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, CALIFORNIA 95054 ● PHONE (408 748-3585 ● FAX (510) 489-6372

October 26, 2011

Ubiquiti Networks, Inc.
91 E. Tasman
San Jose, CA 95134

Dear Jennifer Sanchez,

Enclosed is the EMC test report for compliance testing of the Ubiquiti Networks, Inc., NanoStationLocoM2 tested to the requirements of ETSI EN 300 328 (Article 3.2 of R&TTE Directive).

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: (\Ubiquiti Networks, Inc.\EMCS30565-ETS328)

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Electromagnetic Compatibility Criteria
Test Report

For the

Ubiquiti Networks, Inc.
Model NanoStationLocoM2

Tested under

ETSI EN 300 328

(Article 3.2 of R&TTE Directive)

MET Report: EMCS30565-ETS328

October 26, 2011

Prepared For:

Ubiquiti Networks, Inc.
91 E. Tasman
San Jose, CA 95134

Prepared By:
MET Laboratories, Inc.
3162 Belick St.
Santa Clara, CA 95054

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MET Report: EMCS30565-ETS328

Lionel Gabrillo, Project Engineer
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 ETSI EN 300 328 of the EU Rules under normal use and maintenance.

Shawn McMillen,
Wireless Manager, Electromagnetic Compatibility Lab

Draft Status Sheet

Draft Revision	Draft Date	Reason for Draft Revision
∅	October 26, 2011	Draft Issue.

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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
CISPR	**C**omite **I**nternational **S**pecial des **P**erturbations **R**adioelectriques (International Special Committee on Radio Interference)
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	**micro**Henry
µF	**micro**Farad
µs	**micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Requirements Summary

A. Requirements Summary

ETSI EN 300 328 Section Number	Descriptive Name	Compliance			Comments
		Yes	No	N/A	
Sections 4.3.1	Maximum Transmit Power	✓			The EUT met this requirement.
Sections 4.3.2	Maximum EIRP Spectral Density	✓			The EUT met this requirement.t
Sections 4.3.3	Frequency Range	✓			The EUT met this requirement.
Sections 4.3.5	Medium Access Protocol	✓			The EUT met this requirement.
Sections 4.3.6	Conducted Transmitter Spurious Emissions	✓			The EUT met this requirement.
	Radiated Transmitter Spurious Emissions	✓			The EUT met this requirement.
Sections 4.3.7	Conducted Receiver Spurious Emissions	✓			The EUT met this requirement.
	Radiated Receiver Spurious Emissions	✓			The EUT met this requirement.

Table 1. Summary of EMC ETSI EN 300 328 (Article 3.2 of R&TTE Directive) Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Ubiquiti Networks, Inc. to perform testing on a NanoStationLocoM2.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Ubiquiti Networks, Inc. model NanoStationLocoM2.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	NanoStationLocoM2
Model(s) Number:	NanoStationLocoM2
EUT Specifications:	Primary Power: 110-240 VAC, 50-60 Hz
	Frequency Range: 2412-2472MHz
Lab Ambient (Normal) Test Conditions:	Temperature: 15-35º C
	Relative Humidity: 30-60%
	Atmospheric Pressure: 860-1060 mbar
Extreme Test Conditions:	Temperature: -20 to + 70º C
	Relative Humidity: 30-60%
Evaluated by:	Lionel Gabrillo
Report Date(s):	October 26, 2011

B. References

ETSI EN 300 328 V1.7.1 (2006-10)	Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; data transmission equipment in the 2.4 GHz ISM band and using spread spectrum modulation techniques; Part1: Technical characteristics and test conditions

Table 2. Test References

C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick St., Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

D. Description of Test Sample

The Ubiquiti Networks, Inc. NanoStationLocoM2, Equipment Under Test (EUT), is a 2.4GHz Hi Power 2x2 MIMO.

Photograph 1. Front View of EUT

E. Equipment Configuration

Name / Description	Model Number	Serial Number
Power Supply (Cetus)	CPWA240500US	POEZC101126181008
Power Supply (GME)	UBI-POE-24-5	0912-0009854
LocoM2 (Radiated Sample)	M2L	00156D9E19BF
LocoM2 (Conducted Sample)	M2L	00156D9E1967

Table 3. Equipment Configuration

F. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Name / Description	Manufacturer	Model Number	Serial Number
Laptop	Dell	Vostro 1510	4953929473

Table 4. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port Name on EUT	Cable Description	Qty.	Length (m)	Shielded (Y/N)	Termination Point
1	LAN	Ethernet	1	10	Y	PSU – POE port
1	PSU - POE	Ethernet	1	10	Y	A, Main
2	PSU - LAN	Ethernet	1	10	Y	Laptop
3	AC port	AC Cable	1	0.5	Y	100-240VAC Source

Table 5. Ports and Cabling Information

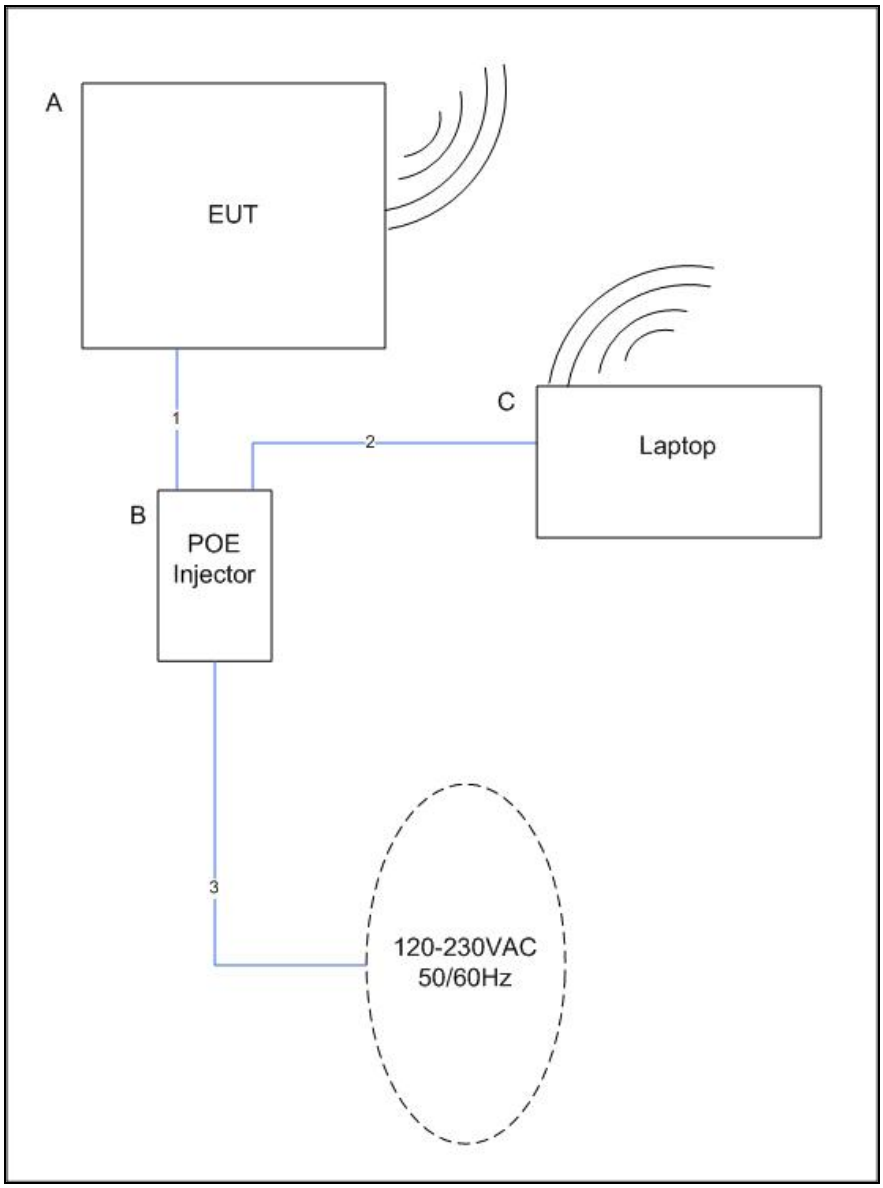


Figure 1. Block Diagram of Test Configuration

H. Mode of Operation

Transmit 1-11Mbps at 802.11b mode and 6-54Mbps at 802.11g/n modes @2.4GHz.

I. Method of Monitoring EUT Operation

IP connectivity is maintained with the EUT. If IP connectivity is lost, EUT connectivity shall be re-established upon power up or re-boot.

J. Modifications

a) Modifications to EUT

No modifications to the EUT

b) Modifications to Test Standard

No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Ubiquiti Networks, Inc. upon completion of testing.

III. Conformance Requirements

Conformance Requirements

4.3.1 Maximum Transmit Power

Test Requirement(s): **ETSI EN 300 328-1, Clause 4.3.1:**

4.3.1.1 Definition

The maximum transmit power is defined as the maximum isotropic radiated power of the equipment.

4.3.1.2 Limit

The equivalent isotropic radiated power (e.i.r.p.) shall be equal to or less than -10 dBW (100 mW). This limit shall apply for any combination of power level and intended antenna assembly.

Test Procedure: Measurements were carried out in all modulations available and at the low, mid and high channels of the transmit band. Both normal and extreme test conditions were observed. The EIRP was calculated from the following equation:

P = A + G + 10 log (1/x); where A is the measured power, x is the duty cycle and G is the antenna assembly gain.

Test Results: The EUT as tested was found compliant with the specified limits in clause 4.3.1.2.

Test Engineer: Lionel Gabrillo

Test Date: 10/07/11

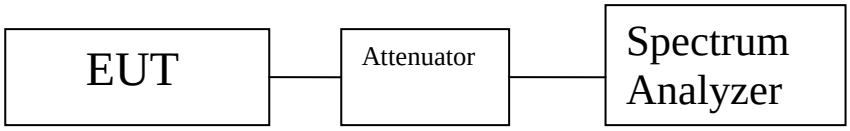


Figure 2. Maximum Transmit Power

Maximum Transmit Power (EIRP) Test Results

Maximum Average Power Under Normal and Extreme Conditions							
Channel (MHz)		Temperature (C)	Voltage AC	Mode DSSS	Conducted Power (dBm) dBm	Antenna Gain (dBi) dBi	EIRP dBm
2412	Low	20	230	802.11b	7.55	8	15.55
2442	Mid	20	230	802.11b	7.13	8	15.13
2472	High	20	230	802.11b	5.35	8	13.35
2412	Low	70	207	802.11b	3.76	8	11.76
2412	Low	70	253	802.11b	3.73	8	11.73
2442	Mid	70	207	802.11b	2.14	8	10.14
2442	Mid	70	253	802.11b	2.17	8	10.17
2472	High	70	207	802.11b	-3.16	8	4.84
2472	High	70	253	802.11b	-3.32	8	4.68
2412	Low	-20	207	802.11b	11.72	8	19.72
2412	Low	-20	253	802.11b	11.51	8	19.51
2442	Mid	-20	207	802.11b	11.78	8	19.78
2442	Mid	-20	253	802.11b	11.89	8	19.89
2472	High	-20	207	802.11b	11.86	8	19.86
2472	High	-20	253	802.11b	11.82	8	19.82

Table 6. EIRP, Test Results, 802.11b

Maximum Average Power Under Normal and Extreme Conditions							
Channel (MHz)		Temperature (C)	Voltage AC	Mode DSSS	Conducted Power (dBm) dBm	Antenna Gain (dBi) dBi	EIRP dBm
2412	Low	20	230	802.11g 20MHz	8.70	8	16.70
2442	Mid	20	230	802.11g 20MHz	7.89	8	15.89
2472	High	20	230	802.11g 20MHz	4.64	8	12.64
2412	Low	70	207	802.11g 20MHz	5.25	8	13.25
2412	Low	70	253	802.11g 20MHz	5.28	8	13.28
2442	Mid	70	207	802.11g 20MHz	3.38	8	11.38
2442	Mid	70	253	802.11g 20MHz	3.36	8	11.36
2472	High	70	207	802.11g 20MHz	-4.34	8	3.67
2472	High	70	253	802.11g 20MHz	-4.21	8	3.80
2412	Low	-20	207	802.11g 20MHz	11.61	8	19.61
2412	Low	-20	253	802.11g 20MHz	11.94	8	19.94
2442	Mid	-20	207	802.11g 20MHz	11.67	8	19.67
2442	Mid	-20	253	802.11g 20MHz	11.73	8	19.73
2472	High	-20	207	802.11g 20MHz	8.57	8	16.57
2472	High	-20	253	802.11g 20MHz	8.65	8	16.65

Table 7. EIRP, Test Results, 802.11g 20 MHz

Maximum Average Power Under Normal and Extreme Conditions							
Channel (MHz)		Temperature (C)	Voltage AC	Mode DSSS	Conducted Power (dBm) dBm	Antenna Gain (dBi) dBi	EIRP dBm
2412	Low	20	230	802.11g 20MHz	8.70	8	16.70
2442	Mid	20	230	802.11g 20MHz	7.89	8	15.89
2472	High	20	230	802.11g 20MHz	4.64	8	12.64
2412	Low	70	207	802.11g 20MHz	5.25	8	13.25
2412	Low	70	253	802.11g 20MHz	5.28	8	13.28
2442	Mid	70	207	802.11g 20MHz	3.38	8	11.38
2442	Mid	70	253	802.11g 20MHz	3.36	8	11.36
2472	High	70	207	802.11g 20MHz	-4.34	8	3.67
2472	High	70	253	802.11g 20MHz	-4.21	8	3.80
2412	Low	-20	207	802.11g 20MHz	11.61	8	19.61
2412	Low	-20	253	802.11g 20MHz	11.94	8	19.94
2442	Mid	-20	207	802.11g 20MHz	11.67	8	19.67
2442	Mid	-20	253	802.11g 20MHz	11.73	8	19.73
2472	High	-20	207	802.11g 20MHz	8.57	8	16.57
2472	High	-20	253	802.11g 20MHz	8.65	8	16.65

Table 8. EIRP, Test Results, 802.11g 20 MHz

Maximum Average Power Under Normal and Extreme Conditions							
Channel (MHz)		Temperature (C)	Voltage AC	Mode DSSS	Conducted Power (dBm) dBm	Antenna Gain (dBi) dBi	EIRP dBm
2412	Low	20	230	HT5	10.04	8	18.04
2442	Mid	20	230	HT5	9.14	8	17.14
2472	High	20	230	HT5	9.05	8	17.05
2412	Low	70	207	HT5	5.58	8	13.58
2412	Low	70	253	HT5	5.32	8	13.32
2442	Mid	70	207	HT5	4.21	8	12.21
2442	Mid	70	253	HT5	4.01	8	12.01
2472	High	70	207	HT5	-0.43	8	7.57
2472	High	70	253	HT5	-0.48	8	7.52
2412	Low	-20	207	HT5	11.71	8	19.71
2412	Low	-20	253	HT5	11.85	8	19.85
2442	Mid	-20	207	HT5	11.97	8	19.97
2442	Mid	-20	253	HT5	11.93	8	19.93
2472	High	-20	207	HT5	11.65	8	19.65
2472	High	-20	253	HT5	11.59	8	19.59

Table 9. EIRP, Test Results, HT5

Maximum Average Power Under Normal and Extreme Conditions							
Channel (MHz)		Temperature (C)	Voltage AC	Mode DSSS	Conducted Power (dBm) dBm	Antenna Gain (dBi) dBi	EIRP dBm
2412	Low	20	230	HT8	9.74	8	17.74
2442	Mid	20	230	HT8	9.29	8	17.29
2472	High	20	230	HT8	10.09	8	18.09
2412	Low	70	207	HT8	4.85	8	12.85
2412	Low	70	253	HT8	4.76	8	12.76
2442	Mid	70	207	HT8	3.49	8	11.49
2442	Mid	70	253	HT8	3.95	8	11.95
2472	High	70	207	HT8	0.35	8	8.35
2472	High	70	253	HT8	0.61	8	8.61
2412	Low	-20	207	HT8	11.28	8	19.28
2412	Low	-20	253	HT8	11.51	8	19.51
2442	Mid	-20	207	HT8	11.32	8	19.32
2442	Mid	-20	253	HT8	11.85	8	19.85
2472	High	-20	207	HT8	11.76	8	19.76
2472	High	-20	253	HT8	11.87	8	19.87

Table 10. EIRP, Test Results, HT8

Maximum Average Power Under Normal and Extreme Conditions							
Channel (MHz)		Temperature (C)	Voltage AC	Mode DSSS	Conducted Power (dBm) dBm	Antenna Gain (dBi) dBi	EIRP dBm
2412	Low	20	230	HT10	9.93	8	17.93
2442	Mid	20	230	HT10	9.26	8	17.26
2472	High	20	230	HT10	8.91	8	16.91
2412	Low	70	207	HT10	5.59	8	13.59
2412	Low	70	253	HT10	5.38	8	13.38
2442	Mid	70	207	HT10	3.89	8	11.89
2442	Mid	70	253	HT10	3.68	8	11.68
2472	High	70	207	HT10	-0.47	8	7.53
2472	High	70	253	HT10	-0.69	8	7.31
2412	Low	-20	207	HT10	11.73	8	19.73
2412	Low	-20	253	HT10	11.45	8	19.45
2442	Mid	-20	207	HT10	11.93	8	19.93
2442	Mid	-20	253	HT10	11.75	8	19.75
2472	High	-20	207	HT10	11.77	8	19.77
2472	High	-20	253	HT10	11.67	8	19.67

Table 11. EIRP, Test Results, HT10

Maximum Average Power Under Normal and Extreme Conditions							
Channel (MHz)		Temperature (C)	Voltage AC	Mode DSSS	Conducted Power (dBm) dBm	Antenna Gain (dBi) dBi	EIRP dBm
2412	Low	20	230	HT20	9.91	8	17.91
2442	Mid	20	230	HT20	9.52	8	17.52
2472	High	20	230	HT20	6.19	8	14.19
2412	Low	70	207	HT20	5.15	8	13.15
2412	Low	70	253	HT20	5.22	8	13.22
2442	Mid	70	207	HT20	3.99	8	11.99
2442	Mid	70	253	HT20	3.95	8	11.95
2472	High	70	207	HT20	-3.48	8	4.52
2472	High	70	253	HT20	-3.47	8	4.53
2412	Low	-20	207	HT20	11.86	8	19.86
2412	Low	-20	253	HT20	11.52	8	19.52
2442	Mid	-20	207	HT20	11.65	8	19.65
2442	Mid	-20	253	HT20	11.83	8	19.83
2472	High	-20	207	HT20	8.74	8	16.74
2472	High	-20	253	HT20	8.62	8	16.62

Table 12. EIRP, Test Results, HT20

Maximum Average Power Under Normal and Extreme Conditions							
Channel (MHz)		**Temperature (C)**	**Voltage AC**	**Mode DSSS**	**Conducted Power (dBm) dBm**	**Antenna Gain (dBi) dBi**	**EIRP dBm**
2422	Low	20	230	HT30	8.62	8	16.62
2442	Mid	20	230	HT30	8.62	8	16.62
2462	High	20	230	HT30	6.30	8	14.30
2422	Low	70	207	HT30	5.15	8	13.15
2422	Low	70	253	HT30	5.22	8	13.22
2442	Mid	70	207	HT30	4.57	8	12.57
2442	Mid	70	253	HT30	4.76	8	12.76
2462	High	70	207	HT30	2.87	8	10.87
2462	High	70	253	HT30	2.60	8	10.60
2422	Low	-20	207	HT30	11.43	8	19.43
2422	Low	-20	253	HT30	11.94	8	19.94
2442	Mid	-20	207	HT30	11.65	8	19.65
2442	Mid	-20	253	HT30	11.71	8	19.71
2462	High	-20	207	HT30	9.50	8	17.50
2462	High	-20	253	HT30	9.43	8	17.43

Table 13. EIRP, Test Results, HT30

Maximum Average Power Under Normal and Extreme Conditions							
Channel (MHz)		**Temperature (C)**	**Voltage AC**	**Mode DSSS**	**Conducted Power (dBm) dBm**	**Antenna Gain (dBi) dBi**	**EIRP dBm**
2422	Low	20	230	HT40	7.77	8	15.77
2442	Mid	20	230	HT40	8.76	8	16.76
2462	High	20	230	HT40	5.93	8	13.93
2422	Low	70	207	HT40	4.98	8	12.98
2422	Low	70	253	HT40	4.87	8	12.87
2442	Mid	70	207	HT40	4.97	8	12.97
2442	Mid	70	253	HT40	5.30	8	13.30
2462	High	70	207	HT40	1.49	8	9.49
2462	High	70	253	HT40	1.37	8	9.37
2422	Low	-20	207	HT40	11.32	8	19.32
2422	Low	-20	253	HT40	11.38	8	19.38
2442	Mid	-20	207	HT40	11.66	8	19.66
2442	Mid	-20	253	HT40	11.81	8	19.81
2462	High	-20	207	HT40	9.80	8	17.80
2462	High	-20	253	HT40	9.71	8	17.71

Table 14. EIRP, Test Results, HT40

Conformance Requirements

4.3.2 Maximum EIRP Spectral Density

Test Requirement(s): **ETSI EN 300 328 Section 4.3.2:**

4.3.2.1 Definition
The maximum EIRP spectral density is defined as the highest EIRP level in Watts per Hertz generated by the transmitter within the power envelope.

4.3.2.2 Limit
For wide band modulations other than FHSS (e.g. DSSS, OFDM, etc.), the maximum EIRP spectral density is limited to 10 mW per MHz.

Test Procedure: Option 1 was used to measure the power (A). The maximum spectral power density EIRP was determined using the following equation:
P = A + G + 10 log (1/x); where A is the measured power, x is the duty cycle and G is the antenna assembly gain.

A positive 18 dB offset was programmed into SA to account for 8 dBi antenna and 10 dB Attenuator.

Test Results: The EUT as tested was found compliant with the specified limits of Clause 4.3.2.2.

Maximum SPD <= 10mW (10 dBm) per MHz EIRP in Normal Test Condition, SPD = Spectral Power Density.

Test Engineer: Lionel Gabrillo

Test Date: 10/18/11

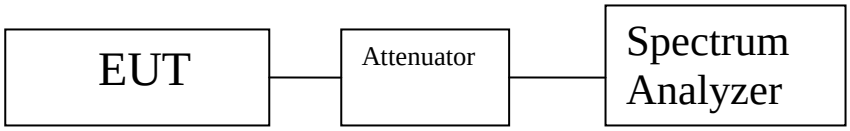
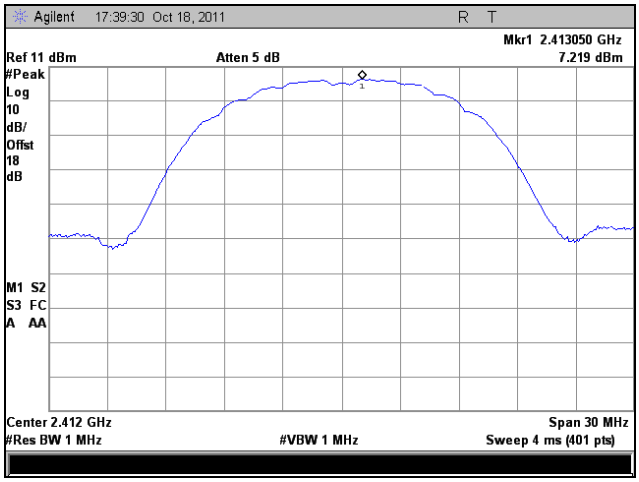


Figure 3. Maximum Spectral Density

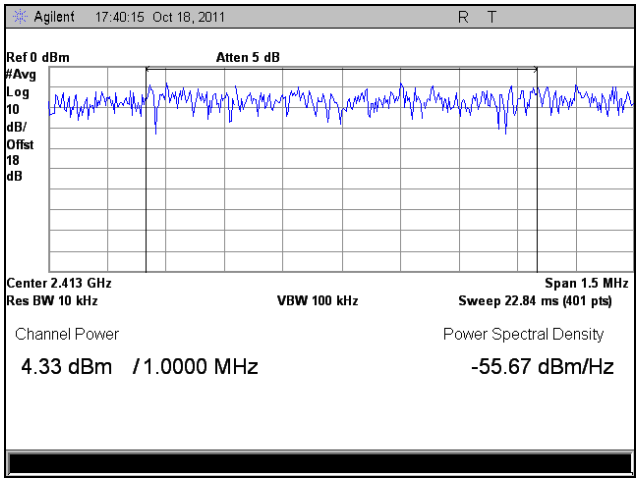
Power Spectral Density					
Channel (MHz)		**Mode OFDM**	**Measured Power Density (OP + AG) dBm**	**Limit dBm**	**Margin dB**
2412	Low	802.11b	4.33	10.00	-5.67
2442	Mid	802.11b	3.85	10.00	-6.15
2472	High	802.11b	2.98	10.00	-7.02
2412	Low	802.11g 20MHz	2.76	10.00	-7.24
2442	Mid	802.11g 20MHz	1.54	10.00	-8.46
2472	High	802.11g 20MHz	-1.21	10.00	-11.21
2412	Low	HT5	7.05	10.00	-2.95
2442	Mid	HT5	6.09	10.00	-3.91
2472	High	HT5	5.36	10.00	-4.64
2412	Low	HT8	5.25	10.00	-4.75
2442	Mid	HT8	4.93	10.00	-5.07
2472	High	HT8	4.5	10.00	-5.50
2412	Low	HT10	4.72	10.00	-5.28
2442	Mid	HT10	4.06	10.00	-5.94
2472	High	HT10	4.68	10.00	-5.32
2412	Low	HT20	2.63	10.00	-7.37
2442	Mid	HT20	2.23	10.00	-7.77
2472	High	HT20	-2.11	10.00	-12.11
2422	Low	HT30	-1.38	10.00	-11.38
2442	Mid	HT30	0.41	10.00	-9.59
2462	High	HT30	0.27	10.00	-9.73
2422	Low	HT40	-0.75	10.00	-10.75
2442	Mid	HT40	-0.79	10.00	-10.79
2472	High	HT40	-2.36	10.00	-12.36

Table 15. Peak Spectral Density, Test Results

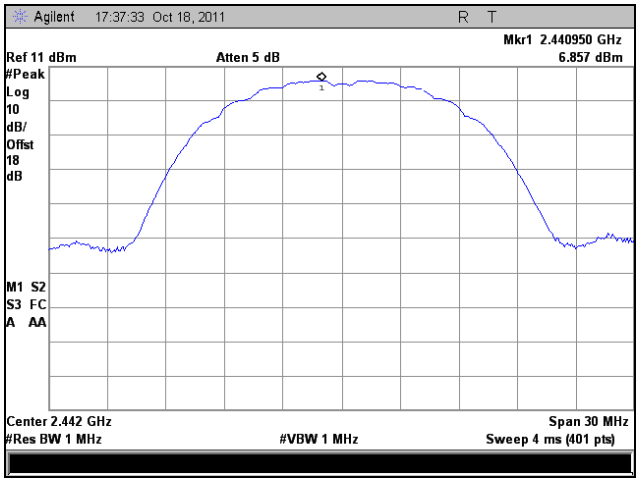
Maximum EIRP Spectral Density, Test Results, 802.11b



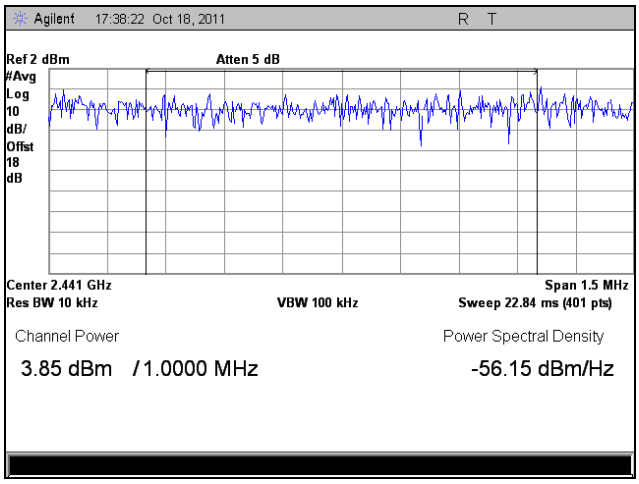
Plot 1. Peak Spectral Density, Low Channel, Determination, 802.11b



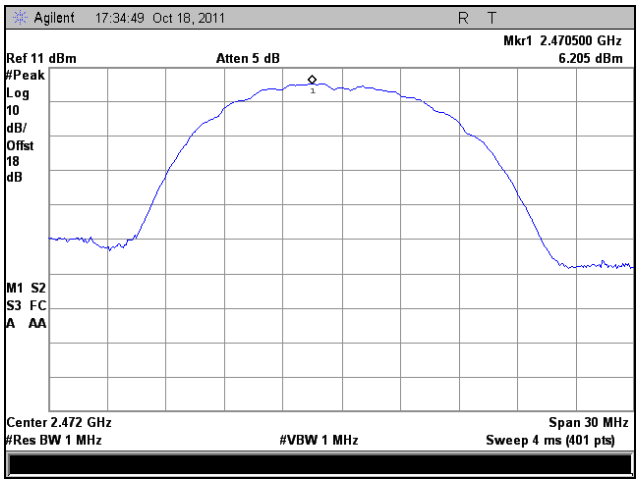
Plot 2. Peak Spectral Density, Low Channel, 802.11b



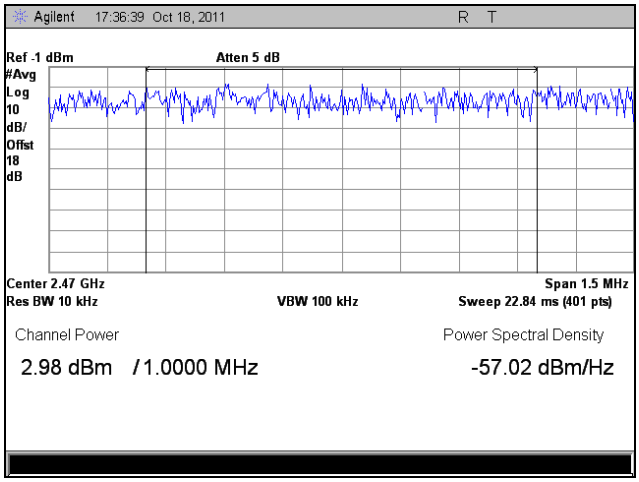
Plot 3. Peak Spectral Density, Mid Channel, Determination, 802.11b



Plot 4. Peak Spectral Density, Mid Channel, 802.11b

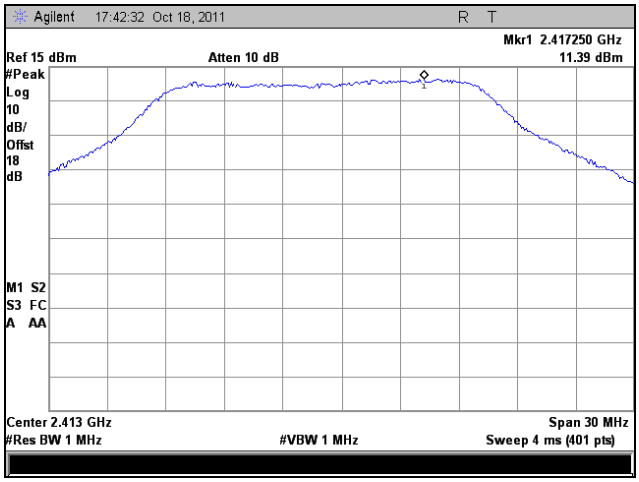


Plot 5. Peak Spectral Density, High Channel, Determination, 802.11b

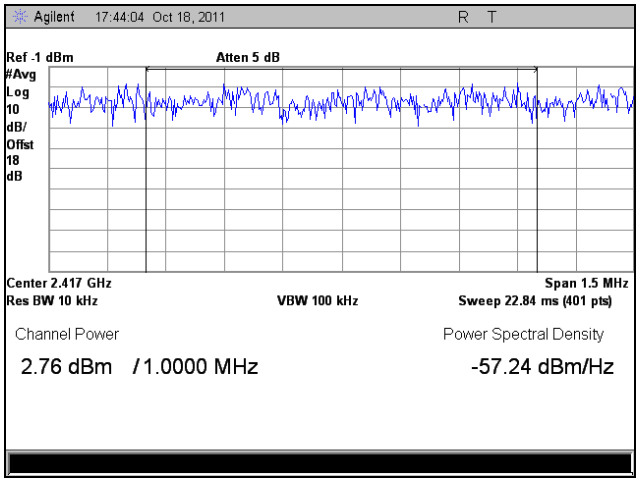


Plot 6. Peak Spectral Density, High Channel, 802.11b

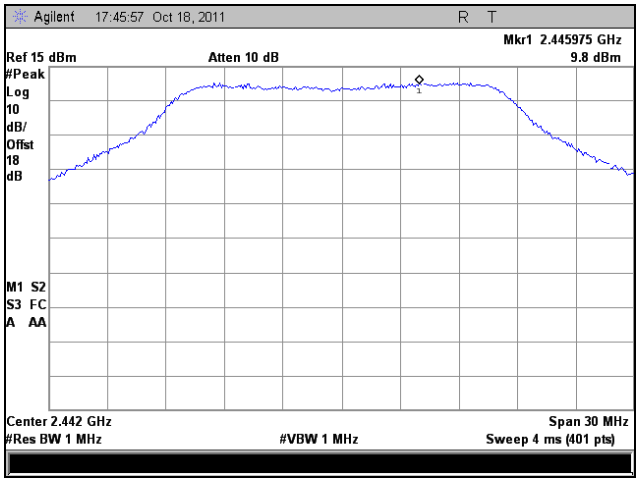
Maximum EIRP Spectral Density, Test Results, 802.11g



