



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

toll-free: (866) 311-3268
fax: (480) 926-3598
<http://www.flomlabs.com>
info@flomlabs.com

Date: May 23, 2006

Federal Communications Commission
Via: Electronic Filing

Attention: Authorization & Evaluation Division

Applicant: Thrane & Thrane A/S
Equipment: Explorer 300
FCC ID: ROJEXPLORER-300
FCC Rules: Part 25, and 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,

Michael Schafer, President

enclosure(s)
cc: Applicant
DEL/del



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

toll-free: (866) 311-3268
fax: (480) 926-3598
<http://www.flomlabs.com>
info@flomlabs.com

Transmitter Certification

of

FCC ID: ROJEXPLORER-300

Model: Explorer 300

to

Federal Communications Commission

Rule Part(s) Part 25, and Confidentiality

Date of report: May 23, 2006

On the Behalf of the Applicant:

Thrane & Thrane A/S

At the Request of:

Thrane & Thrane A/S
Lundtoftegardsvej 93D
DK-2800 Lyngby, Denmark

Attention of:

Morten Becker Saul
+45 39 55 8209
Email: mbs@thrane.com

Supervised by:

David E. Lee, FCC/IC Compliance Manager

List of Exhibits

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

Applicant: Thrane & Thrane A/S

FCC ID: ROJEXPLORER-300

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
6. 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.

Table of Contents

| <u>Rule</u> | <u>Description</u> | <u>Page</u> |
|---------------|--|-------------|
| 2.1033(c)(14) | Rule Summary | 2 |
| | Standard Test Conditions and Engineering Practices | 3 |
| 2.1033(c) | General Information Required | 4 |
| 2.1046(a) | Carrier Output Power (Conducted) | 6 |
| 2.1046(a) | EIRP Carrier Power (Radiated) | 8 |
| 2.1051 | Unwanted Emissions (Transmitter Conducted) | 10 |
| 2.1053(a) | Field Strength of Spurious Radiation | 14 |
| 2.1049(c)(1) | Emission Masks (Occupied Bandwidth) | 17 |
| 2.1055(a)(1) | Frequency Stability (Temperature Variation) | 26 |
| 2.1055(b)(1) | Frequency Stability (Voltage Variation) | 28 |
| 25.216 | Limits on Emissions (Mobile Earth Stations) | 30 |
| 25.253 | Special Requirements | 32 |
| 15.205 | Restricted Bands Of Operation | 36 |

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: d0640004
- d) Client: Thrane & Thrane A/S
Lundtoftegardsvej 93D
DK-2800 Lyngby, Denmark
- e) Identification: Explorer 300
FCC ID: ROJEXPLORER-300
EUT Description: Immarsat Terminal
- f) EUT Condition: Not required unless specified in individual tests.
- g) Report Date: May 23, 2006
EUT Received: April 2, 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: 
David E. Lee, FCC/IC Compliance Manager
- 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:

- 15 Subpart C – Unlicensed Low Power Devices
- 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
- 25 – Satellite Communications
- 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 C63.4-1992/2003, 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.

| | |
|--|---|
|  <p>The certificate image contains the following text: THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION ACCREDITED LABORATORY A2LA has accredited M. FLOM ASSOCIATES, INC. Chandler, AZ for technical competence in the field of Electrical Testing <small>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.</small> <small>Presented this 10th day of June 2004.</small>  <small>For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.</small></p> | <h3 style="margin: 0;">A2LA</h3> <hr/> <p>“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.”</p> <hr/> <p>Certificate Number: 2152-01</p> |
|--|---|

List of General Information Required for Certification

In Accordance with FCC Rules and Regulations,
Volume II, Part 2, Part 25 and Confidentiality

Sub-part 2.1033

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

Thrane & Thrane A/S
Lundtoftegardsvej 93D
DK-2800 Lyngby, Denmark

Manufacturer:

Thrane & Thrane A/S
Lundtoftegardsvej 93D
DK-2800 Lyngby, Denmark

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

ROJEXPLORER-300

Model Number:

Explorer 300

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

Please see attached exhibits

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

21K0G1D, 42K0G1D, 84K0G1D, 200KG1D

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

1626.5 – 1660.5

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

10.0

Switchable

Variable

N/A

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

25.0

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:

Composite Unit: Figures are with both Part 25 and Part 15.247 units operating;

| | | |
|------------------------|---|---------|
| Collector Current, A | = | 3.0 |
| Collector Voltage, Vdc | = | 8.0 |
| Supply Voltage, Vdc | = | 10 - 16 |

(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:**

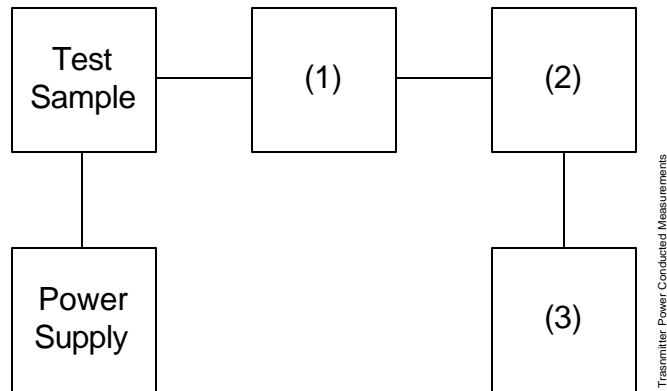
Follows

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

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) Power Meters | | | | |
| X | i00020 HP 8901A Power Mode | 2105A01087 | 12 mo. | Apr-05 |
| (3) Frequency Counter | | | | |
| X | i00020 HP 8901A Frequency Mode | 2105A01087 | 12 mo. | Apr-05 |

Name of Test: Carrier Output Power (Conducted)

Measurement Results
(Worst case)

Immarsat:
 Frequency of Carrier, MHz = 1643.5, 1626.5, 1660.5
 Ambient Temperature = 23°C ± 3°C

| Power Setting | RF Power, dBm | RF Power, Watts |
|---------------|---------------|-----------------|
| High | 29.98 | 0.977 |



Performed by: Fred Chastain, Test Technician

Name of Test: EIRP Carrier Power (Radiated)

Specification: TIA/EIA 603(Substitution Method)

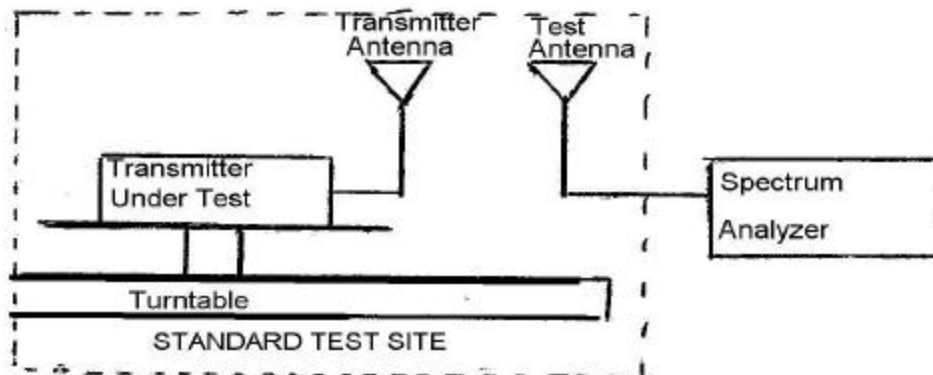
Measurement Procedure

Definition

The average radiated power of a licensed device is the equivalent power required, when delivered to a half-wave dipole or horn antenna, to produce at a distant point the same average received power as produced by the licensed device.

Method of Measurement:

- A) Connect the equipment as illustrated. Place the transmitter to be tested on the turntable in the standard test site.



