

Engineering Exhibit in Support of
Type Acceptance
FCC Form 731

800 MHz Mobile

February 10, 1999

AFFIDAVIT

The technical data included in this report has been accumulated through tests that were performed by me or by engineers under my direction. To the best of my knowledge, all of the data is true and correct.

JOHN S. OBLAK
Director, Radio Engineering

Transcrypt International, E.F. Johnson Radio Systems
Waseca, Minnesota

ENGINEERING STATEMENT OF Lantz Sievert

The application consisting of the attached engineering exhibit and associated FCC form 731, has been prepared in support of a request for Type Acceptance for the 40 watt, 25 kHz channel bandwidth, 800 MHz mobile radio with a 9600 baud modem. The transceiver will be identified by the FCC number ATH2425384. The transceiver operates pursuant to Part(s) 15 and 90 of the Rules and Regulations.

EXISTING CONDITIONS

The Transcrypt International, E.F. Johnson Radio Systems has completed assembly of 40 watt mobile transceivers. The units utilized for these type acceptance measurements were pre-production units. The transceiver is designed to operate on frequencies ranging from 806 MHz to 824 MHz and 851 MHz to 869 MHz. The frequency tolerance of the transceiver is .00015% or 1.5 parts per million. The frequency stability of the transceiver is controlled by a TCXO operating at 17.5 MHz.

PROPOSED CONDITIONS

It is proposed to Type Accept the 40 watt 800 MHz mobile transceiver for operation in the frequency band previously outlined. The applicant anticipates marketing the device for use in wireless transmission of voice and data.

PERFORMANCE MEASUREMENTS

All Type Acceptance measurements were conducted in accordance with Section 2.983 of 47 CFR 1996 of the Rules and Regulations. Equipment performance measurements were made in the engineering laboratory and on the FCC certified test range at the Transcrypt International / E.F. Johnson Radio Systems center in Waseca, Minnesota. All measurements were made and recorded by myself or under my direction.

CONCLUSION

Given the results of the measurements contained herein, the applicant requests that Type Acceptance be granted for the 40 watt 800 MHz mobile transceiver as tested for voice communications and data communications with the 9600 baud modem.

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QUALIFICATIONS OF ENGINEERING PERSONNEL

TEST PERFORMED BY:

NAME: EDWIN BENNETT

TITLE: Principle Engineer

NAME: MOHAMMED EL-HAIDARI

TITLE: Engineer II

NAME: STEVEN E LARSON

TITLE: Certified Technologist I

GENERAL INFORMATION

The following report has been generated for FCC Type Acceptance of the Transcrypt International / E.F. Johnson Radio Systems, 800 MHz Mobile transceiver, Model 242-5380. Unless otherwise noted, all of the measurements were conducted following the procedures set forth in the TIA/EIA-603 standards.

TRADE NAME:	5380
MODEL NUMBER:	242-538X
MANUFACTURER:	Transcrypt International / E.F. Johnson Radio Systems Waseca, MN 56093
FCC ID NUMBER:	FCC ID: ATH2425384
FCC RULES AND REGS:	FCC Part (s) 90
FREQUENCY RANGE:	806 - 821 MHz / 851 - 866 MHz 821 - 824 MHz / 866 - 869 MHz (NPSPAC)
SERIAL NUMBER (S):	FEP # 203

TRANSMITTER

TYPE OF EMISSION:	16K0F3E, 14K0F3E 8K10F1E 20K0F1E, 18K8F1E
MINIMUM POWER RATING:	10 Watts
MAXIMUM POWER RATING:	40 Watts
NUMBER OF CHANNELS:	16 systems of 16 groups or 1 to 256
INPUT IMPEDANCE:	50 ohms, Nominal
VOLTAGE REQUIREMENTS:	13.6 VDC

NAME OF TEST: Transmitter Rated Power Output

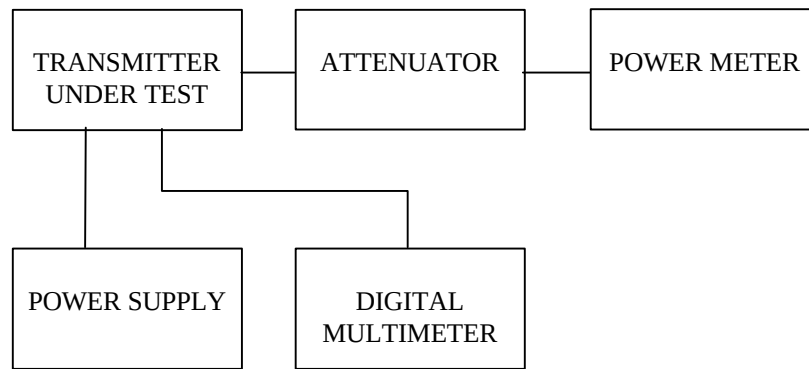
RULE PART NUMBER: 2.983 (d)(5), 2.985 (a)

TEST RESULTS: See results below

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 30 dB, 250 Watt
Power Supply, HP6434B
Power Meter, Model HP436A
Digital Voltmeter, Fluke Model 8012A

TEST SET-UP:



TEST SET-UP

TEST RESULTS:

10 Watts

Frequency (MHz)	DC Voltage at Final (VDC)	DC Current into Final (ADC)	DC Power into Final (W)	RF Power Output (W)
815.000	13.08	2.4	31.39	10

40 Watts

Frequency (MHz)	DC Voltage at Final (VDC)	DC Current into Final (ADC)	DC Power into Final (W)	RF Power Output (W)
815.000	9.94	7.1	70.57	40

NAME OF TEST: Audio Frequency Response of Transmitter Modulating Circuit

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

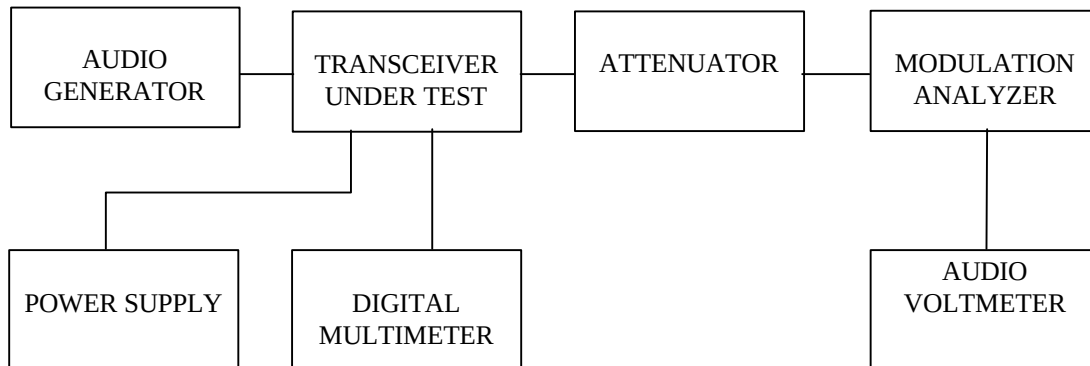
TEST RESULTS: Conforms to minimum standards

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.6.2

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 30 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903A
Audio Voltmeter, Model HP8903A

TEST SET-UP:



TEST SET-UP

(Test data on following pages)

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

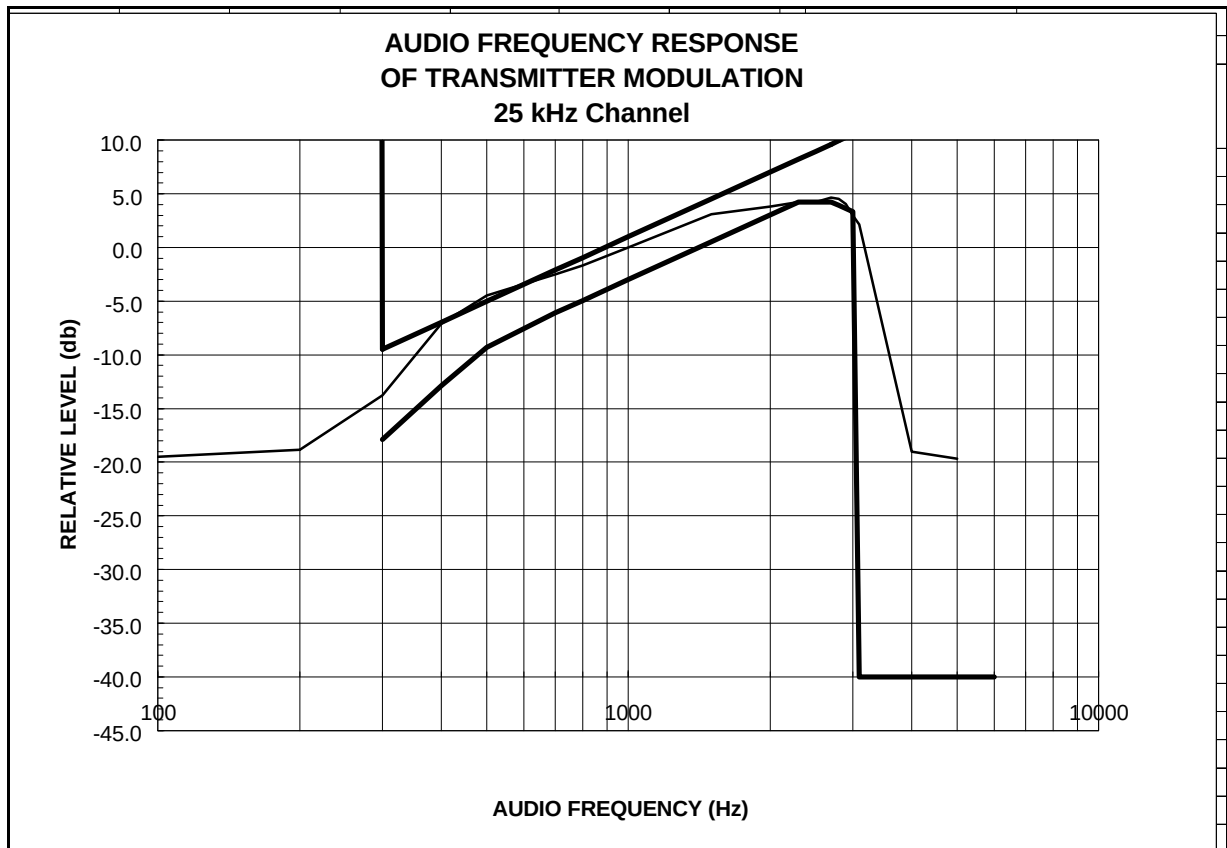
TEST RESULTS: 16K0F3E

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

* Δf = 20% of 5kHz deviation = 1000 Hz.

Frequency (Hz)	Level (dB)		Frequency (Hz)	Level (dB)
100	-19.49		2300	4.25
200	-18.86		2500	4.25
300	-13.80		2700	4.62
400	-6.90		2800	4.55
500	-4.48		2900	4.03
700	-2.50		3000	3.02
800	-1.70		3100	2.15
1000	0		3500	-6.65
1500	3.08		4000	-19.01
2000	3.80		5000	-19.71
			6000	-19.91

These data points are for a constant input voltage level.



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

TEST RESULTS: 14K0F3E

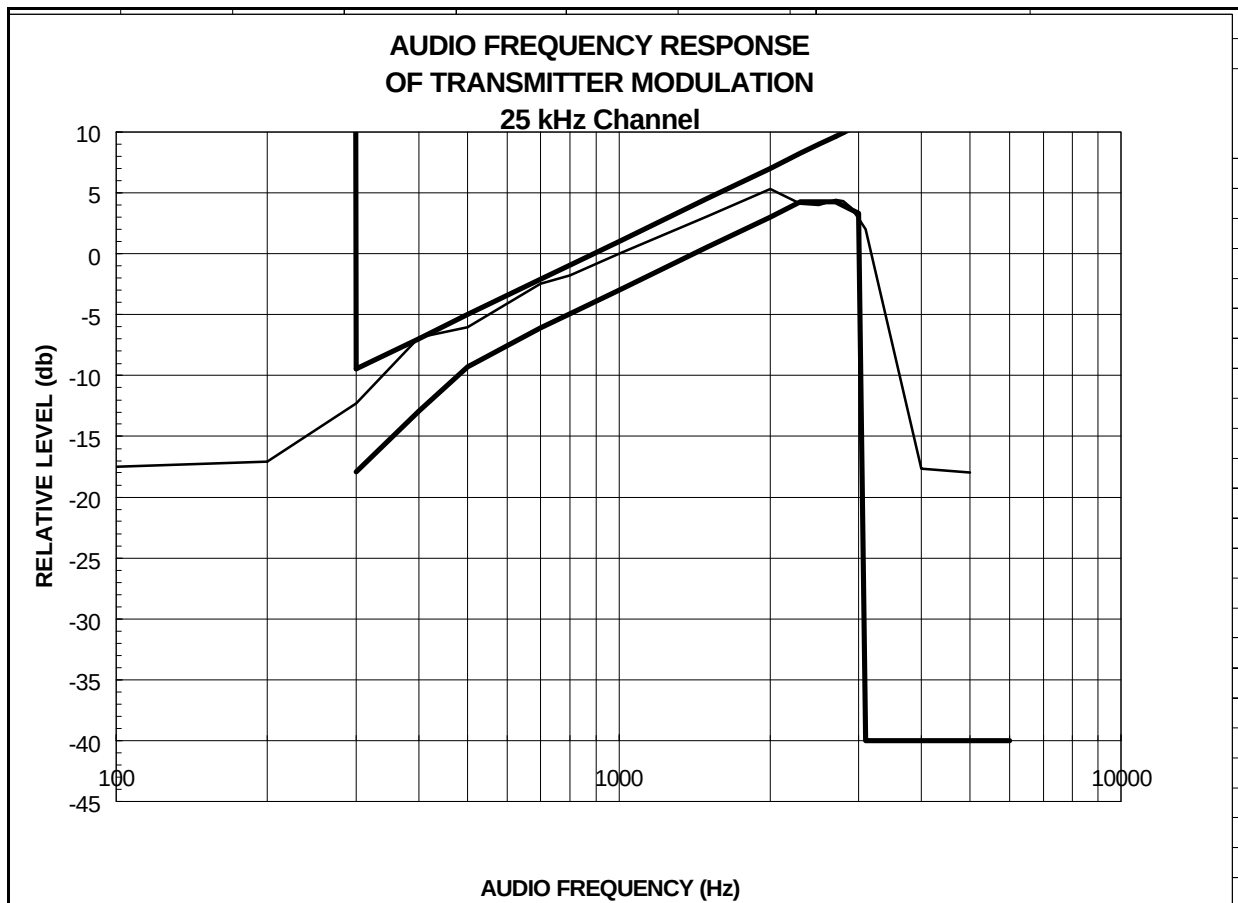
NPSPAC

Reference level (0 dB) = 800 Hz* deviation with 1000 Hz tone at local microphone input.

* Δf = 20% of 4 kHz deviation = 800 Hz.

Frequency (Hz)	Level (dB)		Frequency (Hz)	Level (dB)
100	-17.52		2300	4.11
200	-17.08		2500	3.98
300	-12.30		2700	4.40
400	-6.9		2800	4.30
500	-4.02		2900	3.81
700	-2.46		3000	2.91
800	-1.80		3100	2.05
1000	0		3500	-6.31
1500	3.03		4000	-17.65
2000	3.60		5000	-18.01
			6000	-18.09

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)

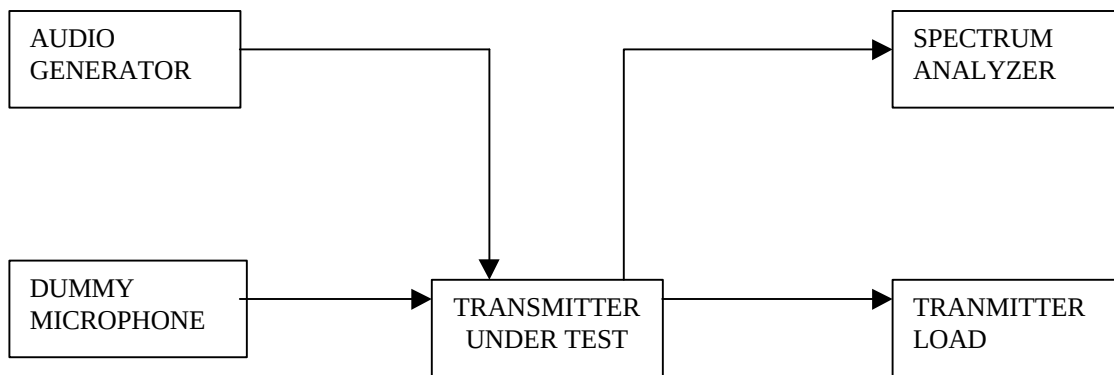
TEST RESULTS: See Graph On Following Page

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

TRANSMIT AUDIO SPLATTER FILTER



TEST SET UP

(Test data on next page)

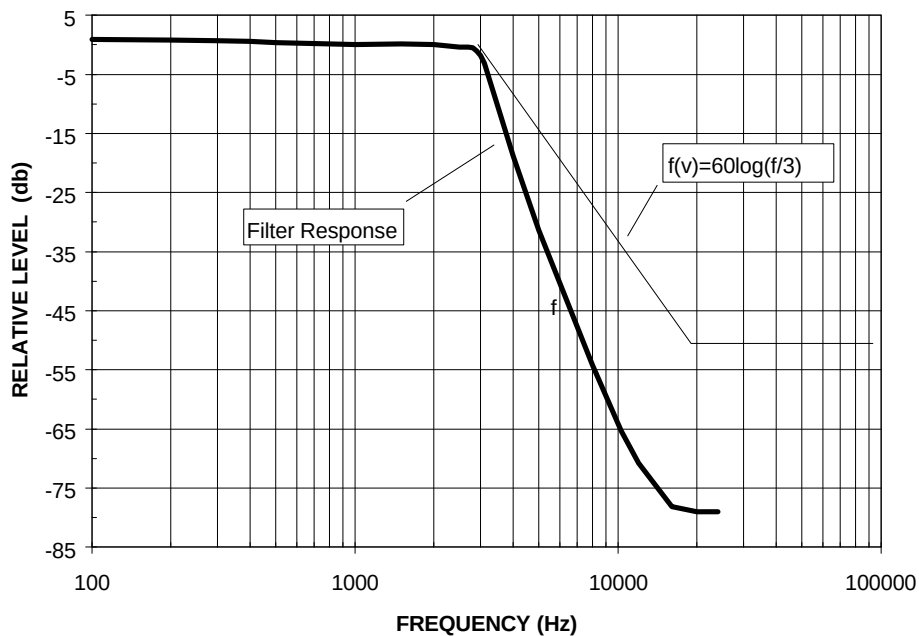
NAME OF TEST: Frequency Response of Transmitter Audio Lowpass Filter
(Continued)