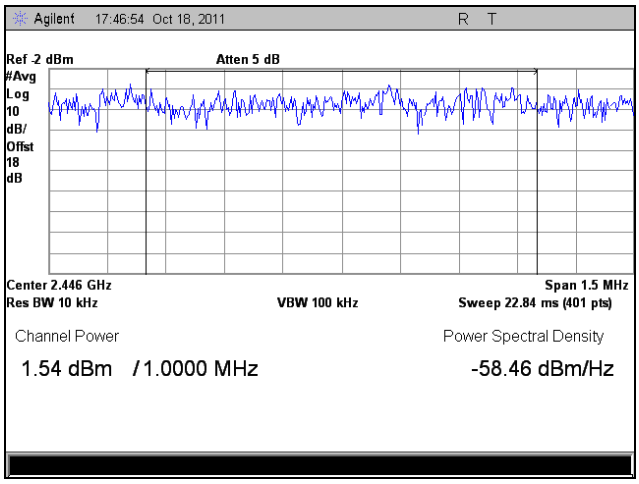
Plot 7. Peak Spectral Density, Low Channel, Determination, 802.11g



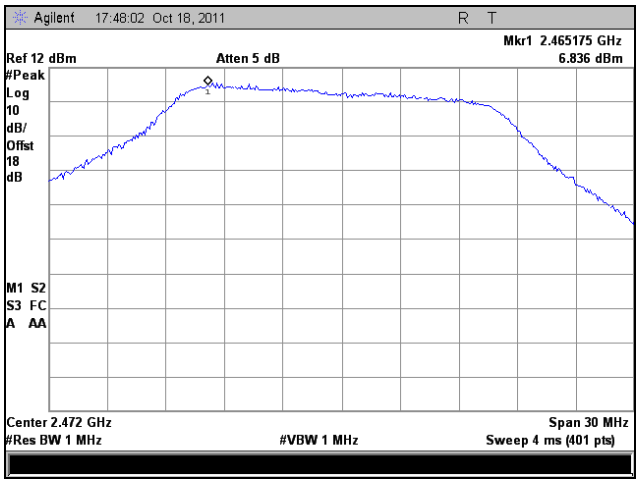
Plot 8. Peak Spectral Density, Low Channel, 802.11g



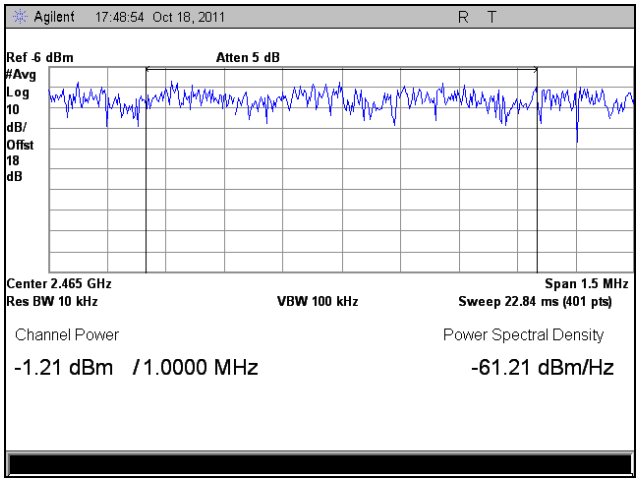
Plot 9. Peak Spectral Density, Mid Channel, Determination, 802.11g



Plot 10. Peak Spectral Density, Mid Channel, 802.11g

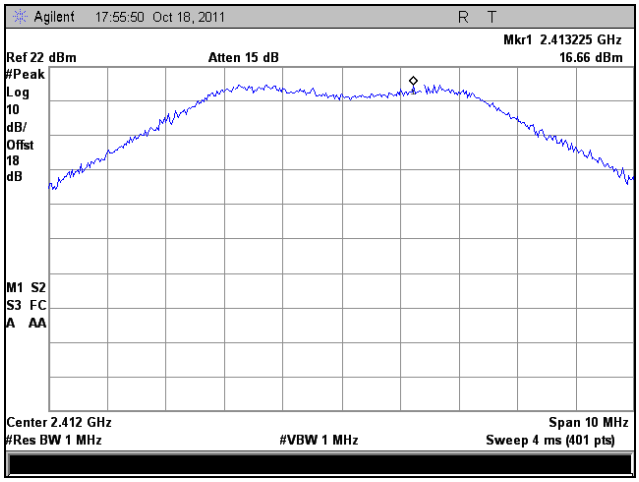


Plot 11. Peak Spectral Density, High Channel, Determination, 802.11g

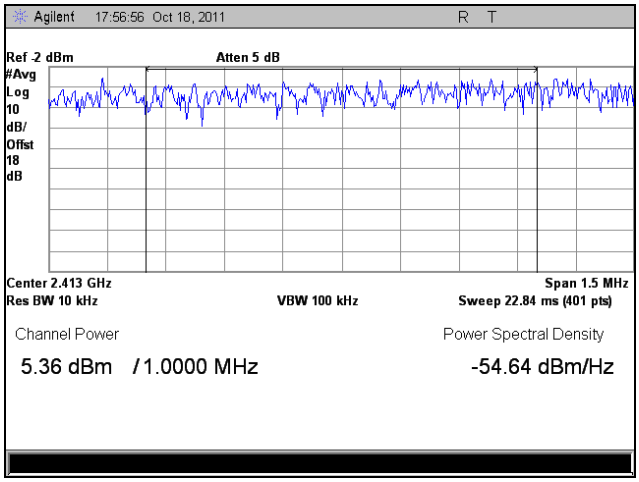


Plot 12. Peak Spectral Density, High Channel, 802.11g

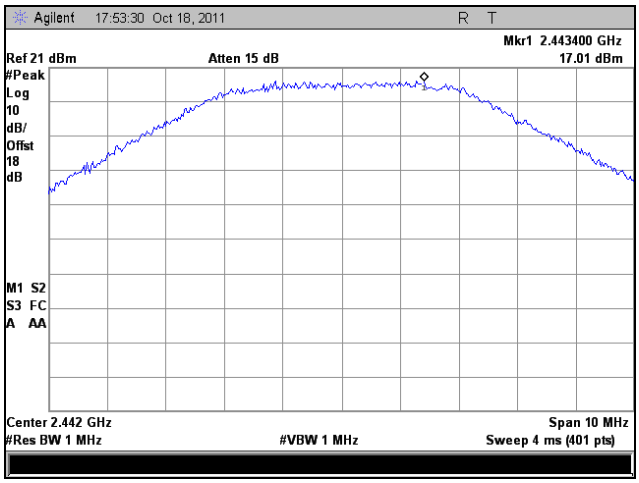
Maximum EIRP Spectral Density, Test Results, HT5



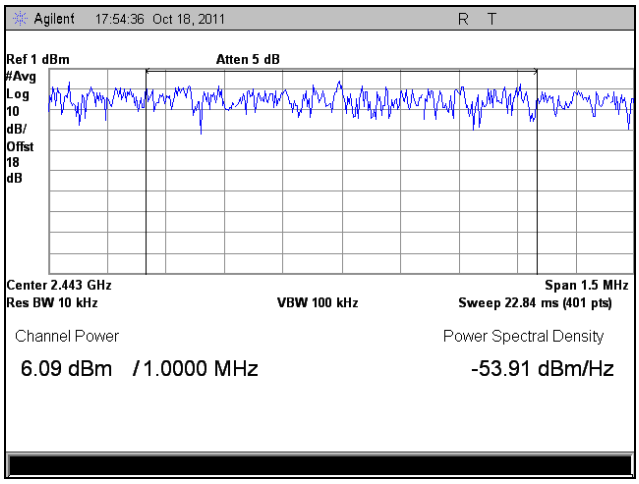
Plot 13. Peak Spectral Density, Low Channel, Determination, HT5



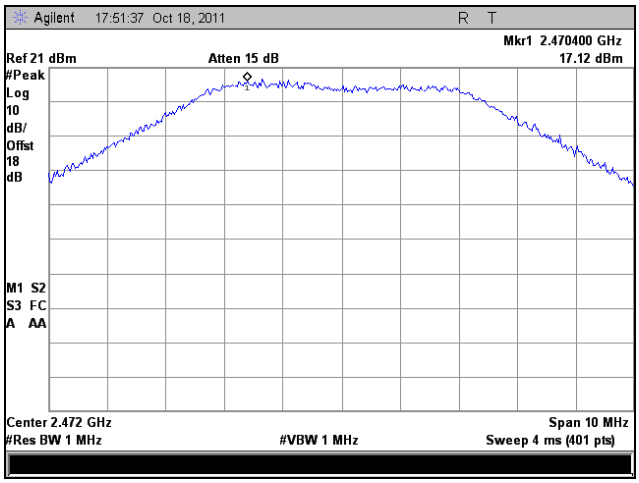
Plot 14. Peak Spectral Density, Low Channel, HT5



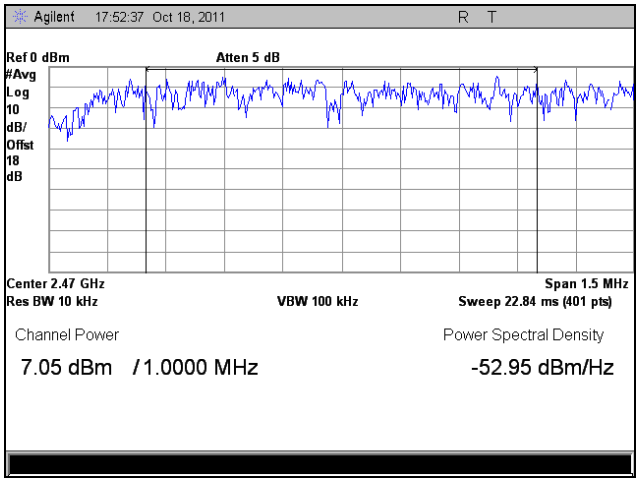
Plot 15. Peak Spectral Density, Mid Channel, Determination, HT5



Plot 16. Peak Spectral Density, Mid Channel, HT5

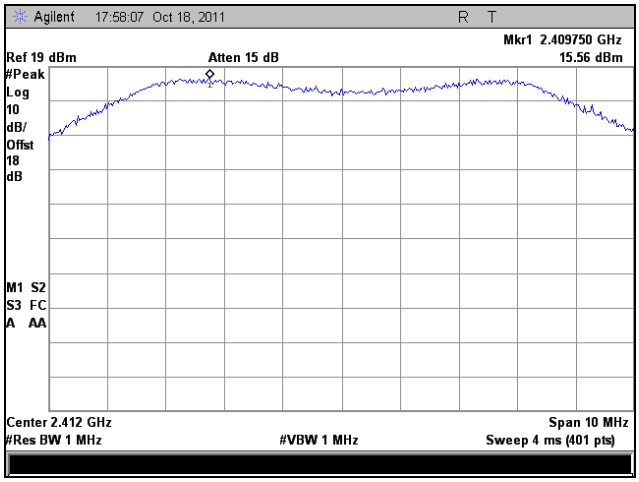


Plot 17. Peak Spectral Density, High Channel, Determination, HT5

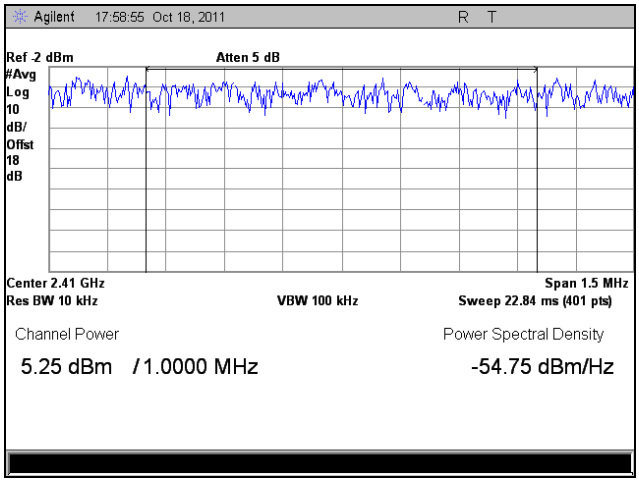


Plot 18. Peak Spectral Density, High Channel, HT5

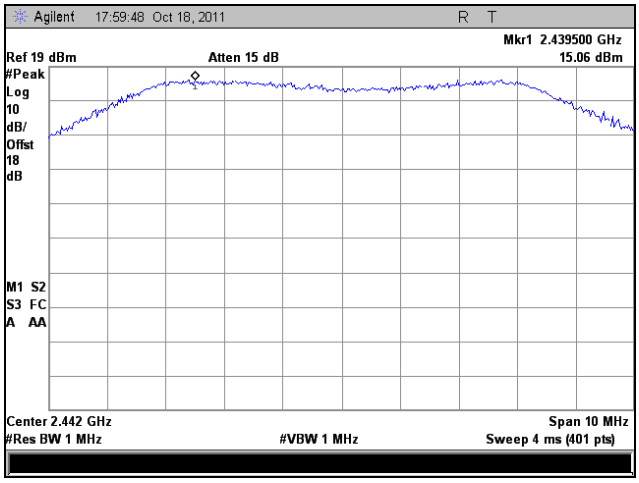
Maximum EIRP Spectral Density, Test Results, HT8



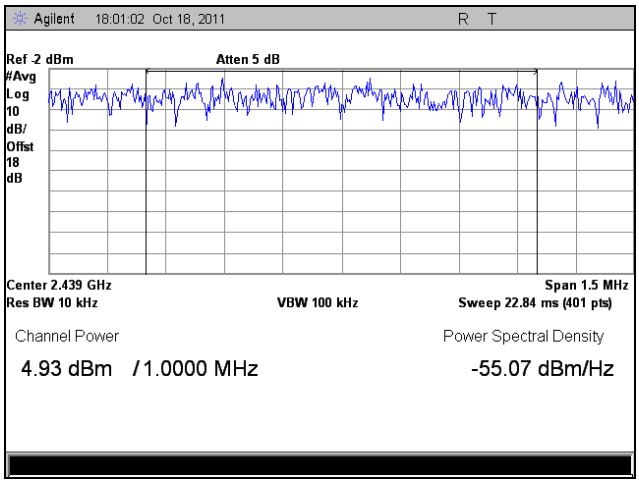
Plot 19. Peak Spectral Density, Low Channel, Determination, HT8



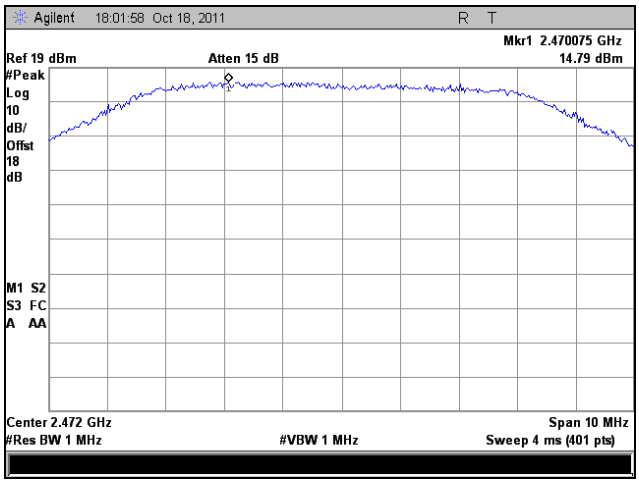
Plot 20. Peak Spectral Density, Low Channel, HT8



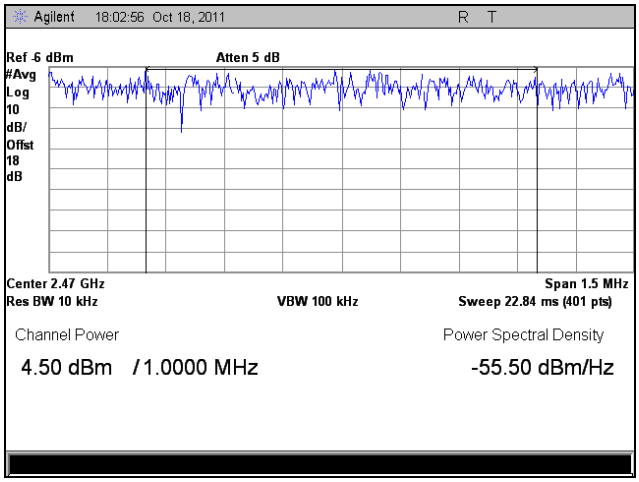
Plot 21. Peak Spectral Density, Mid Channel, Determination, HT8



Plot 22. Peak Spectral Density, Mid Channel, HT8

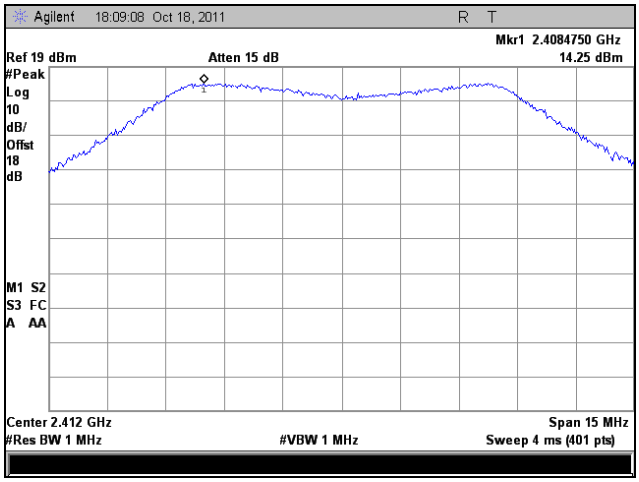


Plot 23. Peak Spectral Density, High Channel, Determination, HT8

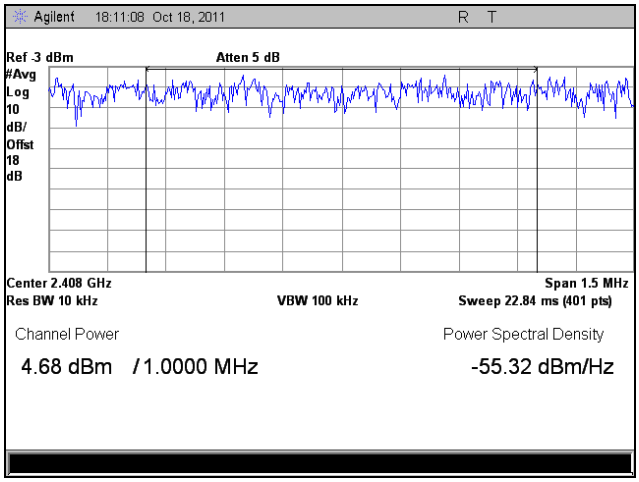


Plot 24. Peak Spectral Density, High Channel, HT8

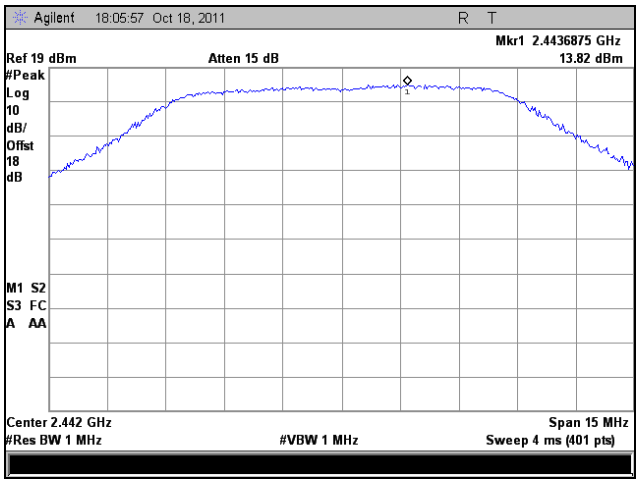
Maximum EIRP Spectral Density, Test Results, HT10



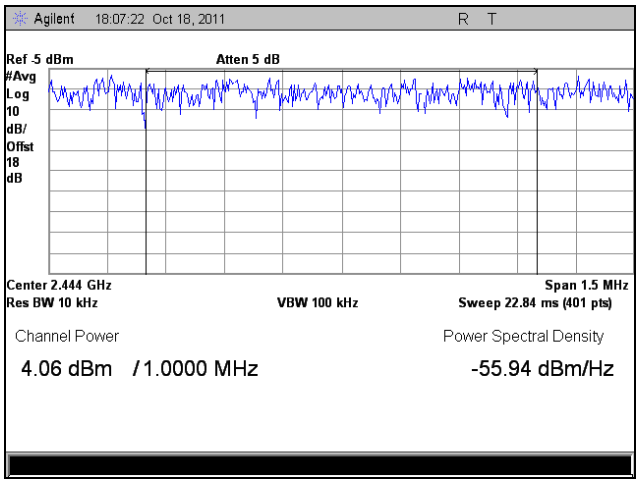
Plot 25. Peak Spectral Density, Low Channel, Determination, HT10



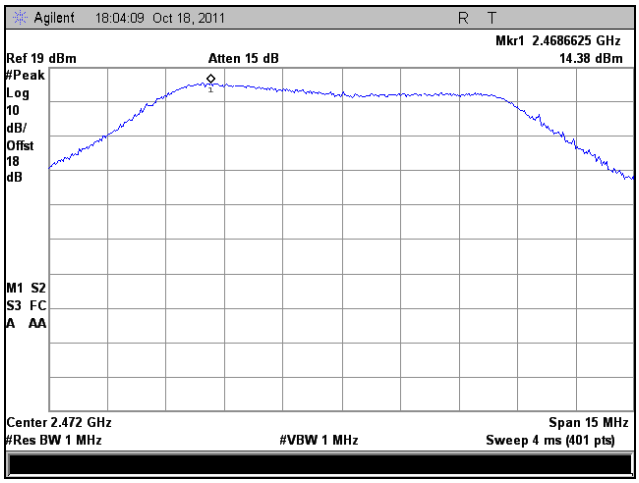
Plot 26. Peak Spectral Density, Low Channel, HT10



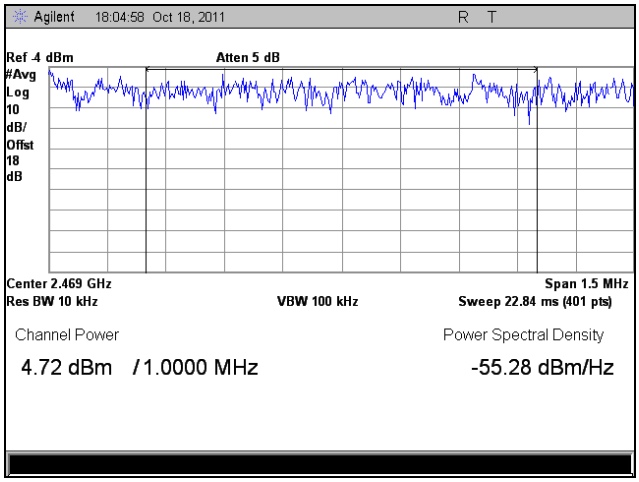
Plot 27. Peak Spectral Density, Mid Channel, Determination, HT10



Plot 28. Peak Spectral Density, Mid Channel, HT10

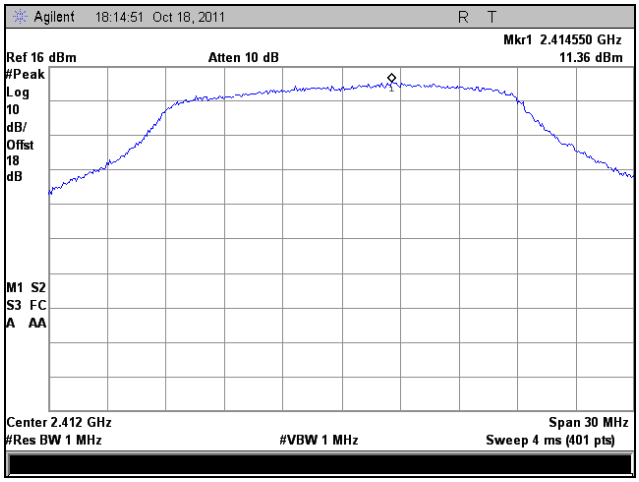


Plot 29. Peak Spectral Density, High Channel, Determination, HT10

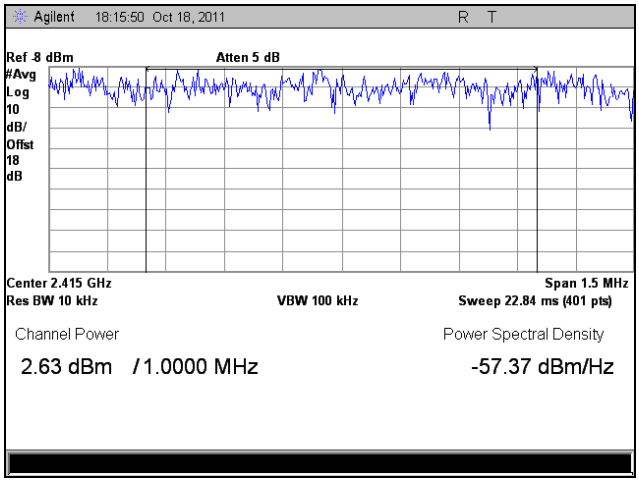


Plot 30. Peak Spectral Density, High Channel, HT10

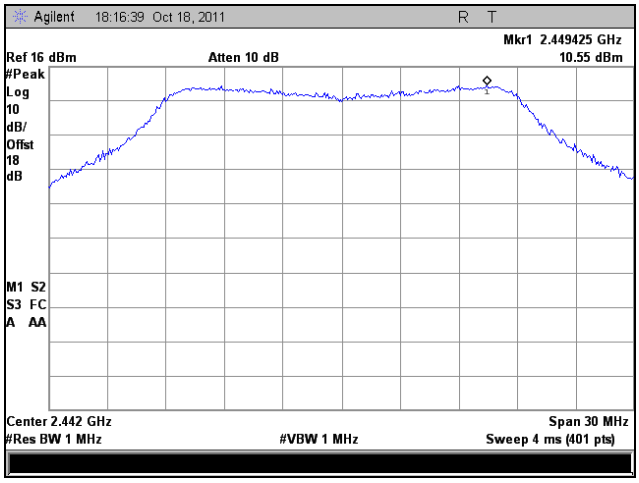
Maximum EIRP Spectral Density, Test Results, HT20



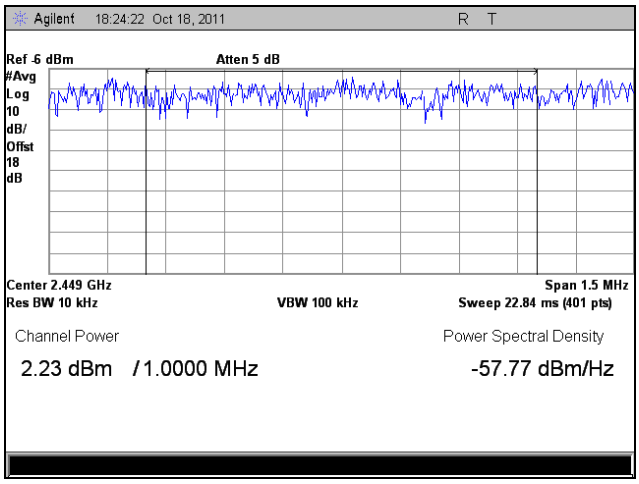
Plot 31. Peak Spectral Density, Low Channel, Determination, HT20



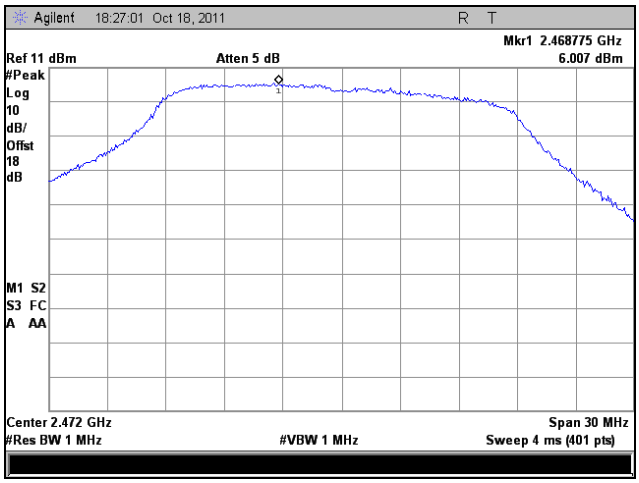
Plot 32. Peak Spectral Density, Low Channel, HT20



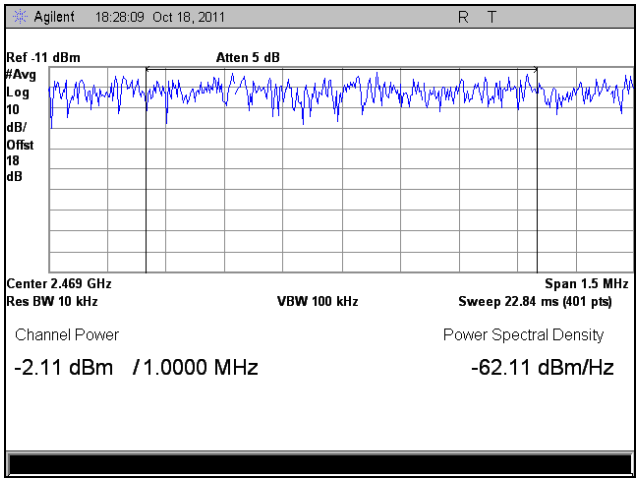
Plot 33. Peak Spectral Density, Mid Channel, Determination, HT20



Plot 34. Peak Spectral Density, Mid Channel, HT20

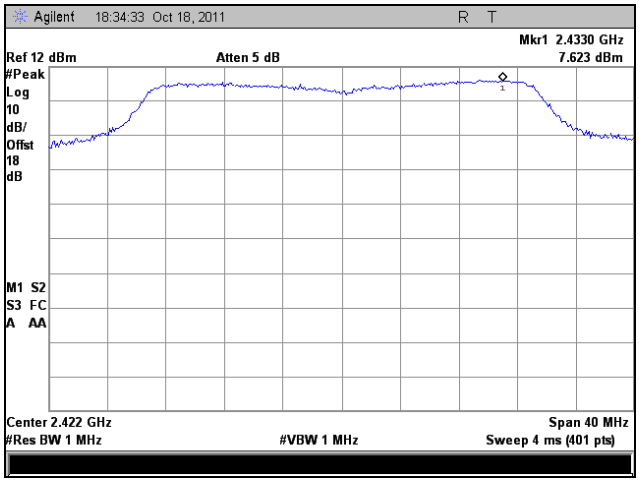


Plot 35. Peak Spectral Density, High Channel, Determination, HT20

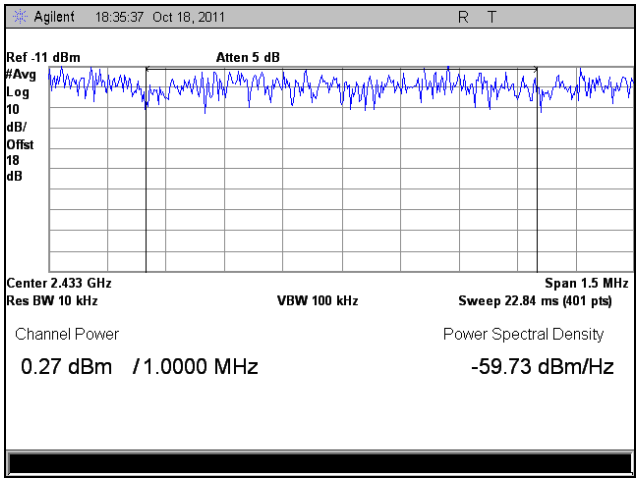


Plot 36. Peak Spectral Density, High Channel, HT20

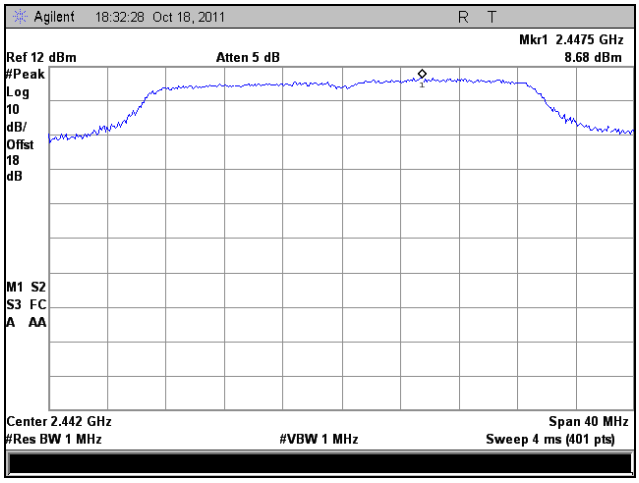
Maximum EIRP Spectral Density, Test Results, HT30



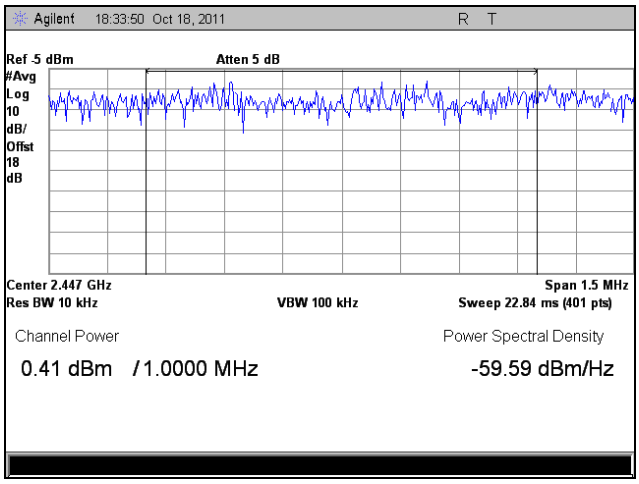
Plot 37. Peak Spectral Density, Low Channel, Determination, HT30



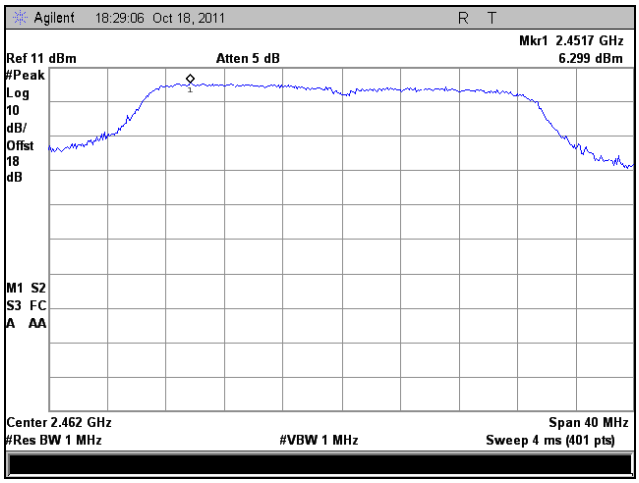
Plot 38. Peak Spectral Density, Low Channel, HT30



