

HEADQUARTERS
U. S. ARMY ENVIRONMENTAL HEALTH LABORATORY
United States Army Medical Service
Army Chemical Center, Maryland

*Attach to
file copy*

MEDEI-R

21 JUL 1960

SUBJECT: Report of Microwave Radiation Hazards Study No. 3613R66-60

TO: The Surgeon General, Department of the Army, Washington 25, D.C.
ATTN: MEDCE-OH
Commanding General, First United States Army, Governors Island,
New York 4, New York
ATTN: Surgeon
Commanding Officer, 56th Artillery Brigade (Air Def),
Fort Banks, Winthrop, Massachusetts
ATTN: Surgeon
IN TURN

Inclosed is Report of Microwave Radiation Hazards Study conducted at Fort Heath, Massachusetts during the period 25-26 April 1960 by 1st Lt Edward B. Martin, MSC, and Sgt Joseph B. Roskilly, AMEDS, Health Physicists from this Laboratory. The report includes findings of the survey, observations based on these findings, and recommendations of this Laboratory with respect to certain of these findings.

1 Incl
Rept of Microwave Rad
Hazards Study
Ft Banks

Adam J. Rapalski
ADAM J. RAPALSKI
Colonel, MC
Commanding

Not sent to Fort Banks (M) 24 Oct 60

ARM2.950140.004

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File: Miscellaneous Radar Sets

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United States Army Medical Service
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MEDEI-R

REPORT OF MICROWAVE RADIATION HAZARDS STUDY NO. 3613R66-60
56TH ARTILLERY BRIGADE (AIR DEF)
FORT BANKS
WINTHROP, MASSACHUSETTS
25-26 APRIL 1960

1. AUTHORITY.

- a. AR 40-557, par 13.
- b. Letter ADBP-C, Hq, 56th Art Brig (Air Def), Ft Banks, Winthrop, Mass., 30 Mar 60, subj: "Request for Technical Assistance," to The Surgeon General, and indorsements thereto.

2. PURPOSE. The purpose of this survey was to accomplish the following objectives:

- a. To evaluate the radiation exposure to persons operating, and to those remaining in the vicinity of, the microwave-radiation facilities and related ionizing radiation equipment at Ft Heath, Mass.
- b. To make such recommendations as are necessary to protect personnel from needless exposure to microwave radiation.

3. STANDARDS. The publications which have been used as guides in determining the adequacy of the microwave-radiation-protection facilities and program are as follows:

- a. TB Sig 338, "Radio Frequency Radiation Hazards," dated 22 April 1959.
- b. AR 40-583, "Hazards to Health from Microwave Energy," dated 9 September 1958.
- c. TB MED 254, "Permissible Dose from External Sources of Ionizing Radiation," dated 6 May 1957.

4. ABBREVIATIONS. The following abbreviations of technical terms and words are used in this report:

- a. db - decibel.
- b. mw - milliwatt.

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- c. cm^2 - square centimeter.
- d. mr/hr - milliroentgen per hour.
- e. RF - radio frequency.
- f. DC - direct current.
- g. CAA - Civil Aeronautics Administration.

5. INSTRUMENTATION. The following microwave-radiation-detection instruments were used:

- a. Summation Bridge, TS-730/URM.
- b. Cable CG-92B/U.
- c. RF Bolometer Mount, Weinschel Model 565.
- d. RF Attenuators, Weinschel Models 530-7 and 530-3.
- e. S-Band Horn Antenna, Sperry Model 383A.

6. FINDINGS.

- a. Two radar sets, AN/FPS-6, with S-Band frequencies were surveyed.
- b. Survey of the radio-frequency equipment of South Tower (A-4) indicated no hazardous ionizing radiation within the modulator, RF Group, Magnatron, and DC Power Supply cabinets. The highest radiation rate was found within the magnatron cabinet. However the radiation rate was not sufficient to warrant additional shielding for the cabinet.
- c. Signs were posted on the control panels of both Army radar sets when personnel were in the dome covering the antennae to warn that the sets should not be operated.
- d. The terrain in the vicinity of the control center is gently rolling but with no terrain feature at an elevation greater than that of the radar antennae.

