



Compliance Testing

Previously Flom Test Lab

RF, EMC & Safety Testing Experts Since 1963

toll-free: (866) 311-3268

fax: (480) 926-3598

<http://www.ComplianceTesting.com>

info@ComplianceTesting.com

Date: July 19, 2010

Applicant: RFI Americas, Inc
9329 Ravenna Rd
Suite C
Twinsburg, OH 44087

Attention of: Sean Johnson, President
Ph: (330) 541-6585
E-mail: sean.johnson@rfi.com.au

Equipment: RFBE460

FCC ID: YK7045004701CXXXM

FCC Rules: Part 22

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. (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).



Compliance Testing

Previously Flom Test Lab
RF, EMC & Safety Testing Experts Since 1963

toll-free: (866) 311-3268

fax: (480) 926-3598

<http://www.ComplianceTesting.com>

info@ComplianceTesting.com

Test Report

for

FCC ID: YK7045004701CXXM

Model: RFBE460

to

Federal Communications Commission

Rule Part(s) 22

Date of report: July 19, 2010

At the Request of:

RFI Americas, Inc
9329 Ravenna Rd
Suite C
Twinsburg, OH 44087

Attention of:

Sean Johnson, President
Ph: (330) 541-6585
E-mail: sean.johnson@rfi.com.au

Supervised by:

John Erhard: Engineering Manager



Test Report Revision History

Revision	Date	Revised By	Reason for revision
1.0	July 19, 2010	J. Erhard	Original Document
2.0	August 12, 2010	J. Erhard	Edit conducted spurious test information
3.0	August 23, 2010	J. Erhard	Edit current rating



List of Exhibits

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

Applicant: RFI Americas, Inc

FCC ID: YK7045004701CXXXM

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 user's 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 that:

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 is true and correct.

A handwritten signature in black ink, appearing to read "John Erhard".

Certifying Engineer:

John Erhard: Engineering Manager



Table of Contents

<u>Rule</u>	<u>Description</u>	<u>Page</u>
	Test Report	2
2.1033(c)(14)	Rule Summary	3
	Standard Test Conditions and Engineering Practices	4
2.1033(c)	General Information Required	5
	Test Results Summary	7
2.1046	Carrier Output Power (Conducted)	8
2.1051	Conducted Spurious Emissions	9
2.1053	Field Strength of Spurious Radiation	14
2.1049	Occupied Bandwidth	17
2.1055	Frequency Stability (Temperature Variation)	24
2.1055	Frequency Stability (Voltage Variation)	25
	Out of Band Rejection	26
	Test Equipment Utilized	27



Required information per ISO 17025-2005, paragraph 5.10.2:

a) **Test Report**

b) Laboratory: Compliance Testing
(FCC: 933597) 3356 N. San Marcos Place, Suite 107
(Canada: IC 2044A-1) Chandler, AZ 85225

c) Report Number: d1070009

d) Client: RFI Americas, Inc
9329 Ravenna Rd
Suite C
Twinsburg, OH 44087

e) Identification: RFBE460
FCC ID: YK7045004701CXXXM

EUT Description: RFBE Module

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

g) Report Date: July 19, 2010

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

i) Sampling method: No sampling procedure used.

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

m) Supervised 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.



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, 2.1051, 2.1053, 2.1049, 2.1055 and the following individual Parts: 22.



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, 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.

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

Measured Temperature – 39.43°C

Measured Humidity – 17.92%

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 22

Sub-part 2.1033

(c)(1):

Name and Address of Applicant: RFI Americas, Inc
9329 Ravenna Rd
Suite C
Twinsburg, OH 44087

Manufacturer: RFI Americas, Inc
9329 Ravenna Rd
Suite C
Twinsburg, OH 44087

(c)(2): **FCC ID:** YK7045004701CXXXM

Model Number: RFBE460

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

Please see attached exhibits

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

(c)(5): **Frequency Range, MHz:** 454 - 460

(c)(6): **Power Rating, Watts:** 39.2

☐ Switchable

☒ Variable

☐ N/A

FCC Grant Note:

(c)(7): **Maximum Allowable Power, Watts:** 45

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	=	1.607
Collector Voltage, Vdc	=	28
Supply Voltage, Vdc	=	28

(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	Transmitter Conducted Output Power	Pass	
2.1051	Transmitter Conducted Spurious Emissions	Pass	
2.1049	Occupied Bandwidth	Pass	
	Out of Band Rejection	Pass	
	Intermodulation Rejection	N/A	N/A for a single channel system
2.1053	Transmitter Radiated Spurious Emissions	Pass	
2.1055	Frequency Stability (Temperature Variation)	Pass	
2.1055	Frequency Stability (Voltage Variation)	Pass	



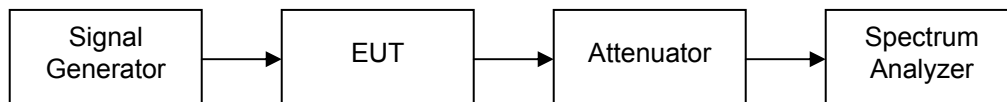
Name of Test: Carrier Output Power (Conducted)
Specification: 2.1046
Test Equipment Utilized: i00331, i00348

Engineer: J. Erhard
Test Date: 7/13/2010

Measurement Procedure

The Equipment Under Test (EUT) was connected to a Spectrum analyzer with appropriate attenuation to ensure the safety of the test equipment utilized. The EUT was set for a 45W maximum output power with a modulated RF input set 20 dB greater than the receiver compression point. The peak RF output power was measured to ensure that the maximum RF output power did not exceed the limit.

Test Setup



Transmitter Peak Output Power

Tuned Frequency MHz	Recorded Measurement dBm	Recorded Measurement Watts	Result
454.05	45.86	38.5	Pass
459.95	45.93	39.2	Pass



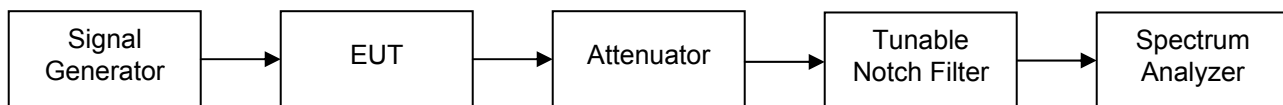
Name of Test: Conducted Spurious Emissions
Specification: 2.1051
Test Equipment Utilized: i00331, i00348, i00364

Engineer: J. Erhard
Test Date: 7/14/2010

Test Procedure

The Equipment Under Test (EUT) was connected to a Spectrum analyzer with appropriate attenuation to ensure the safety of the test equipment utilized. The EUT was set for a 45W maximum output power with both QPSK and FM modulated RF inputs. Each modulation type was performed separately. All forms of QPSK are the same from a vector signaling perspective therefore all types of QPSK signaling are verified. A tunable notch filter was utilized to ensure the spectrum analyzer was not driven into compression to allow for accurate measurement of conducted spurious emissions.

Test Setup



FM Conducted Spurious Emissions Summary Test Table

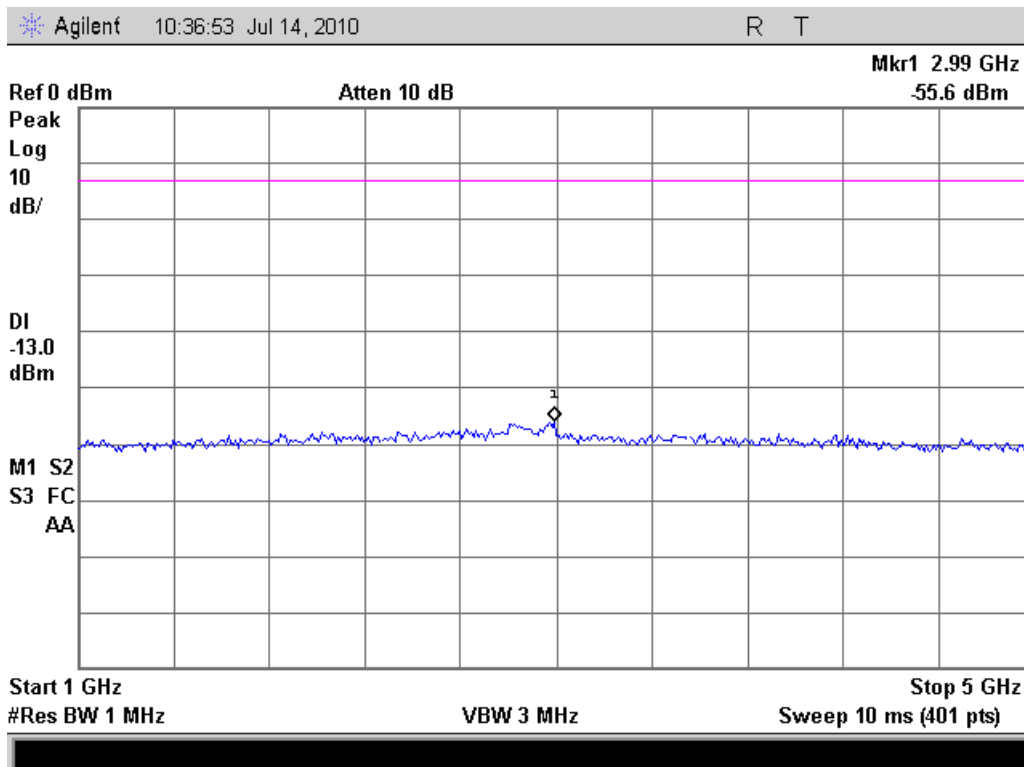
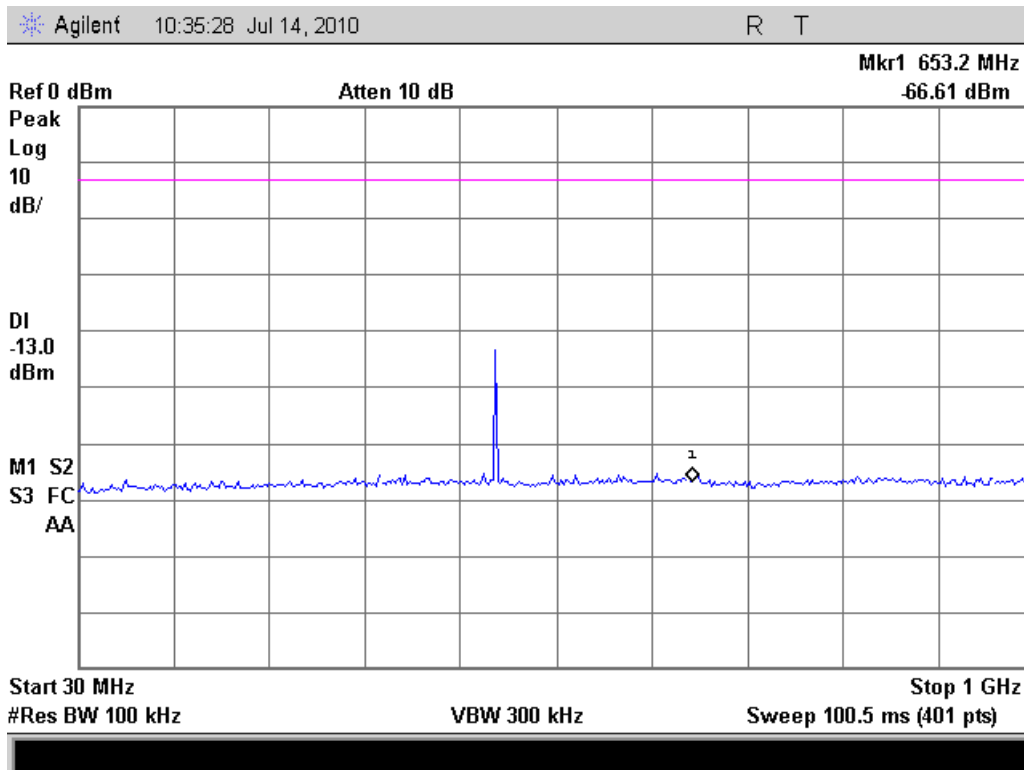
Tuned Frequency (MHz)	Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
454.05	2990	-55.60	-13 dBm	Pass
459.95	2970	-54.39	-13 dBm	Pass

QPSK Conducted Spurious Emissions Summary Test Table

Tuned Frequency (MHz)	Spurious Frequency (MHz)	Measured Spurious Level (dBm)	Specification Limit (dBm)	Result
454.05	2990	-55.60	-13 dBm	Pass
459.95	2970	-53.32	-13 dBm	Pass

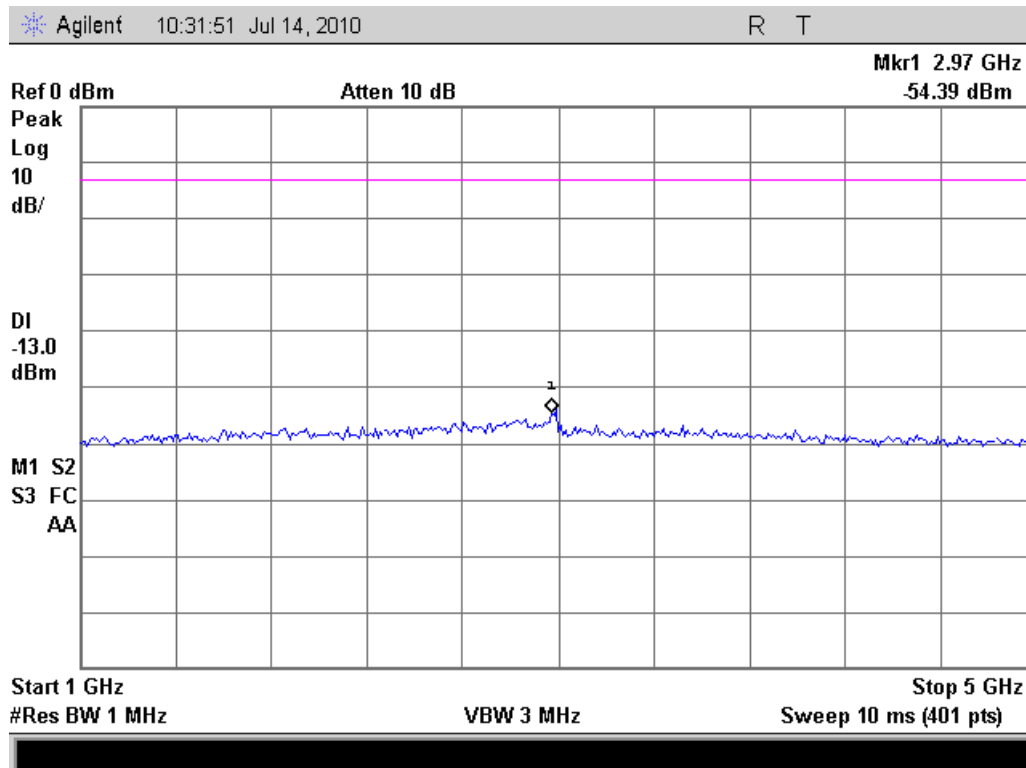
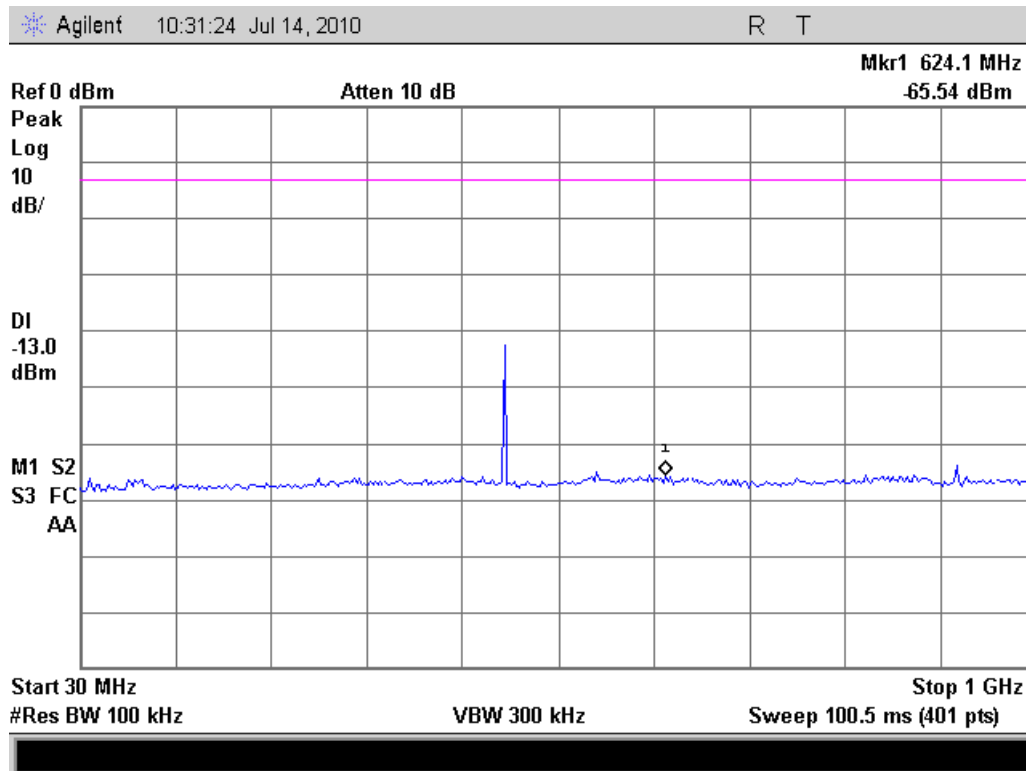


FM Conducted Spurious Emissions 454.05 MHz



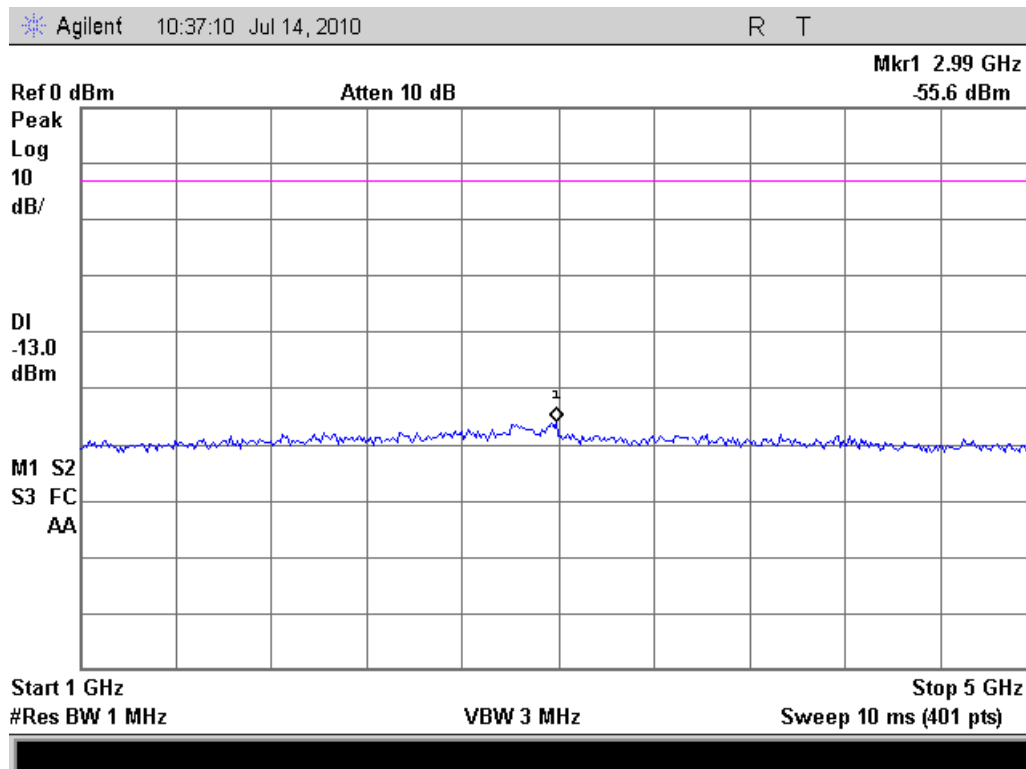
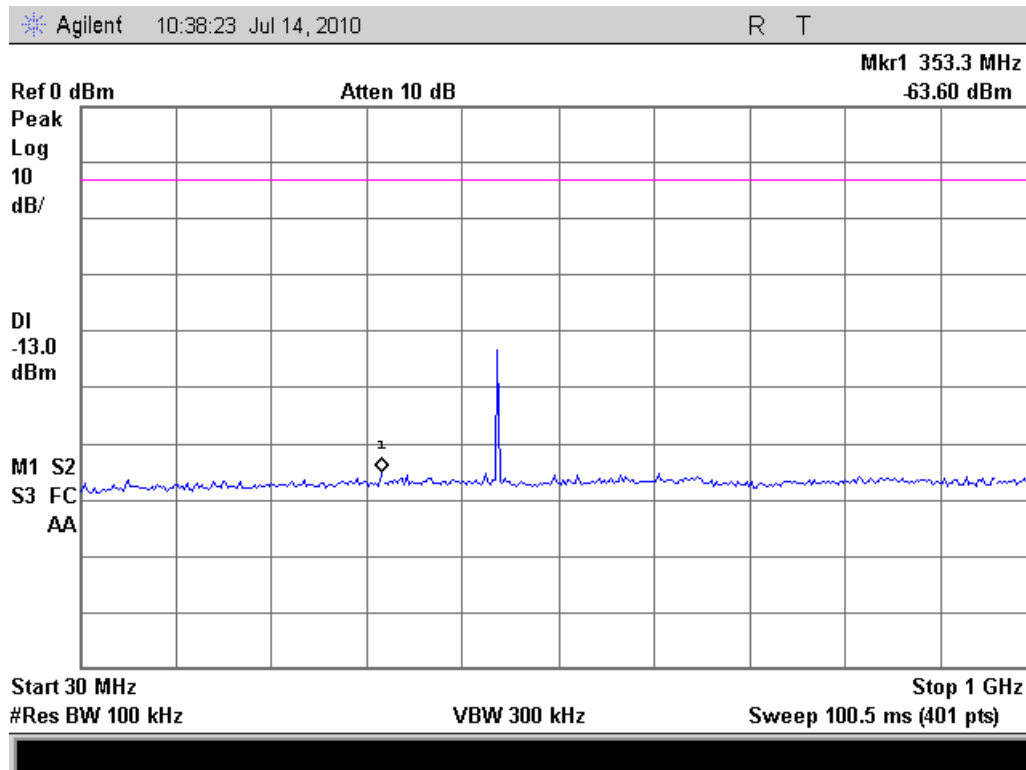


459.95 MHz



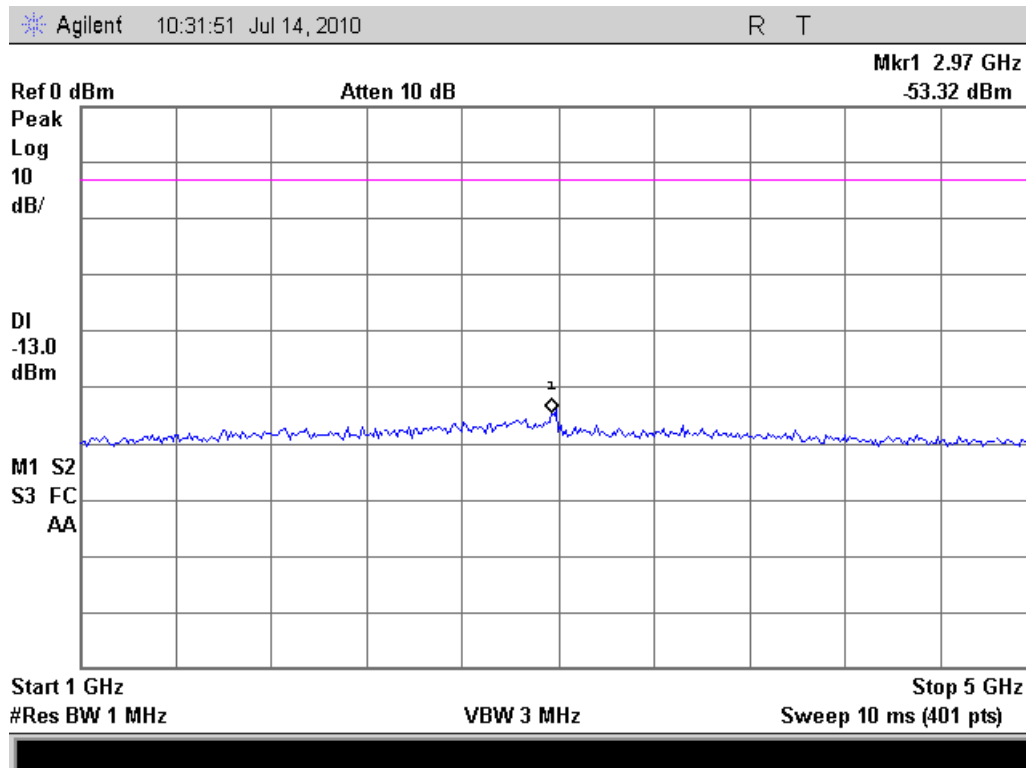
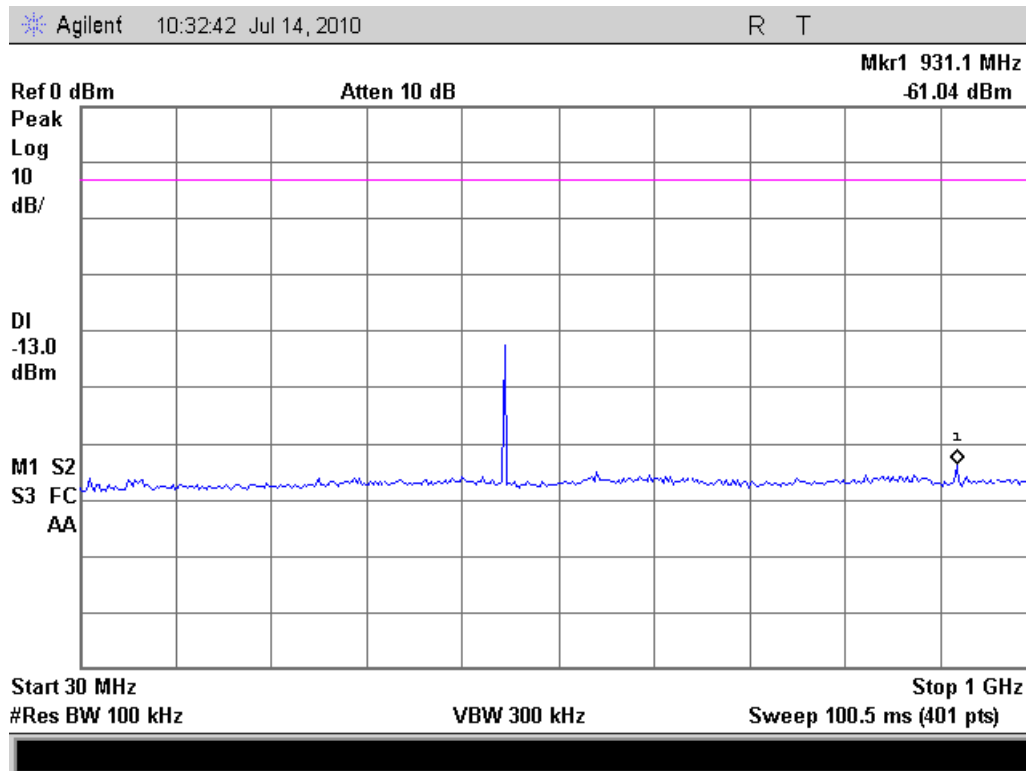


QPSK Conducted Spurious Emissions 454.05 MHz





459.95 MHz





Name of Test: Field Strength of Spurious Radiation
Specification: 2.1053
Test Equipment Utilized: i00033, i00267, i00103

Engineer: J. Erhard
Test Date: 7/16/2010

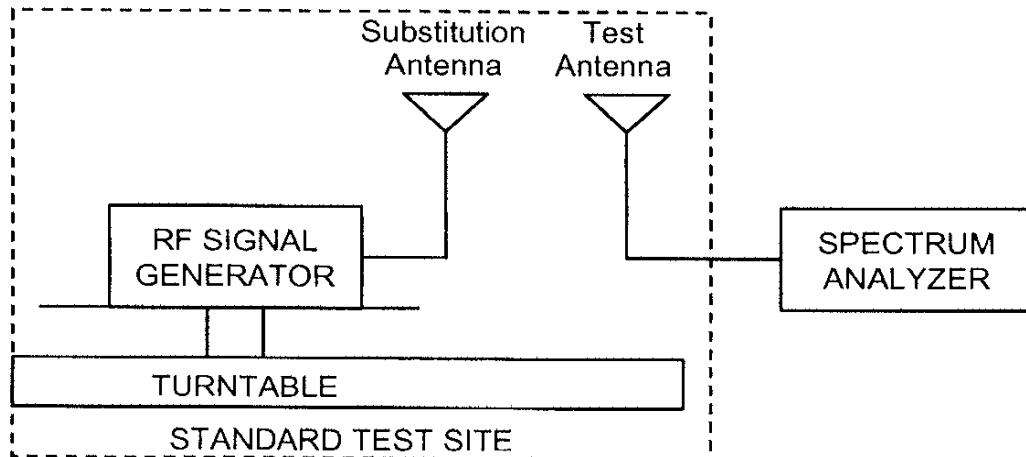
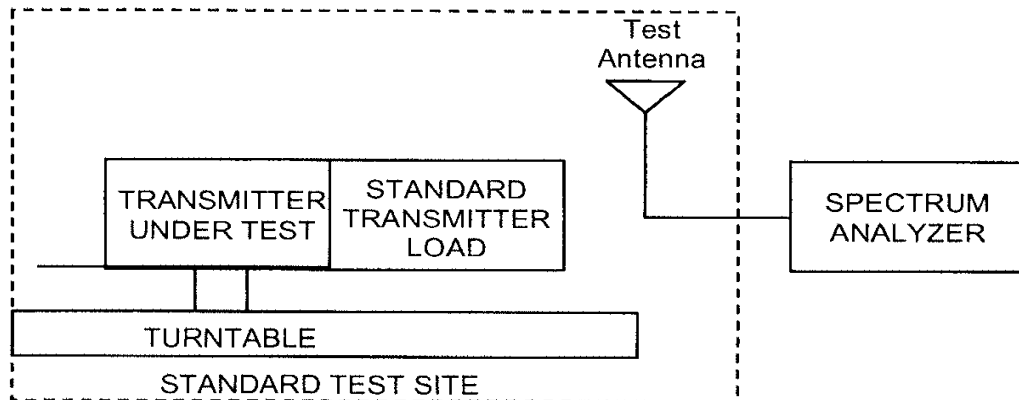
Test Procedure

- 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



**454.05 MHz Test Results**

Emission Frequency (MHz)	Measured Level (dBm)	Correction Factor (dB)	Corrected Value (dBm)	Limit (dBm) ERP/EIRP	Result
908.10	-61.5	36.6	-24.9	-13	Pass
1362.15	-76.4	39.6	-36.8	-13	Pass
1816.20	-76.1	41.9	-34.2	-13	Pass

459.95 MHz Test Results

Emission Frequency (MHz)	Measured Level (dBm)	Correction Factor (dB)	Corrected Value (dBm)	Limit (dBm) ERP/EIRP	Result
919.90	-67.5	37.2	-30.3	-13	Pass
1379.85	-76.5	39.7	-36.8	-13	Pass
1839.80	-76.4	42.0	-34.4	-13	Pass

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

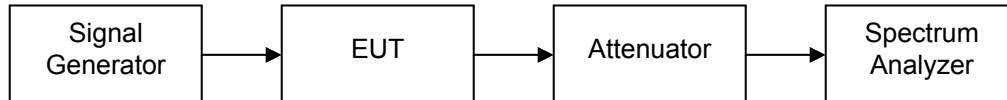


Name of Test: Occupied Bandwidth
Specification: 2.1049
Test Equipment Utilized: i00331, i00348

Engineer: J. Erhard
Test Date: 7/15/2010

The Equipment Under Test (EUT) was connected to a Spectrum analyzer with appropriate attenuation to ensure the safety of the test equipment utilized. The EUT was set for a 45W maximum output power with an FM modulated RF input. The occupied bandwidth of the reference input signal was compared to the RF output signal to ensure that the two signals were similar. FM, C4FM, and QPSK modulations were tested, as they are representative of the emissions types the EUT will utilize.

Test Setup

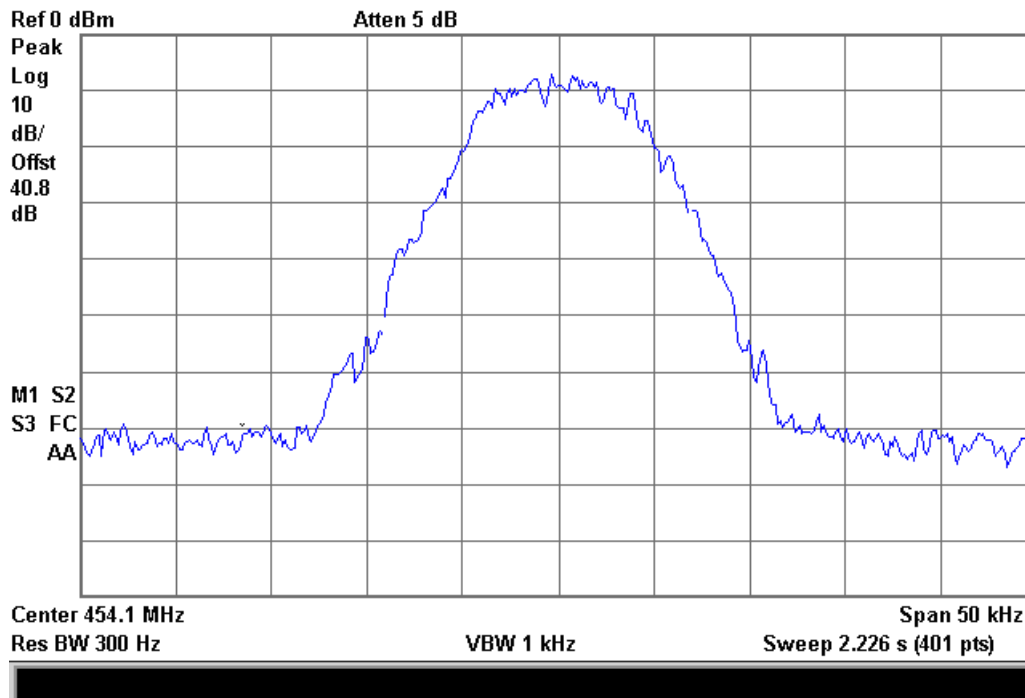


Emissions Designator	Representative Modulation	Results
F1D	C4FM	Pass
F1E	FM	Pass
F3E	FM	Pass
FXE	FM	Pass
G1E	QPSK	Pass
G1D	QPSK	Pass
D7W	QPSK	Pass
D7D	QPSK	Pass
D1E	QPSK	Pass
D1W	QPSK	Pass
F9W	C4FM	Pass



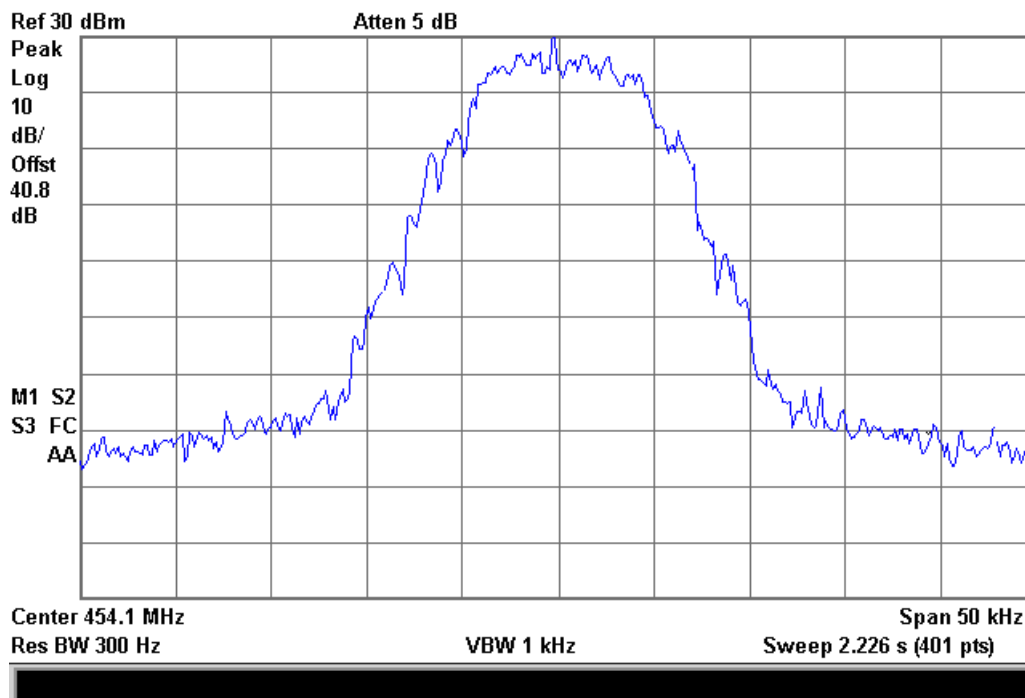
445.05 MHz Test Results FM Reference Input

Agilent 11:45:39 Jul 15, 2010 R T



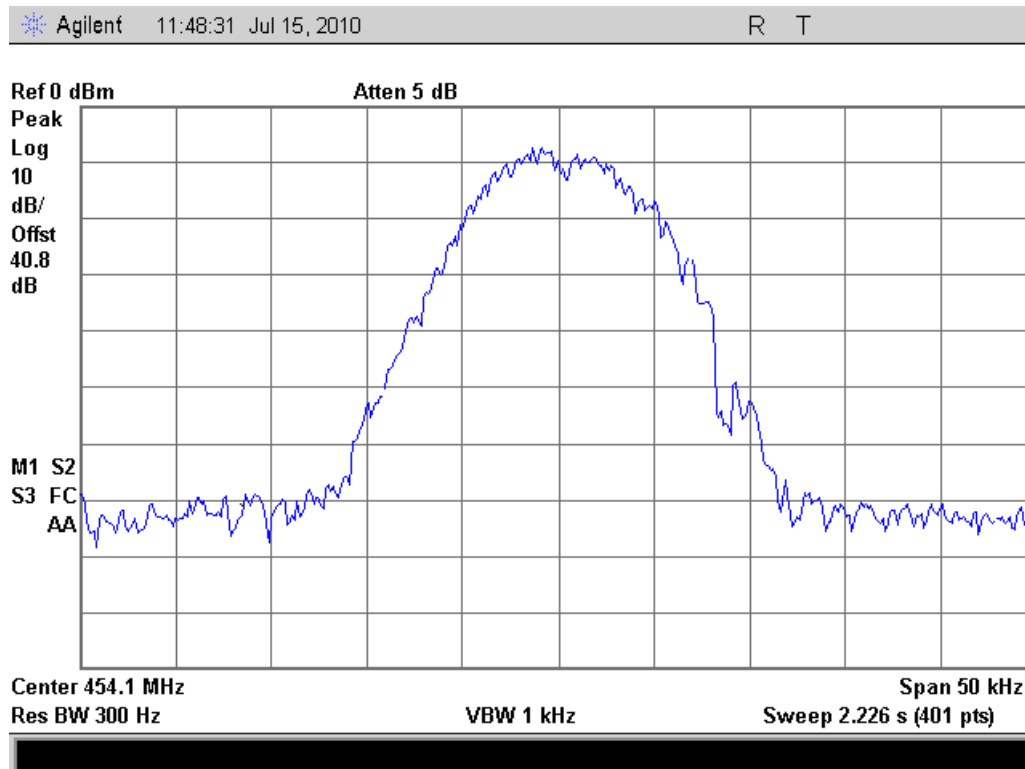
FM RF Output

Agilent 11:46:28 Jul 15, 2010 R T

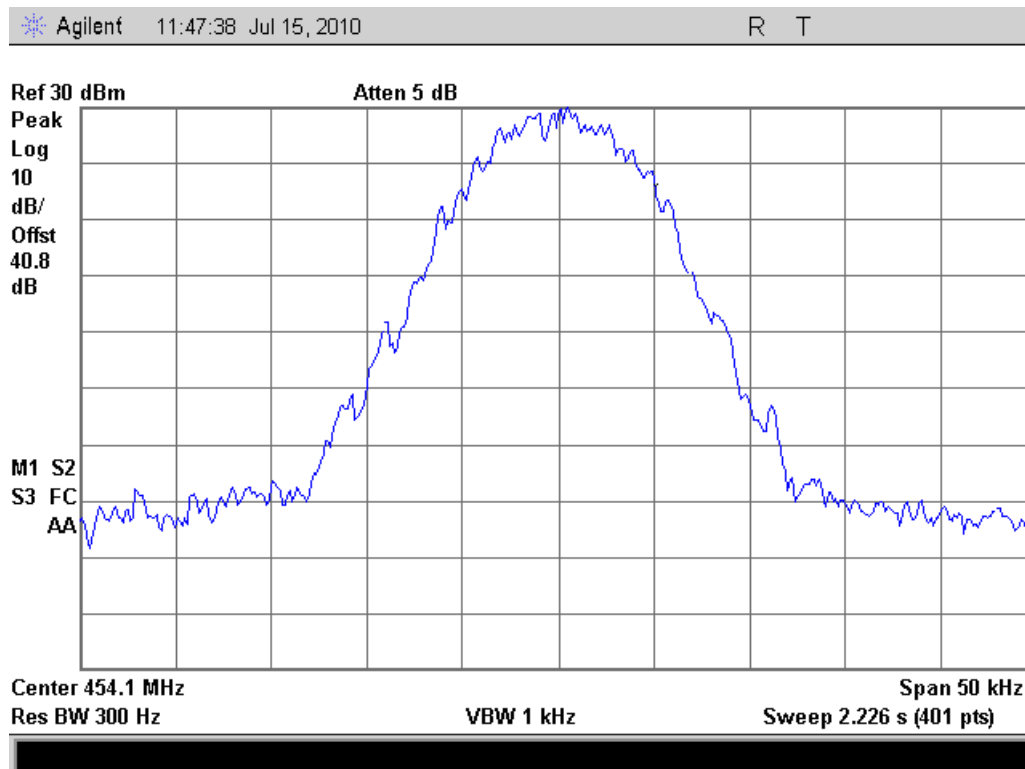




C4FM Reference Input

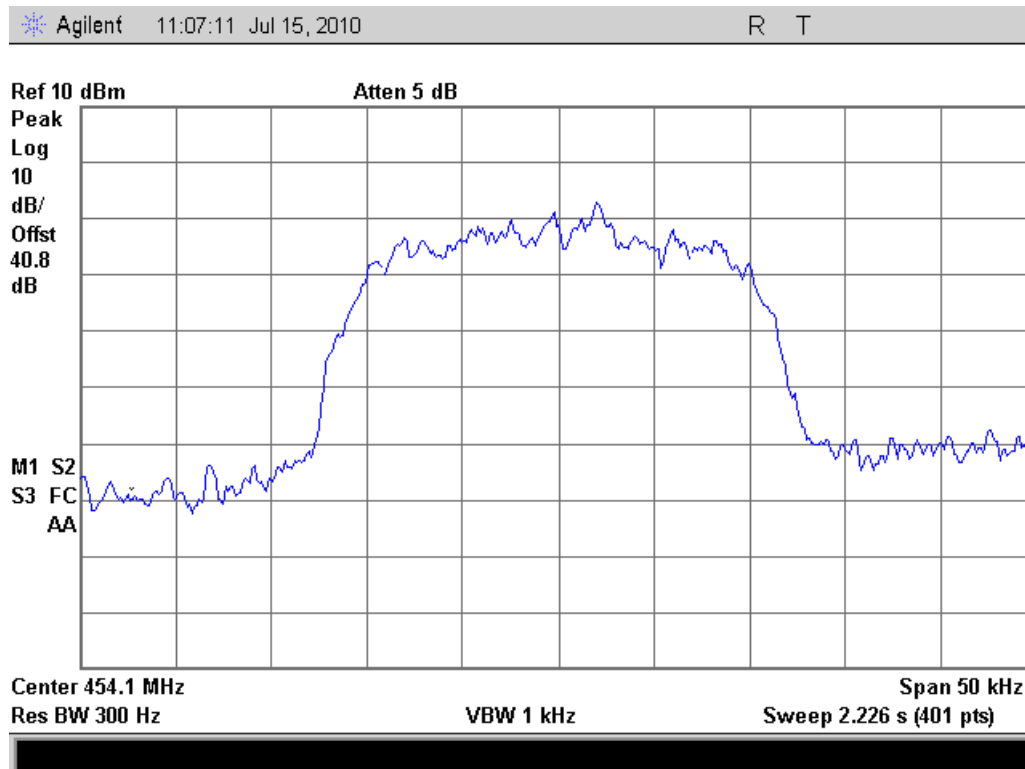


C4FM RF Output

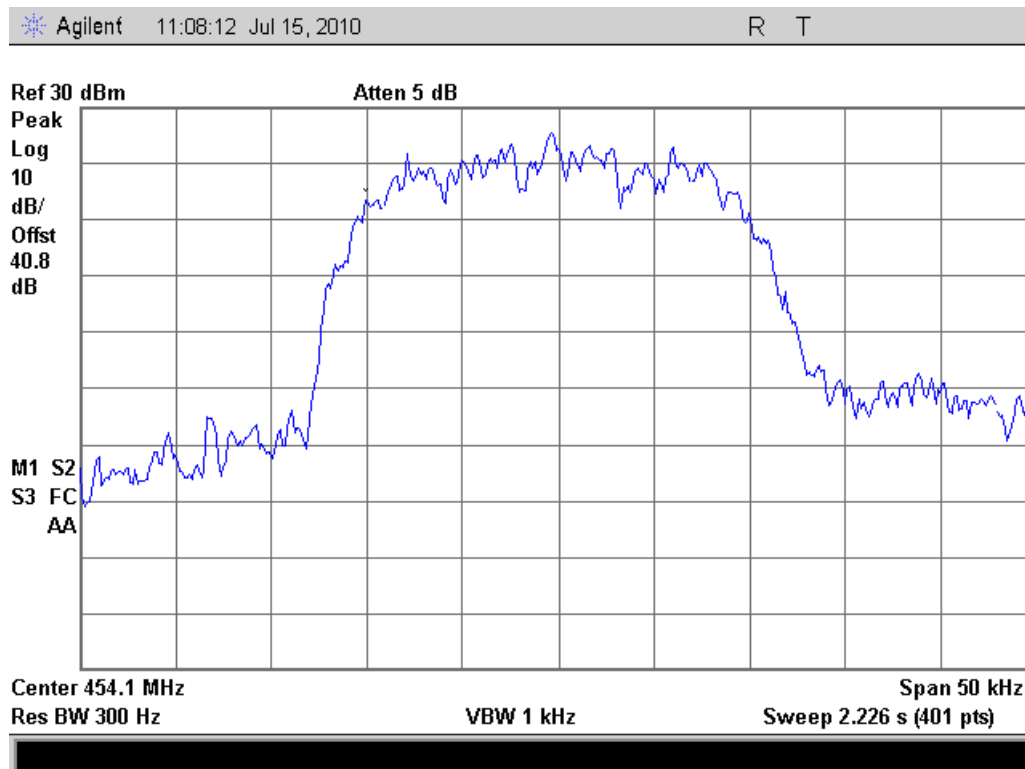




QPSK Reference Input

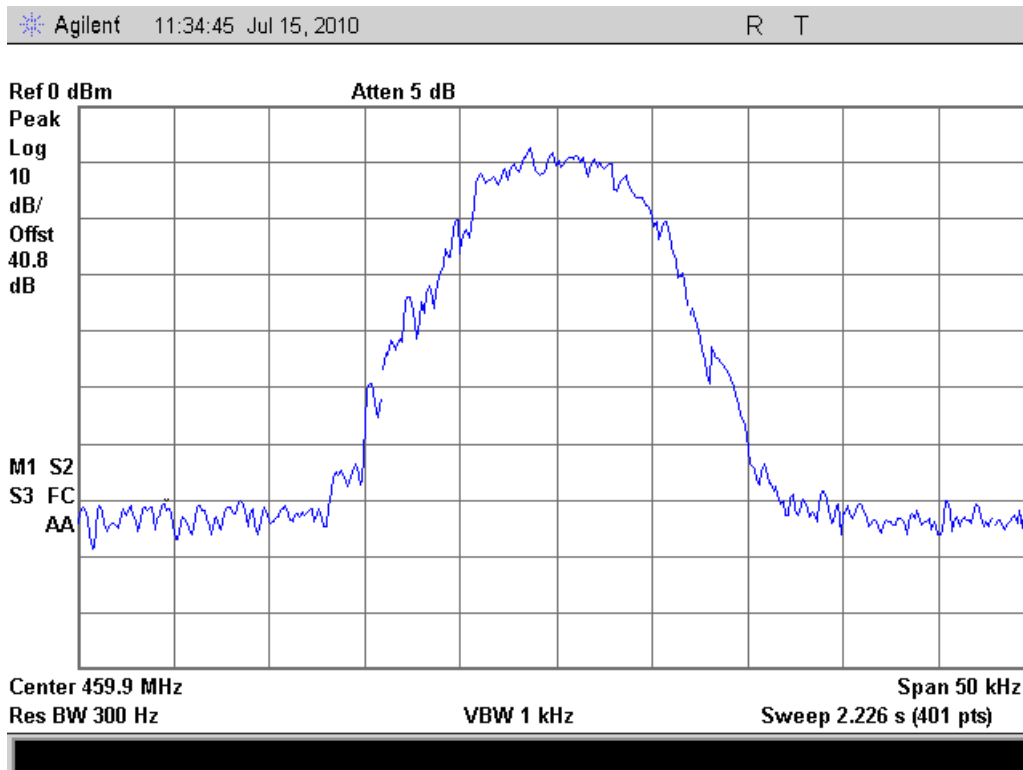


QPSK RF Output

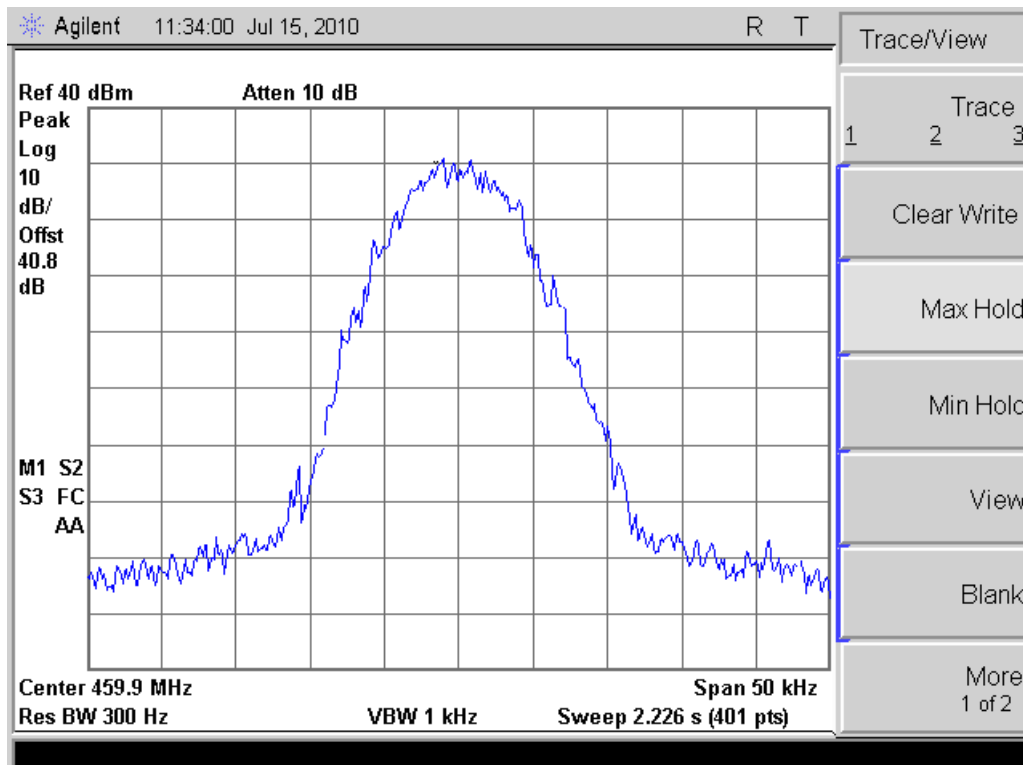




459.95 MHz Test Results FM Reference Input

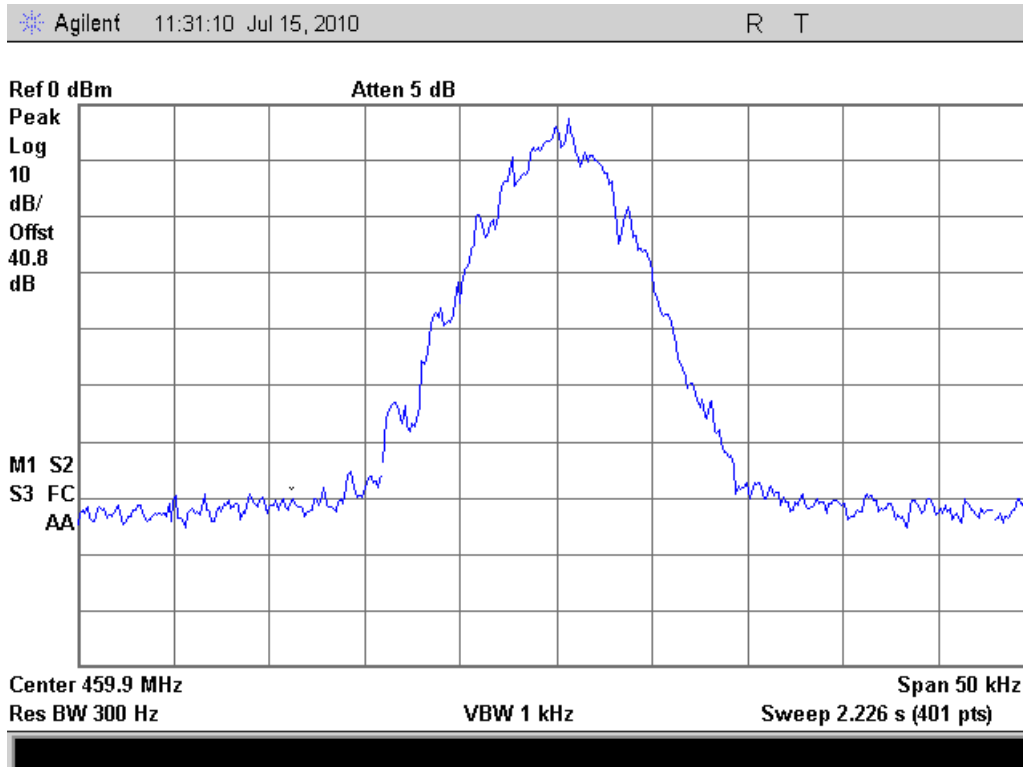


FM RF Output

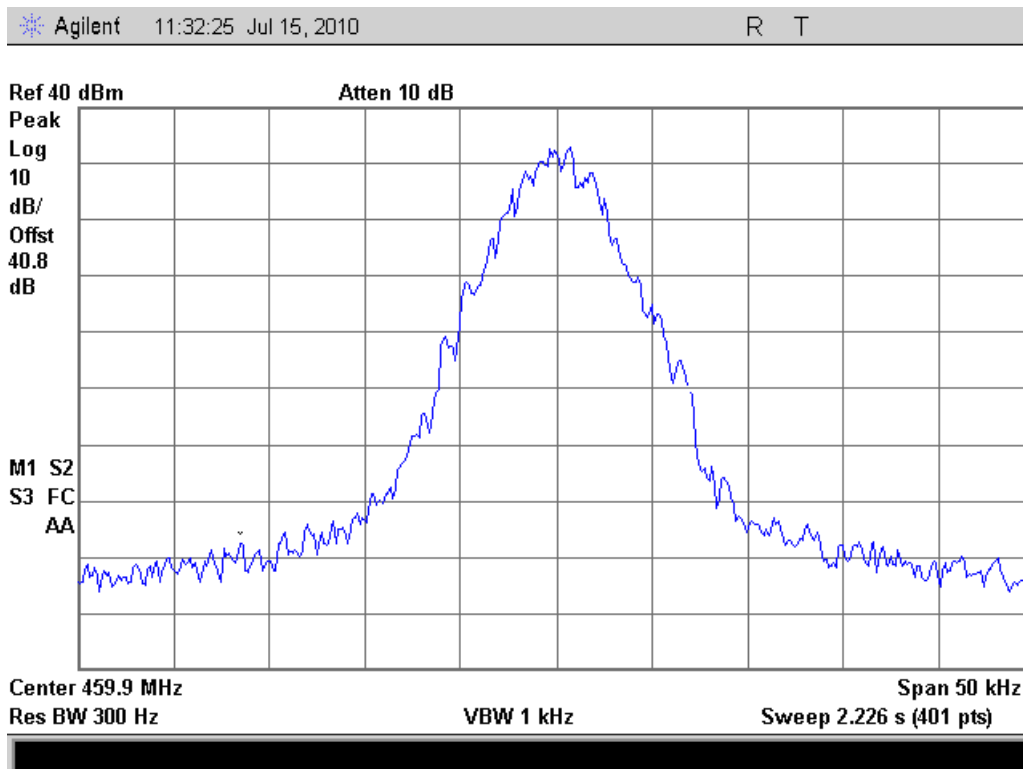




C4FM Reference Input

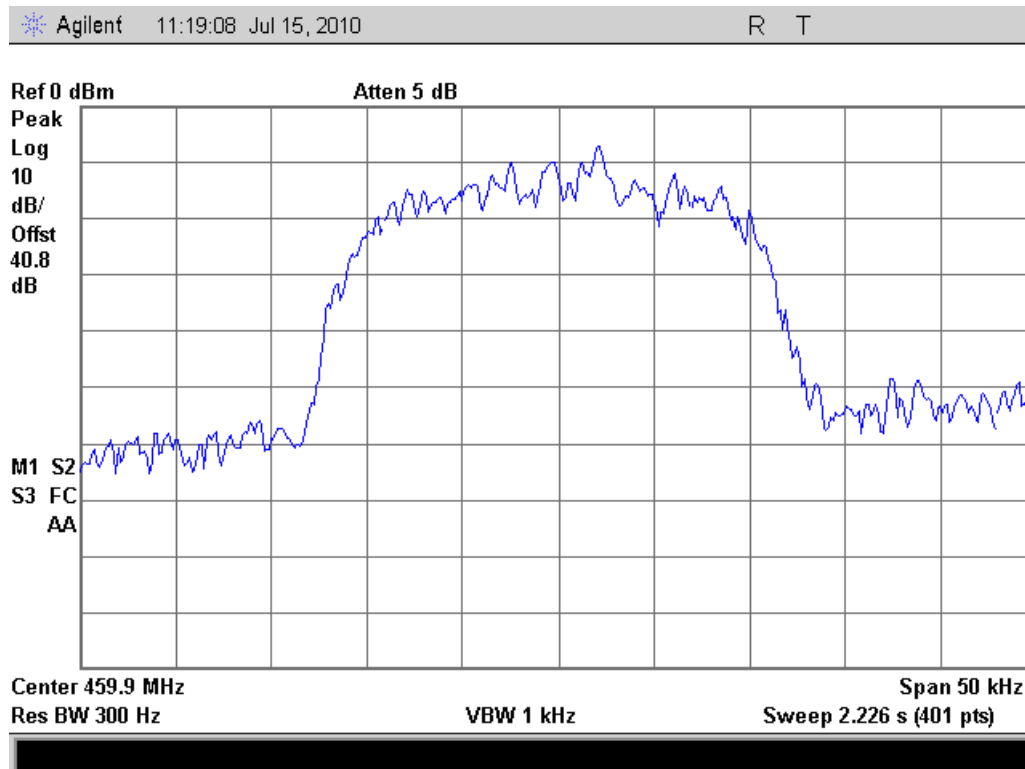


C4FM RF Output

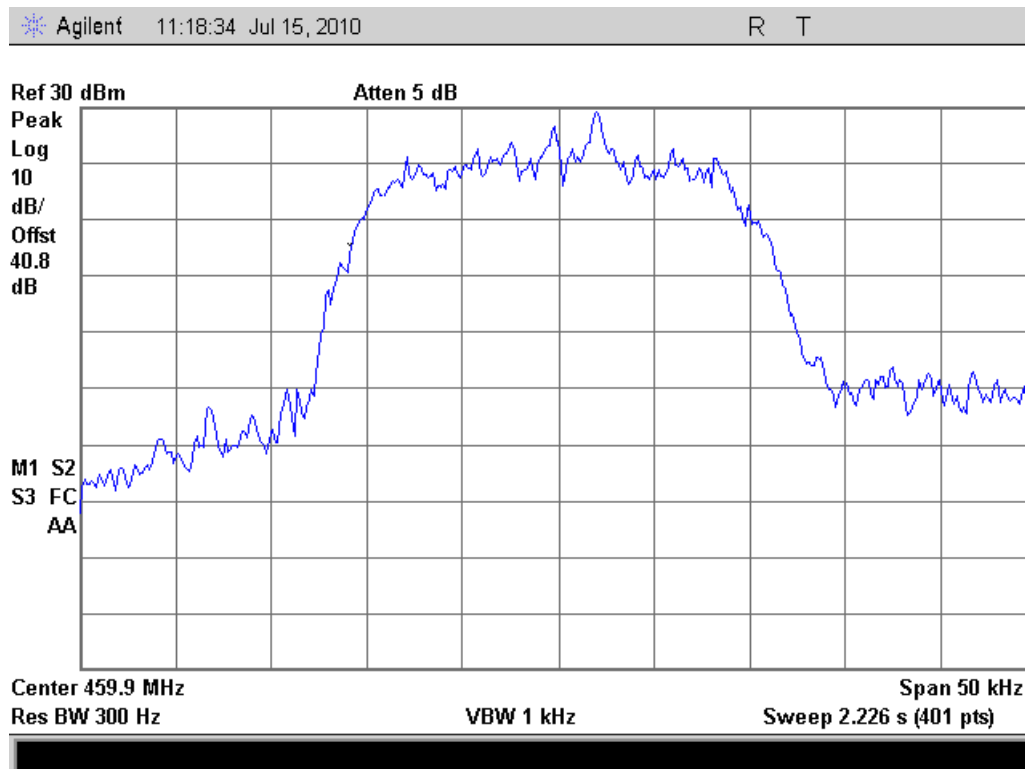




QPSK Reference Input



QPSK RF Output



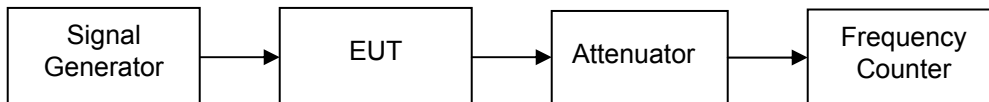
Name of Test: Frequency Stability (Temperature Variation)
Specification: 2.1055
Test Equipment Utilized: i00019, i00348, i00347

Engineer: J. Erhard
Test Date: 7/15/2010

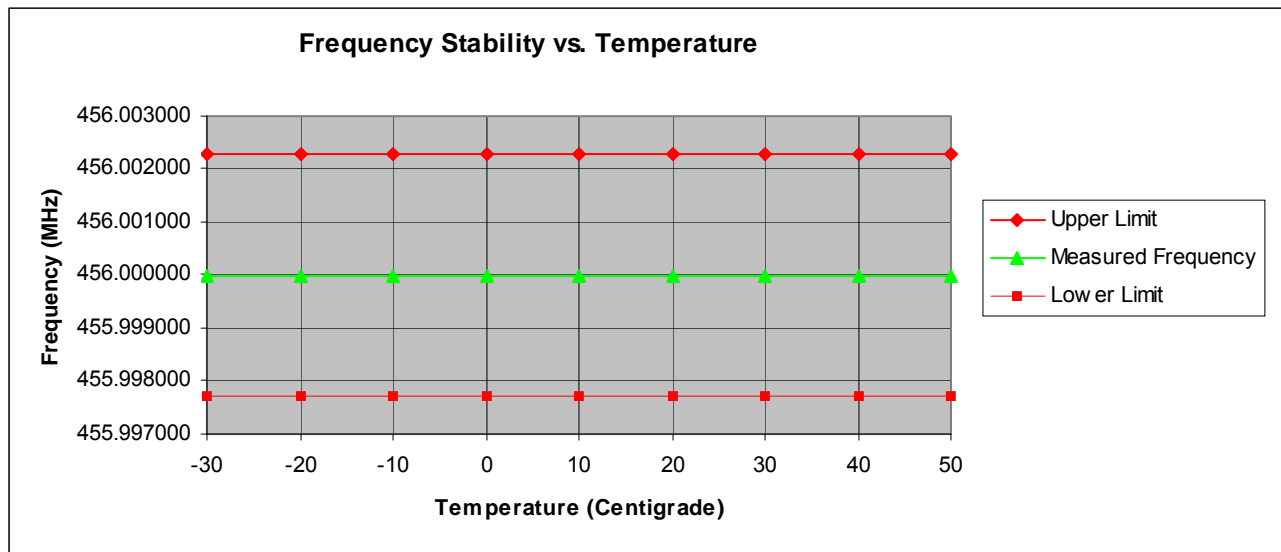
Measurement Procedure

The EUT was placed in an environmental test chamber and the RF output was connected to a frequency counter. The temperature was varied from -30°C to 50°C in 10°C increments. After allowing an appropriate amount of soak time for temperature stabilization A CW RF signal was injected into the receive input and the RF output frequency was measured.