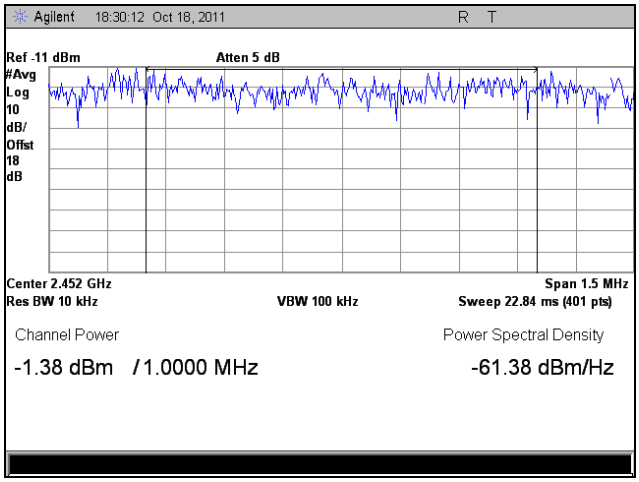
Plot 39. Peak Spectral Density, Mid Channel, Determination, HT30



Plot 40. Peak Spectral Density, Mid Channel, HT30

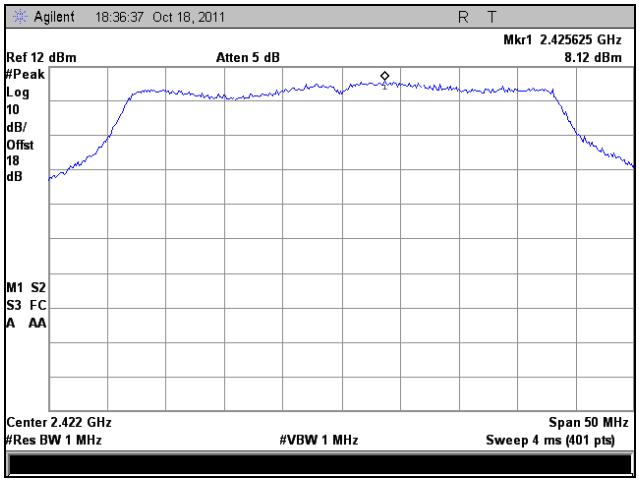


Plot 41. Peak Spectral Density, High Channel, Determination, HT30

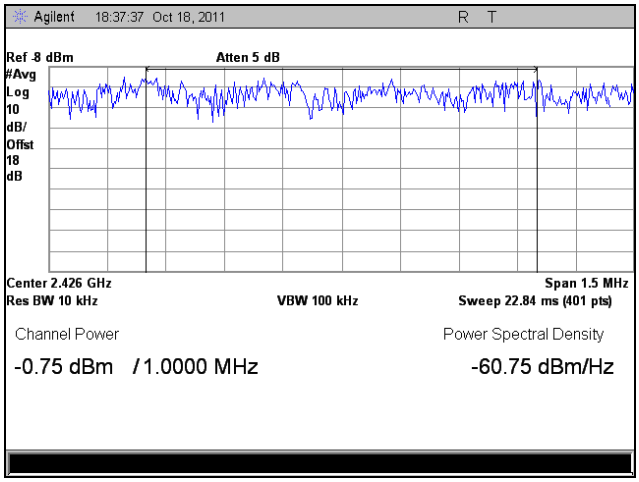


Plot 42. Peak Spectral Density, High Channel, HT30

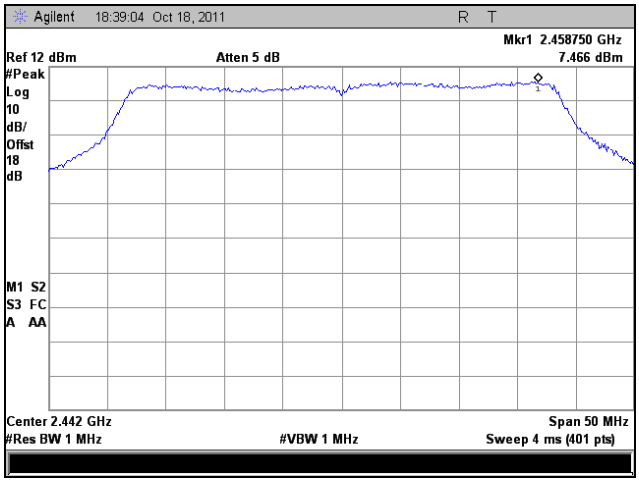
Maximum EIRP Spectral Density, Test Results, HT40



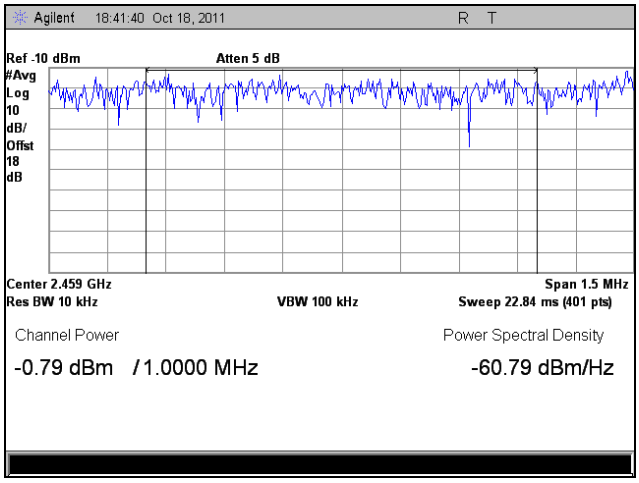
Plot 43. Peak Spectral Density, Low Channel, Determination, HT40



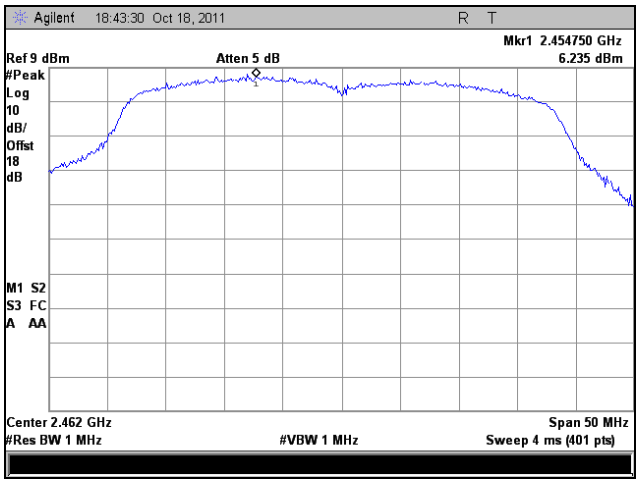
Plot 44. Peak Spectral Density, Low Channel, HT40



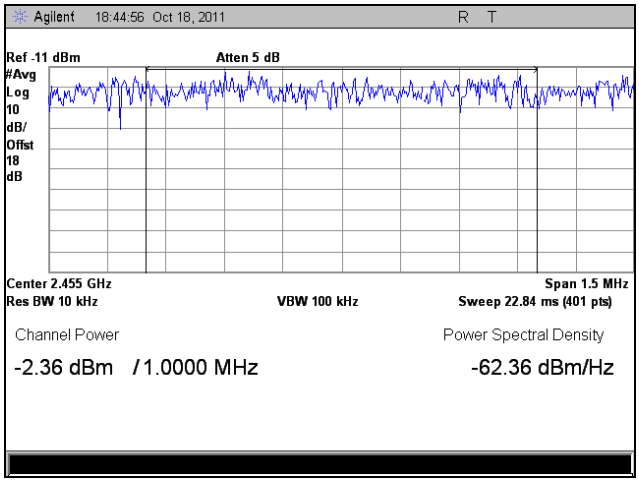
Plot 45. Peak Spectral Density, Mid Channel, Determination, HT40



Plot 46. Peak Spectral Density, Mid Channel, HT40



Plot 47. Peak Spectral Density, High Channel, Determination, HT40



Plot 48. Peak Spectral Density, High Channel, HT40

Conformance Requirements

4.3.3 Frequency Range

Test Requirement(s): **EN 300 328 Clause 4.3.3:**

4.3.3.1 Definition

The frequency range of the equipment is determined by the lowest and highest frequencies occupied by the spectrum envelope.

fH is the highest frequency of the spectrum envelope: it is the frequency furthest above the frequency of maximum power where the EIRP spectral density drops below the level of -80 dBm/Hz (-30 dBm if measured in a 100 kHz bandwidth).

fL is the lowest frequency of the spectrum envelope; it is the frequency furthest below the frequency of maximum power where the EIRP spectral density drops below the level of -80 dBm/Hz (or -30 dBm if measured in a 100 kHz bandwidth).

For a given operating frequency, the width of the spectrum envelope is (*fH* - *fL*). In equipment that allows adjustment or selection of different operating frequencies, the power envelope takes up different positions in the allocated band. The frequency range is determined by the lowest value of *fL* and the highest value of *fH* resulting from the adjustment of the equipment to the lowest and highest operating frequencies.

4.3.3.2 Limit

For all equipment the frequency range shall lie within the band 2.4 GHz to 2.4835 GHz (*fL* > 2.4 GHz and *fH* < 2.4835 GHz).

Test Procedure: Option 1 (using a spectrum analyzer average detector) was used to perform testing. A positive 18 dB offset was programmed into SA to account for 8 dBi antenna and 10 dB Attenuator.

Test Results: The EUT as tested was found compliant with the specified limits of Clause 4.3.3.2.

Test Engineer: Lionel Gabrillo

Test Date: 10/18/11

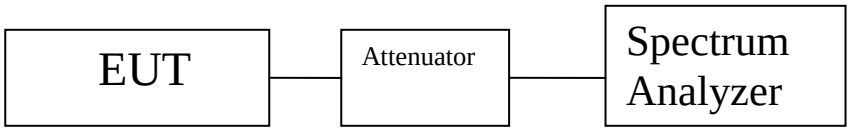


Figure 4. Frequency Range Test Setup

Frequency Range, Test Results

Frequency Range Table							
Temperature (C)	**Voltage AC**	**Mode DSSS**	**Frequency (f_L) MHz**	**Frequency (f_H) MHz**	**Frequency (fH-fL) MHz**	**Limit MHz**	**Margin MHz**
20	230	802.11b	2403.125	2480.580	77.45	83.5	-6.05
70	253	802.11b	2403.375	2479.070	75.70	83.5	-7.80
70	207	802.11b	2403.500	2479.070	75.57	83.5	-7.93
-20	253	802.11b	2402.850	2482.375	79.53	83.5	-3.97
-20	207	802.11b	2402.925	2482.375	79.45	83.5	-4.05

Table 16. Frequency Range, Test Results, 802.11b

Frequency Range Table							
Temperature (C)	**Voltage AC**	**Mode DSSS**	**Frequency (f_L) MHz**	**Frequency (f_H) MHz**	**Frequency (fH-fL) MHz**	**Limit MHz**	**Margin MHz**
20	230	802.11g 20MHz	2401.250	2481.480	80.23	83.5	-3.27
70	253	802.11g 20MHz	2403.125	2480.400	77.28	83.5	-6.22
70	207	802.11g 20MHz	2403.000	2480.400	77.40	83.5	-6.10
-20	253	802.11g 20MHz	2400.000	2483.125	83.13	83.5	-0.38
-20	207	802.11g 20MHz	2400.250	2483.125	82.88	83.5	-0.63

Table 17. Frequency Range, Test Results, 802.11g

Frequency Range Table							
Temperature (C)	**Voltage AC**	**Mode DSSS**	**Frequency (f_L) MHz**	**Frequency (f_H) MHz**	**Frequency (fH-fL) MHz**	**Limit MHz**	**Margin MHz**
20	230	802.11g 40MHz	2408.250	2475.400	67.15	83.5	-16.35
70	253	802.11g 40MHz	2409.525	2474.425	64.90	83.5	-18.60
70	207	802.11g 40MHz	2409.525	2474.425	64.90	83.5	-18.60
-20	253	802.11g 40MHz	2406.525	2478.400	71.88	83.5	-11.63
-20	207	802.11g 40MHz	2406.525	2478.400	71.88	83.5	-11.63

Table 18. Frequency Range, Test Results, HT5

Frequency Range Table							
Temperature (C)	**Voltage AC**	**Mode DSSS**	**Frequency (f_L) MHz**	**Frequency (f_H) MHz**	**Frequency (fH-fL) MHz**	**Limit MHz**	**Margin MHz**
20	230	802.11g 40MHz	2406.900	2476.750	69.85	83.5	-13.65
70	253	802.11g 40MHz	2408.325	2475.625	67.30	83.5	-16.20
70	207	802.11g 40MHz	2408.325	2475.625	67.30	83.5	-16.20
-20	253	802.11g 40MHz	2404.463	2481.488	77.03	83.5	-6.47
-20	207	802.11g 40MHz	2404.463	2481.488	77.03	83.5	-6.47

Table 19. Frequency Range, Test Results, HT8

Frequency Range Table							
Temperature (C)	**Voltage AC**	**Mode DSSS**	**Frequency (f_L) MHz**	**Frequency (f_H) MHz**	**Frequency (fH-fL) MHz**	**Limit MHz**	**Margin MHz**
20	230	802.11g 40MHz	2405.900	2477.813	71.91	83.5	-11.59
70	253	802.11g 40MHz	2407.088	2476.588	69.50	83.5	-14.00
70	207	802.11g 40MHz	2407.088	2476.588	69.50	83.5	-14.00
-20	253	802.11g 40MHz	2404.288	2483.675	79.39	83.5	-4.11
-20	207	802.11g 40MHz	2404.288	2483.675	79.39	83.5	-4.11

Table 20. Frequency Range, Test Results, HT10

Frequency Range Table							
Temperature (C)	**Voltage AC**	**Mode DSSS**	**Frequency (f_L) MHz**	**Frequency (f_H) MHz**	**Frequency (fH-fL) MHz**	**Limit MHz**	**Margin MHz**
20	230	HT20	2401.250	2481.700	80.45	83.5	-3.05
70	253	HT20	2401.750	2481.000	79.25	83.5	-4.25
70	207	HT20	2402.125	2481.000	78.88	83.5	-4.63
-20	253	HT20	2400.000	2483.125	83.13	83.5	-0.38
-20	207	HT20	2400.000	2483.375	83.38	83.5	-0.13

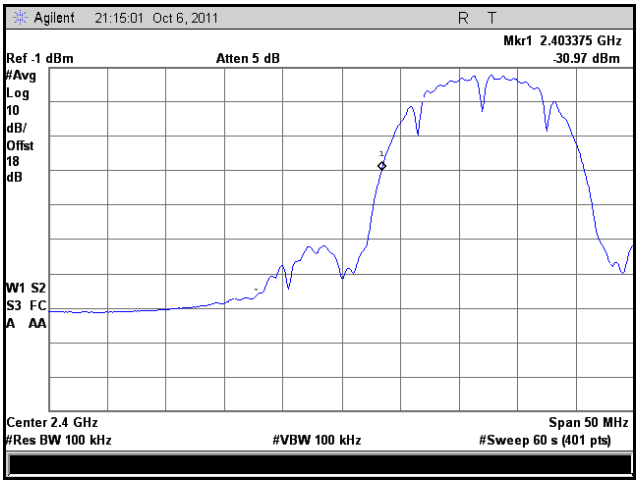
Table 21. Frequency Range, Test Results, HT20

Frequency Range Table							
Temperature (C)	**Voltage AC**	**Mode DSSS**	**Frequency (f_L) MHz**	**Frequency (f_H) MHz**	**Frequency (fH-fL) MHz**	**Limit MHz**	**Margin MHz**
20	230	HT30	2407.000	2476.325	69.32	83.5	-14.18
70	253	HT30	2408.060	2475.630	67.57	83.5	-15.93
70	207	HT30	2408.060	2475.630	67.57	83.5	-15.93
-20	253	HT30	2404.025	2482.800	78.78	83.5	-4.72
-20	207	HT30	2404.375	2482.800	78.43	83.5	-5.07

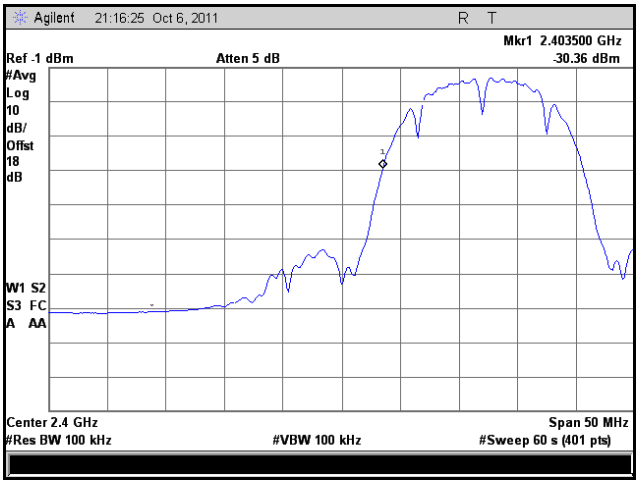
Table 22. Frequency Range, Test Results, HT30

Frequency Range Table							
Temperature (C)	**Voltage AC**	**Mode DSSS**	**Frequency (f_L) MHz**	**Frequency (f_H) MHz**	**Frequency (fH-fL) MHz**	**Limit MHz**	**Margin MHz**
20	230	HT40	2402.250	2480.700	78.45	83.5	-5.05
70	253	HT40	2403.000	2480.300	77.30	83.5	-6.20
70	207	HT40	2403.250	2480.300	77.05	83.5	-6.45
-20	253	HT40	2401.250	2483.100	81.85	83.5	-1.65
-20	207	HT40	2401.750	2482.700	80.95	83.5	-2.55

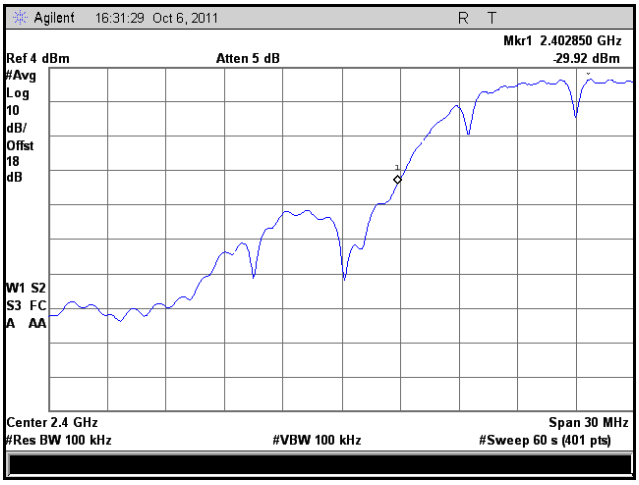
Table 23. Frequency Range, Test Results, HT40



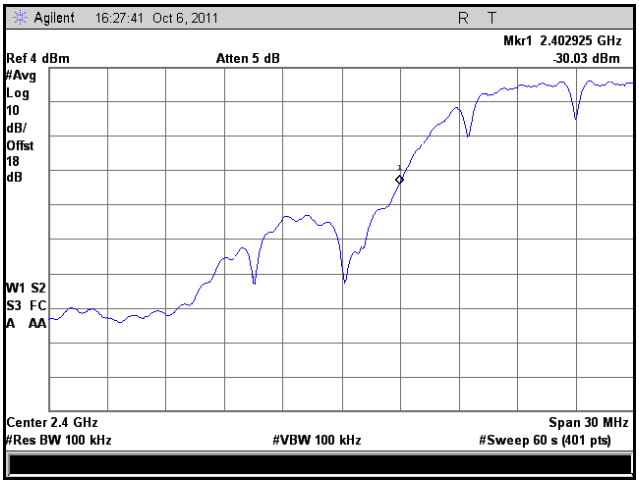
Plot 49. Frequency Range, 802.11b, Low Channel, High Temp., High Voltage



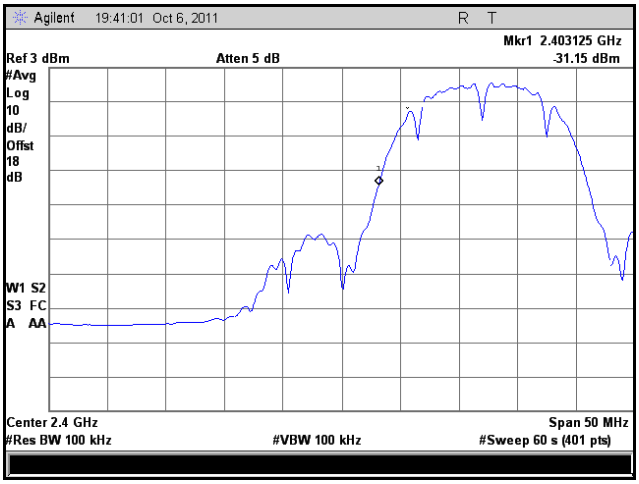
Plot 50. Frequency Range, 802.11b, Low Channel, High Temp., Low Voltage



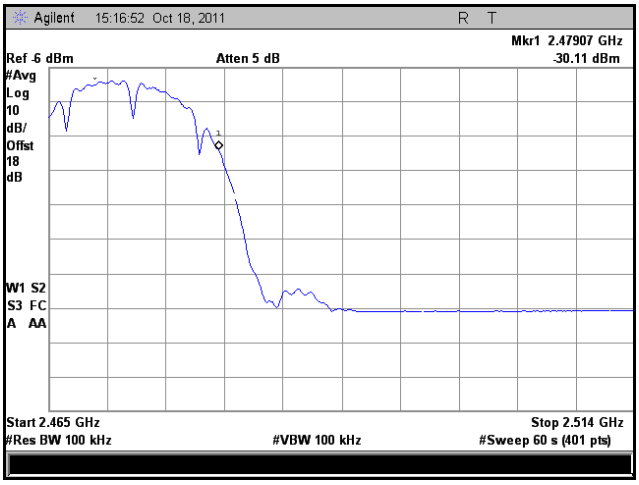
Plot 51. Frequency Range, 802.11b, Low Channel, Low Temp., High Voltage



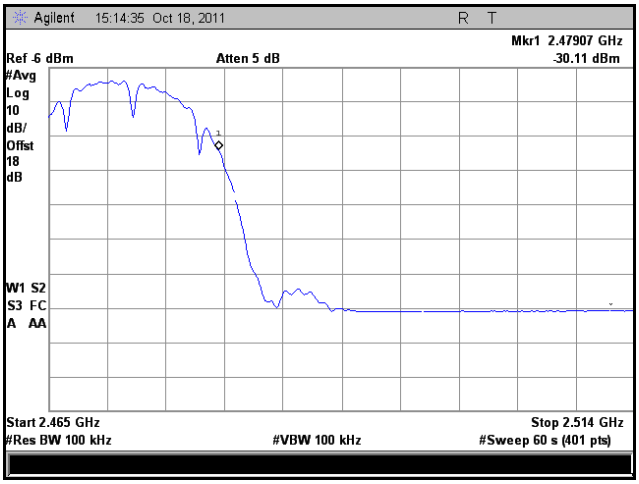
Plot 52. Frequency Range, 802.11b, Low Channel, Low Temp., Low Voltage



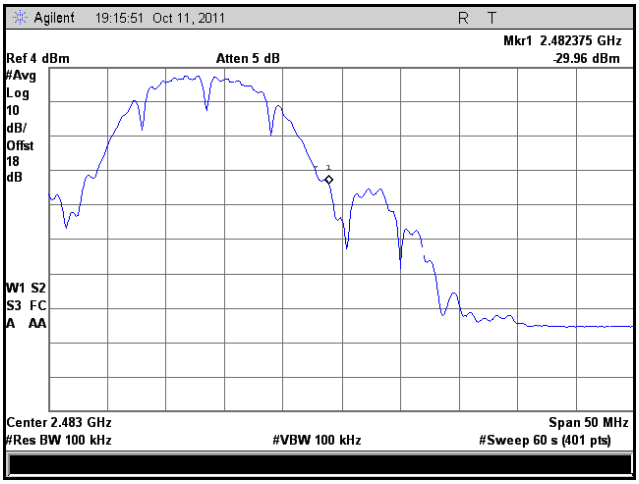
Plot 53. Frequency Range, 802.11b, Low Channel, Room Temp., Nom. Voltage



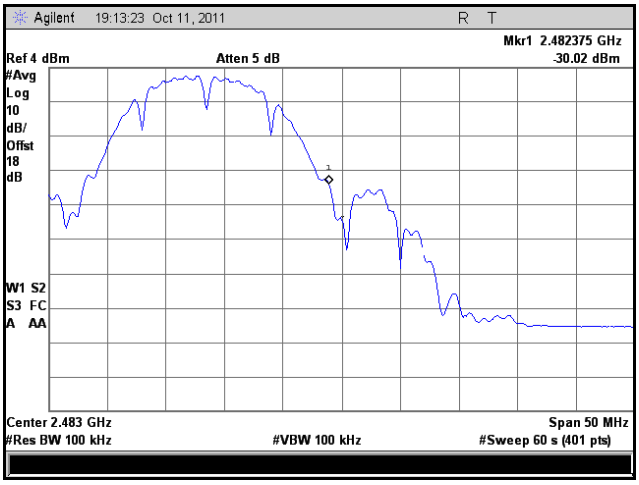
Plot 54. Frequency Range, 802.11b, High Channel, High Temp., High Voltage



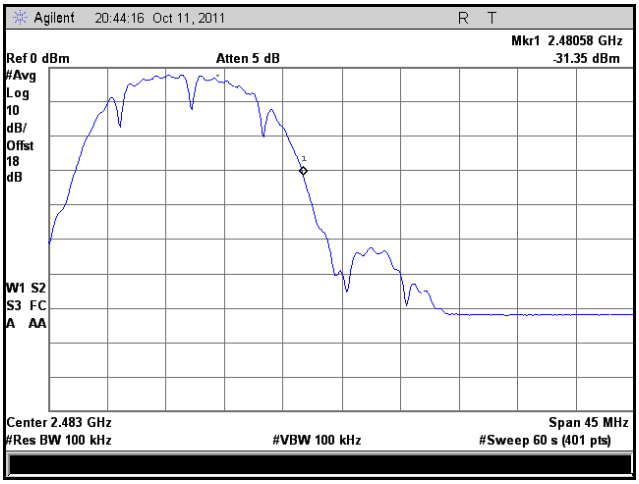
Plot 55. Frequency Range, 802.11b, High Channel, High Temp., Low Voltage



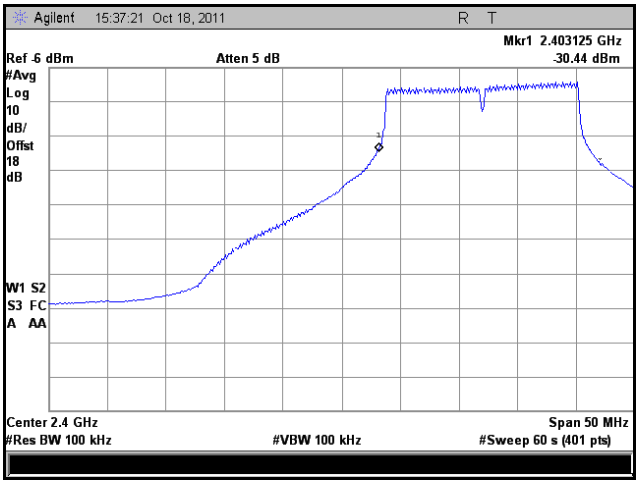
Plot 56. Frequency Range, 802.11b, High Channel, Low Temp., High Voltage



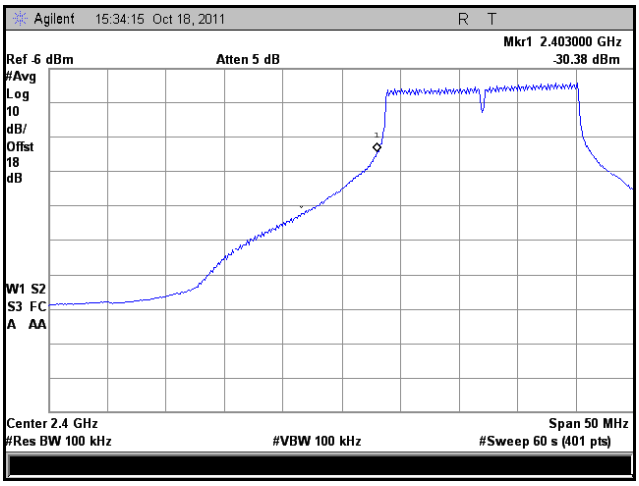
Plot 57. Frequency Range, 802.11b, High Channel, Low Temp., Low Voltage



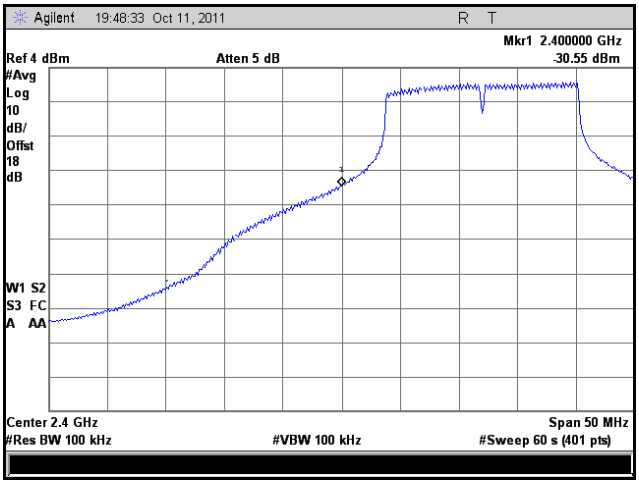
Plot 58. Frequency Range, 802.11b, High Channel, Room Temp., Nom. Voltage



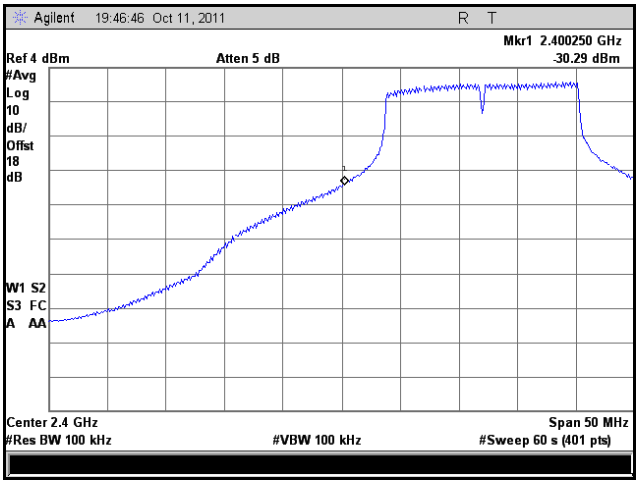
Plot 59. Frequency Range, 802.11g, Low Channel, High Temp., High Voltage



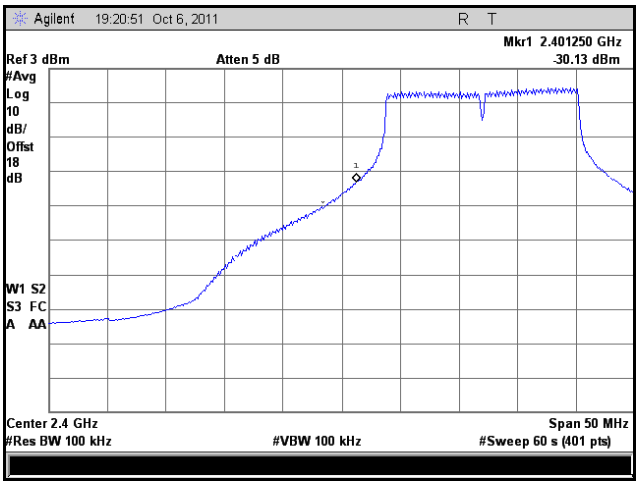
Plot 60. Frequency Range, 802.11g, Low Channel, High Temp., Low Voltage



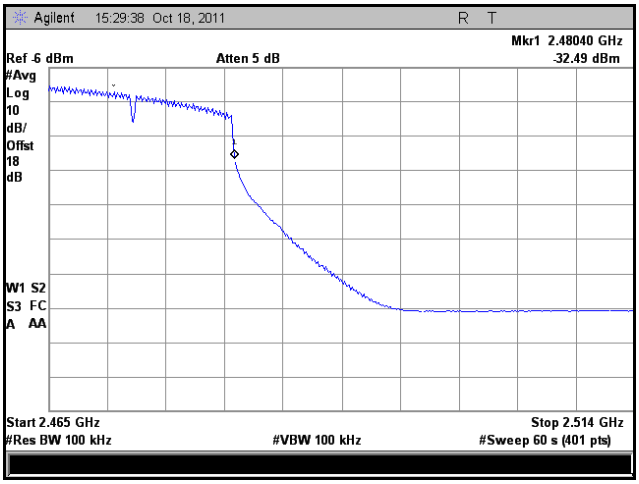
Plot 61. Frequency Range, 802.11g, Low Channel, Low Temp., High Voltage



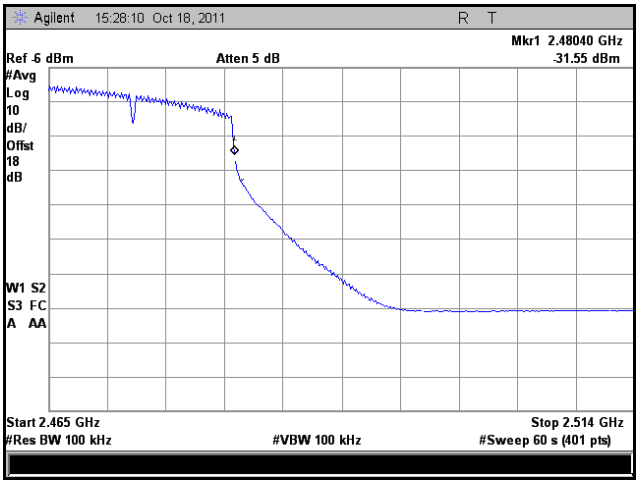
Plot 62. Frequency Range, 802.11g, Low Channel, Low Temp., Low Voltage



