MET Laboratories, Inc. ***Safety Certification - EMI - Telecom Environmental Simulation***
33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

March 3, 2008

Ubiquiti Networks
495-499 Montague Expressway
Milpitas, CA 95035

Dear Robert Pera,

Enclosed is the EMC test report for compliance testing of the Ubiquiti Networks, NS2 tested to the requirements of ETSI EN 300 328 V1.7.1 (2006-10) (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 Sanchez
Documentation Department

Reference: (\Ubiquiti Networks\EMCS80544A-EN328)

MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
3162 BELICK STREET • SANTA CLARA, CALIFORNIA 95054 • PHONE (408) 748-3585 • FAX (510) 489-6372

Electromagnetic Compatibility Criteria
Test Report

For the

Ubiquiti Networks
Model NS2

Tested under

ETSI EN 300 328 V1.7.1 (2006-10)

(Article 3.2 of R&TTE Directive)

MET Report: EMCS80544A-EN328

March 3, 2008

Prepared For:

Ubiquiti Networks
495-499 Montague Expressway
Milpitas, CA 95035

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

Electromagnetic Compatibility Criteria
Test Report

For the

Ubiquiti Networks
Model NS2

Tested under

ETSI EN 300 328 V1.7.1 (2006-10)

(Article 3.2 of R&TTE Directive)

MET Report: EMCS80544A-EN328

Minh Ly, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Sanchez
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 V1.7.1 (2006-10) of the EU Rules under normal use and maintenance.

Tony Permsombut, Manager
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	March 3, 2008	Initial Issue.

Table of Contents

List of Tables

List of Photographs

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**H**enry
µF	**micro**F**arad
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	Effective Radiated Power	X			Compliant
Sections 4.3.2	Maximum Spectral Power Density	X			Compliant
Sections 4.3.3	Frequency Range	X			Compliant
Sections 4.3.6	Transmitter Spurious Emissions	X			Compliant
Sections 4.3.7	Receiver Spurious Emissions	X			Compliant

Table 1. Summary of EMC ETSI EN 300 328 V1.7.1 (2006-10) (Article 3.2 of R&TTE Directive) Compliance Testing

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Ubiquiti Networks to perform testing on a NS2.

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 model NS2.

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

Model(s) Tested:	NS2
Model(s) Number:	NS2
EUT Specifications:	Primary Power from Laptop: 230V/50Hz
	Secondary Power: N/A
Lab Ambient (Normal) Test Conditions:	Temperature: 15-35º C
	Relative Humidity: 30-60%
	Atmospheric Pressure: 860-1060 mbar
Extreme Test Conditions:	Voltage: 230V
	Temperature: -20 to +55º C
	Relative Humidity: 30-60%
Evaluated by:	Minh Ly
Date(s):	March 3, 2008

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., 4855 Patrick Henry Dr., Building 6, Santa Clara, CA 95054 & 3162 Belick Street, 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 NS2, is a high performance 802.11 outdoor CPE device specifically designed for optimized performance at 2.4GHZ.

Photograph 1. Ubiquiti Networks NS2

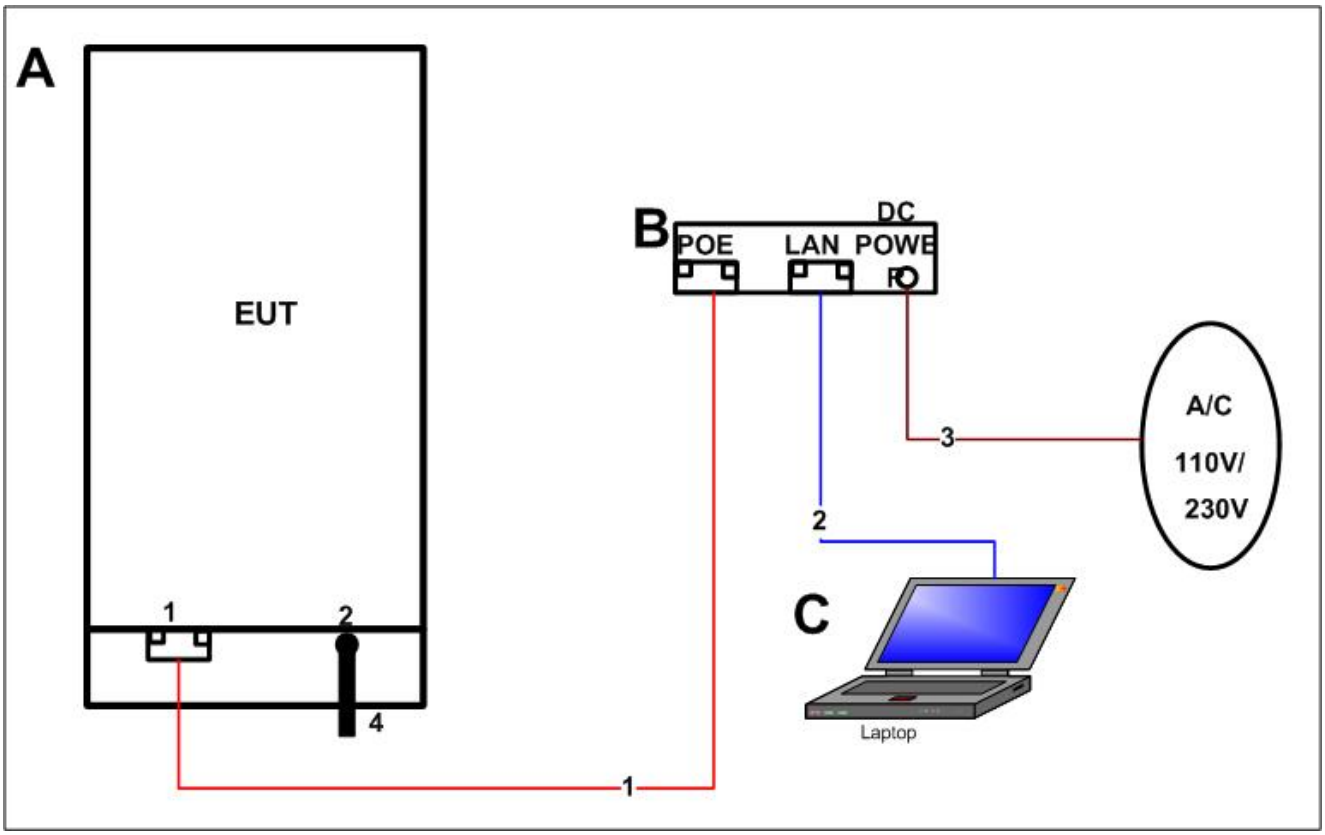


Figure 1. Block Diagram of Test Configuration

E. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Serial Number
A	NanoStation 2	NS2	0643 00156DA65660

Table 3. Equipment Configuration

F. Support Equipment

Ubiquiti Networks supplied support equipment necessary for the operation and testing of the NS2. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
B	AC/DC Adaptor	GME Switching	GFP121U-1219B	
C	Laptop	DELL	Inspiron 630m	

Table 4. Support Equipment

G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded (Y/N)	Termination Box ID & Port ID
1	A,1	Ethernet	1	2 mts	Y	B, POE
2	B, LAN	Ethernet	1	2 mts	Y	C, Laptop
3	B, DC POWER	Power Cable	1	2 mts	N	230V/110V Power Supply
4	A,2	Terminated with 50 Ohm Load	1	N/A	N/A	N/A

Table 5. Ports and Cabling Information

H. Mode of Operation

The EUT operates in DSSS/OFDM modes.

I. Method of Monitoring EUT Operation

A Spectrum Analyzer and a Power Meter was use to monitor the EUT's transmitter channel and power output.

J. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the EUT.

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 upon completion of testing.

III. Conformance Requirements

Conformance Requirements

4.2.1 Effective Radiated Power

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

4.3.1.1 Definition

The effective radiated power is defined as the total power of the transmitter.

4.3.1.2 Limit

The effective radiated power shall be equal to or less than -10 dBW (100 mW) E.I.R.P. This limit shall apply for any combination of power level and intended antenna assembly.

Test Procedure: The EUT was connected directly to a power meter capable of measuring the peak and average RF power of a modulated carrier. 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 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 Engineer: Minh Ly

Test Date: November 14, 2007

Conformance Requirements

Effective Isotropic Radiated Power Test Results

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

Channel	Temperature	Voltage	Mode	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP
Low	Nominal	Nominal	OFDM	9.85	10	19.85
Mid	Nominal	Nominal	OFDM	9.87	10	19.87
High	Nominal	Nominal	OFDM	9.5	10	19.5
Low	Maximum	Minimum	OFDM	9.55	10	19.55
Low	Maximum	Maximum	OFDM	9.52	10	19.52
Mid	Maximum	Minimum	OFDM	9.69	10	19.69
Mid	Maximum	Maximum	OFDM	9.61	10	19.61
High	Maximum	Minimum	OFDM	9.73	10	19.73
High	Maximum	Maximum	OFDM	9.75	10	19.75
Low	Minimum	Minimum	OFDM	9.16	10	19.16
Low	Minimum	Maximum	OFDM	9.32	10	19.32
Mid	Minimum	Minimum	OFDM	9.41	10	19.41
Mid	Minimum	Maximum	OFDM	9.47	10	19.47
High	Minimum	Minimum	OFDM	9.35	10	19.35
High	Minimum	Maximum	OFDM	9.59	10	19.59

Table 6. Effective Isotropic Radiated Power Test Results – OFDM Mode

Channel	Temperature	Voltage	Mode	Conducted Power (dBm)	Antenna Gain (dBi)	EIRP
Low	Nominal	Nominal	DSSS	9.27	10	19.27
Mid	Nominal	Nominal	DSSS	9.31	10	19.31
High	Nominal	Nominal	DSSS	9.46	10	19.46
Low	Maximum	Minimum	DSSS	9.72	10	19.72
Low	Maximum	Maximum	DSSS	9.69	10	19.69
Mid	Maximum	Minimum	DSSS	9.41	10	19.41
Mid	Maximum	Maximum	DSSS	9.5	10	19.5
High	Maximum	Minimum	DSSS	9.33	10	19.33
High	Maximum	Maximum	DSSS	9.68	10	19.68
Low	Minimum	Minimum	DSSS	9.52	10	19.52
Low	Minimum	Maximum	DSSS	9.5	10	19.5
Mid	Minimum	Minimum	DSSS	9.23	10	19.23
Mid	Minimum	Maximum	DSSS	9.63	10	19.63
High	Minimum	Minimum	DSSS	9.47	10	19.47
High	Minimum	Maximum	DSSS	9.3	10	19.3

Table 7. Effective Isotropic Radiated Power Test Results – DSSS Mode

Conformance Requirements

4.3.2 Maximum Spectral Power Density

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

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

4.3.2.2 Limit
For equipment using FHSS modulation, the maximum spectral power density shall be limited to -10 dBW (100mW) per 100 KHz EIRP. For equipment using other types of modulation than FHSS (e.g. DSSS, OFDM, etc), the maximum spectral power density shall be limited to 10mW per MHz EIRP.

Test Procedure: The EUT was connected directly to a spectrum analyzer through an attenuator. The EUT was set to transmit at the highest power level in the appropriate modulation. For DTS modulations, the spectrum analyzer was set with a resolution band width of 1MHz, a positive peak detector, max hold function and a span three times the Occupied Band width. The frequency which produced the highest output across the channel bandwidth was recorded. The spectrum analyzer was then set to this frequency and the channel power/MHz was measured using the spectrum analyzer's channel power function. 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.

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

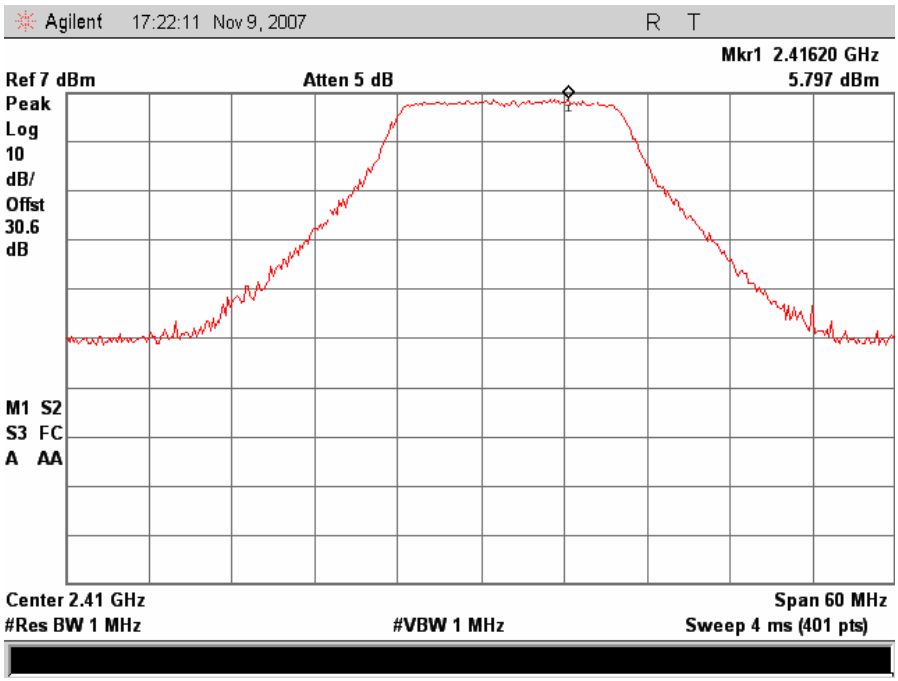
Maximum SPD <= 10mW (10 dBm) per MHz EIRP in Normal Test Condition, SPD = Spectral Power Density.

Frequency (MHz)	Mode	Measured Maximum Spectral Power Density (dBm)	Antenna Gain	Maximum SPD Limit (dBm)	Margin dB
2412	OFDM	-2.37	10	10	-2.37
2437	OFDM	-2.26	10	10	-2.26
2462	OFDM	-2.02	10	10	-2.02

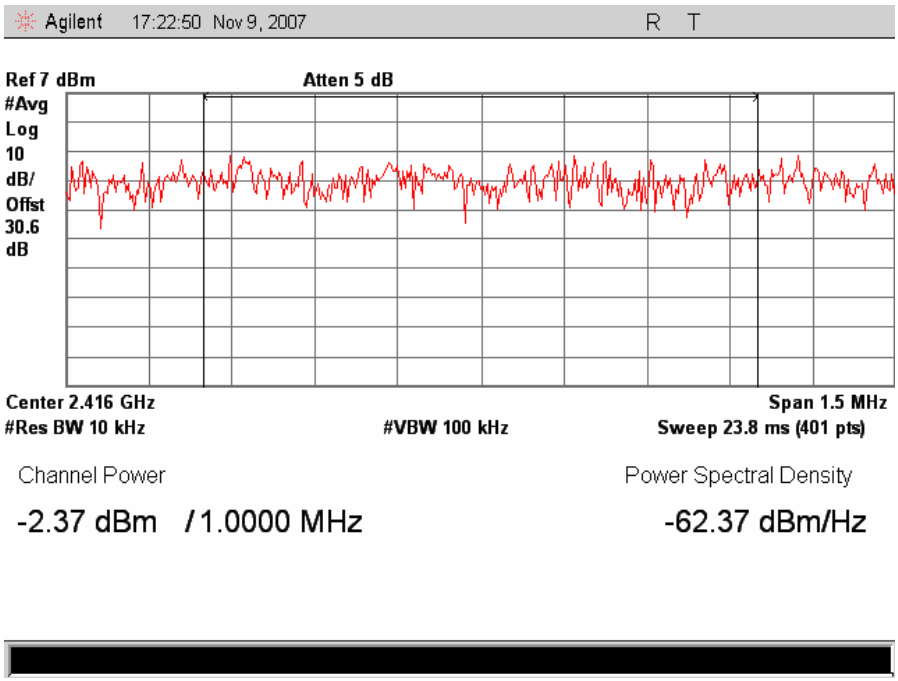
Frequency (MHz)	Mode	Measured Maximum Spectral Power Density (dBm)	Antenna Gain	Maximum SPD Limit (dBm)	Margin dB
2412	DSSS	-0.19	10	10	-0.19
2437	DSSS	-0.41	10	10	-0.41
2462	DSSS	-0.18	10	10	-0.18

Test Engineer: Minh Ly

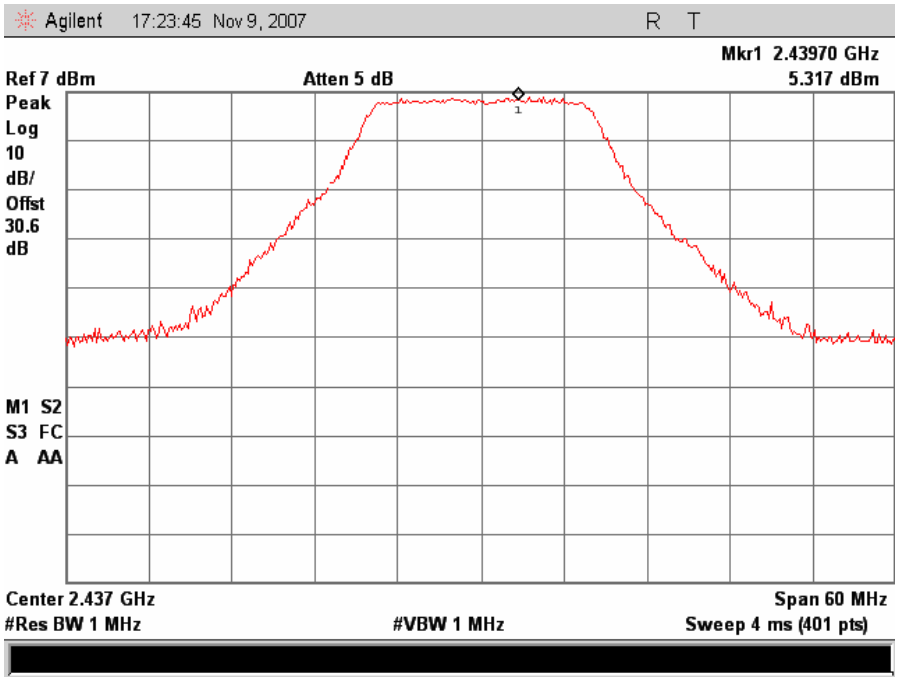
Test Date: November 9, 2007



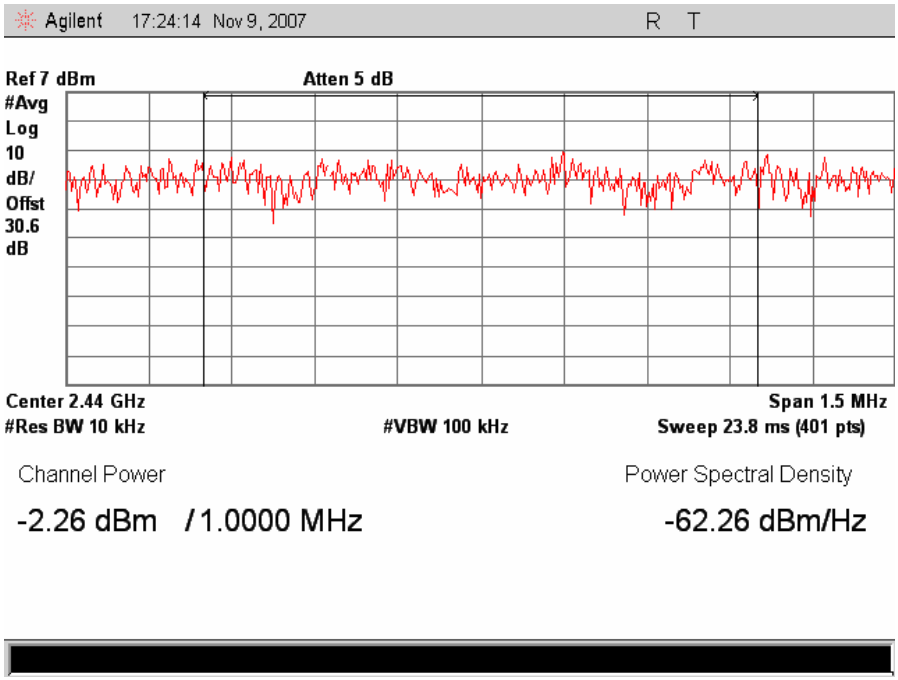
Low Channel Max Determination – OFDM Mode



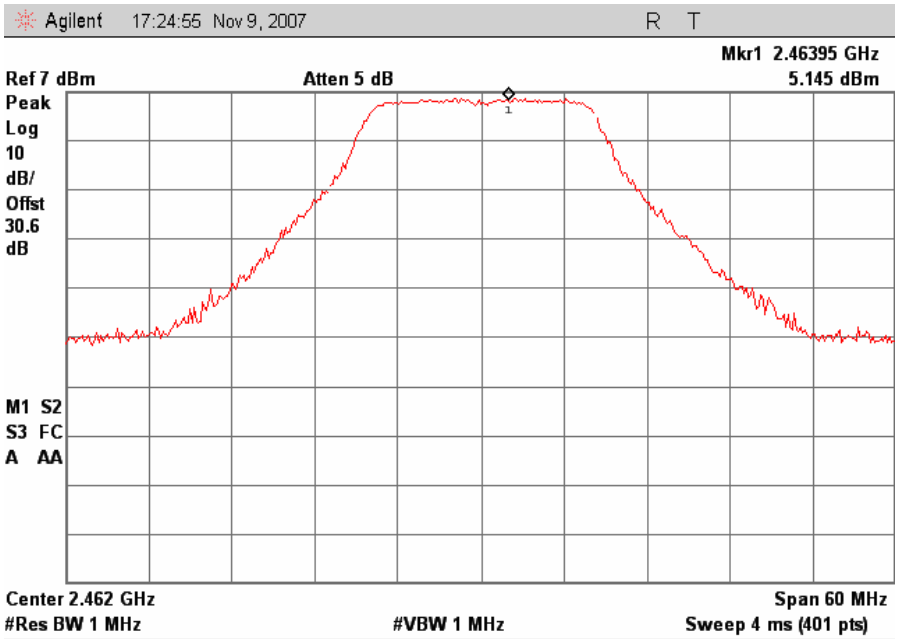
Low Channel Spectral Power Density – OFDM Mode



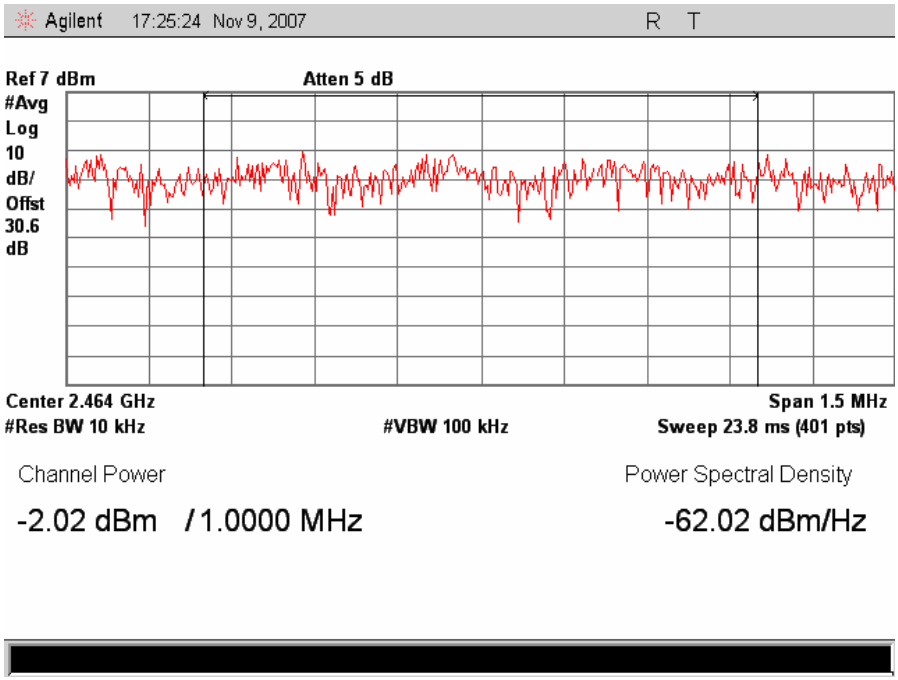
Mid Channel Max Determination – OFDM Mode