TEST RESULTS: Performance Relative To 1000 Hz, 0 dB

Reference: 1000 Hz level set to 0 dB

FREQUENCY	RELATIVE RESPONSE	FREQUENCY	RELATIVE RESPONSE
(Hz)	(dB)	(Hz)	(dB)
100	0.90	2800	-0.50
200	0.80	2900	-1.00
300	0.70	3000	-1.80
400	0.60	3100	-3.10
500	0.40	4000	-18.80
800	0.10	5000	-31.40
1000	0.00	8000	-54.20
1500	0.10	10304	-65.40
2000	0.00	12000	-70.80
2500	-0.40	16000	-78.10
2600	-0.40	20000	-79.00
2700	-0.40	24000	-79.00

POST LIMITING FILTER CHARACTERISTICS



NAME OF TEST: Percentage Modulation Versus Input Voltage

RULE PART NUMBER: 2.987 (b)

MINIMUM STANDARD: Shall not exceed 5 kHz deviation from 300 Hz to 3000 Hz

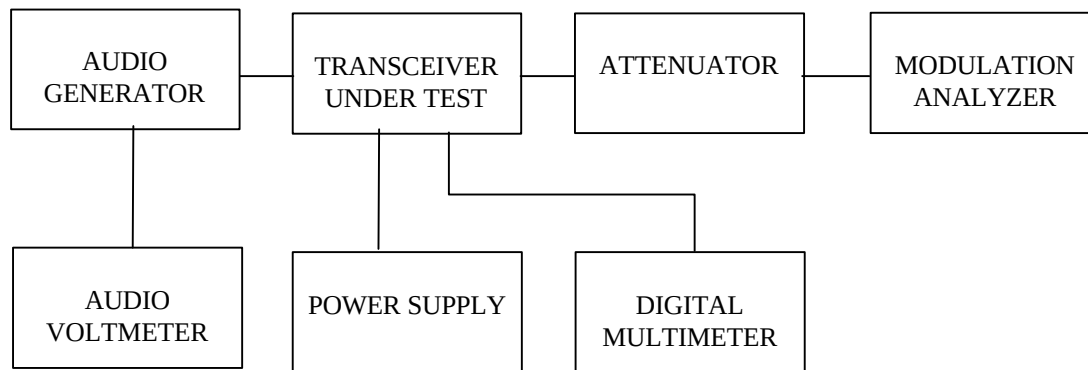
TEST RESULTS: Conforms to minimum standards (see test data on next page)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.3

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 30 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903A
Audio Voltmeter, Model HP8903A

TEST SET-UP:



TEST SET-UP

(Test data on next page)

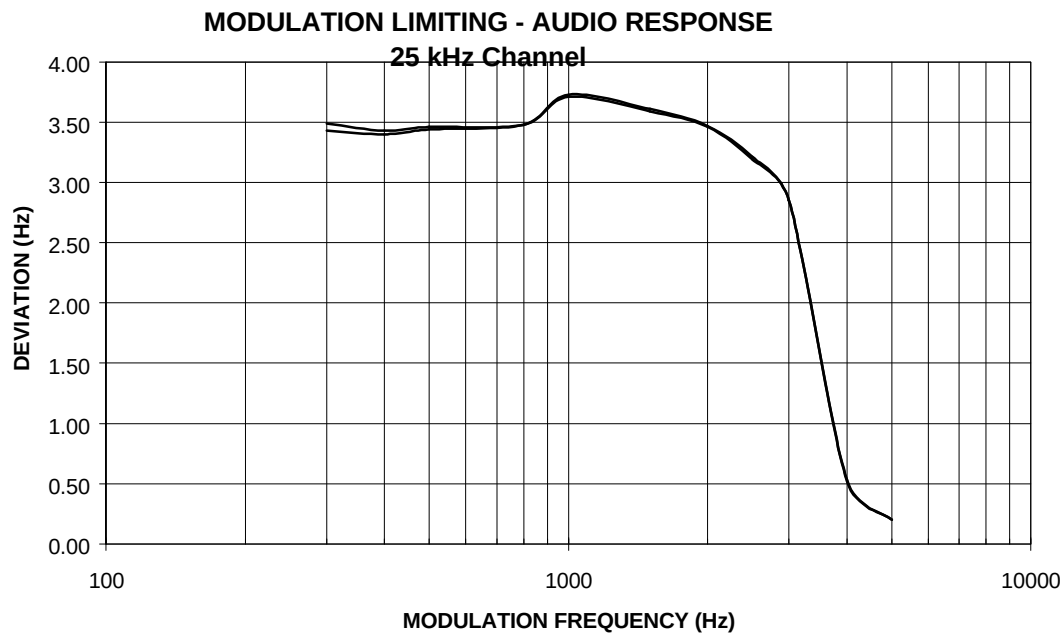
NAME OF TEST: Percentage Modulation Versus Input Voltage
(25 kHz channel, Continued)

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	3.49	3.43
400	3.43	3.40
500	3.46	3.44
800	3.48	3.48
1000	3.71	3.73
1500	3.59	3.61
2000	3.46	3.47
2500	3.19	3.21
3000	2.85	2.85
4000	0.52	0.53
5000	0.20	0.20

GRAPH



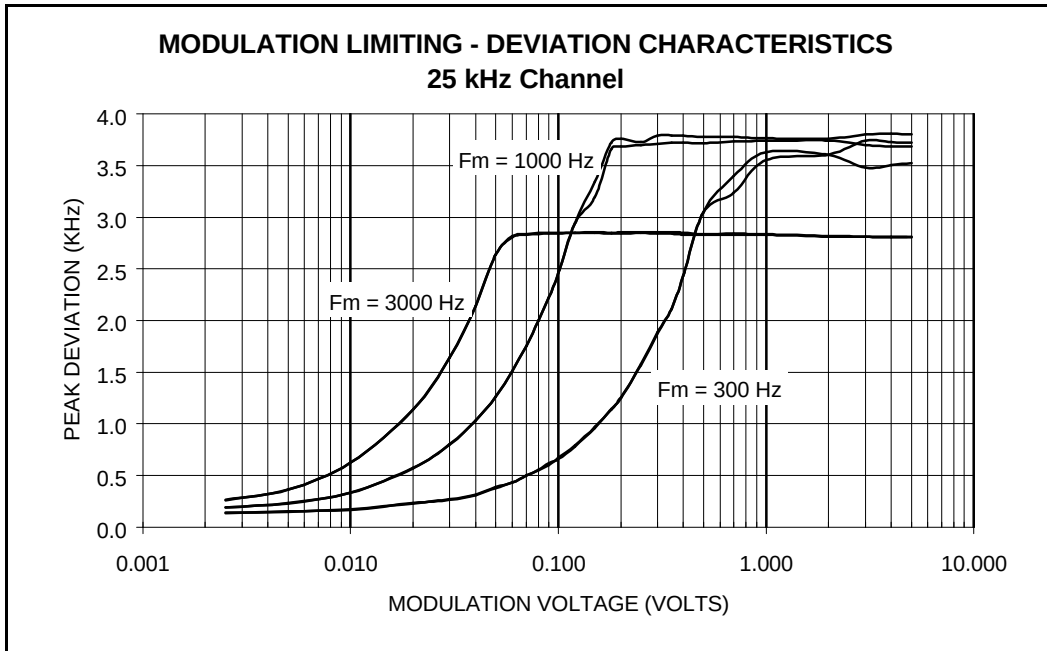
NAME OF TEST: Percentage Modulation Versus Input Voltage
for
16K0F3E

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	0.129	0.133	0.133	0.132	0.118	0.120
0.003	0.137	0.140	0.189	0.192	0.259	0.262
0.005	0.152	0.148	0.231	0.228	0.361	0.363
0.010	0.168	0.174	0.330	0.336	0.624	0.622
0.020	0.228	0.231	0.570	0.572	1.138	1.139
0.030	0.262	0.270	0.803	0.797	1.638	1.642
0.040	0.310	0.315	1.031	1.034	2.142	2.144
0.050	0.379	0.387	1.260	1.261	2.639	2.640
0.060	0.430	0.431	1.512	1.511	2.808	2.816
0.070	0.498	0.499	1.751	1.754	2.829	2.837
0.080	0.554	0.553	1.997	1.998	2.839	2.848
0.090	0.620	0.600	2.222	2.223	2.841	2.850
0.100	0.660	0.671	2.462	2.462	2.844	2.851
0.120	0.782	0.791	2.945	2.940	2.848	2.850
0.150	0.959	0.970	3.346	3.197	2.848	2.854
0.180	1.142	1.138	3.723	3.662	2.840	2.850
0.200	1.250	1.259	3.761	3.683	2.840	2.853
0.250	1.578	1.567	3.726	3.701	2.846	2.853
0.300	1.888	1.874	3.793	3.710	2.841	2.858
0.350	2.113	2.114	3.791	3.720	2.841	2.857
0.400	2.431	2.431	3.789	3.722	2.831	2.850
0.500	3.054	3.048	3.778	3.718	2.831	2.836
0.700	3.398	3.237	3.776	3.733	2.833	2.840
1.000	3.631	3.554	3.765	3.741	2.829	2.834
2.000	3.604	3.607	3.760	3.742	2.812	2.820
3.000	3.481	3.742	3.801	3.701	2.811	2.812
4.000	3.503	3.726	3.808	3.686	2.805	2.814
5.000	3.527	3.724	3.801	3.686	2.809	2.806

See graph on following page.

GRAPH
Percentage Modulation Versus Input Voltage
for
16K0F3E



NAME OF TEST: Percentage Modulation Versus Input Voltage

RULE PART NUMBER: 2.987 (b)

MINIMUM STANDARD: Shall not exceed 4 kHz (NPSPAC) deviation from 300 Hz to 3000 Hz

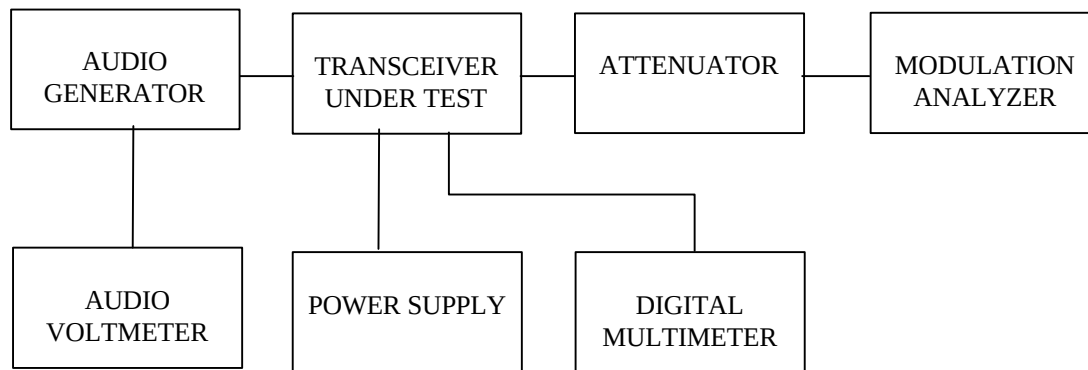
TEST RESULTS: Conforms to minimum standards (see test data on next page)

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA - 603, 2.2.3

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 30 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903A
Audio Voltmeter, Model HP8903A

TEST SET-UP:



TEST SET-UP

(Test data on next page)

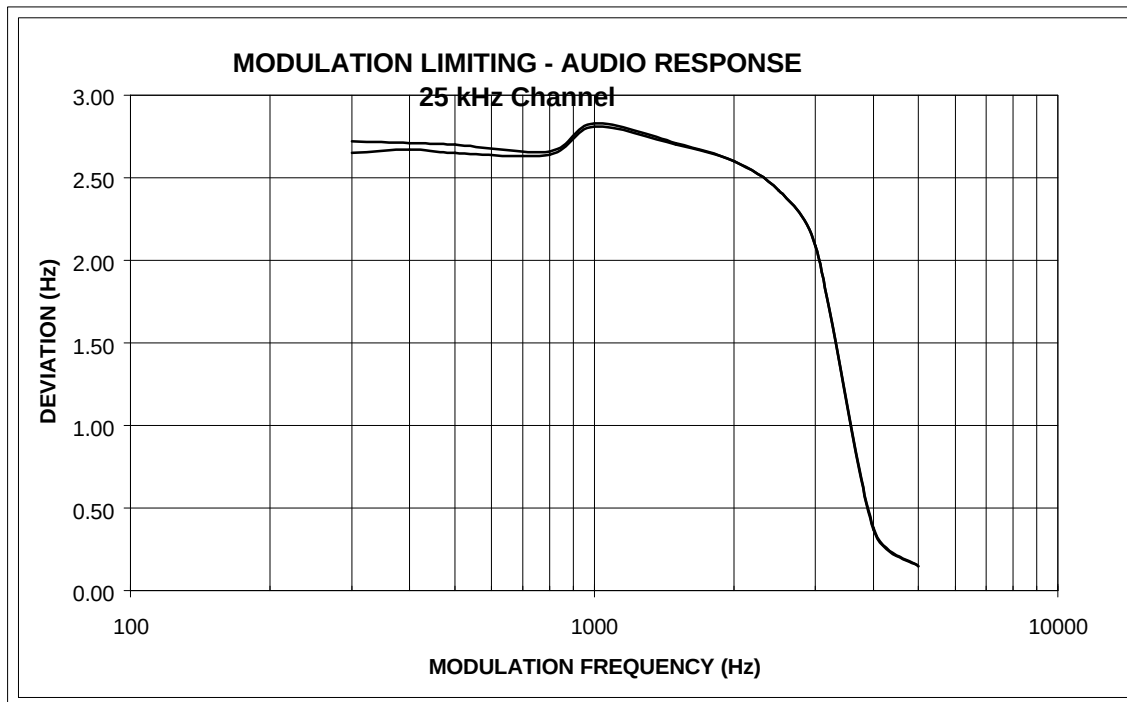
NAME OF TEST: Percentage Modulation Versus Input Voltage
(25 kHz channel, Continued)

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

14K0F3E

MOD. FREQ. (Hz)	@ $V_{m(1000Hz)}$	
	POS. DEV. (kHz)	NEG. DEV. (kHz)
300	2.72	2.65
400	2.71	2.67
500	2.70	2.65
800	2.66	2.64
1000	2.83	2.81
1500	2.71	2.70
2000	2.60	2.60
2500	2.42	2.42
3000	2.09	2.09
4000	0.38	0.37
5000	0.15	0.15

GRAPH



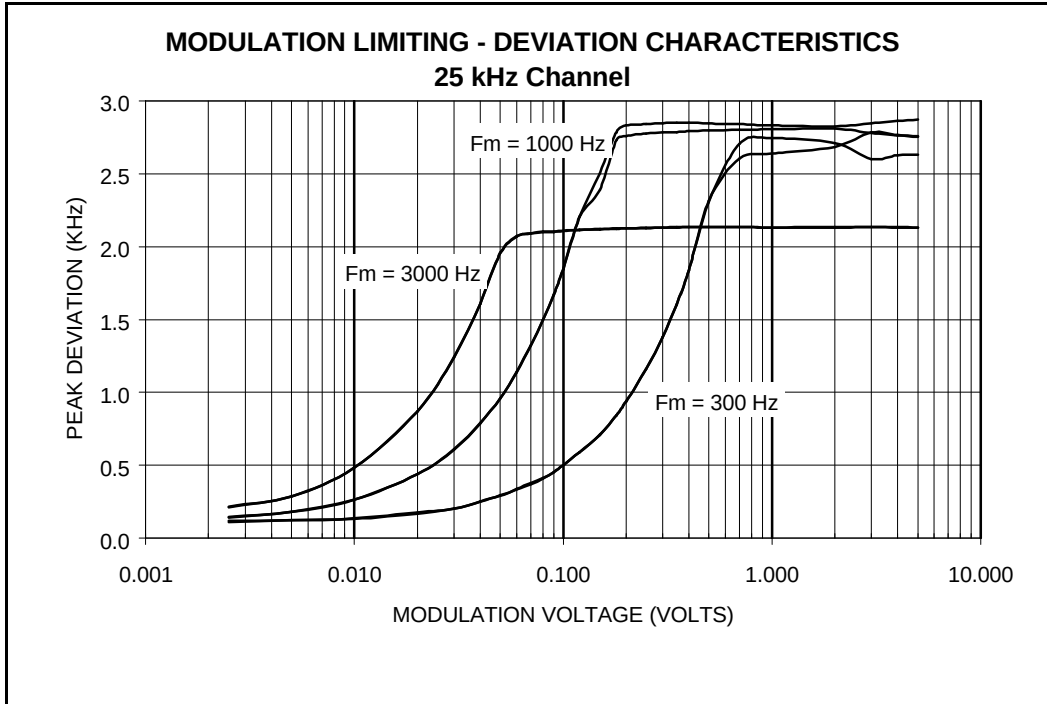
NAME OF TEST: Percentage Modulation Versus Input Voltage
for
14K0F3E

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	0.103	0.104	0.106	0.105	0.108	0.110
0.003	0.120	0.112	0.143	0.144	0.217	0.213
0.005	0.123	0.123	0.181	0.183	0.287	0.287
0.010	0.135	0.132	0.264	0.265	0.484	0.484
0.020	0.178	0.168	0.440	0.439	0.869	0.872
0.030	0.202	0.201	0.606	0.610	1.242	1.240
0.040	0.251	0.253	0.787	0.790	1.609	1.608
0.050	0.293	0.290	0.958	0.956	1.954	1.957
0.060	0.333	0.338	1.140	1.144	2.069	2.071
0.070	0.370	0.379	1.323	1.322	2.089	2.092
0.080	0.409	0.412	1.496	1.498	2.099	2.104
0.090	0.454	0.453	1.673	1.671	2.101	2.105
0.100	0.502	0.503	1.843	1.847	2.106	2.108
0.120	0.590	0.590	2.206	2.203	2.114	2.115
0.150	0.707	0.710	2.504	2.390	2.118	2.120
0.180	0.844	0.846	2.784	2.731	2.123	2.124
0.200	0.940	0.938	2.831	2.758	2.124	2.125
0.250	1.158	1.161	2.840	2.776	2.128	2.127
0.300	1.380	1.381	2.847	2.782	2.130	2.131
0.350	1.601	1.605	2.850	2.785	2.133	2.132
0.400	1.837	1.834	2.850	2.792	2.135	2.136
0.500	2.307	2.312	2.845	2.797	2.135	2.134
0.700	2.705	2.604	2.839	2.800	2.136	2.134
1.000	2.743	2.638	2.832	2.804	2.132	2.131
2.000	2.710	2.683	2.825	2.808	2.135	2.130
3.000	2.601	2.782	2.846	2.779	2.135	2.133
4.000	2.626	2.766	2.861	2.764	2.133	2.131
5.000	2.632	2.756	2.871	2.753	2.131	2.130

See graph on following page.

