

NATIONAL RADIO ASTRONOMY OBSERVATORY

Green Bank, West Virginia

Electronics Division Internal Report No. 116

GREEN BANK ENVIRONMENTAL SPECTRUM
SURVEY: SUMMER 1971

James L. Dolan and Lloyd M. Swartz

FEBRUARY 1972

NUMBER OF COPIES: 150

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GREEN BANK ENVIRONMENTAL SPECTRUM SURVEY: SUMMER 1971

James L. Dolan and Lloyd M. Swartz

INTRODUCTION

This report summarizes the results of a radio frequency survey, at NRAO, conducted during the summer of 1971. It is intended to be a permanent record of those signals detected, for comparison to signal levels, detected in future surveys and to signal levels calculated from path profiles of known radio transmitters. The astronomer will find this survey useful in locating areas in the spectrum that may be used for observations.

SUMMARY

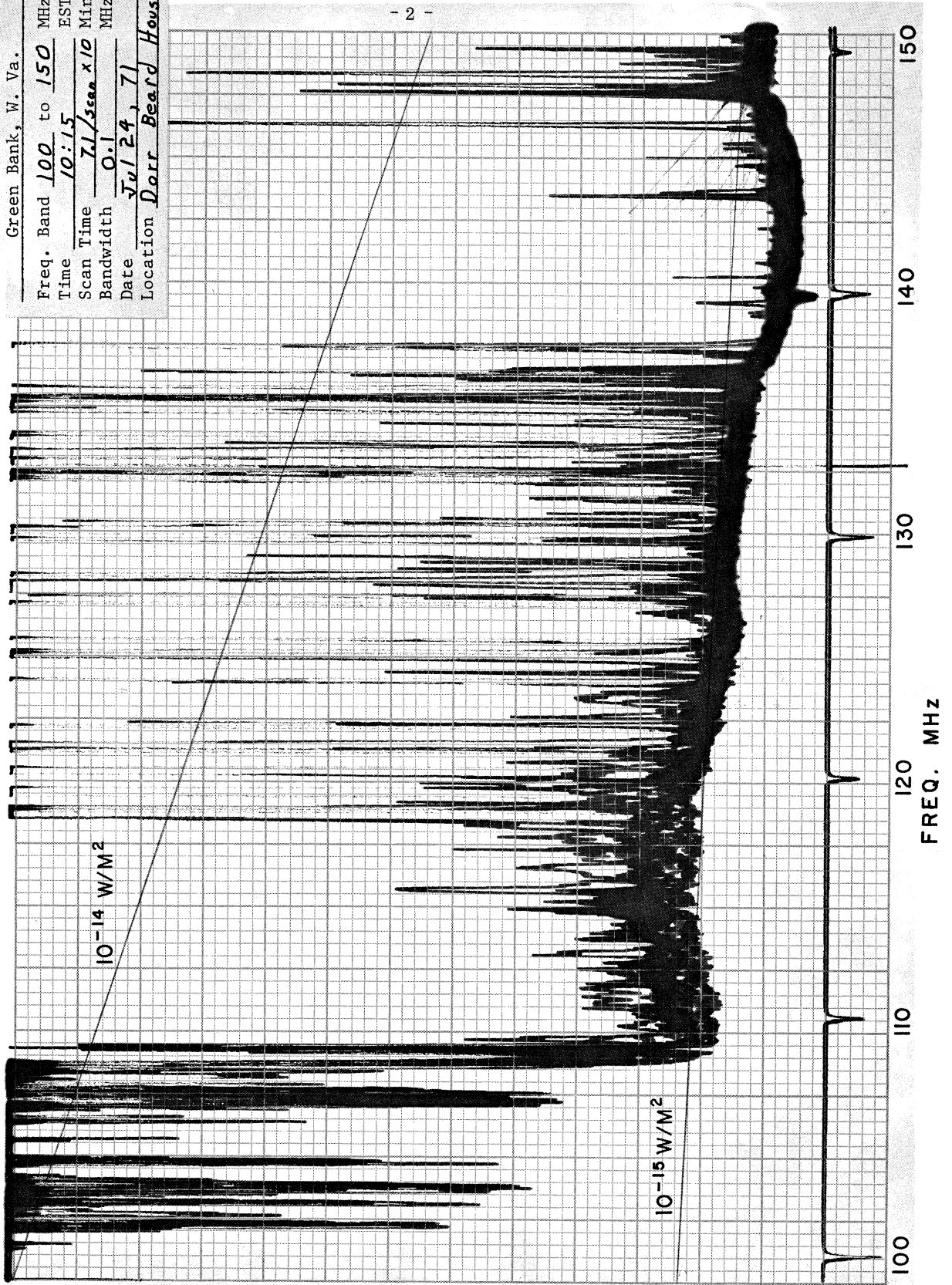
The data, presented in graphical form on the following pages, was collected using an omni-directional antenna on a swept-frequency Dicke radiometer. The total system detection level was 2×10^{-17} W/m² at 100 MHz, decreasing to 3×10^{-13} W/m² at 4 GHz. The data was plotted automatically on an X-Y recorder attached to the receiver. Each graph consists of 10 sweeps or more, as indicated, requiring about 7.1 minutes for each sweep. Three graphs, at maximum sensitivity, were made for each band of frequencies selected, one run for each band in the morning, one run for each band in the afternoon, and one run for each band in the evening. In addition, at the lower frequencies where many large signals exist, three additional graphs were made at a lower level of sensitivity. The resulting data for continuous commercial broadcast stations with signals above the detection level is reliable with power levels accurate to approximately an order of magnitude.

The case for intermittent signals is more complicated and must be viewed from a statistical standpoint. Some considerations are discussed elsewhere in this report.

SITE SPECTRUM SURVEY

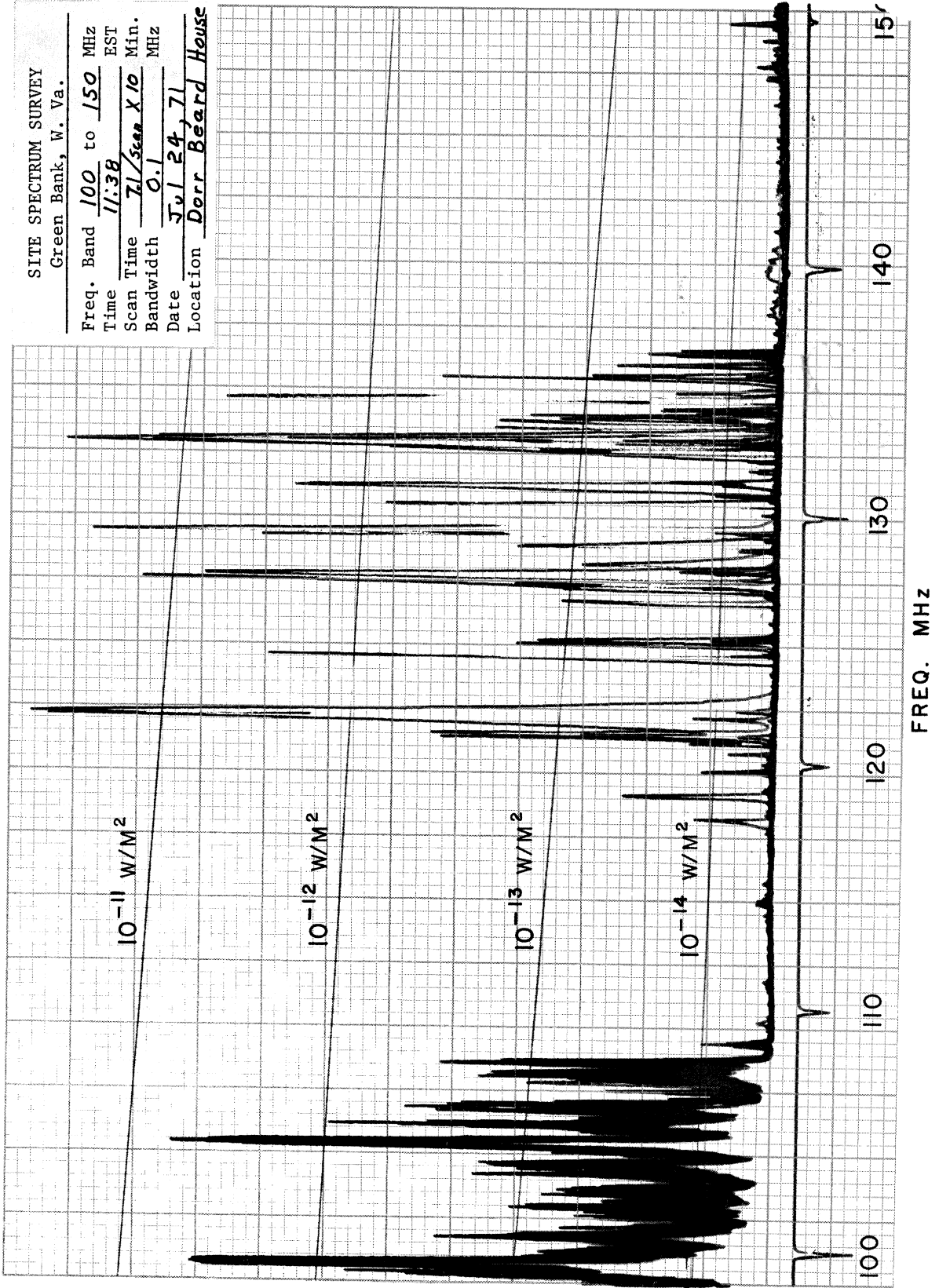
Green Bank, W. Va.

Freq. Band 100 to 150 MHz
Time 10:15 EST
Scan Time 71/3500 x 10 Min.
Bandwidth 0.1 MHz
Date Jul 24, 71
Location Darr Beard House



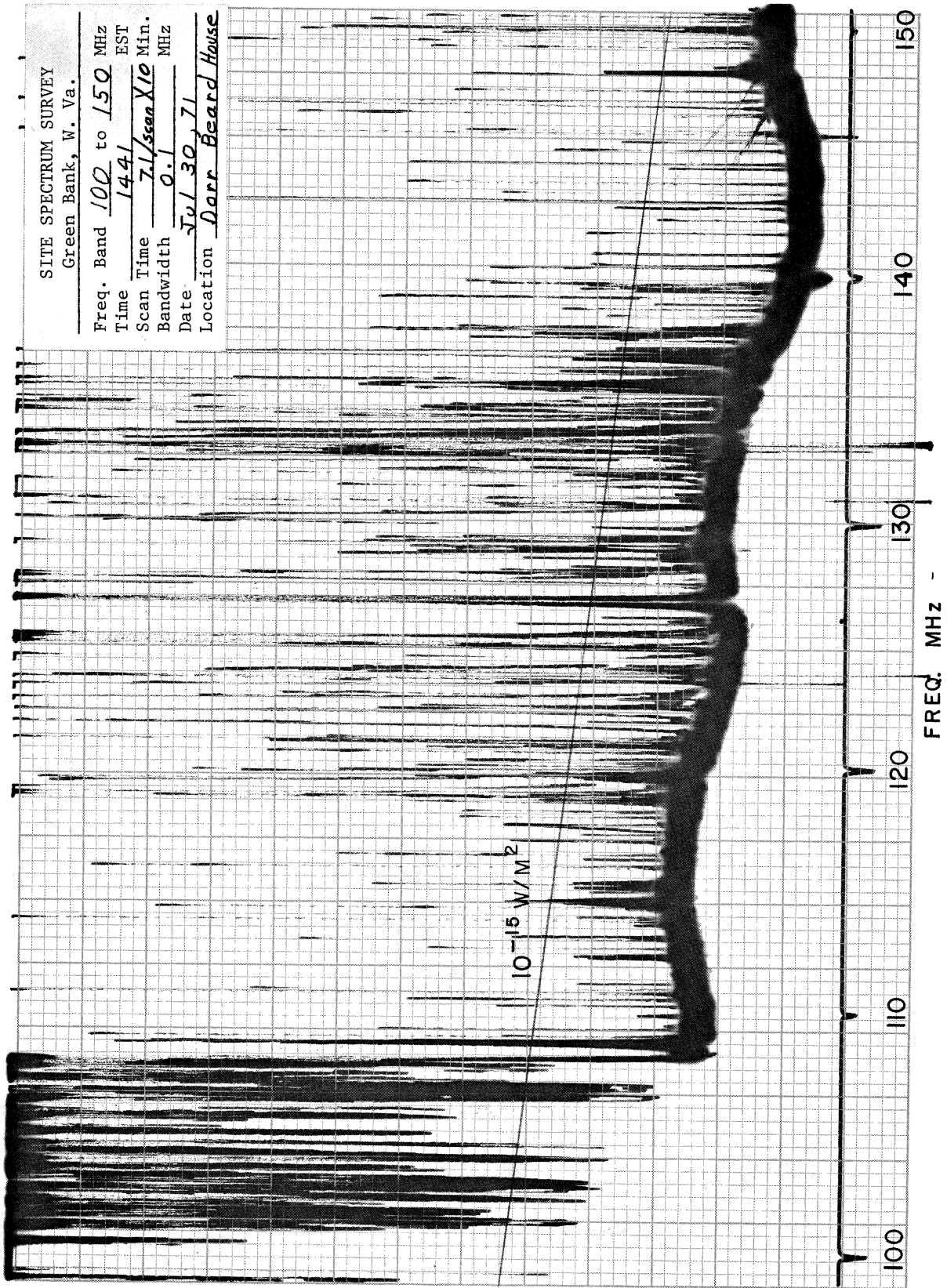
SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 100 to 150 MHz
Time 11:38 EST
Scan Time 71/Scan X 10 Min.
Bandwidth 0.1 MHz
Date Jul 24, 71
Location Dorr Beard House



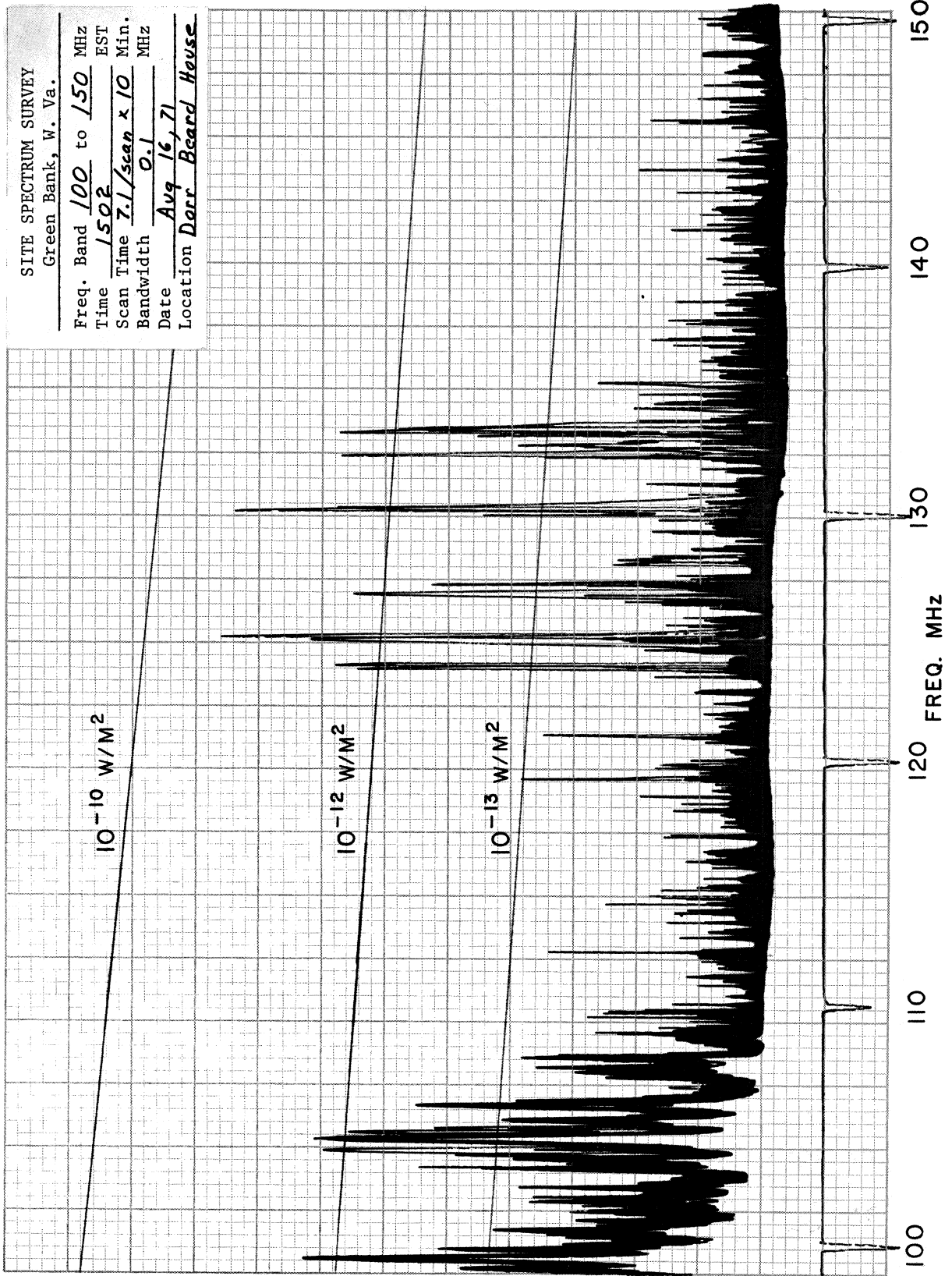
SITE SPECTRUM SURVEY
Green Bank, W. Va.

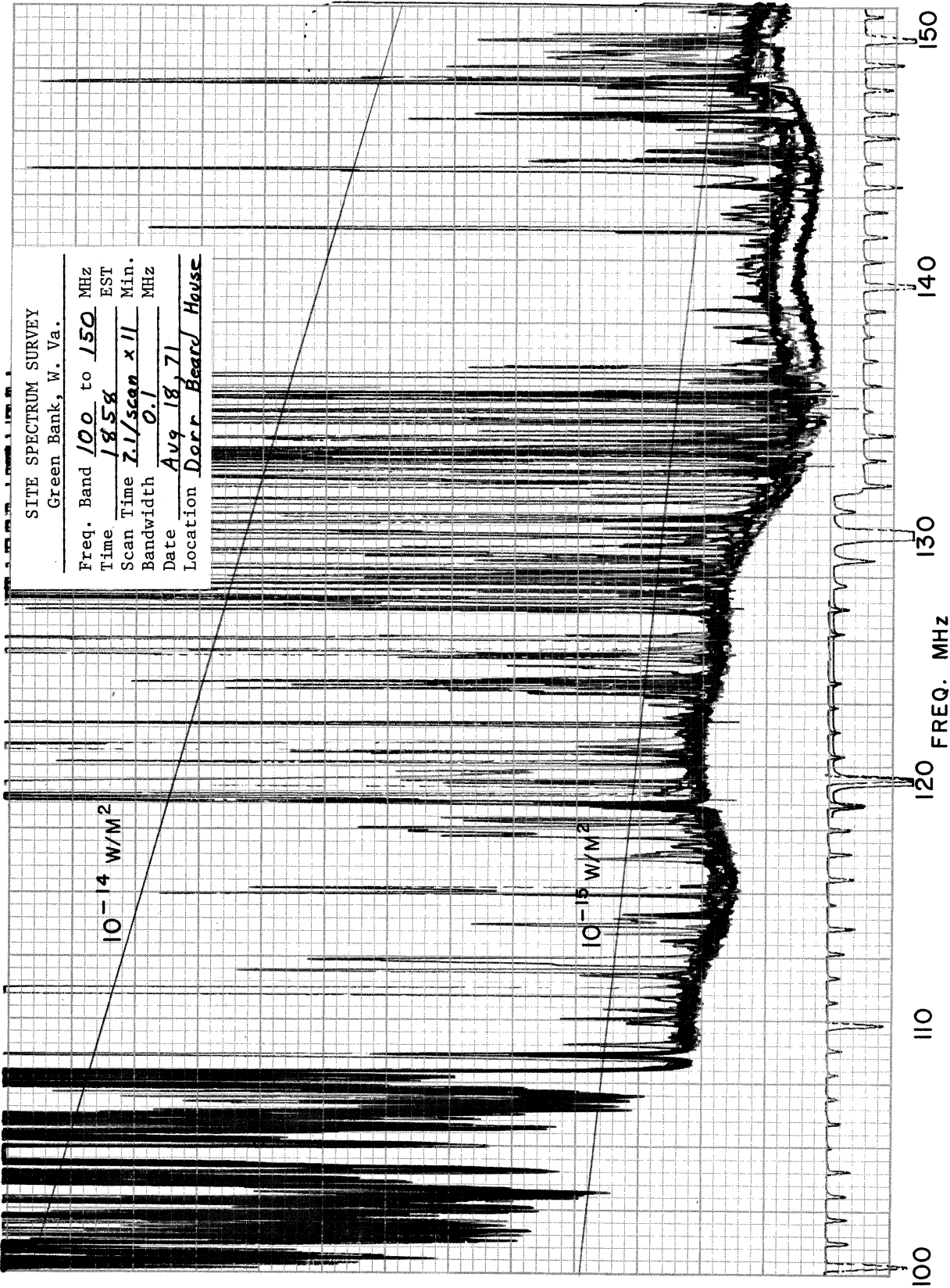
Freq. Band 100 to 150 MHz
Time 1441 EST
Scan Time 7.1/scan X 10 Min.
Bandwidth 0.1 MHz
Date Jul 30, 71
Location Darr Beard House



SITE SPECTRUM SURVEY
Green Bank, W. Va.