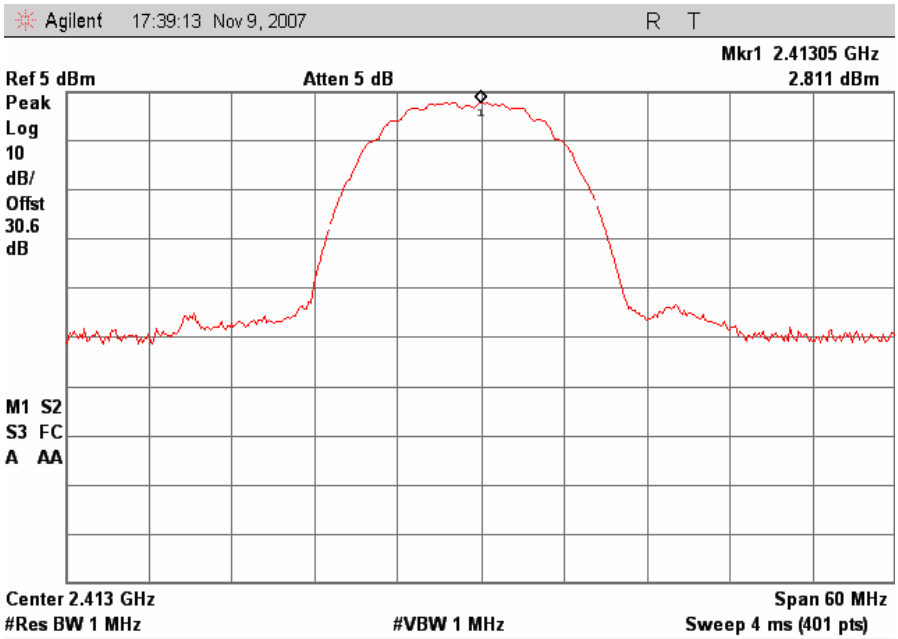
Mid Channel Spectral Power Density – OFDM Mode



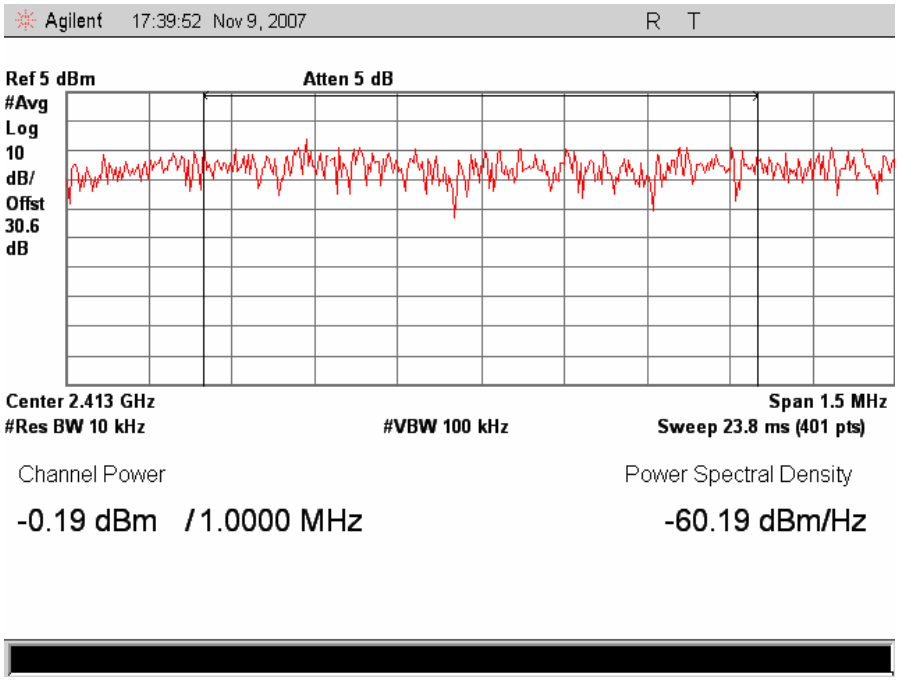
High Channel Max Determination – OFDM Mode



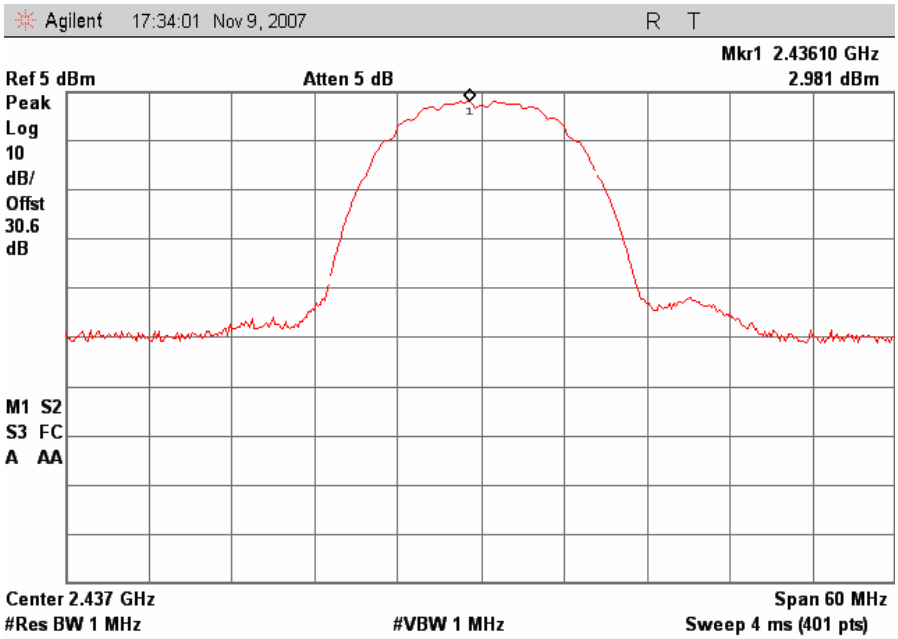
High Channel Spectral Power Density – OFDM Mode



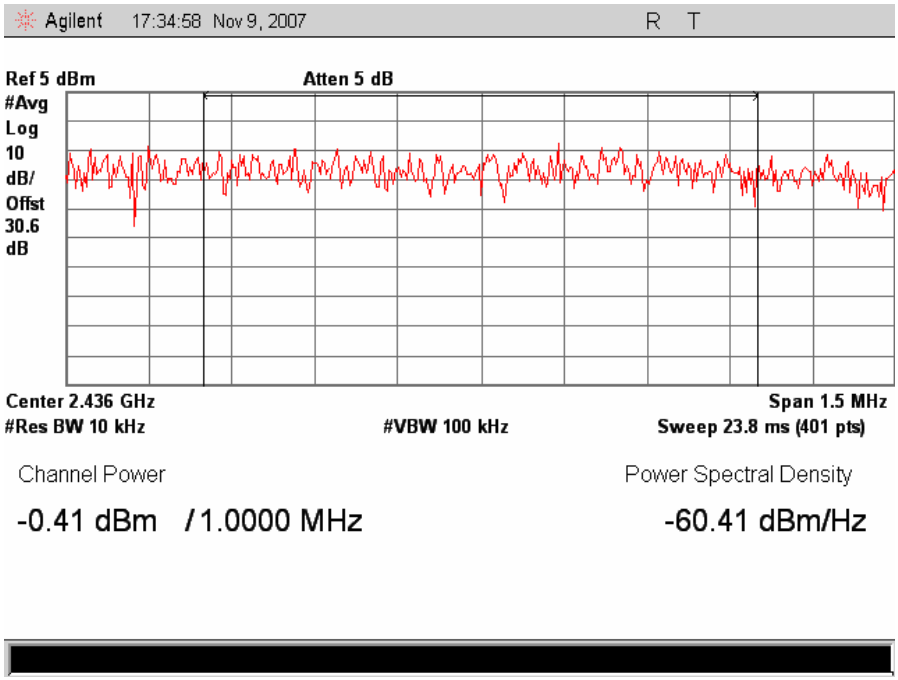
Low Channel Max Determination – DSSS Mode



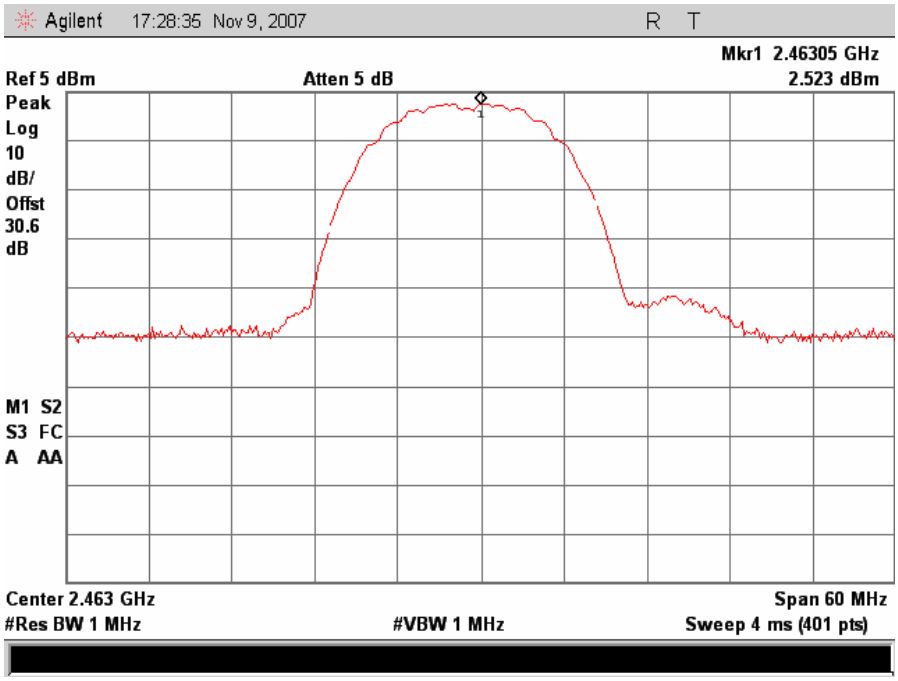
Low Channel Spectral Power Density – DSSS Mode



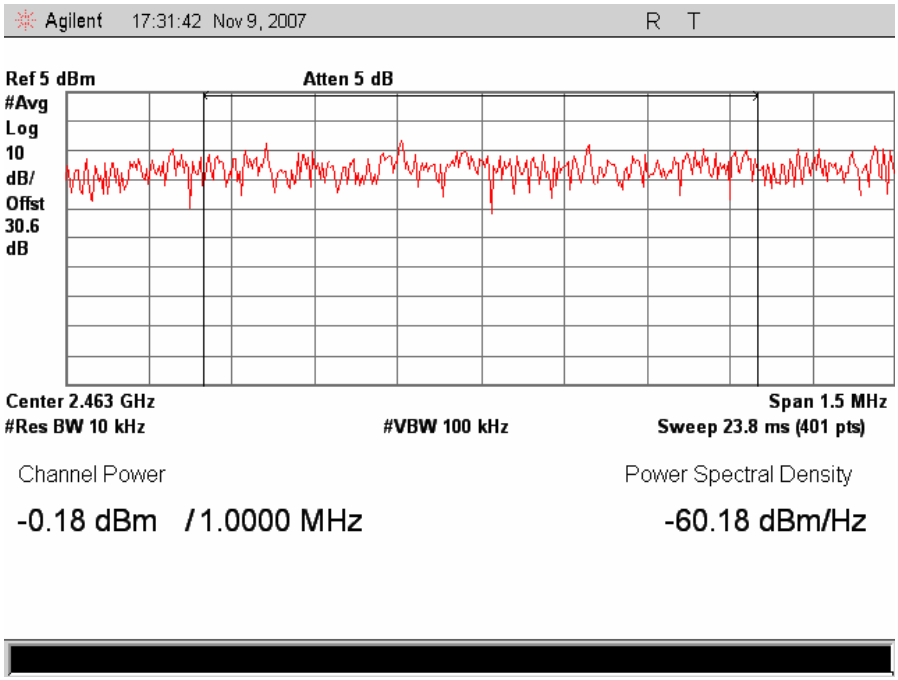
Mid Channel Max Determination – DSSS Mode



Mid Channel Spectral Power Density – DSSS Mode



High Channel Max Determination – DSSS Mode



High Channel Spectral Power Density – DSSS Mode

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 power envelope. *fH* is the highest frequency of the power envelope: it is the frequency furthest above the frequency of maximum power where the output power drops below the level of -80 dBm/Hz e.i.r.p. spectral power density (-30 dBm if measured in a100 kHz bandwidth). *fL* is the lowest frequency of the power envelope; it is the frequency furthest below the frequency of maximum power where the output power drops below the level equivalent to -80 dBm/Hz e.i.r.p. spectral power density (or -30 dBm if measured in a 100 kHz bandwidth).

For a given operating frequency, the width of the power 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: The EUT was connected directly to a spectrum analyzer through a attenuator. The resolution band width of the spectrum analyzer was set to 100 KHz with video averaging and a minimum of 50 sweeps. The lowest and highest carrier frequencies generated by all modulations was set to transmit at the highest rated power level of the EUT. The frequency at which the spectral density dropped by 30dBm from the maximum level measured was recorded for both the upper and lower frequencies of the transmit band. This procedure was carried out at both normal and extreme conditions.

Test Engineer: Minh Ly

Test Date: November 14, 2007

Conformance Requirements

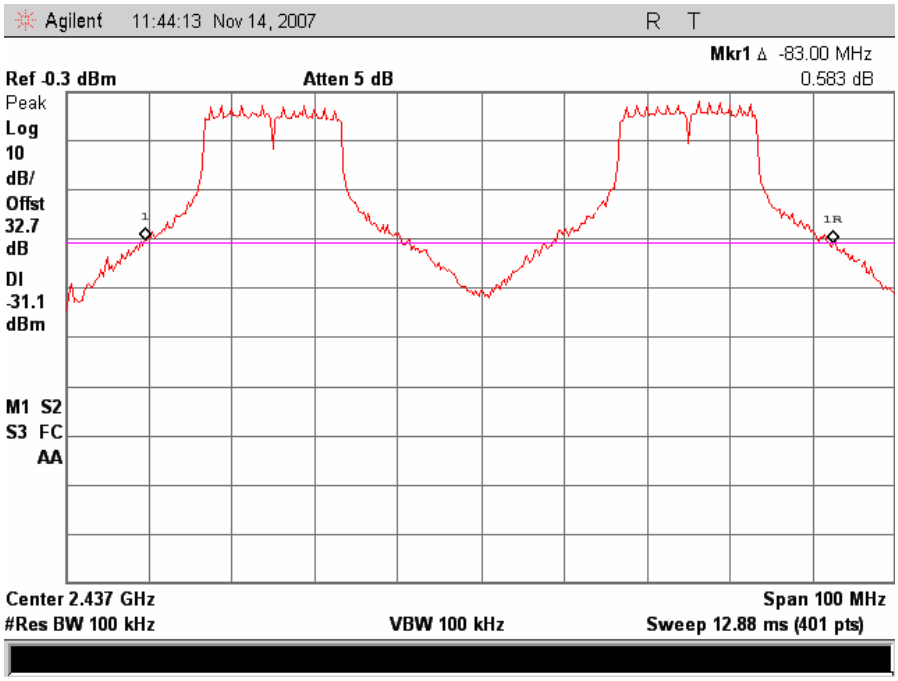
4.3.3 Frequency Range

Test Results: The EUT as tested was found compliant with the specified limits of Clause 4.2.3.

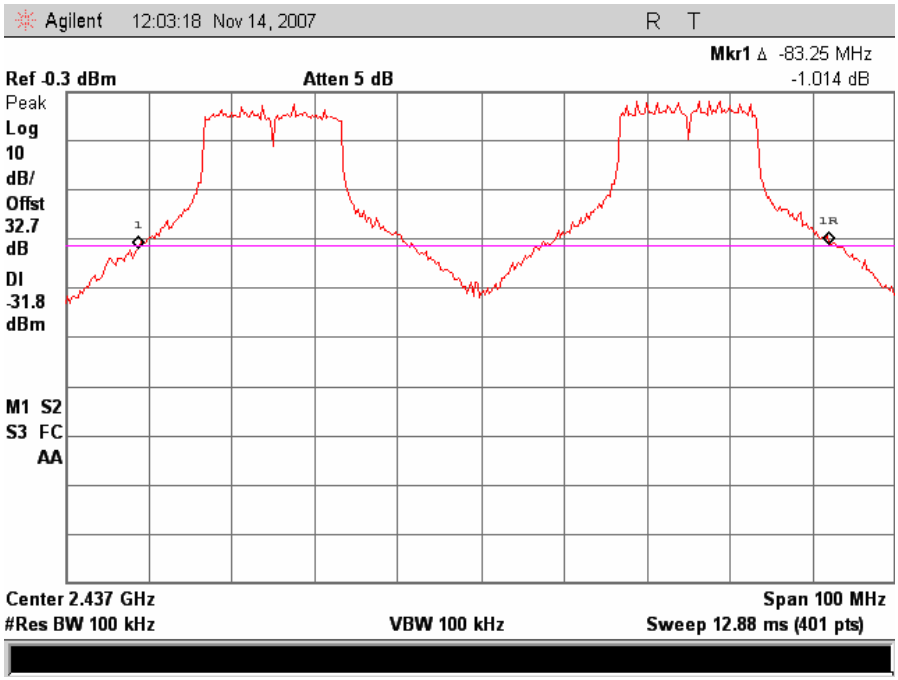
Temperature	Voltage	Mode	Difference (f_H - f_L) MHz	Limit MHz	Margin MHz
Nominal	Nominal	OFDM	76.25	83.5	7.25
Nominal	Nominal	DSSS	70.00	83.5	13.5
Maximum	Nominal	OFDM	74.50	83.5	9
Maximum	Nominal	DSSS	70.00	83.5	13.5
Maximum	Maximum	OFDM	75.00	83.5	8.5
Maximum	Maximum	DSSS	69.50	83.5	14
Maximum	Minimum	OFDM	74.25	83.5	9.25
Maximum	Minimum	DSSS	69.75	83.5	13.75
Minimum	Nominal	OFDM	82.75	83.5	0.75
Minimum	Nominal	DSSS	69.75	83.5	13.75
Minimum	Maximum	OFDM	83.25	83.5	0.25
Minimum	Maximum	DSSS	69.50	83.5	14
Minimum	Minimum	OFDM	83.00	83.5	0.5
Minimum	Minimum	DSSS	69.50	83.5	14
Nominal	Maximum	OFDM	73.25	83.5	10.25
Nominal	Maximum	DSSS	70.00	83.5	13.5
Nominal	Minimum	OFDM	72.75	83.5	10.75
Nominal	Minimum	DSSS	70.00	83.5	13.5

Table 8. Frequency Range Test Results

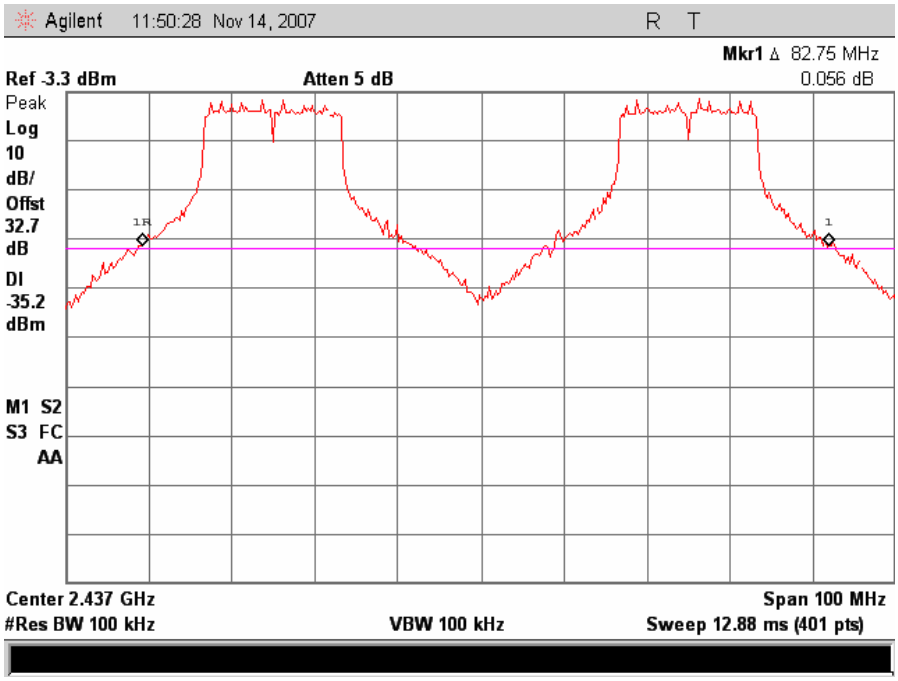
Note; All frequency were contained within 2400-2483.5 in 100 kHz resolution at 30db down from the carrier peak.