GRAPH
Percentage Modulation Versus Input Voltage
for
14K0F3E



TEST: Transmitter Occupied Bandwidth 40 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),90.211(a)

MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.211(a), P = 40 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 59 dB minimum.

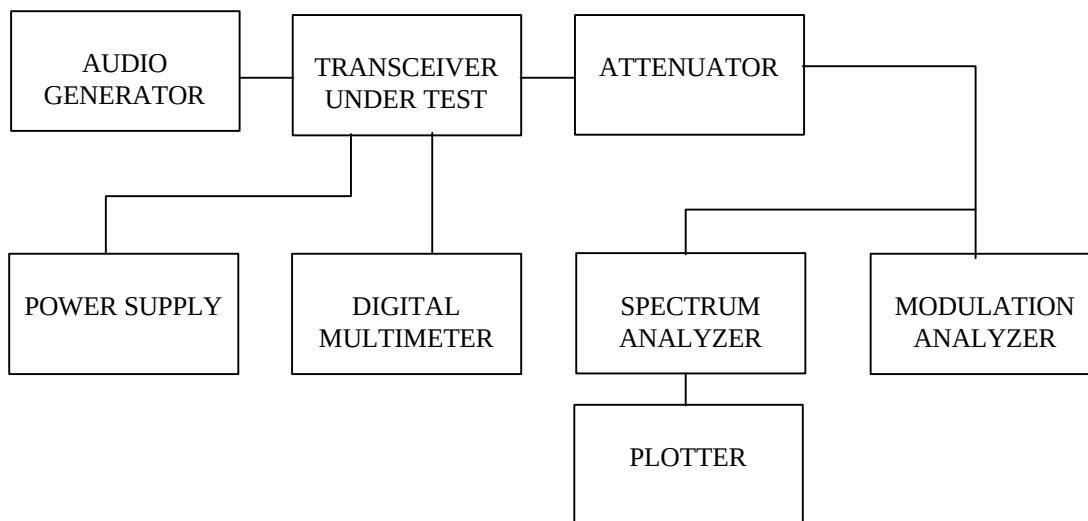
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST PROCEDURE: TIA/EIA - 603, 2.2.11

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903A
Spectrum Analyzer, Model HP8563E
Plotter, Model HP7475A

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 40 Watts (Continued)
In Support of Emission Designator 16K0F3E

NECESSARY BANDWIDTH CALCULATION

$$B_n = 2M + 2DK$$

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**.

TEST DATA: Refer to:

GRAPH: 40W16K0F3E

SPECTRUM FOR EMISSION 16K0F3E

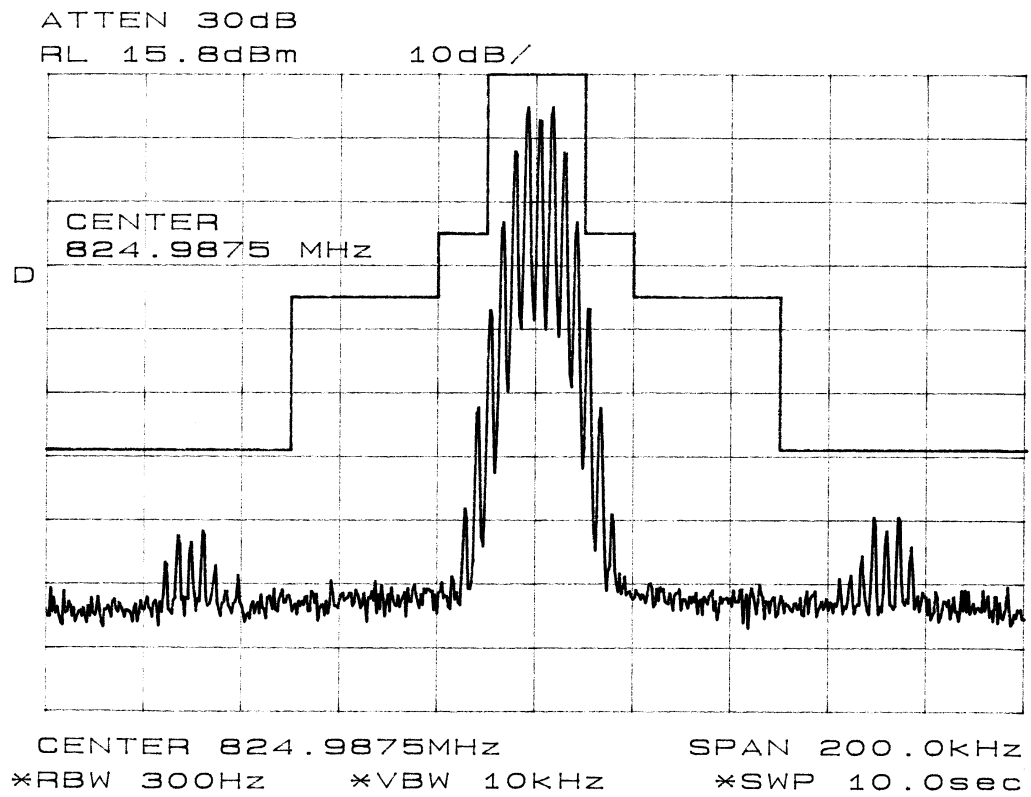
OUTPUT POWER: 40 WATTS

MODULATION: VOICE: 2.5 kHz SINE WAVE

PEAK DEVIATION ≤ 5 kHz

SPAN = 200 kHz

GRAPH



NAME OF TEST: Transmitter Occupied Bandwidth 10 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),
90.211(a)

MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 10 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 53 dB minimum.

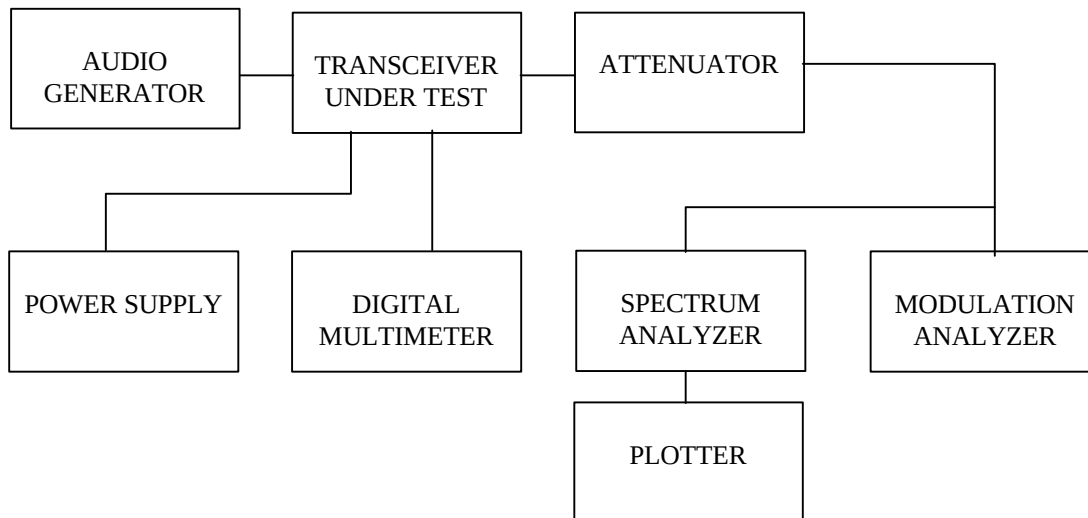
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST PROCEDURE: TIA/EIA - 603, 2.2.11

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903A
Spectrum Analyzer, Model HP8563E
Plotter, Model HP7475A

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 10 Watts (Continued)
In Support of Emission Designator 16K0F3E

NECESSARY BANDWIDTH CALCULATION

$$B_n = 2M + 2DK$$

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**.

TEST DATA: Refer to:

GRAPH: 10W16K0F3E

SPECTRUM FOR EMISSION 16K0F3E

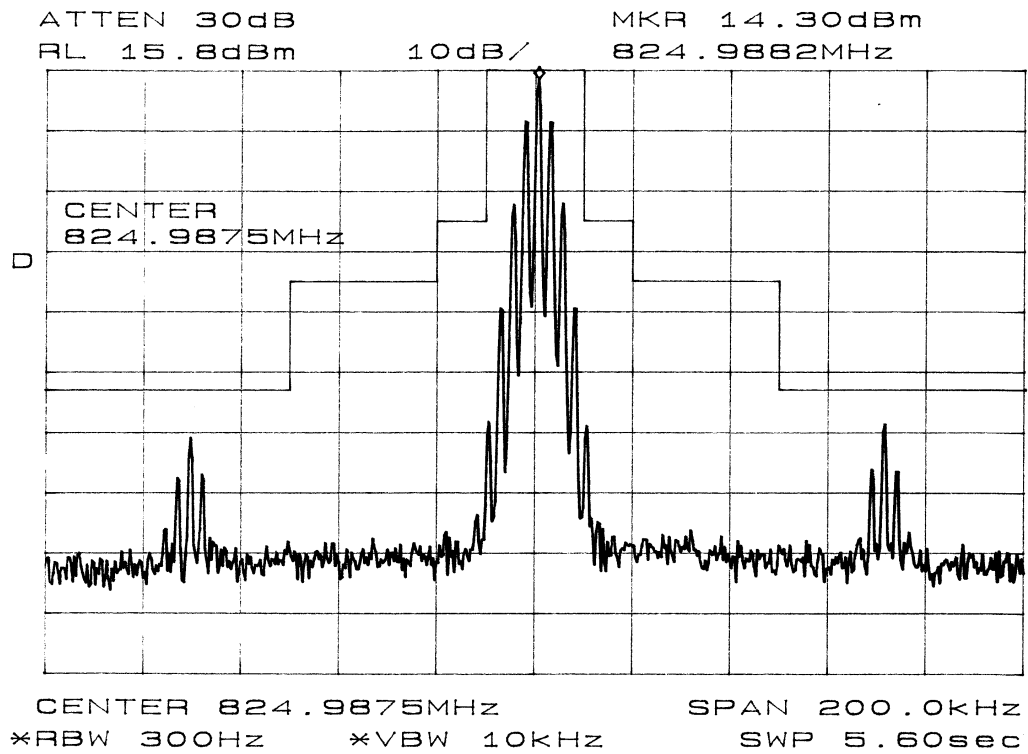
OUTPUT POWER: 10 WATTS

MODULATION: VOICE: 2.5 kHz SINE WAVE

PEAK DEVIATION ≤ 5 kHz

SPAN = 200 kHz

GRAPH



TEST: Transmitter Occupied Bandwidth 40 Watts
In Support of Emission Designator 14K0F3E

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

MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.211(a), P = 40 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 59 dB minimum.

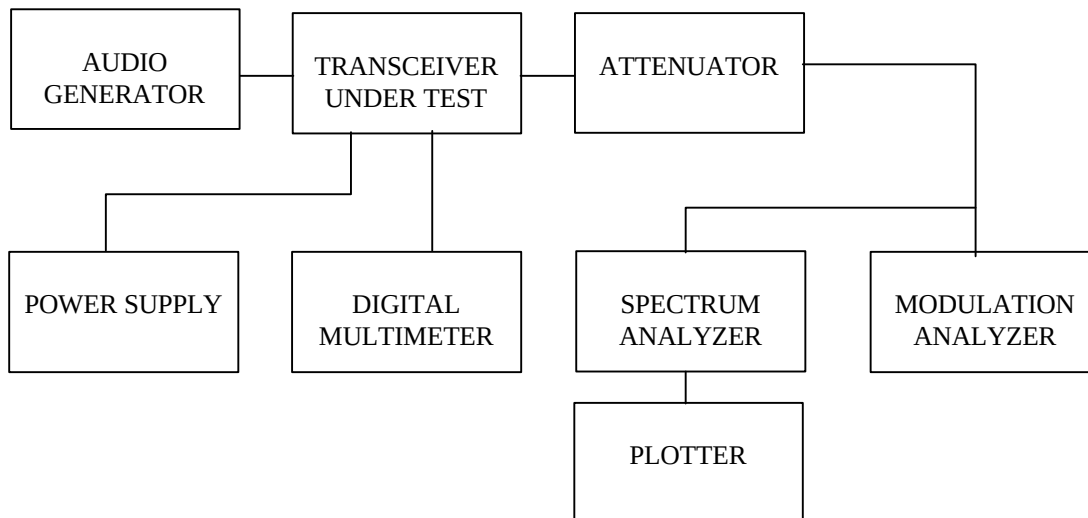
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST PROCEDURE: TIA/EIA - 603, 2.2.11

TEST CONDITIONS: Standard Test Conditions, 25 °C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903A
Spectrum Analyzer, Model HP8563E
Plotter, Model HP7475A

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 40 Watts (Continued)
In Support of Emission Designator 14K0F3E

NECESSARY BANDWIDTH CALCULATION

$$B_n = 2M + 2DK$$

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

D = 4000 Hz. This is the maximum deviation.

$$K = 1$$

$$B_n = 2(3000) + 2(4000)(1) = 14,000 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **14K0**.

TEST DATA: Refer to:

GRAPH: 40W14K0F3E

SPECTRUM FOR EMISSION 14K0F3E

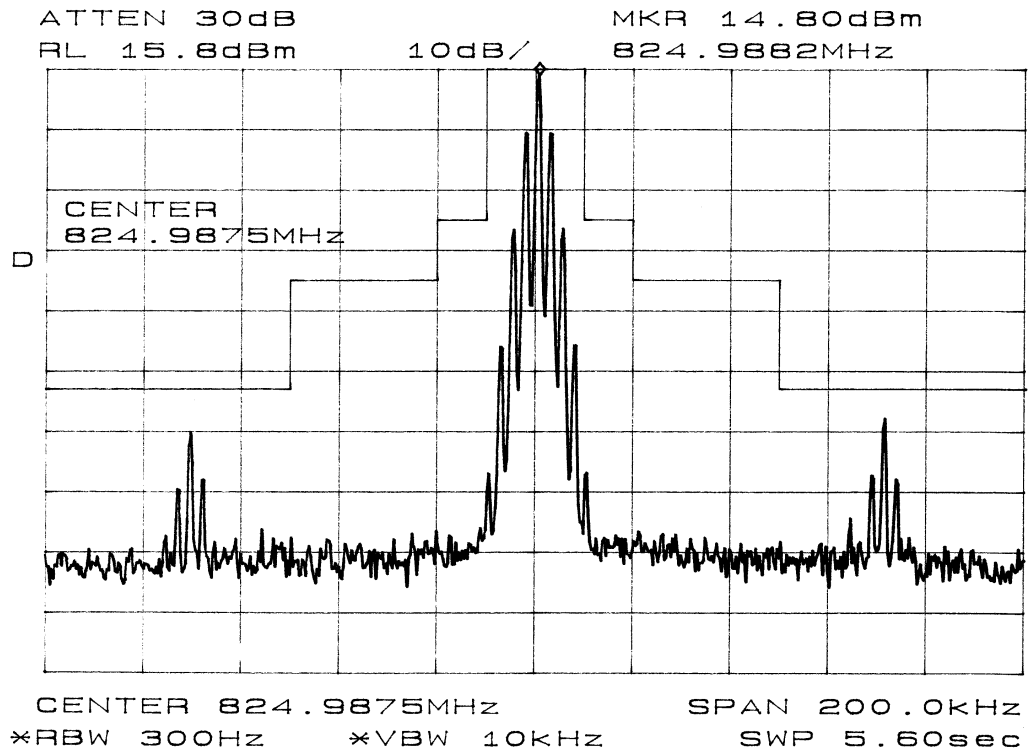
OUTPUT POWER: 40 WATTS

MODULATION: VOICE: 2.5 kHz SINE WAVE

PEAK DEVIATION ≤ 4 kHz

SPAN = 200 kHz

GRAPH



NAME OF TEST: Transmitter Occupied Bandwidth 10 Watts
In Support of Emission Designator 14K0F3E

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

MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 10 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 53 dB minimum.

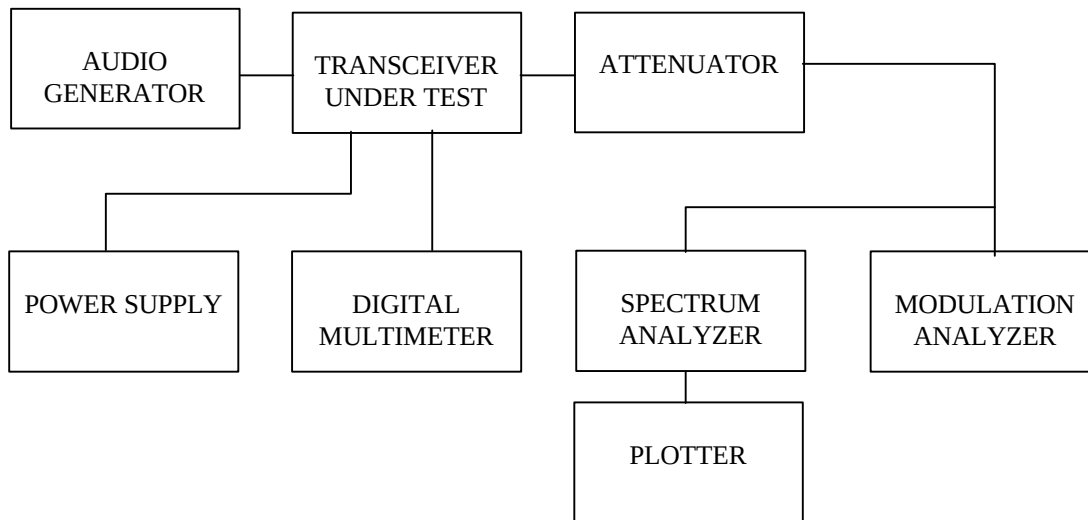
TEST RESULTS: Meets minimum standard (see data on the following pages)

TEST PROCEDURE: TIA/EIA - 603, 2.2.11

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Audio Generator, Model HP8903A
Spectrum Analyzer, Model HP8563E
Plotter, Model HP7475A

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 10 Watts (Continued)
In Support of Emission Designator 14K0F3E

NECESSARY BANDWIDTH CALCULATION

$$B_n = 2M + 2DK$$

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

D = 4000 Hz. This is the maximum deviation.

$$K = 1$$

$$B_n = 2(3000) + 2(4000)(1) = 14,000 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **14K0**.

