MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE ● BALTIMORE, MARYLAND 21230-3432 ● PHONE (410) 354-3300 ● FAX (410) 354-3313
33439 WESTERN AVENUE ● UNION CITY, CALIFORNIA 94587 ● PHONE (510) 489-6300 ● FAX (510) 489-6372
3162 BELICK STREET ● SANTA CLARA, CA 95054 ● PHONE (408) 748-3585 ● FAX (510) 489-6372
13301 MCCALLEN PASS ! AUSTIN, TX 78753 ! PHONE (512) 287-2500 ! FAX (512) 287-2513

July 6, 2012

Infinet Malta Ltd.
222 Merchants St.
Valletta, Malta VLT1170

Dear Andrey Koynov,

Enclosed is the EMC test report for compliance testing of the Infinet Malta Ltd., R5000-Mmx/36.300.2x200.2x22, tested to the requirements of Title 47 of the Code of Federal Regulations (CFR), Part 15, Subpart B, ICES-003, Issue 4 February 2004 for a Class A Digital Device and Part 90 Subpart Z for Land Mobile Radio Services, RSS-197 Issue 1, February 2010 for Wireless Broadband Access Equipment Operating in the Band 3650 – 3675 MHz.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Warnell
Documentation Department

Reference: (\Infinet Malta Ltd.\EMC33284C-FCC90Z Rev. 2)

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Electromagnetic Compatibility Criteria
Test Report

For the

Infinet Malta Ltd.
Model R5000-Mmx/36.300.2x200.2x22

Tested under

The FCC Verification Rules
Contained in Title 47 of the CFR, Parts 15 Subpart B & ICES-003
for Class A Digital Devices
&
Title 47 of the CFR, Part 90, Subpart Z
for Private Land Mobile Radio Services
and RSS-197, Issue 1, February 2010

MET Report: EMC33284C-FCC90Z Rev. 2

July 6, 2012

Prepared For:
Infinet Malta Ltd.
222 Merchants St.
Valletta, Malta VLT1170

Prepared By:
MET Laboratories, Inc.
914 W. Patapsco Ave.
Baltimore, MD 21230

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MET Report: EMC33284C-FCC90Z Rev. 2

Jeff Pratt
Electromagnetic Compatibility Lab

Jennifer Warnell
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 90, Subpart Z and Part 15, Subpart B of the FCC Rules and Industry Canada standards ICES-003, Issue 4 February 2004, RSS-197, Issue 1, Feb. 2010 under normal use and maintenance.

Shawn McMillen, Wireless Lab Manager
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	February 22, 2012	Initial Issue.
1	March 30, 2012	Revised to reflect additional reference.
2	July 6, 2012	Revised to reflect engineer corrections.

Table of Contents

All references to section numbers are taken directly from the standard/specification used. Only sections requiring testing or evaluation are included.

List of Tables

List of Figures

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**H**ert**z**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**k**ilo**h**ert**z**
kPa	**k**ilo**pa**scal
kV	**k**ilo**v**olt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**M**ega**h**ertz
µH	**microh**enry
µf	**microf**arad
µs	**micros**econds
NEBS	**N**etwork **E**quipment-**B**uilding **S**ystem
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

Executive Summary

1. Testing Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90, Subpart Z. All tests were conducted using measurement procedure ANSI TIA/EIA-603-C-2004.

Title 47 of the CFR, Part 90, Subpart Z, Reference and Test Description	Industry Canada RSS-197 Reference	Comments
47 CFR Part §15.107 (a)	ICES-003 Issue 4 February 2004	Compliant
47 CFR Part §15.109 (a)	ICES-003 Issue 4 February 2004	Compliant
§90.1319(b) Policies governing the use of the 3650-3675 MHz band.	RSS-197, Section 5.5	Compliant
47 CFR Part §15.207	RSS-197, Section 5.7	Compliant
§2.1053; §15.209 Radiated Spurious Emissions	RSS-197, Section 5.7	Compliant
§2.1046; §90.1321(a) RF Power Output	RSS-197, Section 5.6	Compliant
§2.1046; §90.1215(a) Peak Power Spectral Density	RSS-197, Section 5.6	Compliant
§2.1049 Occupied Bandwidth	RSS-GEN, Section 4.6	Compliant
§2.1055, §90.213 Frequency Stability	RSS-197, Section 5.3	Compliant
§2.1051; §90.1323(a) Spurious Emissions at Antenna Terminals	RSS-197, Section 5.7	Compliant
§2.1046; §90.1321(a) Peak Power Spectral Density	N/A	Compliant
N/A	Receiver Spurious Emissions	Compliant
§90.1335 RF exposure	RSS-GEN, Section 4.8	Compliant

Equipment Configuration

2. Equipment Configuration

2.1. Overview

MET Laboratories, Inc. was contracted by Infinet Malta Ltd. to perform testing on the R5000-Mmx/36.300.2x200.2x22.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Infinet Malta Ltd.., R5000-Mmx/36.300.2x200.2x22.

An EMC evaluation to determine compliance of the TB 4.9 with the requirements of Part 90, Subpart Z, was conducted. (All references are to the most current version of Title 47 of the Code of Federal Regulations in effect). In accordance with §2.1033, the following data is presented in support of the Certification of the TB4.9. Infinet Malta Ltd.. should retain a copy of this document and it should be kept on file for at least five years after the manufacturing of the EUT has been **permanently** discontinued. The results obtained relate only to the item(s) tested.

Model(s) Tested:	R5000-Mmx/36.300.2x200.2x22	
Model(s) Covered:	R5000-Mmx/36.300.2x200.2x22	
EUT Specifications:	FCC ID: X8Q-MMX-362322 IC: 9144A-MMX362322	
	Type of Modulations:	OFDM 64 with BPSK ½, QAM64 5/6
	RF Output Power:	16.88 dBm
	Equipment Code:	TNB
	EUT Frequency Ranges:	3655 – 3670 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Environmental Test Conditions:	Temperature: 15-35º C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Evaluated by:	Jeff Pratt	
Report Date(s):	July 6, 2012	

Table 1. EUT Specifications

2.2. Test Site

All testing was performed at MET Laboratories, Inc., 914 W. Patapsco Ave., Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

2.3. Description of Test Sample

The R5000-Mmx/36.300.2x200.2x22 product family is a high-performance broadband wireless system.

Photograph 1. Infinet Malta Ltd. R5000-Mmx/36.300.2x200.2x22

2.4. Equipment Configuration

The EUT was set up as outlined in the Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Serial Number
1	Outdoor unit	R5000-Mmx/36.300.2x200.2x22	45169
2	Indoor unit	IDU-BS-G	N/A

Table 2. Equipment Configuration

2.5. Support Equipment

Infinet Malta Ltd. supplied support equipment necessary for the operation and testing of the R5000-Mmx/36.300.2x200.2x22. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	Serial Number
1	ODU mount kit	InfiNet Wireless	MOUNT-KIT-85	N/A

Table 3. Support Equipment

2.6. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded? (Y/N)	Termination Box ID & Port ID
1	Eth0	RJ-45 cable	1	10	Y	ODU R5000-Mmx/36.300.2x200.2x22
2	Console	Console cable	1	1.5	N	ODU R5000-Mmx/36.300.2x200.2x22
3	RF0	RF cable	1	1	Y	ODU R5000-Mmx/36.300.2x200.2x22
4	RF1	RF cable	1	1	Y	ODU R5000-Mmx/36.300.2x200.2x22
5	In	RJ-45 cable	1	1	N	IDU-CPE
6	Out	RJ-45 cable	1	10	Y	IDU-CPE
7	SMA	RF cable	2	1	Y	Antenna

Table 4. Ports and Cabling Information

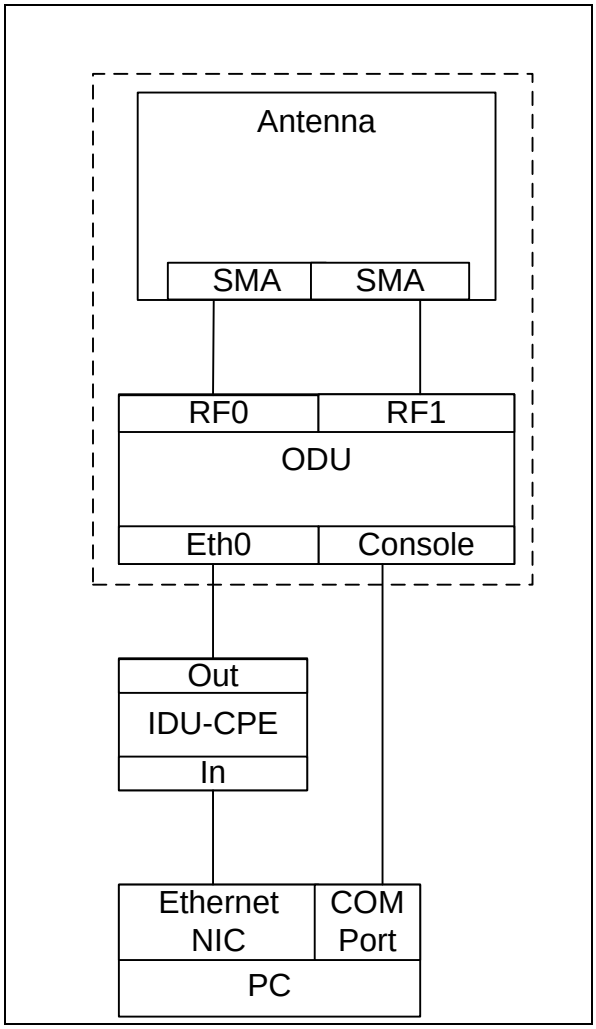


Figure 1. Block Diagram of Test Configuration

2.7. Mode of Operation

The EUT is intended to operate in point-to-point mode with the unit of the same model as a peer.

2.8. Monitoring Method

The EUT is performing according to the manufacturer's intended operation if it is capable to provide data channel with capacity of 1 Mbps or higher measured for TCP traffic as 1 minute average value.

If the unit is not capable to provide such a channel it is not performing according to the manufacturer's intended operation.

2.9. Modifications

2.9.1. Modifications to EUT

No modifications were made to the EUT.

2.9.2. Modifications to Test Standard

No modifications were made to the EUT.

2.10. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Infinet Malta Ltd. upon completion of testing.

Electromagnetic Compatibility Criteria for Unintentional Radiators

3. Electromagnetic Compatibility Criteria for Unintentional Radiators

3.1. Conducted Emissions Limits

Test Requirement(s): **15.107 (a)** "Except for Class B digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 5. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals."

15.107 (b) "For a Class B digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in Table 5. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals. The lower limit applies at the band edges."

Frequency range (MHz)	15.107(b), Class A Limits (dBµV)		15.107(a), Class B Limits (dBµV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15- 0.5	79	66	66 - 56	56 - 46
0.5 – 5.0	73	60	56	46
5.0 - 30	73	60	60	50
Note — The lower limit shall apply at the transition frequencies.				

Table 5. Conducted Limits for Radio Frequency Devices calculated from FCC Part 15 Section 15.107(a) (b)

Test Procedures: The EUT was placed on a 0.8m-high wooden table inside a semi-anechoic chamber. The method of testing, test conditions, and test procedures of ANSI C63.4 were used. The EUT was powered through a 50Ω/50µH LISN. An EMI receiver, connected to the measurement port of the LISN, scanned the frequency range from 150 kHz to 30 MHz in order to find the peak conducted emissions. All peak emissions within 6 dB of the limit were re-measured using a quasi-peak and/or average detector as appropriate.

Test Results: The EUT was found compliant with the Class A requirement(s) of this section. Measured emissions were below applicable limits.

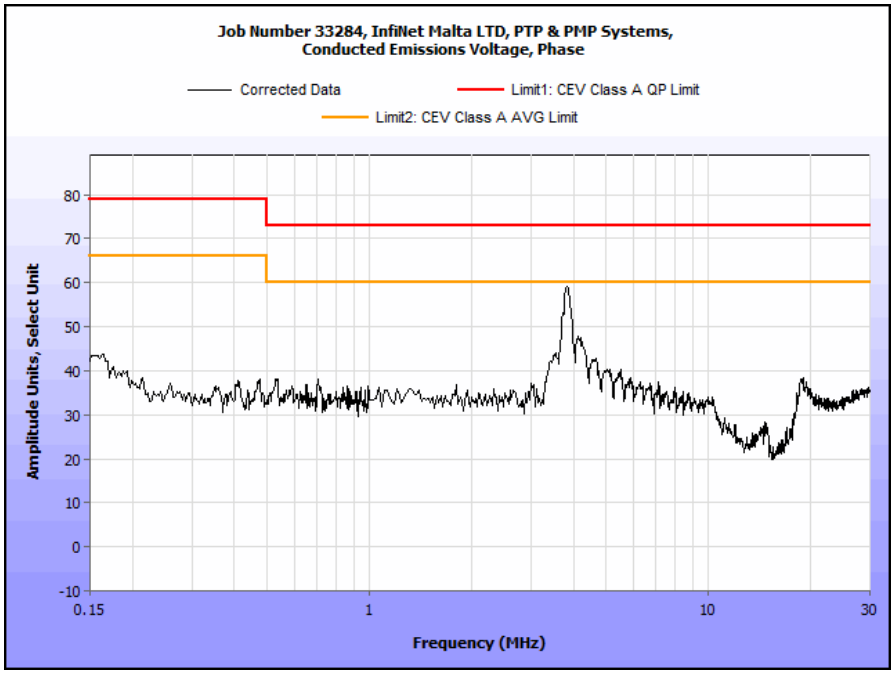
Test Engineer(s): Ben Taylor & Jeff Pratt

Test Date(s): 11/30/11 & 01/12/12

Conducted Emissions

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.15	36.93	0	36.93	79	-42.07	21.26	0	21.26	66	-44.74
0.5295	33.67	0.02	33.69	73	-39.31	27.16	0.02	27.18	60	-32.82
3.473	41.25	0.2	41.45	73	-31.55	34.03	0.2	34.23	60	-25.77
3.825	56.71	0.23	56.94	73	-16.06	50.07	0.23	50.3	60	-9.7
4.178	45.07	0.25	45.32	73	-27.68	40.25	0.25	40.5	60	-19.5
19.09	31.64	0.52	32.16	73	-40.84	22.54	0.52	23.06	60	-36.94

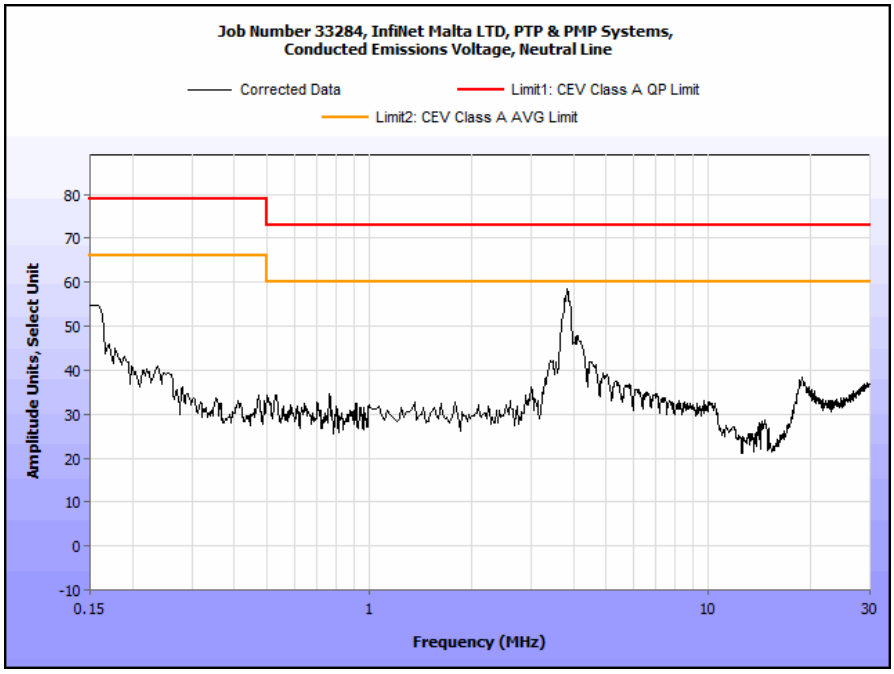
Table 6. Conducted Emissions, Phase Line, Test Results



Plot 1. Conducted Emissions, Phase Line

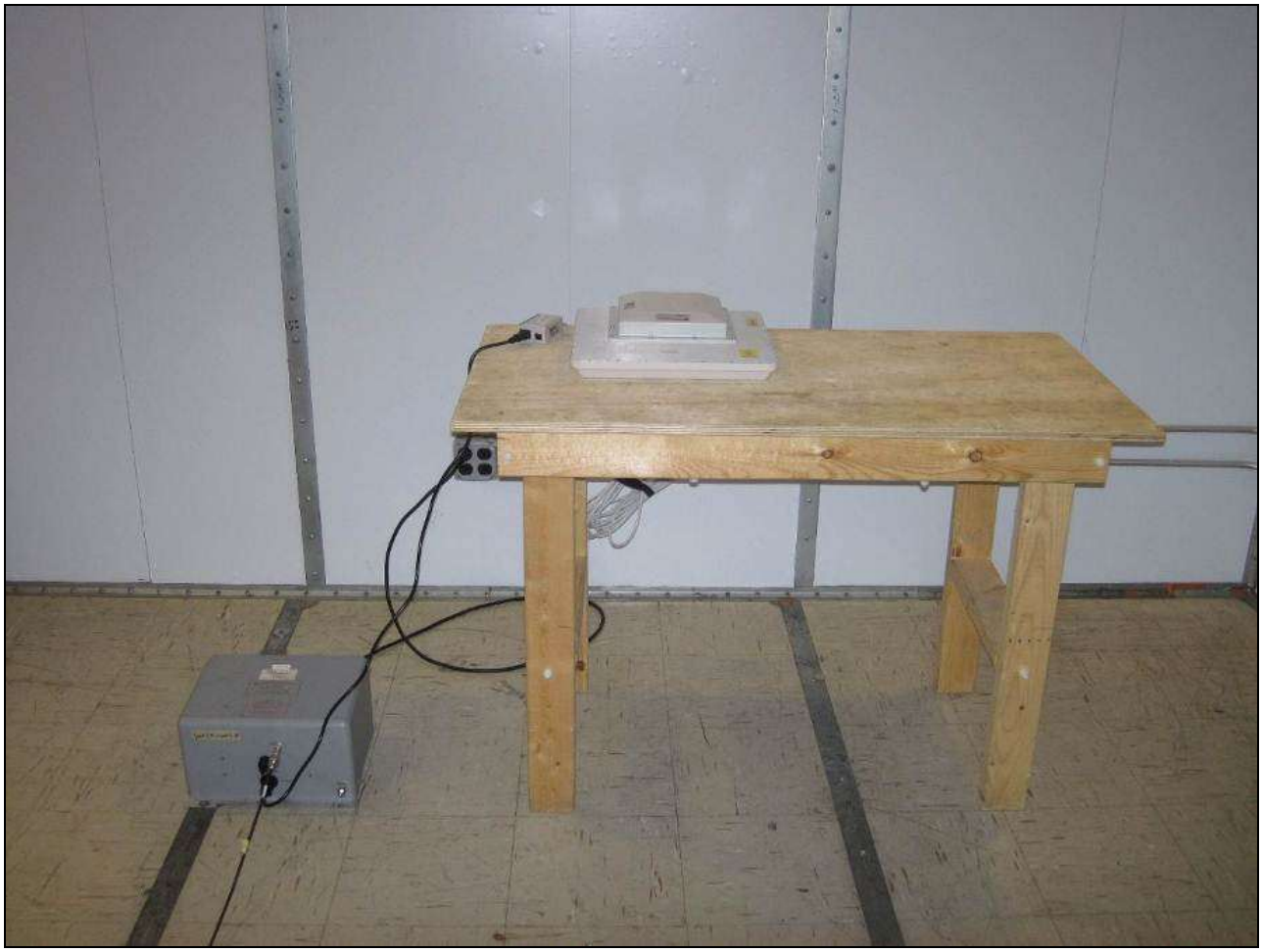
Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.1539	52.78	0	52.78	79	-26.22	41.47	0	41.47	66	-24.53
0.532	32.03	0.03	32.06	73	-40.94	29.13	0.03	29.16	60	-30.84
3.518	32.13	0.2	32.33	73	-40.67	26.38	0.2	26.58	60	-33.42
3.82	56.28	0.23	56.51	73	-16.49	52.85	0.23	53.08	60	-6.92
4.065	43.82	0.25	44.07	73	-28.93	35.18	0.25	35.43	60	-24.57
19.02	34.3	0.52	34.82	73	-38.18	26.95	0.52	27.47	60	-32.53

Table 7. Conducted Emissions, Neutral Line, Test Results



Plot 2. Conducted Emissions, Neutral Line

Conducted Emission Limits Setup



Photograph 2. Conducted Emissions, Test Setup

3.2. Radiated Emissions Limits

Test Requirement(s): **15.109 (a)** Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the Class B limits expressed in Table 8.

15.109 (b) The field strength of radiated emissions from a Class B digital device, as determined at a distance of 10 meters, shall not exceed the Class B limits expressed in Table 8.

Frequency (MHz)	Field Strength (dBµV/m)	
	§15.109 (b), Class A Limit (dBµV) @ 10m	§15.109 (a),Class B Limit (dBµV) @ 3m
30 - 88	39.00	40.00
88 - 216	43.50	43.50
216 - 960	46.40	46.00
Above 960	49.50	54.00

Table 8. Radiated Emissions Limits calculated from FCC Part 15, §15.109 (a) (b)

Test Procedures: The EUT was placed on a 0.8m-high wooden table inside a semi-anechoic chamber. The method of testing and test conditions of ANSI C63.4 were used. An antenna was located 10 m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT was rotated and the antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.

Test Results: The EUT was found compliant with the Class A requirement(s) of this section. Measured emissions were below applicable limits.

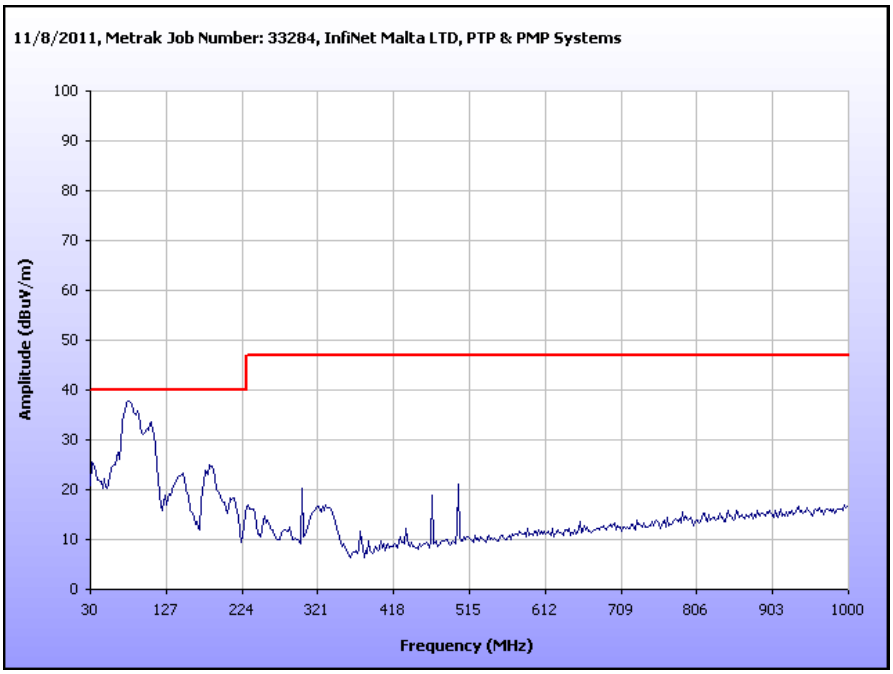
Test Engineer(s): Ben Taylor

Test Date(s): 11/08/11

Radiated Emissions, FCC Limits

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
81.831162	30	H	1.01	15.89	7.72	0.70	10.46	13.85	39.00	-25.15
81.831162	355	V	1.02	38.44	7.72	0.70	10.46	36.40	39.00	-2.60
178.25852	333	H	1.25	8.52	11.30	0.93	10.46	10.29	43.50	-33.21
178.25852	355	V	1.10	18.11	11.30	0.93	10.46	19.88	43.50	-23.62
145.64504	74	H	1.19	9.25	13.00	0.94	10.46	12.73	43.50	-30.77
145.64504	325	V	1.04	15.61	13.00	0.94	10.46	19.09	43.50	-24.41
253.20641	353	H	1.06	5.42	12.16	1.27	10.46	8.39	46.40	-38.01
253.20641	236	V	1.02	8.35	12.16	1.27	10.46	11.32	46.40	-35.08
465.8517	260	H	1.04	5.34	17.52	1.77	10.46	14.17	46.40	-32.23
465.8517	351	V	1.04	5.42	17.52	1.77	10.46	14.25	46.40	-32.15
500.04321	320	H	1.02	7.11	18.00	1.86	10.46	16.51	46.40	-29.89
500.04321	243	V	1.17	8.24	18.00	1.86	10.46	17.64	46.40	-28.76

Table 9. Radiated Emissions Limits, Test Results, FCC Limits

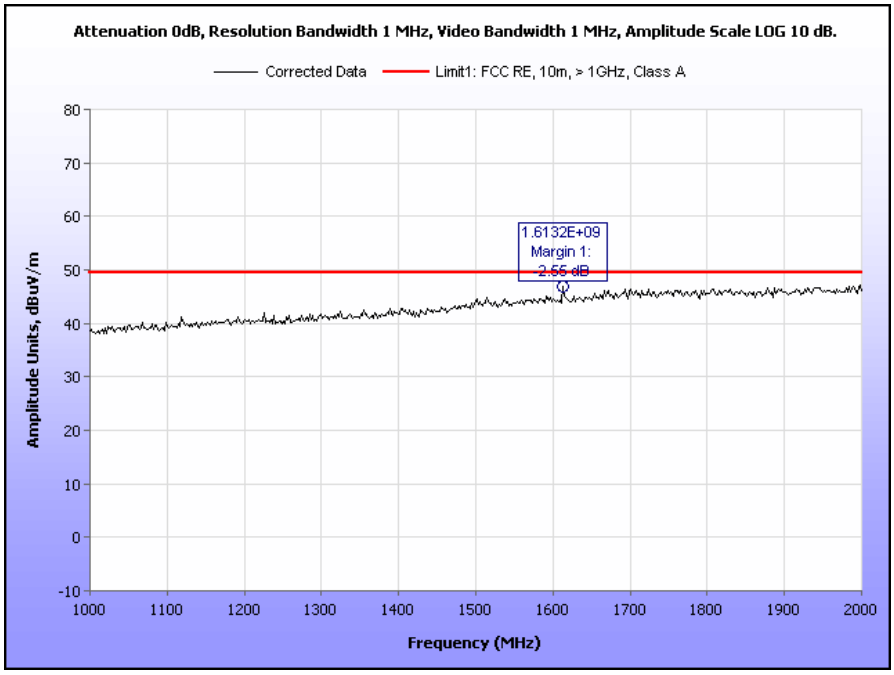


Plot 3. Radiated Emissions, Pre-Scan, 30 MHz – 1 GHz, FCC Limits

Radiated Emissions, Above 1 GHz, FCC Limits

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1.609	251	H	1.05	15.61	28.63	3.21	20	21.03	49.5	-28.47
1.609	300	V	1.01	16.68	28.45	3.21	20	21.92	49.5	-27.58