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e. The antenna of either Army radar set cannot be directed below a minus 2° from the horizontal position. Both antennae (A-4 and A-5) may radiate while rotating or "spotlighting". (Plate R-432)

f. A catwalk built 88 feet above the ground around the outside of the dome of each Army radar set permits personnel to walk or stand around the antenna while the set is being operated.

g. The antennae of both Army radar sets are approximately 110 feet above ground level.

h. The antenna of the CAA tower cannot be operated below the horizontal and is high enough to prevent any exposure to microwave radiation to personnel operating or in the vicinity of the Army radar sets.

i. Results of all measurements made in the vicinity of the radar units are shown on plate R-433.

7. RECOMMENDATIONS.

a. Insure that the cover is on the magnetron cabinet (A-4) when the unit is being operated except for very brief periods for repair or adjustment. This applies to both towers.

b. Signs, "Off Limits to Unauthorized Personnel," should be posted on all entrance doors of both Army towers and on ladders leading to catwalks.

c. The trapdoors opening onto the catwalks should be secured by locks to prevent personnel from ascending to the catwalks while the sets are in operation.

d. All personnel required to be on the catwalk should coordinate with the operator of the set to insure that the set will not be in operation.

e. No antenna should "spotlight" a building or person within a radius of 400 feet.

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f. Personnel operating the CAA radar set should be requested to coordinate with personnel of the North Tower (A-5) prior to ascending the CAA tower to prevent unnecessary exposure (Plate R-432).

3 Incls
Plates R-432 thru R-434

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EDWARD B. MARTIN
1st Lt, MSC
Health Physicist

Joseph B. Roskilly

JOSEPH B. ROSKILLY
Sgt, AMEDS
Health Physicist

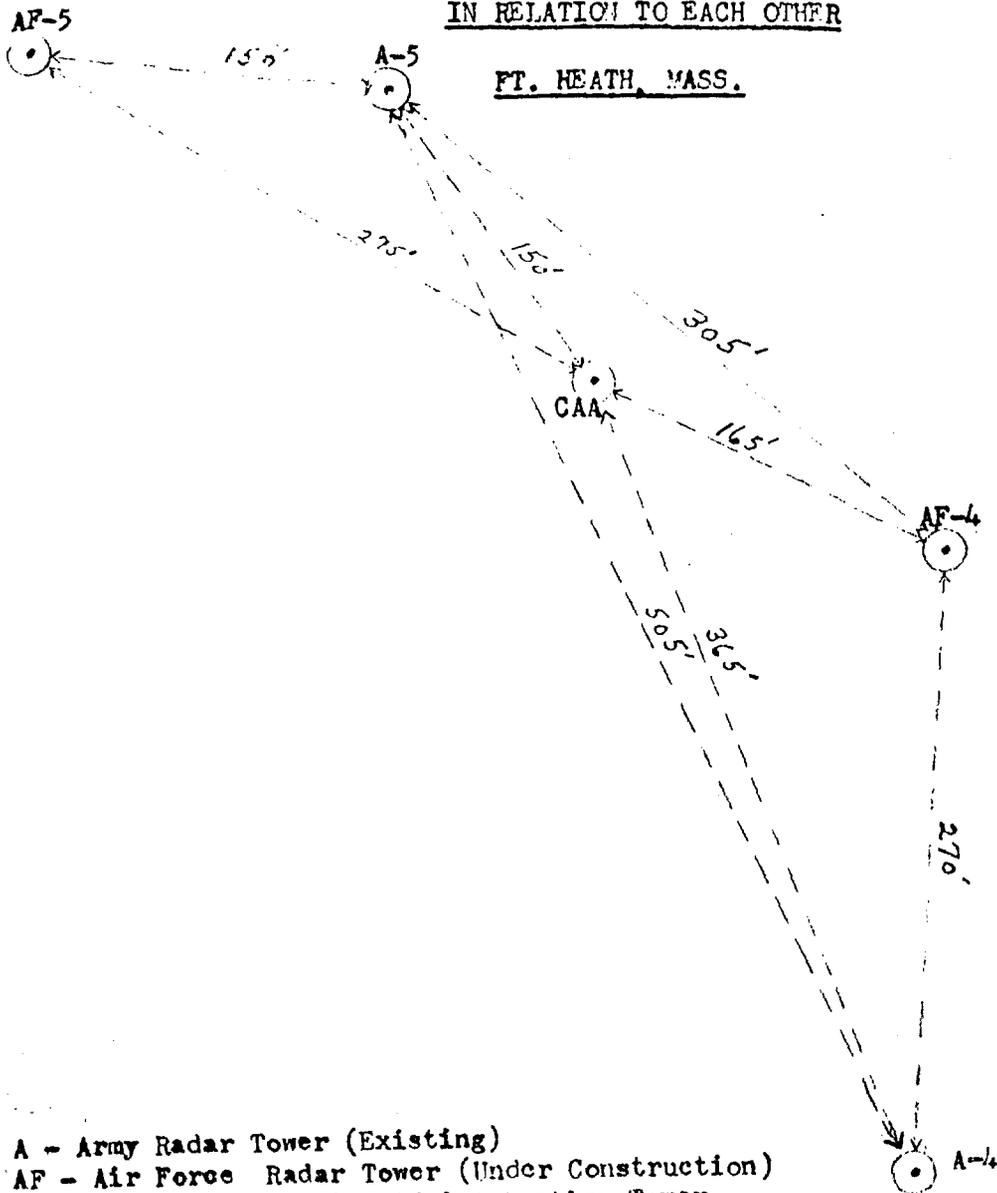
APPROVED:

Adam J. Rapalski
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LOCATION OF RADAR TOWERS
IN RELATION TO EACH OTHER

FT. HEATH, MASS.



A - Army Radar Tower (Existing)
AF - Air Force Radar Tower (Under Construction)
CAA - Civil Aeronautics Administration Tower (Existing)

LEGEND

⊙ Existing and Proposed Radar Towers

Microwave Radiation Hazards Study No. 3613R66-60
Fort Banks, Winthrop, Massachusetts

DATE 31 May 60

DRAWN J.B.R.

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APPROVED E.B.M.

SCALE 1" = 20'

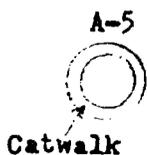
PLATE R-432

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MEASUREMENT LOCATIONS

FT. HEATH, MASS.

CAA



Measurements were made on the 2d landing of the stairwell.

LEGEND



CAA Radar Tower



Array Radar Towers



Location at which microwave measurements were made.

Catwalk



A-4

Measurements were made on the catwalk around the dome.

MICROWAVE MEASUREMENTS

<u>Radiating Antenna</u>	<u>Location of Test Antenna</u>	<u>Attenuation (db)</u>	<u>Bridge Measurement mw per cm²</u>	<u>Corrected Measurement mw per cm²</u>
A-5	1	22	50	25
A-4	1	12	20	1
A-5	2	5.4	7	.08

All measurements taken with radar set beamed directly and continuously on the test antenna.

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Fort Banks, Winthrop, Massachusetts

DATE 31 May 60

DRAWN J.B.R.

APPROVED E.B.M.