TEST DATA: Refer to:

GRAPH: 10W14K0F3E

SPECTRUM FOR EMISSION 14K0F3E

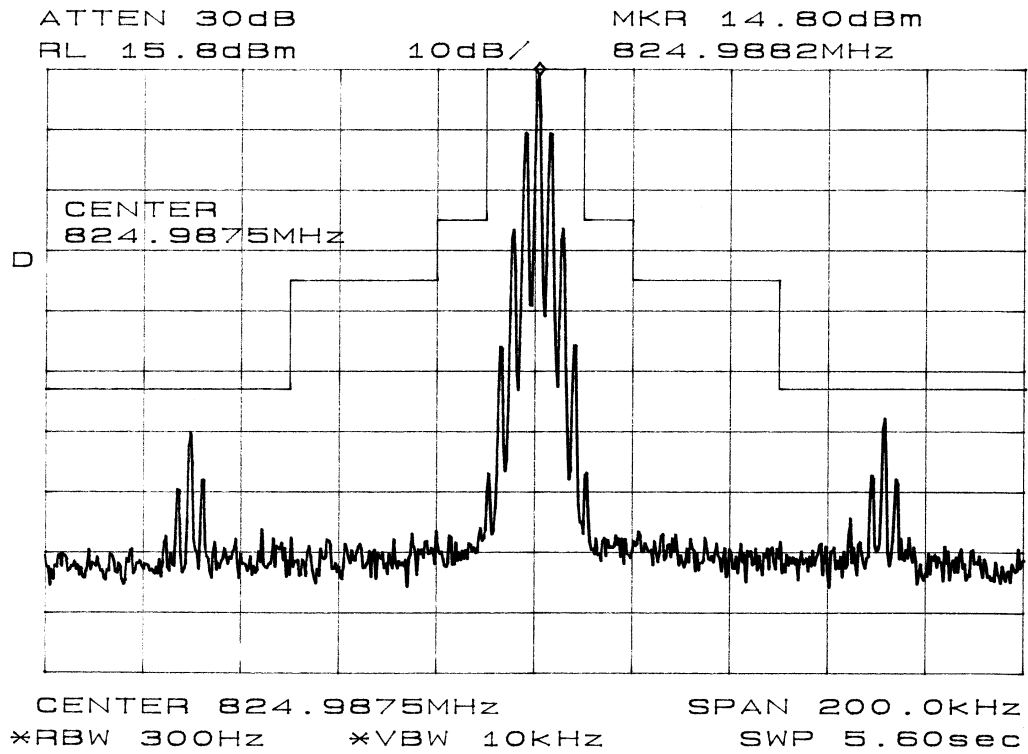
OUTPUT POWER: 10 WATTS

MODULATION: VOICE: 2.5 kHz SINE WAVE

PEAK DEVIATION ≤ 4 kHz

SPAN = 200 kHz

GRAPH



NAME OF TEST: Transmitter Occupied Bandwidth 40 Watts
Apco 25 Digital Modulation
In Support of Emission Designator 8K10F1E

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

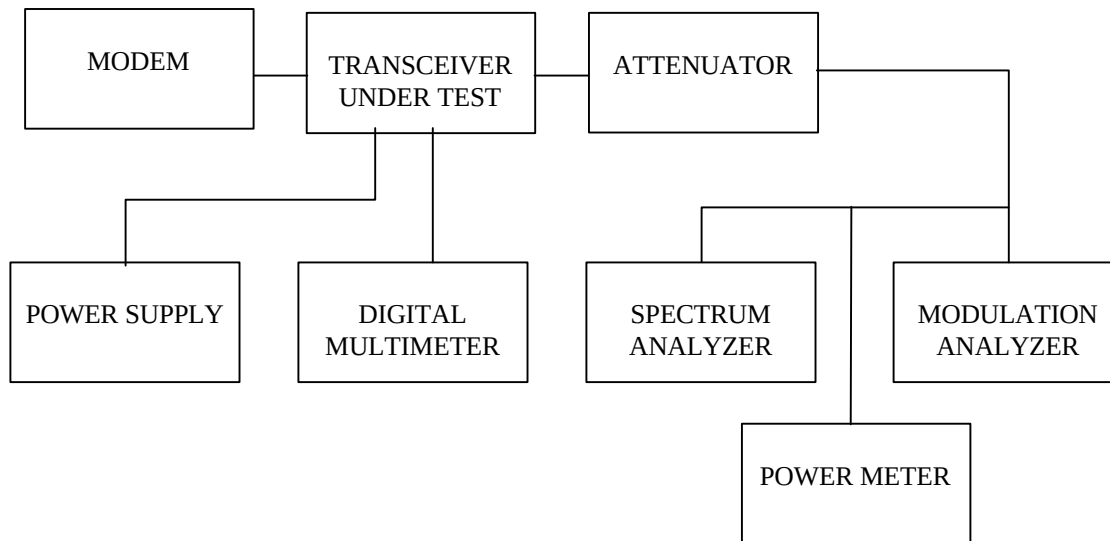
MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 40 Watts]
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
From 10 kHz to 20 kHz, down 25 dB minimum.
From 20 kHz to 50 kHz, down 35 dB minimum.
Greater than 50 kHz, down 59 dB minimum.

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

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Modulation Source, Teledesign TSI 9600 BAUD Modem DL3295
Spectrum Analyzer, Model HP8563E

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 40 Watts
Apco 25 Digital Modulation
In Support of Emission Designator 8K10F1E

NECESSARY BANDWIDTH (B_n) CALCULATION

$$B_n = 2M + 2DK$$

$$M = 2250 \text{ Hz}$$

$$D = 1800 \text{ Hz. This is the maximum deviation required.}$$

$$K = 1.0$$

$$B_n = 2(2250) + 2(1800)(1.0) = 8,100 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **8K10**.

TEST DATA: Refer to:

SPECTRUM FOR EMISSION 8K10F1E
OUTPUT POWER: 40 WATTS
BINARY DATA - C4FM
PEAK DEVIATION $\leq 5 \text{ kHz}$
SPAN = 200 kHz

GRAPH

Transmitter Occupied Bandwidth 40 Watts
Apco 25 Digital

Modulation

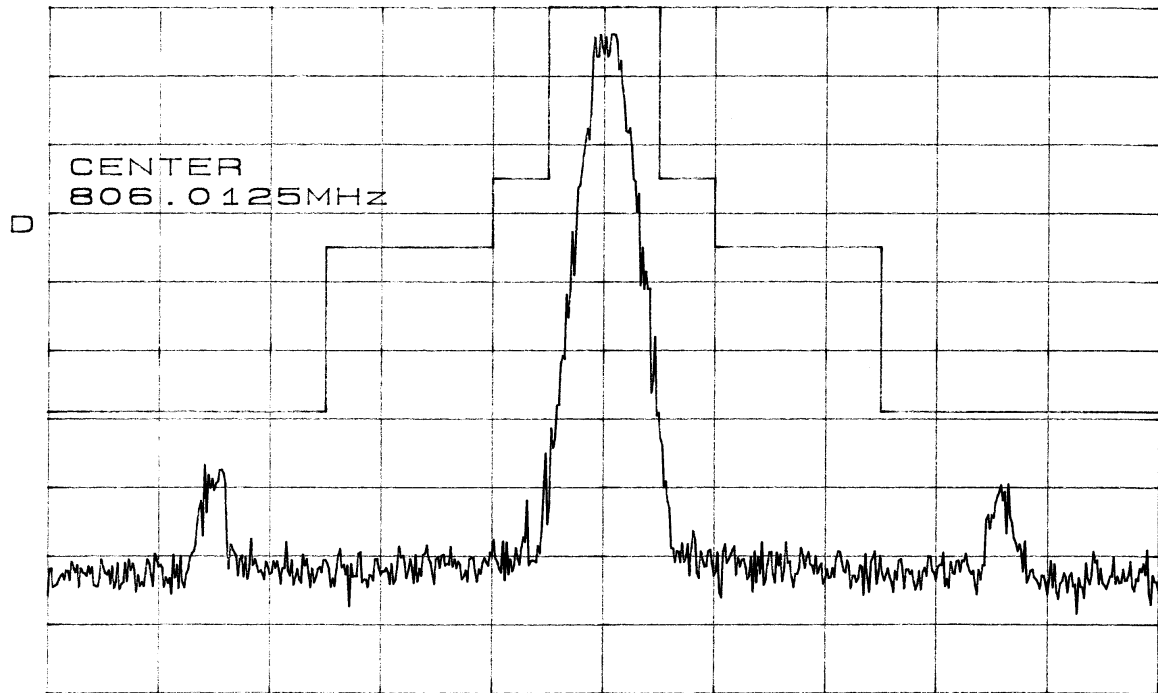
In Support of

Emission Designator 8K10F1E

*ATTEN 30dB

RL 20.0dBm

10dB/



CENTER 806.0125MHz

SPAN 200.0kHz

*RBW 300Hz

*VBW 10kHz

SWP 5.60sec

NAME OF TEST: Transmitter Occupied Bandwidth 10 Watts
Apco 25 Digital Modulation
In Support of Emission Designator 8K10F1E

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

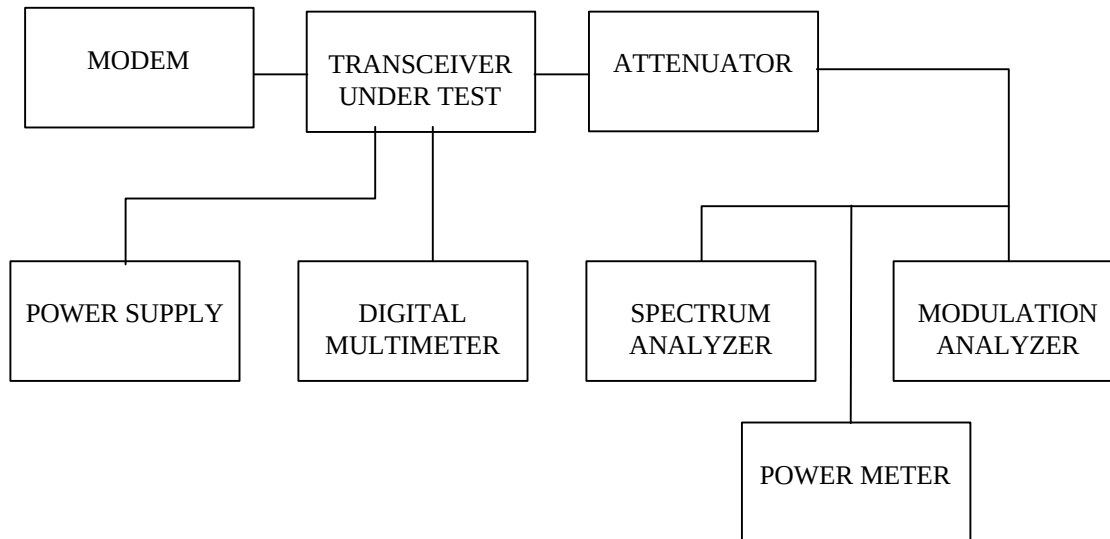
MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 40 Watts]
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
From 10 kHz to 20 kHz, down 25 dB minimum.
From 20 kHz to 50 kHz, down 35 dB minimum.
Greater than 50 kHz, down 59 dB minimum.

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

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Modulation Source, Teledesign TSI 9600 BAUD Modem DL3295
Spectrum Analyzer, Model HP8563E

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 10 Watts
Apco 25 Digital Modulation
In Support of Emission Designator 8K10F1E

NECESSARY BANDWIDTH (B_n) CALCULATION

$$B_n = 2M + 2DK$$

$$M = 2250 \text{ Hz}$$

$$D = 1800 \text{ Hz. This is the maximum deviation required.}$$

$$K = 1.0$$

$$B_n = 2(2250) + 2(1800)(1.0) = 8,100 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **8K10**.

TEST DATA: Refer to:

SPECTRUM FOR EMISSION 8K10F1E
OUTPUT POWER: 10 WATTS
BINARY DATA - C4FM
PEAK DEVIATION $\leq 5 \text{ kHz}$
SPAN = 200 kHz

GRAPH

Transmitter Occupied Bandwidth 10 Watts

Apco 25 Digital

Modulation

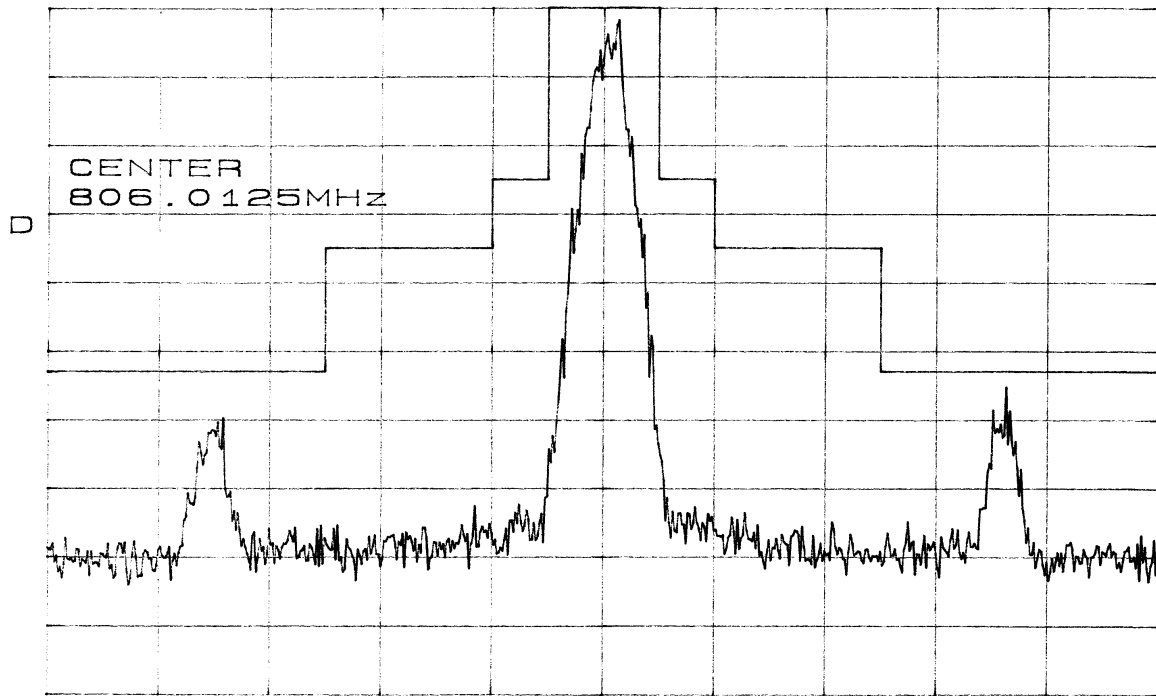
In Support of Emission Designator

8K10F1E

*ATTEN 30dB

RL 15.0dBm

10dB/



CENTER 806.0125MHz

SPAN 200.0kHz

*RBW 300Hz

*VBW 10kHz

SWP 5.60sec

NAME OF TEST: Transmitter Occupied Bandwidth 40 Watts
DES / DES-XL
In Support of Emission Designator 20K0F1E

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

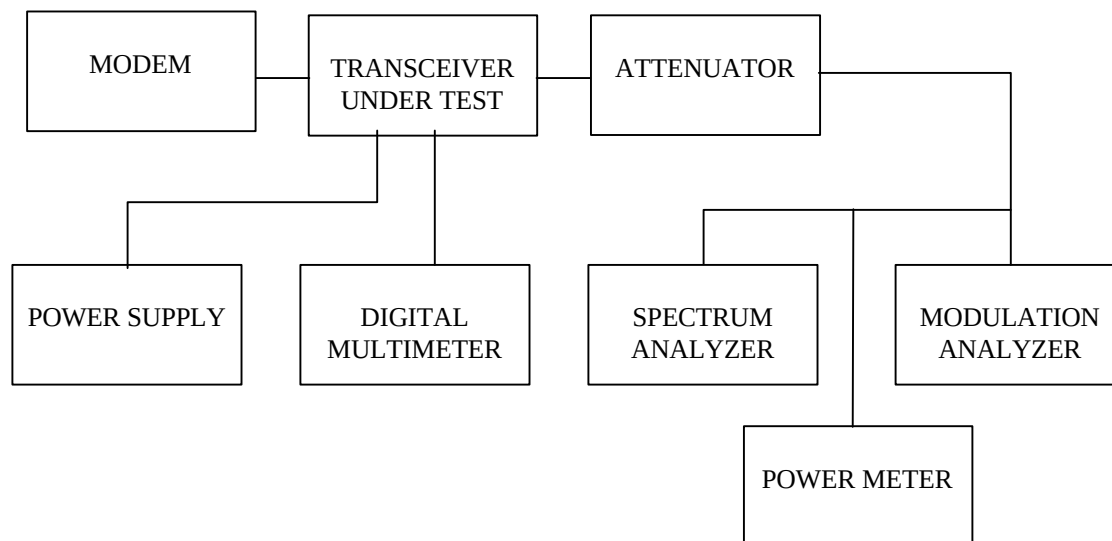
MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 40 Watts]
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
From 10 kHz to 20 kHz, down 25 dB minimum.
From 20 kHz to 50 kHz, down 35 dB minimum.
Greater than 50 kHz, down 59 dB minimum.

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

TEST CONDITIONS: Standard Test Conditions, 25 °C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Modulation Source, Teledesign TSI 9600 BAUD Modem DL3295
Spectrum Analyzer, Model HP8563E

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 40 Watts
DES / DES-XL
In Support of Emission Designator 20K0F1E

NECESSARY BANDWIDTH (B_n) CALCULATION

$$B_n = 2M + 2DK$$

$$M = 6000 \text{ Hz}$$

$$D = 4000 \text{ Hz. This is the maximum deviation required.}$$

$$K = 1.0$$

$$B_n = 2(6000) + 2(4000)(1.0) = 20,000 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **20K0**.

