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COUNTY ARE ESSENTIAL)
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(4 June 1958)

1st Ind

Lt Col MacMurray /as

FILE

JUL 1958

SUBJECT: Report of Microwave Field Intensity

HQ. U. S. ARMY ENVIRONMENTAL HEALTH LABORATORY, of the AMEDS, Army Chemical Center, Maryland - 8 JUL 1958

TO: The Surgeon General, Department of the Army, Washington 25, D. C.
ATTN: MEDCE
Commanding General, Second United States Army, Fort George G. Meade, Maryland
ATTN: Surgeon
Commanding General, Fort George G. Meade, Maryland
ATTN: Surgeon
IN TURN

1. "Report of the Microwave Field Intensity Measurement Survey of Fort George G. Meade, Maryland," by Rome Air Force Depot, Griffiss Air Force Base, New York, has been received and reviewed by this Laboratory. It is understood that this report has been distributed to interested agencies at Fort George G. Meade and Second United States Army.

2. This Laboratory had an officer present during the performance of these tests and considers the tests valid and comprehensive. It concurs in the conclusions and recommendations reported in IV A and B.

1 Incl
v/a

EDWARD J. DEHNE
Lt Colonel, MC
Commanding

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COMPLETED

8 Jul 58

OUTLINE

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OFFICE OF THE BASE SURGEON
ROME AIR FORCE DEPOT
GRIFLINS AIR FORCE BASE
NEW YORK

REPORT OF THE MICROWAVE FIELD INTENSITY
MEASUREMENT SURVEY OF PORT
GEORGE G. MEADE, MARYLAND

28 APR - 1 MAY 1958

GEORGE M. KNAUF
Colonel, USAF (MC)
Sergeant

THOMAS E. POWERS
Captain, USAF (MSC)
OIC, Measurement Team

I. General Radiation Considerations

A. Background

1. In accordance with AMC Supplement 1 dated 29 Oct 57, to AFR 160-118, dated 21 Mar 57, the Surgeon, Griffiss Air Force Base, will perform the Air Materiel Command's responsibilities which, "will include the assembly and interpretation of pertinent data in this area, (biological effects of exposure to radio frequency (microwave) energy on Air Force Personnel), required as a result of research and/or field experiences..." To perform this responsibility the Surgeon, Griffiss Air Force Base, had formed and trained a measurements team to perform surveys in the field.

2. At the request of Headquarters, United States Air Force, the Microwave Field Intensity Measurements Team of the Base Surgeon, Griffiss AF Base, was ordered to Fort G. Meade, Maryland, to perform a survey.

3. Fort George G. Meade has a radar site which is located on the top of Annapolis Hill. The immediate area surrounding the site is well populated. A government housing project borders the southeast portion of the site. There are two 25 ft. + temperature tower mounted AN/FPS-6 radar sets and one 50 ft. arctic tower mounted AN/FPS-33 radar set located on the site. The nearest off site building (Bldg #1915) is approximately 200 feet from the nearest radar set (Channel 2 - AN/FPS-6). The ground elevation at the location of the radar sets is approximately 260 feet above sea level and extending out 200 feet in all directions from the site; the elevation drops off to 240 feet above sea level.

4. Personnel contacted during the survey:

- (1) Lt/Col M.E. Smith (MSC)
Hqs Second U.S. Army
- (2) Lt/Col L.C. MacMurray (MSC)
Army Environmental Health Laboratory
- (3) Lt/Col F.J. Lagasse
12th Det. (Air Def Op)
- (4) Maj D.H. Richardson
12th Det, 562nd Arty 35th Brig.
- (5) CWO B.C. Grunden
ASADEA Site Maintenance
- (6) Mr. H.E. "reiko"
USASADEA

- (7) Mr. J. Cusick
USASADBA
- (8) Mr. H.C. Stackweather
2nd Sig Army
- (9) Mr. G.F. Huseman
2nd Sig Army
- (10) Mr. G.W. Brungarner
Martin Co.
- (11) Mr. G.J. Stricker
Martin Co.

