

NAME OF TEST: Transmitter Rated Power Output

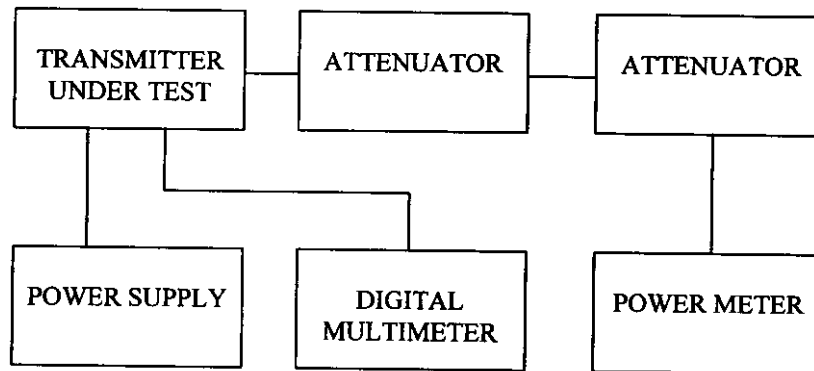
RULE PART NUMBER: 2.983 (d)(5), 2.985 (a)

TEST RESULTS: See results below

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Power Supply, Tectrol Inc., TC845-1081
Power Meter, Model HP436A
Digital Voltmeter, Fluke Model 8012A

TEST SET-UP:



TEST SET-UP

TEST RESULTS:

Frequency (MHz)	DC Voltage at Final (Vdc)	DC Current into Final (ADC)	DC Power into Final (W)	RF Power Output (W)
450.000	25.9	11.6	300	125

NAME OF TEST: Audio Frequency Response of Transmitter Modulating Circuit

RULE PART NUMBER: 2.983 (d)(11), 2.987 (a), 90.211 (a)

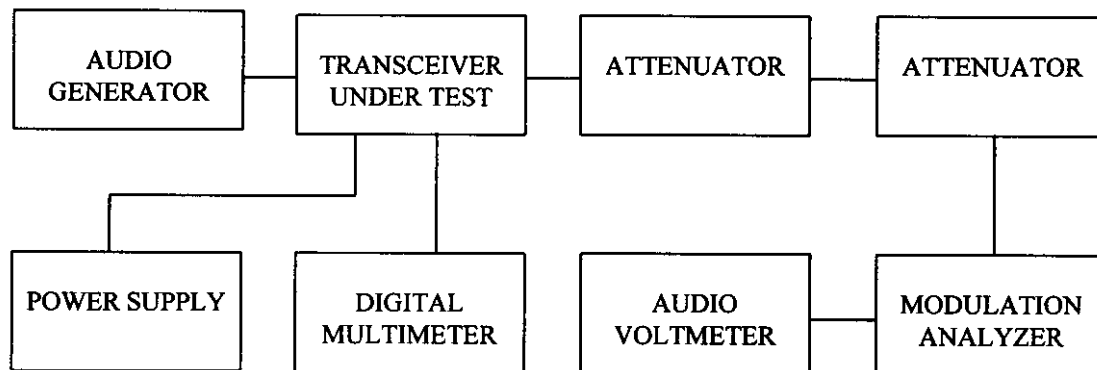
TEST RESULTS: Conforms to minimum standards

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.6.2

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Modulation Analyzer, Model HP8901A
Power Supply, Tectrol Inc., TC845-1081
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903B
Audio Voltmeter, Model HP8903B

TEST SET-UP:



TEST SET-UP

(Test data on next page)

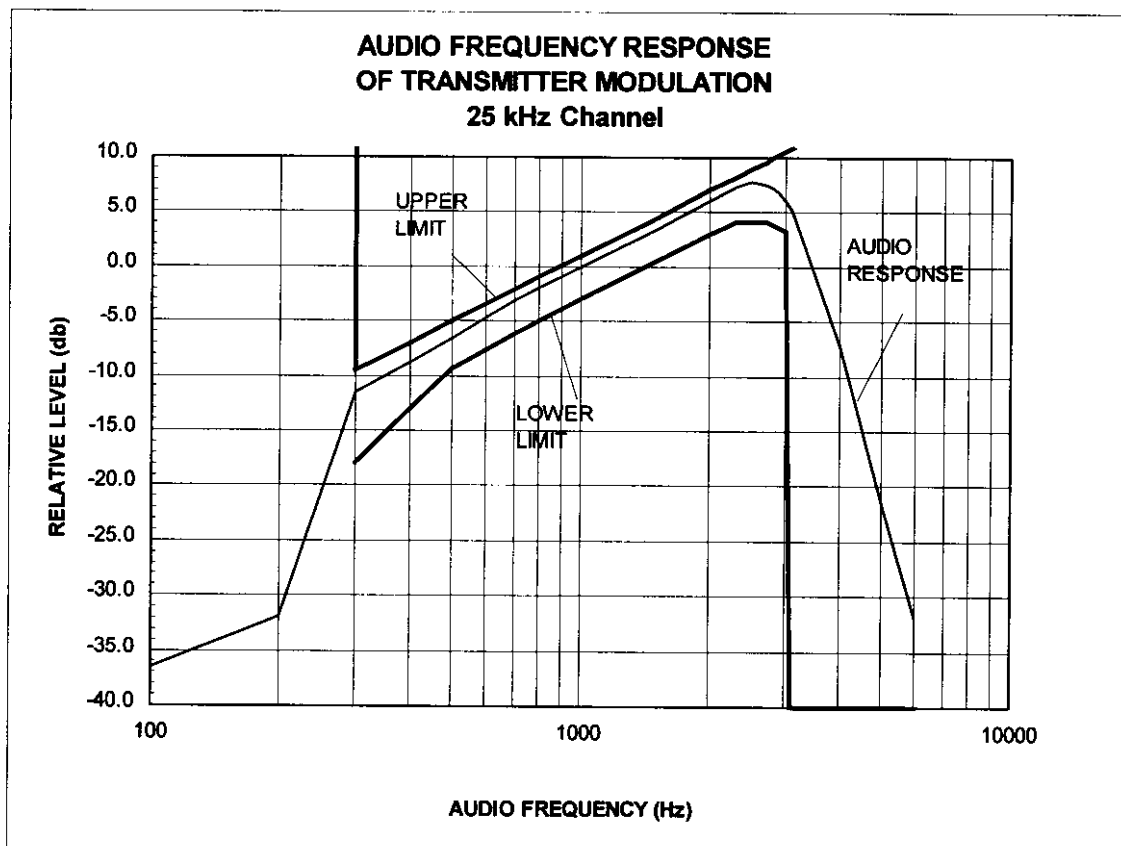
NAME OF TEST: Audio Frequency Response of Transmitter Modulating Circuit
(Continued)

TEST RESULTS: 25 kHz channel

Reference level (0 dB) = 1.0 kHz deviation with 1000 Hz tone at local microphone input.

Frequency (Hz)	Level (dB)	Frequency (Hz)	Level (dB)
100	-36.5	2300	7.34
200	-31.8	2500	7.77
300	-11.48	2700	7.57
400	-8.70	2800	7.24
500	-6.51	2900	6.76
700	-3.10	3000	6.07
800	-1.91	3100	5.19
1000	0.00	3500	0.23
1500	3.43	4000	-7.22
2000	6.07	5000	-21.45
		6000	-31.9

These data points are for a constant input voltage level.



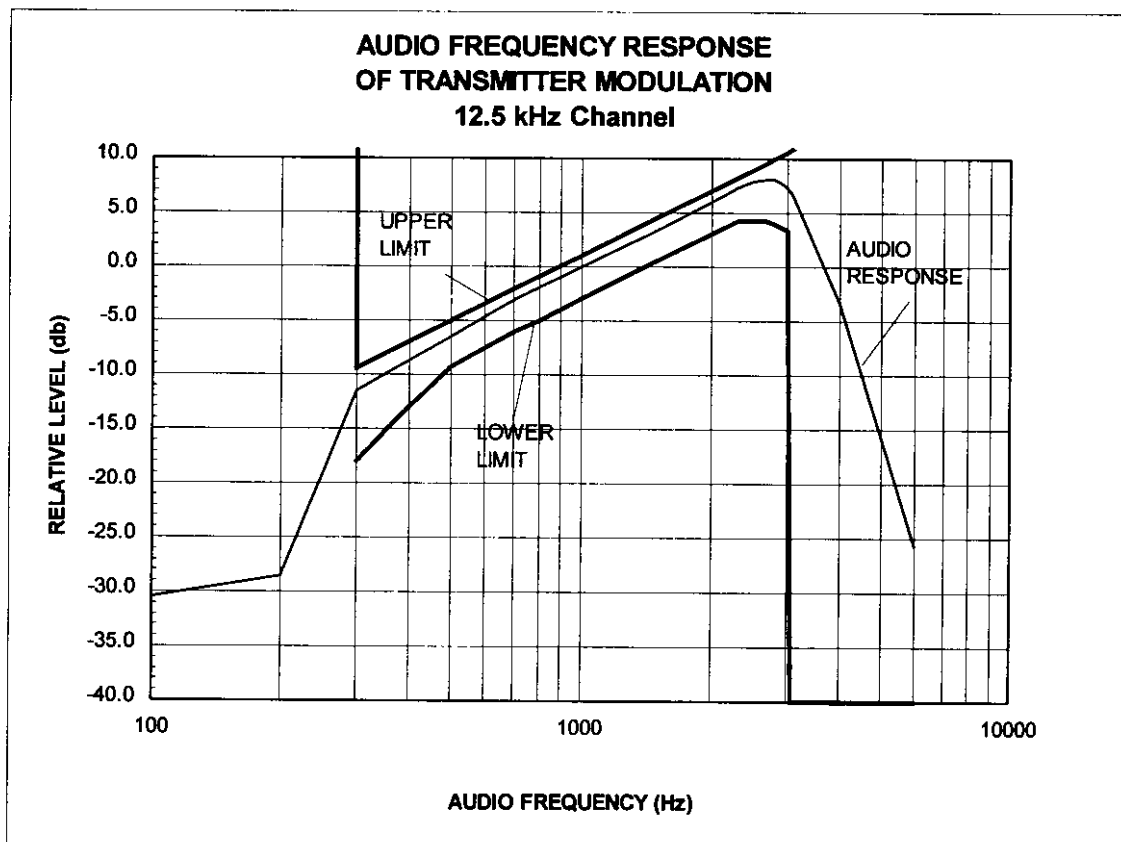
NAME OF TEST: Audio Frequency Response of Transmitter Modulating Circuit
(Continued)

TEST RESULTS: 12.5 kHz channel

Reference level (0 dB) = 500 Hz deviation with 1000 Hz tone at local microphone input.

Frequency (Hz)	Level (dB)	Frequency (Hz)	Level (dB)
100	-30.5	2300	7.32
200	-28.50	2500	7.92
300	-11.42	2700	8.15
400	-8.69	2800	8.04
500	-6.49	2900	7.78
700	-3.08	3000	7.34
800	-1.89	3100	6.71
1000	0.00	3500	2.77
1500	3.42	4000	-3.41
2000	6.06	5000	-15.78
		6000	-25.70

These data points are for a constant input voltage level.



NAME OF TEST: Frequency Response of Transmitter Audio Lowpass Filter

RULE PART NUMBER: 2.987 (a), 90.211 (a)

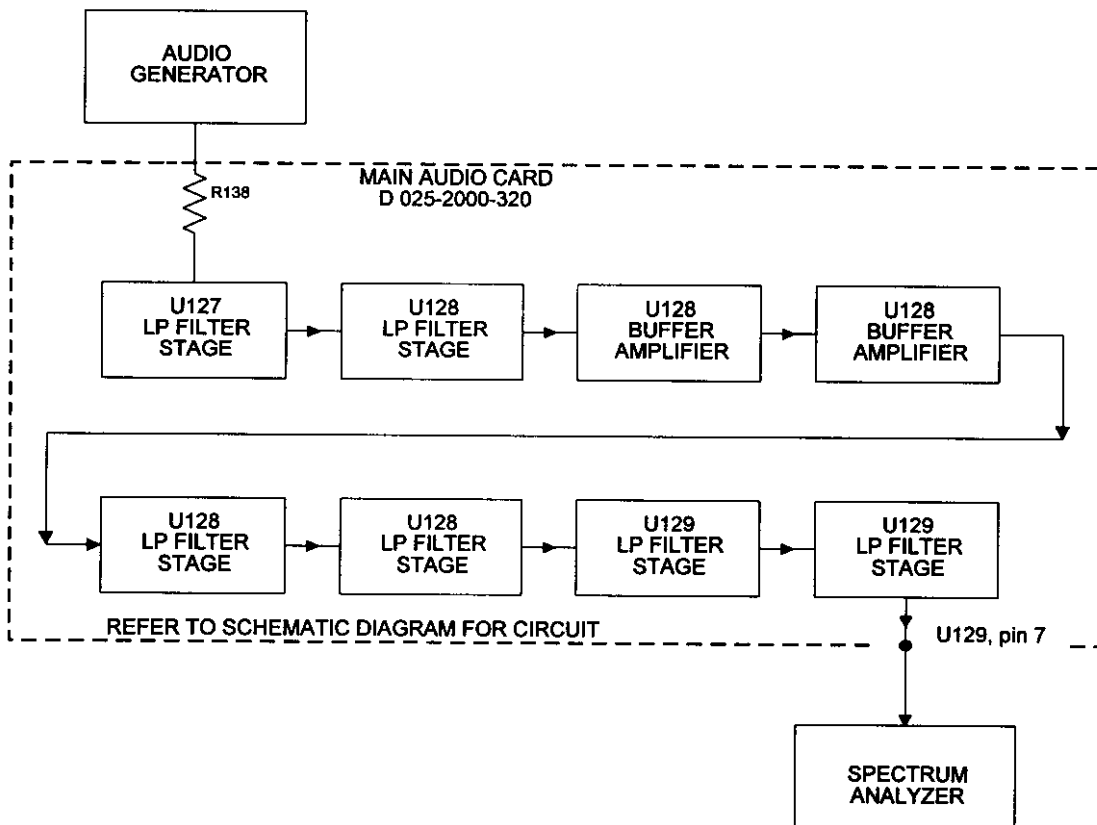
TEST RESULTS: See Graph On Following Page

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.15

TEST EQUIPMENT: Audio Generator, Model HP8903B
Spectrum Analyzer, Model HP8563E

TEST SET-UP: TRANSMIT AUDIO SPLATTER FILTER



TEST SET-UP

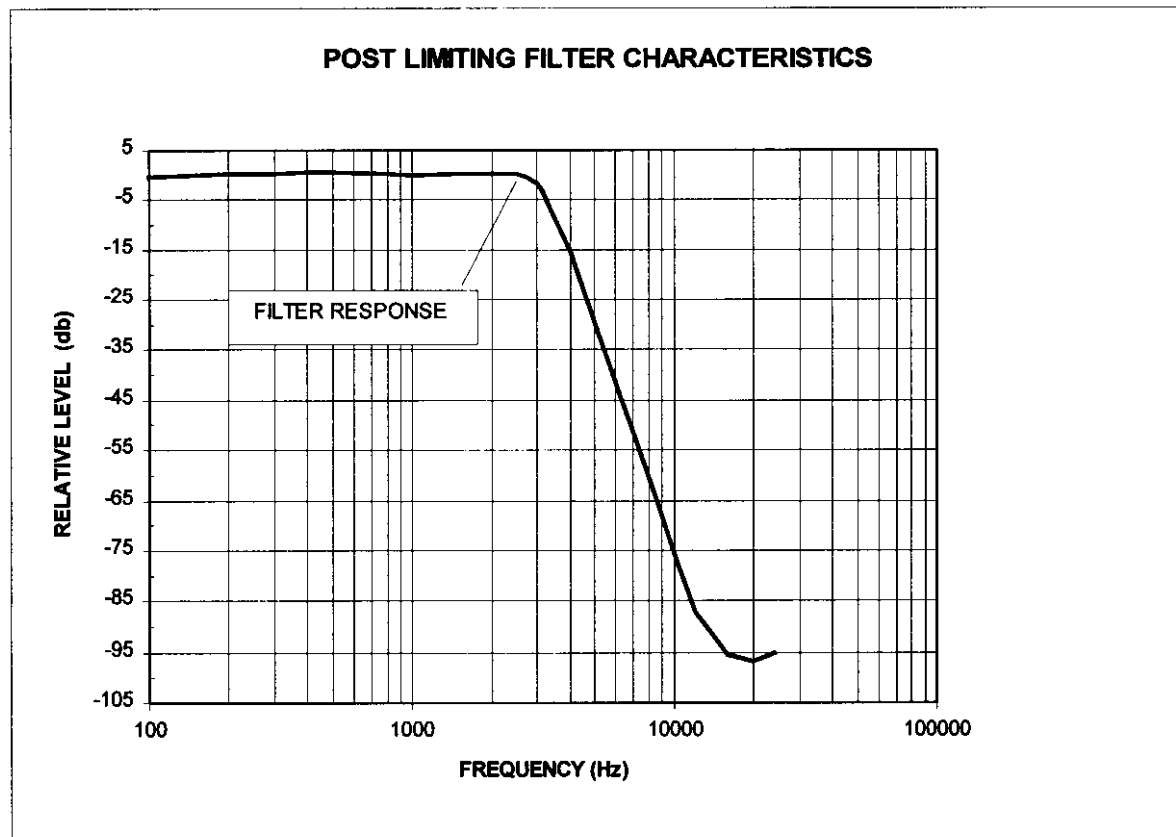
(Test data on next page)

NAME OF TEST: Frequency Response of Transmitter Audio Lowpass Filter
(Continued)

TEST RESULTS: Performance Relative To 1000 Hz, 0 dB

Reference: 1000 Hz level set to 0 dB

Frequency (Hz)	Level (dB)	Frequency (Hz)	Level (dB)
100	-.5	2900	-1.34
200	.33	3000	-1.84
300	.33	3100	-2.84
400	.67	4000	-15.34
500	.67	5000	-29.34
800	.33	8000	-60.5
1000	0.0	10304	-77.5
1500	.16	12000	-87.17
2000	.33	16000	-95.34
2500	.16	20000	-96.84
2600	0.0	24000	-95.17
2700	-.34	50000	-88.67
2800	-.84	100000	-82.34



NAME OF TEST: Percentage Modulation Versus Input Voltage
(25 kHz channel)

RULE PART NUMBER: 2.987 (b)

MINIMUM STANDARD: Shall not exceed 5.0 kHz deviation from 300 Hz to 3000 Hz

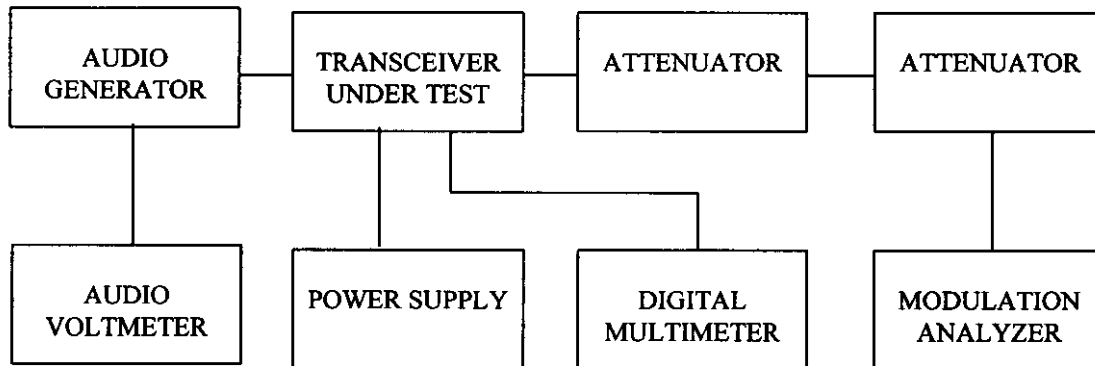
TEST RESULTS: Conforms to minimum standards

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.3

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Modulation Analyzer, Model HP8901A
Power Supply, Tectrol Inc., TC845-1081
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903B
Audio Voltmeter, Model HP8903B

TEST SET-UP:



TEST SET-UP

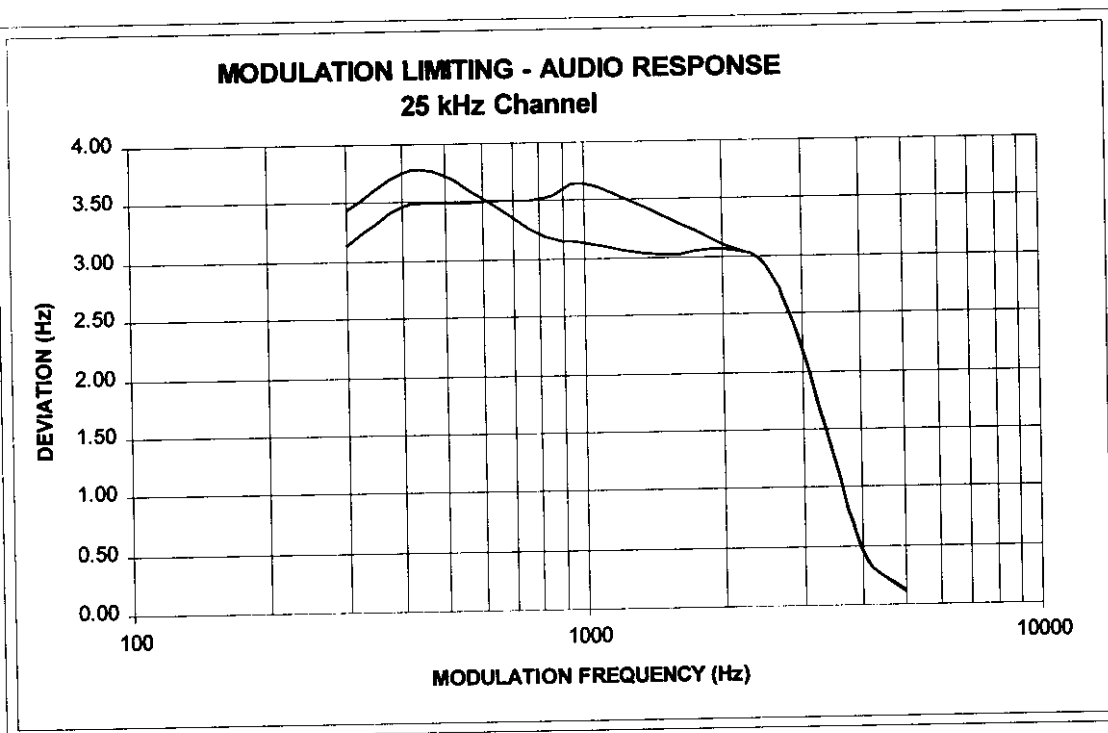
(Test data on next page)

NAME OF TEST: Percentage Modulation Versus Input Voltage
(25 kHz channel, Continued)

DEVIATION LIMITING WITH INPUT VOLTAGE
20 dB ABOVE 60% RATED DEVIATION AT 1000 Hz
for
16K0F3E

MOD. FREQ. (Hz)	@ $V_{m(1000Hz)}$	
	POS. DEV. (kHz)	NEG. DEV. (kHz)
300	3.14	3.44
400	3.46	3.75
500	3.49	3.73
800	3.52	3.21
1000	3.64	3.14
1500	3.36	3.03
2000	3.11	3.06
2500	2.91	2.91
3000	2.17	2.18
4000	0.46	0.47
5000	0.12	0.11