Table 10. Radiated Emissions Limits, Test Results, Above 1 GHz, FCC Limits



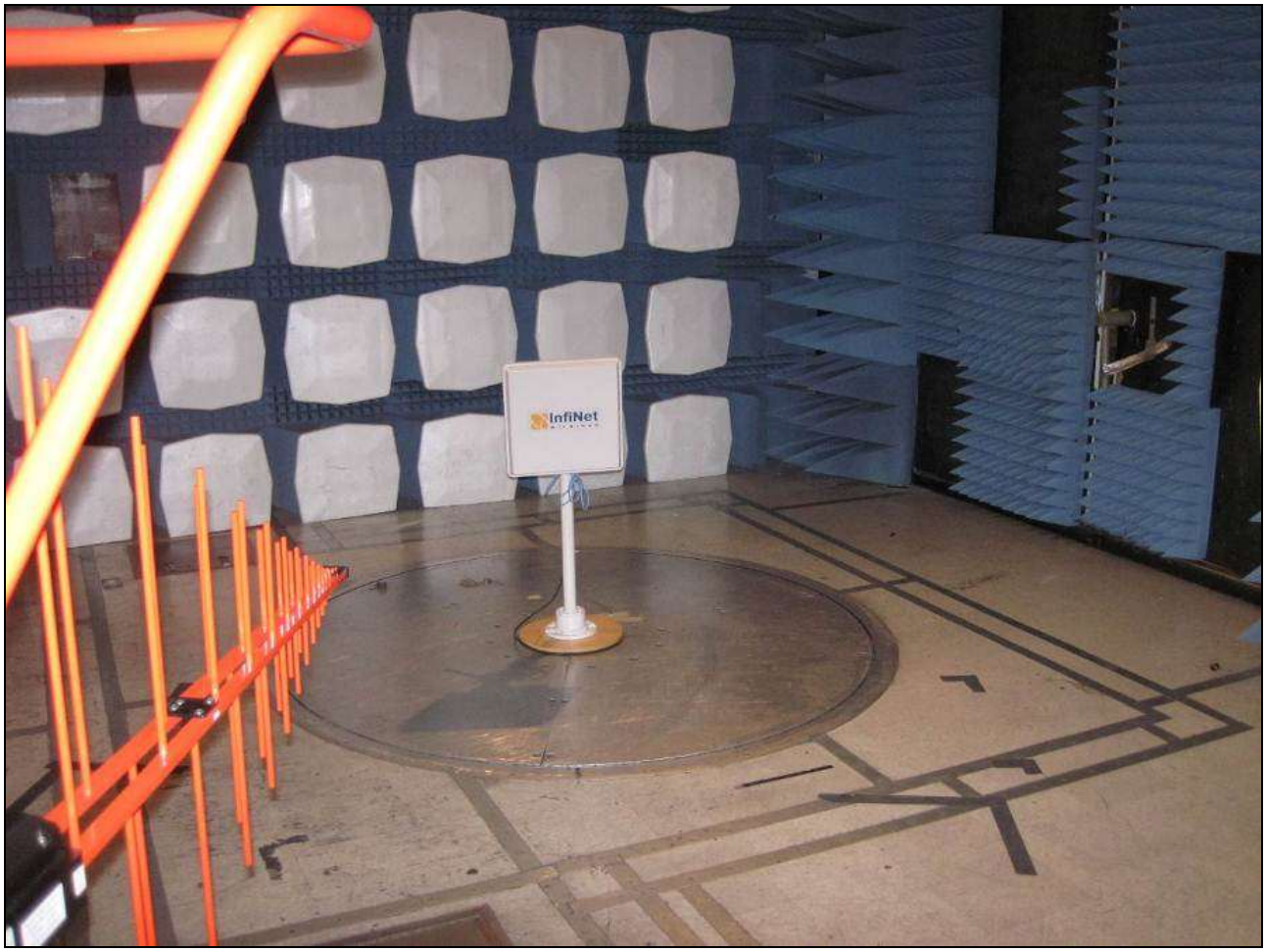
Plot 4. Radiated Emissions, Pre-Scan, 1 GHz – 2 GHz, FCC Limits

Radiated Emissions, IC Limits

Frequency (MHz)	EUT Azimuth (Degrees)	Antenna Polarity (H/V)	Antenna HEIGHT (m)	Uncorrected Amplitude (dBuV)	Antenna Correction Factor (dB) (+)	Cable Loss (dB) (+)	Distance Correction Factor (dB) (-)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
81.831162	30	H	1.01	15.89	7.72	0.70	10.46	13.85	40.00	-26.15
81.831162	355	V	1.02	38.44	7.72	0.70	10.46	36.40	40.00	-3.60
178.25852	333	H	1.25	8.52	11.30	0.93	10.46	10.29	40.00	-29.71
178.25852	355	V	1.10	18.11	11.30	0.93	10.46	19.88	40.00	-20.12
145.64504	74	H	1.19	9.25	13.00	0.94	10.46	12.73	40.00	-27.27
145.64504	325	V	1.04	15.61	13.00	0.94	10.46	19.09	40.00	-20.91
253.20641	353	H	1.06	5.42	12.16	1.27	10.46	8.39	47.00	-38.61
253.20641	236	V	1.02	8.35	12.16	1.27	10.46	11.32	47.00	-35.68
465.8517	260	H	1.04	5.34	17.52	1.77	10.46	14.17	47.00	-32.83
465.8517	351	V	1.04	5.42	17.52	1.77	10.46	14.25	47.00	-32.75
500.04321	320	H	1.02	7.11	18.00	1.86	10.46	16.51	47.00	-30.49
500.04321	243	V	1.17	8.24	18.00	1.86	10.46	17.64	47.00	-29.36

Table 11. Radiated Emissions Limits, Test Results, IC Limits

Radiated Emission Limits Setup



Photograph 3. Radiated Emission Limits, Test Setup

Electromagnetic Compatibility Criteria for Intentional Radiators

4. Electromagnetic Compatibility Requirements

Electromagnetic Compatibility Requirements

4.1 §15.207(a) Conducted Emissions

Test Requirement(s): **§ 15.207 (a):** For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	§ 15.207(a), Conducted Limit (dBμV)	
	Quasi-Peak	Average
* 0.15- 0.45	66 - 56	56 - 46
0.45 - 0.5	56	46
0.5 - 30	60	50

Table 12. Conducted Limits for Intentional Radiators from FCC Part 15 § 15.207(a)

Test Procedure: The EUT was placed on a 0.8 m-high wooden table inside a screen room. The EUT was situated such that the back of the EUT was 0.4 m from one wall of the vertical ground plane, and the remaining sides of the EUT were no closer than 0.8 m from any other conductive surface. The EUT was powered from a 50 Ω/50 μH Line Impedance Stabilization Network (LISN). The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. Conducted Emissions measurements were made in accordance with *ANSI C63.4-2003 "Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40 GHz"*. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to an EMC/field intensity meter. For the purpose of this testing, the transmitter was turned on. Scans were performed with the transmitter on.

Test Results: The EUT was compliant with this requirement.

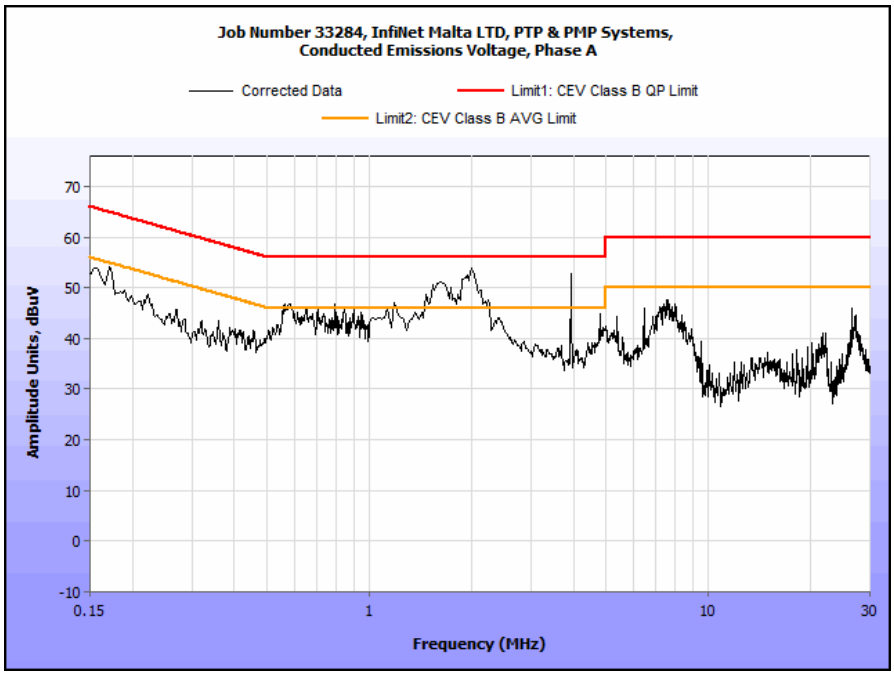
Test Engineer(s): Jeff Pratt

Test Date(s): 01/12/12

15.207(a) Conducted Emissions Test Results

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.584	42.36	0	42.36	56	-13.64	31.73	0	31.73	46	-14.27
1.686	40.23	0	40.23	56	-15.77	25.37	0	25.37	46	-20.63
1.987	47.42	0.01	47.43	56	-8.57	27.3	0.01	27.31	46	-18.69
3.927	32.94	0.04	32.98	56	-23.02	16.61	0.04	16.65	46	-29.35
7.616	36.79	0.1	36.89	60	-23.11	22.44	0.1	22.54	50	-27.46
26.54	31.47	0.2	31.67	60	-28.33	23.15	0.2	23.35	50	-26.65

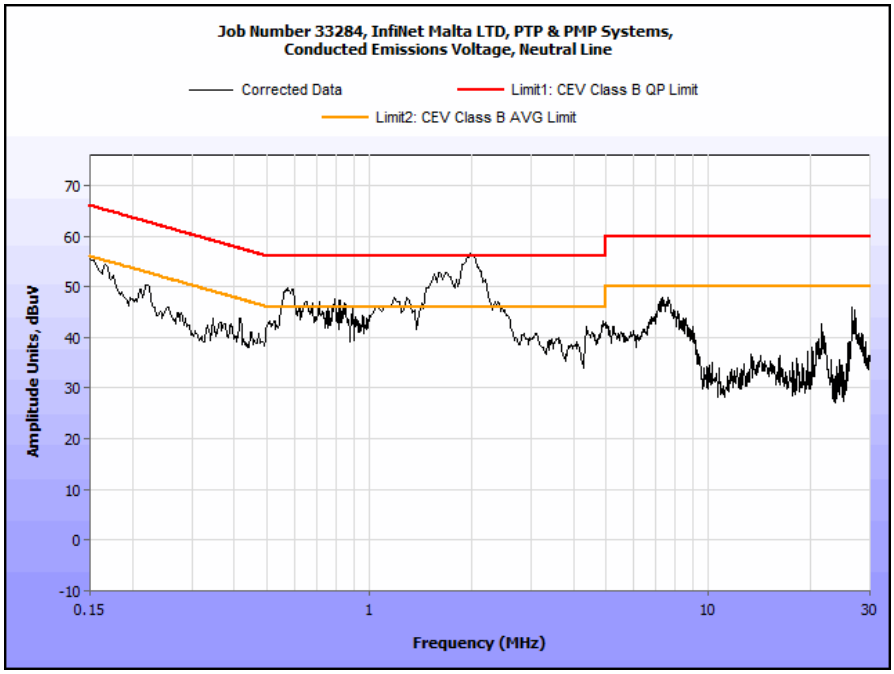
Table 13. Conducted Emissions, 15.207(a), Phase Line, Test Results



Plot 5. Conducted Emissions, 15.207(a), Phase Line

Frequency (MHz)	Uncorrected Meter Reading (dBuV) QP	Cable Loss (dB)	Corrected Measurement (dBuV) QP	Limit (dBuV) QP	Margin (dB) QP	Uncorrected Meter Reading (dBuV) Avg.	Cable Loss (dB)	Corrected Measurement (dBuV) AVG	Limit (dBuV) AVG	Margin (dB) AVG
0.588	46.07	0	46.07	56	-9.93	33.46	0	33.46	46	-12.54
1.727	43.21	0.01	43.22	56	-12.78	27.25	0.01	27.26	46	-18.74
1.984	51.1	0.01	51.11	56	-4.89	30.98	0.01	30.99	46	-15.01
7.64	38.57	0.1	38.67	60	-21.33	29.7	0.1	29.8	50	-20.2
21.66	37.76	0.17	37.93	60	-22.07	33.95	0.17	34.12	50	-15.88
27.16	40.75	0.21	40.96	60	-19.04	36.8	0.21	37.01	50	-12.99

Table 14. Conducted Emissions, 15.207(a), Neutral Line, Test Results



Plot 6. Conducted Emissions, 15.207(a), Neutral Line

15.207(a) Conducted Emissions Setup

Photograph 4. Conducted Emissions, 15.207(a), Test Setup

Electromagnetic Compatibility Requirements

4.2 §2.1046 RF Power Output

Test Requirement(s): **§2.1046, §90. 1321 (a) and §90. 1321 (c)**

Test Procedures: A laptop was connected to EUT to control the RF power output and frequency. The EUT was connected to a Spectrum Analyzer and the spectrum analyzer's channel power measuring option was used. The EUT power was adjusted to produce maximum output power as specified in the owner's manual. Measurements were performed at the low and high channels for each of the EUT's bandwidths and modulations.

Limits: **§90. 1321 (a):** Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one-megahertz slice of spectrum according to FCC Publication 971168.

§90. 1321 (c): Mobile and portable stations are limited to 1 watt/25 MHz EIRP. In any event, the peak EIRP density shall not exceed 40 milliwatts in any one-megahertz slice of spectrum.

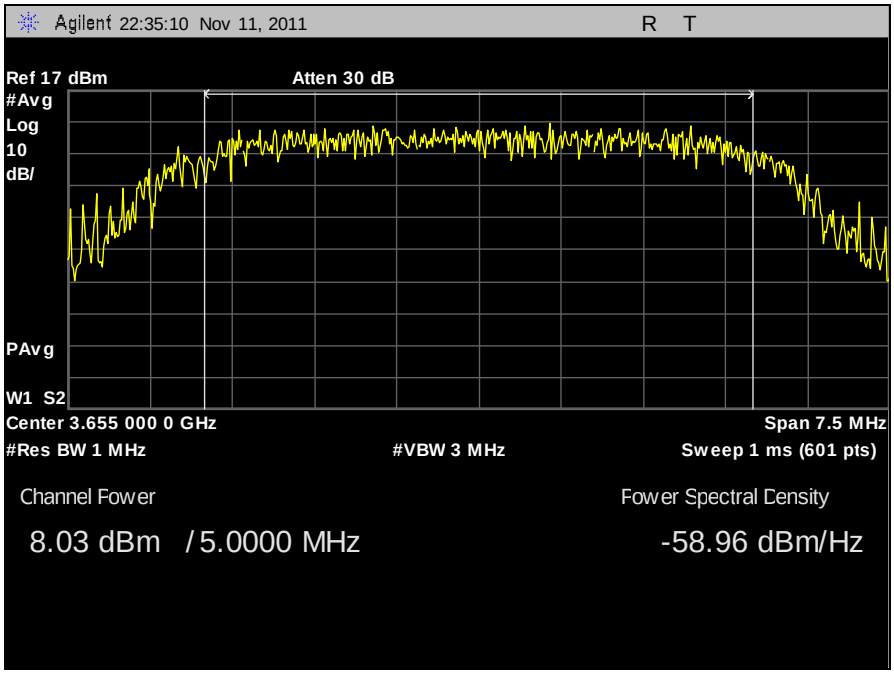
Test Results: Equipment complies with 90.1321(a) for Base and Fixed Stations

Test Engineer(s): Jeff Pratt

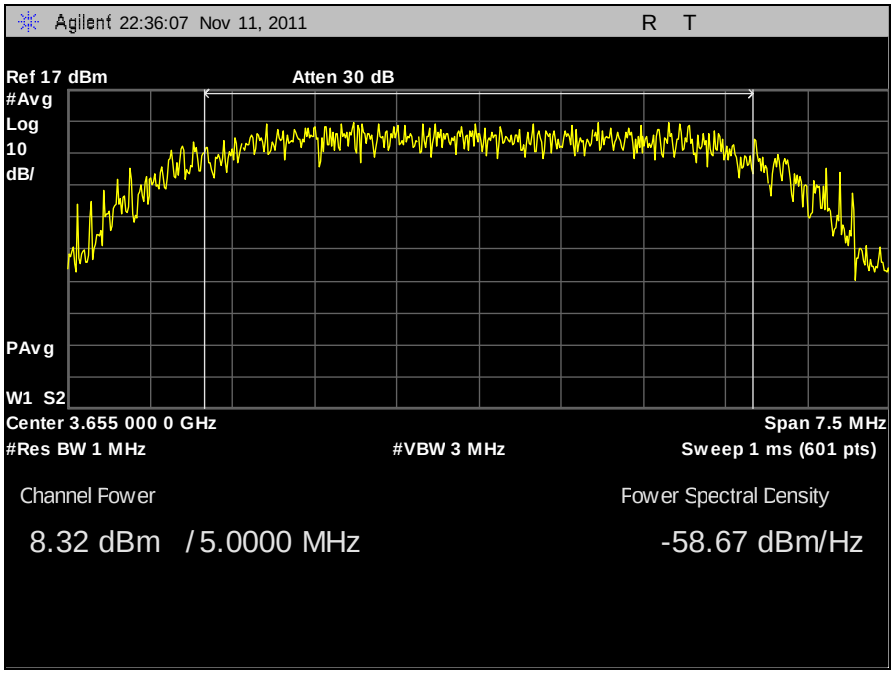
Test Date(s): 11/10/11

5 MHz												
Channel	**Freq. (MHz)**	**Conducted Power, Horizontal (dBm)**	**Conducted Power, Horizontal (mW)**	**Conducted Power, Vertical (dBm)**	**Conducted Power, Vertical (mW)**	**Summed Conducted Power (mW)**	**Summed Conducted Power (dBm)**	**Antenna Gain (dBi)**	**EIRP (dBm)**	**EIRP (W)**	**Limit (W)**	**Margin (W)**
Low	3655	8.03	6.35	8.32	6.79	13.15	11.19	14	25.19	0.33	5	-4.67
High	3670	7.64	5.81	7.57	5.71	11.52	10.62	14	24.62	0.29	5	-4.71
10 MHz												
Channel	**Freq. (MHz)**	**Conducted Power, Horizontal (dBm)**	**Conducted Power, Horizontal (mW)**	**Conducted Power, Vertical (dBm)**	**Conducted Power, Vertical (mW)**	**Summed Conducted Power (mW)**	**Summed Conducted Power (dBm)**	**Antenna Gain (dBi)**	**EIRP (dBm)**	**EIRP (W)**	**Limit (W)**	**Margin (W)**
Low	3655	10.54	11.32	11.06	12.76	24.09	13.82	14	27.82	0.61	10	-9.39
High	3670	11.05	12.74	11.68	14.72	27.46	14.39	14	28.39	0.69	10	-9.31
20 MHz												
Channel	**Freq. (MHz)**	**Conducted Power, Horizontal (dBm)**	**Conducted Power, Horizontal (mW)**	**Conducted Power, Vertical (dBm)**	**Conducted Power, Vertical (mW)**	**Summed Conducted Power (mW)**	**Summed Conducted Power (dBm)**	**Antenna Gain (dBi)**	**EIRP (dBm)**	**EIRP (W)**	**Limit (W)**	**Margin (W)**
Low	3660	13.74	23.66	14	25.12	48.78	16.88	14	30.88	1.23	20	-18.77
High	3665	13.01	20.00	13.11	20.46	40.46	16.07	14	30.07	1.02	20	-18.98

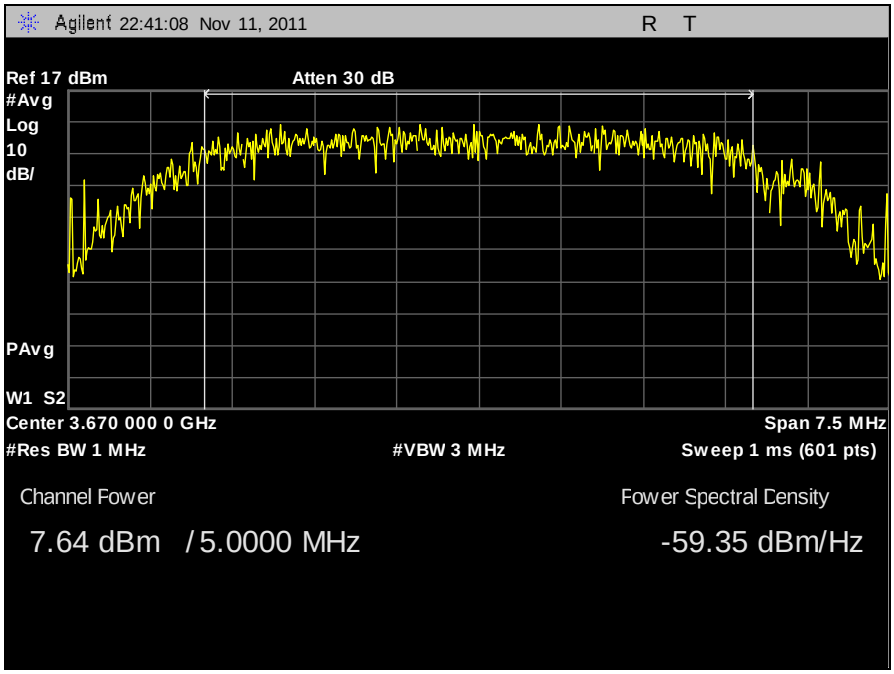
Table 15. RF Output Power, Test Results



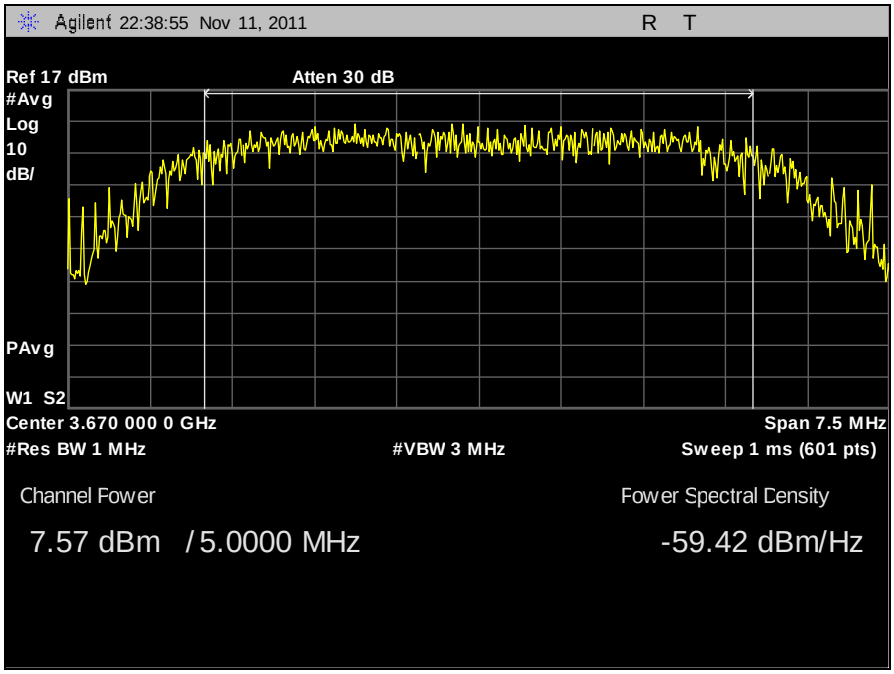
Plot 7. RF Channel Power, 5 MHz, Low Channel, Horizontal



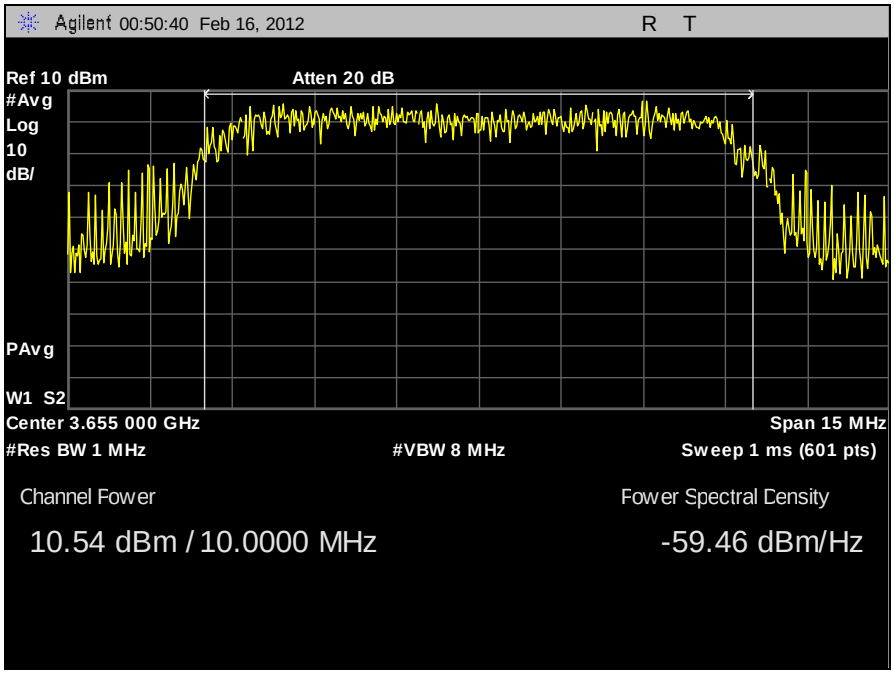
Plot 8. RF Channel Power, 5 MHz, Low Channel, Vertical



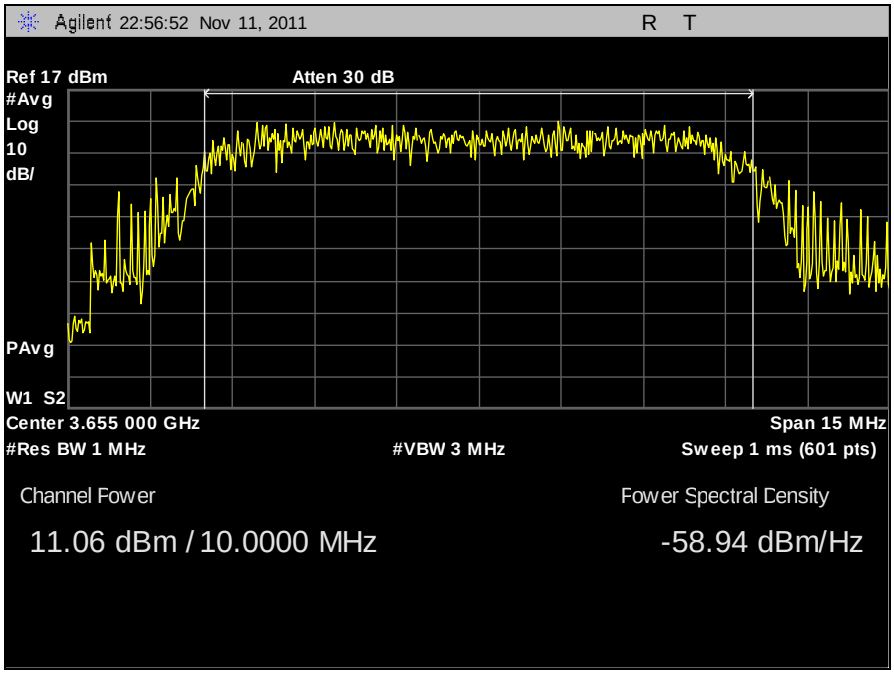
Plot 9. RF Channel Power, 5 MHz, High Channel, Horizontal



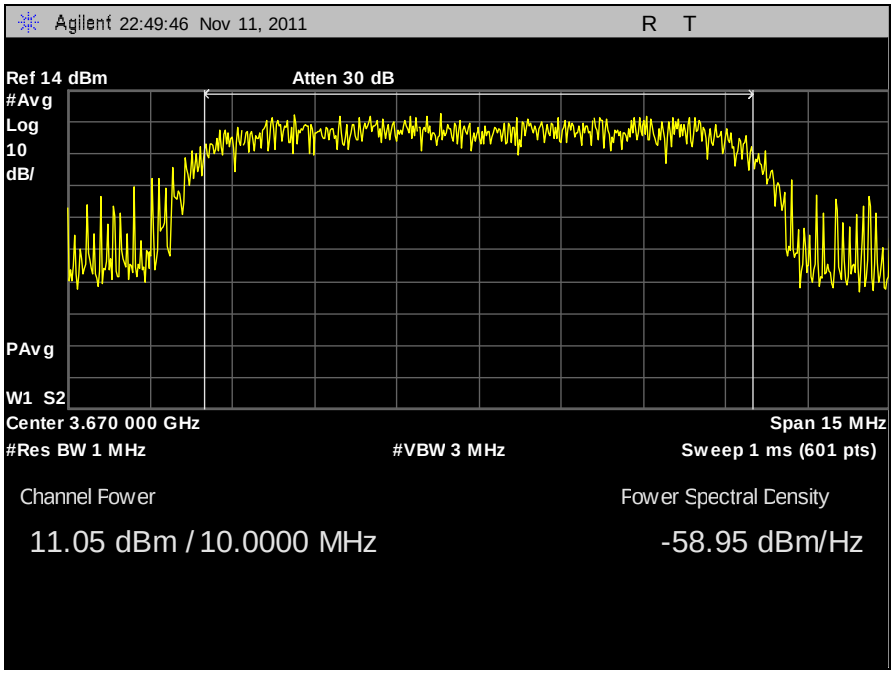
Plot 10. RF Channel Power, 5 MHz, High Channel, Vertical



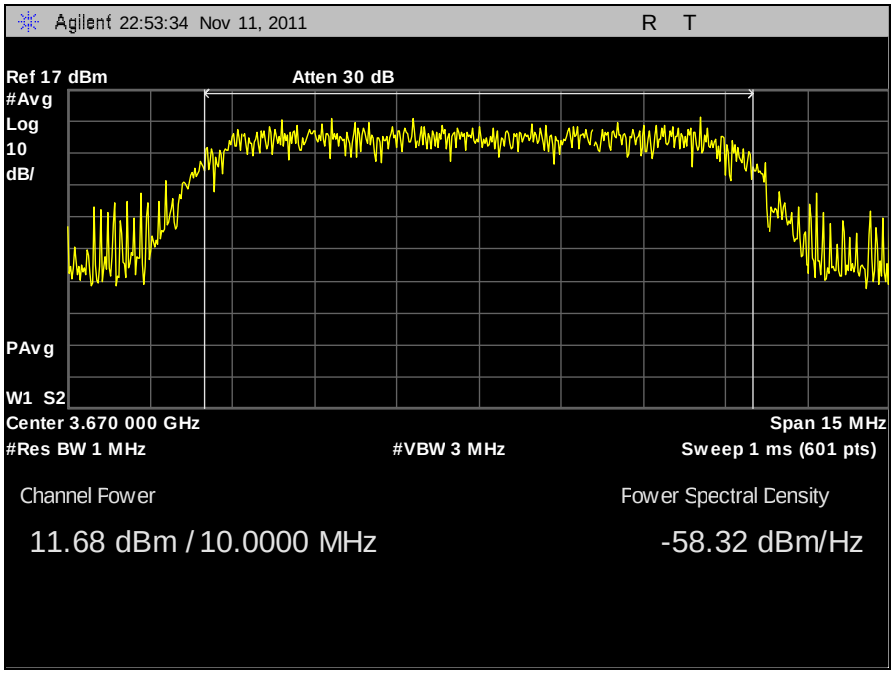
Plot 11. RF Channel Power, 10 MHz, Low Channel, Horizontal