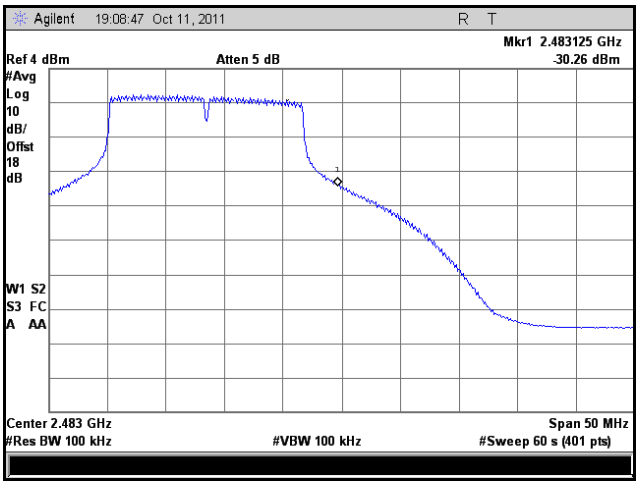
Plot 63. Frequency Range, 802.11g, Low Channel, Room Temp., Nom. Voltage



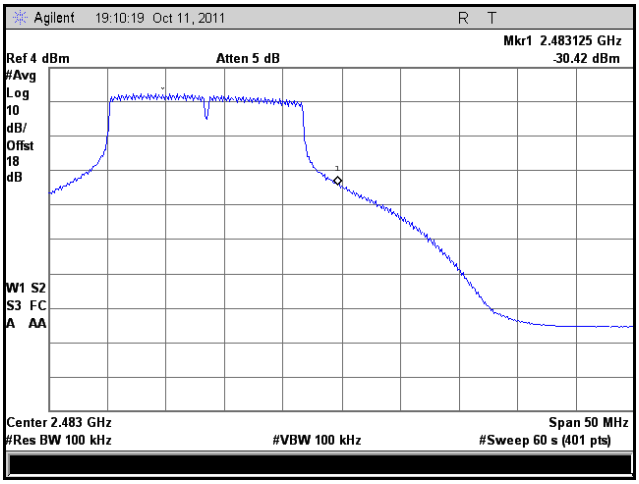
Plot 64. Frequency Range, 802.11g, High Channel, High Temp., High Voltage



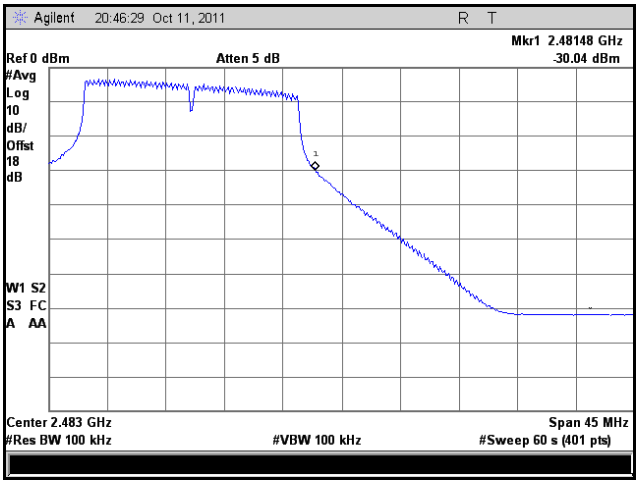
Plot 65. Frequency Range, 802.11g, High Channel, High Temp., Low Voltage



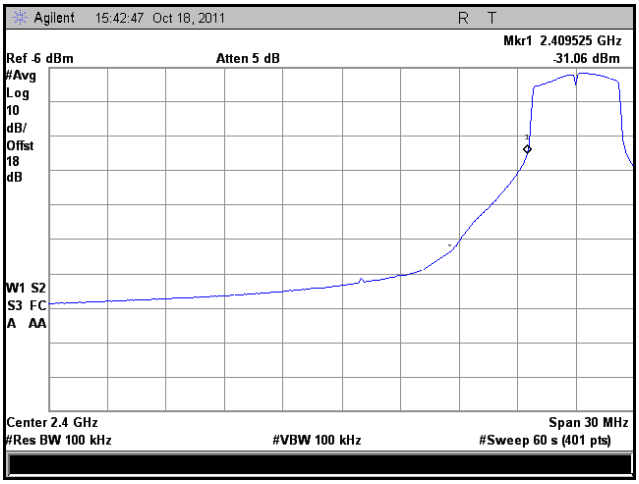
Plot 66. Frequency Range, 802.11g, High Channel, Low Temp., High Voltage



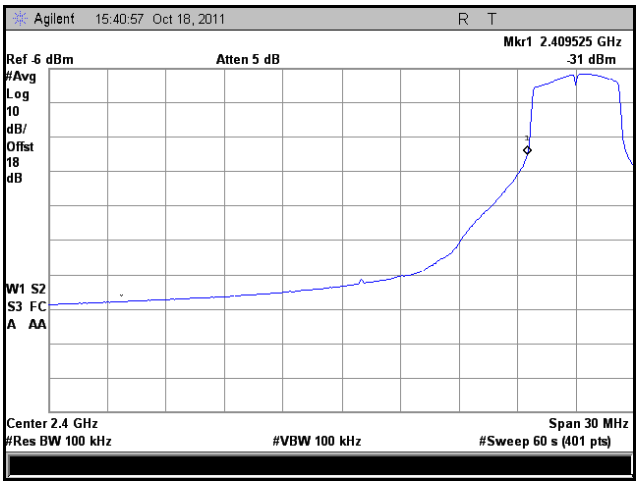
Plot 67. Frequency Range, 802.11g, High Channel, Low Temp., Low Voltage



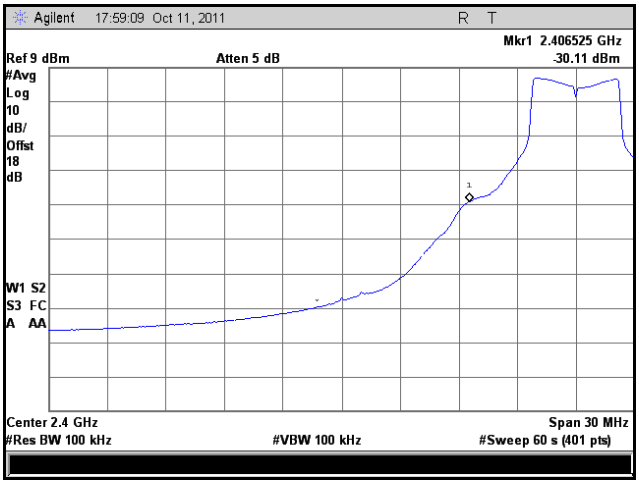
Plot 68. Frequency Range, 802.11g, High Channel, Room Temp., Nom Voltage



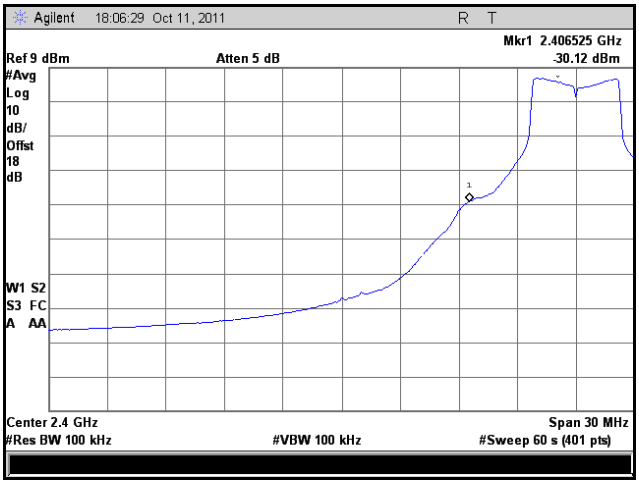
Plot 69. Frequency Range, HT5, Low Channel, High Temp., High Voltage



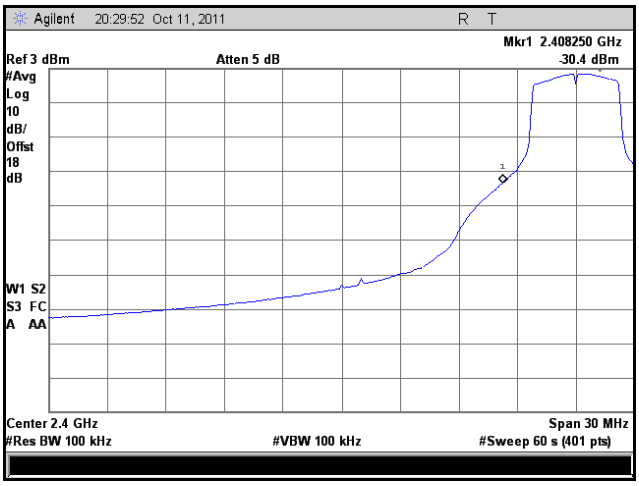
Plot 70. Frequency Range, HT5, Low Channel, High Temp., Low Voltage



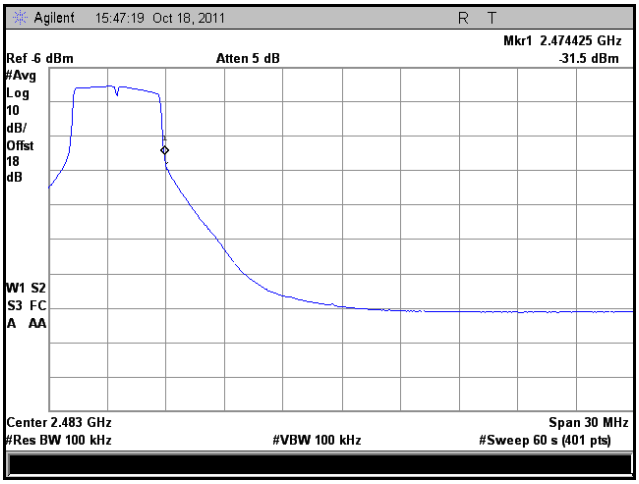
Plot 71. Frequency Range, HT5, Low Channel, Low Temp., High Voltage



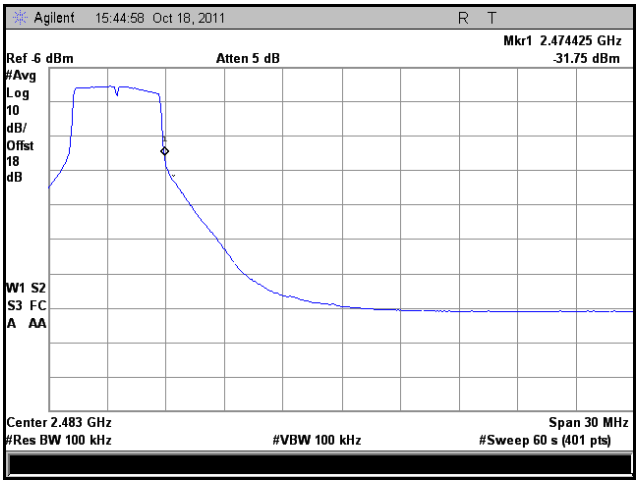
Plot 72. Frequency Range, HT5, Low Channel, Low Temp., Low Voltage



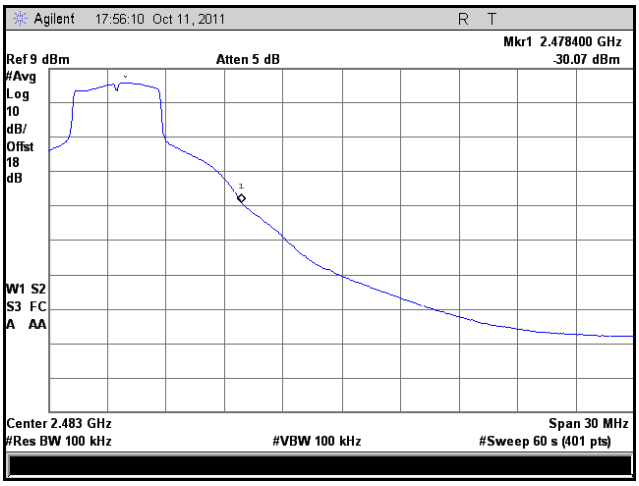
Plot 73. Frequency Range, HT5, Low Channel, Room Temp., Nom. Voltage



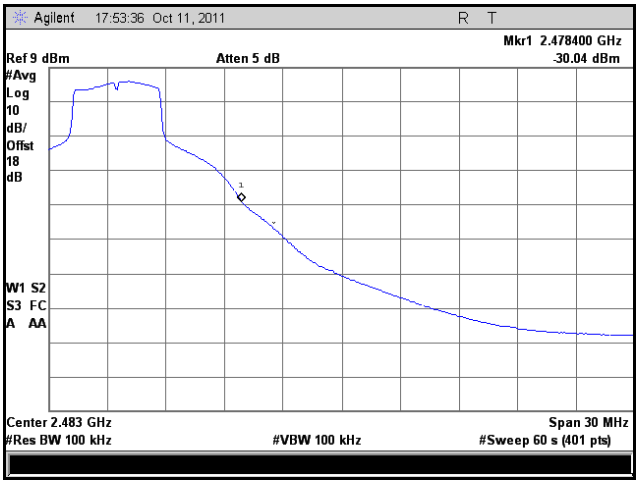
Plot 74. Frequency Range, HT5, High Channel, High Temp., High Voltage



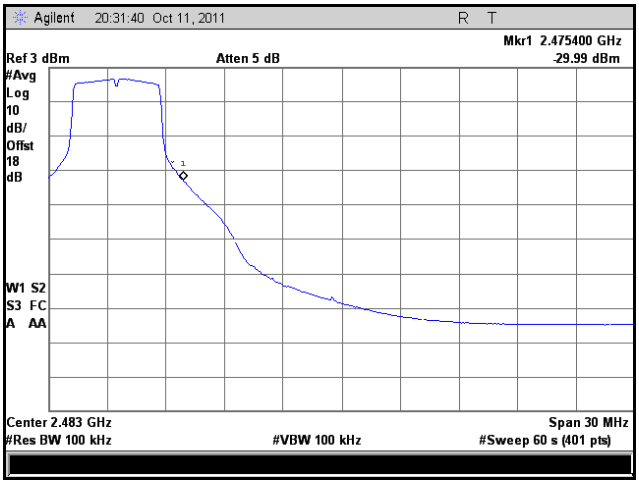
Plot 75. Frequency Range, HT5, High Channel, High Temp., Low Voltage



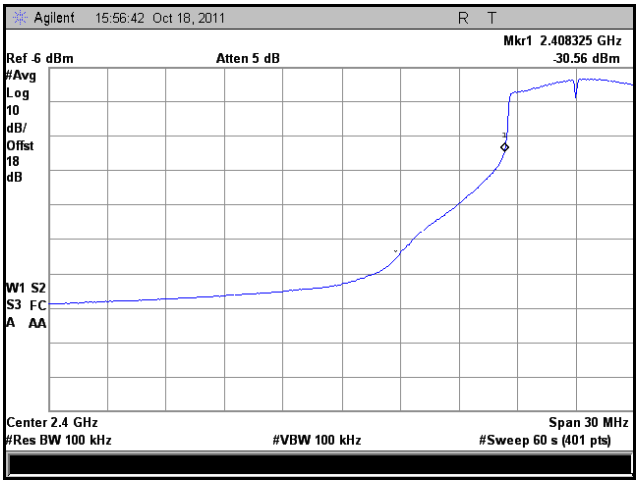
Plot 76. Frequency Range, HT5, High Channel, Low Temp., High Voltage



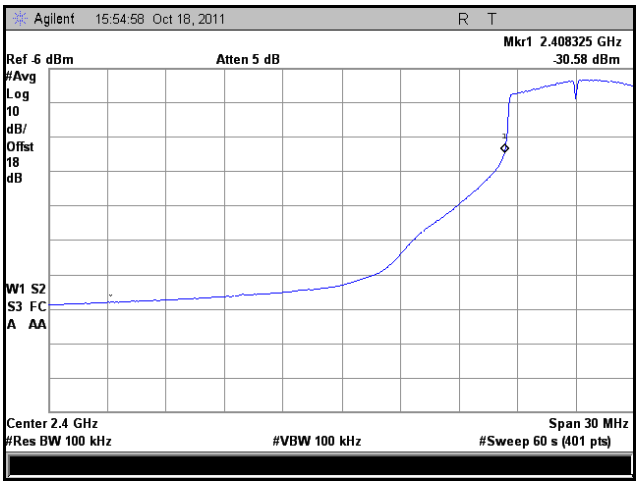
Plot 77. Frequency Range, HT5, High Channel, Low Temp., Low Voltage



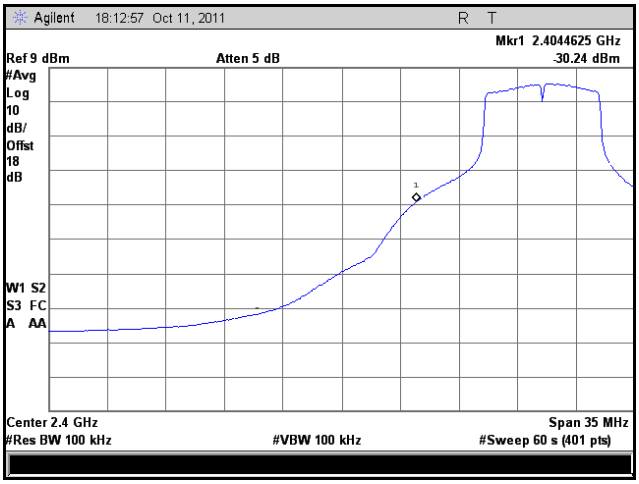
Plot 78. Frequency Range, HT5, High Channel, Room Temp., Nom. Voltage



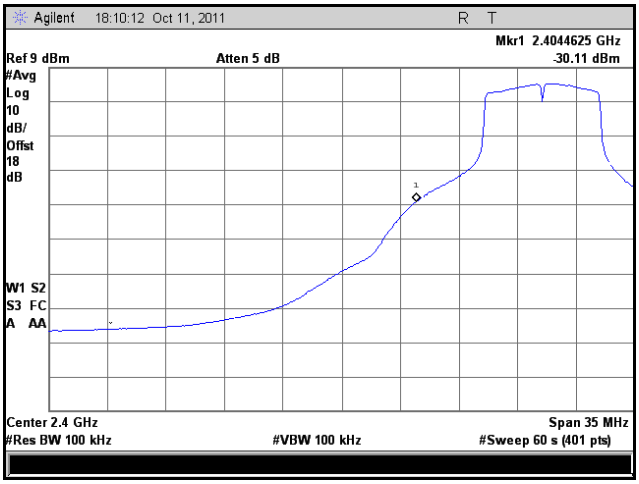
Plot 79. Frequency Range, HT8, Low Channel, High Temp., High Voltage



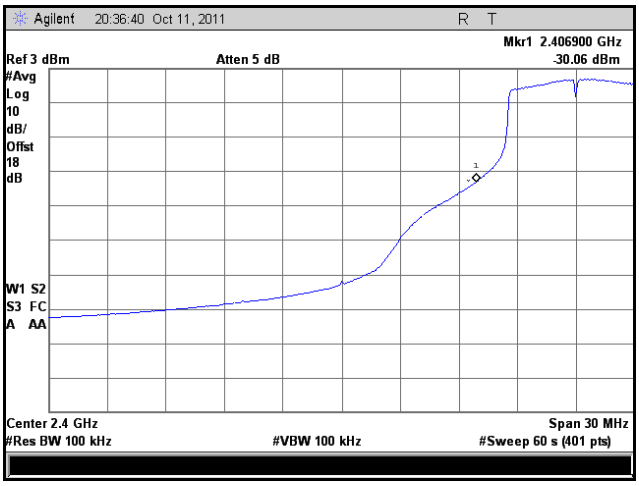
Plot 80. Frequency Range, HT8, Low Channel, High Temp., Low Voltage



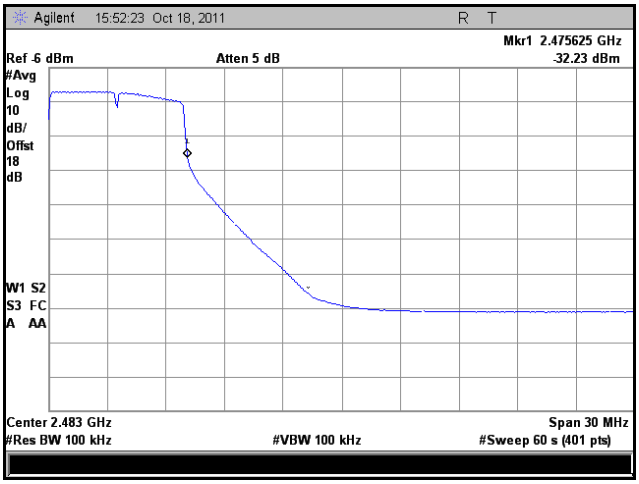
Plot 81. Frequency Range, HT8, Low Channel, Low Temp., High Voltage



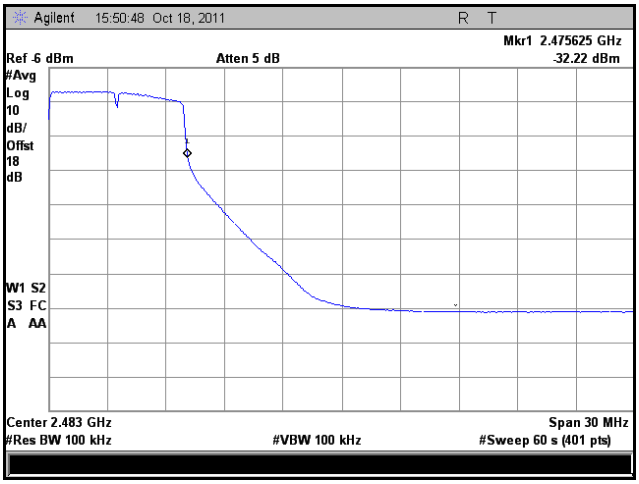
Plot 82. Frequency Range, HT8, Low Channel, Low Temp., Low Voltage



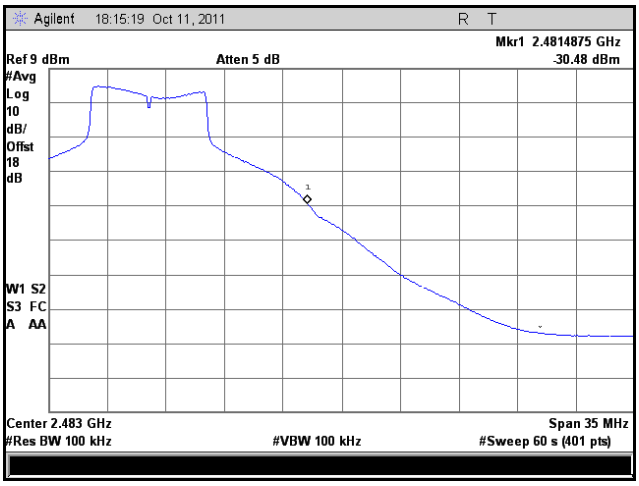
Plot 83. Frequency Range, HT8, Low Channel, Room Temp., Nom. Voltage



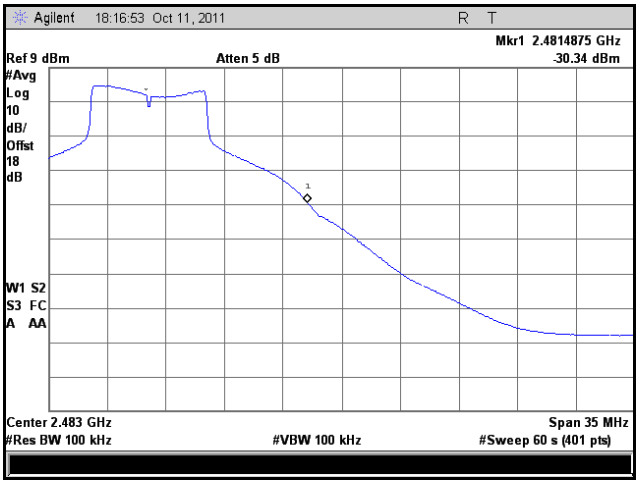
Plot 84. Frequency Range, HT8, High Channel, High Temp., High Voltage



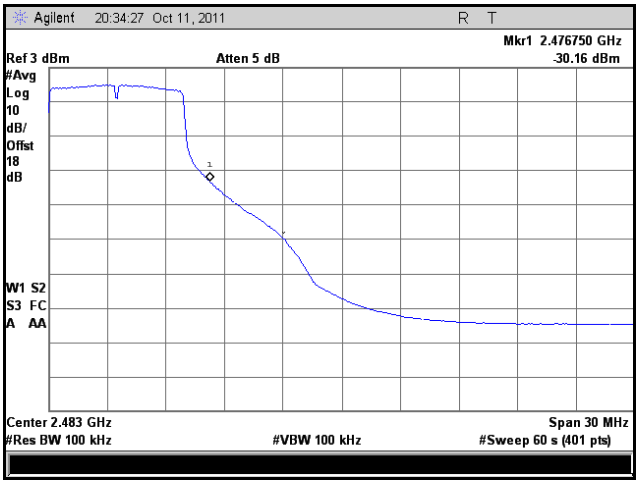
Plot 85. Frequency Range, HT8, High Channel, High Temp., Low Voltage



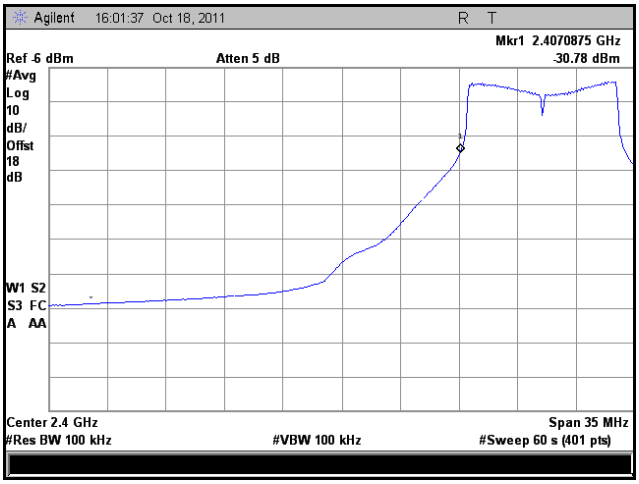
Plot 86. Frequency Range, HT8, High Channel, Low Temp., High Voltage



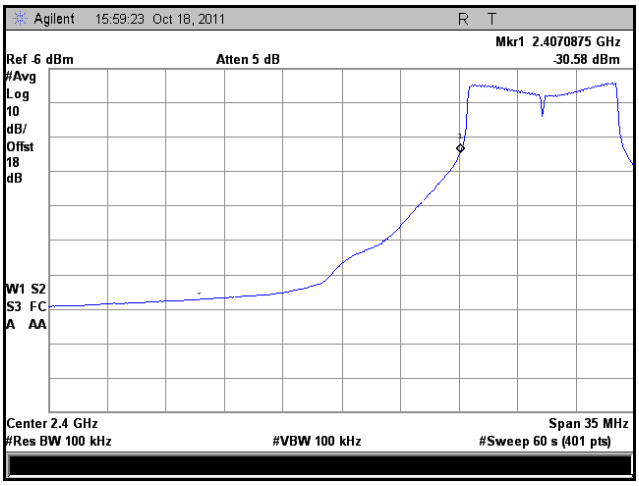
Plot 87. Frequency Range, HT8, High Channel, Low Temp., Low Voltage



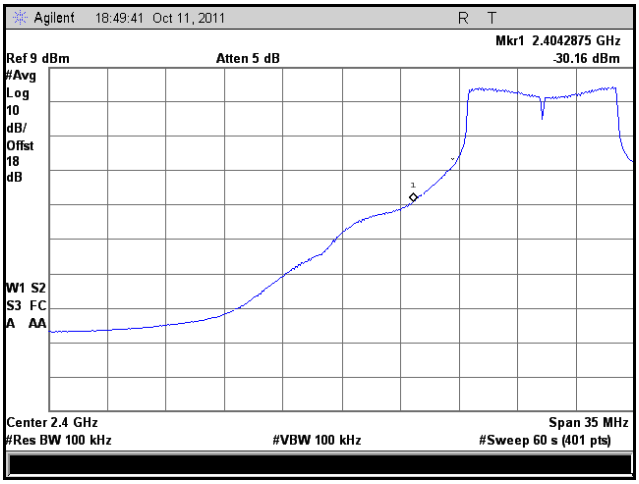
Plot 88. Frequency Range, HT8, High Channel, Room Temp., Nom. Voltage



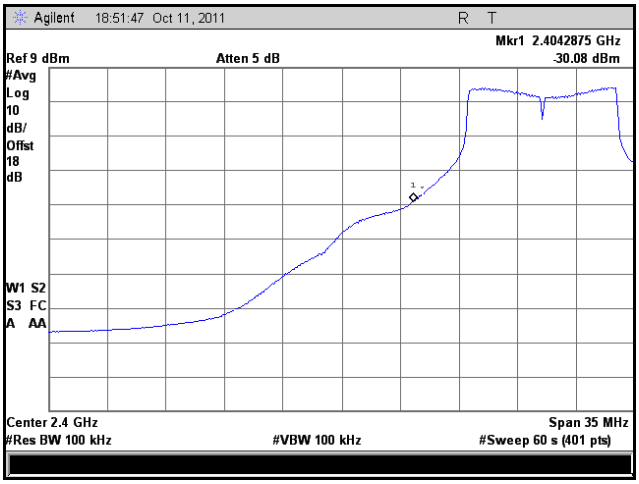
Plot 89. Frequency Range, HT10, Low Channel, High Temp., High Voltage



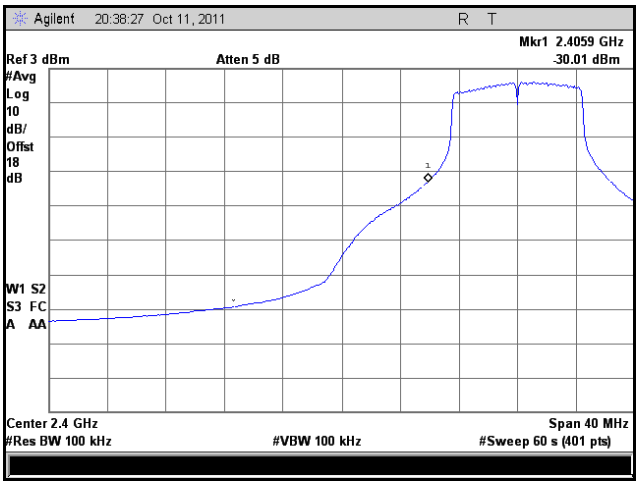
Plot 90. Frequency Range, HT10, Low Channel, High Temp., Low Voltage



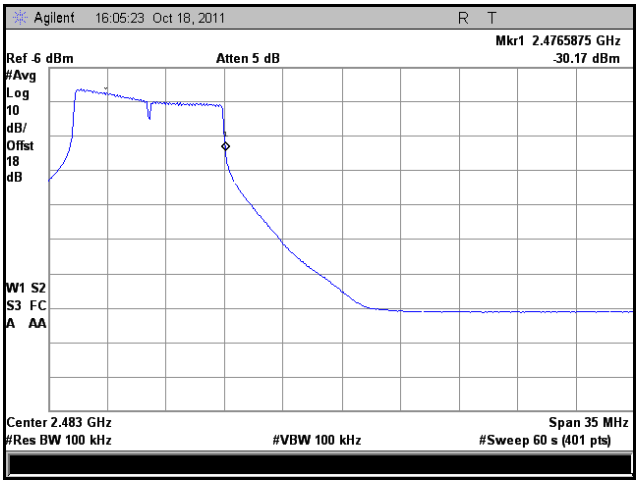
Plot 91. Frequency Range, HT10, Low Channel, Low Temp., High Voltage



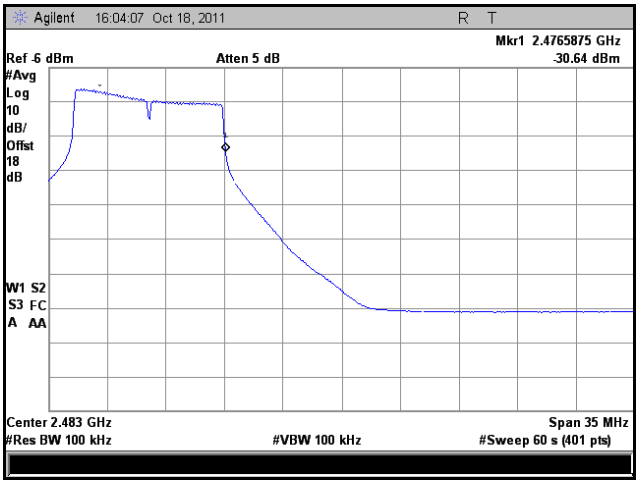
Plot 92. Frequency Range, HT10, Low Channel, Low Temp., Low Voltage



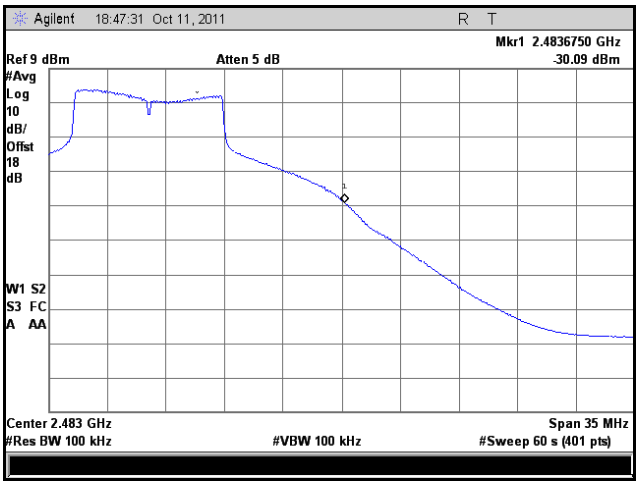
Plot 93. Frequency Range, HT10, Low Channel, Room Temp., Nom. Voltage