GRAPH



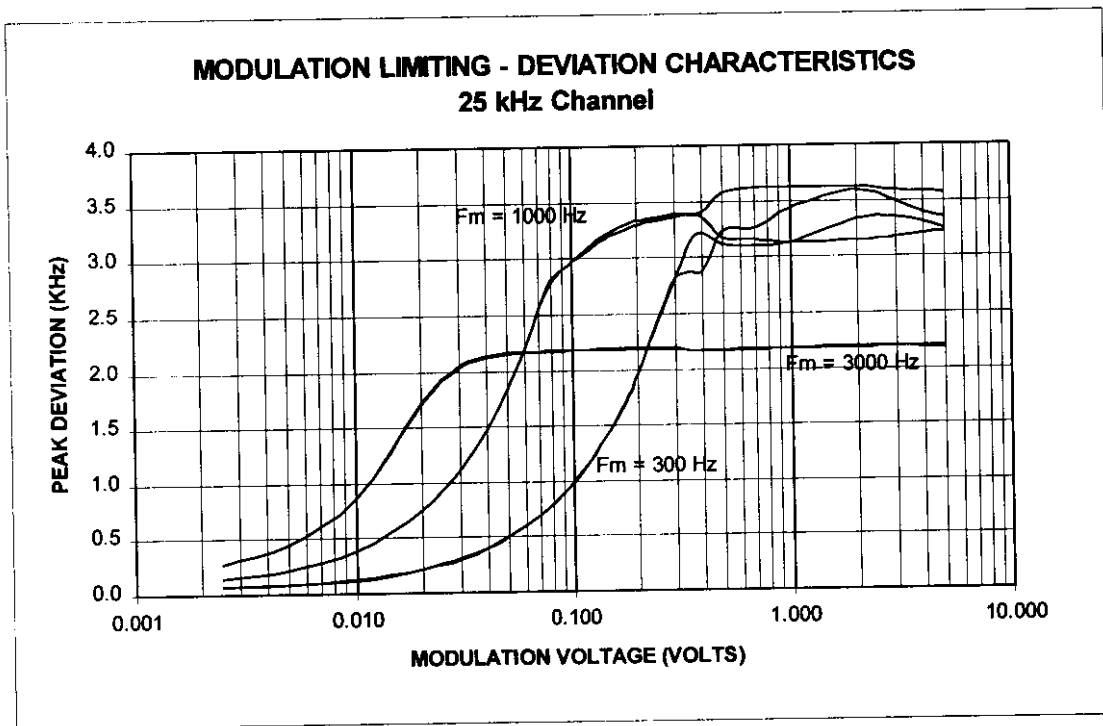
NAME OF TEST: Percentage Modulation Versus Input Voltage
for
16K0F3E

TEST DATA:

Input Voltage (Vrms)	FM = 300Hz		FM = 1000Hz		FM = 3000Hz	
	POS. DEV. (kHz)	NEG. DEV. (kHz)	POS. DEV. (kHz)	NEG. DEV. (kHz)	POS. DEV. (kHz)	NEG. DEV. (kHz)
0.000	0.05	0.05	0.05	0.05	0.05	0.05
0.003	0.07	0.06	0.14	0.14	0.284	0.28
0.005	0.085	0.08	0.21	0.21	0.45	0.45
0.010	0.13	0.12	0.39	0.39	0.87	0.87
0.020	0.22	0.22	0.75	0.75	1.71	1.72
0.030	0.32	0.31	1.11	1.11	2.04	2.05
0.040	0.41	0.41	1.47	1.47	2.12	2.13
0.050	0.51	0.51	1.83	1.84	2.15	2.16
0.060	0.60	0.61	2.20	2.20	2.16	2.17
0.070	0.70	0.70	2.56	2.55	2.17	2.17
0.080	0.80	0.80	2.81	2.79	2.17	2.18
0.090	0.89	0.90	2.90	2.90	2.17	2.18
0.100	0.98	0.99	2.97	2.98	2.18	2.18
0.120	1.18	1.18	3.08	3.11	2.18	2.18
0.150	1.47	1.48	3.20	3.23	2.18	2.19
0.180	1.76	1.77	3.27	3.30	2.18	2.19
0.200	1.96	1.96	3.29	3.33	2.18	2.19
0.250	2.44	2.45	3.34	3.37	2.18	2.19
0.300	2.82	2.81	3.37	3.39	2.18	2.19
0.350	3.13	2.88	3.40	3.38	2.17	2.17
0.400	3.22	2.87	3.41	3.37	2.16	2.17
0.500	3.12	3.24	3.58	3.18	2.17	2.17
0.700	3.10	3.27	3.62	3.16	2.17	2.18
1.000	3.14	3.43	3.63	3.14	2.18	2.18
2.000	3.34	3.59	3.62	3.15	2.18	2.19
3.000	3.35	3.49	3.60	3.18	2.19	2.19
4.000	3.30	3.39	3.58	3.20	2.18	2.19
5.000	3.25	3.35	3.57	3.22	2.18	2.19

See graph on following page.

GRAPH
Percentage Modulation Versus Input Voltage
for
16K0F3E



NAME OF TEST: Percentage Modulation Versus Input Voltage
(12.5 kHz channel)

RULE PART NUMBER: 2.987 (b)

MINIMUM STANDARD: Shall not exceed 2.5 kHz deviation from 300 Hz to 3000 Hz

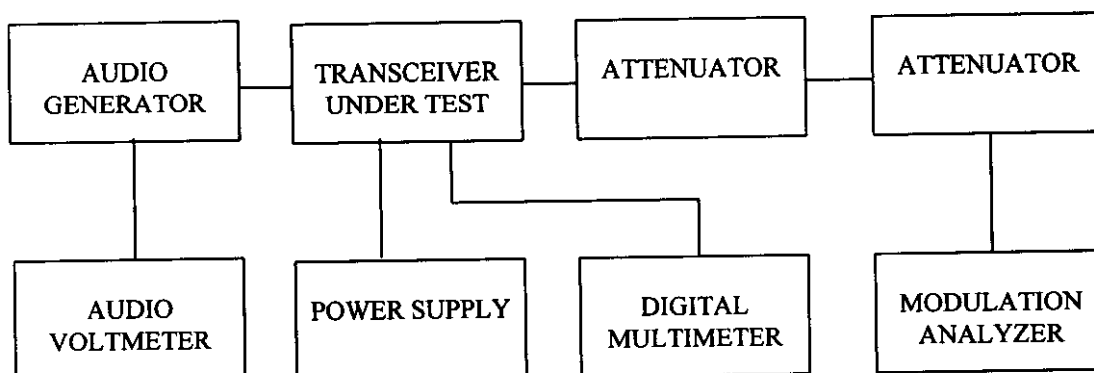
TEST RESULTS: Conforms to minimum standards

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.3

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Modulation Analyzer, Model HP8901A
Power Supply, Tectrol Inc., TC845-1081
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903B
Audio Voltmeter, Model HP8903B

TEST SET-UP:



TEST SET-UP

(Test data on next page)

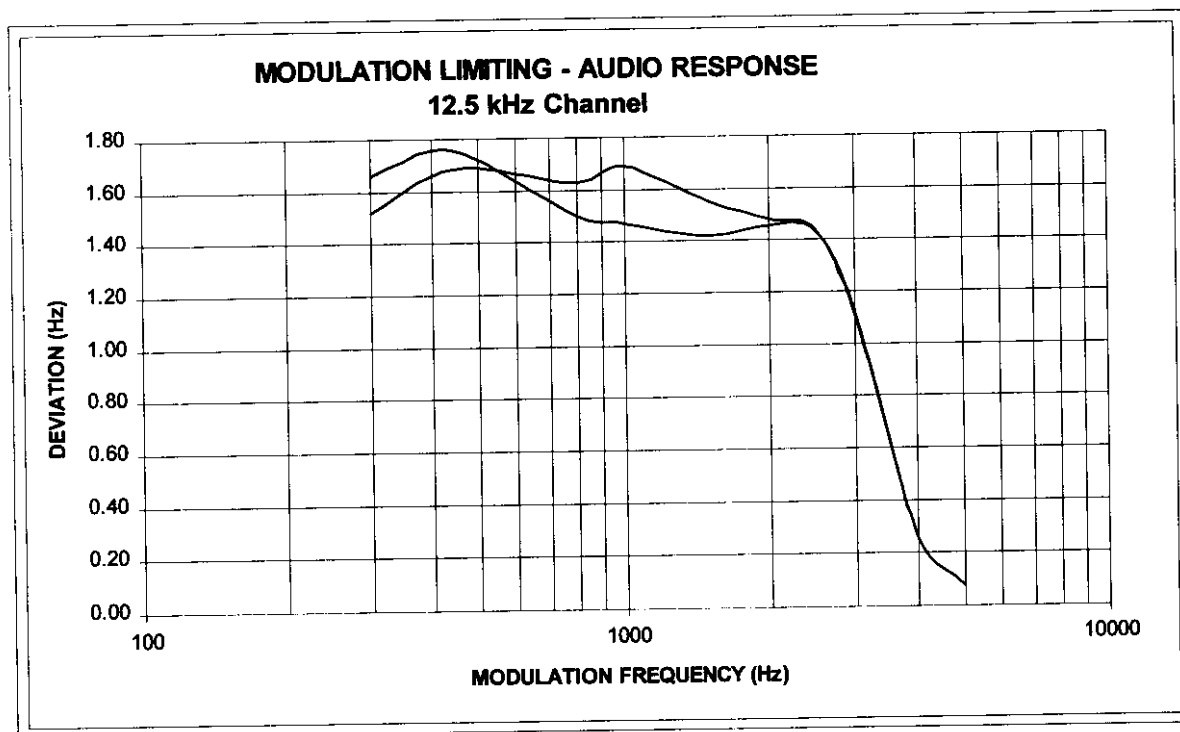
NAME OF TEST: Percentage Modulation Versus Input Voltage
(12.5 kHz channel)

DEVIATION LIMITING WITH INPUT VOLTAGE
20 dB ABOVE 60% RATED DEVIATION AT 1000 Hz
for

11K0F3E

MOD. FREQ. (Hz)	@ $V_{m(1000Hz)}$	
	POS. DEV. (kHz)	NEG. DEV. (kHz)
300	1.52	1.66
400	1.66	1.76
500	1.69	1.72
800	1.63	1.50
1000	1.69	1.47
1500	1.55	1.42
2000	1.48	1.46
2500	1.44	1.43
3000	1.11	1.12
4000	0.26	0.26
5000	0.08	0.08

GRAPH



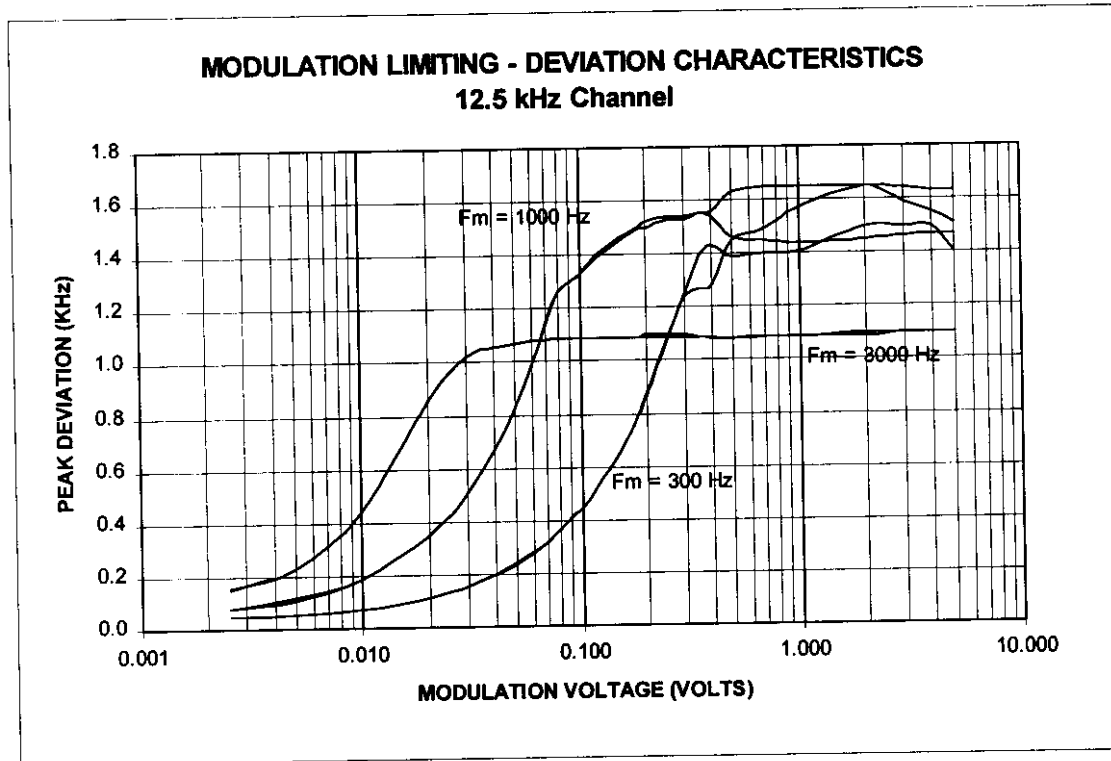
NAME OF TEST: Percentage Modulation Versus Input Voltage
for
11K0F3E

TEST DATA:

Input Voltage (Vrms)	FM = 300Hz		FM = 1000Hz		FM = 3000Hz	
	POS. DEV. (kHz)	NEG. DEV. (kHz)	POS. DEV. (kHz)	NEG. DEV. (kHz)	POS. DEV. (kHz)	NEG. DEV. (kHz)
0.000	0.04	0.04	0.04	0.04	0.04	0.04
0.003	0.05	0.05	0.08	0.08	0.15	0.16
0.005	0.05	0.05	0.11	0.12	0.23	0.23
0.010	0.07	0.07	0.19	0.19	0.44	0.44
0.020	0.11	0.11	0.35	0.35	0.86	0.86
0.030	0.16	0.15	0.51	0.51	1.02	1.02
0.040	0.20	0.19	0.67	0.67	1.06	1.06
0.050	0.23	0.24	0.83	0.83	1.07	1.07
0.060	0.28	0.28	0.99	0.99	1.08	1.08
0.070	0.32	0.32	1.15	1.14	1.08	1.08
0.080	0.37	0.36	1.26	1.26	1.09	1.09
0.090	0.41	0.41	1.30	1.30	1.09	1.09
0.100	0.45	0.45	1.33	1.33	1.09	1.09
0.120	0.53	0.53	1.39	1.40	1.09	1.09
0.150	0.66	0.66	1.45	1.46	1.09	1.09
0.180	0.79	0.79	1.49	1.50	1.09	1.09
0.200	0.87	0.88	1.50	1.52	1.09	1.11
0.250	1.08	1.09	1.53	1.54	1.09	1.10
0.300	1.25	1.24	1.53	1.54	1.09	1.10
0.350	1.39	1.27	1.55	1.55	1.09	1.09
0.400	1.43	1.28	1.56	1.54	1.08	1.09
0.500	1.39	1.45	1.63	1.46	1.08	1.08
0.700	1.40	1.49	1.65	1.45	1.09	1.09
1.000	1.41	1.57	1.65	1.44	1.09	1.09
2.000	1.54	1.65	1.65	1.45	1.09	1.10
3.000	1.54	1.59	1.64	1.46	1.10	1.10
4.000	1.51	1.55	1.63	1.47	1.10	1.10
5.000	1.48	1.51	1.63	1.47	1.10	1.10

See graph on following page.

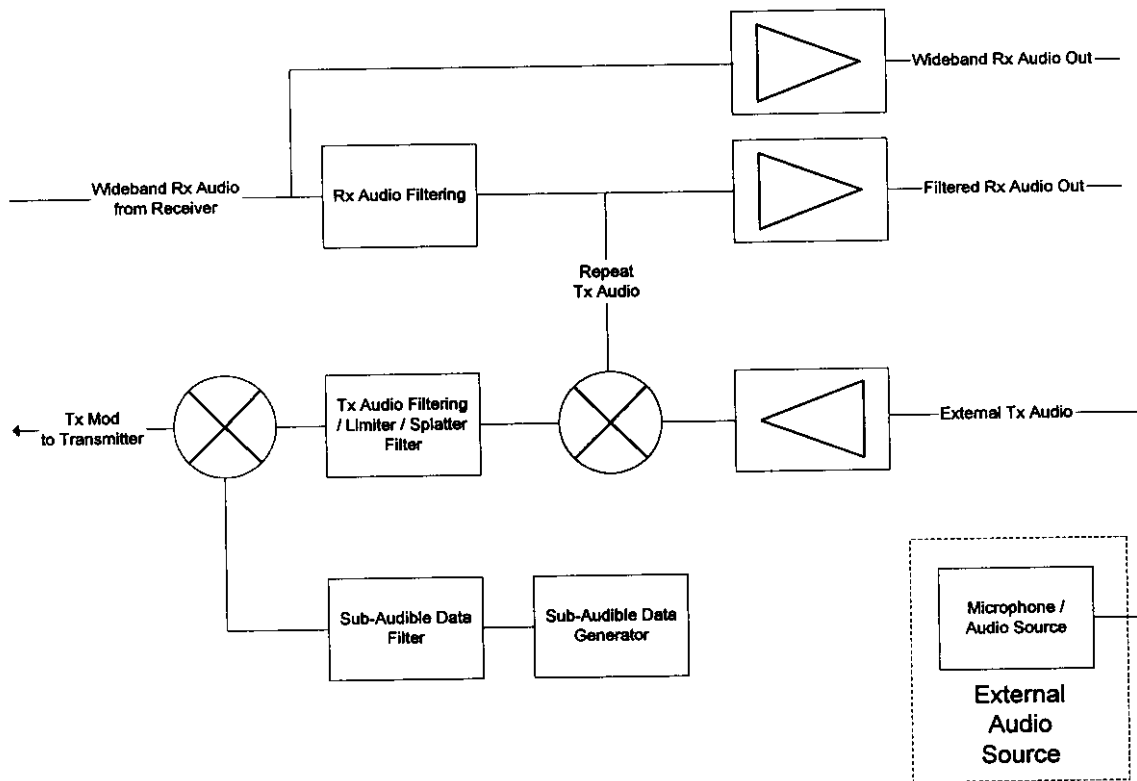
GRAPH
Percentage Modulation Versus Input Voltage
for
11K0F3E



NAME OF TEST:

Transmitter Occupied Bandwidth 25 to 125 Watts
In Support of Emission Designator(s) 11K0F3E and 16K0F3E

Circuit Diagram
In Support of Emission Designator 16K0F3E



NAME OF TEST: Transmitter Occupied Bandwidth 25 to 125 Watts
In Support of Emission Designator(s) 11K0F3E and 16K0F3E

NECESSARY BANDWIDTH CALCULATION (16K0F3E)

$$B_n = 2M + 2DK$$

M = 3000 Hz. This is the highest modulating frequency widely recognized by the industry as a standard for voice.

D = 5000 Hz. This is the maximum deviation.

$$K = 1$$

$$B_n = 2(3000) + 2(5000)(1) = 16,000 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **16K0**.

NECESSARY BANDWIDTH CALCULATION (11K0F3E)

$$B_n = 2M + 2DK$$

M = 3000 Hz. This is the highest modulating frequency widely recognized by the industry as a standard for voice.

D = 2500 Hz. This is the maximum deviation.

$$K = 1$$

$$B_n = 2(3000) + 2(2500)(1) = 11,000 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **11K0**.

NAME OF TEST: Transmitter Occupied Bandwidth 25 Watts
In Support of Emission Designator 16K0F3E

RULE PART NUMBER: 2.201, 2.202 (g)(III-A)(2), 2.989 (c)(1), 90.209 (b)(5), 90.210 (b)(d)(4)

MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 25 Watts]
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
From 10 kHz to 20 kHz, down 25 dB minimum.
From 20 kHz to 50 kHz, down 35 dB minimum.
Greater than 50 kHz, down 57 dB minimum.

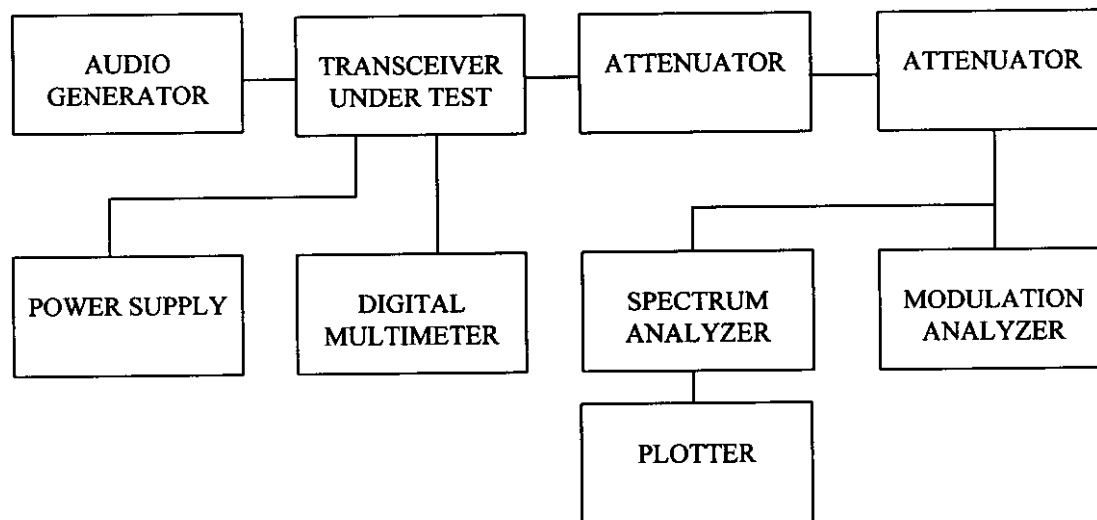
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST PROCEDURE: TIA/EIA - 603, 2.2.11

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Modulation Analyzer, Model HP8901A
Power Supply, Tectrol Inc., TC845-1081
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903B
Spectrum Analyzer, Model HP8563E
Plotter, Model HP7475A

TEST SET-UP:



