



Flom Test Labs
EMI, EMC, RF Testing Experts Since 1963

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Date of Report: June 29, 2006
Date of Submission: July 19, 2006

Federal Communications Commission
Via: Electronic Filing

Attention: Authorization & Evaluation Division

Applicant: Wulfsberg Electronics Division
Equipment: CDM-451
FCC ID: FRWCDM-451
FCC Rules: 87.187(O), 87.0(Q), 87.475, Confidentiality

Gentlemen:

On behalf of the Applicant, enclosed please find Application Form 731, Engineering Test Report and all pertinent documentation, the whole for approval of the referenced equipment as shown.

Filing fees are attached.

We trust the same is in order. Should you need any further information, kindly contact the writer who is authorized to act as agent.

Sincerely yours,

David McPherson, Compliance Engineer

enclosure(s)
cc: Applicant
DEL/ca

Flom Test Labs
3356 N. San Marcos Place, Suite 107
Chandler, Arizona 85225-7176
(866) 311-3268 phone, (480) 926-3598 fax

FCC ID: FRWCDM-451
MFA p0660016, d0660031



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Transmitter Certification

of

FCC ID: FRWCDM-451

Model: CDM-451

to

Federal Communications Commission

Rule Parts
87.187(O), 87.0(Q), 87.475

Date of report: June 29, 2006

On the Behalf of the Applicant:

Wulfsberg Electronics Division

At the Request of:

Wulfsberg Electronics Division
6400 Wilkinson Drive
Prescott, AZ 86301-6164

Attention of:

Main: (928) 708-1550; Fax: (928) 541-7627
Steve Wagner
Email: steve.wagner@wulfsberg.com

Supervised by:

David McPherson, Compliance Engineer

List of Exhibits

(FCC **Certification** (Transmitters) - Revised 9/28/98)

Applicant: Wulfsberg Electronics Division

FCC ID: FRWCDM-451

By Applicant:

1. Letter of Authorization
2. Confidentiality Request: 0.457 And 0.459
3. Identification Drawings, 2.1033(c)(11)
 - Label
 - Location of Label
 - Compliance Statement
 - Location of Compliance Statement
4. Photographs, 2.1033(c)(12)
5. Documentation: 2.1033(c)
 - (3) User Manual
 - (9) Tune Up Info
 - (10) Schematic Diagram
 - (10) Circuit Description
 - Block Diagram
 - Parts List
 - Active Devices

By M.F.A. Inc.:

- A. Testimonial & Statement of Certification

The Applicant has been cautioned as to the following:

15.21 Information to the User.

The users manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) Special Accessories.

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer, without additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

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Required information per ISO/IEC Guide 25-1990, paragraph 13.2:

a) **Test Report**

b) Laboratory: M. Flom Associates, Inc.
(FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107
(Canada: IC 2044) Chandler, AZ 85225

c) Report Number: d0660031

d) Client: Wulfsberg Electronics Division
6400 Wilkinson Drive
Prescott, AZ 86301-6164

e) Identification: CDM-451
FCC ID: FRWCDM-451
EUT Description: DME

f) EUT Condition: Not required unless specified in individual tests.

g) Report Date: June 29, 2006
EUT Received:

h, j, k): As indicated in individual tests.

i) Sampling method: No sampling procedure used.

l) Uncertainty: In accordance with MFA internal quality manual.

m) Supervised by:



David McPherson, Compliance Engineer

n) Results: The results presented in this report relate only to the item tested.

o) Reproduction: This report must not be reproduced, except in full, without written permission from this laboratory.

Sub-part

2.1033(c)(14):

Test and Measurement Data

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.947, 2.1033(c), 2.1041, 2.1046, 2.1047, 2.1079, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts:

- ☐ 21 – Domestic Public Fixed Radio Services
- ☐ 22 – Public Mobile Services
- ☐ 22 Subpart H - Cellular Radiotelephone Service
- ☐ 22.901(d) - Alternative technologies and auxiliary services
- ☐ 23 – International Fixed Public Radiocommunication services
- ☐ 24 – Personal Communications Services
- ☐ 74 Subpart H - Low Power Auxiliary Stations
- ☐ 80 – Stations in the Maritime Services
- ☐ 80 Subpart E - General Technical Standards
- ☐ 80 Subpart F - Equipment Authorization for Compulsory Ships
- ☐ 80 Subpart K - Private Coast Stations and Marine Utility Stations
- ☐ 80 Subpart S - Compulsory Radiotelephone Installations for Small Passenger Boats
- ☐ 80 Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes
- ☐ 80 Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act
- ☐ 80 Subpart V - Emergency Position Indicating Radio Beacons (EPIRB'S)
- ☐ 80 Subpart W - Global Maritime Distress and Safety System (GMDSS)
- ☐ 80 Subpart X - Voluntary Radio Installations
- ☒ 87 – Aviation Services
- ☐ 90 – Private Land Mobile Radio Services
- ☐ 94 – Private Operational-Fixed Microwave Service
- ☐ 95 Subpart A - General Mobile Radio Service (GMRS)
- ☐ 95 Subpart C - Radio Control (R/C) Radio Service
- ☐ 95 Subpart D - Citizens Band (CB) Radio Service
- ☐ 95 Subpart E - Family Radio Service
- ☐ 95 Subpart F - Interactive Video and Data Service (IVDS)
- ☐ 97 - Amateur Radio Service
- ☐ 101 – Fixed Microwave Services

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

In accordance with ANSI C63.4-2003 Draft, section 6.1.9, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104 °F) unless the particular equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst-case measurements.



