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FCC / IC Certification Application

For The

OSMAC
Toro UHF Base Station

FCC ID: J26-PC-UC-2

IC ID: 773B-NBBS01

Table Of Contents

NAME OF TEST: Transmitter Rated Power Output

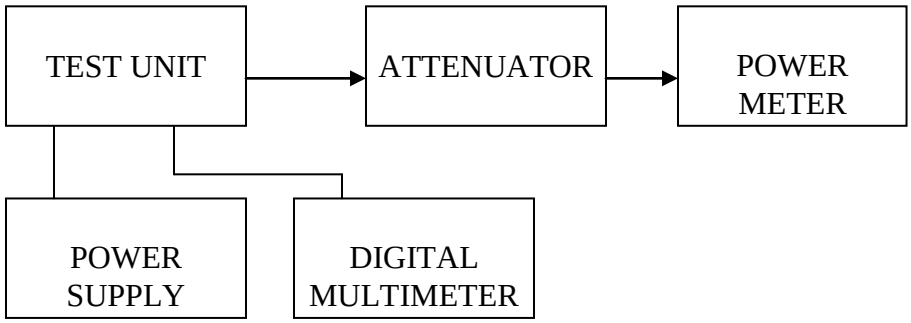
RULE PART NUMBER: 2.1046 (a) (c)
IC: RSS-119 5.4

TEST RESULTS: See results below

TEST CONDITIONS: Standard Test Conditions

TEST EQUIPMENT: 50-Ohm Attenuator, Bird 50-A-FFN-20 / 20 dB / 50 Watt
Digital Multimeter, Fluke 87
Power Meter, Model HP-8901B

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	13.0	0.90	11.7	2.018
460	13.0	0.95	12.4	1.953
470	13.0	1.01	13.1	1.891

NAME OF TEST: Transmitter Spurious and Harmonic Outputs

RULE PART NUMBER: 2.1051, 90.210 (d,3)
IC: RSS-119 5.8.3

MINIMUM STANDARDS: For 2 Watts: $50+10\text{Log}_{10}(2\text{ Watts}) = -53.0$ dBc
or -70dBc, whichever is the lesser attenuation.

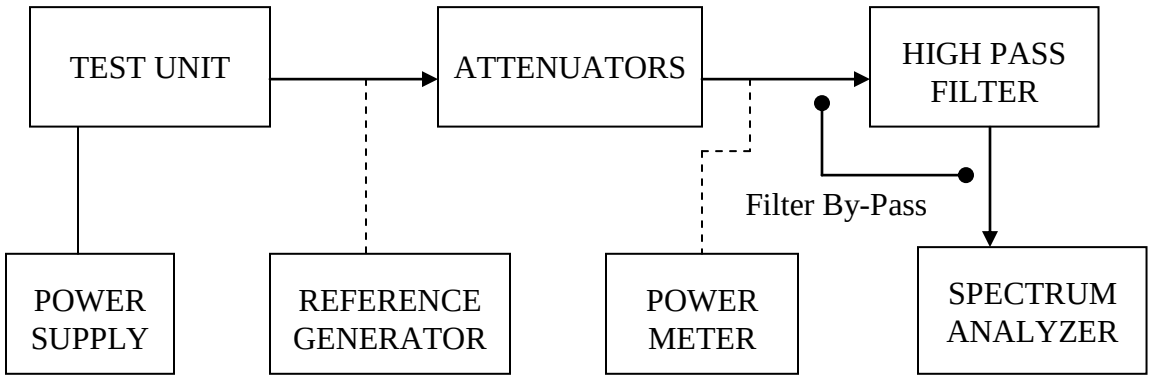
TEST RESULTS: Meets minimum standards (see data on following pages)

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

TEST PROCEDURE: TIA/EIA – 603-C

TEST EQUIPMENT: 50-Ohm Attenuator, Narda 765-10 / 10 dB / 50 Watts
50-Ohm Attenuator, Bird 10-A-MFN-10 / 10 dB / 10 Watts
Spectrum Analyzer, HP-8563E
Reference Generator, Agilent E8257D
High Pass Filter, Mini Circuits VHF-740, Fc = 740 MHz

TEST SET-UP:



MEASUREMENT PROCEDURE:

1. The transmitter carrier output frequency is 450.000, 460.000, and 470.000 MHz.
2. The carrier reference was established on the spectrum analyzer with the filter by-pass in place. Then the spectrum was scanned from DC to 2 Fc. Finally, the high pass filter was inserted to null the carrier fundamental and extend the range of the spectrum analyzer for harmonic measurements above 2 Fc.
3. At each spurious frequency, generation substitution was used to establish the true spurious level.
4. The spectrum was scanned to the 10^{th} harmonic of the highest internally generated frequency.

Tuned Frequency	450.0	MHz
Power	2	Watts
Min. Specification	-20.0	dBm
Worse Case	-52.75	dBm

Spurious Frequency (MHz)	Relation to Carrier	Spurious Level (dBm)
900	2 fo	-52.75
1350	3 fo	-70.79
1800	4 fo	-64.08
2250	5 fo	-80.32
2700	6 fo	-88.25
3150	7 fo	-67.10
3600	8 fo	-72.49
4050	9 fo	-86.43
4500	10 fo	-63.94

Tuned Frequency	460.0	MHz
Power	2	Watts
Min. Specification	-20.0	dBm
Worse Case	-53.14	dBm

Spurious Frequency (MHz)	Relation to Carrier	Spurious Level (dBm)
920	2 fo	-53.14
1380	3 fo	-70.01
1840	4 fo	-72.92
2300	5 fo	-79.76
2760	6 fo	-87.73
3220	7 fo	-70.2
3680	8 fo	-76.91
4140	9 fo	-82.74
4600	10 fo	-77.85

Tuned Frequency	470.0	MHz
Power	2	Watts
Min. Specification	-20.0	dBm
Worse Case	-61.64	dBm

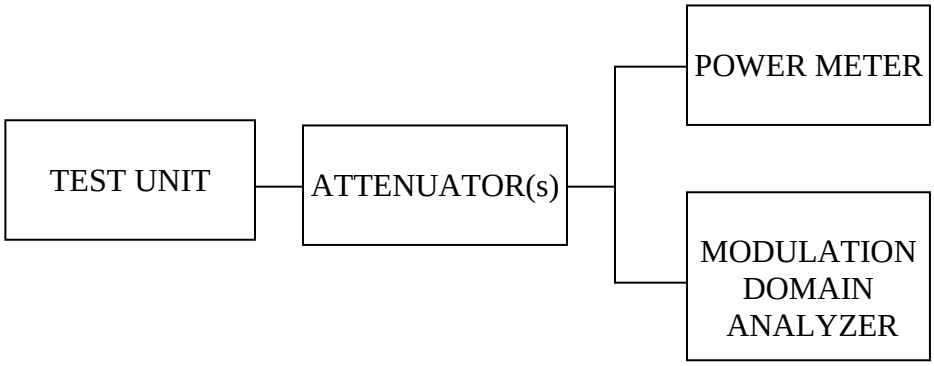
Spurious Frequency (MHz)	Relation to Carrier	Spurious Level (dBm)
940	2 fo	-61.64
1410	3 fo	-70.92
1880	4 fo	-78.44
2350	5 fo	-77.5
2820	6 fo	-76.87
3290	7 fo	-76.58
3760	8 fo	-84.86
4230	9 fo	-79.31
4700	10 fo	-94.18

NAME OF TEST: Transient Frequency Behavior

RULE PART NUMBER: 90.214
RSS-119 5.9

MINIMUM STANDARD: 12.5 kHz channel (used worst case numbers from 450.0 to 470.0 MHz)

TIME INTERVAL	MAXIMUM FREQUENCY DIFFERENCE (kHz)	TIME (ms)
T1	+/- 12.5	10
T2	+/- 6.25	25
T3	+/- 12.5	10



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

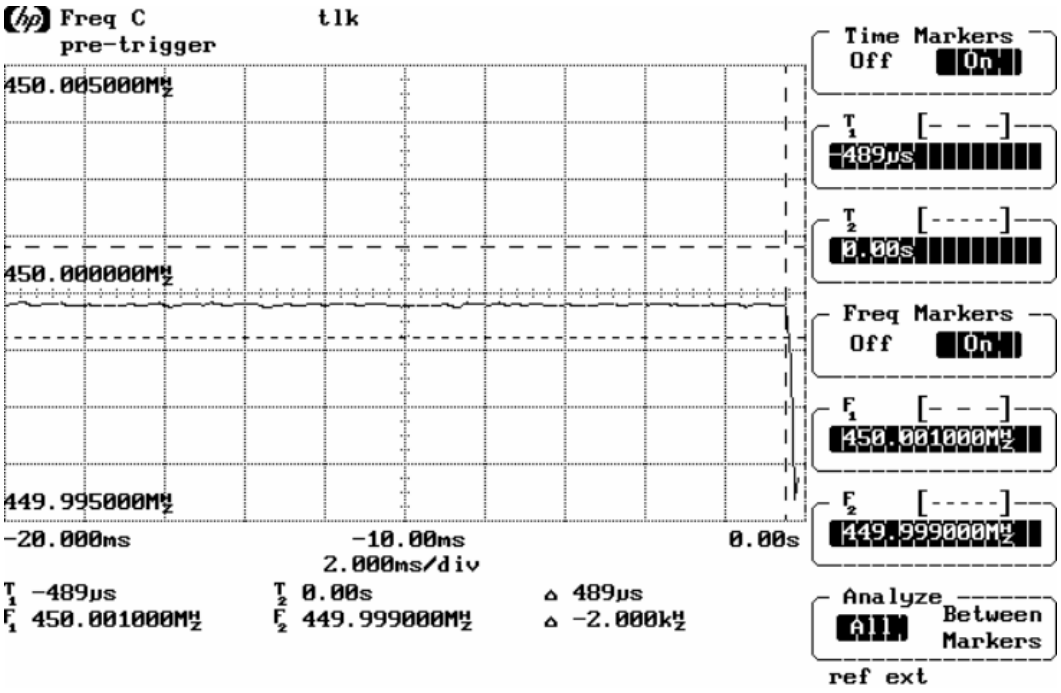
TEST CONDITIONS: RF Power Level = 2 Watts
Standard Test Conditions, 25 C