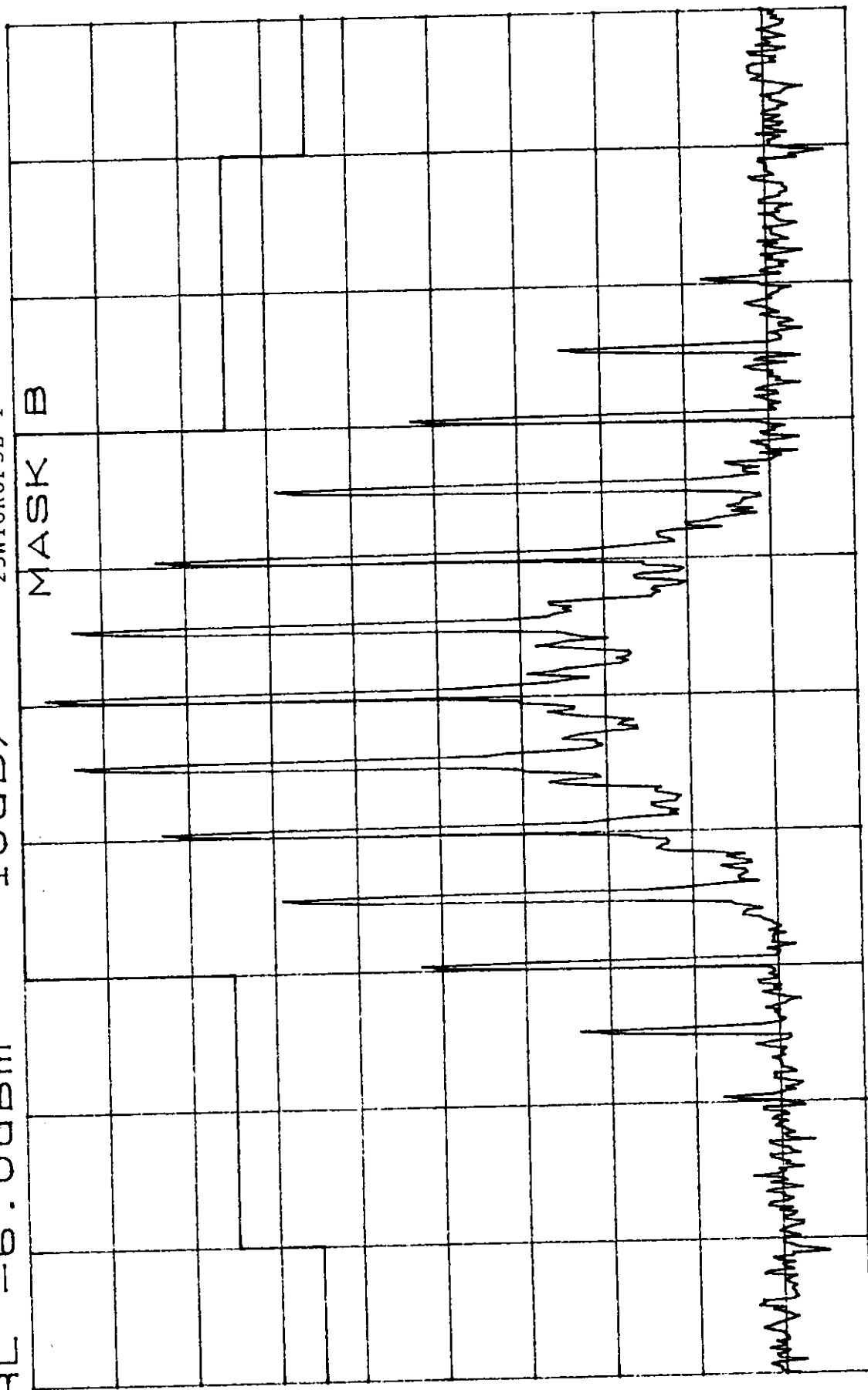
TEST SET-UP

ATTEN 10dB
RL -6.0dBm

25W16K0F3E-1

10dB/

MASK B

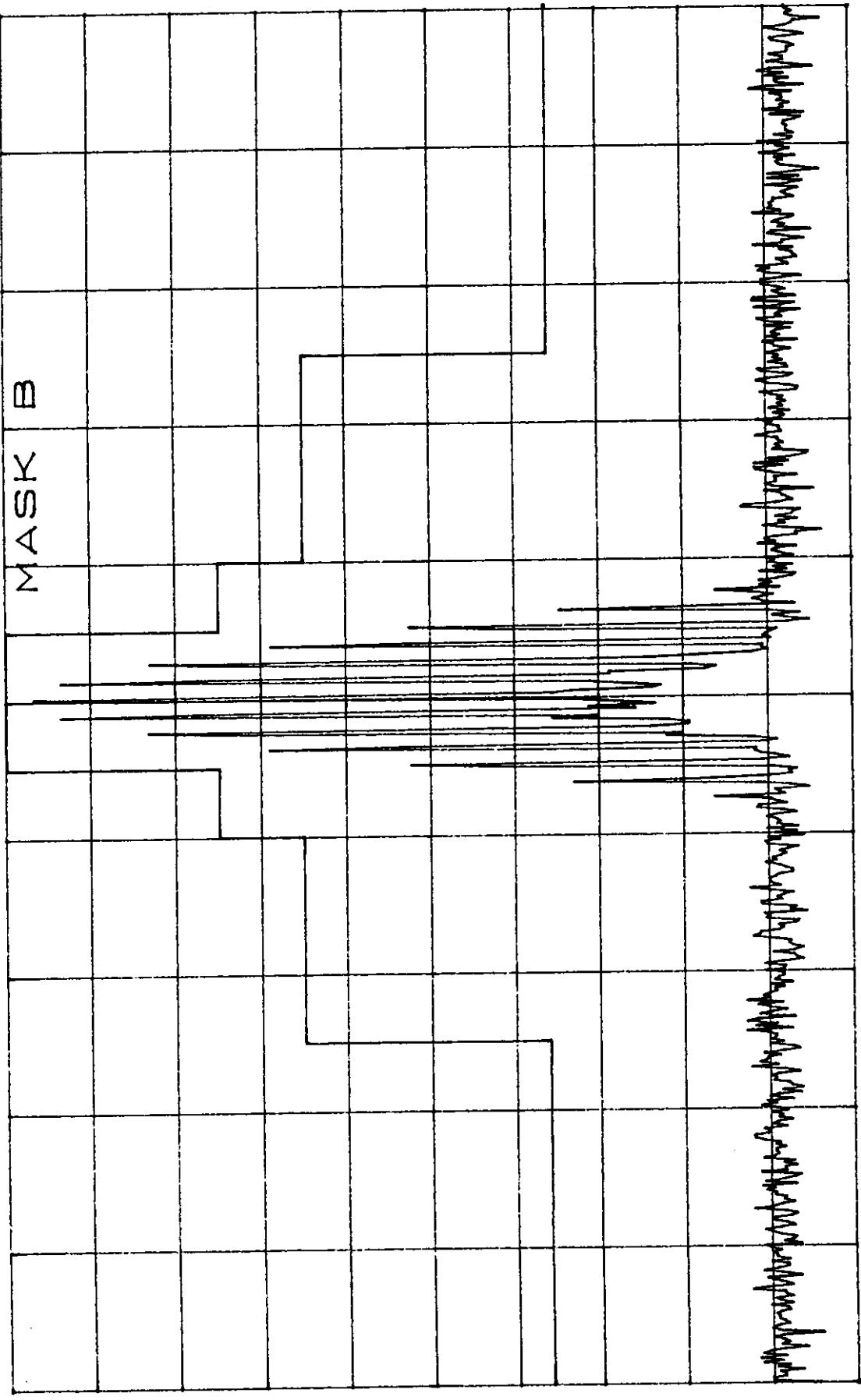


CENTER 450.00000MHZ
*RBW 100HZ *VBW 10KHZ
SPAN 50.00KHZ
*SWP 60.0SEC

ATTEN 10dB
RL -6.0dBm

10dB/

25W16K0F3E-2

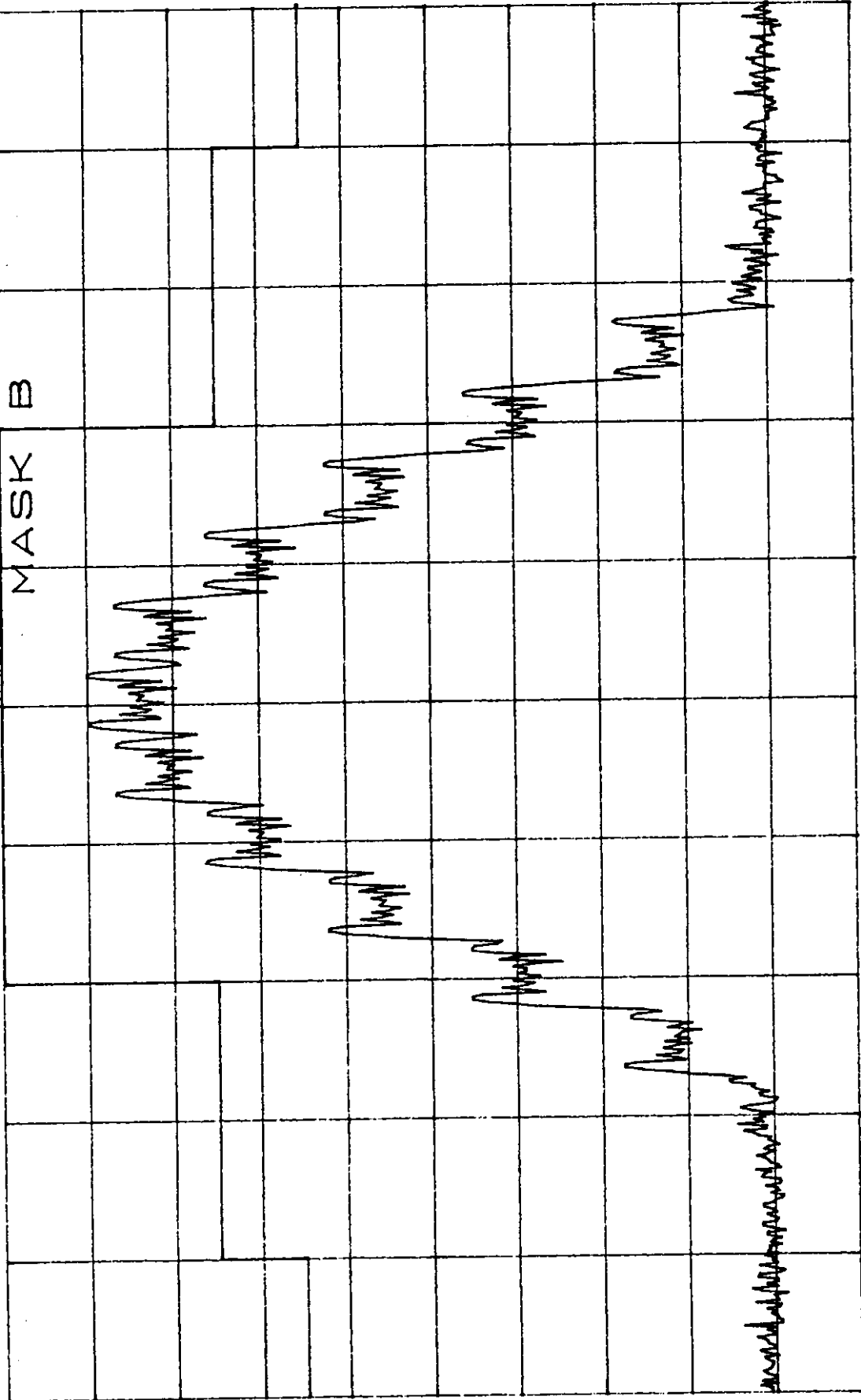


CENTER 450.0000MHZ
*RBW 100HZ
SPAN 200.0KHZ
*SWP 60.0sec

ATTEN 10dB
RL -6.0dBm

10dB/

25W16K0F3E-3



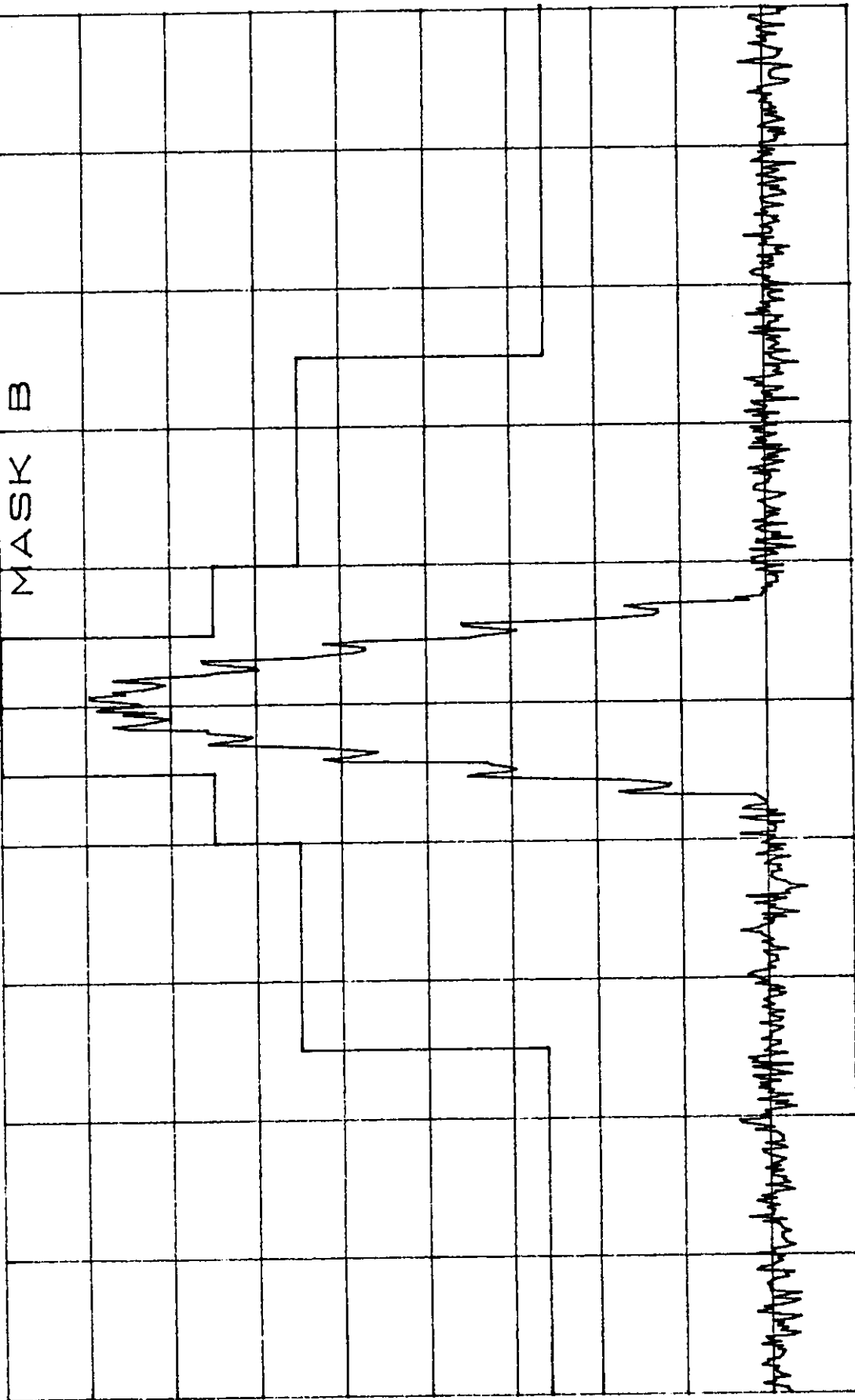
SPAN 50.00KHZ
*SWP 60.0sec

CENTER 450.00000MHZ
*RBW 100HZ *VBW 10KHZ

ATTEN 10dB
RL -6.0dBm

25W16K0F3E-4

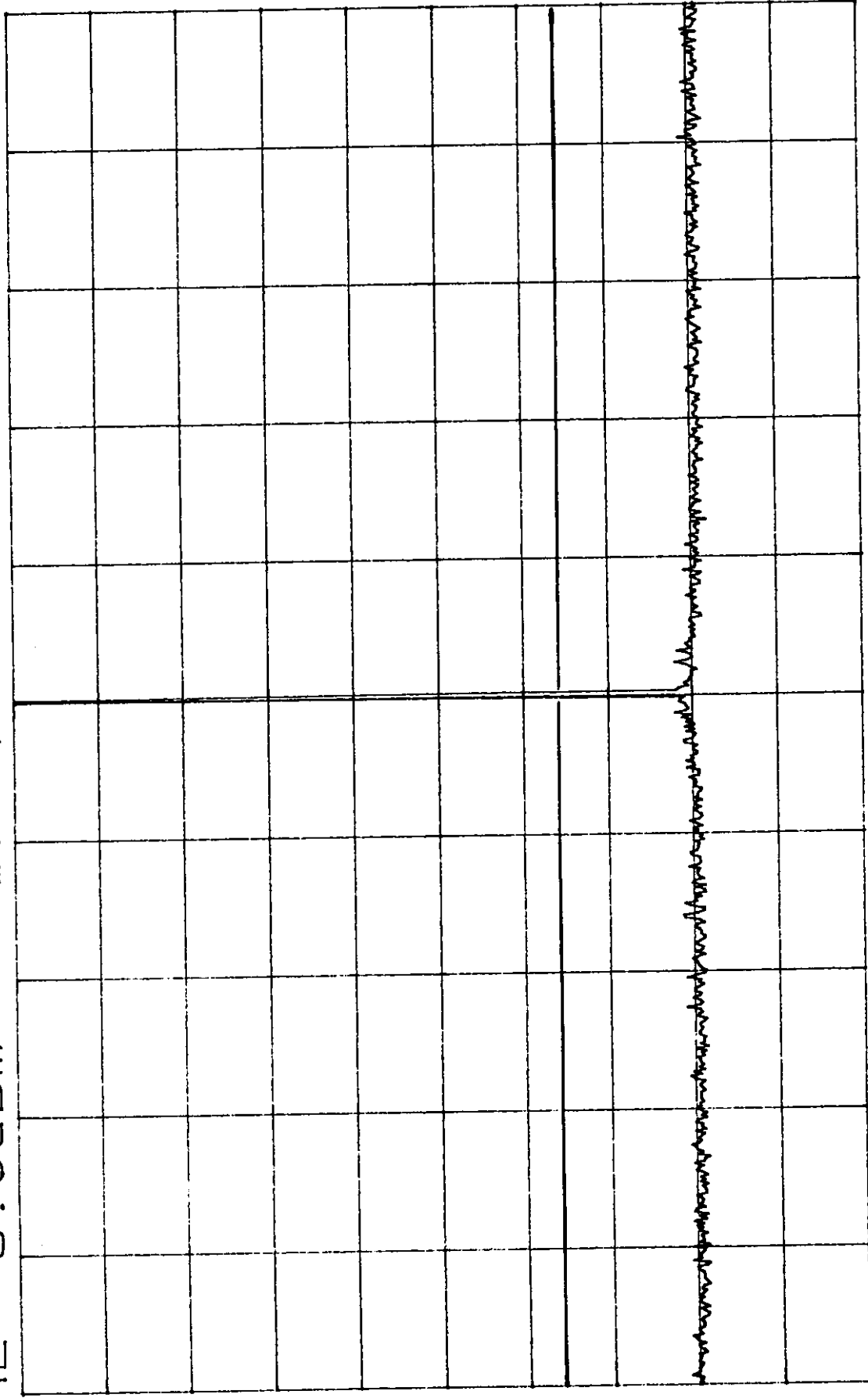
10dB/



CENTER 450.0000MHZ SPAN 200.0KHZ
*RBW 100HZ *VBW 10KHZ *SWP 60.0sec

ATTEN 10dB
RL -6.0dBm

10dB/ 25W16K0F3E-5



CENTER 450.0MHZ SPAN 100.0MHZ
*RBW 10KHZ *VBW 10KHZ *SWP 60.0sec

NAME OF TEST: Transmitter Occupied Bandwidth 125 Watts
In Support of Emission Designator 16K0F3E

RULE PART NUMBER: 2.201, 2.202 (g)(III-A)(2), 2.989 (c)(1), 90.209 (b)(5), 90.210 (b)(d)(4)

MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 125 Watts]
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
From 10 kHz to 20 kHz, down 25 dB minimum.
From 20 kHz to 50 kHz, down 35 dB minimum.
Greater than 50 kHz, down 64 dB minimum.

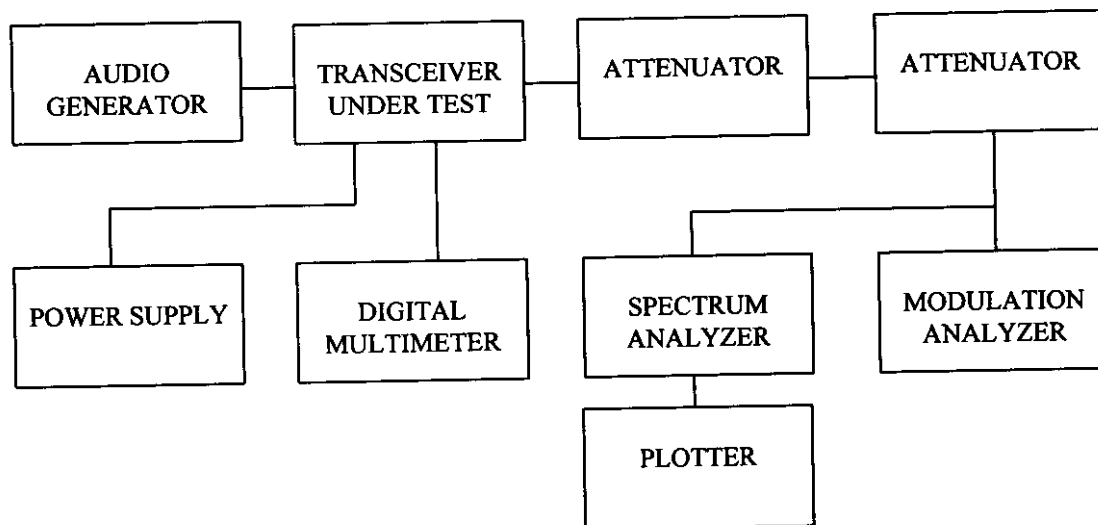
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST PROCEDURE: TIA/EIA - 603, 2.2.11

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Modulation Analyzer, Model HP8901A
Power Supply, Tectrol Inc., TC845-1081
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903B
Spectrum Analyzer, Model HP8563E
Plotter, Model HP7475A

TEST SET-UP:



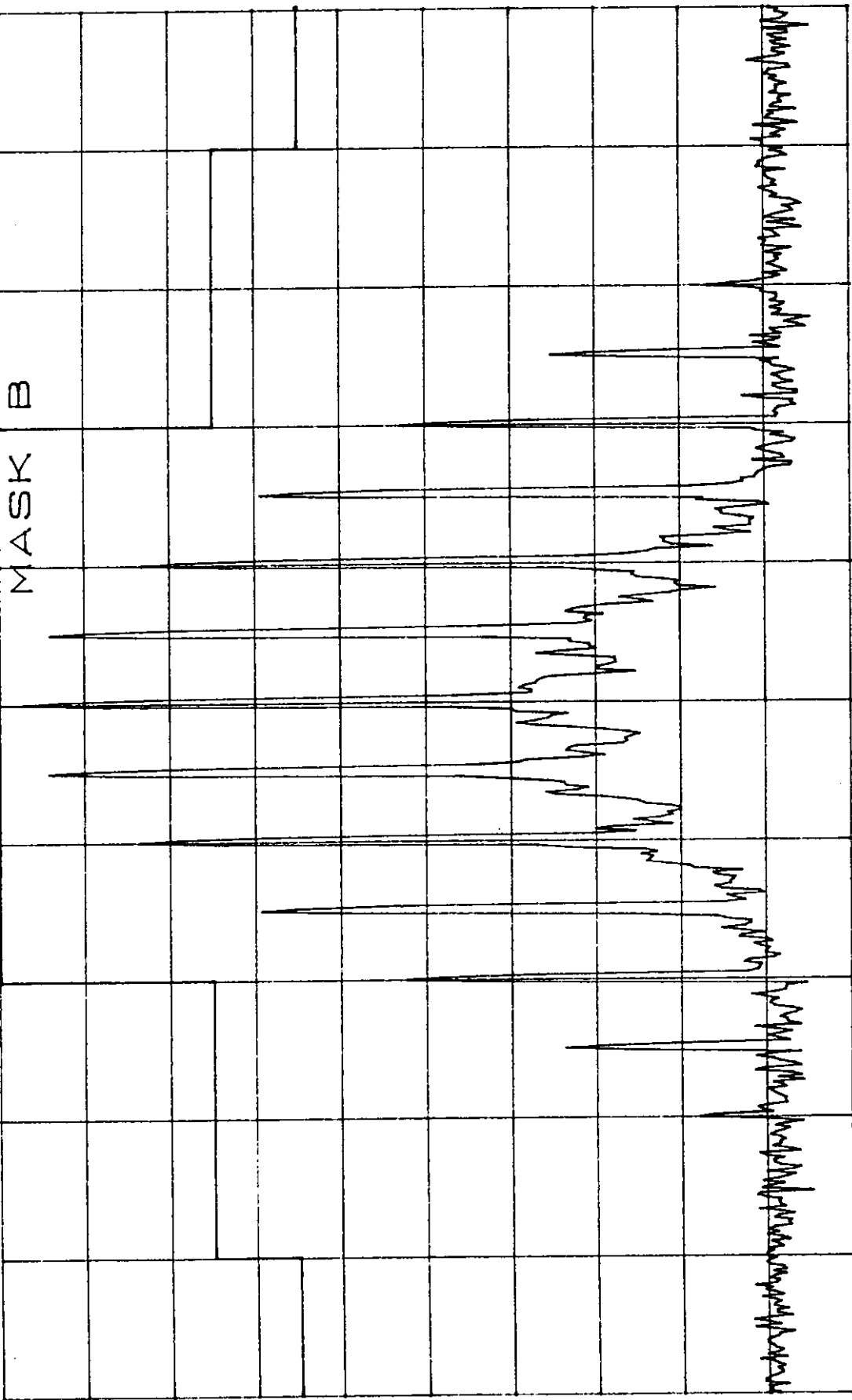
TEST SET-UP

ATTEN 10dB

RL 0dBm

10dB/

125W16K0F3E-1



CENTER 450.00000MHZ

SPAN 50.000KHZ

*RBW 100HZ

*VSW 10KHZ

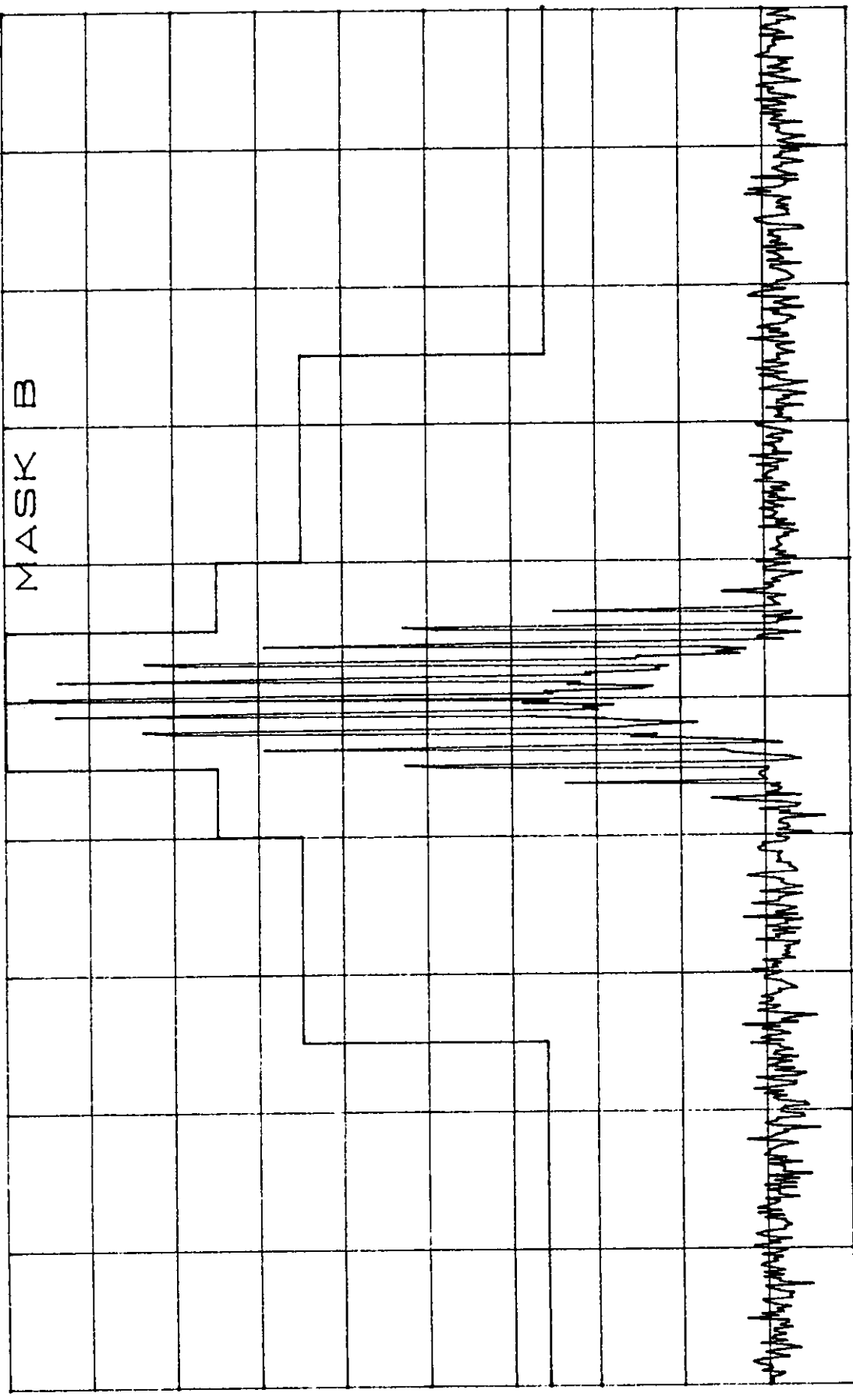
*SMP 60.0SEC

ATTEN 10dB

RL 0dBm

10dB/

125W16K0F3E-2



CENTER 450.0000MHZ

SPAN 200.0KHZ

*RBW 100HZ

*VBW 10KHZ

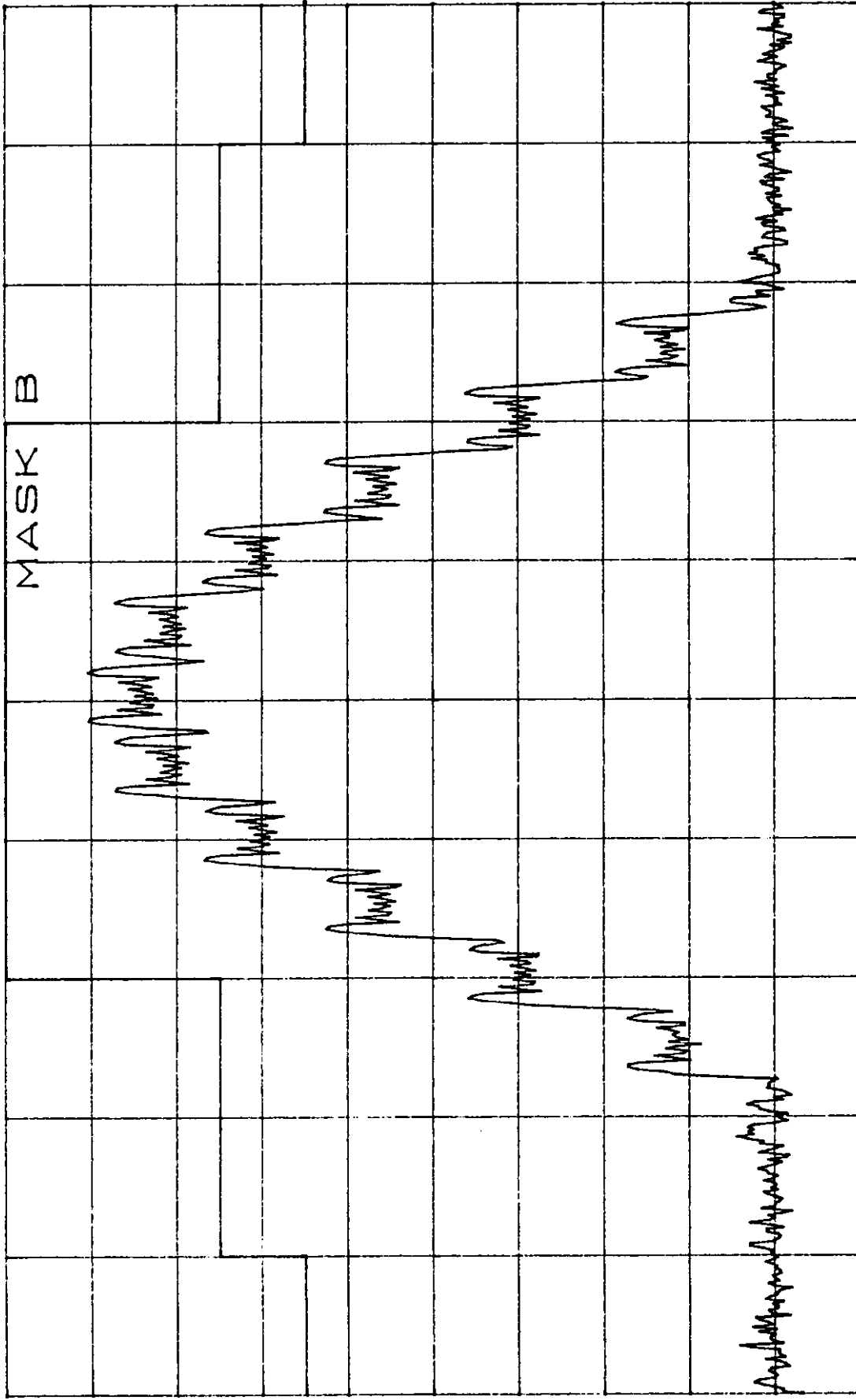
*SWP 60.0sec

ATTEN 10dB

RL 0dBm

10dB/

125W16K0F3E-3



CENTER 450.00000MHZ

SPAN 50.000KHZ

*RBW 100HZ

*VBW 10KHZ

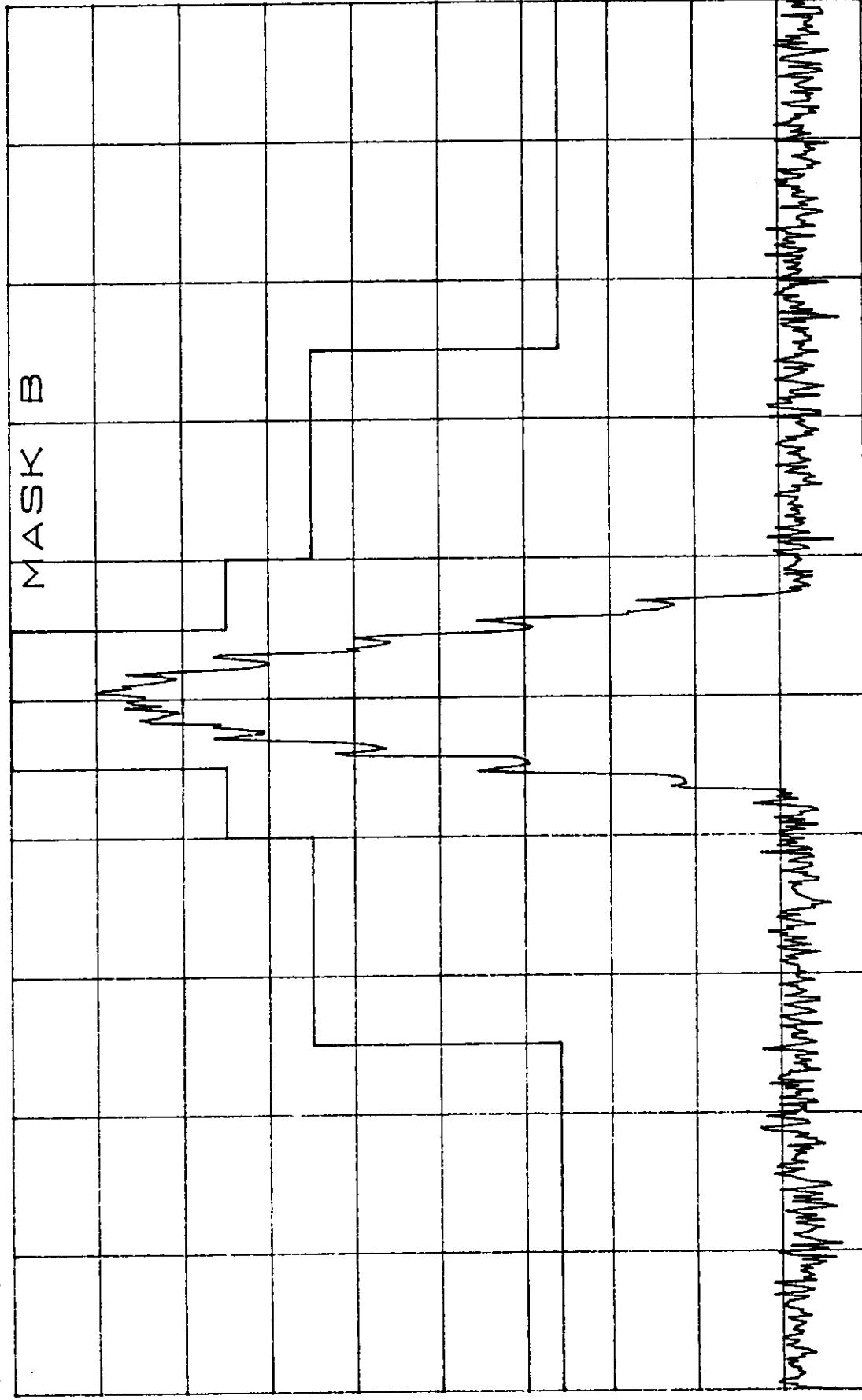
*SWP 60.0sec

ATTEN 10dB

RL 0dBm

10dB/

125W16K0F3E-4



CENTER 450.0000MHZ

SPAN 200.0KHZ

*RBW 100HZ

*VBW 10KHZ

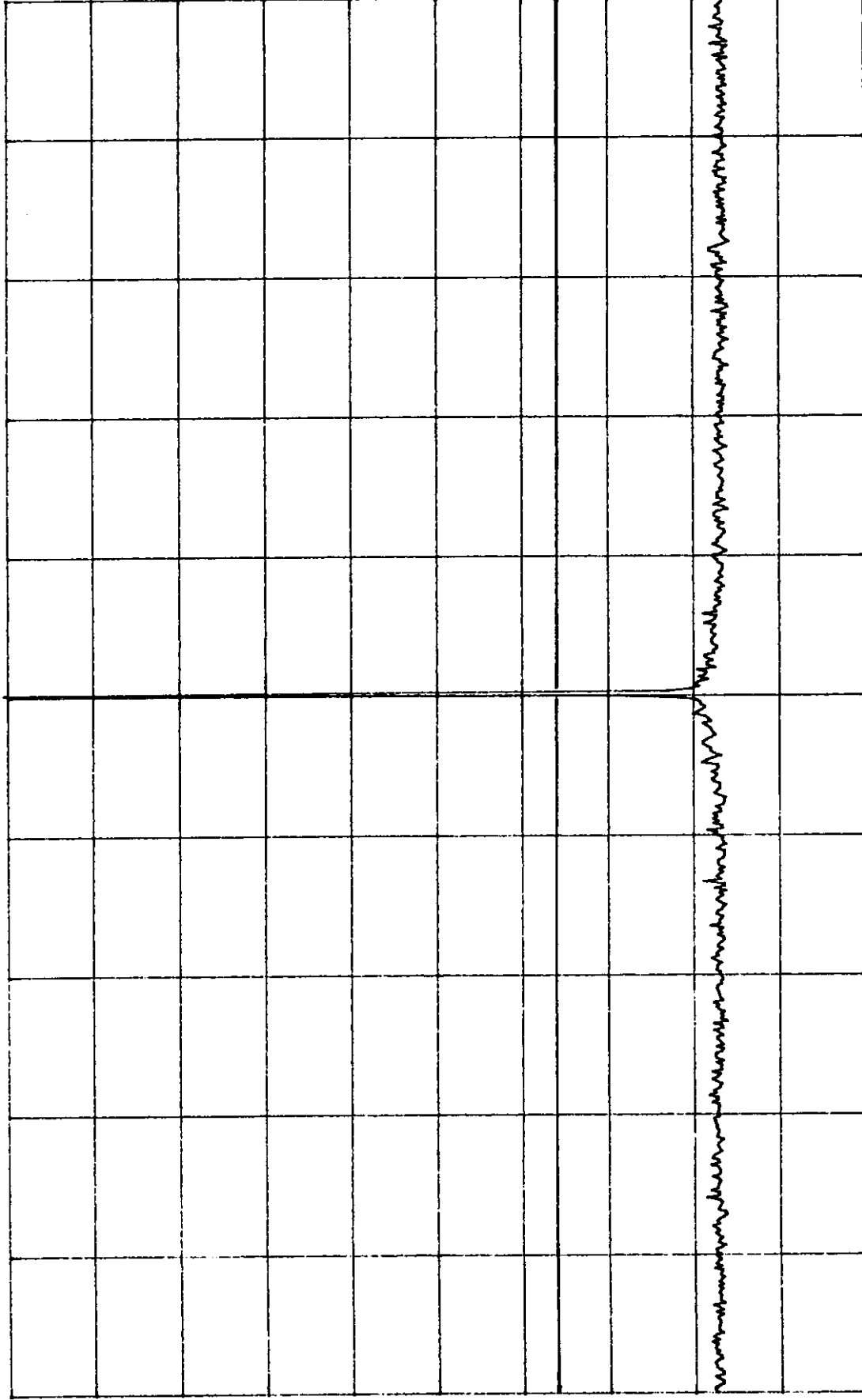
*SWP 60.0sec

ATTEN 10dB

RL 0dBm

10dB/

125W16K0F3E-5



CENTER 450.0MHZ

SPAN 100.0MHZ

*RBW 10KHZ

*VBW 10KHZ

*SWP 60.0SEC

NAME OF TEST: Transmitter Occupied Bandwidth 25 Watts
In Support of Emission Designator 11K0F3E

RULE PART NUMBER: 2.201, 2.202 (g)(III-A)(2), 2.989 (c)(1), 90.209 (b)(5), 90.210 (d)

MINIMUM STANDARD: Mask D
Sidebands and Spurious [Rule 90.210 (d), P = 25 Watts]
Authorized Bandwidth = 11.25 kHz [Rule 90.209(b) (5)]
From Fo to 5.625 kHz, down 0 dB.
Greater than 5.625 kHz to 12.5 kHz, down 7.27($f_d - 2.88$ kHz) dB.
Greater than 12.5 kHz, at least $50 + 10\log_{10}(P)$ or 70 dB, whichever is the lesser of the attenuation.

Attenuation = 0 dB at Fo to 5.625 kHz
Attenuation = 20 dB at 5.625 kHz and 70 dB at 12.5 kHz
Attenuation = 64 dB greater than 12.5 kHz

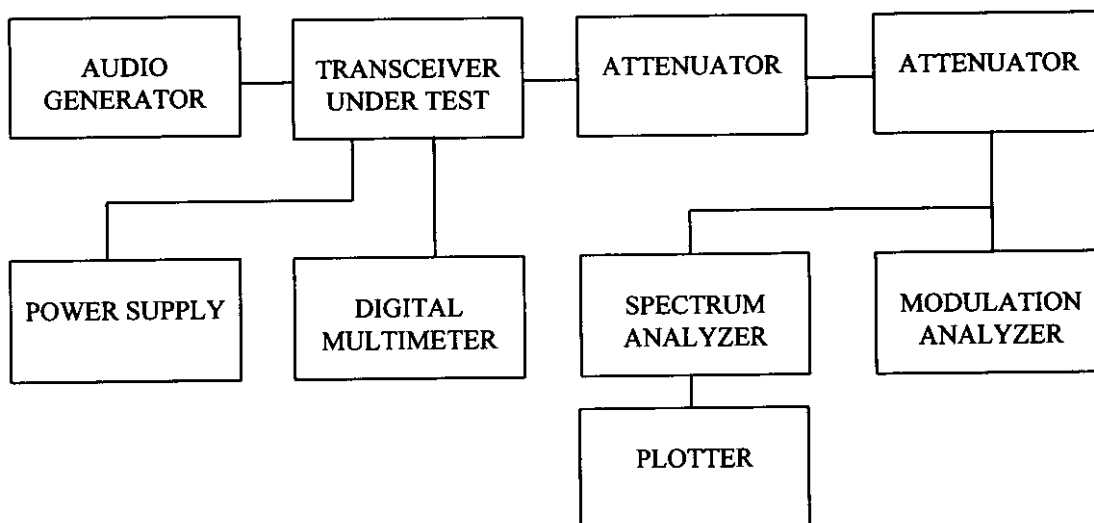
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST PROCEDURE: TIA/EIA - 603, 2.2.11

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Modulation Analyzer, Model HP8901A
Power Supply, Tectrol Inc., TC845-1081
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903B
Spectrum Analyzer, Model HP8563E
Plotter, Model HP7475A

TEST SET-UP:



TEST SET-UP

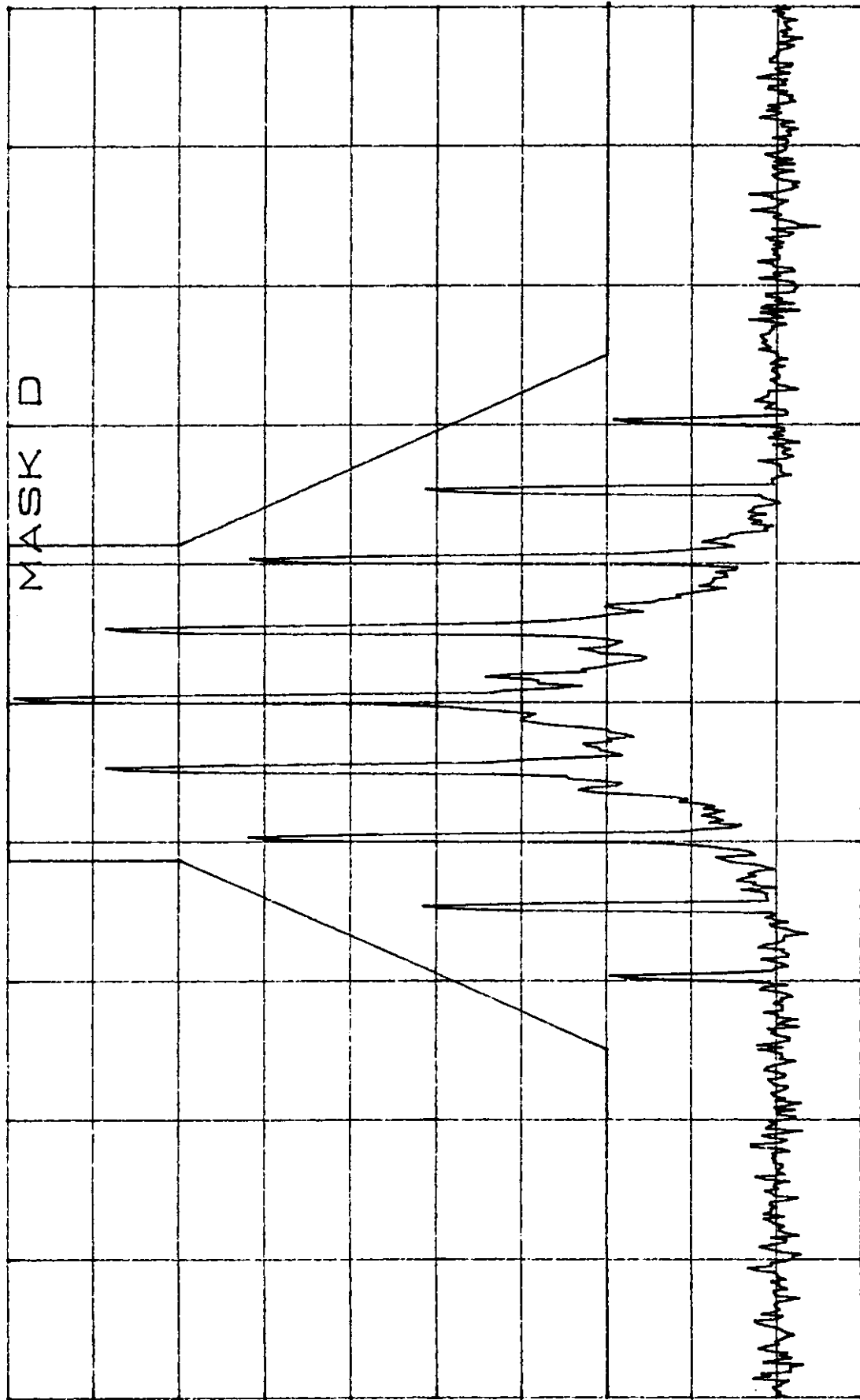
ATTEN 10dB

RL -6.0dBm

10dB/

25W11K0F3E-1

MASK D



CENTER 450.00000MHZ

SPAN 50.00KHZ

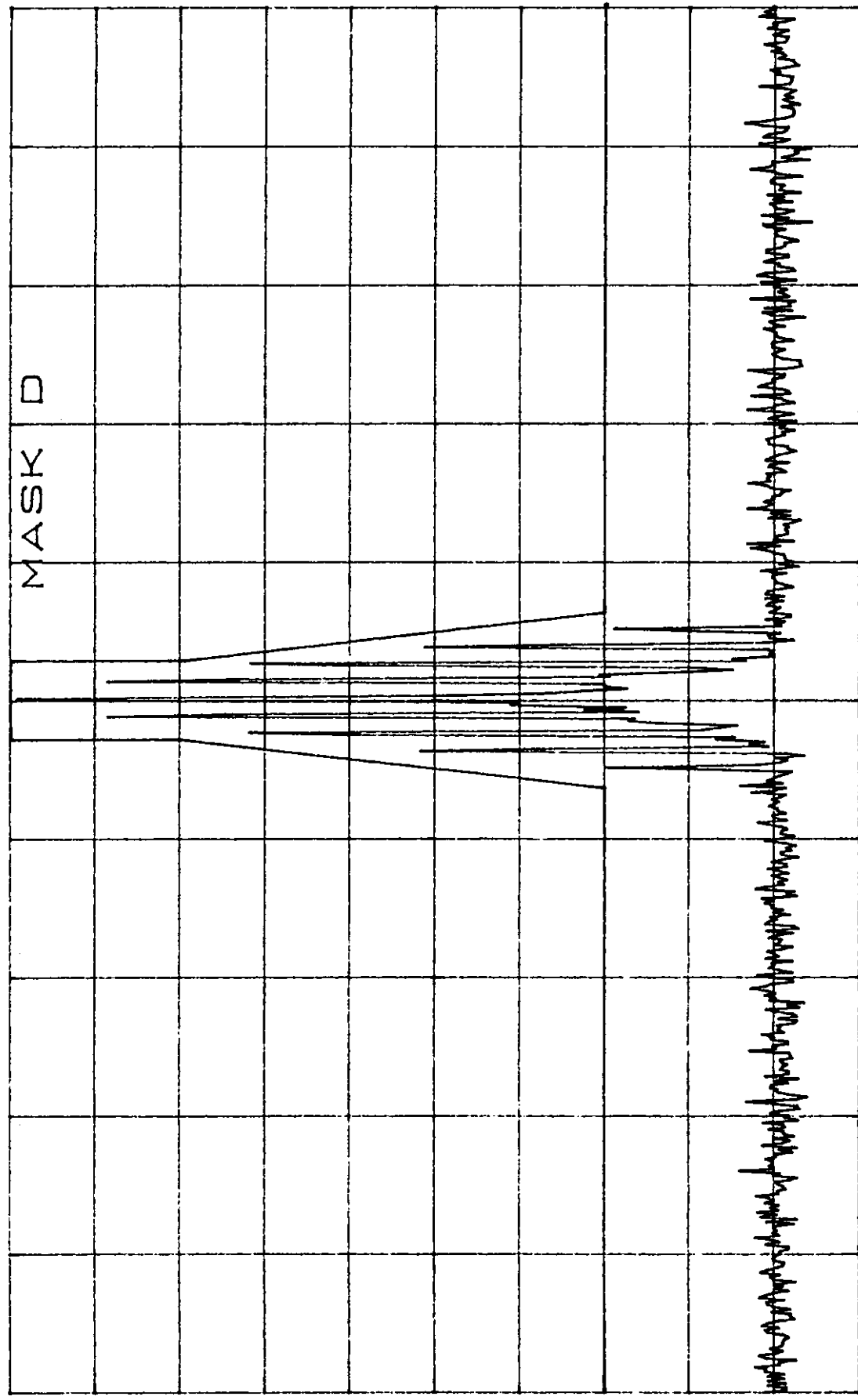
*RBW 100HZ

*VBW 10KHZ

*SWP 60.0sec

ATTEN 10dB
RL -6.0dBm

25W11K0F3E-2
10dB/



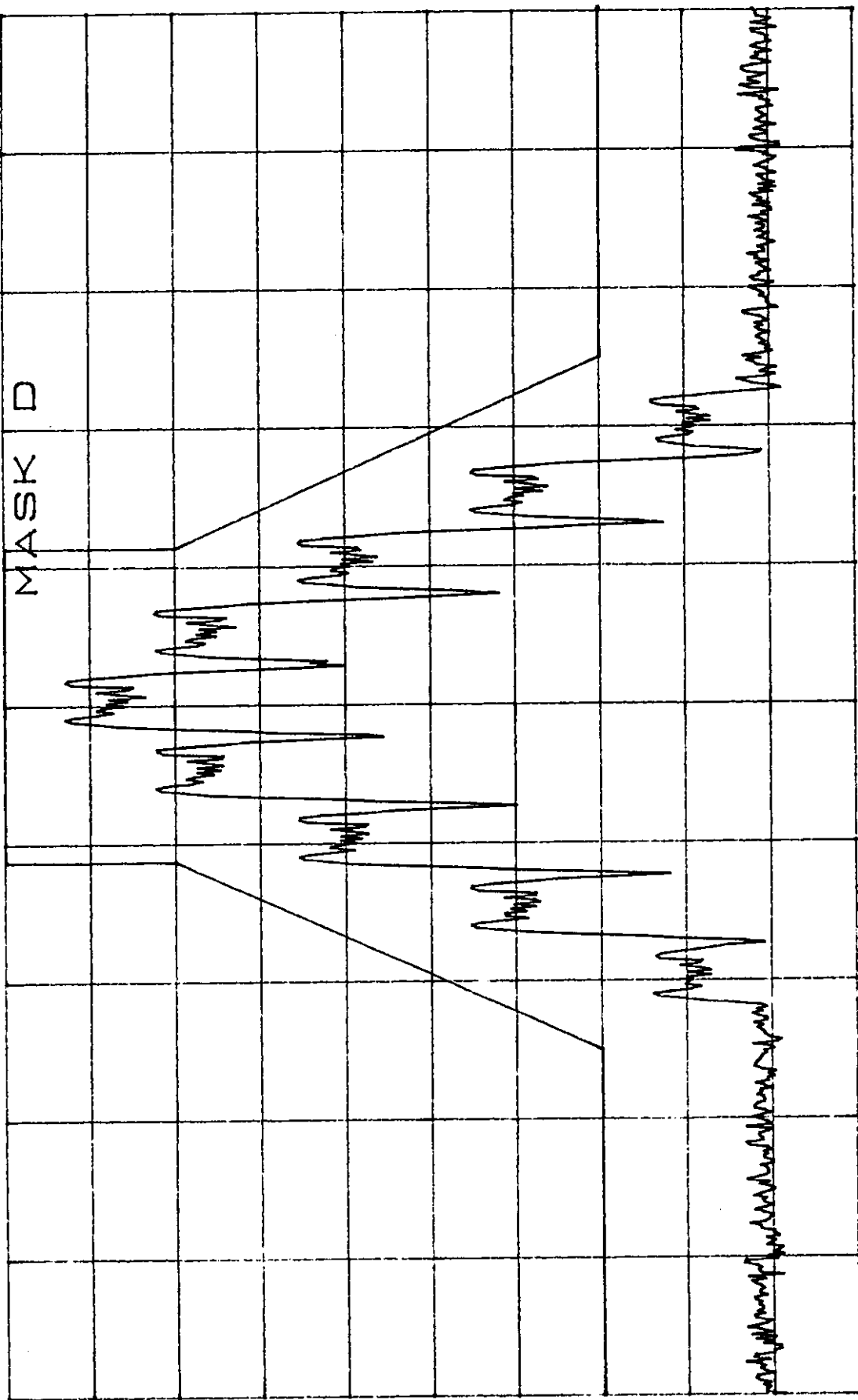
CENTER 450.0000MHZ
*RBW 100HZ *VBW 10KHZ
SPAN 200.0KHZ
*SWP 60.0SEC

ATTEN 10dB
RL -6.0dBm

10dB/

25W11K0F3E-3

MASK D

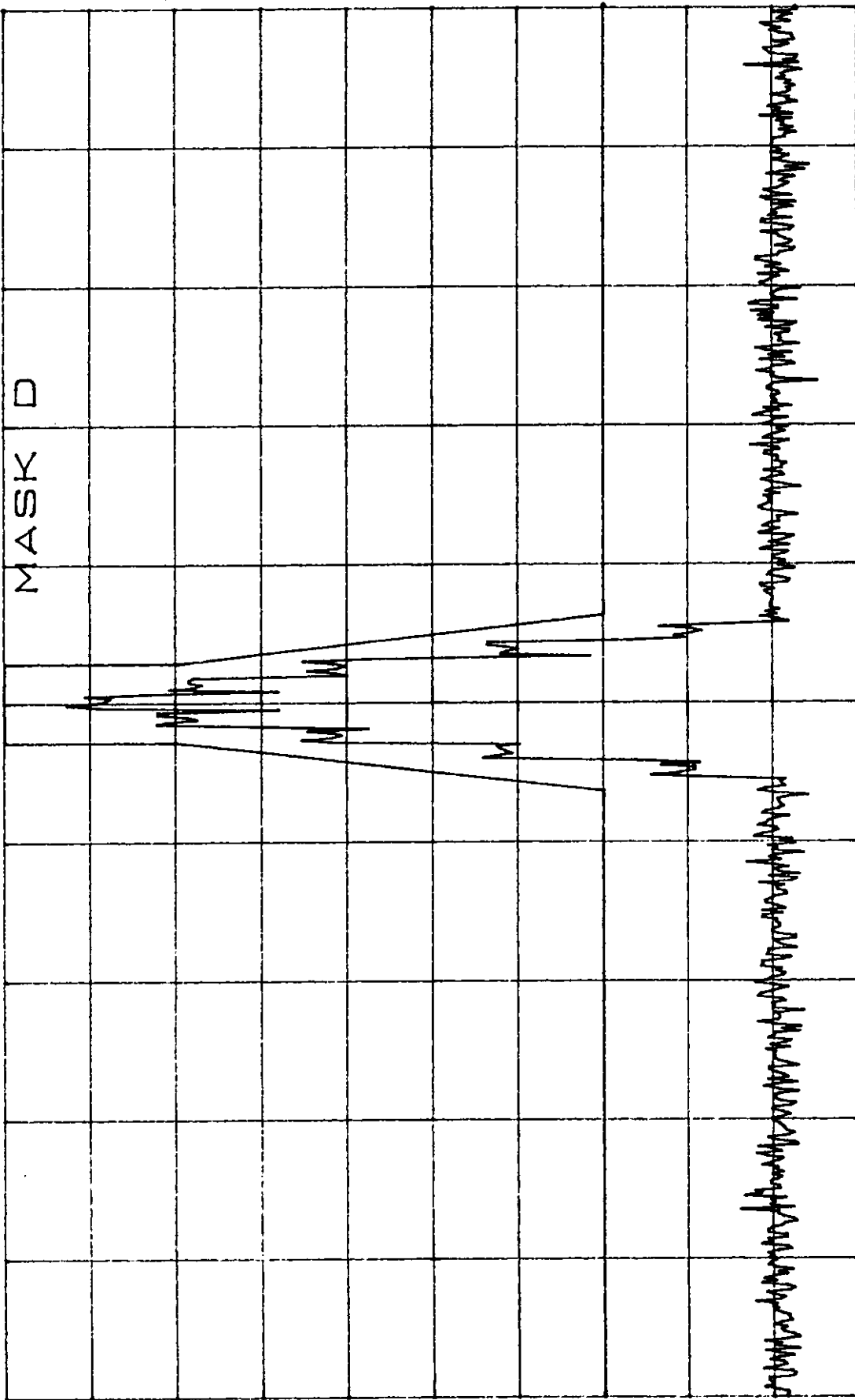


CENTER 450.00000MHZ SPAN 50.00KHZ
*RBW 100HZ *VBW 10KHZ *SWP 60.0SEC

ATTEN 10dB
RL -6.0dBm

10dB/

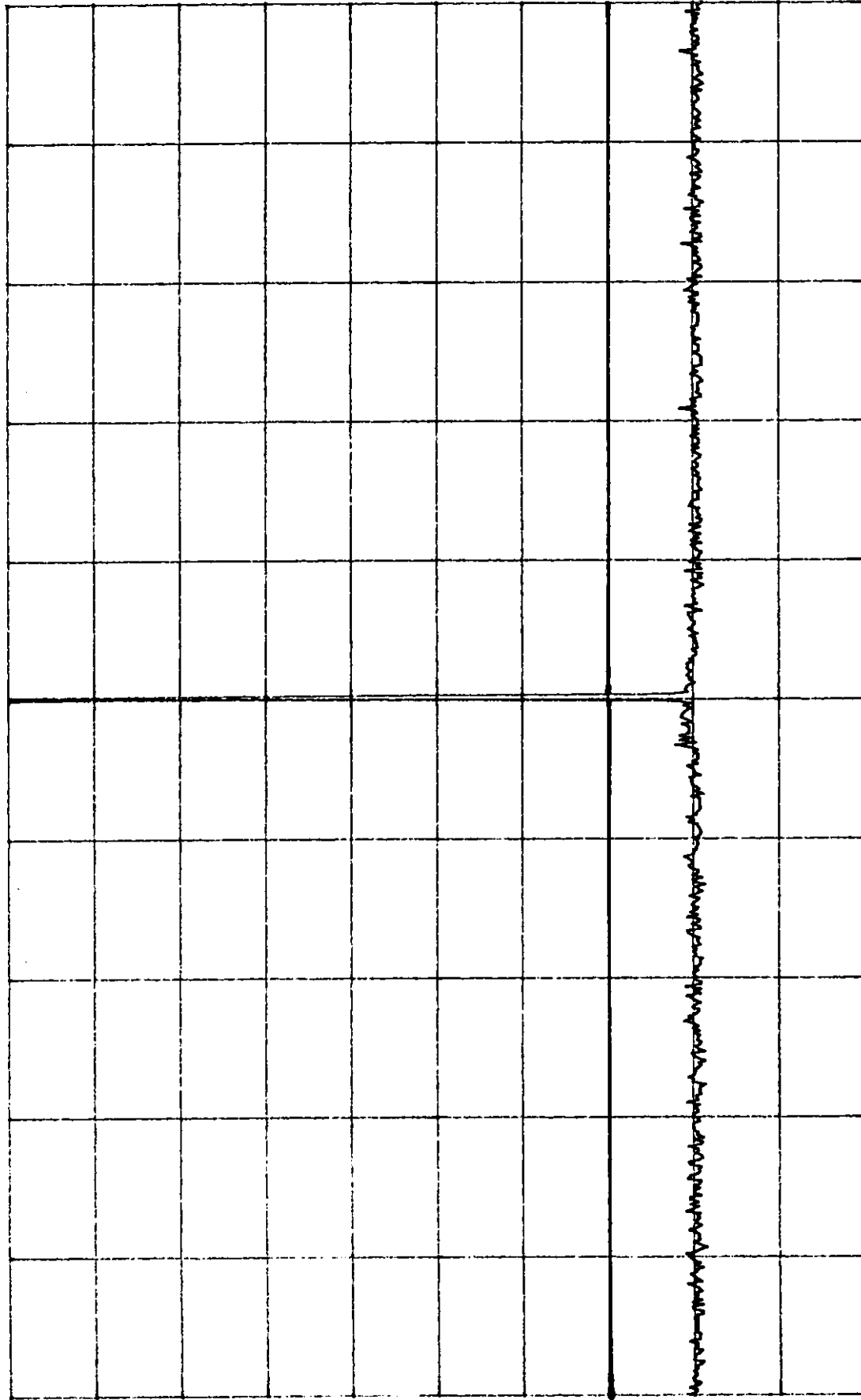
25W11K0F3E-4



CENTER 450.0000MHZ
*RBW 100HZ
SPAN 200.0KHZ
*VSW 10KHZ
*SWP 60.0SEC

ATTEN 10dB
RL -6.0dBm

10dB / 25W11K0F3E-5



CENTER 450.0MHZ SPAN 100.0MHZ
*RBW 10KHZ *VBW 10KHZ *SWP 60.0sec

NAME OF TEST: Transmitter Occupied Bandwidth 125 Watts
In Support of Emission Designator 11K0F3E

RULE PART NUMBER: 2.201, 2.202 (g)(III-A)(2), 2.989 (c)(1), 90.209 (b)(5), 90.210 (d)

MINIMUM STANDARD: Mask D
Sidebands and Spurious [Rule 90.210 (d), P = 125 Watts]
Authorized Bandwidth = 11.25 kHz [Rule 90.209(b) (5)]
From Fo to 5.625 kHz, down 0 dB.
Greater than 5.625 kHz to 12.5 kHz, down 7.27($f_d - 2.88\text{kHz}$) dB.
Greater than 12.5 kHz, at least $50 + 10\log_{10}(P)$ or 70 dB, whichever is the lesser of the attenuation.

Attenuation = 0 dB at Fo to 5.625 kHz
Attenuation = 20 dB at 5.625 kHz and 70 dB at 12.5 kHz
Attenuation = 70 dB greater than 12.5 kHz

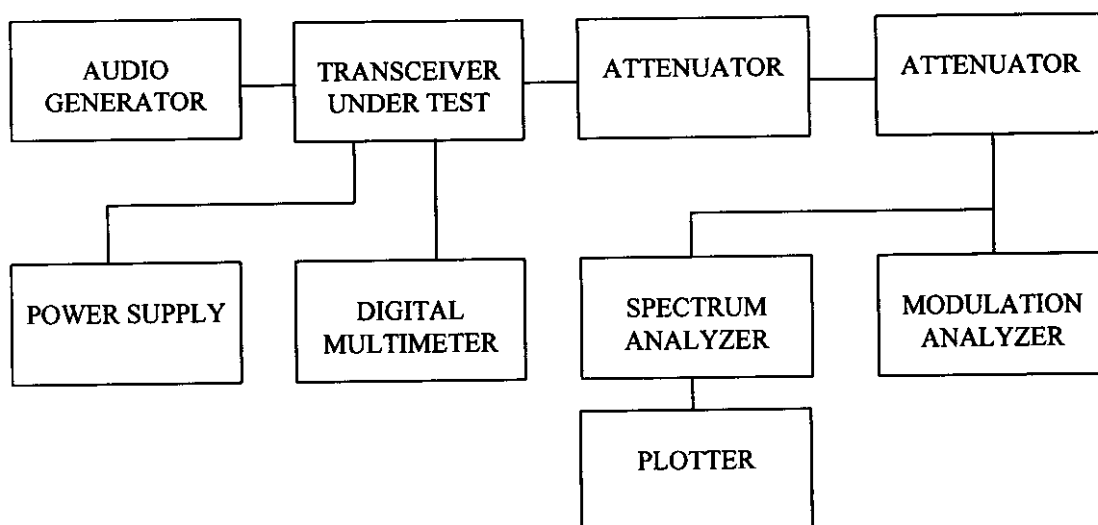
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST PROCEDURE: TIA/EIA - 603, 2.2.11

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Modulation Analyzer, Model HP8901A
Power Supply, Tectrol Inc., TC845-1081
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903B
Spectrum Analyzer, Model HP8563E
Plotter, Model HP7475A

TEST SET-UP:



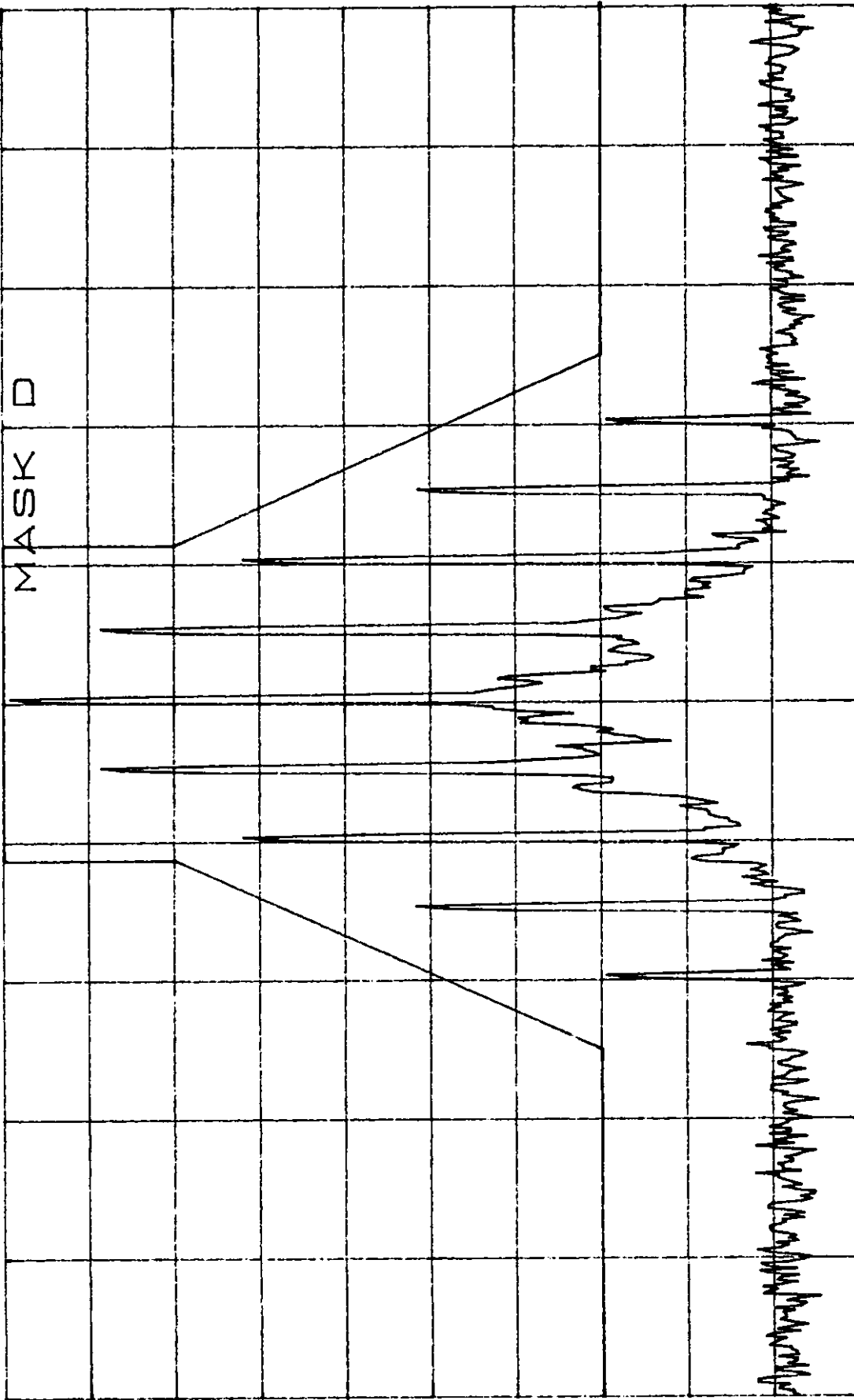
TEST SET-UP

ATTEN 10dB

RL 0dBm

100dB/

125W11K0F3E-1



CENTER 450.00000MHZ

SPAN 50.00KHZ

*RBW 100HZ

*VBW 10KHZ

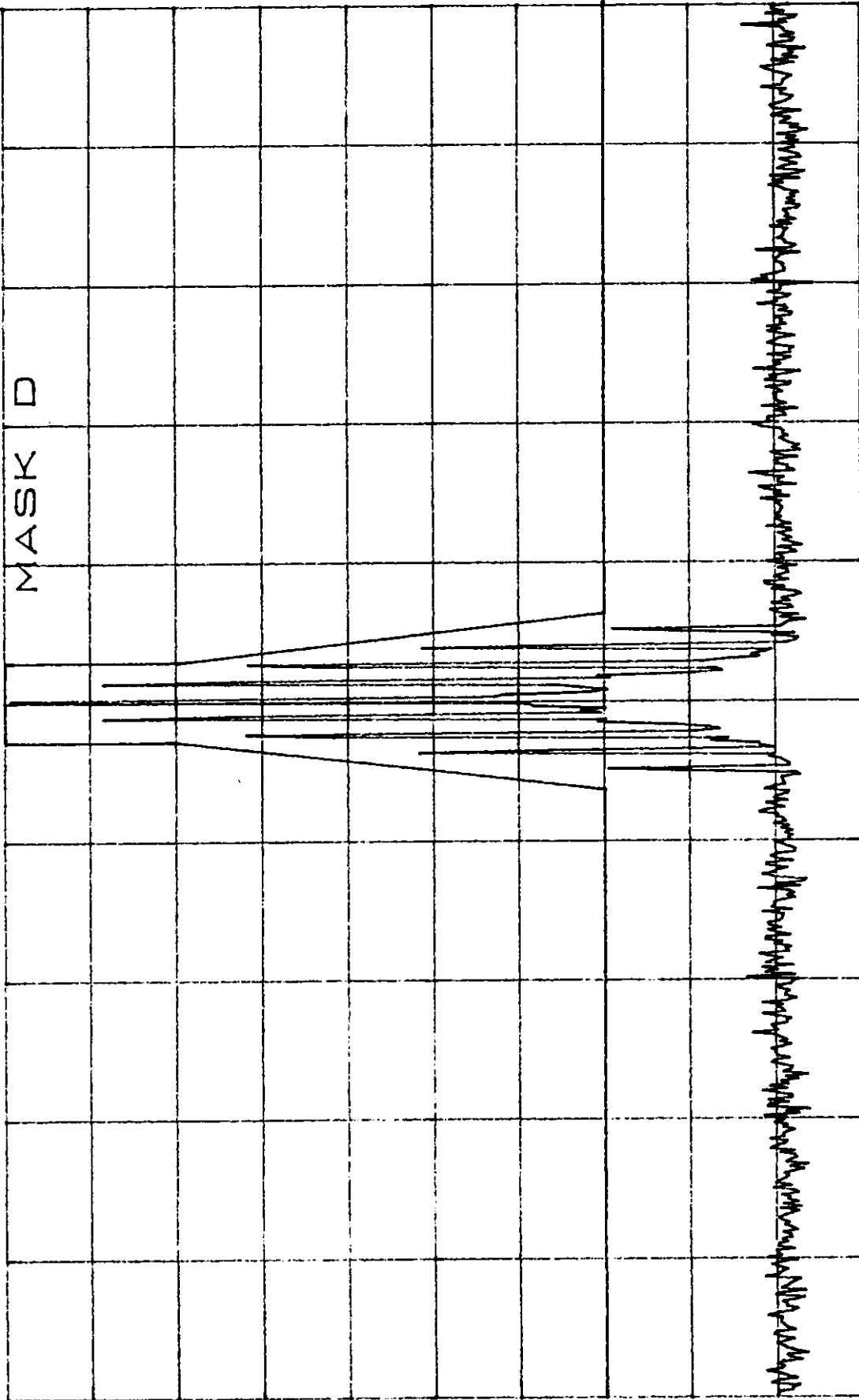
*SWP 60.0sec

ATTEN 10dB

RL 0dBm

10dB/

125W11K0F3E-2



CENTER 450.0000MHZ

SPAN 200.0KHZ

*RBW 100HZ

*SWP 60.0sec

*VBW 10KHZ

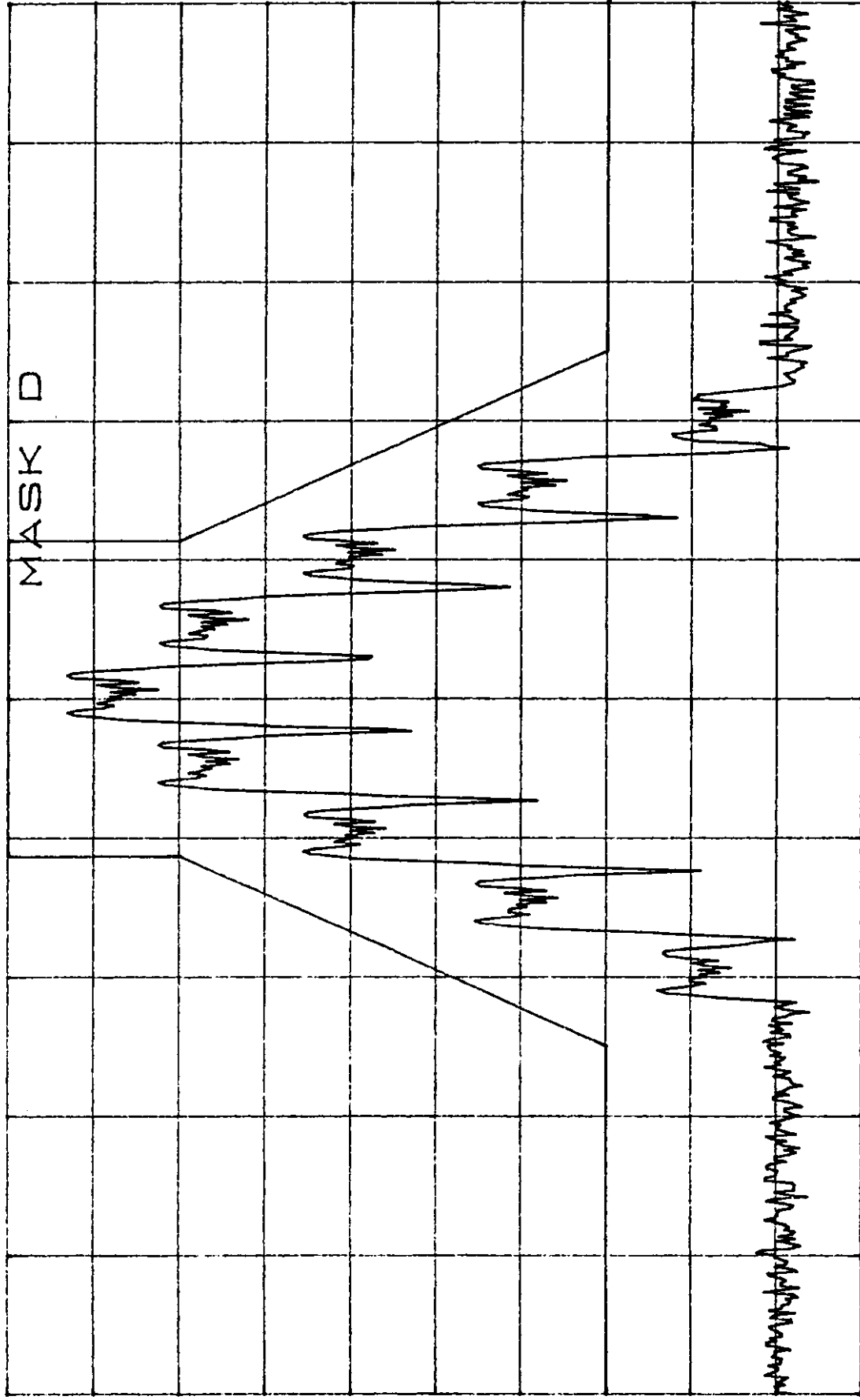
ATTEN 10dB

RL 0dBm

10dB/

125W11K0F3E-3

MASK D



CENTER 450.00000MHZ

SPAN 50.00KHZ

*RBW 100HZ

*VBW 10KHZ

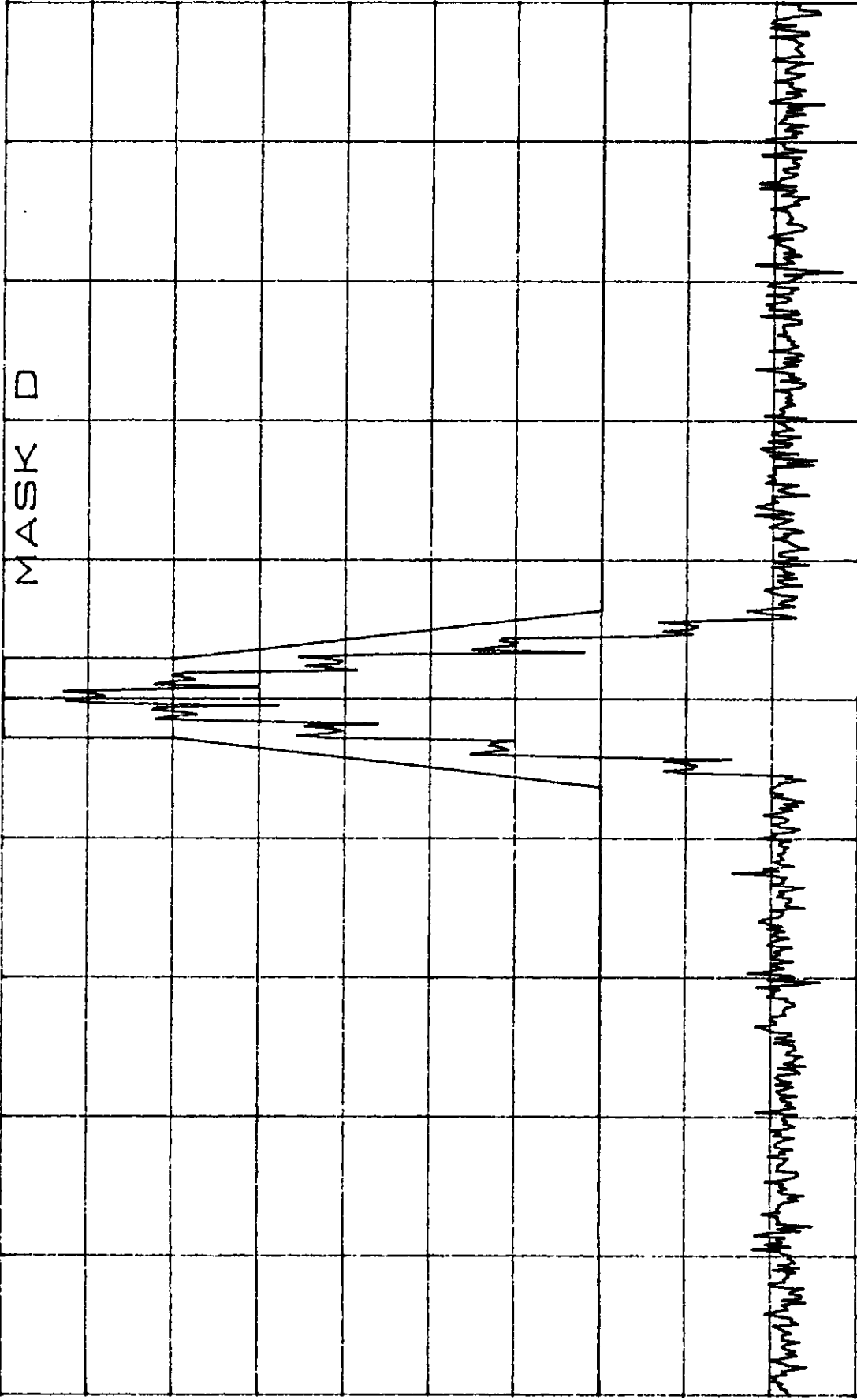
*SWP 60.0sec

ATTEN 10dB

RL 0dBm

10dB/

125W11K0F3E-4



CENTER 450.0000MHZ

*RBW 100HZ

*VBW 10KHZ

SPAN 200.0KHZ

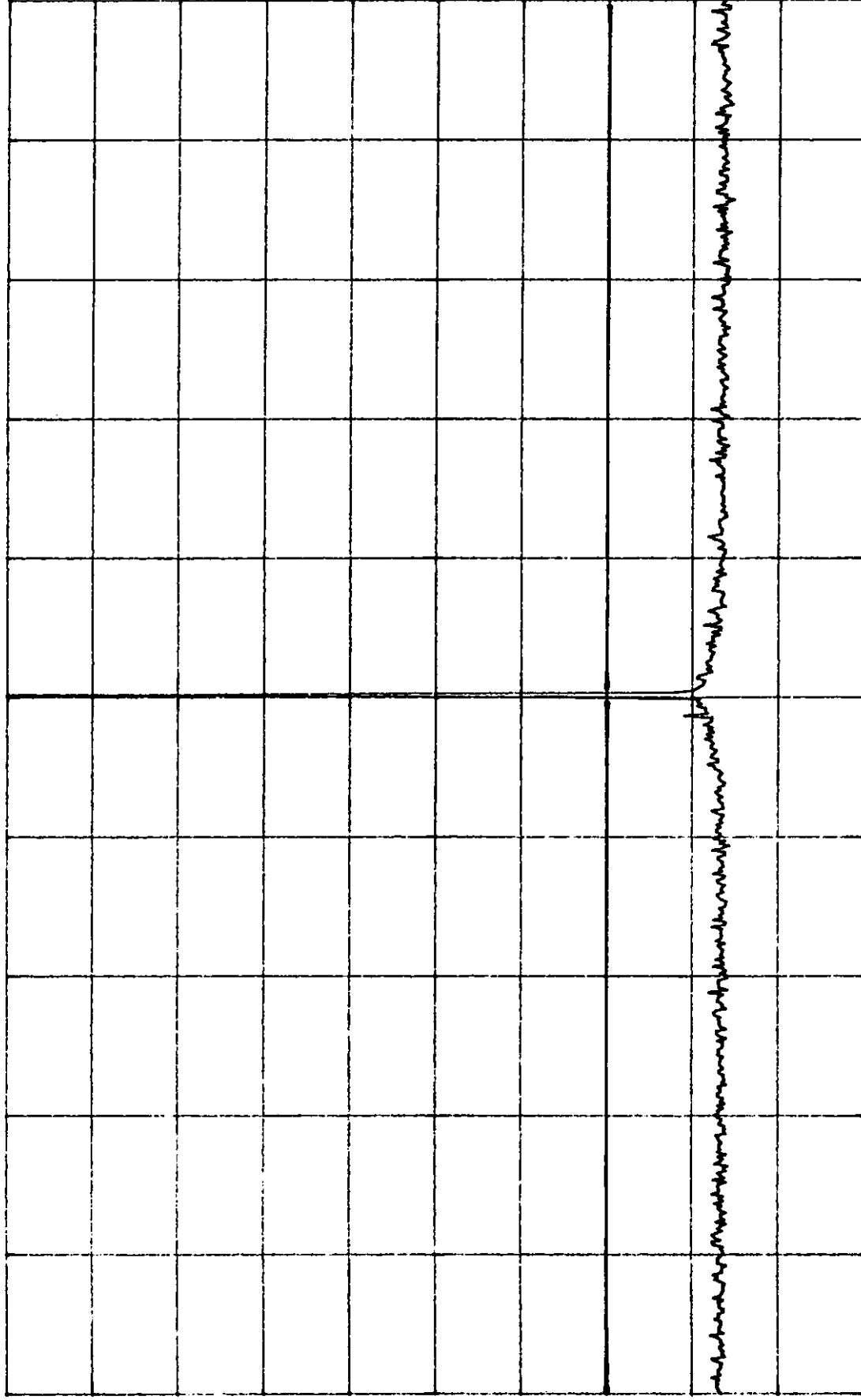
*SWP 60.0sec

ATTEN 10dB

RL 0dBm

10dB/

125W11K0F3E-5



CENTER 450.0MHZ

*RBW 10KHZ

*VBW 10KHZ

SPAN 100.0MHZ

*SWP 60.0sec

NAME OF TEST: Transmitter Spurious and Harmonic Outputs 25 Watts

RULE PART NUMBER: 2.991, 90.210

MINIMUM STANDARD: For 25 Watt; $43 + 10\log_{10}(25\text{Watts}) = -57.0 \text{ dBc}$

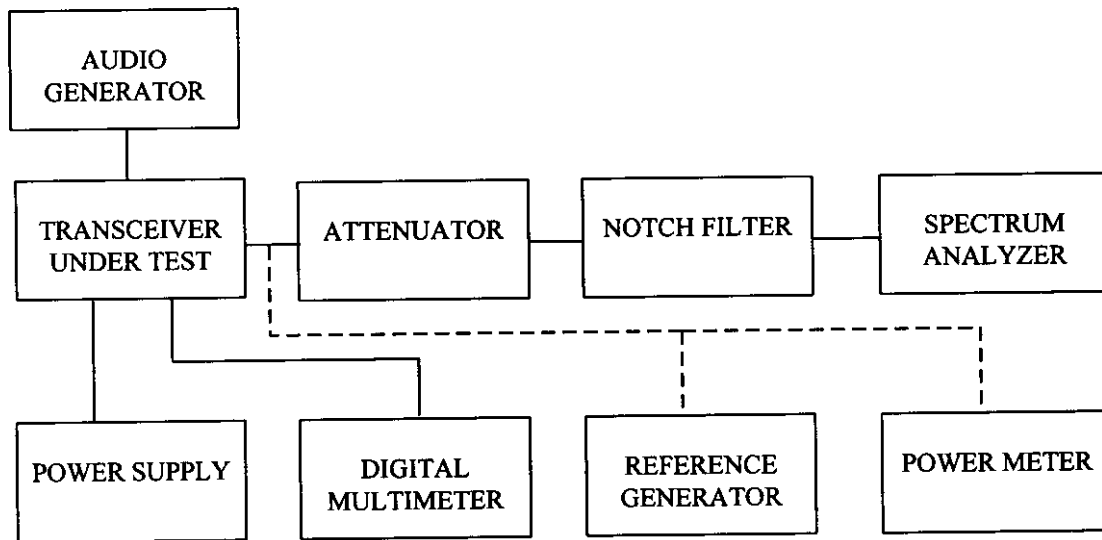
TEST RESULTS: Meets minimum standard (see data on the following page)

TEST CONDITIONS: Standard Test Conditions, 25 C
RF voltage measured at antenna terminals

TEST PROCEDURE: TIA/EIA - 603, 2.2.13

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Power Supply, Tectrol Inc., TC845-1081
Audio Generator, Model HP8903B
Digital Voltmeter, Fluke Model 8012A
Reference Generator, Model HP
Spectrum Analyzer, Model HP8563E
Power Meter, Model HP436A

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Spurious and Harmonic Outputs 25 Watts
(Continued)

MEASUREMENT PROCEDURE:

1. The transmitter carrier output frequency is 450.000 MHz.
The reference oscillator frequency is 17.5000 MHz.
2. After carrier reference was established on spectrum analyzer, the notch filter was adjusted to null the carrier F_c to extend the range of the spectrum analyzer for harmonic measurements.
3. At each spurious frequency, a 0 dB reference was established using a generator and power meter.
4. The spectrum was scanned to the 10th harmonic.

TEST DATA:

Radio # 101

$F_o = 450.000$ MHz

25 Watts Transmitter Spurious and Harmonics

44.0 dBm

<u>Frequency (MHz)</u>	<u>Relation</u>	<u>Level (dBm)</u>	<u>Level Relative to Carrier (dBc)</u>
900	$2 F_o$	-39.5	-83.5
1350	$3 F_o$	-44.0	-88.0
1800	$4 F_o$	-39.8	-83.8

NAME OF TEST: Transmitter Spurious and Harmonic Outputs 125 Watts

RULE PART NUMBER: 2.991, 90.210

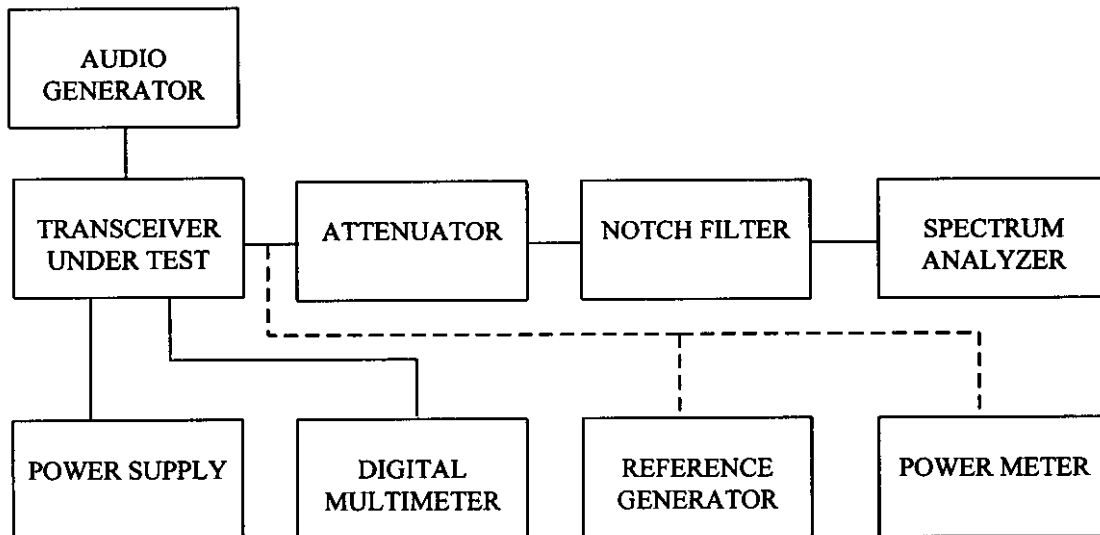
MINIMUM STANDARD: For 125 Watt; $43 + 10\log_{10}(125\text{Watts}) = -64.0 \text{ dBc}$

TEST RESULTS: Meets minimum standard (see data on the following page)

TEST CONDITIONS: Standard Test Conditions, 25 C
RF voltage measured at antenna terminals

TEST PROCEDURE: TIA/EIA - 603, 2.2.13

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Power Supply, Tectrol Inc., TC845-1081
Audio Generator, Model HP8903B
Digital Voltmeter, Fluke Model 8012A
Reference Generator, Model HP
Spectrum Analyzer, Model HP8563E
Power Meter, Model HP436A

TEST SET-UP:**TEST SET-UP**

NAME OF TEST: Transmitter Spurious and Harmonic Outputs 125 Watts
(Continued)

MEASUREMENT PROCEDURE:

1. The transmitter carrier output frequency is 450.000 MHz.
The reference oscillator frequency is 17.5000 MHz.
2. After carrier reference was established on spectrum analyzer, the notch filter was adjusted to null the carrier F_c to extend the range of the spectrum analyzer for harmonic measurements.
3. At each spurious frequency, a 0 dB reference was established using a generator and power meter.
4. The spectrum was scanned to the 10th harmonic.

TEST DATA:

Radio # FEP 101

$F_o = 450.000$ MHz

125 Watts Transmitter Spurious and Harmonics

51 dBm

<u>Frequency (MHz)</u>	<u>Relation</u>	<u>Level (dBm)</u>	<u>Level Relative to Carrier (dBc)</u>
900	$2 F_o$	-35.0	-86.0
1350	$3 F_o$	-43.5	-94.5
1800	$4 F_o$	-38.8	-89.8

NAME OF TEST: Field Strength of Spurious Radiation
(25 Watts)

RULE PART NUMBER: 2.993, 90.210

MINIMUM STANDARD: For 25 Watt; $43 + 10\log_{10}(25\text{Watts}) = -57.0 \text{ dB}$

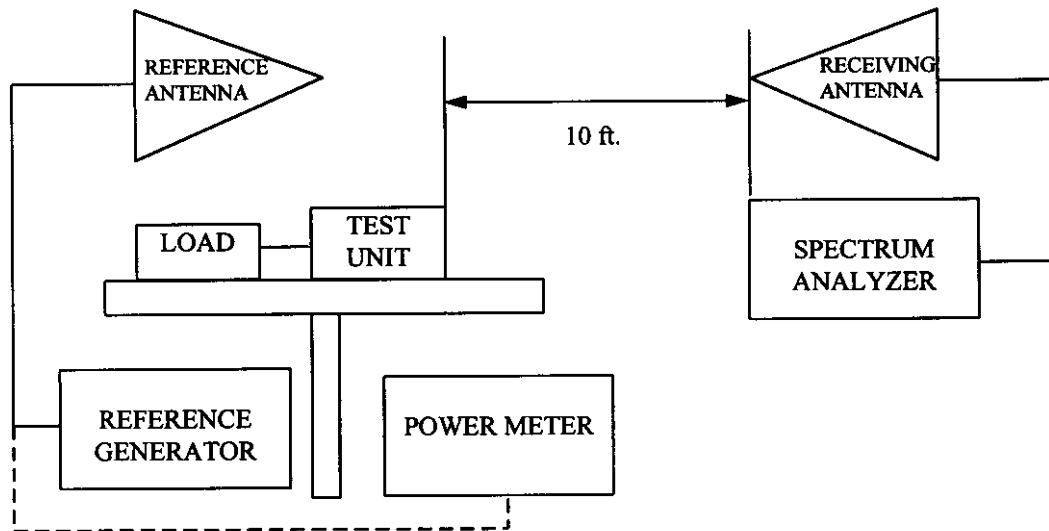
TEST RESULTS: Meets minimum standard (see data on the following page)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.12

TEST EQUIPMENT: EMCO, Adjustable Dipole Antenna, Model 3121C
Electro-Metrics, Tunable Dipole Antenna Set, Model TDS-25
Log Spiral Antenna, Model 93491-2
Log Periodic Antenna, Model LPA-112
Reference Generator, Model HP83732A
Load, Lucas Weinschel 58-30-43
Spectrum Analyzer, Model HP8563E
Power Meter, Model HP436A
Power Supply, Tectrol Inc., TC845-1081

TEST SET-UP:



TEST SET-UP

MEASUREMENT PROCEDURE:

Radiated spurious attenuation was measured according to TIA/EIA
Standard 603 Section 2.2.12

NAME OF TEST: Spurious Radiation Attenuation 25 Watts
(Continued)
Raw Spurious Data

Carrier Frequency = 450.000 MHz

Power Output = 25.0 Watts = 44.0 dBm

Freq. (MHz)	Pol.	S.A. Max (dBm)	Gen. (dBm)	PWR @ Dple (dBm)	Ant Fctr (dB)	Polarity Fctr (dB)	Rad. Sp. Attn. (dBc)
900	H	-96.80	-55.0	-60.3	0.0	0	-104.30
900	V	-100.50	-55.0	-60.3	0.0	0	-104.30
1350	H	-76.00	-29.1	-33.97	1.2	-3	-79.77
1350	V	-75.00	-31.3	-36.17	1.2	-3	-81.97
1800	H	-80.50	-34.7	-40.00	1.2	-3	-85.80
1800	V	-82.17	-38.7	-44.00	1.2	-3	-89.80
2250	H	-80.67	-36.5	-43.00	1.2	-3	-88.80
2250	V	-79.17	-33.5	-40.00	1.2	-3	-85.80
2700	H	-92.00	-45.5	-53.00	1.2	-3	-98.80
2700	V	-87.50	-41.5	-49.00	1.2	-3	-94.80
3150	H	-92.83	-46.0	-54.17	1.2	-3	-99.97
3150	V	-86.83	-40.1	-48.27	1.2	-3	-94.07
3600	H	-89.67	-42.1	-51.17	1.2	-3	-96.97
3600	V	-90.17	-44.0	-53.07	1.2	-3	-98.87
4050	H	-75.83	-22.2	-31.83	1.2	-3	-77.63
4050	V	-74.50	-20.4	-30.03	1.2	-3	-75.83
4500	H	-81.67	-31.8	-42.50	1.2	-3	-88.30
4500	V	-88.67	-38.4	-49.10	1.2	-3	-94.90