TEST DATA: Refer to:

SPECTRUM FOR EMISSION 20K0F1E
OUTPUT POWER: 40 WATTS
DIGITAL VOICE FSK MODULATION
PEAK DEVIATION $\leq 5 \text{ kHz}$
SPAN = 200 kHz

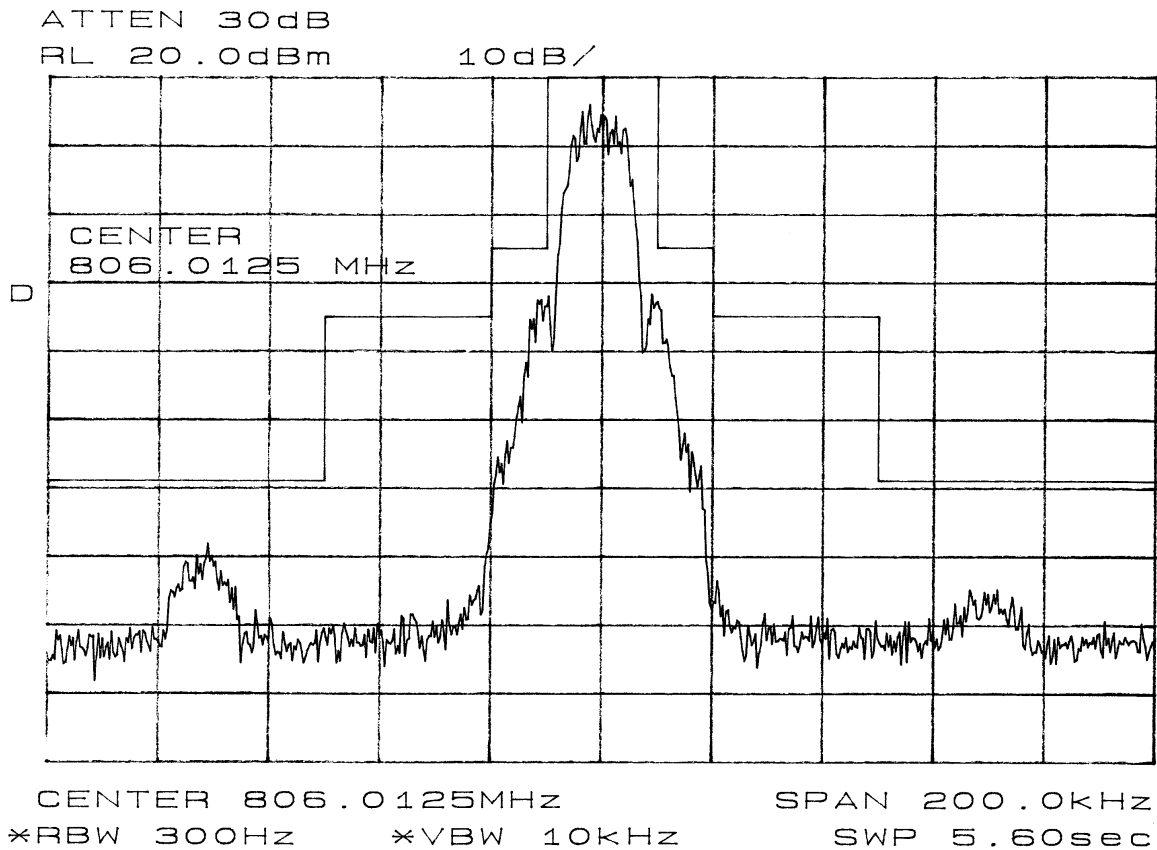
GRAPH

Transmitter Occupied Bandwidth 40 Watts

DES / DES-XL

In Support of Emission Designator

20K0F1E



NAME OF TEST: Transmitter Occupied Bandwidth 10 Watts
DES / DES-XL
In Support of Emission Designator 20K0F1E

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

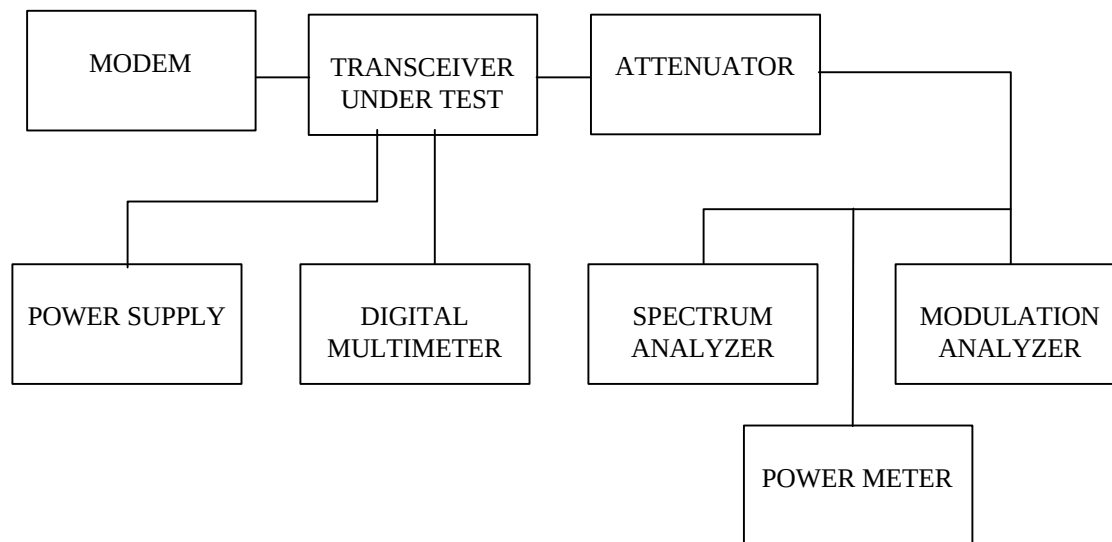
MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 40 Watts]
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
From 10 kHz to 20 kHz, down 25 dB minimum.
From 20 kHz to 50 kHz, down 35 dB minimum.
Greater than 50 kHz, down 59 dB minimum.

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

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Modulation Source, Teledesign TSI 9600 BAUD Modem DL3295
Spectrum Analyzer, Model HP8563E

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 10 Watts
DES / DES-XL
In Support of Emission Designator 20K0F1E

NECESSARY BANDWIDTH (B_n) CALCULATION

$$B_n = 2M + 2DK$$

$$M = 6000 \text{ Hz}$$

$$D = 4000 \text{ Hz. This is the maximum deviation required.}$$

$$K = 1.0$$

$$B_n = 2(6000) + 2(4000)(1.0) = 20,000 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **20K0**.

TEST DATA: Refer to:

SPECTRUM FOR EMISSION 20K0F1E
OUTPUT POWER: 10 WATTS
DIGITAL VOICE FSK MODULATION
PEAK DEVIATION $\leq 5 \text{ kHz}$
SPAN = 200 kHz

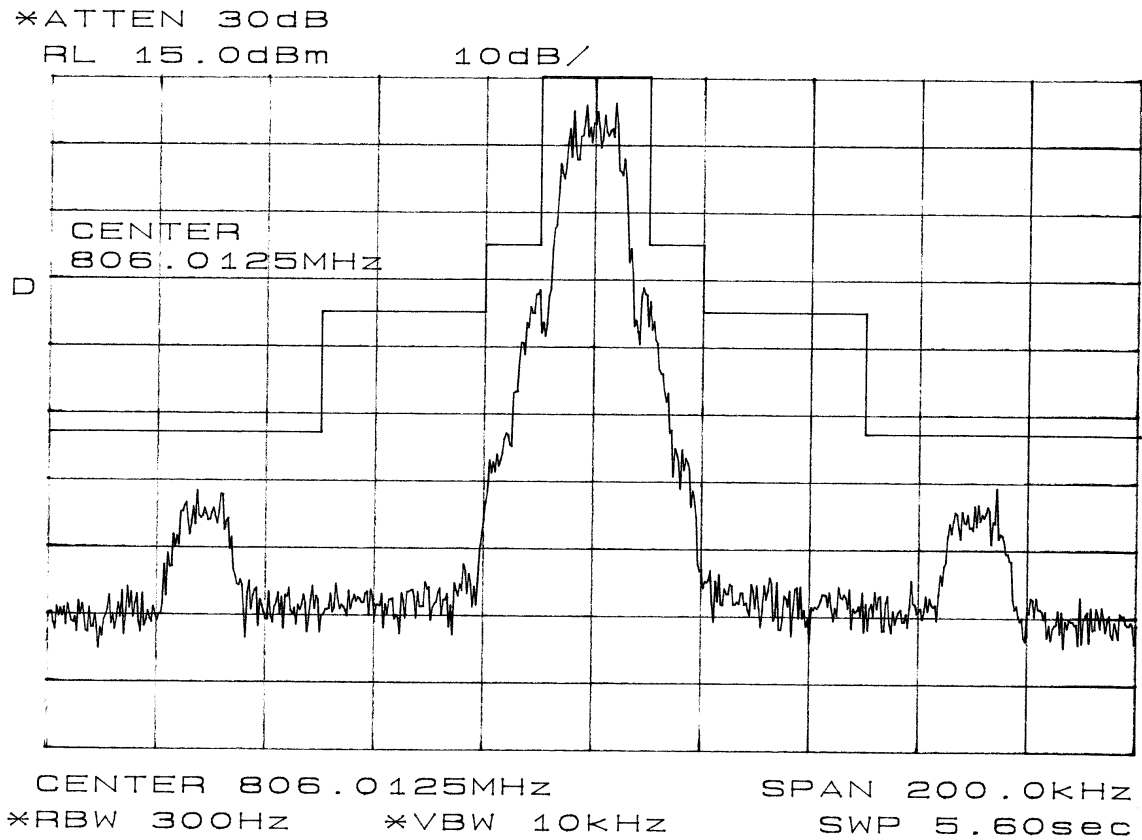
GRAPH

Transmitter Occupied Bandwidth 10 Watts

DES / DES-XL

In Support of Emission Designator

20K0F1E



NAME OF TEST: Transmitter Occupied Bandwidth 40 Watts
DES / DES-XL
In Support of Emission Designator 18K8F1E

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

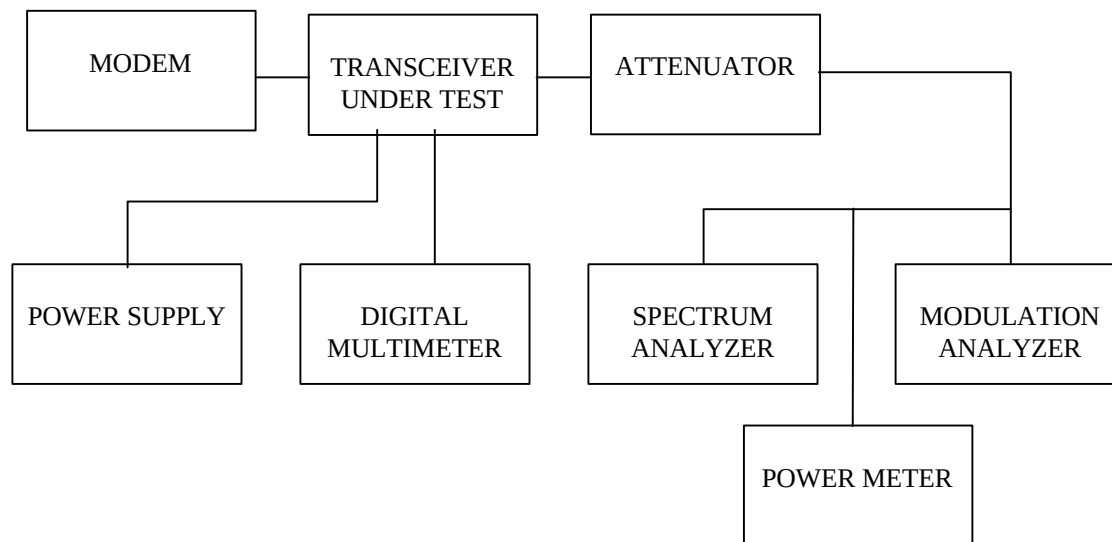
MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 40 Watts]
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
From 10 kHz to 20 kHz, down 25 dB minimum.
From 20 kHz to 50 kHz, down 35 dB minimum.
Greater than 50 kHz, down 59 dB minimum.

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

TEST CONDITIONS: Standard Test Conditions, 25C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Modulation Source, Teledesign TSI 9600 BAUD Modem DL3295
Spectrum Analyzer, Model HP8563E

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 40 Watts
DES / DES-XL
In Support of Emission Designator 18K8F1E

NECESSARY BANDWIDTH (B_n) CALCULATION

$$B_n = 2M + 2DK$$

$$M = 6000 \text{ Hz}$$

$$D = 3400 \text{ Hz. This is the maximum deviation required.}$$

$$K = 1.0$$

$$B_n = 2(6000) + 2(3400)(1.0) = 18,800 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **18K8**.

TEST DATA: Refer to:

SPECTRUM FOR EMISSION 18K8F1E
OUTPUT POWER: 40 WATTS
DIGITAL VOICE FSK MODULATION
PEAK DEVIATION $\leq 5 \text{ kHz}$
SPAN = 200 kHz

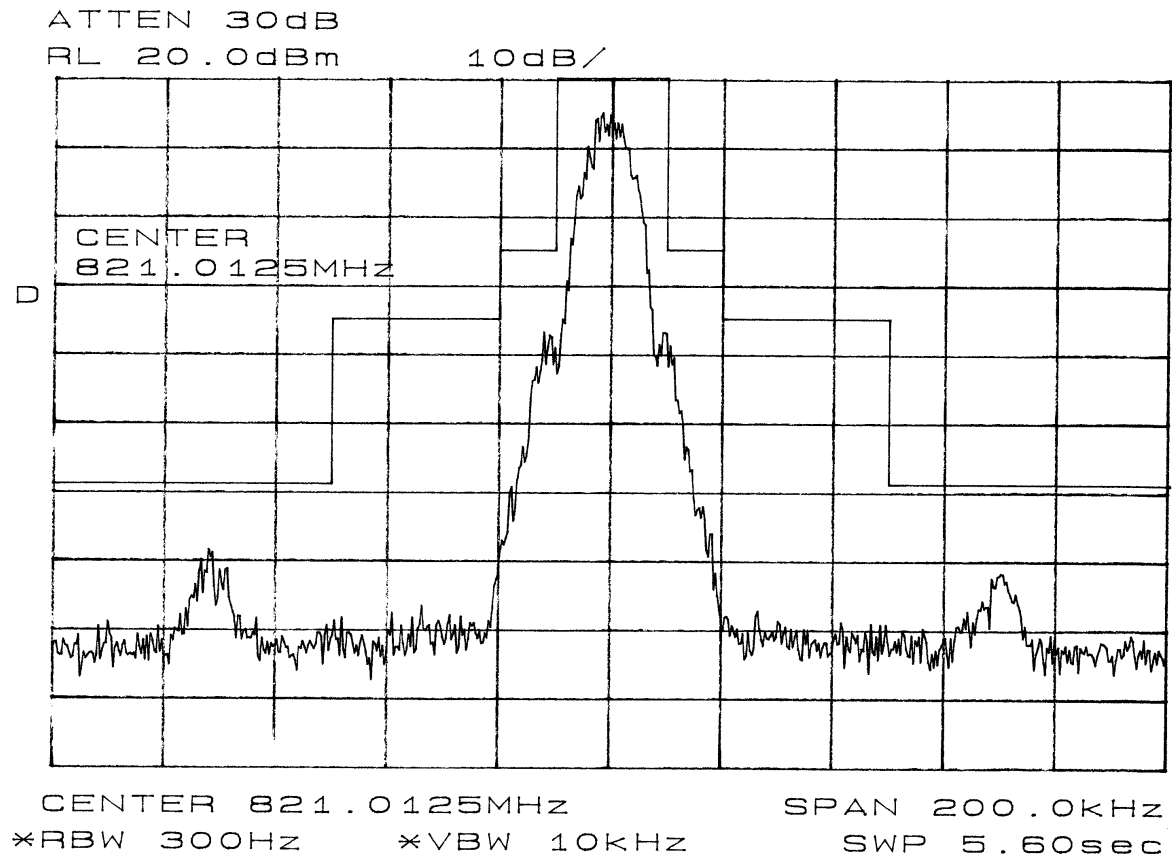
GRAPH

Transmitter Occupied Bandwidth 40 Watts

DES / DES-XL

In Support of Emission Designator

18K8F1E



NAME OF TEST: Transmitter Occupied Bandwidth 10 Watts
DES / DES-XL
In Support of Emission Designator 18K8F1E

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

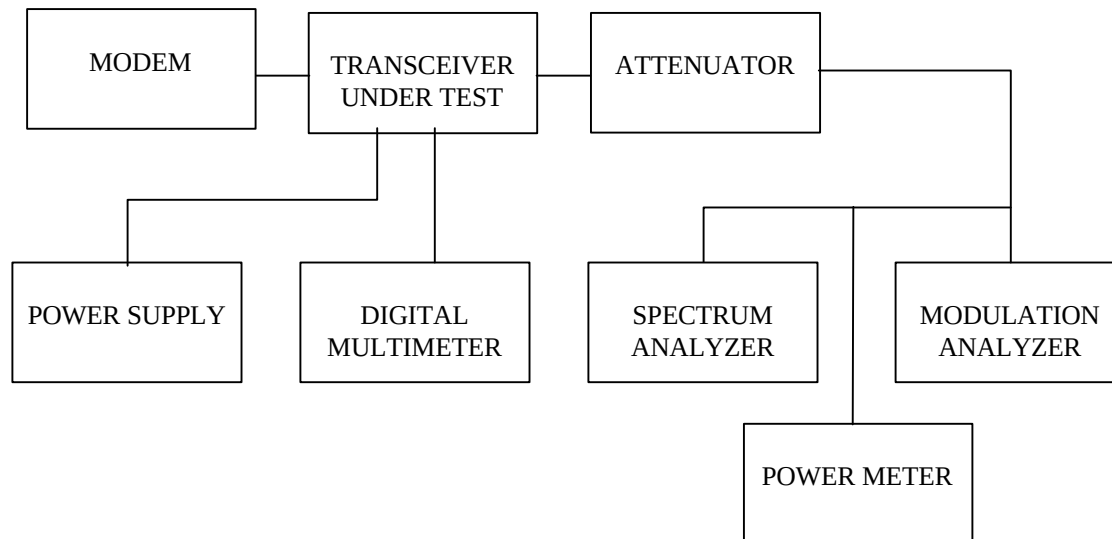
MINIMUM STANDARD: Mask B
Sidebands and Spurious [Rule 90.210 (b), P = 40 Watts]
Authorized Bandwidth = 20 kHz [Rule 90.209(b) (5)]
From 10 kHz to 20 kHz, down 25 dB minimum.
From 20 kHz to 50 kHz, down 35 dB minimum.
Greater than 50 kHz, down 59 dB minimum.

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

TEST CONDITIONS: Standard Test Conditions, 25 °C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 20 dB, 250 Watt
Power Supply, HP6434B
Modulation Analyzer, Model HP8901A
Digital Voltmeter, Fluke Model 8012A
Modulation Source, Teledesign TSI 9600 BAUD Modem DL3295
Spectrum Analyzer, Model HP8563E

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Occupied Bandwidth 10 Watts
DES / DES-XL
In Support of Emission Designator 18K8F1E

NECESSARY BANDWIDTH (B_n) CALCULATION

$$B_n = 2M + 2DK$$

$$M = 6000 \text{ Hz}$$

$$D = 3400 \text{ Hz. This is the maximum deviation required.}$$

$$K = 1.0$$

$$B_n = 2(6000) + 2(3400)(1.0) = 18,800 \text{ Hz.}$$

The corresponding emission designator prefix for necessary bandwidth = **18K8**.