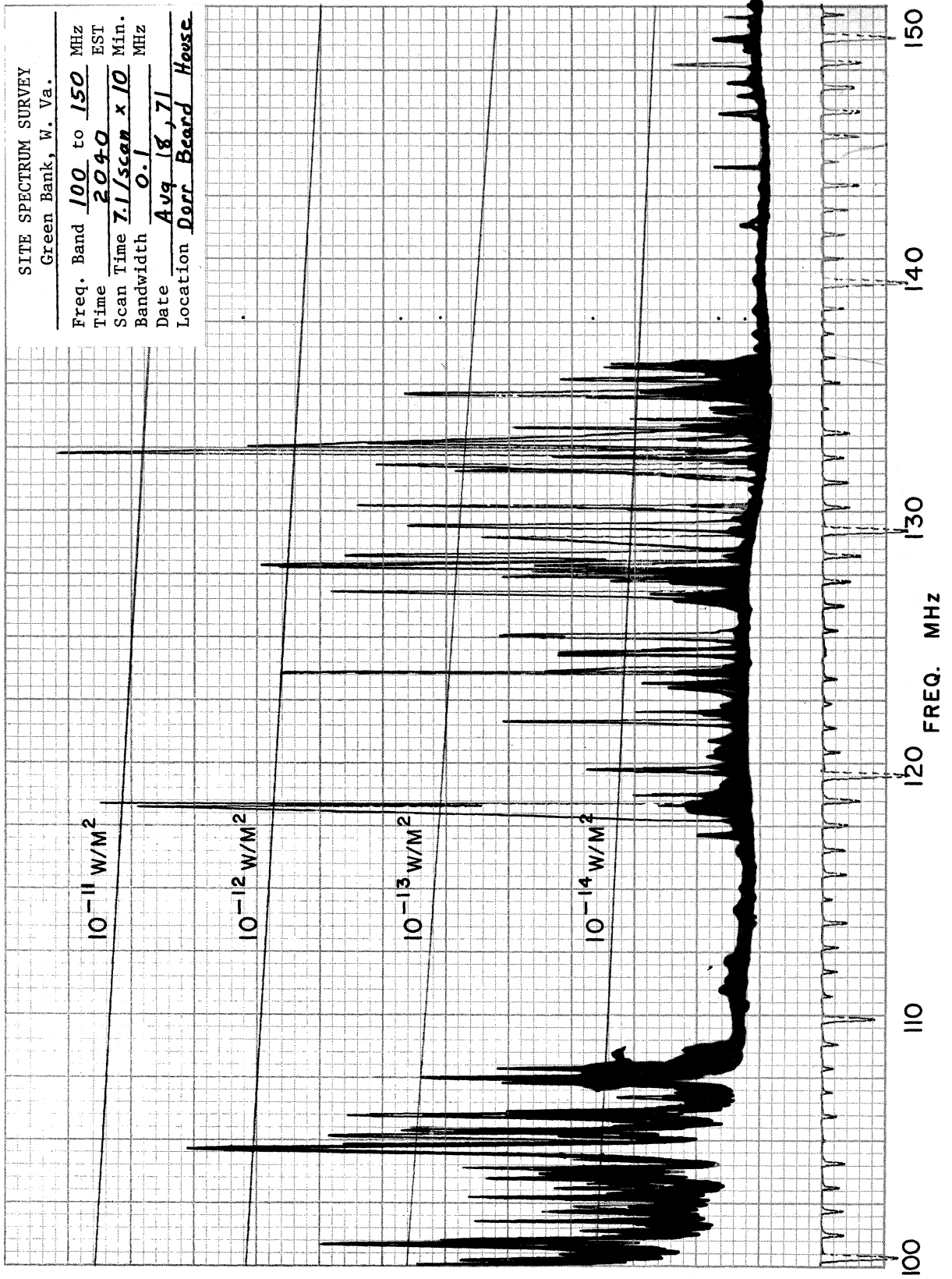
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Time 1502 EST
Scan Time 7.1/scan x 10 Min.
Bandwidth 0.1 MHz
Date Aug 16, 71
Location Darr Beard House

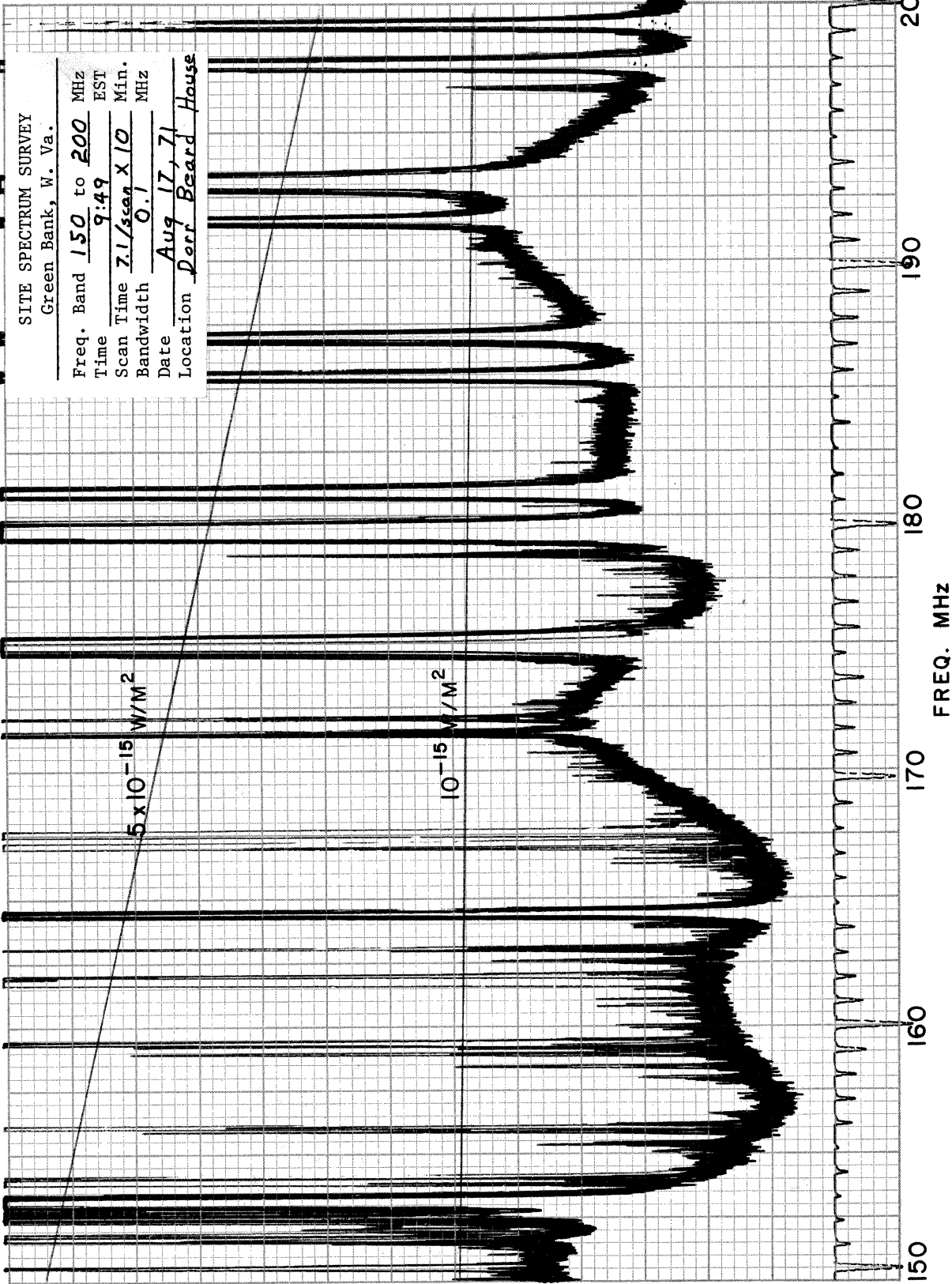




SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 100 to 150 MHz
Time 2040 EST
Scan Time 7.1/scan x 10 Min.
Bandwidth 0.1 MHz
Date Aug 18, 71
Location Dorr Beard House



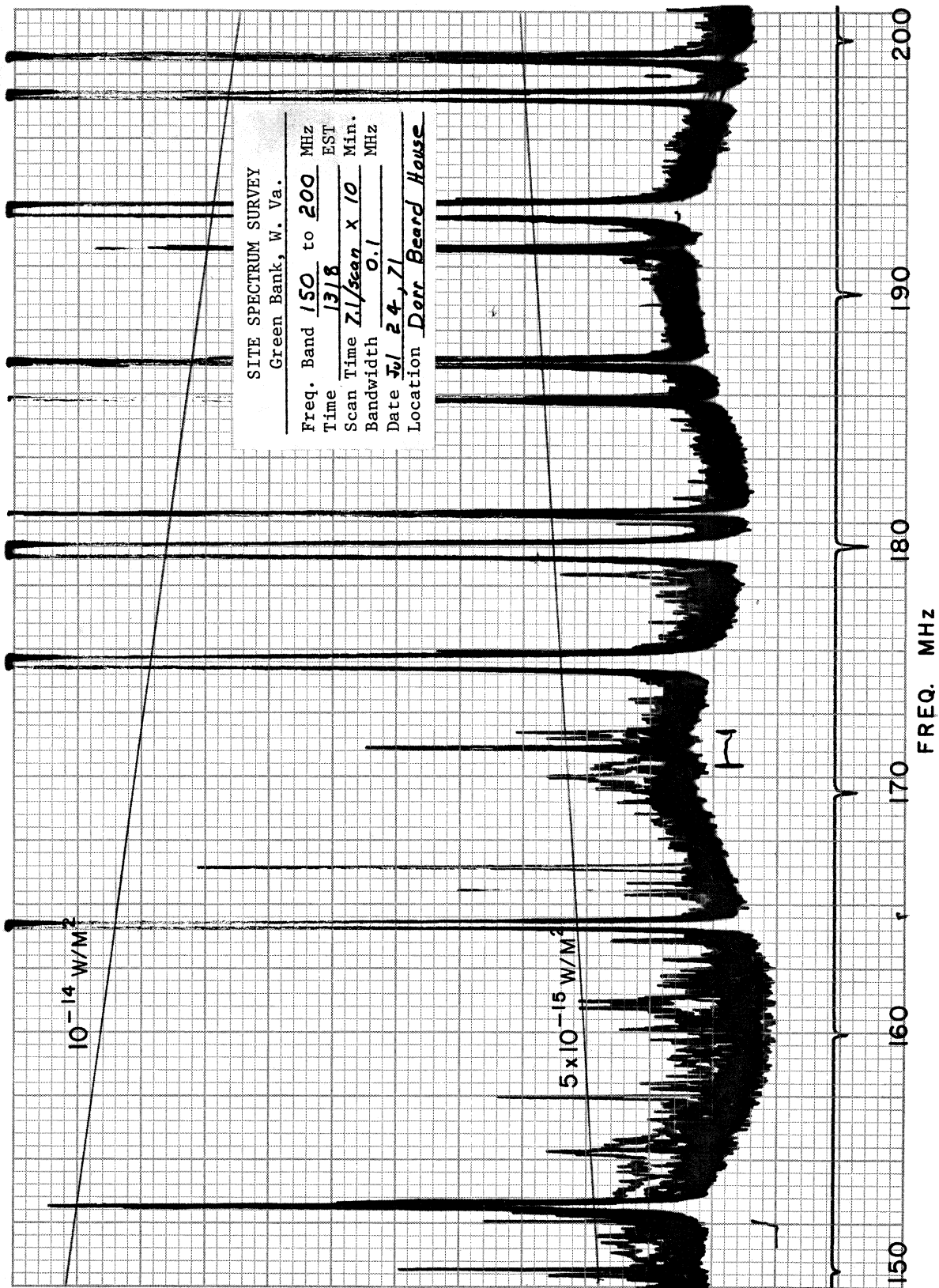


150-200 MHz

Morning

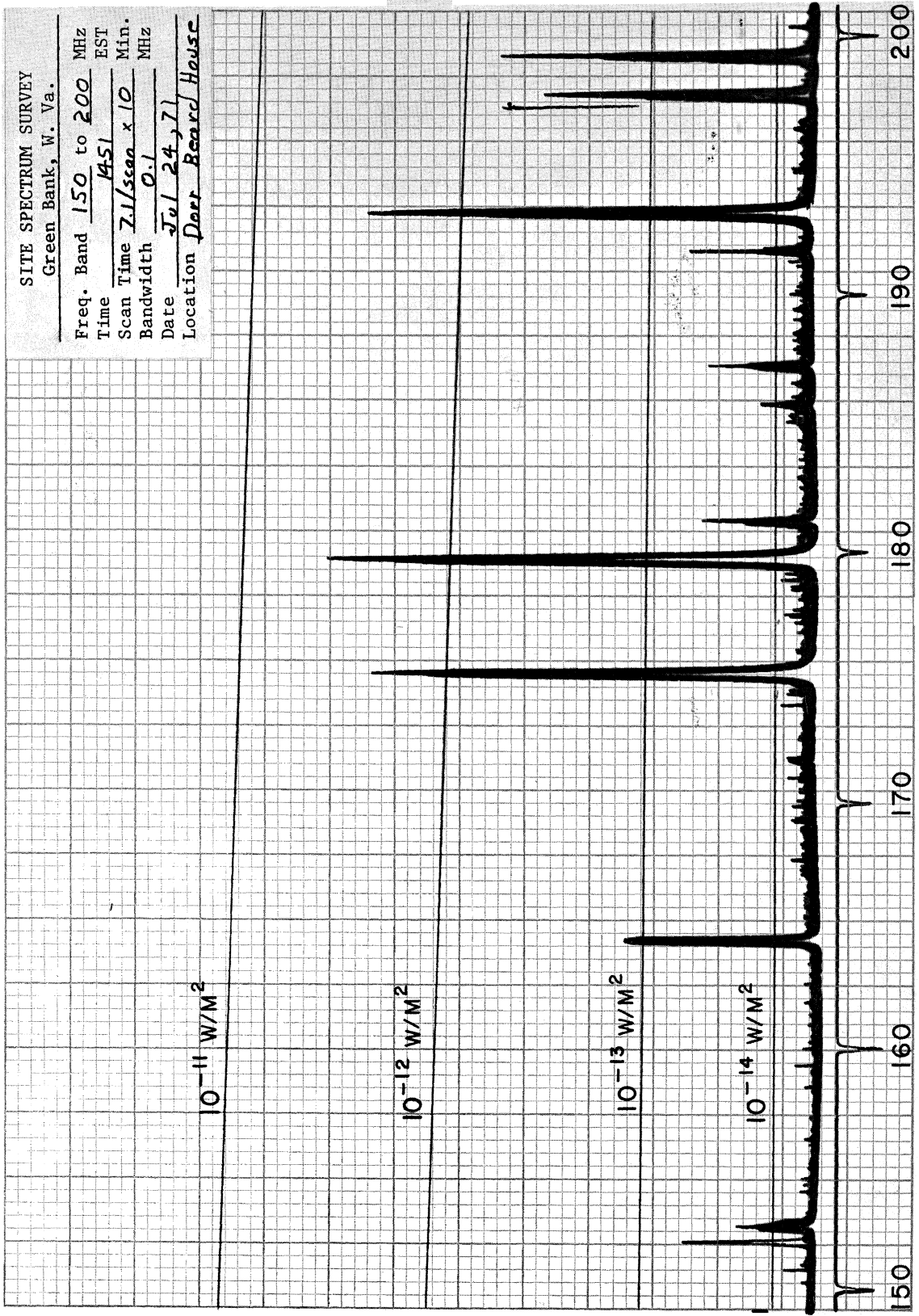
Reduced

NOT INCLUDED



SITE SPECTRUM SURVEY
Green Bank, W. Va.

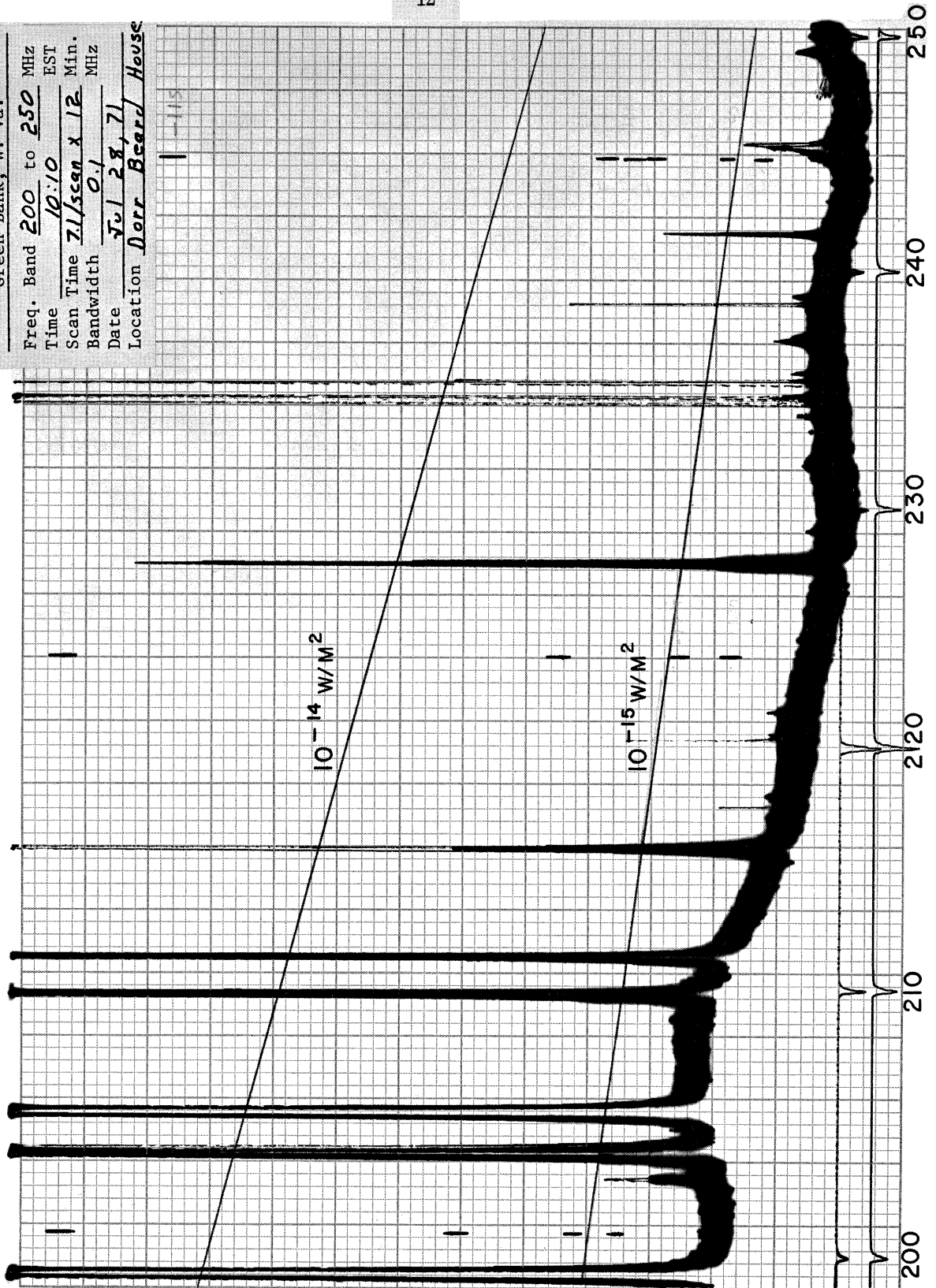
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Scan Time 7.1/scan x 10 Min.
Bandwidth 0.1 MHz
Date Jul 24, 71
Location Dart Beard House

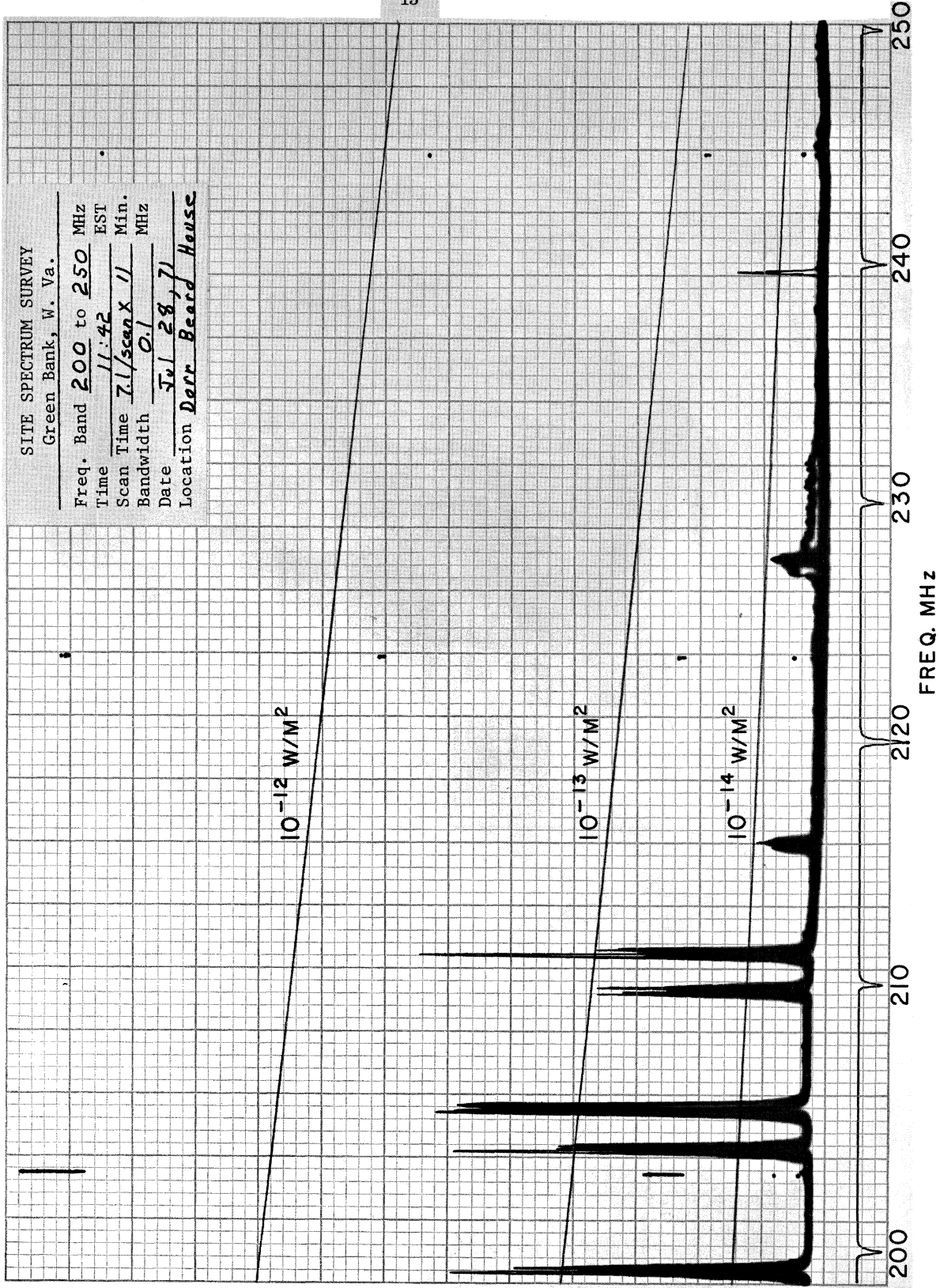


FREQ. MHZ

SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 200 to 250 MHz
Time 10:10 EST
Scan Time 7.1/scan x 12 Min.
Bandwidth 0.1 MHz
Date Jul 28, 71
Location Dorr Beard House





FREQ. MHz

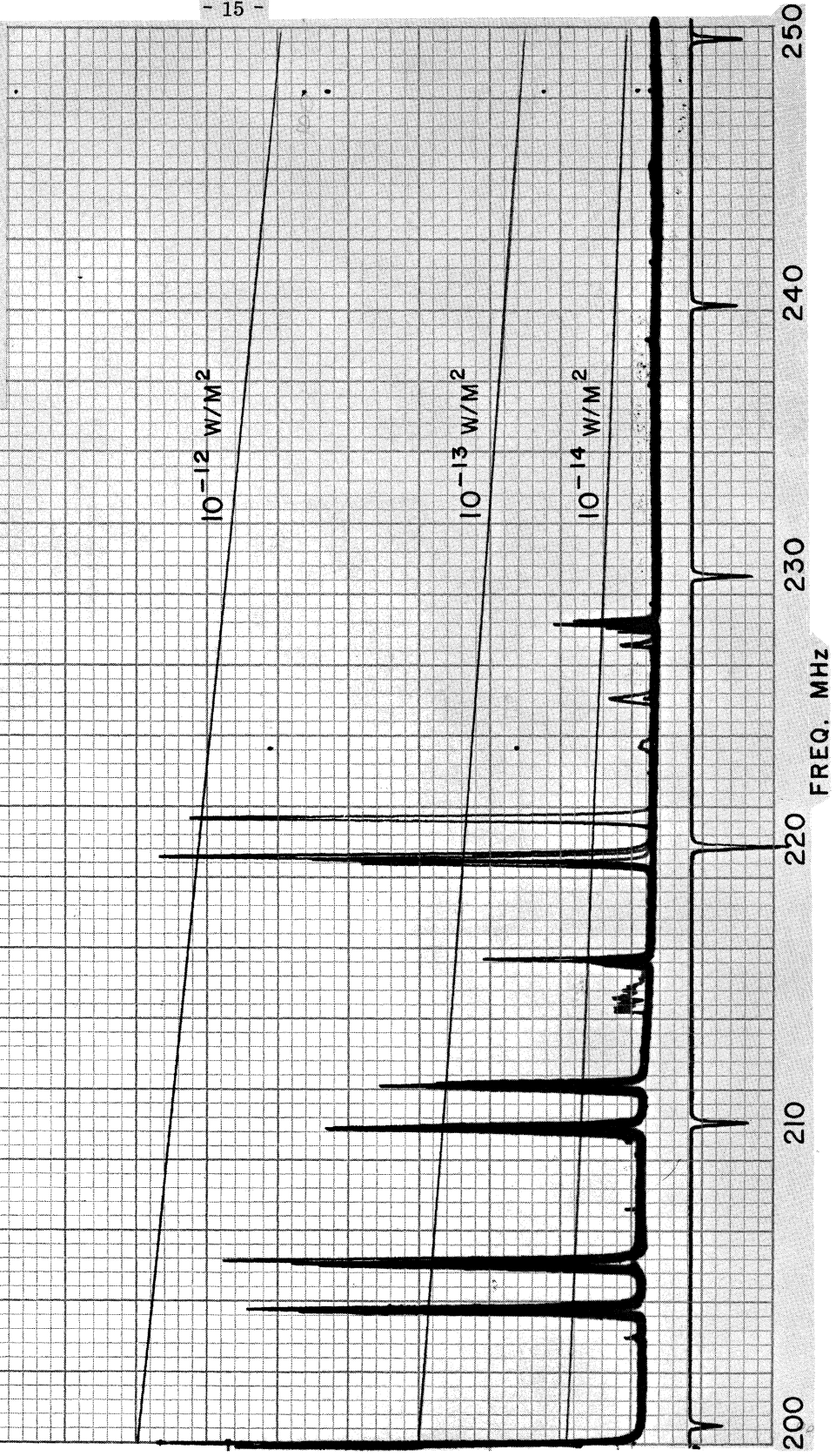
200-250 MHz

Afternoon

Maximum

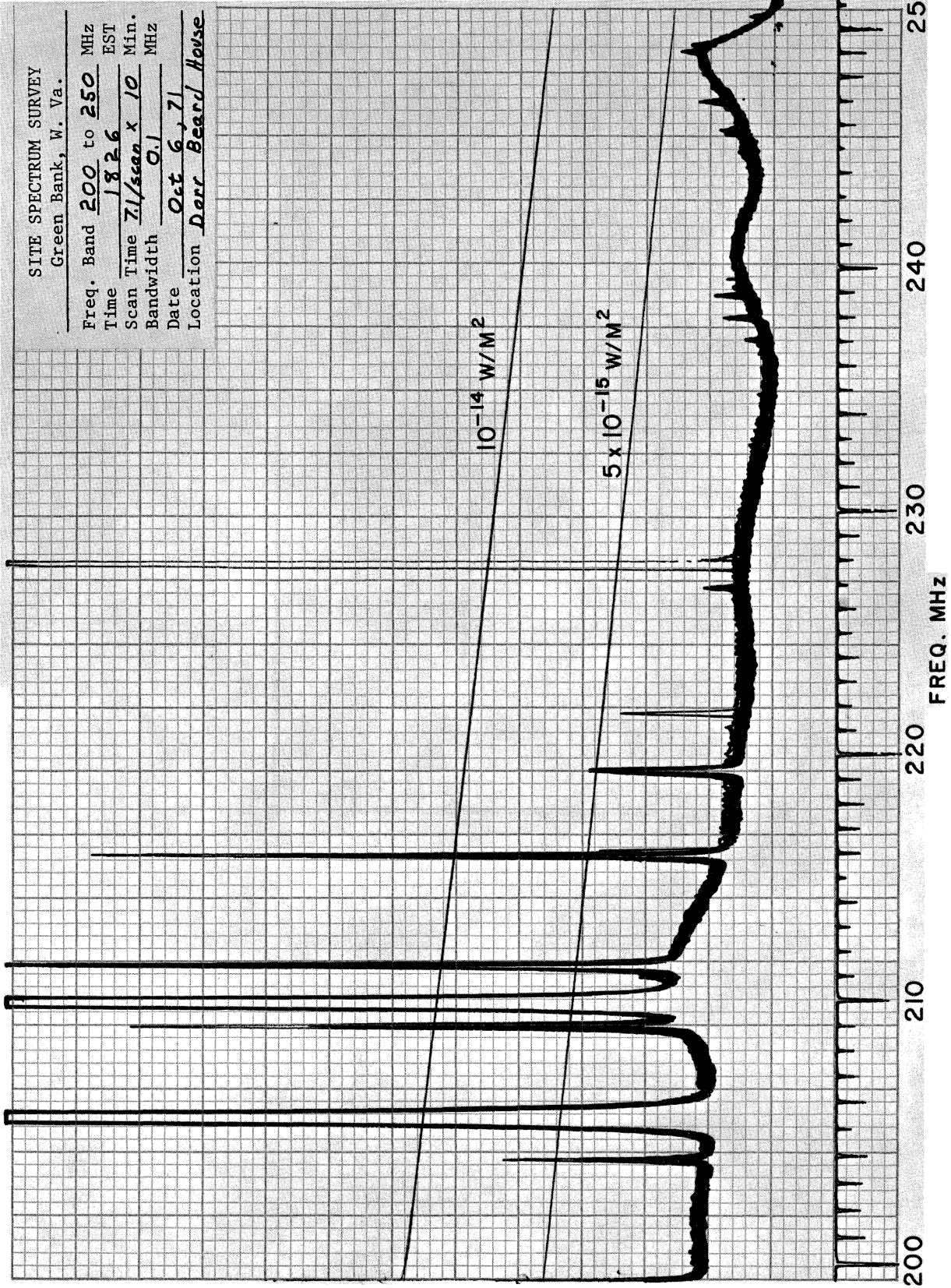
NOT INCLUDED

SITE SPECTRUM SURVEY
Green Bank, W. Va.
Freq. Band 200 to 250 MHz
Time 1635 EST
Scan Time 7.1/scan x 10 Min.
Bandwidth 0.1 MHz
Date Jul 24, 71
Location Derr Beard House



SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 200 to 250 MHz
Time 18 26 EST
Scan Time 71/scan x 10 Min.
Bandwidth 0.1 MHz
Date Oct 6, 71
Location Darr Beard House



200 210 220 230 240 250
FREQ. MHZ

SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 200 to 250 MHz
Time 1928 EST
Scan Time 1.1/scan x 10 Min.
Bandwidth 0.1 MHz
Date Aug 18, 71
Location Derr Beard House

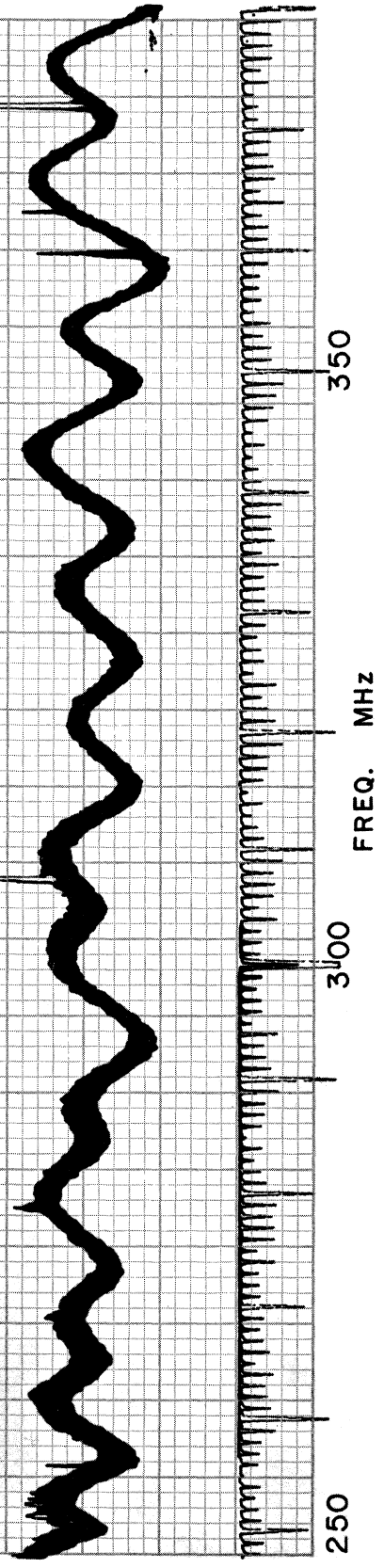


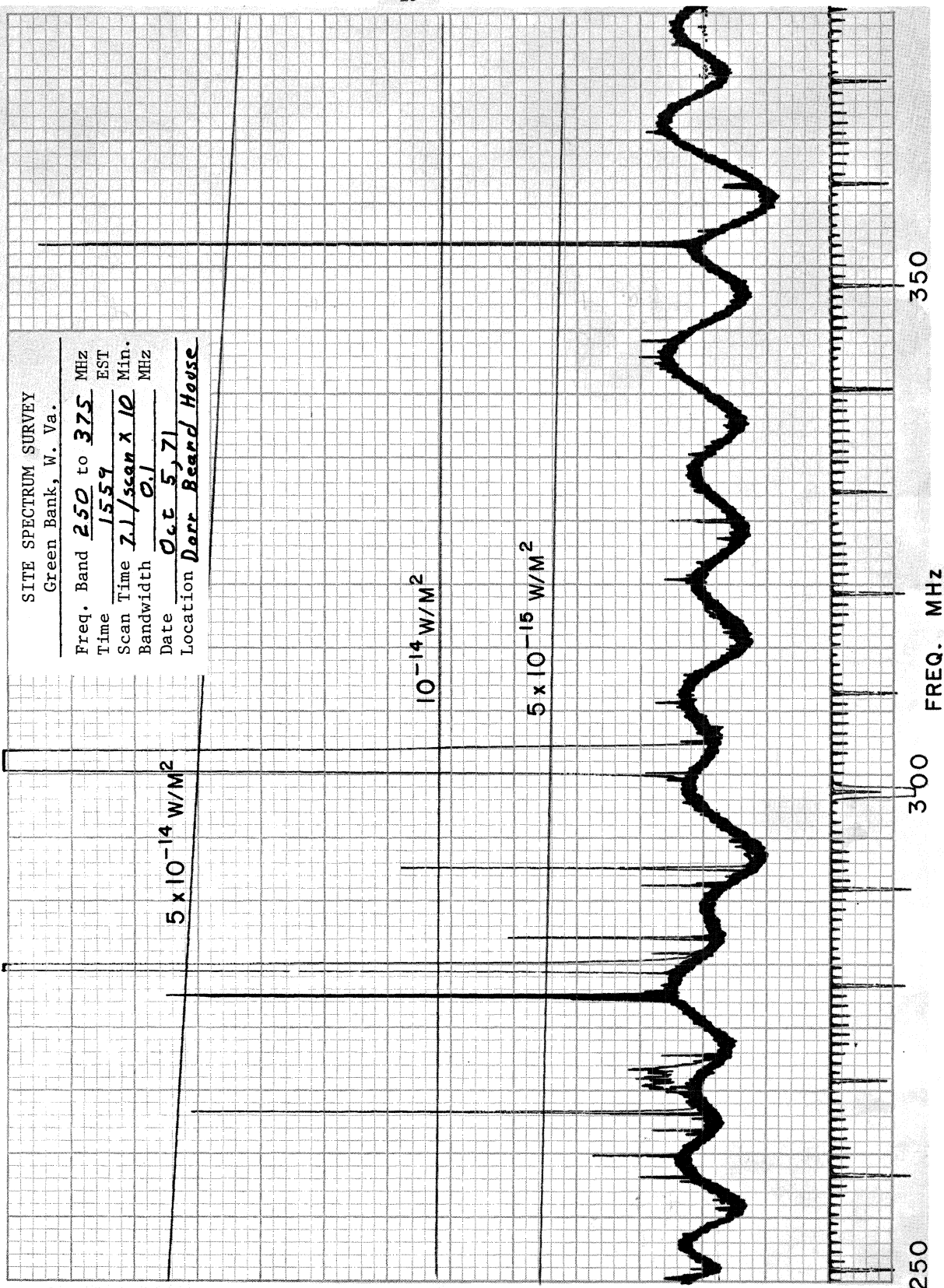
SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 250 to 375 MHz
Time 9:20 EST
Scan Time 7.1/scan X 10 Min.
Bandwidth 0.1 MHz
Date Oct 3, 71
Location Darr Beard House

$5 \times 10^{-14} \text{ W/M}^2$

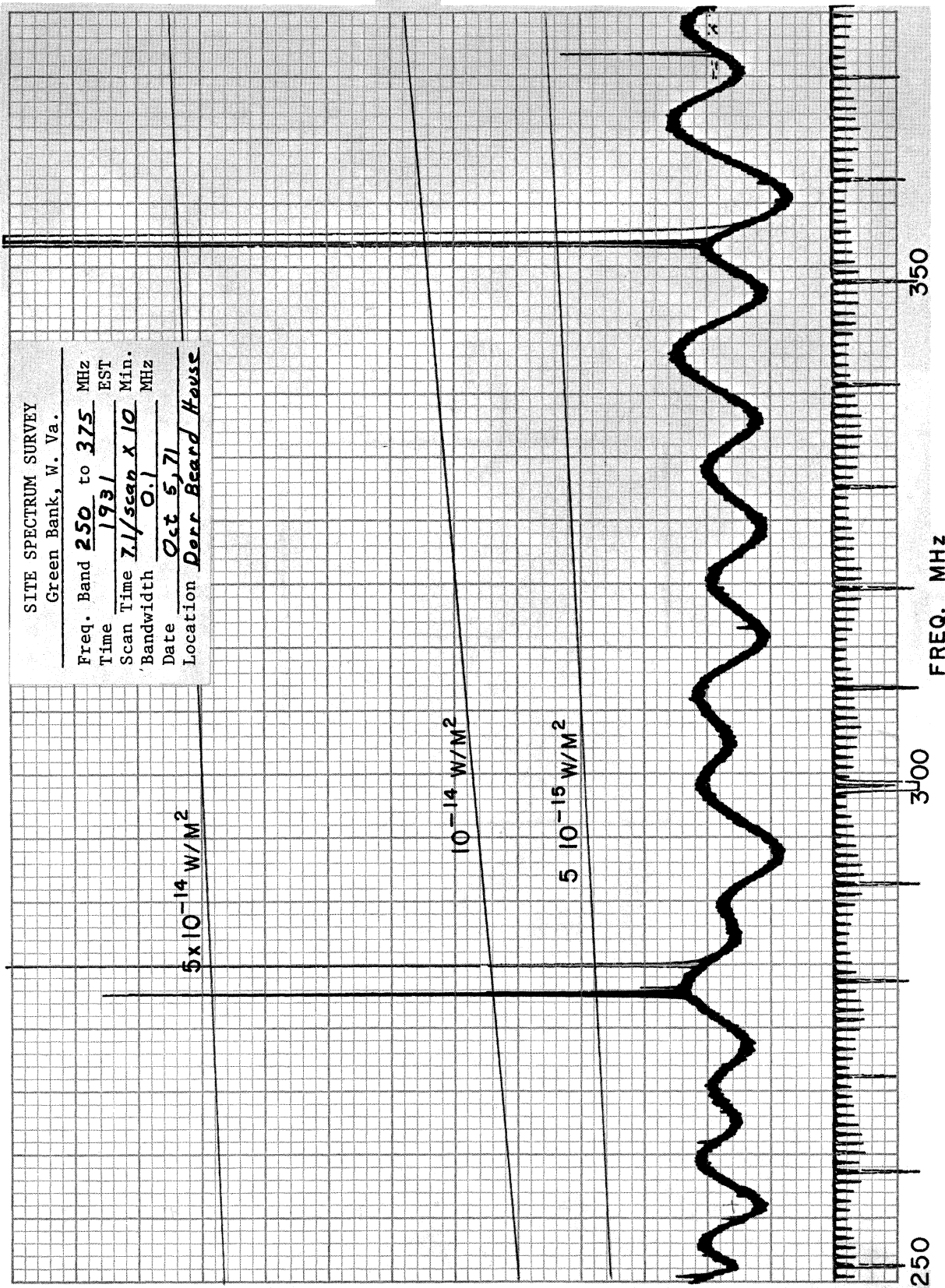
10^{-14} W/M^2





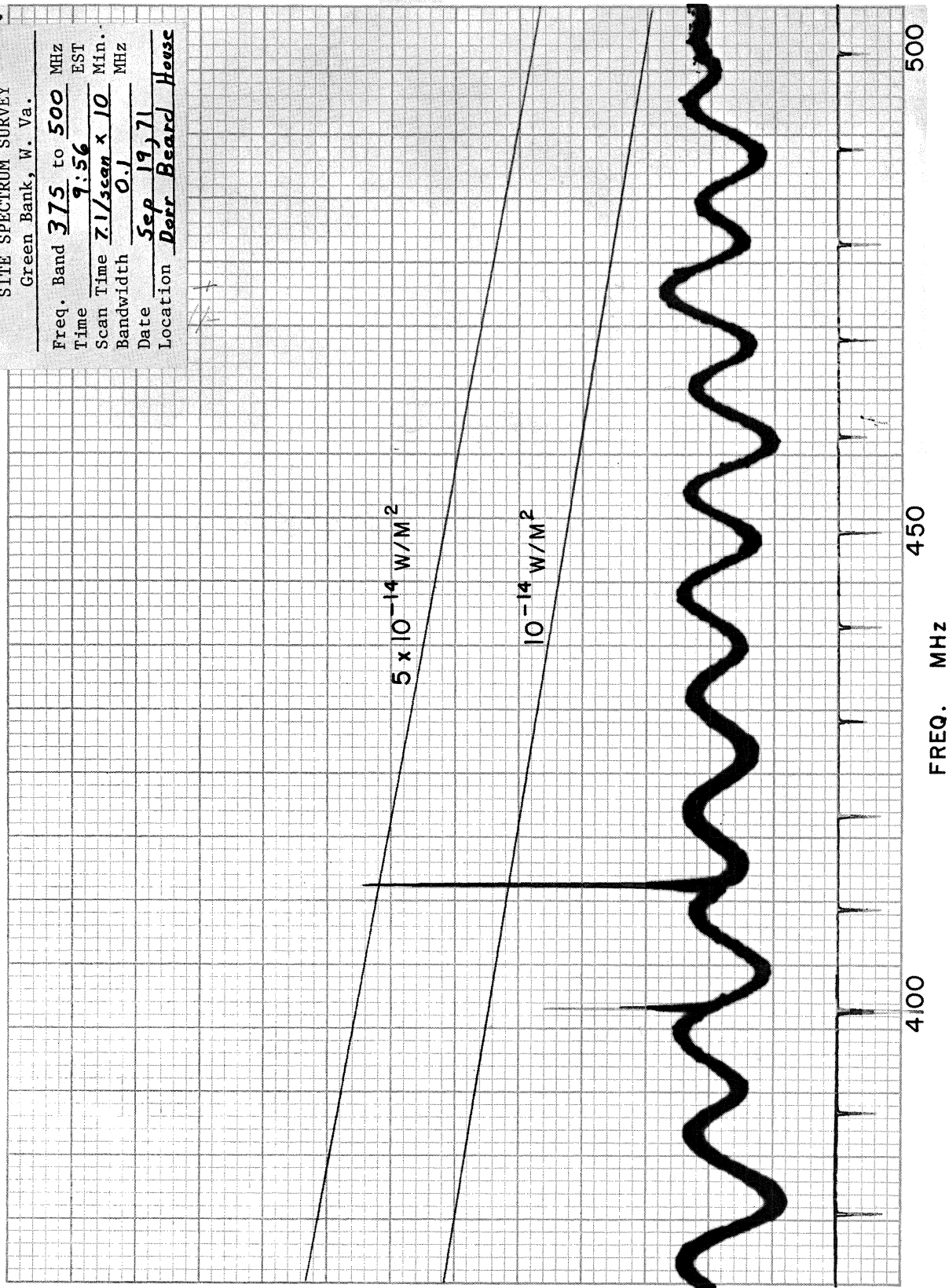
SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band	250 to 375	MHz
Time	1931	EST
Scan Time	7.1/scan x 10	Min.
Bandwidth	0.1	MHz
Date	Oct 5, 71	
Location	Dorr Beard House	



SITE SPECTRUM SURVEY
Green Bank, W. Va.

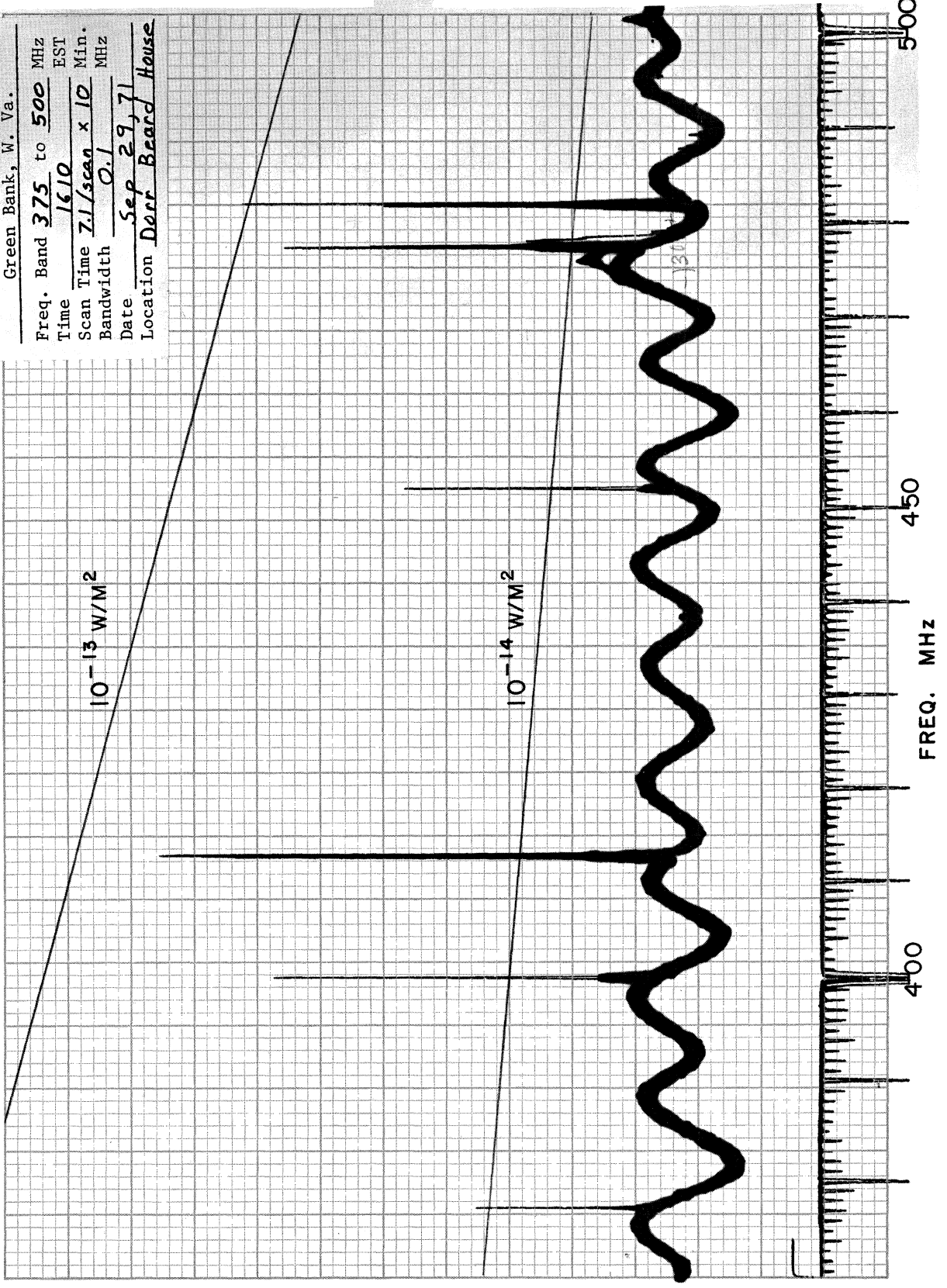
Freq. Band 375 to 500 MHz
Time 9:56 EST
Scan Time 7.1/scan x 10 Min.
Bandwidth 0.1 MHz
Date Sep 19, 71
Location Barr Beard House

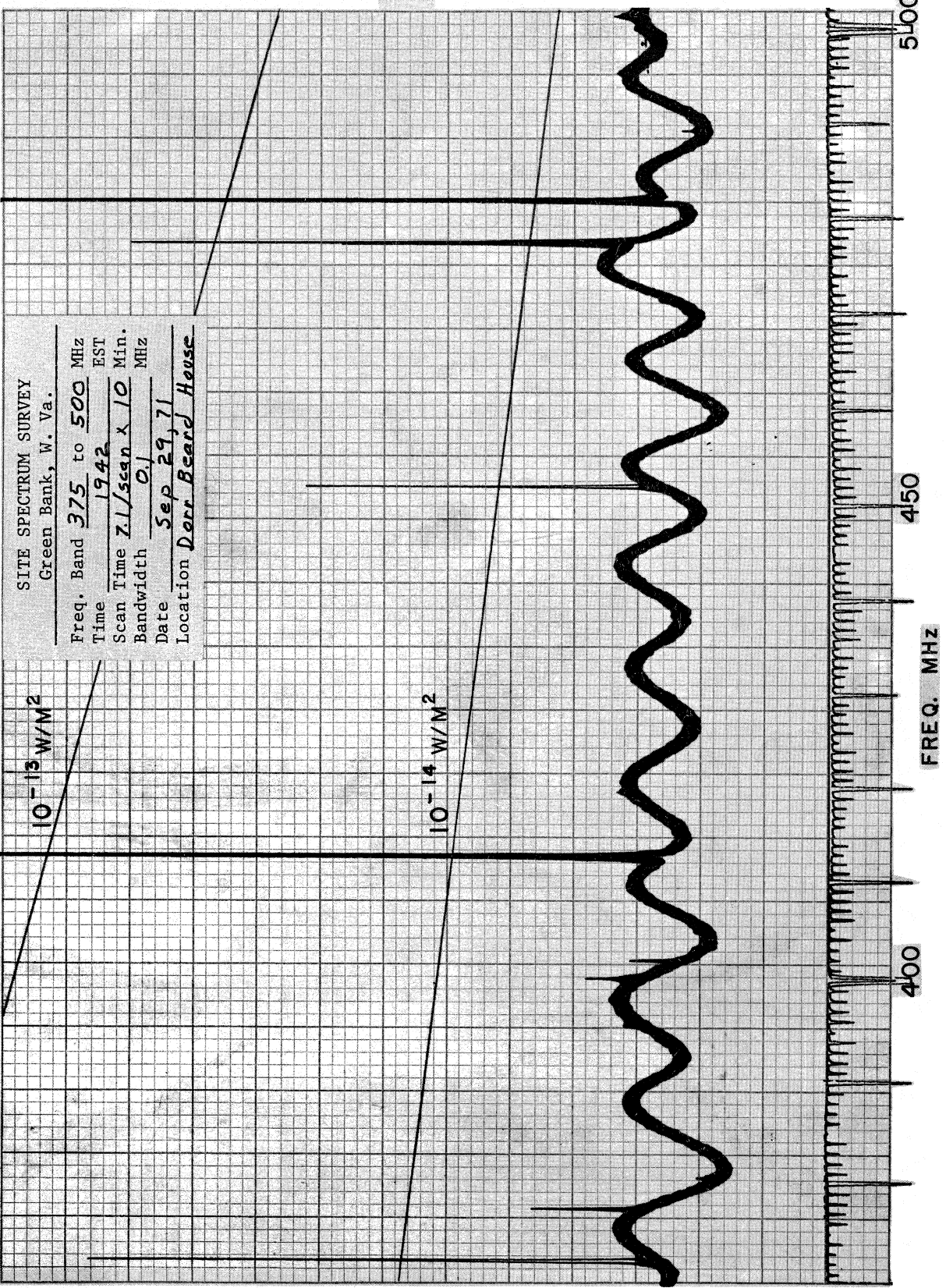


SITE SPECTRUM SURVEY

Green Bank, W. Va.