TEST PROCEDURE: TIA/EIA – 603-C

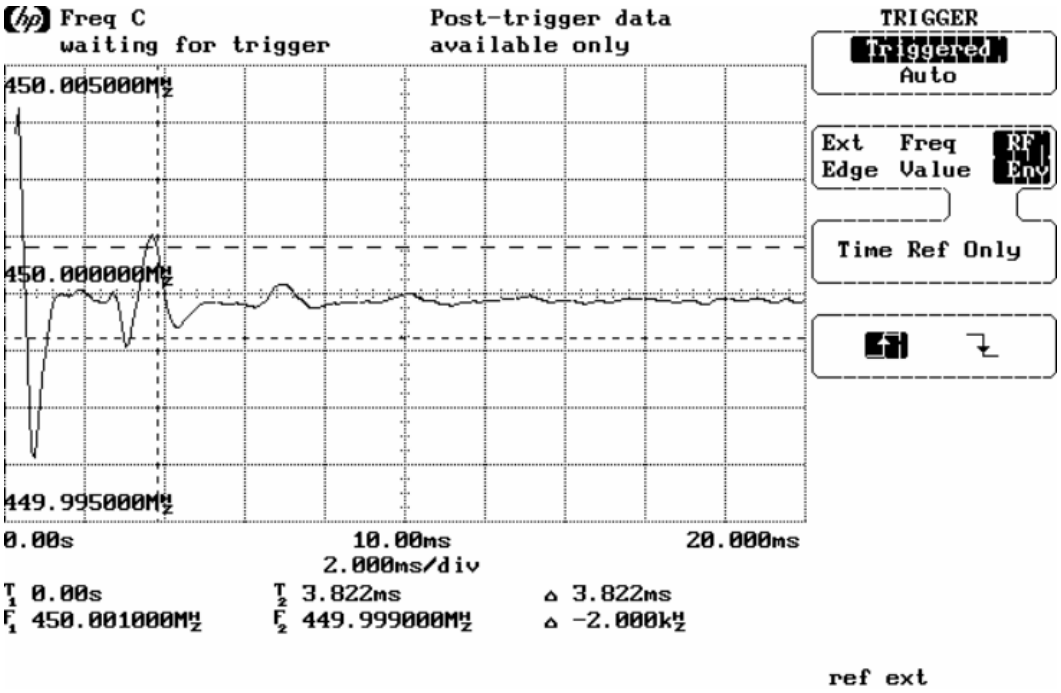
TEST EQUIPMENT: 50-Ohm Attenuator, Bird Electronics Model 50-A-FFN-20 (20dB, 50W)
50-Ohm Attenuator, Bird Electronics Model 10-A-MFN-10 (10dB, 10W)
Modulation Domain Analyzer, HP-53310A
Power Meter, Model HP436

