



Compliance Testing, LLC
Previously Flom Test Lab
EMI, EMC, RF Testing Experts Since 1963

toll-free: (866) 311-3268

fax: (480) 926-3598

<http://www.ComplianceTesting.com>
info@ComplianceTesting.com

Date: December 8, 2009

Applicant: Monitron, Inc
3731 Rutledge Road, NE
Albuquerque, NM 87109

Attention of: Max Lopez
Ph: 505-856-5285
Fax: 505-856-5942
email: mlopez@monitron.us

Equipment: L5L
FCC ID: V88-TRX876
FCC Rules: Part 90

Gentlemen:

Enclosed please find your copy of the Engineering Test Report for which you are subject to the restrictions as listed on the attached summary.

Once a Telecommunication Certification Body (TCB) issues a Grant the Federal Communication Commission (FCC) has 30 days to review the application and request added information. It is your decision whether or not to market the equipment subject to a possible recall before the end of the 30 days.

If your equipment is still retained by us, it will be returned to you 30 days after approval is achieved. Our invoice for services has been directed to your Accounts Payable Department.

For any additional information please contact us.

Thank you.

Sincerely yours,

John Erhard: Engineering Manager

Summary of Restrictions

1. All submissions to the FCC are subject to **their** Examiner's interpretation.
2. Please allow from 60 to 90 days before hearing from the FCC with regard to any submission.
3. The FCC can set aside any action; modify or set aside any action, within 30 days. (FCC Rule 1.108, 1.113).
4. Under Rule 2.803, if device is not type accepted/certificated then it must **not** be sold, leased, offered for sale, imported, shipped or distributed or advertised for sale.
5. FCC can revoke its certificates at any time if the equipment does not meet or **continue** to meet their Rules. (Rule Parts 2.927, 2.939).
6. FCC can request a sample at any time (2.936).



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Date: December 8, 2009

Federal Communications Commission
Via: Electronic Filing

Attention: Authorization & Evaluation Division

Applicant: Monitron, Inc
Equipment: L5L
FCC ID: V88-TRX876
FCC Rules: Part 90

Dear Gentleman:

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.

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

Best regards,

John Erhard: Engineering Manager



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Test Report

for

FCC ID: V88-TRX876

Model: L5L

to

Federal Communications Commission

Rule Part(s)

Date of report: December 8, 2009

On the Behalf of the Applicant: Monitron, Inc

At the Request of: Monitron, Inc
3731 Rutledge Road, NE
Albuquerque, NM 87109

Attention of: Max Lopez
Ph: 505-856-5285
Fax: 505-856-5942
email: mlopez@monitron.us

Reviewed by:

John Erhard: Engineering Manager

Test Report Revision History

Revision	Date	Revised By	Reason for revision
1.0	December 8, 2009	J. Erhard	Original Document
2.0	December 28, 2009	J. Erhard	Clarify mask used for testing OCC BW. Add EIA/TIA 603-C measurement guide information. Test Report Table on pg 9 corrected
3.0	March 18, 2010	K. Springer	Correction to Emission Designator

List of Exhibits

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

Applicant: Monitron, Inc

FCC ID: V88-TRX876

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/SAR Report

By Compliance Testing:

- 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.

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.



John Erhard: Engineering Manager

Certifying Engineer:

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Required information per ISO 17025-2005, paragraph 5.10.2:

a) **Test Report**

b) Laboratory: Compliance Testing
(FCC: 31040/SIT) 3356 N. San Marcos Place, Suite 107
(Canada: IC 2044-A) Chandler, AZ 85225

c) Report Number: d09c0002

d) Client: Monitron, Inc
3731 Rutledge Road, NE
Albuquerque, NM 87109

e) Identification: L5L
FCC ID: V88-TRX876
EUT Description: 150-164 MHZ Telemetry Transmitter

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

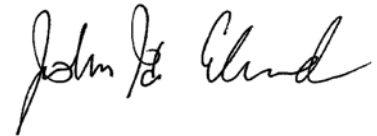
g) Report Date: December 8, 2009

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

i) Sampling method: No sampling procedure used.

l) Measurement Uncertainty: In accordance with Compliance Testing internal quality manual.

m) Reviewed by:



John Erhard: Engineering 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.

Accessories used during testing:

Type	Quantity	Manufacturer	Model	Serial No.	FCC ID
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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: 90.

Standard Test Conditions and Engineering Practices

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

In accordance with ANSI/C63.4-2009 with EIA/TIA 603-C as the measurement guide, 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.

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

A2LA

“A2LA has accredited Compliance Testing in 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 17025:2005 ‘General Requirements for the Competence of Testing and Calibration Laboratories’ and any additional program requirements in the identified field of testing.”

Please refer to www.a2la.org for current scope of accreditation.

Certificate number: 2152.01



FCC OATS Reg. #933597

IC Reg. # 2044A-1

List of General Information Required for Certification

In Accordance with FCC Rules and Regulations,
Volume II, Part 2 and to Part 90 Sub-part 2.1033

(c)(1):

Name and Address of Applicant: Monitron, Inc
3731 Rutledge Road, NE
Albuquerque, NM 87109

Manufacturer: Monitron, Inc
3731 Rutledge Road, NE
Albuquerque, NM 87109

(c)(2): **FCC ID:** V88-TRX876

Model Number: L5L

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

Please see attached exhibits

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

(c)(5): **Frequency Range, MHz:** 150.8 - 164

(c)(6): **Power Rating, Watts:** 4.9
_____ Switchable _____ Variable X N/A

FCC Grant Note: None

(c)(7): **Maximum Allowable Power, Watts:** 5

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	=	0.5
Collector Voltage, Vdc	=	10
Supply Voltage, Vdc	=	10

(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

Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046	Carrier Output Power (Conducted)	Pass	
2.1051	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1053	Field Strength of Spurious Radiation	Pass	
90.210	Emission Masks (Occupied Bandwidth)	Pass	
2.1047	Audio Low Pass Filter (Voice Input)	N/A	The UUT does not have an audio input
2.1047	Audio Frequency Response	N/A	The UUT does not have an audio input
2.1047	Modulation Limiting	N/A	The UUT does not have an audio input
90.213	Frequency Stability (Temperature Variation)	Pass	
90.213	Frequency Stability (Voltage Variation)	Pass	

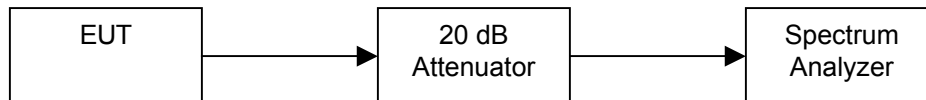
Name of Test: Carrier Output Power (Conducted)
Specification: 2.1046
Test Equipment Utilized: i00004, i00331

Engineer: J. Erhard
Test Date: 12/4/2009

Test Procedure

The Equipment Under Test (EUT) was connected to a spectrum analyzer through an attenuator. The attenuator and cable loss were input as a reference level offset to ensure accurate readings. The RBW was set to greater than 3 times the occupied bandwidth with the VBW 3 times the RBW. The peak readings were taken and the result was then compared to the limit.

