | | |

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Sensitivity set to 50

221 April
1951
10:30
11:00
11:30

Development of print - 100

Result → P. 100

no marks on up or down side
A Heavy exposure

Keep in the following position when taken
Film no 1

1	100	100	100	100	100	100	100	100	100
2	100	100	100	100	100	100	100	100	100
3	100	100	100	100	100	100	100	100	100
4	100	100	100	100	100	100	100	100	100
5	100	100	100	100	100	100	100	100	100
6	100	100	100	100	100	100	100	100	100
7	100	100	100	100	100	100	100	100	100
8	100	100	100	100	100	100	100	100	100
9	100	100	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100	100	100

B Paper in the air

C Dillo

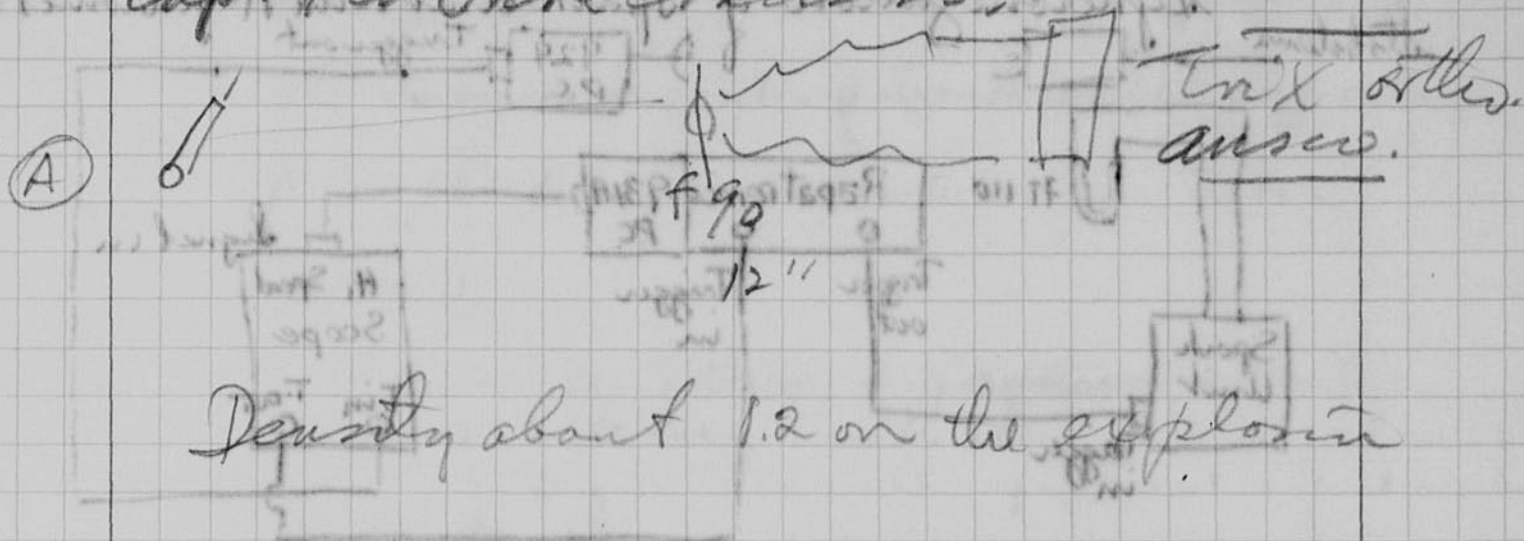
Film no 10

marks on up or down

1	100	100	100	100	100	100	100	100	100
2	100	100	100	100	100	100	100	100	100
3	100	100	100	100	100	100	100	100	100
4	100	100	100	100	100	100	100	100	100
5	100	100	100	100	100	100	100	100	100
6	100	100	100	100	100	100	100	100	100
7	100	100	100	100	100	100	100	100	100
8	100	100	100	100	100	100	100	100	100
9	100	100	100	100	100	100	100	100	100
10	100	100	100	100	100	100	100	100	100

Exposure without sleep.

capt Kid Time Gradiers.



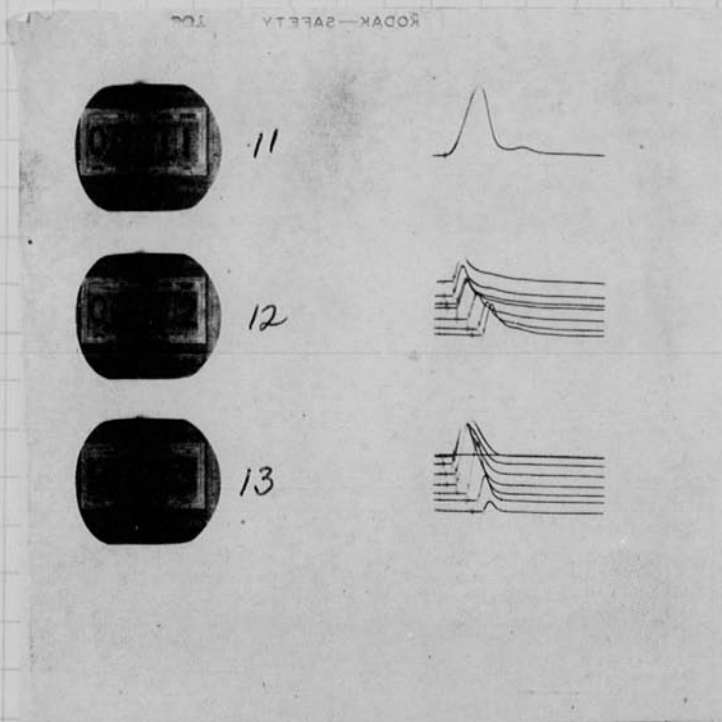
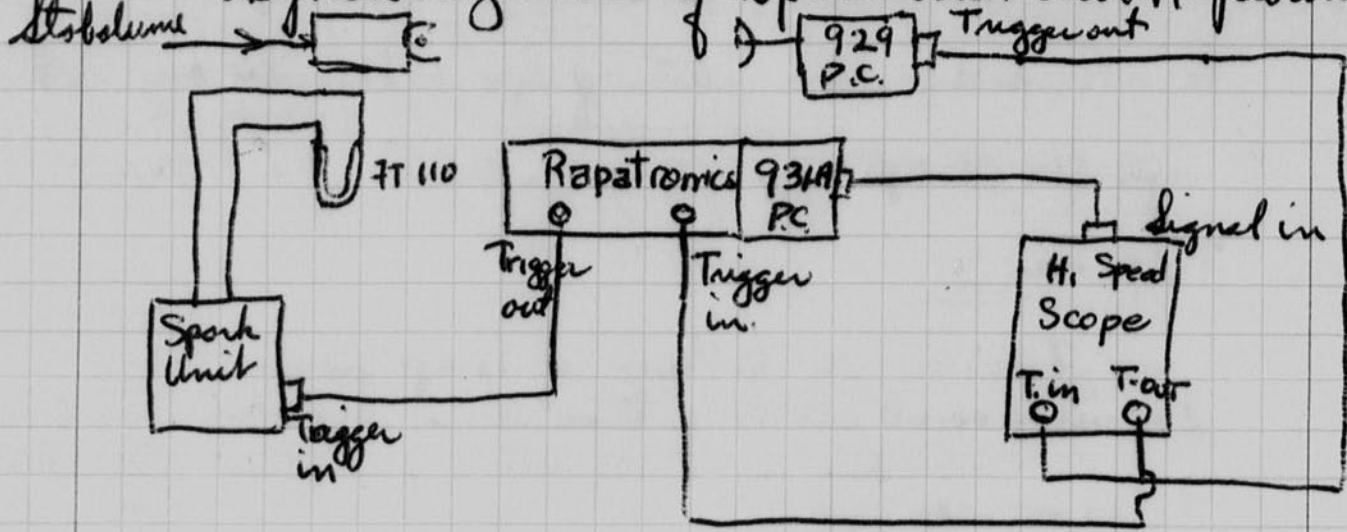
Density about 1.2 on the explosion

(B) Dilto but with 5 park and lens

C " " " " " " and
x20 filter on the
light.

Schematic of set up to get

Synchronization of Spark Unit with Rapatronics



Aug 5 1950
 H. E. Edgerton
 W. Ward
 J. Gamble

Synchronization of Spark Unit with Rapatronics

Using the set up as shown on page 72 to obtain synchronization of Spark Unit delay setting with the Rapatronics camera.

Film no 11

Film no 11 taken of Rapatronics shutter opening and closing time.

Film no 12

Using 7T-110 lamp with Spark unit and same set up as on page 72 delay setting of unit was taken: slug pulled out and double cloth over camera lens.

Delay Dial setting on Spark Unit

0 / 20 / 40 / 60 / 80 / 100 / 110

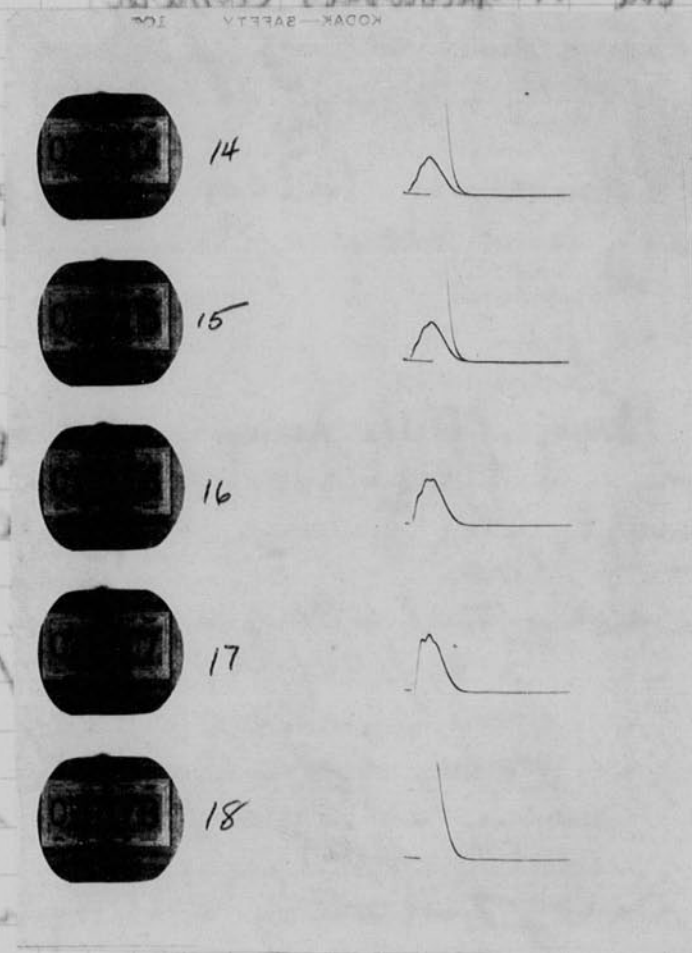
Film no 13

same set up as above but with slug in
 Delay Dial setting on Spark Unit

0 / 20 / 40 / 60 / 80 / 100 / 110

to obtain superimposition of spectra (but delay setting
 with the Ramanometer camera
 leaving the set up as shown on page 73
 superimposition of spectra (but delay setting)

Page 192
 H.C. ...
 W. ...
 ...



Film
 open
 film
 as
 film
 K.F.

... ..

... ..

... ..

... ..

0/20/100/100/100/100/100/100

Aug 5 1950
HCE
WU
Subs

Cont 1 _____

Film no 14

Same set up as on page 72. Using

FT 130 Argon lamp. Slug in.

Delay Dial setting of spark unit

0

100

Film no 15

Same as above

Delay dial setting of spark unit.