TEST DATA: Refer to:

SPECTRUM FOR EMISSION 18K8F1E
OUTPUT POWER: 10 WATTS
DIGITAL VOICE FSK MODULATION
PEAK DEVIATION $\leq 5 \text{ kHz}$
SPAN = 200 kHz

GRAPH

Transmitter Occupied Bandwidth 10 Watts

DES / DES-XL

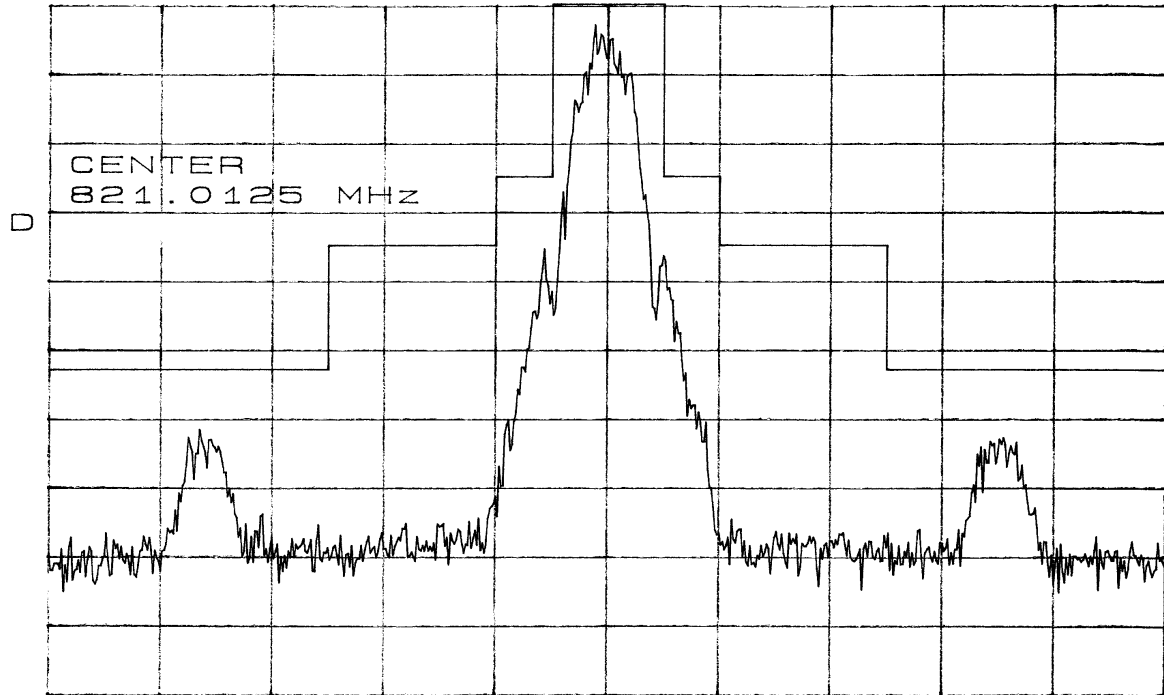
In Support of Emission Designator

18K8F1E

*ATTEN 30dB

RL 15.0dBm

10dB/



NAME OF TEST: Transmitter Spurious and Harmonic Outputs 10/40 Watts

RULE PART NUMBER: 2.991, 90.210 (d)(3)

MINIMUM STANDARD: At 10 Watt level; $43 + 10\log_{10}(10\text{Watts}) = -53.0 \text{ dBc}$
At 40 Watt level; $43 + 10\log_{10}(40\text{Watts}) = -59.0 \text{ dBc}$

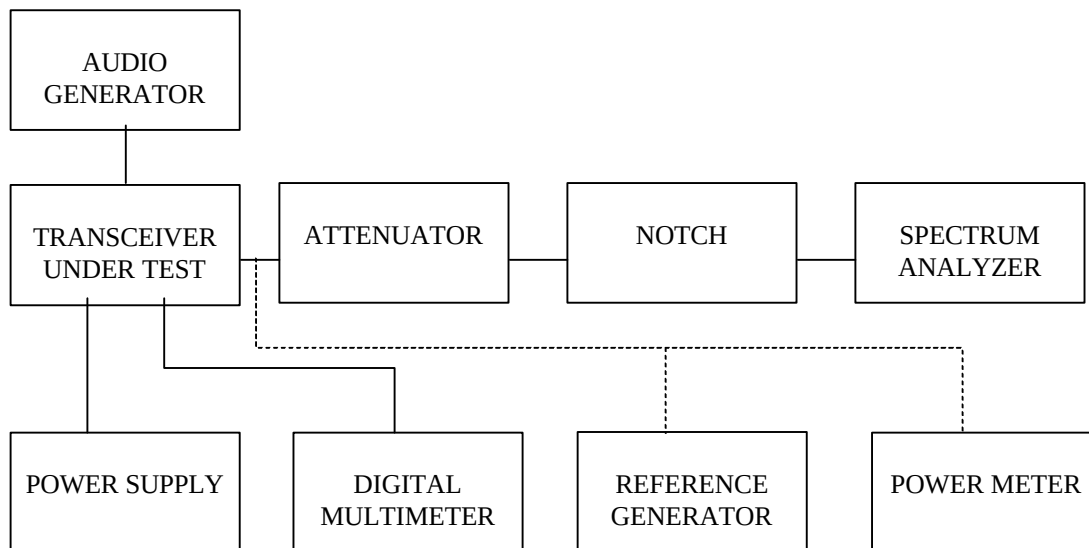
TEST RESULTS: Meets minimum standard (see data on the following page)

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

TEST PROCEDURE: TIA/EIA - 603, 2.2.13

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 58-30-43, 30 dB, 250 Watt
Power Supply, HP6434B
Audio Generator, Model HP8903A
Digital Voltmeter, Fluke Model 8012A
Reference Generator, Model HP83732A
Spectrum Analyzer, Model HP8563E
Power Meter, Model HP436A

TEST SET-UP:



TEST SET-UP

NAME OF TEST: Transmitter Spurious and Harmonic Outputs 10/40 Watts
(Continued)

MEASUREMENT PROCEDURE:

1. The transmitter carrier output frequency is 815.000 MHz.
The reference oscillator frequency is 17.500 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:

$F_o = 815.000$ MHz

10 Watts Transmitter Spurious and Harmonics

10 Watts = 40.0 dBm

<u>Frequency</u> (MHz)	<u>Relation</u>	<u>SA Level</u> (dBm)	<u>Gen. Sub.</u> <u>Level (dBm)</u>	<u>Level Relative to Carrier (dBc)</u>
1630	2 F_o	-59.00	-36.8	-76.8
2445	3 F_o	-78.33	-57.0	-97.0
3260	4 F_o	-67.17	-39.8	-79.8
4075	5 F_o	-81.83	-48.0	-88.0
4890	6 F_o	-84.50	-48.0	-88.0

40 Watts Transmitter Spurious and Harmonics

40 Watts = 46.0 dBm

<u>Frequency</u> (MHz)	<u>Relation</u>	<u>SA Level</u> (dBm)	<u>Gen. Sub.</u> <u>Level (dBm)</u>	<u>Level Relative to Carrier (dBc)</u>
1630	2 F_o	-57.50	-35.2	-81.2
2445	3 F_o	-71.50	-50.0	-96.0
3260	4 F_o	-79.50	-52.0	-98.0
4075	5 F_o	-83.17	-49.0	-95.0
4890	6 F_o	-87.17	-51.0	-97.0
5705	7 F_o	Below -105		
6520	8 F_o	-94.17	-48.0	-94.0
7335	9 F_o	-95.00	-48.0	-94.0

NAME OF TEST: Field Strength of Spurious Radiation
(10 / 40 Watts)

RULE PART NUMBER: 2.993, 90.210 (d)(3)

MINIMUM STANDARD: For 10 Watts; $43 + 10 \log_{10}(10 \text{ Watts}) = -53.0 \text{ dBc}$
For 40 Watts; $43 + 10 \log_{10}(40 \text{ Watts}) = -59.0 \text{ dBc}$

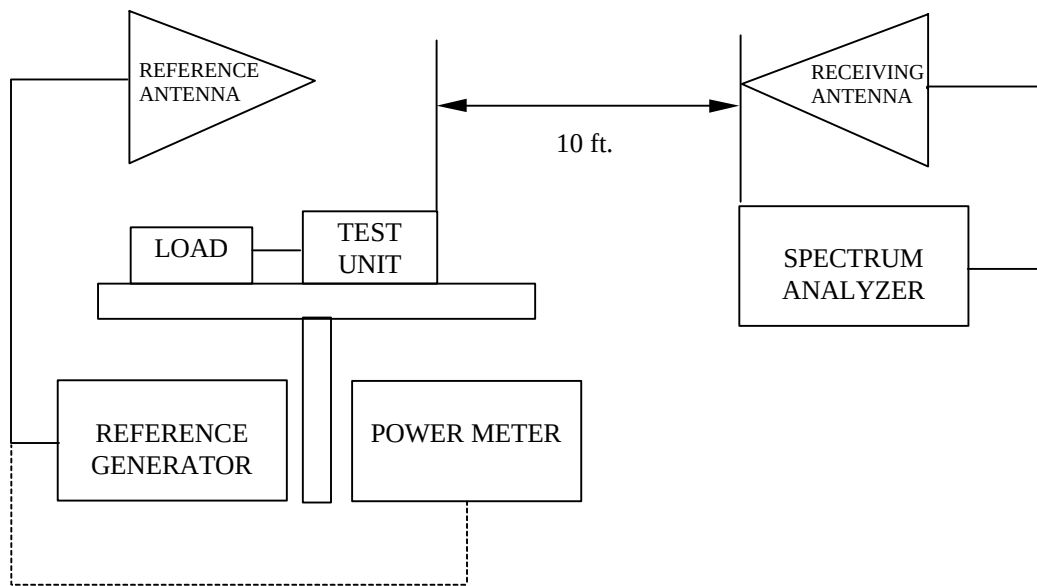
TEST RESULTS: Meets minimum standard (see data on the following page)

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
Chase Bilog, Model CBL6111B
Reference Generator, Model HP83732A
Spectrum Analyzer, Model HP8563E
Power Meter, Model HP436A
Load, Lucas Weinschel, Model 58-30-43, 30 dB, 250 Watt
Power Supply, HP6434B

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 10 and 40 Watts
(Continued)
Raw Spurious Data

Carrier Frequency = 815.000 MHz

Power Output = 10.0 Watts = 40 dBm

Freq. (MHz)	Pol.	S.A. max (dBm)	Gen. (dBm)	PWR @ Dple (dBm)	Ant Fctr (dB)	Polarity Fctr (dB)	Rad. Sp. Attn. (dBc)
1630	H	-52.67	-10.0	-16.5	1.2	-3	-58.3
1630	V	-56.33	-6.5	-12.5	1.2	-3	-54.3
2445	H	-78.83	-30.0	-37.8	1.2	-3	-79.6
2445	V	-74.33	-21.0	-28.8	1.2	-3	-70.6
3260	H	-67.17	-5.5	-14.3	1.2	-3	-56.1
3260	V	-68.50	-15.0	-24.0	1.2	-3	-65.8
4075	H	-79.67	-14.0	-25.3	1.2	-3	-67.1
4075	V	-77.50	-18.5	-30.0	1.2	-3	-71.8
4890	H	-87.17	-25.0	-36.7	1.2	-3	-78.5
4890	V	-85.33	-22.0	-34.8	1.2	-3	-76.6
5705	H	-91.33	-27.0	-40.0	1.2	-3	-81.8
5705	V	-88.00	-18.0	-31.0	1.2	-3	-72.8
6520	H	-95.17	-28.0	-43.0	1.2	-3	-84.8
6520	V	-96.17	-30.0	-45.2	1.2	-3	-87.0

V = Vertical Polarization
H = Horizontal Polarization

FCC Rad. Spurious Atten. Limit = -53 dBc

Power Output = 40.0 Watts = 46 dBm

Freq. (MHz)	Pol.	S.A. Max (dBm)	Gen. (dBm)	PWR @ Dple (dBm)	Ant Fctr (dB)	Polarity Fctr (dB)	Rad. Sp. Attn. (dBc)
1630	H	-52.00	-9.2	-15.5	1.2	-3	-63.3
1630	V	-53.83	-6.5	-12.8	1.2	-3	-60.6
2445	H	-74.50	-27.0	-34.3	1.2	-3	-82.1
2445	V	-66.83	-13.5	-20.8	1.2	-3	-68.6
3260	H	-69.50	-11.2	-19.8	1.2	-3	-67.6
3260	V	-68.33	-14.5	-23.2	1.2	-3	-67.0
4075	H	-78.67	-15.5	-26.0	1.2	-3	-73.8
4075	V	-80.50	-23.0	-33.5	1.2	-3	-81.3
4890	H	-82.33	-19.0	-30.5	1.2	-3	-78.3
4890	V	-77.17	-17.5	-29.0	1.2	-3	-76.8
5705	H	-91.17	-26.0	-38.3	1.2	-3	-86.1
5705	V	-91.67	-27.0	-39.3	1.2	-3	-87.1
6520	H	-96.50	-32.0	-46.5	1.2	-3	-94.3
6520	V	-95.50	-27.0	-41.5	1.2	-3	-89.3

V = Vertical Polarization
H = Horizontal Polarization

FCC Rad. Spurious Atten. Limit = -59 dBc

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 4075 MHz, 40 Watts and horizontal polarization.

R - Reference Generator (dBm) -26.0

A - Antenna Gain (dB) +1.2

P - Polarization Correction Factor (dB) -3.0

R' - Corrected Reference (dBm)

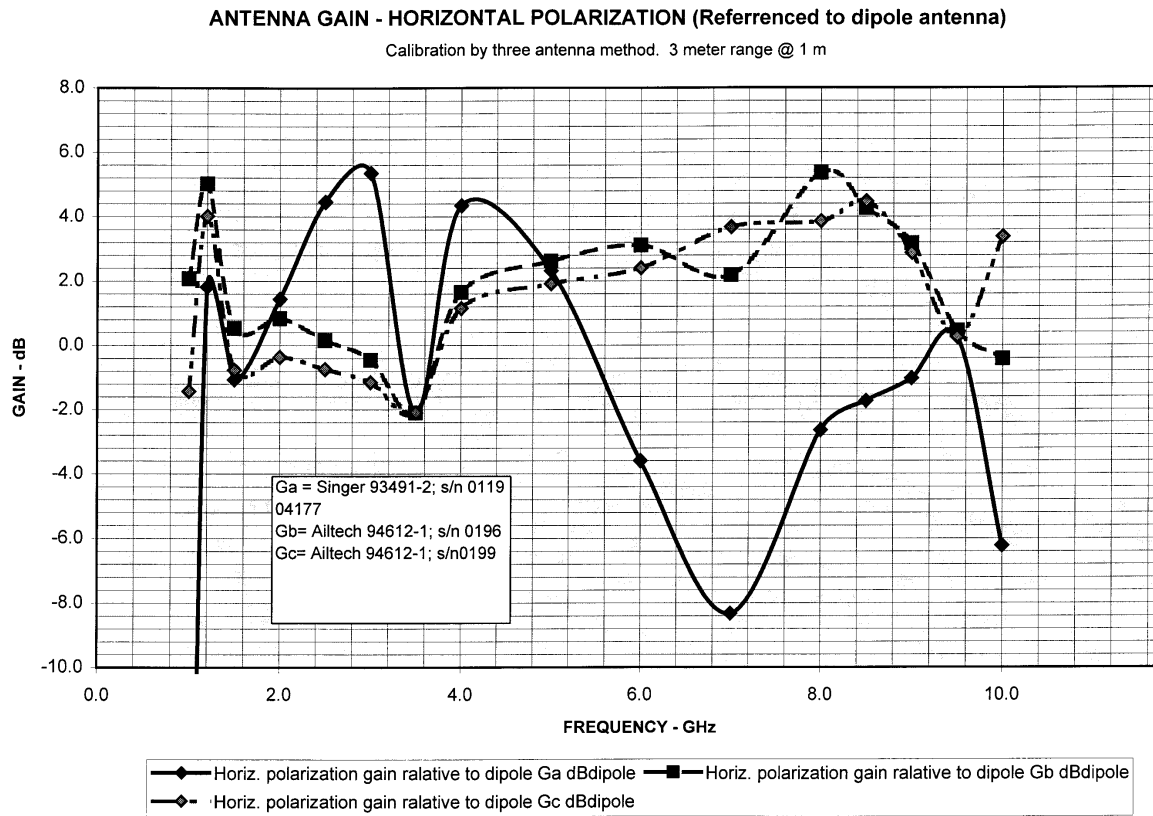
$$R' = R + A - P = -26.0 + 1.2 - 3.0 = -27.8 \text{ dBm}$$

Po - Radiated Carrier Power (dBm)

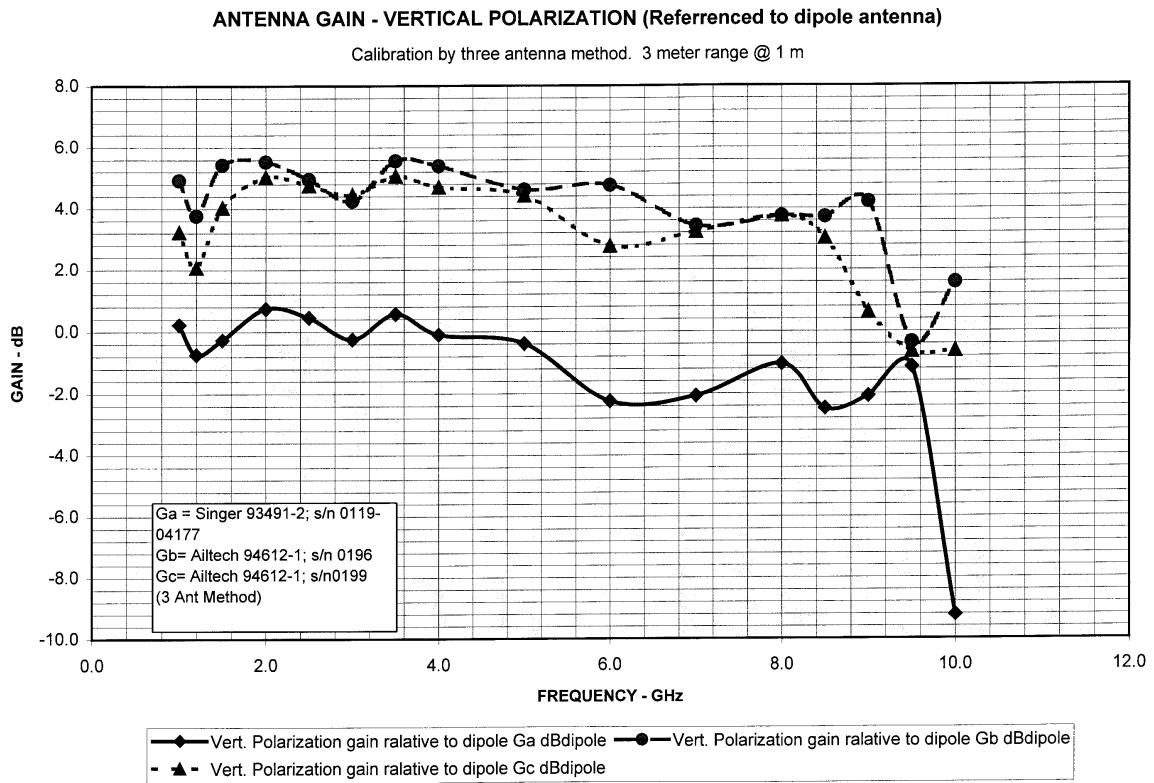
$$40 \text{ Watts} = 46 \text{ dBm}$$

$$\text{Radiated Spurious Emission (dBc)} = P_o - R' = -27.8 - (+46) = -73.8 \text{ dBc}$$

Antenna Gain – Horizontal



Antenna Gain – Vertical



NAME OF TEST: Frequency Stability with Variation in Ambient Temperature

RULE PART NUMBER: 2.1.55 subpart J, 90.213

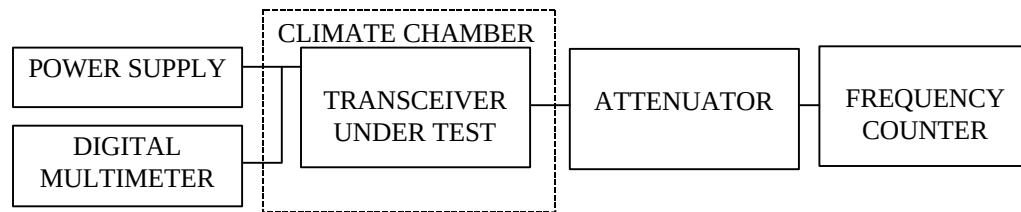
MINIMUM STANDARD: Shall not exceed $\pm 0.000150\%$ from test frequency, 1.50 ppm

TEST RESULTS: Meets minimum standard, see data below.