Test Setup



High Power Transmitter Peak Output Power

Tuned Frequency MHz	Recorded Measurement (dBm)	Result
150.8	36.9	Pass
157.5	36.7	Pass
164.0	36.8	Pass

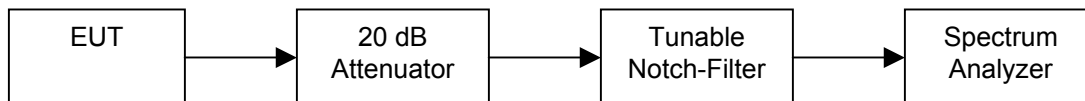
Name of Test: Conducted Spurious Emissions
Specification: 2.1051
Test Equipment Utilized: i00004, i00124, i00331

Engineer: J. Erhard
Test Date: 12/4/2009

Test Procedure

The EUT was connected through a 20 dB attenuator to a spectrum analyzer to verify that the UUT met the requirements for spurious emissions. A tunable notch filter was utilized to ensure the fundamental did not put the spectrum analyzer into compression. The reference level was adjusted to ensure the system had sufficient dynamic range to measure spurious emissions. The frequency range of 30 MHz to beyond the 10th harmonic of the fundamental transmitter was observed and plotted.

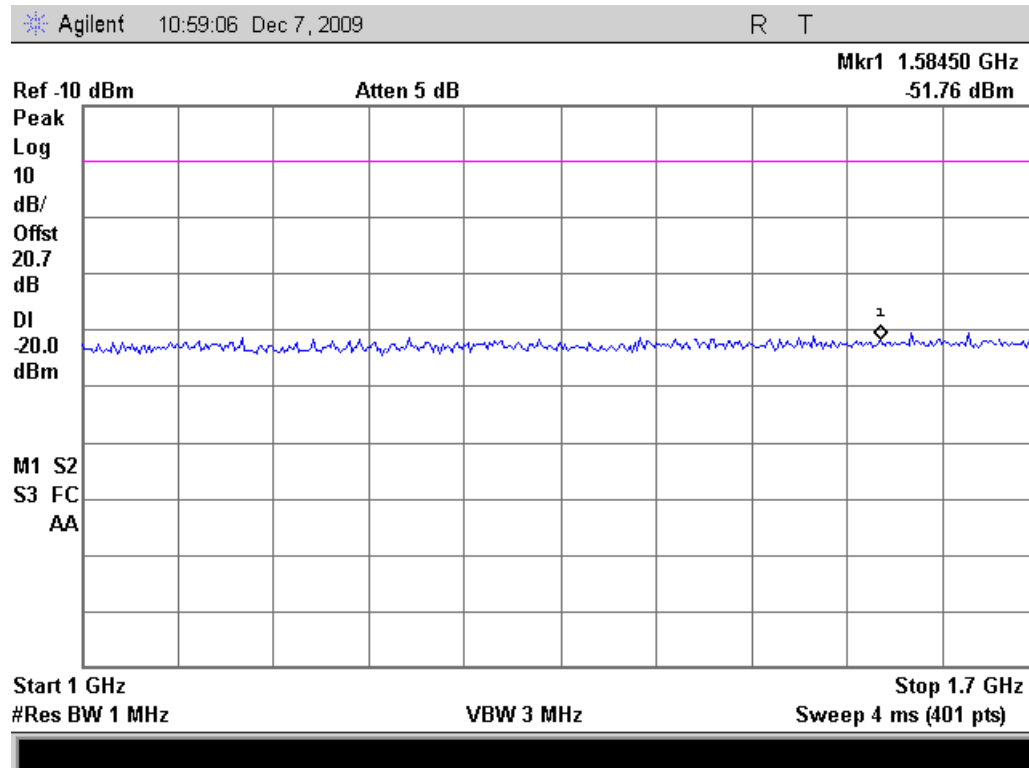
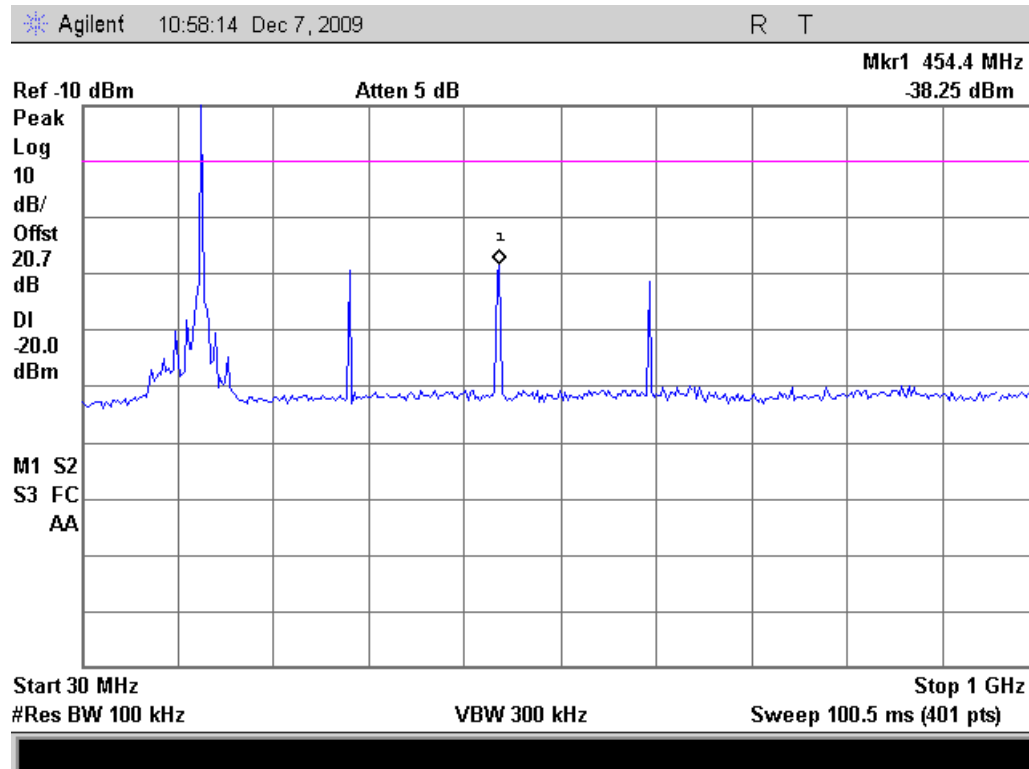
Test Setup