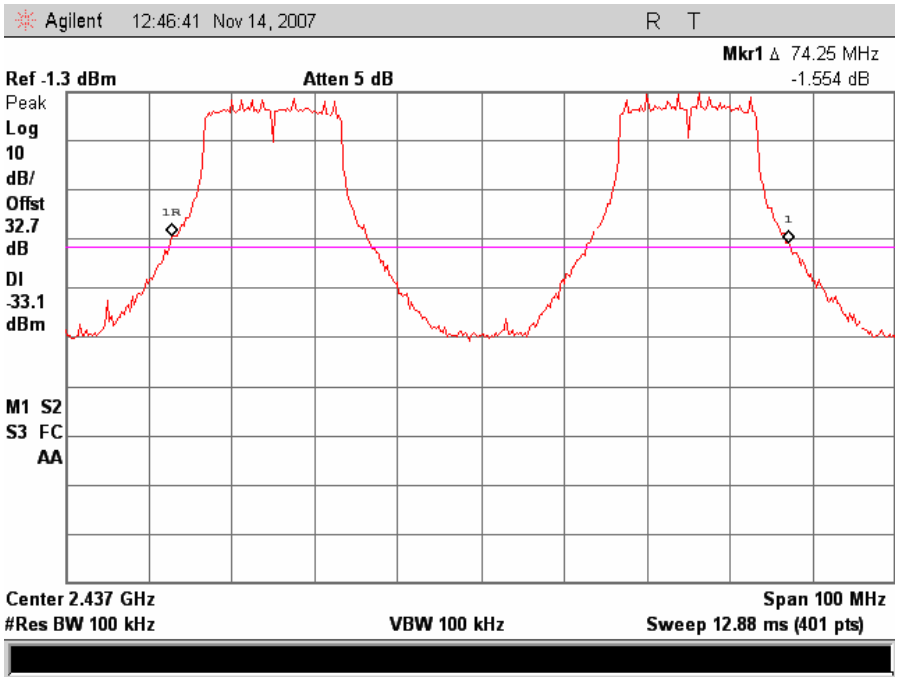
Low Temp, Low Voltage – OFDM



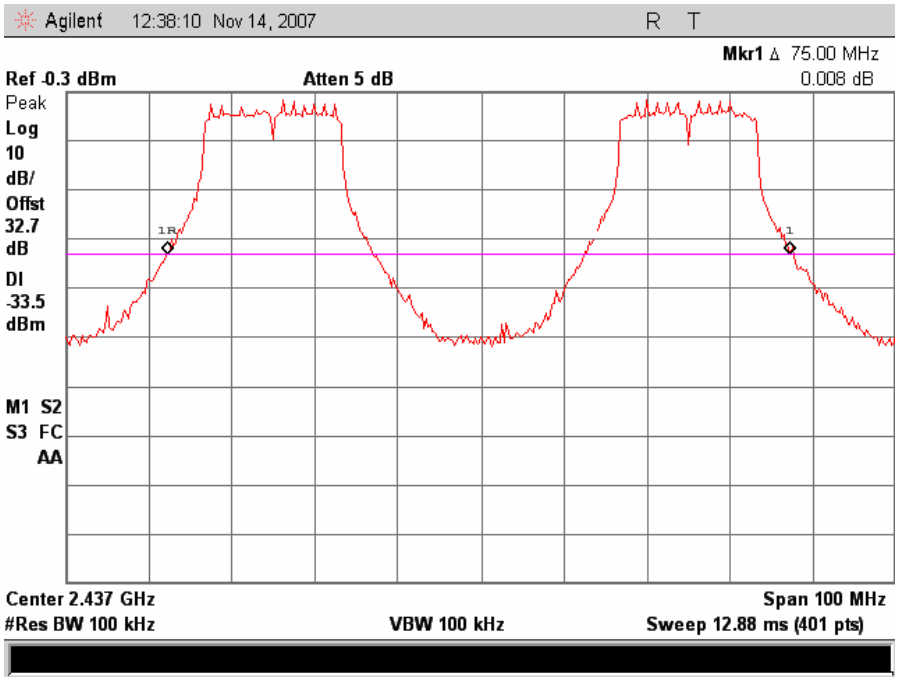
Low Temp, High Voltage – OFDM



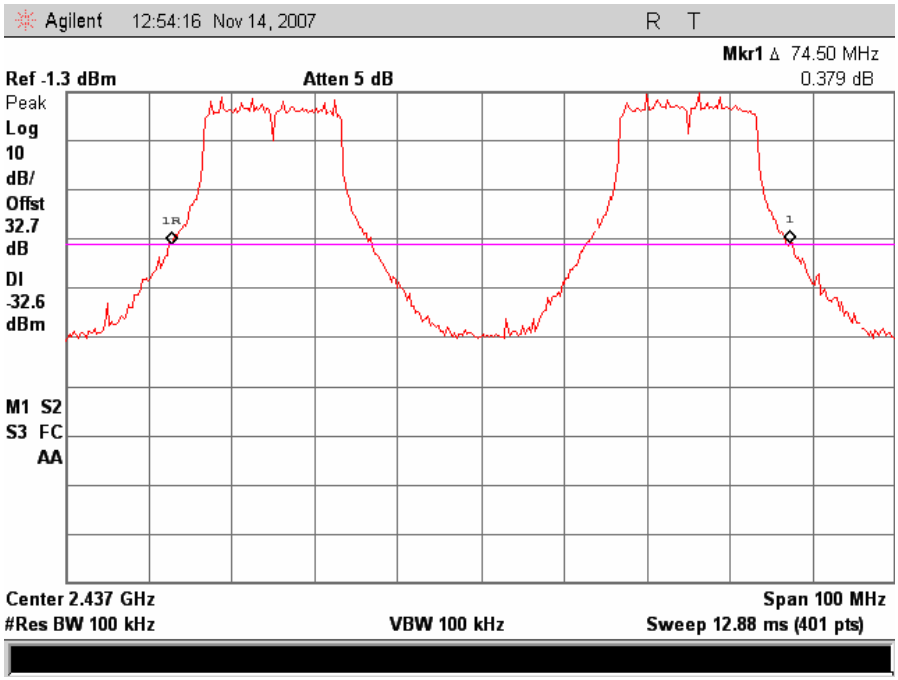
Low Temp, Normal Voltage – OFDM



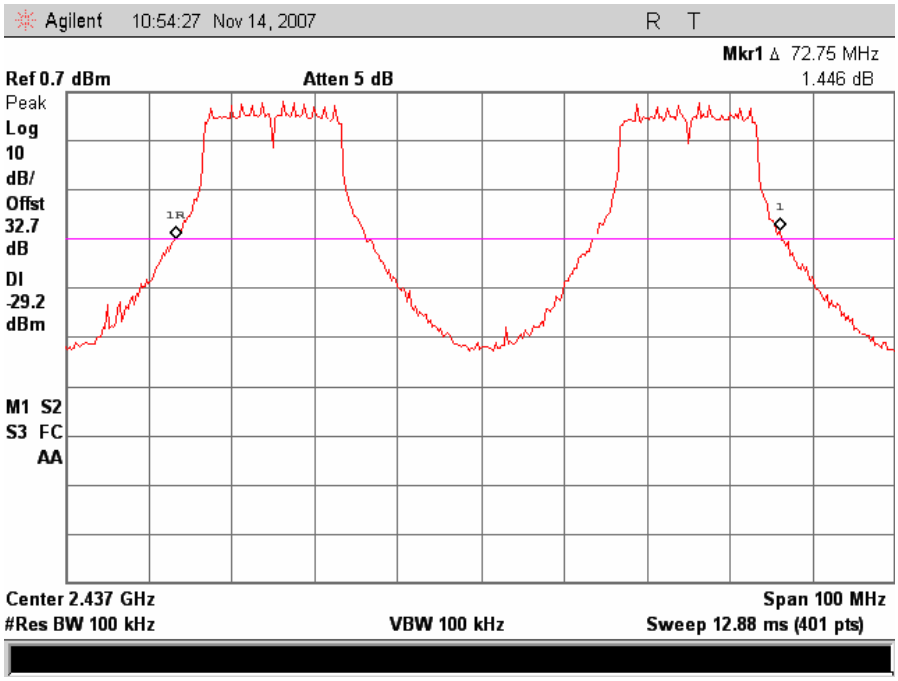
High Temp, Low Voltage – OFDM



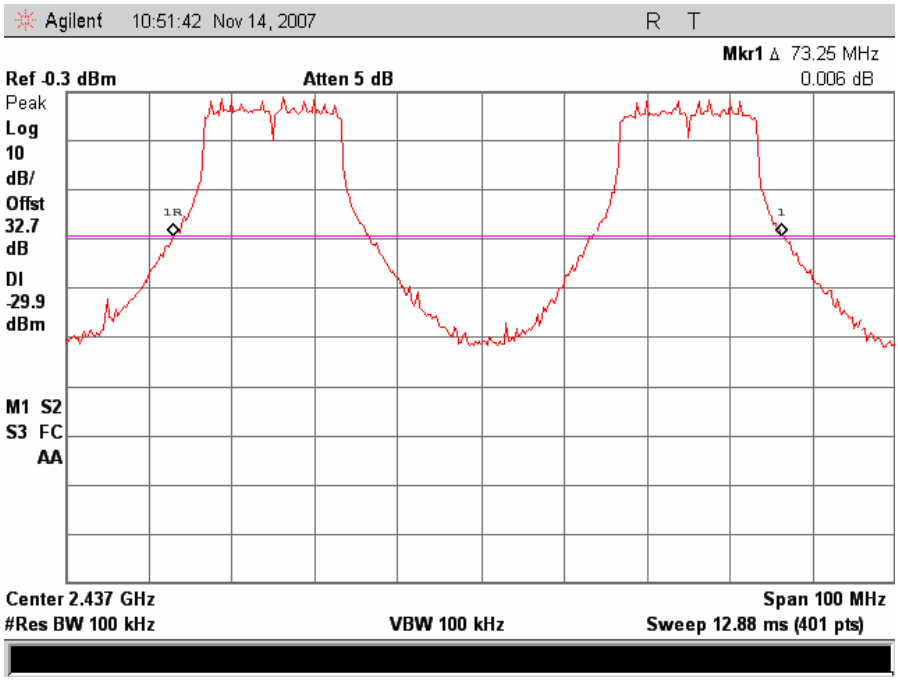
High Temp, High Voltage – OFDM



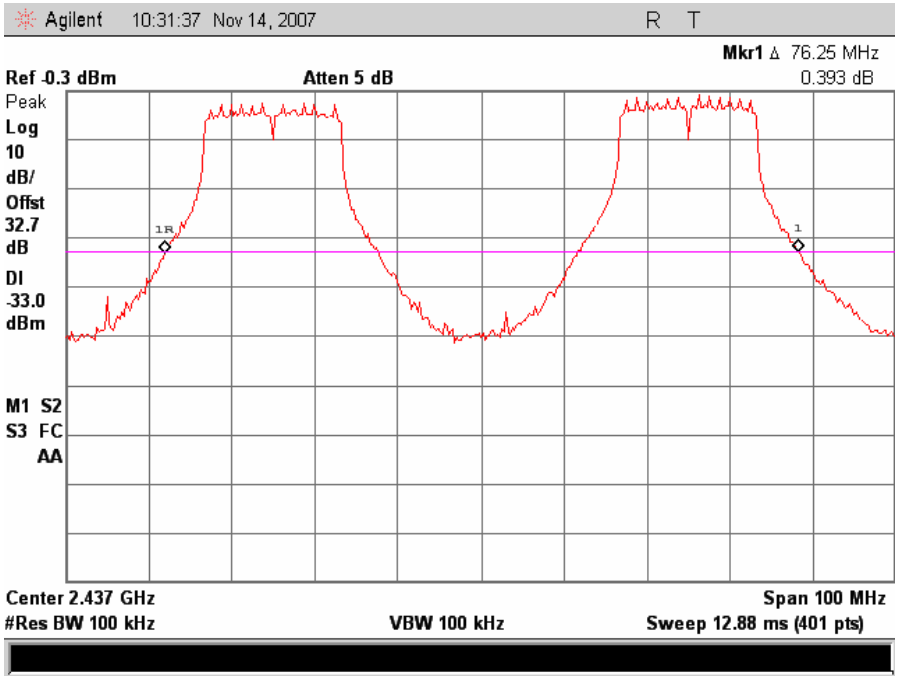
High Temp, Normal Voltage – OFDM



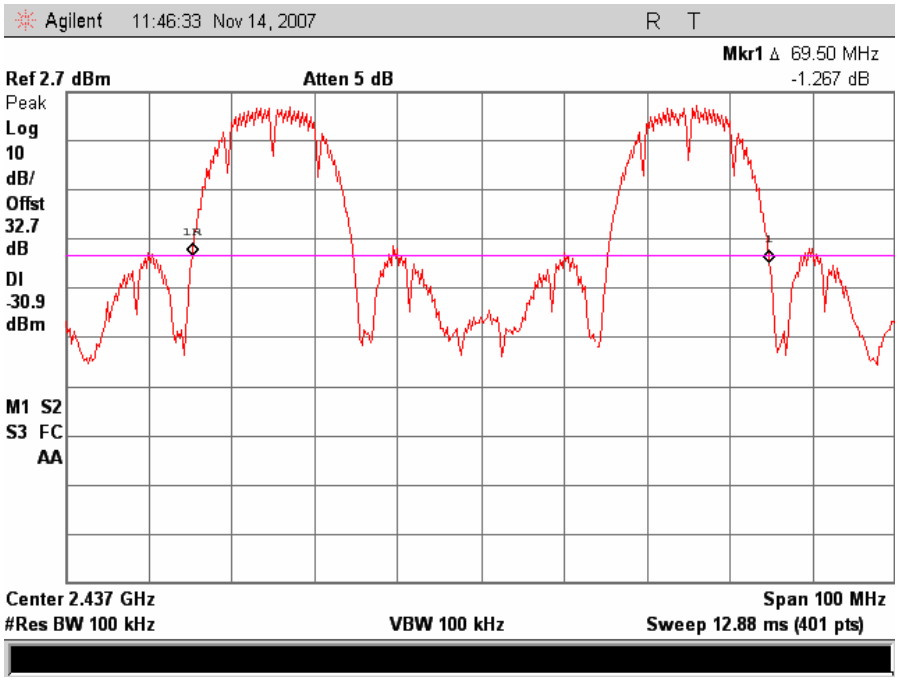
Normal Temp, Low Voltage – OFDM



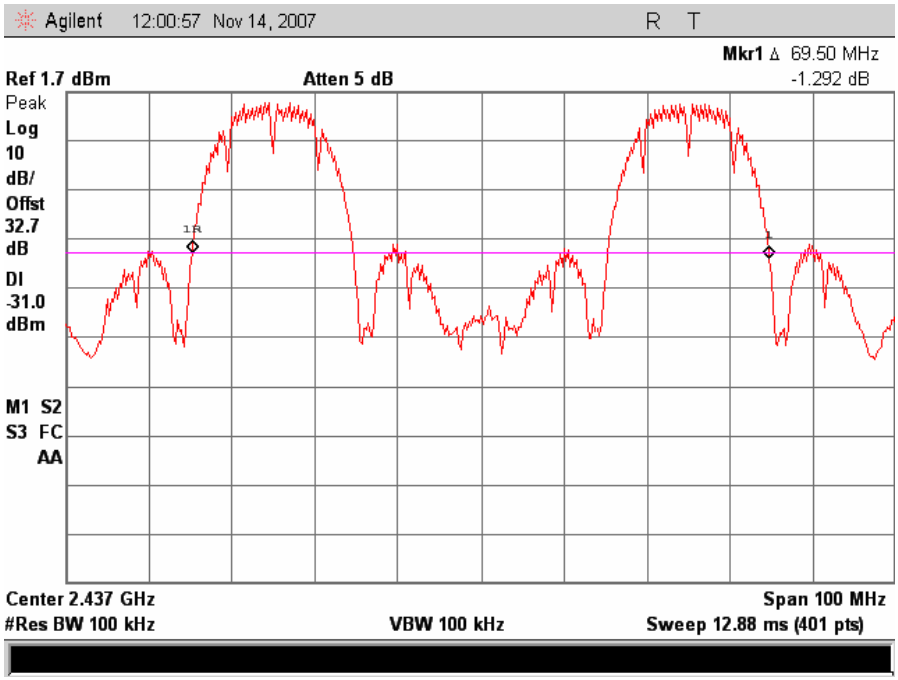
Normal Temp, High Voltage – OFDM



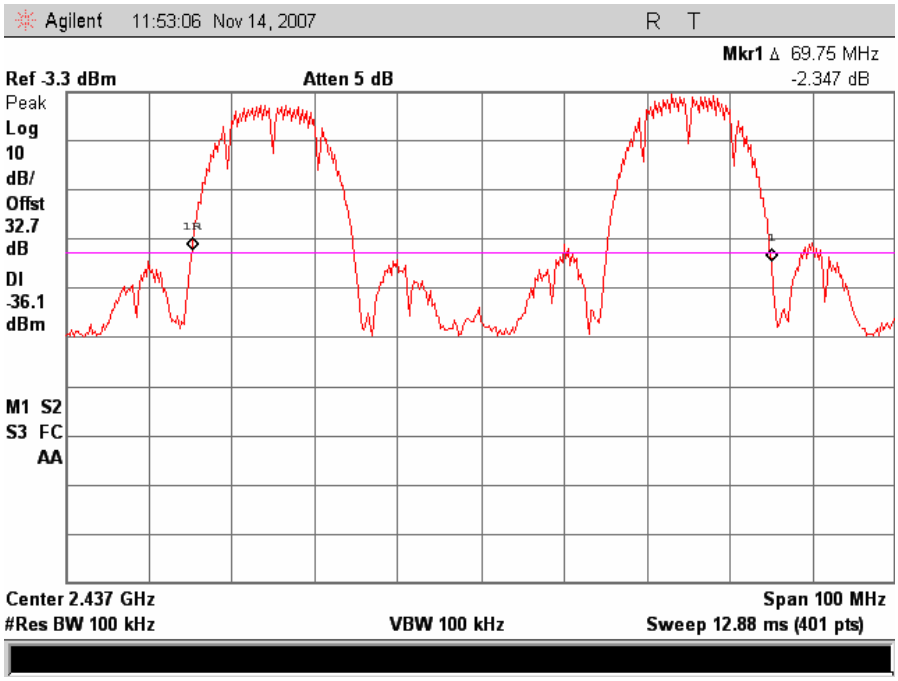
Normal Temp, Normal Voltage – OFDM



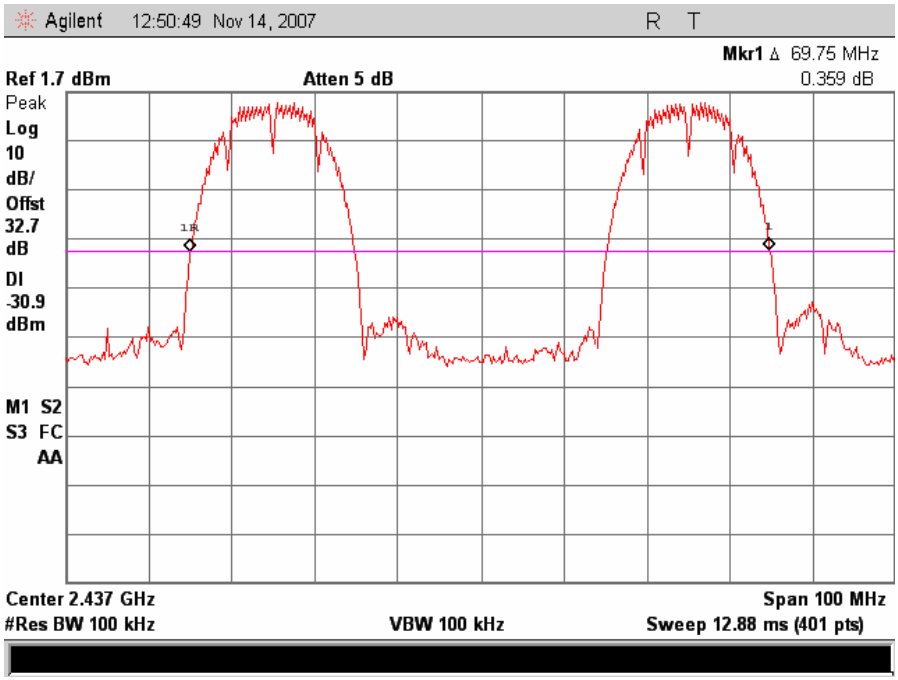
Low Temp, Low Voltage – DSSS



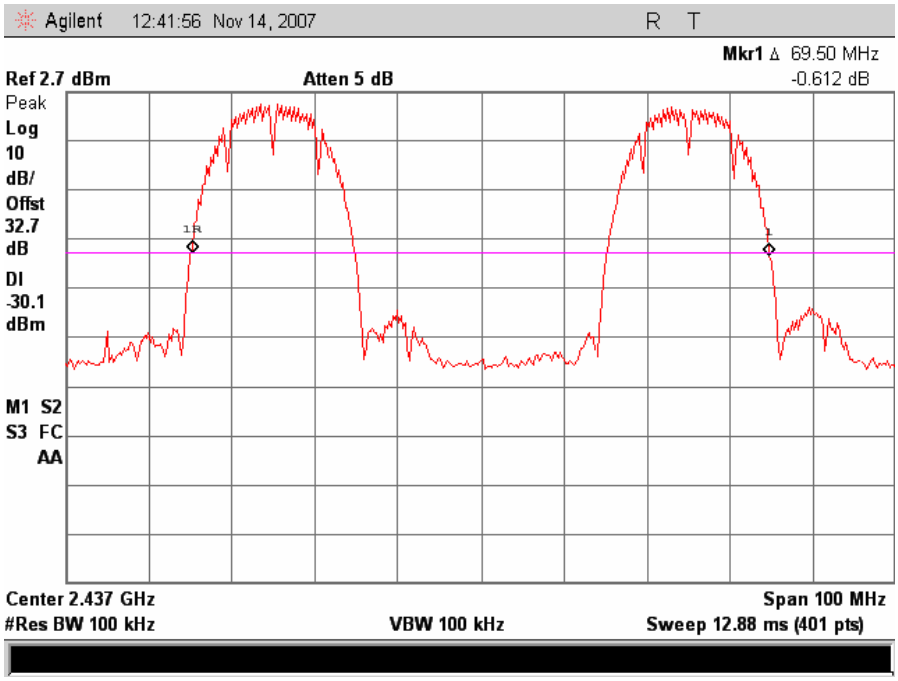
Low Temp, High Voltage – DSSS



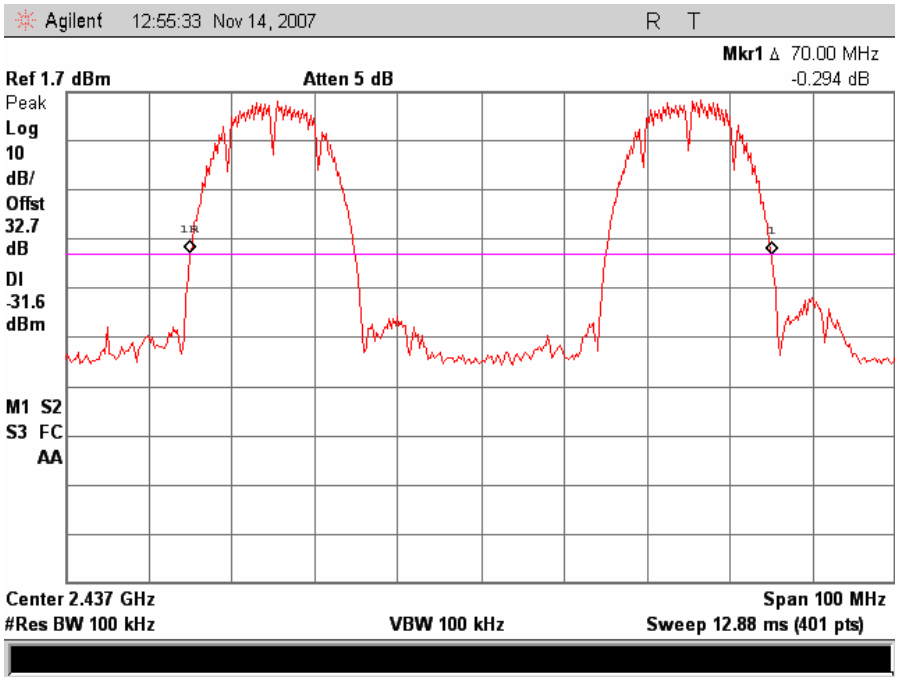
Low Temp, Normal Voltage – DSSS



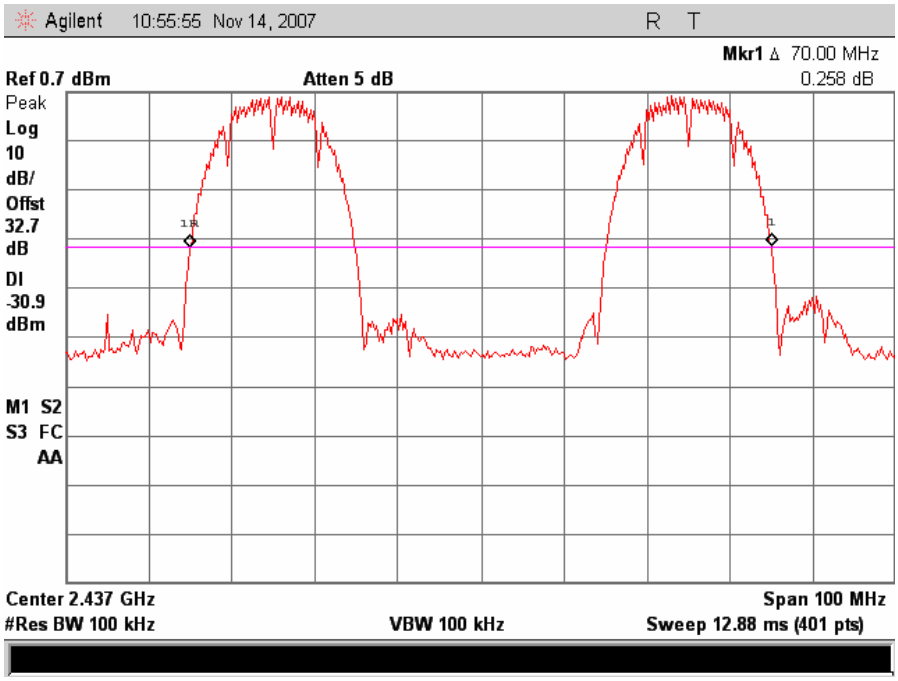
High Temp, Low Voltage – DSSS



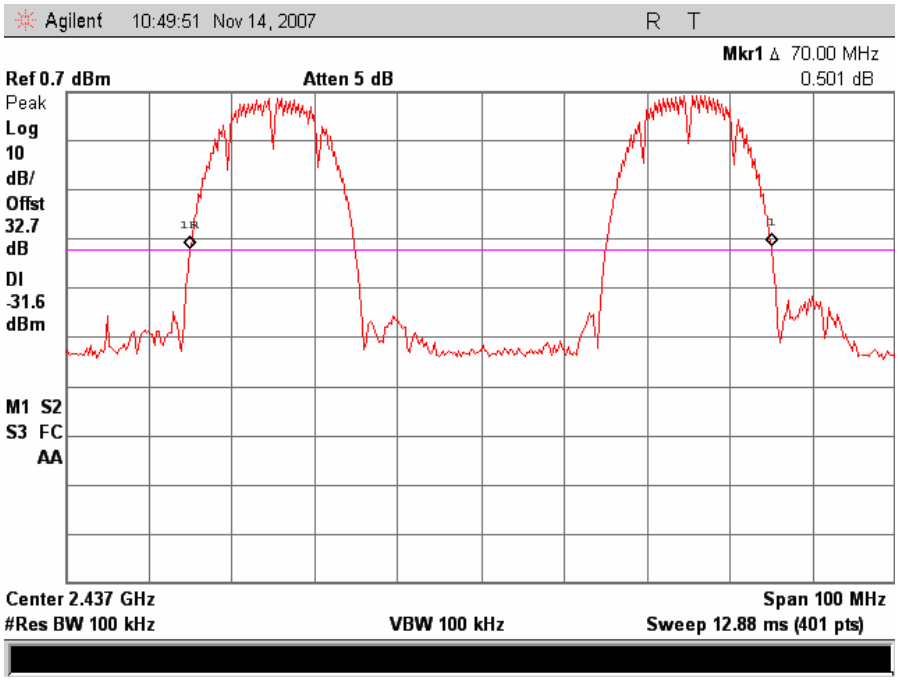
High Temp, High Voltage – DSSS



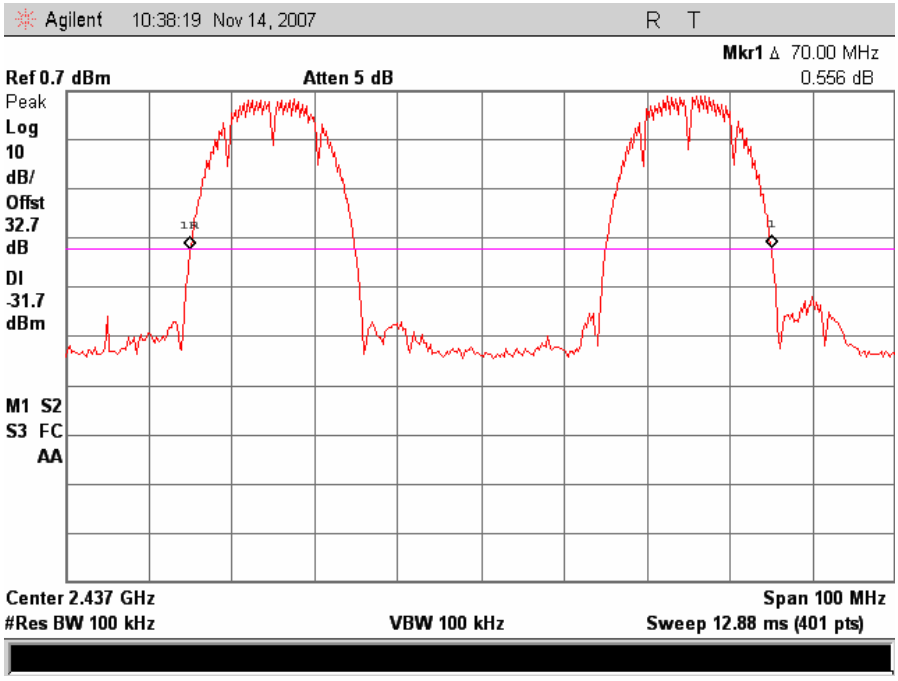
High Temp, Normal Voltage – DSSS



Normal Temp, Low Voltage – DSSS



Normal Temp, High Voltage – DSSS



Normal Temp, Normal Voltage - DSSS

4.3.4 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.

4.3.4.2 Limit

The spurious emissions of the transmitter shall not exceed the values in Table 9 and Table 10 and in the indicated bands.