A2LA

"A2LA has accredited M. Flom Associates, Inc. Chandler, AZ for technical competence in the field of Electrical Testing. The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 – 1999 'General Requirements for the Competence of Testing and Calibration Laboratories' and any additional program requirements in the identified field of testing."

Certificate Number: **2152-01**

List of General Information Required for Certification

In Accordance with FCC Rules and Regulations,
Volume II, Part 2 and .187(O), 87.0(Q), 87.475

Sub-part 2.1033

(c)(1): **Name and Address of Applicant:**

Wulfsberg Electronics Division
6400 Wilkinson Drive
Prescott, AZ 86301-6164

Manufacturer:

Wulfsberg Electronics Division
6400 Wilkinson Drive
Prescott, AZ 86301-6164

(c)(2): **FCC ID:** FRWCDM-451

Model Number: CDM-451

(c)(3): **Instruction Manual(s):**

Please see attached exhibits

(c)(4): **Type of Emission:** 1M00P0N

(c)(5): **Frequency Range, MHz:** 1025 to 1150

(c)(6): **Power Rating, Watts:** 250.0 (min)
 _____ Switchable _____ Variable X N/A

(c)(7): **Maximum Power Rating, Watts:** N/A

DUT Results: Passes x Fails

Subpart 2.1033 (continued)

(c)(8): Voltages & currents in all elements in final RF stage, including final transistor or solid-state device:

Collector Current, A	=	22 (peak)
Collector Voltage, Vdc	=	50
Supply Voltage, Vdc	=	28 (nominal)

(c)(9): **Tune-Up Procedure:**

Please see attached exhibits

(c)(10): **Circuit Diagram/Circuit Description:**

Including description of circuitry & devices provided for determining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation and limiting power.

Please see attached exhibits

(c)(11): **Label Information:**

Please see attached exhibits

(c)(12): **Photographs:**

Please see attached exhibits

(c)(13): **Digital Modulation Description:**

☐ Attached Exhibits
☒ N/A

(c)(14): **Test and Measurement Data:**

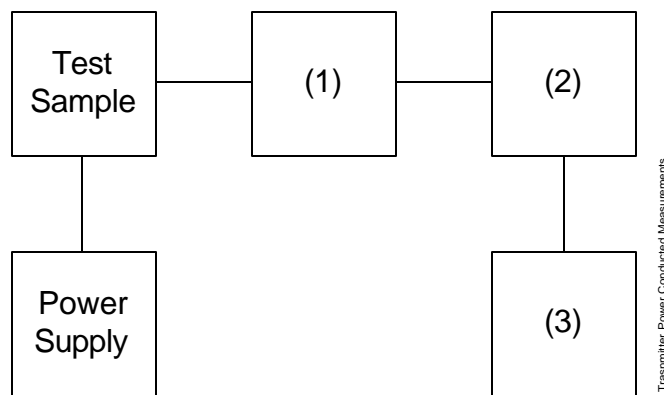
Follows

Name of Test: Carrier Output Power (Conducted)
Specification: 47 CFR 2.1046(a)
Guide: ANSI/TIA/EIA-603-1992, Paragraph 2.2.1

Measurement Procedure

A) The EUT was connected to a resistive coaxial attenuator of normal load impedance, and the unmodulated output power was measured by means of an Spectrum Analyzer.

Transmitter Test Set-Up: RF Power Output



	Asset	Description	s/n	Cycle	Last Cal
(1)	Coaxial Attenuator				
X		WEINSCHTEL CORP 68-30-34 (30 dB)	LW934	NCR	
		NARDA 4772-10 (10 dB)		NCR	
(2)	Spectrum Analyzer				
X	i00048	HP 8566B Spectrum Analyzer	2152A02970	12 mo.	Jun-06
(3)	Frequency Counter				
X	i00048	HP 8566B Spectrum Analyzer	2511A01467	12 mo.	Sep-05

Name of Test: Carrier Output Power (Conducted)

Measurement Results
(Worst case)

Frequency of Carrier, MHz = 1025.000, 1080.000, 1150.000
Ambient Temperature = 23°C ± 3°C

Power Setting	RF Power, dBm	RF Power, Watts
High	56.6	457.09 (peak)

Performed by:



David McPherson, Compliance Engineer

Name of Test: RF Power Output (Radiated)

Specification: 47 CFR 2.1046(a)

Test Equipment: As per attached page

Measurement Procedure (Radiated)

1. The EUT was placed on an open-field site and its radiated field strength at a known distance was measured by means of a spectrum analyzer. Equivalent loading was calculated from the equation $P_t = ((E \times R)^2 / 49.2)$ watts, where $R = 3m$.
2. Measurement accuracy is ± 1.5 dB.

Measurement Results

Ambient Temperature: $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Tuned, MHz	Frequency Emission, Frequency MHz	Meter, dBuV/m	CF, dB	ERP, dBm	ERP, Watts
1025.000	1024.975000	117.2	26.2	46.1	40
1080.000	1080.013000	116.7	26.5	45.8	35
1150.000	1150.013000	116.5	26.8	46.0	40



Performed by:

Fred Chastain, Compliance Engineer

Name of Test: Unwanted Emissions (Transmitter Conducted)