Freq. Band 375 to 500 MHz
Time 1610 EST
Scan Time 7.1/scan x 10 Min.
Bandwidth 0.1 MHz
Date Sep 29, 71
Location Darr Beard House



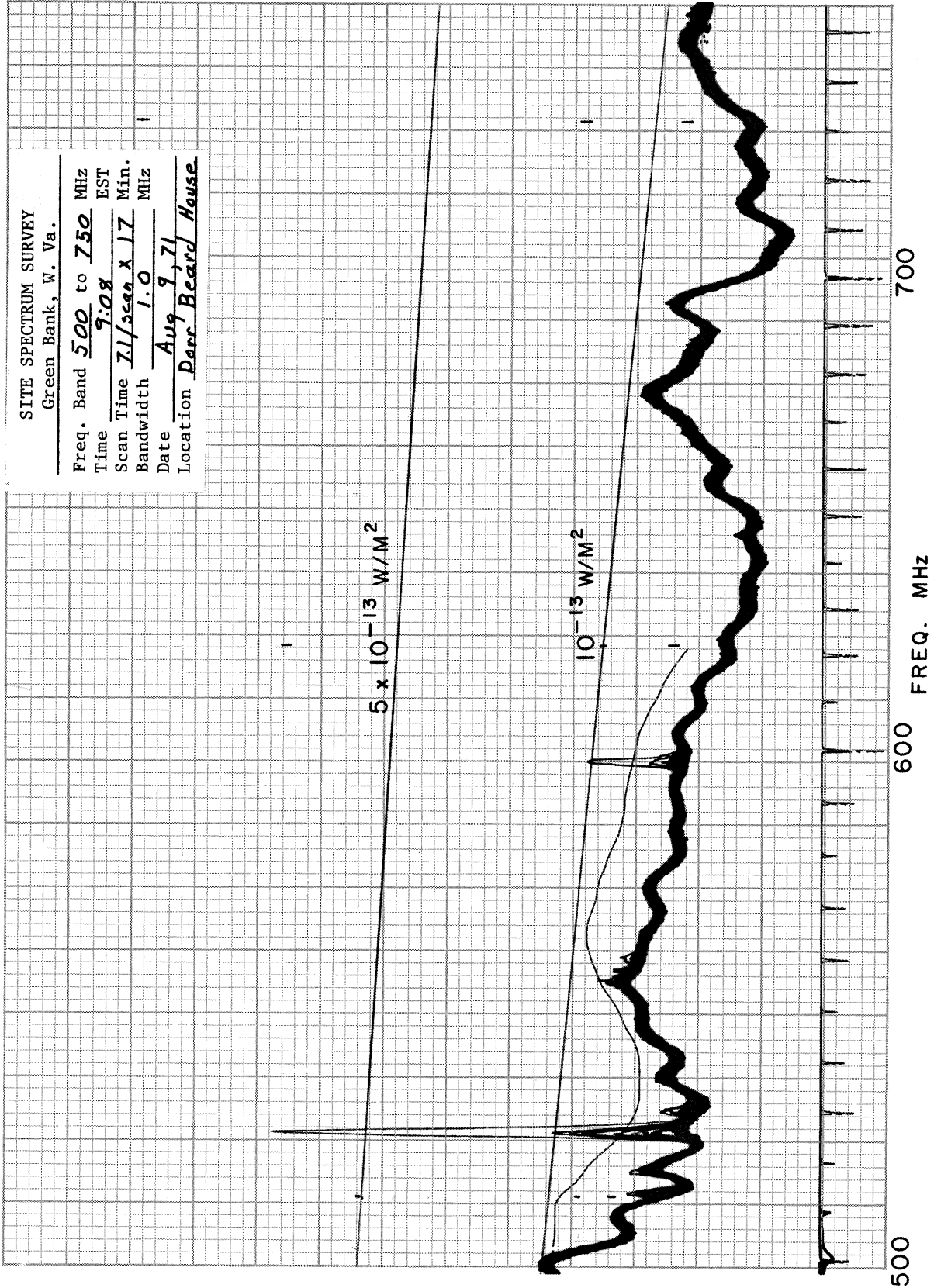


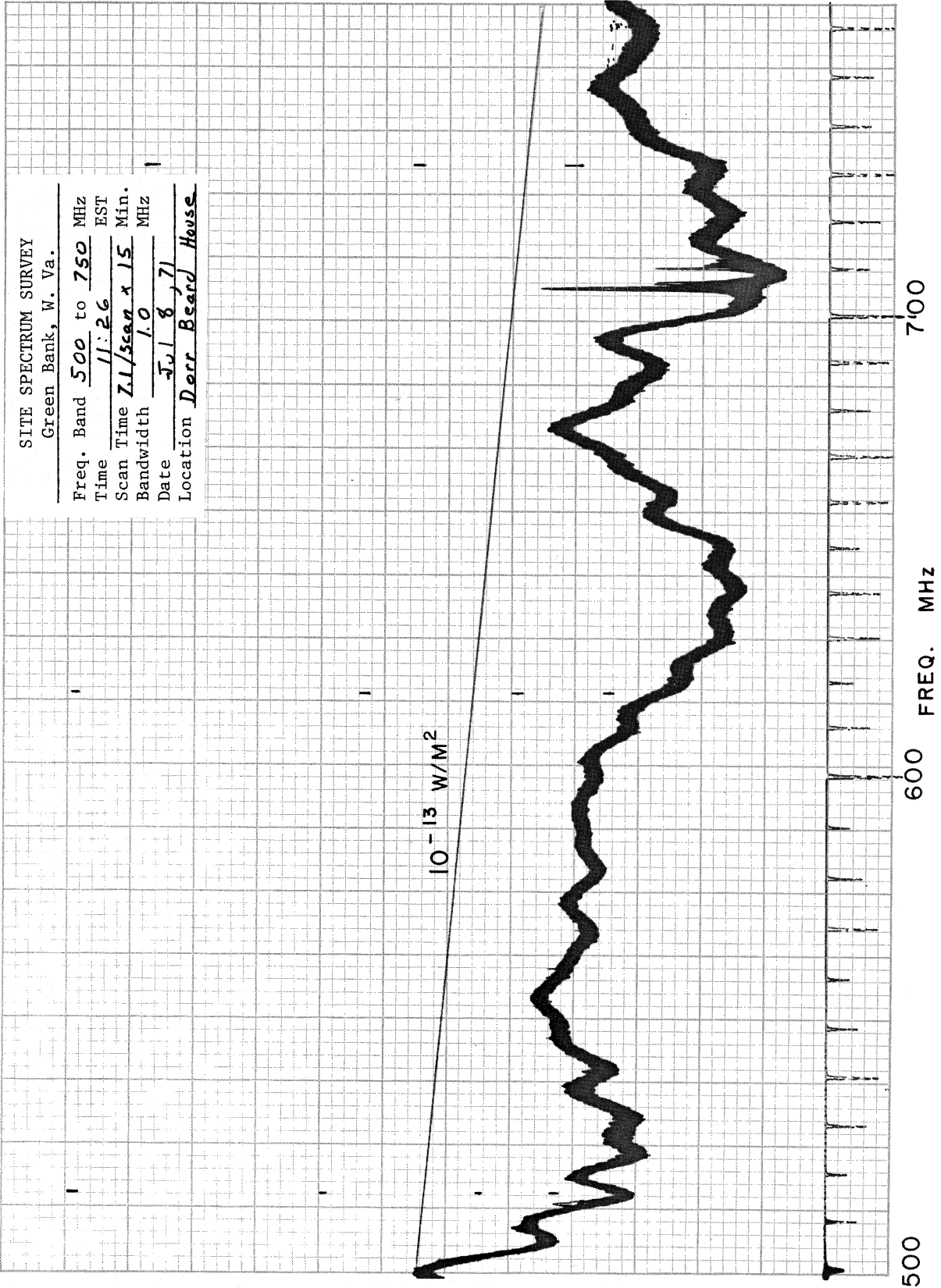
SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 375 to 500 MHz
Time 1942 EST
Scan Time 7.1/scan x 10 Min.
Bandwidth 0.1 MHz
Date Sep 29, 71
Location Dorr Beard House

SITE SPECTRUM SURVEY
Green Bank, W. Va.

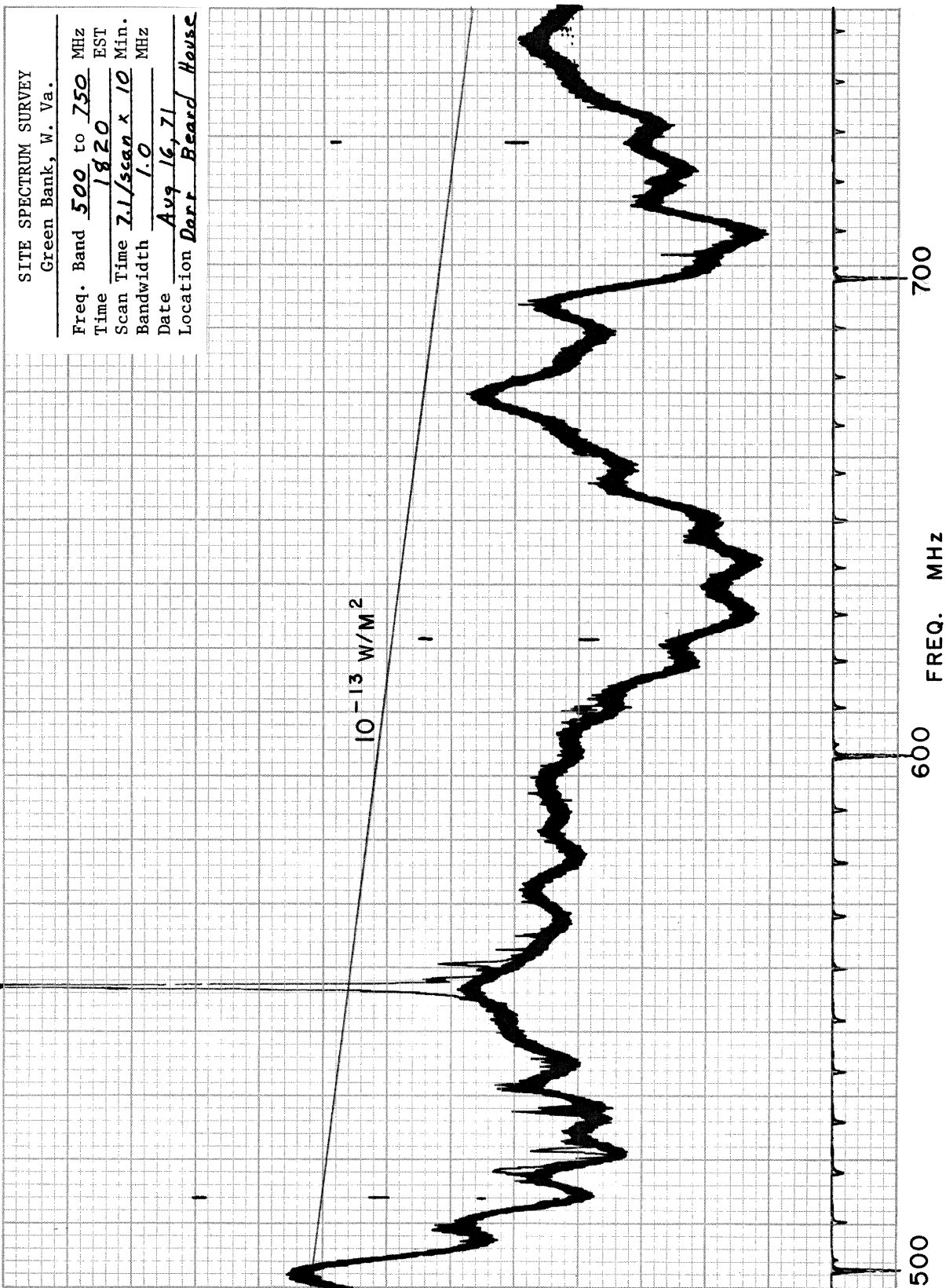
Freq. Band 500 to 750 MHz
Time 9:08 EST
Scan Time 7/1/55 X 17 Min.
Bandwidth 1.0 MHz
Date Aug 9, 71
Location Darr Beard House





SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 500 to 750 MHz
Time 1820 EST
Scan Time 7.1/scan x 10 Min.
Bandwidth 1.0 MHz
Date Aug 16, 71
Location Darr Beard House

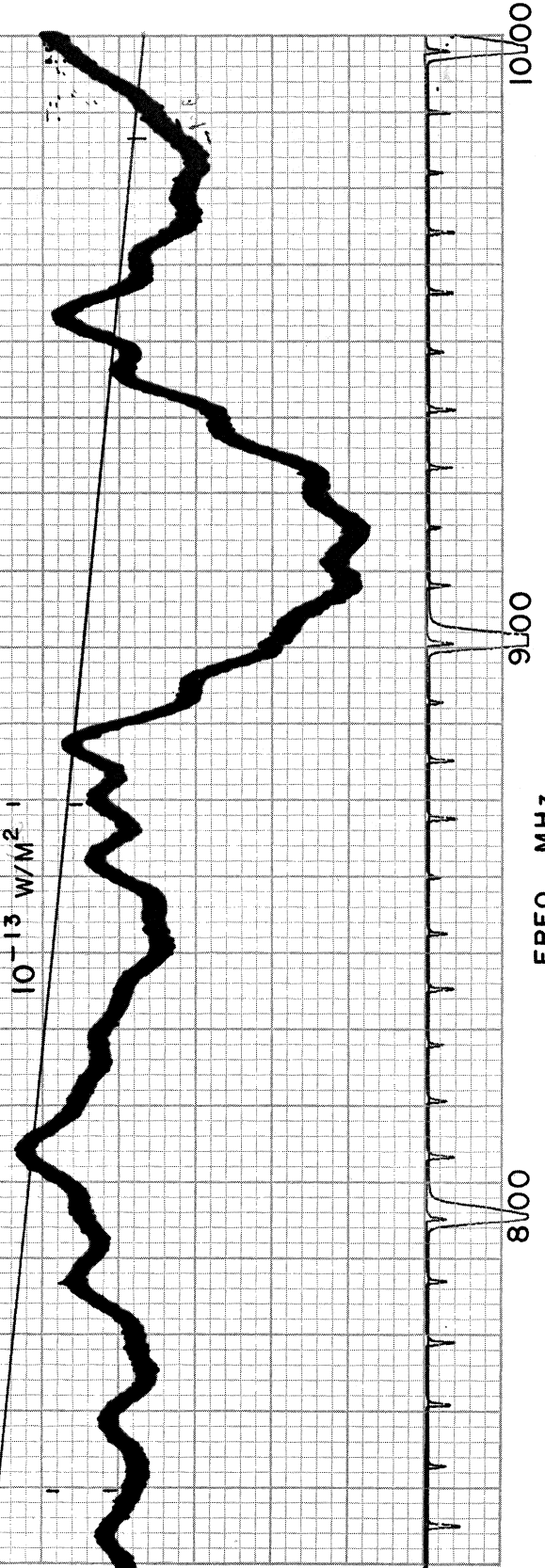


SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 750 to 1000 MHz
Time 10.37 EST
Scan Time 7.1/scan x 10 Min.
Bandwidth 1 MHz
Date Aug. 10, 71
Location Deer Beard House

NOTE: No signals were detected in this portion of the frequency spectrum during the entire survey. This graph is typical of all the graphs made for this band of frequencies and is enclosed for future reference purposes only.

10^{-13} W/M²



800

900

1000

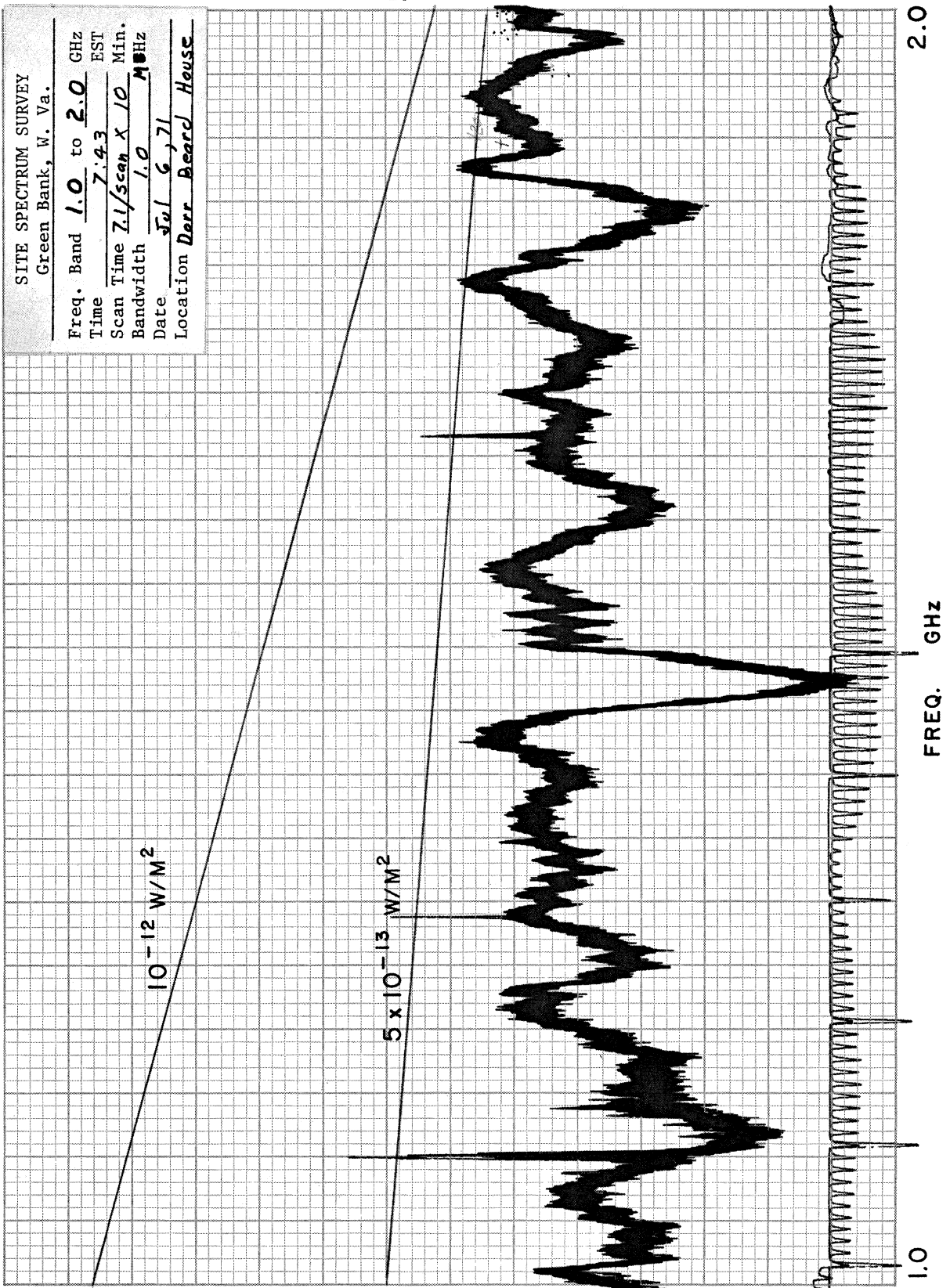
FREQ. MHZ

SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 1.0 to 2.0 GHz
Time 7:43 EST
Scan Time 7.1/scan X 10 Min.
Bandwidth 1.0 MHz
Date Jul 6, 71
Location Derr Beard House

10^{-12} W/M²

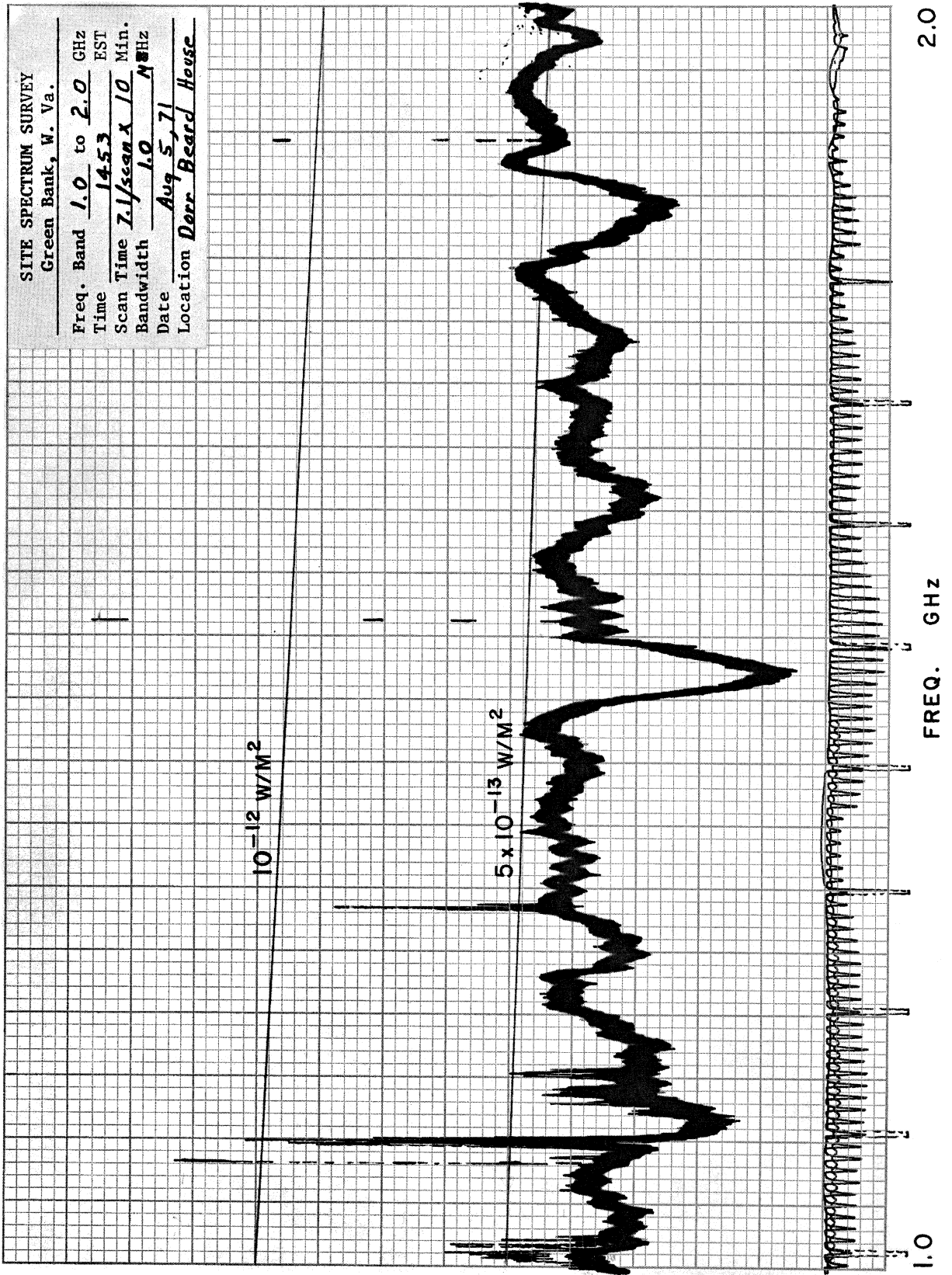
5×10^{-13} W/M²



1.0 FREQ. GHz 2.0

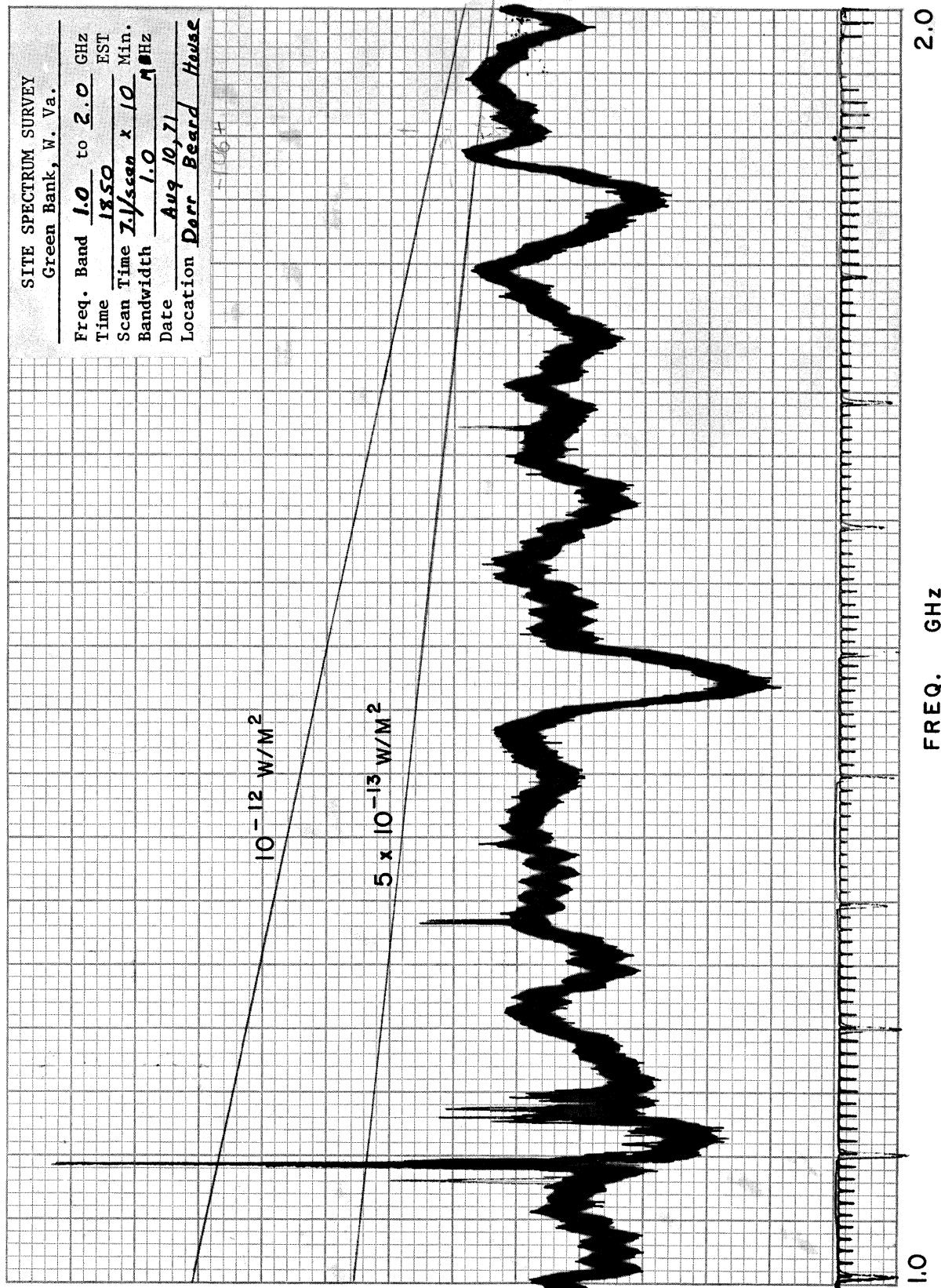
SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 1.0 to 2.0 GHz
Time 1453 EST
Scan Time 7.1/scan X 10 Min.
Bandwidth 1.0 MHz
Date Aug 5, 71
Location Dorr Beard House



SITE SPECTRUM SURVEY
Green Bank, W. Va.