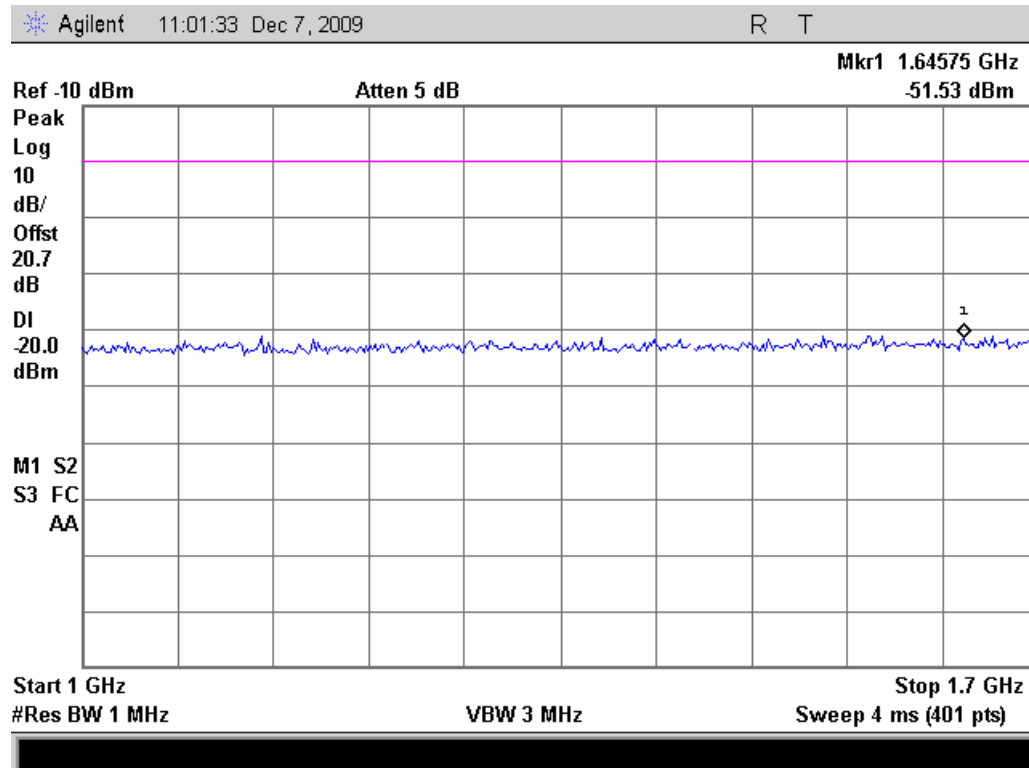
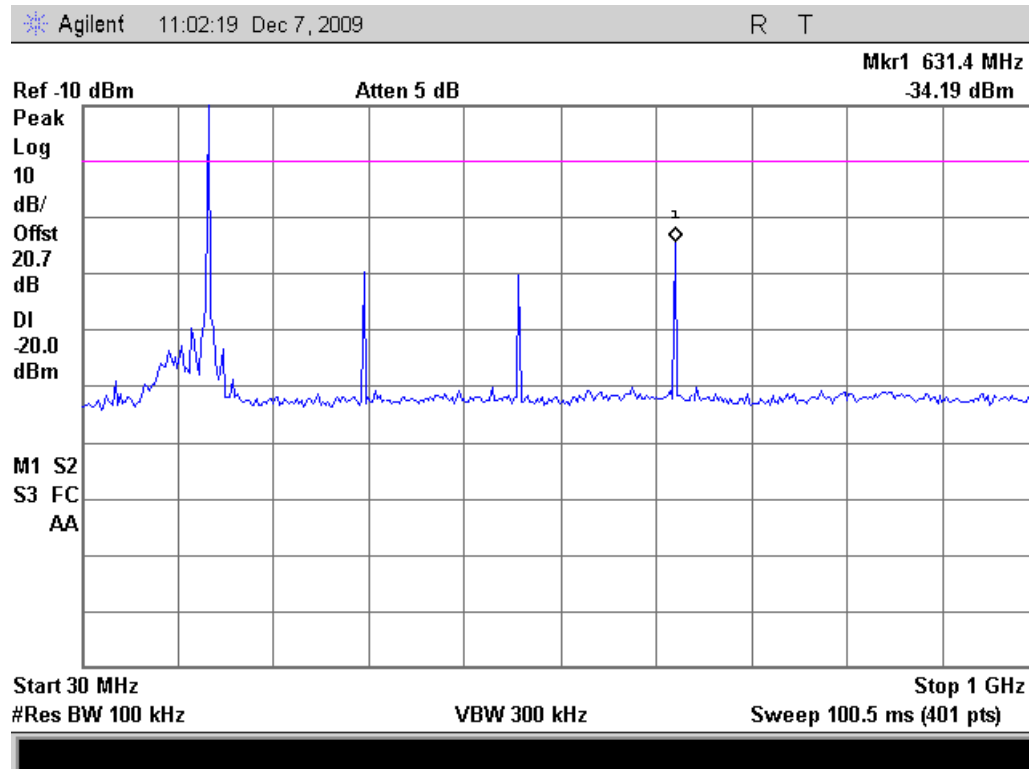
High Power Conducted Spurious Emissions Summary Test Table

Tuned Frequency MHz	Spurious Frequency MHz	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
150.8	454.4	-38.25	-13	Pass
157.5	631.4	-34.19	-13	Pass
164.0	328.3	-31.51	-13	Pass

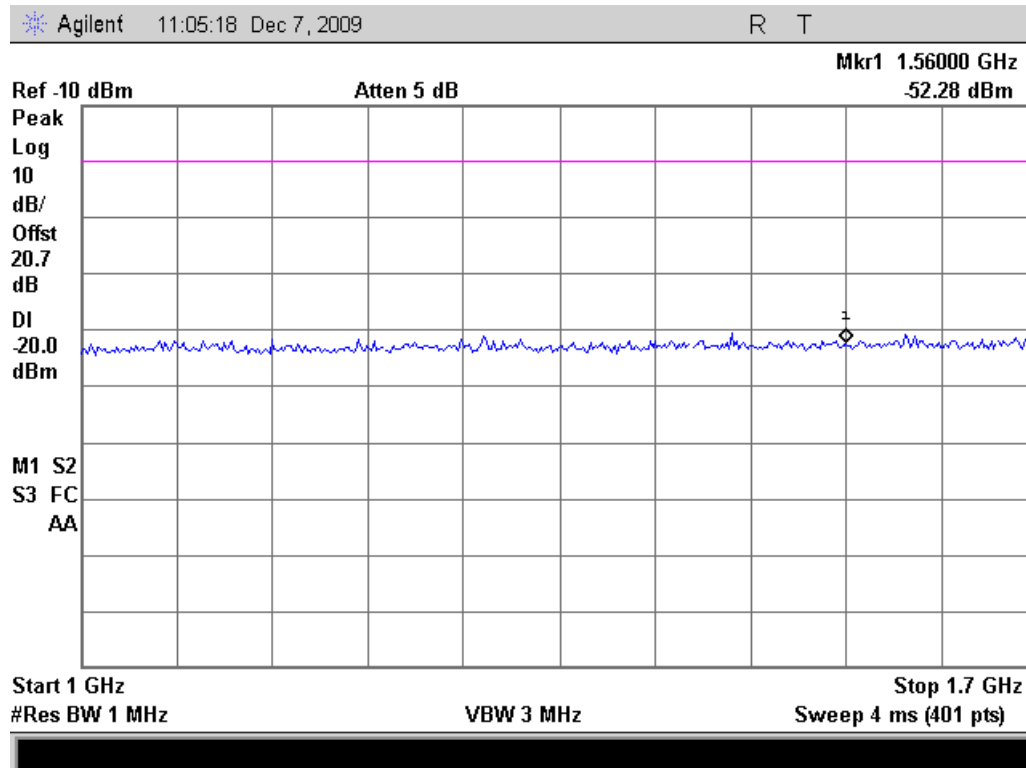
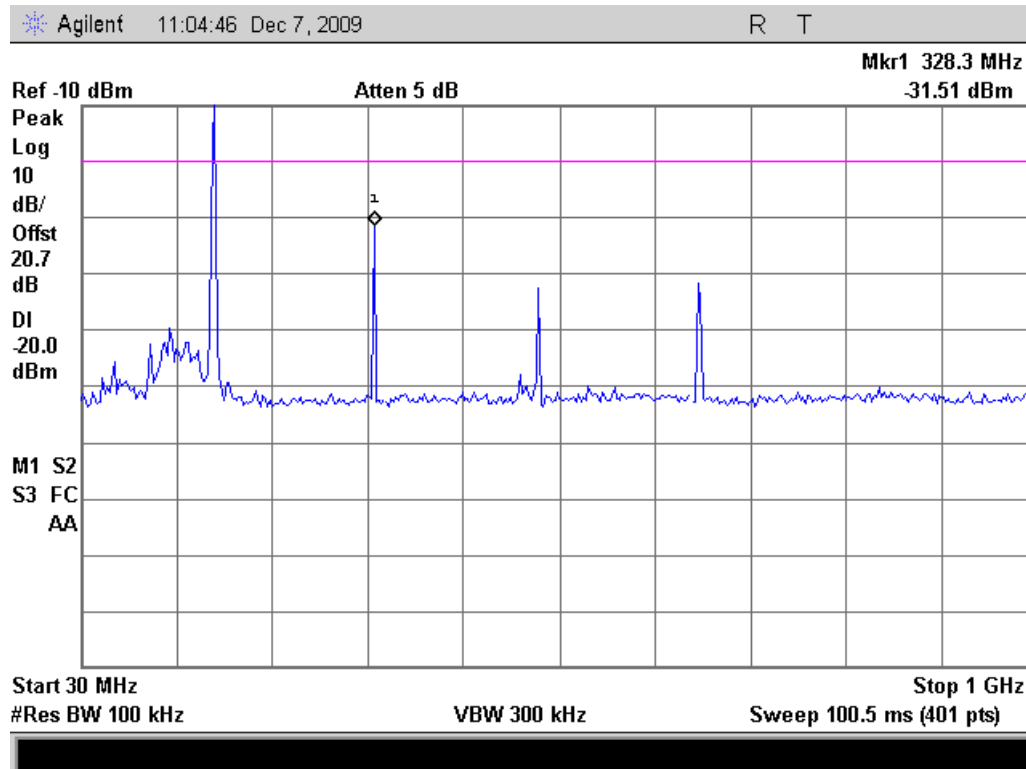
150.8 MHz Test Plots