20

110

Film no 16

Same as above

Delay dial setting of spark unit

40

Film no 17

Same as above

Delay dial setting of spark unit

60

Film no 18

Same as above

Delay dial setting of spark unit

80

~~Results~~

Results: - Synchronization was obtained at a dial setting 60 in the spark unit using lamp FT 110 with Rapatronics

Synchronization was obtained at a dial setting 100 in spark unit using lamp FT 130 with Rapatronics.

CONFIDENTIAL

Copy 199
H
H
H

(Cont)
Film no 14
Same as above
FT 130 paper lamp & glass
Relay dial setting of spark unit

0
100

Film no 15

Same as above
Relay dial setting of spark unit

80
110

Film no 16

Same as above
Relay dial setting of spark unit

40

Film no 17

Same as above
Relay dial setting of spark unit

10

Film no 18

Same as above
Relay dial setting of spark unit

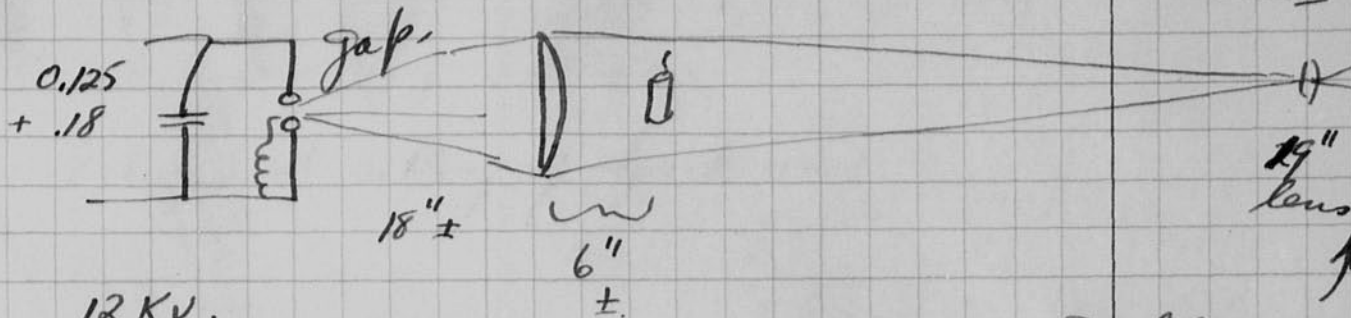
80

Relay dial setting of spark unit
FT 130 paper lamp & glass
Same as above
Relay dial setting of spark unit

Aug 5 1950
HEE
W W
S W

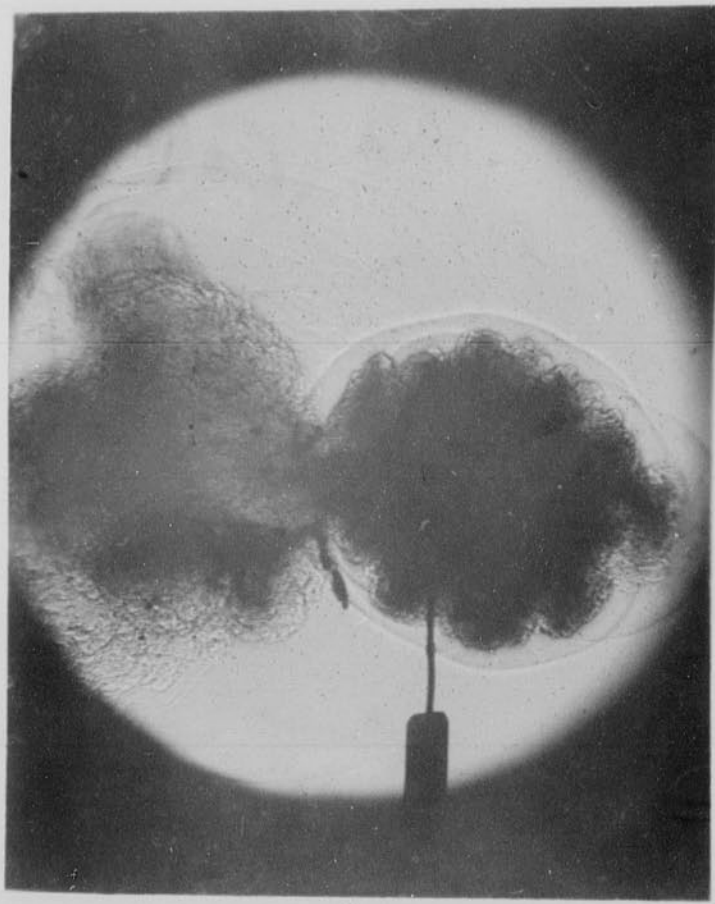
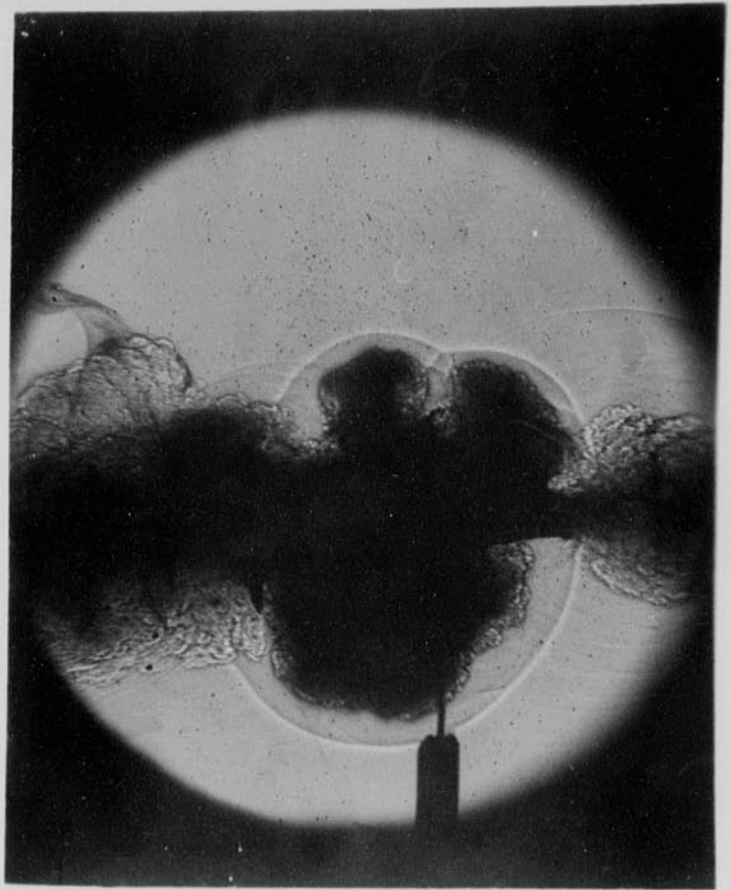
Picture taking with Papatronics

6x03
6
.18



↑ Has delay in sparks
to sync with
Papatronics camera.

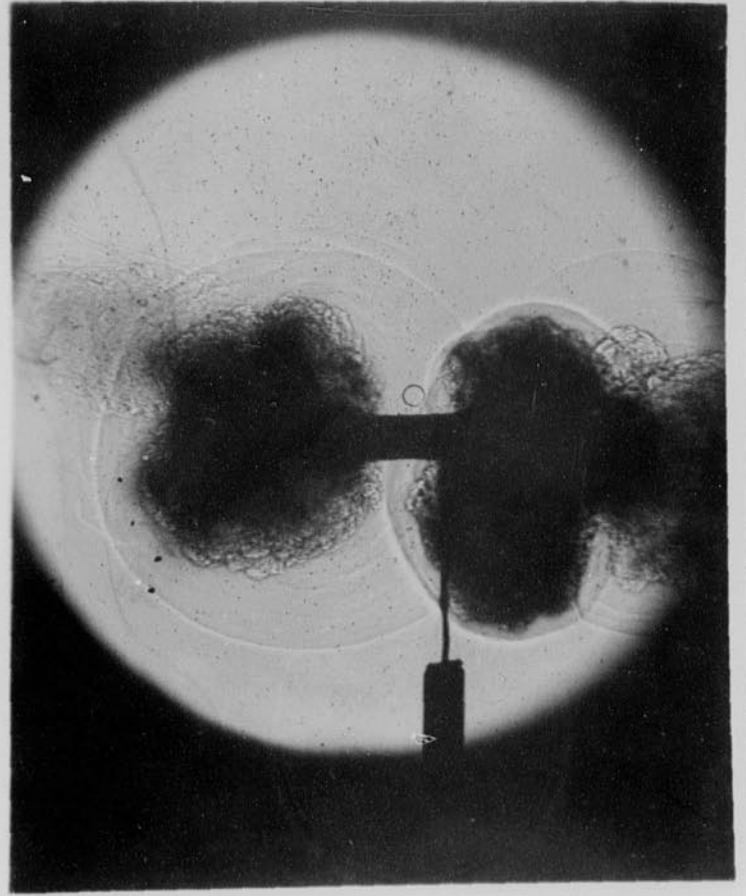
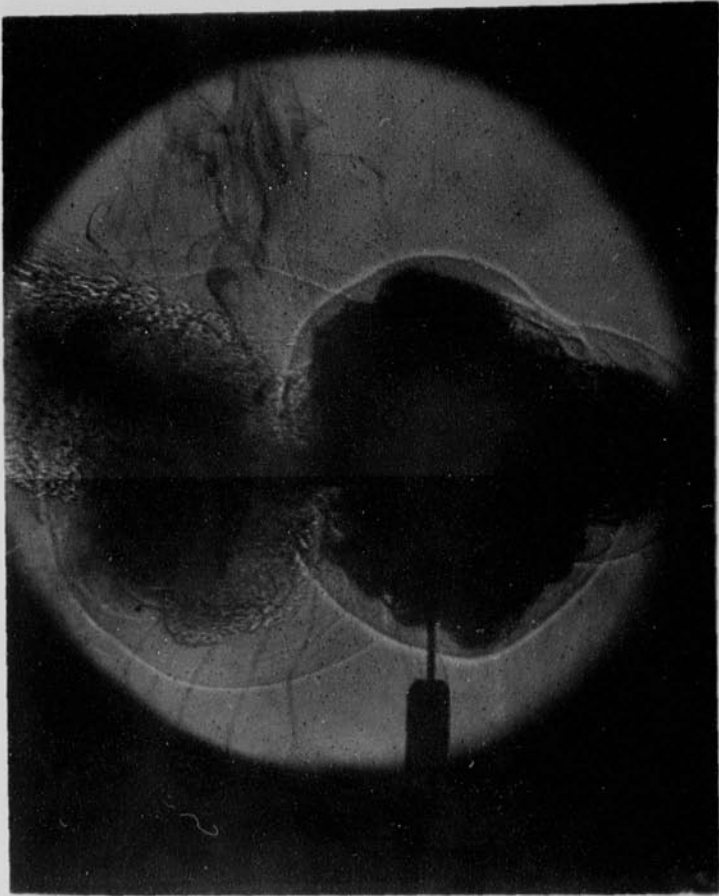
Double
Papatronics
slug set
for 5 us.
output



Capt Kidd
Firecracker.

