



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

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Transmitter Certification

of

FCC ID: T04-RMTX-2025

Model: Rack Mount TX

to

Federal Communications Commission

Rule Parts 74(F), 90

Date of report: January 26, 2006

Date of Amended report: October 10, 2006

On the Behalf of the Applicant:

Gigawave US

At the Request of:

Total RF
777 American Drive
Bensalem, PA 19020

Attention of:

Tom Sharkoski
215-633-1000; fax: 215-633-1085
Email: tsharkoski@totalrf.com

Supervised by:

Hoosamuddin S. Bandukwala, Lab
Director

List of Exhibits

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

Applicant: Gigawave US

FCC ID: T04-RMTX-2025

By Applicant:

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

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: d0610037

d) Client: Gigawave US
777 American Drive
Bensalem, PA 19020

e) Identification: FCC ID: T04-RMTX-2025
EUT Description: Rack Mount TX

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

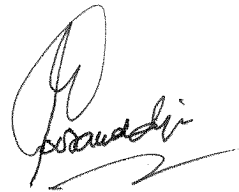
g) Report Date: January 26, 2006
EUT Received: December 12, 2006

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:



Hoosamuddin S. Bandukwala, Lab
Director

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 F – Television Broadcast Auxiliary Stations
- ☐ 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, 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 to 74(F), 90.202 and Confidentiality

Sub-part 2.1033

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

Gigawave US
 777 American Drive
 Bensalem, PA 19020

Manufacturer:

Applicant

(c)(2): **FCC ID:**

T04-RMTX-2025

Model Number:

Rack Mount TX

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

Please see attached exhibits

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

12M0W7D, 12M0F8W, 7M75F3W

(c)(5): **Frequency Range, MHz:**

1990 to 2483.5

(c)(6): **Power Rating, Watts:**

☒ Switchable

☐ Variable

0.500

☐ N/A

(c)(7): **Maximum Power Rating, Watts:**

100

DUT Results:

Passes ☒ 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 | = | 3.0 |
| Collector Voltage, Vdc | = | 8.0 |
| Supply Voltage, Vdc | = | 12V |

(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)

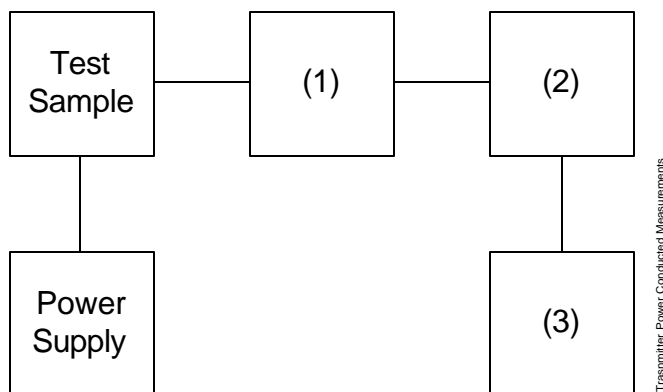
Guide: ANSI/TIA/EIA-603-1992, Paragraph 2.2.1

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 RF Power Meter.

B) Measurement accuracy is $\pm 3\%$.

Transmitter Test Set-Up: RF Power Output



| Asset | Description | s/n | Cycle | Last Cal |
|---------------------------------------|--------------------------------------|---------------|--------|----------|
| (1) Coaxial Attenuator | | | | |
| X | i00231/2 PASTERNAK PE7021-30 (30 dB) | 231 or 232 | NCR | |
| | i00122/3 NARDA 766 (10 dB) | 7802 or 7802A | NCR | |
| (2) Filters; Notch, HP, LP, BP | | | | |
| | None required | nsn | NCR | |
| (3) Spectrum Analyzer | | | | |
| X | i00048 HP 8566B Spectrum Analyzer | 2511A01467 | 12 mo. | Aug-06 |

Name of Test: Carrier Output Power (Conducted)

Measurement Results
(Worst case)

Frequency of Carrier, MHz = 2200
Ambient Temperature = 23°C ± 3°C

| Power Setting | RF Power, dBm | RF Power, Watts |
|---------------|---------------|-----------------|
| High | 27.0 | 0.500 |



Performed by: Fred Chastain, Test Technician

Name of Test: Unwanted Emissions (Transmitter Conducted)