157.5 MHz Test Plots



164.0 MHz Test Plots



Name of Test: Field Strength of Spurious Radiation
Specification: 2.1053
Test Equipment Utilized: i00004, i00041, i00049, i00103, i00142, i00147, i00148, i00266, i00267

Engineer: J. Erhard
Test Date: 12/4/2009

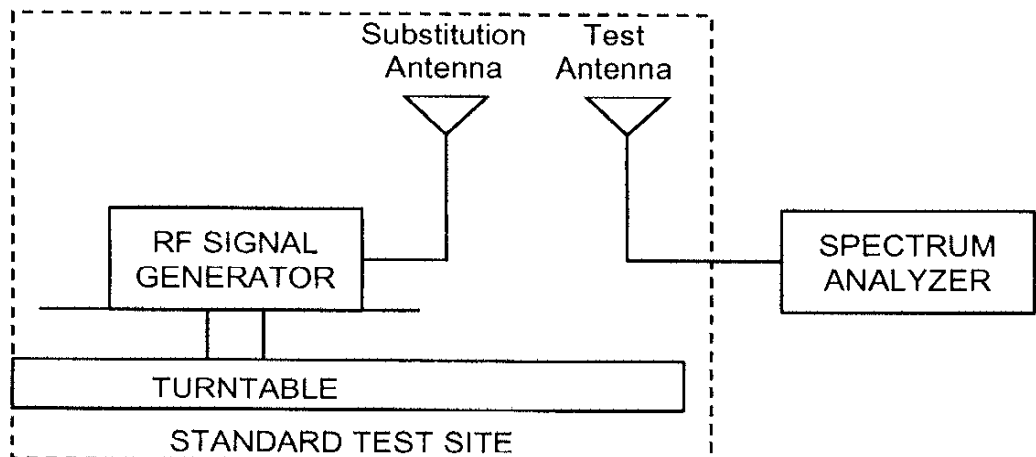
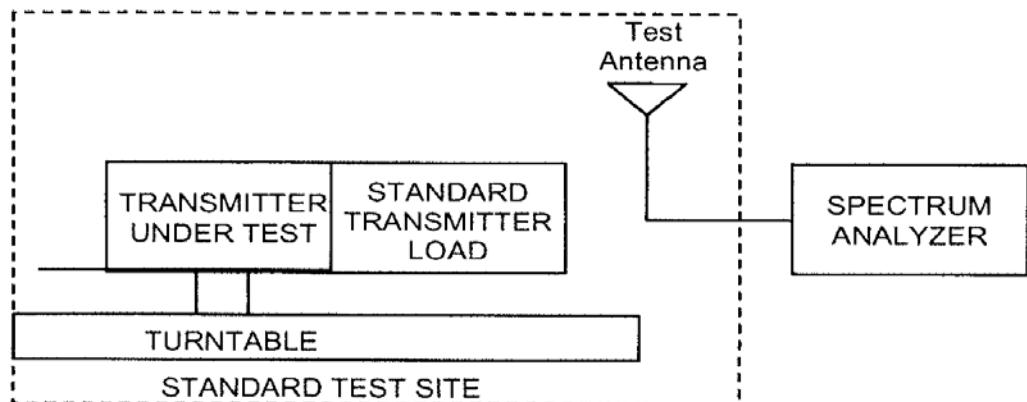
Test Procedure

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

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

Test Setup



150.8 MHz Radiated Fundamental ERP Test Results

Tuned Frequency (MHz)	Signal Generator Level (dBm)	Amplifier Gain (dB)	Antenna Gain (dBi)	Cable Loss (dB)	ERP (dBm)
150.8	-19.5	50.6	0	0.5	31.6
157.5	-17.7	50.6	0	0.5	33.4
164.0	-15.1	50.6	0	0.5	36.0

150.8 MHz Radiated Spurious Test Results

Emission Frequency (MHz)	Measured Level (dBm)	Correction Factor (dB)	Corrected Value (dBm)	Limit (dBm)	Result
301.596	-39.3	15.9	-23.4	-13	Pass
452.396	-46.1	19.7	-26.4	-13	Pass
603.196	-48.1	22.6	-25.5	-13	Pass
753.996	-48	25.4	-22.6	-13	Pass

157.5 MHz Radiated Spurious Test Results

Emission Frequency (MHz)	Measured Level (dBm)	Correction Factor (dB)	Corrected Value (dBm)	Limit (dBm)	Result
315.049	-48.8	16.2	-32.6	-13	Pass
472.549	-48.4	20.3	-28.1	-13	Pass
630.149	-47.5	23.1	-24.4	-13	Pass
787.549	-49.3	25.5	-23.8	-13	Pass

164 MHz Radiated Spurious Test Results

Emission Frequency (MHz)	Measured Level (dBm)	Correction Factor (dB)	Corrected Value (dBm)	Limit (dBm)	Result
327.992	-36.5	16.7	-19.8	-13	Pass
491.992	-42.3	20.7	-21.6	-13	Pass
655.992	-48.2	23.3	-24.9	-13	Pass
819.992	-48.5	25.9	-22.6	-13	Pass

No other emissions were detected. All emissions were greater than -13 dBm.