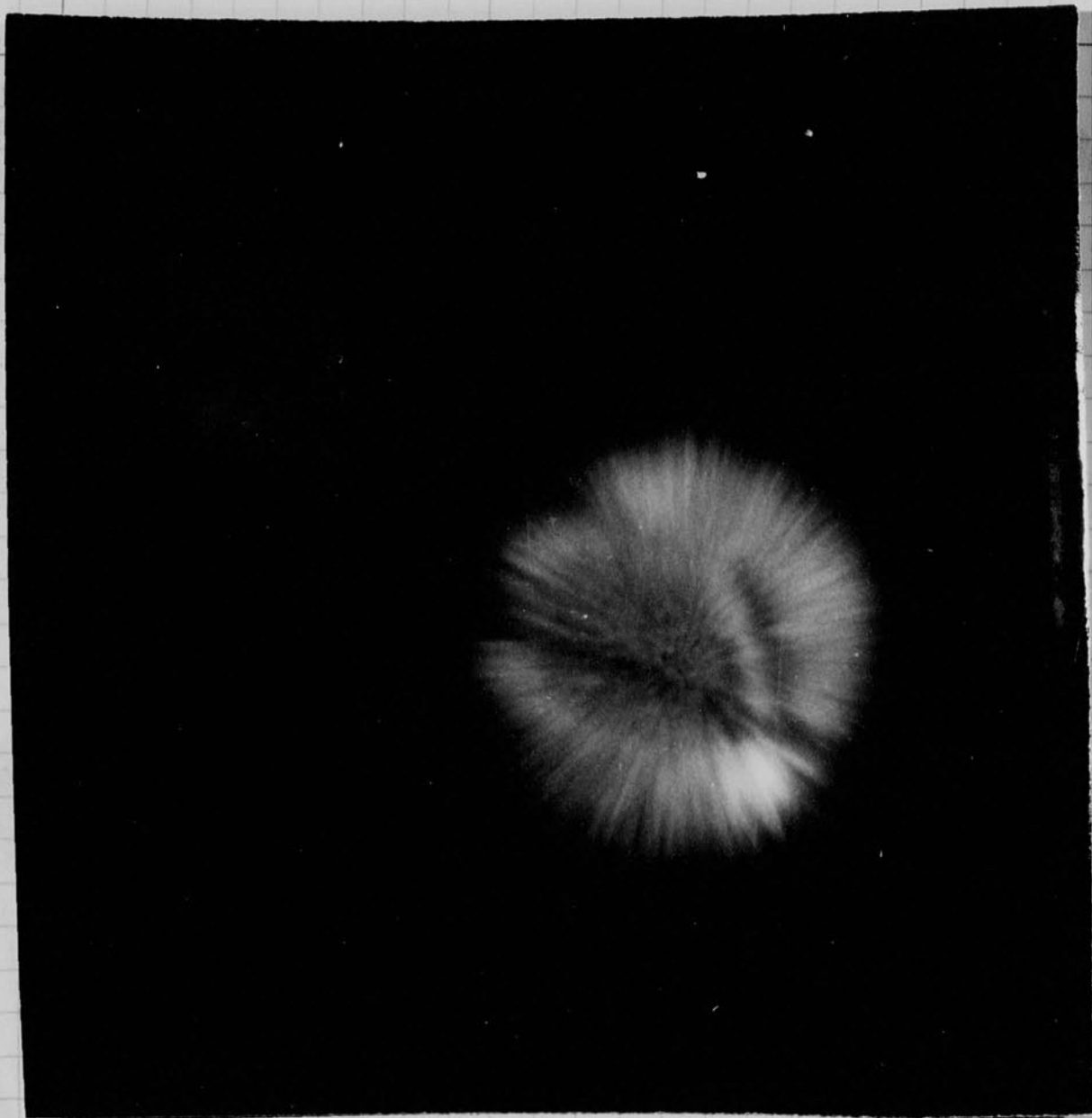
CONFIDENTIAL

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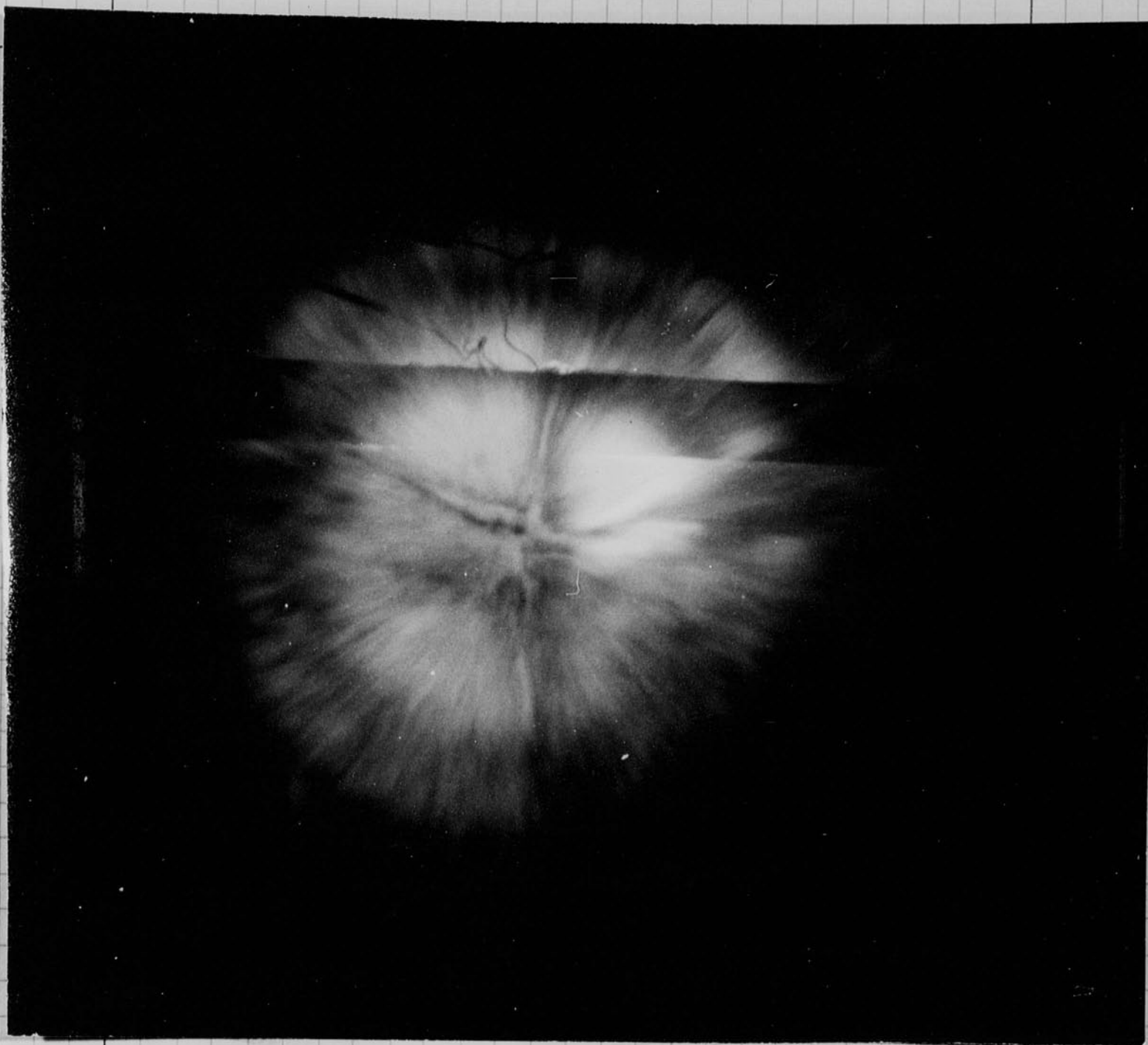
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Pentolite sphere 1" diam
Photographed at Aberdeen Md,
Dr. Jane Dewey's lab
Milton Sultanoff

CONFIDENTIAL



a three face photo taken at Aberdeen Md.



Aug. 9 1950
H.C. Edgerton
W. Ward
2 Fellows from Dupont
Firing jet
Program
Davis O.C.

Picture taking with Repatronics of
20" lens Film 21A Repatronics Delay 0 Zero delay
12" lens 1A 10µs
No slide pulled

Focus of Camera

Film no

2 — 12" lens Film no 4415
17 — 20" lens. Film no 4416

Couldn't put slide in → 20" lens Film pack no 21A Repatronics delay Zero delay Film no

Firing jet 12" lens 1A 10µs
16-A Dupont Jetperforator

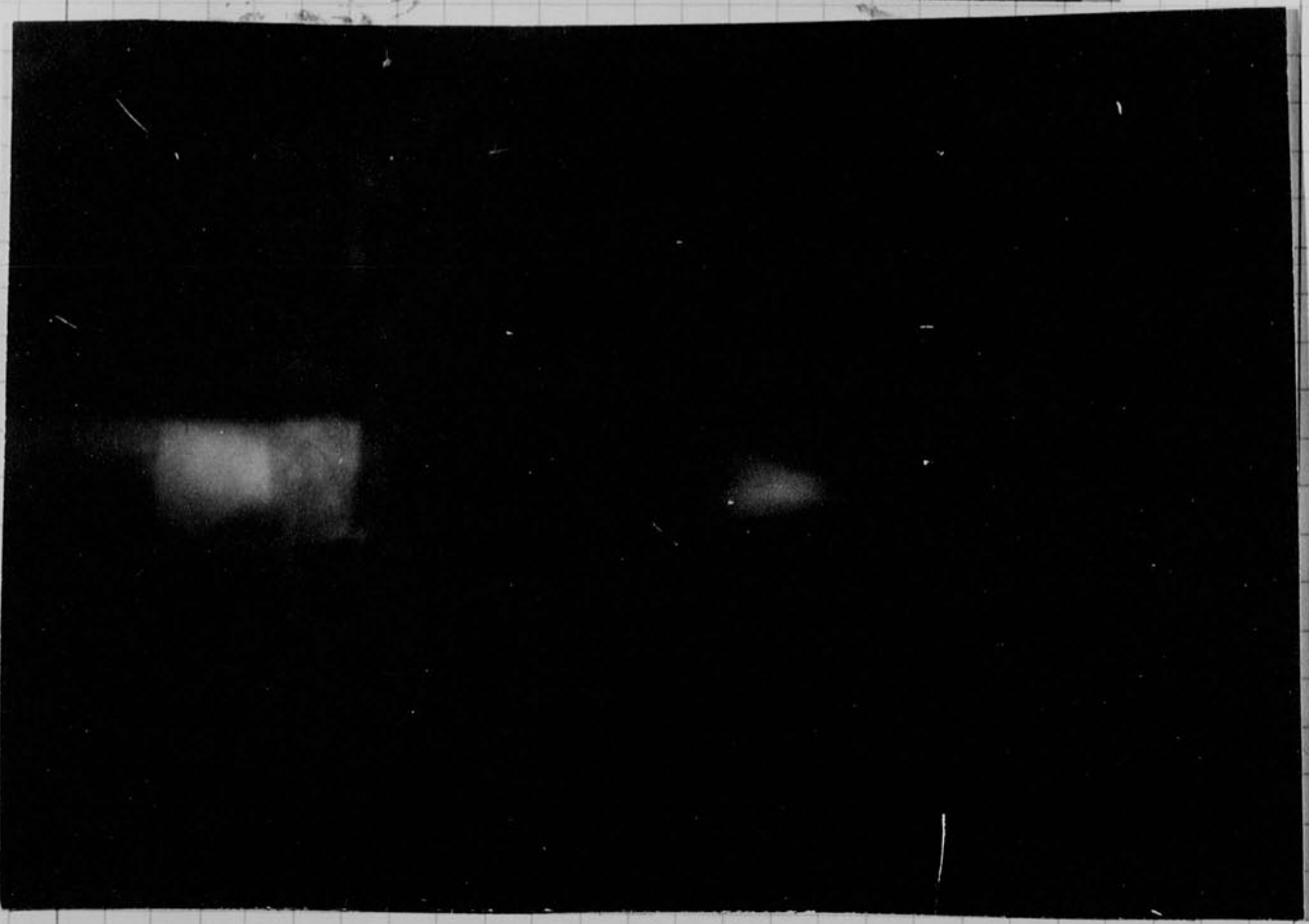
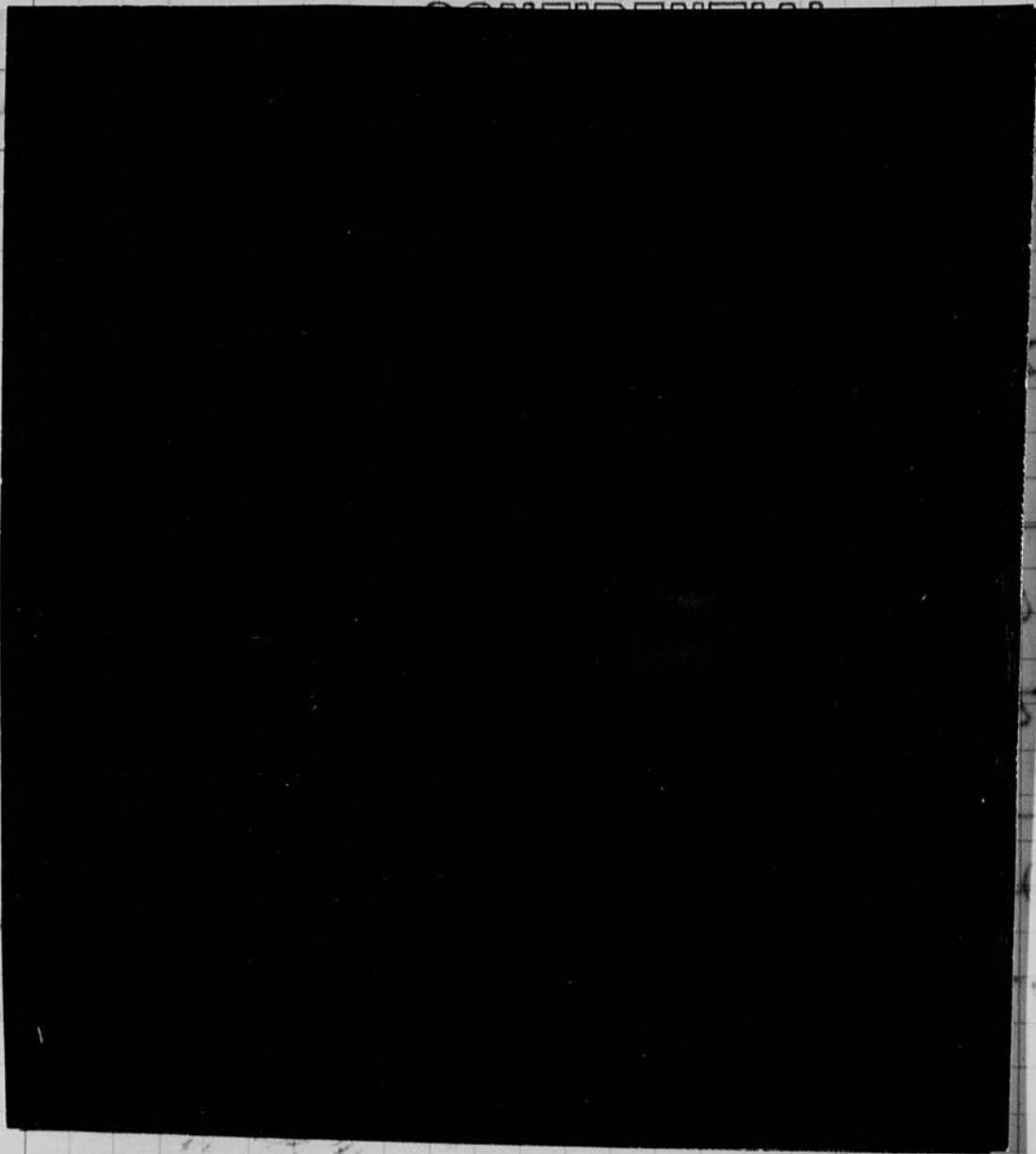
Focus 20" Film no 23 5420 Repatronics delay
12" 13 5418 " "