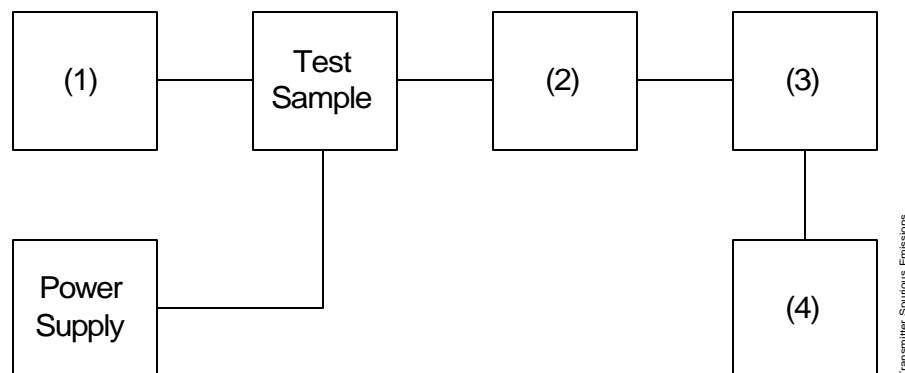
Specification: 47 CFR 2.1051

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 | | | | |
| X i00017 | HP 8903A Audio Analyzer | 2216A01753 | 12 mo. | Jul-06 |
| (2) Coaxial Attenuator | | | | |
| X i00231/2 | PASTERNAK PE7021-30 (30 dB) | 231 or 232 | NCR | |
| i0012/3 | NARDA 766 (10 dB) | 7802 or 7802A | NCR | |
| (3) Filters; Notch, HP, LP, BP | | | | |
| | None required | | | |
| (4) Spectrum Analyzer | | | | |
| X i00048 | HP 8566B Spectrum Analyzer | 2511A01467 | 12 mo. | Aug-06 |

Name of Test: Unwanted Emissions (Transmitter Conducted)

Measurement Results
(Worst Case)

Summary:

| | | |
|---------------------------|---|--------------------------|
| Frequency of carrier, MHz | = | 2200 |
| Spectrum Searched, GHz | = | 0 to 10 x F _C |
| Maximum Response, Hz | = | 4500 |
| All Other Emissions | = | = 20 dB Below Limit |
| Limit(s), dBc | | |

Tabulated Results follow:

Measurement Results

g0610275: 2006-Jan-23 Thu 08:53:00

STATE: 2:High Power

Ambient Temperature: 23°C ± 3°C

| Frequency Tuned, MHz | Frequency Emission, MHz | ERP, dBm | ERP, dBc |
|----------------------|-------------------------|----------|----------|
| 1990.000000 | 3980.000000 | -49.00 | -69.00 |
| 2016.500000 | 4033.000000 | -35.80 | -55.80 |
| 2101.500000 | 4203.000000 | -56.40 | -76.40 |
| 2458.000000 | 4916.000000 | -33.40 | -53.40 |
| 2467.000000 | 4934.000000 | -57.40 | -77.40 |
| 2470.000000 | 4940.000000 | -59.40 | -79.40 |
| 1990.000000 | 5970.000000 | -50.40 | -70.40 |
| 2016.500000 | 6049.500000 | -35.00 | -55.00 |
| 2101.500000 | 6304.500000 | -55.30 | -75.30 |
| 2458.000000 | 7374.000000 | -52.70 | -72.70 |
| 2467.000000 | 7401.000000 | -53.80 | -73.80 |
| 2470.000000 | 7410.000000 | -59.90 | -79.90 |
| 1990.000000 | 7960.000000 | -46.90 | -66.90 |
| 2101.500000 | 8406.000000 | -47.30 | -67.30 |
| 1990.000000 | 9950.000000 | -46.50 | -66.50 |
| 2101.500000 | 10507.500000 | -47.00 | -67.00 |
| 2458.000000 | 9832.000000 | -45.40 | -65.40 |
| 2467.000000 | 9868.000000 | -52.00 | -72.00 |
| 2470.000000 | 9880.000000 | -55.00 | -75.00 |
| 1990.000000 | 11940.000000 | -43.30 | -63.30 |
| 2458.000000 | 12290.000000 | -44.80 | -64.80 |
| 2467.000000 | 12335.000000 | -52.50 | -72.50 |
| 2470.000000 | 12230.000000 | -52.60 | -72.60 |
| 2101.500000 | 12609.000000 | -46.00 | -66.00 |
| 1990.000000 | 13930.000000 | -43.80 | -63.80 |
| 2101.500000 | 14710.500000 | -44.40 | -64.40 |
| 2458.000000 | 14748.000000 | -43.10 | -63.10 |
| 2467.000000 | 14802.000000 | -47.30 | -67.30 |
| 2470.000000 | 14820.000000 | -48.30 | -68.30 |
| 1990.000000 | 15920.000000 | -47.30 | -67.30 |
| 2101.500000 | 16812.000000 | -47.30 | -67.30 |
| 2458.000000 | 17206.000000 | -48.60 | -68.60 |
| 2467.000000 | 17269.000000 | -46.60 | -66.60 |
| 2470.000000 | 17290.000000 | -46.80 | -66.80 |
| 1990.000000 | 17910.000000 | -43.60 | -63.60 |