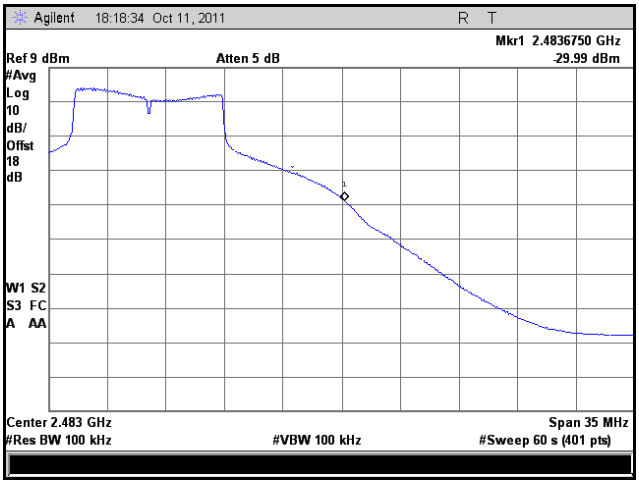
Plot 94. Frequency Range, HT10, High Channel, High Temp., High Voltage



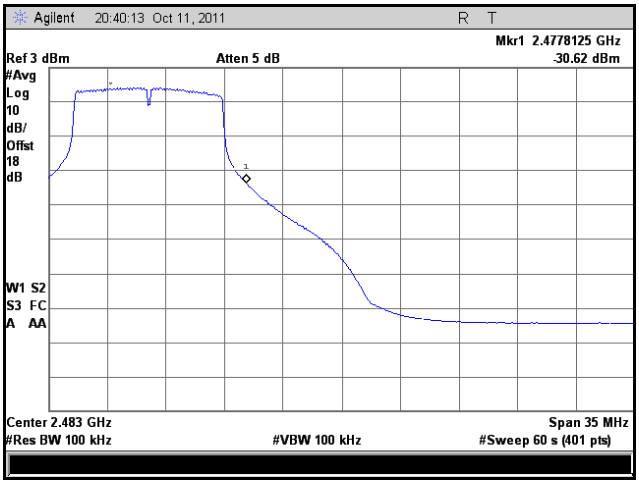
Plot 95. Frequency Range, HT10, High Channel, High Temp., Low Voltage



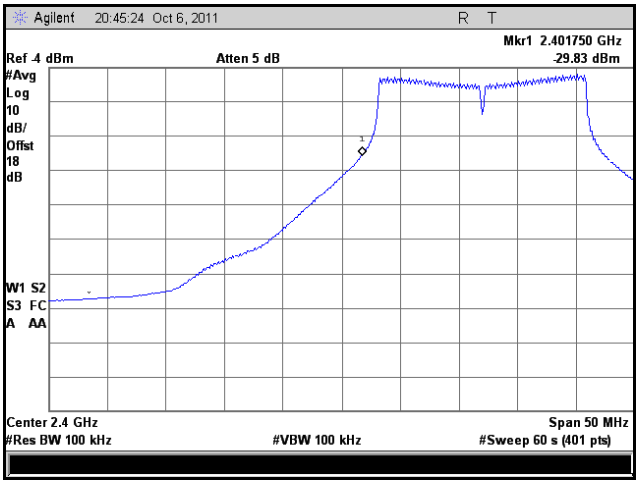
Plot 96. Frequency Range, HT10, High Channel, Low Temp., High Voltage



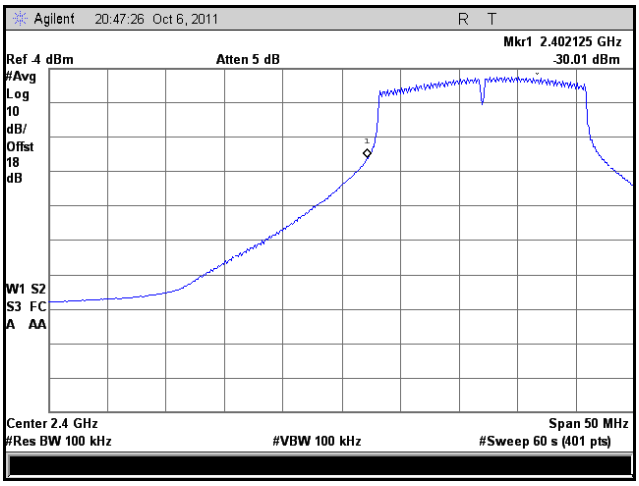
Plot 97. Frequency Range, HT10, High Channel, Low Temp., Low Voltage



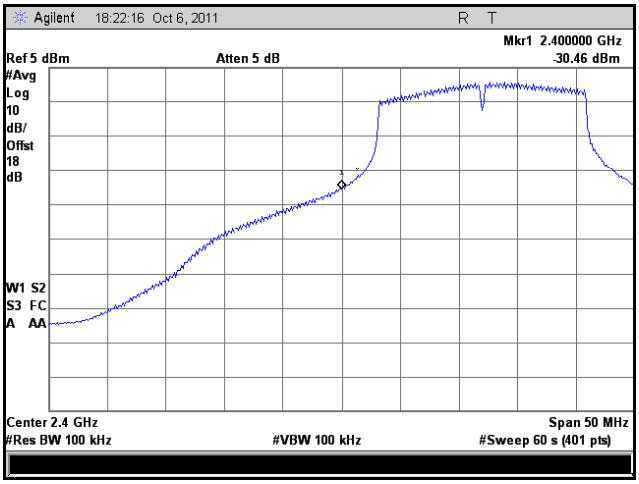
Plot 98. Frequency Range, HT10, High Channel, Room Temp., Nom. Voltage



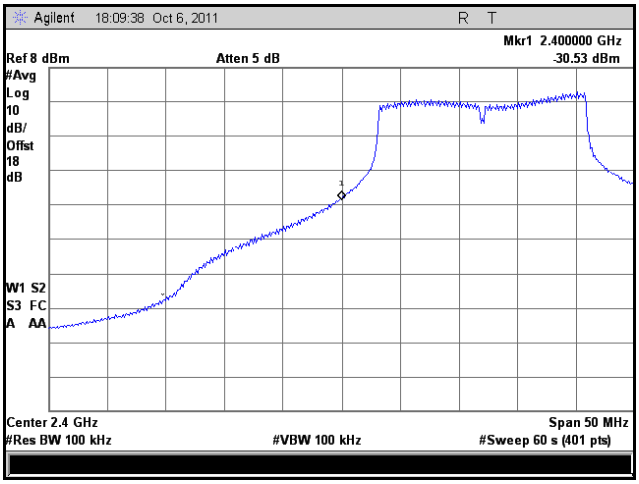
Plot 99. Frequency Range, HT20, Low Channel, High Temp., High Voltage



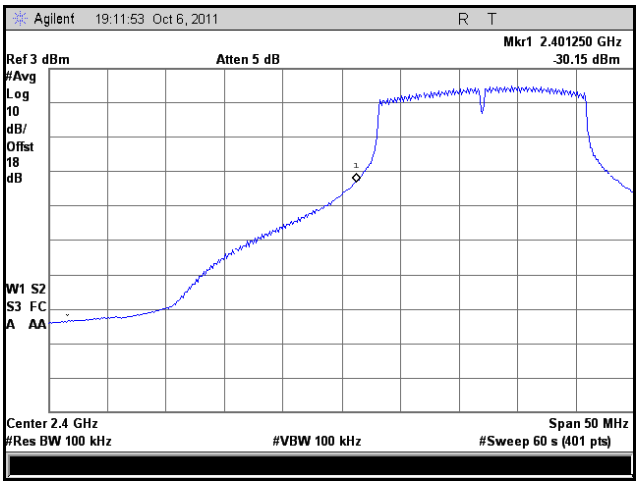
Plot 100. Frequency Range, HT20, Low Channel, High Temp., Low Voltage



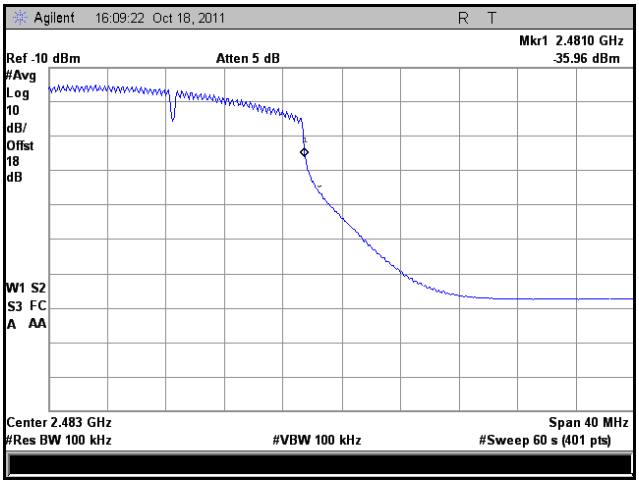
Plot 101. Frequency Range, HT20, Low Channel, Low Temp., High Voltage



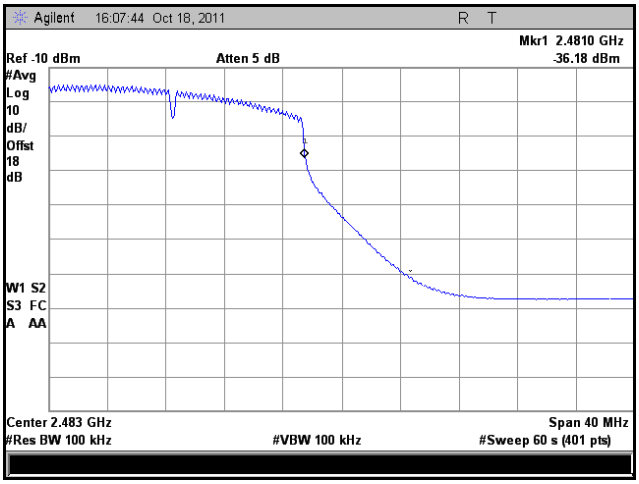
Plot 102. Frequency Range, HT20, Low Channel, Low Temp., Low Voltage



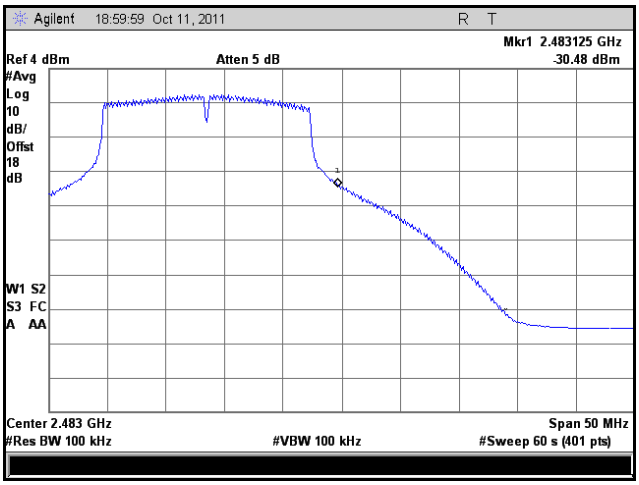
Plot 103. Frequency Range, HT20, Low Channel, Room Temp., Nom. Voltage



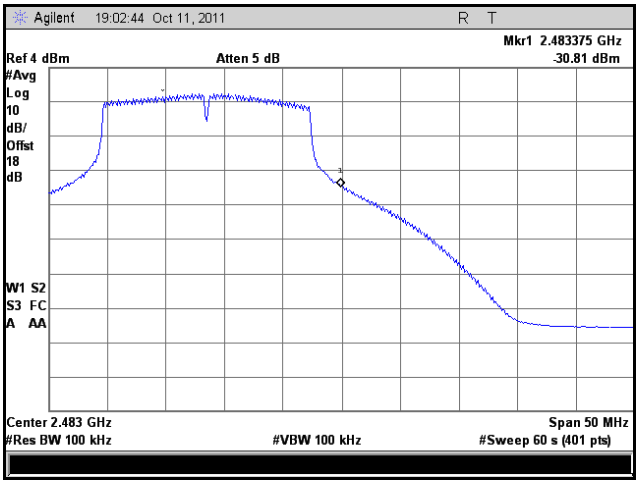
Plot 104. Frequency Range, HT20, High Channel, High Temp., High Voltage



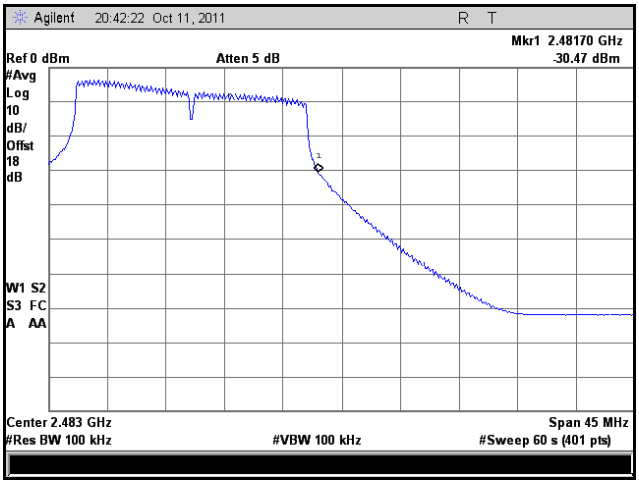
Plot 105. Frequency Range, HT20, High Channel, High Temp., Low Voltage



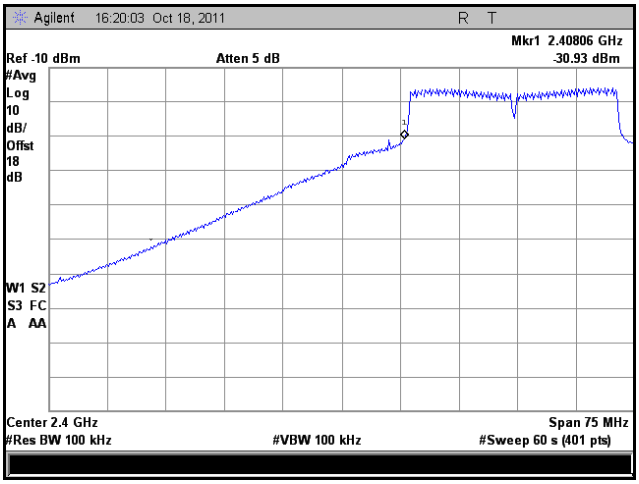
Plot 106. Frequency Range, HT20, High Channel, Low Temp., High Voltage



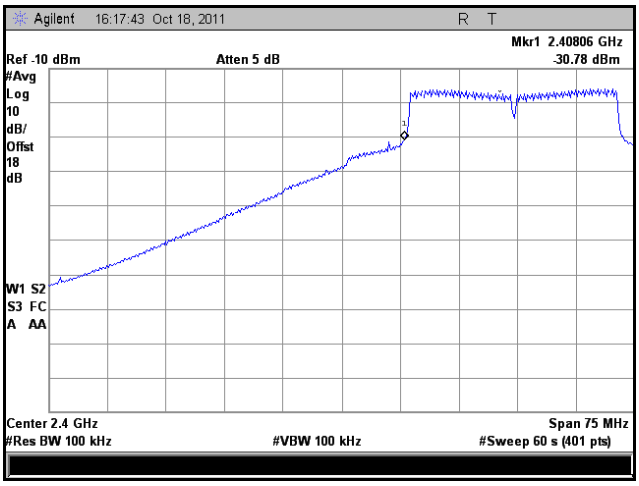
Plot 107. Frequency Range, HT20, High Channel, Low Temp., Low Voltage



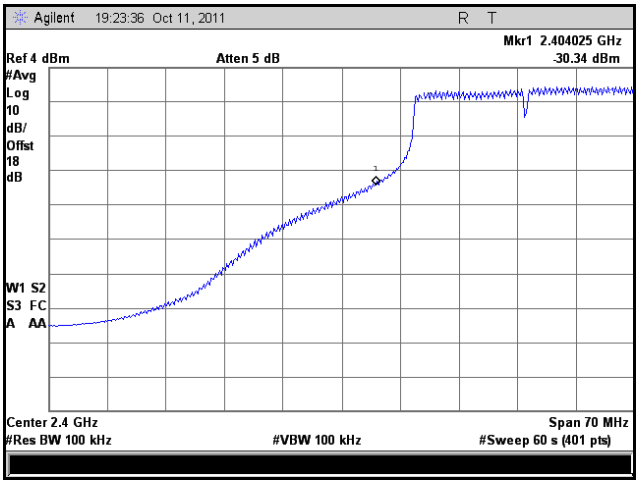
Plot 108. Frequency Range, HT20, High Channel, Room Temp., Nom. Voltage



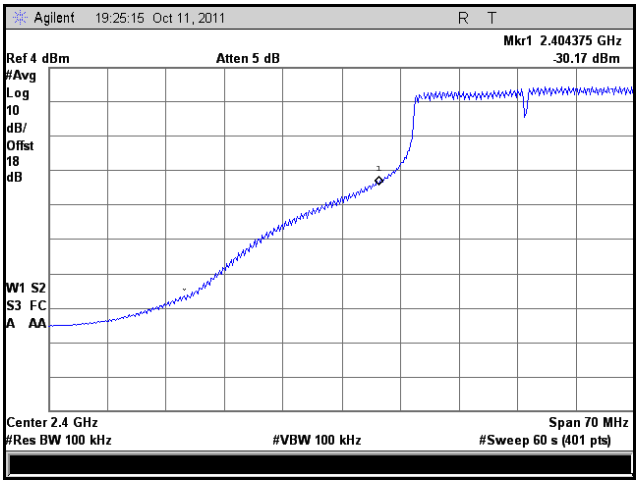
Plot 109. Frequency Range, HT30, Low Channel, High Temp., High Voltage



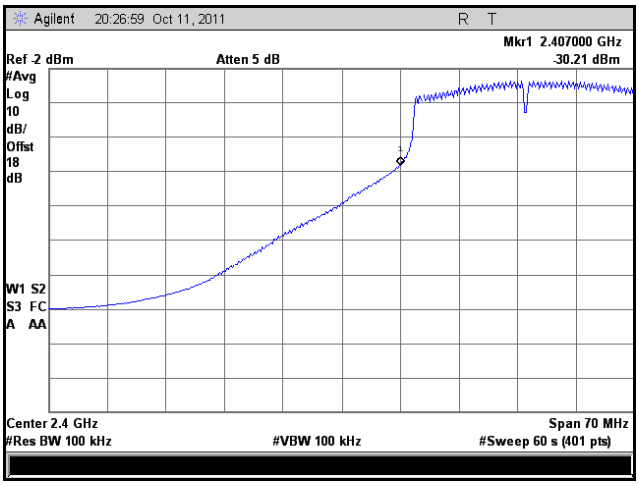
Plot 110. Frequency Range, HT30, Low Channel, High Temp., Low Voltage



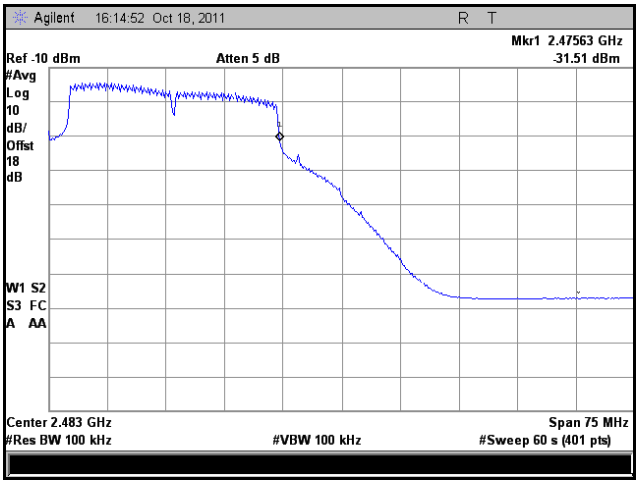
Plot 111. Frequency Range, HT30, Low Channel, Low Temp., High Voltage



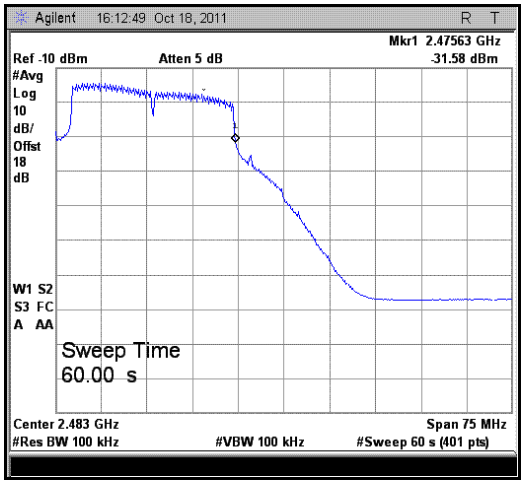
Plot 112. Frequency Range, HT30, Low Channel, Low Temp., Low Voltage



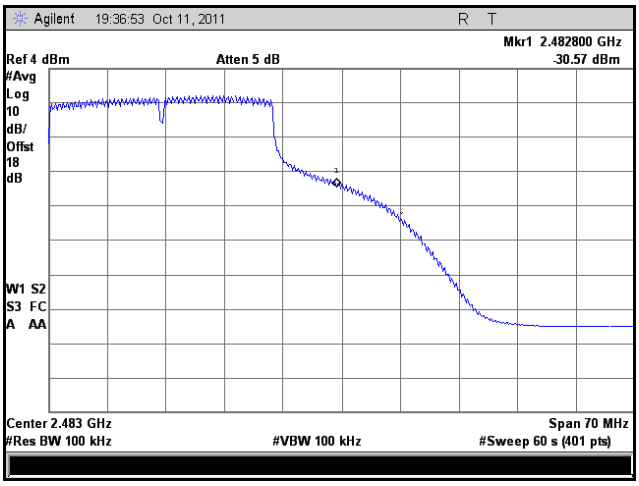
Plot 113. Frequency Range, HT30, Low Channel, Room Temp., Nom. Voltage



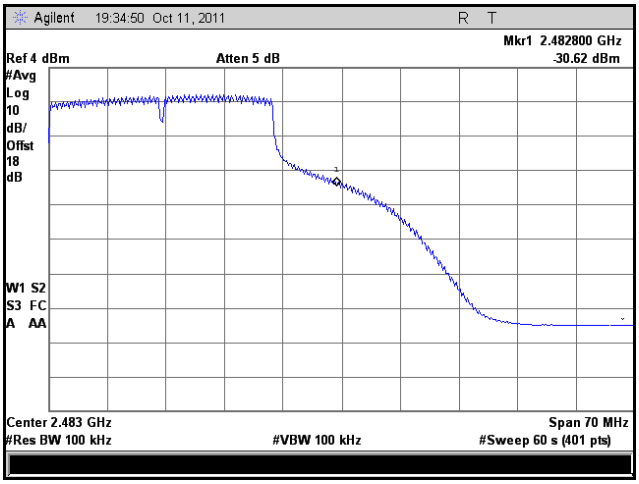
Plot 114. Frequency Range, HT30, High Channel, High Temp., High Voltage



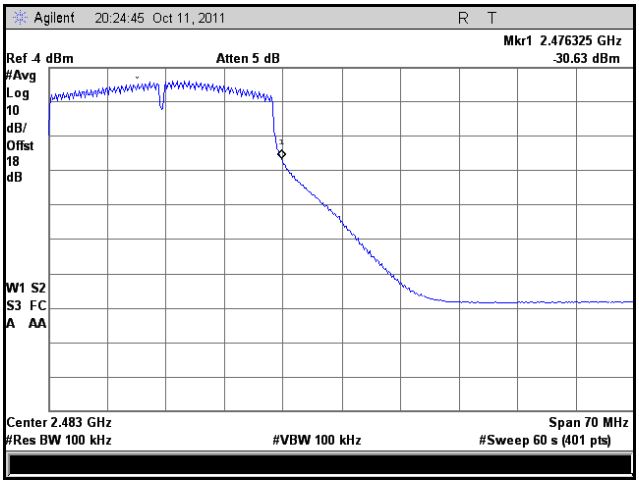
Plot 115. Frequency Range, HT30, High Channel, High Temp., Low Voltage



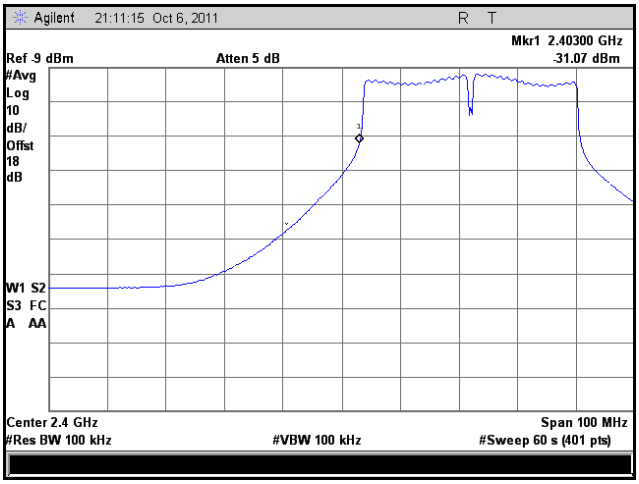
Plot 116. Frequency Range, HT30, High Channel, Low Temp., High Voltage



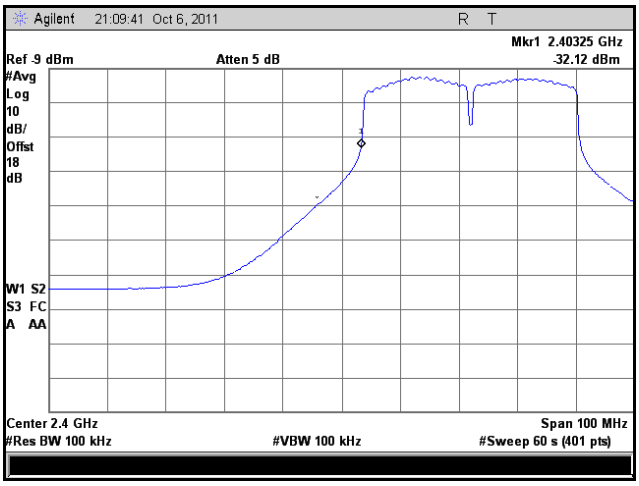
Plot 117. Frequency Range, HT30, High Channel, Low Temp., Low Voltage



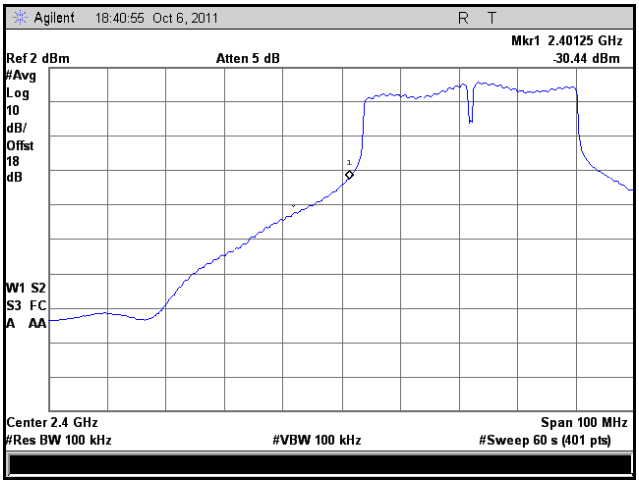
Plot 118. Frequency Range, HT30, High Channel, Room Temp., Nom. Voltage



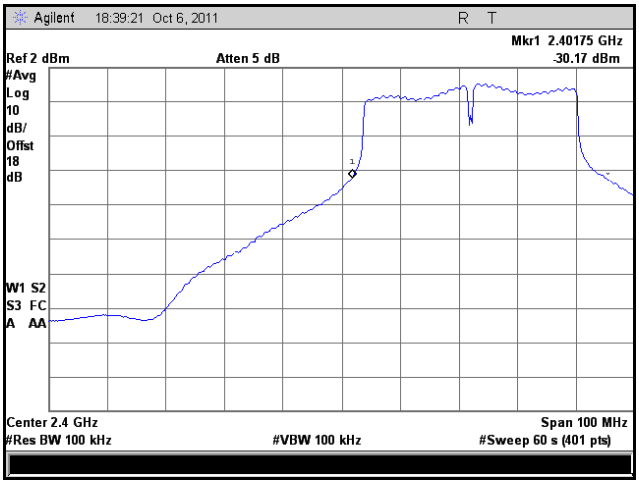
Plot 119. Frequency Range, HT40, Low Channel, High Temp., High Voltage



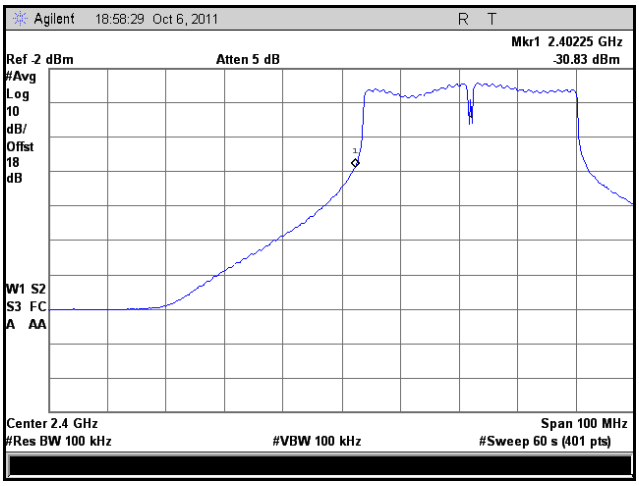
Plot 120. Frequency Range, HT40, Low Channel, High Temp., Low Voltage



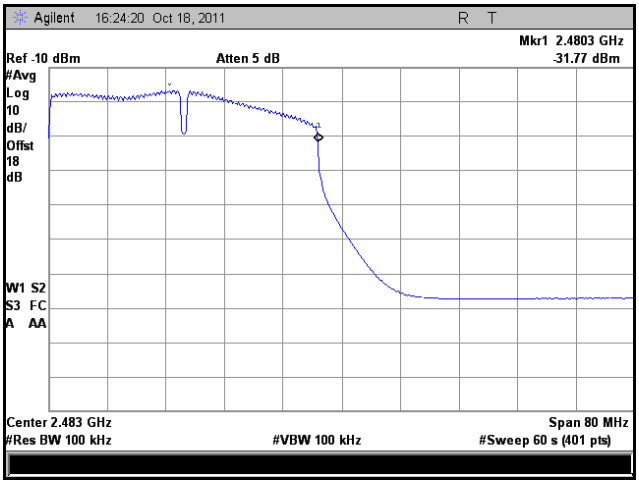
Plot 121. Frequency Range, HT40, Low Channel, Low Temp., High Voltage



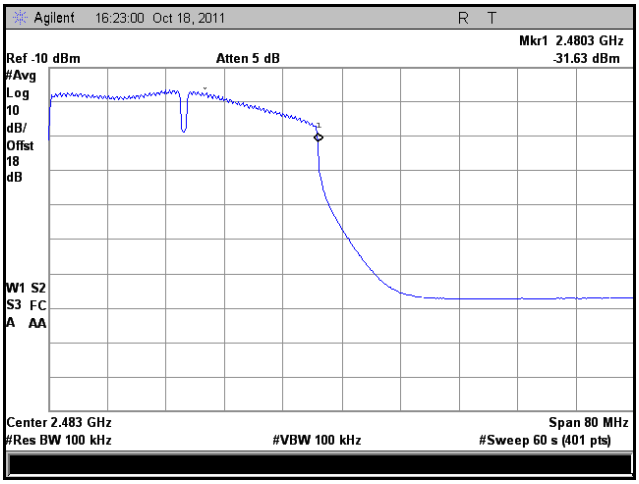
Plot 122. Frequency Range, HT40, Low Channel, Low Temp., Low Voltage



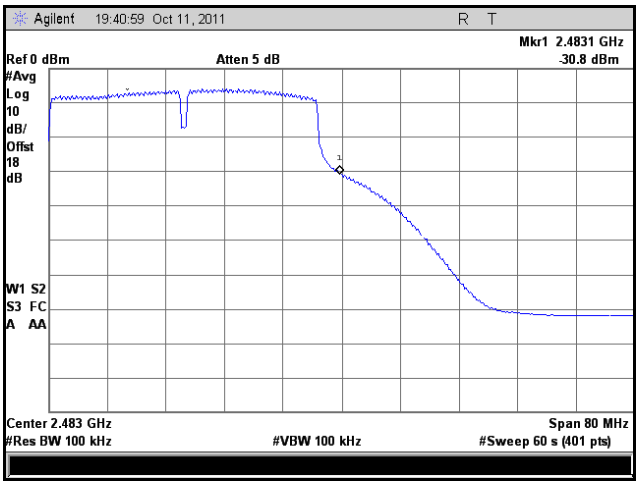
Plot 123. Frequency Range, HT40, Low Channel, Room Temp., Nom. Voltage



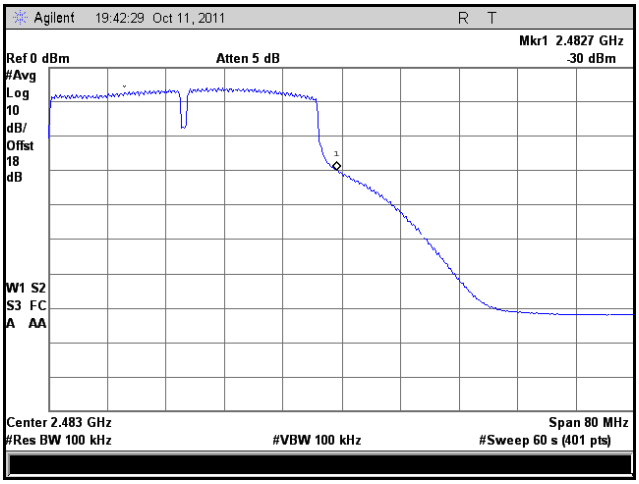
Plot 124. Frequency Range, HT40, High Channel, High Temp., High Voltage



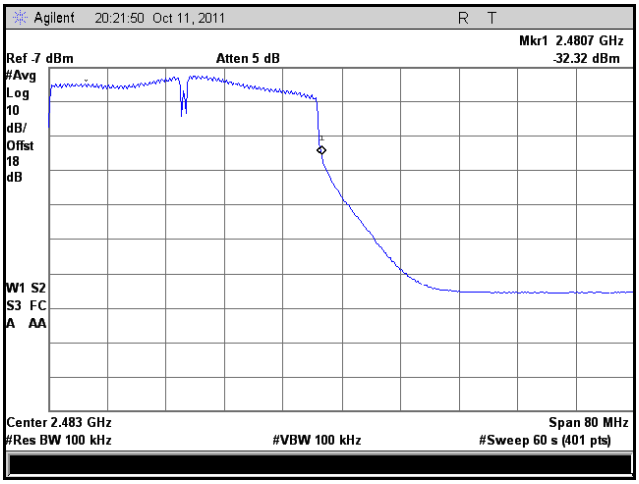
Plot 125. Frequency Range, HT40, High Channel, High Temp., Low Voltage



Plot 126. Frequency Range, HT40, High Channel, Low Temp., High Voltage



Plot 127. Frequency Range, HT40, High Channel, Low Temp., Low Voltage



Plot 128. Frequency Range, HT40, High Channel, Room Temp., Nom. Voltage

4.3.5 Medium Access Protocol

Test Requirement(s): **EN 300 328, Clause 4.3.5:**

4.3.5.1 Definition

A medium access protocol is a mechanism designed to facilitate spectrum sharing with other devices in a wireless network.