Agatronics Delay

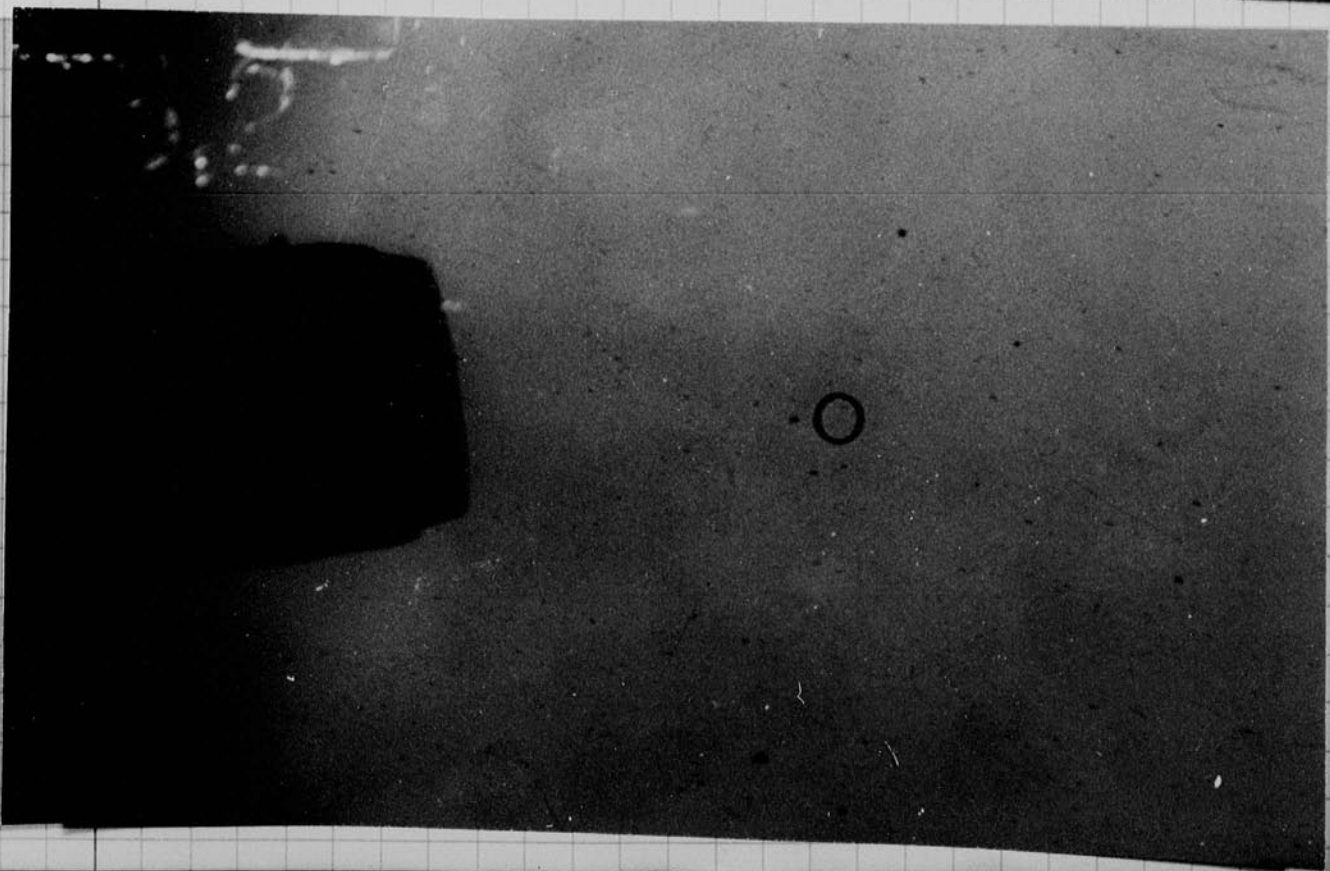
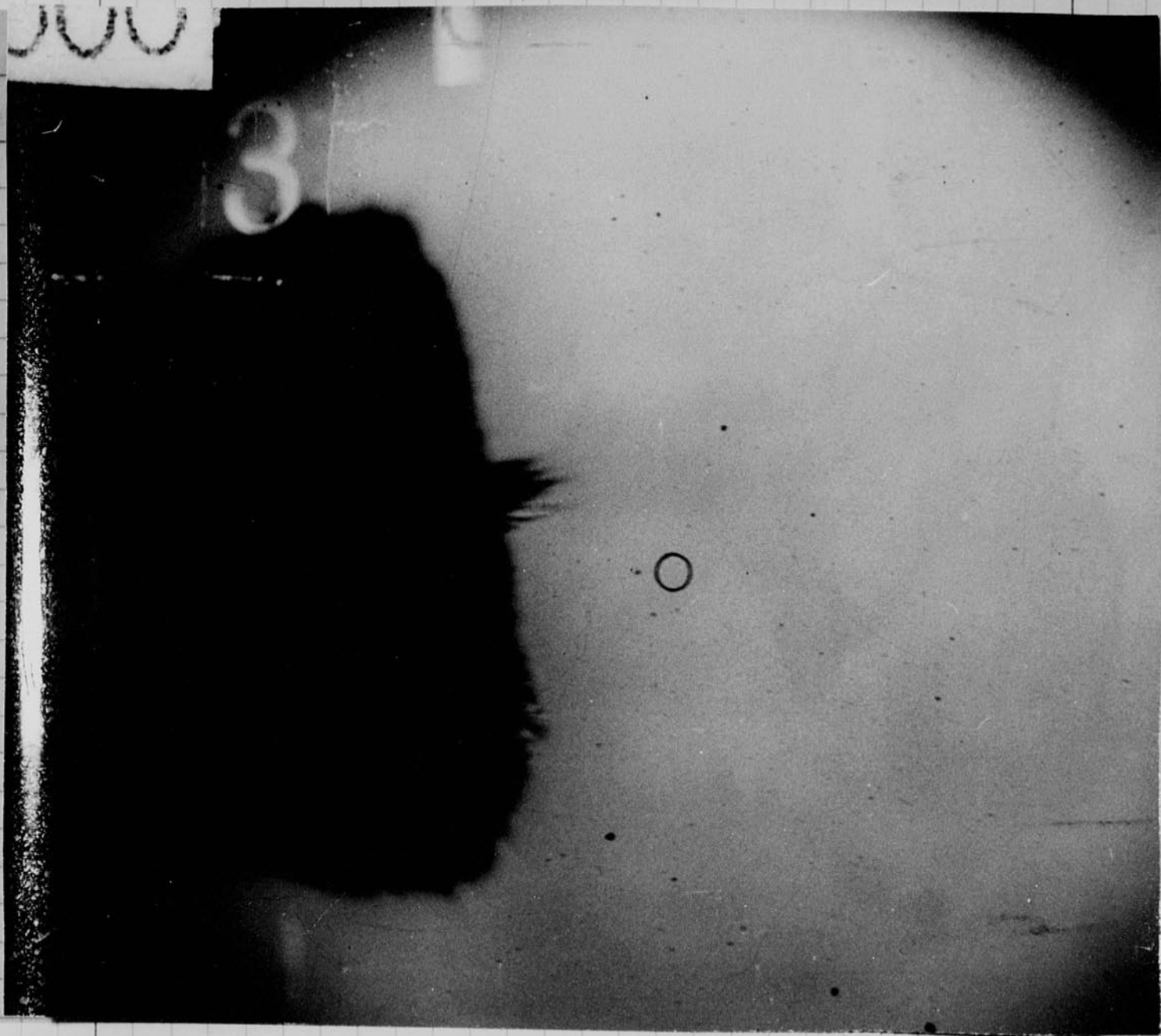
jet	20" lens	Film pack no		Delay
Firing	12" lens	24	5421	10 μ s
		14	5419	15 μ s

Focus	20"	5	5422	Zero delay
	12"	5A		Zero delay

jet firing	20" Film no	.6 Spark gap fired	zero delay
	5423		
	12"	6A	zero delay

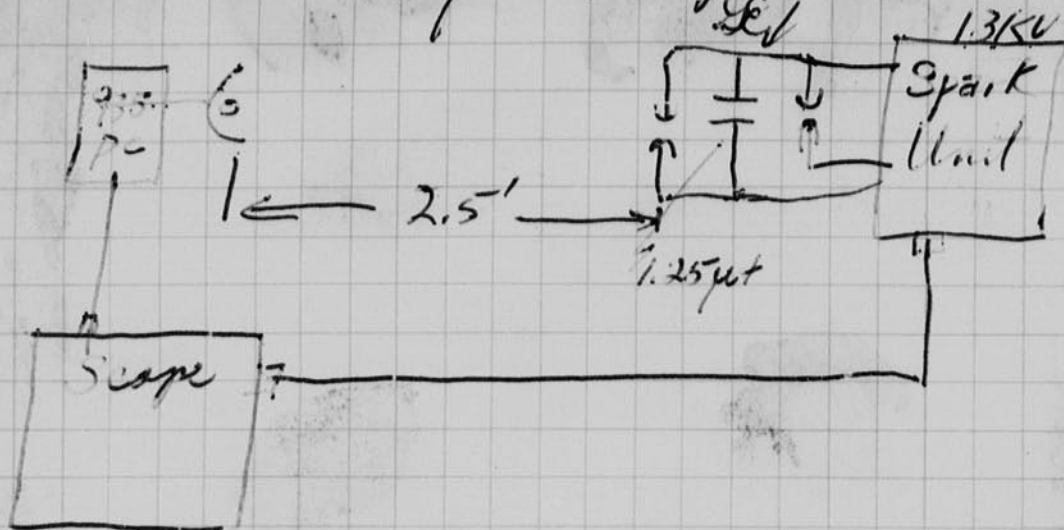


[Faint, illegible handwritten notes and scribbles are visible in the background on the grid paper, including some numbers and lines.]