B. Measurement Teams:

- (1) Capt T.E. Powers - 2845th USAF Hospital
- (2) S/Sgt T.M. Barnes - 1st Comm Maint Sqdn - 3108th Maint Op
- (3) A/2C J.L. Christman " "
- (4) A/2C J.J. Gentile " "
- (5) A/2C N.J. Kulczyk " "
- (6) A/2C J.E. Conwell " "

C. Measurement Techniques.

The measurement techniques utilized for this survey were those outlined in Air Force Technical Order 31-1-80 dated 15 Apr 58.

D. Test Equipment.

- (1) S - Band

AN/URM-23, Power Meter
UG-400/U Adapter

- (2) L - Band

AN/URM-23, Power Meter

Waveguide Adapter to Coax, Test Antenna
UG-953/U (Flange removed)

(3) AN/URM-23 Components

- * RF Cable CG-92B/U
- * RF Adapter UG-402/U
- * Attenuator Kit MX-1309
- * RF Bolometer Mount DT-76/U
- * RNC Coaxial Cable
- * Summation Bridge TS-730/URM

E. Precautionary Measures.

Reference Air Force Technical Order 31-1-80 dated 15 Apr 58.

II Test Program

A. Radiation Sources:

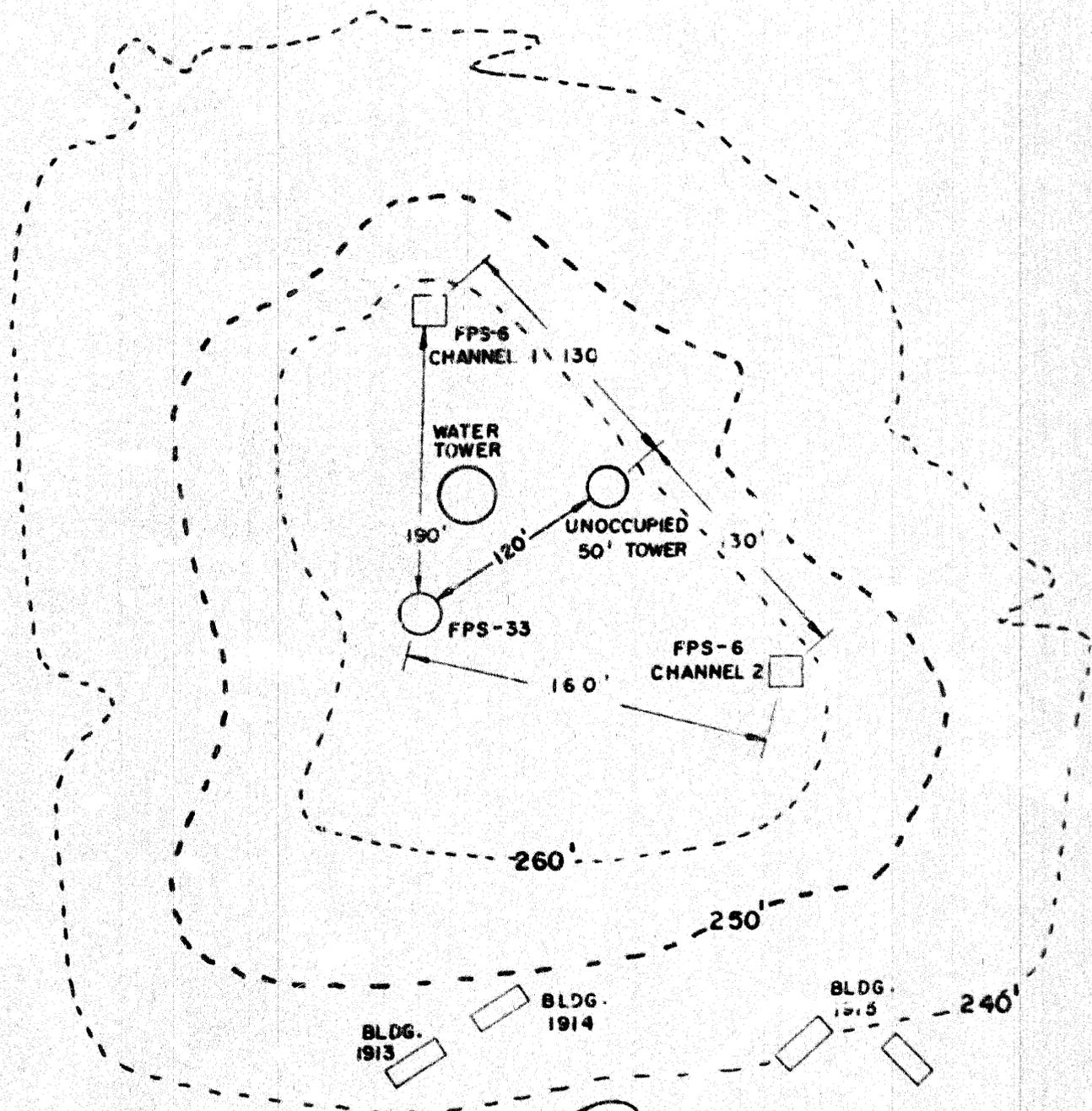
- (1) Two AN/FPS-6 radar sets.
- (2) One AN/FPS-33 radar sets.