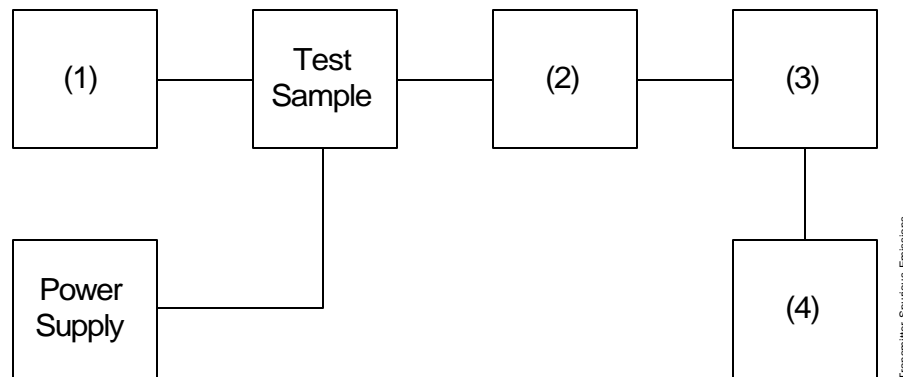
Specification: 47 CFR 2.1051

Guide: ANSI/TIA/EIA-603-1992, Paragraph 2.2.13

Measurement Procedure

- A) The emissions were measured for the worst case as follows:
- 1). within a band of frequencies defined by the carrier frequency plus and minus one channel.
 - 2). from the lowest frequency generated in the EUT and to at least the 10th harmonic of the carrier frequency, or 40 GHz, whichever is lower.
- B) The magnitude of spurious emissions that are attenuated more than 20 dB below the permissible value need not be specified.

Transmitter Test Set-Up: Spurious Emission



Asset	Description	s/n		
(1) Audio Oscillator/Generator				
i00017	HP 8903A Audio Analyzer	2216A01753	12 mo.	Apr-04
i00002	HP 3336B Synthesizer / Level Gen.	1931A01465	12 mo.	Apr-04
(2) Coaxial Attenuator				
X	WEINSCHEL CORP 68-30-34 (30 dB)	LW934	NCR	
X	NARDA 4772-10 (10 dB)		NCR	
(3) Filters; Notch, HP, LP, BP				
X	Mini Circuits 15542 (VHF-2000)			
(4) Spectrum Analyzer				
X i00048	HP 8566B Spectrum Analyzer	2152A02970	12 mo.	Jun-06

Name of Test: Unwanted Emissions (Transmitter Conducted)

Measurement Results
(Worst Case)

Summary:

Frequency of carrier, MHz	=	1025, 1080, 1150
Spectrum Searched, GHz	=	0 to 10 x F _C
Maximum Response, Hz	=	N/A
All Other Emissions	=	= 20 dB Below Limit
Limit(s), dBc	=	-69.6 (P max = 457.09 Watts)

Tabulated Results follow:

Measurement Results

State: Ambient Temperature: 23°C ± 3°C

Freq Tuned [MHz]	Spurious Freq [MHz]	Measured Level [dBm]	Level Below Carrier [dB]	Margin [dB]
1025.00	2050.00	-24.7	81.3	11.4
	3075.00	-21.0	77.6	7.7
	4100.00	-31.1	87.7	17.8
	5125.00	-28.4	85.0	15.1
	6150.00	-25.5	82.1	12.2
	7175.00	-22.9	79.5	9.6
	8200.00	-24.8	81.4	11.5
	2160.00	-25.4	82.0	12.1
	3240.00	-24.3	80.9	11.0
	4320.00	-29.3	85.9	16.0
1080.00	5400.00	-17.6	74.2	4.3
	6480.00	-25.4	82.0	12.1
	7560.00	-23.9	80.5	10.6
	8640.00	-25.7	82.3	12.4
	2300.00	-23.6	80.2	10.3
1150.00	3450.00	-27.8	84.4	14.5
	4600.00	-31.8	88.4	18.5
	5750.00	-30.8	87.4	17.5
	6900.00	-26.1	82.7	12.8
	8050.00	-26.1	82.7	12.8
	9200.00	-26.9	83.5	13.6

All other emissions greater than 20 dB below limit

Performed by:



David McPherson, Compliance Engineer

Name of Test: Field Strength of Spurious Radiation

Specification: 47 CFR 2.1053(a)

Guide: ANSI/TIA/EIA-603-1992/2001, Paragraph 1.2.12 and Table 16, 47 CFR 22.917

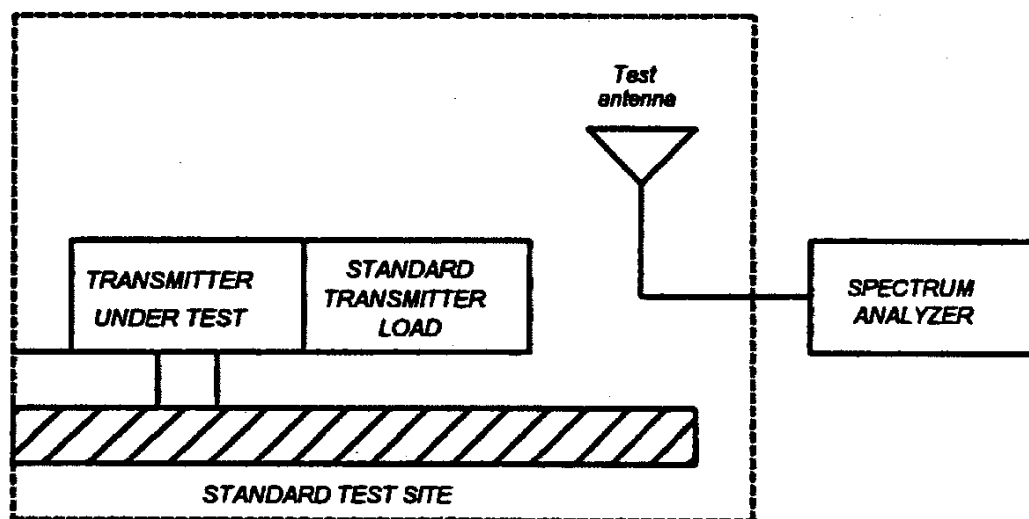
Measurement Procedure

Definition:

Radiated spurious emissions are emissions from the equipment when transmitting into a non-radiating load on a frequency or frequencies which are outside an occupied band sufficient to ensure transmission of information of required quality for the class of communications desired.