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

Table 9. Transmitter limits for narrowband spurious emissions - Conducted

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 10.

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

Table 10. Transmitter limits for wideband spurious emissions - Conducted

Conformance Requirements

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.

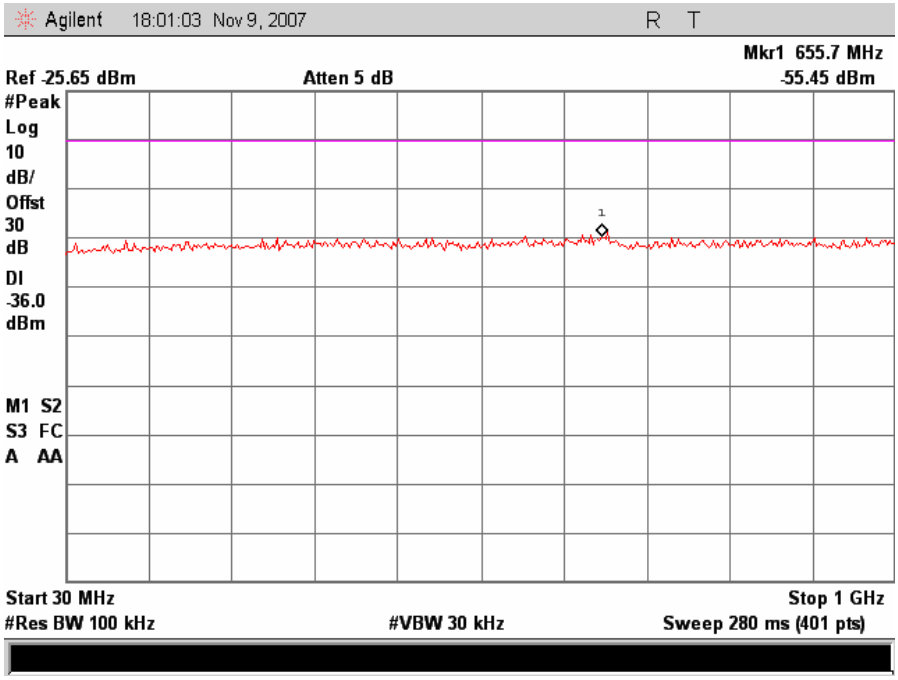
Test Results: The EUT as tested was found compliant with the specified requirements of Clause 4.2.4.

Test Engineer: Minh Ly

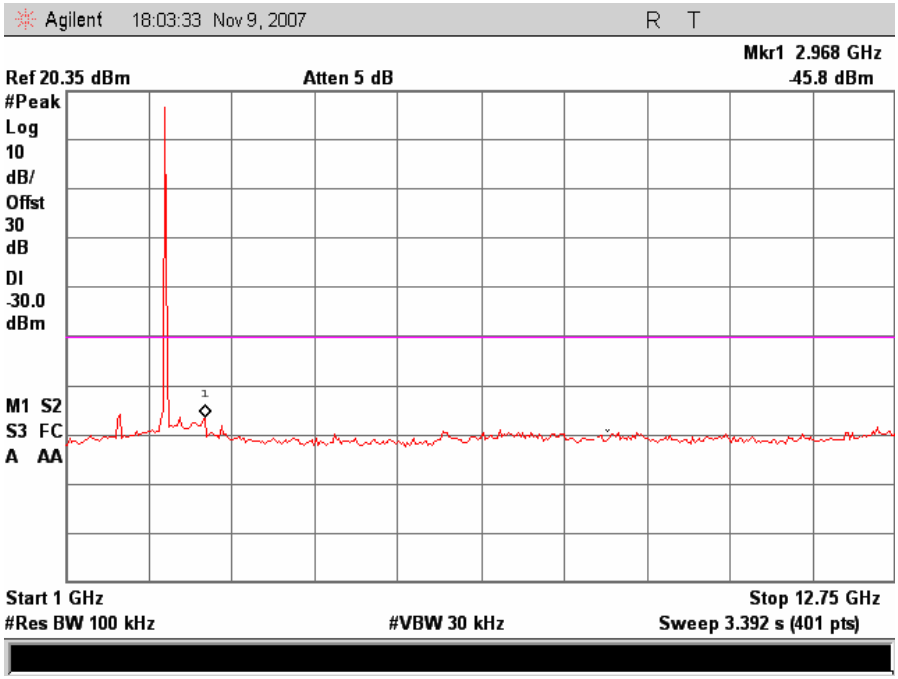
Test Date: November 9, 2007

Conformance Requirements

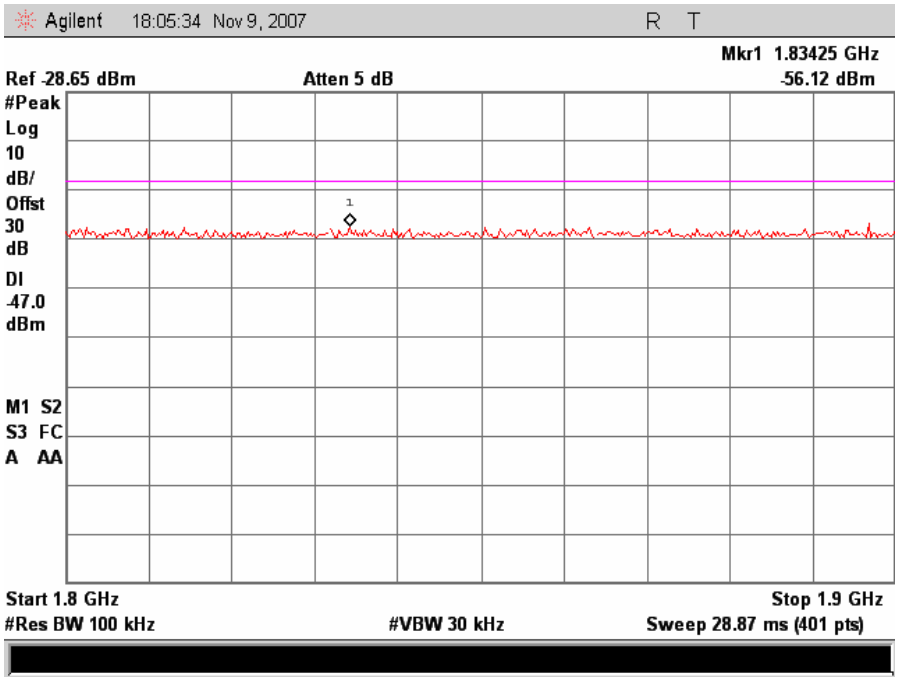
4.3.6 Transmitter Spurious Emissions - Conducted



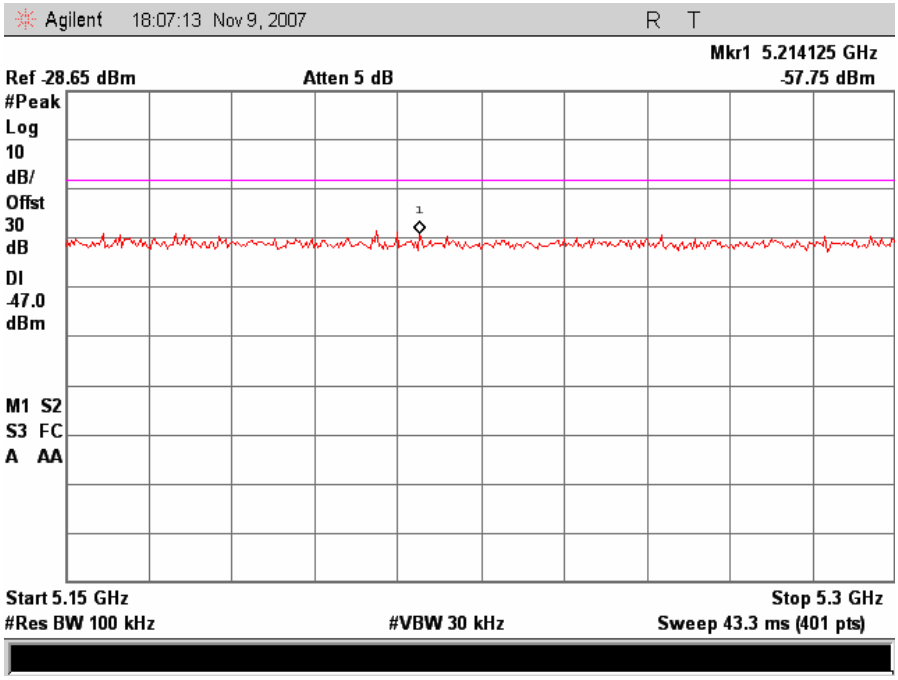
Low channel (2412 MHz) Spurious Emission 30 MHz - 1GHz OFDM Mode



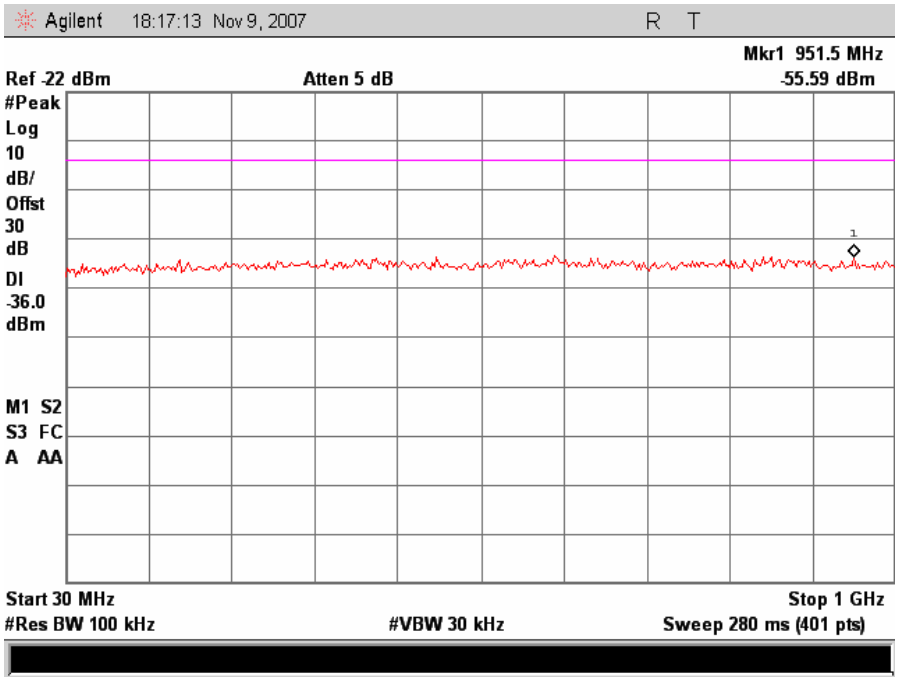
Low channel (2412 MHz) Spurious Emission 1 GHz - 12.75 GHz OFDM Mode



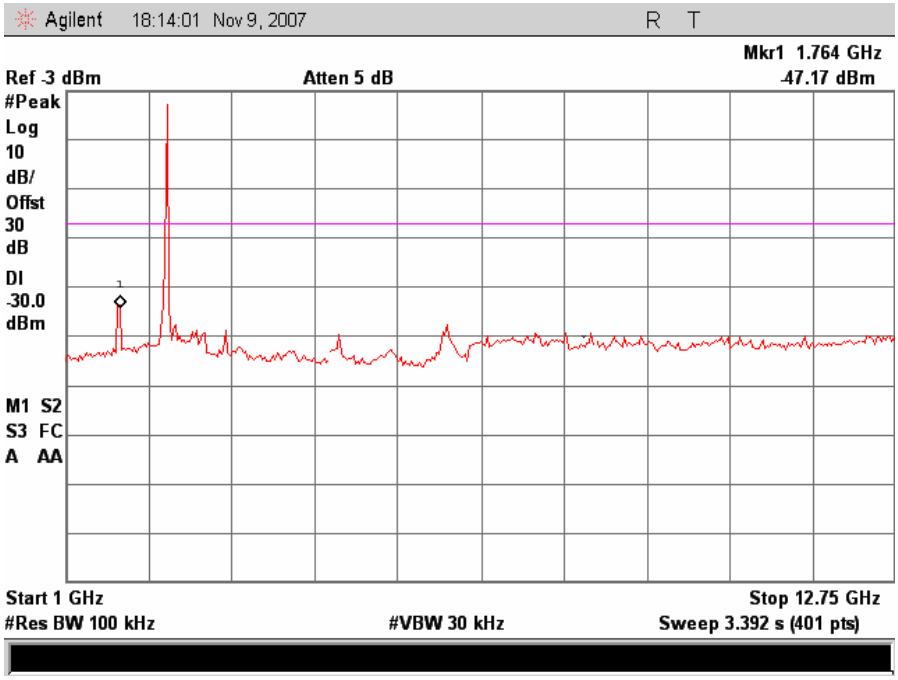
Low channel (2412 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz OFDM Mode



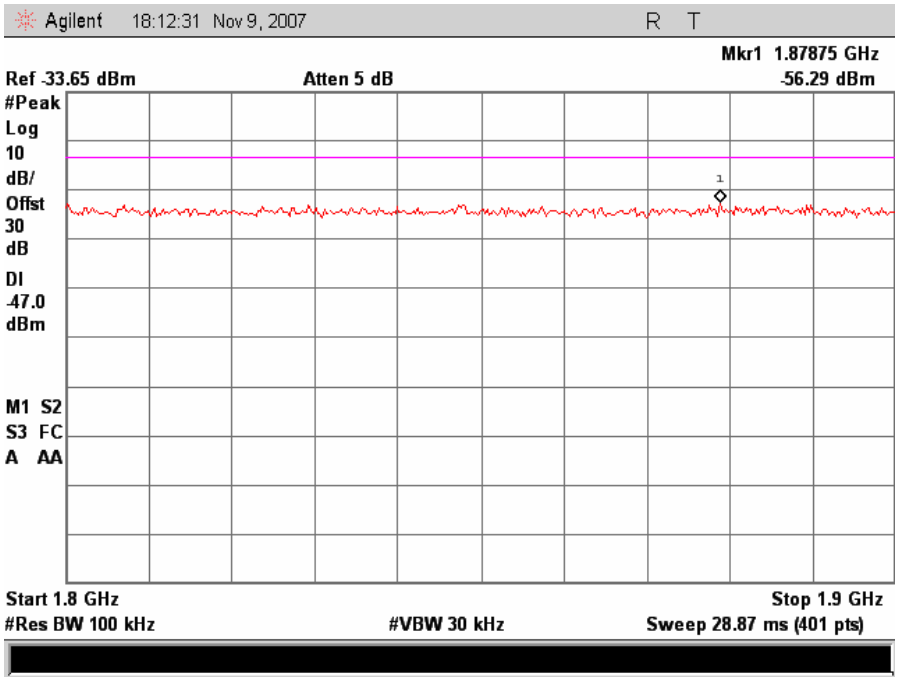
Low channel (2412 MHz) Spurious Emission 5.15 GHz - 5.3 GHz OFDM Mode



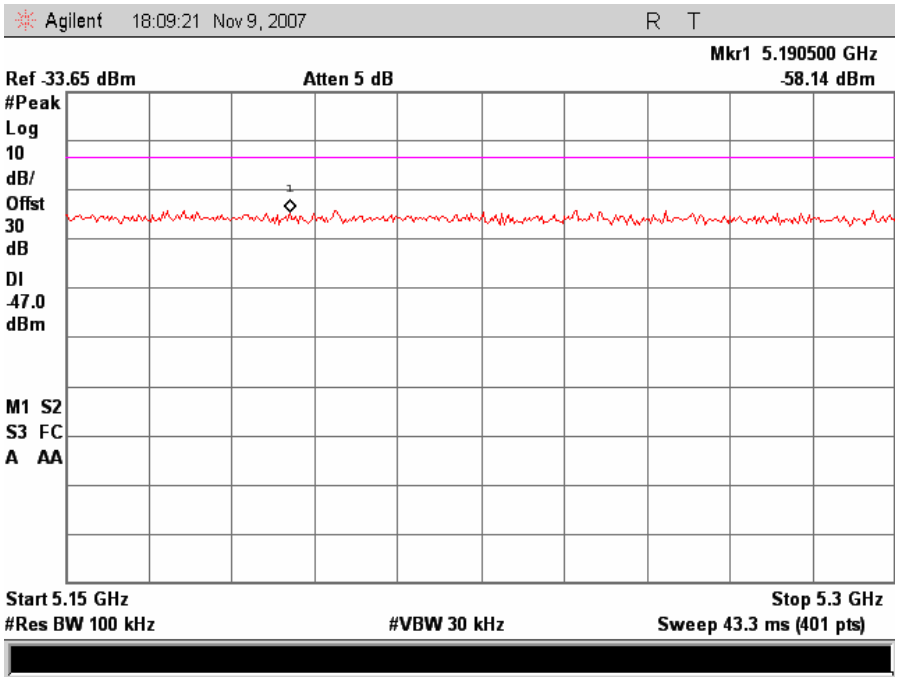
Mid channel (2462 MHz) Spurious Emission 30 MHz - 1GHz OFDM Mode



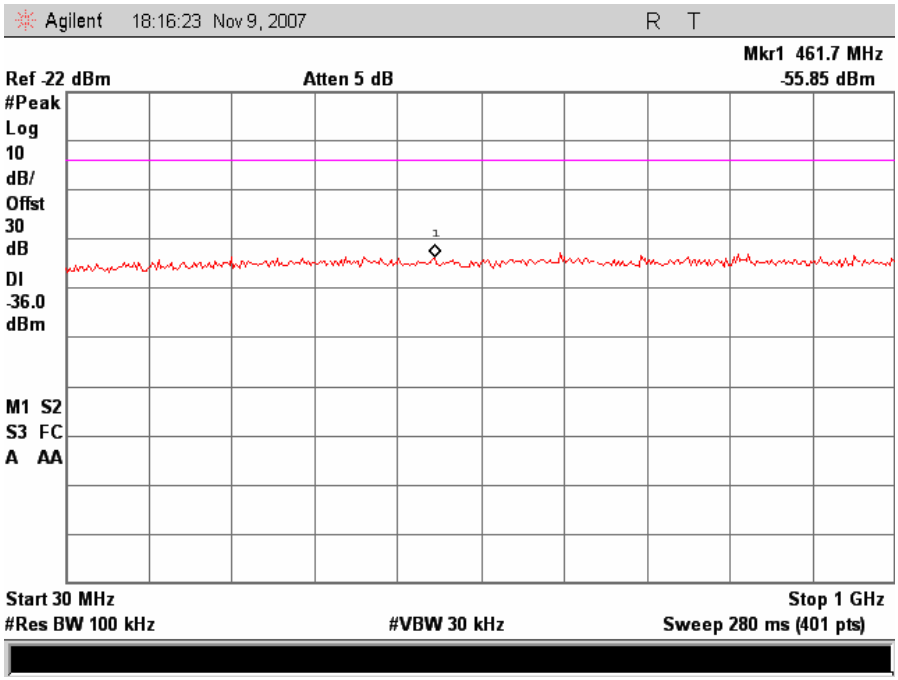
Mid channel (2462 MHz) Spurious Emission 1 GHz - 12.75 GHz OFDM Mode