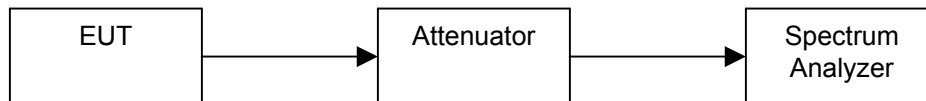
Name of Test: Emission Masks (Occupied Bandwidth)
Specification: 90.210
Test Equipment Utilized: i00004, i00331

Engineer: J. Erhard
Test Date: 12/4/2009

Test Procedure

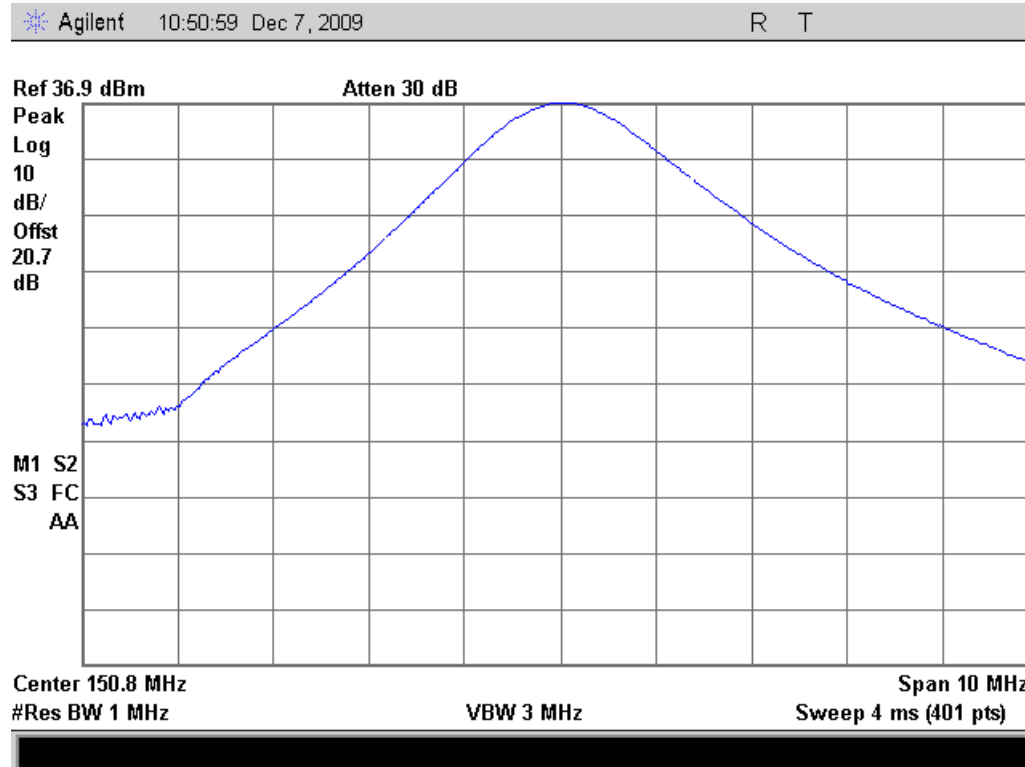
The EUT was connected through an attenuator to a spectrum analyzer to verify that the EUT meets the required emissions mask. A reference level plot is provided to verify that the peak power was established prior to testing the mask. The EUT is a digital radio only with no audio input so an encoded pattern generator internal to the radio is used to modulate the signal.