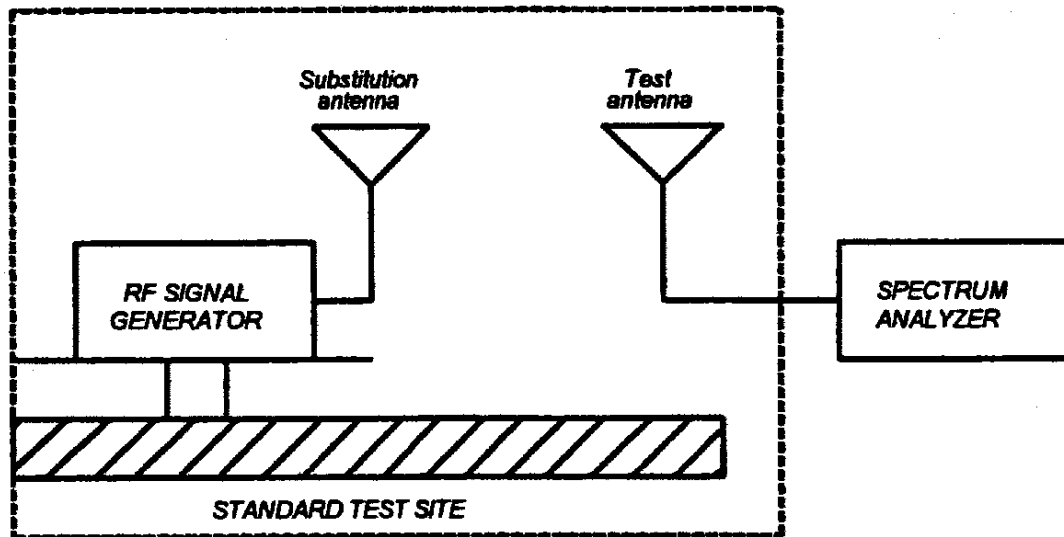
Method of Measurement:

- A) Connect the equipment as illustrated
- B) Adjust the spectrum analyzer for the following settings:
 - 1) Resolution Bandwidth 100 kHz (<1 GHz), 1 MHz (> 1GHz).
 - 2) Video Bandwidth = 3 times Resolution Bandwidth, or 30 kHz (22.917)
 - 3) Sweep Speed ≤ 2000 Hz/second
 - 4) Detector Mode = Mean or Average Power
- C) Place the transmitter to be tested on the turntable in the standard test site. The transmitter is transmitting into a non-radiating load that is placed on the turntable. The RF cable to this load should be of minimum length.



Name of Test: Field Strength of Spurious Radiation (Cont.)

- D) For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to \pm the test bandwidth (see section 1.3.4.4).
- E) For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
- F) Repeat step E) for each spurious frequency with the test antenna polarized vertically.



- G) Reconnect the equipment as illustrated.
- H) Keep the spectrum analyzer adjusted as in step B).
- I) Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.

Name of Test: Field Strength of Spurious Radiation (Cont.)

- J) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
- K) Repeat step J) with both antennas vertically polarized for each spurious frequency.
- L) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps J) and K) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.
- M) The levels recorded in step L) are absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:

Radiated spurious emissions dB =

$$10\log_{10}(\text{TX power in watts}/0.001) - \text{the levels in step I)}$$

NOTE: It is permissible that other antennas provided can be referenced to a dipole.

Test Equipment

Asset	Description	s/n	Cycle	Last Cal
Transducer				
i00088	EMCO 3109-B 25MHz-300MHz	2336	12 mo.	Sep-03
X i00089	Apriel 2001 200MHz-1GHz	001500	12 mo.	Sep-03
X i00103	EMCO 3115 1GHz-18GHz	9208-3925	12 mo.	Jan-04
Amplifier				
X i00028	HP 8449A	2749A00121	12 mo.	May-04
Spectrum Analyzer				
X i00029	HP 8563E	3213A00104	12 mo.	May-04
X i00033	HP 85462A	3625A00357	12 mo.	Sep-04
Substitution Generator				
X i00067	HP 8920A Communication TS	3345U01242	12 mo.	Jun-04
i00207	HP 8753D Network Analyzer	3410A08514	12 mo.	Jul-04

Microphone, Antenna Port, and Cabling

Microphone	_____	Cable Length	_____	Meters
Antenna Port Terminated	_____	Load	_____	Antenna Gain
All Ports Terminated by Load	_____	Peripheral	_____	