SCALE None

PLATE R-433

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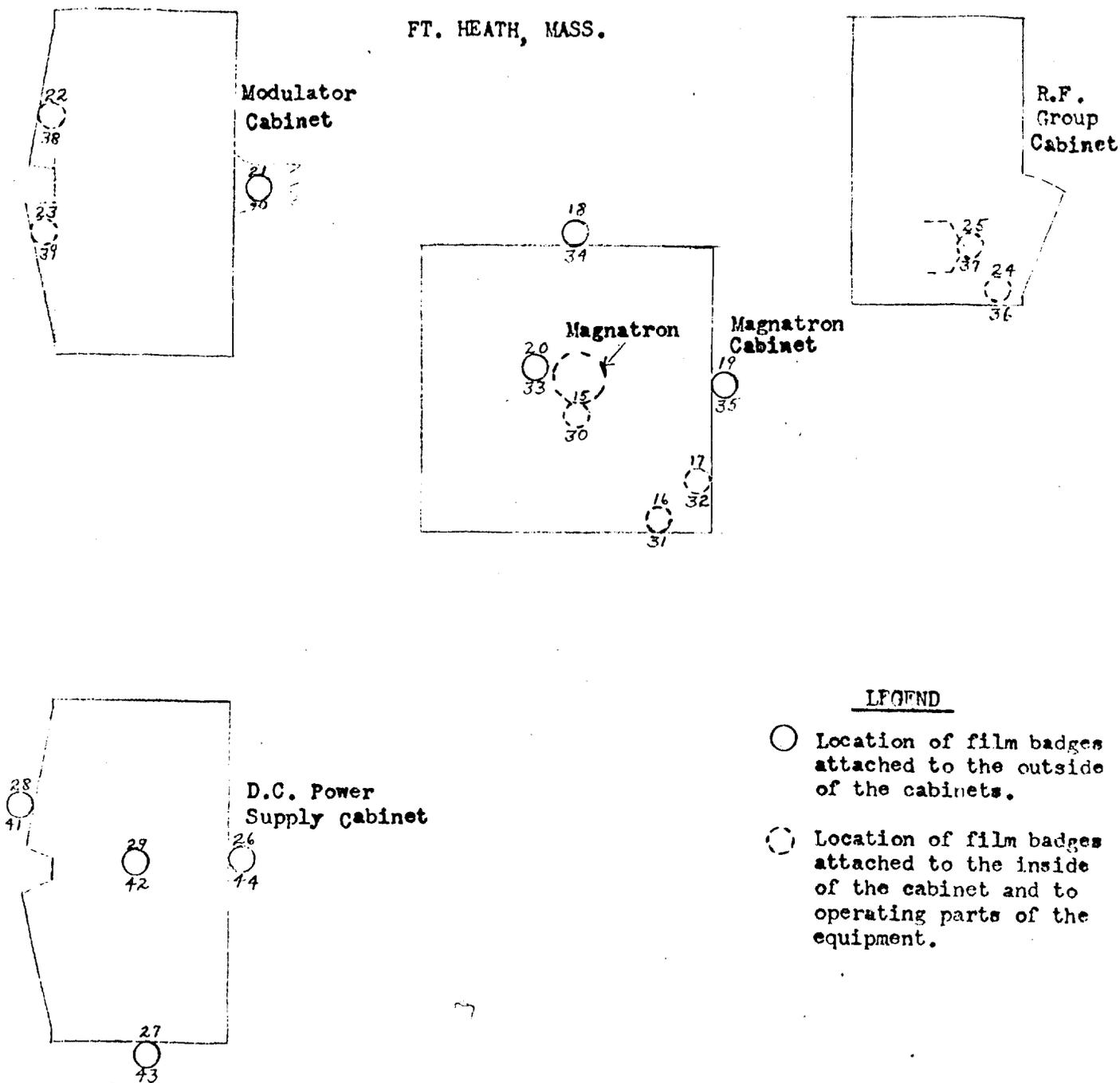
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IONIZING RADIATION MEASUREMENTS

RADAR AND RELATED EQUIPMENT

SOUTH TOWER (A-4)

FT. HEATH, MASS.



LEGEND

- Location of film badges attached to the outside of the cabinets.
- ⊖ Location of film badges attached to the inside of the cabinet and to operating parts of the equipment.

Sheet 1 of 2 Sheets

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DATE 31 May 60
DRAWN J.B.R.
APPROVED E.B.V.
SCALE None
PLATE R-434

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IONIZING RADIATION EXPOSURE RATE

Film Badges # 15 through 29 were exposed for a period of two (2) hours.
 Film Badges # 30 through 44 were exposed for a period of 174.2 hours.

All readings are in mr/hr for the following:

<u>Film Badge No.</u>	<u>Mr/hr</u>	<u>Film Badge No</u>	<u>Mr/hr</u>	
15	3.50	30	Affected by heat exposure rate could not be determined.	
16	6.50			
17	6.50			
18	0.00	31		4.59
19	0.00	32		5.73
20	0.00	33		0.23
21	0.00	34		0.92
22	0.00	35		0.08
23	0.00	36		0.00
24	0.00	37		0.01
25	0.00	38		0.04
26	0.00	39		0.07
27	0.00	40		0.02
28	0.00	41		0.04
29	0.00	42	0.29	
		43	0.00	
		44	0.02	

Sheet 2 of 2 Sheets

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UNITED STATES ARMY ENVIRONMENTAL HEALTH LABORATORY ARMY CHEMICAL CENTER, MARYLAND	DRAWN <u>J.B.R.</u>
	APPROVED <u>E.B.M.</u>
	SCALE <u>None</u>
	PLATE <u>R-434</u>

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