Test Setup

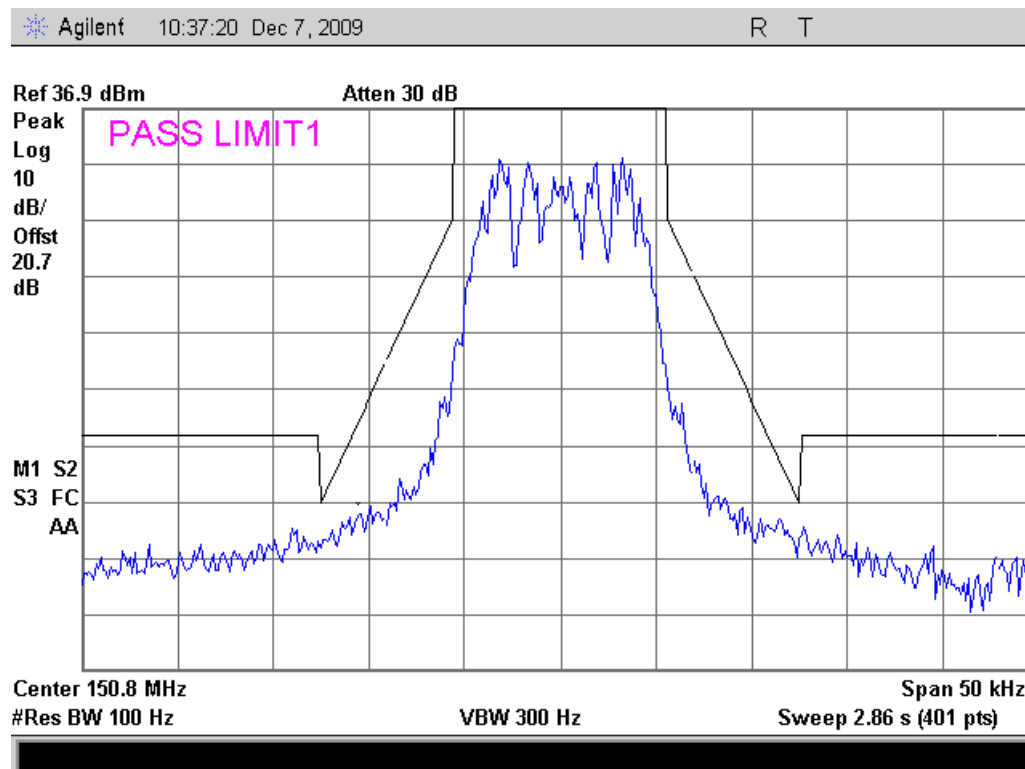


Occupied Bandwidth Plots

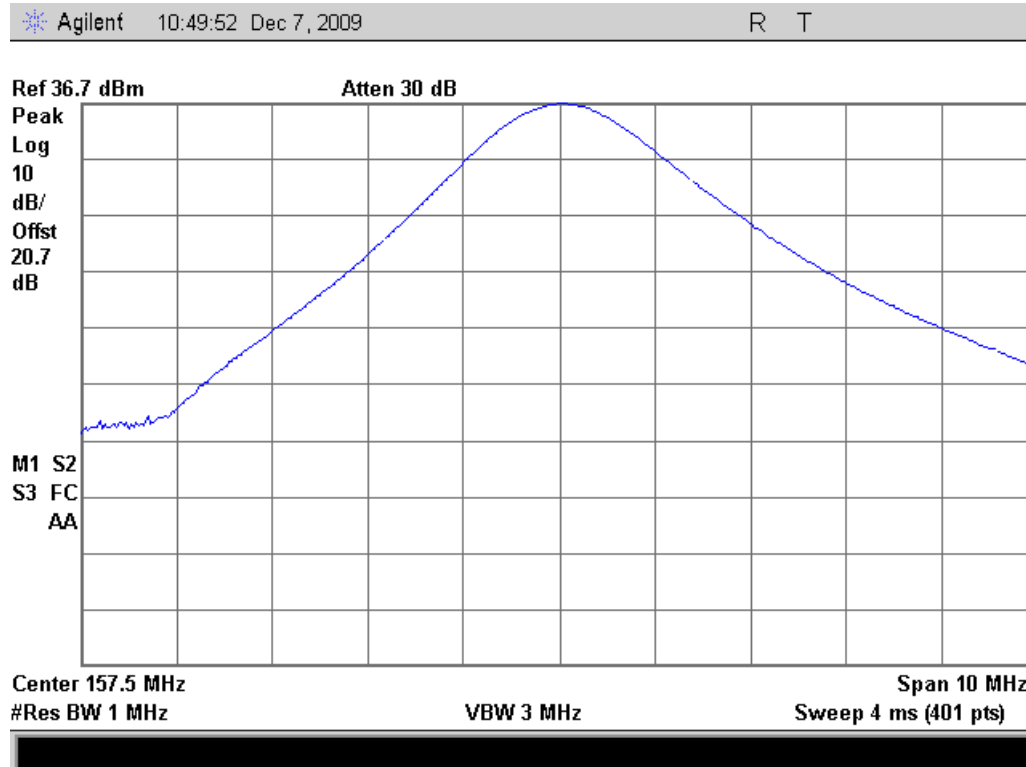
150.8 MHz Reference



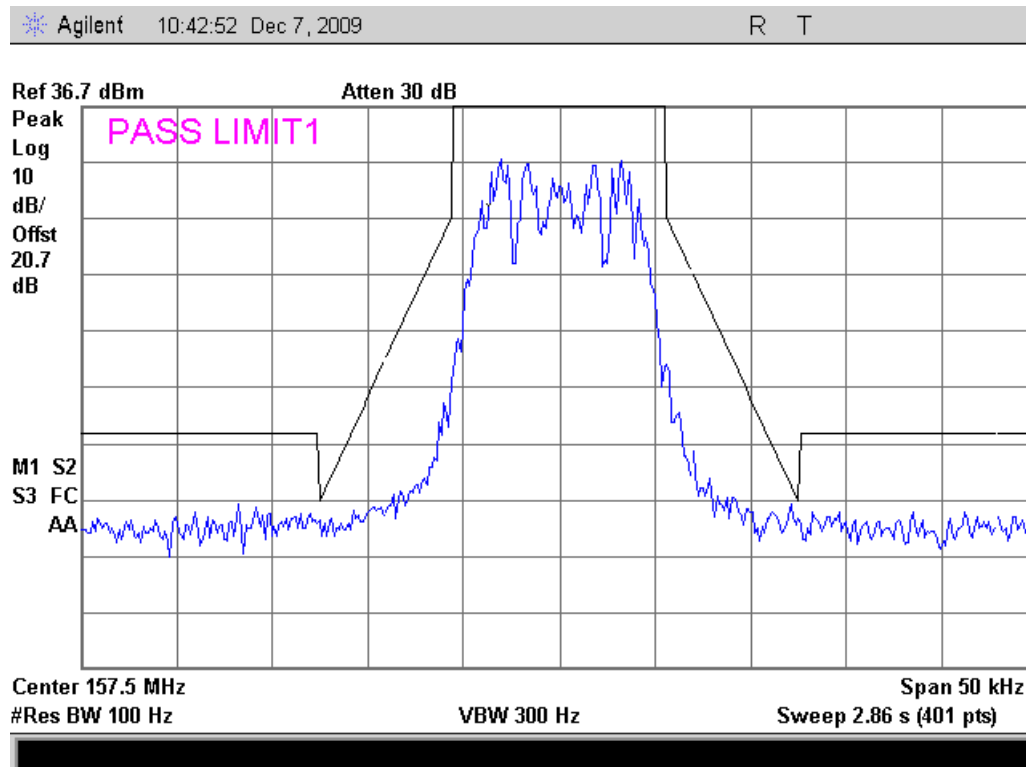
150.8 MHz Mask D



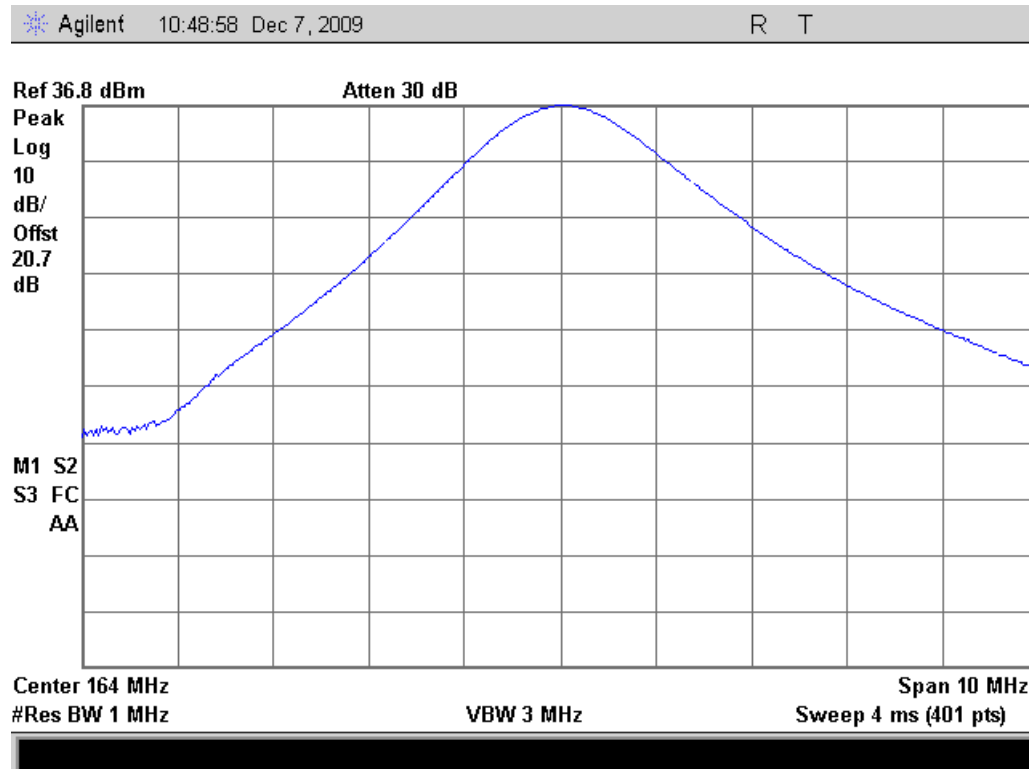
157.5 MHz Reference



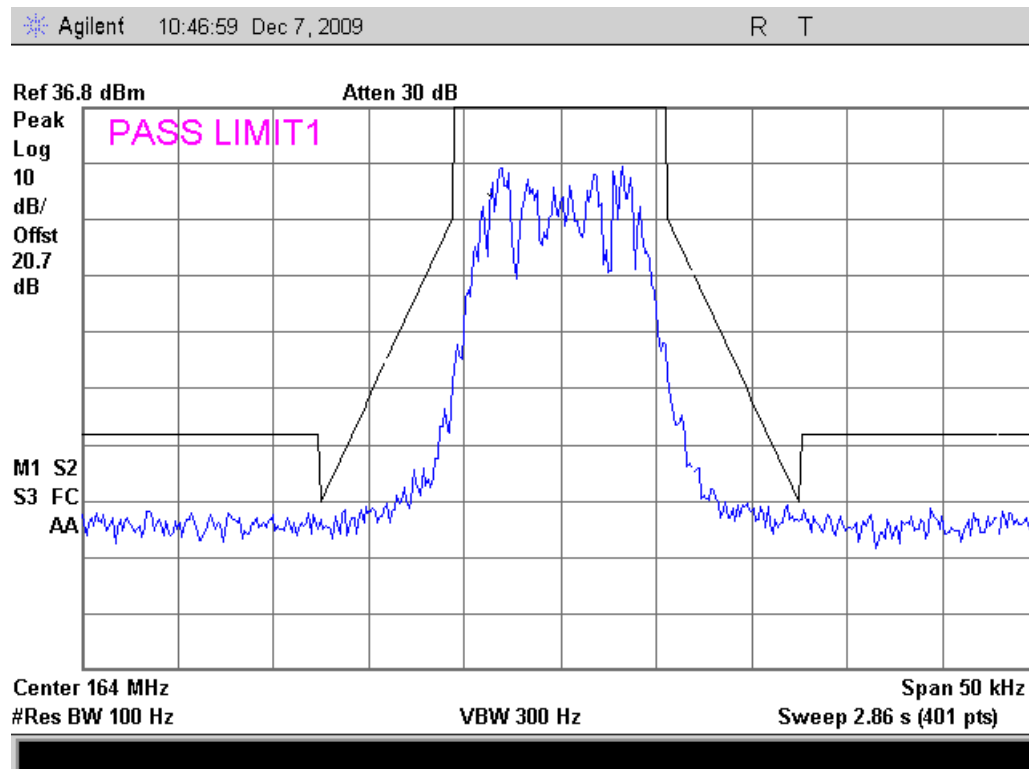
157.5 MHz Mask D



164 MHz Reference



164 MHz Mask D



Name of Test: Necessary Bandwidth and Emission Bandwidth
Specification: 2.202(g)