4.3.5.2 Limit

A medium access protocol shall be implemented by the equipment.

Test Results: The EUT facilitates medium access protocol and therefore is compliant with the requirements of Clause 4.3.5.2.

Test Engineer: Lionel Gabrillo

Test Date: 10/18/11

4.3.6 Transmitter Spurious Emissions - Conducted

Test Requirement(s): **EN 300 328, Clause 4.3.6:**

4.3.6.1 Definition

Transmitter spurious emissions are emissions outside the frequency range(s) of the equipment as defined in *Clause 4.3.3.1* when the equipment is in Transmit mode and/or in Standby mode.

4.3.6.2 Limit

The spurious emissions of the transmitter shall not exceed the values in Table 24 and Table 25 and in the indicated bands.

Frequency Range	Limit when operating	Limit when in standby
30 MHz to 1 GHz	-36 dBm	-57 dBm
above 1 GHz to 12,75 GHz	-30 dBm	-47 dBm
1,8 GHz to 1,9 GHz 5,15 GHz to 5,3 GHz	-47 dBm	-47 dBm

Table 24. Transmitter limits for narrowband spurious emissions

The above limit values apply to narrowband emissions, e.g. as caused by local oscillator leakage. The measurement bandwidth for such emissions may be as small as necessary to achieve a reliable measurement result.

Wideband emissions shall not exceed the values given in Table 25.

Frequency Range	Limit when operating	Limit when in standby
30 MHz to 1 GHz	-86 dBm	-107 dBm/Hz
above 1 GHz to 12,75 GHz	-80 dBm	-97 dBm/Hz
1,8 GHz to 1,9 GHz 5,15 GHz to 5,3 GHz	-97 dBm	-97 dBm/Hz

Table 25. Transmitter limits for wideband spurious emissions

4.3.6 Transmitter Spurious Emissions - Conducted

Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The resolution band width of the spectrum analyzer was set to 100 KHz and the video band width set to 30 KHz. A positive peak detector was used along with peak hold function. The measurement was performed using normal operation of the equipment. Cable loss has been pre-programmed into SA.

Test Results: The EUT as tested was found compliant with the specified requirements of Clause 4.3.6.2.

Test Engineer: Lionel Gabrillo

Test Date: 09/16/11

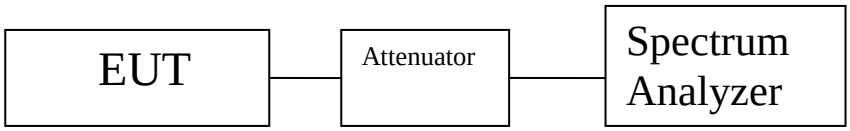
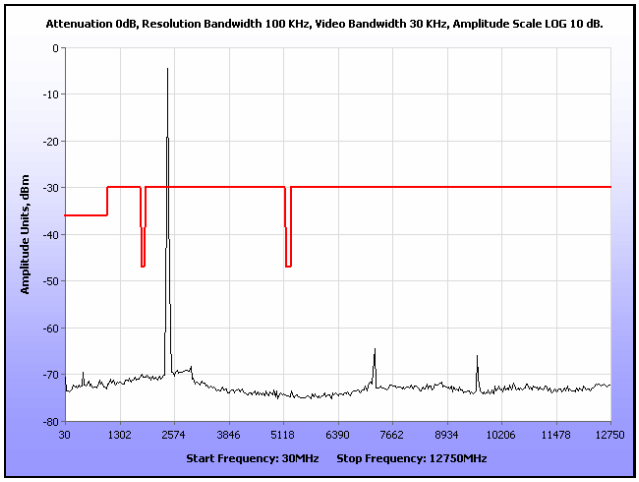
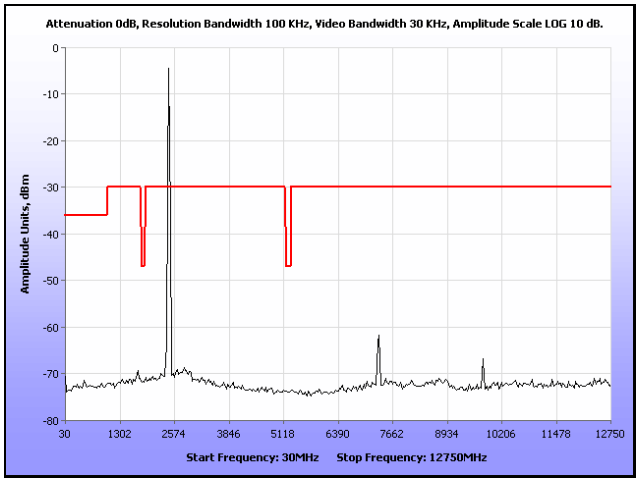


Figure 5. Transmitter Spurious Emissions - Conducted Test Setup

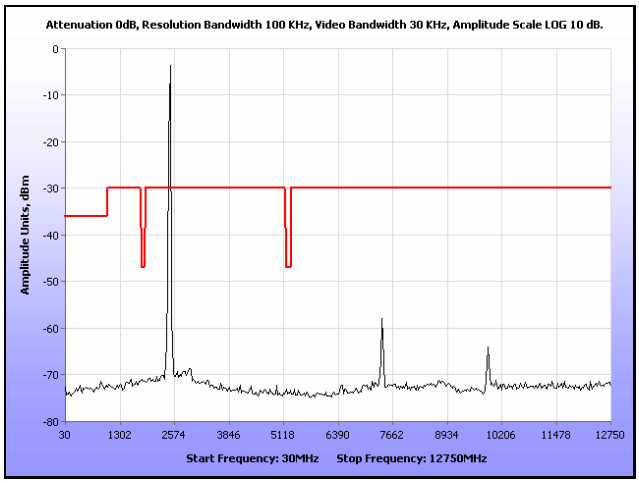
Transmitter Spurious Emissions – Conducted, Test Results, 802.11b



Plot 129. Conducted Spurious Emission, Low Channel, 30 MHz – 12.75 GHz, 802.11b

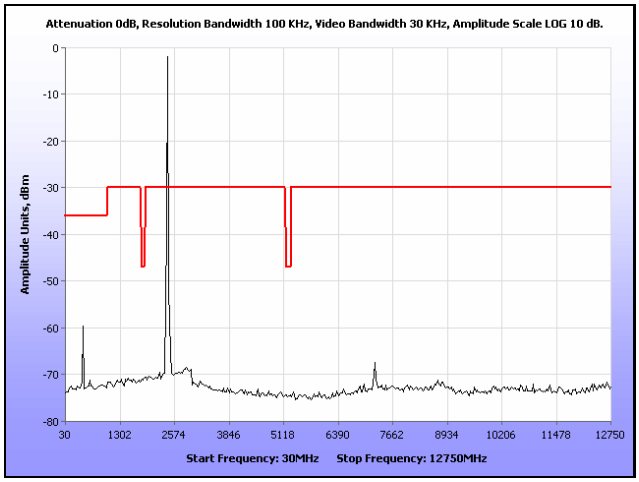


Plot 130. Conducted Spurious Emission, Mid Channel, 30 MHz - 12.75 GHz, 802.11b

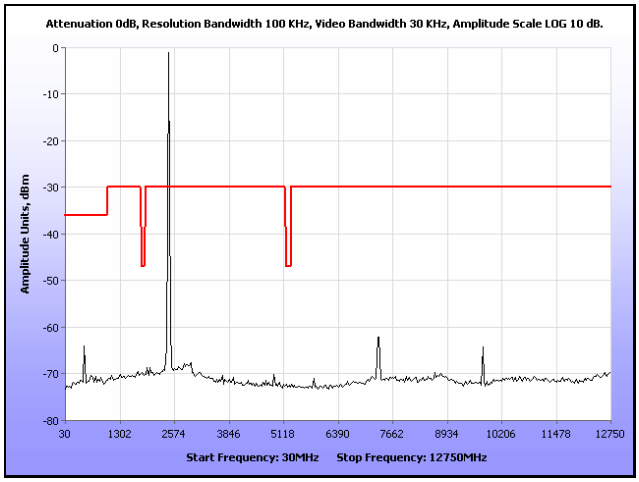


Plot 131. Conducted Spurious Emission, High Channel, 30 MHz – 12.75 GHz, 802.11b

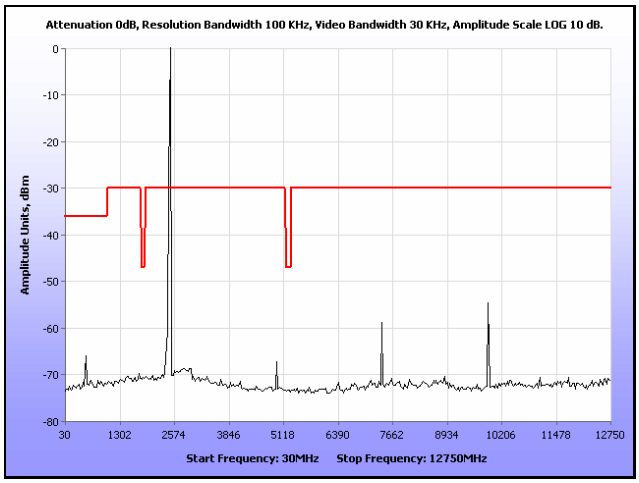
Transmitter Spurious Emissions – Conducted, Test Results, 802.11g



Plot 132. Conducted Spurious Emission, Low Channel, 30 MHz – 12.75 GHz, 802.11g

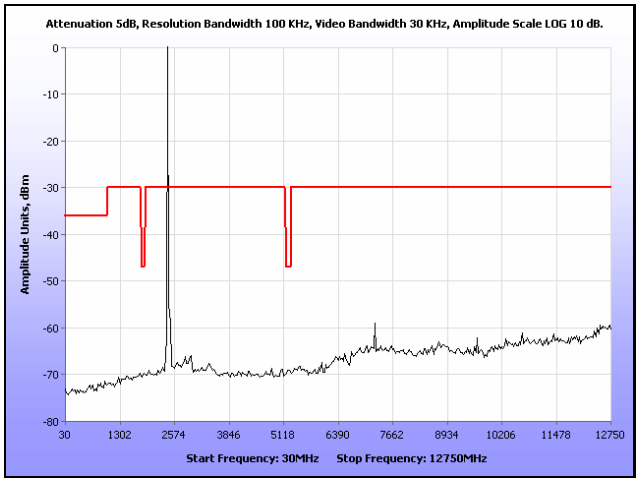


Plot 133. Conducted Spurious Emission, Mid Channel, 30 MHz - 12.75 GHz, 802.11g

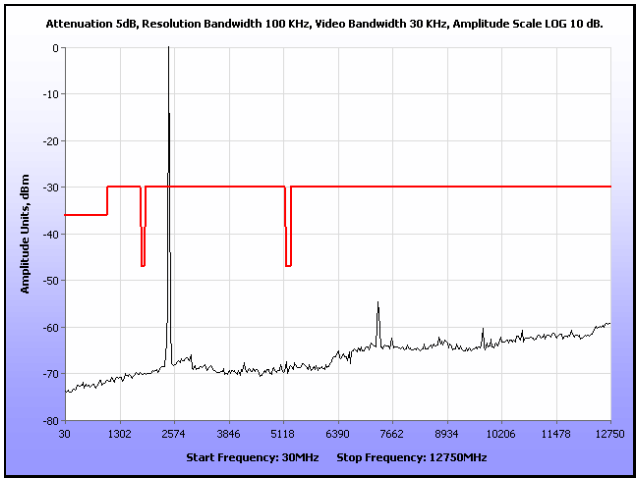


Plot 134. Conducted Spurious Emission, High Channel, 30 MHz – 12.75 GHz, 802.11g

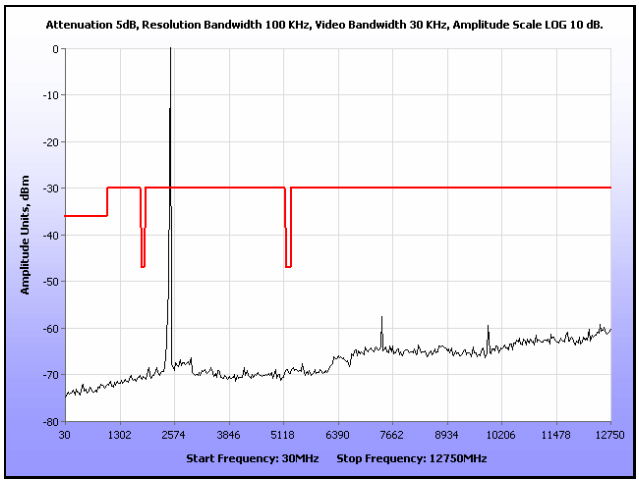
Transmitter Spurious Emissions – Conducted, Test Results, HT5



Plot 135. Conducted Spurious Emission, Low Channel, 30 MHz – 12.75 GHz, HT5

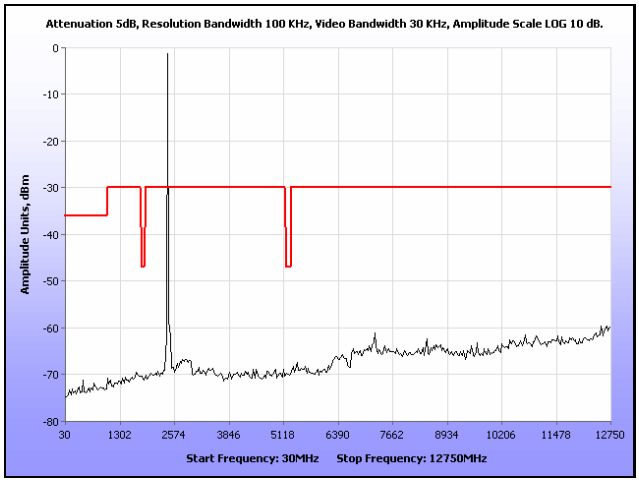


Plot 136. Conducted Spurious Emission, Mid Channel, 30 MHz - 12.75 GHz, HT5

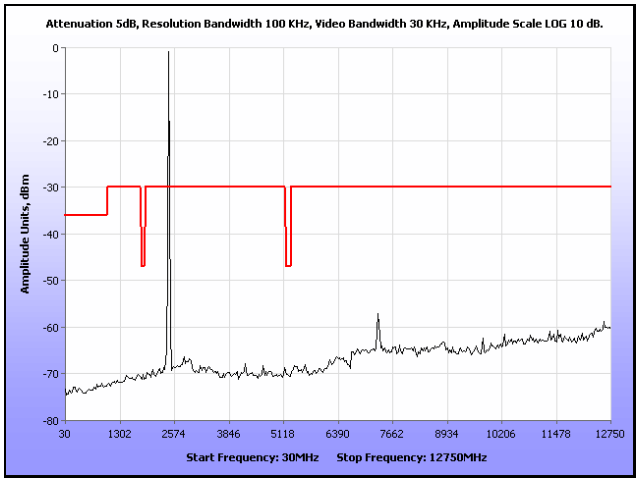


Plot 137. Conducted Spurious Emission, High Channel, 30 MHz – 12.75 GHz, HT5

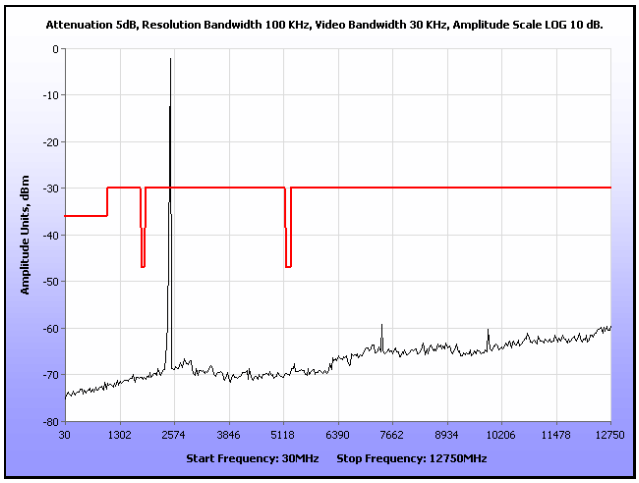
Transmitter Spurious Emissions – Conducted, Test Results, HT8



Plot 138. Conducted Spurious Emission, Low Channel, 30 MHz – 12.75 GHz, HT8

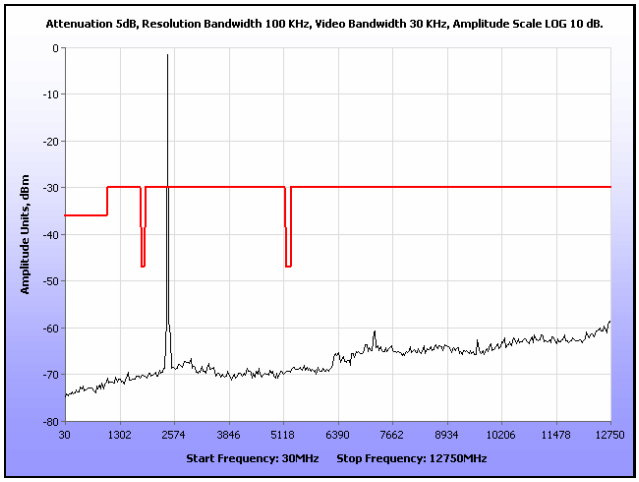


Plot 139. Conducted Spurious Emission, Mid Channel, 30 MHz - 12.75 GHz, HT8

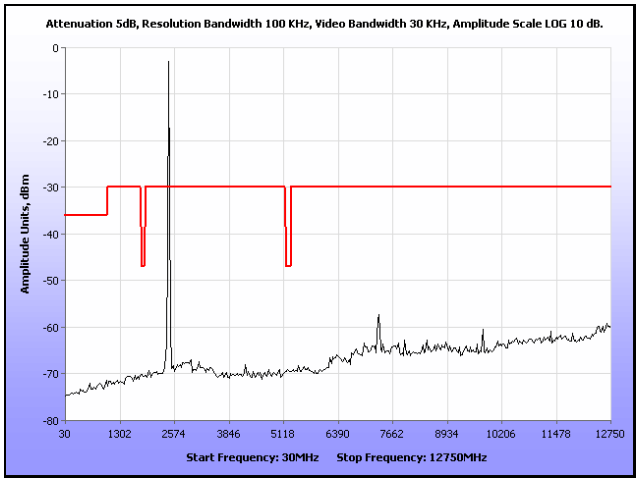


Plot 140. Conducted Spurious Emission, High Channel, 30 MHz – 12.75 GHz, HT8

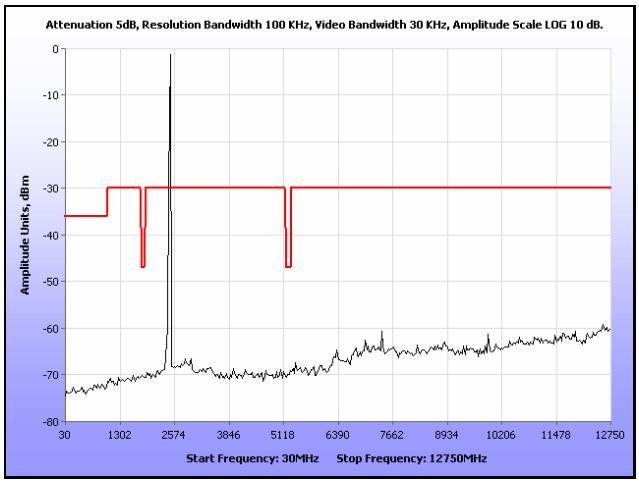
Transmitter Spurious Emissions – Conducted, Test Results, HT10



Plot 141. Conducted Spurious Emission, Low Channel, 30 MHz – 12.75 GHz, HT10

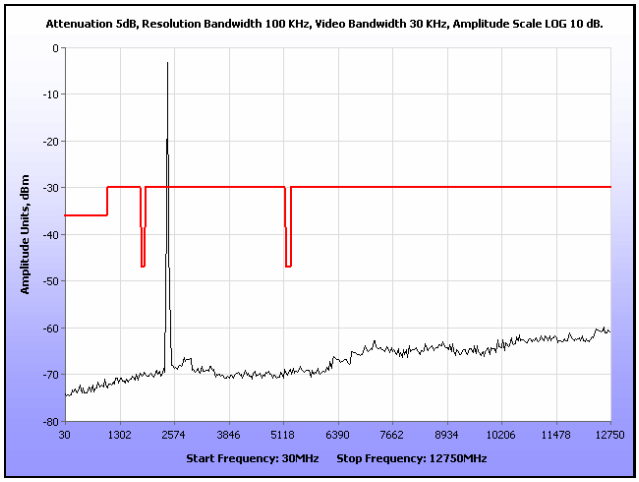


Plot 142. Conducted Spurious Emission, Mid Channel, 30 MHz - 12.75 GHz, HT10

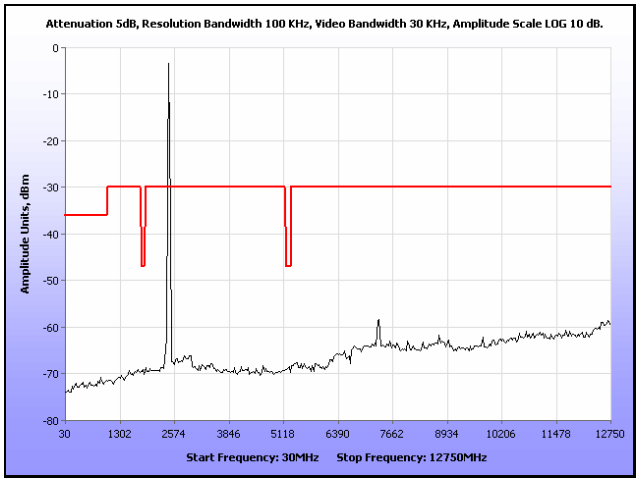


Plot 143. Conducted Spurious Emission, High Channel, 30 MHz – 12.75 GHz, HT10

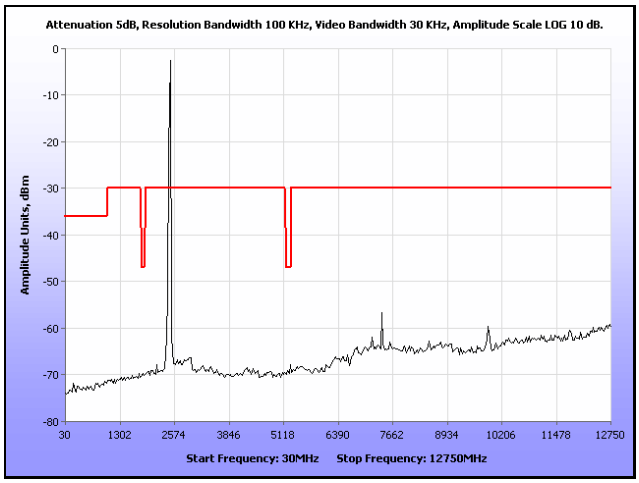
Transmitter Spurious Emissions – Conducted, Test Results, HT20



Plot 144. Conducted Spurious Emission, Low Channel, 30 MHz – 12.75 GHz, HT20

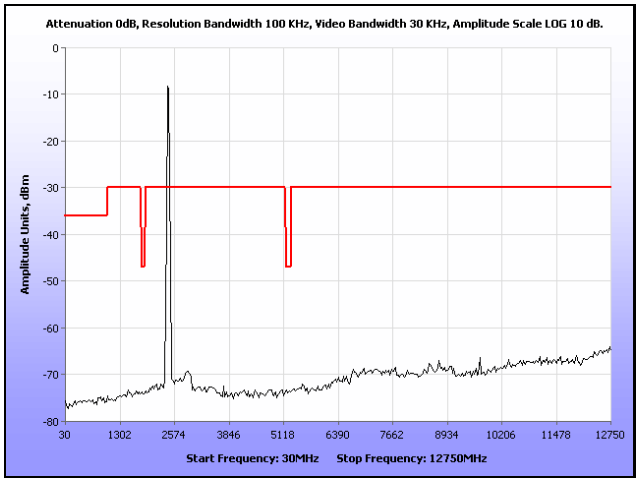


Plot 145. Conducted Spurious Emission, Mid Channel, 30 MHz - 12.75 GHz, HT20

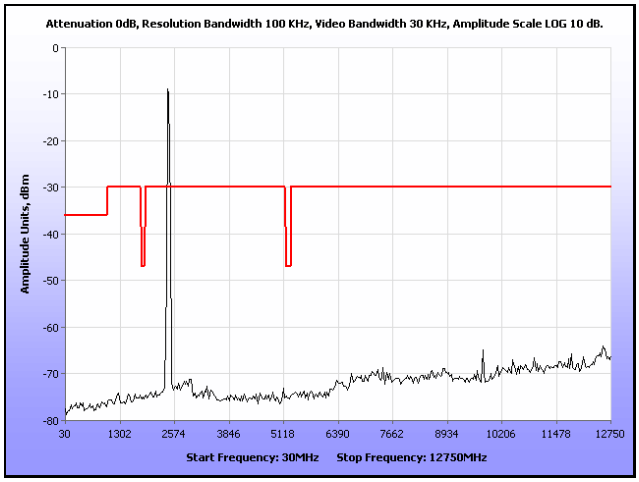


Plot 146. Conducted Spurious Emission, High Channel, 30 MHz – 12.75 GHz, HT20

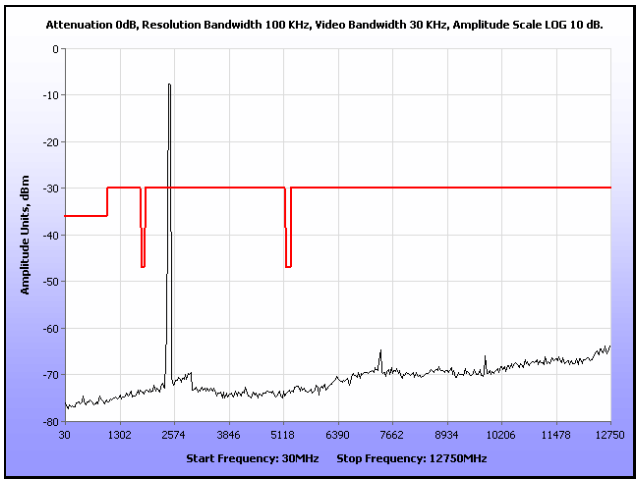
Transmitter Spurious Emissions – Conducted, Test Results, HT30



Plot 147. Conducted Spurious Emission, Low Channel, 30 MHz – 12.75 GHz, HT30

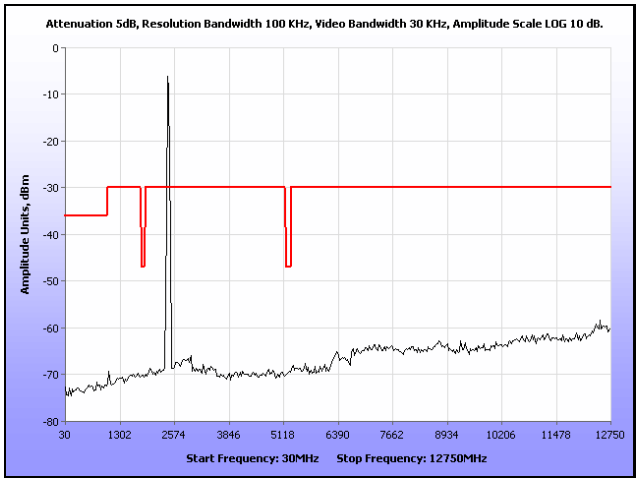


Plot 148. Conducted Spurious Emission, Mid Channel, 30 MHz - 12.75 GHz, HT30

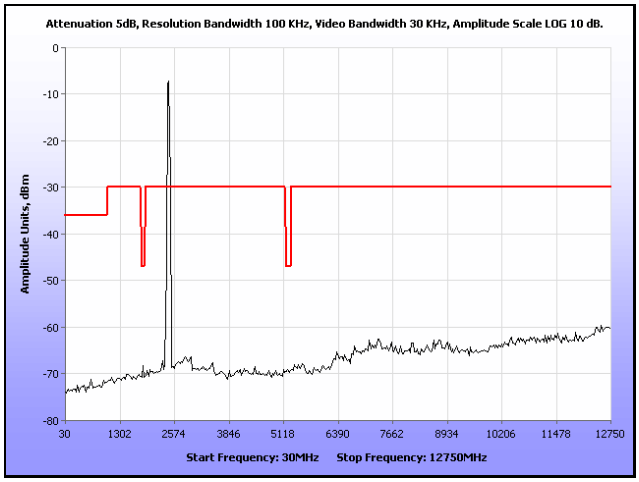


Plot 149. Conducted Spurious Emission, High Channel, 30 MHz – 12.75 GHz, HT30

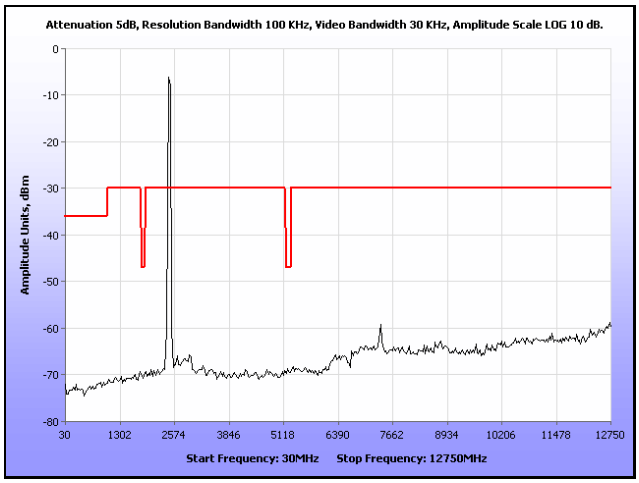
Transmitter Spurious Emissions – Conducted, Test Results, HT40



Plot 150. Conducted Spurious Emission, Low Channel, 30 MHz – 12.75 GHz, HT40



Plot 151. Conducted Spurious Emission, Mid Channel, 30 MHz - 12.75 GHz, HT40



Plot 152. Conducted Spurious Emission, High Channel, 30 MHz – 12.75 GHz, HT40

4.3.6 Transmitter Spurious Emissions - Radiated

Test Requirement(s): **EN 300 328, Clause 4.3.6:**

4.3.6.1 Definition

Transmitter spurious emissions are emissions outside the frequency range(s) of the equipment as defined in *Clause 4.3.3.1* when the equipment is in Transmit mode and/or in Standby mode.

4.3.6.2 Limit

The spurious emissions of the transmitter shall not exceed the values in Table 24 and Table 25 and in the indicated bands.

Frequency Range	Limit when operating	Limit when in standby
30 MHz to 1 GHz	-36 dBm	-57 dBm
above 1 GHz to 12,75 GHz	-30 dBm	-47 dBm
1,8 GHz to 1,9 GHz 5,15 GHz to 5,3 GHz	-47 dBm	-47 dBm

Table 26. Transmitter limits for narrowband spurious emissions

The above limit values apply to narrowband emissions, e.g. as caused by local oscillator leakage. The measurement bandwidth for such emissions may be as small as necessary to achieve a reliable measurement result.

Wideband emissions shall not exceed the values given in Table 25.

Frequency Range	Limit when operating	Limit when in standby
30 MHz to 1 GHz	-86 dBm	-107 dBm/Hz
above 1 GHz to 12,75 GHz	-80 dBm	-97 dBm/Hz
1,8 GHz to 1,9 GHz 5,15 GHz to 5,3 GHz	-97 dBm	-97 dBm/Hz

Table 27. Transmitter limits for wideband spurious emissions

Test Procedure: The EUT was placed on a 1.5m high wooden table inside a semi-anechoic chamber. The measurements were performed using normal operation of the equipment. The method of testing, test conditions, and test procedures of *Annex B* were used. The frequencies and amplitudes of field strengths were recorded for reference during final measurements.

The EUT was set to transmit at its highest output power at both the low and high channels of the transmit band as well as all applicable modulations. The receive antenna was adjusted in order to find the maximum emission. The table was also rotated about 360^0. Both vertical and horizontal polarizations were used to determine the maximum emission.

Measurements were made at 3m. The plots have been corrected for antenna correction factor and cable loss. A field strength measurement was made at 1m and then converted to an EIRP measurement using the formula:

The plots have been corrected to take into account all these conversions. Therefore, the following plots show the absolute ERP values compared to the limit.

Test Results: The EUT as tested was found compliant with the specified limits of Clause 4.3.6.2. There were no emissions within 6dB of the limit.