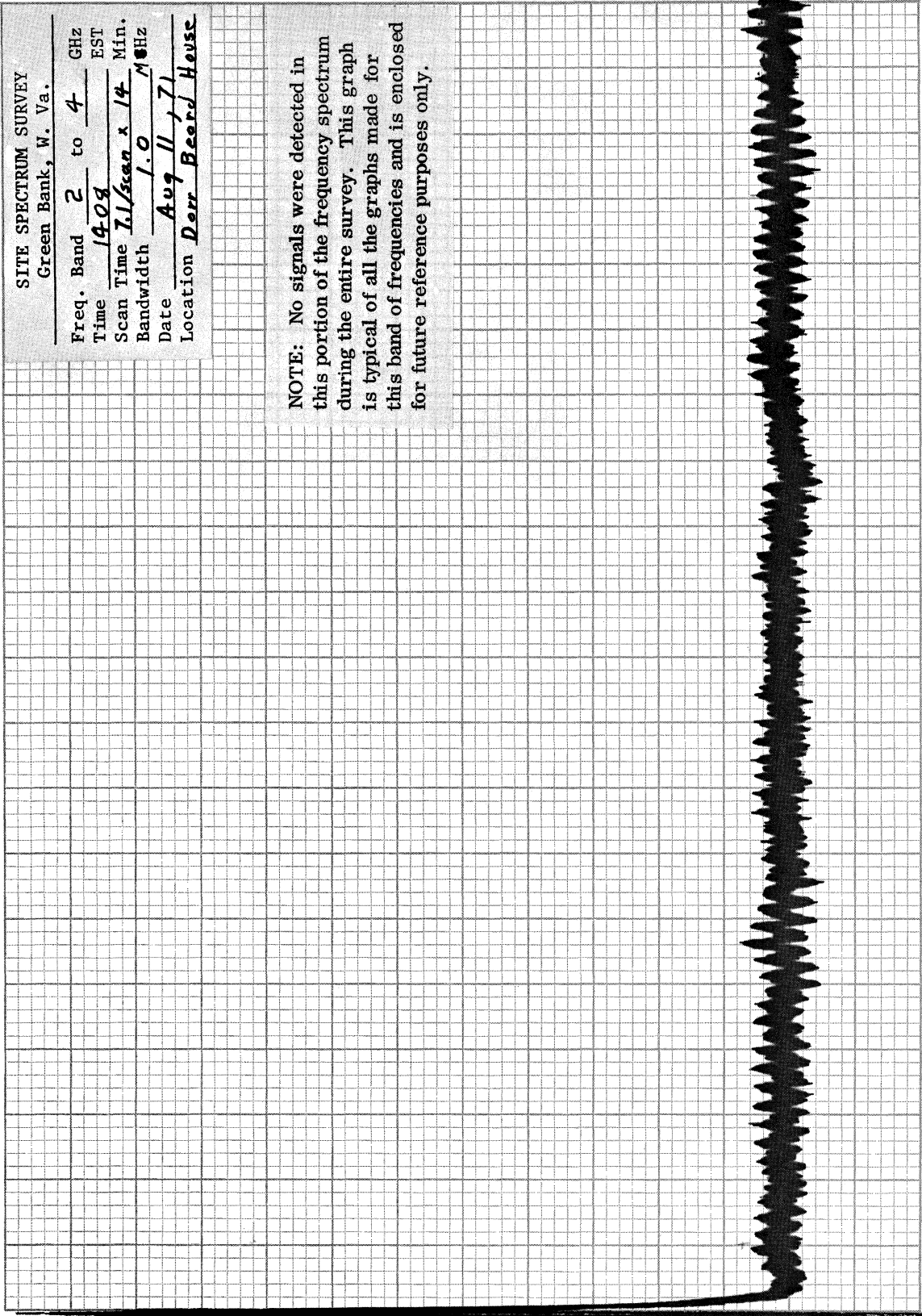
Freq. Band 1.0 to 2.0 GHz
Time 1350 EST
Scan Time 7.1/scan x 10 Min.
Bandwidth 1.0 MHz
Date Aug 10, 71
Location Darr Beard House



SITE SPECTRUM SURVEY
Green Bank, W. Va.

Freq. Band 2 to 4 GHz
Time 1409 EST
Scan Time 1.1/scan x 14 Min.
Bandwidth 1.0 MHz
Date Aug 11/71
Location Dorr Beard House

NOTE: No signals were detected in this portion of the frequency spectrum during the entire survey. This graph is typical of all the graphs made for this band of frequencies and is enclosed for future reference purposes only.



DISCUSSION

The data for this report was obtained by means of the NRAO mobile interference detection van. ^{1/} Data of this type is subject to misinterpretation. Most of the spectrum displays are swept for approximately 70 minutes with instantaneous bandwidths and sweep rates shown on each record. For long duty-cycle transmitters such as television, radio beacons, FM broadcast, etc., with power density at Green Bank above the receiver detection level, the probability of detection (or capture) is almost unity, dependent only on the signal being present during the period of observation. However, the case for random transmitters such as point-to-point communications, air-to-ground, etc., the situation is more complex and confidence in the data is based on a number of assumptions and variables. The probability that the signal is on, is its duty cycle, or

$$P_{\text{on}} = \frac{\Delta t}{T}$$

where P_{on} = probability the signal is on.
 Δt = time signal is on.
 T = unit time interval.

This requires some knowledge of the on-time distribution. For a standard TV station P_{on} , for $T = 24$ hours, is about $\frac{18}{24}$. If T is taken from 8 a. m. until 8 p. m., then $P_{\text{on}} = 1$. The case for point-to-point communication may be $P_{\text{on}} = \frac{1}{24}$, for $T = 24$ hours. A good estimate is probably $P_{\text{on}} = 0.1$, or the signal may be on an average of 1 minute out of 10 during the daylight hours. The problem for this type of signal then reduces to the following question:

What is the probability of capture of a random signal with an on probability of 0.1 using a spectrum analyzer with the following parameters:

b = instantaneous bandwidth,
 B = swept bandwidth containing target frequency,
 N = total number of sweeps, and
 T_s = time required to sweep B ?

^{1/} Specifications and operating instructions for the NRAO van will be available in a forthcoming publication.

Definitions

- P_d = probability of detection.
- P_x = probability of not detecting.
- P_{on} = probability signal is on.
- P_{off} = probability signal is off.

The following assumptions have been made:

- 1) When the signal is on, it is above the noise of our receiver.
- 2) The signal is located within B.
- 3) $\Delta t < \frac{b}{B} T_s N$

The equation

$$P_d = 1 - P_{off}^{\left(\frac{NT_s}{\Delta t} \cdot \frac{b}{B} \right)}$$

is derived as follows:

The signal is on in independent increments of Δt . Then the probability that the signal (F_i) is off in consecutive samples is $\left(P_{off_1} \right) \left(P_{off_2} \right) \dots \left(P_{off_n} \right)$. The probability that f_t is off in n samples is P^n . Therefore, the probability of detection is $1 - P_{off}^n$, where n is total look time, or

$$n = \left(\frac{NT_s}{\Delta t} \right) \left(\frac{b}{B} \right)$$

The probability of detecting a station with the following characteristics

$$P_{on} = 0.1$$

$$\frac{b}{B} = 0.1$$

$$\frac{NT_s}{\Delta t} = 10$$

is ≈ 0.65 .

So, it is probably safe to assume a confidence level of about 60% to 80% for short, random-type signals.

RECEIVER CONSIDERATIONS

The receiver system used to obtain these displays possesses some undesirable characteristics. Sensitivity across a given band and from band to band varies because of varying gain, and at higher frequencies because of increasing noise figure. The effect of different VSWR between the antenna and the reference load can be seen as a quasi sine wave variation in the baseline, particularly on the most sensitive settings. The worst case was in the 250 to 500 MHz region. The VSWR of the 0.1 to 1.0 GHz antenna varied from 1 to about 2.5. The VSWR of the 1.0 to 8.0 GHz was comparable.

FREQUENCY CALIBRATION

The frequency calibration marks on the abscissa were obtained by injecting harmonics from a HP model 8406A comb generator. Specifications for the generator are $\pm .01\%$ (0 °C - 50 °C). The spectrum analyzer local oscillator is the limiting factor in the frequency stability. The local oscillator stability is about 1% at any given frequency.

POWER DENSITY CALIBRATION

Level calibration was done by injecting a C.W. signal into the front-end and measuring the power with the HP 432 power meter. Because of tolerances on pads, line losses and instruments, the estimated level accuracy is about \pm an order of magnitude. The power densities shown should be used only as a guide.

MISCELLANEOUS CONSIDERATIONS

Some trouble was experienced with wideband, incoherent interference on some displays. This effect can be seen as baseline not tracking from scan to scan. This trouble was minor and should cause little trouble in using the charts. Some overload trouble was noticed in the lower bands, caused by the low power handling capabilities of the wideband amplifiers. High-pass filters between the antennas and front-end practically eliminated this problem. There are periodic cases of local interference such as power line faults, defective switches, laboratory signal sources, etc., that

are not shown on these graphs. In other words, the spectrum as shown should not be considered as the worst case.

MEASUREMENT SET UP

Figure 1 is a typical block diagram of the measurement systems used for this survey. These systems are permanently mounted in the NRAO interference van. A detailed description of each measurement system can be found in the instruction and specification publication for the NRAO interference van.

At the start of the survey the antenna systems were checked for VSWR. The signal generator was then connected to the power meter at point A and the signal generator was adjusted for 1 mW. Next the signal generator was connected to the transmission line at point A leading to the calibration port on the appropriate receiver. Various precision pads were inserted at point B to calibrate the system. For operational details consult the operation manual for the NRAO interference van.

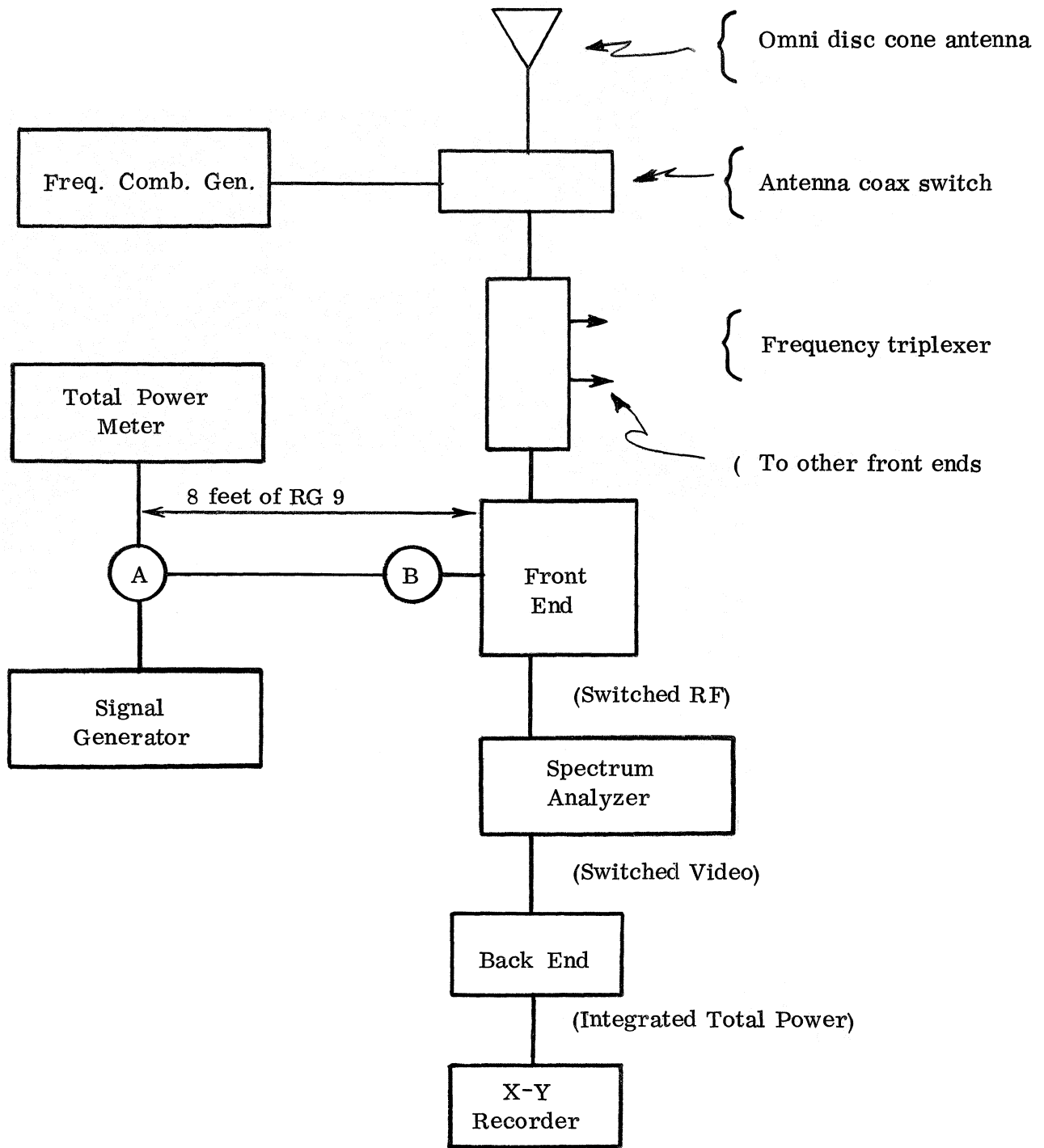


FIGURE 1

SWEPT FREQUENCY DICKIE RADIOMETER

EQUIPMENT LIST

Antennas

- . 1-1 GHz Disc Cone, NRAO special
- 1-12 GHz Disc Cone, Dorne and Margolin, Inc. , Serial No. 032

Triplexers

- . 1-1 GHz, Microphase Co. , G0105
- 1-12 GHz, Microphase Co. , 66D 13814

Frequency Comb Generator

- HP Model 8406A, NRAO 5183, Serial No. 737-00594

Power Meter

- HP Model 431C, NRAO 4288, Serial No. 618-00840 (Cal. Date 3-3-69)

Spectrum Analyzer

- HP Model 851B, NRAO 4953, Serial No. 813-02256
- HP Model 8551, NRAO 4954, Serial No. 823-02263

X-Y Recorder

- HP Model 7035B, NRAO 5160, Serial No. 926-03556 (Cal. Date 8-4-71)

Signal Generator

- . 1-1 GHz, HP Model 3200B, Serial No. 708-01366 (Cal. Date 8-14-67)
- 1-2 GHz, HP Model 8614A, Serial No. 972-01465 (Cal. Date 5-12-71)
- 2-4 GHz, GR Type 1360A, NRAO 2025, Serial No. 201 (Cal. Date 7-15-68)

Antenna Switches

- . 1-1 GHz, Transco Products, Serial No. 268
- 1-12 GHz, Transco Products, Serial No. 268

APPENDIX

FCC LISTING OF

U. S. AND INTERNATIONAL FREQUENCY ALLOCATIONS

§ 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States				Federal Communications Commission			
Band (MHz)	Service	Band (MHz)	Service	Band (MHz)	Allocation	Band (MHz)	Service	Class of station	Frequency (MHz)	Nature of services (of stations)	
1	2	3	4	5	6	7	8	9	10	11	
37.75-38.25	FIXED. (228) (229) (231) MOBILE. Radio astronomy.			37-38	NG.	37-37.01	LAND MOBILE.	Base Land mobile.		INDUSTRIAL.	
38.25-41 (235) (236)	FIXED. (228) (229) (230) (231) MOBILE.			38-39	G. (US81)	37.01-37.43	LAND MOBILE.	Base Land mobile.		PUBLIC SAFETY.	
				39-40	NG. (US94)	37.43-37.89	LAND MOBILE. (NG569)	Base Land mobile.		INDUSTRIAL.	
				40-42 (236)	G. (US94)	37.89-38	LAND MOBILE.	Base Land mobile.		PUBLIC SAFETY.	
						39-40	LAND MOBILE.	Base Land mobile.		PUBLIC SAFETY.	
									40.68	Industrial, scientific and medical equipment.	
41-50		41-50	FIXED. (228) (230) (237) MOBILE.	42-46.6	NG.	42-42.95	LAND MOBILE.	Base Land mobile.		PUBLIC SAFETY.	
						42.95-43.2	LAND MOBILE.	Base Land mobile.		INDUSTRIAL.	
						43.2-43.68	LAND MOBILE.	Base Land mobile.		DOMESTIC PUBLIC.	
						43.68-44.61	LAND MOBILE.	Base Land mobile.		LAND TRANSPORTATION.	
						44.61-46.6	LAND MOBILE.	Base Land mobile.		PUBLIC SAFETY.	
				46.6-47	G.						
				47-49.6	NG.	47-47.43	LAND MOBILE.	Base Land mobile.		PUBLIC SAFETY.	
						47.43-47.69	LAND MOBILE.	Base Land mobile.		PUBLIC SAFETY. INDUSTRIAL.	
						47.69-49.6	LAND MOBILE.	Base Land mobile.		INDUSTRIAL.	
				49.6-50	G.						
50-54		50-54	AMATEUR.	50-54	AMATEUR. (US1)	50-54	AMATEUR.	Amateur.		AMATEUR.	

54-68	54-68	FIXED, (228) (237) MOBILE, BROADCASTING.	54-72	BROADCASTING.	Television broadcast- ing.	55.25 59.75 61.25 65.75 67.25 71.75	Video } Channel 2, Sound } Video } Channel 3, Sound } Video } Channel 4, Sound }
68-73.0	68-73.0	FIXED, MOBILE, BROADCASTING.	72-73 (US20)	FIXED, (NG1) (NG3) (NG49)	Operational fixed.	72.02- 72.98 (NG33)	Operational fixed.
73-74.6	73-74.6	RADIO ASTRONOMY. (253A) (253B)	G, NG, (US21) (US100)	RADIO ASTRON- OMY. (US74)	Radio astronomy.		RADIO ASTRON- OMY.
74.6-75.4 (259)	74.6-75.4	AERONAUTICAL RADIONAVIGATION.	G, NG.	74.6-75.4	Aeronautical radio- navigation.	75	Marker beacon.
75.4-88	75.4-76 (US20)	FIXED, MOBILE, BROADCASTING.	NG.	75.4-76 (NG56)	Operational fixed.	75.42- 75.98 (NG33)	Operational fixed.
88-100	76-88 (US23)	BROADCASTING.	NG.	76-88 (NG21)	Television broadcast- ing.	77.25 81.75 83.25 87.75	Video } Channel 5, Sound } Video } Channel 6, Sound }
100-108	88-108 (US23) (US98)	BROADCASTING.	NG.	88-108 (NG21)	F.M. broadcasting.	88.1- 107.9 (NG36)	F.M. Channel 201- F.M. Channel 300.
108-117.975	108-117.975 (US98)	AERONAUTICAL RADIONAVIGATION.	G, NG.	108-117.975	Radionavigation land.	108.1 108.2 108.3 108.4 108.5 108.6 108.7 108.8 108.9 109.0 109.1 109.2 109.3 109.4 109.5 109.6 109.7 109.8 109.9 110.0 110.1	Localizer. Omni-directional range. Localizer. Omni-directional range. Localizer. Omni-directional range. Localizer. Omni-directional range. Localizer. Omni-directional range. Localizer. Omni-directional range. Localizer. Omni-directional range. Localizer. Omni-directional range. Localizer. Omni-directional range. Localizer. Omni-directional range. Localizer.

See footnotes at end of table.

§ 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States		Federal Communications Commission				
Band (MHz)	Service	Band (MHz)	Service	Band (MHz)	Allocation	Band (MHz)	Service	Class of station	Frequency (MHz)	Nature of services (of stations)
1	2	3	4	5	6	7	8	9	10	11
117.975-132	AERONAUTICAL MOBILE, (R) (273) (273A)			117.975-121.975 (273) (US26) (US28) (US85)	G, NG.	117.975-121.975	AERONAUTICAL MOBILE, (R)	Aeronautical. Aircraft.	118-121.4 (NG34)	Airborne control.
				121.975-123.075 (US29) (US31) (US33) (US80) (US85) (US102)	NG.	121.975-123.075	AERONAUTICAL MOBILE.	Aeronautical. Aircraft.	121.5	AERONAUTICAL MOBILE.
				123.075-123.575 (US32) (US33)	G, NG.	123.075-123.575	AERONAUTICAL MOBILE.	Aeronautical. Aircraft.	121.6-121.90 (NG34)	Aeronautical utility land; aeronautical utility mobile.
									121.95	Flight test.
									122.0-123.05 (NG34)	Private aircraft.
									123.1	Aeronautical search and rescue mobile.
									123.15	Flight test.
									123.2	Do.
									123.25	Do.
									123.3	Flight test; aviation instructional.
									123.35	Flight test.
									123.4	Do.
									123.45	Do.

123.5	Flight test; aviation instructional. Flight test.
123.55	
123.6-128.8 (NG34)	AERONAUTICAL MOBILE.
128.85-132 (NG34)	AERONAUTICAL MOBILE.
132.05-135.95 (NG34)	AERONAUTICAL MOBILE.
	Telemetering; tracking.
	METEOROLOGICAL-SATELLITE SPACE.
143.90	Civil air patrol land; civil air patrol mobile.
	AMATEUR.
148.15	Civil air patrol land; civil air patrol mobile.
148.25	Earth (telecommand).
	RADIONAVIGATION-SATELLITE.
	LAND TRANSPORTATION. (NG35).

123.575-128.825 (US26) (US85)	G, N.G.	123.575-128.825	AERONAUTICAL MOBILE. (R)		123.575-128.825	AERONAUTICAL MOBILE. (R)			123.575-128.825 (US26) (US85)	G, N.G.	132-136 (US2) (US85)	AERONAUTICAL MOBILE. (R)		132-136 (US2) (US85)	AERONAUTICAL MOBILE. (R)			132-136 (US2) (US85)	G, N.G. (US3)	136-137	SPACE RESEARCH.		136-137	SPACE RESEARCH.		137-138	METEOROLOGICAL-SATELLITE SPACE (Telemetering and tracking).		138-144 (US10)	G.	138-144 (US10)	FIXED MOBILE. Radiolocation.		143.6-143.65	FIXED MOBILE. SPACE RESEARCH (Telemetering and tracking). Radiolocation.		143.65-144	FIXED MOBILE. Radiolocation.		146-148	AMATEUR.		148-149.9 (US86)	G.	148-149.9 (US86)	FIXED MOBILE.		149.9-150.05	G, N.G. (US100)	149.9-150.05	RADIONAVIGATION-SATELLITE.		150.05-150.8	G.	150.05-150.8	FIXED MOBILE.		150.8-157.0375	N.G.	150.8-157.0375	LAND MOBILE.	
128.825-132 (US2) (US85)																																																														
132-136 (281A) (281B)																																																														
137-138 (281E)																																																														
138-143.6																																																														
143.6-143.65																																																														
143.65-144																																																														
144-146																																																														
146-148																																																														
148-149.9 (285A)																																																														
149.9-150.05 (285B)																																																														
150.05-174																																																														

See footnotes at end of table

§ 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States		Federal Communications Commission				
Band (MHz)	Service	Band (MHz)	Service	Band (MHz)	Allocation	Band (MHz)	Service	Class of station	Frequency (MHz)	Nature (OF SERVICES) (of stations)
1	2	3	4	5	6	7	8	9	10	11
(285A)		(285A)		(US86)		150.98-151.49 151.49-152	LAND MOBILE.	Base. Land mobile.		PUBLIC SAFETY (NG5).
						152-152.255	LAND MOBILE.	Base. Land mobile.		INDUSTRIAL.
						152.255-152.465	LAND MOBILE.	Base. Land mobile.		DOMESTIC -PUB-PORTATION. (NG38)
						152.465-152.495	LAND MOBILE.	Base. Land mobile.		INDUSTRIAL.
						152.495-152.855	LAND MOBILE.	Base. Land mobile.		DOMESTIC PUB-LIC. (NG4)
						152.855-153.7325	LAND MOBILE.	Base. Land mobile.		INDUSTRIAL. (NG4)
						153.7325-154.46	LAND MOBILE.	Base. Land mobile.	154.2	PUBLIC SAFETY. Earth. (telecom-mand).
						154.46-154.6275	LAND MOBILE.	Base. Land mobile.		INDUSTRIAL. (NG57).
						154.6275-156.25	LAND MOBILE.	Base. Land mobile.		PUBLIC SAFETY.
(287)				(US77)		156.250-157.0375	MARITIME MOBILE. (NG5)	Coast. Ship.	156.275 156.300 156.325 156.350	MARITIME MOBILE. Do. MOBILE. (NG24) MARITIME MOBILE. Do.
				(US106) (US107)					156.375 156.400 156.425 156.450	Do. MOBILE. (NG24) MARITIME MOBILE. Do.
									156.475 156.500 156.525 156.550	MARITIME MOBILE. (NG24) Do. MOBILE. (NG24) MARITIME MOBILE. Do.
									156.575 156.600 156.625 156.650	MARITIME MOBILE. (NG24) Do. MOBILE. (NG24) MARITIME MOBILE. Do.
									156.675 156.700 156.725 156.750	Do. Do. Do. Do.
									156.800	MARITIME MOBILE. (NG24)
									156.850 156.875 156.900 156.925	MOBILE (distress, safety, and calling). MARITIME MOBILE. Do. Do.
									156.950 156.975 157.000 157.025	Do. Do. Do. Do.