B. Assumptions and Limitations:

(1) After a preliminary review of the radar sets and their locations, it was assumed that a possibility existed of having areas where persons could be exposed to levels of R/F energy in excess of $.01 \text{ watt/cm}^2$. The FPS-33 tower is located within 190 feet from both channel #1 and channel #2 FPS-6 radar sets. Previous measurements performed on an FPS-6 indicates that the $.01 \text{ watt/cm}^2$ extends out to a distance of 240 feet.

(2) Tests to accurately measure R/F energy from more than one radar set simultaneously are impossible due to the directional dependence of the test antenna. This factor makes it necessary to measure one set at one test point and then measure the second set at the same point. It is assumed that the energy received from multiple sources is directly additive.

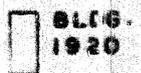
(3) Many measurements were performed under conditions where many reflections were present. The reflections can possibly have an additive effect or a cancelling effect. The test procedure under such conditions is to carefully probe the field and record the highest meter readings obtained.



MICROWAVE FIELD INTENSITY SURVEY AREA

FT. GEORGE G. MEADE, MD.

SCALE 1" = 100'



III Factual Data and Results

A. Off Site Measurements

(1) An Attempt to perform measurements at ground level on the north side of buildings #1914 and #1915 was performed. The results were entirely negative for no measurable amount of radiation was detected. The tests were performed with the FPS-6 antenna at maximum negative tilt of -2° .

(2) Roof top measurements on Building #1920 were attempted but again no measurable amount of radiation was detected. This attempt was performed with both FPS-6 radar sets orientated in the direction of the test point and the antennae at their lowest possible tilt -2° .

(3) Building #1915

(a) Set AN/FPS-6, Channel 2

With the antenna at -2° no measurable amount of R/F energy was detected. The field was probed from five feet below the roof ridge to four feet above the roof ridge.

(b) Set AN/FPS-6, Channel 1

	Test I	Test II	Test III
Frequency	S Band	S Band	S Band
Average Power	2259W	2259W	2259W
Horizontal Distance	400'	400'	400'
Antenna Tilt	-2°	-2°	-2°
Power Density watt/cm ²	.0009	.0003	0

Remarks:

Test I was 4' above the roof ridge.

Test II was 2'6" above the roof ridge

Test III was 5' below the roof ridge.

The set was moved in azimuth for each measurement to detect the highest concentration of energy.

(c) It should be noted that Channel 1, FPS-6 is mounted at a lower elevation than channel 2, an estimated 10 feet.

(4) Building #1914

(a) Set AN/FPS-6, Channel 2

With the antenna at -2° no measureable amount of R/F energy was detected. The field was probed from three feet above the roof ridge to the bottom of a second story window.

(b) Set AN/FPS-6, Channel 1

	Test I	Test II	Test III	Test IV
Frequency	S Band	S Band	S Band	S Band
Average Power	2366W	2366W	2366W	2366W
Horizontal Distance	400'	400'	400'	400'
Antenna Tilt	-2°	-2°	-2°	-2°
Power Density watt/cm ²	.0003	.0005	.0001	.0001

Remarks:

Test I was 3' above roof ridge.