TEST CONDITIONS: Standard Test Conditions, 25C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 40-30-33, 30 dB, 150 Watt
Power Supply, HP6264B
Frequency Counter, Fluke Model 7220A
Digital Voltmeter, Fluke Model 8012A
Thermometer, Tenny Engineering.
Climate Chamber, Tenny Engineering.

TEST SET-UP:



TEST SET-UP

MEASUREMENTS TAKEN:

1.50 ppm Reference Oscillator

Channel Frequency: 824.9875 MHz
Tolerance Requirements: 0.000150 %

Temperature (C)	Frequency (MHz)	DELTA FREQ. (% of assigned freq.)	SPEC LIMIT (% of assigned frequency)	ppm from assigned frequency
-30	824.98826	0.0000921	< 0.00015	0.921
-20	824.98813	0.0000764	< 0.00015	0.764
-10	824.98806	0.0000679	< 0.00015	0.679
0	824.98773	0.0000279	< 0.00015	0.279
10	824.98767	0.0000206	< 0.00015	0.206
20	824.98754	0.0000048	< 0.00015	0.048
30	824.98744	-0.0000063	< 0.00015	-0.063
40	824.98755	0.0000061	< 0.00015	0.061
50	824.98729	-0.0000255	< 0.00015	-0.255

Name of test: Transient Frequency Behavior

Rule part number: 2.1055 (b) Subpart J. CFR 90.214
TIA/EIA- 603 2.2.19

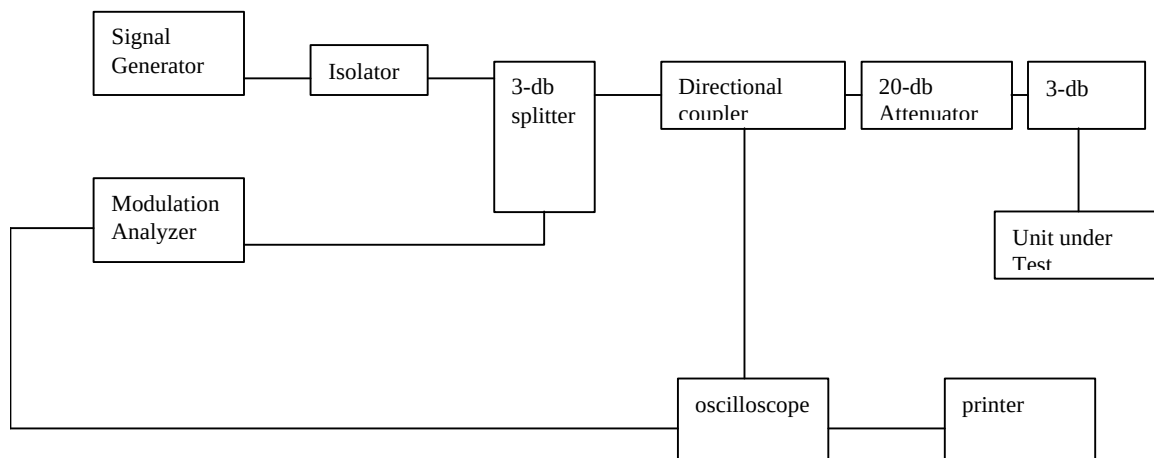
Minimum Standard: This is a measurement of the difference as a function in time, of the actual transmitter Frequency to the assigned transmitter Frequency when the transmitted RF output power is switched on or off.

Test results: meets the minimum standards (see data of the following pages).

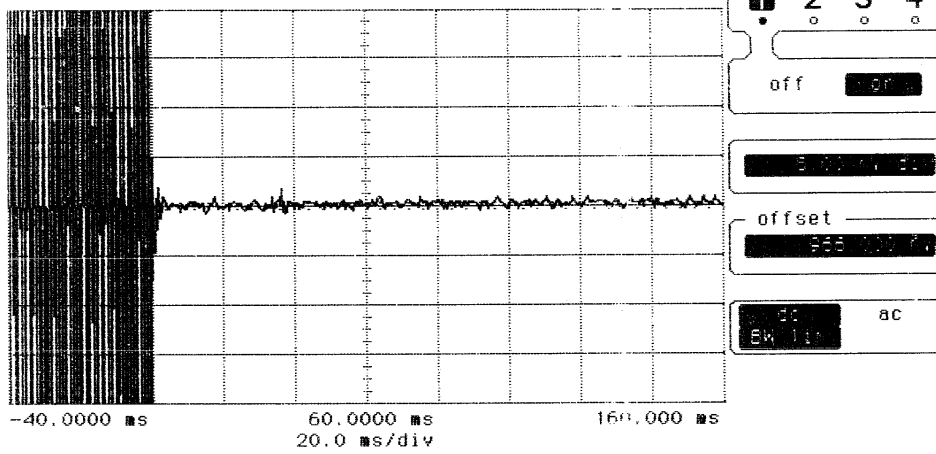
Test conditions: -30 to +50 °c.

Test equipment: Attenuator, lucas wienschel, 30 db model # 40-30-33 150 watts
Attenuator, lucas weinschel, 3 db # 1
Power supply HP6264B
Modulation Analyzer hp 8901
Digital Oscilloscope HP 5450A
RF Signal Generator HP 8644B
Splitter Anazac H-8-4.
Isolator MWA#8008.

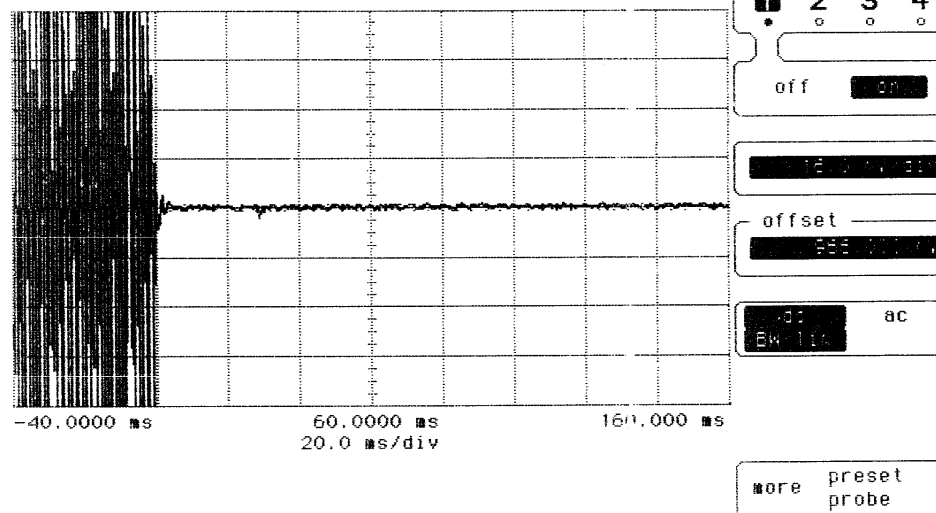
Test set-up:



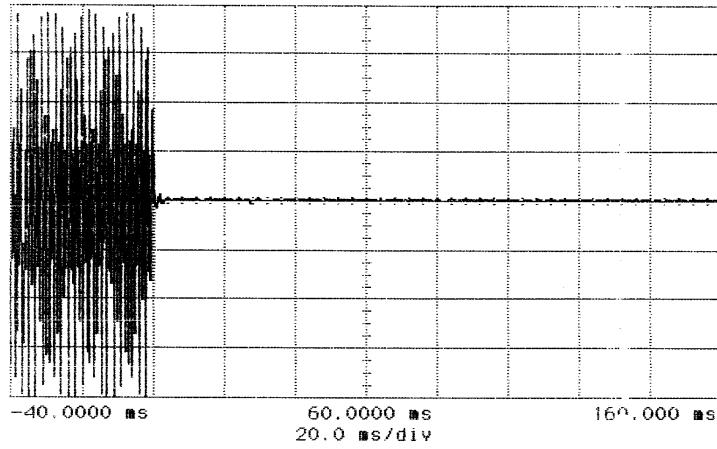
hp awaiting trigger



hp awaiting trigger



hp awaiting trigger



CHANNEL

1 2 3 4

off

offset

dc ac

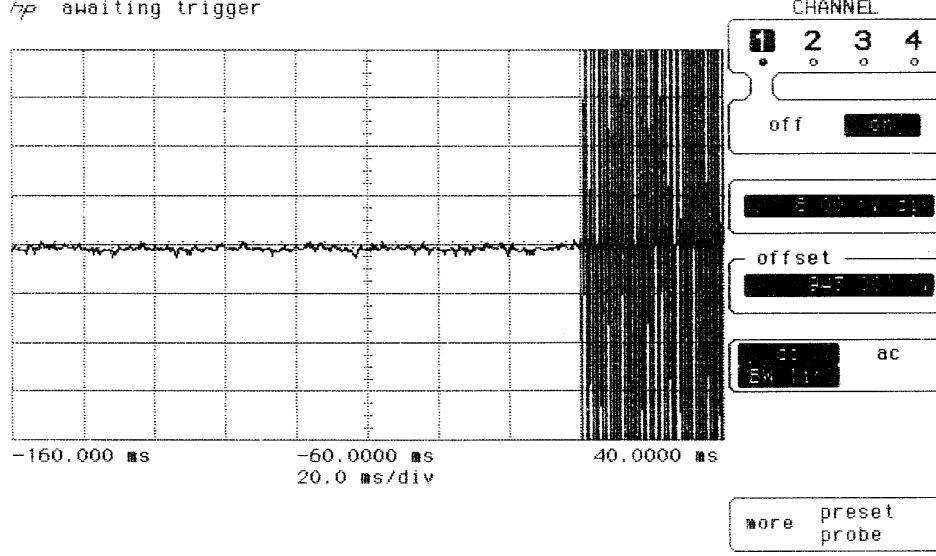
EW 11M

more preset probe

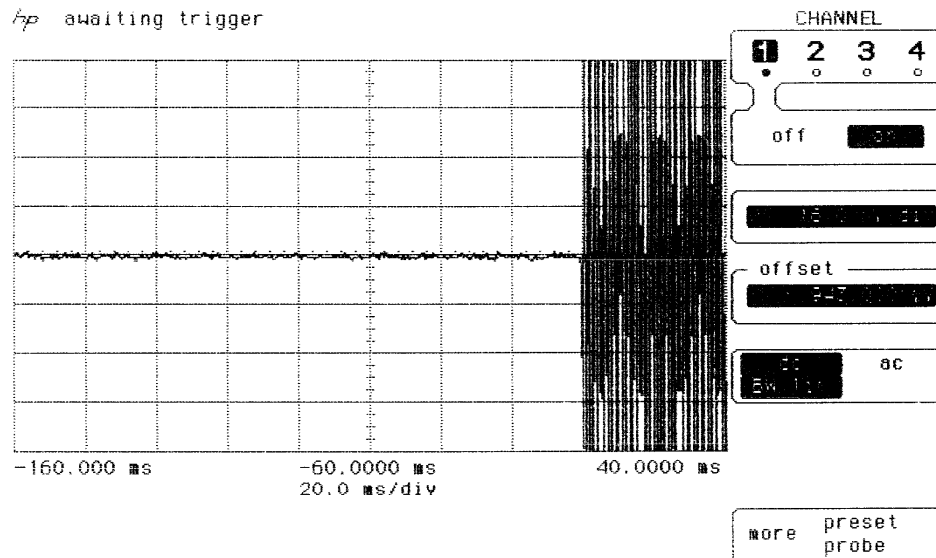
40 Watts
806.9875 MHz
25 KHz
+50 °C

40 Watts
824.9875Mhz
6.25KHz
+50 °C

hp awaiting trigger

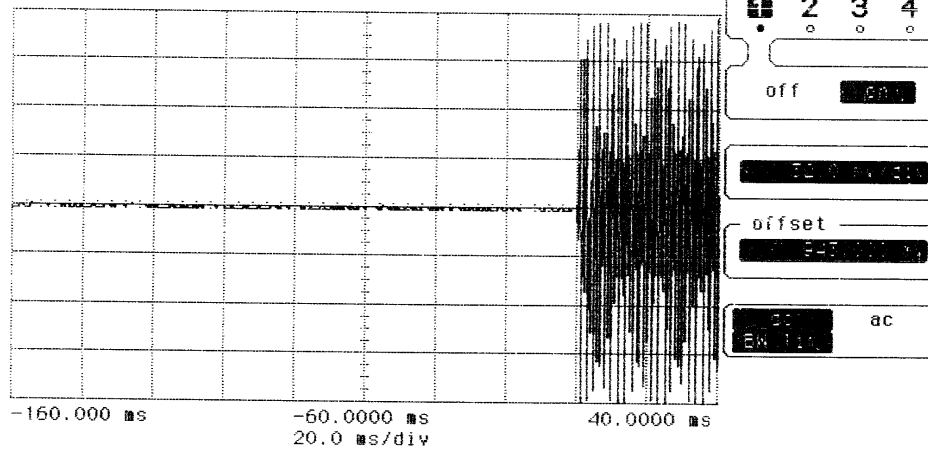


hp awaiting trigger



12.5KHz

hp awaiting trigger



CHANNEL

2 3 4

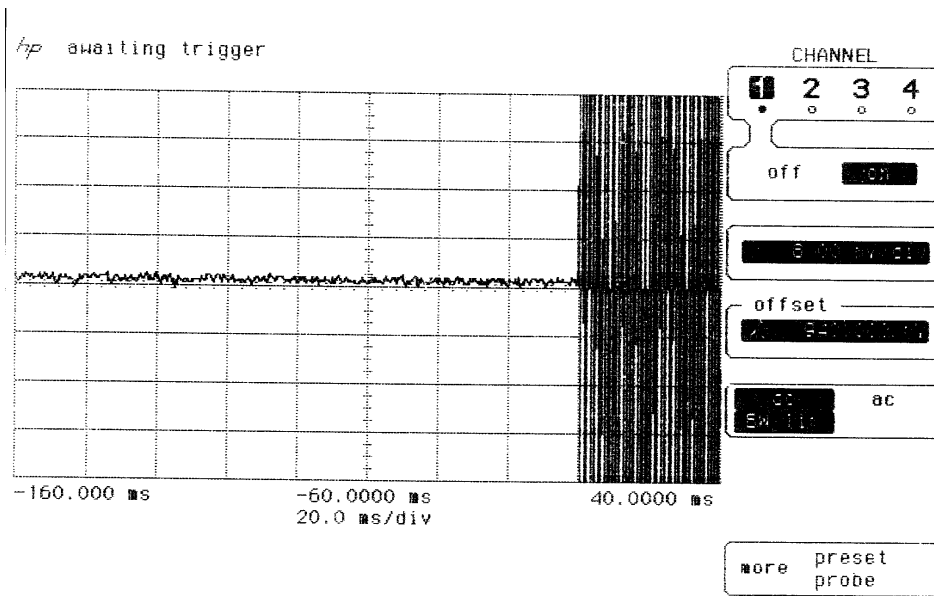
off

offset

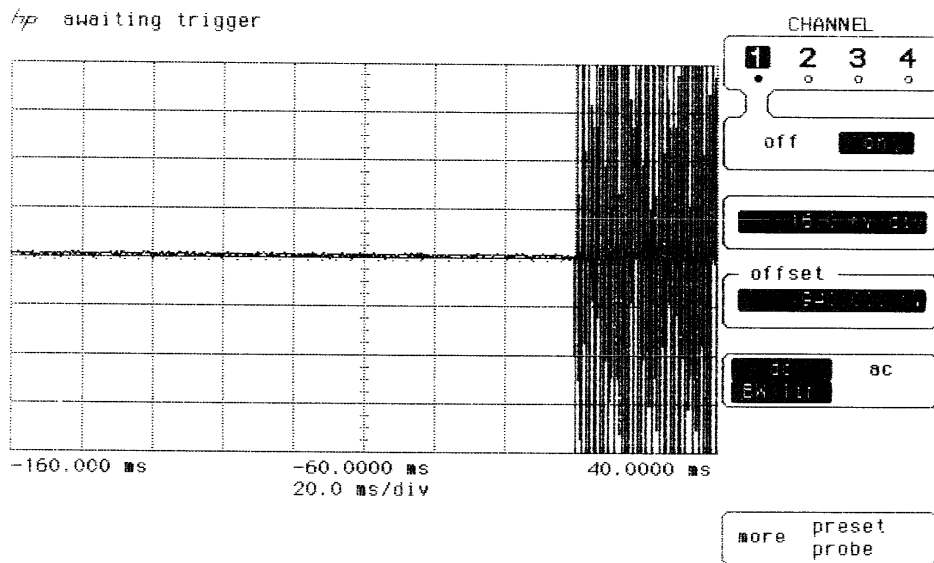
ac

more preset probe

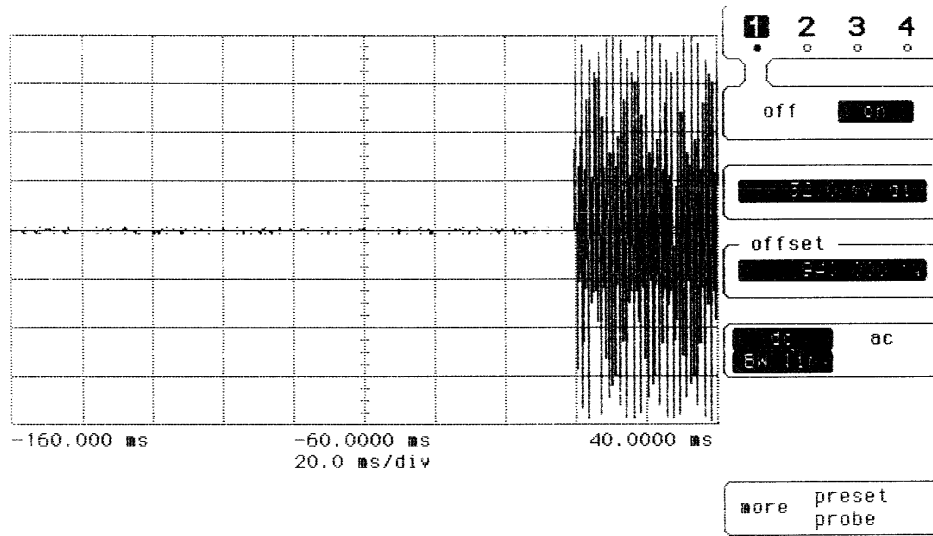
40 Watts
824.9875 MHz
25 KHz
+50 °C



40 Watts
806.9875 MHz
6.25 KHz
0 °C

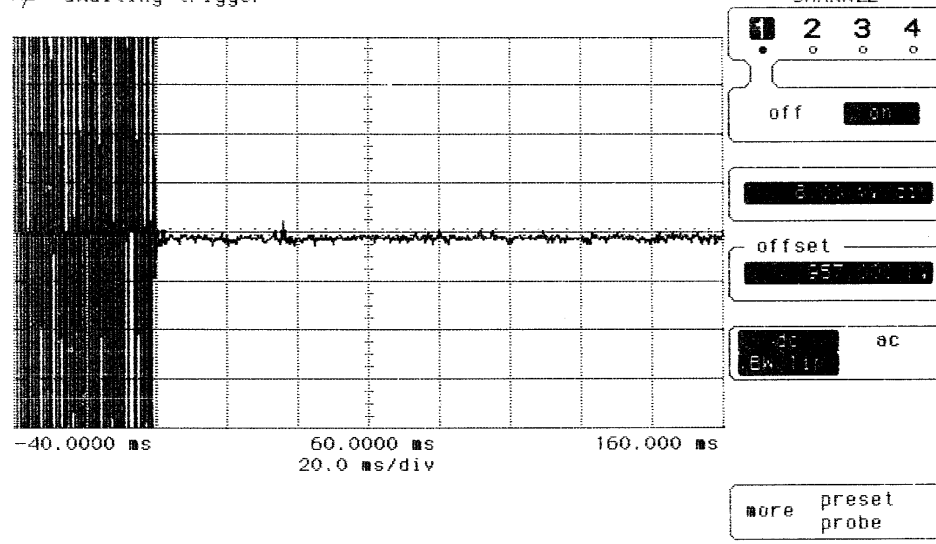


12.5 kHz



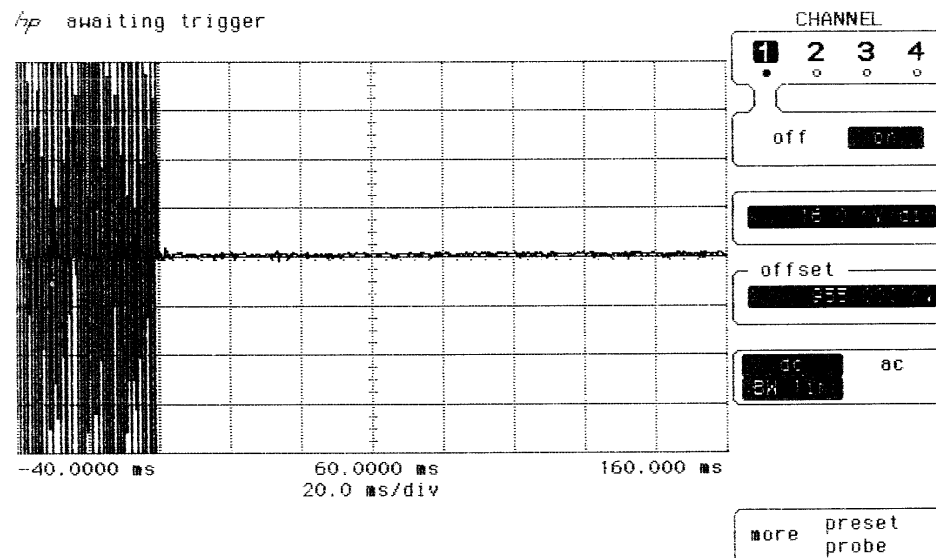
40 Watts
 824.9875 MHz
 25 KHz
 0 °C

hp awaiting trigger



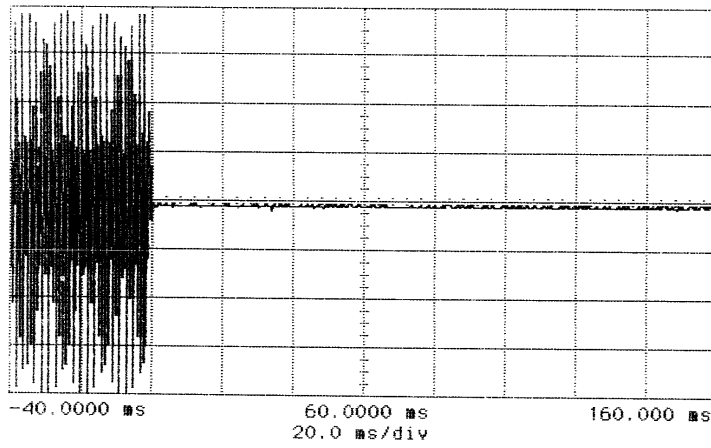
40 Watts
824.9875 MHz
6.25 KHz
0 °C

hp awaiting trigger



12.5 KHz

hp awaiting trigger



CHANNEL

1 2 3 4

off on

72.0000

offset

888.0000

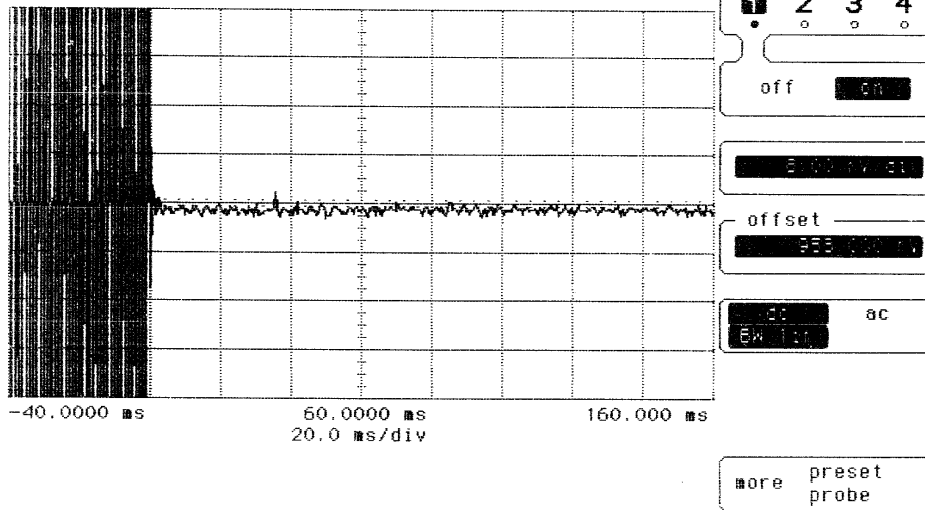
dc ac

EW 117

more preset probe

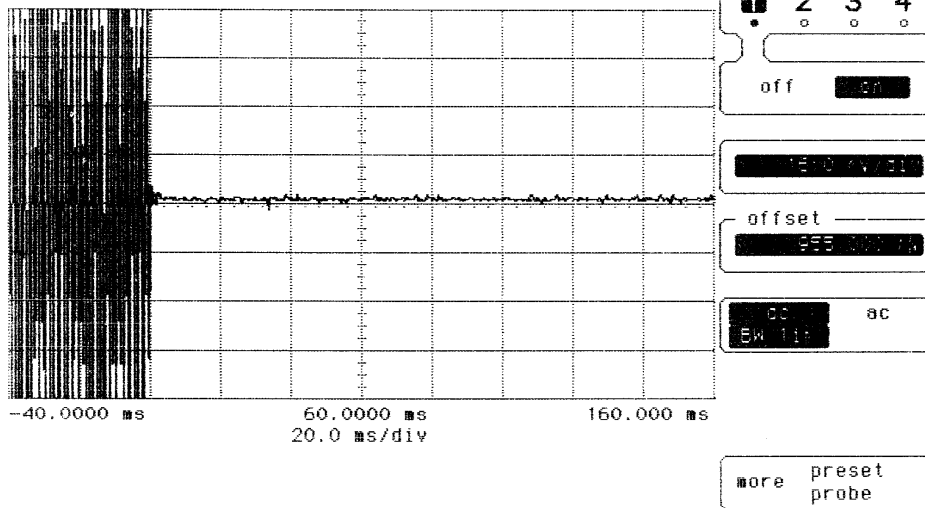
40 Watts
824.9875 MHz
25 KHz
0 °C

hp awaiting trigger



40 Watts
806.9875 MHz
6.25 KHz
-30 °C

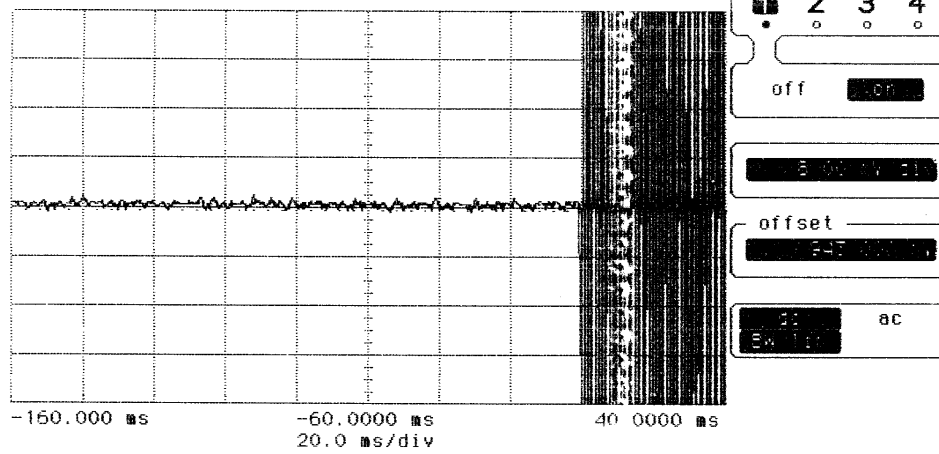
hp awaiting trigger



12.5 KHz

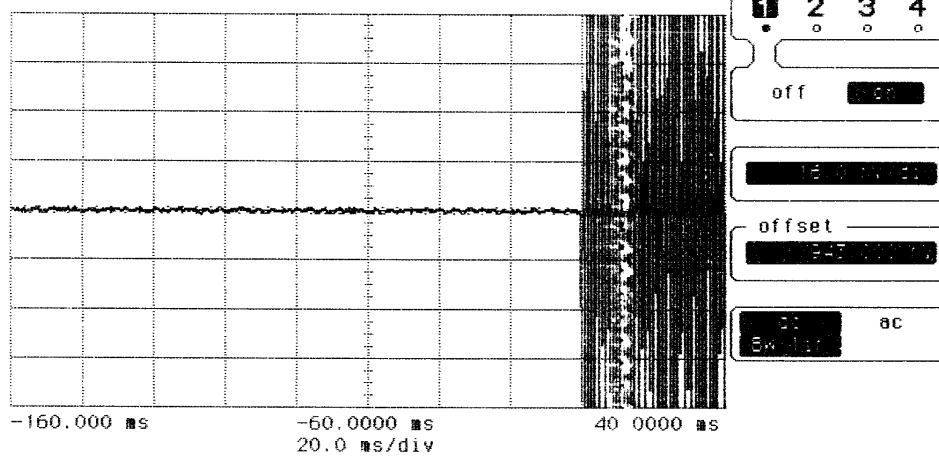
40 Watts
806.9875 MHz
6.25 KHz
-30 °C

hp awaiting trigger



more preset probe

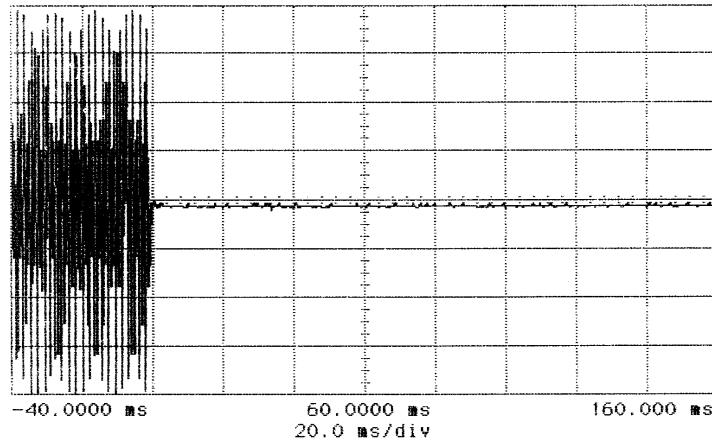
hp printing



more preset probe

12.5 KHz

hp awaiting trigger



CHANNEL

1	2	3	4
0	0	0	0

off ☒ on

32.0 V/div

offset 0.000000

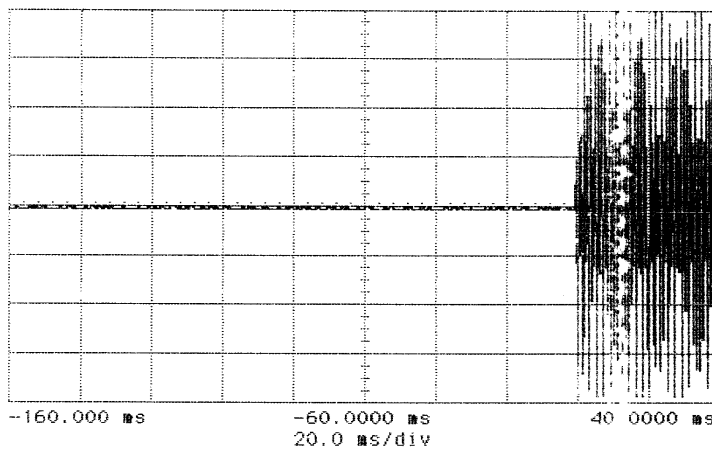
0.0 ac

BW 11

more preset probe

40 W
806.0125 MHz
25 KHz
-30°

hp awaiting trigger



CHANNEL

1	2	3	4
0	0	0	0

off ☒ on

32.0 V/div

offset 0.000000

0.0 ac

BW 11

more preset probe

40 W
806.0125 MHz
25 KHz
-30°

NAME OF TEST: Frequency Stability with Variation in Supply Voltage

RULE PART NUMBER: 2.1055 (d) Subpart J

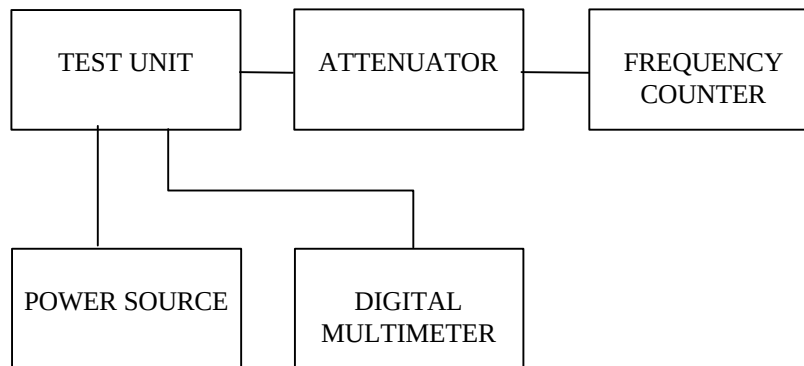
MINIMUM STANDARD: Shall not exceed $\pm 0.000150\%$ from test frequency, 1.5 ppm
For $\pm 15\%$ change in supply voltage.

TEST RESULTS: Meets minimum standard, see data below.

TEST CONDITIONS: Standard Test Conditions, 25 °C

TEST EQUIPMENT: Attenuator, Lucas Weinschel, Model 40-30-33, 30 dB, 150 Watt
Power Supply, HP6264B
Modulation Analyzer, HP 8901
Digital Voltmeter, Fluke Model 77

TEST SET-UP:



TEST SET-UP

MEASUREMENTS TAKEN:

1.50 ppm Reference Oscillator

Channel Frequency: 824.9875 MHz
Tolerance Requirements: 0.000150%

40 Watts

VDC INPUT	FREQ. (MHz)	DELTA FREQ. (% of assigned freq.)	SPEC LIMIT (% of assigned freq.)	PPM from assigned frequency
11.00	824.987465	-0.0000043	< 0.00015	-0.043
13.80	824.987449	-0.0000062	< 0.00015	-0.062
16.00	824.987441	-0.0000072	< 0.00015	-0.072

10 Watts

VDC INPUT	FREQ. (MHz)	DELTA FREQ. (% of assigned freq.)	SPEC LIMIT (% of assigned freq.)	PPM from assigned frequency
11.00	824.987433	-0.0000082	< 0.00015	-0.082
13.80	824.987445	-0.0000067	< 0.00015	-0.067
16.00	824.987452	-0.0000059	< 0.00015	-0.059