- B) Raise and lower the test antenna from 1m to 6 m with the transmitter facing the antenna and record the highest received signal in dB as LVL.
- C) Replace the transmitter under test with a half-wave or horn vertically polarized antenna. The center of the antenna should be at the same location as the transmitter under test. Connect the antenna to a signal generator with a known output power and record the path loss in dB or LOSS.
- D) Calculate the radiated output power from the following:

$$\text{average radiated power} = 10 \log_{10} \hat{O} 10(\text{LVL} - \text{LOSS})/10 \text{ (dBm)}$$

Name of Test: EIRP Carrier Power (Radiated)

Test Equipment

| Asset | Description | s/n | Cycle | Last Cal |
|-------------------------------|---------------------------|------------|--------|----------|
| Transducer | | | | |
| i00088 | EMCO 3109-B 25MHz-300MHz | 2336 | 24 mo. | Sep-05 |
| X i00089 | April 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 | | | | |
| i00067 | HP 8920A Communication TS | 3345U01242 | 12 mo. | Jun-05 |
| X i00207 | HP 8753D Network Analyzer | 3410A08514 | 12 mo. | Jul-05 |

Measurement Results

g0640002: 2006-Apr-24 Mon 09:50:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C

| Frequency Tuned, MHz | Measured, dBm | Path Loss, dB | Cable CF, dB | Sub Ant, dBi | EIRP, dBm |
|----------------------|---------------|---------------|--------------|--------------|-----------|
| 1626.500000 | -1.51 | 12.20 | 33.50 | 4.80 | 39.39 |
| 1643.500000 | -0.70 | 11.30 | 33.60 | 4.90 | 39.30 |
| 1660.500000 | 0.09 | 11.40 | 33.70 | 5.00 | 40.19 |



Performed by:

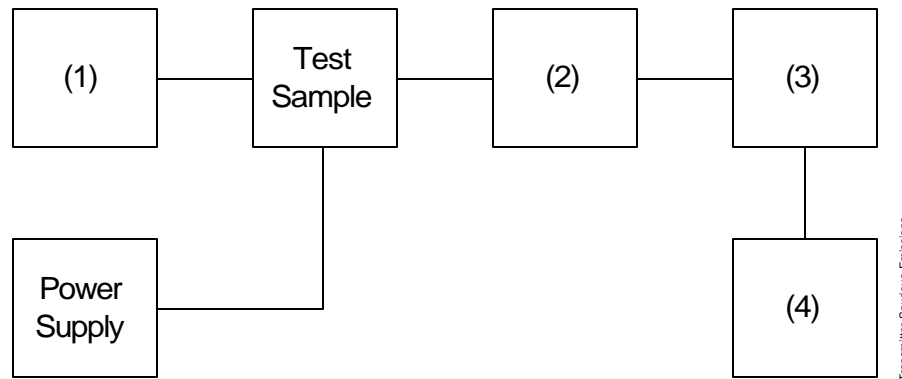
Fred Chastain, Test Technician

Name of Test: Unwanted Emissions (Transmitter Conducted)
Specification: 47 CFR 2.1051
Guide: ANSI/TIA/EIA-603-C

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. Apr-05 |
| | i00002 | HP 3336B Synthesizer / Level Gen. | 1931A01465 | 12 mo. Apr-05 |
| (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 | | | | |
| X | - | High Pass, 3GHz | - | NCR |
| (4) Spectrum Analyzer | | | | |
| | i00048 | HP 8566B Spectrum Analyzer | 2511A01467 | 12 mo. Oct-05 |
| X | i00029 | HP 8563E Spectrum Analyzer | 3213A00104 | 12 mo. May-05 |

Name of Test: Unwanted Emissions (Transmitter Conducted)

Measurement Results
(Worst Case)

Summary:

Frequency of carrier, MHz = 1643.5, 1626.5, 1660.5
 Spectrum Searched, GHz = 50MHz – 10*Fc
 Maximum Response, Hz = N/A
 All Other Emissions = = 20 dB Below Limit
 Limit(s), dBc
 -(43+10xLOG P) = -13dBm

Tabulated Results follow:

Measurement Results

2005-Apr-24 Mon 11:39:00
 State: 2:High Power

Ambient Temperature: 23°C ± 3°C

| Frequency Tuned, MHz | Frequency Emission, MHz | Level, dBm | Level, dBc |
|----------------------|-------------------------|------------|------------|
| 1643.500000 | 50.000000 | -68.70 | -101.50 |
| 1626.500000 | 50.000000 | -69.30 | -102.10 |
| 1660.500000 | 50.000000 | -69.50 | -102.30 |
| 1626.500000 | 125.433333 | -66.00 | -98.80 |
| 1660.500000 | 143.766667 | -66.00 | -98.80 |
| 1643.500000 | 148.900000 | -65.20 | -98.00 |
| 1643.500000 | 214.250000 | -65.50 | -98.30 |
| 1626.500000 | 263.200000 | -65.80 | -98.60 |
| 1660.500000 | 298.950000 | -65.80 | -98.60 |
| 1643.500000 | 319.750000 | -65.80 | -98.60 |
| 1626.500000 | 367.233333 | -65.30 | -98.10 |
| 1660.500000 | 370.533333 | -66.20 | -99.00 |
| 1643.500000 | 398.116667 | -66.30 | -99.10 |
| 1660.500000 | 414.800000 | -66.00 | -98.80 |
| 1626.500000 | 432.766667 | -66.00 | -98.80 |
| 1660.500000 | 516.266667 | -66.00 | -98.80 |
| 1643.500000 | 555.500000 | -66.20 | -99.00 |
| 1626.500000 | 573.466667 | -66.20 | -99.00 |
| 1643.500000 | 611.500000 | -66.00 | -98.80 |
| 1626.500000 | 623.050000 | -65.70 | -98.50 |
| 1660.500000 | 698.400000 | -66.00 | -98.80 |
| 1626.500000 | 701.233333 | -66.20 | -99.00 |
| 1643.500000 | 727.083333 | -65.50 | -98.30 |
| 1660.500000 | 739.000000 | -66.00 | -98.80 |

Name of Test: Unwanted Emissions (Transmitter Conducted)

| Frequency Tuned, MHz | Frequency Emission, MHz | Level, dBm | Level, dBc |
|----------------------|-------------------------|------------|------------|
| 1660.500000 | 802.700000 | -66.00 | -98.80 |
| 1626.500000 | 889.966667 | -65.50 | -98.30 |
| 1643.500000 | 896.933333 | -65.30 | -98.10 |
| 1626.500000 | 905.083333 | -65.80 | -98.60 |
| 1660.500000 | 925.066667 | -65.30 | -98.10 |
| 1643.500000 | 947.066667 | -66.00 | -98.80 |
| 1660.500000 | 995.366667 | -65.30 | -98.10 |
| 1626.500000 | 1031.850000 | -66.20 | -99.00 |
| 1643.500000 | 1057.333333 | -66.20 | -99.00 |
| 1643.500000 | 1101.783333 | -66.00 | -98.80 |
| 1660.500000 | 1121.766667 | -65.70 | -98.50 |
| 1626.500000 | 1202.983333 | -65.70 | -98.50 |
| 1626.500000 | 1208.383333 | -65.80 | -98.60 |
| 1643.500000 | 1212.233333 | -65.30 | -98.10 |
| 1660.500000 | 1212.233333 | -65.70 | -98.50 |
| 1660.500000 | 1328.916667 | -66.00 | -98.80 |
| 1643.500000 | 1340.283333 | -65.80 | -98.60 |
| 1626.500000 | 1360.450000 | -65.30 | -98.10 |
| 1660.500000 | 1436.983333 | -65.50 | -98.30 |
| 1643.500000 | 1458.250000 | -65.80 | -98.60 |
| 1626.500000 | 1494.366667 | -64.80 | -97.60 |
| 1626.500000 | 1524.516667 | -66.00 | -98.80 |
| 1643.500000 | 1534.600000 | -65.50 | -98.30 |
| 1660.500000 | 1552.383333 | -65.80 | -98.60 |
| 1643.500000 | 1723.600000 | -65.50 | -98.30 |
| 1626.500000 | 1760.450000 | -65.50 | -98.30 |
| 1660.500000 | 1770.533333 | -65.80 | -98.60 |
| 1643.500000 | 1803.983333 | -65.80 | -98.60 |
| 1626.500000 | 1819.566667 | -65.30 | -98.10 |
| 1660.500000 | 1871.633333 | -66.00 | -98.80 |
| 1660.500000 | 1899.950000 | -65.30 | -98.10 |
| 1643.500000 | 1927.083333 | -65.20 | -98.00 |
| 1626.500000 | 1999.316667 | -65.20 | -98.00 |
| 1626.500000 | 3253.445000 | -65.50 | -98.30 |
| 1643.500000 | 3287.108333 | -66.80 | -99.60 |
| 1660.500000 | 3321.256667 | -67.50 | -100.30 |
| 1626.500000 | 4879.568333 | -67.70 | -100.50 |
| 1643.500000 | 4930.306667 | -67.70 | -100.50 |
| 1660.500000 | 4981.285000 | -67.80 | -100.60 |
| 1626.500000 | 6506.121667 | -65.50 | -98.30 |
| 1643.500000 | 6573.515000 | -66.20 | -99.00 |
| 1660.500000 | 6642.111667 | -66.20 | -99.00 |
| 1626.500000 | 8132.811667 | -64.70 | -97.50 |
| 1643.500000 | 8217.166667 | -66.30 | -99.10 |
| 1660.500000 | 8302.876667 | -66.30 | -99.10 |

Name of Test: Unwanted Emissions (Transmitter Conducted)

| Frequency Tuned, MHz | Frequency Emission, MHz | Level, dBm | Level, dBc |
|----------------------|-------------------------|------------|------------|
| 1626.500000 | 9759.485000 | -66.50 | -99.30 |
| 1643.500000 | 9861.448333 | -66.30 | -99.10 |
| 1660.500000 | 9963.388333 | -66.00 | -98.80 |
| 1626.500000 | 11385.975000 | -66.30 | -99.10 |
| 1643.500000 | 11504.001667 | -66.70 | -99.50 |
| 1660.500000 | 11623.630000 | -65.30 | -98.10 |
| 1626.500000 | 13012.475000 | -66.30 | -99.10 |
| 1643.500000 | 13147.623333 | -66.30 | -99.10 |
| 1660.500000 | 13283.551667 | -63.20 | -96.00 |
| 1626.500000 | 14638.191667 | -65.00 | -97.80 |
| 1643.500000 | 14791.005000 | -63.80 | -96.60 |
| 1660.500000 | 14944.516667 | -63.70 | -96.50 |
| 1626.500000 | 16264.756667 | -63.70 | -96.50 |
| 1643.500000 | 16435.475000 | -63.80 | -96.60 |
| 1660.500000 | 16604.741667 | -63.70 | -96.50 |



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-C, 47 CFR 22.917

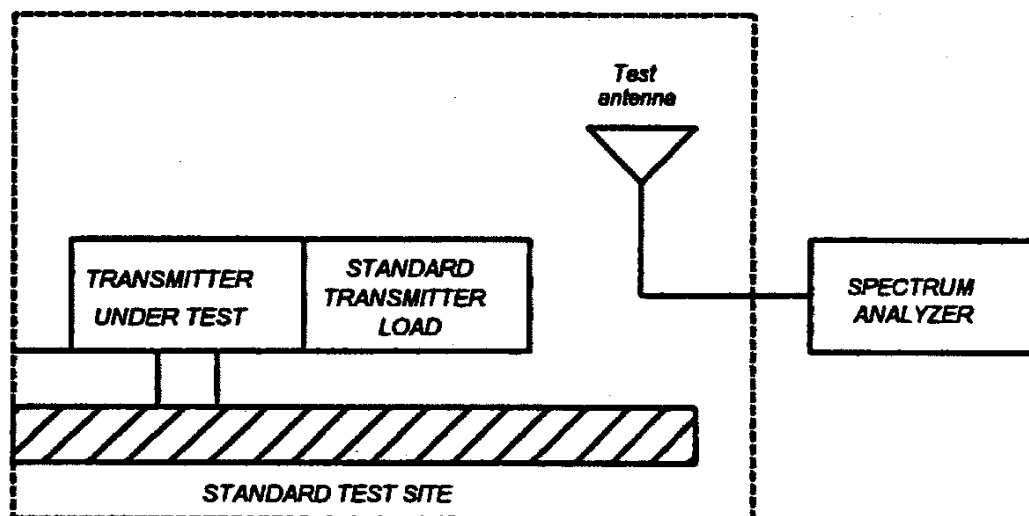
Measurement Procedure

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.

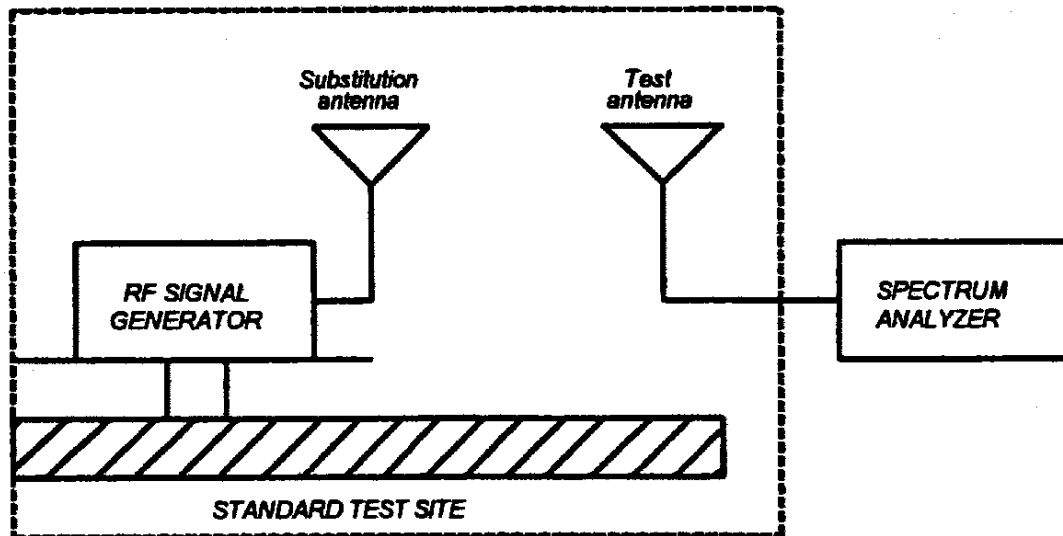
Method of Measurement:

- 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 | 24 mo. Sep-05 |
| X | i00089 | Aprel 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 |
| | i00207 | HP 8753D Network Analyzer | 3410A08514 | 12 mo. Jul-05 |

Microphone, Antenna Port, and Cabling

Microphone No Cable Length - Meters
 Antenna Port Terminated Yes Load 50 ohm Antenna Gain -
 All Ports Terminated by Load Yes Peripheral No

Name of Test: Field Strength of Spurious Radiation

Measurement Results

2006-Apr-24 Mon 10:19:00

STATE: 2:High Power

Ambient Temperature: 23°C ± 3°C

| Frequency Tuned, MHz | Frequency Emission, MHz | ERP, dBm | ERP, dBc |
|----------------------|-------------------------|----------|----------|
| 1626.600000 | 3253.460000 | -52.8 | -92.80 |
| 1643.000000 | 3286.300000 | -53.1 | -93.10 |
| 1660.400000 | 3320.800000 | -49.5 | -89.50 |
| 1626.600000 | 4879.800708 | -56.9 | -96.90 |
| 1643.000000 | 4929.000766 | -55.9 | -95.90 |
| 1660.400000 | 4981.200342 | -56.1 | -96.10 |
| 1626.600000 | 6506.400966 | -51.7 | -91.70 |
| 1643.000000 | 6572.000974 | -56.4 | -96.40 |
| 1660.400000 | 6641.600342 | -55.2 | -95.20 |
| 1626.600000 | 8133.000966 | -63.4 | -103.40 |
| 1643.000000 | 8215.000974 | -61.8 | -101.80 |
| 1660.400000 | 8302.000342 | -58.0 | -98.00 |
| 1626.600000 | 9759.600966 | -58.9 | -98.90 |
| 1643.000000 | 9858.000974 | -60.0 | -100.00 |
| 1660.400000 | 9962.400342 | -52.2 | -92.20 |
| 1626.600000 | 11386.200999 | -61.1 | -101.10 |
| 1643.000000 | 11501.000974 | -56.8 | -96.80 |
| 1660.400000 | 11622.800342 | -56.6 | -96.60 |
| 1626.600000 | 13012.800999 | -55.9 | -95.90 |
| 1643.000000 | 13144.000974 | -56.0 | -96.00 |
| 1660.400000 | 13283.200342 | -58.6 | -98.60 |
| 1626.600000 | 14639.400999 | -50.5 | -90.50 |
| 1643.000000 | 14787.000974 | -57.2 | -97.20 |
| 1660.400000 | 14943.600342 | -55.0 | -95.00 |
| 1626.600000 | 16266.000999 | -51.6 | -91.60 |
| 1643.000000 | 16430.000974 | -62.8 | -102.80 |
| 1660.400000 | 16604.000342 | -54.6 | -94.60 |



Performed by:

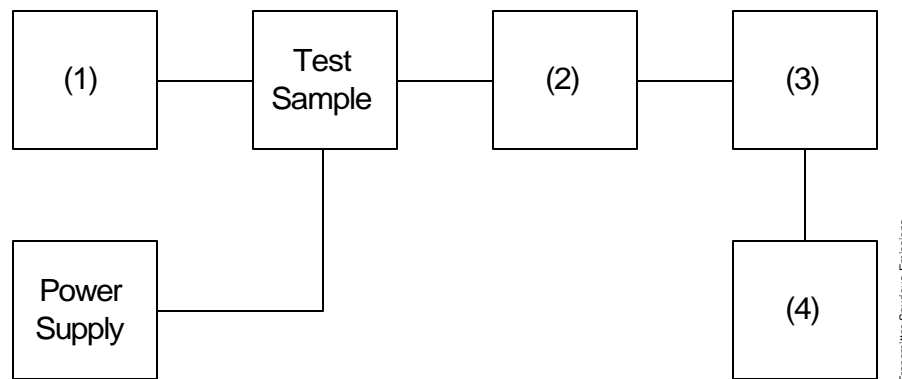
Fred Chastain, Test Technician

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

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



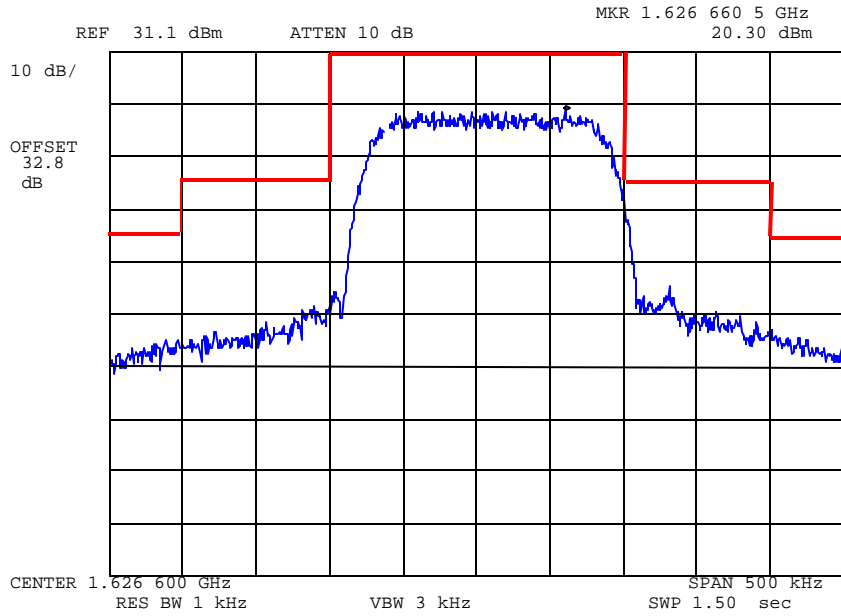
| Asset | Description | s/n | Cycle | Last Cal |
|---------------------------------------|--------------------------------|------------|--------|----------|
| (1) Audio Oscillator/Generator | | | | |
| X i00017 | HP 8903A Modulation Meter | 2216A01753 | 12 mo. | Apr-05 |
| (2) Coaxial Attenuator | | | | |
| 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. | Oct-04 |
| i00029 | HP 8563E Spectrum Analyzer | 3213A00104 | 12 mo. | May-05 |

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0580112: 2005-Aug-22 Mon 09:35:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
QPSK, 151.2kHz Symbol Rate (20/5ms)
200KD1W



Performed by:

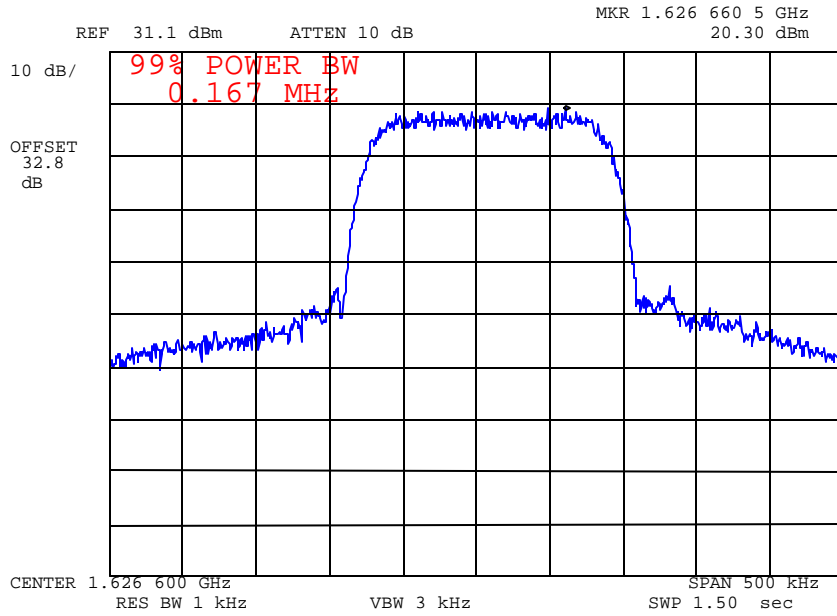
Fred Chastain, Test Technician

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0580113: 2005-Aug-22 Mon 09:35:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
QPSK, 151.2kHz Symbol Rate (20/5ms)
99% Power Bandwidth



Performed by:

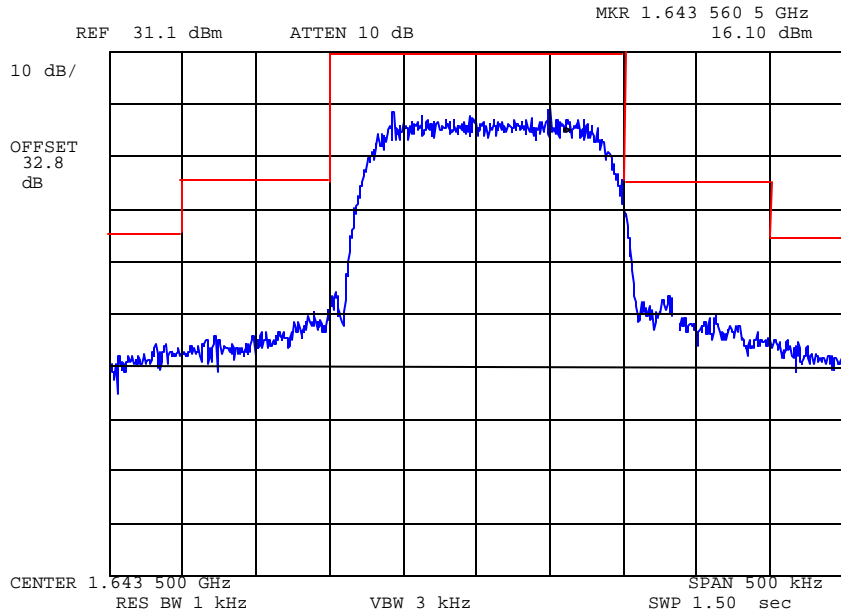
Fred Chastain, Test Technician

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0580114: 2005-Aug-22 Mon 09:38:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
QPSK, 151.2kHz Symbol Rate (20/5ms)
200KD1W



Performed by:

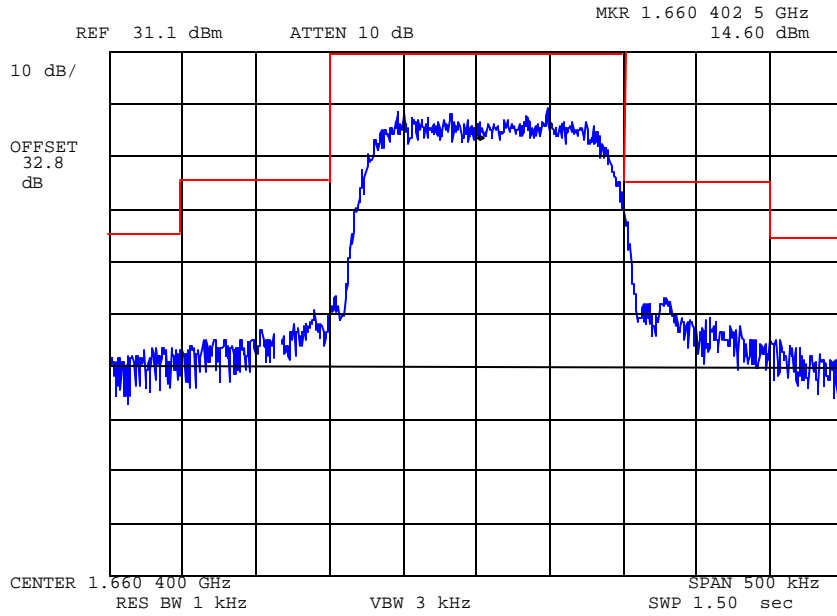
Fred Chastain, Test Technician

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0580115: 2005-Aug-22 Mon 09:39:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
QPSK, 151.2kHz Symbol Rate (20/5ms)
200KD1W



Performed by:

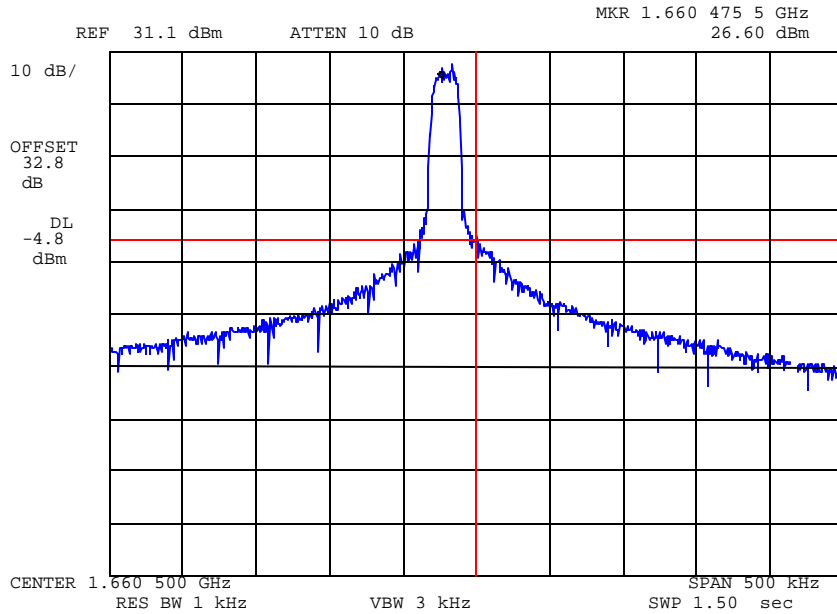
Fred Chastain, Test Technician

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0580116: 2005-Aug-22 Mon 09:43:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
QPSK, 16.8kHz Symbol Rate (5ms)
21KD1W
Upper Band Edge, Worst-case



Performed by:

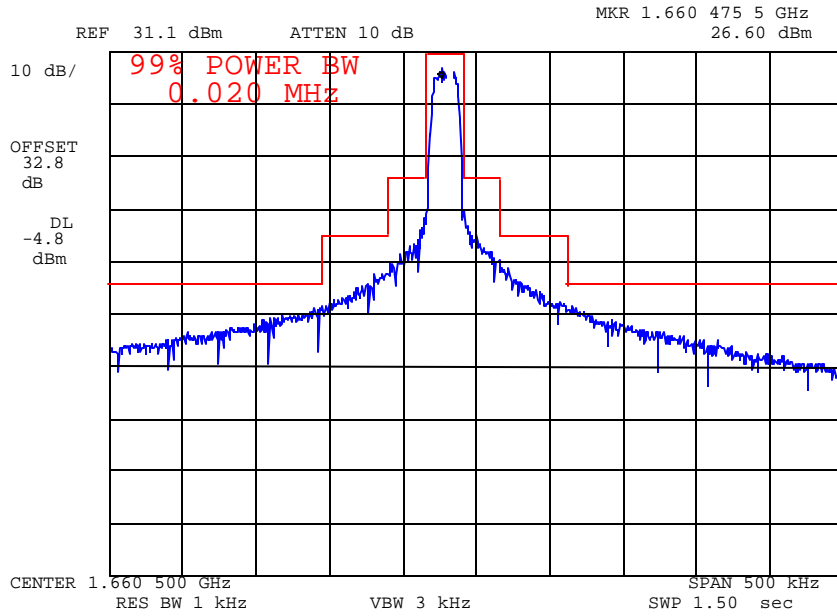
Fred Chastain, Test Technician

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0580117: 2005-Aug-22 Mon 09:44:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
QPSK, 16.8kHz Symbol Rate (5ms)
99% Power Bandwidth



Performed by:

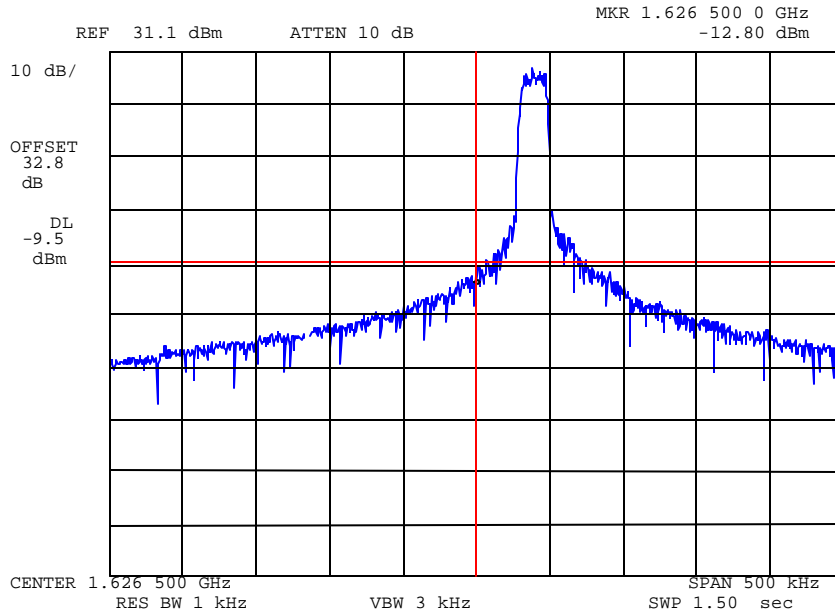
Fred Chastain, Test Technician

Name of Test: Emission Masks (Occupied Bandwidth)

Measurement Results

g0580119: 2005-Aug-22 Mon 09:48:00
State: 2:High Power

Ambient Temperature: 23°C ± 3°C



Power:
Modulation:

HIGH
QPSK, 16.8kHz Symbol Rate (20ms)
21KD1W
Upper Band Edge, Worst-case



Performed by:

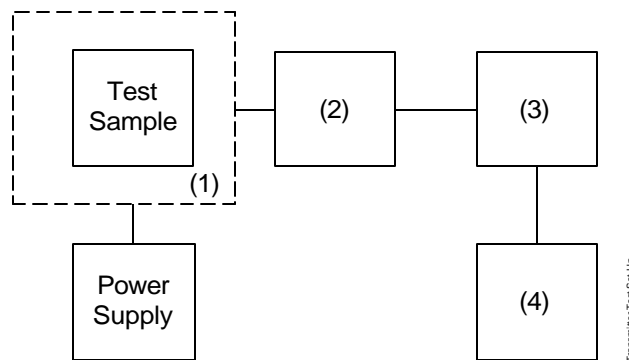
Fred Chastain, Test Technician

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

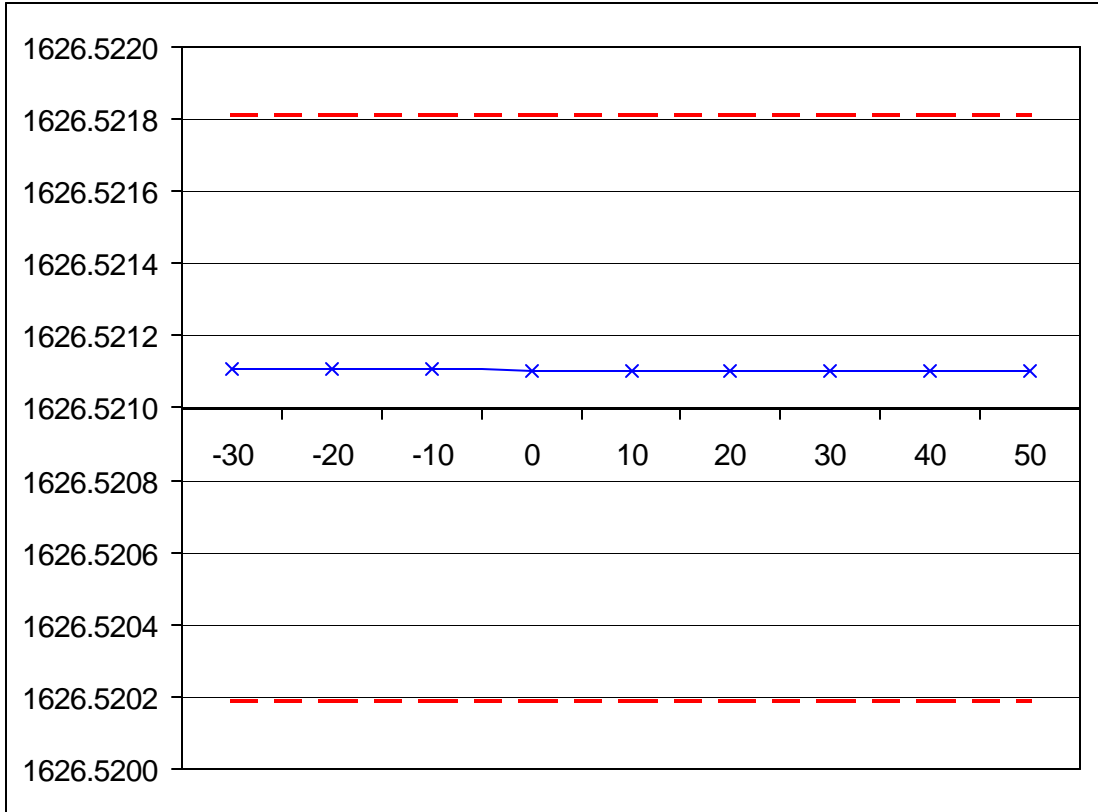


| Asset | Description | s/n | Cycle | Last Cal |
|---|--------------------------------------|---------------|--------|----------|
| (1) Temperature, Humidity, Vibration | | | | |
| X | i00027 Tenney Temp. Chamber | 9083-765-234 | NCR | |
| (2) Coaxial Attenuator | | | | |
| X | i00231/2 PASTERNAK PE7021-30 (30 dB) | 231 or 232 | NCR | |
| | i00122/3 NARDA 766 (10 dB) | 7802 or 7802A | NCR | |
| (3) RF Power | | | | |
| X | i00067 HP 8920A Communications TS | 3345U01242 | 12 mo. | Jun-05 |
| (4) Frequency Counter | | | | |
| X | i00067 HP 8920A Communications TS | 3345U01242 | 12 mo. | Jun-05 |

Name of Test: Frequency Stability (Temperature Variation)

Measurement Results

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



Plot based on data obtained during Immarsat Compliance Testing with device locked to Satellite.

Limits shown are 0.5ppm



Performed by:

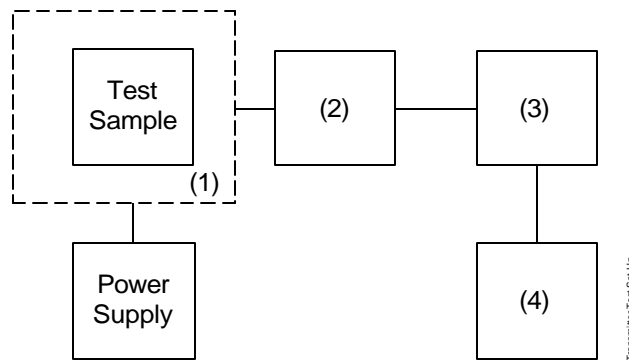
Fred Chastain, Test Technician

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±5°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 | | | | |
| i00027 | Tenney Temp. Chamber | 9083-765-234 | NCR | |
| (2) Coaxial Attenuator | | | | |
| X i00231/2 | PASTERNAK PE7021-30 (30 dB) | 231 or 232 | NCR | |
| i00122/3 | NARDA 766 (10 dB) | 7802 or 7802A | NCR | |
| (3) RF Power | | | | |
| X i00020 | HP 8901A Power Mode | 2105A01087 | 12 mo. | Apr-05 |
| (4) Frequency Counter | | | | |
| X i00020 | HP 8901A Frequency Mode | 2105A01087 | 12 mo. | Apr-05 |

Results: Frequency Stability (Voltage Variation)

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

Limit, ppm = ± 0.5
 Limit, Hz = ± 814
 Battery End Point (Voltage) = 10.0

| % of STV | Voltage | Frequency, MHz | Change, Hz | Change, ppm |
|----------|---------|----------------|------------|-------------|
| 115 | 15.87 | 1643.607640 | +40 | |
| 100 | 13.20 | 1643.607640 | +40 | >0.05 |
| 85 | 11.73 | 1643.607635 | +35 | |
| BEP | 10.0 | 1643.607630 | +30 | |



Performed by: Fred Chastain, Test Technician

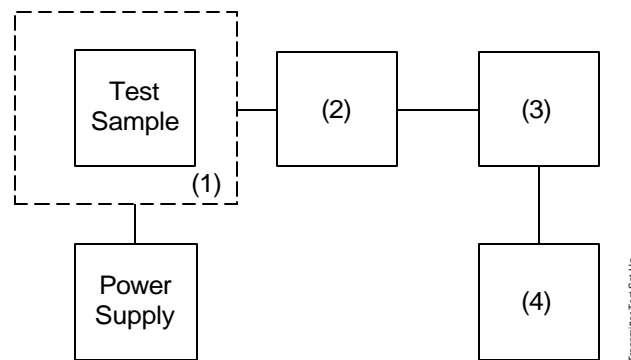
Name of Test: Limits on emissions from mobile earth stations for protection of aeronautical radio navigation satellite service

Specification: 47 CFR 25.216

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

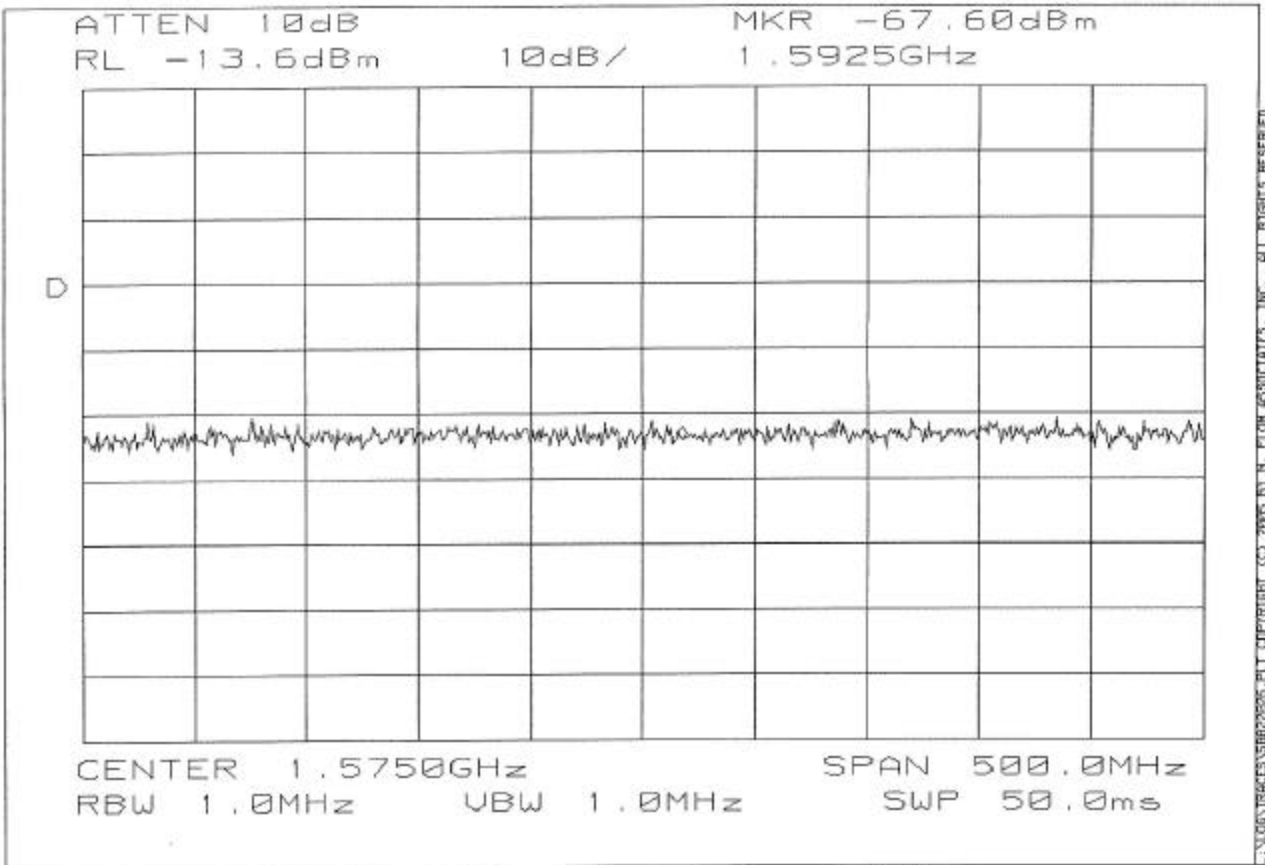


| Asset | Description | s/n | Cycle | Last Cal |
|---|--------------------------------------|---------------|--------|----------|
| (1) Temperature, Humidity, Vibration | | | | |
| X | i00027 Tenney Temp. Chamber | 9083-765-234 | NCR | |
| (2) Coaxial Attenuator | | | | |
| X | i00231/2 PASTERNAK PE7021-30 (30 dB) | 231 or 232 | NCR | |
| | i00122/3 NARDA 766 (10 dB) | 7802 or 7802A | NCR | |
| (3) RF Power | | | | |
| X | i00067 HP 8920A Communications TS | 3345U01242 | 12 mo. | Jun-05 |
| (4) Frequency Counter | | | | |
| X | i00067 HP 8920A Communications TS | 3345U01242 | 12 mo. | Jun-05 |

Name of Test: Limits on emissions from mobile earth stations for protection of aeronautical radio navigation satellite service

2005-AUG-22, 13:31, MON

REMARK: GPS BAND PRESCAN



No measurable emissions were present in the band of interest.



Performed by:

Fred Chastain, Test Technician

Name of Test: Special requirements for ancillary terrestrial components operating in the 1626.5-1660.5 MHz / 1525-1559 MHz bands

Specification: 47 CFR 25.253(d)(6), (d)(7), (g)(3)

Measurement Procedure

(d)(6) *Exceed a peak antenna gain of 16 dBi;*

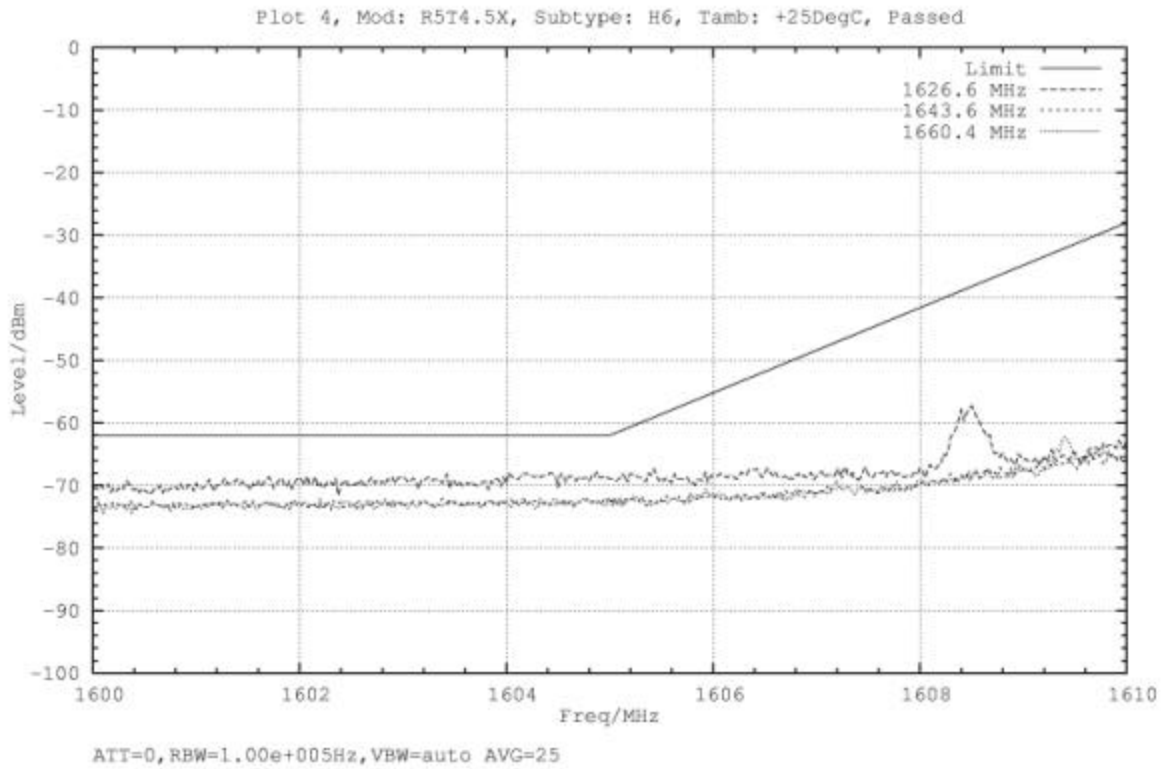
The EUT has a peak antenna gain of 11.1dBi

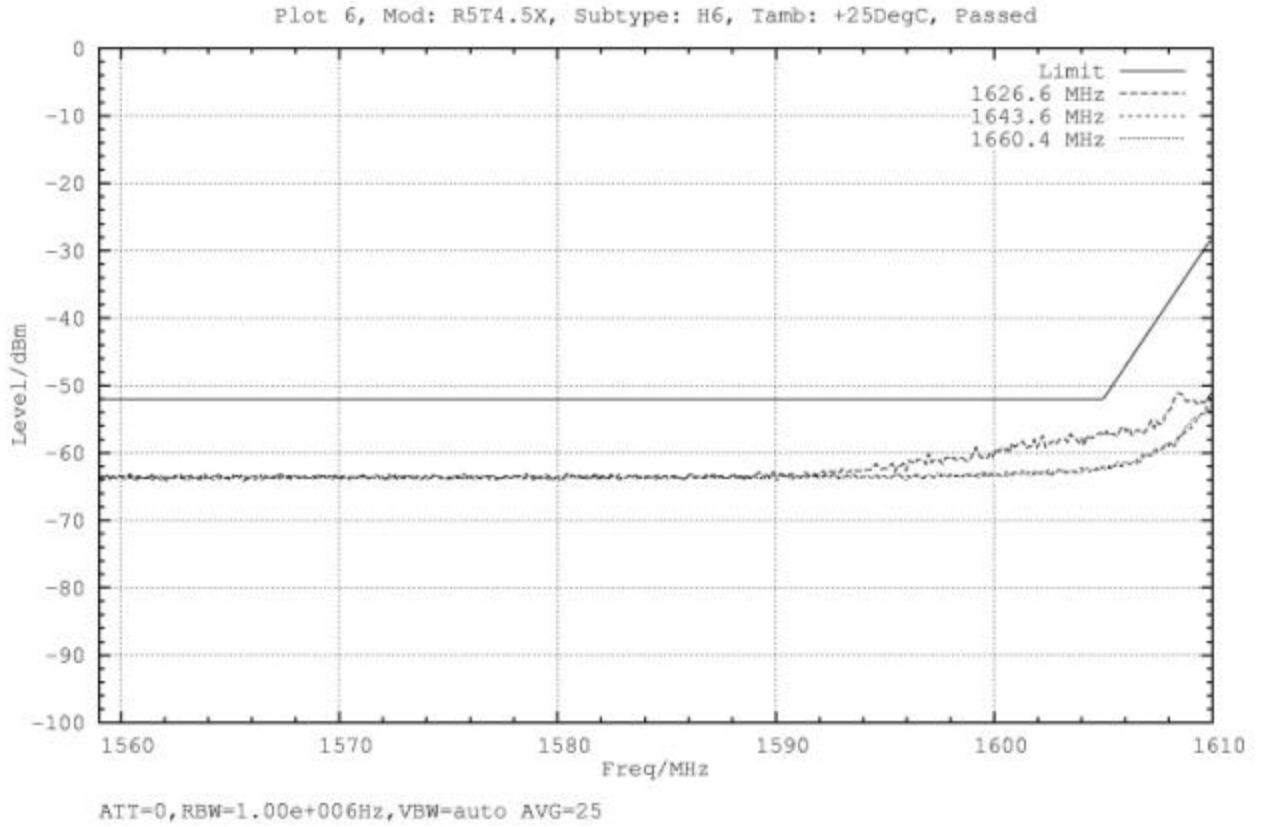
(d)(7) *Exceed an EIRP in the 1559-1605 MHz band of -70 dBW/MHz for wideband emissions and -80 dBW for narrowband emissions (discrete emissions of less than 700 Hz bandwidth). The ATC station shall not exceed an EIRP in the 1605-1610 MHz frequency range that is determined by the linear interpolation from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz for wideband emissions. The wideband EIRP level is to be measured using a root mean square (RMS) detector function with a resolution bandwidth of 1 MHz or equivalent and the video bandwidth is not less than the resolution bandwidth. The narrowband EIRP level is to be measured using an RMS detector function with a resolution bandwidth of 1 kHz or equivalent. The measurements are to be made over a 20 millisecond averaging period when the base station is transmitting.*

And

(g)(3) *. . . exceed an EIRP in the 1559-1605 MHz band of -70 dBW/MHz for wideband emissions and -80 dBW for narrowband emissions (discrete emissions of less than 700 Hz bandwidth). The ATC station shall not exceed an EIRP in the 1605-1610 MHz frequency range that is determined by the linear interpolation from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz for wideband emissions. The wideband EIRP level is to be measured using a root mean square (RMS) detector function with a resolution bandwidth of 1 MHz or equivalent and the video bandwidth is not less than the resolution bandwidth. The narrowband EIRP level is to be measured using an RMS detector function with a resolution bandwidth of 1 kHz or equivalent. The measurements are to be made over a 20 millisecond averaging period when the mobile terminal is transmitting.*

The plots extracted from the Immarsat compliance data filed by the applicant, which show compliance with the corresponding paragraphs of 47CFR25.253 are attached





Name of Test: Necessary Bandwidth and Emission Bandwidth

Specification: 47 CFR 2.202(g)

Modulation = 21K0D1W

Necessary Bandwidth Calculation:

Maximum Modulation (M), kHz = 3.1
 Maximum Deviation (D), kHz = 7.4
 Constant Factor (K) = 1
 Necessary Bandwidth (B_N), kHz = (2xM)+(2xDxK)
 (2x3.1)+(2x7.4x1)
 6.2+14.8
 = 21.0

Modulation = 42K0D1W

Necessary Bandwidth Calculation:

Maximum Modulation (M), kHz = 14.1
 Maximum Deviation (D), kHz = 7.4
 Constant Factor (K) = 1
 Necessary Bandwidth (B_N), kHz = (2xM)+(2xDxK)
 (2x13.1)+(2x7.4x1)
 28.2+14.8
 = 42.0

Modulation = 84K0D1W

Necessary Bandwidth Calculation:

Maximum Modulation (M), kHz = 29.6
 Maximum Deviation (D), kHz = 7.4
 Constant Factor (K) = 1
 Necessary Bandwidth (B_N), kHz = (2xM)+(2xDxK)
 (2x13.1)+(2x7.4x1)
 59.2+14.8
 = 84.0

Modulation = 200KD1W

Necessary Bandwidth Calculation:

Maximum Modulation (M), kHz = 92.6
 Maximum Deviation (D), kHz = 7.4
 Constant Factor (K) = 1
 Necessary Bandwidth (B_N), kHz = (2xM)+(2xDxK)
 (2x13.1)+(2x7.4x1)
 185.2+14.8
 = 200.0



Calculated by:

David E. Lee, FCC/IC Compliance Manager

Name of Test: Restricted Bands of Operation

Specification: 47 CFR 15.205

Measurement Procedure

The EUT was set up on a three-meter open field site according to the procedure on ANSI C63.4.

Sensitivity of system was measured:

Below 2 GHz:

| | | |
|----------------------|---|---------------|
| CISPR Bandwidths | = | 8 dB μ V |
| 1 MHz RBW, 1 MHz VBW | = | 12 dB μ V |
| 1 MHz RBW, 10 Hz VBW | = | 3 dB μ V |

Above 2 GHz:

| | | |
|----------------------|---|---------------|
| 1 MHz RBW, 1 MHz VBW | = | 33 dB μ V |
| 1 MHz RBW, 10 Hz VBW | = | 22 dB μ V |

Sensitivity of system with preamps:

Below 2 GHz:

Preamps are not used in this range.

Above 2 GHz:

| | | |
|---------|---|---------------|
| Peak | = | 3 dB μ V |
| Average | = | -8 dB μ V |

Cable Loss:

| | | |
|----------|---|-----------------|
| 915 MHz | = | -0.8 dB μ V |
| 2450 MHz | = | -3 dB μ V |

Note:

dB loss vs. frequency included in programmed software.

Reference Level Offset:

set @ 1 dB, accounts for cable and connector loss.

Test Results: No harmonic or spurious emissions were detected in the restricted bands in excess of the limits of 15.205. System measurement sensitivity was -130 dBm.



Supervised By:

David E. Lee, FCC/IC Compliance Manager

§ 15.205 Restricted Bands of Operation

(a) Except as shown in paragraph (b) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|-------------------|---------------------|---------------|-------------|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.25 |
| 0.495-0.505 | 16.69475-16.69625 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.17725-4.17775 | 37.5-38.25 | 1435-1626.5 | 9.0-9.2 |
| 4.20725-4.20775 | 73-74.6 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 74.8-75.2 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 108-121.94 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 123-138 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 149.9-150.05 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 156.52475-156.52525 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.7-156.9 | 2655-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 162.0125-167.17 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 167.72-173.2 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 240-285 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 322-339.4 | 3600-4400 | |
| 13.36-13.41 | | | |

END OF TEST REPORT

**Testimonial
and
Statement of Certification**

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 E. Lee, FCC/IC Compliance Manager