Name of Test: Field Strength of Spurious Radiation

Measurement Results

g0660227: 2006-Jun-28 Wed 14:12:00

STATE: 2:High Power

Ambient Temperature: 23°C ± 3°C

Frequency Tuned, MHz	Frequency Emission, MHz	ERP, dBm	ERP, dBc
1025.000000	2050.000000	-58.2	-86.20
1080.000000	2160.000000	-55.8	-83.80
1150.000000	2300.000000	-55.9	-83.70
1025.000000	3075.000000	-56.1	-84.10
1080.000000	3240.000000	-56.5	-84.50
1150.000000	3450.000000	-57.4	-85.40
1025.000000	4100.000000	-53.1	-81.10
1080.000000	4320.000000	-50.8	-78.60
1150.000000	4600.000000	-52.2	-80.20
1025.000000	5125.000000	-50.4	-78.40
1080.000000	5400.000000	-49.1	-76.90
1150.000000	5750.000000	-48.2	-76.20
1025.000000	6150.000000	-48.4	-76.40
1080.000000	6480.000000	-46.3	-74.10
1150.000000	6900.000000	-45.4	-73.40
1025.000000	7175.000000	-44.4	-72.40
1080.000000	7560.000000	-47.2	-75.00
1150.000000	8050.000000	-42.5	-70.50
1025.000000	8200.000000	-42.7	-70.70
1080.000000	8640.000000	-43.9	-71.70
1150.000000	9200.000000	-39.7	-67.70
1025.000000	9225.000000	-39.7	-67.70
1080.000000	9720.000000	-40.2	-68.00
1025.000000	10250.000000	-37.6	-65.60
1150.000000	10350.000000	-38.5	-66.50
1080.000000	10800.000000	-39.8	-67.60
1150.000000	11500.000000	-38.2	-66.20



Performed by:

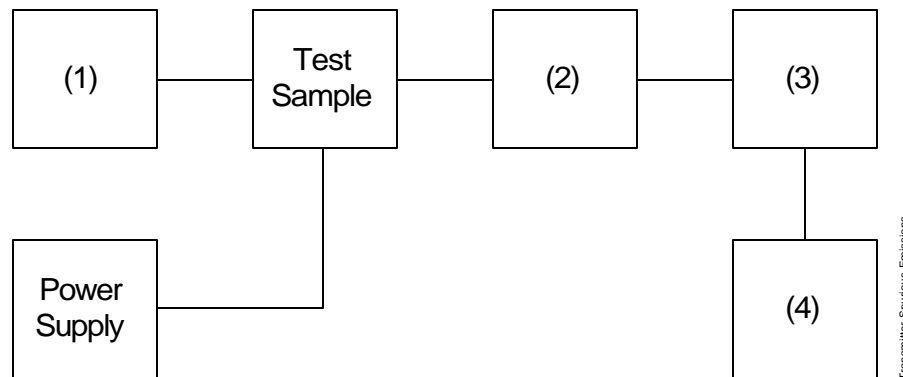
Fred Chastain, Compliance Engineer

Name of Test: Emission Masks (Occupied Bandwidth)
Specification: 47 CFR 2.1049(c)(1)
Guide: ANSI/TIA/EIA-603-1992, Paragraph 2.2.11

Measurement Procedure

- A) The EUT and test equipment were set up as shown below
- B) For EUTs supporting audio modulation, the audio signal generator was adjusted to the frequency of maximum response and with output level set for $\pm 2.5/\pm 1.25$ kHz deviation (or 50% modulation). With level constant, the signal level was increased 16 dB.
- C) For EUTs supporting digital modulation, the digital modulation mode was operated to its maximum extent.
- D) The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

Transmitter Test Set-Up: Occupied Bandwidth



Asset	Description	s/n	Cycle	Last Cal
(1) Audio Oscillator/Generator (not required)				
(2) Coaxial Attenuator				
X i00231/2	PASTERNAK PE7021-30 (30 dB)	231 or 232	NCR	
i00123	NARDA 766 (10 dB)	7802A	NCR	
(3) Spectrum Analyzer				
X i00048	HP 8566B Spectrum Analyzer	2152A02970	12 mo.	Jun-06
	HP 8563 E Spectrum Analyzer			
(4) Not needed				

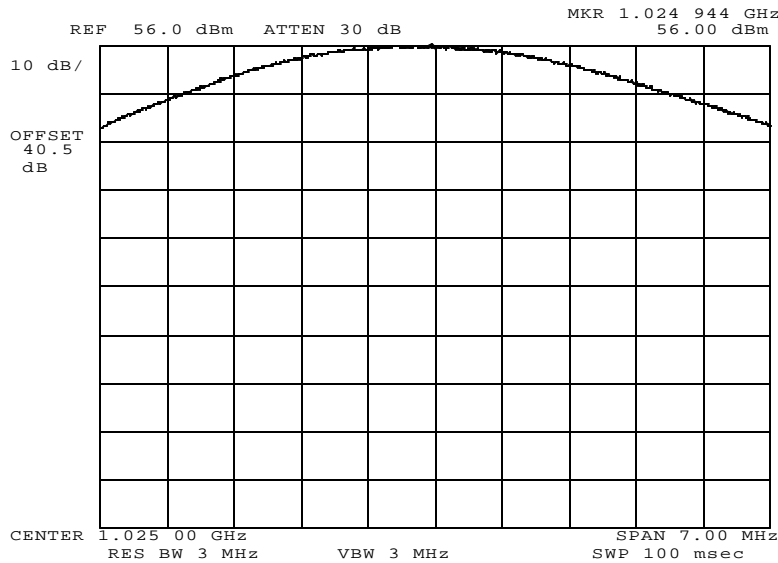
Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0660209: 2006-Jun-26 Mon 14:39:00

State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
PULSE P0
LOW CH - L BAND PULSE REFERENCE
LEVEL

Performed by:

David McPherson, Compliance Engineer

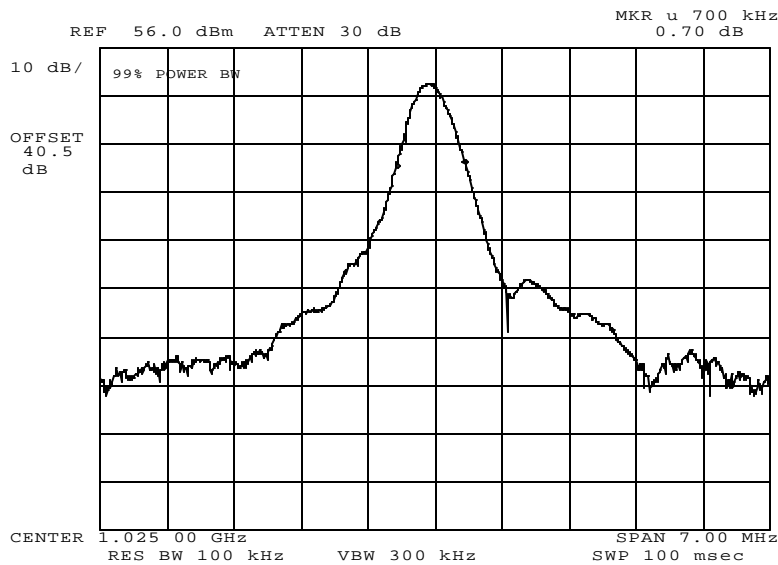
Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0660211: 2006-Jun-26 Mon 14:52:00

State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
PULSE P0
LOW CH - 99% Bandwidth Power

Performed by:

David McPherson, Compliance Engineer

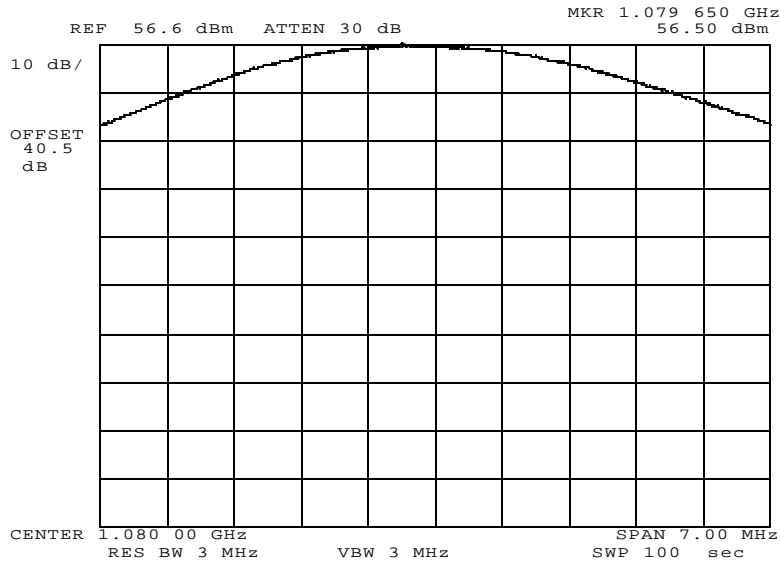
Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0660214: 2006-Jun-26 Mon 16:11:00

State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
PULSE P0
MID CH - L BAND PULSED REFERENCE
LEVEL

Performed by:

David McPherson, Compliance Engineer

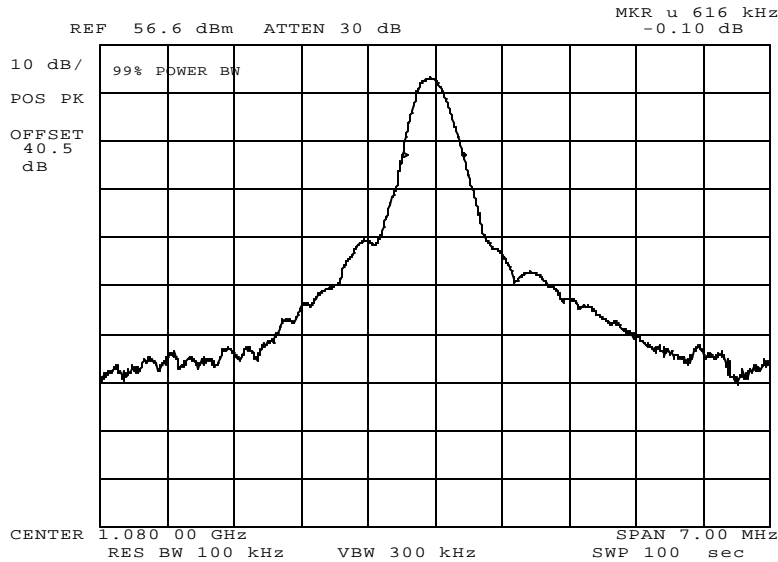
Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0660217: 2006-Jun-26 Mon 17:59:00

State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
PULSE P0
MID CH - 99% Bandwidth Power

Performed by:

David McPherson, Compliance Engineer

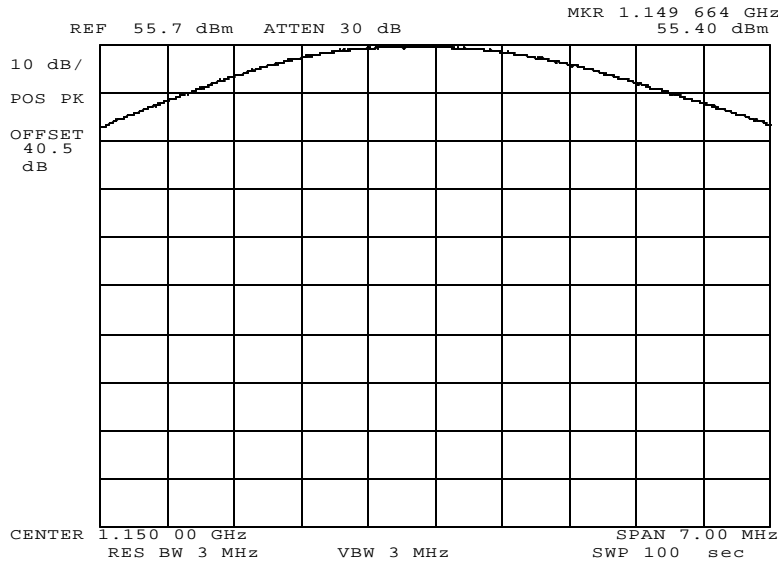
Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0660219: 2006-Jun-26 Mon 18:22:00