Frequency : 450.000000 MHz
Power: 2 W

Key-Down

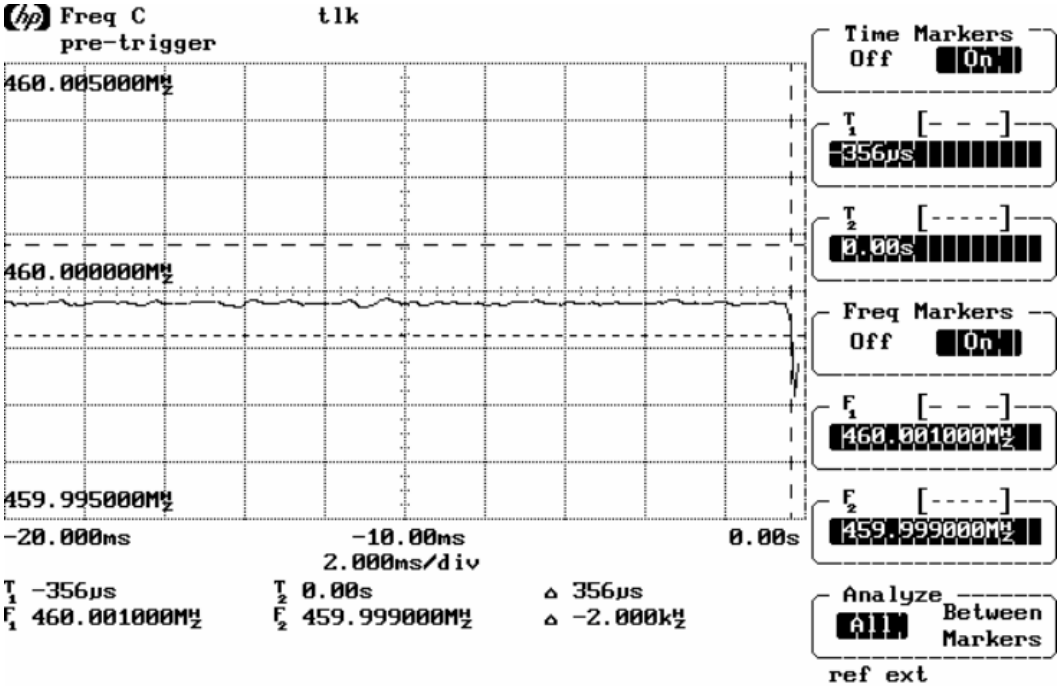


Key-up

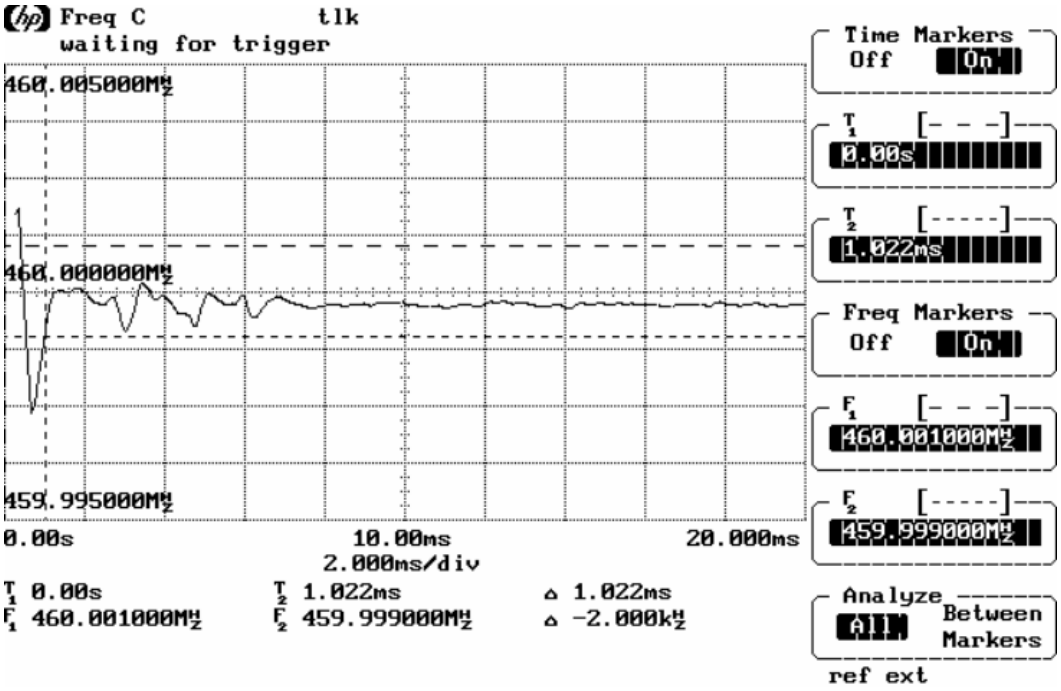


Frequency : 460.000000 MHz
Power: 2 W

Key-Down

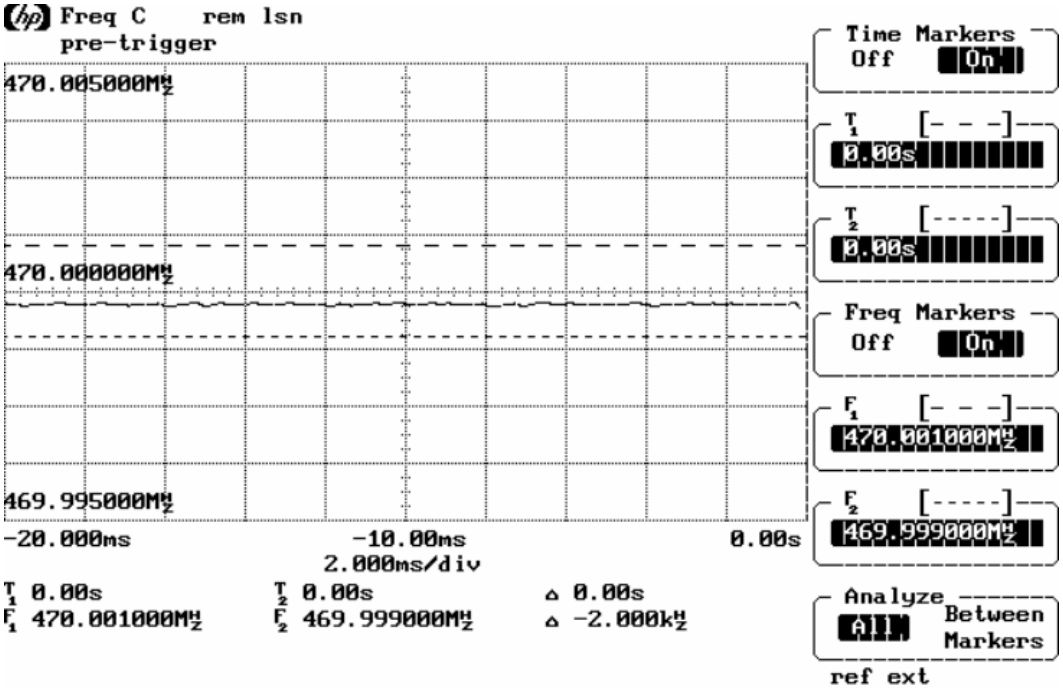


Key-up

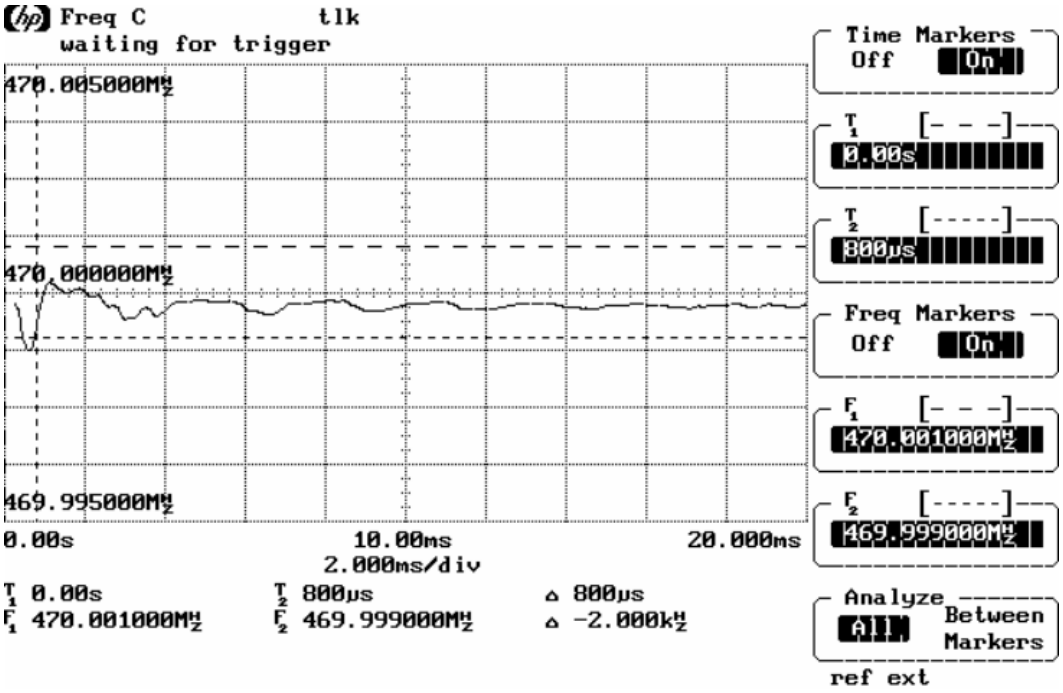


Frequency : 470.000000 MHz
Power: 2 W

Key-Down



Key-up



NAME OF TEST: Frequency Stability with Variation in Supply Voltage

RULE PART NUMBER: 2.1055 (d)(1), 90.213 (a)
RSS-Gen 4.7, RSS-119 5.3

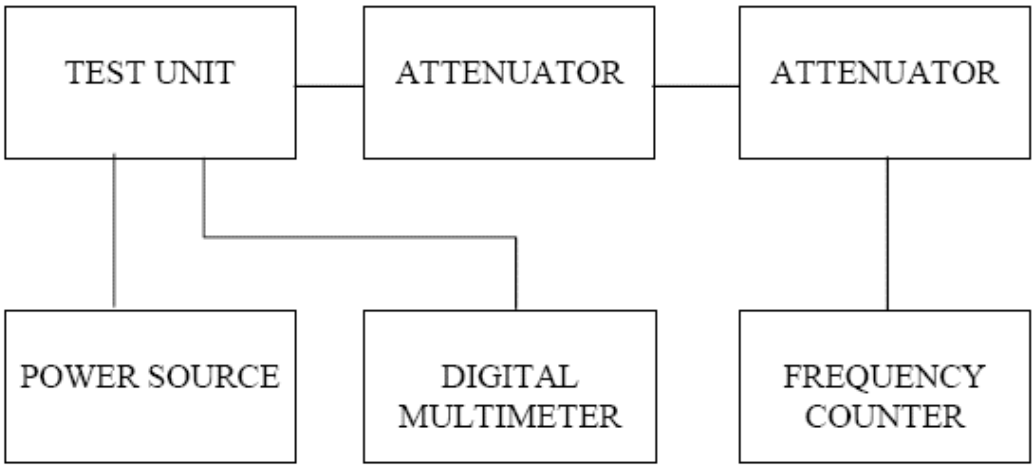
MINIMUM STANDARD: Shall not exceed 1.50 ppm.

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

TEST CONDITIONS: Standard Test Conditions, 25 C

TEST EQUIPMENT: Frequency Counter, HP 8901A Modulation Analyzer
Digital Voltmeter, Fluke Model 8012A
50-Ohm Attenuator, Bird Electronics Model 50-A-FFN-20 (20dB, 50W)
50-Ohm Attenuator, Bird Electronics Model 10-A-MFN-10 (10dB, 10W)

TEST SET-UP:



TEST SET-UP

Channel Frequency: 450.0000 MHz
Tolerance Requirements: 1.5ppm
Highest Variation: -0.51 ppm

Input Voltage (Vdc)	Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
93.5	449.999770	-230	-0.51
110	449.999770	-230	-0.51
126.5	449.999800	-200	-0.44

Channel Frequency: 460.0000 MHz
Tolerance Requirements: 1.5ppm
Highest Variation: -0.50 ppm

Input Voltage (Vdc)	Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
93.5	459.999790	-210	-0.46
110	459.999770	-230	-0.50
126.5	459.999770	-230	-0.50

Channel Frequency: 470.0000 MHz
Tolerance Requirements: 1.5ppm
Highest Variation: -0.61 ppm

Input Voltage (Vdc)	Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
93.5	469.999750	-250	-0.54
110	469.999780	-280	-0.61
126.5	469.999760	-240	-0.52

NAME OF TEST: Frequency Stability with Variation in Ambient Temperature

RULE PART NUMBER: 2.1055 (a) (b), 90.213 (a)
RSS-Gen 4.7, RSS-119 5.3

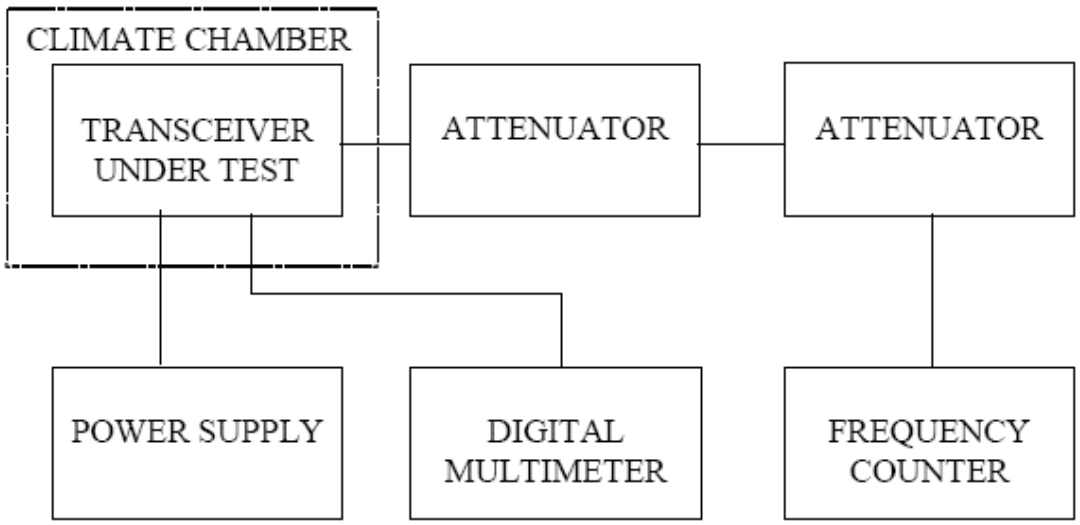
MINIMUM STANDARD: Shall not exceed 1.50 ppm from test frequency

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

TEST CONDITIONS: Standard Test Conditions

TEST EQUIPMENT: Frequency Counter, HP 8901A Modulation Analyzer
Digital Voltmeter, Fluke Model 8012A
50-Ohm Attenuator, Bird Electronics Model 50-A-FFN-20 (20dB, 50W)
50-Ohm Attenuator, Bird Electronics Model 10-A-MFN-10 (10dB, 10W)
Climate Chamber, Test Equity Half Cube Model 105

TEST SET-UP:



Channel Frequency: 450.00000 MHz
Voltage & Power Level: 110 Volts @ 2.0 Watts
Highest Variation: 1.27 ppm

Temperature (Deg C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
-30	450.000530	530	1.18
-20	450.000570	570	1.27
-10	450.000490	490	1.09
0	450.000460	460	1.02
10	449.999980	-20	-0.04
20	449.999980	-20	-0.04
30	449.999660	-340	-0.76
40	449.999590	-410	-0.91
50	449.999520	-480	-1.07
60	449.999530	-470	-1.04

Channel Frequency: 460.00000 MHz
Voltage & Power Level: 110 Volts @ 2.0 Watts
Highest Variation: -1.22 ppm

Temperature (Deg C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
-30	460.000370	370	0.80
-20	460.000350	350	0.76
-10	460.000210	210	0.46
0	460.000170	170	0.37
10	460.000060	60	0.13
20	459.999800	-200	-0.43
30	459.999640	-360	-0.78
40	459.999580	-420	-0.91
50	459.999440	-560	-1.22
60	459.999580	-420	-0.91

Channel Frequency: 470.00000 MHz
Voltage & Power Level: 110 Volts @ 2.0 Watts
Highest Variation: -1.21 ppm

Temperature (Deg C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)
-30	470.000270	270	0.57
-20	470.000570	570	1.21
-10	470.000530	530	1.13
0	470.000350	350	0.74
10	470.000320	320	0.68
20	469.999850	-150	-0.32
30	469.999600	-400	-0.85
40	469.999480	-520	-1.11
50	469.999440	-560	-1.19
60	469.999540	-460	-0.98

NAME OF TEST: Transmitter Occupied Bandwidth

RULE PART NUMBER: 2.201, 2.202, 2.1033 (c)(14), 2.1049 (h), 2.1041;90.203(j)(3); 90.209
IC: RSS-Gen 4.6.1

Necessary Bandwidth Measurement

The necessary bandwidth calculation for this type of modulation (DRCMSK) is not covered by paragraphs (1), (2) or (3) from 2.202(c). Therefore, the approach outlined in (2.202(c)(4)) is applicable in this case.

The measurement explanations are provided below.

Necessary Bandwidth Measurement:

Channel Spacing	12.5 kHz	12.5 kHz	12.5 kHz
Emission Type	8K90F1D	7K42F3D	9K83F3E
Data rate	9600bps	2400bps	Voice
Measured 99% Occupied BW	8.90 kHz	7.42 kHz	9.83 kHz

THEORY OF MEASUREMENT

The way to define the Occupied Bandwidth is "the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission" (FCC 2.202), the mathematics are as follows:

$$0.005*TP=P_{(f1)}=\int_{0}^{f1} PSD_{(f)}df$$

$$0.995*TP=P_{(f2)}=\int_{0}^{f2} PSD_{(f)}df$$

$$OBW=f2-f1$$

where TP (total mean power) is

$$TP=\int_{0}^{+\infty} PSD_{(f)}df=(1/t)\int_{-\infty}^{+\infty} |z_{(t)}|^2 dt$$

and PSD (power spectral distribution) is

$$PSD_{(f)}=|Z_{(f)}|^2+|Z_{(-f)}|^2 \qquad 0\leq f<\infty$$

and expresses the positive frequency representation of the transmitter output power for z(t) signal.

By applying these mathematics to the measurements, it is possible to measure the Occupied Bandwidth using a digital spectrum analyzer.