CONFIDENTIAL

Schematic of set up Condenser



CONFIDENTIAL

Oct. 3, 1950

CONFIDENTIAL

89

~~Aug 14 1950~~ H. G. Gjesten
Soc. Gabriel
Bill Ward.

Finished Land-Polaroid camera
with the Papatronie shutter f2 2" lens.

Focus chart

Setting

Focus new scale.

∞

36"

15

18"

8

13.5"

5

9.5"

3.5

7.5"

A series of photos were taken of the FT-617 with 600 mf at 4000 volts. The damping resistor was used in the coil driver. Exposure was adequate at f11 with the damped coil. The light at 0 delay showed a thin filament of light in the tube. at 150 μ s the lamp showed a peak output. at 500 μ s the light was decreasing.

A series was taken of the SM chemical flash bulb. The damping resistance was removed to increase the exposure time. up to 2 millisees at f2 there was no appreciable light. then the light rapidly grew to a peak at 6 ms. (our calibration could have been 5)

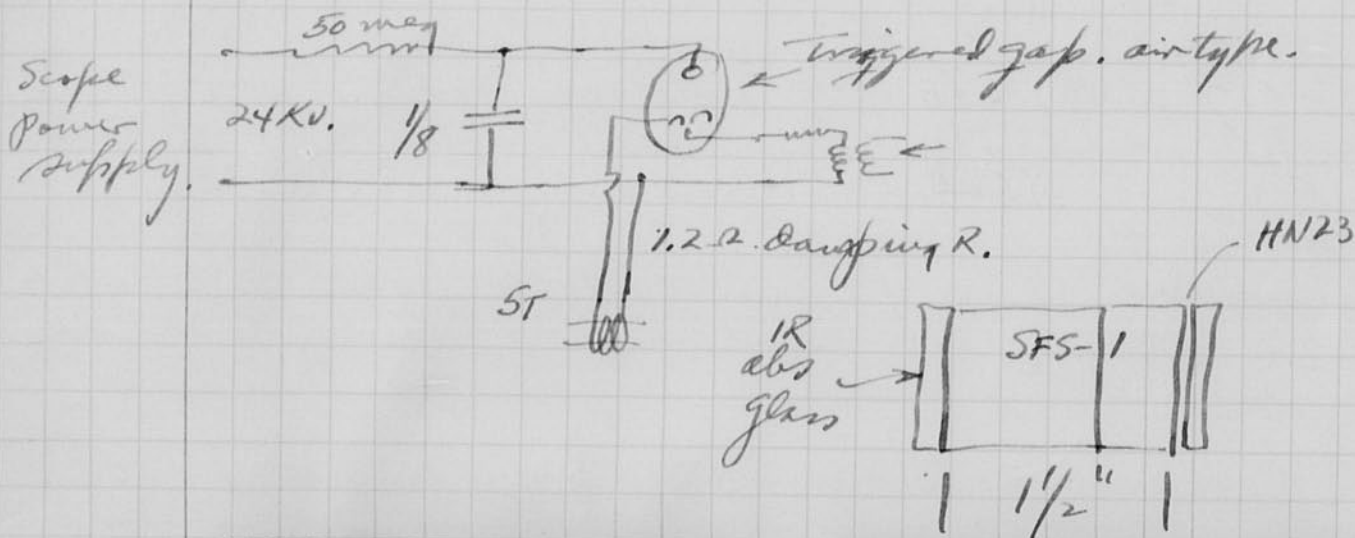
Similar photos were made of a #22 flash bulb. Peak came at 17+ms. 7ms showed the fire growing in the bulb.

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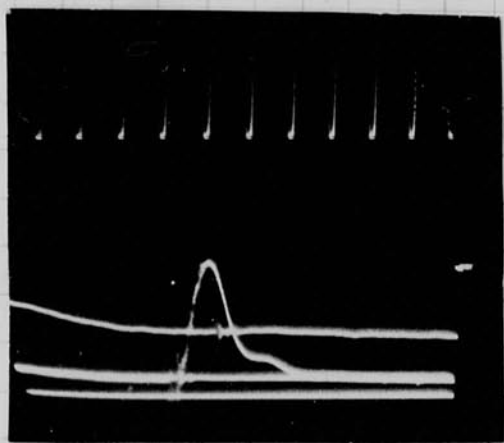
A repitronic shutter with about 1 μ s exposure has been developed during the past month with the help of Bill Ward and Bill Mc Roberts.

The Fordoy shutter part consists of a 2 1/2" length of Schott glass # SFS-1 of 1" in diameter, a polaroid HN23 is cemented under a cover glass on one end and an infra red absorbing glass is used as the other cover glass.

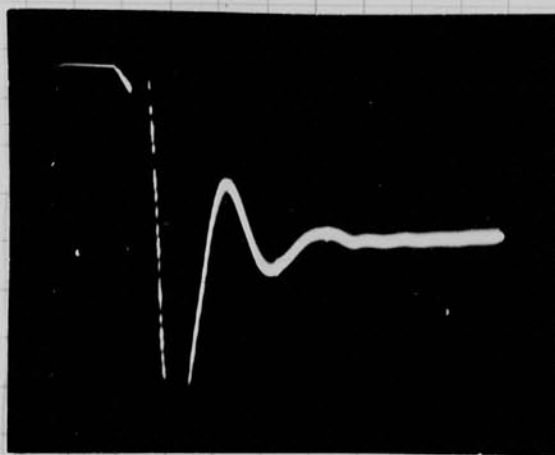
The circuit below drives the coil



1 mega
cble.

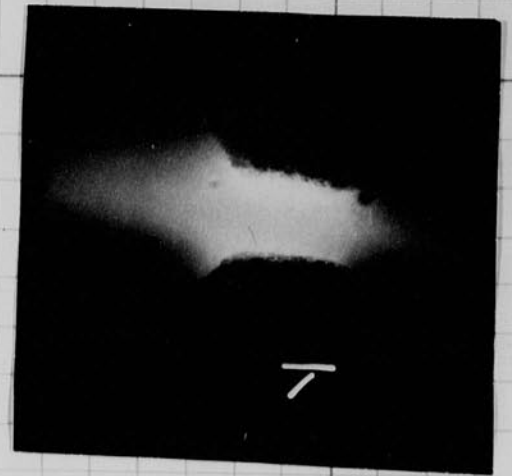
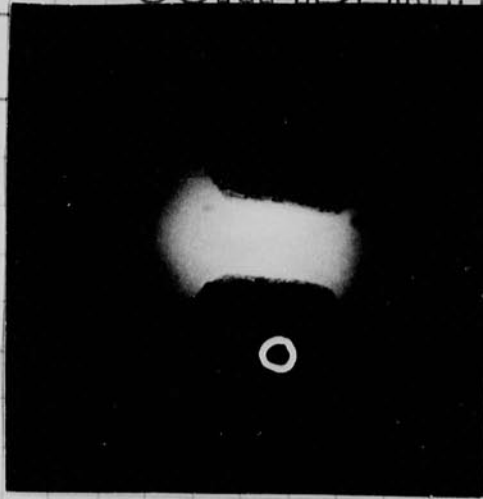


Shutter open curve.



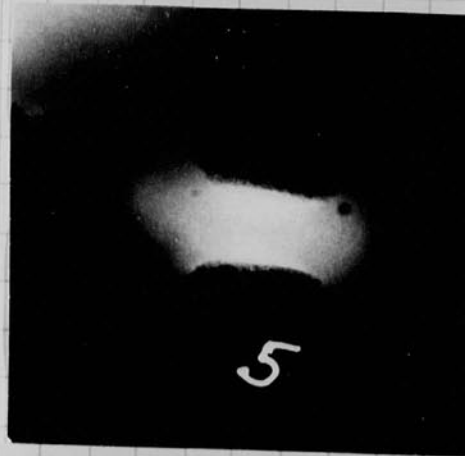
capacitor
Shutter voltage curve.
0.3 mc approx freq.

Zero time delay.



Total integrated light of the spark.

dial



Spark gap
4 mf 6000 volts.

dial



approx
4 microseconds
delay.

dial.



Notebook # Dec. 8, 1948 - April 8, 1951

Filming and Separation Record

___ unmounted photograph(s)

___ negative strip(s)

3 unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 90 and 91.

Item(s) now housed in accompanying folder.

Log Recording of Light from High Explosive.

This report describes a method of recording the light output of a high-explosive charge as a function of time. A photomultiplier tube ~~with~~ is connected so that the output response is a log function of the light input. Conventional cathode-ray oscillographic apparatus is used to record the resulting voltage.

It was found that a type 931A photomultiplier tube when connected as shown in the accompanying diagram would produce a voltage that is a log function of the light input. Calibration was made with a flash tube (type FT-214) operated from a 5 mfd capacitor charged to 2000 volts. This flash tube has a peak output of about 10^6 candle power with a temperature of about 7000 degrees Kelvin. The tube at a 3.3 meter distance from the photomultiplier tube produced an intensity of

$$E = \frac{10^6}{3.3^2} = 10^5 \text{ meter candles} \quad \text{or lumens per square meter.}$$

The area of the P.M. tube is $\frac{1}{4}$ sq inch

$$\text{or } \frac{1}{4} \times \left(\frac{1}{144}\right) \times (.305)^2 = 16 \times 10^{-4} \text{ sq meters.}$$

Neutral density filters of density 1, 2, 3 and 4 were used to decrease the light input to the photomultiplier tube. Oscillograms were taken to show the ~~deflection~~ ~~the~~ voltage output.