Test Engineer: Lionel Gabrillo

Test Date: 10/18/11

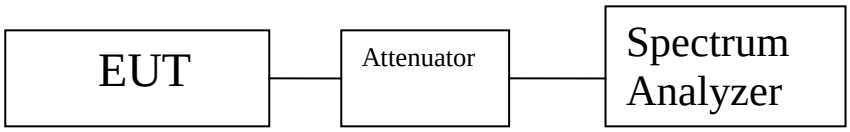
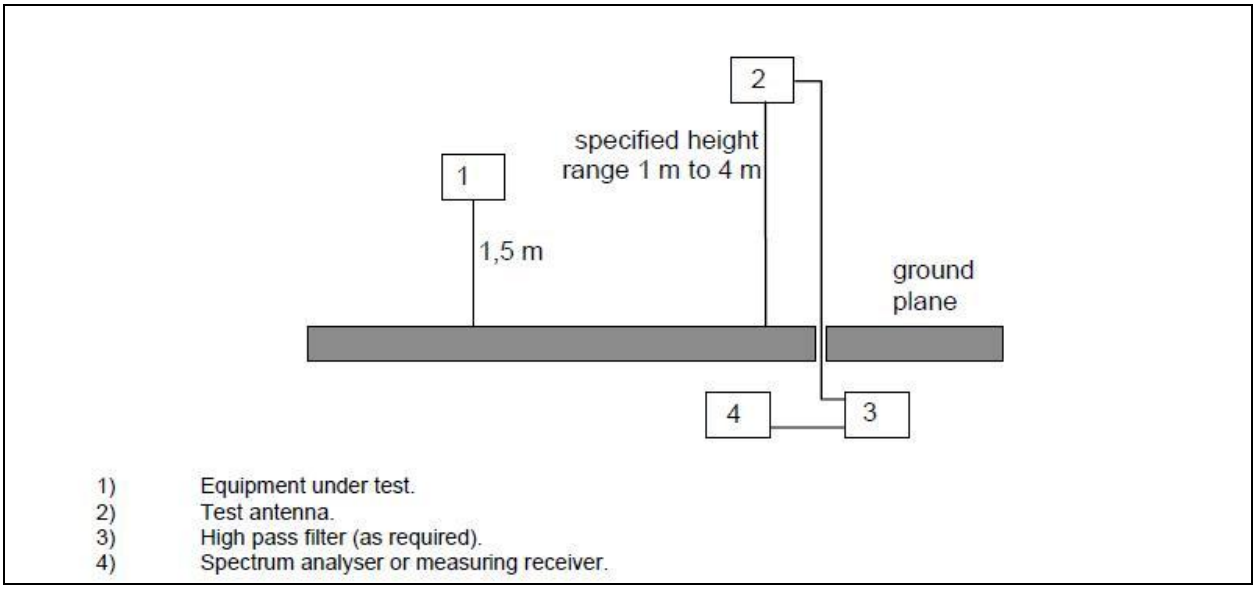
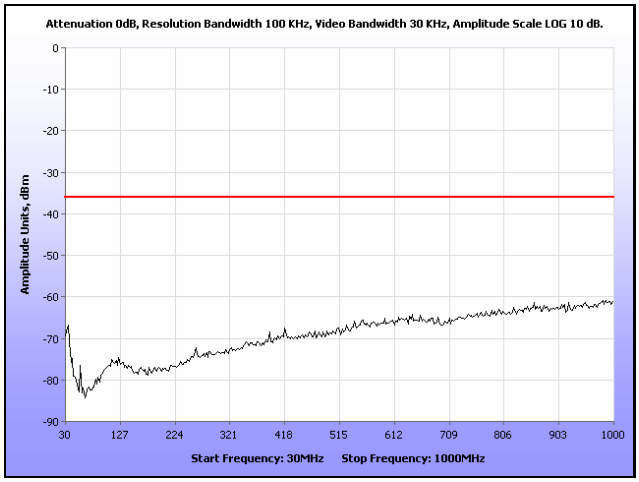


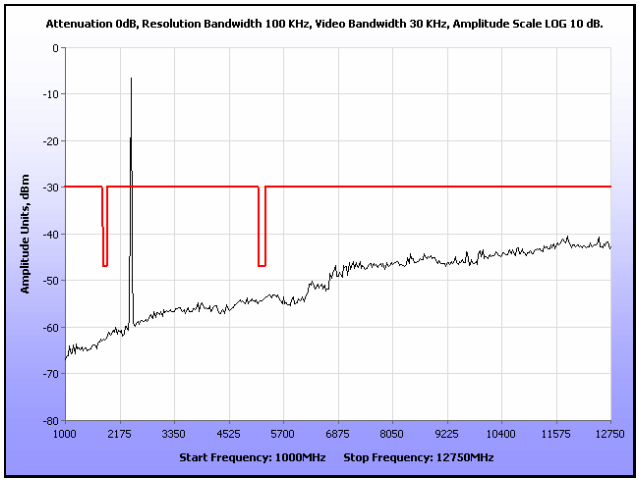
Figure 6. Transmitter Spurious Emissions - Radiated Test Setup



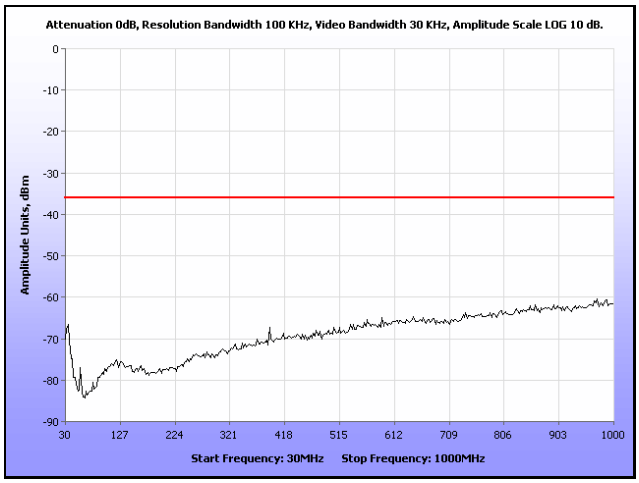
Transmitter Spurious Emissions – Radiated, Test Results, 802.11b



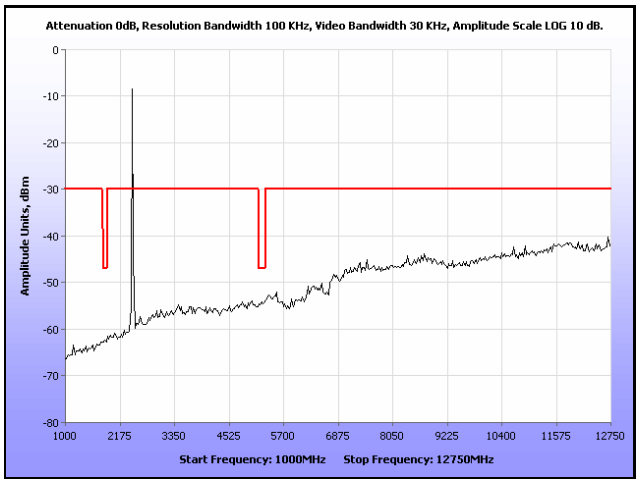
Plot 153. Radiated Spurious Emissions, 802.11b, Low Channel, 30 MHz – 1 GHz



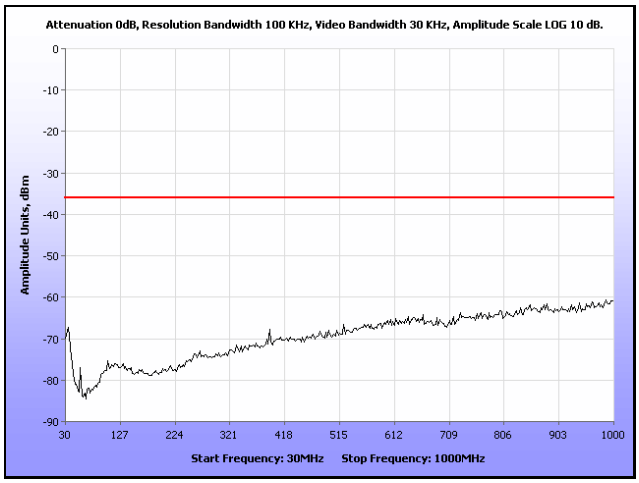
Plot 154. Radiated Spurious Emissions, 802.11b, Low Channel, 1 GHz – 12.75 GHz



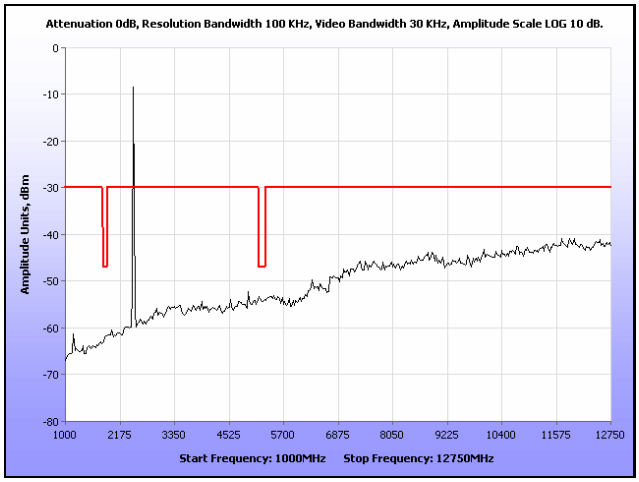
Plot 155. Radiated Spurious Emissions, 802.11b, Mid Channel, 30 MHz – 1 GHz



Plot 156. Radiated Spurious Emissions, 802.11b, Mid Channel, 1 GHz – 12.75 GHz

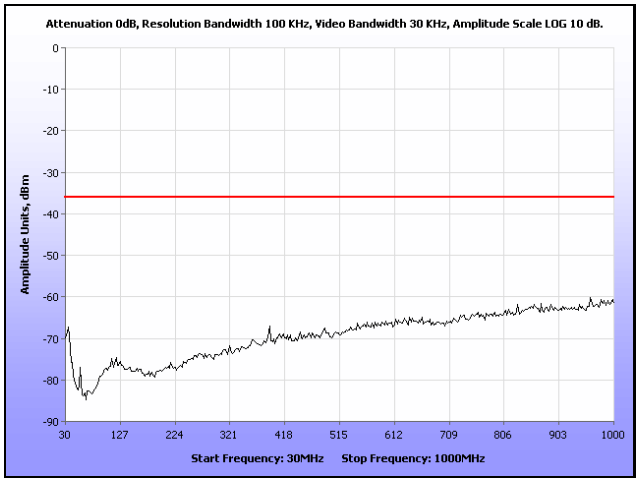


Plot 157. Radiated Spurious Emissions, 802.11b, High Channel, 30 MHz – 1 GHz

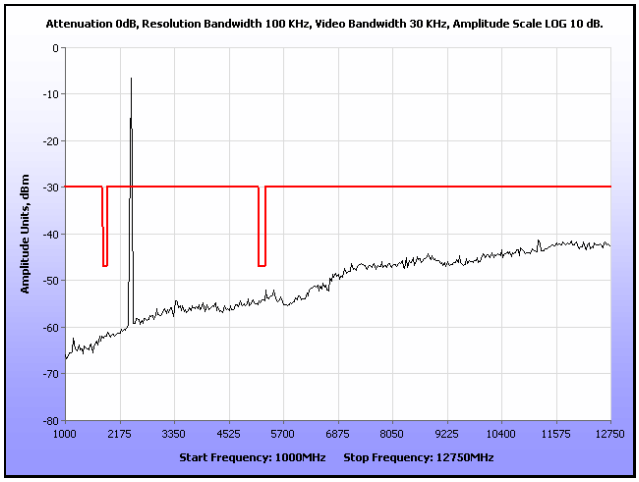


Plot 158. Radiated Spurious Emissions, 802.11b, High Channel, 1 GHz – 12.75 GHz

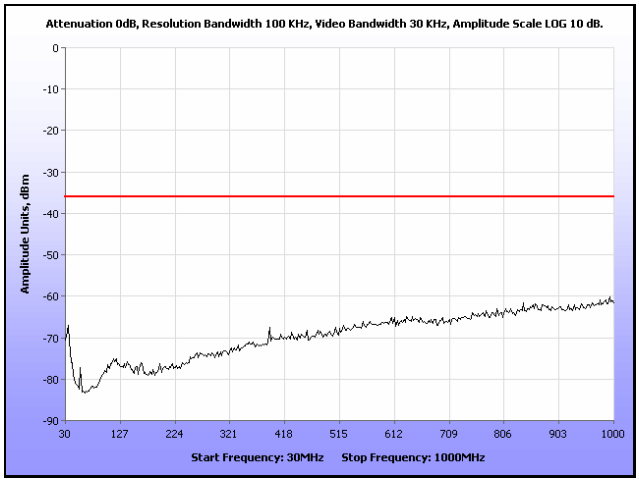
Transmitter Spurious Emissions – Radiated, Test Results, 802.11g



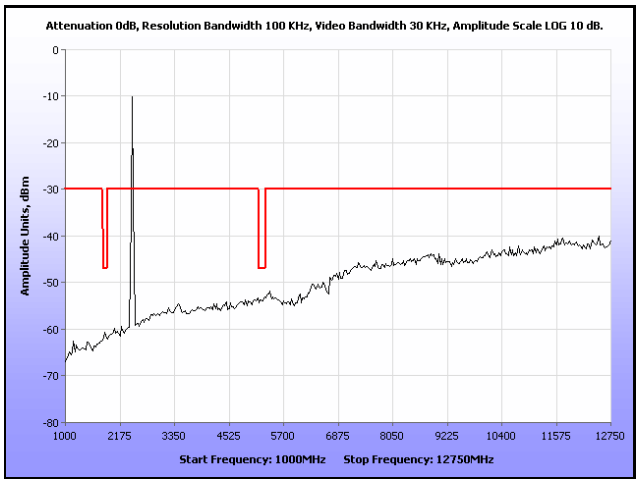
Plot 159. Radiated Spurious Emissions, 802.11g, Low Channel, 30 MHz – 12 GHz



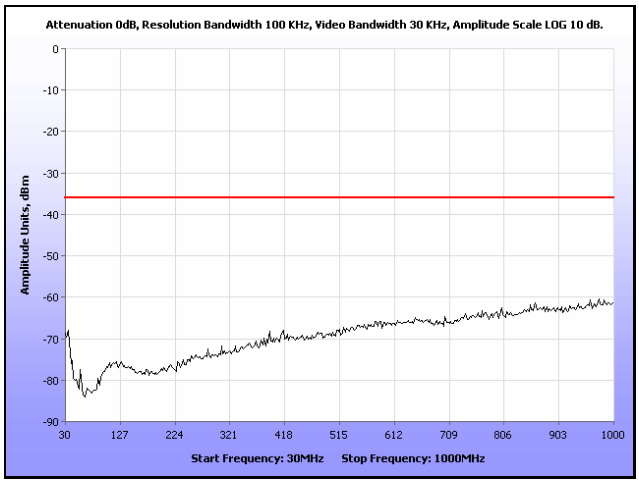
Plot 160. Radiated Spurious Emissions, 802.11g, Low Channel, 1 GHz – 12.75 GHz



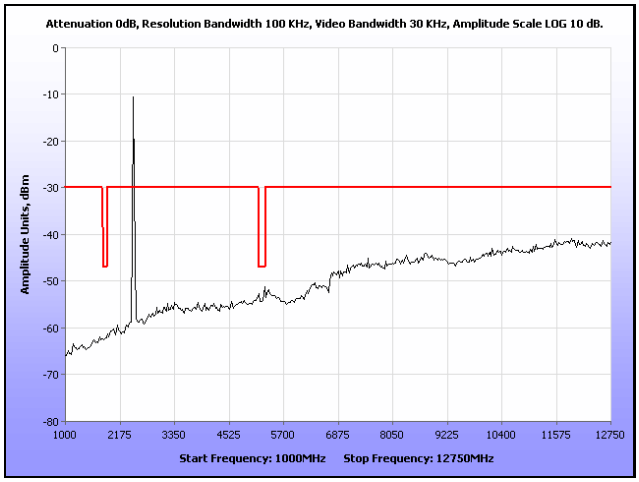
Plot 161. Radiated Spurious Emissions, 802.11g, Mid Channel, 30 MHz – 1 GHz



Plot 162. Radiated Spurious Emissions, 802.11g, Mid Channel, 1 GHz – 12.75 GHz

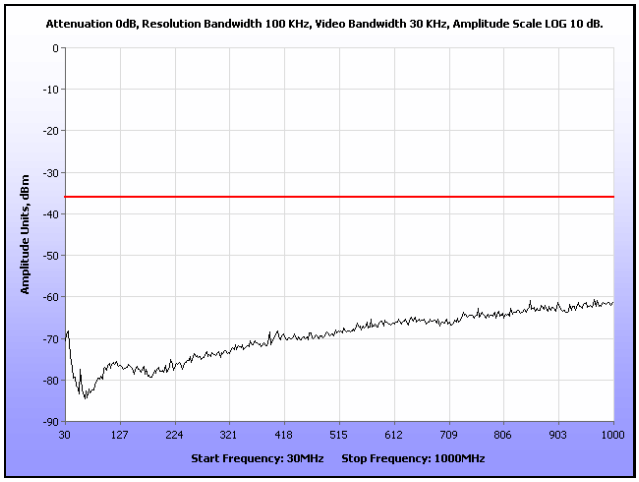


Plot 163. Radiated Spurious Emissions, 802.11g, High Channel, 30 MHz – 1 GHz

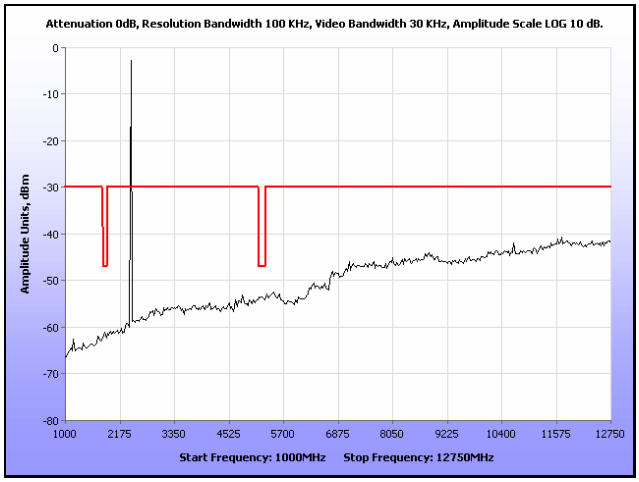


Plot 164. Radiated Spurious Emissions, 802.11g, High Channel, 1 GHz – 12.75 GHz

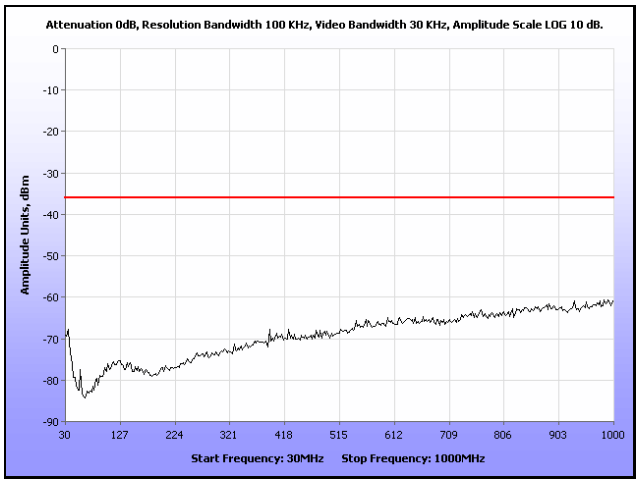
Transmitter Spurious Emissions – Radiated, Test Results, HT5



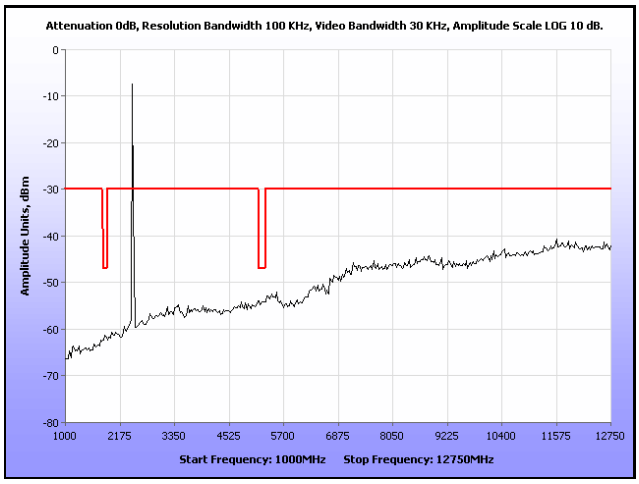
Plot 165. Radiated Spurious Emissions, HT5, Low Channel, 30 MHz – 1 GHz



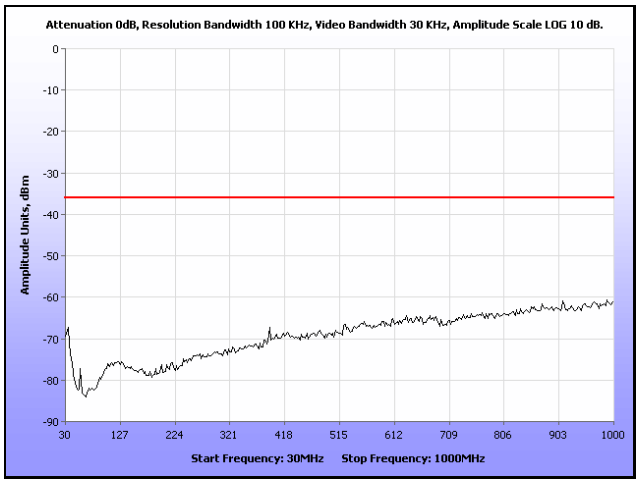
Plot 166. Radiated Spurious Emissions, HT5, Low Channel, 1 GHz – 12.75 GHz



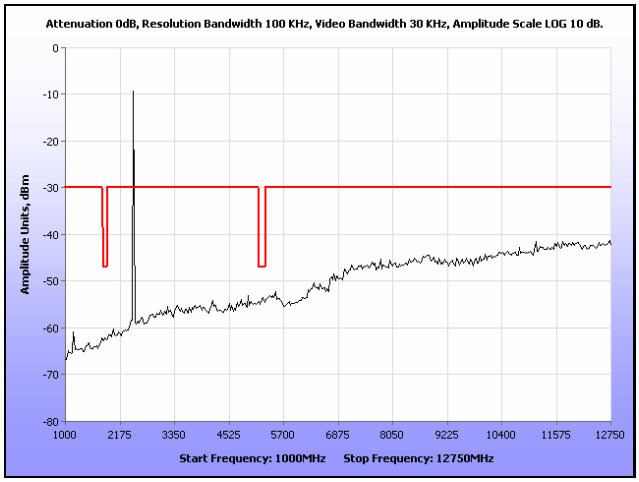
Plot 167. Radiated Spurious Emissions, HT5, Mid Channel, 30 MHz – 1 GHz



Plot 168. Radiated Spurious Emissions, HT5, Mid Channel, 1 GHz – 12.75 GHz

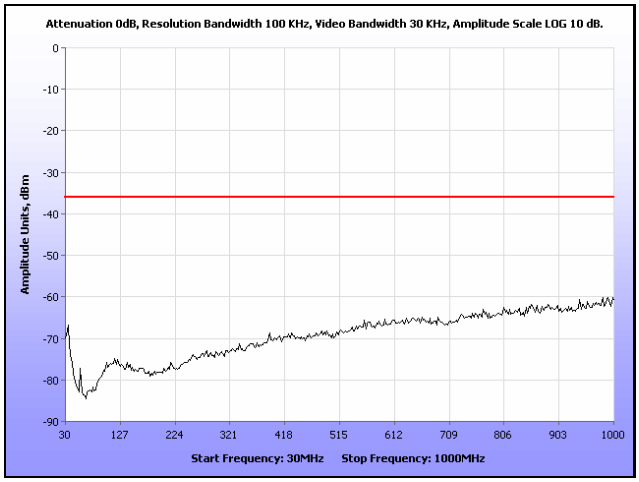


Plot 169. Radiated Spurious Emissions, HT5, High Channel, 30 MHz – 1 GHz

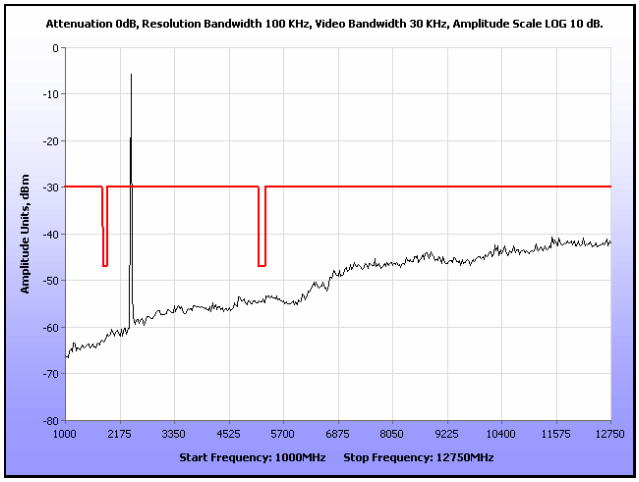


Plot 170. Radiated Spurious Emissions, HT5, High Channel, 1 GHz – 12.75 GHz

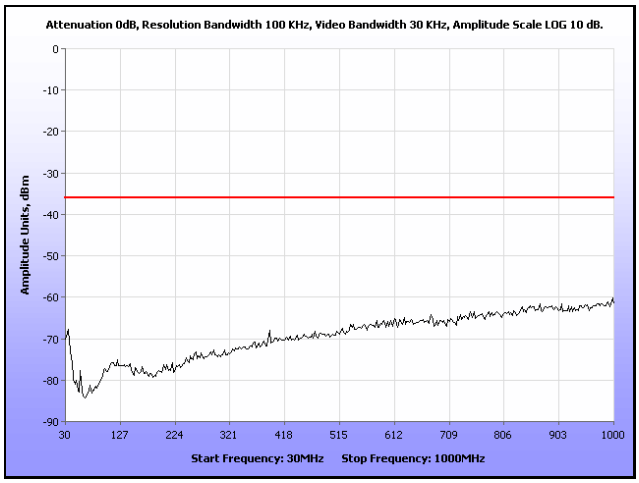
Transmitter Spurious Emissions – Radiated, Test Results, HT8



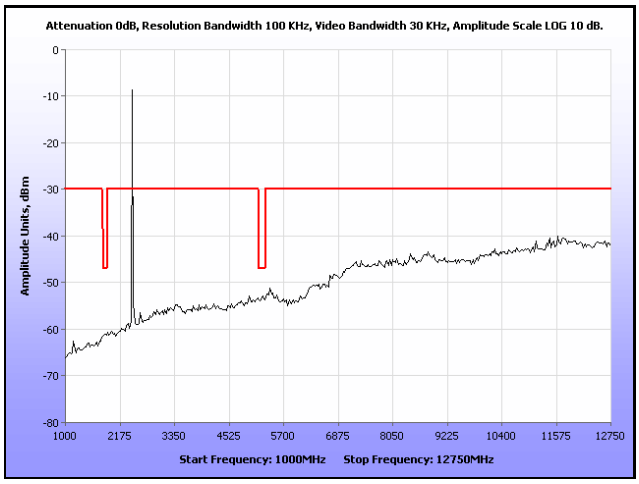
Plot 171. Radiated Spurious Emissions, HT8, Low Channel, 30 MHz – 1 GHz



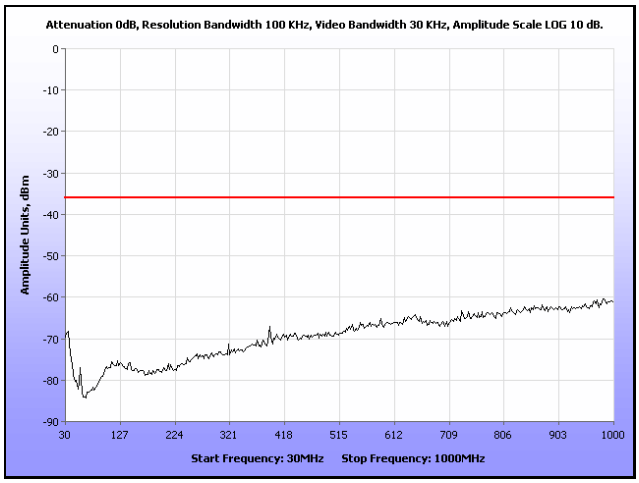
Plot 172. Radiated Spurious Emissions, HT8, Low Channel, 1 GHz – 12.75 GHz



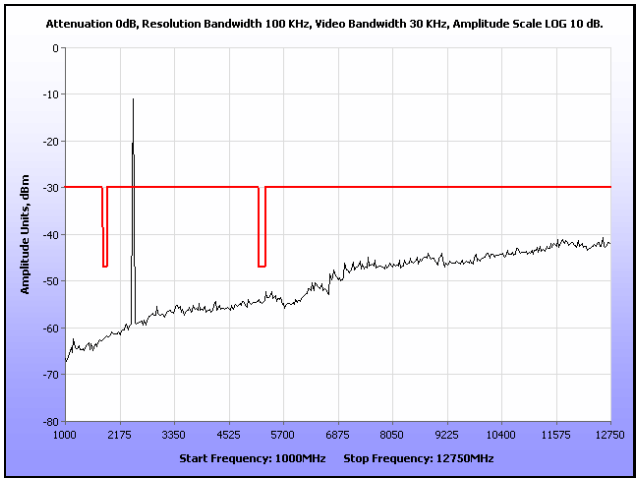
Plot 173. Radiated Spurious Emissions, HT8, Mid Channel, 30 MHz – 1 GHz



Plot 174. Radiated Spurious Emissions, HT8, Mid Channel, 1 GHz – 12.75 GHz

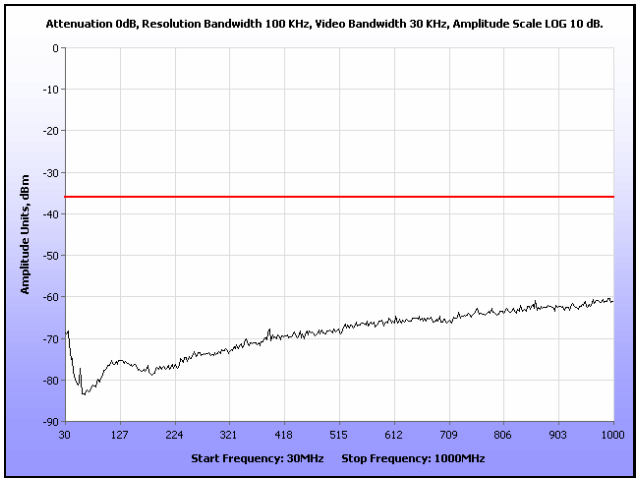


Plot 175. Radiated Spurious Emissions, HT8, High Channel, 30 MHz – 1 GHz

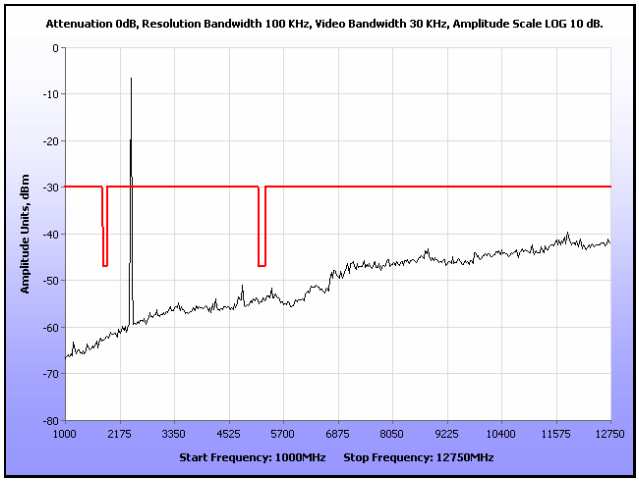


Plot 176. Radiated Spurious Emissions, HT8, High Channel, 1 GHz – 12.75 GHz

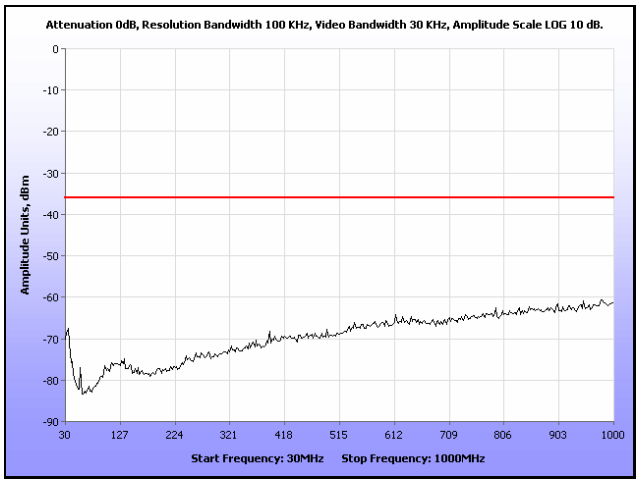
Transmitter Spurious Emissions – Radiated, Test Results, HT10



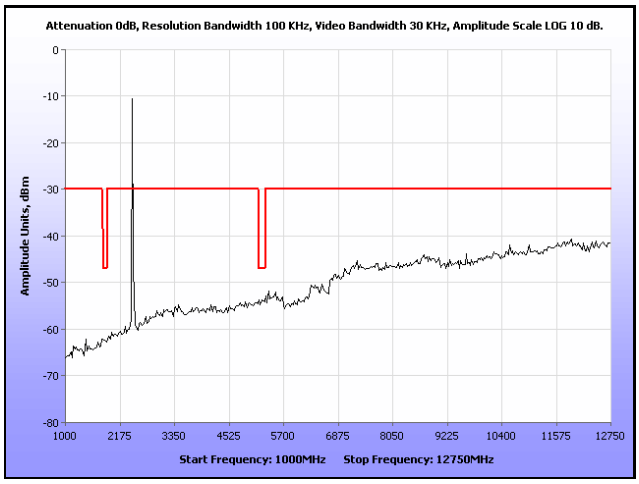
Plot 177. Radiated Spurious Emissions, HT10, Low Channel, 30 MHz – 1 GHz