State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
PULSE P0
HI CH - L BAND PULSED REFERENCE
LEVEL

Performed by:

David McPherson, Compliance Engineer

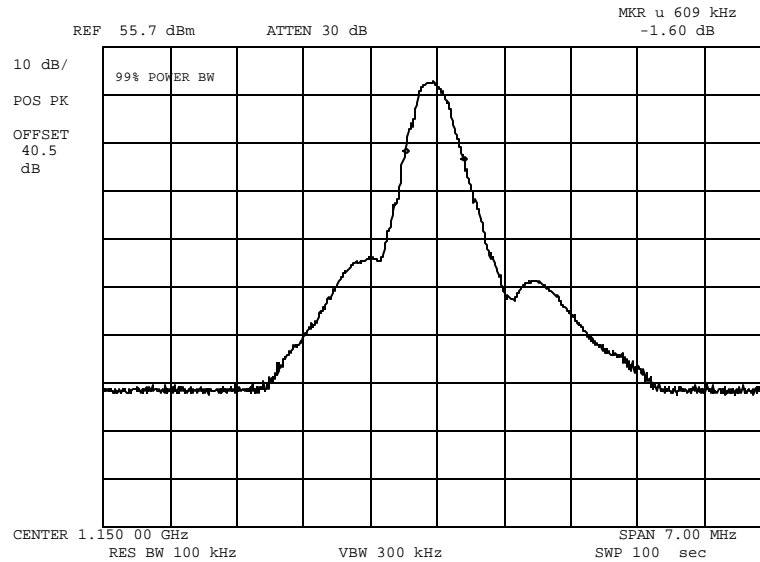
Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0660223: 2006-Jun-26 Mon 18:35:00

State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
PULSE P0
HI CH - 99% Bandwidth Power

Performed by:


David McPherson, Compliance Engineer

Name of Test: Frequency Stability (Temperature Variation)

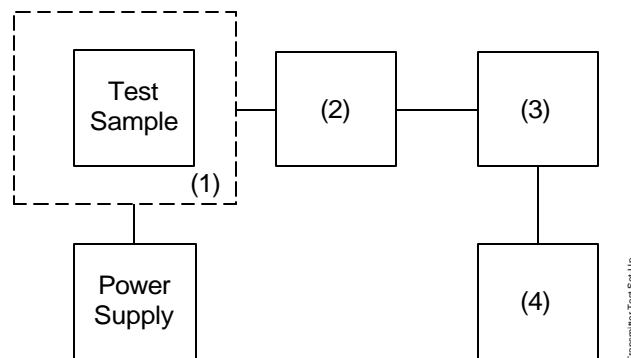
Specification: 47 CFR 2.1055(a)(1)

Guide: ANSI/TIA/EIA-603-1992, Paragraph 2.2.2

Measurement Procedure

- A) The EUT and test equipment were set up as shown on the following page.
- B) With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.
- C) With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.
- D) The temperature tests were performed for the worst case.

Transmitter Test Set-Up: Temperature Variation



Asset	Description	s/n	Cycle	Last Cal
(1) Temperature, Humidity, Vibration				
X	i00027 Tenney Temp. Chamber	9083-765-234	NCR	
(2) Coaxial Attenuator				
X	i00231/2 Coax cable			
(3) RF Power Frequency Counter				
X	ATC-1400A IFR	204006799	12 mo.	May-06
(4) Frequency Counter				
X	ATC-1400A IFR	204006799	12 mo.	May-06

Name of Test: Frequency Stability (Temperature Variation)

Measurement Results

g0660188: 2006-Jun-28 Wed 15:29:01

State: 0:General

Operating Frequency

Reference Voltage

Deviation Limit

Ambient Temperature: 23°C ± 3°C

1080.00 MHz

28 VDC

± 100 KHz (+ 0.009259 % or 92.59 ppm)

VOLTAGE [%]	POWER [VDC]	TEMP [° C]	FREQ. [MHz]	DEVIATION [%]	[PPM]
	28				
100%		25 (ref)	1079.98	0.001852	18.52
100%		-55	1079.95	0.004630	46.30
100%		-50	1079.95	0.004630	46.30
100%		-40	1079.96	0.003704	37.04
100%		-30	1079.98	0.001852	18.52
100%		-20	1079.98	0.001852	18.52
100%		-10	1079.97	0.002778	27.78
100%		0	1079.98	0.001852	18.52
100%		+10	1079.98	0.001852	18.52
100%		+20	1079.98	0.001852	18.52
100%		+25	1079.98	0.001852	18.52
100%		+30	1079.97	0.002778	27.78
100%		+40	1079.98	0.001852	18.52
100%		+50	1079.98	0.001852	18.52
100%		+60	1079.98	0.001852	18.52
100%		+70	1079.98	0.001852	18.52
85%	23.8	+25	1079.98	0.001852	18.52
115%	32.2	+25	1079.98	0.001852	18.52

Performed by:

David McPherson, Compliance Engineer

Flom Test Labs

3356 North San Marcos Place, Suite 107

Chandler, Arizona 85225-7176

(866) 311-3268 phone, (480) 926-3598 fax

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FCC ID: FRWCDM-451

MFA p0660016, d0660031

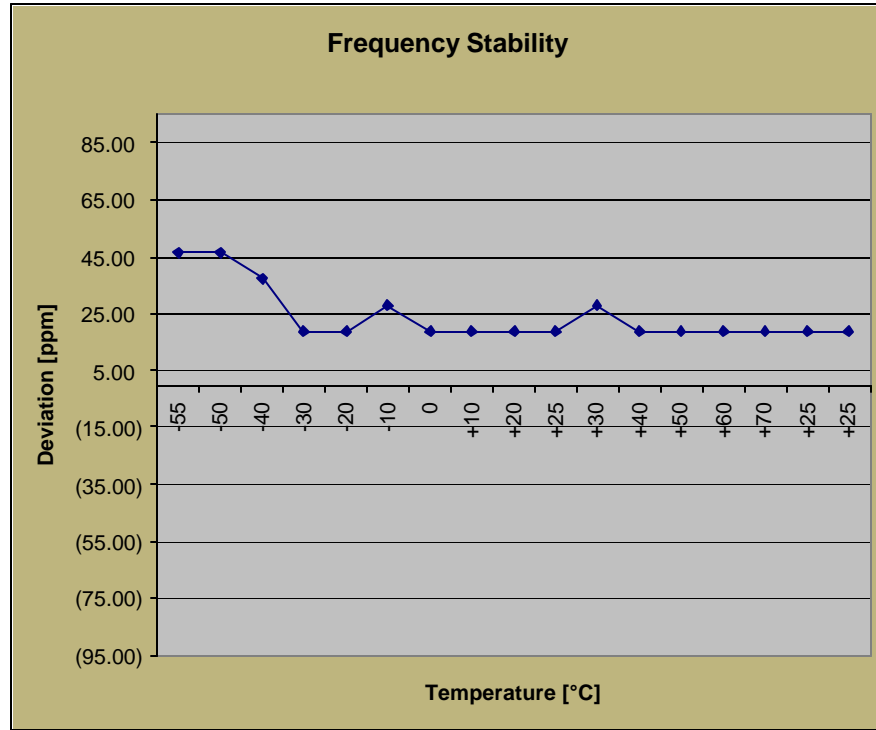
Name of Test: Frequency Stability (Temperature Variation)

Measurement Results

g0660188: 2006-Jun-28 Wed 15:29:01

State: 0:General

Ambient Temperature: 23°C ± 3°C



Performed by:

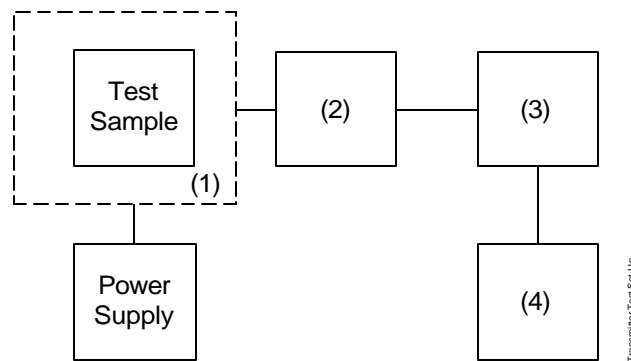
David McPherson, Compliance Engineer

Name of Test: Frequency Stability (Voltage Variation)
Specification: 47 CFR 2.1055(d)(1)
Guide: ANSI/TIA/EIA-603-1992, Paragraph 2.2.2

Measurement Procedure

- A) The EUT was placed in a temperature chamber (if required) at $25 \pm 5^\circ\text{C}$ and connected as shown below.
- B) The power supply voltage to the EUT was varied from 85% to 115% of the nominal value measured at the input to the EUT.
- C) The variation in frequency was measured for the worst case.

Transmitter Test Set-Up: Voltage Variation



Asset	Description	s/n	Cycle	Last Cal
(1) Temperature, Humidity, Vibration				
X	i00027 Tenney Temp. Chamber	9083-765-234	NCR	
(2) Coaxial Attenuator				
X	i00231/2 Coax cable			
(3) RF Power Frequency Counter				
X	ATC-1400A IFR	204006799	12 mo.	May-06
(4) Frequency Counter				
X	ATC-1400A IFR	204006799	12 mo.	May-06

Results: Frequency Stability (Voltage Variation)

State: Ambient Temperature: 23°C ± 3°C

Limit, ppm = 92.59
Limit, KHz = ± 100

VOLTAGE [%]	POWER [VDC]	TEMP [° C]	FREQ. [MHz]	DEVIATION [%]	[PPM]
85%	23.8	+25	1079.98	0.001852	18.52
115%	32.2	+25	1079.98	0.001852	18.52

Performed by:



David McPherson, Compliance Engineer

Name of Test: Necessary Bandwidth and Emission Bandwidth

Specification: 47 CFR 2.202(g)

Modulation = 1M00P0N

Necessary Bandwidth Calculation:

Maximum Modulation (M), kHz	=	N/A
Maximum Deviation (D), kHz	=	N/A
Constant Factor (K)	=	1
Necessary Bandwidth (B_N), kHz	=	$(2 \times M) + (2 \times D \times K)$
	=	700.0 (Measured)

Performed by:


David McPherson, Compliance Engineer

END OF TEST REPORT

<p style="text-align: center;">Testimonial and Statement of Certification</p>
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This is to Certify:

1. **That** the application was prepared either by, or under the direct supervision of, the undersigned.
2. **That** the technical data supplied with the application was taken under my direction and supervision.
3. **That** the data was obtained on representative units, randomly selected.
4. **That**, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

Certifying Engineer:



David McPherson, Compliance Engineer