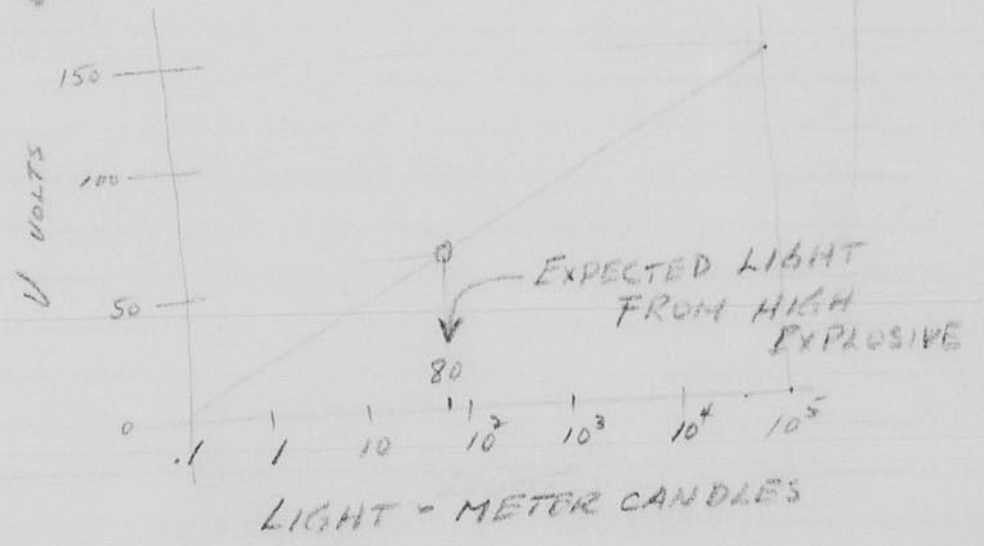
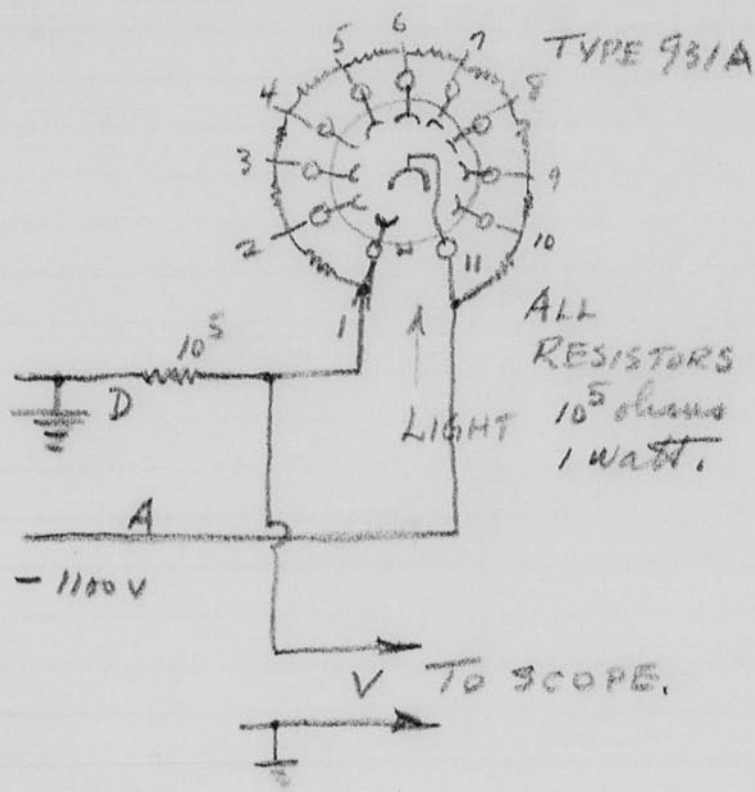
Dr. Fussell calculates that ~~the~~ the received light at a 5 kilometer distance from the explosion will produce a light output of about 80 meter candles

under the following assumptions.

Distance 5 kilometers
level 2 tons
diam 1.3 meters.
temp. 5000 degrees

The voltage output of the pm tube at 5 kilometers thus should be about 50 volts under the above conditions. Due to the log presentation, light values of 100 greater or less can be detected.
(than this median value)

$$\frac{100}{10^3} = 10^{-3}$$



Light transmission

$1\frac{1}{2}$ " SFS-1 Shutter

	mm	units
Open 1 HN23	2.5×1000	2500

Assume HN23 absorbs

75% of light

Open calc. no polaroids	417500	10,000
-------------------------	--------	--------

Closed	.6 x 1	.6
--------	--------	----

Open electrical	4.5×100	450.
-----------------	------------------	------

$$\text{Ratio } \frac{\text{open elect (peak)}}{\text{closed}} = \frac{450}{.6} = 750$$

$$\text{Ratio } \frac{\text{no opt. shutter}}{\text{open shutter (peak) elect.}} = \frac{10,000}{450} = 2.2$$

HEEg
Feb 16 1951

CONFIDENTIAL

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H.E. Light from subject - Data from Fussel Feb 14 1951
Barc P.M. tube at 5 kilometers early level

Check data from Fussel

Energy on cathode = 2×10^{-5} watts of photo multiplier

Convert to lumen = 1 watt = 650 lumens,

1300×10^{-5} lumens on cathode of P.M. tube
 1.3×10^{-2} " " " " "

$\frac{1.3 \times 10^{-2}}{2.5 \times 1/144} = 82$
meter candles
at cathode

From 931 A data Sens at 100 volts / stage	= 20 amp / lumen
75 " / stage	= 3 amp / lumen
50	.18 "
25 $\times 10 = 250$.002 "

cathode area = 0.25 sq inch = $\frac{.25}{12^2}$ sq ft = $.17 \times 10^{-2}$ sq ft.

(Try for a source) ^{FT} 220 tube in stolobine. \rightarrow 10^3 c.p. beam peak.
at 10 feet $E = \frac{10^3}{10^2} = 10^5$ ft candles
= 10^5 lumens / sq ft

on cathode $10^5 \times .17 \times 10^{-2} = .17 \times 10^3$ lumens.
= 1.7×10^2 lumens

This is 10⁴ too much.

Try a bare ^{FT} 214 with 10^6 c.p. peak
at 10 ft $E = \frac{10^6}{10^2} = 10^4$ ft candles

on cathode $E = 1.7 \times 10^{-1} = 0.17$ lumens.
10³ too much.

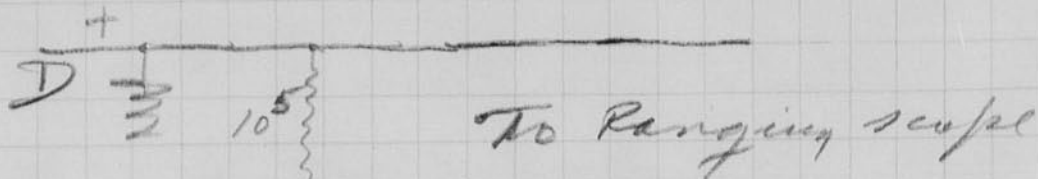
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Feb 17 1951 MIT

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H. E. Gerton
John Mills.

Non Linear Pickup.

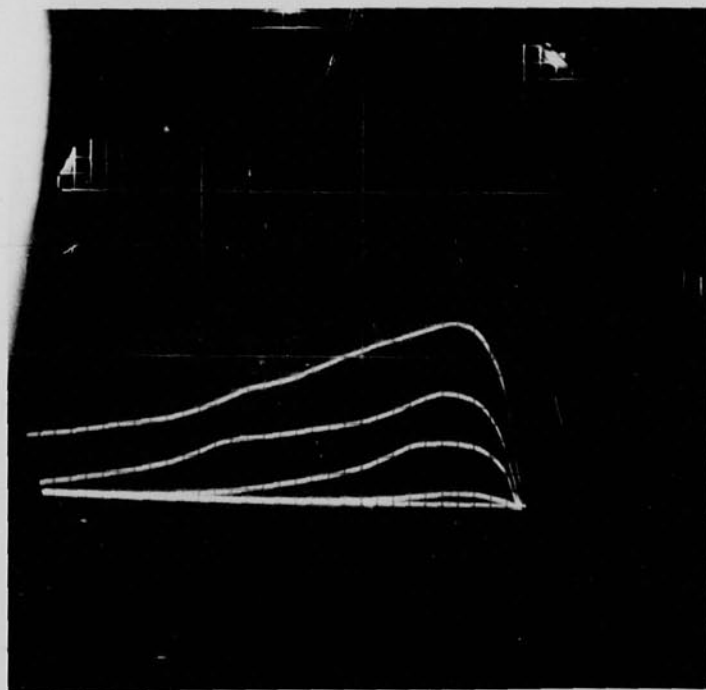


A
-1100
volts
931A Photo mult.

10 ft.

FT 214
5 mt
2000V
approx 10.6
peak C.P.

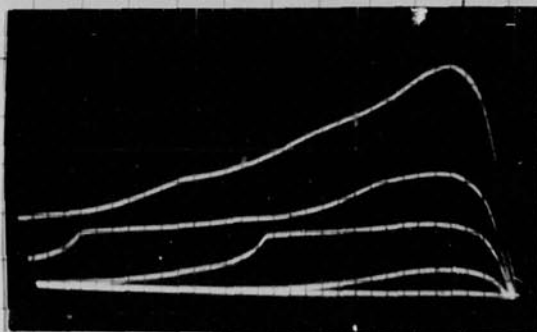
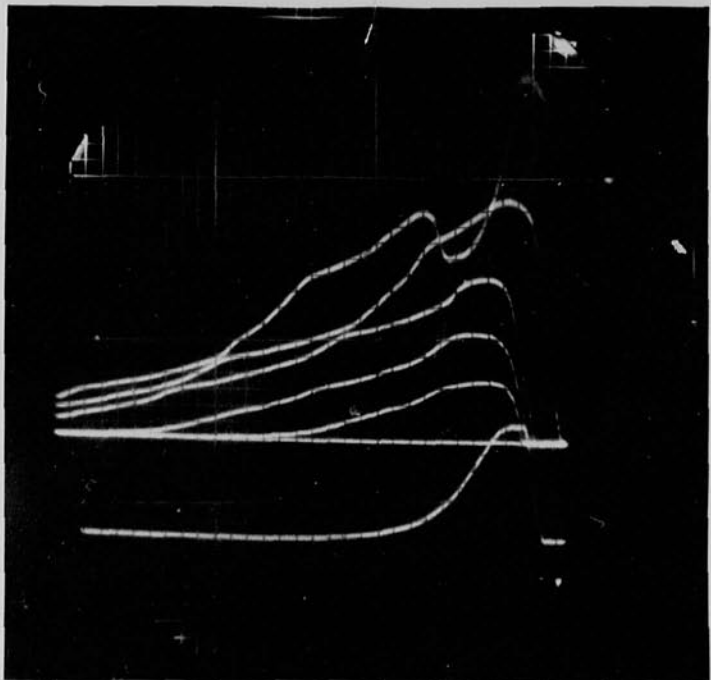
Photograms were taken of the
oscilloscope on a 300 us sweep with the
Demund Ranging Scope # 256D # 244



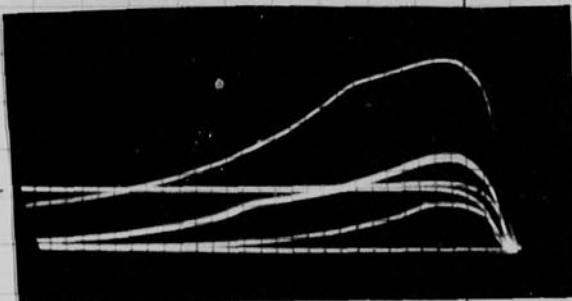
↑ Light x10
for each curve.

← TIME 300 μ S.