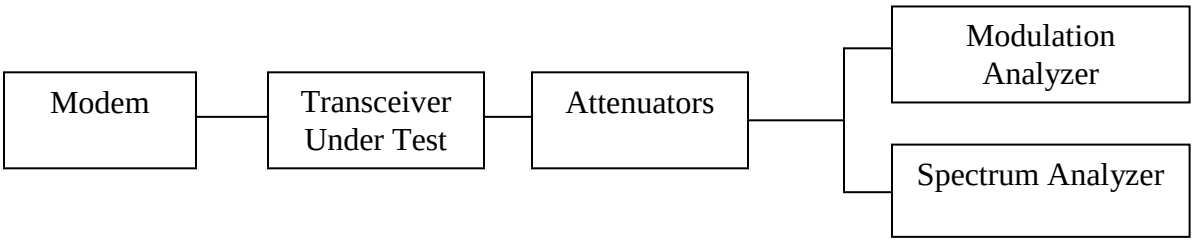
The Occupied Bandwidth measurement is in two parts relatively independent of each other. The first gives the RF spectrum profile, and the second calculates the frequency limits and they result in the Occupied bandwidth. While the first involves RF measurement instrumentation, the second is strictly a computational part related to measured trace.

TEST EQUIPMENT:

50-Ohm Attenuator, Bird Electronics Model 25-A-MFN-20 (20dB, 25W)
50-Ohm Attenuator, Bird Electronics Model 25-A-MFN-06 (6dB, 25W)
Spectrum Analyzer, HP 8563E Spectrum Analyzer
Modulation Analyzer, Hewlett Packard Model HP8901A

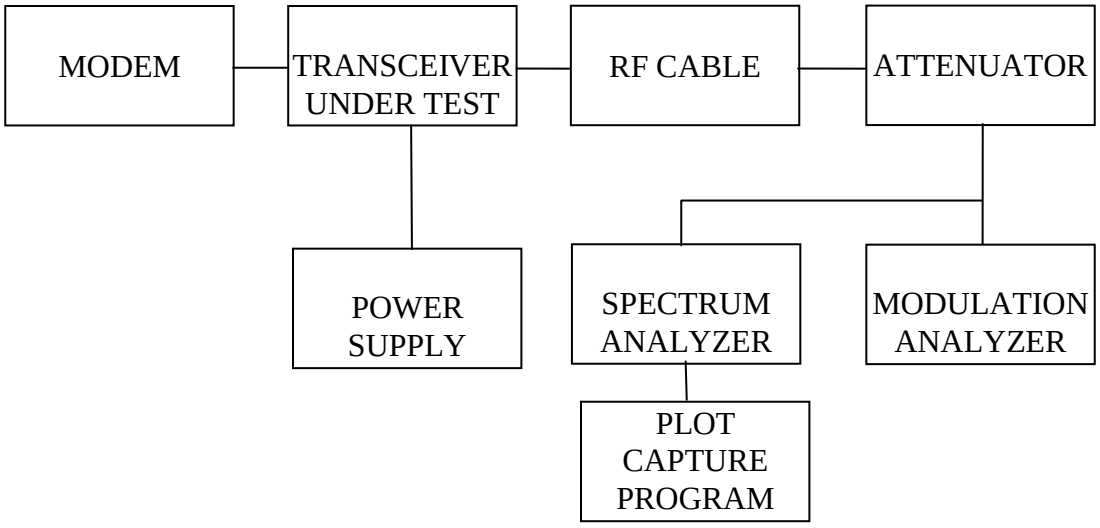
TEST SET-UP:

For the above requirements, the occupied bandwidth of a transmitter was measured using an HP 8563E Spectrum Analyzer using the following settings:
Occupied BW % Power: 99%
Trace: Max Hold A
RBW: 300 Hz (12.5 kHz channels)
VBW: 300 Hz
SPAN: 50 kHz (12.5 kHz channels)

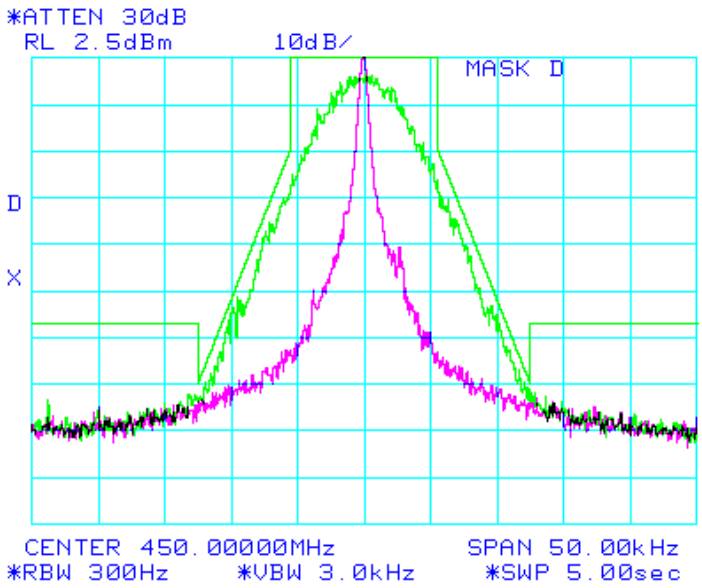


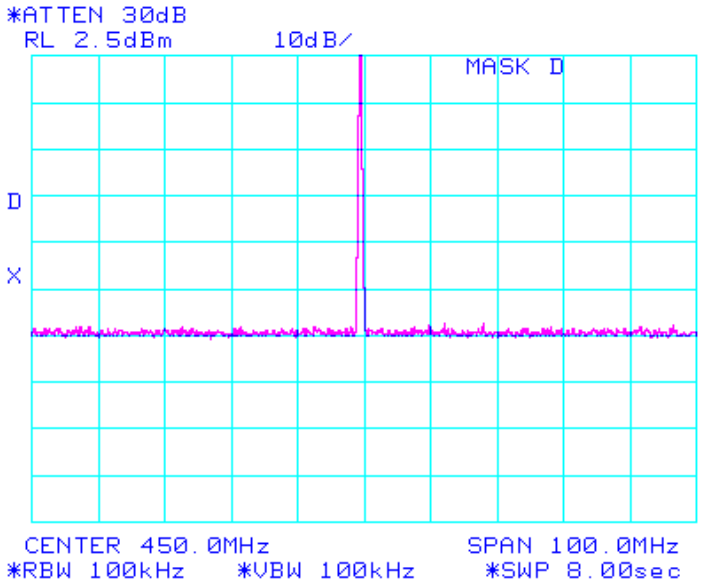
NAME OF TEST:	Transmitter Occupied Bandwidth for Emission Designators 8K90 F1D
RULE PART NUMBER:	2.202, 90.209 (b)(5), 90.210(d), 2.1049 (c) (1) IC: RSS-119 5.8.3
MINIMUM STANDARDS:	Mask D Sidebands and Spurious [Rule 90.210 (d), P = 2 Watts] Authorized Bandwidth = 11.25 kHz [Rule 90.209(b) (5)] From Fo to 5.625 kHz, down 0 dB. Greater than 5.625 kHz to 12.5 kHz, down 7.27(f_d-2.88kHz) 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 = 57 dB at > 12.5 kHz
TEST RESULTS:	Meets minimum standards (see data on following page)
TEST CONDITIONS:	Standard Test Conditions, 25 C RF Power Level = 1 Watt and 5 Watts Voltage = 13.3VDC
TEST PROCEDURE:	TIA/EIA – 603-C
TEST EQUIPMENT:	50-Ohm Attenuator, Bird Electronics Model 50-A-FFN-20 (20dB, 50W) 50-Ohm Attenuator, Bird Electronics Model 25-A-MFN-6 (6dB, 25W) DC Power Supply, Hewlett Packard Model 6653A Spectrum Analyzer, Hewlett Packard Model HP8563E Modulation Analyzer, Hewlett Packard Model HP8901A

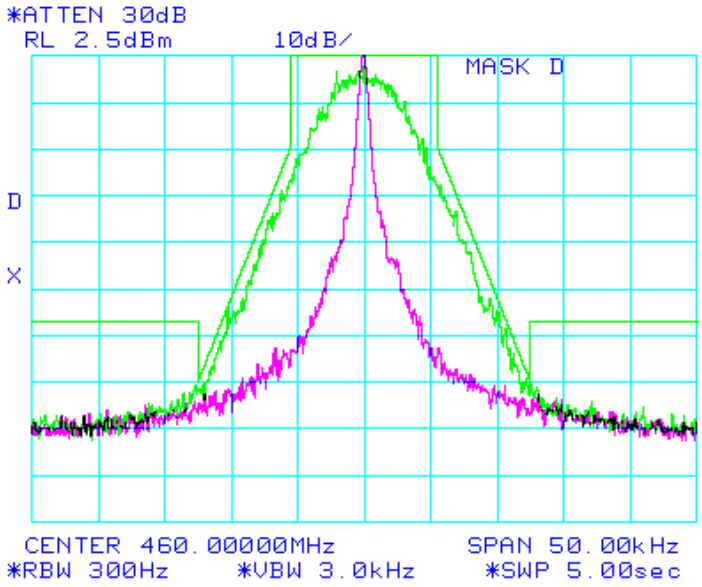
TEST SET-UP:

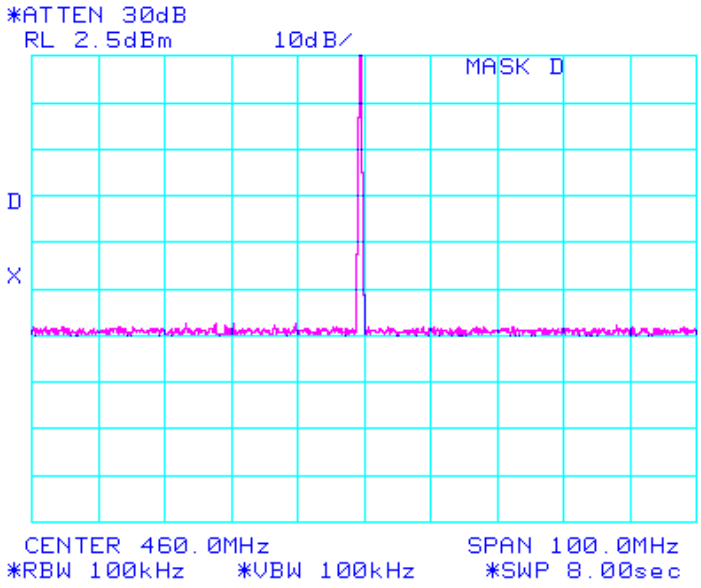


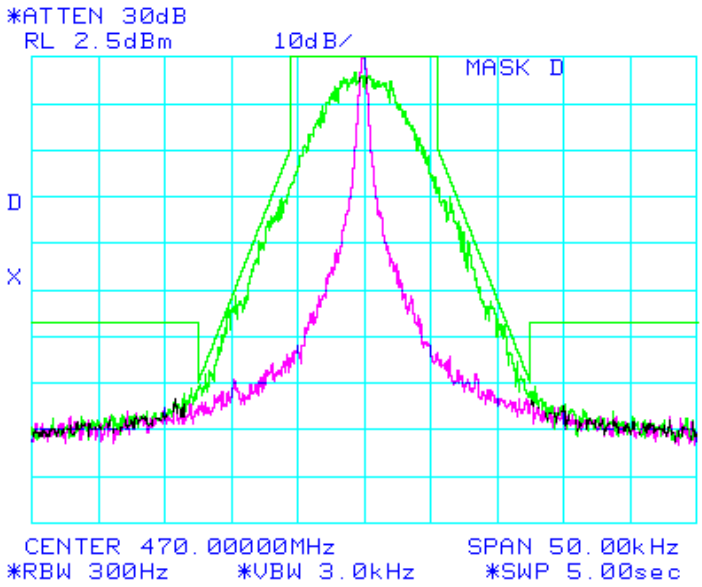
SPECTRUM FOR EMISSION:	**8K90F1D**
MASK:	D (2W)
OUTPUT POWER:	2 Watts
DATARATE:	9600 bps
PEAK DEVIATION:	3250 Hz
SPAN:	100 kHz and 100 MHz