By Carson's rule:

$$\text{Ex: } BW_{\text{Necessary}} = (2M + 2DK)$$

Modulation = 9K00F1D

Necessary Bandwidth Calculation:

Maximum Modulation (M), kHz	= 1.5
Maximum Deviation (D), kHz	= 3.0
Constant Factor (K)	= 1
Necessary Bandwidth (B_N), kHz	= 9.0

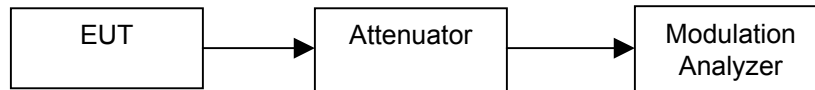
Name of Test: Transient Frequency Behavior
Specification: 90.214
Test Equipment Utilized: i00004, i00345

Engineer: J. Erhard
Test Date: 12/8/2009

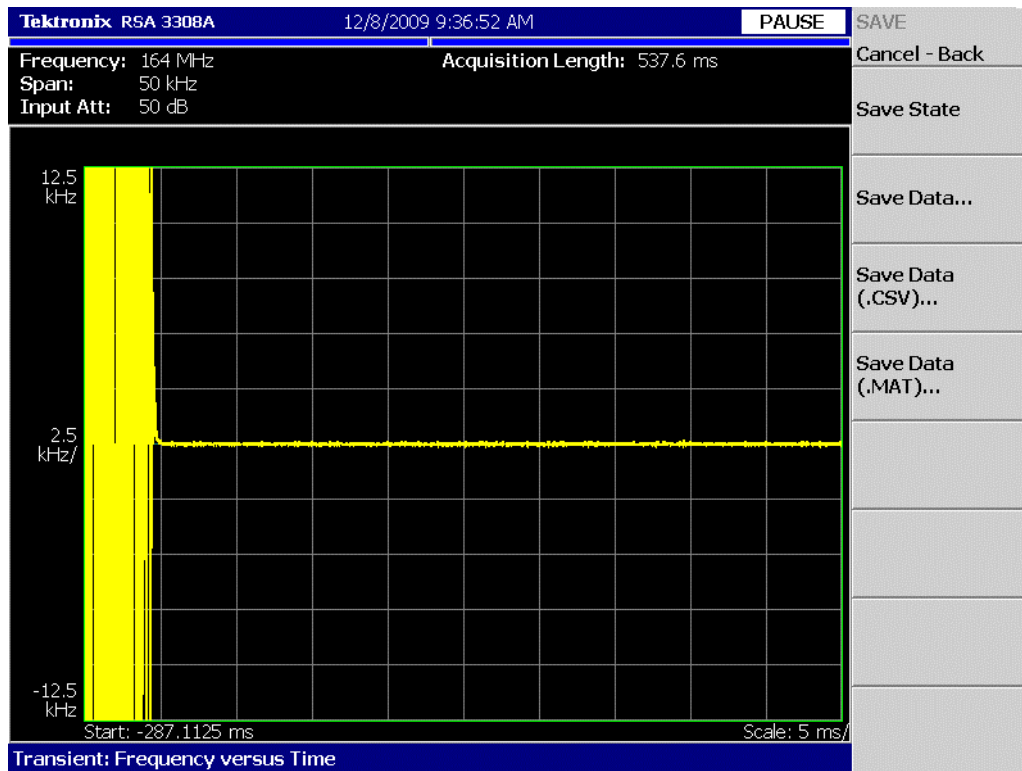
Test Procedure

The EUT was connected through an attenuator to a Real Time Spectrum analyzer (RSA) with a built in modulation domain analyzer. The EUT transient frequency behavior was plotted for both the turn on and turn off transition timing.

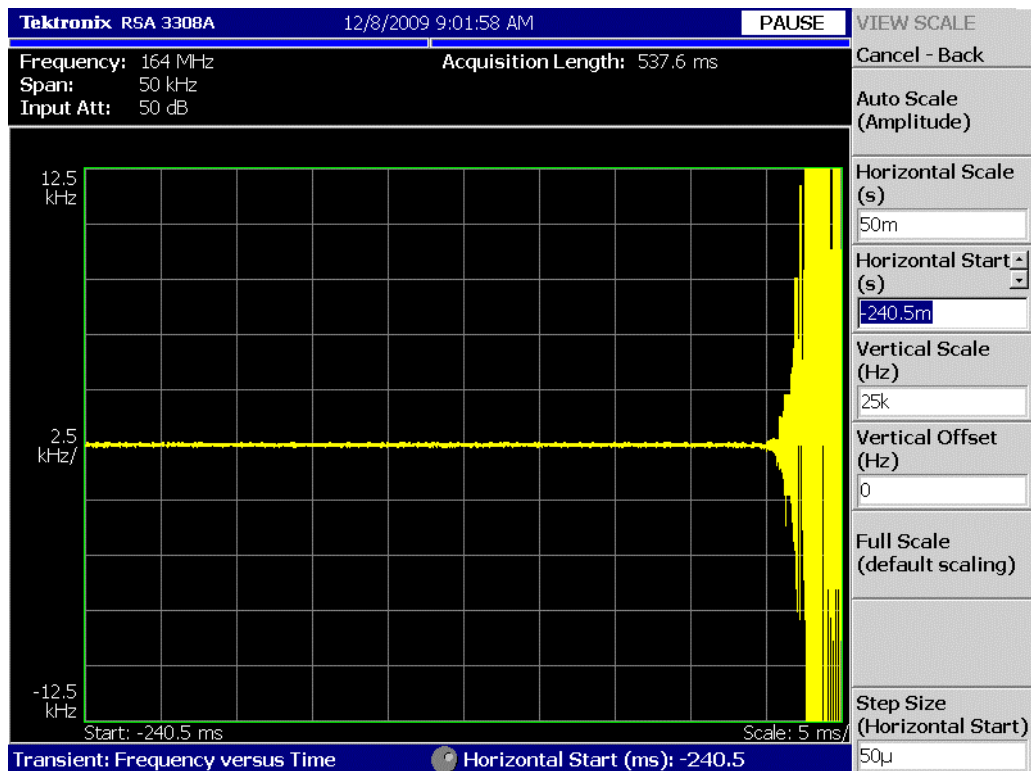
Test Setup



Test Results On Time



Test Results Off Time

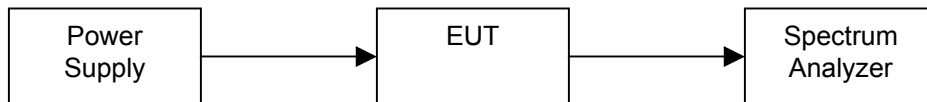


Name of Test: Frequency Stability (Temperature Variation)
Specification: 90.213
Test Equipment Utilized: i00004, i00027, i00029
Engineer: J. Erhard
Test Date: 12/4/2009