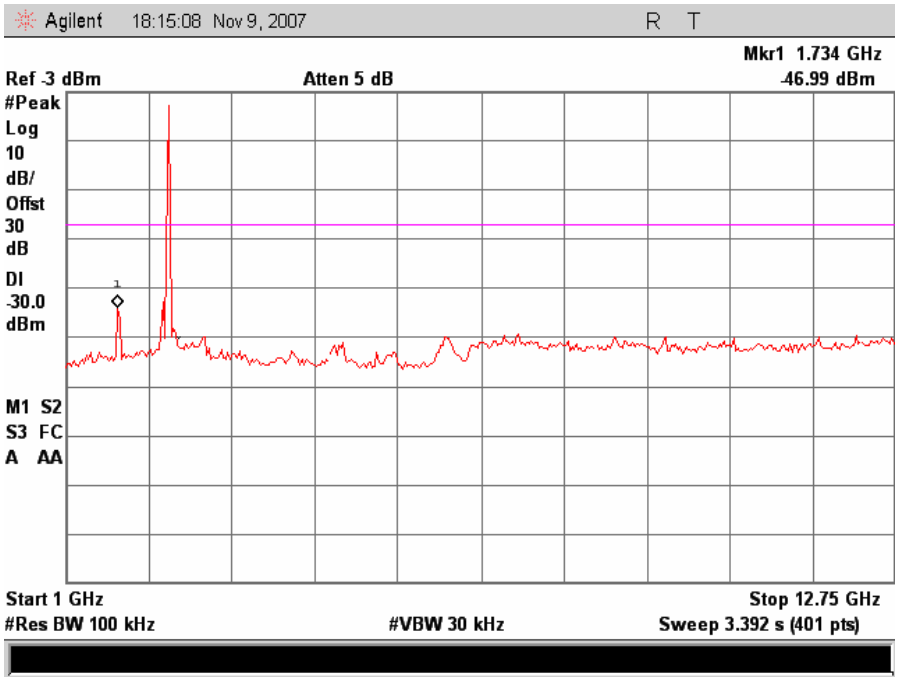
Mid channel (2462 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz OFDM Mode



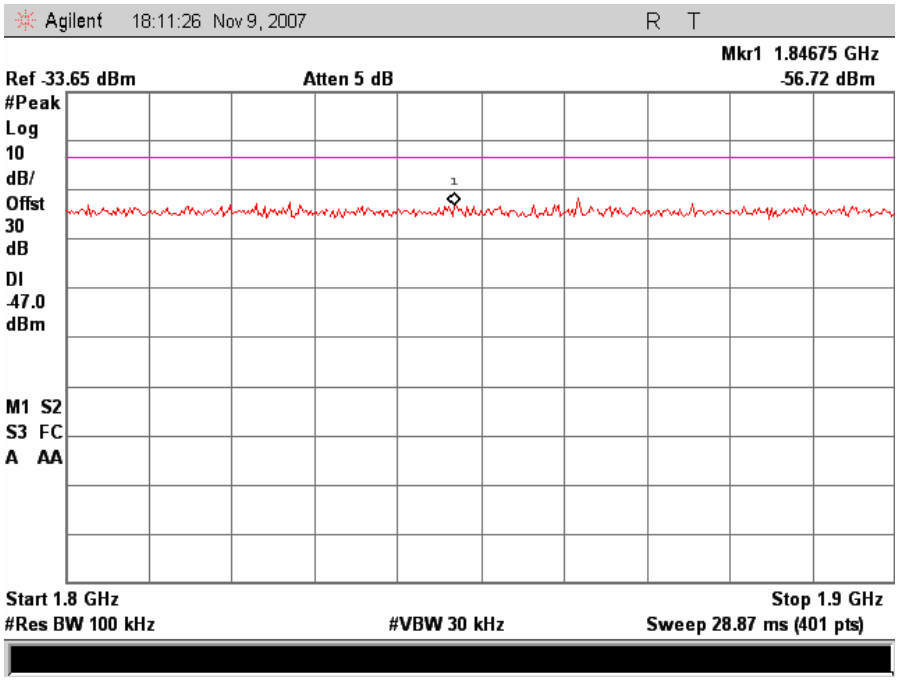
Mid channel (2462 MHz) Spurious Emission 5.15 GHz - 5.3 GHz OFDM Mode



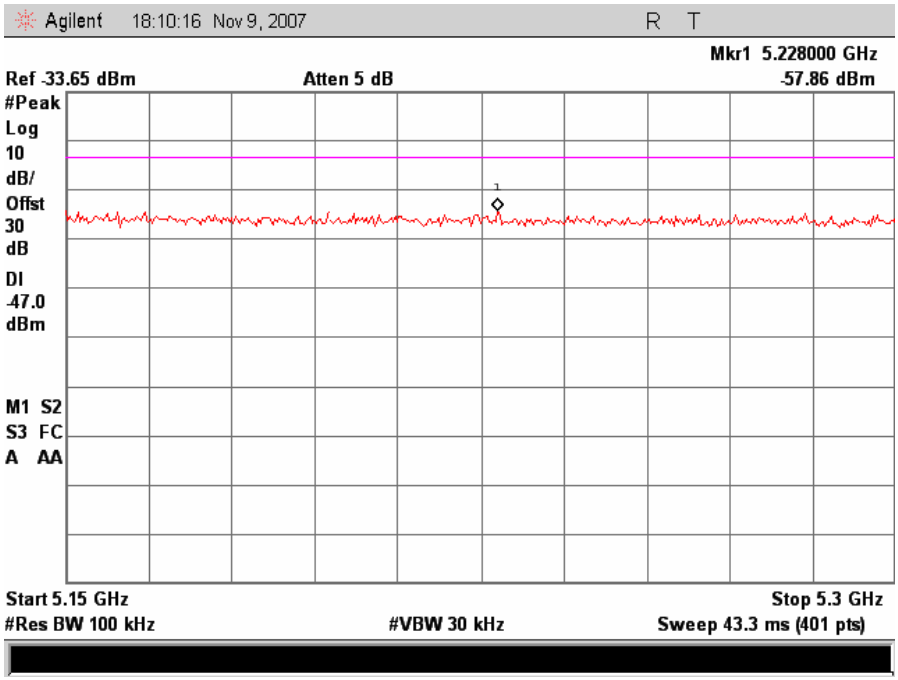
High channel (2462 MHz) Spurious Emission 30 MHz - 1GHz OFDM Mode



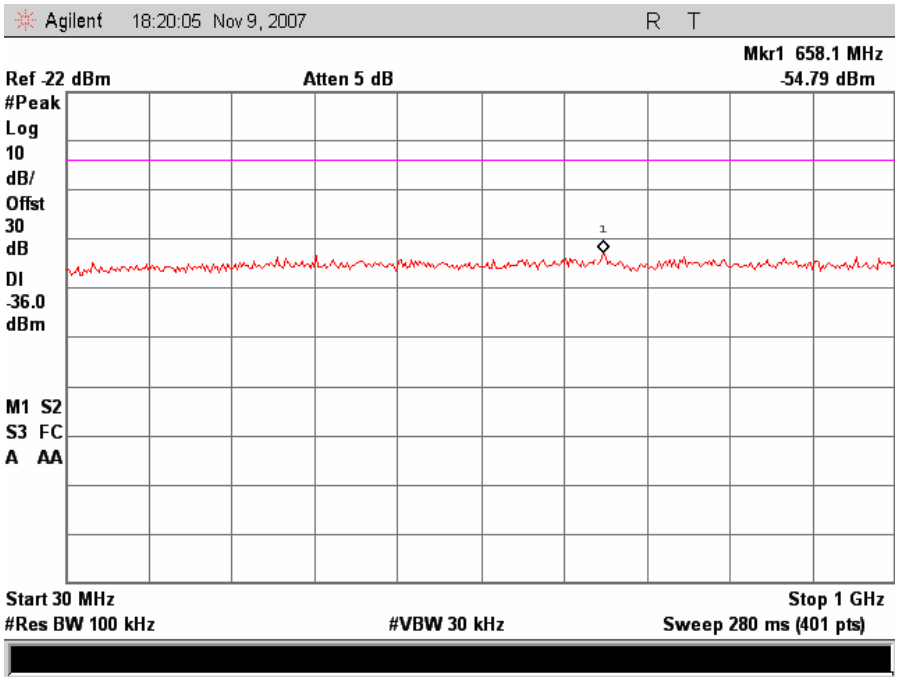
High channel (2462 MHz) Spurious Emission 1 GHz - 12.75 GHz OFDM Mode



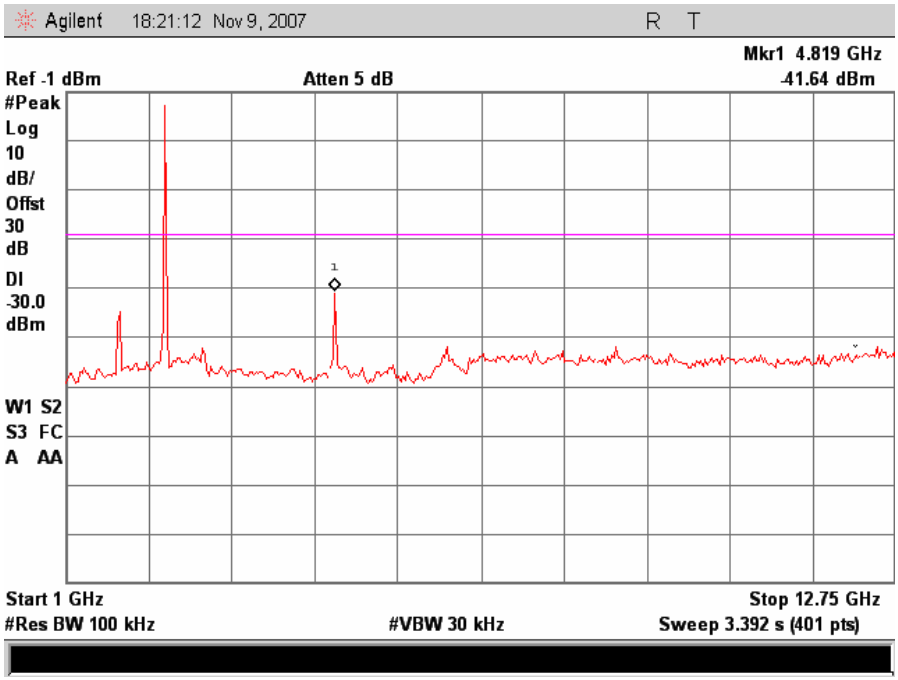
High channel (2462 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz OFDM Mode



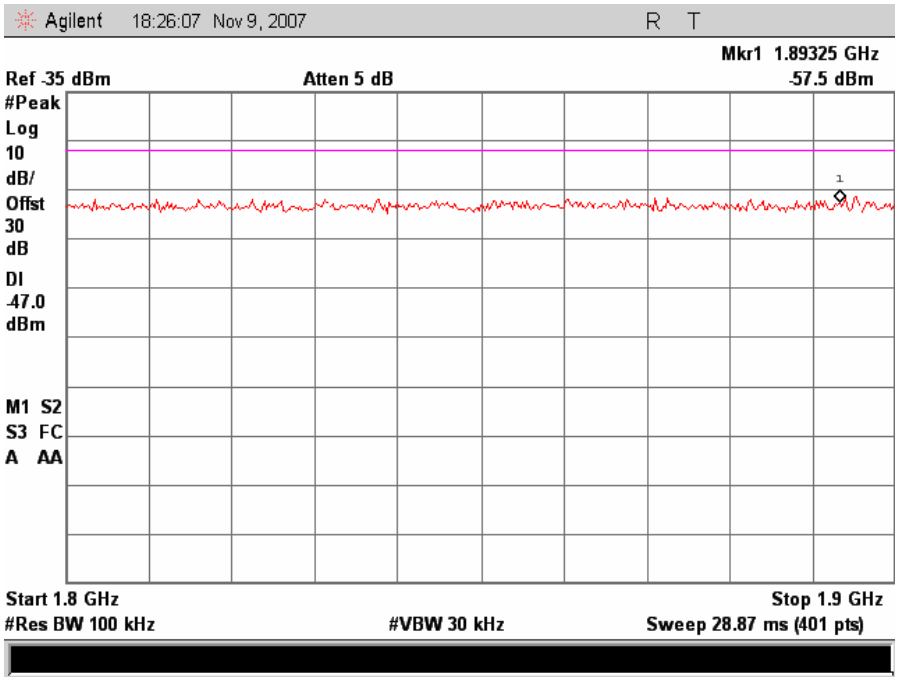
High channel (2462 MHz) Spurious Emission 5.15 GHz - 5.3 GHz OFDM Mode



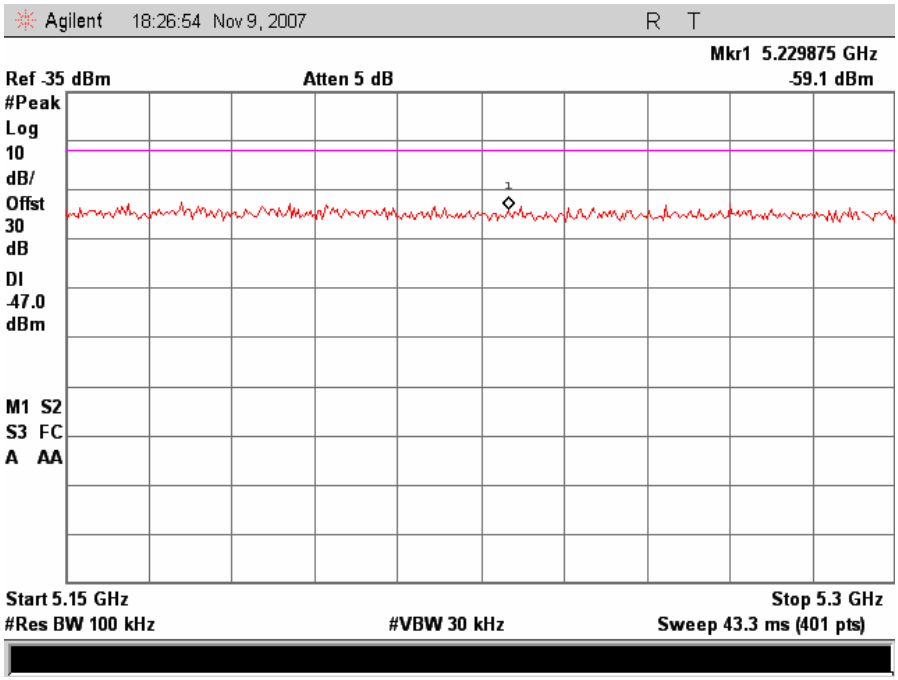
Low channel (2412 MHz) Spurious Emission 30 MHz - 1GHz DSSS Mode



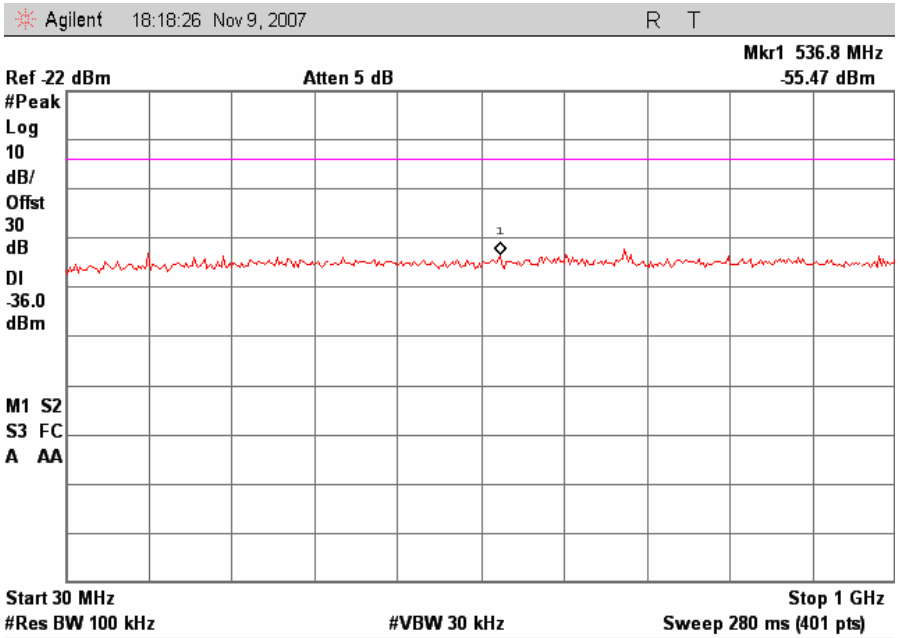
Low channel (2412 MHz) Spurious Emission 1 GHz - 12.75 GHz DSSS Mode



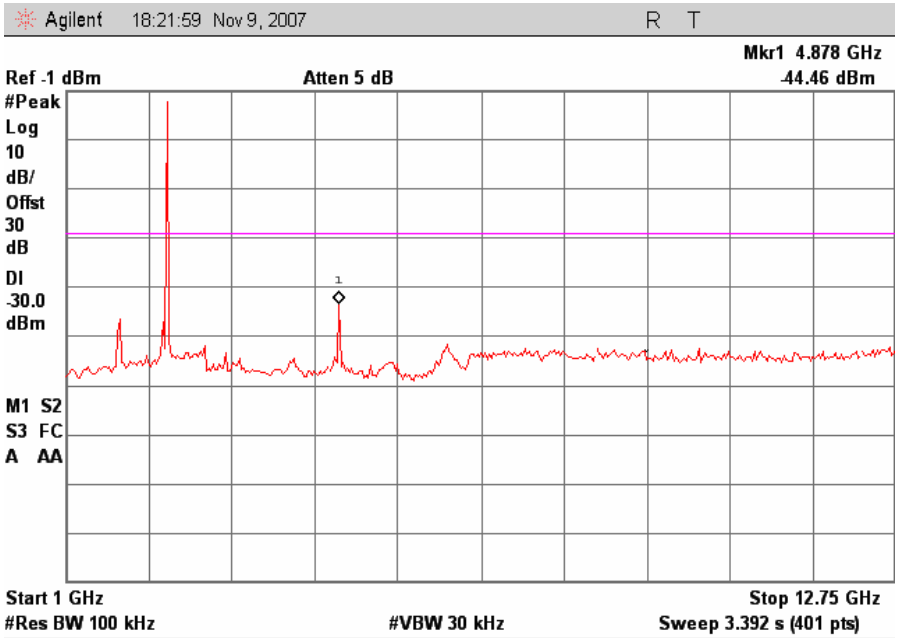
Low channel (2412 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz DSSS Mode



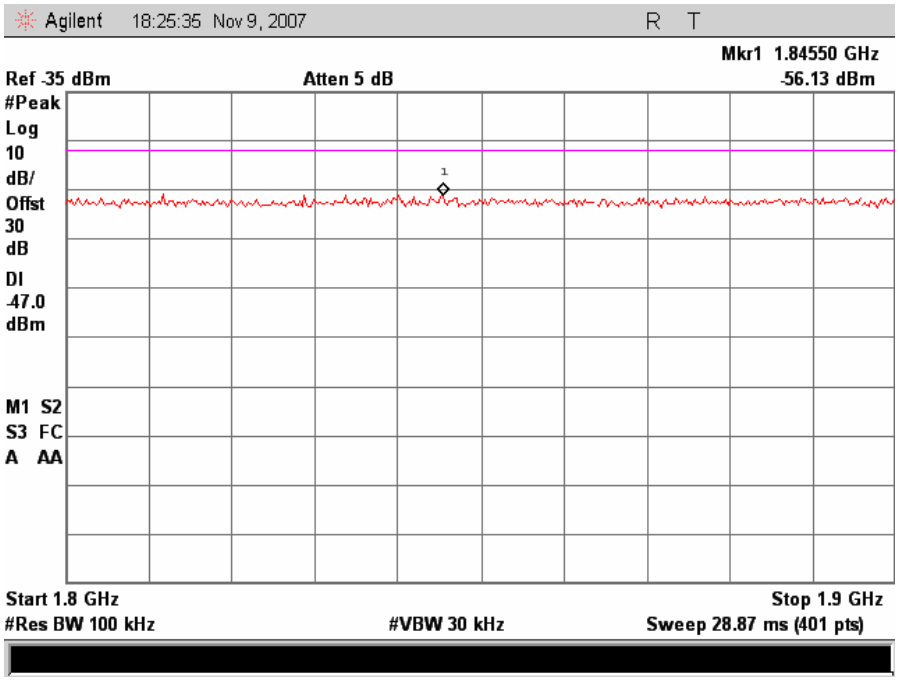
Low channel (2412 MHz) Spurious Emission 5.15 GHz - 5.3 GHz DSSS Mode



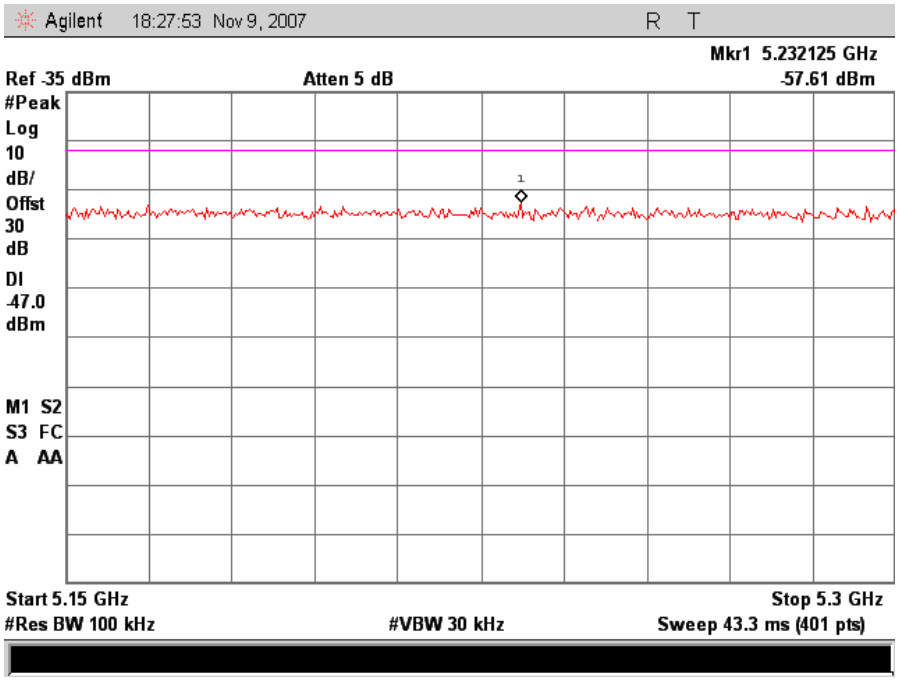
Mid channel (2462 MHz) Spurious Emission 30 MHz - 1GHz DSSS Mode



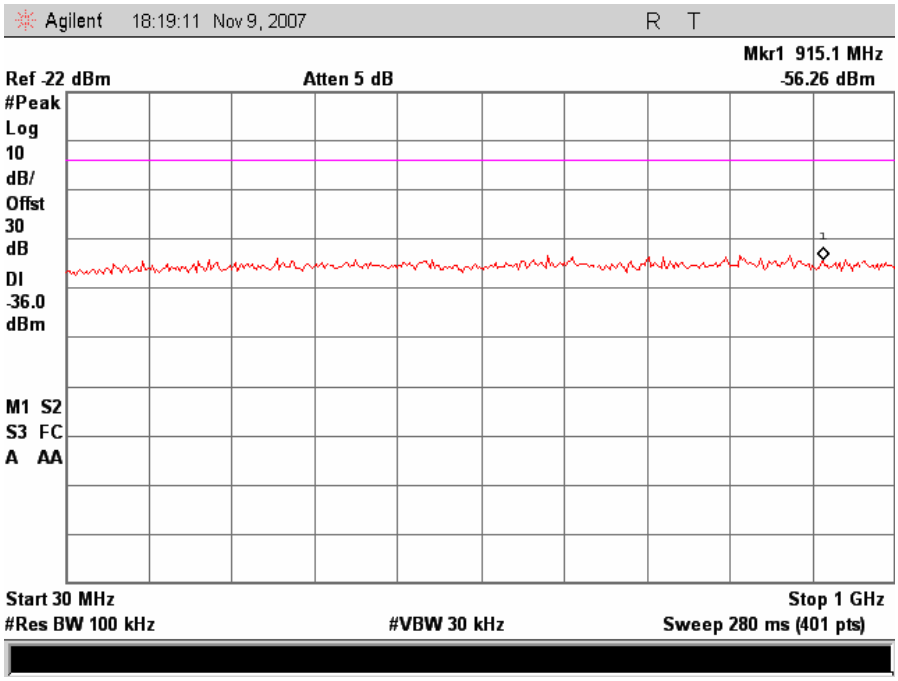
Mid channel (2462 MHz) Spurious Emission 1 GHz - 12.75 GHz DSSS Mode



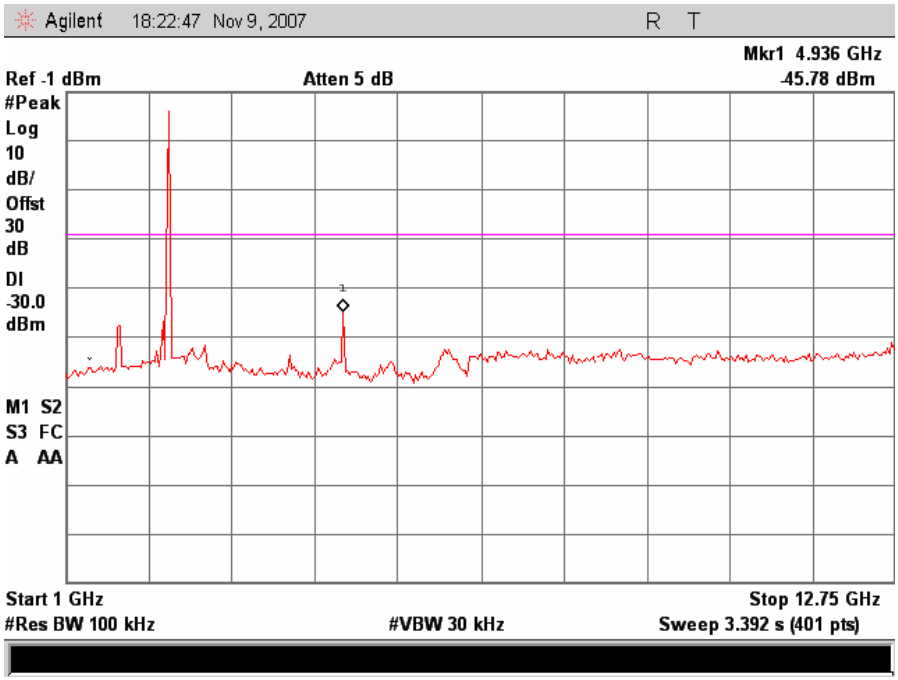
Mid channel (2462 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz DSSS Mode



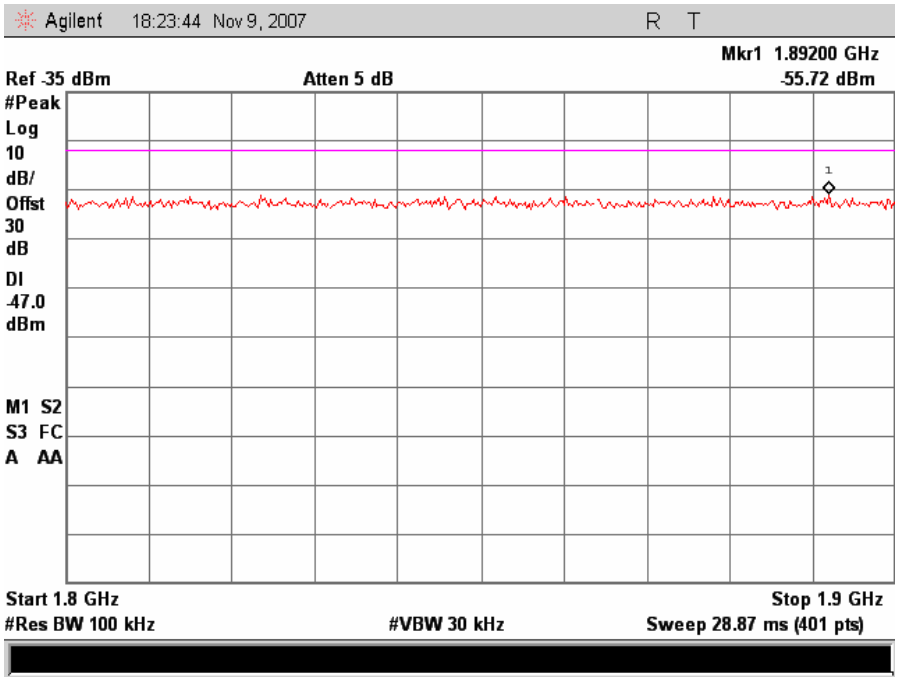
Mid channel (2462 MHz) Spurious Emission 5.15 GHz - 5.3 GHz DSSS Mode



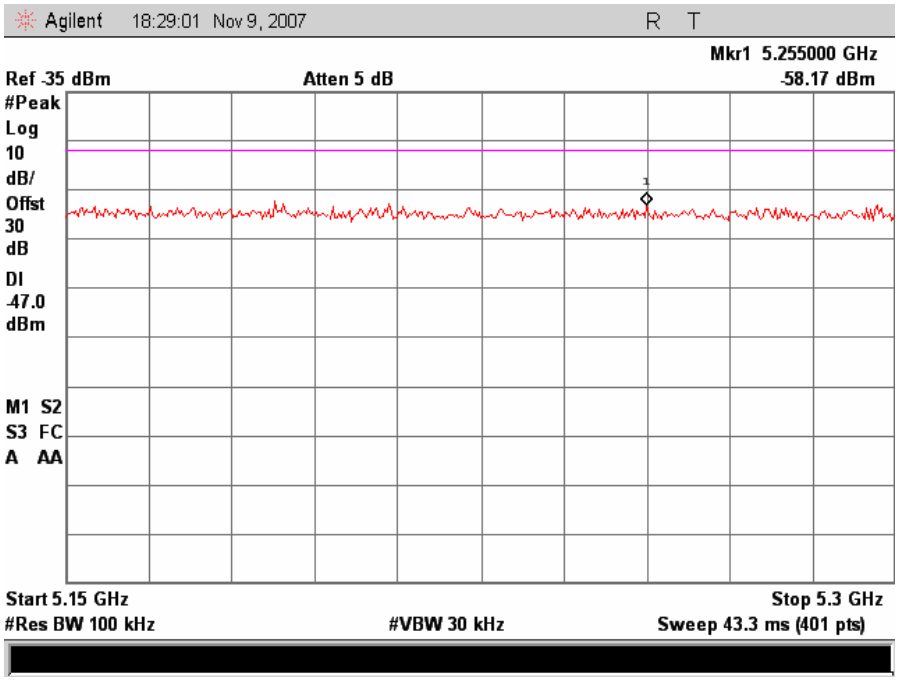
High channel (2462 MHz) Spurious Emission 30 MHz - 1GHz DSSS Mode



High channel (2462 MHz) Spurious Emission 1 GHz - 12.75 GHz DSSS Mode



High channel (2462 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz DSSS Mode



High channel (2462 MHz) Spurious Emission 5.15 GHz - 5.3 GHz DSSS Mode

4.3.4 Transmitter Spurious Emissions - Radiated

Test Requirement(s): **ETSI EN 300 328, Section 5.7.5:**

In accordance with *EN 300 328 Section 4.3.6*, the EUT shall meet the Spurious Emissions limits for emissions outside the transmit frequency band as shown in Table 11 and Table 12.

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

Table 11. Transmitter Limits for Narrowband Spurious Emissions - Radiated

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

Table 12. Transmitter Limits for Wideband Spurious Emissions - Radiated

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 between 1 and 4 m 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.

In order to determine the magnitude of each emission within 6dB of the limit, other than the noise floor of the spectrum analyzer, the signal substitution method was used as described in Annex B of *EN 300 328*.

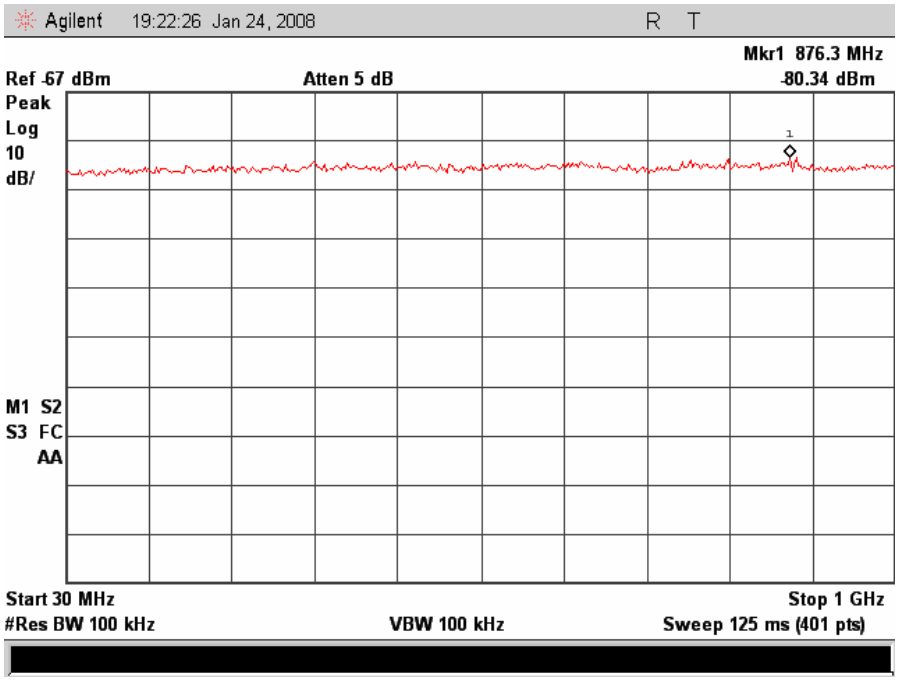
Test Results: The EUT as tested was found compliant with the specified limits of Clause 4.3.4.2.

Test Engineer: Minh Ly

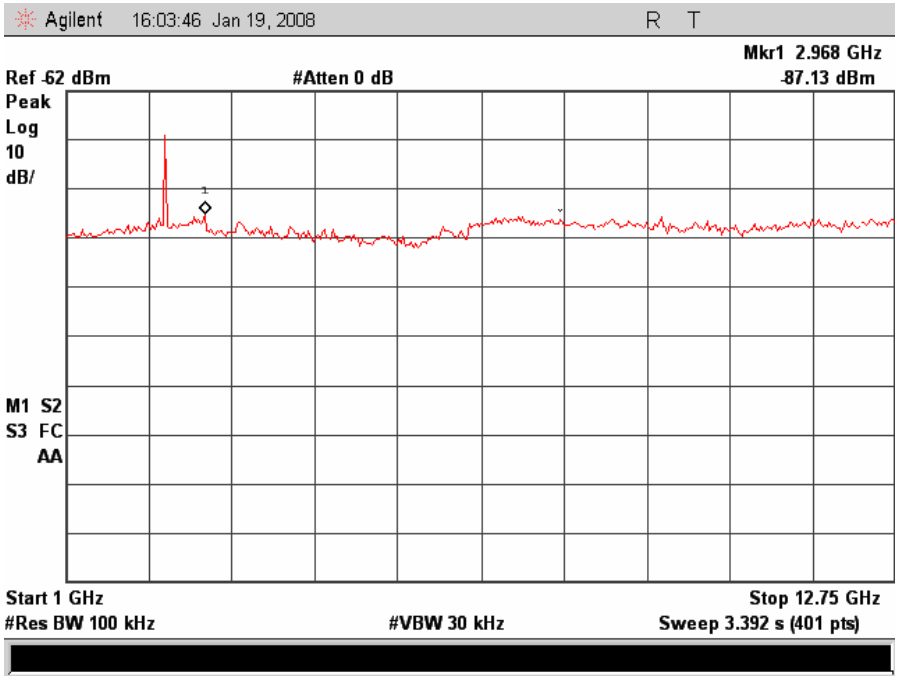
Test Date: January 19 and January 24, 2008

Conformance Requirements

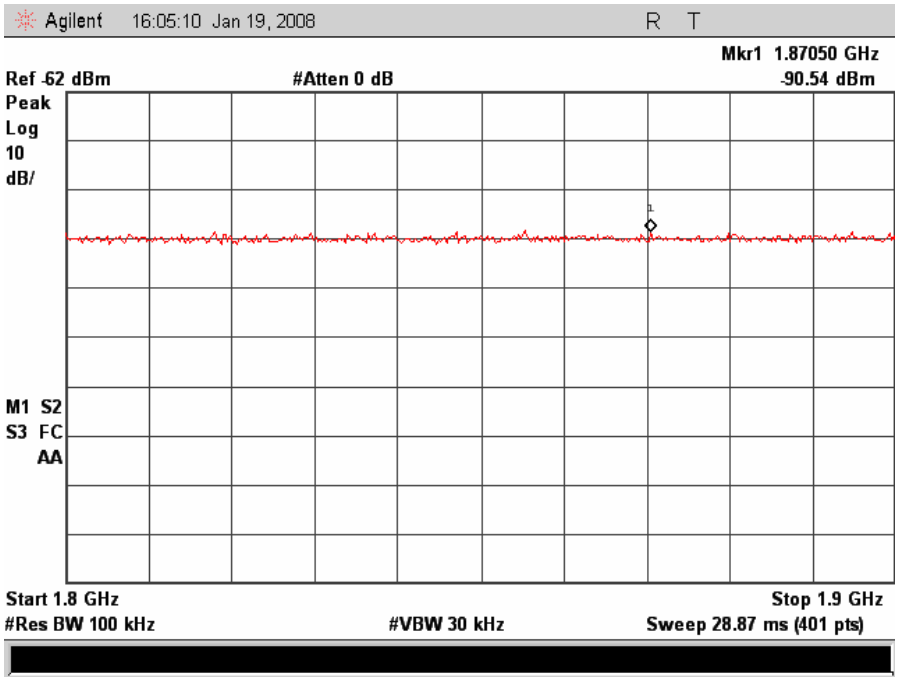
4.3.6 Transmitter Spurious Emissions - Radiated



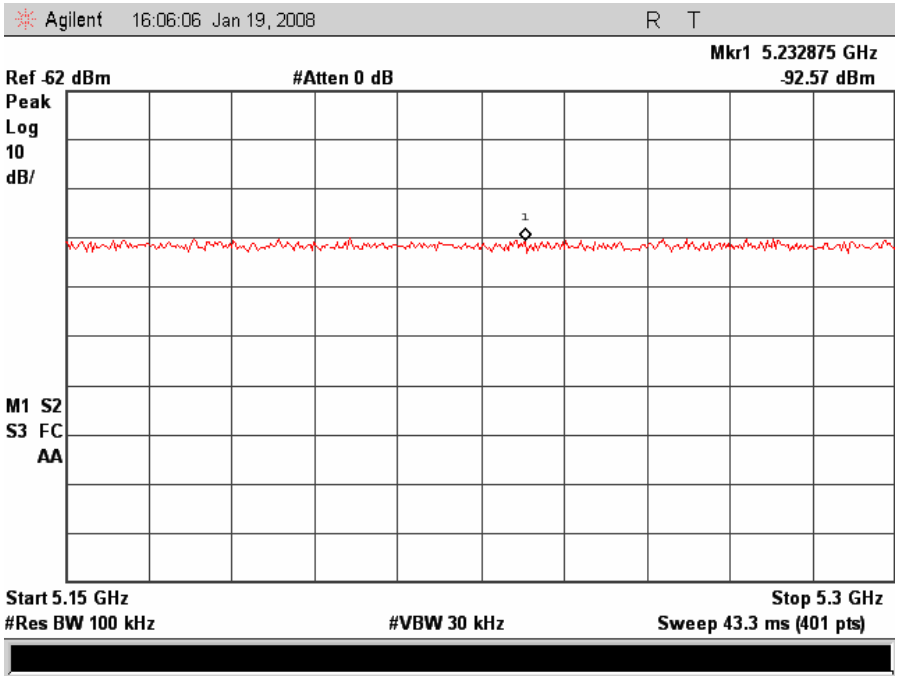
Low channel (2412 MHz) Spurious Emission 30 MHz - 1GHz OFDM Mode



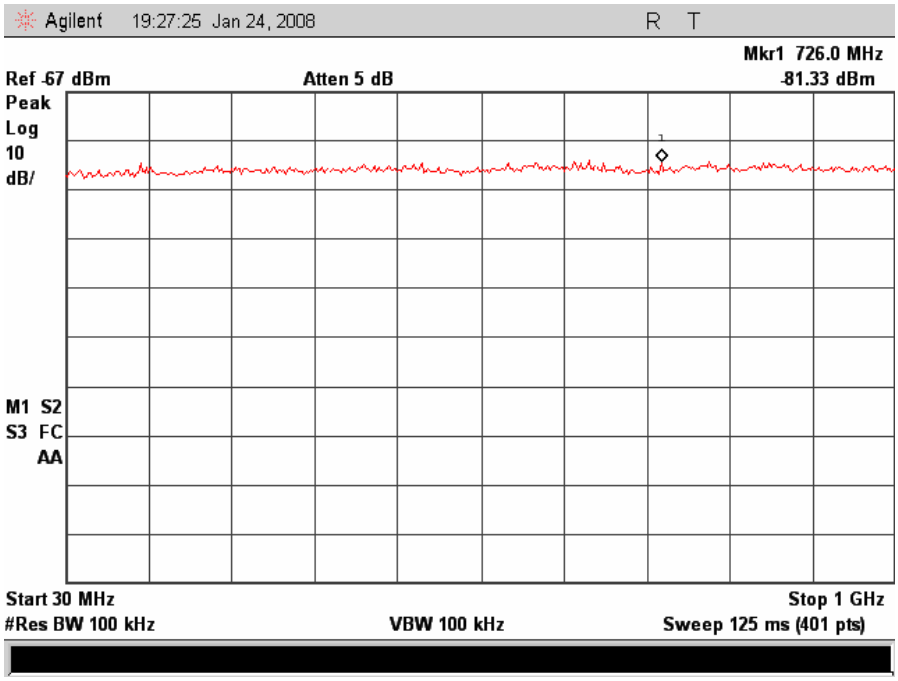
Low channel (2412 MHz) Spurious Emission 1 GHz - 12.75 GHz OFDM Mode



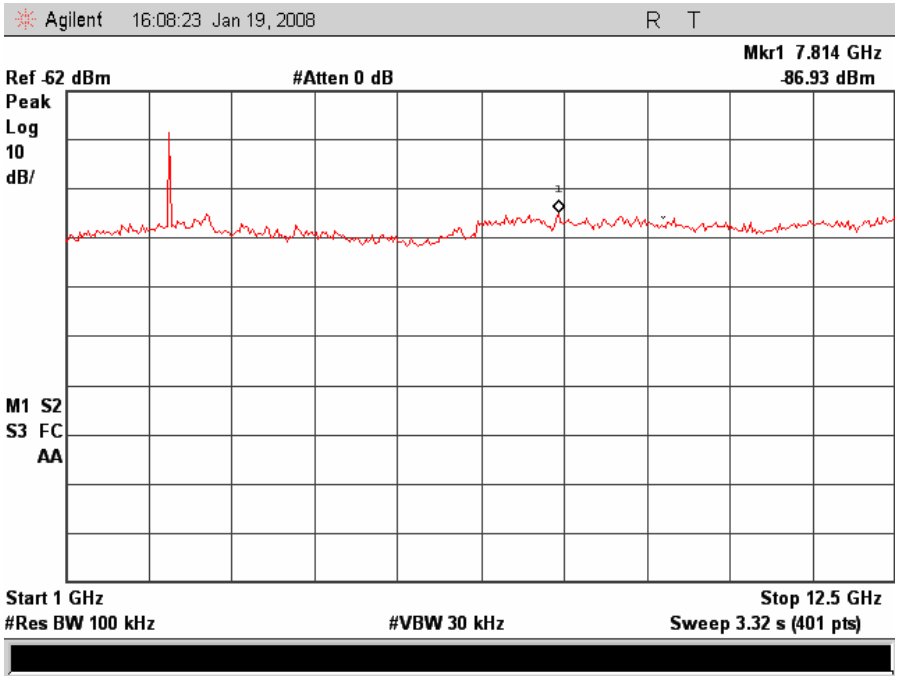
Low channel (2412 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz OFDM Mode



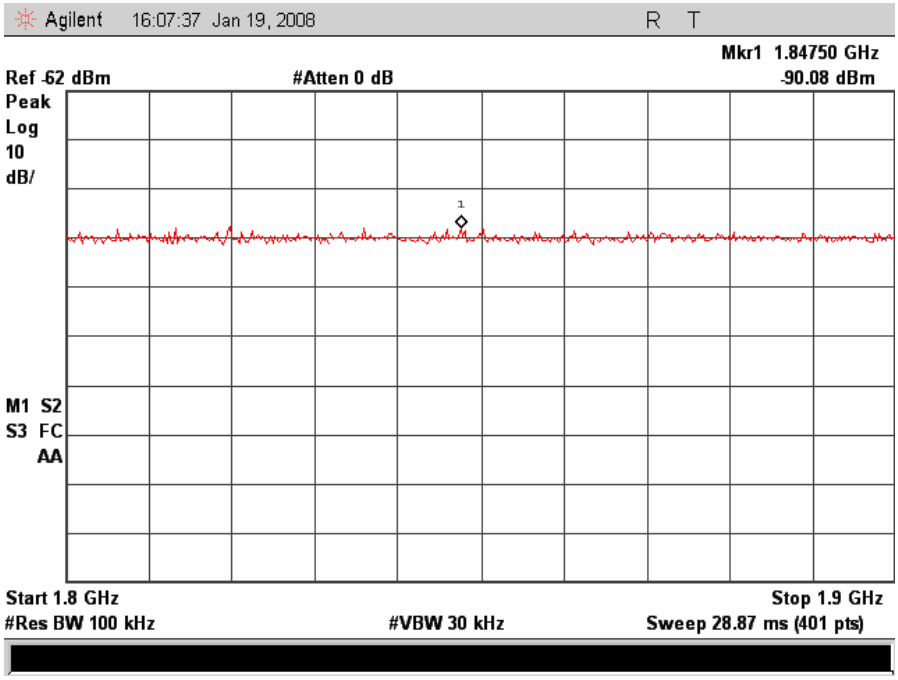
Low channel (2412 MHz) Spurious Emission 5.15 GHz - 5.3 GHz OFDM Mode



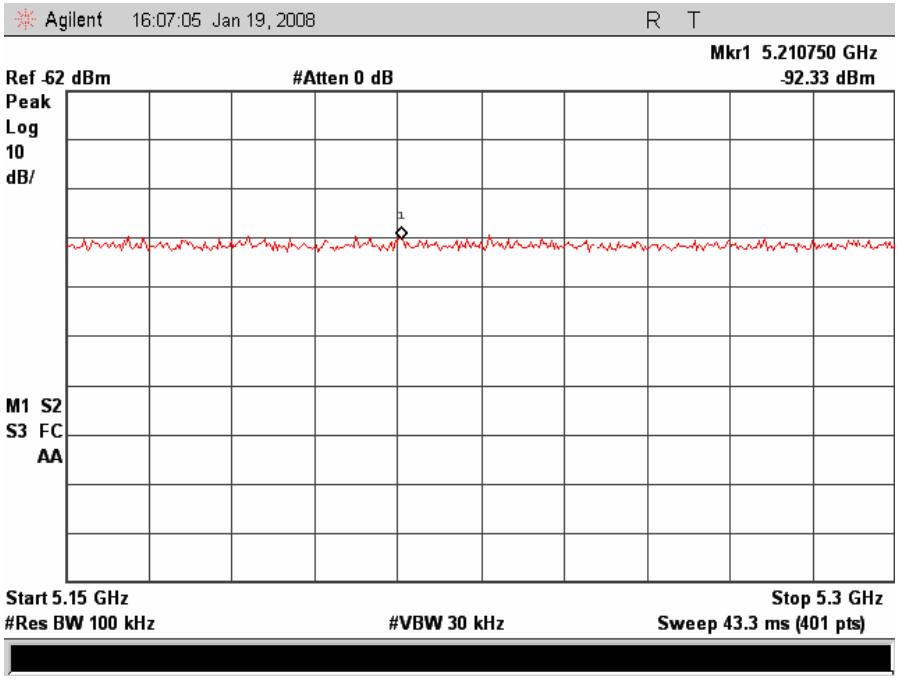
Mid channel (2412 MHz) Spurious Emission 30 MHz - 1GHz OFDM Mode



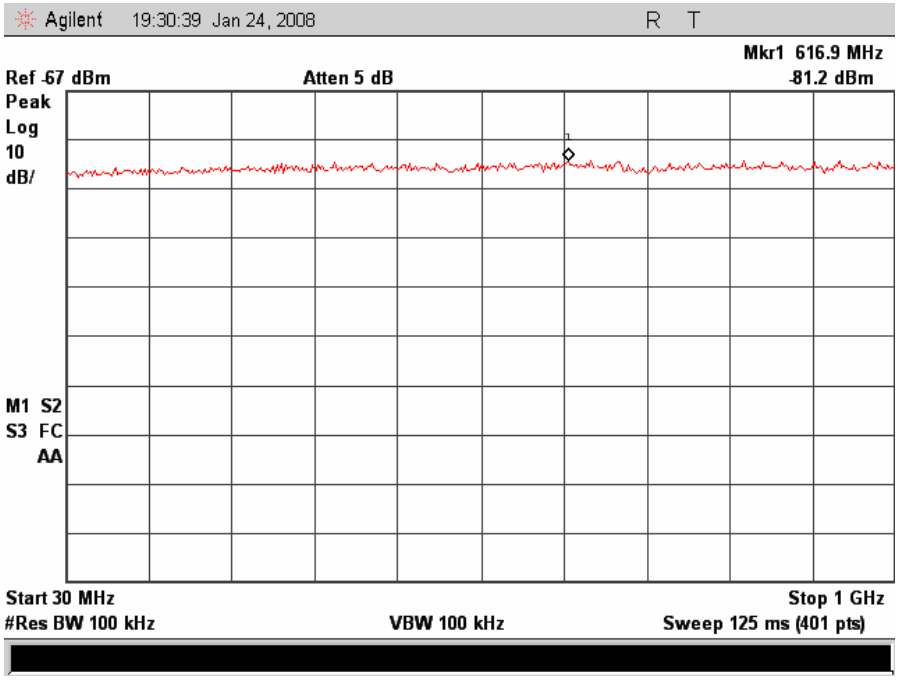
Mid channel (2412 MHz) Spurious Emission 1 GHz - 12.75 GHz OFDM Mode



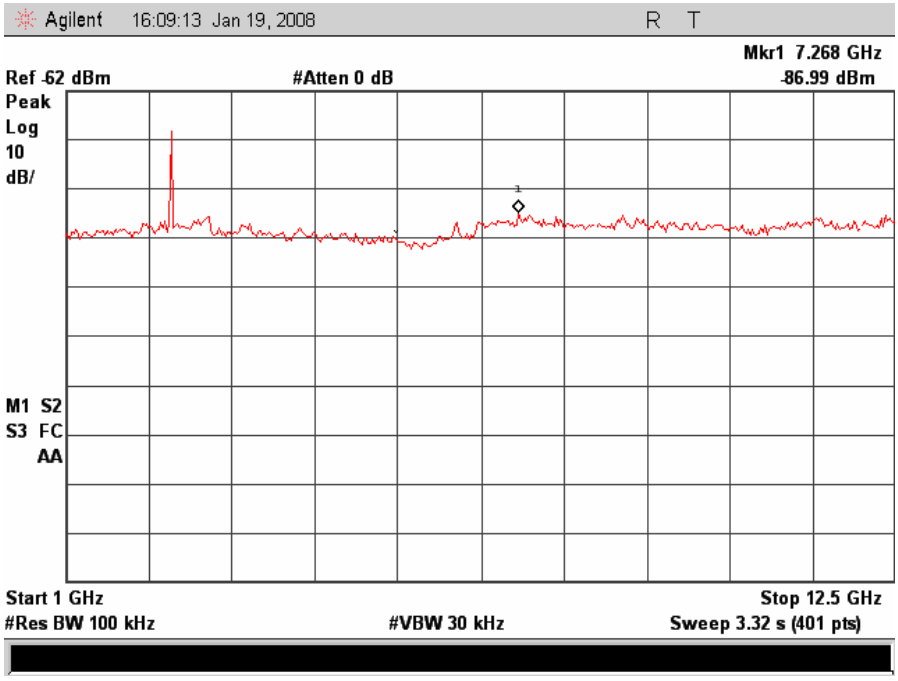
Mid channel (2412 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz OFDM Mode



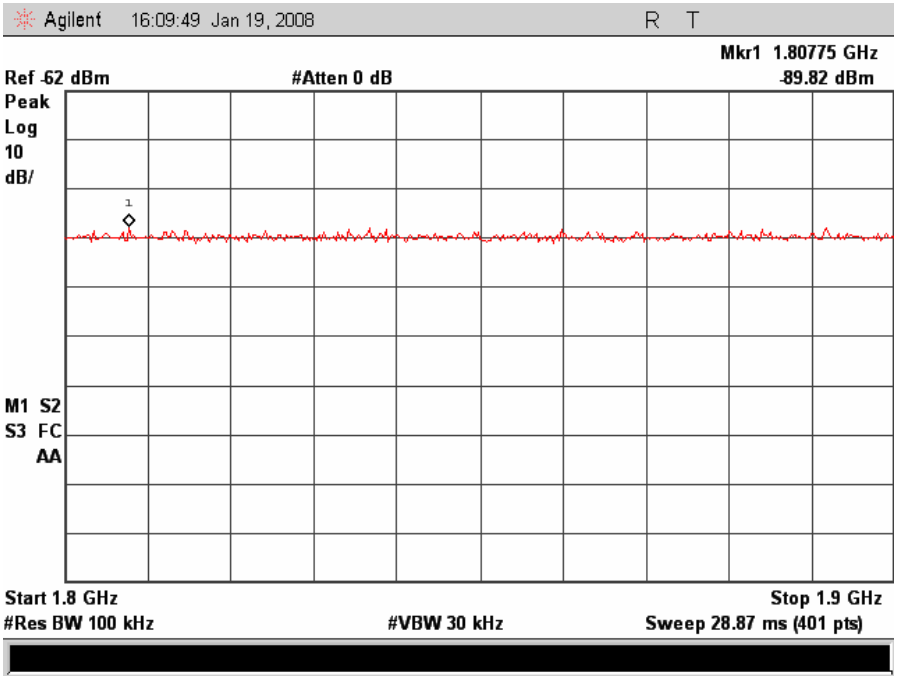
Mid channel (2412 MHz) Spurious Emission 5.15 GHz - 5.3 GHz OFDM Mode



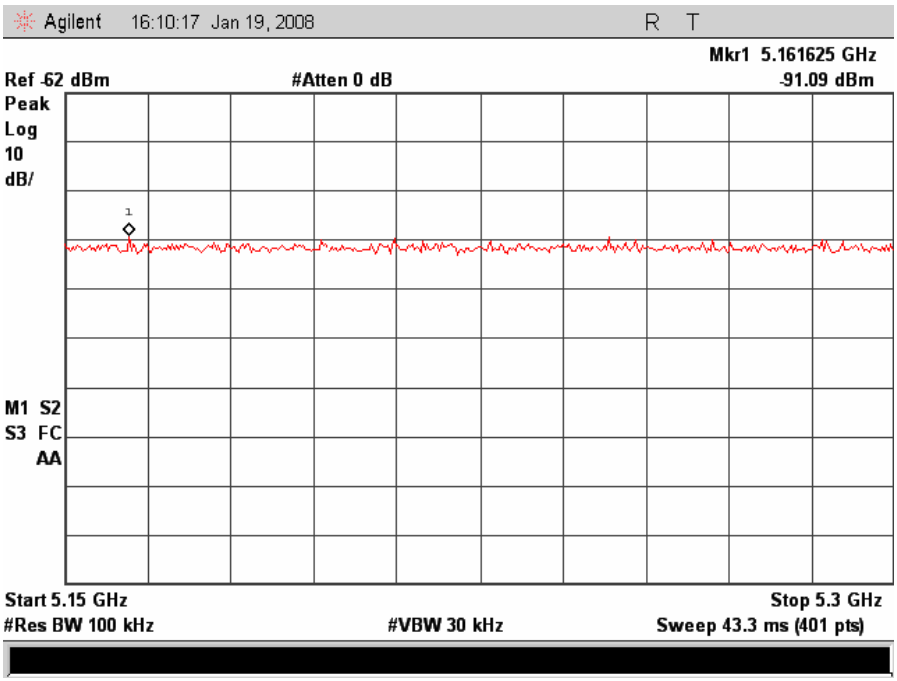
High channel (2462 MHz) Spurious Emission 30 MHz - 1GHz OFDM Mode



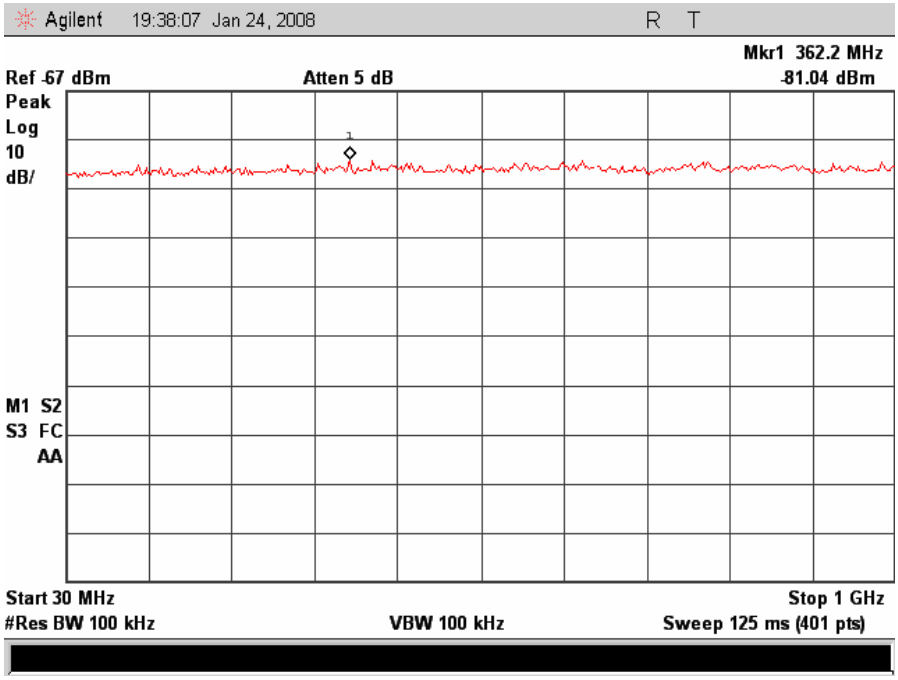
High channel (2462 MHz) Spurious Emission 1 GHz - 12.75 GHz OFDM Mode



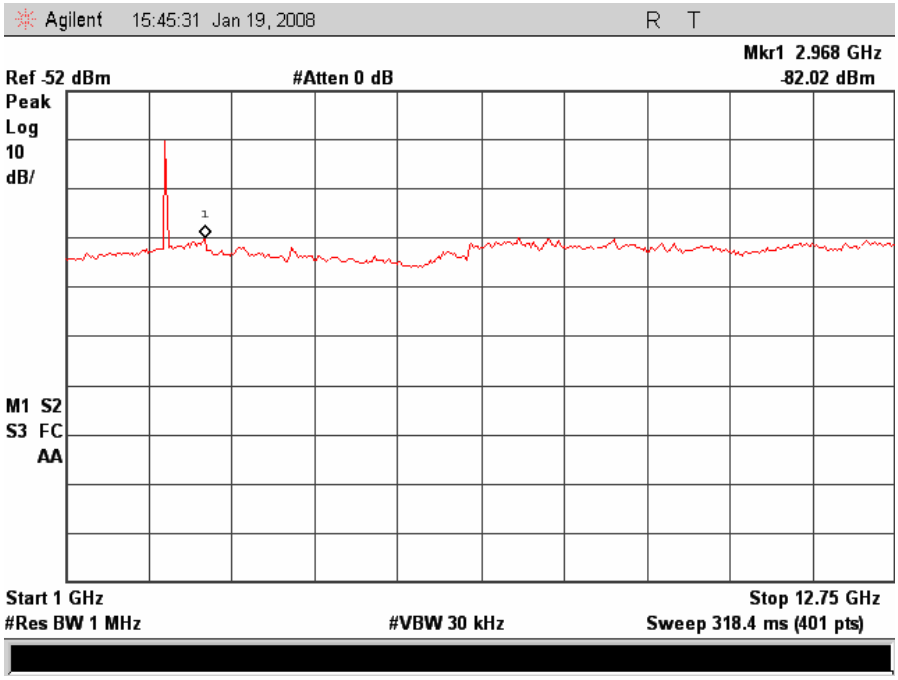
High channel (2462 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz OFDM Mode



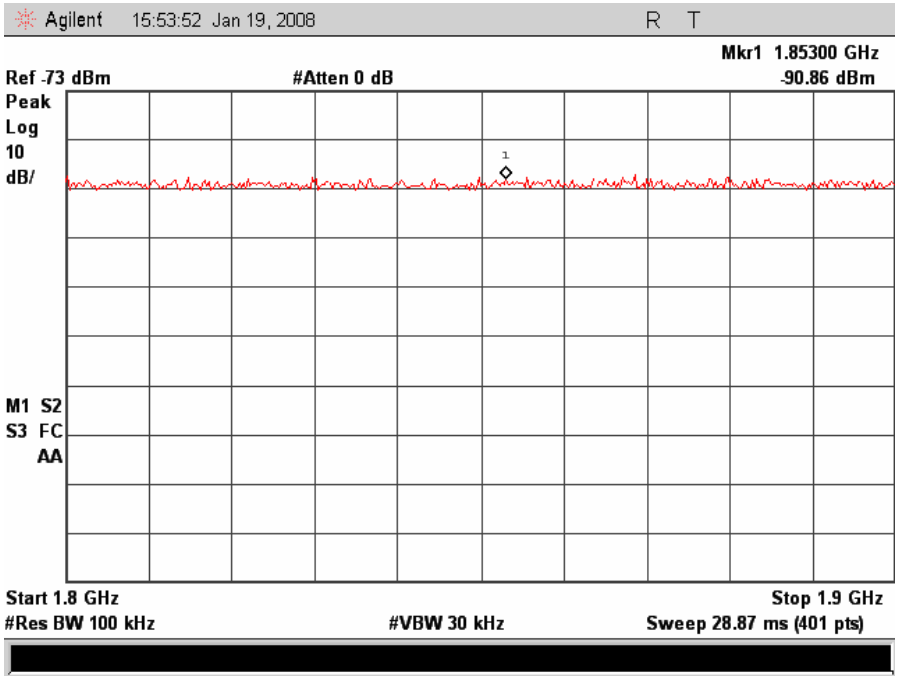
High channel (2462 MHz) Spurious Emission 5.15 GHz - 5.3 GHz OFDM Mode



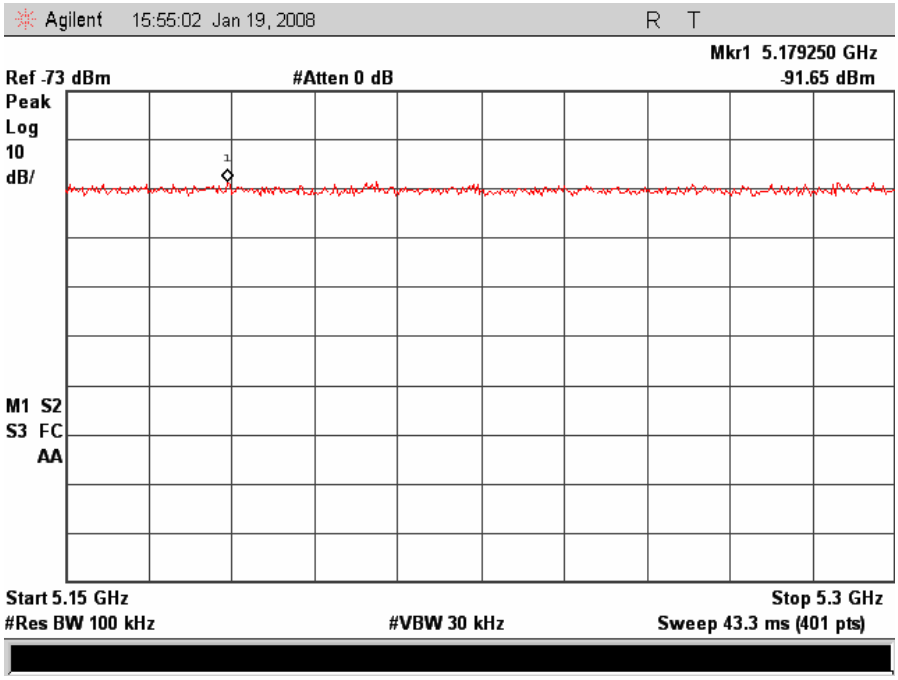
Low channel (2412 MHz) Spurious Emission 30 MHz - 1GHz DSSS Mode



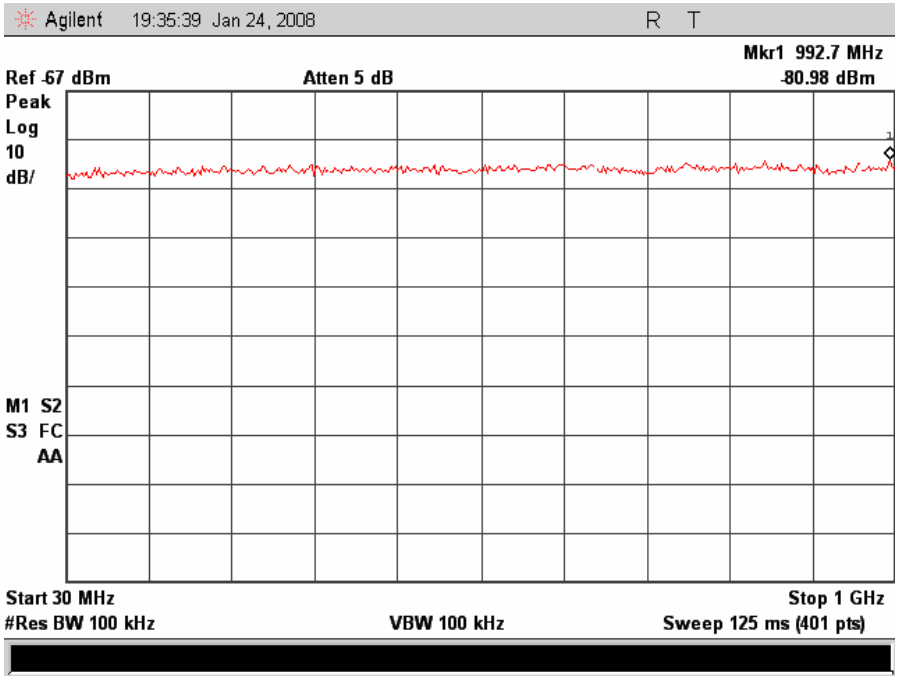
Low channel (2412 MHz) Spurious Emission 1 GHz - 12.75 GHz DSSS Mode



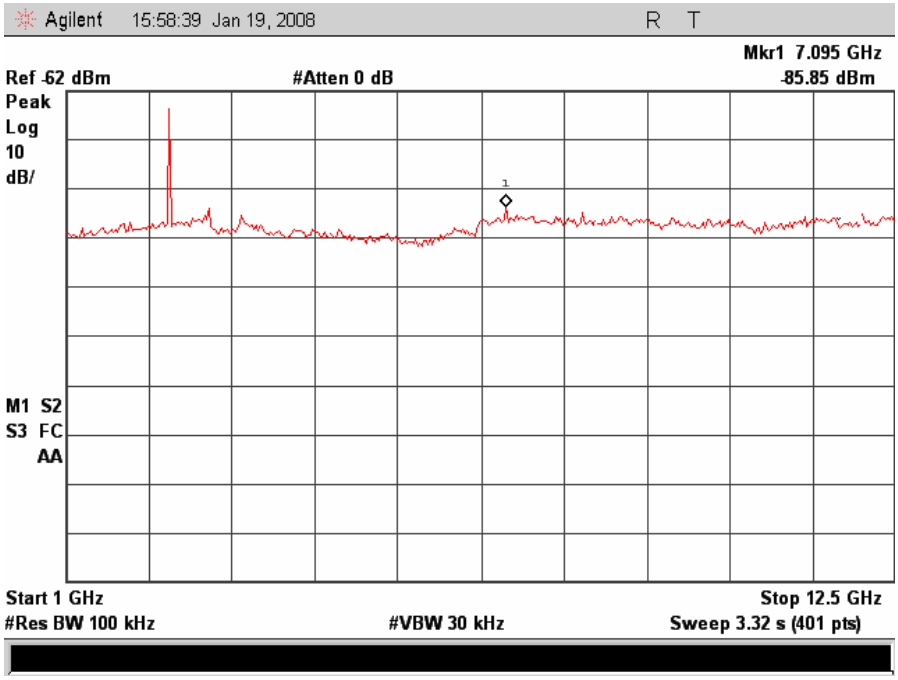
Low channel (2412 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz DSSS Mode



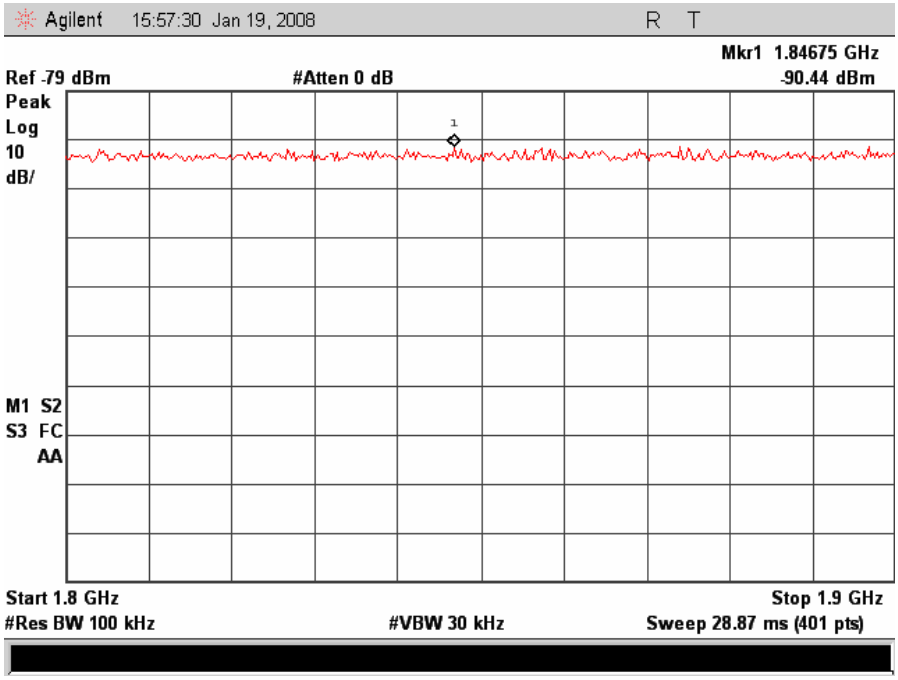
Low channel (2412 MHz) Spurious Emission 5.15 GHz - 5.3 GHz DSSS Mode



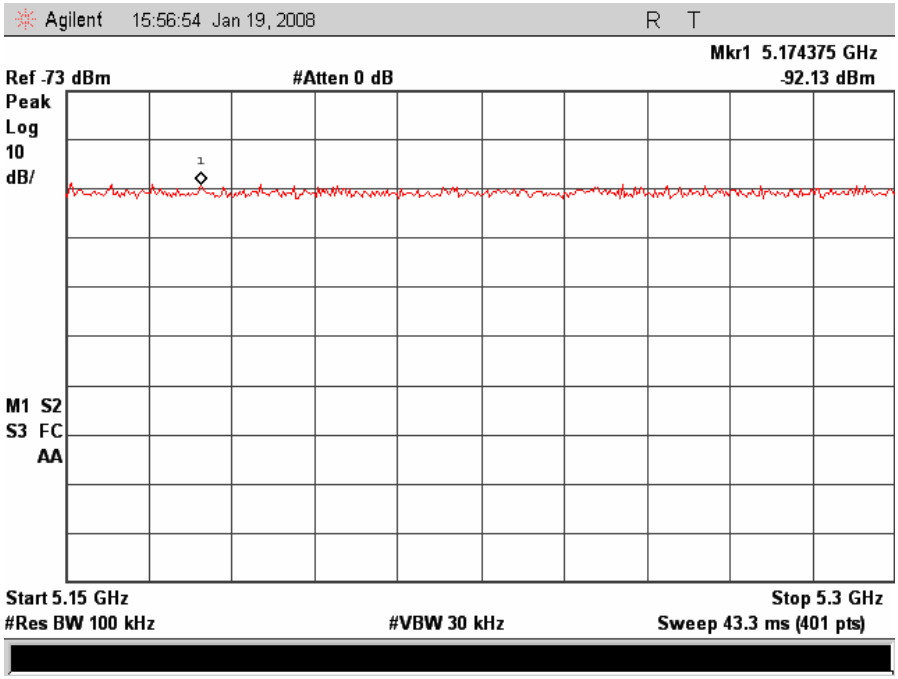
Mid channel (2412 MHz) Spurious Emission 30 MHz - 1GHz DSSS Mode



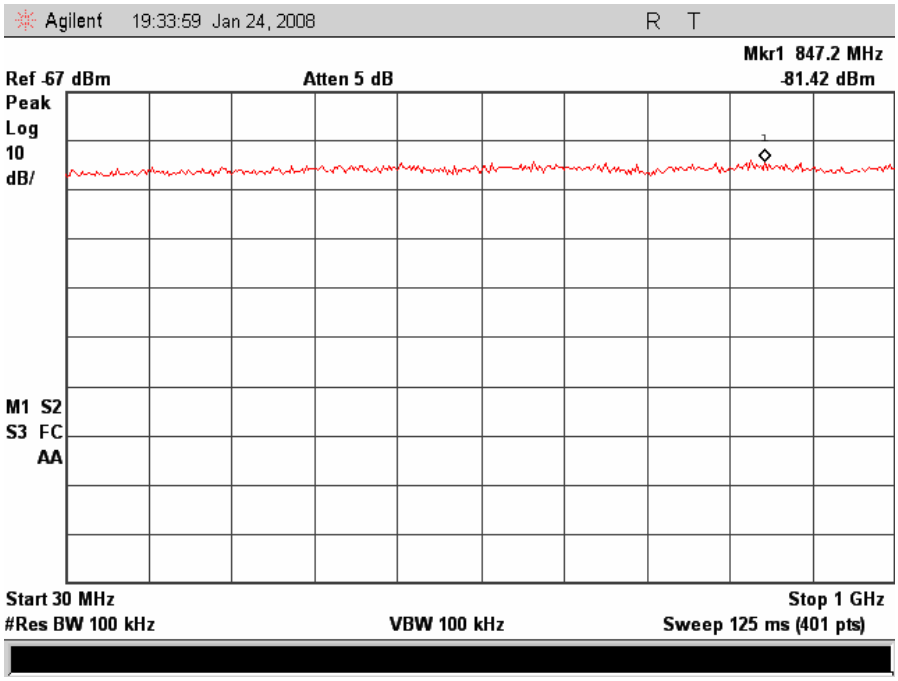
Mid channel (2412 MHz) Spurious Emission 1 GHz - 12.75 GHz DSSS Mode



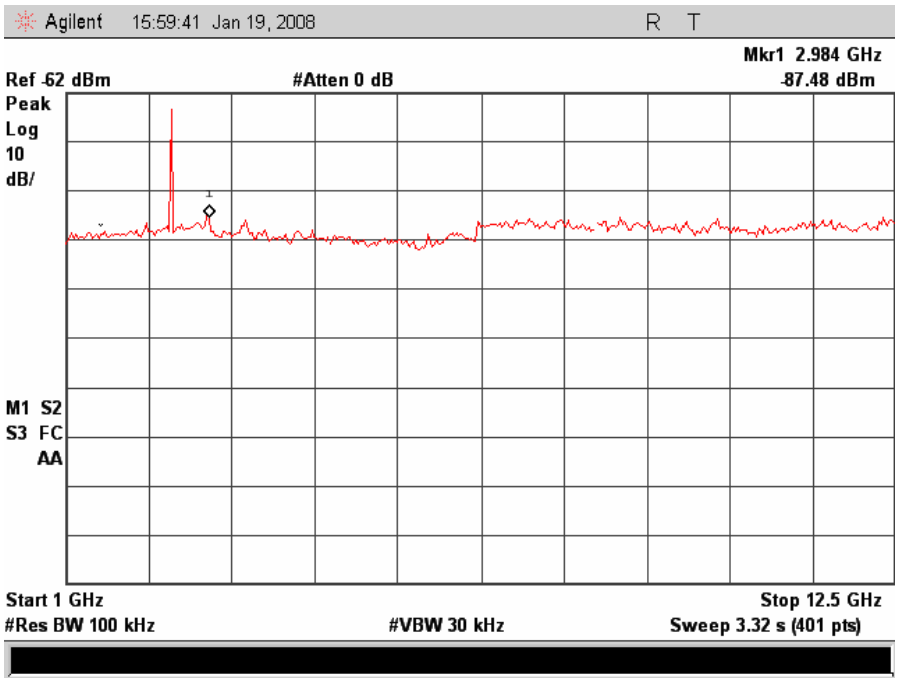
Mid channel (2412 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz DSSS Mode



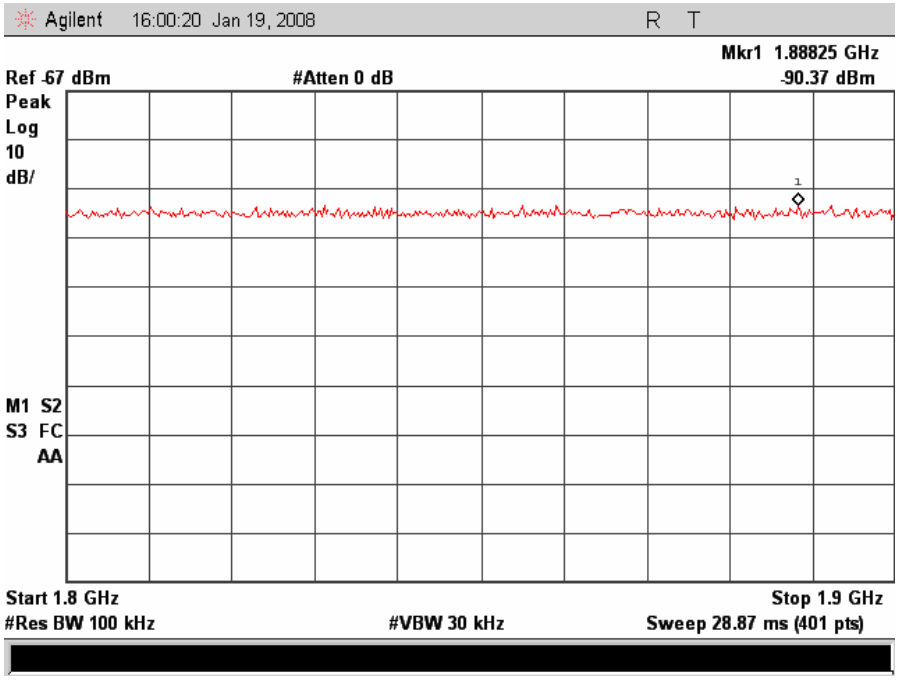
Mid channel (2412 MHz) Spurious Emission 5.15 GHz - 5.3 GHz DSSS Mode



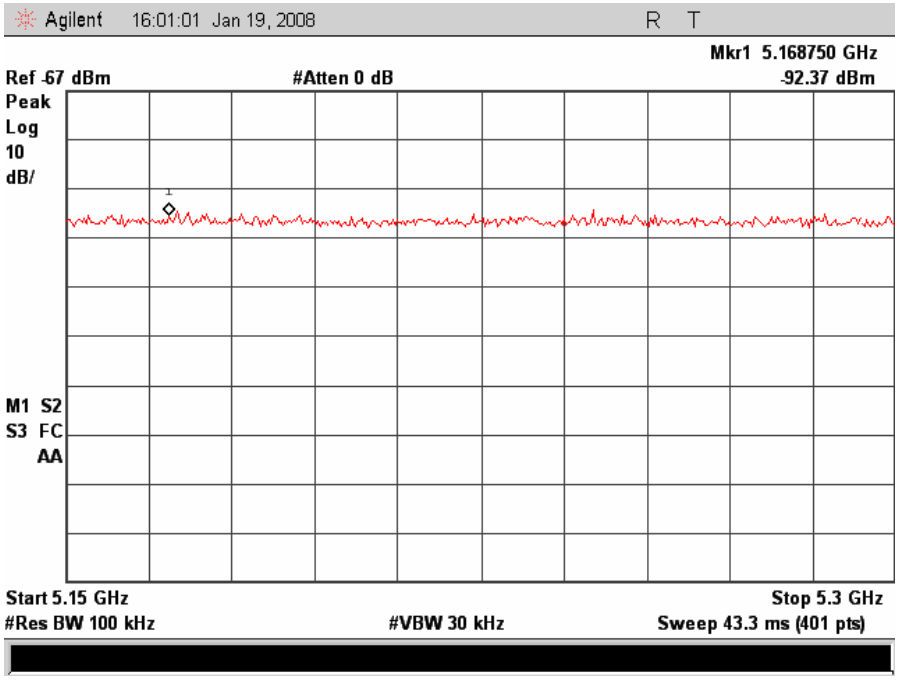
High channel (2462 MHz) Spurious Emission 30 MHz - 1GHz DSSS Mode



High channel (2462 MHz) Spurious Emission 1 GHz - 12.75 GHz DSSS Mode



High channel (2462 MHz) Spurious Emission 1.8GHz Hz - 1.9 GHz DSSS Mode



High channel (2462 MHz) Spurious Emission 5.15 GHz - 5.3 GHz DSSS Mode

Test Photograph

Photograph 2. Radiated Emissions Setup

Conformance Requirements

4.3.7 Receiver Spurious Emissions

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 13 and Table 14 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 13. 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 14.

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

Table 14. 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 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 between 1 and 4 m 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.

In order to determine the magnitude of each emission within 6dB of the limit, other than the noise floor of the spectrum analyzer, the signal substitution method was used as described in Annex B of *EN 300 328*.

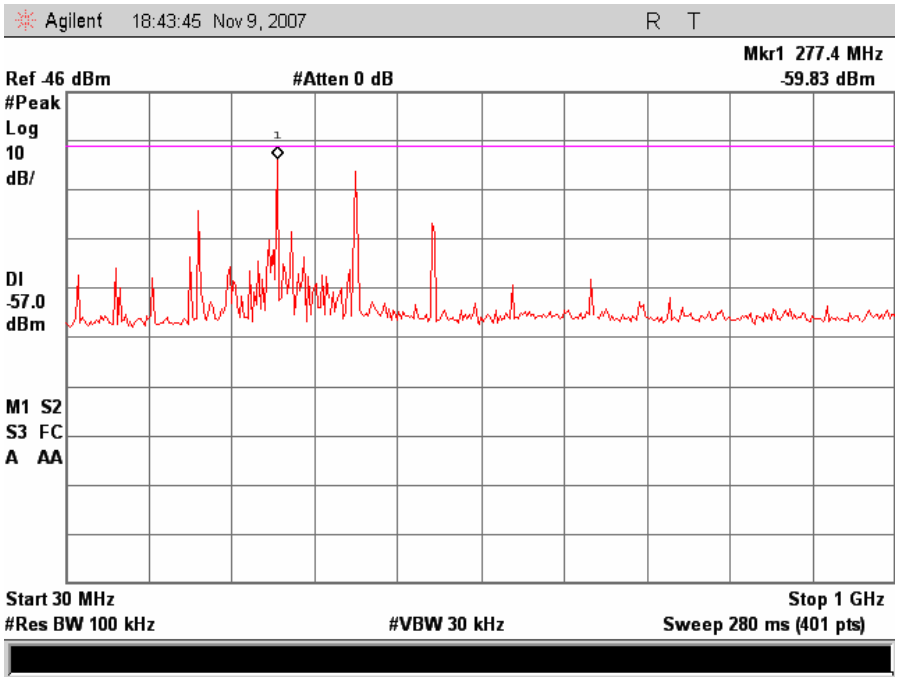
Test Results: The EUT as tested was found compliant with the specified limits of Clause 4.3.5.2.

Test Engineer: Minh Ly

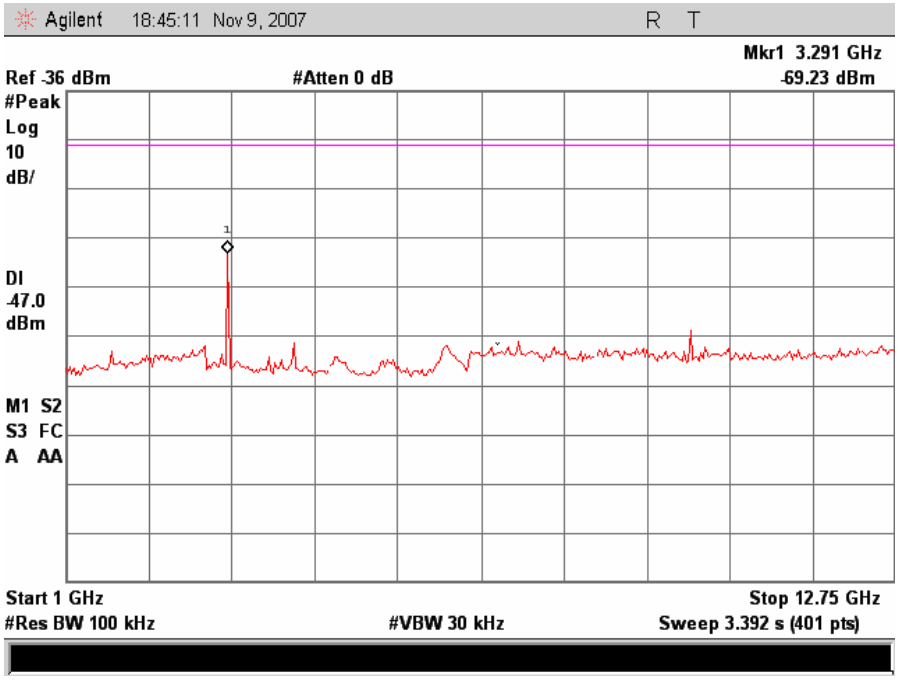
Test Date: November 9, 2007 & January 24, 2008

Conformance Requirements

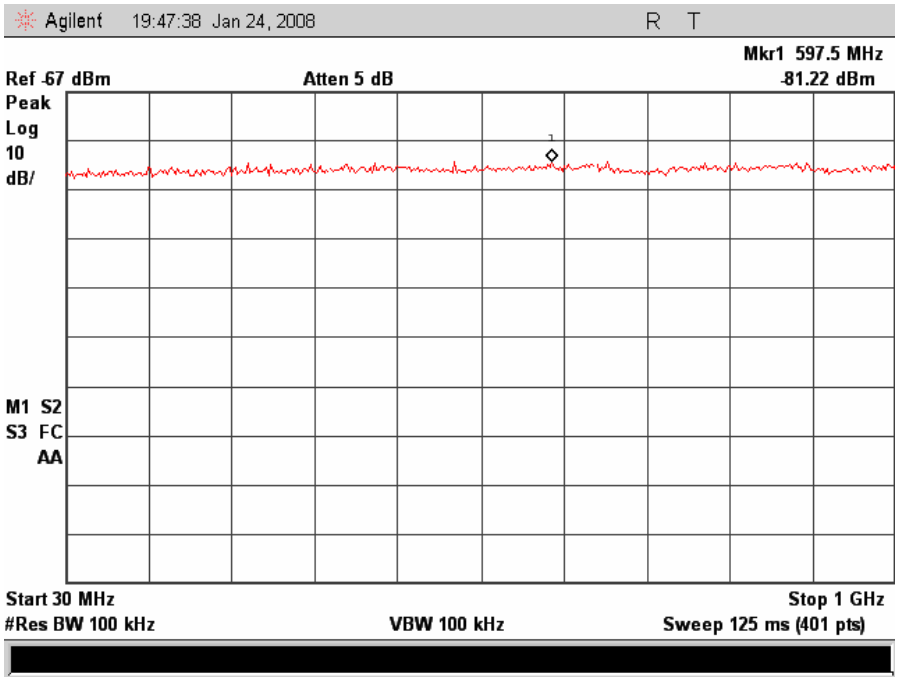
4.3.7 Receiver Spurious Emissions



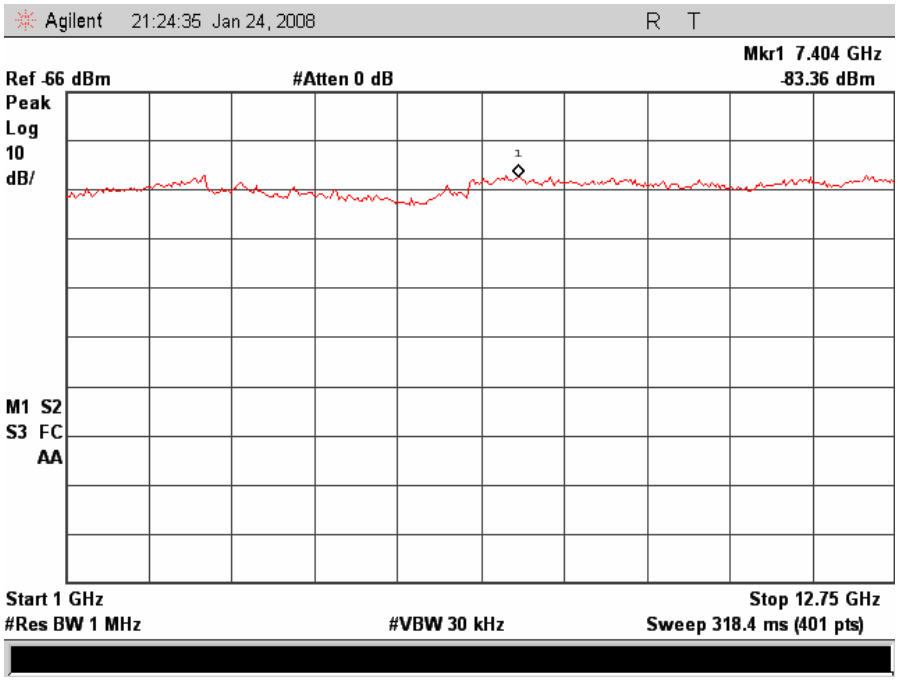
Standby Mode Spurious Emission , Conducted, 30 MHz - 1GHz



Standby Mode Spurious Emission, Conducted, 1 GHz - 12.75 GHz



Standby Mode Spurious Emission , Radiated, 30 MHz - 1GHz



Standby Mode Spurious Emission, Radiated, 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
1S2421	EMI RECEIVER	ROHDE&SCHWARZ	ESIB 7	03/27/2007	03/27/2008
1S2185	BILOG ANTENNA	CHASE	CBL 6111	6/29/2007	6/29/2008
1S2121	PRE-AMPLIFIER	HEWLETT PACKARD	8449B	10/25/2007	10/25/2008
1S2198	ANTENNA, HORN	EMCO	3115	08/31/2007	08/31/2008
1S2202	ANTENNA, HORN, 1 METER	EMCO	3116	04/10/2007	04/10/2010
N/A	HIGH PASS FILTER	MICRO-TRONICS	HPM13146	SEE NOTE	
1S2481	SHIELDED TEST CHAMBER	ETS-Lindgren	DKE8X8DBL	12/26/2007	12/26/2008
1S2041	COUPLER, BI DIRECTIONALCOAXIAL	NARDA	N/A	SEE NOTE	
1S2460	Analyzer, Spectrum 9 kHz-40GHz	Agilent	E4407B	07/06/2005	07/06/2008
1S2430	WIDEBAND POWER METER	ANRITSU COMPANY	ML2488A	03/12/2007	03/12/2008
1S2432	WIDEBAND POWER SENSOR	ANRITSU COMPANY	MA2491A	03/12/2007	03/12/2008
1S2034	COUPLER, DIRECTIONAL 1-20 GHz	KRYTAR	101020020	SEE NOTE	
1S2041	COUPLER, BI DIRECTIONALCOAXIAL	NARDA	N/A	SEE NOTE	
1S2128	Harmonic Mixer	Hewlett Packard	11970A	10/26/2006	10/26/2008
1S2129	Harmonic Mixer	Hewlett Packard	11970K	10/26/2006	10/26/2008

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

End of Report