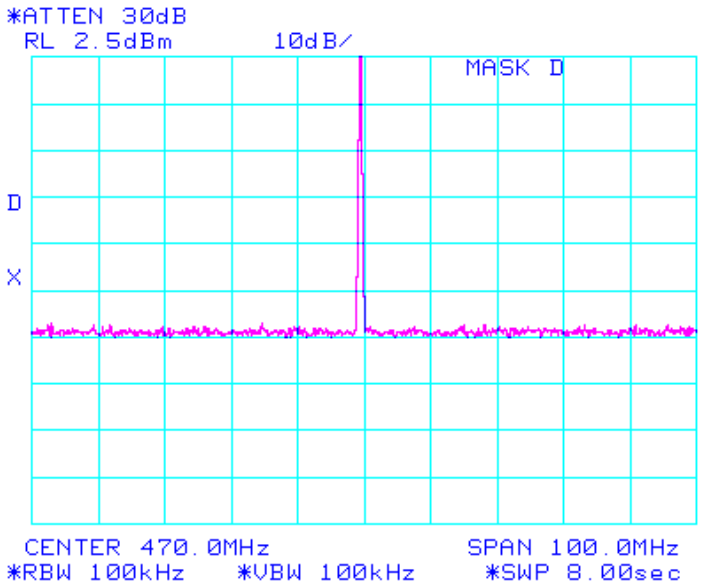





*ATTEN 30dB
RL 2.5dBm
10dB/
MASK D
D
X
CENTER 460.00000MHz
SPAN 50.00kHz
*RBW 300Hz
*VBW 3.0kHz
*SWP 5.00sec


*ATTEN 30dB
RL 2.5dBm
10dB/
MASK D
D
X
CENTER 460.0MHz
SPAN 100.0MHz
*RBW 100kHz
*VBW 100kHz
*SWP 8.00sec


*ATTEN 30dB
RL 2.5dBm
10dB/
MASK D
D
X
CENTER 470.00000MHz
SPAN 50.00kHz
*RBW 300Hz
*VBW 3.0kHz
*SWP 5.00sec


*ATTEN 30dB
RL 2.5dBm
10dB/
MASK D
D
X
CENTER 470.0MHz
SPAN 100.0MHz
*RBW 100kHz
*VBW 100kHz
*SWP 8.00sec

NAME OF TEST: Transmitter Occupied Bandwidth for Emission Designators **7K42F3D** and **9K83F3E**

RULE PART NUMBER: FCC: 2.202, 90.209 (b)(5), 90.210(d), 2.1049 (c)(1)
IC: RSS-119 5.8.3

MINIMUM STANDARDS: **Mask D**
Sidebands and Spurious [Rule 90.210 (d), P = 2 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-2.88kHz) dB.
Greater than 12.5 kHz, at least 50+10$\log_{10}$(P) or 70 dB, whichever is the lesser 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 = 53.0 dB at frequencies greater than 12.5 kHz @ 2 W

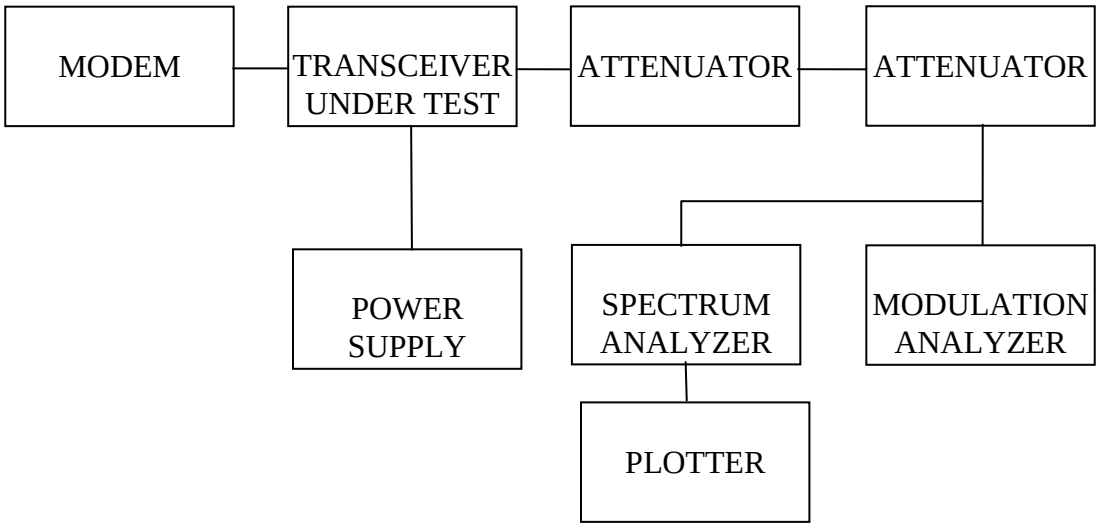
TEST RESULTS: Meets minimum standards (see data on following page)

TEST CONDITIONS: Standard Test Conditions, 25 C
RF Power Level = 2 Watts
Voltage = 20VDC

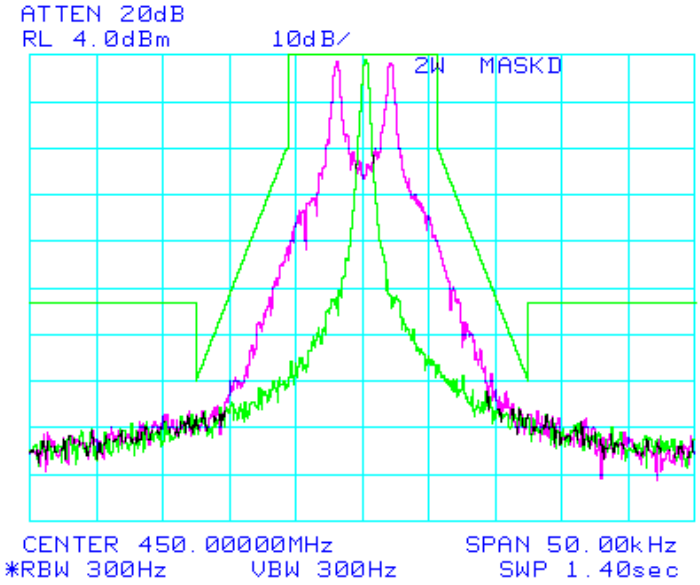
TEST PROCEDURE: TIA/EIA – 603-C

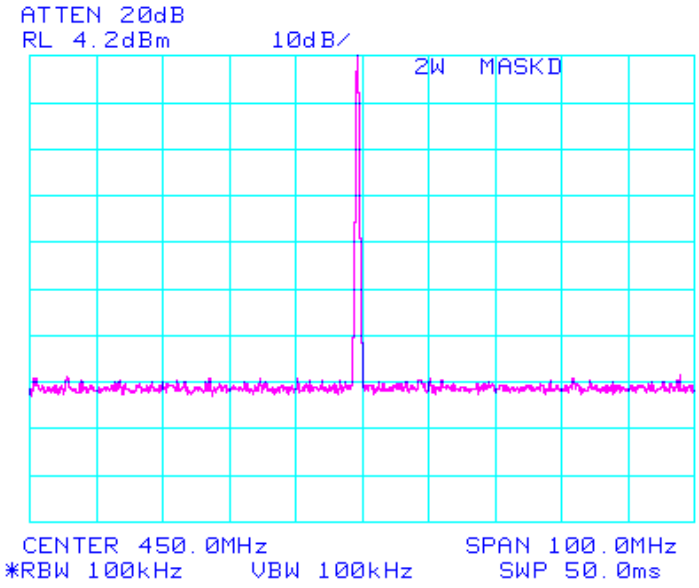
TEST EQUIPMENT: 50-Ohm Attenuator, Bird Electronics 25-A-MFN-20 (20dB, 25W)
50-Ohm Attenuator, Bird Electronics Model 25-A-MFN-06 (6dB,25W)
Spectrum Analyzer, Hewlett Packard Model HP8563E
Modulation Analyzer, Hewlett Packard Model HP8901A

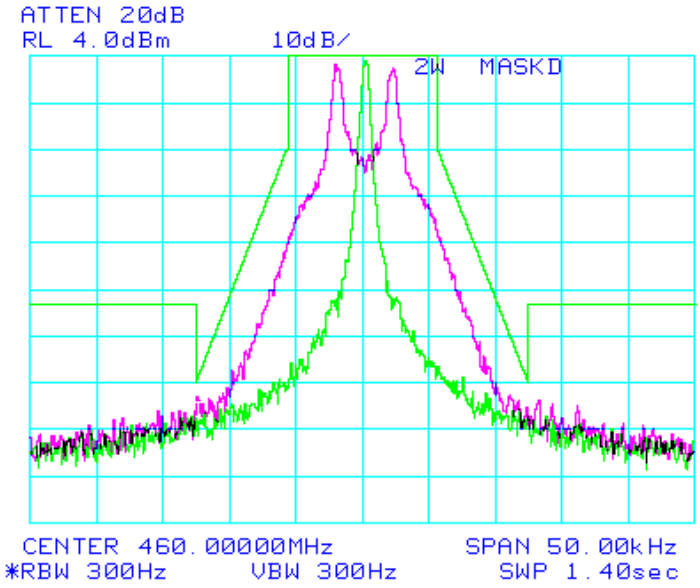
TEST SET-UP:

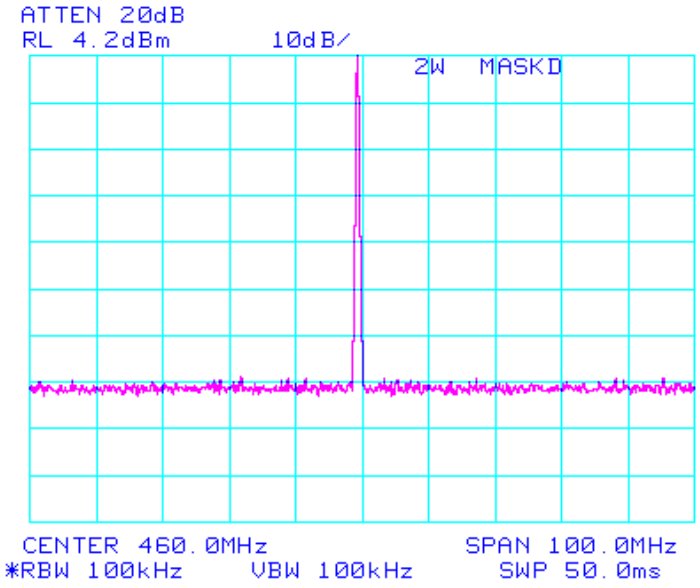


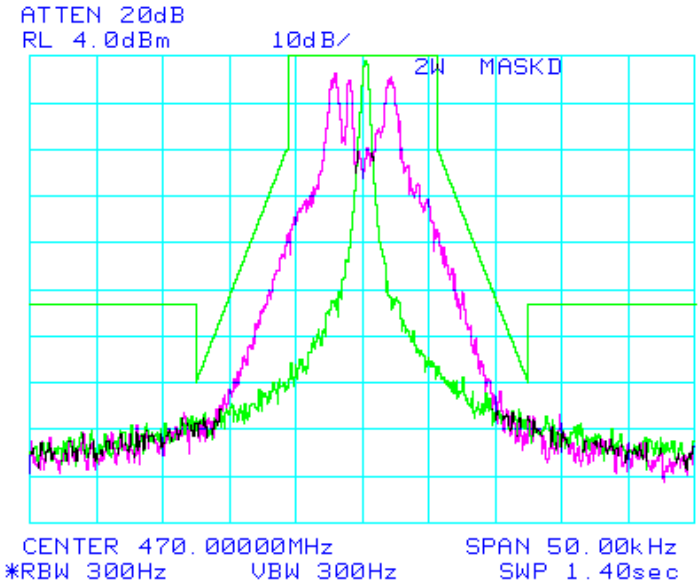
SPECTRUM FOR EMISSION: **7K42F3D**
MASK: D (2W)
OUTPUT POWER: 2 Watts
DATARATE: 2400 bps

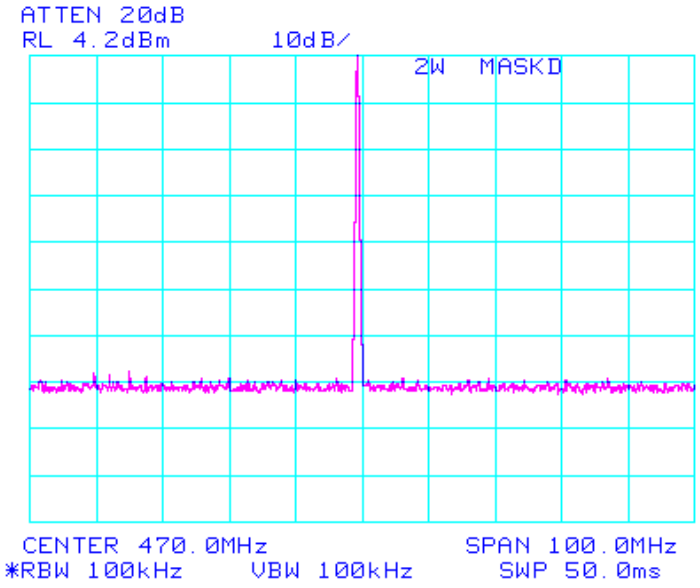




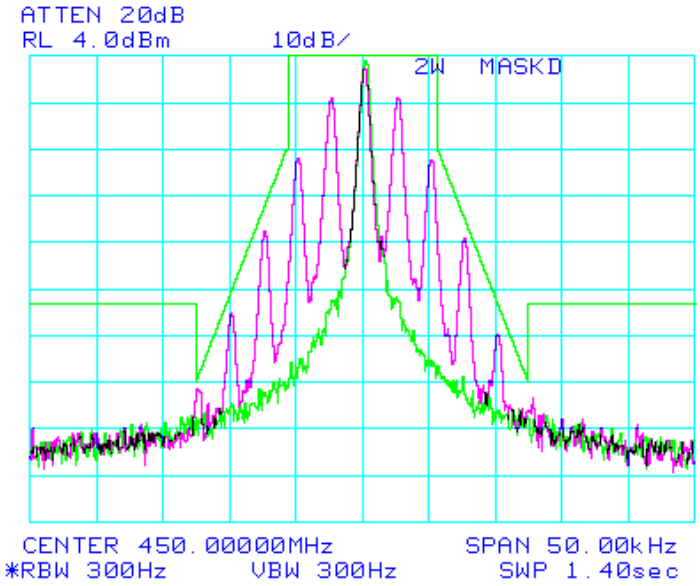

ATTEN 20dB
RL 4.0dBm
10dB/
2W MASKD
CENTER 460.00000MHz
SPAN 50.00kHz
*RBW 300Hz
VBW 300Hz
SWP 1.40sec

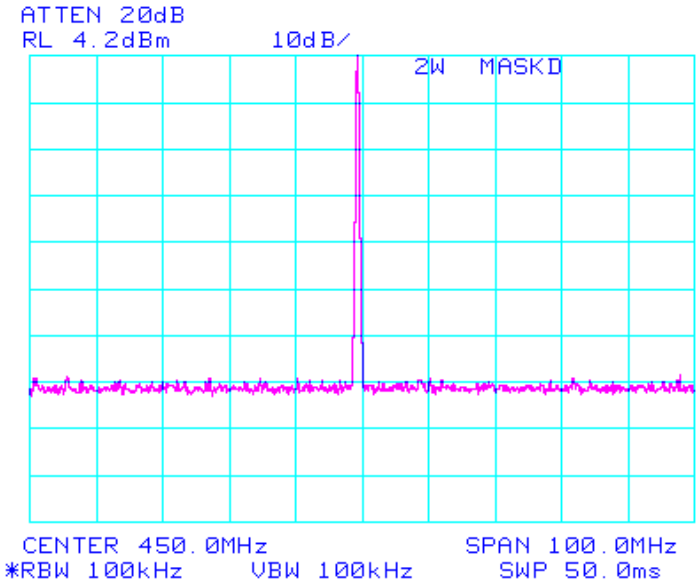

ATTEN 20dB
RL 4.2dBm
10dB/
2W MASKD
CENTER 460.0MHz
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

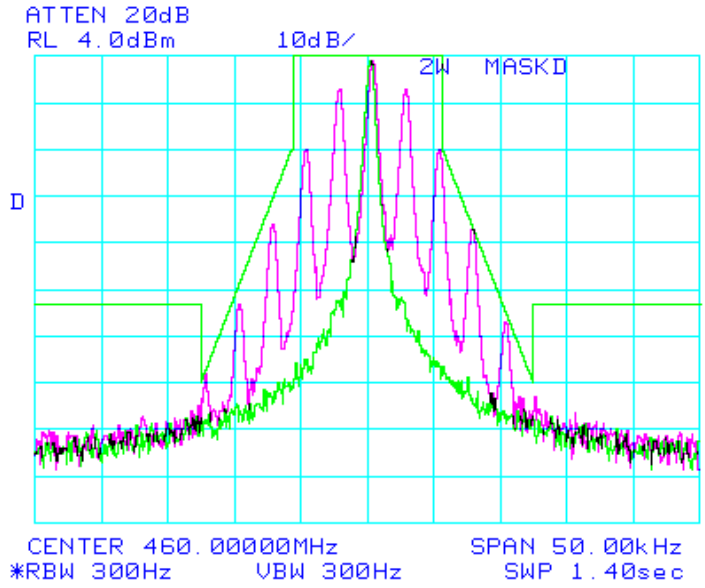

ATTEN 20dB
RL 4.0dBm
10dB/
2W MASKD
CENTER 470.00000MHz
SPAN 50.00kHz
*RBW 300Hz
VBW 300Hz
SWP 1.40sec

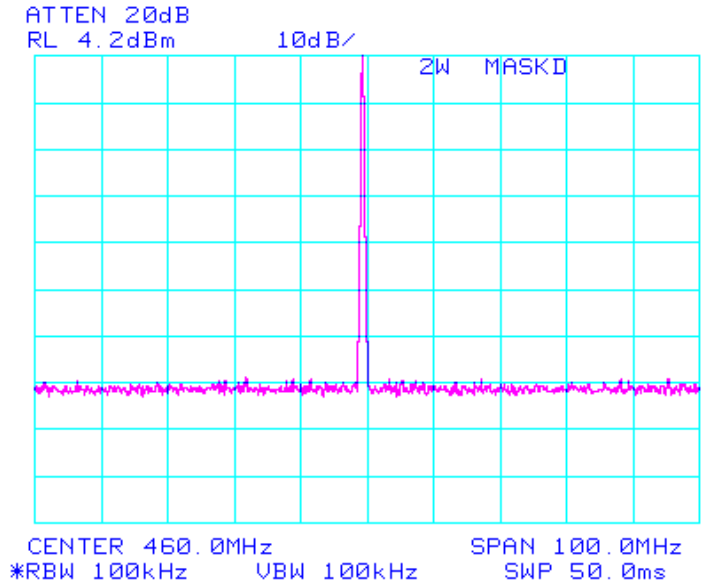

ATTEN 20dB
RL 4.2dBm
10dB/
2W MASKD
CENTER 470.0MHz
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

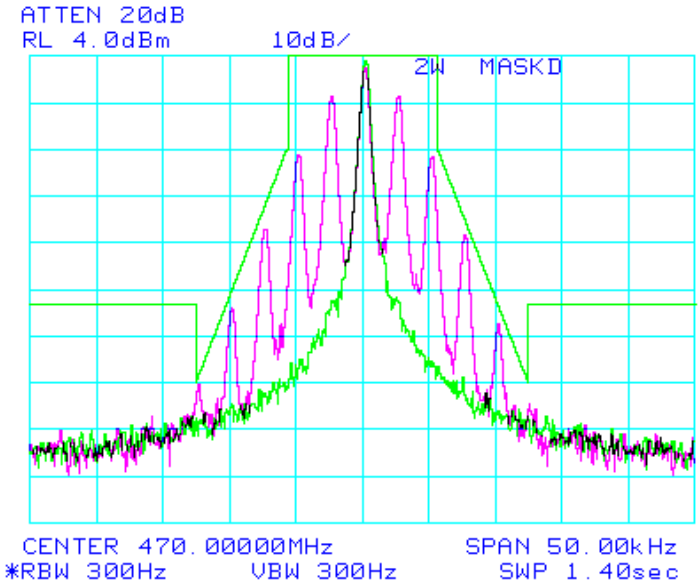
SPECTRUM FOR EMISSION: **9K83F3E**
MASK: D (2W)
OUTPUT POWER: 2 Watts