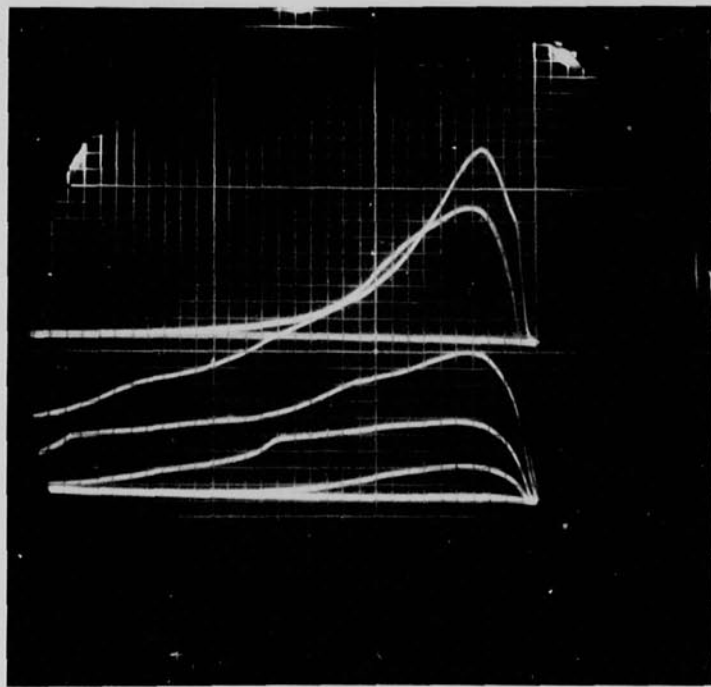
CONFIDENTIAL



Kinks
 ← 5mf
 2500v

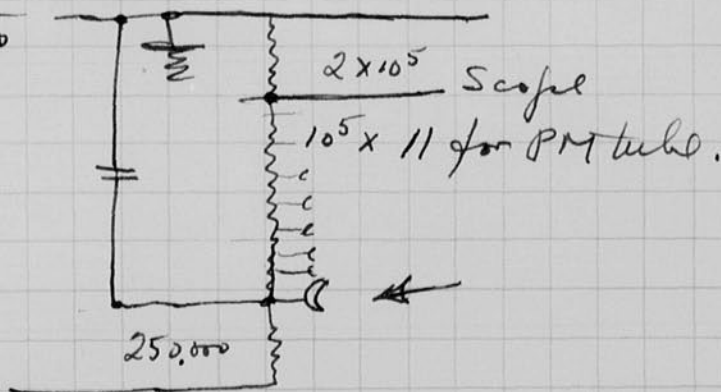


Holdover.



10.5mf.
 2000v.

Circuit changed to



March 17 1951

CONFIDENTIAL

James E. Edgerton

The trip to here was completed on Tues Mar. 13 via the General E. D. Patrick (ship) from Honolulu. We are established in a camp on Parry Island. For the past few days we have been looking for and unpacking our boxes from Boston.

I made two trips to Lunit where some action is contemplated shortly. Our group have three photo towers to activate at this location about 2 miles from the center. One of these 75' high towers is located on a reef south east of the X spot. It is here that the 1 us repatriation will be located.

The 1 us repatriation was set up yesterday for a lab check. A FT-110 was used for a subject. A 90mm lens was used.

at f 12.5 the direct light from the arc was enough to give an exposure with the polaroids crossed.

The wire shutter at 2600 volts was ok to cut off the light from the green flash and enable one to shoot a ~~4 to 5~~ 1 us photo of the arc in the tube.

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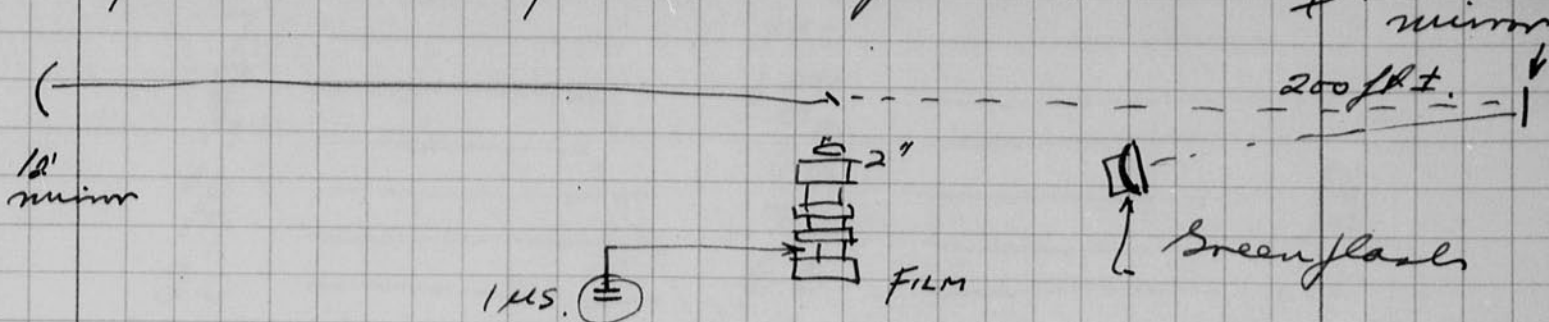
March 19 1951

H.E. Edgerton Parry Island

CONFIDENTIAL

97

Set up mirror as per sketch last night and afternoon. Took photos in aft. and evening.



My phototube trigger was used to flash the shutter. The most sensitive setting was 5 and the least was 1. Apparently the exposure is about the same on each.

A faint ^{*} exposure was recorded from the Green flash. A $5/32$ " image was on the film of the 5" diam reflector * with the repatronie shutter closed. Exposure seemed to be about right with the trigger operation.

I also set up a fid marker trigger and increased the capacitor from 50 uuf to ~~50~~ 1000 uuf. so the ~~short~~ long slow lights would trigger the equipment.

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Aug 16/1950

Film pack no	Setting of Delay	Film no punched
7	110	7
8	100	8
15	90	15
16	80	16
19	70	19
20	60	20

Gaps breaking over
Gap F-8 lower breakdown was

Cam #2 second gap
Gap F-9 - First gap

New Gaps in

Cam #2 First gap F-4
Second gap F-14
16 Aug 50
← changed 17 Aug
to F-3 due to
filler.

Camera #1 Removing Gaps First gap # F-22
Second gap # F-3

Aug 17, 1950

Replacing Gaps First gap # F-1
Second gap # F-2

Aug 10/1980

Temperature	Altitude of Gap	Wind
80	20	10
80	20	10
80	20	10
80	20	10
80	20	10
80	20	10

Gap F-8 lower breakdown
 second gap
 Gap F-1 - first gap

then gaps in
 first gap F-4
 second gap F-14

Course #1 Remaining gaps first gap # F-12
 second gap # F-3

Remaining gaps first gap # F-1
 second gap # F-3

Aug 18 1950

Gap ~~is~~ changed in Camera #2
First gap

CONFIDENTIAL

Photos of microsecond Repetitive
taken by Crook at Parry Island
Eriwetok March 1951

Entire setup. B 488-1

Camera closeups B 488-2

Loris Gardner in charge of photo dept.

CONFIDENTIAL

Aug 19, 1950

Light Output



spark unit
 spark source,
 and an

← 10' mirror

spark unit only
 using

FT-130 Flash lamp.
 Photo pick up
 3' away using
 1.6 filter

Picture 00116 } Light output from FT-130 Flash lamp
 in series with spark unit and 3-plate
 condensers with twisted pair of leads on
 spark unit. Photo pick up 3' away
 using 2-x10 and 1-x2 filters

Picture 00117 } Light output from FT-130 Flash lamp
 in series with spark unit and 3-plate
 condensers with 16" approx of Rg 54 A/U
 cable and connector. Photo pick up 3' away
 using 2-x10 and 1-x2 filters.

No change was noticed in light duration
 between pictures 00116 and 00117 of twisted pair
 of leads as compared to 16" of Rg 54 A/U cable and
 connector.

Notebook # Dec. 8, 1948 - April 8, 1951

Filming and Separation Record

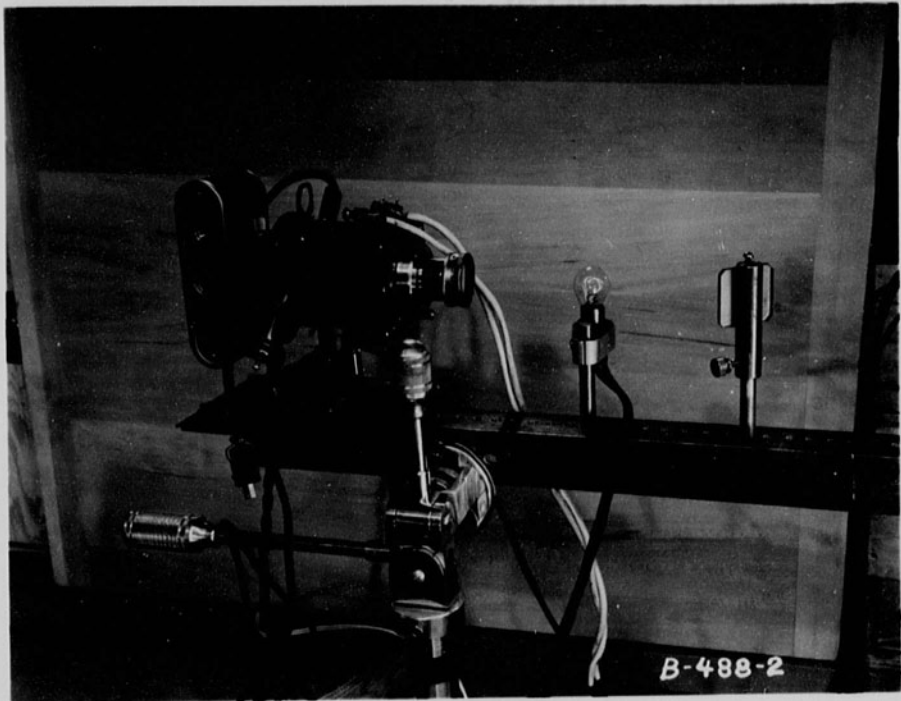
4 unmounted photograph(s)

___ negative strip(s)

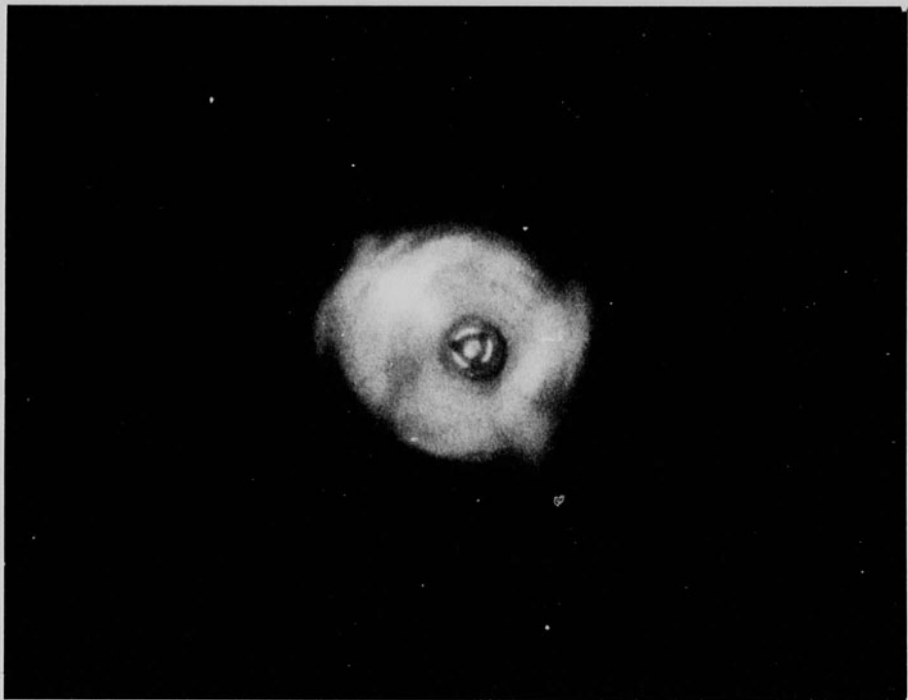
___ unmounted page(s)
(notes, drawings, letters, etc.)