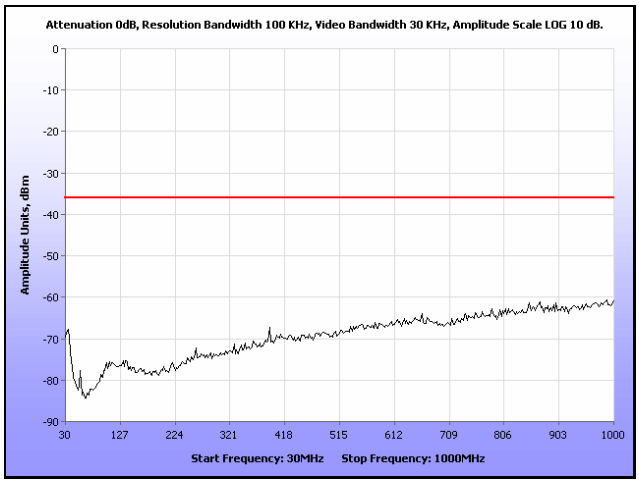
Plot 178. Radiated Spurious Emissions, HT10, Low Channel, 1 GHz – 12.75 GHz



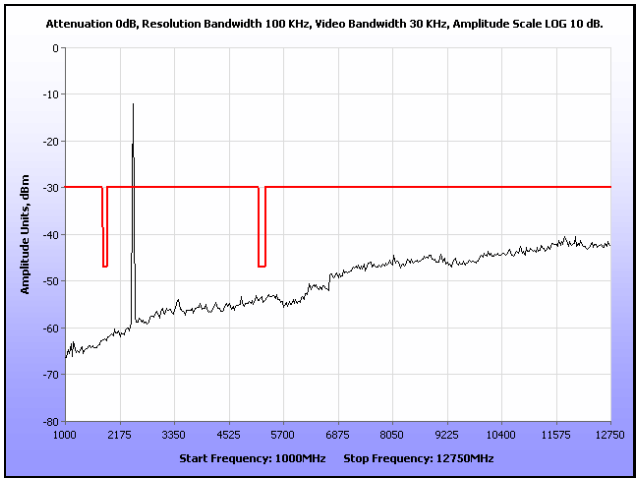
Plot 179. Radiated Spurious Emissions, HT10, Mid Channel, 30 MHz – 1 GHz



Plot 180. Radiated Spurious Emissions, HT10, Mid Channel, 1 GHz – 12.75 GHz

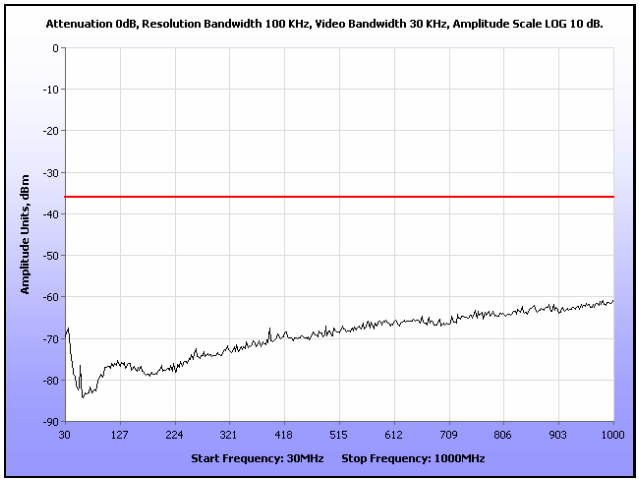


Plot 181. Radiated Spurious Emissions, HT10, High Channel, 30 MHz – 1 GHz

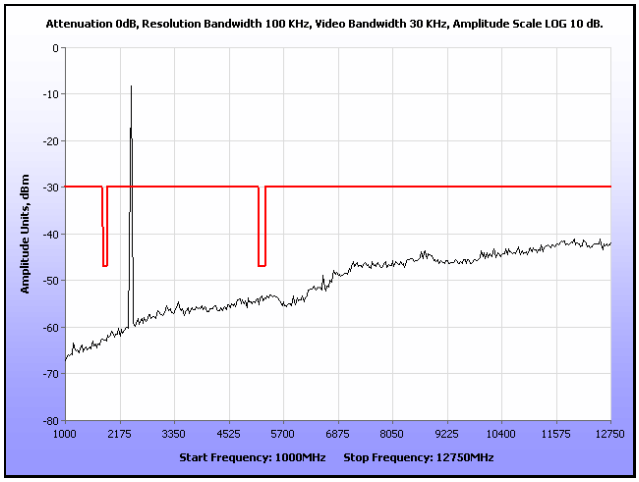


Plot 182. Radiated Spurious Emissions, HT10, High Channel, 1 GHz – 12.75 GHz

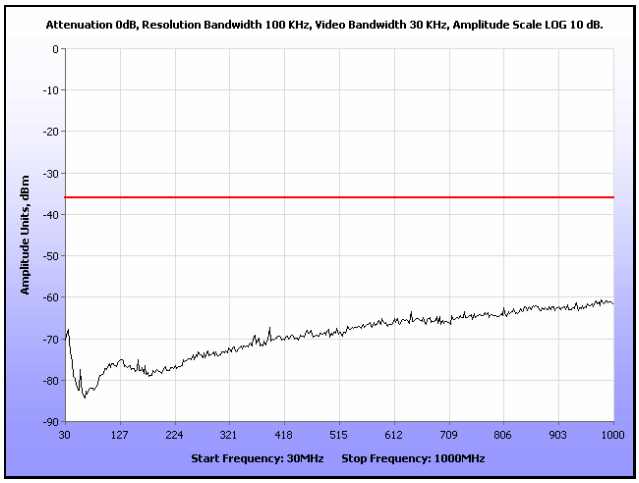
Transmitter Spurious Emissions – Radiated, Test Results, HT20



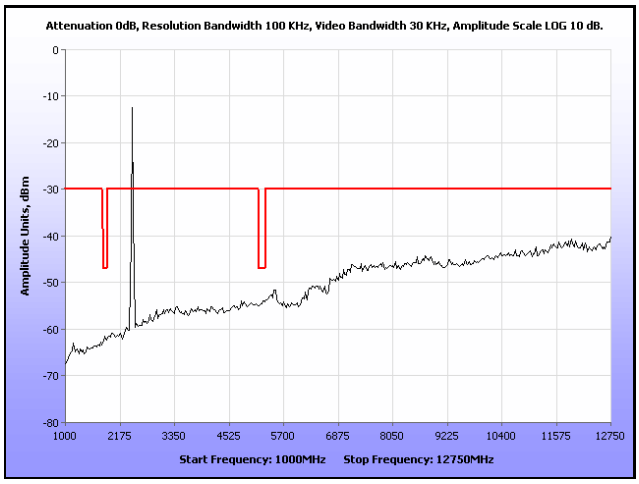
Plot 183. Radiated Spurious Emissions, HT20, Low Channel, 30 MHz – 1 GHz



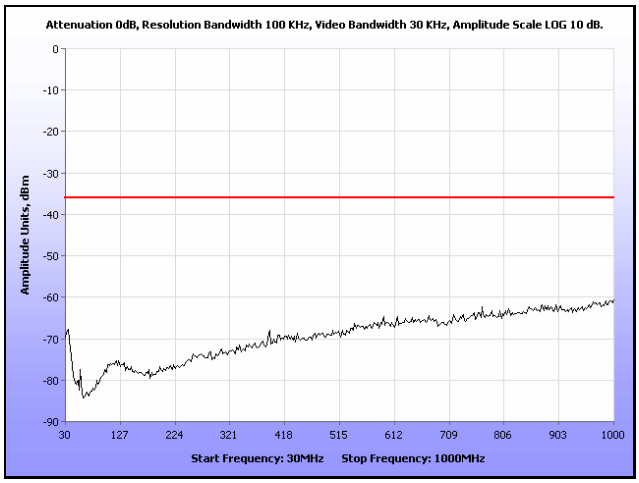
Plot 184. Radiated Spurious Emissions, HT20, Low Channel, 1 GHz – 12.75 GHz



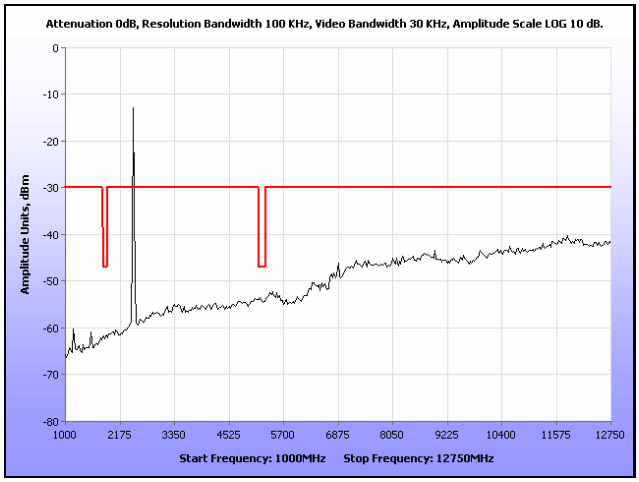
Plot 185. Radiated Spurious Emissions, HT20, Mid Channel, 30 MHz – 1 GHz



Plot 186. Radiated Spurious Emissions, HT20, Mid Channel, 1 GHz – 12.75 GHz

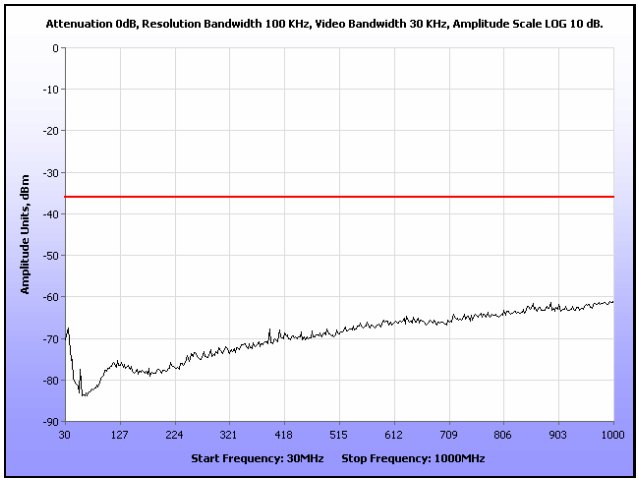


Plot 187. Radiated Spurious Emissions, HT20, High Channel, 30 MHz – 1 GHz

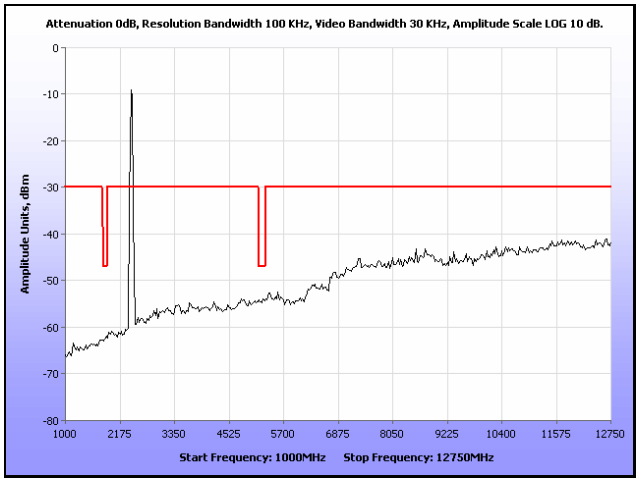


Plot 188. Radiated Spurious Emissions, HT20, High Channel, 1 GHz – 12.75 GHz

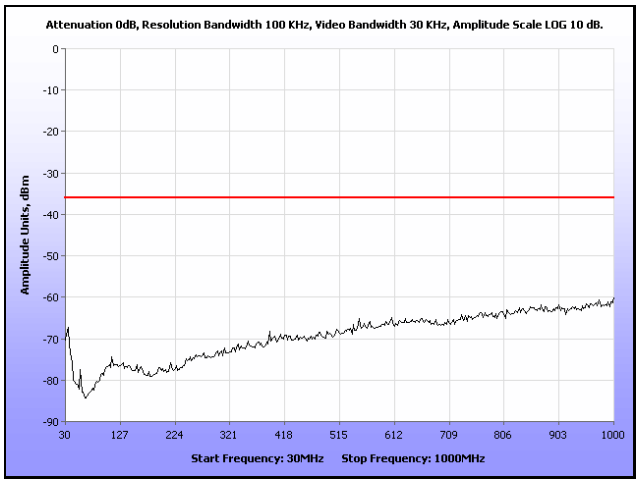
Transmitter Spurious Emissions – Radiated, Test Results, HT30



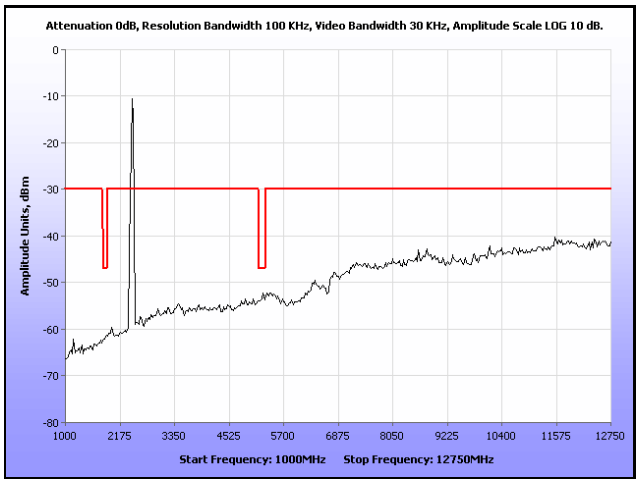
Plot 189. Radiated Spurious Emissions, HT30, Low Channel, 30 MHz – 1 GHz



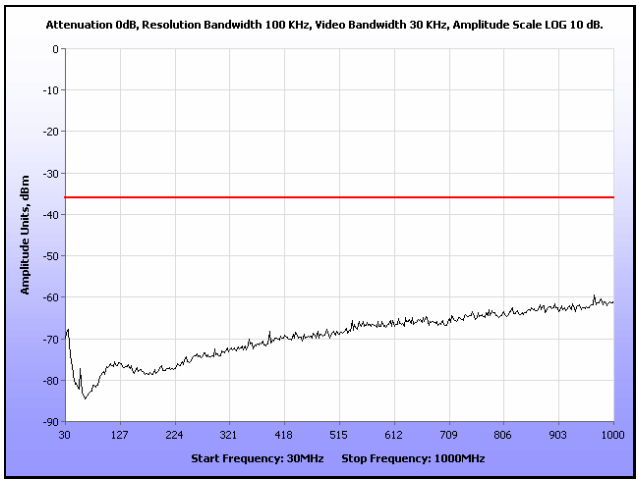
Plot 190. Radiated Spurious Emissions, HT30, Low Channel, 1 GHz – 12.75 GHz



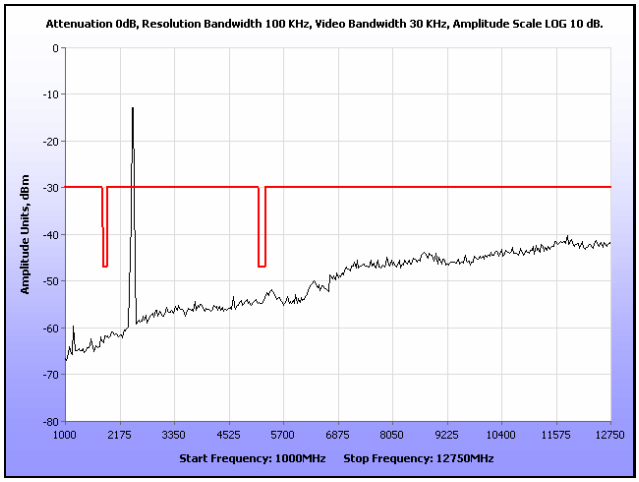
Plot 191. Radiated Spurious Emissions, HT30, Mid Channel, 30 MHz – 1 GHz



Plot 192. Radiated Spurious Emissions, HT30, Mid Channel, 1 GHz – 12.75 GHz

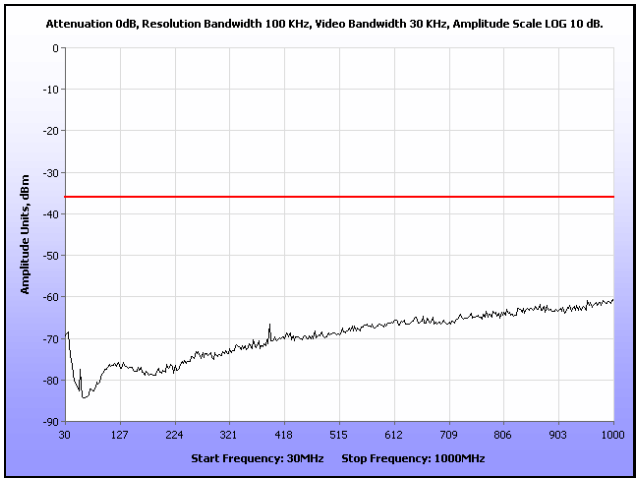


Plot 193. Radiated Spurious Emissions, HT30, High Channel, 30 MHz – 1 GHz

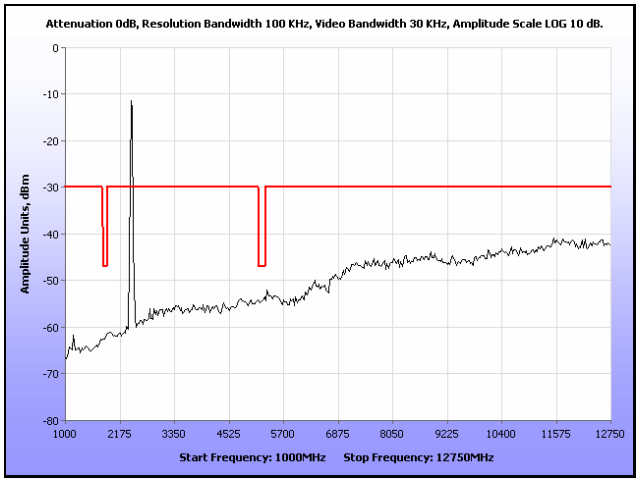


Plot 194. Radiated Spurious Emissions, HT30, High Channel, 1 GHz – 12.75 GHz

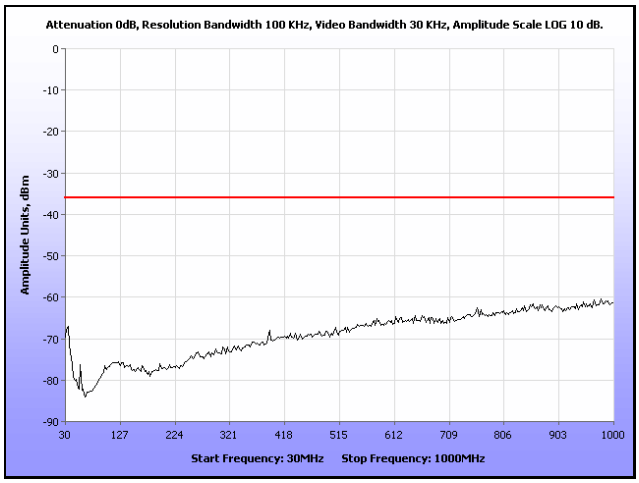
Transmitter Spurious Emissions – Radiated, Test Results, HT40



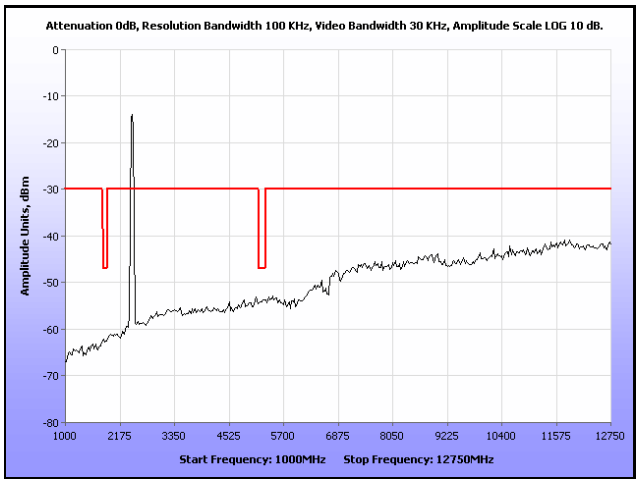
Plot 195. Radiated Spurious Emissions, HT40, Mid Channel, 30 MHz – 1 GHz



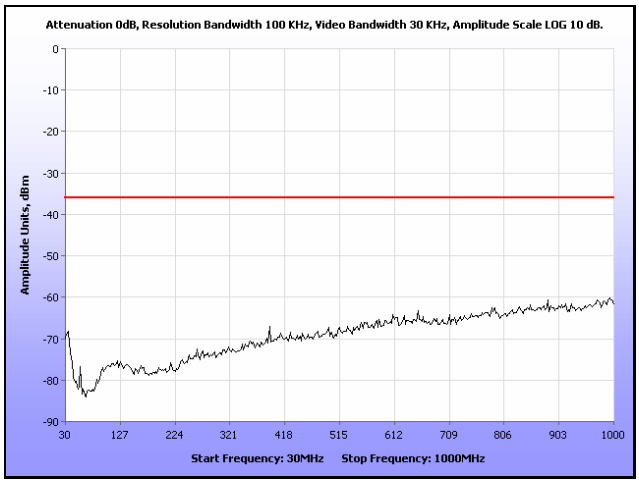
Plot 196. Radiated Spurious Emissions, HT40, Low Channel, 1 GHz – 12.75 GHz



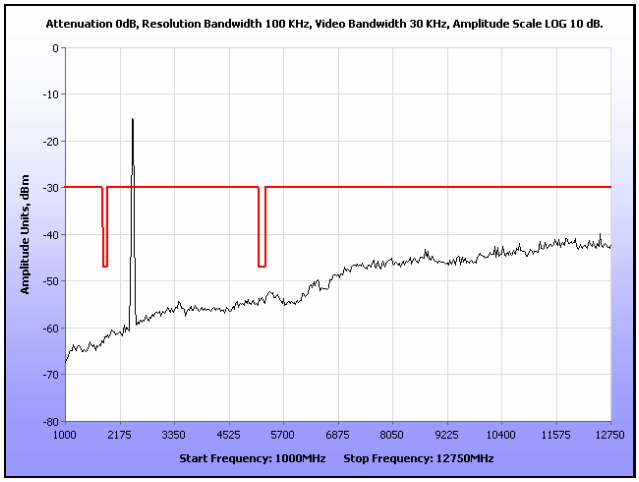
Plot 197. Radiated Spurious Emissions, HT40, Low Channel, 30 MHz – 1 GHz



Plot 198. Radiated Spurious Emissions, HT40, Mid Channel, 1 GHz – 12.75 GHz



Plot 199. Radiated Spurious Emissions, HT40, High Channel, 30 MHz – 1 GHz



Plot 200. Radiated Spurious Emissions, HT40, High Channel, 1 GHz – 12.75 GHz

Transmitter Spurious Emissions – Radiated, Test Setup

Photograph 2. Radiated Emissions, Test Setup, 30 MHz – 1 GHz

Photograph 3. Radiated Emissions, Test Setup, 1 GHz – 12.75 GHz

Conformance Requirements

4.3.7 Receiver Spurious Emissions - Conducted

Test Requirement(s): 4.3.7.1 Definition

Receiver spurious emissions are emissions at any frequency when the equipment is in received mode.

4.3.7.2 Limit

The spurious emissions of the receiver shall not exceed the values in tables Table 28 and Table 29 and in the indicated bands.

Frequency Range	Limit
30 MHz to 1 GHz	-57 dBm
above 1 GHz to 12,75 GHz	-47 dBm

Table 28. Narrowband spurious emission limits for receivers

The above limit values apply to narrowband emissions, e.g. as caused by local oscillator leakage. The measurement bandwidth for such emissions may be as small as necessary to get a reliable measurement result.

Wideband emissions shall not exceed the values given in Table 29.

Frequency Range	Limit
30 MHz to 1 GHz	-107dBm/Hz
above 1 GHz to 12,75 GHz	-97 dBm/Hz

Table 29. Wideband spurious emission limits for receivers

Test Procedure: The EUT was directly connected to a SA through a 10dB antenuator. Cable loss has been pre-programmed into SA.

Test Results: The EUT as tested was found compliant with the specified limits of Clause 4.3.7.2.

Test Engineer: Lionel Gabrillo

Test Date: 09/19/11

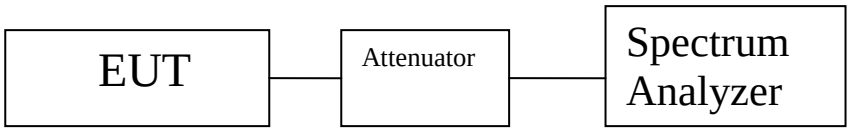
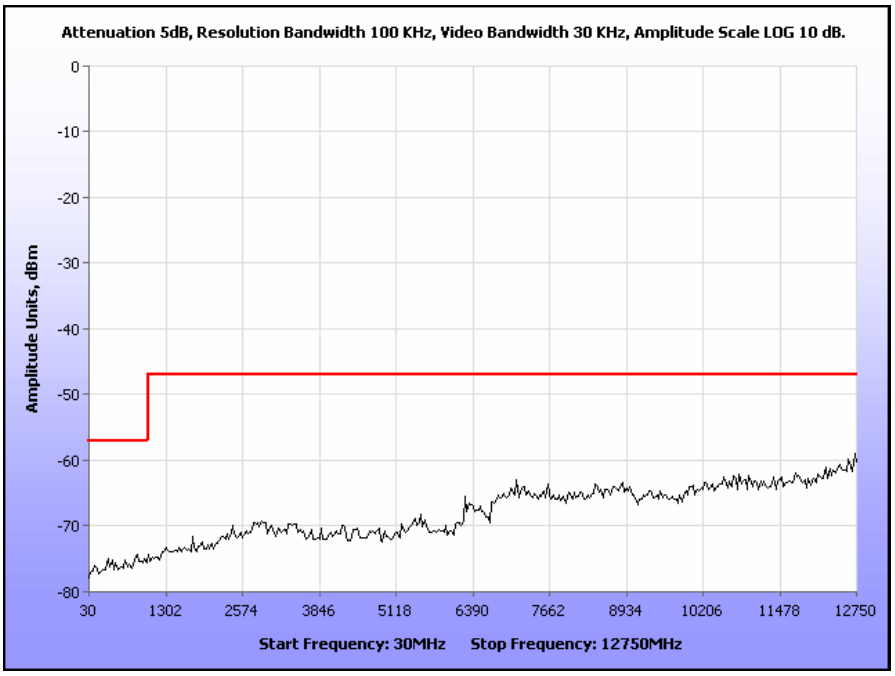


Figure 7. Receiver Spurious Emissions

Conducted Receiver Spurious Emissions, Test Results



Plot 201. Conducted Spurious Emission, 30 MHz – 12.75 GHz

Conformance Requirements

4.3.7 Receiver Spurious Emissions – Radiated

Test Requirement(s): 4.3.7.1 Definition

Receiver spurious emissions are emissions at any frequency when the equipment is in received mode.

4.3.7.2 Limit

The spurious emissions of the receiver shall not exceed the values in tables Table 28 and Table 29 and in the indicated bands.

Frequency Range	Limit
30 MHz to 1 GHz	-57 dBm
above 1 GHz to 12,75 GHz	-47 dBm

Table 30. Narrowband spurious emission limits for receivers

The above limit values apply to narrowband emissions, e.g. as caused by local oscillator leakage. The measurement bandwidth for such emissions may be as small as necessary to get a reliable measurement result.

Wideband emissions shall not exceed the values given in Table 29.

Frequency Range	Limit
30 MHz to 1 GHz	-107dBm/Hz
above 1 GHz to 12,75 GHz	-97 dBm/Hz

Table 31. Wideband spurious emission limits for receivers

Test Procedure: The EUT was placed on a 1.5m high wooden table inside a semi-anechoic chamber. The measurements were performed using normal operation of the equipment. The method of testing, test conditions, and test procedures of *Annex B* were used. The frequencies and amplitudes of field strengths were recorded for reference during final measurements.

The receive antenna was adjusted in order to find the maximum emission. The table was also rotated about 360^0. Both vertical and horizontal polarizations were used to determine the maximum emission.

Measurements were made at 3m. The plots have been corrected for antenna correction factor and cable loss.

Test Results: The EUT as tested was found compliant with the specified limits of Clause 4.3.7.2.

Test Engineer: Lionel Gabrillo

Test Date: 10/11/11

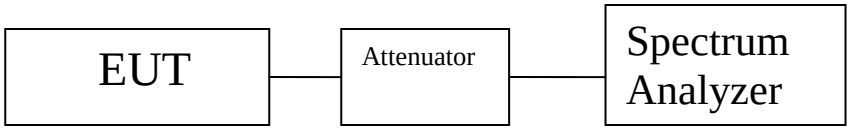
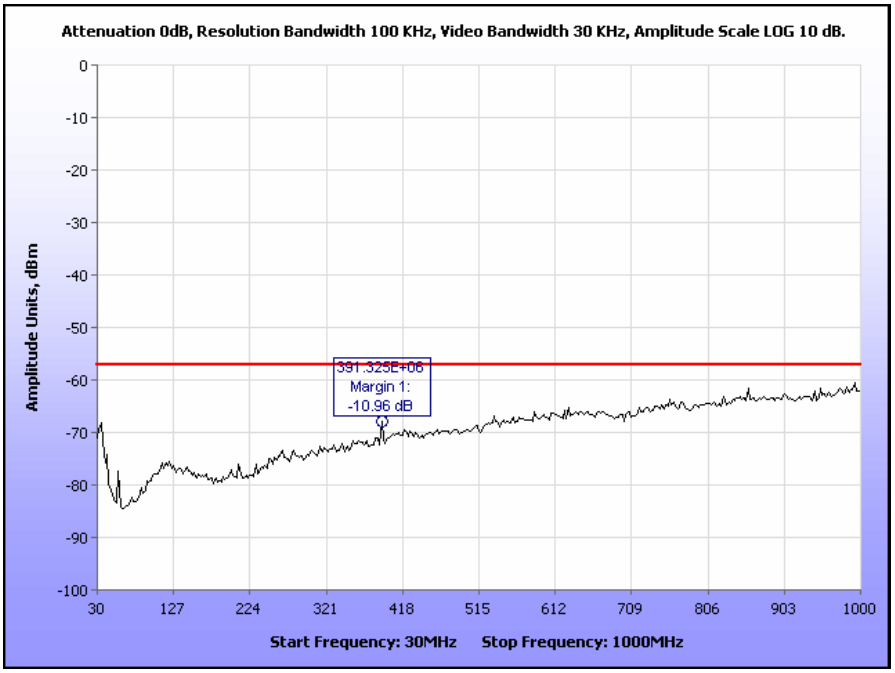
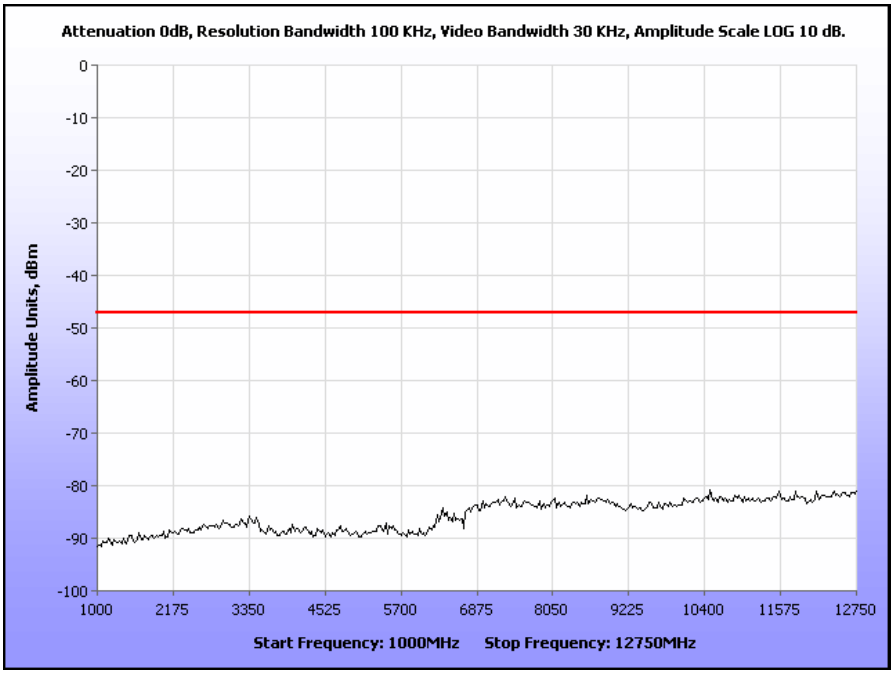


Figure 8. Receiver Spurious Emissions

Receiver Spurious Emissions – Radiated, Test Results



Plot 202. Radiated Spurious Emission, 30 MHz – 1 GHz



Plot 203. Radiated Spurious Emission, 1 GHz – 12.75 GHz

IV. Test Equipment

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
1S2198	HORN ANTENNA	EMCO	3115	9/29/2011	9/29/2012
1S2603	HORN ANTENNA	ETS-Lindgren	3117	4/15/2011	4/15/2011
1S2583	ANALYZER, SPECTRUM	AGILENT	E4447A	03/18/2011	03/18/2012
1S2460	ANALYZER, SPECTRUM	AGILENT	E4407B	07/12/2011	07/12/2012
1S2482	CHAMBER, 5 METER	PANASHIELD	641431	11/13/2010	11/13/2011
1S2399	TURNTABLE CONTROLLER	SUNOL SCIENCE	SC99V	SEE NOTE	
1S2498	VARIABLE POWER SUPPLY	ISE., INC	5021CT-DVAM	SEE NOTE	
1S2229	TEMPERATURE CHAMBER	TENNY	T6	02/18/2011	02/18/2012
1S2484	BILOG ANTENNA	TESEQ	CBL6112D	2/27/2011	2/27/2012

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

End of Report