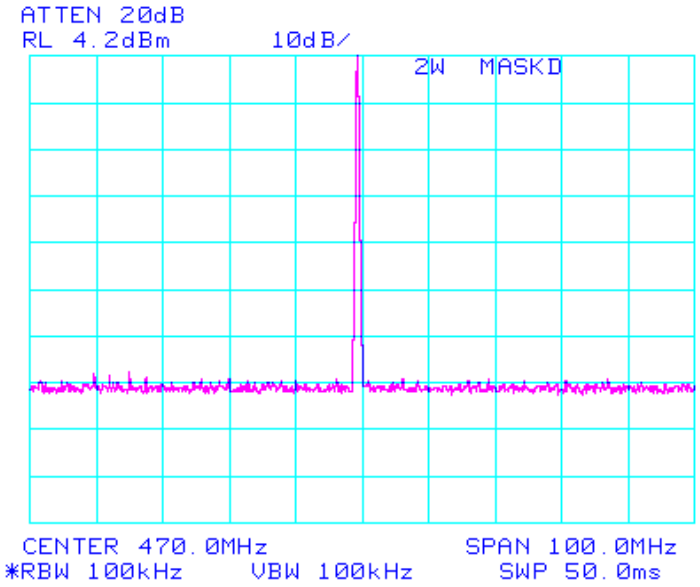





ATTEN 20dB
RL 4.0dBm
10dB/
2W MASKD
D
CENTER 460.00000MHz
SPAN 50.00kHz
*RBW 300Hz
VBW 300Hz
SWP 1.40sec


ATTEN 20dB
RL 4.2dBm
10dB/
2W MASKD
CENTER 460.0MHz
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms


ATTEN 20dB
RL 4.0dBm
10dB/
2W MASKD
CENTER 470.00000MHz
SPAN 50.00kHz
*RBW 300Hz
VBW 300Hz
SWP 1.40sec


ATTEN 20dB
RL 4.2dBm
10dB/
2W MASKD
CENTER 470.0MHz
SPAN 100.0MHz
*RBW 100kHz
VBW 100kHz
SWP 50.0ms

NAME OF TEST: Field Strength of Spurious Radiation

RULE PART NUMBER: 2.1053, 90.210 (d,3)
IC: RSS-119 5.8.4, 5.8.3

MINIMUM STANDARDS: For 2 Watts: $50+10\text{Log}_{10}(2\text{ Watts}) = -53$ dBc
or -70dBc, whichever is the lesser attenuation.

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

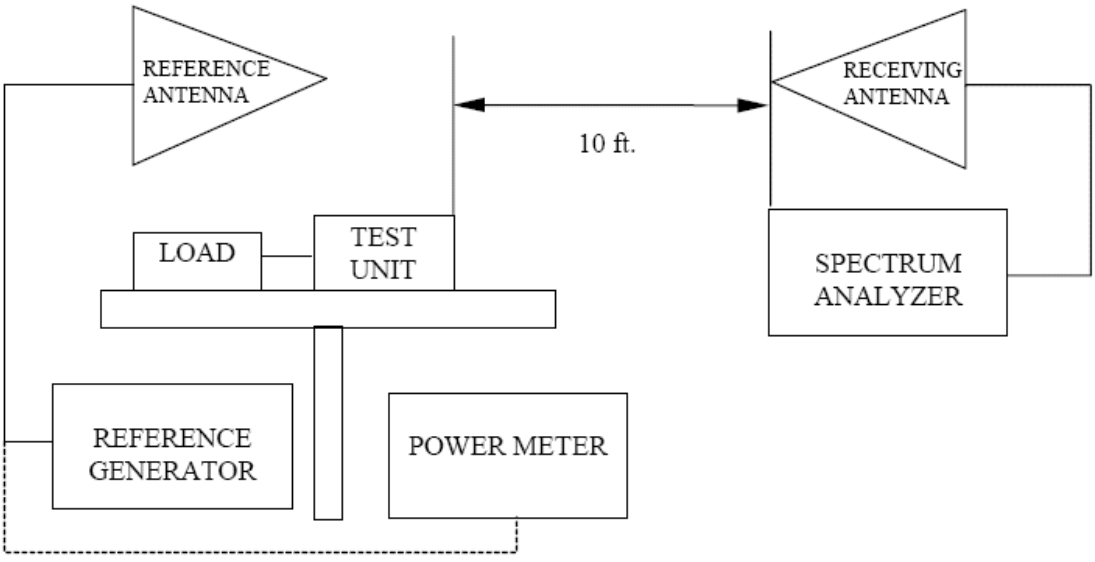
TEST CONDITIONS: Standard Test Conditions, 25 C
RF Power Level = 2 Watts
Voltage = 110 VAC

TEST PROCEDURE: TIA/EIA – 603-C

TEST EQUIPMENT: Waveguide Horn Antenna, EMCO Model 3115
Waveguide Horn Antenna, Electro-Metrics EM-6961
Bilog Antenna, Chase Model CBL6111B
Dipole Antenna, Electro-Metrics Model EM-6924
Spectrum Analyzer, Model HP-8563E
Reference Generator, Agilent Model E82570
Power Meter, Model HP436A
50-Ohm Attenuator, Bird Electronics 50-A-FFN-20 (20dB, 50W)
50-Ohm Load, Lucas Weinschel 58-30-43

MEASUREMENT PROCEDURE:
Radiated spurious attenuation was measured according to TIA/EIA Standard 603-C

TEST SET-UP:



Freqency:	450	MHz	Spec =	-53.0	dBc
			Highest		
Power:	2	Watts	Spur =	-55.0	dBc
	33.0	dBm			

Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Spurious Attenuation dBc
900	H	-58.0	-23.8	3.50	-0.51	-60.8
	V	-61.6	-18.0	3.50	-0.51	-55.0
1350	H	-85.3	-46.3	4.83	4.75	-79.4
	V	-80.7	-44.1	4.83	4.75	-77.2
1800	H	-82.8	-43.1	5.67	4.95	-76.8
	V	-76.5	-36.1	5.67	4.95	-69.8
2250	H	-99.5	-56.8	6.33	5.55	-90.6
	V	-93.6	-50.4	6.33	5.55	-84.2
2700	H	-105.6	-59.2	7.50	5.55	-94.2
	V	-104.8	-57.6	7.50	5.55	-92.6
3150	H	-111.0	-61.5	9.83	5.75	-98.6
	V	-111.0	-61.3	9.83	5.75	-98.4
3600	H	-104.6	-52.1	10.50	5.95	-89.6
	V	-104.6	-49.7	10.50	5.95	-87.3
4050	H	-113.0	-57.1	11.17	5.95	-95.4
	V	-111.6	-57.7	11.17	5.95	-96.0
4500	H	-103.5	-47.0	11.50	7.05	-84.4
	V	-103.3	-45.8	11.50	7.05	-83.2

Freqency:	460	MHz	Spec =	-53.0	dBc
			Highest		
Power:	2	Watts	Spur =	-57.8	dBc
	33.0	dBm			

Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Spurious Attenuation dBc
920	H	-63.0	-28.3	3.50	-0.48	-65.3
	V	-64.5	-20.8	3.50	-0.48	-57.8
1380	H	-93.9	-56.0	5.00	4.75	-89.3
	V	-85.3	-47.1	5.00	4.75	-80.4
1840	H	-83.6	-41.4	5.50	4.95	-75.0
	V	-78.8	-38.9	5.50	4.95	-72.5
2300	H	-95.0	-52.3	6.83	5.55	-86.6
	V	-90.6	-45.8	6.83	5.55	-80.1
2760	H	-103.6	-55.4	7.33	5.75	-90.0
	V	-105.5	-60.3	7.33	5.75	-94.9
3220	H	-107.5	-59.1	9.83	5.75	-96.2
	V	-111.5	-60.0	9.83	5.75	-97.1
3680	H	-105.3	-49.9	10.33	5.95	-87.3
	V	-104.8	-51.8	10.33	5.95	-89.2
4140	H	-111.3	-57.4	11.17	5.95	-95.7
	V	-109.5	-53.8	11.17	5.95	-92.0
4600	H	-105.1	-48.4	12.00	7.05	-86.4
	V	-107.1	-50.1	12.00	7.05	-88.0

Freqency:	470	MHz	Spec =	-53.0	dBc
			Highest		
Power:	2	Watts	Spur =	-62.0	dBc
	33.0	dBm			

Spurious Frequency (MHz)	Polarization (Horz/Vert)	Spurious Level (dBm)	Substitution Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBd)	Spurious Attenuation dBc
940	H	-66.5	-30.6	3.50	-0.54	-67.7
	V	-68.6	-25.0	3.50	-0.54	-62.0
1410	H	-92.8	-56.1	4.67	4.75	-89.0
	V	-88.5	-49.4	4.67	4.75	-82.4
1880	H	-87.6	-43.9	5.83	4.95	-77.8
	V	-85.3	-44.9	5.83	4.95	-78.8
2350	H	-93.5	-49.4	6.50	5.55	-83.4
	V	-93.6	-48.1	6.50	5.55	-82.1
2820	H	-102.3	-55.9	7.33	5.75	-90.5
	V	-102.5	-58.1	7.33	5.75	-92.7
3290	H	-106.5	-56.3	10.00	5.95	-93.4
	V	-107.6	-53.4	10.00	5.95	-90.5
3760	H	-105.8	-51.6	10.17	5.95	-88.8
	V	-106.3	-54.3	10.17	5.95	-91.5
4230	H	-106.6	-51.4	11.33	5.95	-89.8
	V	-108.8	-51.6	11.33	5.95	-90.0
4700	H	-109.6	-53.2	11.83	7.05	-91.0
	V	-110.3	-54.3	11.83	7.05	-92.1

NAME OF TEST: Audio Frequency Response

RULE PART NUMBER: 2.1033 (c)(14); 2.1047(b)

MINIMUM STANDARDS:

TEST RESULTS: See data on following page

TEST CONDITIONS: Standard Test Conditions, 25 C

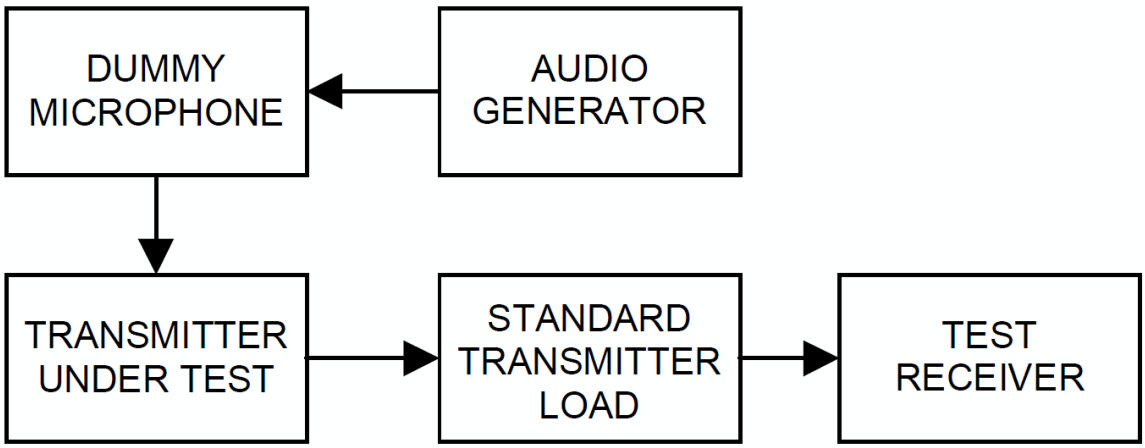
TEST PROCEDURE: TIA/EIA – 603-C

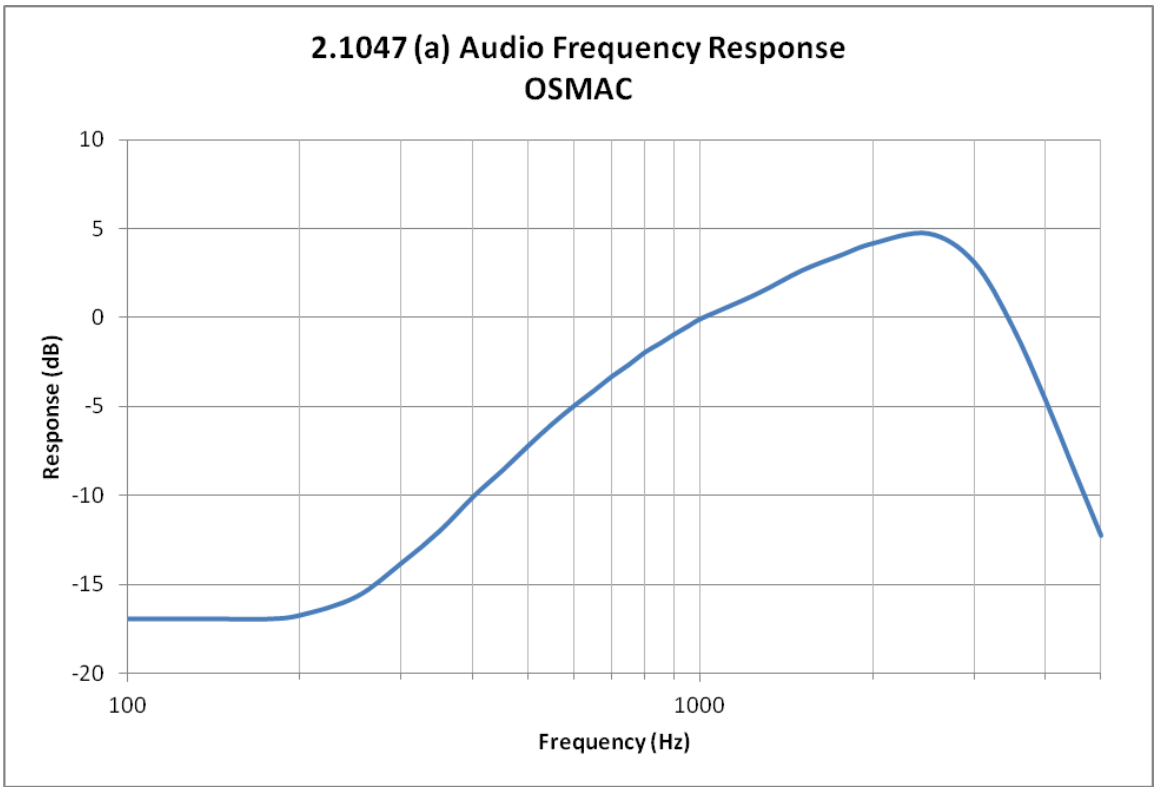
TEST EQUIPMENT: Audio Analyzer, HP 8903B
Modulation Analyzer, Hewlett Packard Model HP8901A
50-Ohm Attenuator, Bird Electronics 50-A-FFN-20 (20dB, 50W)

MEASUREMENT PROCEDURE:

Audio frequency response was measured according to TIA/EIA Standard 603-C

TEST SET-UP:



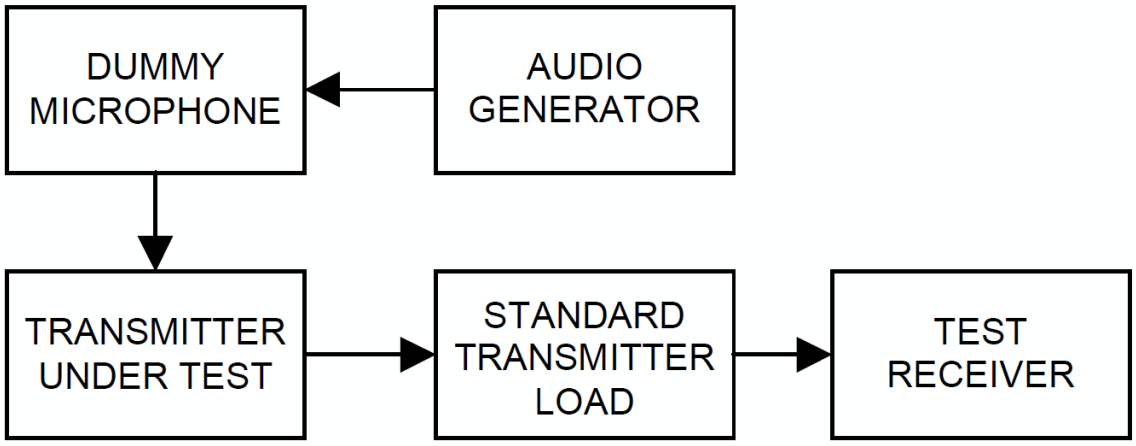

2.1047 (a) Audio Frequency Response
OSMAC
10
5
0
-5
-10
-15
-20
Response (dB)
100
1000
Frequency (Hz)

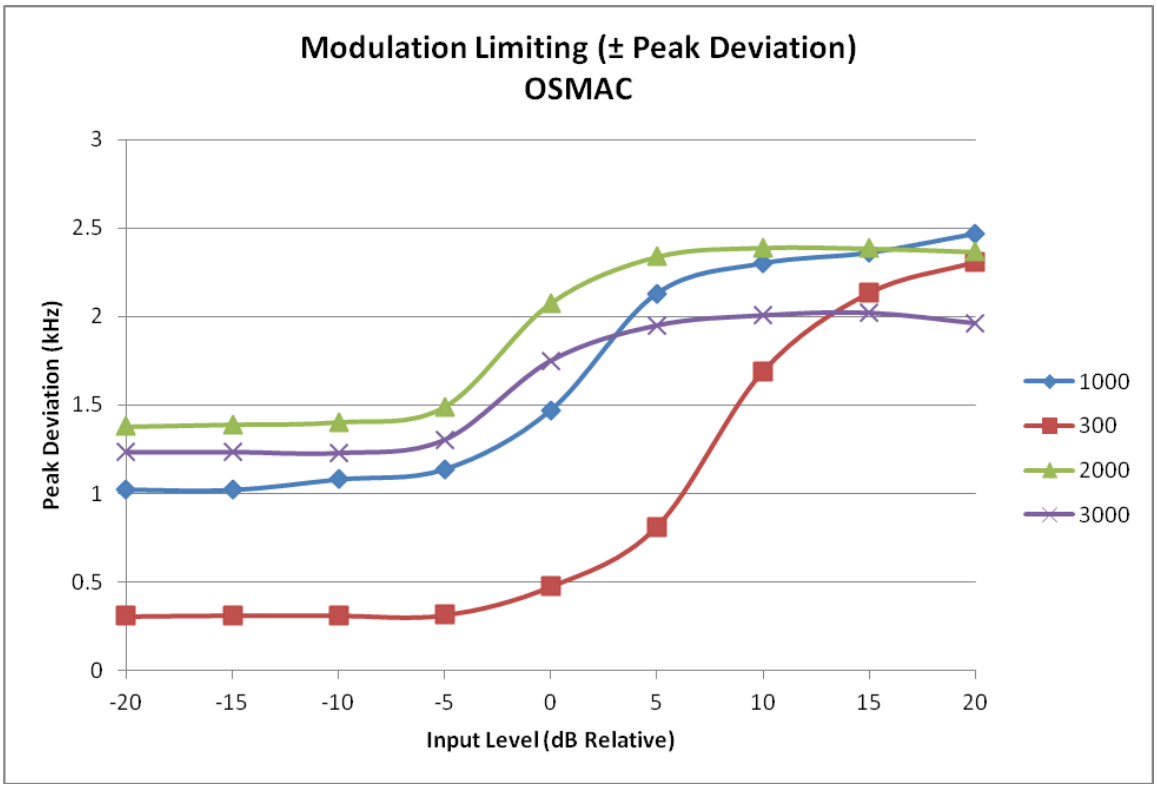
NAME OF TEST:	Modulation Limiting Response
RULE PART NUMBER:	2.1033 (c)(14); 2.1047(b)
MINIMUM STANDARDS:	The instantaneous peak and steady state deviations shall not exceed rated system deviations
TEST RESULTS:	Meets minimum standards (see data on following page)
TEST CONDITIONS:	Standard Test Conditions, 25 C
TEST PROCEDURE:	TIA/EIA – 603-C
TEST EQUIPMENT:	Audio Analyzer, HP 8903B Modulation Analyzer, Hewlett Packard Model HP8901A 50-Ohm Attenuator, Bird Electronics 50-A-FFN-20 (20dB, 50W)

MEASUREMENT PROCEDURE:

Modulation limiting response was measured according to TIA/EIA Standard 603-C

TEST SET-UP:




Modulation Limiting (± Peak Deviation)
OSMAC
Peak Deviation (kHz)
3
2.5
2
1.5
1
0.5
0
-20
-15
-10
-5
0
5
10
15
20
Input Level (dB Relative)
1000
300
2000
3000

Equipment Calibration Information

Equipment	Serial Number	Cal Date	Cal Due
HP 8563E Spectrum Analyzer	3221A00149	4/15/2010	4/15/2012
Agilent E8257D Signal Generator	MY44320507	4/20/2010	4/20/2012
HP 8901A Modulation Analyzer	2950A05551	4/12/2010	4/12/2012
HP 437B Power Meter	3125U13882	4/12/2010	4/12/2012

Instruments have been calibrated using standards with accuracies traceable to NIST standards.