V = Vertical Polarization

H = Horizontal Polarization

FCC Rad. Spurious Atten. Limit = -57dBc

NAME OF TEST: Field Strength of Spurious Radiation
(125 Watts)

RULE PART NUMBER: 2.993, 90.210

MINIMUM STANDARD: The lesser of the following attenuation:
For 125 Watt; $50 + 10\log_{10}(125 \text{ Watts}) = -64.0 \text{ dBc}$

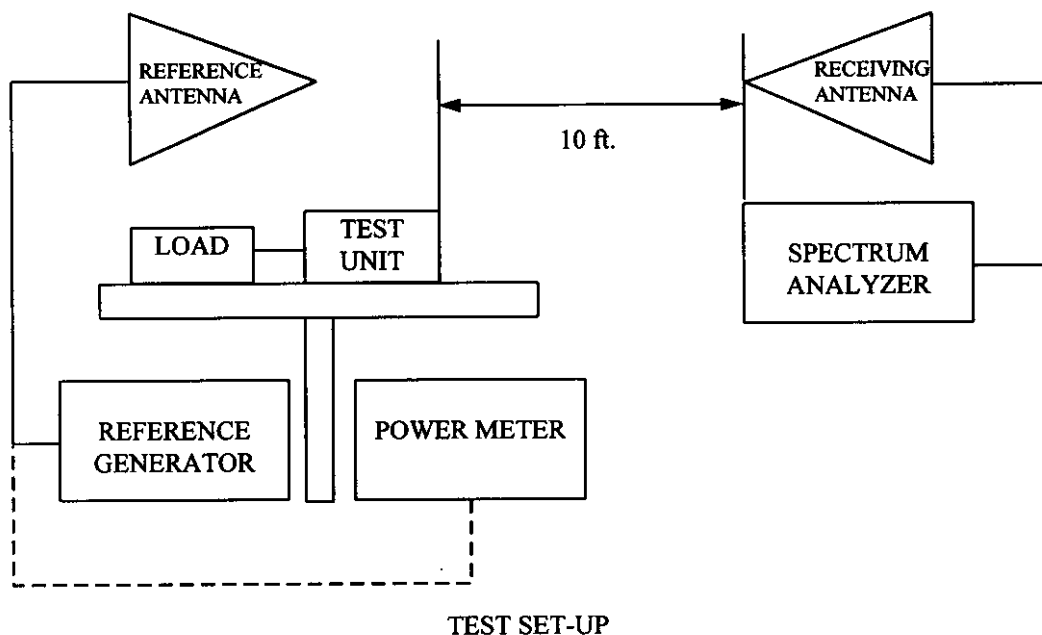
TEST RESULTS: Meets minimum standard (see data on the following page)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.12

TEST EQUIPMENT: EMCO, Adjustable Dipole Antenna, Model 3121C
Electro-Metrics, Tunable Dipole Antenna Set, Model TDS-25
Log Spiral Antenna, Model 93491-2
Log Periodic Antenna, Model LPA-112
Reference Generator, Model HP83732A
Load, Lucas Weinschel 58-30-43
Spectrum Analyzer, Model HP8563E
Power Meter, Model HP436A
Power Supply, Tectrol Inc., TC845-1081

TEST SET-UP:



MEASUREMENT PROCEDURE:

Radiated spurious attenuation was measured according to TIA/EIA
Standard 603 Section 2.2.12

NAME OF TEST: Spurious Radiation Attenuation 125 Watts
(Continued)
Raw Spurious Data

Carrier Frequency = 450.000 MHz

Power Output = 125.0 Watts = 51 dBm

Freq. (MHz)	Pol.	S.A. Max (dBm)	Gen. (dBm)	PWR @ Dple (dBm)	Ant Fctr (dB)	Polarity Fctr (dB)	Rad. Sp. Attn. (dBc)
900	H	-96.17	-54.4	-59.67	0.0	0	-110.67
900	V	-100.00	-54.5	-59.80	0.0	0	-110.80
1350	H	-63.67	-16.8	-21.64	1.2	-3	-74.44
1350	V	-66.67	-23.0	-27.84	1.2	-3	-80.64
1800	H	-73.83	-28.0	-33.33	1.2	-3	-86.13
1800	V	-72.17	-28.7	-34.00	1.2	-3	-86.80
2250	H	-79.50	-35.3	-41.83	1.2	-3	-94.63
2250	V	-81.33	-35.7	-42.16	1.2	-3	-94.96
2700	H	-90.50	-44.0	-51.50	1.2	-3	-104.30
2700	V	-89.00	-43.0	-50.50	1.2	-3	-103.30
3150	H	-90.17	-43.3	-51.51	1.2	-3	-104.31
3150	V	-85.67	-38.9	-47.11	1.2	-3	-99.91
3600	H	-92.17	-44.6	-53.67	1.2	-3	-106.47
3600	V	-90.67	-44.5	-53.57	1.2	-3	-106.37
4050	H	-76.83	-23.2	-32.83	1.2	-3	-85.63
4050	V	-75.83	-21.7	-31.36	1.2	-3	-84.16
4500	H	-82.33	-32.5	-43.16	1.2	-3	-95.96
4500	V	-88.00	-37.7	-48.43	1.2	-3	-101.23

V = Vertical Polarization

H = Horizontal Polarization

FCC Rad. Spurious Atten. Limit = -64dBc

CALCULATIONS FOR FIELD STRENGTH OF SPURIOUS RADIATION TESTS:

Since the reference antenna used above 1 GHz has gain that differed from a dipole, the generator output was corrected for antenna gain at each spurious frequency. The power was measured directly at the reference antenna and therefore requires no coaxial cable loss correction. An additional correction was made above 1 GHz to correct for the 3 dB polarization loss in the reference path.

EXAMPLE:

At 4500 MHz, 125 Watts and horizontal polarization.

R - Reference Generator (dBm)	-43.16
A - Antenna Gain (dB)	+1.2
P - Polarization Correction Factor (dB)	-3.0
R' - Corrected Reference (dBm)	

$R' = R + A - P = -43.16 + 1.2 - 3.0 = -44.96 \text{ dBm}$

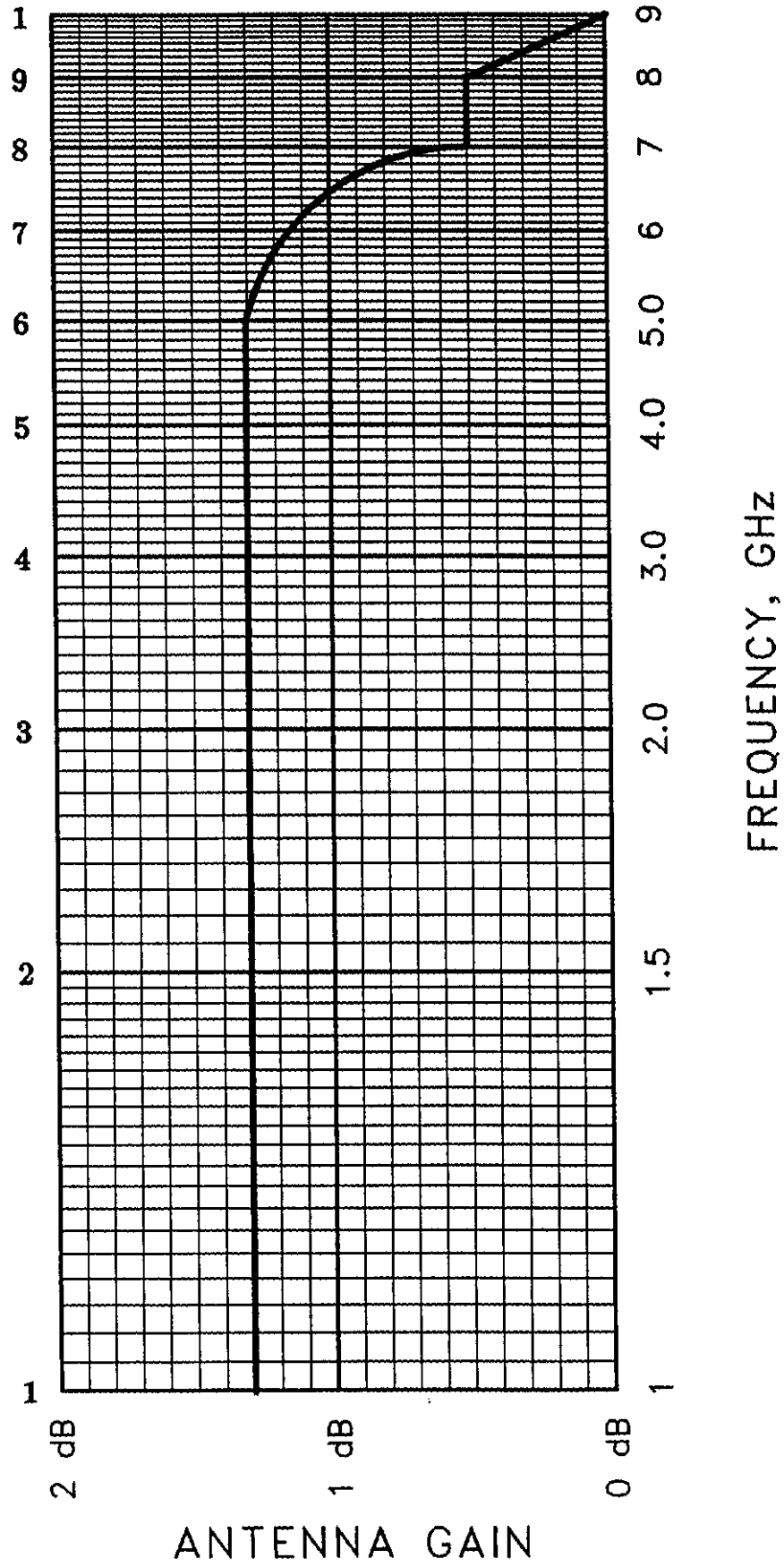
$P_o - \text{Radiated Carrier Power (dBm)}$

$125 \text{ Watts} = 51 \text{ dBm}$

$\text{Radiated Spurious Emission (dBc)} = P_o - R' = -44.96 - (+51) = -95.96 \text{ dBc}$

LOG PERIODIC ANTENNA
ANTENNA GAIN REFERENCED TO A DIPOLE

SEMI-LOGARITHMIC
1 CYCLE X 10 DIVISIONS



NAME OF TEST: Frequency Stability with Variation in Ambient Temperature

RULE PART NUMBER: 2.995 (a)(1), 90.213 (a) (7)

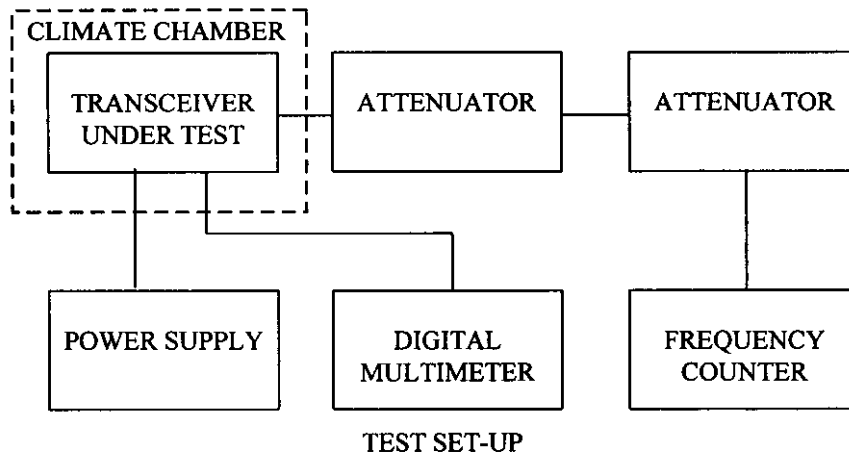
MINIMUM STANDARD: Shall not exceed $\pm 0.000150\%$ from test frequency, 1.50 PPM

TEST RESULTS: Meets minimum standard, see data on following page

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Frequency Counter, Model HP8901A
Power Supply, Tectrol Inc., TC845-1081
Digital Voltmeter, Fluke Model 8012A
Thermometer, Fluke Model 80T-150U
Climate Chamber, Thermotron Model SM-8C

TEST SET-UP:



(Test data on next page)

NAME OF TEST: Frequency Stability with Variation in Ambient Temperature
(Continued)

MEASUREMENTS TAKEN:

1.00 PPM Reference Oscillator

Channel Frequency: 450.000 MHz

Tolerance Requirements: 0.000150 %

Highest Variation: 0.000098 %

Temperature (C)	Frequency (Hz)	DELTA FREQUENCY (Hz)	SPEC LIMIT (% of assigned frequency)	PPM from assigned frequency
-30	450.00044	0.000098	< 0.00015	0.978
-20	450.00042	0.000093	< 0.00015	0.933
-10	450.00019	0.000042	< 0.00015	0.422
0	450.00007	0.000016	< 0.00015	0.156
10	449.99998	-0.000004	< 0.00015	-0.044
20	449.99993	-0.000016	< 0.00015	-0.156
25	449.99993	-0.000016	< 0.00015	-0.156
30	449.99987	-0.000029	< 0.00015	-0.289
40	449.99980	-0.000044	< 0.00015	-0.444
50	449.99970	-0.000067	< 0.00015	-0.667
60	449.99960	-0.000089	< 0.00015	-0.889

NAME OF TEST: Frequency Stability with Variation in Supply Voltage

RULE PART NUMBER: 2.995 (d)

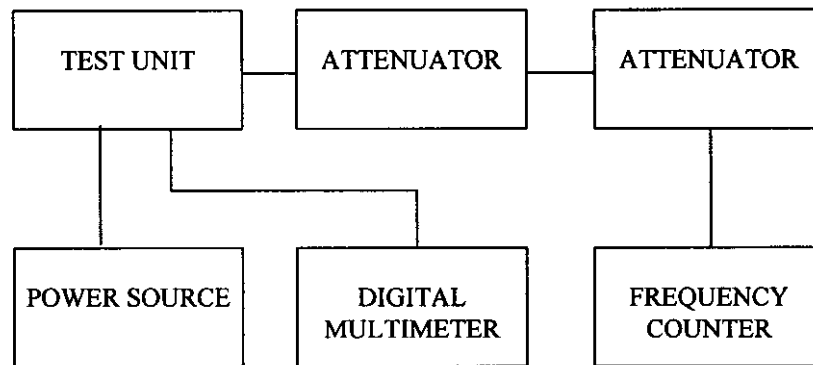
MINIMUM STANDARD: Shall not exceed $\pm 0.000150\%$ from test frequency, 1.50 PPM
for $\pm 15\%$ change in supply voltage

TEST RESULTS: Meets minimum standard, see data on following page

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Tenuline Model 8322 / 30 dB 200 Watt
Attenuator, Texscan Model FP-50 / 20 dB
Frequency Counter, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
AC Power Source, Elgar Model 1751SL
DC Power Source, Model HP6624A

TEST SET-UP:



TEST SET-UP

(Test data on next page)

NAME OF TEST: Frequency Stability with Variation in Supply Voltage
(Continued)

MEASUREMENTS TAKEN:

1.00 PPM Reference Oscillator

Channel Frequency: 450.000 MHz
Tolerance Requirements: 0.000150%
Highest Variation:

125Watts

VAC INPUT	FREQ. (Hz)	DELTA FREQ. (% of assigned freq.)	SPEC LIMIT (% of assigned freq.)	PPM from assigned frequency
100	449.99988	-0.000027	< 0.0001	-0.267
115	449.99988	-0.000027	< 0.0001	-0.267
132	449.99988	-0.000027	< 0.0001	-0.267
187	449.99989	-0.000024	< 0.0001	-0.244
220	449.99989	-0.000024	< 0.0001	-0.244
253	449.99989	-0.000024	< 0.0001	-0.244

125Watts

Vdc INPUT	FREQ. (Hz)	DELTA FREQ. (% of assigned freq.)	SPEC LIMIT (% of assigned freq.)	PPM from assigned frequency
21.5	449.99990	-0.000022	< 0.0001	-0.222
26.5	449.99990	-0.000022	< 0.0001	-0.222
30.5	449.99990	-0.000022	< 0.0001	-0.222

25Watts

Vdc INPUT	FREQ. (Hz)	DELTA FREQ. (% of assigned freq.)	SPEC LIMIT (% of assigned freq.)	PPM from assigned frequency
21.5	449.99990	-0.000022	< 0.0001	-0.222
26.5	449.99990	-0.000022	< 0.0001	-0.222
30.5	449.99990	-0.000022	< 0.0001	-0.222

NAME OF TEST: Transient Frequency Behavior

RULE PART NUMBER: 90.214

MINIMUM STANDARD: **25 kHz channel** (used worst case numbers from 450 to 512 MHz)
PTT Enable
Shall not exceed ± 25 kHz for t_0 to 10 msec
Shall not exceed ± 12.5 kHz for 10 msec to 25 msec
Shall not exceed FCC frequency limit for $t > 35$ msec

PTT Disable
Shall not exceed ± 25 kHz for t_3 to t_{off} (10msec)

12.5 kHz channel (used worst case numbers from 450 to 512 MHz)
PTT Enable
Shall not exceed ± 12.5 kHz for t_0 to 10 msec
Shall not exceed ± 6.25 kHz for 10 msec to 25 msec
Shall not exceed FCC frequency limit for $t > 35$ msec

PTT Disable
Shall not exceed ± 12.5 kHz for t_3 to t_{off} (10msec)

TEST RESULTS: Meets minimum standards, see data on following pages

TEST CONDITIONS: RF Power Level = 125 Watts
Standard Test Conditions, 25 C

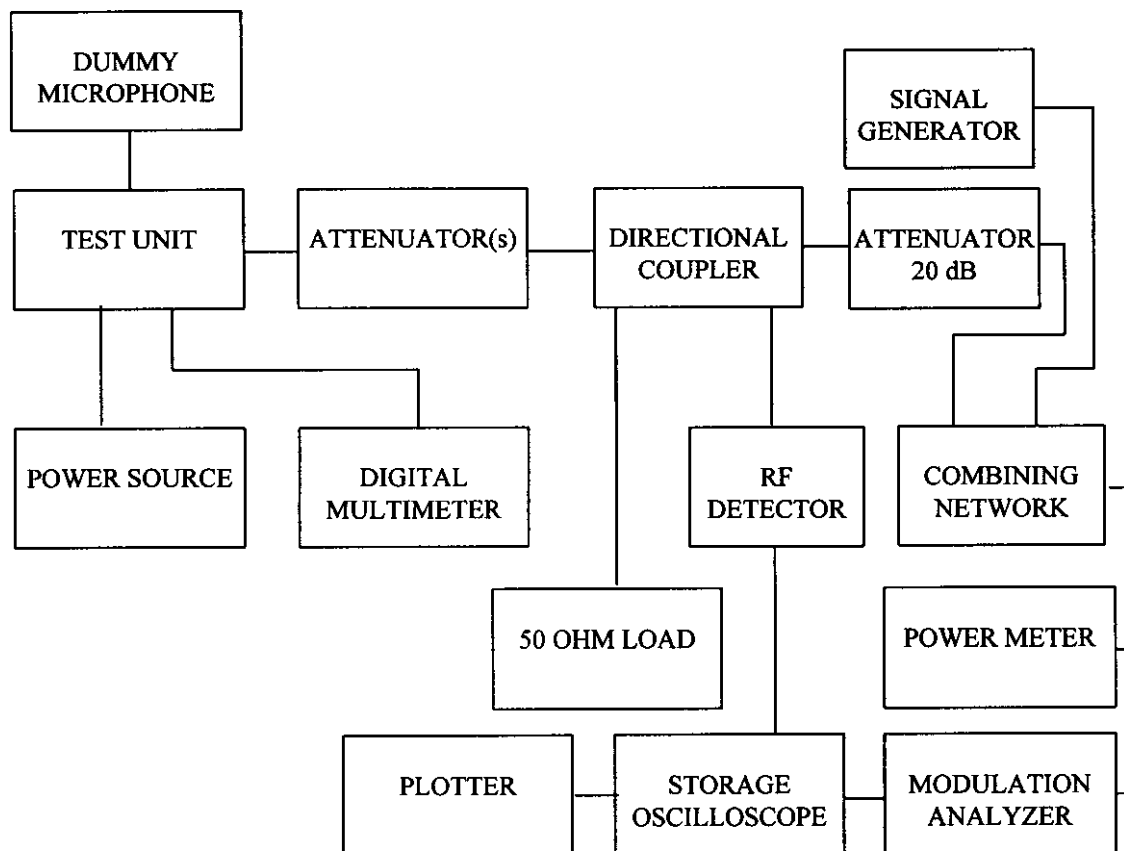
TEST PROCEDURE: TIA/EIA - 603, 2.2.19

TEST EQUIPMENT: Attenuator, Coaxial Dynamics Model 6005 / 10 dB 200 Watt
Attenuator, Tenuline Model 8340-100 / 10 dB 25 Watt
Attenuator, Lucas Weinschel Model 45-3-43 / 3 dB 250 Watt
Attenuator, Kay Step Attenuator, Model 439A
Attenuator, Texscan Model FP-50 / 20 dB 0.5 Watt
Power Supply, Tectrol Inc., TC845-1081
Digital Voltmeter, Fluke Model 8012A
Power Combiner, Model MCL ZFSC-4-1
Modulation Analyzer, Model HP8901A
Power Meter, Model HP436
Oscilloscope, Model HP54501A
Power Detector, Model EFJ lab made
Directional Coupler, Model HP778D
Signal Generator, Model HP8644B
Plotter, Model HP2671G

NAME OF TEST: Transient Frequency Behavior

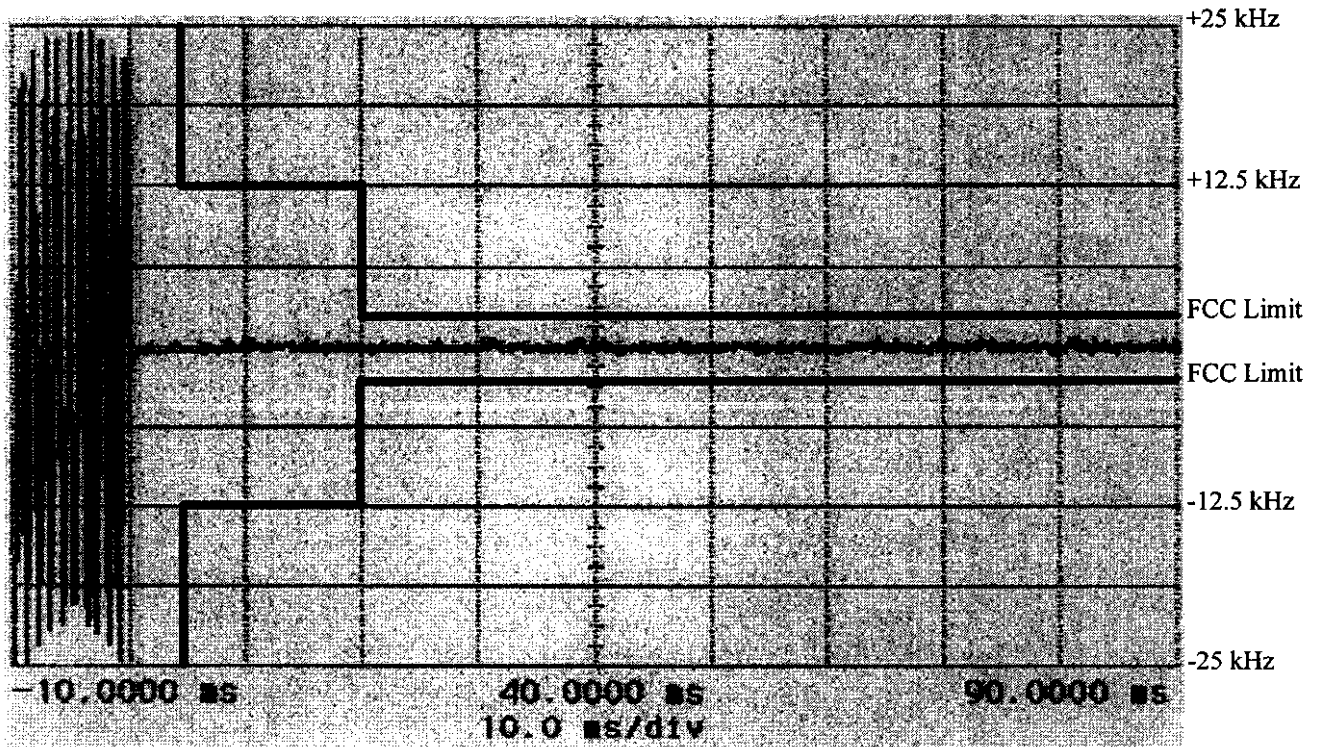
TEST DESCRIPTION:

1. Adjust signal generator to -100 dBm with a 1 kHz tone at +/- 25 kHz deviation.
2. Enable the transmitter.
3. Adjust the step attenuator such that the transmitter output is -10 dBm at the test receiver input.
(maximum input to test receiver = 1 Watt or 30 dBm)
4. Disable the transmitter.
5. Adjust the signal generator such that the level at the test receiver input is -30 dBm.
6. Adjust the oscilloscope to a 10 msec. per division horizontal sweep rate. Then adjust the vertical amplitude control to display the 1 kHz tone at +/- 4 divisions. The +/- 4 divisions represents a deviation of +/- 25 kHz.
7. Adjust the oscilloscope to trigger, and store the result, on a rising edge signal at 1 division from the left side of the display.
8. Remove 30 dB of attenuation from the attenuators that are inline with the transmitter signal.
9. Enable the transmitter and record the display results as the "On Transient Frequency Behavior".
10. Adjust the oscilloscope to trigger, and store the result, on a falling edge signal at 1 division from the right side of the display.
11. Disable the transmitter and record the display results as the "Off Transient Frequency Behavior".