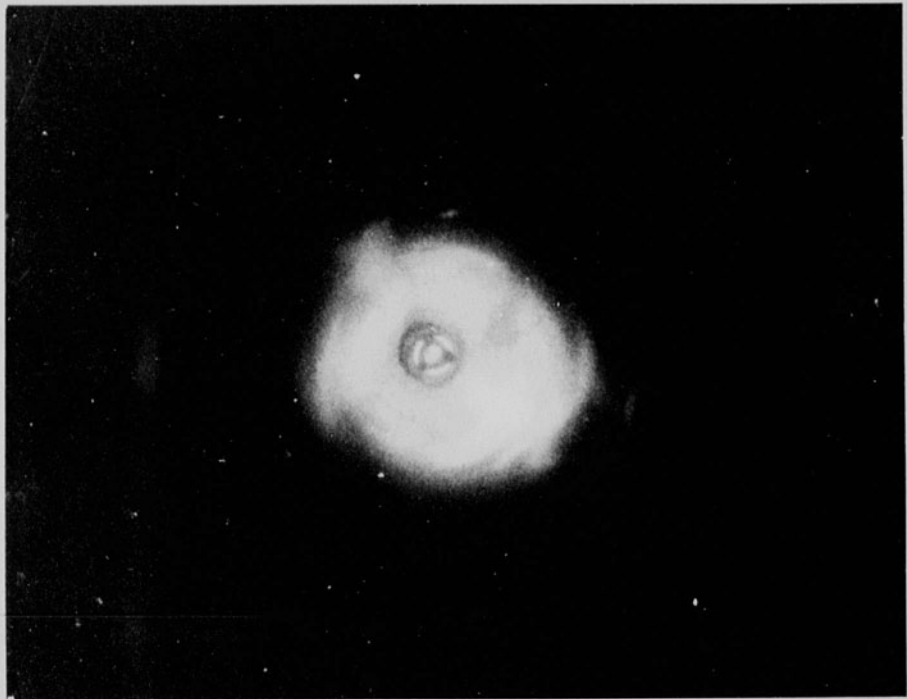
was/were filmed where originally located between page 102 and 103.

Item(s) now housed in accompanying folder.



B-488-2







Notebook # Dec. 8, 1948 - April 8, 1951

Filming and Separation Record

___ unmounted photograph(s)

___ negative strip(s)

1 unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 104 and 105.

Item(s) now housed in accompanying folder.

HE Edgerton
Feb 13 1951

Data from Russell



Sandstone.

1200 meter

1 lumen/sq cm
at the 1 km level.

5 kilometers

50 KT

5 kilometers
no later than 500 T

2 tons high exp. 5000° K.

1.3 meters diam

Radius 1.3 meter

Area = $4\pi 1.3^2 = 21.20$ sq meters.

at 5000° -

radiated 3.5×10^7 watts sq meter.

3.5 .5 4

3.3 16.1 -

12.8% in band.

$3.5 \times 12.8 = .45 \times 10^7$ watts sq meter.

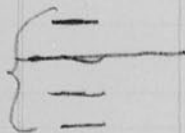
$4.5 \times 10^6 \times 20.2 = 9.5 \times 10^7 = 10^8$ watts.

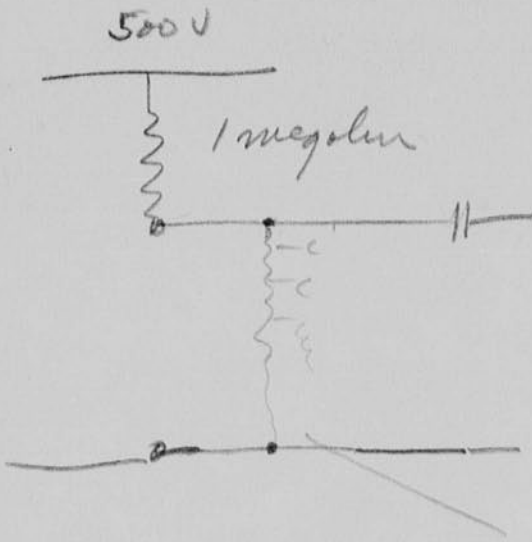
at 5000 meters, $\frac{10^8}{4\pi 5000^2} \times \frac{1}{3} = \frac{1}{10}$ watt sq meter

area of 931 cathode = 2 cm^2

2×10^{-5} watts on cathode.

= 10^{-5} watts/sq cm





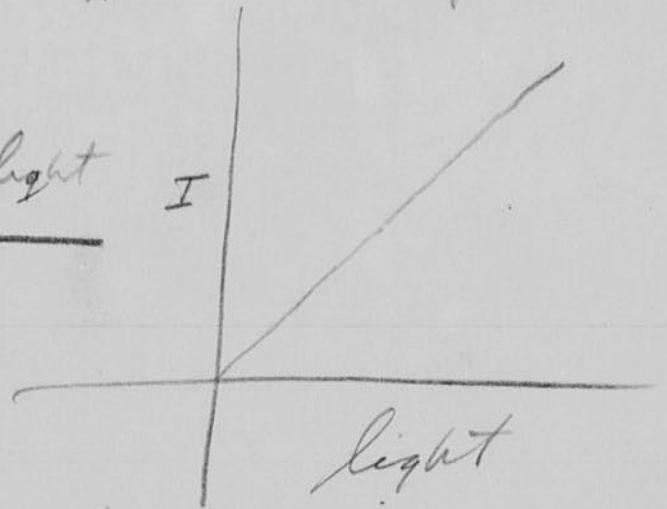
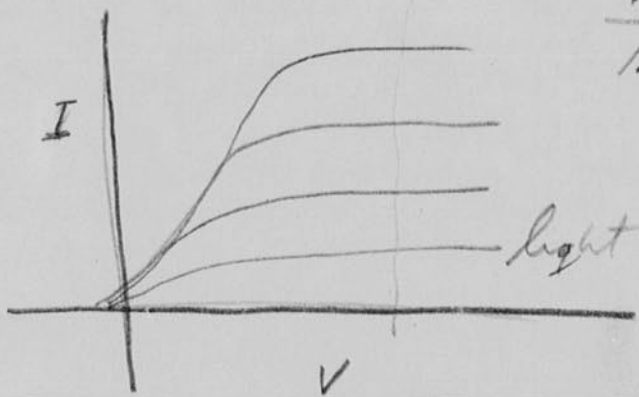
$20 \times .01$
 100 $.2 \text{ amp.}$
 75 $.02 \text{ amp.}$
 50 $.002$
 25 $.0002 \text{ amp.}$

$$\frac{10^7}{10^2} = 10^5 \text{ lumens/sq ft.}$$

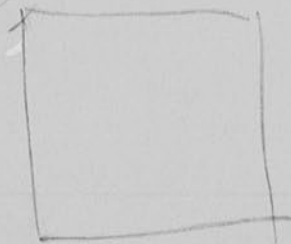
area of cathode = .25 sq inch
 $15/16 \times 5/16$

$$\frac{65}{250}$$

$$\frac{125}{12^2} = .173 \times 10^{-2} \text{ sq ft.}$$



$10 \times 10 \text{ sq ft.}$
 $10 \times 10 \text{ sq ft.}$
 $10 \times 10 \text{ sq ft.}$
 $E = \frac{10 \text{ W}}{(15000)^2} = \frac{10^3}{2.2} = 400 \text{ lumens/sq ft.}$
 $\sqrt{100} = 10 \text{ inch}$
 3 inch



3"

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Mar 21 1951
Harold S Edgerton
Perry Gniwetok

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Chas Wyckoff, Joe Bryant,
Tom Mullins.

Exposure tests were made last night with the sun flash at the air port into the test area.

The 1 us shutter was used on the dived image of the FT 623 in a 30 inch reflector.

A Fid marker was used to trigger the 1 us magneto optic shutter. I used a ND2 filter on the front of the pickup snout.

Alignment was made by observing the output from a photo flood at the air port. With out the filter, the current was slightly less than 200 ma.

Tan of angle =

$$\frac{15'' \times \frac{1}{39}}{1000 \text{ meters}} \approx \frac{1}{2000}$$

The bomb at a 3 meter diameter would give the same solid angle at 6 times the distance - 6000 meters.

Light output at 3 meter R = 10¹⁰ lumens/sq meter
(Data from Fusell) 1 us time.

High exploding light data from Los Alamos curve from Felt to Graves.

at 120 us - average surface brightness
= 2000 candles/meter²
or 20,000 lumens/sq meter.

Suitable exposure resulted from a 0.4 setting of p.m. gain and a ND.2 on the fid PM tube.

I plan to use the same settings on the actual test.

FT-623 output with 600 nF at 4000 volts
= 300 x 10⁶ lumens

area of lamps = 1/20 sq meter (approx).

surface lum = 6000 x 10⁶ lumens/sq meter
= 6 x 10¹⁰ lumens/sq meter.

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March 26 1951
 Harold E. Edgerton

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Grid Repetition. Delay Calc.

Pattern at min radius = .008" between dots.
 10 dots in pattern. = .08"

$$\text{diameter} = 6.75" \times 2$$

$$\text{circumference} = 2\pi R = 42 \text{ inches}$$

$$\text{speed} = 300 \text{ rps min}$$

or 5 r.p.s

$$\text{velocity} = 42 \times 5 = 2100 \text{ inches/sec.}$$

pattern repeat time

$$= 2100 \times \frac{1}{08} = 2620 \frac{1}{\text{sec.}}$$

$$T = \frac{1}{2620} = 382 \mu\text{s.}$$

set shutter for 300 μs delay.

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April 8 1951

Eniwetok (Perry Island)

A.G. Edgerton

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107

The shot was this am at 7.34 at Runit. I was at Perry near the docks with Eastman, Tillist, and Ward. The flash of light blinded me even when I looked away from the bomb. Clouds excluded a good look at the later stages of the fire ball.

I helped to set up Site M near Runit on the reef to the south. This tower was 75 ft high and about 2 miles from the 300 ft zero tower. Capt Caldwell, Lee Carr, Bob Morris worked with me.

Photos are to be put in this book to show the arrangement in the tower.

We had

- 4 Eastman high speed 16 mm cameras
- 2 Instar " 8 mm "
- 3 B.R. Slit cameras.
- 3 K cameras 15" lenses
- 2 K " 6 inch.

- 1 Eastman grid 40" lenses
- 1 Ins Radiatronic (Piddletronic)

For later information see "site" books that were used at the different locations.

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Notebook # Dec. 8, 1948-Apr. 8, 1951

Filming and Separation Record

___ unmounted photograph(s)

___ negative strip(s)

1 unmounted page(s)
(notes, drawings, letters, etc.)

was/were filmed where originally located between page 106 and 107.

Item(s) now housed in accompanying folder.

From
Joe Adams
Apr? 1951

MEASURED POINTS ON LIGHT CURVE FOR MARK THREE CASED CHARGE

Luxens/cm ² (at 40')	Time (//sec)*	Remarks
0.0	47.3	Small bump at beginning of curve.
0.02	49.5	Start of main curve and height of small bump
0.2	50.	
0.4	51.	
0.5	52.	At 120 // sec conversion of
0.6	53.	these photomultiplier data
0.7	54.	to <u>average</u> surface brightness
0.8	55.	gives about 2000 candles/cm ² .
0.9	56.	Brixner gets 2 - 3000 candles/
1.1	57.	cm ² for brightness of large
1.5	58.	spots over detonator positions.
1.9	59.	We have not estimated actual
2.4	60.	luminous area seen by Marley
2.8	61.	or multipliers but feel results
3.9	73.	are in essential agreement for
5.0	82.	both intensity and time depend-
5.8	95.	ence.
7.9	103.	
8.5	108.	
9.8	113.	
11.5	116.	
14.1	123.	

* Measured from
Alex pulse

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