Performed by:

Fred Chastain, Test Technician

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

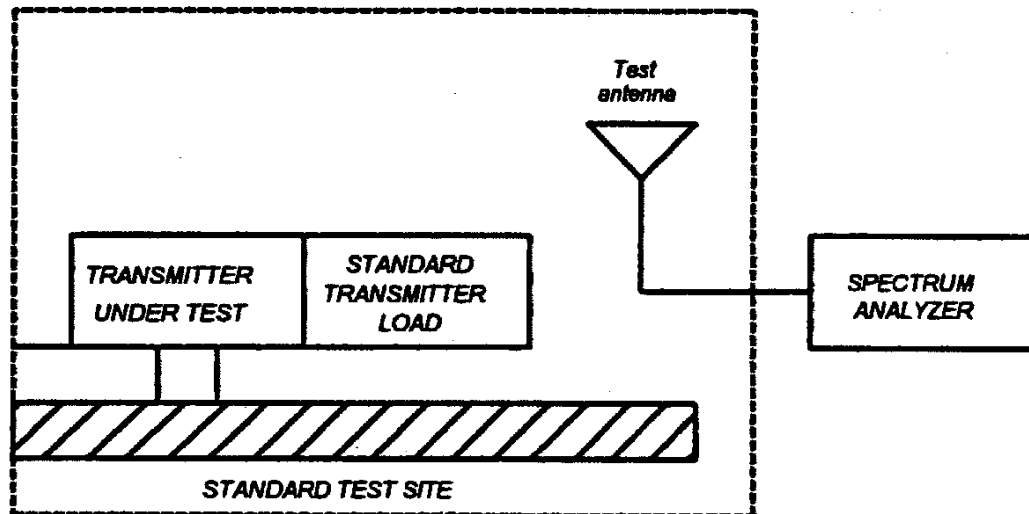
Measurement Procedure

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.

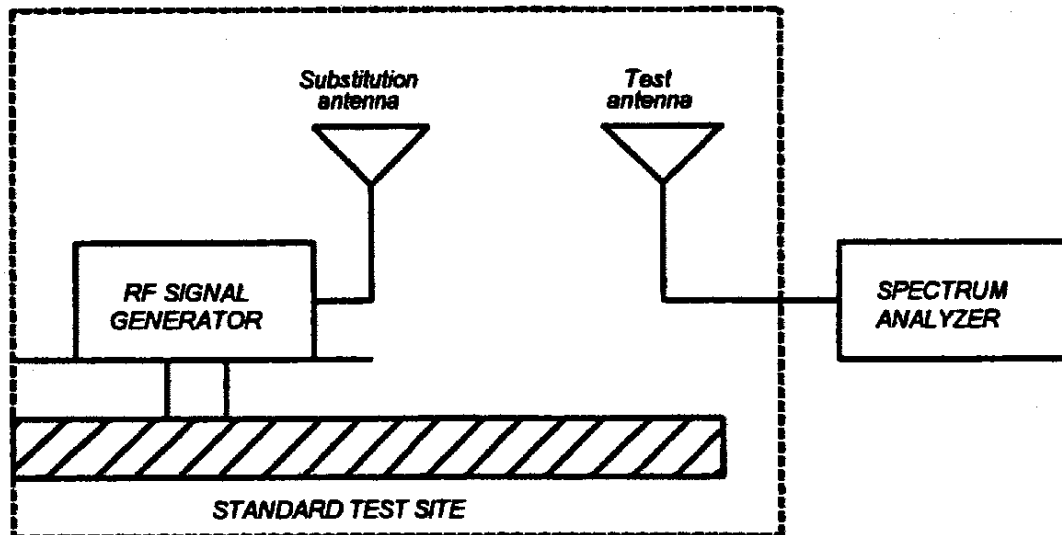
Method of Measurement:

- 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 | | | | |
| X i00088 | EMCO 3109-B 25MHz-300MHz | 2336 | 24 mo. | Sep-05 |
| X i00089 | Apriel 2001 200MHz-1GHz | 001500 | 24 mo. | Sep-05 |
| X i00103 | EMCO 3115 1GHz-18GHz | 9208-3925 | 24 mo. | Jan-05 |
| Amplifier | | | | |
| X i00028 | HP 8449A | 2749A00121 | 12 mo. | May-05 |
| Spectrum Analyzer | | | | |
| X i00029 | HP 8563E | 3213A00104 | 12 mo. | May-05 |
| X i00033 | HP 85462A | 3625A00357 | 12 mo. | Sep-05 |
| Substitution Generator | | | | |
| X i00067 | HP 8920A Communication TS | 3345U01242 | 12 mo. | Jun-05 |
| X i00207 | HP 8753D Network Analyzer | 3410A08514 | 12 mo. | Jul-05 |

All ports terminated.

Test Setup Photos:

Radiated Emissions

State:



State:



Name of Test: Radiated Spurious Emissions

g0610280: 2006-Jan-30 Thu 08:53:00

State: 0:

| Frequency Emission, MHz | Level, dBuV | | @ m | C.F., dB | dbm | dBc |
|-------------------------|-------------|---|-----|----------|--------|---------|
| 73.373000 | 17.72 | V | 3 | 6.14 | -83.14 | -110.14 |
| 73.732800 | 24.63 | H | 3 | 7.07 | -75.30 | -102.30 |
| 122.876000 | 13.66 | H | 3 | 12.02 | -81.32 | -108.32 |
| 122.876000 | 14.91 | V | 3 | 12.67 | -79.42 | -106.42 |
| 172.030000 | 23.66 | V | 3 | 9.96 | -73.38 | -100.38 |
| 172.038000 | 13.69 | H | 3 | 9.95 | -83.36 | -110.36 |
| 240.030000 | 22.63 | V | 3 | 12.10 | -72.27 | -99.27 |
| 240.039000 | 14.23 | H | 3 | 12.10 | -80.67 | -107.67 |
| 614.505000 | 9.57 | H | 3 | 21.05 | -76.38 | -103.38 |
| 614.505000 | 15.83 | V | 3 | 21.05 | -70.12 | -97.12 |
| 663.253000 | 15.73 | V | 3 | 21.55 | -69.72 | -96.72 |
| 712.700000 | 15.43 | H | 3 | 22.14 | -69.43 | -96.43 |
| 712.700000 | 15.50 | V | 3 | 22.14 | -69.36 | -96.36 |

Tests performed up to 10 x Fc

All other emissions in the required measurement range were more that 20 dB below the required limits.



Performed By:

Fred Chastain, Test Technician

Name of Test: Emission Masks (Occupied Bandwidth)

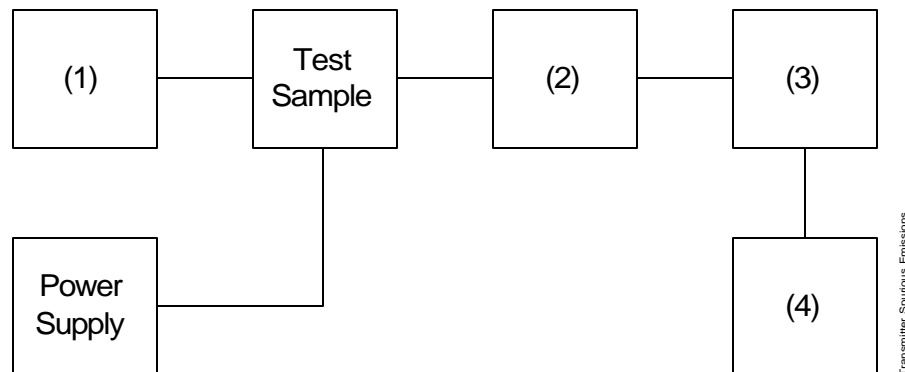
Specification: 47 CFR 2.1049(c)(1)

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 | | | | |
| X i00017 | HP 8903A Modulation Meter | 2216A01753 | 12 mo. | Jul-05 |
| (2) Coaxial Attenuator | | | | |
| X i00231/2 | PASTERNAK PE7021-30 (30 dB) | 231 or 232 | NCR | |
| i00123 | NARDA 766 (10 dB) | 7802A | NCR | |
| (3) Interface | | | | |
| X i00021 | HP 8954A Transceiver Interface | 2146A00159 | NCR | |
| (4) Spectrum Analyzer | | | | |
| X i00048 | HP 8566B Spectrum Analyzer | 2511A01467 | 12 mo. | Aug-06 |

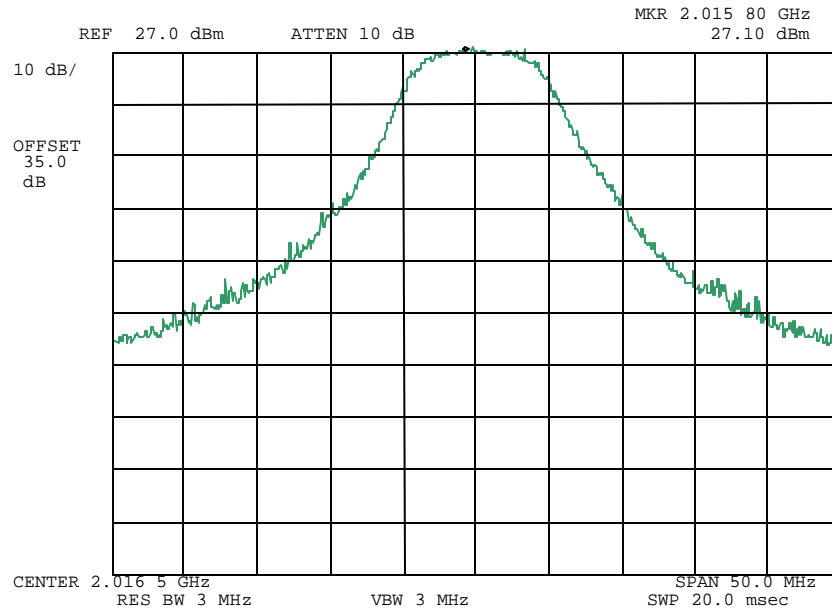
Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0610027: 2006-Jan-26 Thu 14:07:00

State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
NONE (MAX BW)
REF LEVEL (+27dBm)

Fred Chastain

Performed by:

Fred Chastain, Test Technician

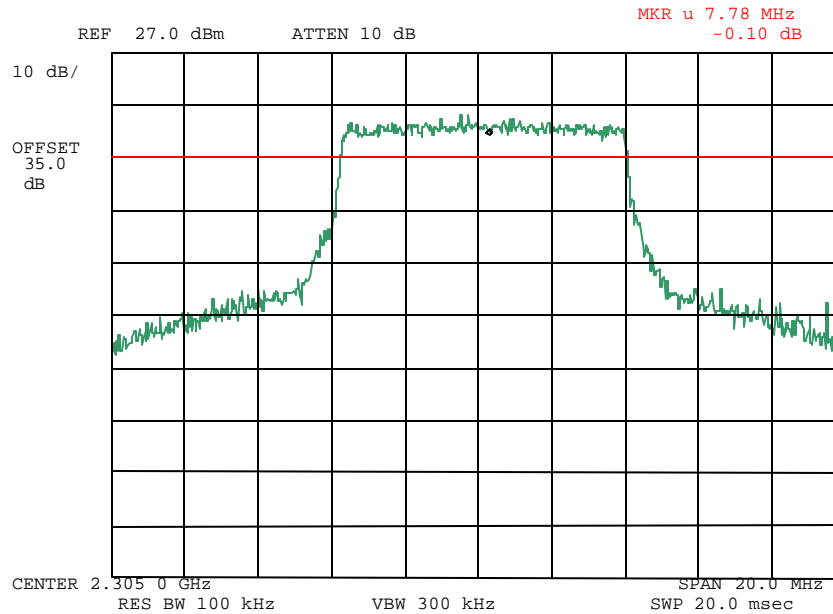
Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0610029: 2006-Jan-26 Thu 14:10:00

State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
64QAM
MID CHANNEL
(OCC BW @ 6dB = 7.61MHz)

Fred Chastain

Performed by:

Fred Chastain, Test Technician