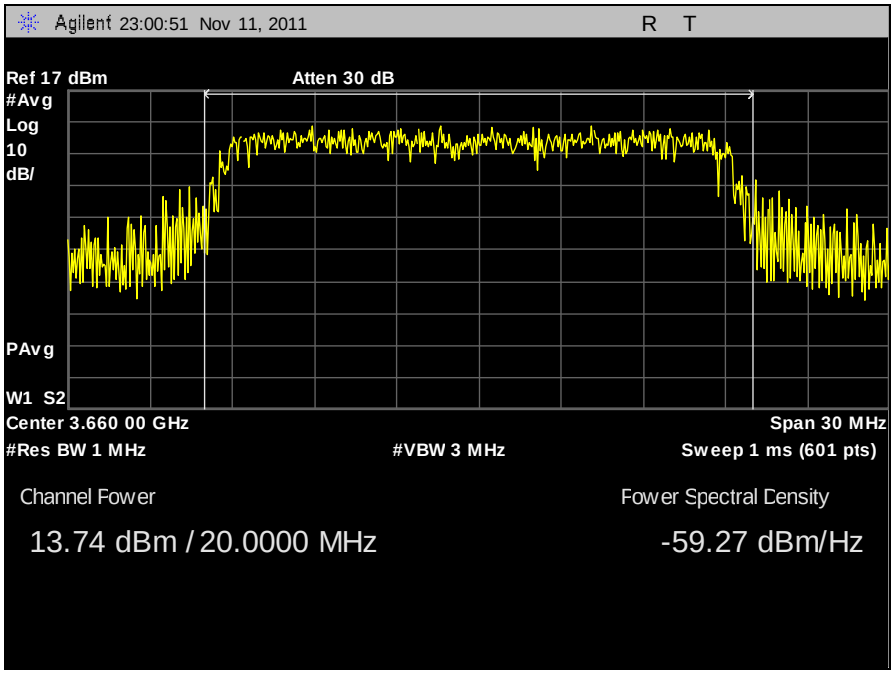
Plot 12. RF Channel Power, 10 MHz, Low Channel, Vertical



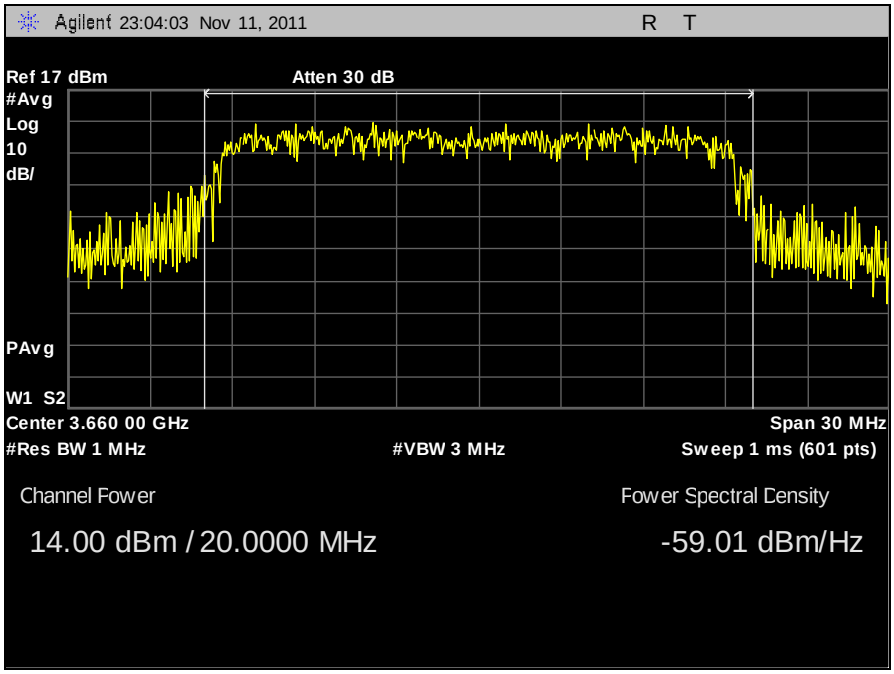
Plot 13. RF Channel Power, 10 MHz, High Channel, Horizontal



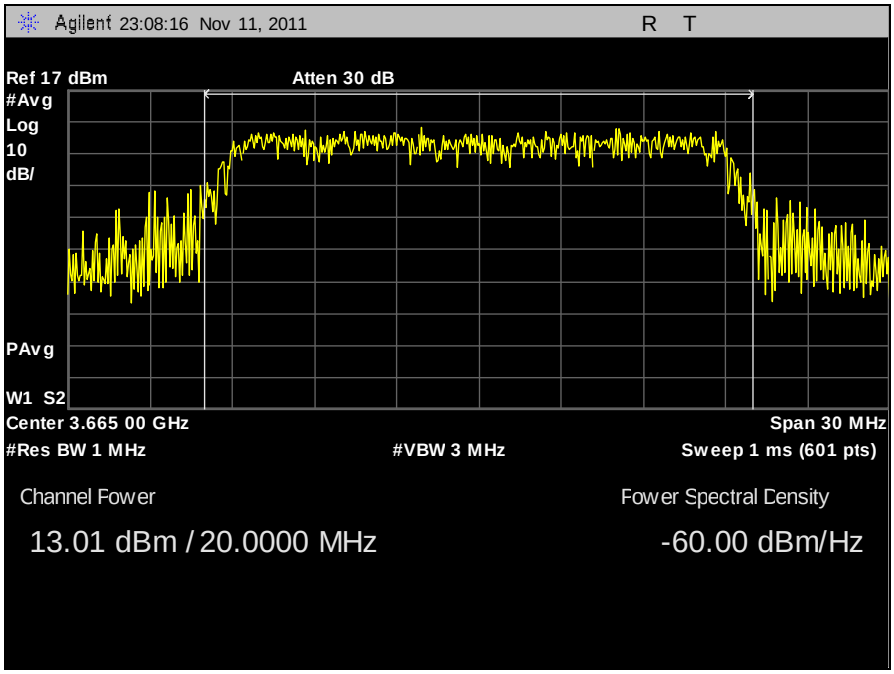
Plot 14. RF Channel Power, 10 MHz, High Channel, Vertical



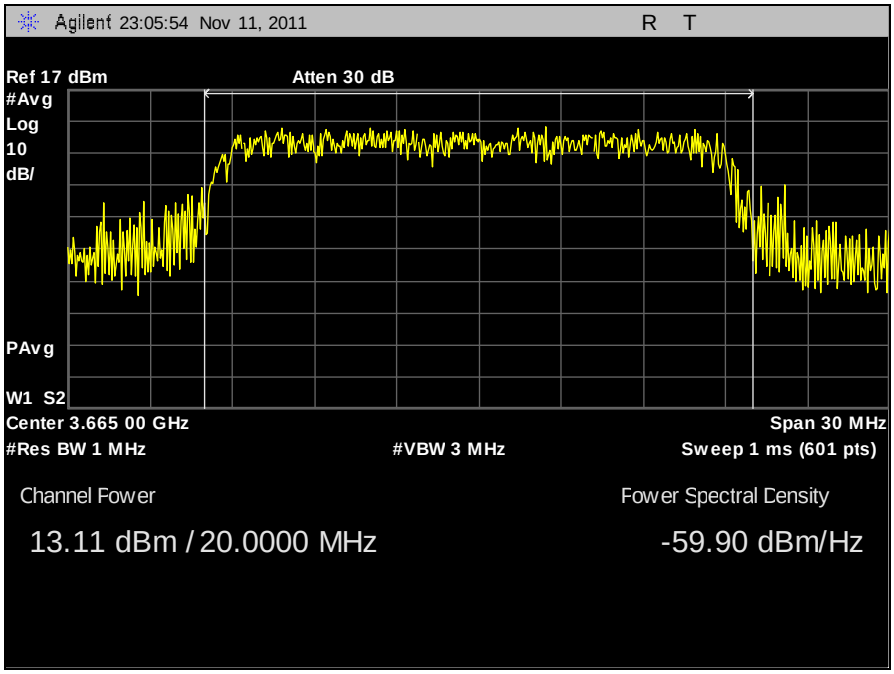
Plot 15. RF Channel Power, 20 MHz, Low Channel, Horizontal



Plot 16. RF Channel Power, 20 MHz, Low Channel, Vertical



Plot 17. RF Channel Power, 20 MHz, High Channel, Horizontal



Plot 18. RF Channel Power, 20 MHz, High Channel, Vertical

4.3 §90.1321 Peak Power Spectral Density

Test Requirement(s): **§90. 1321 (a) and §90. 1321 (c)**

Test Procedures: The EUT was connected to a spectrum analyzer through an attenuator. The spectrum analyzer was set to an RBW=1MHz and a VBW > 1MHz. A sample detector was used with power averaging on the spectrum analyzer. The Peak Power Spectral Density was determined by detecting the highest emission within the EUT's occupied bandwidth. Measurements were performed at the low and high channels for each of the EUT's bandwidths and compared to the test limits.

Limits: For base and fixed stations, the peak EIRP spectral density shall not exceed 1W per MHz.
For mobile and portable stations, the peak EIRP spectral density shall not exceed 40mW per MHz.

Test Results: Equipment is compliant 90.1321(a) for Base and Fixed Stations.

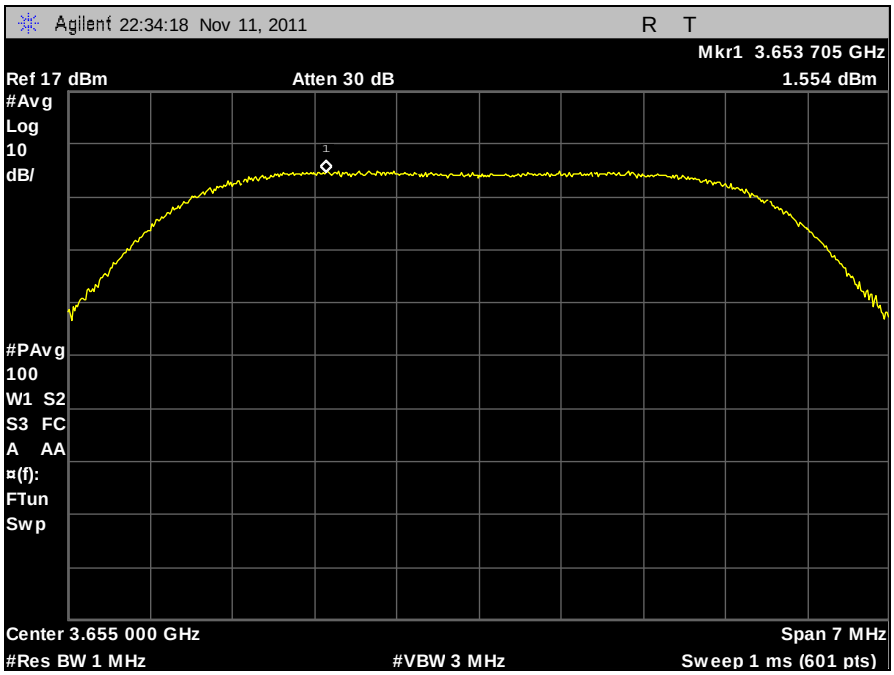
Measurements of Peak Power Spectral Density are shown in the plots on the following pages.

Test Engineer(s): Ben Taylor

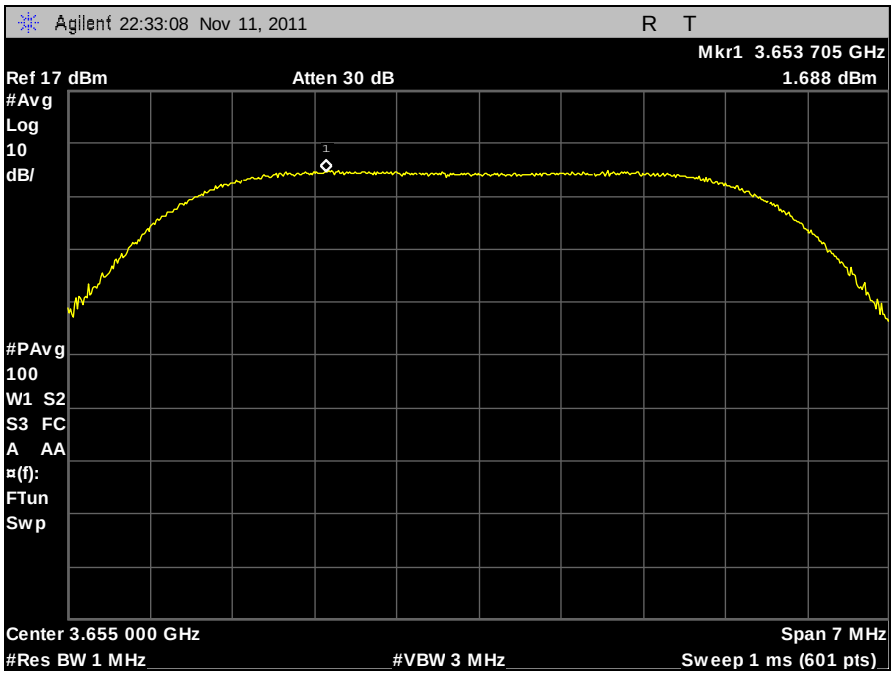
Test Date(s): 12/06/11

5 MHz												
Channel	**Freq. (MHz)**	**Spectral Density, Horizontal (dBm)**	**Spectral Density, Horizontal (mW)**	**Spectral Density, Vertical (dBm)**	**Spectral Density, Vertical (mW)**	**Summed Spectral Density (mW)**	**Summed Spectral Density (dBm)**	**Antenna Gain (dBi)**	**EIRP Spectral Density (dBm)**	**EIRP Spectral Density (W)**	**Limit (W)**	**Margin (W)**
Low	3655	1.554	1.43	1.688	1.48	2.91	4.63	14	18.63	0.07	1	-0.93
High	3670	1.008	1.26	1.612	1.45	2.71	4.33	14	18.33	0.07	1	-0.93
10 MHz												
Channel	**Freq. (MHz)**	**Spectral Density, Horizontal (dBm)**	**Spectral Density, Horizontal (mW)**	**Spectral Density, Vertical (dBm)**	**Spectral Density, Vertical (mW)**	**Summed Spectral Density (mW)**	**Summed Spectral Density (dBm)**	**Antenna Gain (dBi)**	**EIRP Spectral Density (dBm)**	**EIRP Spectral Density (W)**	**Limit (W)**	**Margin (W)**
Low	3655	1.322	1.36	1.388	1.38	2.73	4.37	14	18.37	0.07	1	-0.93
High	3670	1.577	1.44	1.657	1.46	2.90	4.63	14	18.63	0.07	1	-0.93
20 MHz												
Channel	**Freq. (MHz)**	**Spectral Density, Horizontal (dBm)**	**Spectral Density, Horizontal (mW)**	**Spectral Density, Vertical (dBm)**	**Spectral Density, Vertical (mW)**	**Summed Spectral Density (mW)**	**Summed Spectral Density (dBm)**	**Antenna Gain (dBi)**	**EIRP Spectral Density (dBm)**	**EIRP Spectral Density (W)**	**Limit (W)**	**Margin (W)**
Low	3660	1.347	1.36	1.113	1.29	2.66	4.24	14	18.24	0.07	1	-0.93
High	3665	0.783	1.20	1.514	1.42	2.61	4.17	14	18.17	0.07	1	-0.93

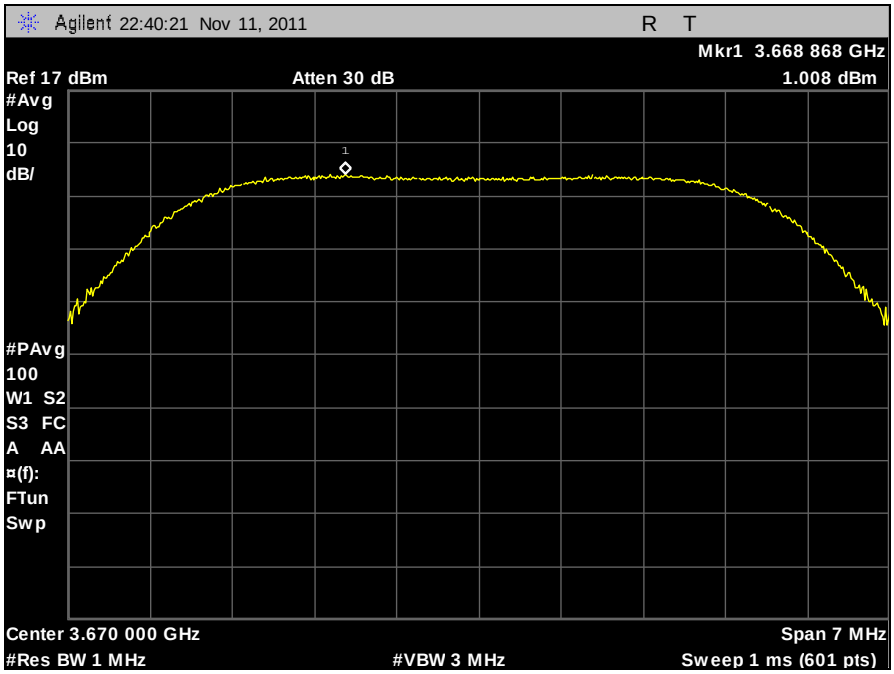
Peak Power Spectral Density Results



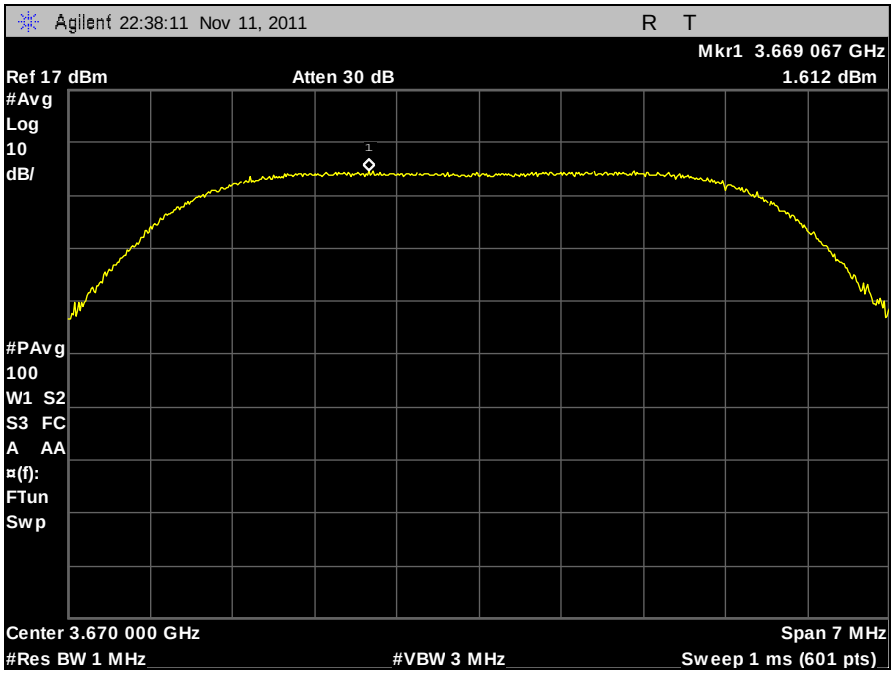
Plot 19. Peak Power Spectral Density, 5 MHz, Low Channel, Horizontal



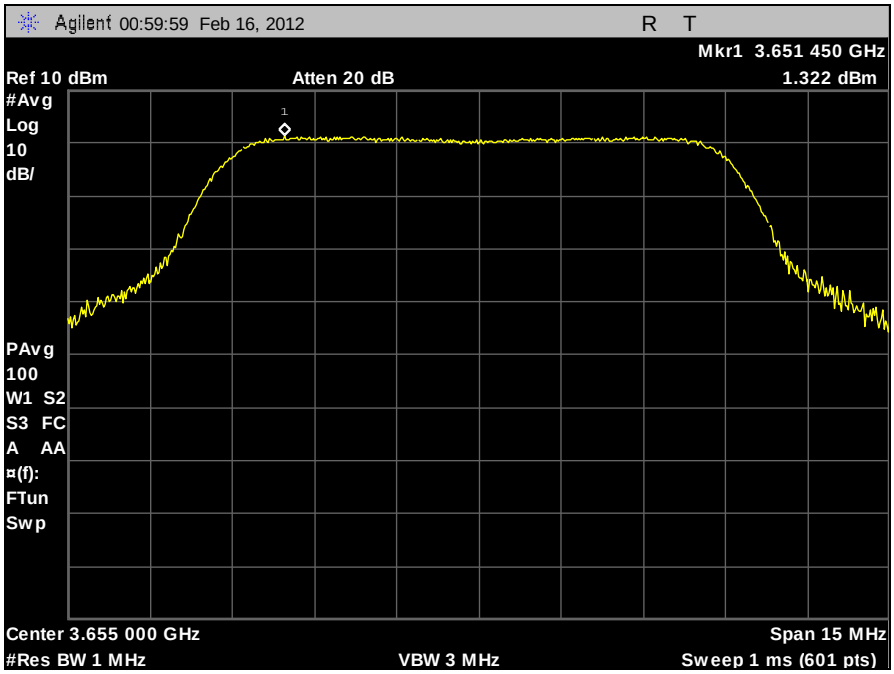
Plot 20. Peak Power Spectral Density, 5 MHz, Low Channel, Vertical



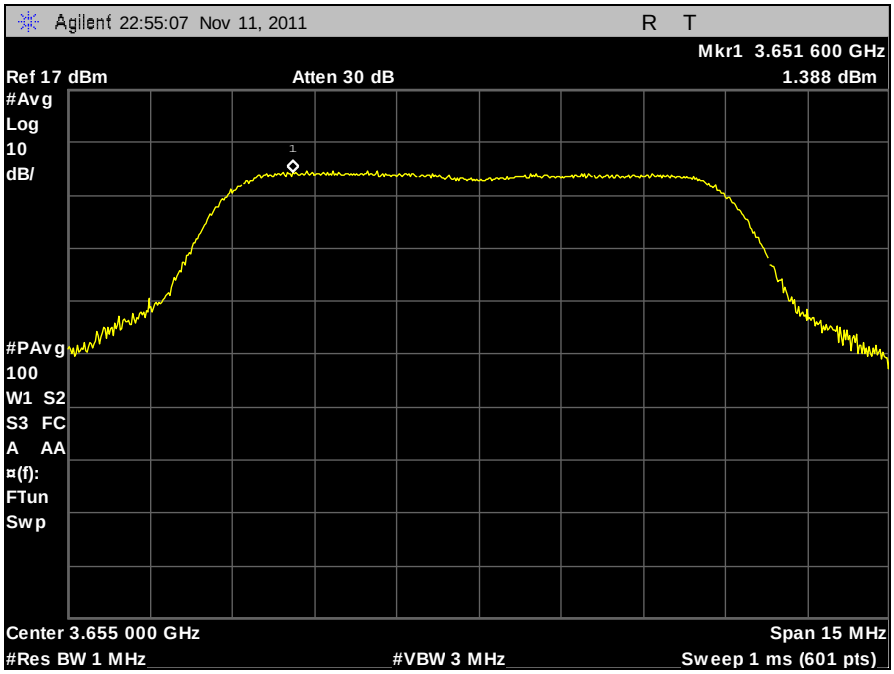
Plot 21. Peak Power Spectral Density, 5 MHz, High Channel, Horizontal



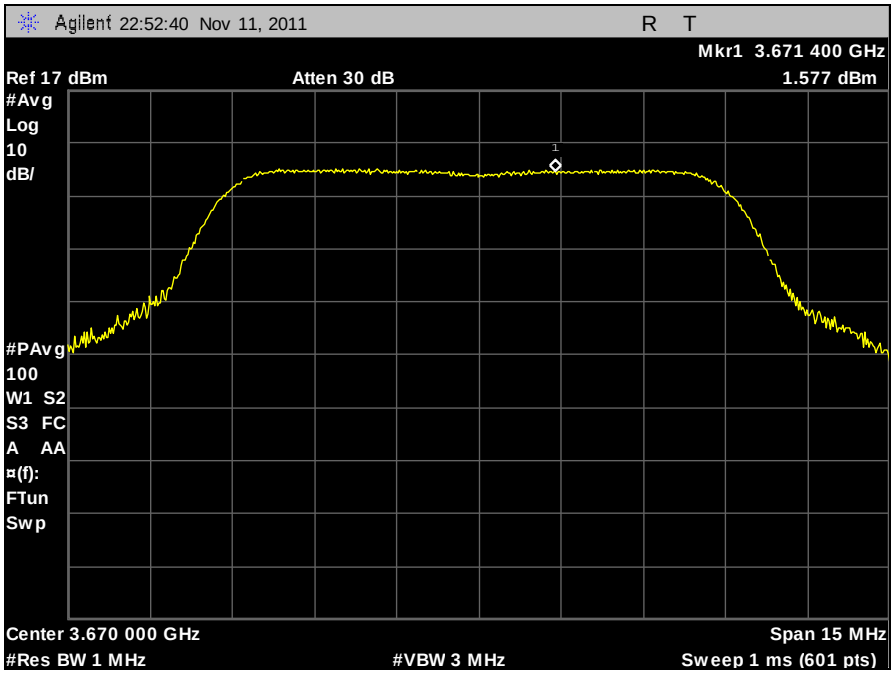
Plot 22. Peak Power Spectral Density, 5 MHz, High Channel, Vertical



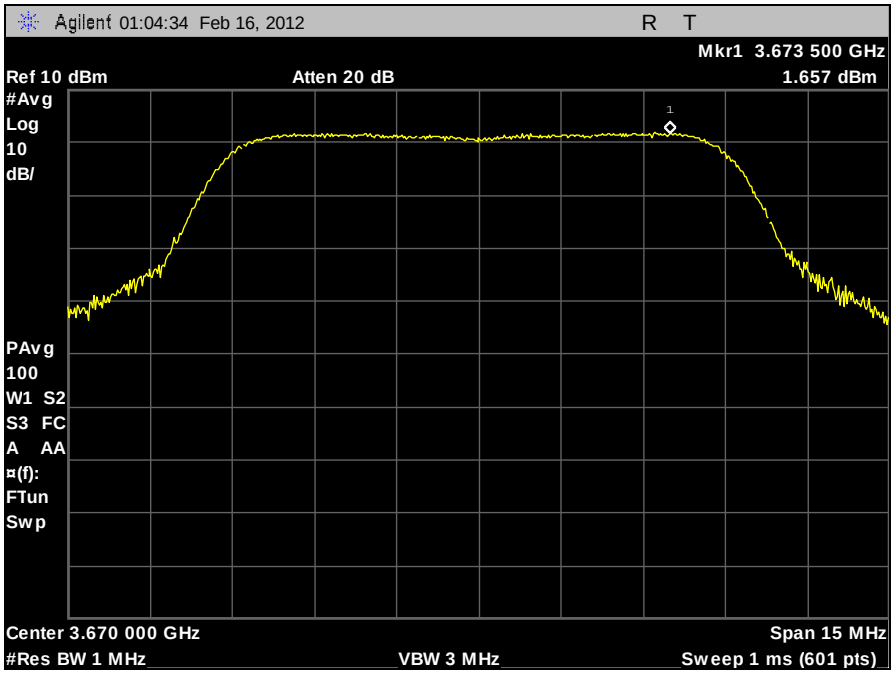
Plot 23. Peak Power Spectral Density, 10 MHz, Low Channel, Horizontal



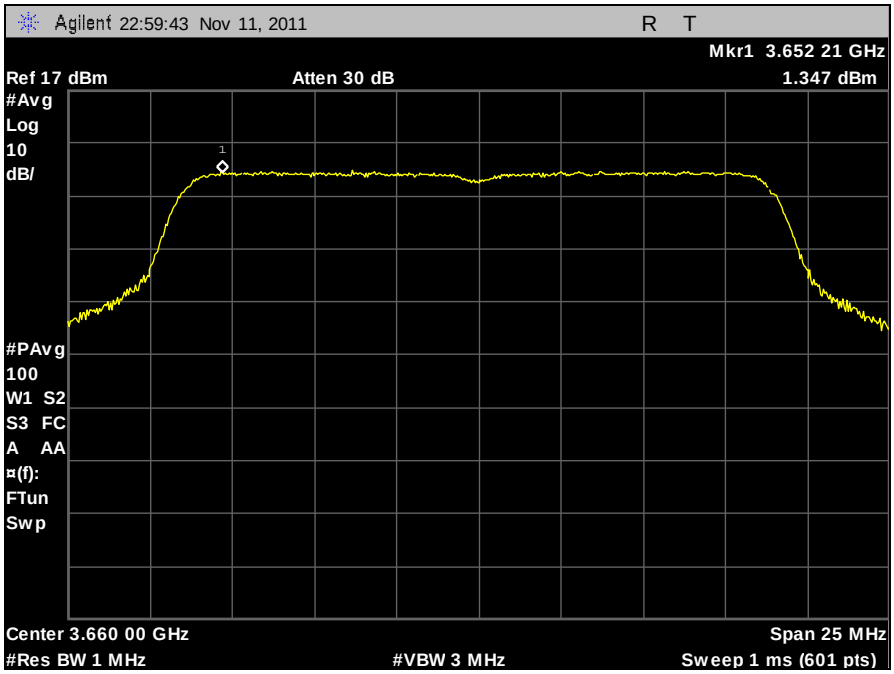
Plot 24. Peak Power Spectral Density, 10 MHz, Low Channel, Vertical