Test II was 2'6" below roof ridge.

Test III At the eaves of the roof.

Test IV Second story window level.

The set was moved in azimuth for each measurement to detect the highest concentration of energy.

B. On Site Measurements

(1) Set AN/FPS-6, Channel 1

	Test I	Test II
Average Power	2259W	2259W
Vertical Distance	52'	52'
Horizontal Distance	174'	174'
Power Density watt/cm ²	.0197	.022

Remarks:

The test point was at the outside edge of the FPS-33 radome and on an axis between the center of the FPS-33 tower and the center of the FPS-6 tower. Vertical distance is the test point in reference to the ground. Antenna was tilted so that the primary beam was at the test point.

(2) Set AN/FPS-6, Channel 2

	Test I	Test II
Frequency	S Band	S Band
Average Power	2366W	2366W
Vertical Distance	50'	52'
Horizontal Distance	144'	144'
Antenna Tilt	0°	+1°
Power Density watt/cm ²	.0243	.0293

Remarks:

The test point was at the outside edge of the upper ramps at the base of the FPS-33 radome and on an axis between the center of the FPS-6 tower and the center of the FPS-33 tower. Vertical distance is the test point in reference to the ground.

(3) Set AN/FPS-33

The test point was one hundred and twenty feet from the FPS-33 antenna on the platform of an adjacent fifty feet tower. No measureable amount of radiation was detected. The antenna was fixed in its normal operating position.

(4) On Site Measurements (Inside Tower) (First Floor of FPS-33 Tower)

(1) Set AN/FPS-6, Channel 1

	Test A	Test A'	Test B	Test C	Test D
Frequency	S Band	S Band	S Band	S Band	S Band
Test Point	see enclosed diagram				
Average Power	240W	240W	240W	240W	240W
Power Density watt/cm ²	.010	.0087	.0037	.0088	.015

Remarks:

(a) See Diagram.

(b) Tests at points A, A' and B were performed with the center of the beam directed at the door.

(c) Tests at points C and D were performed with the center of the beam directed at the window.

(d) All power density values were detected four to six feet above the floor.

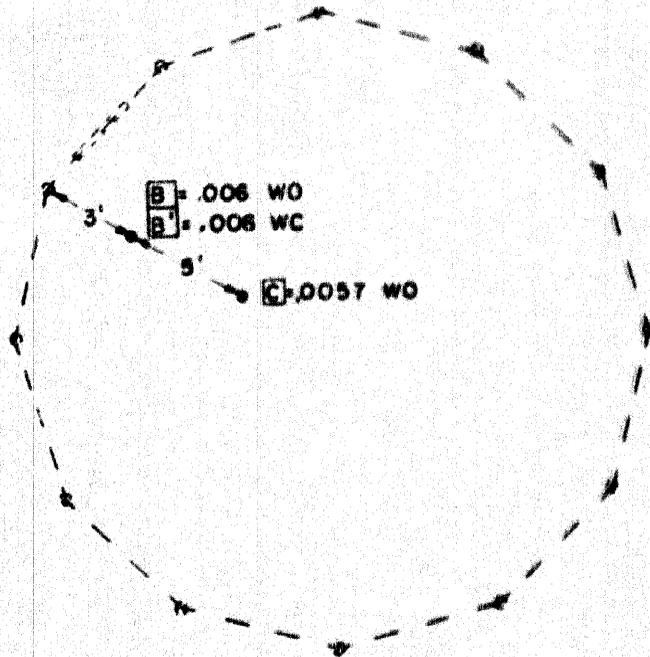
(2) Set AN/FPS-6, Channel 1 (Second Floor of FPS-33 Tower)

	Test I	Test II	Test III
Frequency	1 Band	1 Band	S Band
Average Power	240LW	240LW	240LW
Vertical Distance	4'	4'	4'
Horizontal Distance	3'	3'	3'
Antenna Tilt	-2°	-2°	-2°
Power Density watt/cm ²	.005	.006	.0057

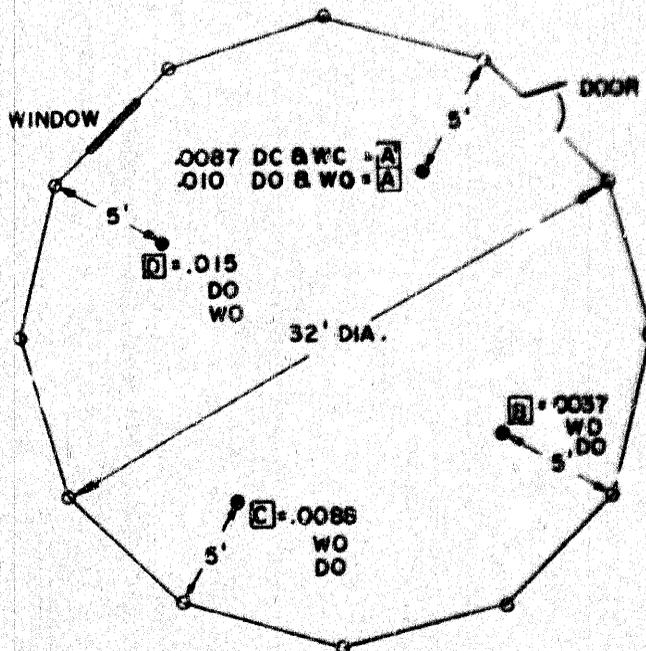
Remarks:

- (a) Vertical distance is the distance from the floor to the test point.
- (b) Horizontal distance is the distance from the test point to the window.
- (c) Set was rotated in azimuth to obtain highest readings.
- (d) See diagram.

FPS - 33 TOWER



SECOND FLOOR



LEGEND

- DO - DOOR OPEN
- DC - DOOR CLOSED
- WO - WINDOW OPEN
- WC - WINDOW CLOSED

1ST FLOOR

(ALL VALUES IN WATT/CM²)

IV Conclusions and Recommendations

A. Conclusions.

(1) A review of the measurements performed at off site test points reveals that there are no exposure problems beyond the site boundaries. It is apparent that the primary beams of all three radar sets are above any of the buildings located off the site.

(2) There are no exposure problems related to the AN/FPS-33 radar set.

(3) A problem area does exist in the area of the FPS-33 tower when this area is search lighted by either FPS-6. This area extends from the first floor level to the top of the tower.

(4) The measurements performed inside the FPS-33 tower indicate that the majority of R/F energy is entering the tower through the windows and the doors which have glass in them. The data on window open versus window closed clearly demonstrates that a closed window offers a negligible amount of attenuation.

(5) R/F energy received from more than one source is considered to be additive, therefore the power density values for the ramp measurements (measurements of individual FPS-6 radar sets) can be exceeded by search lighting a second set towards the same area.

B. Recommendations.

(1) It is recommended that action be taken to avoid the FPS-6 radar sets from "search lighting" the FPS-33 tower. This can be accomplished by marking P.P.I. scopes to indicate area of concern and/or utilizing vector blankers.

(2) If vector blanking is not possible it is recommended that copper screens be installed on the doors and windows of the FPS-33 tower.

V General.

(1) A critique of the survey was held on 1 May 58 with all persons listed in Part I, as present. During this critique questions regarding criteria for medical examination of personnel working in a R/F environment were mentioned. Such queries should be directed under separate cover to:

Col George M. Knauf
Office of the Base Surgeon
Home Air Force Depot
Griffiss Air Force Base, N.Y.

(2) A comprehensive profile drawing showing buildings and beam patterns was impossible due to non-availability of satisfactory blueprints and topographical drawings.

(3) Operational frequencies were intentionally omitted from this report in order to allow the report to remain unclassified. If this information is required it will be furnished upon request.

(4) The measurement team received excellent support from both USASADEA and site personnel. Mr. H.E. Noroiko, USASADEA, performed an excellent duty of support and coordination throughout the survey.