Measurement Setup



Measurement Results





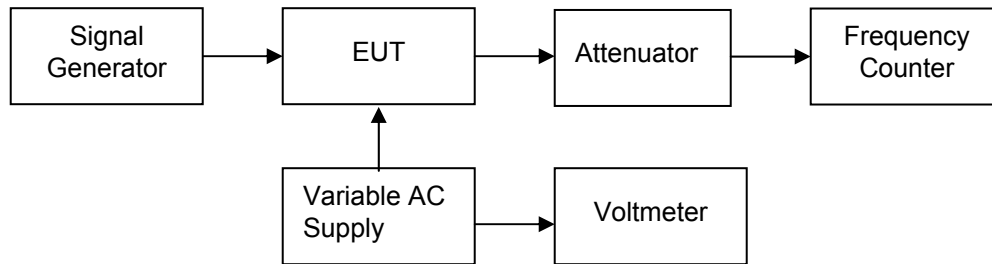
Name of Test: Frequency Stability (Voltage Variation)
Specification: 2.1055
Test Equipment Utilized: i00019, i00348, i00347, i00108, i00320

Engineer: J. Erhard
Test Date: 7/14/2010

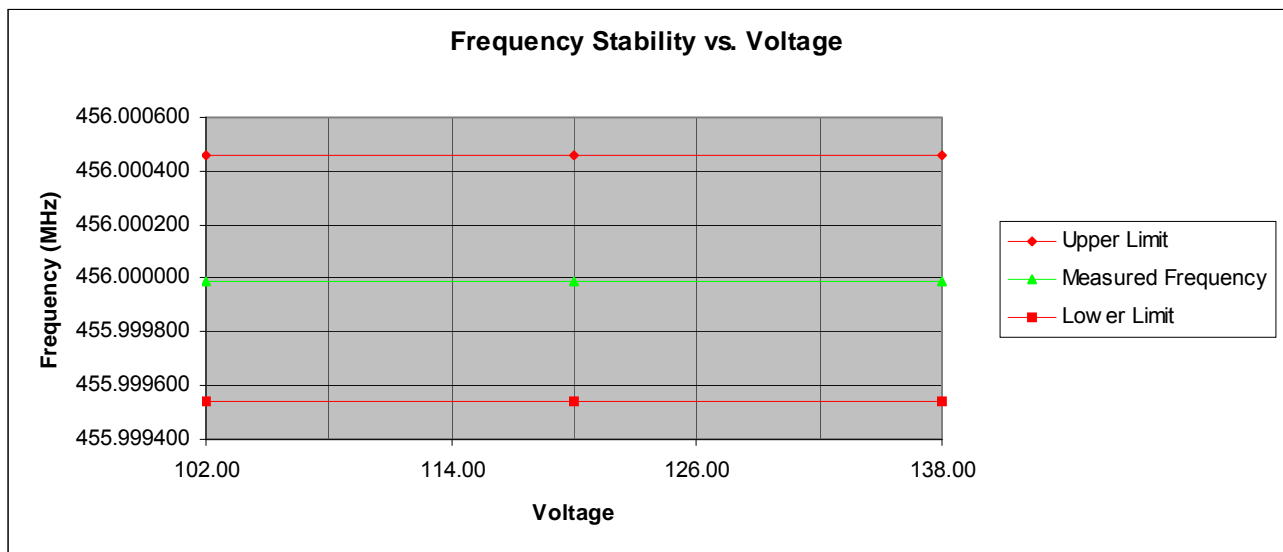
Measurement Procedure

The EUT was placed in an environmental test chamber and the RF output was connected to a frequency counter. At 20°C A CW RF signal was injected into the receive input and the RF output frequency was measured while the input voltage was varied +/- 15%.

Measurement Setup



Measurement Results





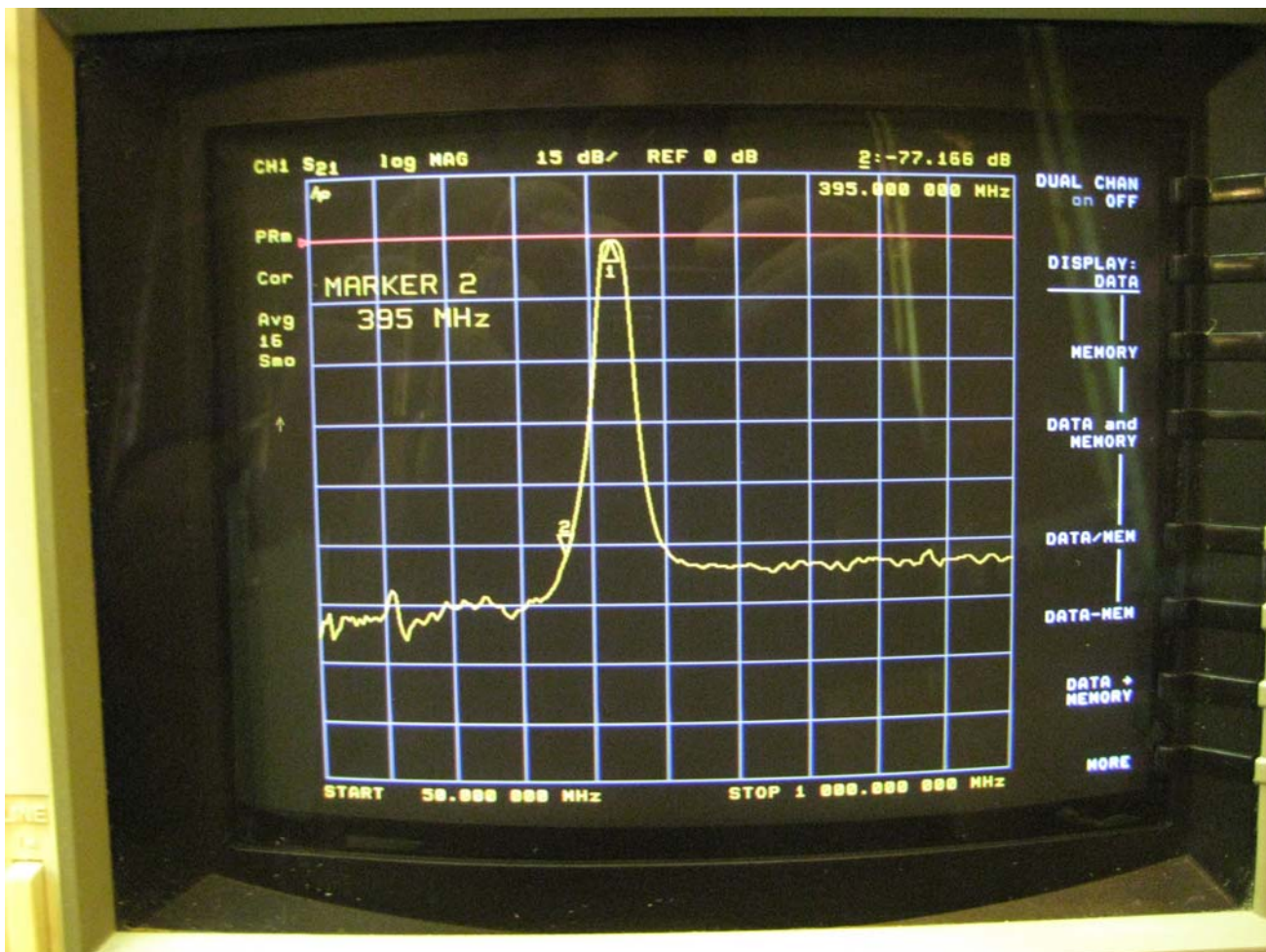
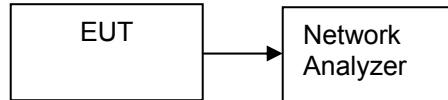
Name of Test: Out of Band Rejection
Specification:
Test Equipment Utilized: i00207

Engineer: J. Erhard
Test Date: 7/15/2010

Measurement Procedure

The EUT filter section was connected to a network analyzer and the response curve was plotted. Marker 1 was set to the center of the passband and marker 2 was set 56 MHz outside of the passband to show the total out of band rejection.

Measurement Setup



**Test Equipment Utilized**

Description	MFG	Model Number	CT Asset Number	Last Cal Date	Cal Due Date
Frequency Counter	HP	5334B	i00019	2/15/2010	2/15/2011
Spectrum Analyzer	Agilent	E4407B	i00331	11/3/2009	11/3/2010
Signal Generator	Agilent	E4438C	i00348	11/23/2009	11/23/2010
Attenuator	Narda	769-30	i00347	Verify When Used	
Horn Antenna	Emco	3115	i00103	11/25/2008	11/25/2010
RF Load	Thermaline	8201	i00134	NCR	
Bilog Antenna	Schaffner	CBL6111C	i00267	11/21/2009	11/21/2011
EMI receiver	HP	8546A	i00033	11/4/2003	11/4/2010
Attenuator	Weinschel	24-40-12	N/A	Verify When Used	
Variac	Powerstat	3PN125	i00108	Verify When Used	
DMM	Fluke	75III	i00320	2/16/2010	2/16/2011
Tunable notch filter	Eagle	TNF240MFMF	i00364	Verify When Used	
Network Analyzer	HP	8573D	i00207	8/3/2009	8/3/2010

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