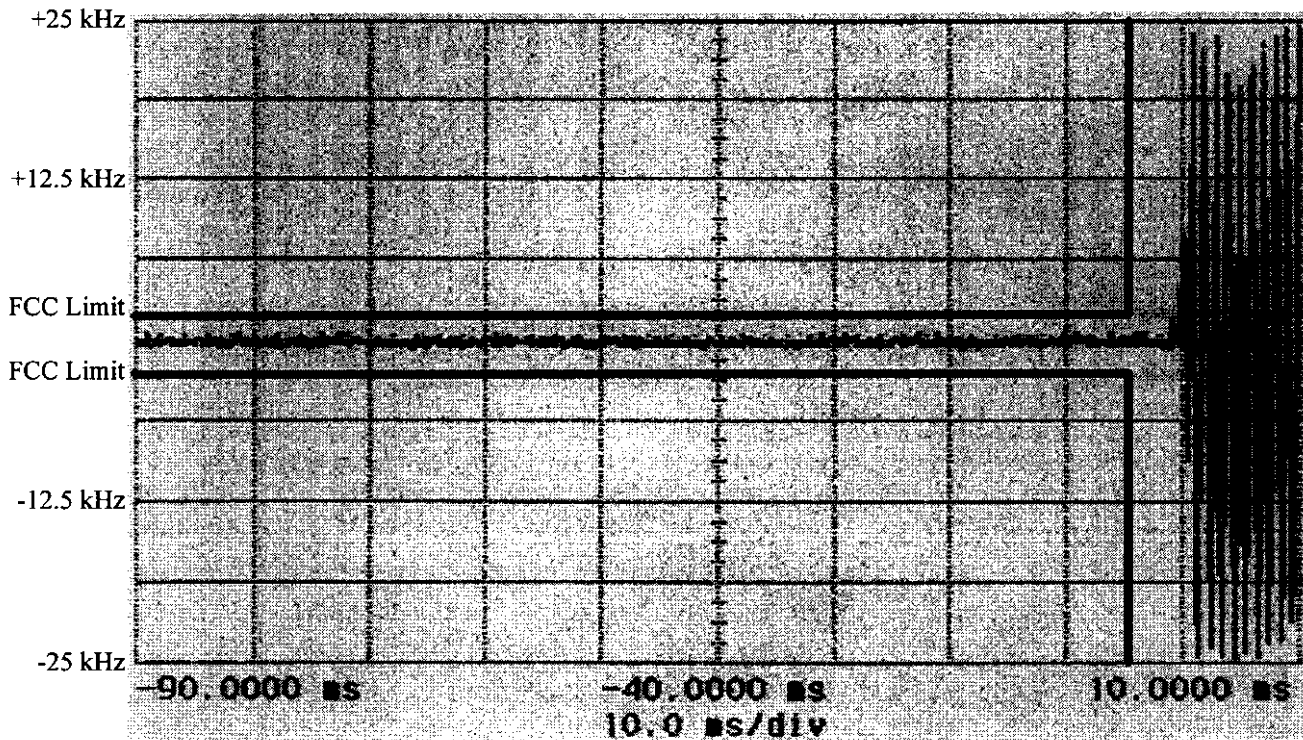


TEST SET-UP

NAME OF TEST: Transient Frequency Behavior / 25 Watts
In Support of Emission Designator 16K0F3E



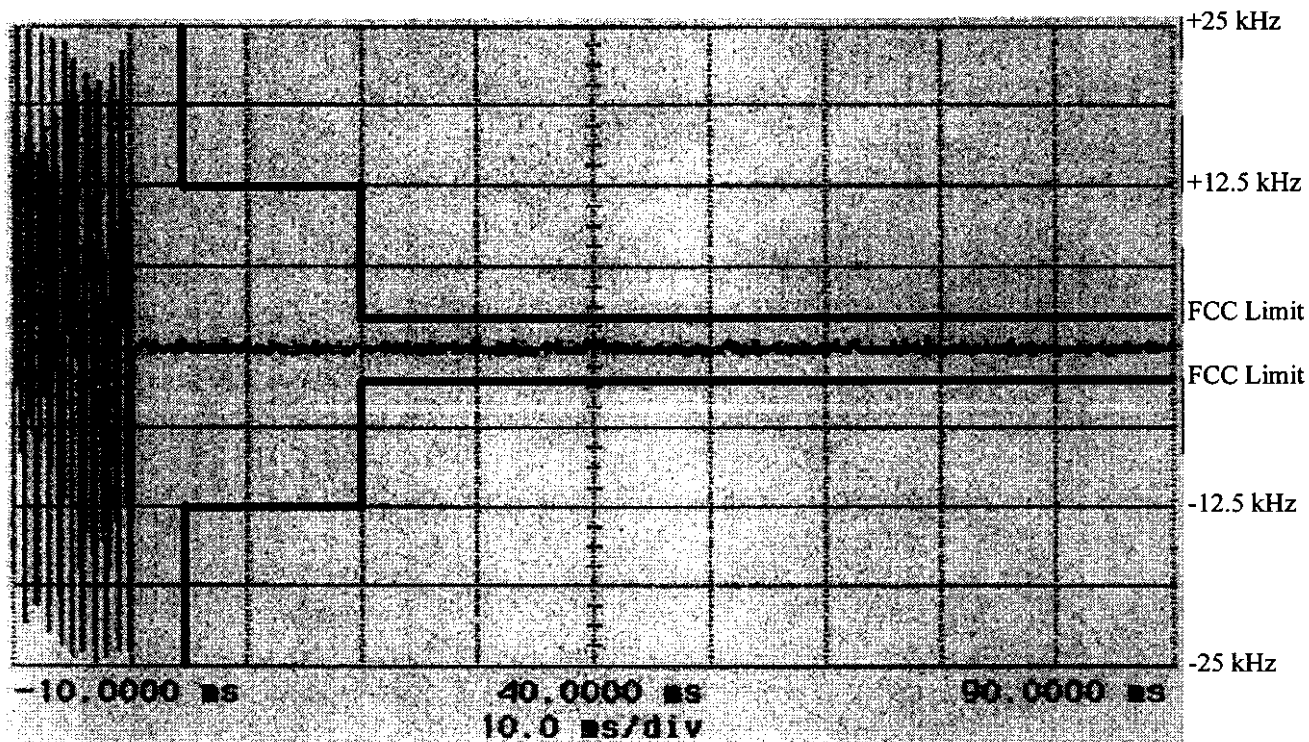
Switch On



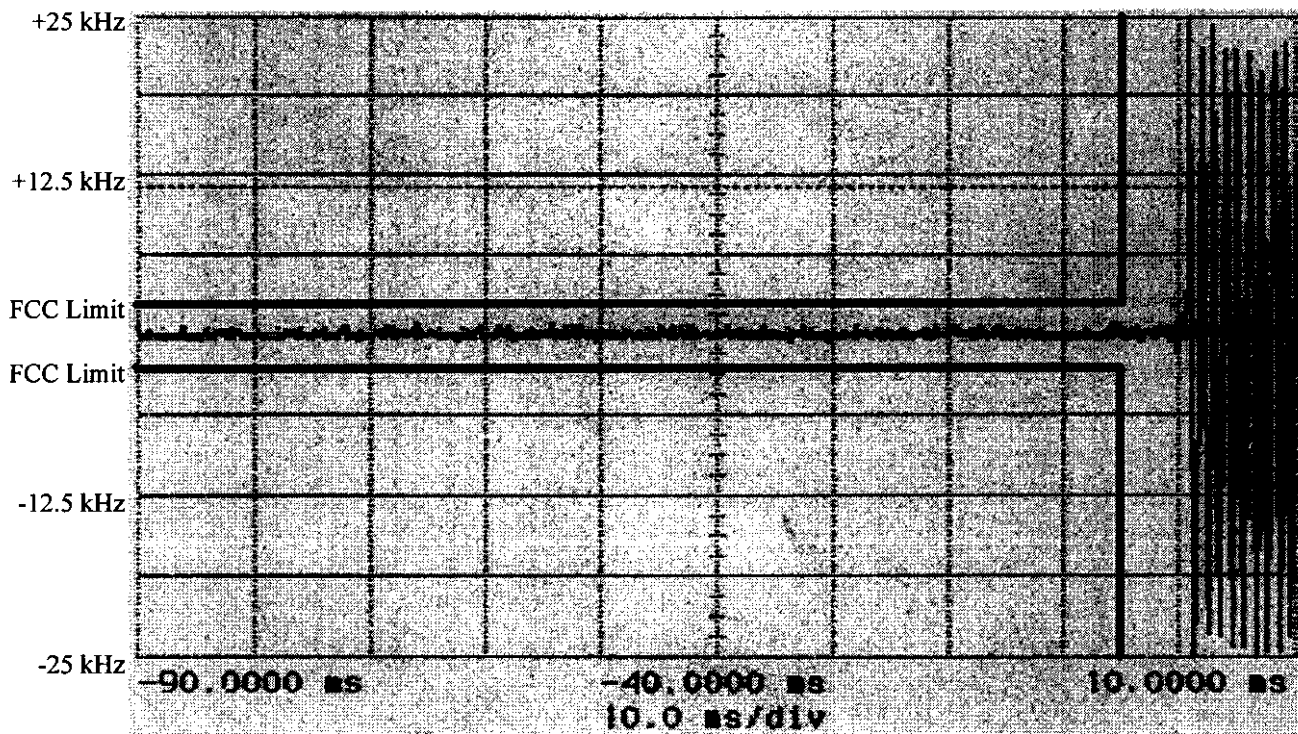
Switch Off

NAME OF TEST:

Transient Frequency Behavior / 125 Watts
In Support of Emission Designator 16K0F3E

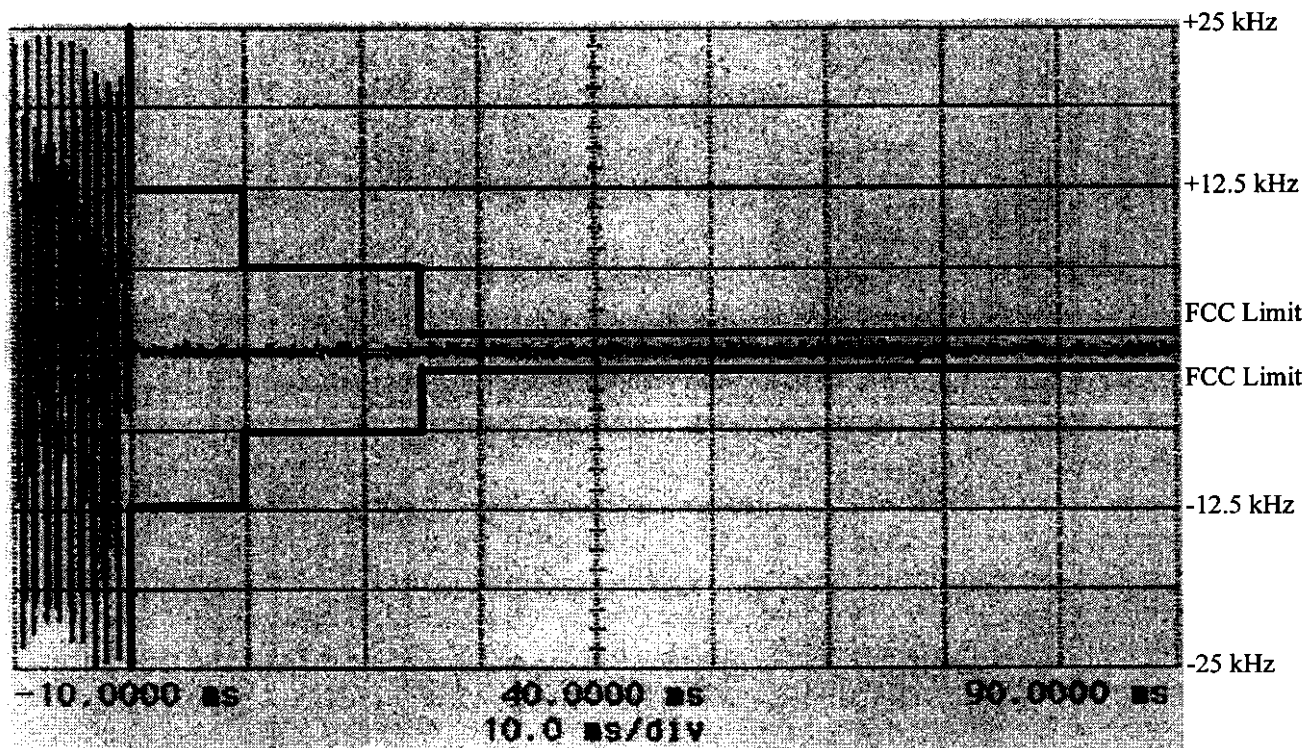


Switch On

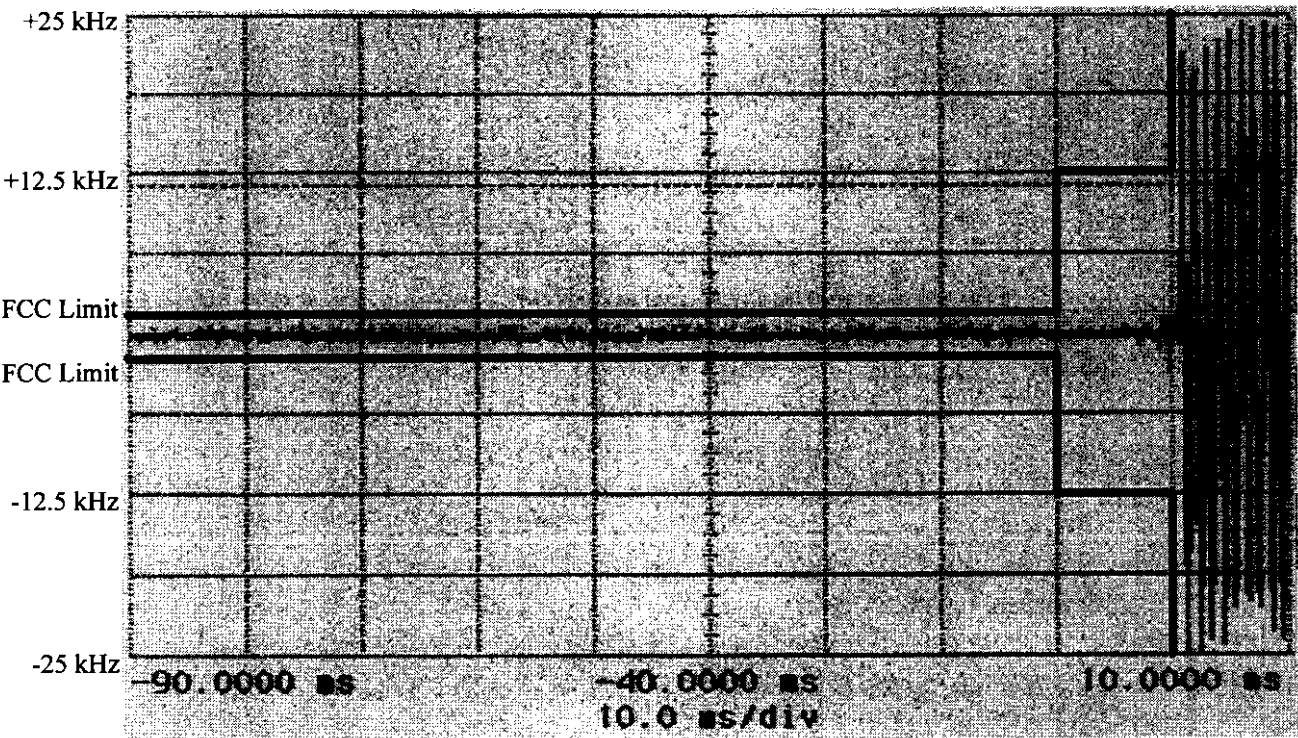


Switch Off

NAME OF TEST: Transient Frequency Behavior / 25 Watts
In Support of Emission Designator 11K0F3E

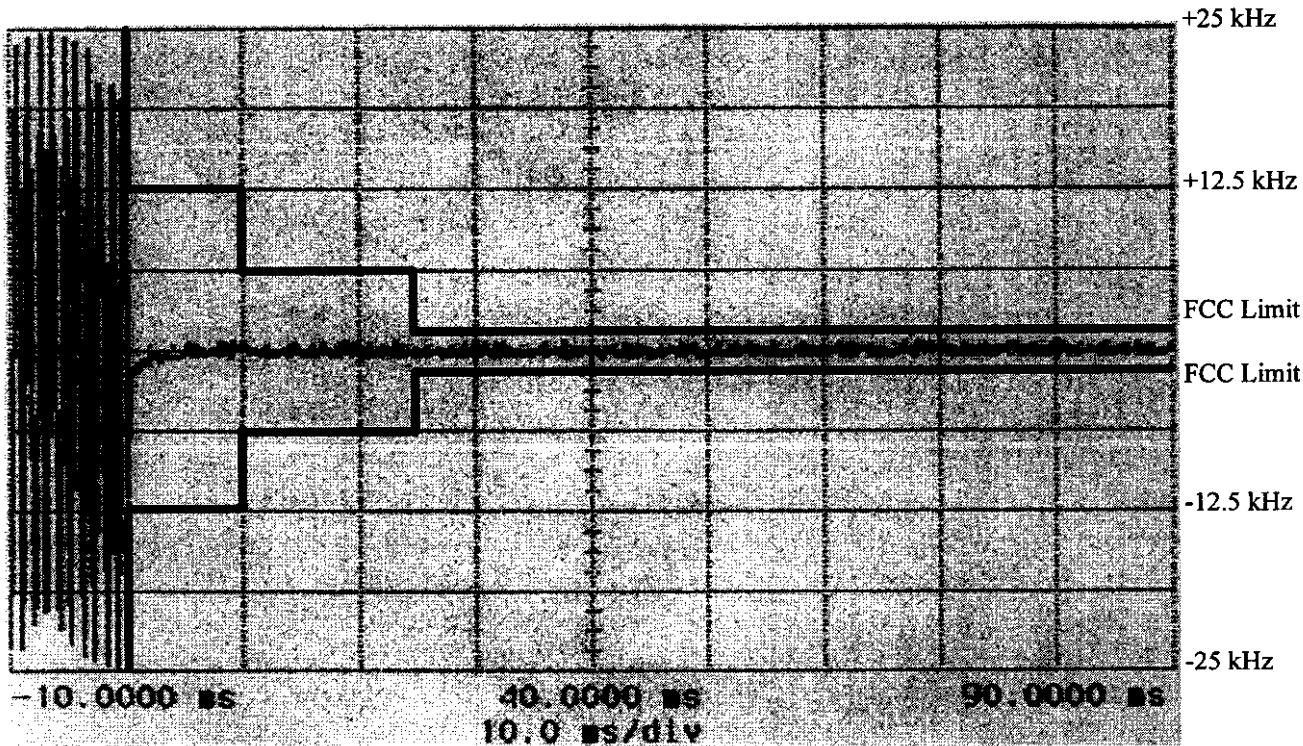


Switch On

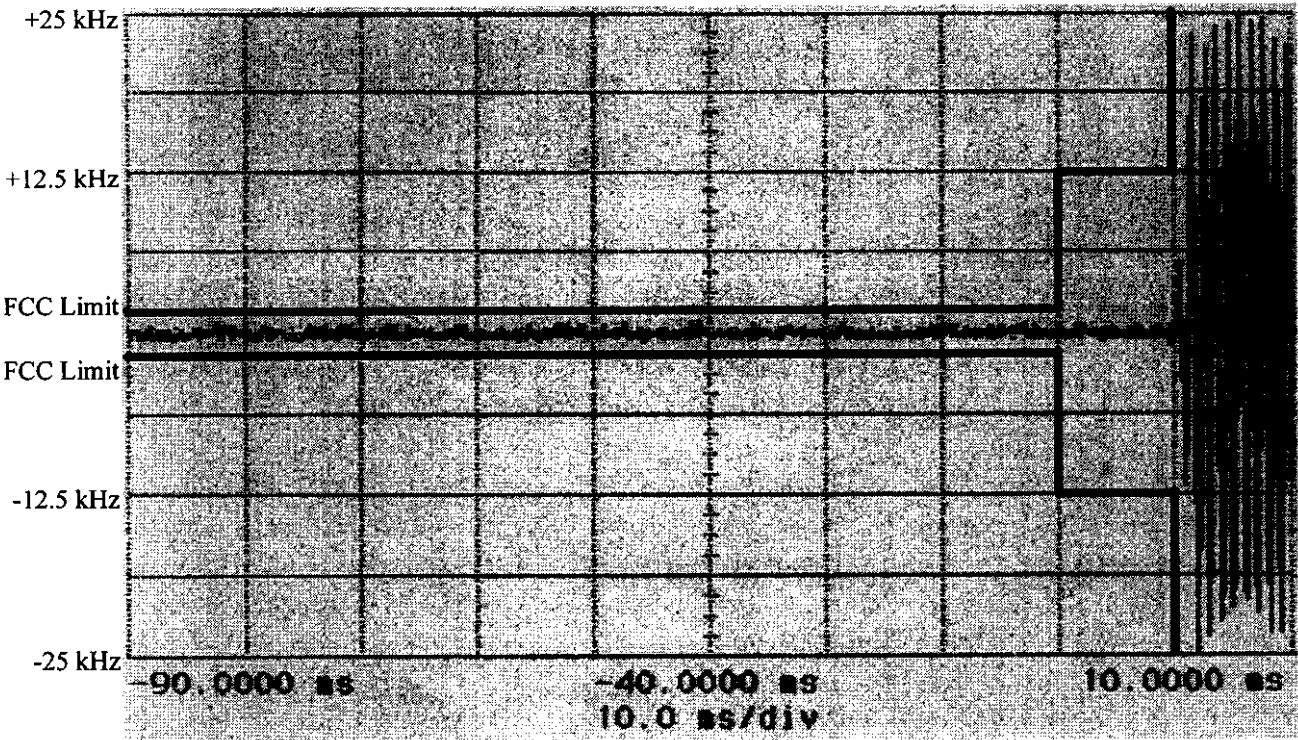


Switch Off

NAME OF TEST: Transient Frequency Behavior / 125 Watts
In Support of Emission Designator 11K0F3E



Switch On



Switch Off