157.0875- 157.1875	G.				Ship.	157.200 157.225 157.250 157.275 157.300 157.325 157.350 157.375 157.400 157.425	MARITIME MOBILE. Do. Do. Do. Do. Do. Do. Do. Do.
157.1875- 162.0125	NG: (US77)	157.1875- 157.450	MARITIME MOBILE. (NG3)				
		157.45- 157.725	LAND MOBILE.		Base, Land mobile.		LAND TRANS- PORTATION. (NG5) (NG38)
		157.725- 157.755	LAND MOBILE.		Base, Land mobile.		INDUSTRIAL.
		157.755- 158.115	LAND MOBILE.		Base, Land mobile.		DOMESTIC PUB- LIC.
		158.115- 158.475	LAND MOBILE.		Base, Land mobile.		INDUSTRIAL.
		158.475- 158.715	LAND MOBILE.		Base, Land mobile.		DOMESTIC PUB- LIC.
		158.715- 158.48	LAND MOBILE.		Base, Land mobile.		PUBLIC SAFETY.
		158.48- 161.575	LAND MOBILE.		Base, Land mobile.		LAND TRANSPOR- TATION (NG6) (NG26) (NG28)
		161.575- 161.625 (US77)	MARITIME MO- BILE.		Coast.	161.6	MARITIME MO- BILE (NG6) (NG17) (NG26)
		161.625- 161.775	LAND MOBILE.		Base, Land mobile.		Remote pickup broad- cast base; remote pickup broadcast mobile. (NG6) (NG26).
		161.775- 162.0125	MARITIME MOBILE. (NG6).		Coast.	161.800 161.825 161.850 161.875 161.900 161.925 161.950 161.975 162.000	Coast (NG26). Do. Do. Do. Coast. Do. Do. Do. Do. Do.
162.0125- 173.2	G: (US8) (US11) (US13)					166.25 170.15	PUBLIC SAFETY. Remote pickup. Do.
		170.425- 170.475	PUBLIC SAFETY.			170.425 170.475 171.425 171.475 171.575 172.225 172.275 172.375	PUBLIC SAFETY. Do. Do. Do. Do. Do. Do. Do.
173.2- 173.4	NG.	173.2-173.4	FIXED LAND MOBILE.		Base, Fixed, Land mobile.		INDUSTRIAL.
173.4- 174.0	G.						

See footnotes at end of table.

§ 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States		Federal Communications Commission				
Band (MHz)	Service	Band (MHz)	Service	Band (MHz)	Allocation	Band (MHz)	Service	Class of station	Frequency (MHz)	Nature (of stations)
174-216		174-216 (294)	FIXED MOBILE BROADCASTING.	174-216	N.G.	174-216	BROADCASTING.	Television broadcasting.	175, 25 176, 75 184, 75 187, 75 188, 75 193, 75 194, 75 199, 75 203, 75 208, 75 209, 75 211, 25 213, 75	Channel 7. Channel 8. Channel 9. Channel 10. Channel 11. Channel 12. Channel 13.
216-220		216-220	FIXED MOBILE RADIOLOCATION.	216-220	G, N.G. (US114).	216-220	Landmobile (telemetering only).	Telemetering land Telemetering mobile.		INDUSTRIAL.
220-225		220-225	AMATEUR RADIOLOCATION.	220-225	G, N.G. (US84)	220-225	Amateur. (NG12)	Amateur.		AMATEUR.
225-235		225-235	FIXED MOBILE.	225-328.6 (310) (US17) (US98)	G.					
235-267 (309)	FIXED MOBILE.									
267-272	FIXED MOBILE Space (telemetering). (309A) (309E)									
272-273	FIXED MOBILE SPACE (Telemetering). (309A)									
273-328.6 (310)	FIXED MOBILE.									
328.6-335.4 (310)	AERONAUTICAL RADIOLOCATION. (311)	328.6-335.4 (310)		328.6-335.4 (310)	G, N.G.	328.6-335.4	AERONAUTICAL RADIOLOCATION. (311)	Radionavigation land.	243	Survival craft and equipment.
335.4-399.9	FIXED MOBILE.	335.4-399.9		335.4-399.9	G.					Glide path.

399.9-400.05	RADIONAVIGATION. SATELLITE. (311A)			399.9-400.05	G, N, G. (US100)	399.9-400.05	RADIONAVIGATION. SATELLITE.	Space.	RADIONAVIGATION. SATELLITE.
400.05-401	METEOROLOGICAL AIDS. SATELLITE. (Maintenance telemetering). SPACE RESEARCH (Telemetering and tracking).			400.05-401	G, N, G.	400.05-401	METEOROLOGICAL AIDS. SPACE RESEARCH (Telemetering and tracking).	Radionsonde. Space.	Radionsonde. Space.
401-402	METEOROLOGICAL AIDS. (Fixed. Mobile except aeronautical mobile.			401-402	G, N, G.	401-402	METEOROLOGICAL AIDS. (US70) SPACE (Telemetering). (318A)	Radionsonde. Space.	Radionsonde. Space.
402-406 (317)	METEOROLOGICAL AIDS. Fixed. Mobile except aeronautical mobile.			402-404	G, N, G.	402-404	METEOROLOGICAL AIDS. (US70)	Radionsonde.	Radionsonde.
406-420 (317)	FIXED. MOBILE except aeronautical mobile.			404-406	G, N, G. (US70)	404-406	METEOROLOGICAL AIDS.	Radionsonde.	Radionsonde.
420-450				406-410	G, N, G. (US13) (US74) (US117)	406-410	RADIO ASTRONOMY.	Radio astronomy.	RADIO ASTRONOMY.
450-460 (318) (319A)				410-420	G (US13)				
420-450		420-450 (318) (319A)	RADIOLOCATION. Amateur.	420-450 (US35) (US36) (US37)	G, N, G.	420-450	Amateur. (US7)	Amateur.	AMATEUR.
450-460 (318) (319A)	FIXED. MOBILE.			450-470 (US56) (US57)	N, G.	450-451	LAND MOBILE.	Base. Land mobile.	Remote pickup broadcast base; remote pickup broadcast mobile.
						451-454	LAND MOBILE.	Base. Land Mobile.	PUBLIC SAFETY. INDUSTRIAL. LAND TRANS-PORTATION.
						454-455	LAND MOBILE.	Base. Land mobile.	DOMESTIC PUBLIC. (NG12)
						455-456	LAND MOBILE.	Base. Land mobile.	Remote pickup broadcast base; remote pickup broadcast mobile.
						456-459	LAND MOBILE.	Mobile.	PUBLIC SAFETY. INDUSTRIAL. LAND TRANS-PORTATION.
						459-460	LAND MOBILE.	Base. Land mobile.	DOMESTIC PUBLIC. (NG12)

See footnotes at end of table.

§ 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States		Federal Communications Commission				
Band (MHz)	Service	Band (MHz)	Service	Band (MHz)	Allocation	Band (MHz)	Service	Class of station	Frequency (MHz)	Nature of services of stations
1	2	3	4	5	6	7	8	9	10	11
460-470	FIXED, MOBILE, Meteorological-Satellite. (318A)				(US100)	460-462, 5375	LAND MOBILE.	Base, Land Mobile.		PUBLIC SAFETY, INDUSTRIAL, LAND TRANS-PORTATION.
						462, 5375-462, 7375	LAND MOBILE.	Base, Land Mobile.		CITIZENS RADIO.
						462, 7375-465, 0125	LAND MOBILE.	Base, Land Mobile.		PUBLIC SAFETY, INDUSTRIAL, LAND TRANS-PORTATION.
						465, 0125-467, 5375	LAND MOBILE.	Mobile.		PUBLIC SAFETY, INDUSTRIAL, LAND TRANS-PORTATION.
						467, 5375-467, 7375	LAND MOBILE.	Mobile.		CITIZENS RADIO.
						467, 7375-470	LAND MOBILE.	Mobile.		PUBLIC SAFETY, INDUSTRIAL, LAND TRANS-PORTATION.
470-800		470-800 (332)	BROADCASTING.	470-512 (NG30) (NG43) (US88)	NG, (US100)	470-512	BROADCASTING, LAND MOBILE. (NG66)	Television broadcasting, Land mobile.		BROADCASTING, PUBLIC SAFETY, INDUSTRIAL, LAND TRANS-PORTATION, DOMESTIC PUBLIC.
800-942		800-942 (330A) (340)	FIXED, RADIOLOCATION.	902-928 (US26) (US115)		512-806	BROADCASTING.	Television broadcasting.		
						806-881 (NG63) (NG65)	LAND MOBILE.	Base, Land mobile.		DOMESTIC PUBLIC.
						881-902 (NG63)	LAND MOBILE.	Base, Land mobile.		LAND MOBILE (non-common carrier).
942-960		942-960 (339A)	FIXED.	928-960	NG.	928-947 (NG64)	LAND MOBILE.	Base, Land mobile.		Industrial, scientific, and medical equipment.
						947-952 (NG39) (NG40) (NG58)	FIXED.	Aural broadcast STL, International aeronautical fixed (Alaska, Hawaii, and U.S. possessions only), International fixed public (Alaska, Hawaii, and U.S. possessions only).		LAND MOBILE (non-common carrier).

§ 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States				Federal Communications Commission			
Band (MHz)	Service	Band (MHz)	Service	Band (MHz)	Allocation	Band (MHz)	Service	Class of station	Frequency (MHz)	Nature OF SERVICES (of stations)	
1	2	3	4	5	6	7	8	9	10	11	
1660-1664.4 (354A)	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE. (324A)			1622.5-1637.5	G, NG. (352A) (352B) (US39) (US39A)	1622.5-1637.5	AERONAUTICAL RADIONAVIGATION.				
1664.4-1668.4 (354A)	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE. (324A)			1637.5-1657.5	G, NG. (352F) (US39) (US39A)	1637.5-1657.5	AERONAUTICAL MOBILE (R). Maritime mobile.			MOBILE using space techniques. (Provisional).	
1668.4-1670 (354A)	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE. (324A)			1657.5-1660	G, NG. (352F) (US39) (US39A)	1657.5-1660	MARITIME MOBILE. Aeronautical mobile (R).			MOBILE using space techniques. (Provisional).	
1670-1690 (354A)	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE. (324A)			1660-1670	G, NG. (324A) (US74) (US94) (US98) (US100) (US101)	1660-1670	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE. RADIO ASTRONOMY.	Radio astronomy. Radiosonde. Space.			
1670-1690 (354A)	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE. (324A)			1670-1690	G, NG. (US99)	1670-1690	METEOROLOGICAL AIDS.	Radiosonde.			
1690-1700 (354A)	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE. (324A)	1690-1700	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE. (324A)	1690-1700	G, NG. (324A) (US99) (US100)	1690-1700	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE.	Radiosonde. Space.			
1700-1710	METEOROLOGICAL AIDS CAL AID METEOROLOGICAL SATELLITE. (324A)	1700-1710 (355A)	SPACE RESEARCH (Telemetering and tracking).	1700-1710	G, NG. (US100)	1700-1710	SPACE RESEARCH (Telemetering and tracking).	Space.		Space (telemetering and tracking).	
1710-1770	FIXED MOBILE. Meteorological Satellite. (356A)	1710-1770	FIXED MOBILE. Meteorological Satellite. (356A)	1710-1850	G.						
1770-1790	FIXED MOBILE. Meteorological Satellite. (356A)	1770-1790	FIXED MOBILE. Meteorological Satellite. (356A)		(US100)						

1790-2290	FIXED, MOBILE.	1850-2200	N.G. (US96) (US111)	1850-1990 (N G8)	FIXED.	International control. Operational fixed.		
1790-2290 (356A)	FIXED, MOBILE.	2200-2290	G.	1990-2110 (N G11)	FIXED, MOBILE.	Television pickup. Television STL.		
				2110-2130 (N G10) (N G23) (US90)	FIXED.	Domestic fixed public.		
				2130-2150 (N G10) (N G23)	FIXED.	Operational fixed. International control.		
				2150-2160 (N G23) (N G45)	FIXED.			
				2160-2180 (N G10) (N G23)	FIXED.	Domestic fixed public.		
				2180-2200 (N G10) (N G23)	FIXED.	Operational fixed. International control.		
2290-2300		2290-2300	G, N.G. (US100)	2290-2300	SPACE RE- SEARCH (Tele- metering and track- ing in deep space).	Space.		Space (telemetering and tracking in deep space).
2300-2450 (357)		2300-2450	G, N.G. (US40)	2300-2450 (357)	Amateur	Amateur.		
2450-2550 (357)		2450-2500	N.G. (US41)	2450-2500 (357)	FIXED, MOBILE. Radiolocation.			2450 Industrial, scientific and medical equip- ment.
2550-2690 (365)	FIXED, MOBILE.	2500-2690	N.G.	2500-2690 (N G8) (N G47)	FIXED.	International control. Operational fixed. Instructional tele- vision fixed.		
2690-2700 (364A) (365)	RADIO ASTRONO- M.Y.	2690-2700	G, N.G. (US74) (US100)	2690-2700	RADIO ASTRONO- M.Y.	Radio astronomy.		

See footnotes at end of table.

§ 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States		Federal Communications Commission				
Band (MHz)	Service	Band (MHz)	Service	Band (MHz)	Allocation	Band (MHz)	Service	Class of station	Frequency (MHz)	Nature of services (of stations)
1	2	3	4	5	6	7	8	9	10	11
2700-2900 (366)	AERONAUTICAL RADIONAVIGATION. (346). Radiolocation.			2700-2900	G, (346) (US42) (US43)					
2900-3100	RADIONAVIGATION. Radiolocation.			2900-3100	G, NG.	2900-3100	MARITIME RADIONAVIGATION. Radiolocation. (US44)			
3100-3300 (369)	RADIOLOCATION.			3100-3300	G, NG. (369) (US 110)	3100-3300	Radiolocation.	Radiolocation land. Radiolocation mobile.		RADIOLOCATION.
3300-3400		3300-3400	RADIOLOCATION. Amateur.							
3400-3500		3400-3500	RADIOLOCATION. COMMUNICATION-SATELLITE (satellite to earth). (374A) Amateur.			3300-3500	Amateur. Radiolocation.	Amateur. Radiolocation land. Radiolocation mobile.		AMATEUR. RADIOLOCATION.
3500-3700		3500-3700	FIXED. MOBILE. RADIOLOCATION. COMMUNICATION-SATELLITE (satellite to earth). (374A)			3500-3700	Radiolocation.	Radiolocation land. Radiolocation mobile.		RADIOLOCATION.

§ 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States		Federal Communications Commission				
Band (MHz)	Service	Band (MHz)	Service	Band (MHz)	Allocation	Band (MHz)	Service	Class of station	Frequency (MHz)	Nature of services (of stations)
1	2	3	4	5	6	7	8	9	10	11
3700-4200		3700-4200	FIXED, MOBILE, COMMUNICATION, SATELLITE (satellite to earth), (374A)	3700-4200	3700-4200	COMMUNICATION, SATELLITE, (374A) (US91) FIXED, (NG)	Common carrier fixed, Space.		COMMUNICATION, SATELLITE, DOMESTIC PUBLIC, (NG41) (NG55)
4200-4400 (352A)	AERONAUTICAL RADIO-NAVIGATION.			4200-4400	G, N.G. (352A) (US47)	4200-4400	AERONAUTICAL RADIO-NAVIGATION.	Altimeter.		
4400-4700	FIXED, MOBILE, COMMUNICATION, SATELLITE (earth to satellite), (392A)			4400-4990	G.					
4700-4990 (365)	FIXED, MOBILE.									
4990-5000		4990-5000 (383A)	RADIO ASTRONOMY.	4990-5000	G, N.G. (US74) (US100)	4990-5000	RADIO ASTRONOMY.	Radio astronomy.		
5000-5250 (352A) (352B)	AERONAUTICAL RADIONAVIGATION.			5000-5250	G, N.G. (352A) (352B)	5000-5250	AERONAUTICAL RADIONAVIGATION.			
5250-5350	RADIOLOCATION, Space research, RADIOLOCATION.			5250-5350	G, N.G. (US110)	5250-5350	Radiolocation.	Radio location land, Radiolocation mobile.		RADIOLOCATION.
5255-5350										

5350-5460	AERONAUTICAL RADIOLOCATION. Amateur.	5350-5460	G, N.G.	5350-5460	AERONAUTICAL RADIOLOCATION. Radiolocation. (US48)
5460-5470	RADIOLOCATION. Amateur.	5460-5470	G, N.G.	5460-5470	RADIOLOCATION. Radiolocation. (US65)
5470-5650	MARITIME RADIOLOCATION. Radiolocation.	5470-5600	G, N.G.	5470-5600	MARITIME RADIOLOCATION. Radiolocation. (US65)
5650-5670	RADIOLOCATION. Amateur.	5650-5650	G, N.G.	5650-5650	MARITIME RADIOLOCATION. Radiolocation. (US65)
5670-5725	RADIOLOCATION. Amateur.	5670-5725	G, N.G.	5670-5725	MARITIME RADIOLOCATION. Radiolocation. (US65)
5725-5925	RADIOLOCATION. Amateur.	5725-5925	G, N.G.	5725-5925	MARITIME RADIOLOCATION. Radiolocation. (US65)
5925-6425	FIXED. MOBILE.	5925-6425	(392A)	5925-6425	COMMUNICA- TION-SATEL- LITE. (US91)
6425-7250	FIXED. MOBILE.	6425-7125	NG.	6425-6525	MOBILE.
7250-7300	COMMUNICA- TION-SATEL- LITE (satellite to earth).	7250-7300	G.	6525-6575	MOBILE.
7300-7750	FIXED. MOBILE.	7300-7750	(374A) (392D)	6575-6875	FIXED.
				6875-7125	FIXED. MOBILE.
				7125-7250	
				7250-7300	COMMUNICA- TION-SATEL- LITE. (US91)
				7300-7750	COMMUNICA- TION-SATEL- LITE. (US91) METEOROLOGICAL-SATEL- LITE. (G/NG) (US92) FIXED (G). MOBILE (G).
					5800
					Industrial scientific & medical equipment.
					Common carrier fixed. Fixed earth.
					Common carrier land Common carrier mobile.
					Operational land. Operational mobile.
					Operational fixed.
					Television pickup. Television STL.
					Space.
					Space.

See footnotes at end of table.

S 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States		Federal Communications Commission				
Band (MHz)	Service	Band (MHz)	Service	Band (MHz)	Allocation	Band (MHz)	Service	Class of station	Frequency (MHz)	Nature of Services (of stations)
1	2	3	4	5	6	7	8	9	10	11
7750-7900	FIXED MOBILE.			7750-7900	G.					
7900-7975	FIXED MOBILE. COMMUNICATION-SATEL-LITE (earth to satellite). (392A)			7900-7975	(392A)	7900-7975	COMMUNICATION-SATEL-LITE. (US91) [FIXED (G), MOBILE (G)].	Earth.		COMMUNICATION-SATEL-LITE.
7975-8025 (392A) (392C) (392H)	COMMUNICATION-SATEL-LITE (earth to satellite). (392A)			7975-8025	(392A) (US100)	7975-8025	COMMUNICATION-SATEL-LITE. (US91)	Earth.		COMMUNICATION-SATEL-LITE.
8025-8400	FIXED MOBILE. COMMUNICATION-SATEL-LITE (earth to satellite). (392A)			8025-8400	(392A)	8025-8400	COMMUNICATION-SATEL-LITE. (US91) [FIXED (G), MOBILE (G)].	Earth.		COMMUNICATION-SATEL-LITE.
8400-8500		8400-8500	SPACE RE-SEARCH. (394C)	8400-8500	G, N.G. (US62) (US100)	8400-8500	SPACE RE-SEARCH. Fixed. Mobile.	Fixed. Mobile. Space.		
8500-8750	RADIOLOCATION.			8500-9000	G, N.G. (US53) (US110)	8500-9000	Radiolocation.	Radiolocation land. Radiolocation mobile.	8800	RADIOLOCATION. Airborne doppler radar.
8750-8850	RADIOLOCATION. AERONAUTICAL RADIONAVIGATION. (396)									
8850-9000	RADIOLOCATION.									
9000-9200	AERONAUTICAL RADIONAVIGATION. (346) Radiolocation.			9000-9200	G, N.G.	9000-9200	AERONAUTICAL RADIONAVIGATION. (346) (US54) (US55) Radiolocation.			
9200-9300	RADIOLOCATION.			9200-9300	G, N.G. (US110)	9200-9300	Radiolocation.	Radiolocation land. Radiolocation mobile.		RADIOLOCATION.
9300-9500 (399)	RADIONAVIGATION. Radiolocation.			9300-9500	G, N.G.	9300-9500	RADIONAVIGATION. (US67) Meteorological aids. Radiolocation. (US66) (US68)			
9500-9800	RADIOLOCATION.			9500-10000	G, N.G. (401A) (US110)	9500-10000	Radiolocation.	Radiolocation land. Radiolocation mobile.		RADIOLOCATION.
9800-10000 (401A)	RADIOLOCATION. Fixed.									
10000-10500 (401A)	RADIOLOCATION. Amateur.			10000-10500	G, N.G. (401A) (US68) (US108)	10000-10500	Amateur. Radiolocation. (NG42)	Amateur. Radiolocation land. Radiolocation mobile.		AMATEUR. RADIOLOCATION.

§2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States		Federal Communications Commission				
Band (GHz)	Service	Band (GHz)	Service	Band (GHz)	Allocation	Band (GHz)	Service	Class of station	Frequency (GHz)	OF Nature/SERVICES of stations
1	2	3	4	5	6	7	8	9	10	11
10.5-10.55		10.5-10.55	RADIOLOCATION. (404).	10.5-10.55	G, NG, (US59)	10.5-10.55	RADIOLOCATION.	Radiolocation land. Radiolocation mobile.		RADIOLOCATION.
10.55-10.68	FIXED. MOBILE. Radiolocation.	10.55-10.68		10.55-10.68	NG.	10.55-10.68 (NG46)	MOBILE.	Operational land. Operational mobile.		
10.68-10.7 (405B)	RADIO AS-TRONOMY.	10.68-10.7		10.68-10.7	G, NG, (US74) (US100)	10.68-10.7	RADIO AS-TRONOMY.			
10.7-11.7	FIXED. MOBILE.	10.7-11.7		10.7-11.7	NG.	10.7-11.7	FIXED.	Common carrier fixed.		DOMESTIC PUBLIC. (NG4)
11.7-12.7	FIXED. MOBILE except aeronautical mobile. BROADCASTING.	11.7-13.25		11.7-13.25	NG.	11.7-12.2	MOBILE.	Common carrier land. Common carrier mobile (except aeronautical mobile).		
12.7-13.25	FIXED. MOBILE.					12.2-12.7 (NG8) (NG52)	FIXED.	International control. Operational fixed.		
						12.7-12.95	FIXED. MOBILE.	Community Antenna Relay. Television Intercity Relay. Television Pickup. (NG53)		
						12.95-13.2 (NG11)	FIXED. MOBILE.	Television STL.		
						13.2-13.25	FIXED. MOBILE.	Television Pickup. Television STL.		
13.25-13.4	AERONAUTICAL RADIOLOCATION. (406)	13.25-13.4		13.25-13.4	G, NG.	13.25-13.4	AERONAUTICAL RADIOLOCATION. (406)			Airborne doppler radar.
13.4-14.0	RADIOLOCATION.	13.4-14.0		13.4-14.0	G, NG, (US110)	13.4-14.0	RADIOLOCATION.	Radiolocation land. Radiolocation mobile.		RADIOLOCATION.
14.0-14.3	RADIOLOCATION.	14.0-14.3		14.0-14.3	G, NG.	14.0-14.3	RADIOLOCATION.			
14.3-14.4	RADIOLOCATION. (406)	14.3-14.4		14.3-14.4	G, NG.	14.3-14.4	RADIOLOCATION. (406)	Earth. Space.		RADIOLOCATION-SATELLITE.

See footnotes at end of table.

§ 2.106 Table of Frequency Allocations—Continued

Worldwide		Region 2		United States		Federal Communications Commission				
Band (GHz)	Service	Band (GHz)	Service	Band (GHz)	Allocation	Band (GHz)	Service	Class of station	Frequency (GHz)	Nature OF SERVICES (of stations)
1	2	3	4	5	6	7	8	9	10	11
14.4-15.25	FIXED, MOBILE.			14.4-15.25	G.					
15.25-15.35 (409A)	SPACE RESEARCH.			15.25-15.35	G, N.G. (US100)	15.25-15.35	SPACE RESEARCH.	Space.		
15.35-15.4 (409C)	RADIO ASTRONOMY.			15.35-15.4	G, N.G. (US74) (US100)	15.35-15.4	RADIO ASTRONOMY.			
15.4-15.7	AERONAUTICAL RADIONAVIGATION. (352A)(352B)			15.4-15.7	G, N.G. (352A) (352B)	15.4-15.7	AERONAUTICAL RADIONAVIGATION.			
15.7-17.7	RADIOLOCATION.			15.7-17.7	G, N.G. (US110)	15.7-17.7	Radiolocation.	Radiolocation land. Radiolocation mobile.		RADIOLOCATION.
17.7-19.3	FIXED, MOBILE.			17.7-19.3	NG.	17.7-19.3	FIXED, MOBILE.			
19.3-19.4 (409D)	RADIO ASTRONOMY.			19.3-19.4	G, N.G. (US74) (US100)	19.3-19.4	RADIO ASTRONOMY.			
19.4-21.0	FIXED, MOBILE.			19.4-19.7	NG.	19.4-19.7	FIXED, MOBILE.			
21.0-22.0	AMATEUR.			19.7-21.0	G.	21.0-22.0	AMATEUR.	Amateur.		AMATEUR.
22.0-23.0 (410)	FIXED, MOBILE.			21.0-22.0	G.	22.0-23.0			22.125	Industrial, scientific and medical equipment.
23.0-24.25	RADIOLOCATION.			23.0-24.25	G, N.G. (US110)	23.0-24.25	Radiolocation.	Radiolocation land. Radiolocation mobile.		RADIOLOCATION.

24. 25-25. 25	RADIONAVIGATION. (411)			24. 25-25. 25	RADIONAVIGATION. (411)		
25. 25-31.0	FIXED. MOBILE.			25. 25-27. 525	G. (US72)		
31. 0-31.3 (412H)	FIXED. MOBILE. Space research.			27. 525-31.3	G.		
31. 2-31.5 (412A)	RADIO ASTRONOMY.			31. 3-31.5	NG. (US100)		
31. 5-31.8				31. 5-31.8	G. NG. (US74) (US100)		
31. 8-32.3 (412B)	RADIONAVIGATION. Space research.	31. 5-31.8 (405C)	SPACE RESEARCH.	31. 5-31.8	G. NG. (US100)		
32. 3-33.0	RADIONAVIGATION.			31. 8-33.4	G. NG. (US100)		
33. 0-33.4		33. 0-33.4	RADIONAVIGATION. (412F)				
33. 4-34.2 (412G)	RADIOLOCATION.			33. 4-36.0	G. NG. (412D) (US100) (US110)		RADIOLOCATION.
34. 2-35.2 (412C) (412D)	RADIOLOCATION. Space research.						
35. 2-36.0	RADIOLOCATION.			36. 0-38.6	G. (US100)		
36. 0-40.0 (412E)	FIXED. MOBILE.			38. 6-40.0	NG.		
Above 40.0	Not allocated.			40. 0-88.0	G. NG.		Amateur. Experimental.
				88. 0-90.0	G. NG. (US74)		Amateur. Experimental.
				Above 90.0	G. NG.		Amateur. Experimental.

See footnotes on following page.

FOOTNOTES

GENEVA FOOTNOTES

(157) Administrations authorizing the use of frequencies below 10 kHz for special national purposes shall ensure that no harmful interference is caused thereby to the services to which the bands above 10 kHz are allocated (see also Article 14, No. 699).

(158) Limited to coast telegraph stations (A1 and F1 only). Exceptionally, the use of class A7J emission is permissible subject to the necessary bandwidth not exceeding that normally used for class A1 or F1 emissions in the bands concerned.

(159) The stations of services to which the bands between 14 and 70 kHz are allocated may transmit standard frequency and time signals. Such stations shall be afforded protection from harmful interference. In Albania, Bulgaria, Hungary, Poland, Roumania, Czechoslovakia, and the U.S.S.R., the frequencies 25 kHz and 50 kHz will be used for this purpose under the same conditions.

(160) The standard frequency is 20 kHz.

(161) In the U.S.S.R., frequencies in the band 60–80 kHz may be used for industrial, scientific and medical purposes subject to the condition that interference is not caused to stations of services to which this band is allocated.

(162) Limited to continuous wave systems.

(164) The establishment and operation of maritime radionavigation stations shall be subject to agreements between administrations whose services, operating in accordance with the Table, may be affected. However, the fixed, maritime mobile and radiolocation services shall not cause harmful interference to maritime radionavigation stations established under such agreements.

(166) The development and operation of long distance radionavigation systems are authorized in this band, which will become exclusively allocated, wholly or in part, to the radionavigation service for the use of any one such system as soon as it is internationally adopted. Other considerations being equal, preference should be given to the system requiring the minimum bandwidth for world-wide service and causing the least harmful interference to other services. If a pulse radionavigation system is employed, the pulse emissions shall nevertheless be confined within the band 90–110 kHz and shall not cause harmful interference outside the band to stations operating in accordance with the Regulations. In Regions 1 and 3, during the period prior to the international adoption of any long distance radionavigation system, the operation of specific radionavigation stations shall be subject to agreements between administrations whose services, operating in accordance with the Table, may be affected. Once established under such agreements, radionavigation stations shall be protected from harmful interference.

(167) Only classes A1 or F1, A4 or F4 emissions are authorized in the band 90–160 kHz for stations of the fixed and maritime mobile services. Exceptionally, class A7J emission is also authorized in the band 90–160 kHz for stations of the maritime mobile service.

(168) Aeronautical stations may use frequencies in the bands 110–112 kHz, 115–126 kHz and 120–130 kHz on a permitted basis for high-speed communications to aircraft.

(179) In northern areas which are subject to auroral disturbances the aeronautical fixed service is the primary service.

(181) Norwegian fixed stations situated in northern areas subject to auroral disturbances are allowed to continue operation on two frequencies in the band 385–395 kHz for transmissions chiefly composed of weather messages.

(182) The frequency 410 kHz is designated for the maritime radionavigation service (radio direction-finding). Other allocated services in the band 405–415 kHz shall not cause harmful interference to radio direction-finding. In the band 405–415 kHz no frequency shall be assigned to coast stations.

(185) In the European Maritime Area, subject to the conditions specified in the Final Acts of the European Maritime Conference (Copenhagen 1948), and any subsequent revision of that agreement, the administrations concerned

may keep in the bands 415–485 kHz and 515–525 kHz such of the following broadcasting stations as will not cause harmful interference to the maritime mobile service: Hamar, Innsbruck, Oestersund, Oulu.

(186) Limited to radiotelegraphy.

(187) The frequency 500 kHz is the international distress and calling frequency for radiotelegraphy. The conditions for its use are prescribed in Article 32.

(188) In operating stations of the aeronautical radionavigation service, the administrations concerned shall take all the technical steps necessary to avoid harmful interference to the maritime mobile service.

(191) The carrier power of broadcasting stations in this band shall not exceed 250 watts.

(198) In Region 2 the Loran system has priority. Other services to which the band is allocated may use any frequency in this band provided that they do not cause harmful interference to the Loran system.

In Region 3 the Loran system in any particular area operates either on 1850 or 1950 kHz, the bands occupied being 1825–1875 kHz and 1925–1975 kHz respectively. Other services to which the band 1800–2000 kHz is allocated may use any frequency therein on condition that no harmful interference is caused to the Loran system operating on 1850 or 1950 kHz.

(200) In Region 2, except in Greenland, coast stations and ship stations using radiotelephony shall be limited to class A3A or A3J emission and to a peak envelope power not exceeding 1kw. Preferably, the following carrier frequencies should be used: 2065.0 kHz, 2079.0 kHz, 2082.5 kHz, 2086.0 kHz, 2093.0 kHz, 2096.5 kHz, 2100.0 kHz, 2103.5 kHz.

(201) The frequency 2182 kHz is the international distress and calling frequency for radiotelephony. The conditions for the use of the band 2170–2194 kHz are prescribed in Article 35.

[(201) amended eff. 7-24-70; II(69)-5]

(202) For the conditions of use of this band by the broadcasting service see Nos. 135, 136, and 423 to 428.

(203) Standard frequency is 2500 kHz.

(204) The standard frequency guardbands at 2.5 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz, and 25 MHz may be used by the radio astronomy service. The radio astronomy service shall be protected from harmful interference from services operating in other bands in accordance with the provisions of these Regulations, only to the extent that these services are protected from each other.

(208) In the U.S.S.R., in the bands 4063–4133 kHz and 4408–4438 kHz, fixed stations of limited power may operate provided that, in order to minimize the possibility of causing harmful interference to the maritime mobile service, they are situated at least 600 km from the coast. A limited power station is one whose power and antenna characteristics are so adjusted that the field strength established at any point in any direction does not exceed that obtainable with a nondirectional antenna and a peak envelope power of 1 kw.

(209) On condition that harmful interference is not caused to the maritime mobile service, the frequencies between 4063 and 4438 kHz may be used exceptionally by fixed stations communicating only within the boundary of the country in which they are located, with a mean power not exceeding 50 watts; however, in Regions 2 and 3, between 4238 and 4368 kHz, a mean power not exceeding 500 watts may be used by such fixed stations.

(210) The standard frequency is 5000 kHz.

(211) On condition that harmful interference is not caused to the maritime mobile service, the frequencies between 6200 and 6525 kHz may be used exceptionally by fixed stations, communicating only within the boundary of the country in which they are located, with a mean power not exceeding 50 watts. At the time of notification of these frequencies, the attention of the International Frequency Registration Board will be drawn to the above conditions.

(213) Between 8615 and 8815 kHz, 12,925 and 13,200 kHz, and between 17,160 and 17,360 kHz, the U.S.S.R. will meet their special requirements for the fixed service with due regard to technical provisions (power, location, antenna.

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NG40 Non-Government fixed stations which were authorized on April 16, 1958, to use frequencies in the band 890-942 MHz may, upon the showing that interference is being caused by or to their assignments, be authorized to use frequencies in the band 947-952 MHz provided the bandwidth of emission does not exceed 1100 kHz and provided that an engineering study by the Commission indicates that the proposed frequency assignment for such stations in the band 947-952 MHz is likely to result in the elimination of the interference occurring in the band 890-942 MHz, and will not cause interference to existing operations in the band 947-952 MHz.

NG41 Frequencies in the bands 3700-4200 MHz, 5925-6425 MHz, and 10.7-11.7 GHz may also be assigned to stations in the international fixed public and international control services located in U.S. Possessions in the Caribbean area.

NG42 Non-Government stations in the radiolocation service shall not cause harmful interference to the amateur service.

NG43 Fixed stations in the domestic public radio services in Alaska, south of 56° north latitude and east of 134° west longitude, may be authorized to use frequencies in the band 800-830 MHz, on the condition that harmful interference will not be caused to the broadcasting service of any country.

NG44 Under exceptional circumstances, the frequencies 2638 and 2738 kHz may be authorized to coast stations.

NG45 Authorizations in this frequency band will be granted for omni-directional point-to-point operations only, excluding broadcast and auxiliary broadcast operations.

NG46 Licensees holding a valid authorization on July 15, 1963, to operate in the frequency bands 6425-6525 MHz, 6525-6575 MHz, 7050-7125 MHz, and 10550-10680 MHz may continue to be authorized for such operation until July 15, 1968, on the condition that harmful interference will not be caused to services operating in accordance with the Table of Frequency Allocations.

NG47 Pending determination of final action concerning allocation of the 2500-2690 MHz band to the instructional television service and further Order of the Commission, frequencies in this band are not available for operation of new radio systems comprised of operational fixed or international control stations except for those stations which comply with the technical standards established for the instructional television service. [Reference, Report and Order, FCC 63-722, in Docket No. 14744]

NG49 The frequencies 72.02, 72.04, 72.06, 72.08, 72.10, 72.12, 72.14, 72.16, 72.18, 72.20, 72.22, 72.24, 72.26, 72.28, 72.30, 72.32, 72.34, 72.36, 72.38, 72.40, 72.44, 72.48, 72.52, 72.56, 72.60, 75.44, 75.48, 75.52, 75.56, and 75.60 MHz may be authorized for low powered (1 watt input) mobile operations in the manufacturers radio service subject to the condition that no interference is caused to the reception of television stations operating on channels 4 and 5.

NG50 In the band 25.07-25.11 MHz, stations in the Industrial Radio Services shall not cause harmful interference to,

and must accept interference from, stations in the Maritime Mobile Service operating in accordance with the International table of frequency allocations.

NG51 In Puerto Rico and the Virgin Islands only, the bands 150.8-150.98 MHz and 150.98-151.49 MHz are allocated exclusively to the Business Radio Service. Stations in the Land Transportation and Public Safety Radio Services in those territories which have been authorized as of January 1, 1965, to use frequencies in the bands 150.8-150.98 MHz and 150.98-151.49 MHz, respectively, may continue to operate on these frequencies until January 1, 1970.

NG52 Stations used to relay television signals to community antenna television systems, which are authorized to operate in the band 12.2-12.7 GHz on November 22, 1965, may continue to be authorized to so operate until February 1, 1976, under the conditions specified in that license.

[NG52 amended eff. 1-15-71; II (69)-6]

NG53 In the band 12.7-12.95 GHz, television pickup stations shall not cause harmful interference to community antenna relay, television intercity relay and television STL stations.

NG55 Frequencies in the bands 3700-4200 MHz and 5925-6425 MHz will not be assigned to stations used to relay television signals to community antenna television systems after Mar. 22, 1968: *Provided, however*, That stations which were authorized to so operate in these bands on Mar. 22, 1968, may continue to be authorized to so operate until Feb. 1, 1971, under the conditions specified in that license, and after Feb. 1, 1971, only upon conditions that: (a) The station is not within fifty (50) miles of the coordinates of the principal city, as set forth in the U.S. Department of Commerce publication "Air Line Distances Between Cities in the United States," of one of the top 25 standard metropolitan statistical areas, as ranked by the U.S. Census Bureau, and (b) the station shall not cause harmful interference to fixed earth stations in the Communication Satellite Service or to fixed common carrier stations in the Domestic Public Service which are used for services other than the relay of television signals to community antenna television systems.

NG56 The frequencies 72.08, 72.24, 72.40, 72.96 and 75.64 MHz may be authorized for low-powered (one watt input) mobile operations in the Citizens Radio Service subject to the condition that interference will not be caused to remote control of industrial equipment operating on the same or adjacent frequencies and to the reception of television stations operating on channels 4 or 5. TV interference shall be considered to occur whenever reception of regularly used television signals is impaired or destroyed, regardless of the strength of the television signals or the distance to the television station.

NG57 The frequency bands 154.4525-154.46 MHz, 154.46-154.4675 MHz and 154.4675-154.4750 MHz may also be assigned to fixed stations.

NG58 Low-power broadcast auxiliary stations licensed pursuant to the provisions of § 74.437 of this chapter may be authorized to operate in the band 947-952 MHz subject to the condition that no harmful interference is caused to sta-

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tions operating in accordance with the Table of Frequency Allocations.

NG59 The frequencies 37.60 and 37.84 MHz may be authorized only for use by base, mobile, and operational fixed stations participating in an interconnected or coordinated power service utility system. Existing operations not conforming to this limitation must be terminated by September 24, 1970.

NG60 Frequencies in this band may be authorized for communication with helicopters in support of off-shore drilling operations on the condition that harmful interference will not be caused to services operating in accordance with the Table of Frequency Allocations.

NG61 Frequencies in this band may be authorized for flight test purposes on the condition that harmful interference will not be caused to services operating in accordance with the Table of Frequency Allocations.

NG62 Consistent with Resolution 10, Radio Regulations, Geneva, 1959, interregional amateur contacts in this band should be limited to that portion between 7000 and 7100 kHz. In the band 7100 to 7300 kHz, the provisions of No. 117 of the Radio Regulations, Geneva, 1959, are applicable. In addition, 7100 to 7300 kHz is not available in the following U.S. possessions: Baker, Canton, Enderbury, Guam, Howland, Jarvis, Palmyra, American Samoa, and Wake Islands.

NG63 Rulemaking proceedings in Docket No. 18861 contemplate the accommodation of UHF-TV translator stations on channels 69 and below. However, pending a decision in that docket, applications will be accepted for new, modified, or renewed licenses for such stations in the band 806-890 MHz (channels 70-83). If the proposal is adopted, translator stations holding a valid license to operate within the band 806-890 MHz as of the effective date of the decision in the above docket will be afforded protection from the land mobile service for the balance of their license terms. Subsequent license renewals, however, will be contingent upon the condition that each such translator station shall accept secondary status with respect to the land mobile service. However, the band 806-890 MHz will continue to be available for UHF-TV assignments in Puerto Rico.

NG64 Broadcast auxiliary stations licensed as of July 10, 1970, to operate in the frequency band 942-947 MHz may continue to so operate pending a decision as to their disposition through a future rule making proceeding.

NG65 No accommodation was made in the Commission's first report and order in Docket No. 18262 for ETV assignments at Bowling Green, Ohio (Channel 70, 806-812 MHz), or Glen Ridge, N.J. (channel 77, 848-854 MHz). These will be treated in a separate rule making proceeding.

NG66 The frequency band 470-512 MHz is allocated for use in the Broadcasting and Land Mobile Radio Services. In the Land Mobile Services it is available for assignment in the Domestic Public, Public Safety, Industrial, and Land Transportation Radio Services at, or in the vicinity of, the 10 largest urbanized areas of the United States, as defined in the U.S. Census of Population, 1960, Vol. 1, Table 23 in accordance with the allocations set out in the following table and subject to the standards and conditions set forth in Parts 21, 89, 91, and 93 of this chapter.

Urbanized area	TV channel
New York-Northeastern New Jersey-----	14, 15
Los Angeles-----	14, 20
Chicago-Northwestern Indiana-----	(1)
Philadelphia, Pa.-New Jersey-----	(1)
Detroit, Mich-----	15, 16
San Francisco-Oakland, Calif-----	16, 17
Boston, Mass-----	14, 16
Washington, D.C.-Maryland-Virginia-----	17, 18
Pittsburgh, Pa-----	14, 18
Cleveland, Ohio-----	14, 15

¹ The specific channel availability will be designated following the conclusion of a separate proceeding.

US1 Pulsed emissions prohibited.

US2 The frequency 132.0 MHz may be authorized to non-Government stations only.

US3 The Government fixed, mobile except aeronautical mobile (R), and radiolocation services may be authorized in the band 132.0-136.0 MHz on condition that harmful interference is not caused to the aeronautical mobile (R) service. [US5 deleted eff. 6-30-71; II(69)-7]

US6 Radio altimeters operating in the band 420-460 MHz under a valid authorization on February 15, 1968, may continue to operate after that date, on the condition that harmful interference is not caused to stations of services operating in accordance with the U.S. Table of Frequency Allocations. Such authorizations may be renewed, but no new authorizations will be granted after February 15, 1968, and all radio altimeter operations in this band shall be discontinued prior to January 1, 1973.

US7 In the band 420-450 MHz and within the following areas, the DC plate power input to the final stage of a transmitter employed in the amateur service shall not exceed 50 watts, unless expressly authorized by the Commission after mutual agreement, on a case-by-case basis, between the Federal Communications Commission Engineer in Charge at the applicable District Office and the Military Area Frequency Coordinator at the applicable military base:

(a) Those portions of Texas and New Mexico bounded on the south by latitude 31°53' North, on the east by longitude 105°40' West, on the north by latitude 33°24' North, and on the west by longitude 106°40' West;

(b) The entire State of Florida including the Key West area and the areas enclosed within a 200-mile radius of Patrick Air Force Base, Florida (latitude 28°21' North, longitude 80°43' West), and within a 200-mile radius of Eglin Air Force Base, Florida (latitude 30°30' North, longitude 86°30' West);

(c) The entire State of Arizona;

(d) Those portions of California and Nevada south of latitude 37°10' North, and the areas enclosed within a 200-mile radius of the U.S. Naval Missile Center, Point Mugu, California (latitude 34°09' North, longitude 119°11' West).

US8 The use of the frequencies 170.475, 171.425, 171.575, and 172.275 MHz east of the Mississippi River, and 170.425, 170.575, 171.475, 172.225, and 172.375 MHz west of the Mississippi River may be authorized to fixed, land and mobile stations operated by non-Federal forest fire-fighting agencies. In addition, land stations and mobile stations operated by non-Federal conservation agencies, for mobile relay operation only, may be authorized to use the frequency 172.275 MHz east of the Mississippi River and the frequency 171.475 MHz west of the Mississippi River. The use of any of the foregoing nine frequencies shall be on the condition that no harmful interference will be caused to Government stations.

US10 The use of frequencies 26.62 MHz (in all areas), 143.90 MHz (in the continental United States excluding Alaska), and 148.15 MHz (in all areas) may be authorized to Civil Air Patrol land stations and Civil Air Patrol mobile stations on the condition that harmful interference will not be caused to Government stations.

US11 The use of the frequencies 166.250 and 170.15 MHz may be authorized to non-Government remote pickup broadcast base and land mobile stations and to non-Government base, fixed and land mobile stations in the public safety radio services (the sum of the bandwidth of emission and tolerance not to exceed 60 kHz) in the continental United States (excluding Alaska) only, except within the area bounded on the west by the Mississippi River, on the north by the parallel of latitude 37°30' N., and on the east and south by that arc of the circle with center at Springfield, Ill., and radius equal

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to the airline distance between Springfield, Ill., and Montgomery, Ala., subtended between the foregoing west and north boundaries, on the condition that harmful interference will not be caused to Government stations present or future in the Government band 162-174 MHz. The use of these frequencies by remote pickup broadcast stations will not be authorized for locations within 150 miles of New York City and the use of these frequencies by the public safety radio services will not be authorized except for locations within 150 miles of New York City.

US13 For the specific purpose of transmitting hydrological and meteorological data in cooperation with agencies of the Federal Government, the following frequencies may be authorized to non-Government fixed stations on the condition that harmful interference will not be caused to Government stations:

MHz	MHz	MHz	MHz
169.425	170.275	171.125	406.075
169.450	170.300	171.825	406.125
169.475	170.325	171.850	406.175
169.500	171.025	171.875	412.625
169.525	171.050	171.900	412.675
170.225	171.075	171.925	412.725
170.250	171.100	406.025	412.775

Licensees holding a valid authorization on June 11, 1962, to operate on the frequencies 169.575, 170.375, 171.175, 171.975, or 406.050 MHz may continue to be authorized for such operation on the condition that harmful interference will not be caused to Government stations.

US14 This frequency band is not available to non-Government stations except that the frequency 512 kHz is available for use by non-Government ship telegraph stations, as a working frequency. When 500 kHz is being used for distress purposes, ship and coast stations may use 512 kHz for calling.

US15 The use of the frequency 540 kHz is subject to the conditions that no harmful interference is caused to the services operating on 500 kHz, and in the band 510-535 kHz.

US16 Airdrome control stations may continue to be authorized to use frequencies in the band 290-325 kHz on the condition that harmful interference will not be caused to stations of services operating in accordance with the Table of Frequency Allocations.

US17 For the radiolocation activities of the petroleum industry only, radiolocation land stations and radiolocation mobile stations making use of SHORAN equipment may be authorized the use of the frequencies 230 MHz, 250 MHz and 310 MHz only until October 1, 1971, at locations within 150 miles of the respective ocean shorelines of Alaska and the contiguous 48 states (including the areas in and about bays and sounds), provided that no harmful interference is caused to stations operating in accordance with the Table of Frequency Allocations and provided that SHORAN operations are coordinated locally with Federal Government authorities making use of frequencies in this band in the same area. As of January 1, 1971, no new authorizations will be granted for SHORAN operation on these frequencies.

US18 Navigation aids in the U.S. and possessions between 90 and 110 kHz, 200 and 415 kHz, and 1800 and 2000 kHz, are normally operated by the U.S. Government. However, authorizations may be made by the Commission for non-Government operation in these bands subject to the conclusion of appropriate arrangements between the Commission and the Government agencies concerned and upon special showing of need for service which the Government is not yet prepared to render.

US19 In the band 405-415 kHz, stations in the aeronautical mobile service shall not cause harmful interference to stations in the radionavigation service.

US20 In Alaska, Government stations in the fixed service may be authorized to use frequencies in the band 72-73 and 75.4-76 MHz on the condition that harmful interference will not be caused to the reception of TV channel 4.

US21 Existing Government operations and non-Government stations authorized in this band as of December 1, 1961, may continue and shall not be required to afford protection to radio astronomy observatories within the United States and its possessions. However, by international agreement, such stations must afford protection to the observatories of other countries.

US23 In Alaska, the frequency bands 76-88 MHz and 89-100 MHz are allocated to Government radio services and the non-Government fixed service.

US25 The use of frequencies in the band 25.85-26.1 MHz may be authorized in any area to non-Government remote pickup broadcast base and mobile stations on the condition that harmful interference is not caused to stations in the broadcasting service.

US26 The bands 117.975-121.425 MHz, 123.575-128.825 MHz and 132.025-136 MHz are for air traffic control communications.

US28 The band 121.65-121.975 MHz is for use by aeronautical utility land and mobile stations, and for air traffic control communications.

US29 The current use of the band 121.975-123.075 MHz by military aircraft is temporary and may continue until they are moved to an appropriate band.

US30 The band 121.975-123.075 MHz is available to FAA aircraft for communications pursuant to flight inspection functions in accordance with the Federal Aviation Act of 1958.

US31 Except as provided below, the band 121.975-123.075 MHz is for use by private aircraft stations.

The frequencies 122.80, 122.85, 122.95, 123.00, and 123.05 MHz may be assigned to aeronautical advisory stations.

The frequency 122.90 MHz may be assigned to aeronautical multicom stations.

Air carrier aircraft stations may use 122.00 MHz for communications with aeronautical stations of the Federal Aviation Administration and 122.8 MHz for communication with other aircraft and with aeronautical advisory stations.

Frequencies in the band 121.975-122.625 MHz may be used by aeronautical stations of the Federal Aviation Administration for communication with private aircraft stations only except that 122.0 MHz may also be used for communication with air carrier aircraft stations concerning weather information.

US32 The band 123.075-123.575 MHz is for (a) non-Government operations in accordance with the Commission's Rules and (b) for FAA communications incident to flight test activities pertinent to aircraft certification.

US33 The band 123.075-123.575 MHz is for use by flight test and aviation instructional stations.

US34 The only non-Government service permitted in the band 220-225 MHz is the amateur service. The amateur service shall not cause harmful interference to the radiolocation service.

US35 Except as provided by footnotes US6 and US87, the only non-Government service permitted in the band 420-450 MHz is the amateur service. The amateur service shall not cause harmful interference to the radiolocation service.

US36 Non-Government stations in the fixed service, authorized to operate in the band 890-942 MHz and holding a valid authorization to so operate as of April 16, 1958, have since been granted renewal authorizations contingent upon the condition that each such station (1) accept any harmful interference that may be experienced from the operation of ISM equipment on 915 MHz or from the radiolocation service and (2) shall not cause harmful interference to the radiolocation service. Renewals of such authorizations after July 10, 1970, shall be contingent upon the additional condition that they be on a secondary basis with respect to the land mobile service.

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US37 The only non-Government service permitted in the band 1215–1300 MHz is the amateur service. The amateur service shall not cause harmful interference to the radiolocation service.

US38 The non-Government use of the band 1300–1350 MHz is limited to the aeronautical radionavigation service.

US39 Within the band 1535–1660 MHz radio altimeters are permitted to use only the portion 1600–1660 MHz and then only until such time as international standardization of other aeronautical radionavigation systems or devices require the discontinuance of radio altimeters in this band.

US39A The band 1592.5–1622.5 MHz is allotted provisionally, but on a primary basis, for the collision avoidance function, noting the continued use of existing altimeters in the band 1600–1660 MHz.

US40 The only non-Government service permitted in the band 2300–2450 MHz is the amateur service. The amateur service shall not cause harmful interference to the radiolocation service.

US41 The Government radiolocation service is permitted in the band 2450–2500 MHz on the condition that harmful interference is not caused to non-Government services.

US42 Temporarily, and until certain operations of the radiolocation service in the band 2700–2900 MHz can be transferred to other appropriate frequency bands, the aeronautical radionavigation and meteorological aids services may, in certain geographical areas, be subject to receiving some degree of interference from the radiolocation service.

US43 Non-Government land based radars in the aeronautical radionavigation service may be authorized in the band 2700–2900 MHz, subject to the conclusion of appropriate arrangements between the Commission and the Government agencies concerned, and upon special showing of need for service which the Government is not yet prepared to render.

US44 The non-Government radiolocation service may be authorized in the band 2900–3100 MHz on the condition that no harmful interference is caused to Government services.

[US45 and US46 deleted eff. 12-16-70; II(69)-6]

US47 The band 4200–4400 MHz is reserved exclusively for radio altimeters.

US48 The non-Government radiolocation service may be authorized in the band 5350–5460 MHz on the condition that it does not cause harmful interference to the aeronautical radionavigation service or to the Government radiolocation service.

US49 The non-Government radiolocation service may be authorized in the band 5460–5470 MHz on the condition that it does not cause harmful interference to the aeronautical or maritime radionavigation services or to the Government radiolocation service.

US50 The non-Government radiolocation service may be authorized in the band 5470–5600 MHz on the condition that it does not cause harmful interference to the maritime radionavigation service or to the Government radiolocation service.

US51 In the band 5600–5650 MHz, the non-Government radiolocation service shall not cause harmful interference to the Government radiolocation service.

US52 The only non-Government service permitted in the band 5650–5925 MHz is the amateur service. The amateur service shall not cause harmful interference to the radiolocation service.

US53 In view of the fact that the band 13.25–13.4 GHz is allocated exclusively to Doppler navigation aids, Government and non-Government airborne Doppler radars in the aeronautical radionavigation service are permitted in the band 8750–8850 MHz only on the condition that they must accept any interference which may be experienced from stations in the radiolocation service in the band 8500–10000 MHz.

US54 Temporarily, and until certain operations of the

radiolocation service in the band 9000–9200 MHz can be transferred to other appropriate frequency bands, the aeronautical radionavigation service may, in certain geographical areas, be subject to receiving some degree of interference from the radiolocation service.

US55 The non-Government radiolocation service may be authorized in the band 9000–9200 MHz on the condition that harmful interference is not caused to the aeronautical radionavigation service or the Government radiolocation service.

US56 The non-Government radiolocation service may be authorized in the band 9300–9500 MHz on the condition that harmful interference is not caused to the Government radiolocation services.

US58 In the band 10,000–10,500 MHz, pulsed emissions are prohibited, except for weather radars on board meteorological satellites in the band 10,000–10,025 MHz. The amateur service and the non-Government radiolocation service, which shall not cause harmful interference to the Government radiolocation service, are the only non-Government services permitted in this band. The non-Government radiolocation service is limited to survey operations as specified in footnote US108.

US59 The band 10,500–10,550 MHz is restricted to systems using type A0 emission with a power not to exceed 40 watts into the antenna.

US60 The use of this band by non-Government services is limited to the space (telecommand) service.

US61 Non-Government use of the band 3300–3500 MHz is limited to the amateur service and as indicated by US108.

[US61 amended eff. 12-16-70; II(69)-6]

US62 The use of this band by Government services is limited to the space research service.

US65 The use of the band 5460–5650 MHz by the maritime radionavigation service is limited to shipborne radars.

US66 The use of the band 9300–9500 MHz by the aeronautical radionavigation service is limited to airborne radars and associated airborne beacons.

US67 The use of the band 9300–9500 MHz by the meteorological aids service is limited to ground-based radars. Radiolocation installations will be coordinated with the meteorological aids service and, insofar as practicable, will be adjusted to meet the requirements of the meteorological aids service.

US68 The non-Government use of this band is limited to the radio astronomy service.

US69 In the band 31.8–33.4 GHz, ground-based radionavigation aids are not permitted except where they operate in cooperation with airborne or shipborne radionavigation devices.

US70 The meteorological aids service allocation in the band 400.05–406 MHz does not preclude the operation therein of associated ground transmitters.

US71 In the band 9300–9320 MHz, low-powered maritime radionavigation stations shall be protected from harmful interference caused by the operation of land-based equipment.

US72 In the band 24.25–25.25 GHz, Government radiolocation devices (ASDE) are permitted between 24.25–24.47 GHz on a shared basis.

US74 The radio astronomy service shall be protected from extraband radiation only to the extent that such radiation exceeds the level which would be present if the offending station were operating in compliance with the technical standards or criteria applicable to the service in which it operates.

US77 Government stations may also be authorized:

(a) Port operations use on a simplex basis by coast and ship stations of the frequencies 156.6 and 156.7 MHz;

(b) Duplex port operations use of the frequency 157.0 MHz for ship stations and 161.6 MHz for coast stations;

(c) Intership use of 156.3 MHz on a simplex basis.

US78 In the band 1435–1525 MHz, the frequencies between 1435 and 1485 MHz will be assigned primarily for the flight testing of manned aircraft, or major components there-

FOOTNOTES—Continued

of; the frequencies between 1485 and 1525 MHz will be assigned primarily for the flight testing of unmanned aircraft and missiles or major components thereof. Included as permissible usage for aeronautical telemetering stations in the band 1435–1525 MHz is telemetry associated with launching and re-entry into the earth's atmosphere, as well as any incidental orbiting prior to re-entry, of manned or unmanned objects undergoing flight tests.

US80 Government stations may use the frequency 122.9 MHz subject to the following conditions:

(a) All operation by Government stations shall be restricted to the purpose for which the frequency is authorized to non-Government stations, and shall be in accordance with the appropriate provisions of the Commission's rules and regulations, Part 87, Aviation Services;

(b) Use of the frequency is required for coordination of activities with Commission licensees operating on this frequency; and

(c) Government stations will not be authorized for operation at fixed locations.

US81 The band 38–38.16 MHz may be used by both Government and non-Government radio astronomy observatories. No new assignments are to be made and Government stations in the band 38–38.16 MHz will be moved to other bands on a case-by-case basis, as required, to protect radio astronomy observations from harmful interference. As an exception, however, low-powered military transportable and mobile stations used for tactical and training purposes will continue to use the band. To the extent practicable, the latter operations will be adjusted to relieve such interference as may be caused to radio astronomy observations. In the event of harmful interference from such local operations, radio astronomy observatories may contact local military commands directly, with a view to effecting relief. A list of military commands, areas of coordination, and points of contact for purposes of relieving interference may be obtained upon request from the Office of Chief Engineer, Federal Communications Commission, Washington, D.C., 20554.

US82 The assignable frequencies in this band may be authorized on a shared non-priority basis to Government and non-Government ship and coast stations (SSB telephony, with peak envelope power not to exceed 1 kw).

US83 Non-Government use of this band is limited to the following: 9995–10003 kHz, radio astronomy service; 10003–10005 kHz, radio astronomy and space research services.

US84 The non-Government use of this band is limited to the space research service.

US85 In the bands 117.975–123.075 and 123.575–136 MHz, the use and development, for the aeronautical mobile (R) service, of systems using space communication techniques may be authorized but limited initially to satellite relay stations of the aeronautical mobile (R) service.

US86 The frequencies 148.25 MHz \pm 15 kHz and 154.2 MHz \pm 15 kHz may be used by Government and non-Government stations for space telecommand at specific locations, subject to such conditions as may be imposed on a case-by-case basis. With respect to 154.2 MHz, the commands are to be limited to short duration of the order of three seconds ("Address and execute" commands). Further, on a case-by-case basis and solely to avoid harmful interference to non-Government stations in the land mobile service, a comparable replacement frequency assignment will be made available below 150.8 MHz, if required.

US87 The frequency 450 MHz, with maximum emission bandwidth of 500 kHz, may be used by Government and non-Government stations for space telecommand at specific locations, subject to such conditions as may be applied on a case-by-case basis.

US88 Stations in the broadcasting service will not be authorized in the band 608–614 MHz prior to January 1, 1974.

In the interim the band is available for use by the radio astronomy service. The radio astronomy service shall be protected from extraband radiation only to the extent that such radiation exceeds the level which would be present if the offending station were operating in compliance with the technical standards or criteria applicable to the service in which it operates.

US89 The aeronautical telemetering frequencies in the band 1525–1535 MHz will be assigned primarily for the flight testing of unmanned aircraft and missiles or major components thereof. Included as permissible usage for aeronautical telemetering stations in the band 1525–1535 MHz is telemetry associated with launching and reentry into the earth's atmosphere, as well as any incidental orbiting prior to re-entry, of manned or unmanned objects undergoing flight tests.

US90 The band 2110–2120 MHz may be used by Government and non-Government stations for space telecommand at specific locations in conjunction with spacecraft engaged in deep space research, subject to such conditions as may be applied on a case-by-case basis.

US91 The ultimate disposition of this band in the communication-satellite service, as between Government and non-Government, is deferred. In the meanwhile the non-Government may exploit the 4 and 6 GHz bands and the Government may exploit the 7 and 8 GHz bands for communication-satellite service systems intended to become operational. Any modification of this policy will be discussed and agreed in the FCC/DTM (IRAC) mechanism prior to the filing of applications with the IRAC for frequency assignments which are not in accordance with the foregoing.

US92 In the band 7300–7750 MHz, the meteorological-satellite service may use a band up to 100 MHz in width. This 100 MHz band may also be used for the transmission of tracking and telemetering signals associated with meteorological-satellite space stations operating in the same band.

US93 In the conterminous United States, the frequency 108.0 MHz may be authorized for use by VOR test facilities, the operation of which is not essential for the safety of life or property, subject to the condition that no interference is caused to the reception of FM broadcasting stations operating in the band 88–108 MHz. In the event that such interference does occur, the licensee or other agency authorized to operate the facility shall discontinue operation on 108 MHz and shall not resume operation until the interference has been eliminated or the complaint otherwise satisfied. VOR test facilities operating on 108 MHz will not be protected against interference caused by FM broadcasting stations operating in the band 88–108 MHz nor shall the authorization of a VOR test facility on 108 MHz preclude the Commission from authorizing additional FM broadcasting stations.

US94 The bands 30.005–30.015 MHz and 39.986–40.02 MHz are also allocated, on a secondary basis, to the space research service for space to earth transmissions only.

US96 In the band 1990–2110 MHz, the frequencies 2106.4 MHz and 2101.8 MHz may be authorized for Government earth station transmissions in connection with Project Apollo, until December 31, 1970, at the following sites only: Goldstone, Calif. (35°23'20" N., 116°50'53" W.) Guam, Mariana Islands (13°18'34" N, 144°44'10" E.) Cape Kennedy, Fla. (28°28'54" N., 80°34'35" W.) Kauai, Hawaii (22°07'31" N., 159°40'16" W.) Corpus Christi, Tex. (27°39'19" N., 97°22'49" W.)

Full power operation shall occur only when spacecraft launched as a part of Project Apollo are in actual flight. During such operation, the carrier shall be fully modulated at all times to ensure dispersal of the transmitted power, and transmissions shall not occur using antenna elevation angles of less than 3° above the horizontal plane. Operation at all other times shall be confined to laboratory tests or subdued radiation spacecraft tests, subject to the condition that no

FOOTNOTES—Continued

harmful interference is caused to TV broadcast auxiliary stations.

US97 The use of the band 1605–1715 kHz by non-Government stations in the aeronautical radionavigation service is limited to the frequencies 1638 and 1708 kHz. Stations in the radiolocation service shall not cause harmful interference to stations in the aeronautical radionavigation service operating on 1638 or 1708 kHz.

US98 The frequency 245 MHz is the frequency in this band for use by Government and non-Government survival craft stations and equipment used for survival purposes.

US99 In the band 1660–1700 MHz, the meteorological aids service (radiosonde) will to the maximum extent practicable confine its operations above the frequency 1670 MHz. Whenever it is necessary to operate radiosondes in the band 1660–1670 MHz within the United States, the radio astronomers will be notified in a timely manner.

US100 In the Additional Protocol to the Final Acts of the Space EARC, Geneva, 1963, a declaration on behalf of the USA states that the USA cannot accept any obligation to observe the exceptions claimed by Cuba in those footnotes to the Table of Frequency Allocations which were adopted by the EARC and which specifically name Cuba.

US101 In the band 1660–1670 MHz, the radio astronomy service must accept such interference as may be received from the meteorological-satellite service.

US102 In Alaska only, the frequency 122.1 MHz may also be used for air carrier air traffic control purposes at locations where other frequencies are not available to air carrier aircraft stations for air traffic control.

US103 Non-Government aeronautical radionavigation stations, intended to provide service for helicopter operations in the New York City area, may be authorized on the following frequencies:

<i>kHz</i>	<i>kHz</i>
70.8375	113.340
84.945	116.1735
85.005	127.5075
85.065	

Such authorizations shall be limited to the specific sites, coverage area and period of time in accordance with formal advice from the Federal Aviation Agency to the Federal Communications Commission that the service is required.

US104 The LORAN radionavigation system has priority in this band in the United States and Possessions.

US105 On the express condition that harmful interference is not caused to stations operating in accordance with the Table of Frequency Allocations, frequencies in the bands 3230–3240 and 3240–3400 kHz may be assigned to radiolocation systems which are also assigned frequencies in the 1600–1800 kHz band, provided the use of frequencies in the bands 3230–3240 and 3240–3400 kHz is necessary for the proper functioning of the particular radiolocation system.

US106 The frequency 159.75 MHz is available for assignment to non-Government and Government stations for environmental communications in accordance with an agreed plan.

US107 The frequency 156.8 MHz is the national distress, safety and calling frequency for the maritime mobile VHF radiotelephone service for use by Government and non-Government ship and coast stations. Guard bands of 156.7625–156.7875 and 156.8125–156.8375 MHz are maintained.

US108 Within the bands 3300–3500 MHz and 10,000–10,500 MHz, survey operations, using transmitters with a peak

power not to exceed 5 watts into the antenna, may be authorized for Government and non-Government use on a secondary basis to other Government radiolocation operations.

US110 In the frequency bands 3100–3300 MHz, 3500–3700 MHz, 5250–5350 MHz, 8500–9000 MHz, 9200–9300 MHz, 9500–10,000 MHz, 13.4–14.0 GHz, 15.7–17.7 GHz, 23.0–24.25 GHz, and 33.4–36.0 GHz, the non-Government radiolocation service shall be secondary to the Government radiolocation service and to airborne doppler radars at 8800 MHz.

US111 Government space research earth stations may be authorized to use the frequency 2106.4 MHz for earth-to-space transmissions for tracking, ranging and telecommand purposes at only the sites listed below. Such transmissions shall not cause harmful interference to non-Government operations.

- Goldstone, Calif. (35°23'20" N., 116°50'53" W.).
- Cape Kennedy, Fla. (28°28'54" N., 80°34'35" W.).
- Kauai, Hawaii (22°07'31" N., 159°40'16" W.).
- Corpus Christi, Tex. (27°39'19" N., 97°22'49" W.).
- Guam, Mariana Islands (13°18'34" N., 144°44'10" E.).

US113 The frequency 2182 kHz is the international distress and calling frequency for radiotelephony. The conditions for the use of this frequency are prescribed in Article 35 of the International Radio Regulations.

US114 Non-Government use of the band 216–220 MHz is limited to the land mobile service for telemetering and associated telecommand purposes only and shall have secondary status with respect to the Government radiolocation service; airborne devices will not be authorized.

[US114 added eff. 6–30–71; II(69)–7]

US115 The frequency 915 MHz is designated for industrial, scientific, and medical purposes. Emissions must be confined within the limits of ±13 MHz of that frequency. Radiocommunication services operating within those limits must accept any harmful interference that may be experienced from the operation of industrial, scientific, and medical equipment. (The applicability and effective date of the new limits, ±13 MHz, are under study in FCC Docket No. 18262. Pending further decision in that docket, the limits shall continue to be ±25 MHz.)

US117 In the band 406–410 MHz, all new authorizations will be limited to a maximum of 7 watts per kHz of necessary bandwidth; existing authorizations as of November 30, 1970, exceeding this power are permitted to continue in use.

New authorizations in this band for stations, other than mobile stations, within the following areas are subject to prior coordination by the applicant with the Secretary of the Committee on Radio Frequencies of the National Academy of Sciences:

- Arecibo Observatory: Rectangle between latitudes 17°30' N. and 19°00' N. and between longitudes 65°10' W. and 68°00' W.
- Five College Radio Astronomy Observatory: Rectangle between latitudes 41°40' N. and 42°50' N. and between longitudes 71°20' W. and 73°20' W.
- Owens Valley Radio Observatory: Two contiguous rectangles, one between latitudes 36° N. and 37° N. and longitudes 117°40' W. and 118°30' W., and the second between latitudes 37° N. and 38° N. and longitudes 118° W. and 118°50' W.
- Pennsylvania State University Radio Astronomy Observatory: Rectangle between latitudes 40°00' N. and 41°40' N. and longitudes 77°15' W. and 78°40' W.
- Vermilion River Observatory: Rectangle between latitudes 38°35' N. and 41°31' N. and longitudes 86°15' W. and 89°30' W.

(The foregoing provisions will be reviewed in connection with U.S. implementation of the Final Acts of the 1971 Space WARC.)

The non-Government use of this band is limited to the radio astronomy service and as provided by footnote US13.

SUBPART C—EMISSIONS

§ 2.201 Emission, modulation, and transmission characteristics.

The following system of designating emission, modulation and transmission characteristics shall be employed.

(a) Emissions are designated according to their classification and their necessary bandwidth.

(b) Emissions are classified and symbolized according to the following characteristics.

(1) Type of modulation of main carrier.

(2) Type of transmission.

(3) Supplementary characteristics.

(c) Types of modulation of main carrier :

(1) Amplitude	<i>Symbol</i>	A
(2) Frequency (or Phase).....		F
(3) Pulse.....		P

(d) Types of transmission :

(1) Absence of any modulation intended to carry information	0
(2) Telegraphy without the use of a modulating audio frequency	1

(3) Telegraphy by the on-off keying of a modulating audio frequency or audio frequencies, or by the on-off keying of the modulated emission (special case: an unkeyed modulated emission).....	<i>Symbol</i>	2
(4) Telephony (including sound broadcasting).....		3
(5) Facsimile (with modulation of main carrier either directly or by a frequency modulated sub-carrier) ..		4
(6) Television (visual only).....		5
(7) Four-frequency duplex telegraphy.....		6
(8) Multichannel voice-frequency telegraphy.....		7
(9) Cases not covered by the above.....		9

(e) Supplementary characteristics :

(1) Double sideband.....	(None)
(2) Single sideband :	
(i) Reduced carrier.....	A
(ii) Full carrier.....	H
(iii) Suppressed carrier.....	J
(3) Two independent sidebands.....	B
(4) Vestigial sideband.....	C
(5) Pulse :	
(i) Amplitude modulated.....	D
(ii) Width (or duration) modulated.....	E
(iii) Phase (or position) modulated.....	F
(iv) Code modulated.....	G

(f) The classification of typical emissions is tabulated as follows :

Type of modulation of main carrier	Type of transmission	Supplementary characteristics	Symbol
Amplitude modulation.....	With no modulation.....		A0
	Telegraphy without the use of a modulating audio frequency (by on-off keying).....		A1
	Telegraphy by the on-off keying of an amplitude modulating audio frequency or audio frequencies, or by the on-off keying of the modulated emission (special case: an unkeyed emission amplitude modulated).....		A2
	Telephony.....		A3
	Facsimile (with modulation of main carrier either directly or by a frequency modulated subcarrier).....	Double sideband.....	A3A
	Facsimile.....	Single sideband, reduced carrier.....	A3J
	Television.....	Single sideband, suppressed carrier.....	A3B
	Multichannel voice-frequency telegraphy.....	Two independent sidebands.....	A4
	Cases not covered by the above, e.g., a combination of telephony and telegraphy.....	Single sideband, reduced carrier.....	A4A
		Vestigial sideband.....	A5C
Frequency (or Phase) modulation.....	Telegraphy by frequency shift keying without the use of a modulating audio frequency: one of two frequencies being emitted at any instant.....		F1
	Telegraphy by the on-off keying of a frequency modulating audio frequency or by the on-off keying of a frequency modulated emission (special case: an unkeyed emission, frequency modulated).....		F2
	Telephony.....		F3
	Facsimile by direct frequency modulation of the carrier.....		F4
	Television.....		F5
	Four-frequency duplex telegraphy.....		F6
	Cases not covered by the above, in which the main carrier is frequency modulated.....		F9
Pulse modulation.....	A pulsed carrier without any modulation intended to carry information (e.g. radar).....		P0
	Telegraphy by the on-off keying of a pulsed carrier without the use of a modulating audio frequency.....		P1D
	Telegraphy by the on-off keying of a modulating audio frequency or audio frequencies, or by the on-off keying of a modulated pulsed carrier (special case: an unkeyed modulated pulsed carrier).....		P2D
		Audio frequency or audio frequencies modulating the amplitude of the pulses.....	P2E
		Audio frequency or audio frequencies modulating the width (or duration) of the pulses.....	P2F
		Audio frequency or audio frequencies modulating the phase (or position) of the pulses.....	P3D
		Amplitude modulated pulses.....	P3E
		Width (or duration) modulated pulses.....	P3F
		Phase (or position) modulated pulses.....	P3G
	Telephony.....	Code modulated pulses (after sampling and quantization).....	P9
Cases not covered by the above in which the main carrier is pulse modulated.....			