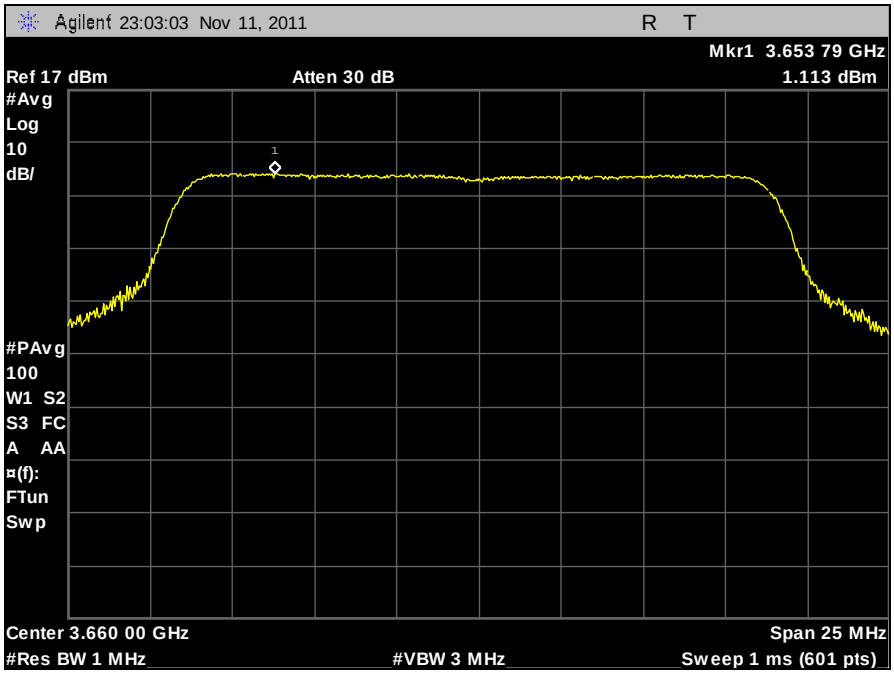
Plot 25. Peak Power Spectral Density, 10 MHz, High Channel, Horizontal



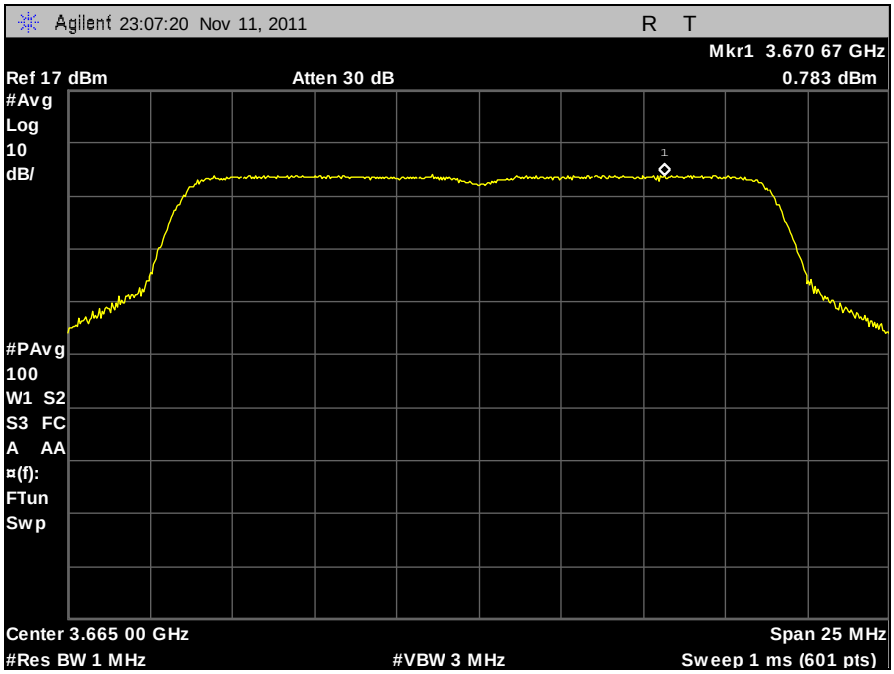
Plot 26. Peak Power Spectral Density, 10 MHz, High Channel, Vertical



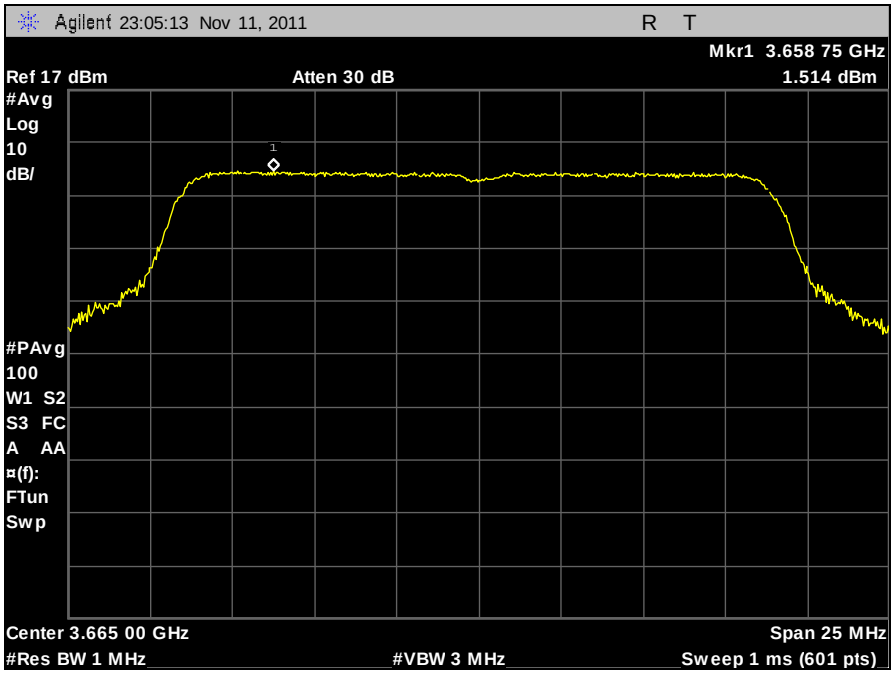
Plot 27. Peak Power Spectral Density, 20 MHz, Low Channel, Horizontal



Plot 28, Peak Power Spectral Density, 20 MHz, Low Channel, Vertical



Plot 29. Peak Power Spectral Density, 20 MHz, High Channel, Horizontal



Plot 30. Peak Power Spectral Density, 20 MHz, High Channel, Vertical

Electromagnetic Compatibility Requirements

4.3 §2.1049 Occupied Bandwidth

Test Requirement(s): **§2.1049**

Test Procedures: As required by 47 CFR 2.1049, occupied bandwidth measurements were made at the RF output terminals using a Spectrum Analyzer.

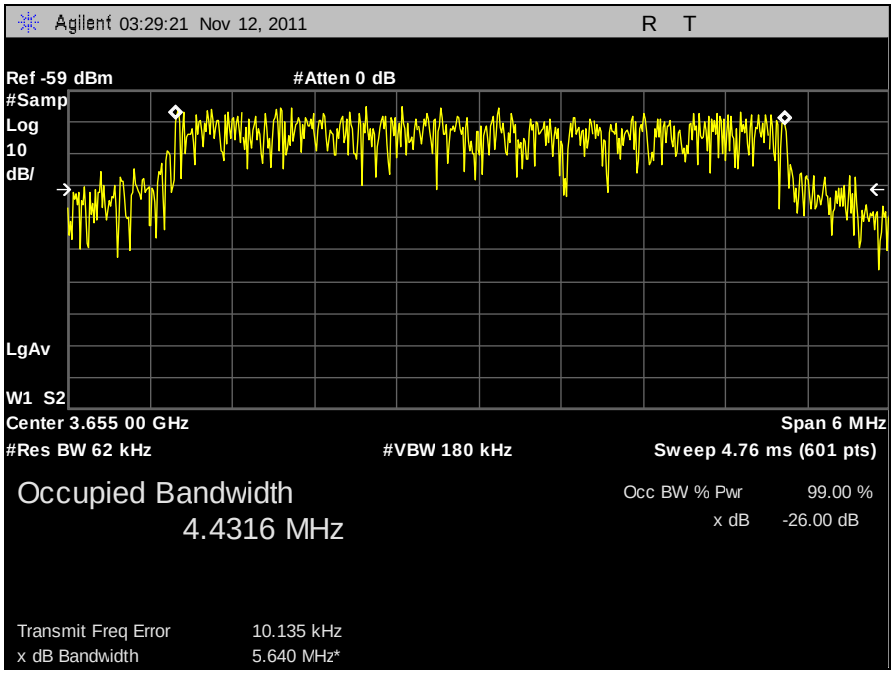
A laptop was connected to the EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer. The RBW of the Spectrum Analyzer was set to at least 1% of the channel bandwidth to measure to 1% of the span to measure the 99% bandwidth. The EUT power was adjusted at the maximum output power level. Measurements were carried out at the low and high channel of the TX band.

Test Results: Equipment complies with Section 2.1049.

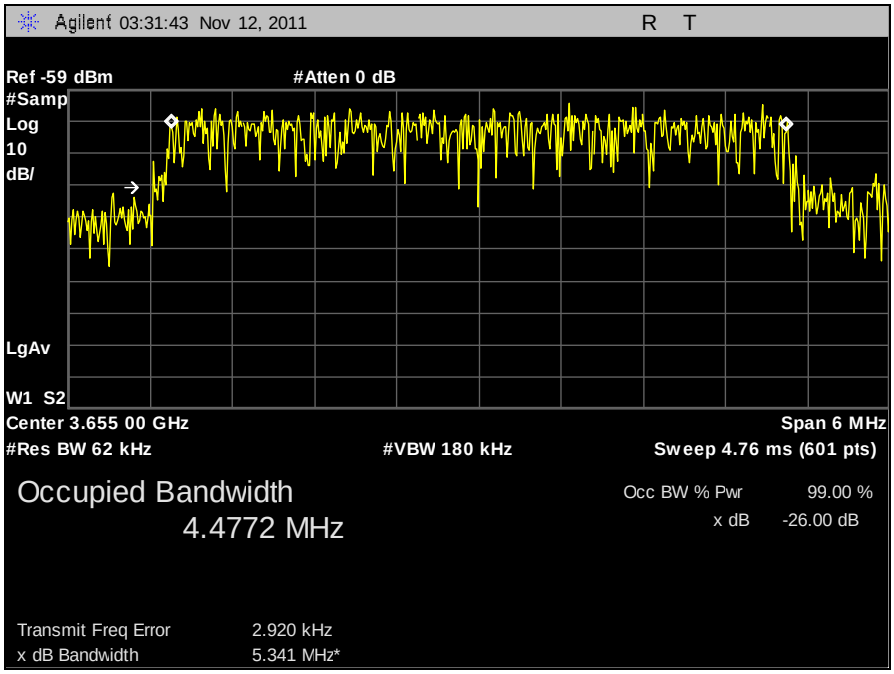
The following pages show measurements of occupied bandwidth.

Test Engineer(s): Ben Taylor

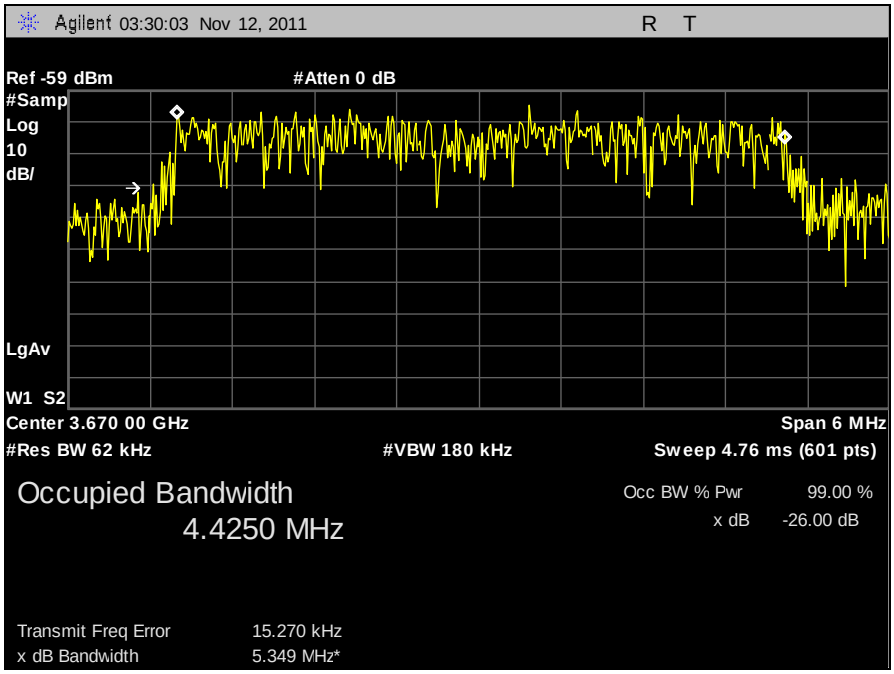
Test Date(s): 12/06/11



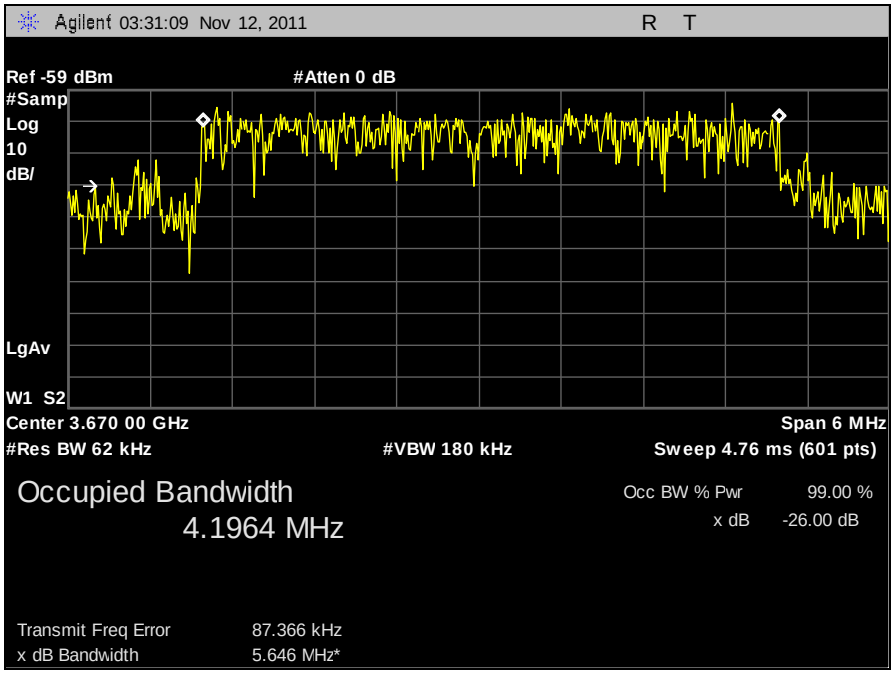
Plot 31. 99% Occupied Bandwidth, 5 MHz, Low Channel, Horizontal



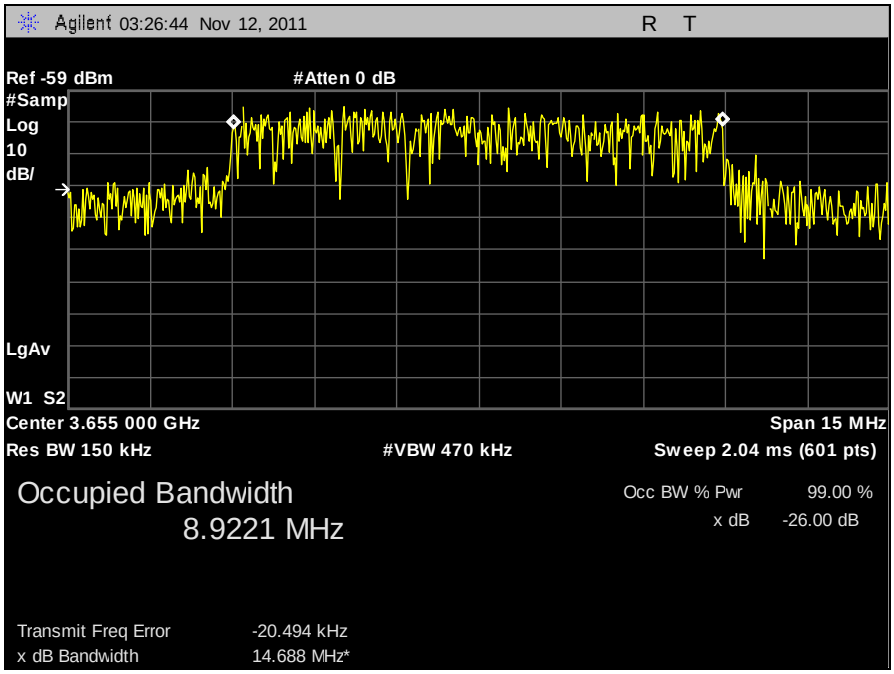
Plot 32. 99% Occupied Bandwidth, 5 MHz, Low Channel, Vertical



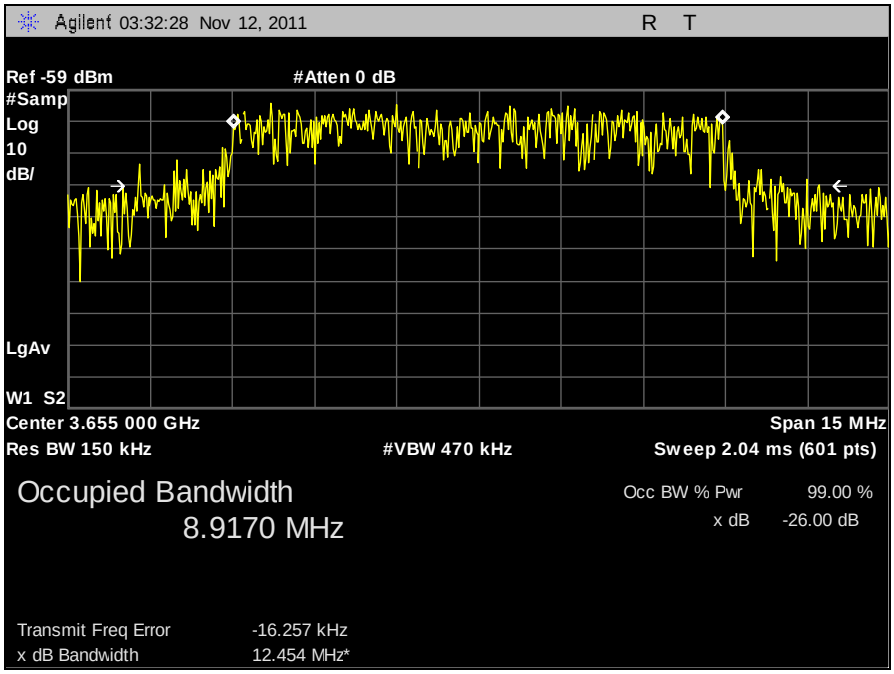
Plot 33. 99% Occupied Bandwidth, 5 MHz, High Channel, Horizontal



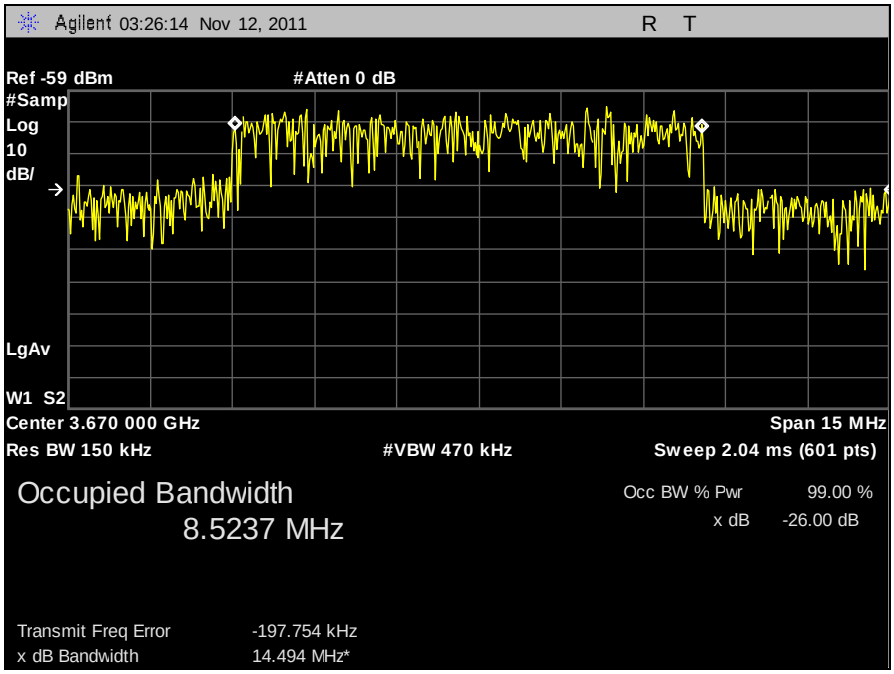
Plot 34. 99% Occupied Bandwidth, 5 MHz, High Channel, Vertical



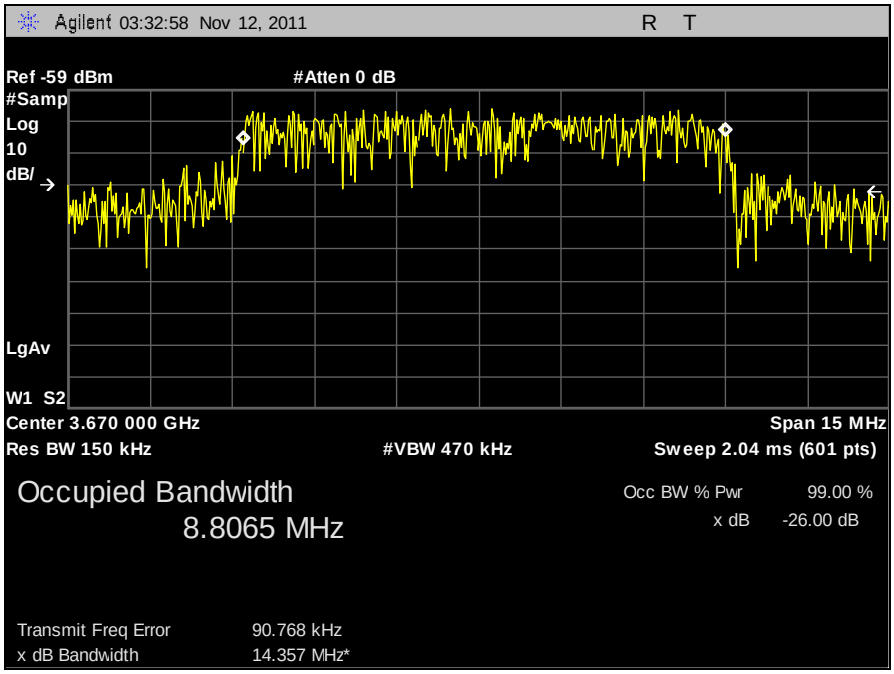
Plot 35. 99% Occupied Bandwidth, 10 MHz, Low Channel, Horizontal



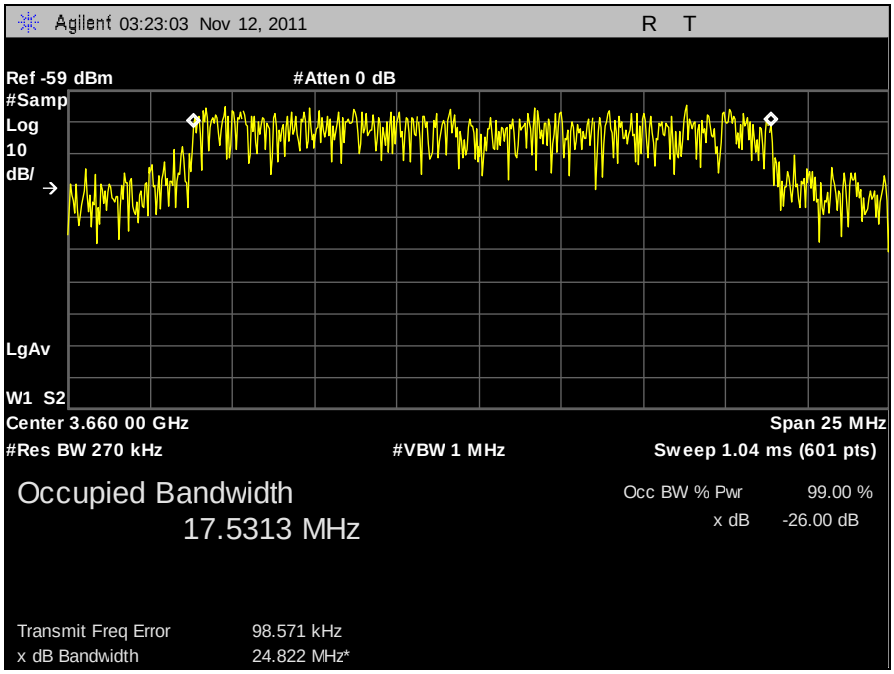
Plot 36. 99% Occupied Bandwidth, 10 MHz, Low Channel, Vertical



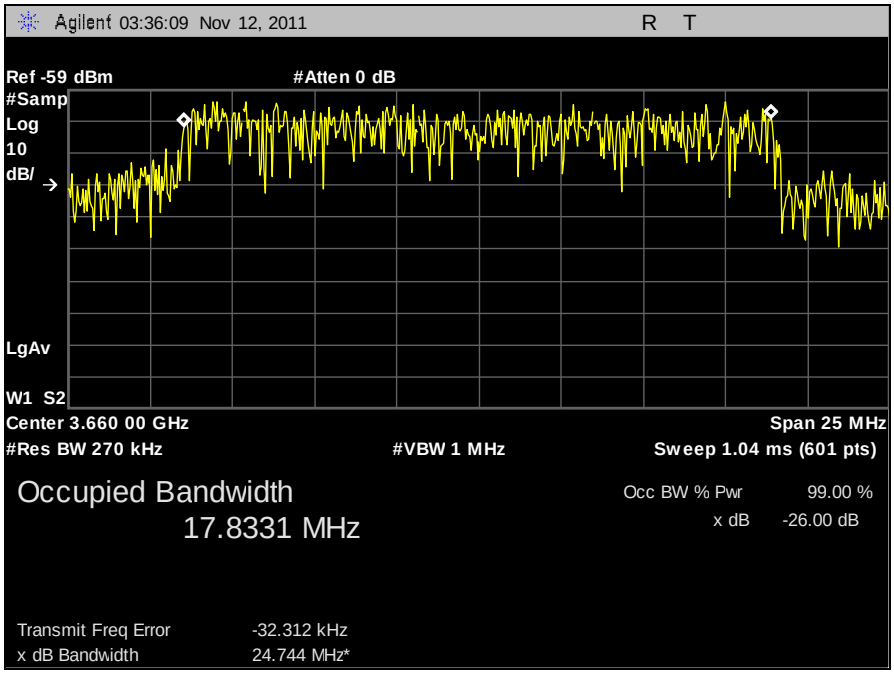
Plot 37. 99% Occupied Bandwidth, 10 MHz, High Channel, Horizontal



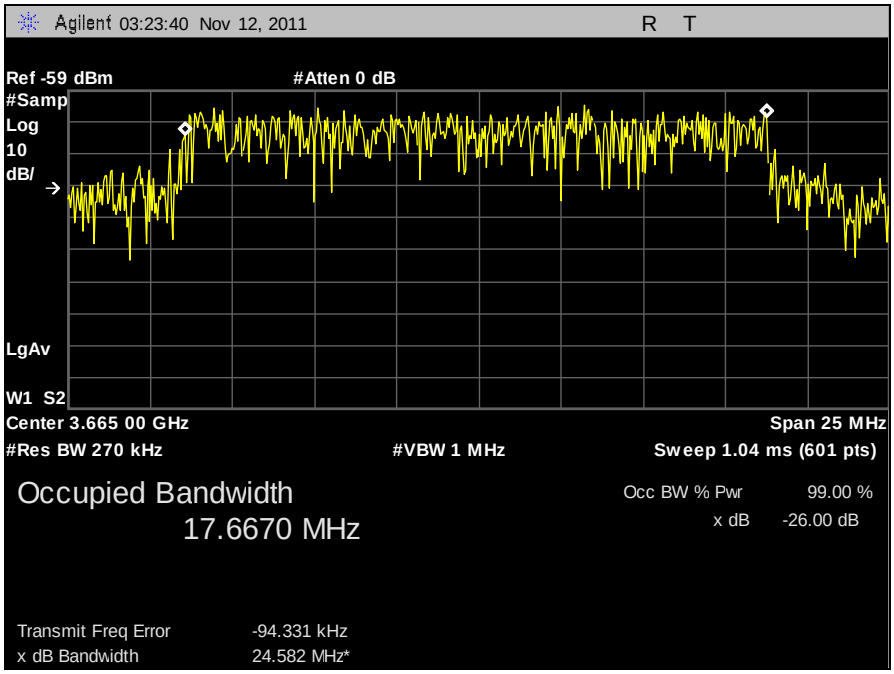
Plot 38. 99% Occupied Bandwidth, 10 MHz, High Channel, Vertical



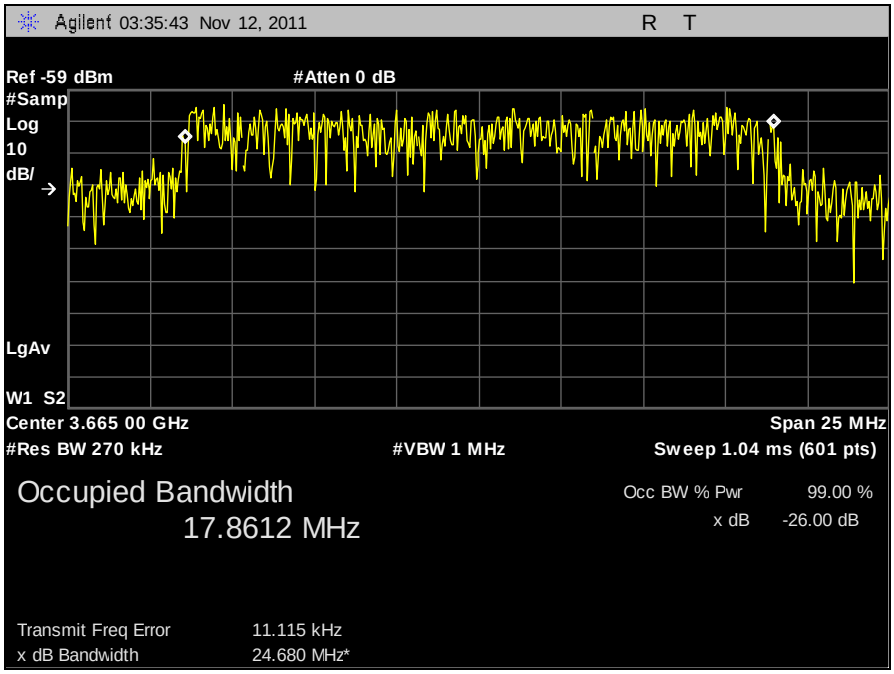
Plot 39. 99% Occupied Bandwidth, 20 MHz, Low Channel, Horizontal



Plot 40. 99% Occupied Bandwidth, 20 MHz, Low Channel, Vertical



Plot 41. 99% Occupied Bandwidth, 20 MHz, High Channel, Horizontal



Plot 42. 99% Occupied Bandwidth, 20 MHz, High Channel, Vertical

Electromagnetic Compatibility Requirements

4.4 §2.1051 RF Conducted Spurious Emissions Requirements

Test Requirement: **§ 90.1323 Emission limits.**

(a) The power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth.

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

See following pages for detailed test results with RF Conducted Spurious Emissions.

Test Results: The EUT was compliant with the Conducted Spurious Emission limits of **§90.1323**.

Test Engineer(s): Ben Taylor

Test Date(s): 12/06/11

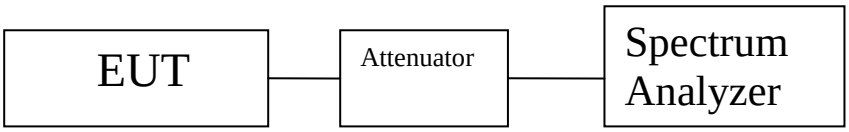
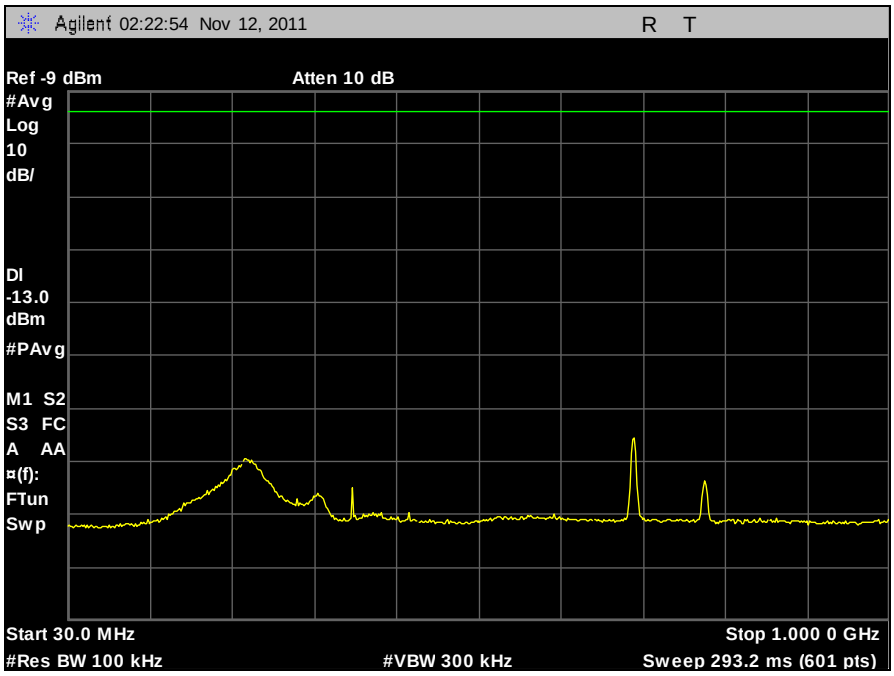
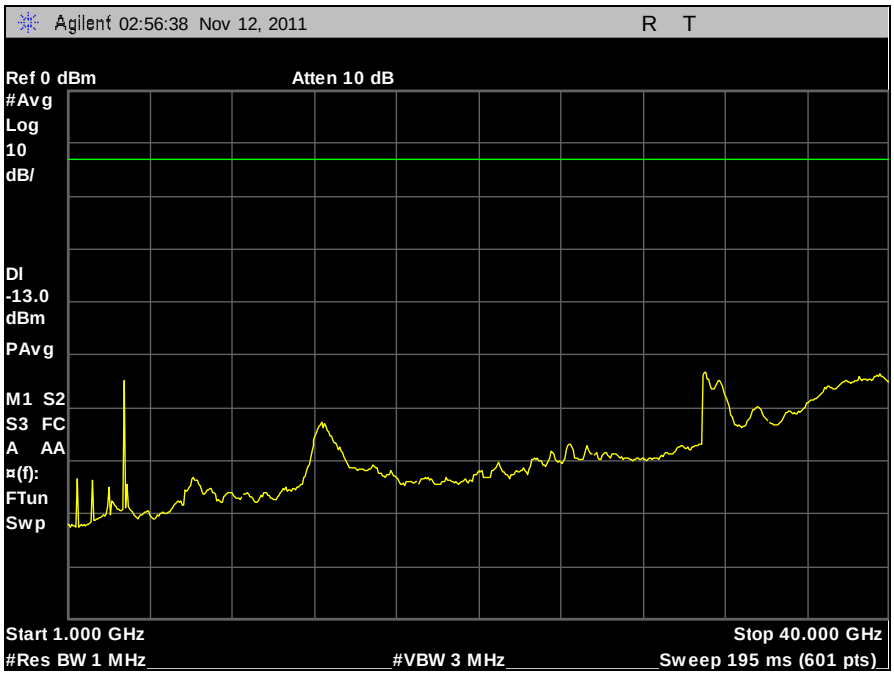


Figure 2. Block Diagram, Conducted Spurious Emissions Test Setup

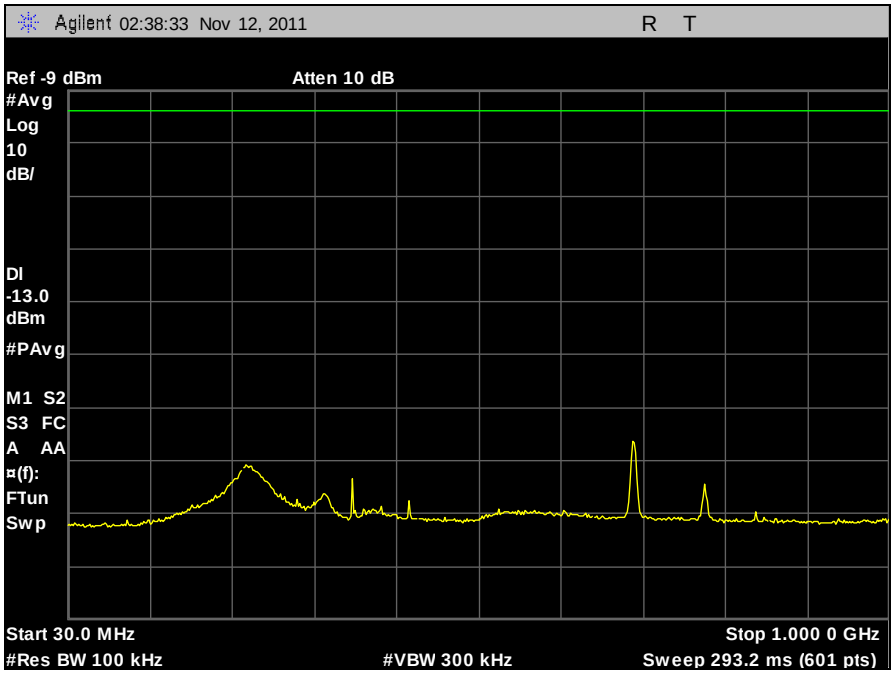
Conducted Spurious Emissions Test Results



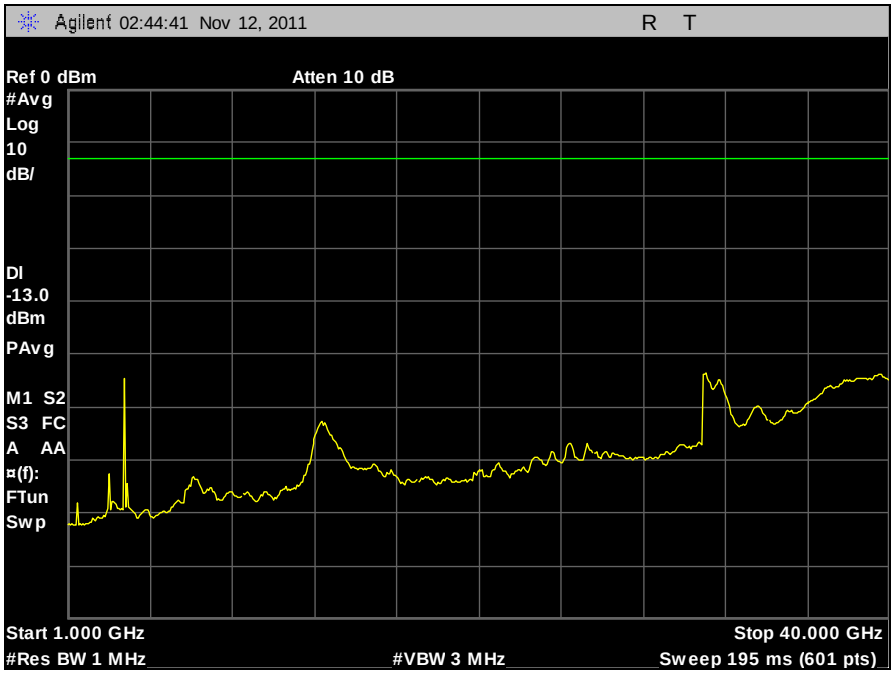
Plot 43. Conducted Spurious Emissions, 5 MHz, Low Channel, Horizontal, 30 MHz – 1 GHz



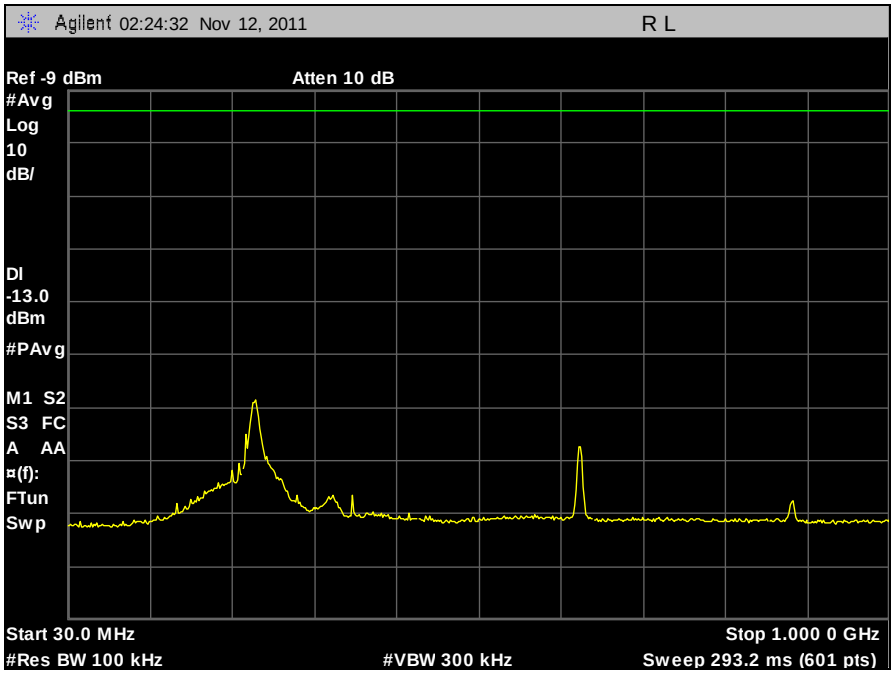
Plot 44. Conducted Spurious Emissions, 5 MHz, Low Channel, Horizontal,, 1 GHz – 40 GHz



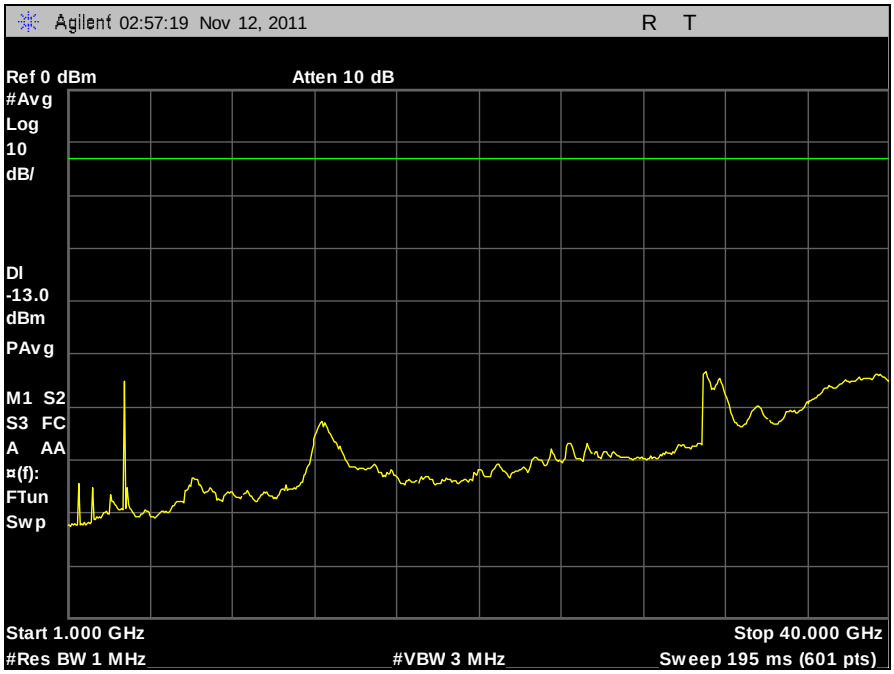
Plot 45. Conducted Spurious Emissions, 5 MHz, Low Channel, Vertical, 30 MHz – 1 GHz



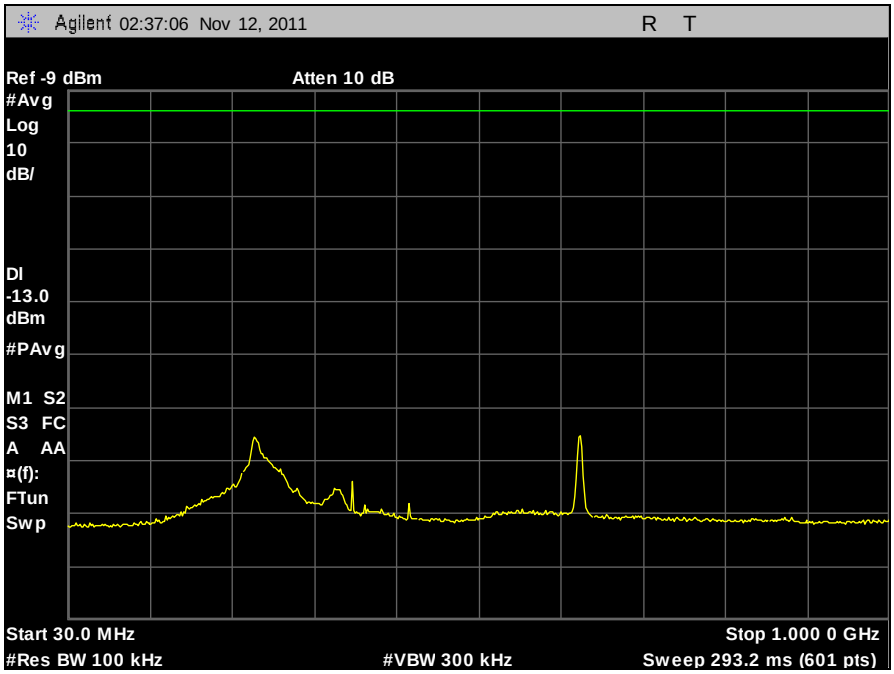
Plot 46. Conducted Spurious Emissions, 5 MHz, Low Channel, Vertical, 1 GHz – 40 GHz



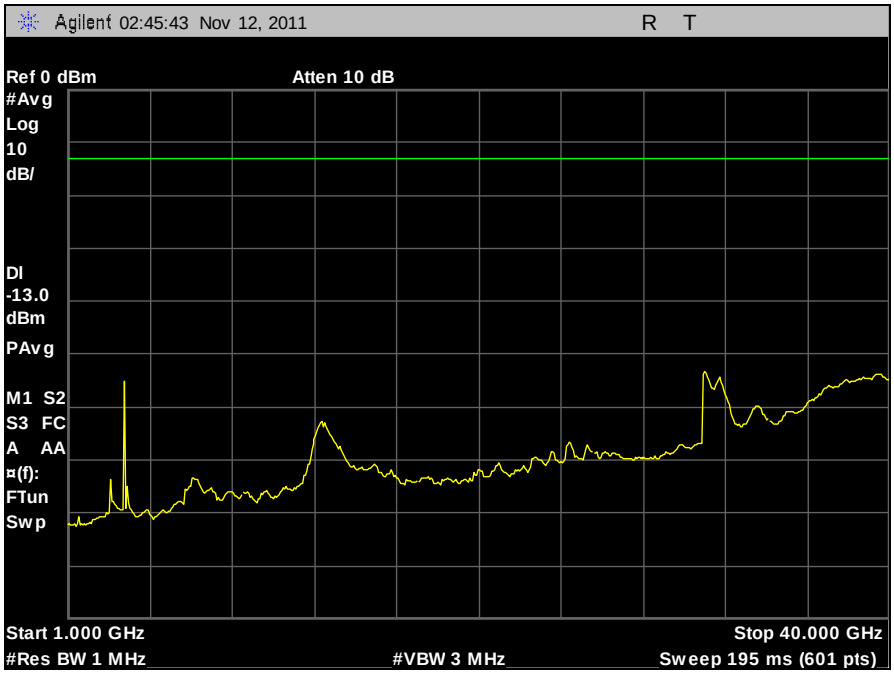
Plot 47. Conducted Spurious Emissions, 5 MHz, High Channel, Horizontal, 30 MHz – 1 GHz



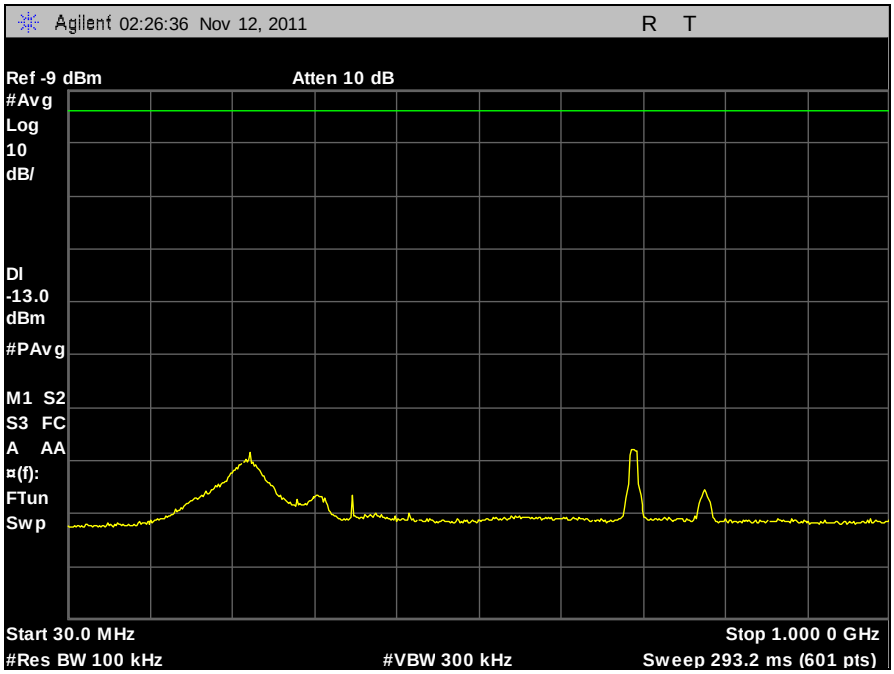
Plot 48. Conducted Spurious Emissions, 5 MHz, High Channel, Horizontal, 1 GHz – 40 GHz



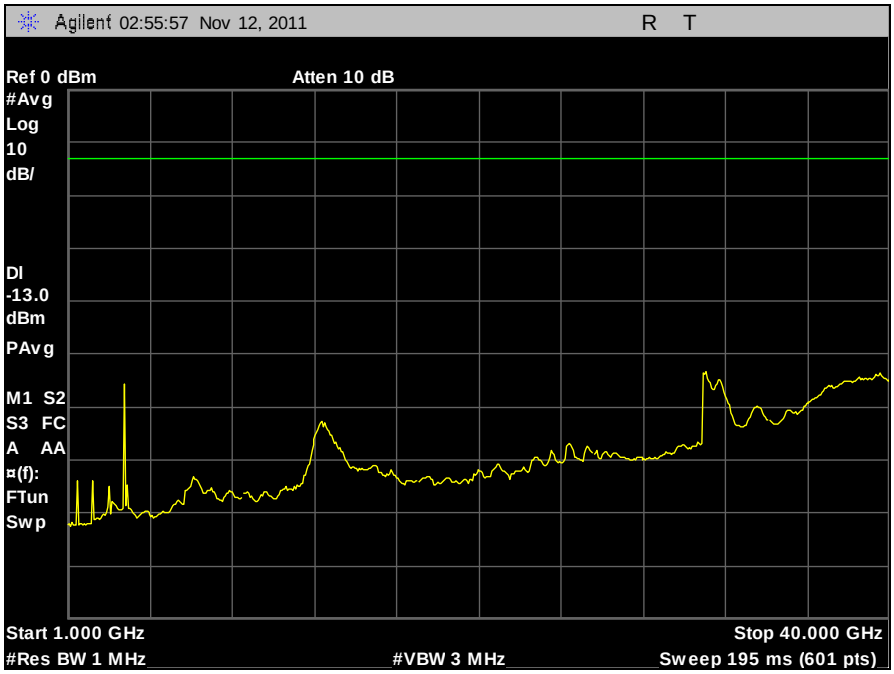
Plot 49. Conducted Spurious Emissions, 5 MHz, High Channel, Vertical, 30 MHz – 1 GHz



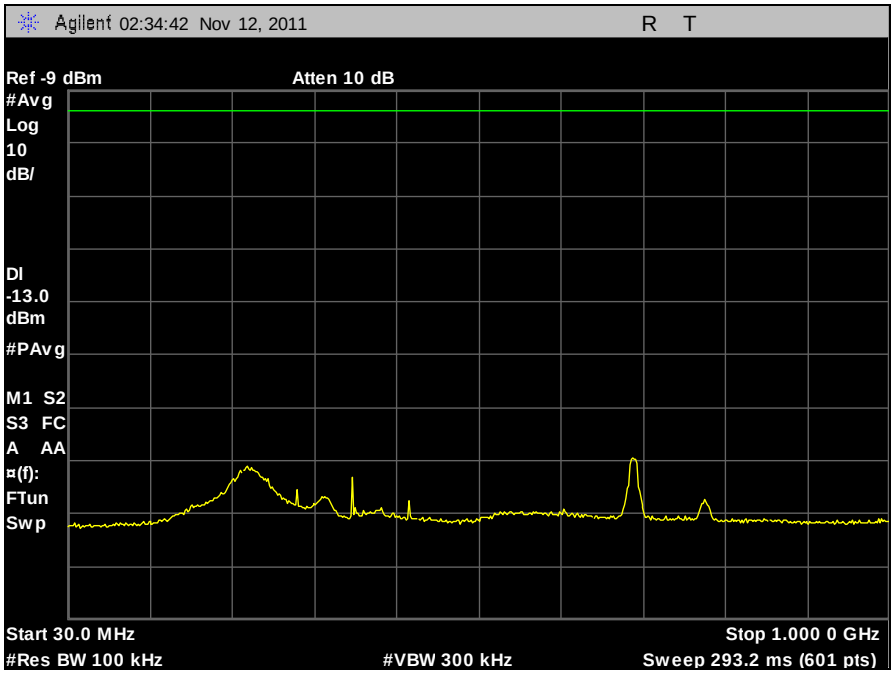
Plot 50. Conducted Spurious Emissions, 5 MHz, High Channel, Horizontal, 1 GHz – 40 GHz



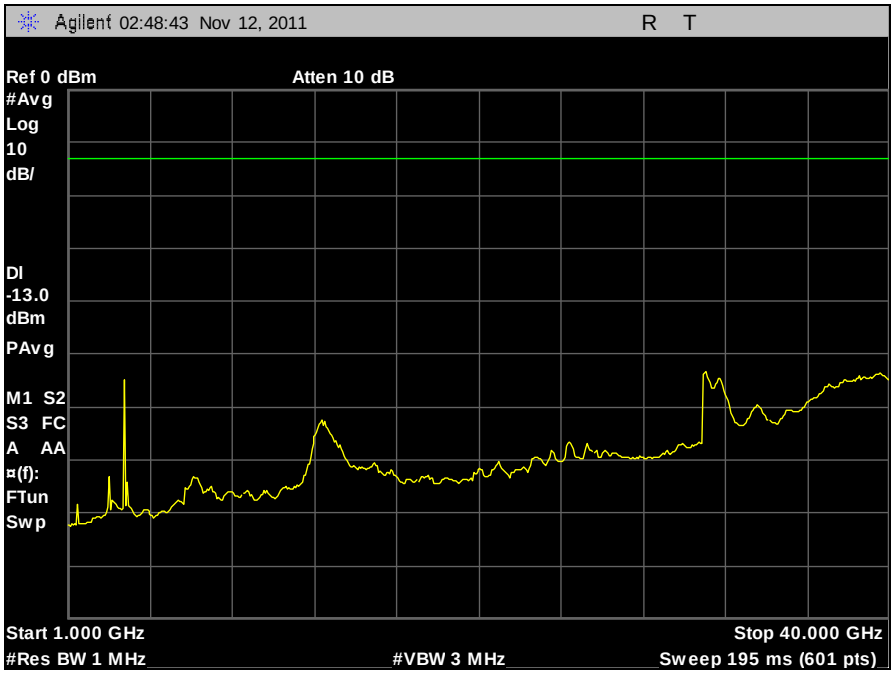
Plot 51. Conducted Spurious Emissions, 10 MHz, Low Channel, Horizontal, 30 MHz – 1 GHz



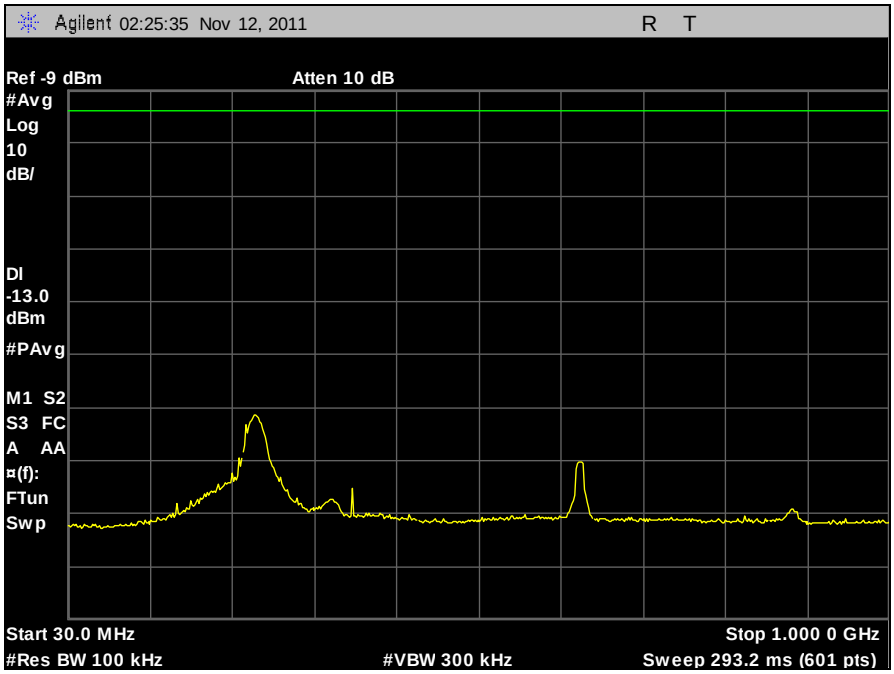
Plot 52. Conducted Spurious Emissions, 10 MHz, Low Channel, Horizontal, 1 GHz – 40 GHz



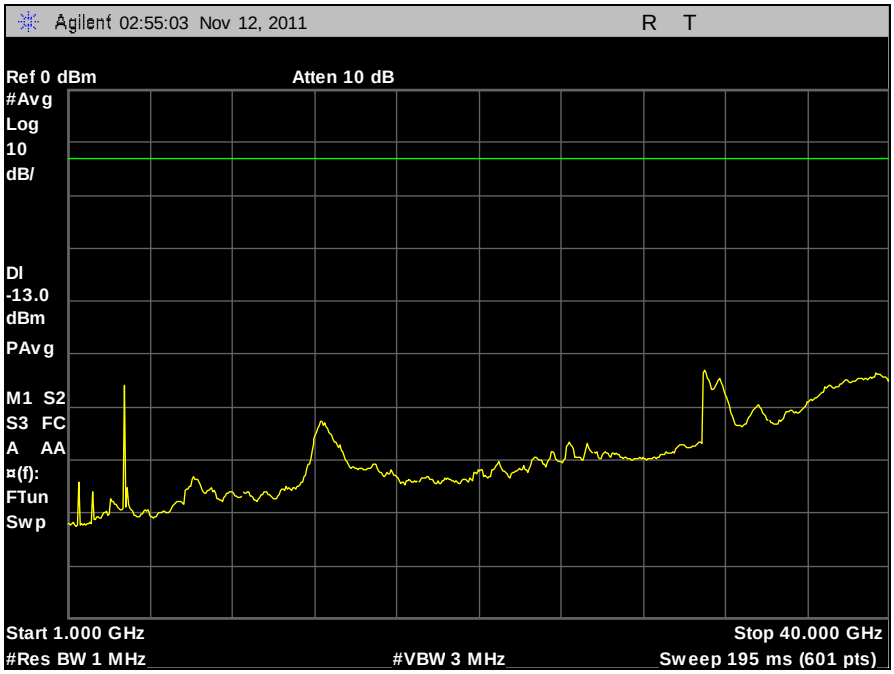
Plot 53. Conducted Spurious Emissions, 10 MHz, Low Channel, Vertical, 30 MHz – 1 GHz



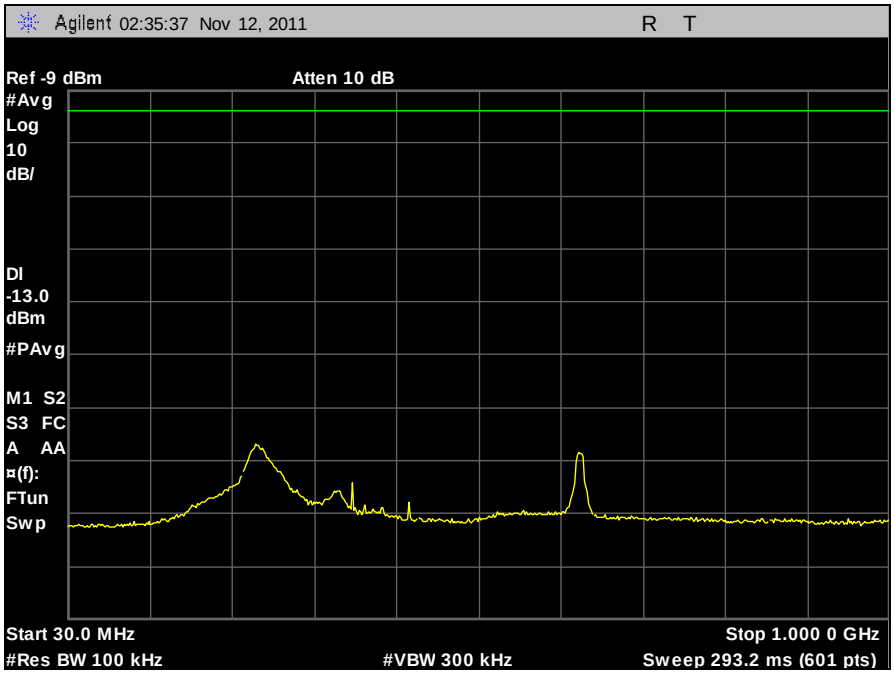
Plot 54. Conducted Spurious Emissions, 10 MHz, Low Channel, Vertical, 1 GHz – 40 GHz



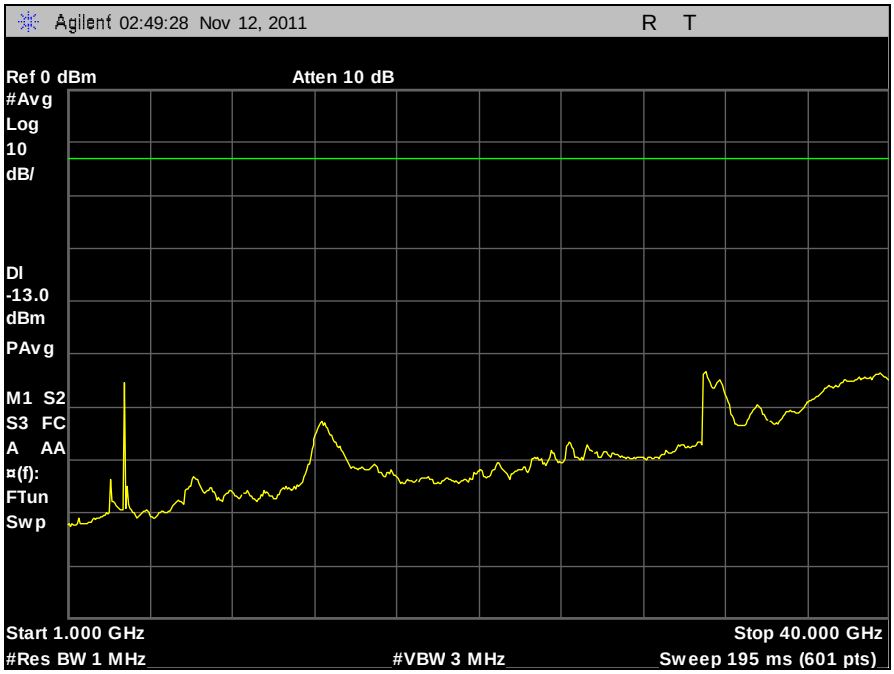
Plot 55. Conducted Spurious Emissions, 10 MHz, High Channel, Horizontal, 30 MHz – 1 GHz



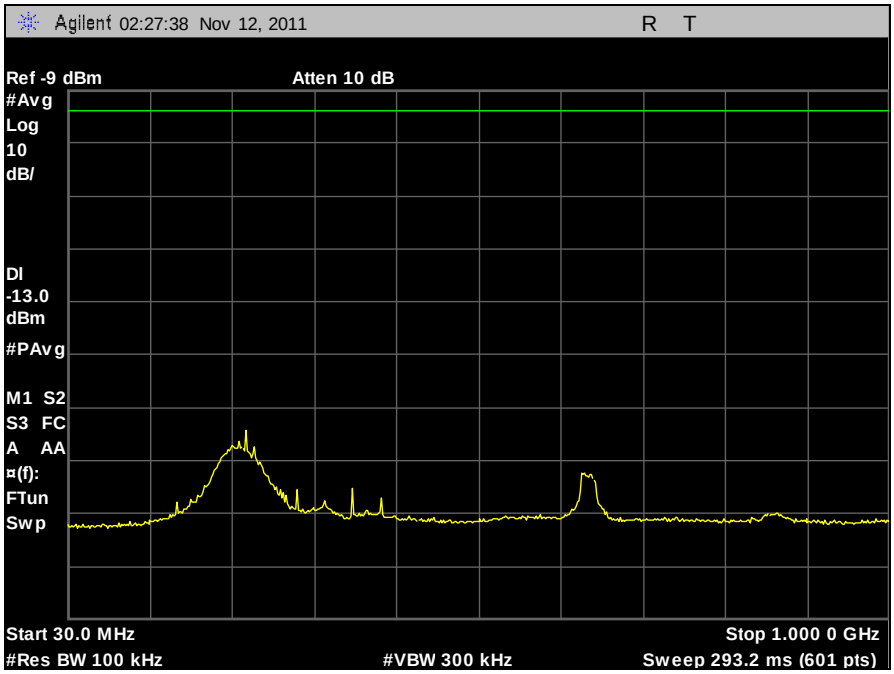
Plot 56. Conducted Spurious Emissions, 10 MHz, High Channel, Horizontal, 1 GHz – 40 GHz



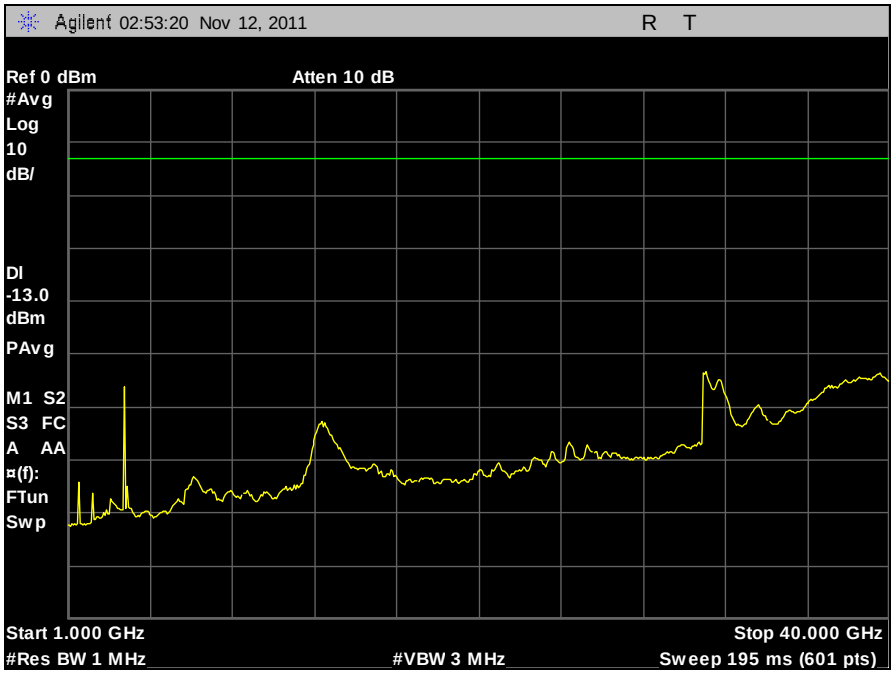
Plot 57. Conducted Spurious Emissions, 10 MHz, High Channel, Vertical, 30 MHz – 1 GHz



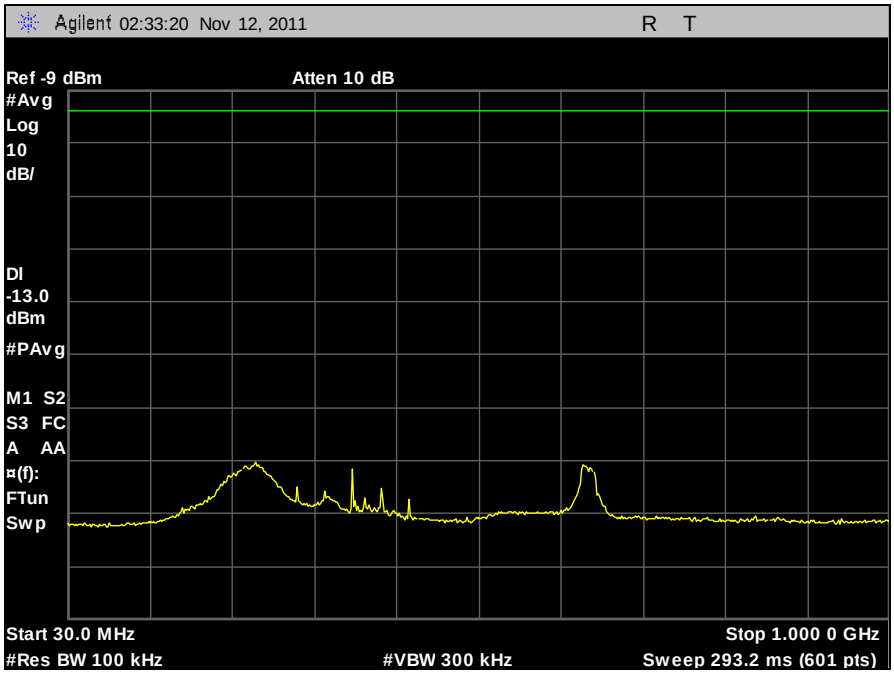
Plot 58. Conducted Spurious Emissions, 10 MHz, High Channel, Vertical, 1 GHz – 40 GHz



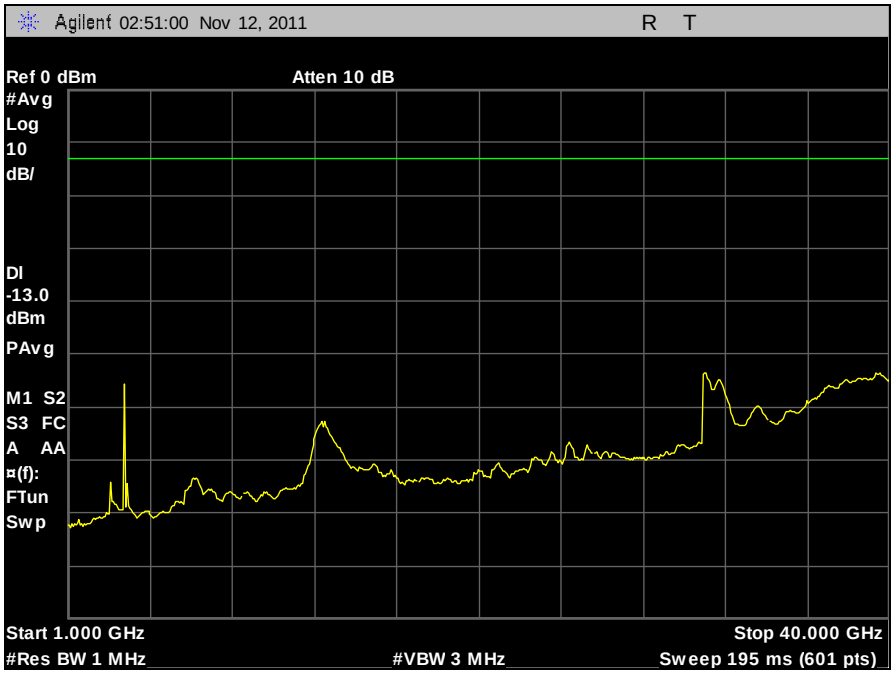
Plot 59. Conducted Spurious Emissions, 20 MHz, Low Channel, Horizontal, 30 MHz – 1 GHz



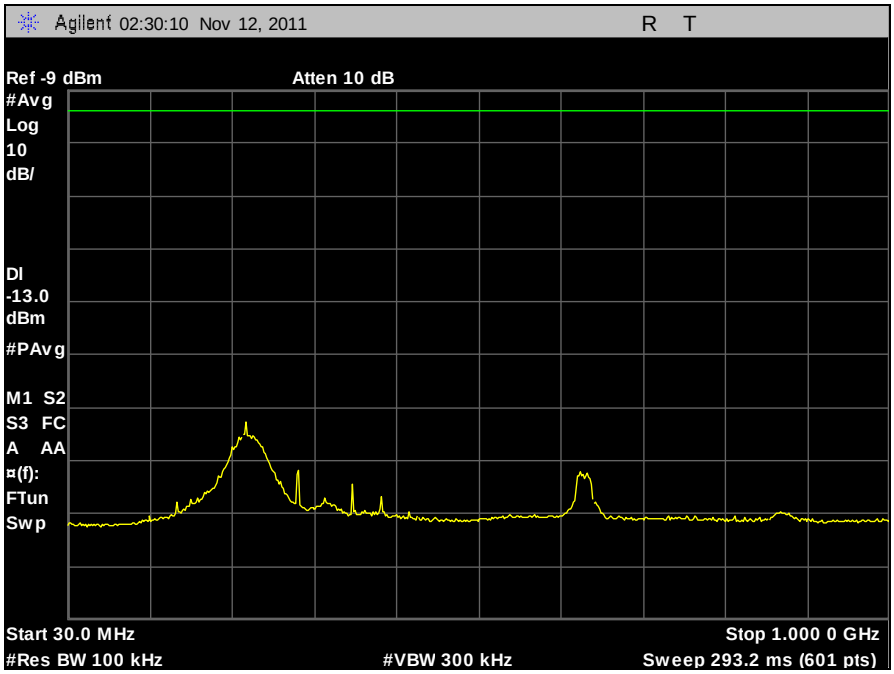
Plot 60. Conducted Spurious Emissions, 20 MHz, Low Channel, Horizontal, 1 GHz – 40 GHz



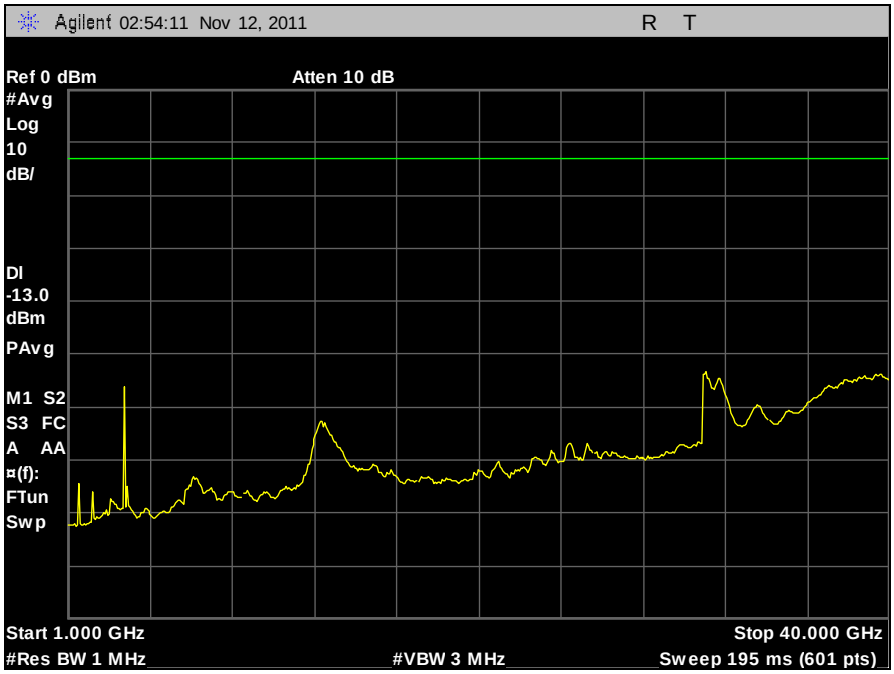
Plot 61. Conducted Spurious Emissions, 20 MHz, Low Channel, Vertical, 30 MHz – 1 GHz



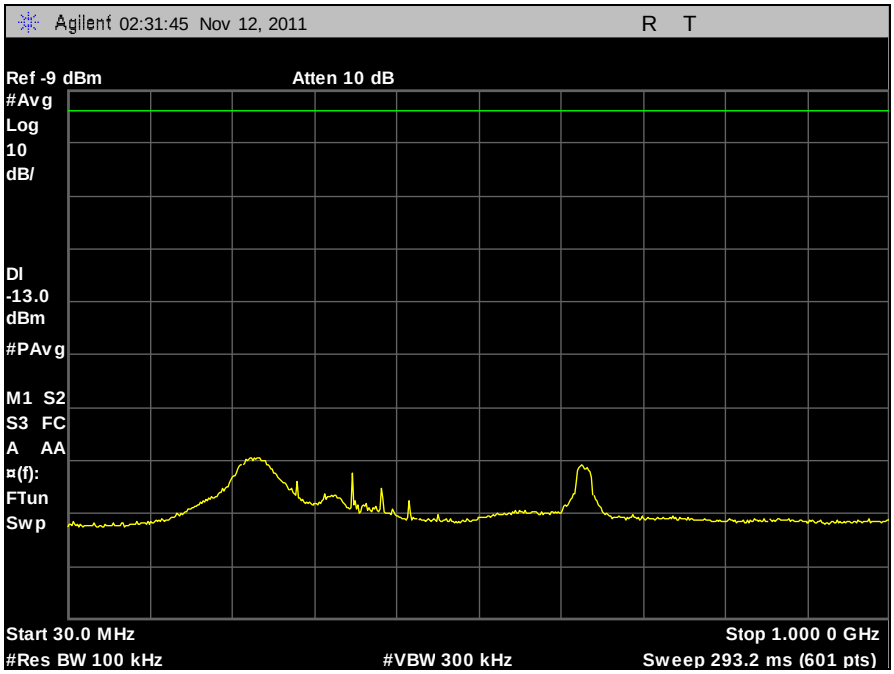
Plot 62. Conducted Spurious Emissions, 20 MHz, Low Channel, Vertical, 1 GHz – 40 GHz



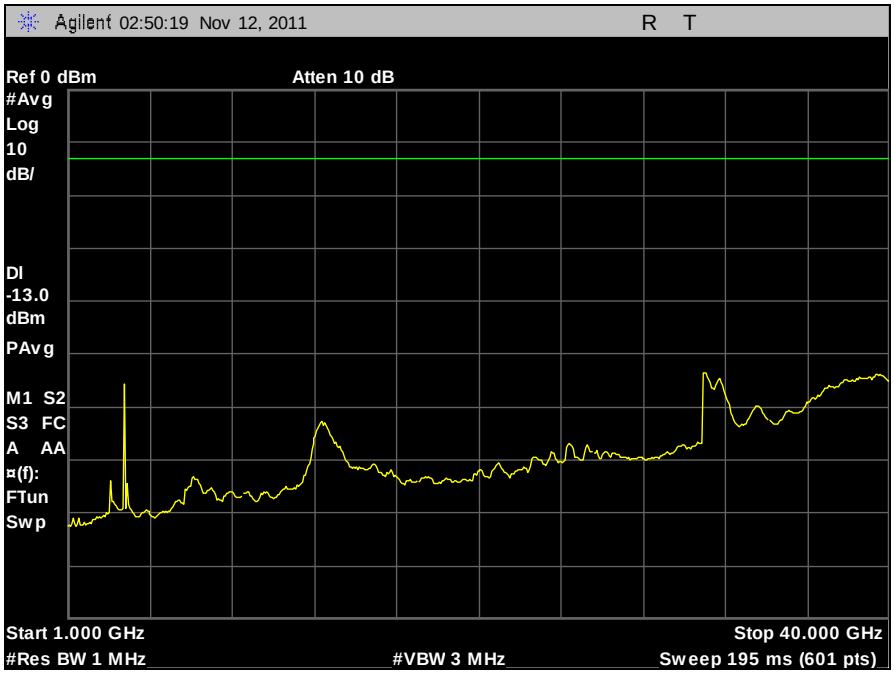
Plot 63. Conducted Spurious Emissions, 20 MHz, High Channel, Horizontal, 30 MHz – 1 GHz



Plot 64. Conducted Spurious Emissions, 20 MHz, High Channel, Horizontal, 1 GHz – 40 GHz



Plot 65. Conducted Spurious Emissions, 20 MHz, High Channel, Vertical, 30 MHz – 1 GHz



Plot 66. Conducted Spurious Emissions, 20 MHz, High Channel, Vertical, 1 GHz – 40 GHz

Electromagnetic Compatibility Requirements

4.5 §2.1053 Radiated Spurious Emissions

Test Requirement(s): **§2.1053 and §15.209**

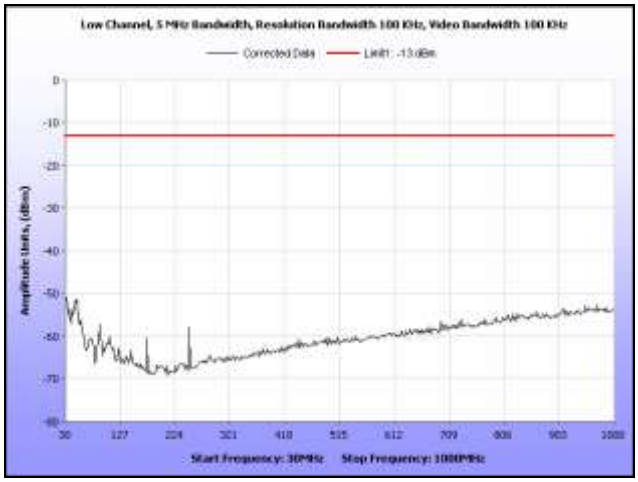
Test Procedures: A laptop was connected to EUT to control the RF power output and frequency channel. The EUT was connected to a Spectrum Analyzer through a broad band attenuator. The Spectrum Analyzer was set to sweep 30 MHz and up to 10th harmonic of the fundamental or 40GHz whichever is the lesser. The Spectrum Analyzer was set to a RBW = 100 kHz and a VBW > 100 kHz for a frequency range between 30 MHz to 1 GHz and a RBW = 1 MHz and a VBW > 1MHz for frequency range above 1GHz. Measurements were made at the low and high channels. Measurement was also carried out at the band edges of the band of operation.

Limits: The power of any emission outside the licensee's frequency band of operation shall be attenuated below the transmitters power (P) by at least 43 + 10log (P) dB.

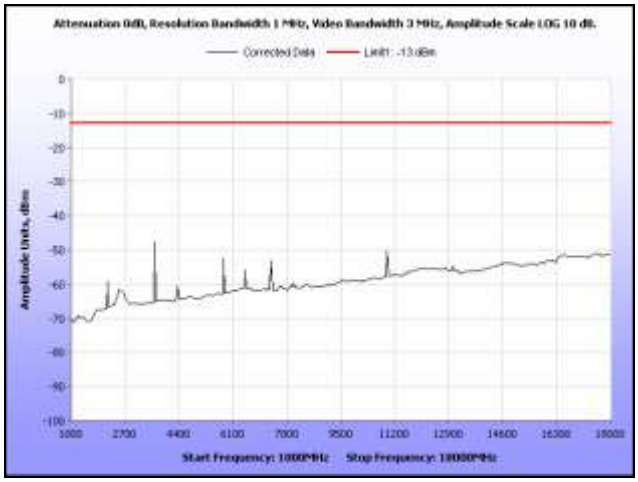
Test Results: Equipment complies with Section 2.1053 and 15.209.

Test Engineer(s): Jeff Pratt and Ben Taylor

Test Date(s): 12/14/11

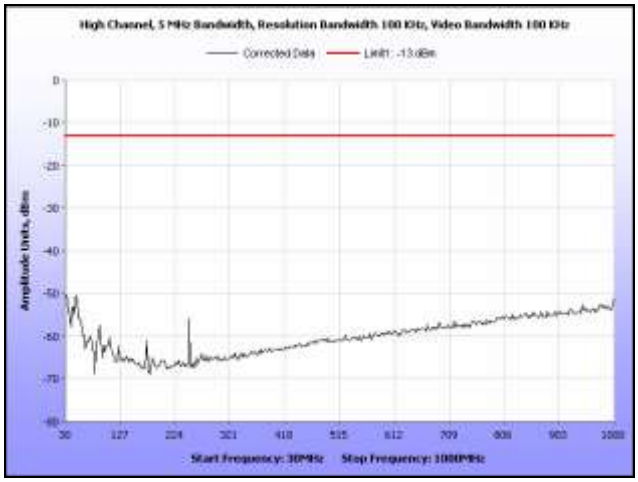


Plot 67. Radiated Spurious Emissions, 5 MHz, Low Channel, 30 MHz – 1 GHz

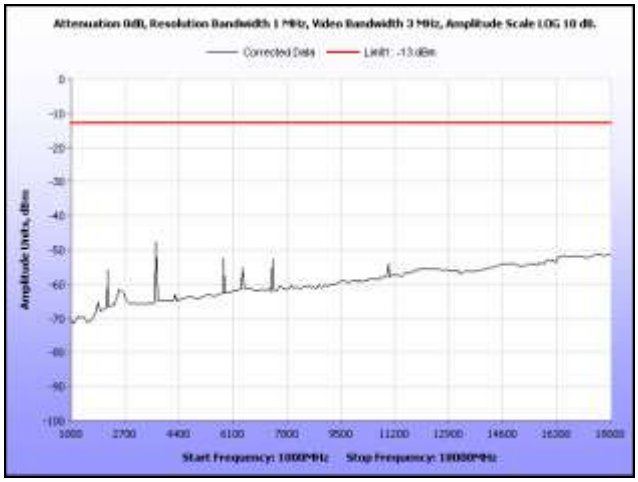


Plot 68. Radiated Spurious Emissions, 5 MHz, Low Channel, 1 GHz – 18 GHz

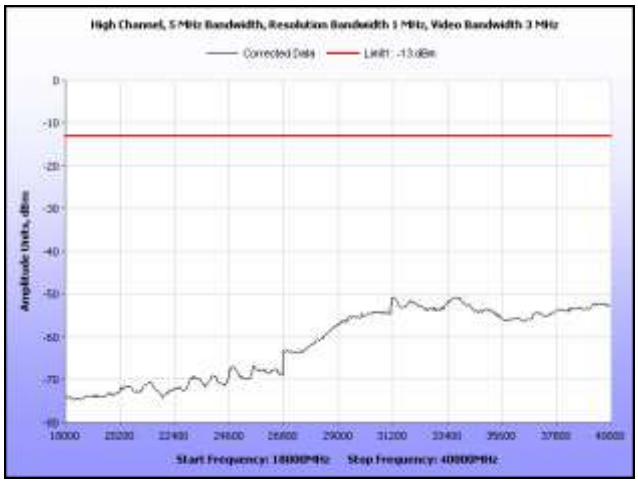
Plot 69. Radiated Spurious Emissions, 5 MHz, Low Channel, 18 GHz – 40 GHz



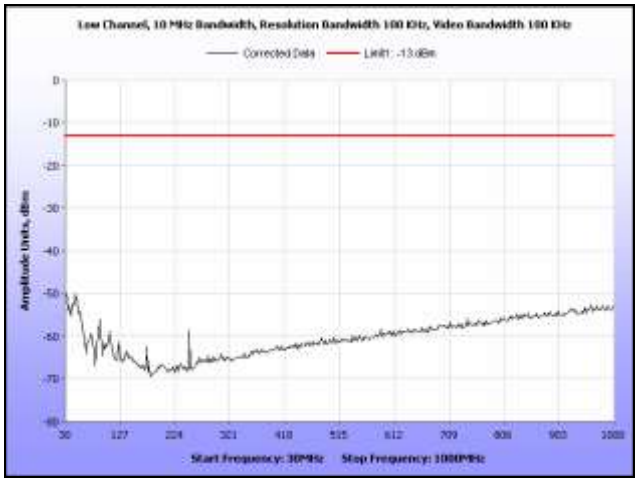
Plot 70. Radiated Spurious Emissions, 5 MHz, High Channel, 30 MHz – 1 GHz



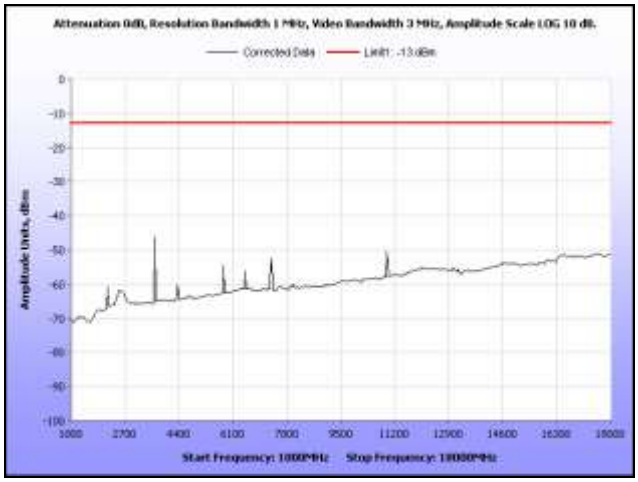
Plot 71. Radiated Spurious Emissions, 5 MHz, High Channel, 1 GHz – 18 GHz



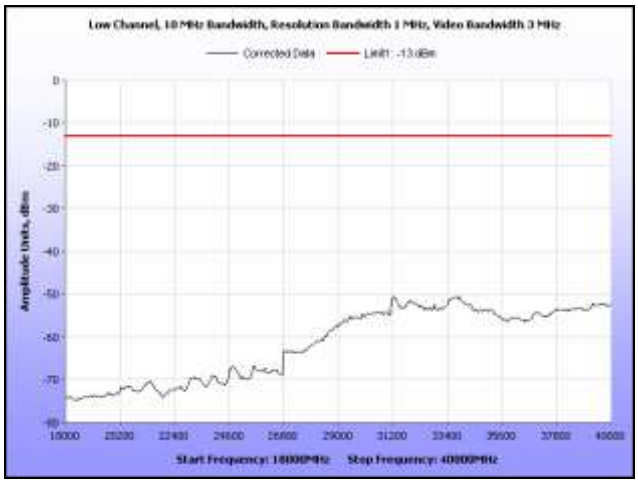
Plot 72. Radiated Spurious Emissions, 5 MHz, High Channel, 18 GHz – 40 GHz



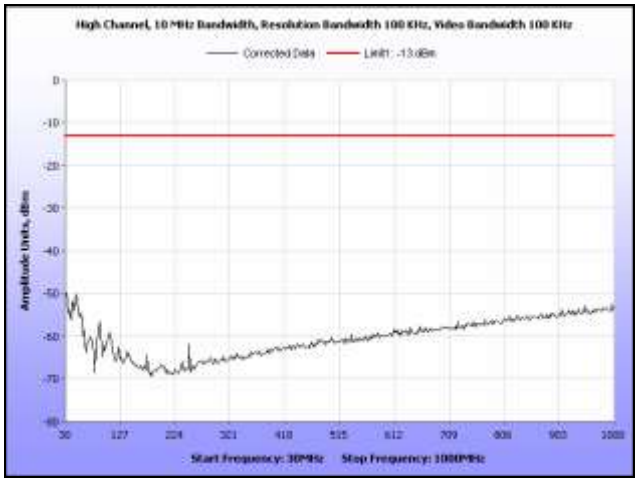
Plot 73. Radiated Spurious Emissions, 10 MHz, Low Channel, 30 MHz – 1 GHz



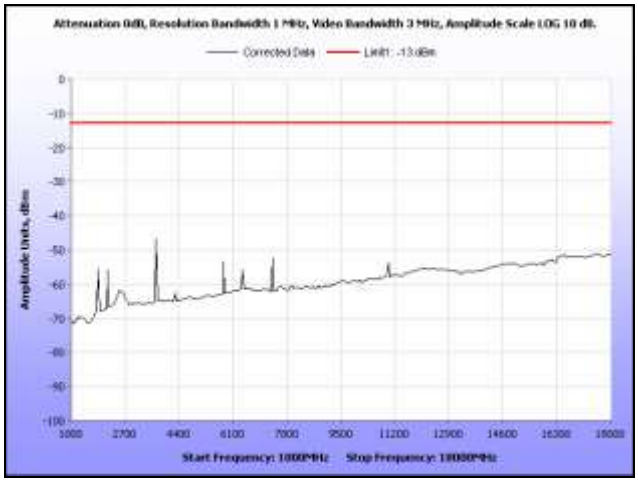
Plot 74. Radiated Spurious Emissions, 10 MHz, Low Channel, 1 GHz – 18 GHz



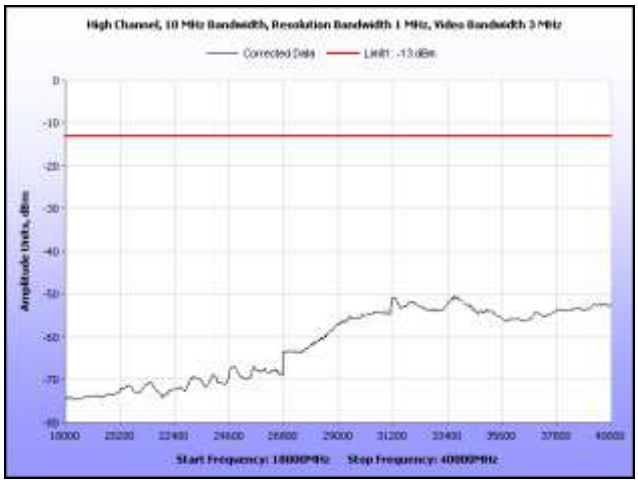
Plot 75. Radiated Spurious Emissions, 10 MHz, Low Channel, 18 GHz – 40 GHz



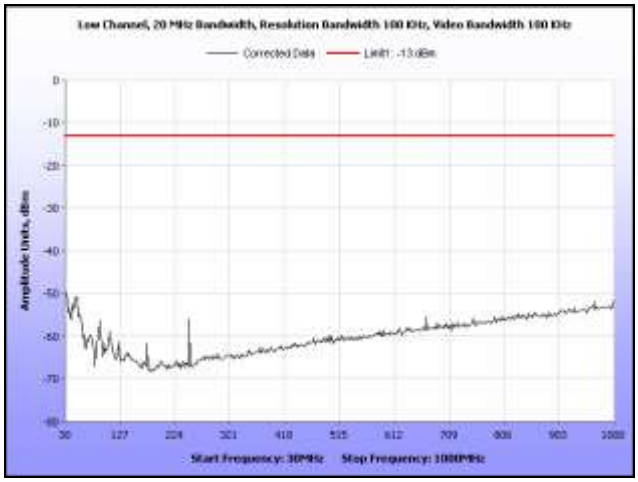
Plot 76. Radiated Spurious Emissions, 10 MHz, High Channel, 30 MHz – 1 GHz



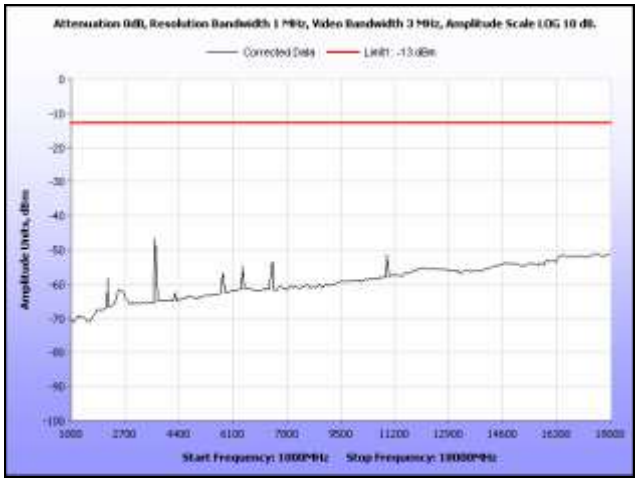
Plot 77. Radiated Spurious Emissions, 10 MHz, High Channel, 1 GHz – 18 GHz



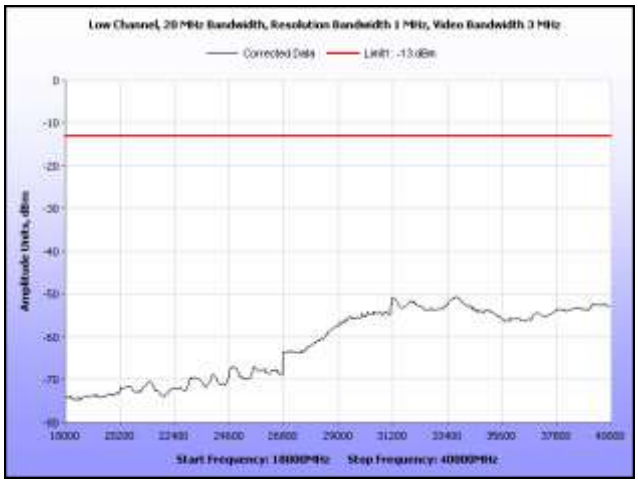
Plot 78. Radiated Spurious Emissions, 10 MHz, High Channel, 18 GHz – 40 GHz



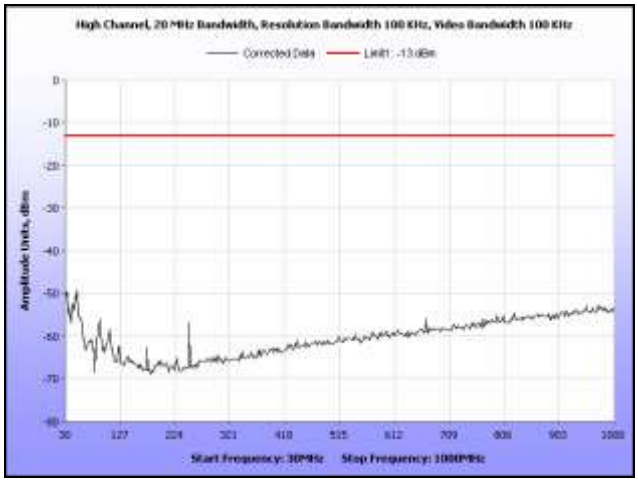
Plot 79. Radiated Spurious Emissions, 20 MHz, Low Channel, 30 MHz – 1 GHz



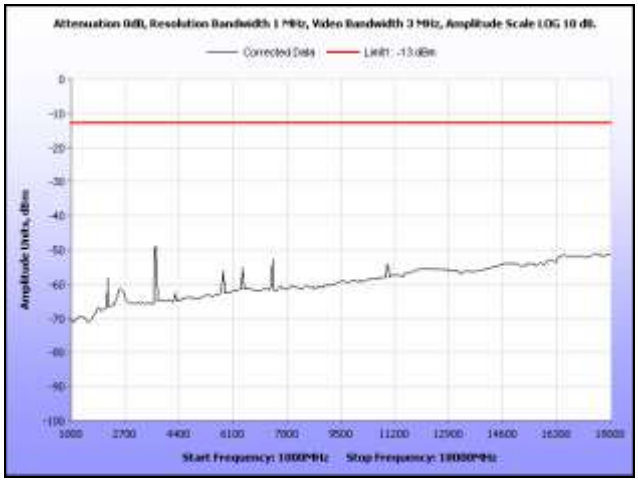
Plot 80. Radiated Spurious Emissions, 20 MHz, Low Channel, 1 GHz – 18 GHz



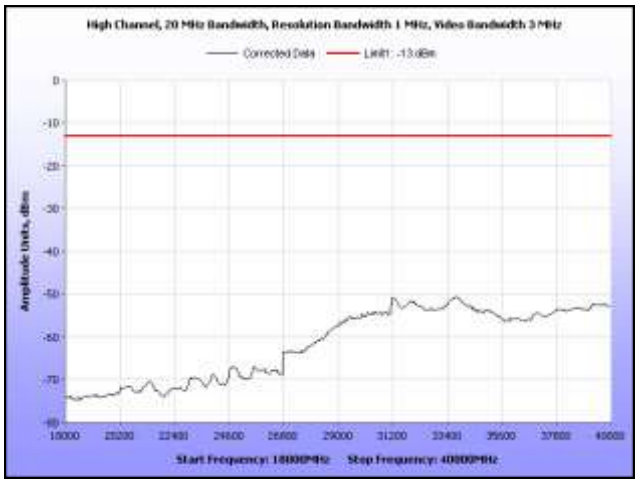
Plot 81. Radiated Spurious Emissions, 20 MHz, Low Channel, 18 GHz – 40 GHz



Plot 82. Radiated Spurious Emissions, 20 MHz, High Channel, 30 MHz – 1 GHz



Plot 83. Radiated Spurious Emissions, 20 MHz, High Channel, 1 GHz – 18 GHz



Plot 84. Radiated Spurious Emissions, 20 MHz, High Channel, 18 GHz – 40 GHz

Electromagnetic Compatibility Requirements

4.6 §2.1055 Frequency Stability

Test Requirement(s): **§2.1055 and §90.213**

Test Procedures: As required by 47 CFR 2.1055, *Frequency Stability measurements* were made at the RF output terminals using a Spectrum Analyzer.

The EUT was placed in the Environmental Chamber with support equipment outside the chamber on a table. The EUT was set to transmit on its low and high channels, with nominal bandwidths of 5MHz, 10MHz, and 20MHz. The peak of the channel was measured and the frequencies on the high and low end of the channel at which the spectral density was 6dB below the peak were found. These frequencies were used to calculate the center frequency of the channel and any frequency deviations. The frequency drift was investigated at increments of 10C, with a temperature range of -20C to +50C.

Voltage supplied to EUT is 120 VAC reference temperature was done at 20 ^{C}. The voltage was varied by ± 15 % of nominal

Test Results: Equipment complies with Section 2.1055 and 90.213

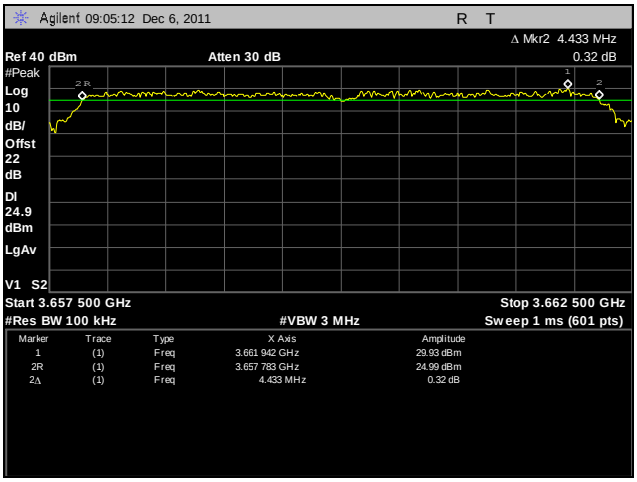
Test Engineer(s): Jeff Pratt

Test Date(s): 12/14/11

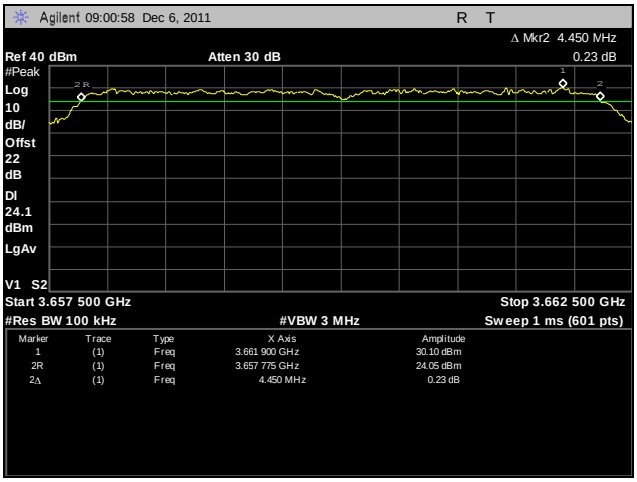
Frequency Stability Test Results

3660 MHz							
Reference @ 120VAC 20C				3660.008			
Temperature	Voltage	Frequency Low	Frequency High	Frequency (MHz)	PPM	Limit	Margin
50	102	3657.758	3662.258	3660.008	0	20	-20
50	120	3657.767	3662.242	3660.0045	0.956282	20	-19.0437
50	138	3657.758	3662.233	3659.9955	3.415293	20	-16.5847
40	102	3657.758	3662.283	3660.0205	3.415293	20	-16.5847
40	120	3657.758	3662.241	3659.9995	2.322399	20	-17.6776
40	138	3657.75	3662.283	3660.0165	2.322399	20	-17.6776
30	102	3657.758	3662.258	3660.008	0	20	-20
30	120	3657.758	3662.25	3660.004	1.092894	20	-18.9071
30	138	3657.75	3662.283	3660.0165	2.322399	20	-17.6776
20	102	3657.775	3662.2	3659.9875	5.601081	20	-14.3989
20	120	3657.758	3662.258	3660.008	0	20	-20
20	138	3657.758	3662.233	3659.9955	3.415293	20	-16.5847
10	102	3657.767	3662.234	3660.0005	2.049176	20	-17.9508
10	120	3657.775	3662.233	3660.004	1.092894	20	-18.9071
10	138	3657.775	3662.233	3660.004	1.092894	20	-18.9071
0	102	3657.783	3662.225	3660.004	1.092894	20	-18.9071
0	120	3657.783	3662.233	3660.008	0	20	-20
0	138	3657.767	3662.234	3660.0005	2.049176	20	-17.9508
-10	102	3657.767	3662.242	3660.0045	0.956282	20	-19.0437
-10	120	3657.775	3662.292	3660.0335	6.967198	20	-13.0328
-10	138	3657.767	3662.259	3660.013	1.366117	20	-18.6339
-20	102	3657.783	3662.216	3659.9995	2.322399	20	-17.6776
-20	120	3657.775	3662.225	3660	2.185788	20	-17.8142
-20	138	3657.783	3662.208	3659.9955	3.415293	20	-16.5847

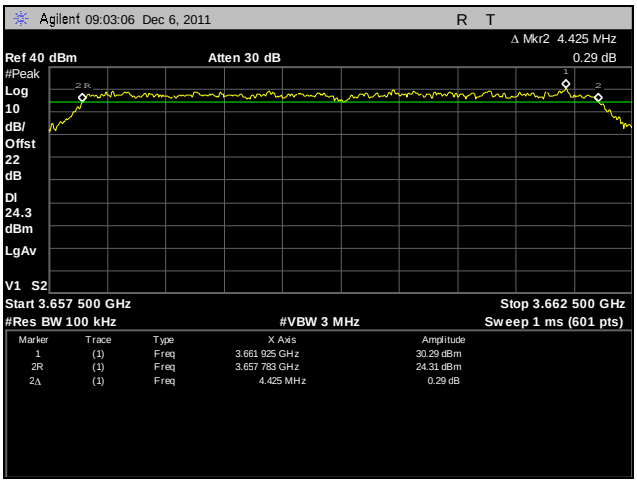
Table 16. Frequency Stability, Test Results



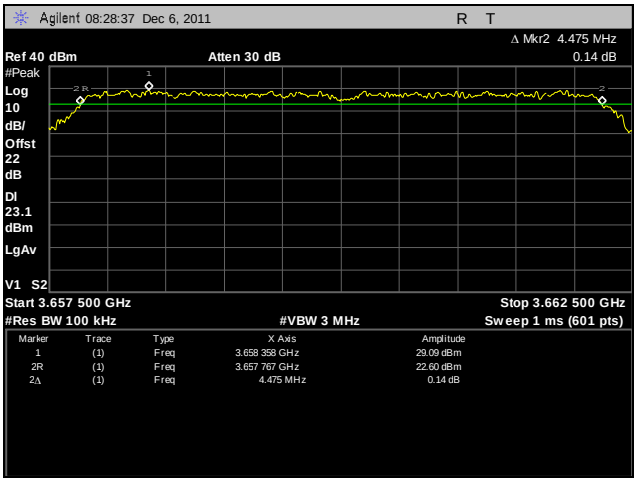
Plot 85. Frequency Stability, 3660 MHz, 102V, -20°C



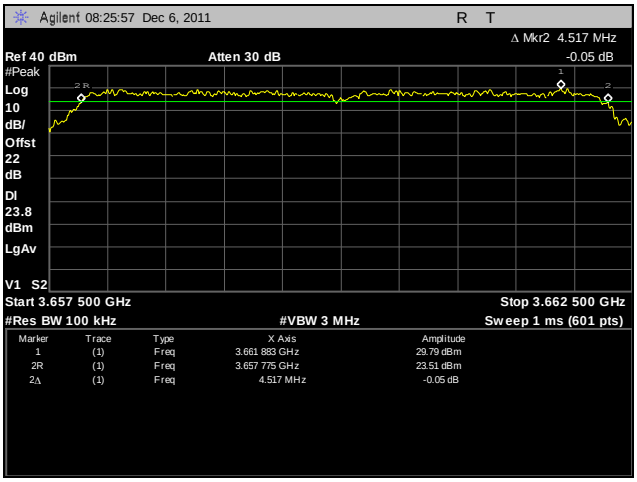
Plot 86. Frequency Stability, 3660 MHz, 120V, -20°C



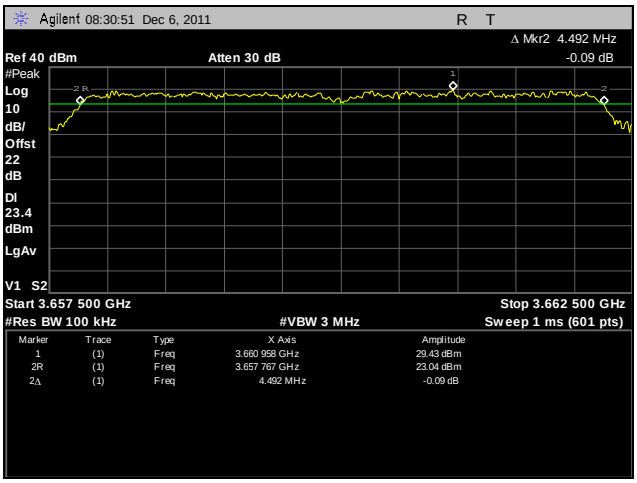
Plot 87. Frequency Stability, 3660 MHz, 138V, -20°C



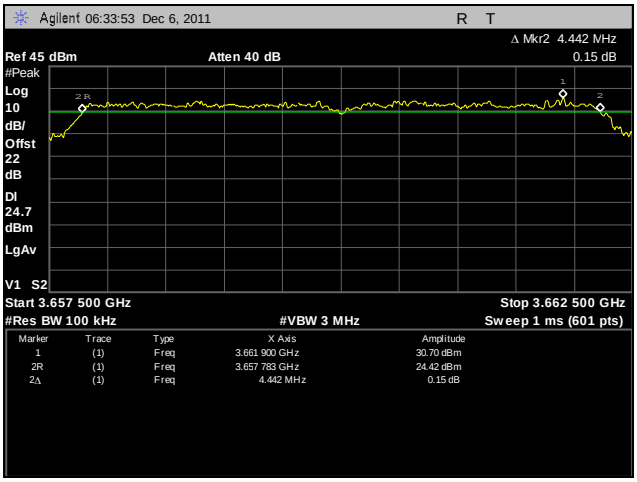
Plot 88. Frequency Stability, 3660 MHz, 102V, -10°C



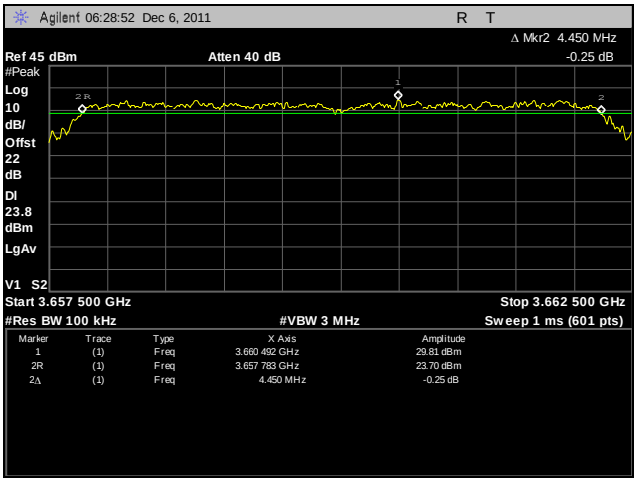
Plot 89. Frequency Stability, 3660 MHz, 120V, -10°C



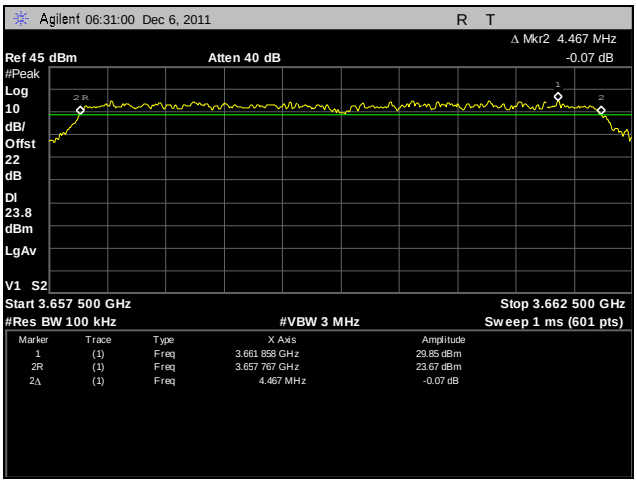
Plot 90. Frequency Stability, 3660 MHz, 138V, -10°C



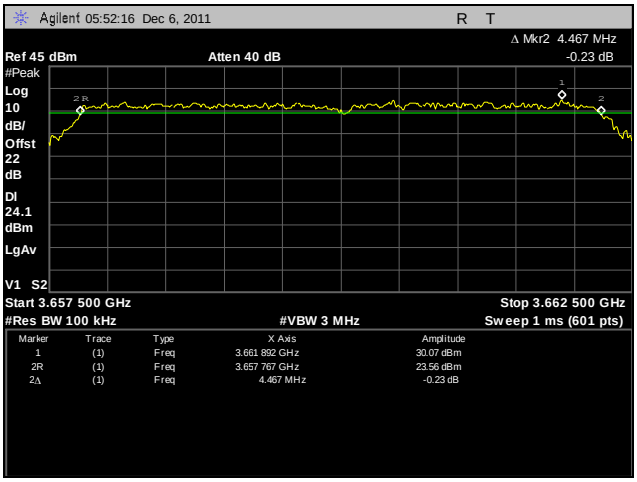
Plot 91. Frequency Stability, 3660 MHz, 102V, 0°C



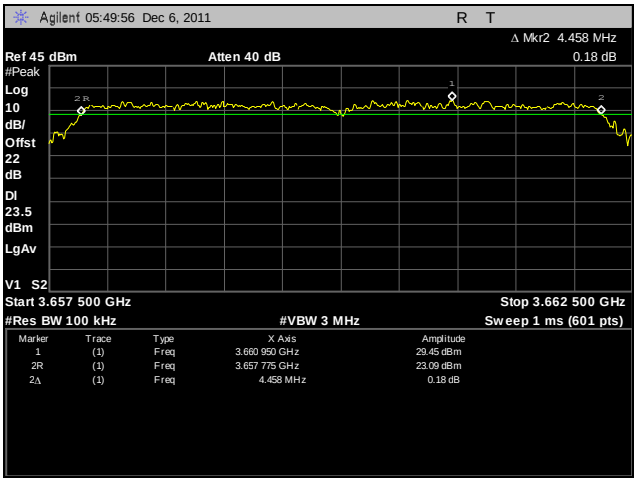
Plot 92. Frequency Stability, 3660 MHz, 120V, 0°C



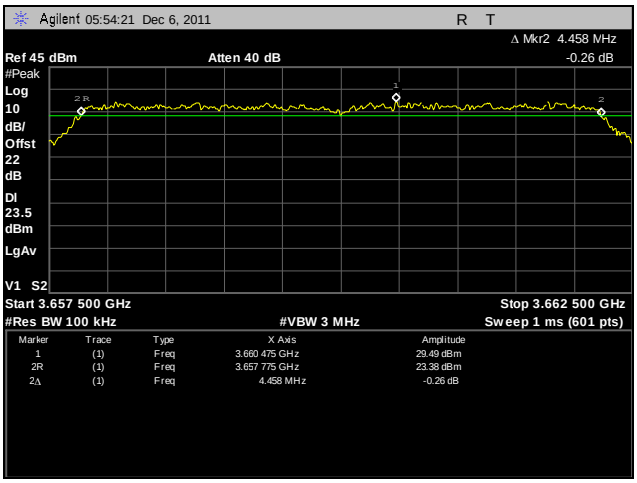
Plot 93. Frequency Stability, 3660 MHz, 138V, 0°C



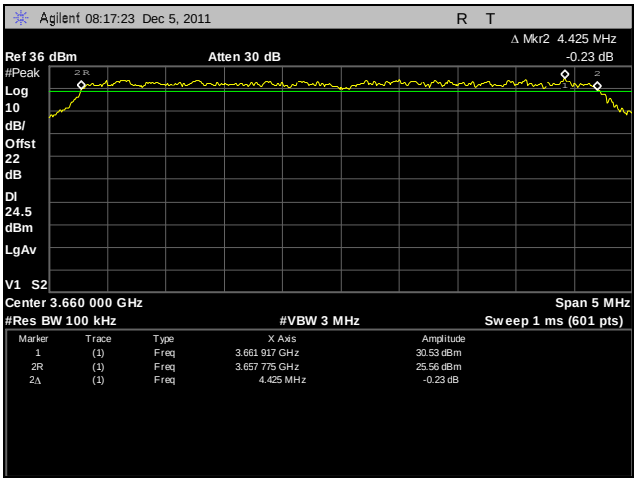
Plot 94. Frequency Stability, 3660 MHz, 102V, 10°C



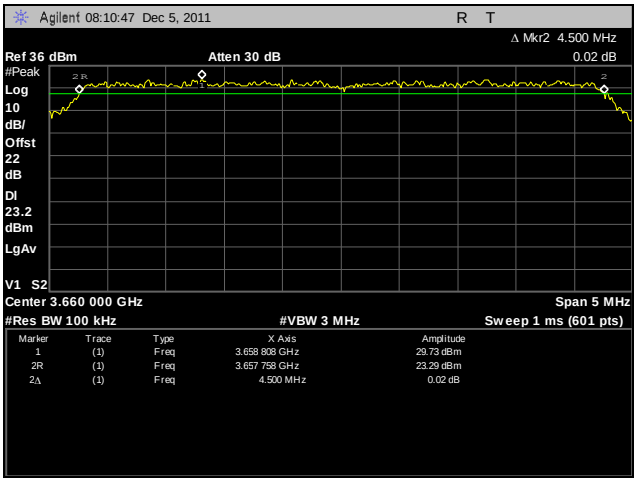
Plot 95. Frequency Stability, 3660 MHz, 120V, 10°C



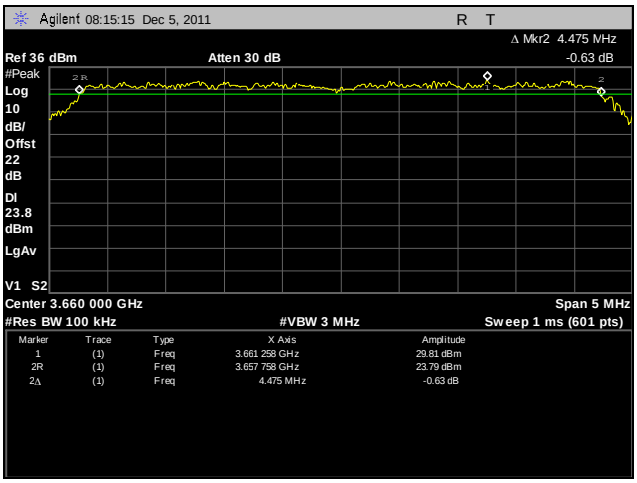
Plot 96. Frequency Stability, 3660 MHz, 138V, 10°C



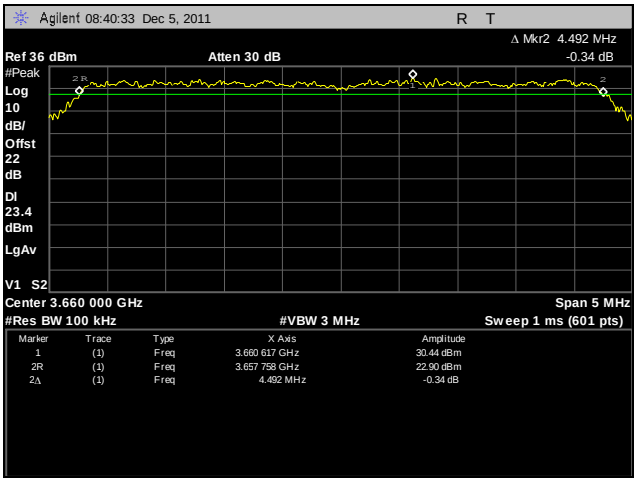
Plot 97. Frequency Stability, 3660 MHz, 102V, 20°C



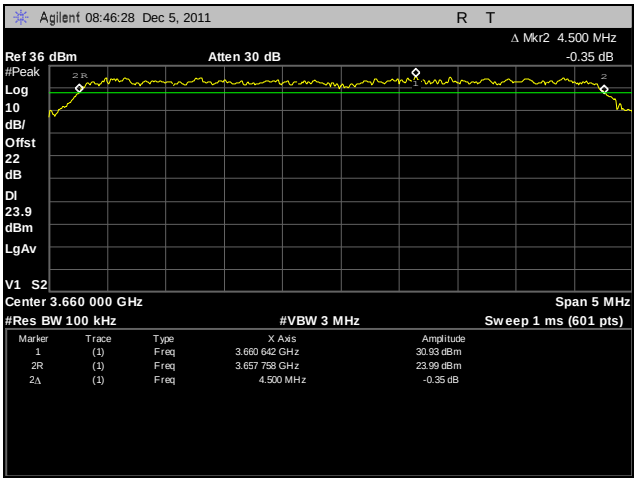
Plot 98. Frequency Stability, 3660 MHz, 120V, 20°C



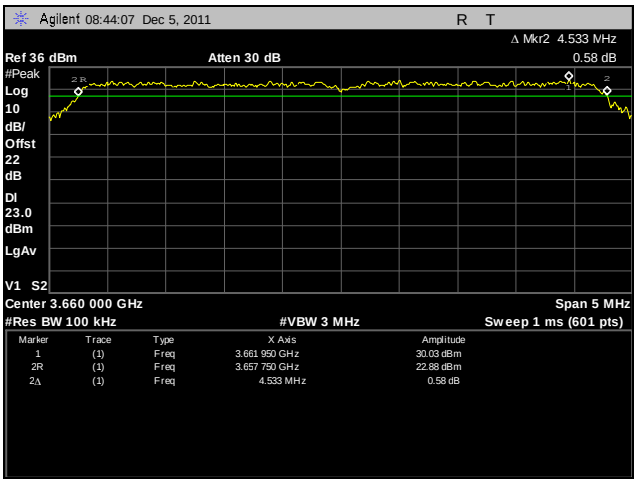
Plot 99. Frequency Stability, 3660 MHz, 138V, 20°C



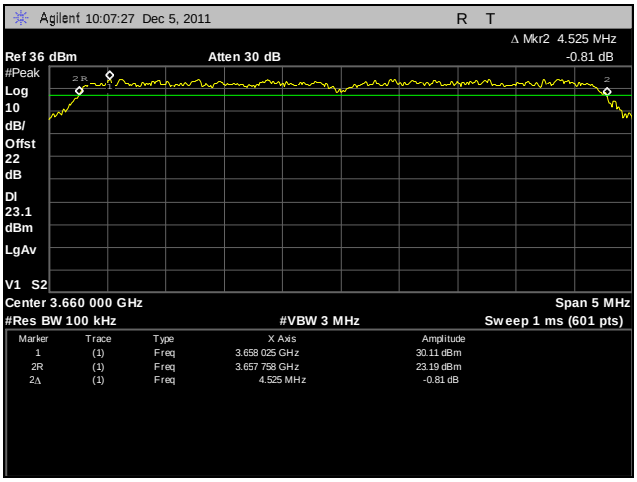
Plot 100. Frequency Stability, 3660 MHz, 102V, 30°C



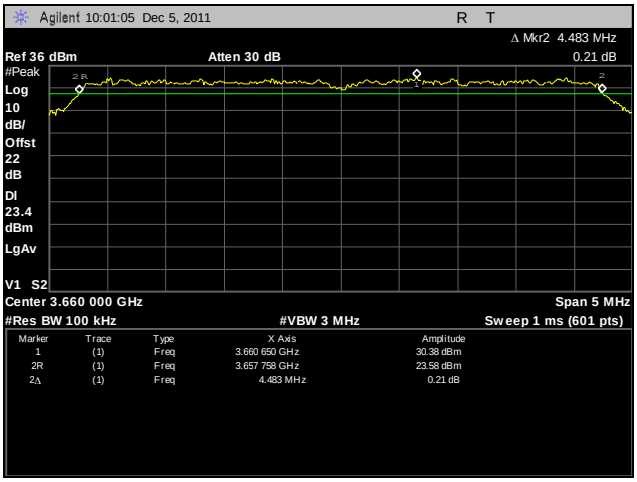
Plot 101. Frequency Stability, 3660 MHz, 120V, 30°C



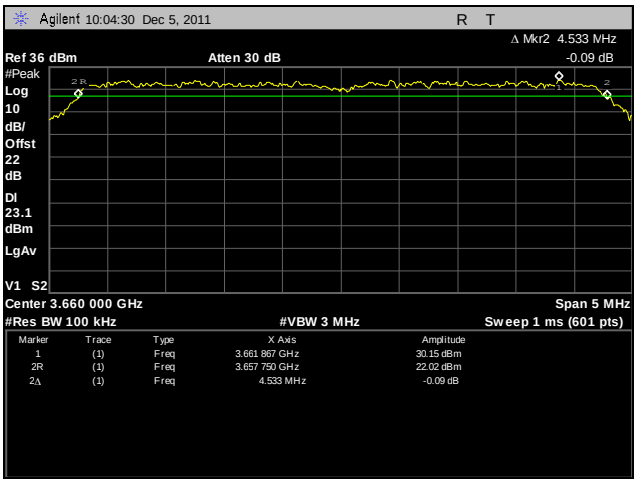
Plot 102. Frequency Stability, 3660 MHz, 138V, 30°C



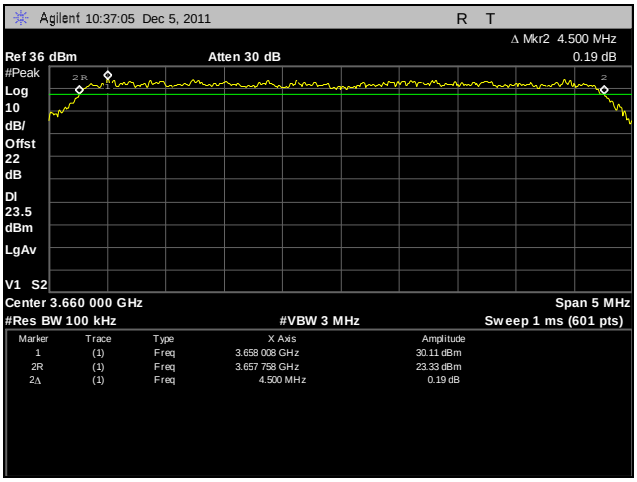
Plot 103. Frequency Stability, 3660 MHz, 102V, 40°C



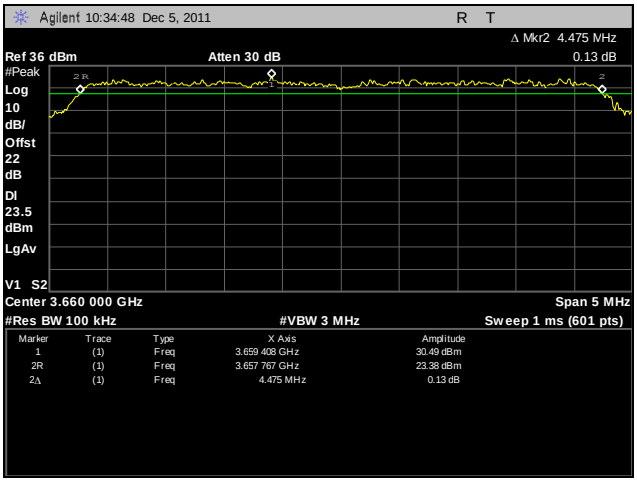
Plot 104. Frequency Stability, 3660 MHz, 120V, 40°C



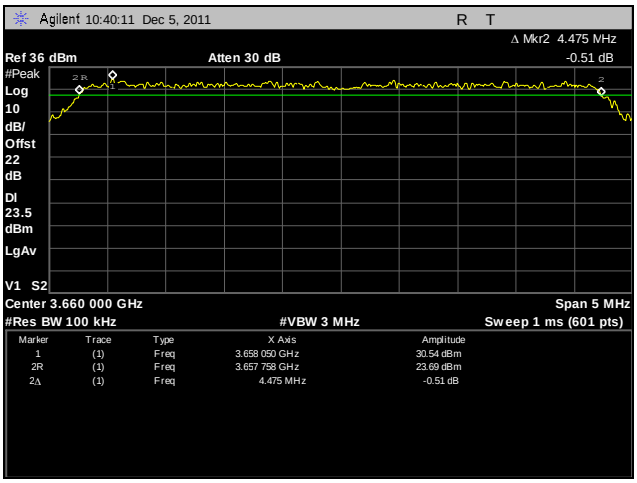
Plot 105. Frequency Stability, 3660 MHz, 138V, 40°C



Plot 106. Frequency Stability, 3660 MHz, 102V, 50°C



Plot 107. Frequency Stability, 3660 MHz, 120V, 50°C



Plot 108. Frequency Stability, 3660 MHz, 138V, 50°C

Electromagnetic Compatibility Requirements

4.7 RF Exposure Requirements

RF Exposure Requirements: **§90.1335, §1.1307(b), 2.1091, 2.1093:** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1307:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit Calculation: EUT's operating frequencies @ 3650–3675 MHz; highest conducted power = 16.88 dBm (peak) therefore, **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

EUT maximum antenna gain = 22 dBi.

Equation from page 18 of OET 65, Edition 97-01

EUT with 22dBi Antenna

$S = PG / 4\pi R^2$ or $R = \sqrt{PG / 4\pi S}$

where, S = Power Density (1 mW/cm^2)
P = Power Input to antenna (48.75 mW)
G = Numeric Antenna Gain (158.49)

$R = \sqrt{((48.75 * 158.49)/(4*\pi*1))} = 24.803$ cm

Electromagnetic Compatibility Requirements

4.8 Receiver Spurious Emission

Test Requirement: The following receiver spurious emission limits shall be complied with:

a) If a radiated measurement is made, all spurious emissions shall comply with the limits of Table 17.

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

Table 17. Spurious Emission Limits for Receivers

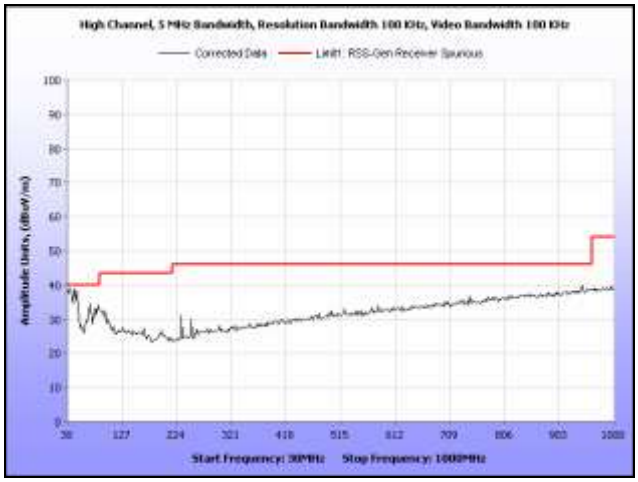
b) If a conducted measurement is made, no spurious output signals appearing at the antenna terminals shall exceed 2 nanowatts per any 4 kHz spurious frequency in the band 30-1000 MHz, or 5 nanowatts above 1 GHz.

Test Procedure: The receiver spurious emissions were tested in compliance with the limits of Table 17. The testing was performed radiated.

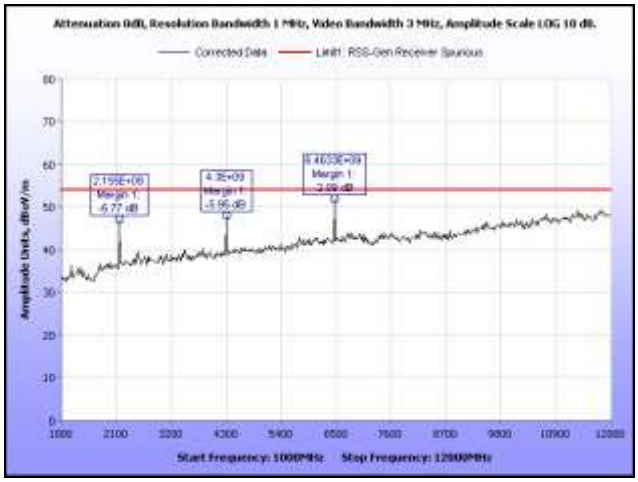
Test Results: The EUT was compliant with the Receiver Spurious Emission limits of this requirement.

Test Engineer(s): Jeff Pratt

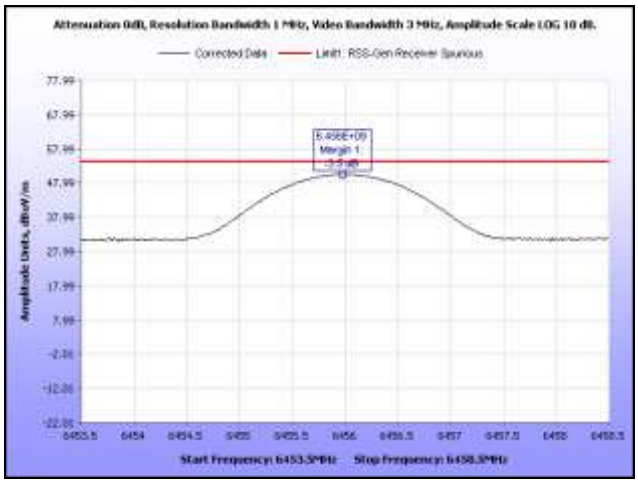
Test Date(s): 01/16/12



Plot 109. Radiated Receiver Spurious Emissions, 30 MHz – 1 GHz



Plot 110. Radiated Receiver Spurious Emissions, 1 GHz – 12 GHz



Plot 111. Radiated Receiver Spurious Emissions, 6.456 GHz Emission Power Average

Test Equipment

5 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

MET Asset #	Equipment	Manufacturer	Model	Last Cal Date	Cal Due Date
1T4409	EMI RECEIVER	ROHDE&SCHWARZ	ESIB 7	6/14/2011	6/14/2012
1T4753	BILOG ANTENNA	SUNOL SCIENCES	JB6	1/5/2012	1/5/2013
1T4442	PRE-AMPLIFIER, MICROWAVE	MITEQ	AFS42-01001800-30-10P	SEE NOTE	
1T4483	ANTENNA, HORN	ETS-LINDGREN	3117	7/19/2011	7/19/2012
1T4771	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4446A	6/25/2011	6/25/2012
1T4752	PRE-AMPLIFIER	MITEQ	JS44-18004000-35-8P	SEE NOTE	
1T4300	SEMI-ANECHOIC CHAMBER	EMC TEST SYSTEMS	N/A	8/23/2010	8/23/2013
1T4149	HIGH-FREQUENCY ANECHOIC CHAMBER	RAY-PROOF	81	FUNCTIONAL TEST YEARLY	
1T4612	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4407B	12/15/2010	6/15/2012
1T4214	SHIELD ROOM #4	UNIVERSAL SHIELD INC.	N/A	CAL NOT REQUIRED	
1T4568	RADIATING NOISE SOURCE	MET LABORATORIES	N/A	SEE NOTE	
1T4728	PROGRAMMABLE AC POWER SOURCE	QUADTECH	31010	SEE NOTE	
1T4621	SPECTRUM ANALYZER	AGILENT TECHNOLOGIES	E4402B	5/31/2011	5/31/2012
1T4564	LISN (24 AMP)	SOLAR ELECTRONICS	9252-50-R-24-BNC	11/4/2011	11/4/2012
1T4633	THERMO/HYGRO/BAROMETER	CONTROL COMPANY	02-401	3/11/2010	3/11/2012
1T4634	THERMO/HYGRO/BAROMETER	CONTROL COMPANY	02-401	3/11/2010	3/11/2012
1T4502	COMB GENERATOR	COM-POWER	CGC-255	11/3/2011	11/3/2012
1T4505	TEMPERATURE CHAMBER	TEST EQUITY	115	11/30/2011	11/30/2012

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

Certification & User's Manual Information

6 Certification Label & User's Manual Information

6.4 Certification Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart I — Marketing of Radio frequency devices:

§ 2.801 Radio-frequency device defined.

As used in this part, a radio-frequency device is any device which in its operation is capable of Emitting radio-frequency energy by radiation, conduction, or other means. Radio- frequency devices include, but are not limited to:

(a) The various types of radio communication transmitting devices described throughout this chapter.

(b) The incidental, unintentional and intentional radiators defined in Part 15 of this chapter.

(c) The industrial, scientific, and medical equipment described in Part 18 of this chapter.

(d) Any part or component thereof which in use emits radio-frequency energy by radiation, conduction, or other means.

§ 2.803 Marketing of radio frequency devices prior to equipment authorization.

(a) Except as provided elsewhere in this chapter, no person shall sell or lease, or offer for sale or lease (including advertising for sale or lease), or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any radio frequency device unless:

(1) In the case of a device subject to certification, such device has been authorized by the Commission in accordance with the rules in this chapter and is properly identified and labeled as required by §2.925 and other relevant sections in this chapter; or

(2) In the case of a device that is not required to have a grant of equipment authorization issued by the Commission, but which must comply with the specified technical standards prior to use, such device also complies with all applicable administrative (including verification of the equipment or authorization under a Declaration of Conformity, where required), technical, labeling and identification requirements specified in this chapter.

(d) Notwithstanding the provisions of paragraph (a) of this section, the offer for sale solely to business, commercial, industrial, scientific or medical users (but not an offer for sale to other parties or to end users located in a residential environment) of a radio frequency device that is in the conceptual, developmental, design or pre-production stage is permitted prior to equipment authorization or, for devices not subject to the equipment authorization requirements, prior to a determination of compliance with the applicable technical requirements *provided* that the prospective buyer is advised in writing at the time of the offer for sale that the equipment is subject to the FCC rules and that the equipment will comply with the appropriate rules before delivery to the buyer or to centers of distribution.

(e)(1) Notwithstanding the provisions of paragraph (a) of this section, prior to equipment authorization or determination of compliance with the applicable technical requirements any radio frequency device may be operated, but not marketed, for the following purposes and under the following conditions:

(i) Compliance testing;

(ii) Demonstrations at a trade show provided the notice contained in paragraph (c) of this section is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iii) Demonstrations at an exhibition conducted at a business, commercial, industrial, scientific or medical location, but excluding locations in a residential environment, provided the notice contained in paragraphs (c) or (d) of this section, as appropriate, is displayed in a conspicuous location on, or immediately adjacent to, the device;

(iv) Evaluation of product performance and determination of customer acceptability, provided such operation takes place at the manufacturer's facilities during developmental, design or pre-production states; or

(v) Evaluation of product performance and determination of customer acceptability where customer acceptability of a radio frequency device cannot be determined at the manufacturer's facilities because of size or unique capability of the device, provided the device is operated at a business, commercial, industrial, scientific or medical user's site, but not at a residential site, during the development, design or pre-production stages.

(e)(2) For the purpose of paragraphs (e)(1)(iv) and (e)(1)(v) of this section, the term *manufacturer's facilities* includes the facilities of the party responsible for compliance with the regulations and the manufacturer's premises, as well as the facilities of other entities working under the authorization of the responsible party in connection with the development and manufacture, but not the marketing, of the equipment.

(f) For radio frequency devices subject to verification and sold solely to business, commercial, industrial, scientific and medical users (excluding products sold to other parties or for operation in a residential environment), parties responsible for verification of the devices shall have the option of ensuring compliance with the applicable technical specifications of this chapter at each end user's location after installation, provided that the purchase or lease agreement includes a provision that such a determination of compliance be made and is the responsibility of the party responsible for verification of the equipment.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 2, Subpart Y — Equipment Authorization Procedures:

§ 2.901 Basis and Purpose

(a) In order to carry out its responsibilities under the Communications Act and the various treaties and international regulations, and in order to promote efficient use of the radio spectrum, the Commission has developed technical standards for radio frequency equipment and parts or components thereof. The technical standards applicable to individual types of equipment are found in that part of the rules governing the service wherein the equipment is to be operated.[1] *In addition to the technical standards provided, the rules governing the service may require that such equipment be verified by the manufacturer or importer*, be authorized under a Declaration of Conformity, or receive an equipment authorization from the Commission by one of the following procedures: certification or registration.

(b) The following sections describe the verification procedure, the procedure for a Declaration of Conformity, and the procedures to be followed in obtaining certification from the Commission and the conditions attendant to such a grant, whichever is applicable.

§ 2.902 Certification.

(a) Certification is an equipment authorization issued by the Commission, based on representation and test data submitted by the applicant.

(b) Certification attaches to all units subsequently marketed by the grantee which are identical (see Section 2.908) to the sample tested except for permissive changes or other variations authorized by the Commission pursuant to Section 2.1043.

[1] In this case, the equipment is subject to the rules of Part 15. More specifically, the equipment falls under Subpart B (of Part 15), which deals with unintentional radiators.

§ 2.948 Description of measurement facilities.

(a) Each party making measurements of equipment that is subject to an equipment authorization under Part 15 or Part 18 of this chapter, regardless of whether the measurements are filed with the Commission or kept on file by the party responsible for compliance of equipment marketed within the U.S. or its possessions, shall compile a description of the measurement facilities employed.

(1) If the measured equipment is subject to the verification procedure, the description of the measurement facilities shall be retained by the party responsible for verification of the equipment.

(i) If the equipment is verified through measurements performed by an independent laboratory, it is acceptable for the party responsible for verification of the equipment to rely upon the description of the measurement facilities retained by or placed on file with the Commission by that laboratory. In this situation, the party responsible for the verification of the equipment is not required to retain a duplicate copy of the description of the measurement facilities.

(ii) If the equipment is verified based on measurements performed at the installation site of the equipment, no specific site calibration data is required. It is acceptable to retain the description of the measurement facilities at the site at which the measurements were performed.

(2) If the equipment is to be authorized by the Commission under the certification procedure, the description of the measurement facilities shall be filed with the Commission's Laboratory in Columbia, Maryland. The data describing the measurement facilities need only be filed once but must be updated as changes are made to the measurement facilities or as otherwise described in this section. At least every three years, the organization responsible for filing the data with the Commission shall certify that the data on file is current.

6.5 Label and User's Manual Information

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart A — General:

§ 15.19 Labeling requirements.

(a) In addition to the requirements in Part 2 of this chapter, a device subject to certification or verification shall be labeled as follows:

(1) Receivers associated with the operation of a licensed radio service, e.g., FM broadcast under Part 73 of this chapter, land mobile operation under Part 90, etc., shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

(2) A stand-alone cable input selector switch, shall bear the following statement in a conspicuous location on the device:

This device is verified to comply with Part 15 of the FCC Rules for use with cable television service.

(3) All other devices shall bear the following statement in a conspicuous location on the device:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit.

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

§ 15.21 Information to user.

The users manual or instruction manual for an intentional or unintentional 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.

The following is extracted from Title 47 of the Code of Federal Regulations, Part 15, Subpart B — Unintentional Radiators:

§ 15.105 Information to the user.

(a) For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at own expense.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

– Reorient or relocate the receiving antenna.

– Increase the separation between the equipment and receiver.

– Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

– Consult the dealer or an experienced radio/TV technician for help.

End of Report