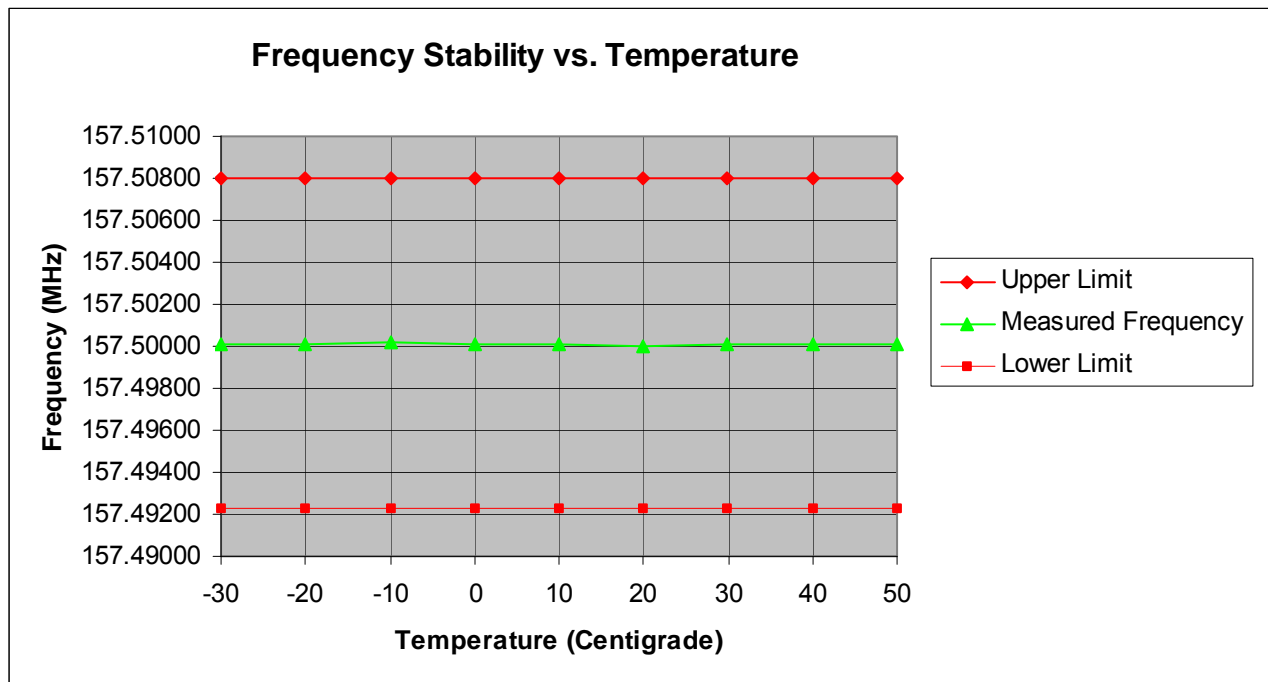
Measurement Procedure

The EUT was placed in an environmental test chamber and the RF output was connected directly to a frequency counter. The temperature was varied from -30°C to 50°C in 10°C increments. After a sufficient time for temperature stabilization the RF output frequency was measured.

Measurement Setup



Measurement Results



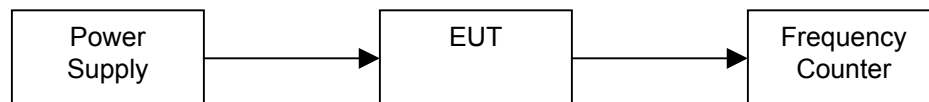
Name of Test: Frequency Stability (Voltage Variation)
Specification: 90.213
Test Equipment Utilized: i00004, i00027, i00029

Engineer: J. Erhard
Test Date: 12/4/2009

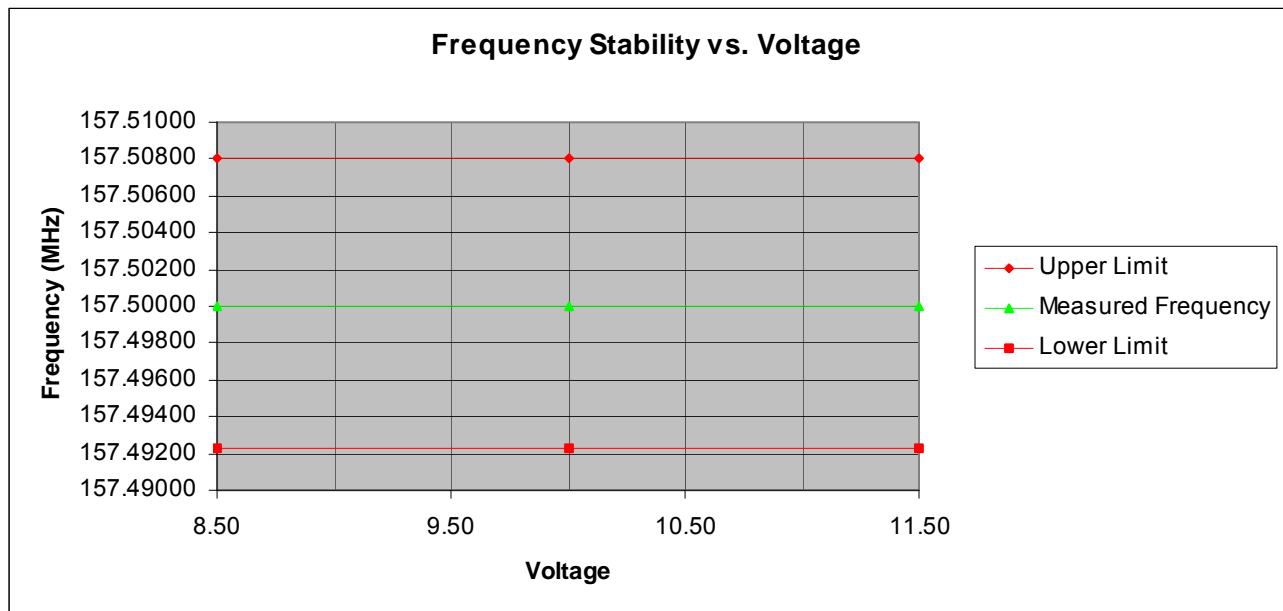
Measurement Procedure

The EUT was placed in a temperature chamber at 20°C and connected directly to a frequency counter and variable power supply. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value and the RF output was measured.

Measurement Setup



Measurement Results



Test Equipment Utilized

Description	MFG	Model Number	CT Asset Number	Last Cal Date	Cal Due Date
Power Supply	HP	6634A	i00004	NCR	NCR
Temperature Chamber	Tenney	Tenney Jr.	i00027	12/8/08	12/08/09
Spectrum Analyzer	HP	8563E	i00029	6/8/09	6/8/10
Amplifier	AR	50W1000A	i00041	NCR	NCR
Spectrum Analyzer	HP	8566B	i00049	10/09/09	10/9/10
Horn Antenna	EMCO	3115	i00103	11/25/08	11/25/10
Tunable Notch Filter	Eagle	TNF-1	i00124	NCR	NCR
Dipole Antenna Set	Alitech	DM-105A – 1,2,3	i00142, i00147, i00148	NCR	NCR
Signal Generator	R&S	SMT-03	i00266	11/20/09	11/20/10
Biconilog Antenna	Schaffner	CLB6111C	i00267	11/21/09	11/21/11
Spectrum Analyzer	Agilent	E4407B	i00331	11/3/08	11/3/09
Real time Spectrum Analyzer	Tektronix	RSA 3308A	i00345	8/21/09	8/21/10

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT