Test Certificate

A sample of the following product received on November 8, 2009 and tested on January 22, January 28 and February 1, 2010 complied with the requirements of

- **EN 300 328 V1.7.1 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive"**

given the measurement uncertainties detailed in Elliott report R78444.

Summit Data Communications Inc.

Model SDC-MSD30AG

Mark E. Hill
Staff Engineer

Summit Data Communications Inc.

Printed Name

ACCREDITED

Testing Cert #2016.01

Elliott Laboratories 684 West Maude Avenue 408-245-7800 Phone
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Radio Test Report

EN 300 328 V1.7.1
ElectroMagnetic Compatibility and Radio spectrum Matters (ERM); Wideband Transmission Systems; Data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques;

Model: SDC-MSD30AG

COMPANY:	Summit Data Communications Inc. 526 South Main St. Suite 805 Akron, OH 44311
TEST SITE(S):	Elliott Laboratories 684 W. Maude Avenue Sunnyvale, CA 94085
REPORT DATE:	March 10, 2010
FINAL TEST DATES:	January 22, January 28 and February 1, 2010

AUTHORIZED SIGNATORY:

Mark E. Hill
Staff Engineer
Elliott Laboratories

Testing Cert #2016.01

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	March 10, 2010	First release	

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SCOPE

The European Committee for Electrotechnical Standardization (CENELEC) and the European Telecommunications Standards Institute (ETSI) publish standards regarding ElectroMagnetic Compatibility and Radio spectrum Matters for radio-communications devices.

Tests have been performed on the Summit Data Communications Inc. model SDC-MSD30AG, pursuant to the relevant requirements of the following harmonized EN standard(s) covering essential requirements under article 3.2 of the R&TTE Directive:

- EN 300 328 V1.7.1 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques"

OBJECTIVE

The objective of the manufacturer is to comply with the harmonized standards identified in the previous section. In the case of most equipment, this document requires testing to other EN specifications. In order to demonstrate compliance, the manufacturer or a contracted laboratory makes measurements and takes the necessary steps to ensure that the equipment complies with the appropriate technical standards.

STATEMENT OF COMPLIANCE

The tested sample of Summit Data Communications Inc. model SDC-MSD30AG complied with the requirements of:

EN 300 328 V1.7.1

Although all measurements were below the specification limit, one or more measurements were below the limit by a margin less than the measurement uncertainty. It is not therefore possible to state that the tested sample complied with the requirements based upon a 95% level of confidence. However, where a confidence level of less than 95% is acceptable, the device is considered to be in compliance with the requirements.

The test results recorded herein are based on a single type test of Summit Data Communications Inc. model SDC-MSD30AG and therefore apply only to the tested sample. The sample was selected and prepared by Jerry Pohmurski of Summit Data Communications Inc..

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS

EN 300 328 V1.7.1 – Digital Modulation

Section	Description	Measured	Limit	Result
4.3.1.2	Average Effective Radiated Power (over normal and extreme conditions)	802.11b: 19.9 dBm 802.11g: 16.9 dBm	100mw (20dBm)	Complies
4.3.2	Peak Power Density[1]	802.11b: 8.8 dBm/MHz 802.11g: 9.5 dBm/MHz	10 dBm/1MHz	Complies
4.3.3	Frequency Range (over normal and extreme conditions)	802.11b: 2402.07 - 2481.95 MHz 802.11g: 2401.78 - 2482.12 MHz	2400 MHz – 2483.5 MHz	Complies
4.3.4	Number of hopping channels	-	Not applicable to digital modulation transmitters	-
4.3.4	Channel separation	-		
4.3.4	Maximum time of occupancy	-		
4.3.5	Medium Access Protocol	Uses 802.11 protocol	-	Complies
4.3.6	Transmit Mode Spurious Emissions (conducted)	More than 10dB below the limit	EN 300 328 v1.4.1 Tables 2 and 3	Complies
4.3.6	Transmit Mode Spurious Emissions (radiated)	More than 10dB below the limit	EN 300 328 v1.4.1 Tables 2 and 3	Complies
4.3.7	Stand-By/Receive Mode Spurious Emissions (conducted)	More than 20dB below the limit	EN 300 328 v1.4.1 Tables 4 and 5	Complies
4.3.7	Stand-By/Receive Mode Spurious Emissions (radiated)	-49.4 dBm eirp @ 3296.2MHz (-2.4 dB Margin)	EN 300 328 v1.4.1 Tables 4 and 5	Complies
Note – Although the measurement is below the specification limit, it is below the limit by a margin less than the measurement uncertainty.				

EXTREME CONDITIONS

Voltage extremes used during testing were those for AC-powered equipment, +/-10% of nominal.

Temperature extremes used during testing were -10°C to +55°C (taken from AS/NZS 4268) and based on the manufacturer declared values for extremes based on operating range of host or equipment."

[1] Does not apply to systems that use frequency hopping modulation.

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF frequency	Hz	25 to 7000 MHz	1.7×10^{-7}
RF power, conducted	dBm	25 to 7000 MHz	± 0.52 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dBµV/m	25 to 1000 MHz	± 3.6 dB
Transmitter switch off time	Seconds	-	0.1 sec

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Summit Data Communications Inc. model SDC-MSD30AG is a 802.11ag compliant wireless LAN radio Module which is designed to provide wireless local area networking connectivity. Normally, the EUT would be embedded in various types of mobile and stationary computing devices such as handheld and vehicle mounted data terminals during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 3.3 VDC =/-5%. It's typical power consumption is 400mA (1320mW) while in transmit mode, 180mA (594mW) while in receive mode and 10mA (33mW) while in standby mode.

The sample was received on November 8, 2009 and tested on January 22, January 28 and February 1, 2010. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Summit Data Communications Inc.	SDC-MSD30AG	802.11AG Mini Compact Flash Module with antenna connectors	-	TWG-SDCMSD30AG

OTHER EUT DETAILS

Monopole Antenna - 2.4 and 5GHz bands, Huber+Suhner, SOA 2459/360/5/0/V_C, 3dBi (2.4GHz), 6.5dBi (5GHz)
Dipole Antenna #1 - 2.4 and 5GHz bands - Larsen, R380.500.314, 1.6dBi (2.4GHz), 5dBi (5GHz)
Dipole Antenna #2 - 2.4 GHz only - Cisco Air-Ant 4941 2dBi(2.4GHz)
Dipole Antenna #3 - 5GHz only - Cisco Air-Ant 5135 3.5dBi(5GHz)
Dipole Antenna #4 - 2.4GHz only - Summit SDC-CF22G - 0dBi

For purposes of this evaluation, the worse case antenna gains of 3dBi (2.4GHz) and 6.5dBi (5GHz) were used.

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host computer or system.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Hewlett Packard	iPAQ	Handheld Computer	-	-

No remote support equipment was used during testing.

EUT INTERFACE PORTS

The I/O cabling configuration during testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
iPAQ Power	AC Mains	2wire	Unshielded	1.5
Flash Module	iPAQ Module Port	-	-	-

EUT OPERATION

During emissions testing the EUT was configured to transmit at the Low, Middle, and High Channel. Unless otherwise stated, testing performed at 6Mbs for 802.11g mode and 1Mbs for 802.11b mode.

EMISSIONS TESTING

GENERAL INFORMATION

Antenna port measurements were taken at the Elliott Laboratories test site located at 684 West Maude Ave, Sunnyvale, CA 94085-3518

Final radiated spurious emissions measurements were taken at the Elliott Laboratories Anechoic Chambers and/or Open Area Test Site(s) listed below. The sites conform to the requirements of ANSI C63.4: 2003 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are registered with the VCCI and are on file with the FCC and industry Canada.

Site	Registration Numbers			Location
	VCCI	FCC	Canada	
SVOATS #2	R709 C729	90593	IC 2845A-2	684 West Maude Ave, Sunnyvale CA 94085-3518

In the case of Open Area Test Sites, ambient levels are at least 6 dB below the specification limits with the exception of predictable local TV, radio, and mobile communications traffic.

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

RADIATED EMISSIONS CONSIDERATIONS

CISPR has determined that radiated measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an Open Area Test Site or anechoic chamber, as defined in CISPR 16-1-4 and Annex A of EN 300 328 / EN 301 893 / EN 300 440-1. The test site is maintained free of conductive objects within the CISPR defined elliptical area.

EMISSIONS MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of the standards referenced in this document.

INSTRUMENT CONTROL COMPUTER

Software control is used to convert the receiver measurements to the field strength at an antenna, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer runs automated data collection programs that control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the EUT antenna port or receiving antenna and the test receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 25 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 25 to 1000 MHz frequency range as the reference antenna for substitution measurements.

Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

The test height above ground for non-body worn devices shall be 150 centimeters. Floor mounted equipment will be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

RADIO STANDARD TEST PROCEDURES

OUTPUT POWER

Output power is measured using an average sensor head. If the device is operating with a duty cycle during the measurement the measurement time is set to exceed the on/off duty cycle and the measured value is then corrected by adding a factor of 10 log(1/duty cycle) to the measured value.

Peak power measurements as required by EN 300 328 are measured using a diode detector as detailed in EN 300 328 section 5.7.2.2.

Power density is initially measured as a peak bandwidth (RBW=VBW=1MHz). If the power density is within 3dB of the limit it is re-measured via the IF output of the spectrum analyzer using an average sensor.

Power measurements made directly on the rf power port are, when appropriate, converted to an EIRP by adding the gain of the highest gain antenna that can be used with the device under test, as specified by the manufacturer.

FREQUENCY RANGE (EN 300 328, 2.4 GHz Band)

Frequency range is measured in accordance with EN 300 328 section 5.7.4.. Typically a bandwidth of 100kHz is used and the lower and upper frequencies at which the transmitted signal exceeds the spurious emission limit, adjusted for the measurement bandwidth, define the frequency range.

CONDUCTED SPURIOUS EMISSIONS

Conducted emissions are measured at the output of the device using a RF cable and attenuator if required. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

RADIATED SPURIOUS EMISSIONS

Radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in either an anechoic chamber or on an OATS during which all significant EUT frequencies are identified with the system in a nominal configuration.

At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. The limit is a field strength limit derived from the ERP limit specified in the standard(s).

All signals within 10dB of this calculated limit are re-measured on an OATS or Semi-anechoic chamber. The field strength is recorded and the EUT is then replaced with a substitution antenna of known gain (typically a dipole antenna or a double-ridged horn antenna). The erp of the substitution antenna is measured and used to calculate the erp of the EUT as outlined in section C3 of EN 300 328 and EN 301 893.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

R_r = Measured value in dBm
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED SPURIOUS EMISSIONS

Receiver readings are compared directly to a converted specification limit (decibel form). The conversion uses the effective radiated power limit specified in the standard to calculate the expected field strength in free space using the following formula:

$$E = \frac{\sqrt{30\ P\ G}}{d}$$

where:

E = Field Strength in V/m
P = Power in Watts
G = Gain of antenna in numeric gain[2]
D = distance in meters

The field strength limit is then converted to decibel form (dBuV/m) and the margin of a given emission peak relative to the limit is calculated as follows:

$$M = R_c - L_s$$

where:

R_c = Corrected Receiver Reading in dBuV/m
L_s = Calculated specification Limit in dBuV/m
M = Margin in dB Relative to Spec

When substitution measurements are required (all signals with less than 6dB of margin relative the field strength limit) the margin of the emissions relative to the effective radiated power limit is calculated from:

$$P_s - S = M$$

where:

P_s = effective radiated power determined from antenna substitution (dBm)
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

[2] Although the gain relative to a dipole should be used for limits expressed as an erp, the isotropic gain is used as this produces a more conservative limit.

Appendix A Test Equipment Calibration Data

Radiated Emissions, 1000 - 26,500 MHz, 23-Jan-10

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	8/19/2010
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	3/12/2010
EMCO	Antenna, Horn, 1-18 GHz	3117	1662	4/11/2010

Environmental test, 01-Feb-10

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	11/10/2010
Rohde & Schwarz	Power Sensor 100 uW - 10 Watts	NRV-Z53	1796	6/3/2010
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	1/6/2011
Thermotron	Temp Chamber (w/ F4 Watlow Controller)	S1.2	2170	6/29/2010

Appendix B Test Data

T78058 18 Pages

Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		-
Emissions Standard(s):	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Summit Data Communications

Model

802.11abg Module

Date of Last Test: 2/5/2010

Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Radio Performance Test - EN 300 328

RF Port Measurements

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 2/1/2010
Test Engineer: Mehran Birgani
Test Location: Environmental Chamber

Config. Used: 1
Config Change: Module 2C
Host EUT Voltage: 230V/ 50Hz

General Test Configuration

The EUT's rf port was connected to the measurement instrument's rf port, via an attenuator or dc-block if necessary.

Ambient Conditions:

Temperature: 15-20 °C
Rel. Humidity: 40-50 %

Summary of Results

Run #	Test Performed	Limit	Result	Value / Margin
1	Power spectral density at normal conditions	EN 300 328 10dBm/MHz (10mW/MHz) eirp	Pass	802.11b: 8.8 dBm/MHz 802.11g: 9.5 dBm/MHz
2	Output Power over extreme conditions	EN 300 328 20dBm (100mW) eirp	Pass	802.11b: 19.9 dBm 802.11g: 16.9 dBm
2	Frequency Range over extreme conditions	EN 300 328 2400 - 2483.5 MHz	Pass	802.11b: 2402.07 - 2481.95 MHz 802.11g: 2401.78 - 2482.12 MHz
3	Transmitter spurious emissions 30MHz - 12,750MHz (rf port)	EN 300 328	Pass	More than 10dB below the limit
3	Receiver spurious emissions 30MHz - 12,750MHz (rf port)	EN 300 328	Pass	More than 20dB below the limit

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Normal and Extreme Operating Conditions:

Test Notes

Voltage extremes (nominal/normal voltage defined as 230 V):

X	Voltage extremes for AC-powered equipment +/10% of nominal
	Voltage extremes for Lead-Acid Battery 1.3 and 0.9 times nominal
	Voltage extremes for Leclanché or lithium type battery: 0.85 and 1.15 times the nominal voltage of the battery
	Voltage extremes for Mercury or nickel-cadmium type of battery: 0.9 times and 1.15 times the nominal voltage of the battery

Temperature extremes:

	-20°C to +55°C (Limits for unrestricted use taken from EN 300 328 / EN 300 220)
	0°C to +35°C (Limits for indoor use taken from EN 300 328 / EN 300 220)
X	-10°C to +55°C (taken from AS/NZS 4268)

Extremes used were based on ??describe here the justification for choice of voltage and temperature extremes??

Run #1: Power Measurements - Spread spectrum (Digital Modulation)

Initial measurements made on the center channel to determine the data rate with the highest output power. All final measurements made with device operating at the highest power level.

8021.11b

Rate	Setting	Pmeas	Duty Cycle	Pout
1	19	18.8	1	18.8
2	19	18.8	1	18.8
5.5	19	18.8	1	18.8
11	19	18.8	1	18.8

Setting: software power setting of EUT
Pmeas: Measured output power (average)
Duty Cycle: Duty cycleof transmissions (1 = 100%)

8021.11g

Rate	Setting	Pmeas	Duty Cycle	Pout
6	19	19.1	1	19.1
9	19	19.0	1	19.0
12	19	18.9	1	18.9
18	19	18.9	1	18.9
24	19	18.8	1	18.8
36	19	18.7	1	18.7
48	19	18.8	1	18.8
54	19	18.7	1	18.7

Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Run #1: Power Measurements - Spread spectrum (Digital Modulation)

Notes for power and power spectral density measurements

Note 1:	Average Power measured using a wideband, calibrated RF power meter with a thermocouple detector (or an equivalent thereof).
Note 2:	PSD measured using a thermocouple detector (or an equivalent thereof) connected to the IF output of the spectrum analyzer, with the analyzer set to positive peak detector with RB=VB= 1MHz for digital modulation and RB=VB= 100kHz for FHSS.
Note 3:	Gain is the maximum gain of the antenna assembly that can be used with the EUT at this power level.
Note 4:	Duty Cycle - the duty cycle of the transmitter during the power measurement [time on /(time off + time on)]. Measured using diode detector and oscilloscope or directly from the analyzer.
Note 5:	EIRP levels are the measured levels corrected for duty cycle [10log(duty cycle)] and EUT antenna gain. For MIMO modes the total power is the aggregated eirp for each transmit chain.

Average Power[1] under normal and extreme operating conditions

Power Setting	Channel / Mode	Average Power (dBm)[1] For Operating Condition					Max Antenna Gain[3]	Duty Cycle[4]	Max Average Power (EIRP)[5]	Maximum permitted EIRP (dBm)
		Normal	Extreme							
		20°C	-10°C		55°C					
		230.0 V	207.0 V	253.0 V	207.0 V	253.0 V				
17	#1b	16.3	16.8	16.8	16.1	16.1	3.0	1.0	19.8	20.0
17	#6b	16.5	16.9	16.9	16.1	16.1	3.0	1.0	19.9	20.0
17	#13b	15.9	16.7	16.7	15.5	15.5	3.0	1.0	19.7	20.0
14	#1g	12.8	13.7	13.7	12.4	12.4	3.0	1.0	16.7	20.0
14	#6g	12.7	13.5	13.5	12.6	12.6	3.0	1.0	16.5	20.0
15	#13g	13.1	13.9	13.9	12.8	12.8	3.0	1.0	16.9	20.0

Power spectral Density[2] (normal operating conditions)

Power Setting	Channel	Frequency	PSD[2]	Gain[3]	Duty	EIRP[5]	PSD	
		MHz	dBm	dBi	Cycle[4]	PSD	Limit	Margin
17	#1b	2410.370	5.7	3.0	1.0	8.7	10.0	-1.3
17	#6b	2438.300	5.8	3.0	1.0	8.8	10.0	-1.2
17	#13b	2470.949	5.5	3.0	1.0	8.5	10.0	-1.5
14	#1g	2413.151	6.5	3.0	1.0	9.5	10.0	-0.5
14	#6g	2430.584	6.4	3.0	1.0	9.4	10.0	-0.6
15	#13g	2465.343	6.4	3.0	1.0	9.4	10.0	-0.6

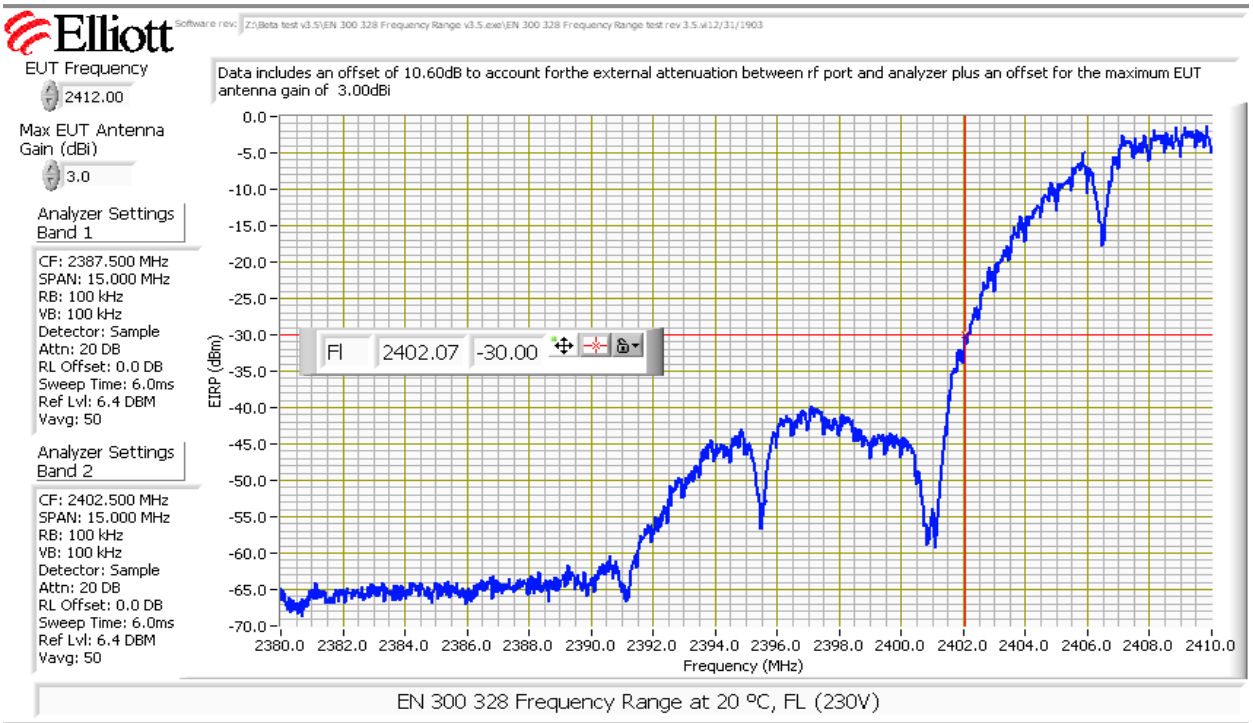
Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Run #2: Frequency Range Under Normal and Extreme Conditions - EN 300 328

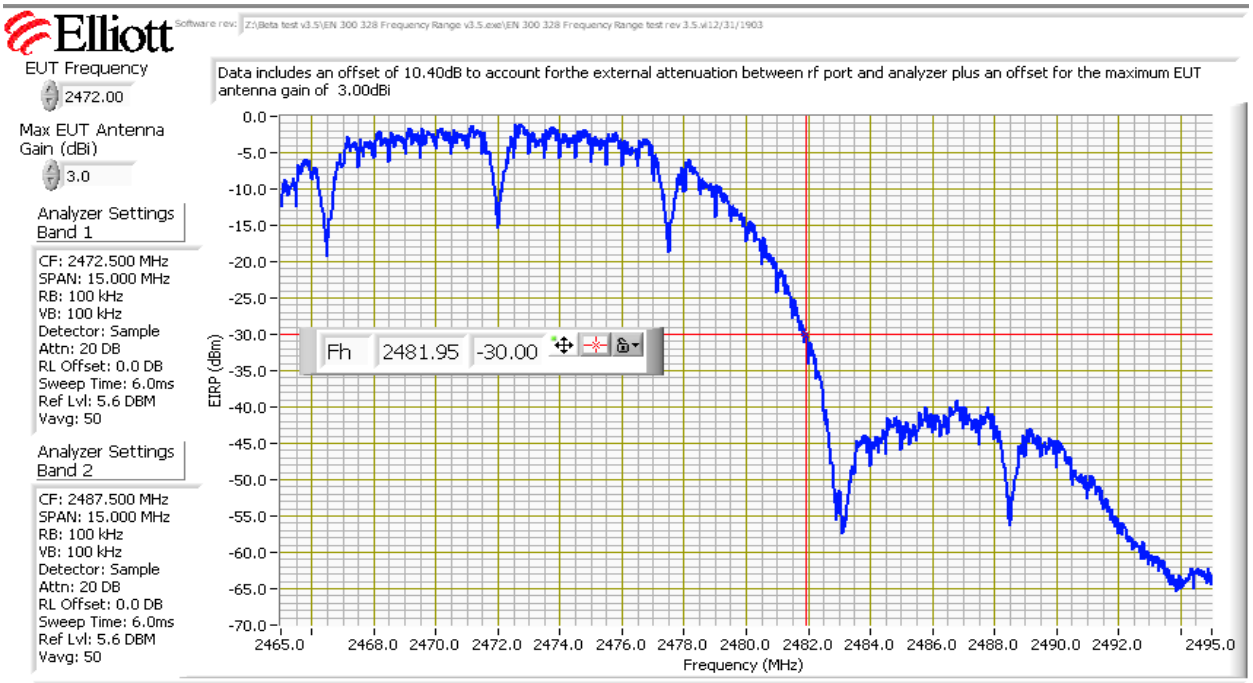
	Mode	Antenna Gain	Power Setting	Measured Frequency (MHz) For Operating Condition					Low F_L High F_H	Resullt
				Normal	Extreme					
				20°C	-10°C		55°C			
				230.0 V	207.0 V	253.0 V	207.0 V	253.0 V		
F_L (MHz)	b	3.0	17	2402.07	2402.12	2402.12	2402.12	2402.12	2402.07	PASS
F_H (MHz)	b	3.0	17	2481.85	2481.87	2481.95	2481.75	2481.78	2481.95	PASS
F_L (MHz)	g	3.0	14	2401.78	2401.78	2401.85	2402.29	2401.78	2401.78	PASS
F_H (MHz)	g	3.0	15	2481.79	2482.03	2482.05	2482.12	2482.02	2482.12	PASS

FL and Fh are the lowest and highest frequencies above the spurious emission limit of -30dBm/100kHz eirp for the operating mode (data rate and modulation) that produced the widest frequency range.

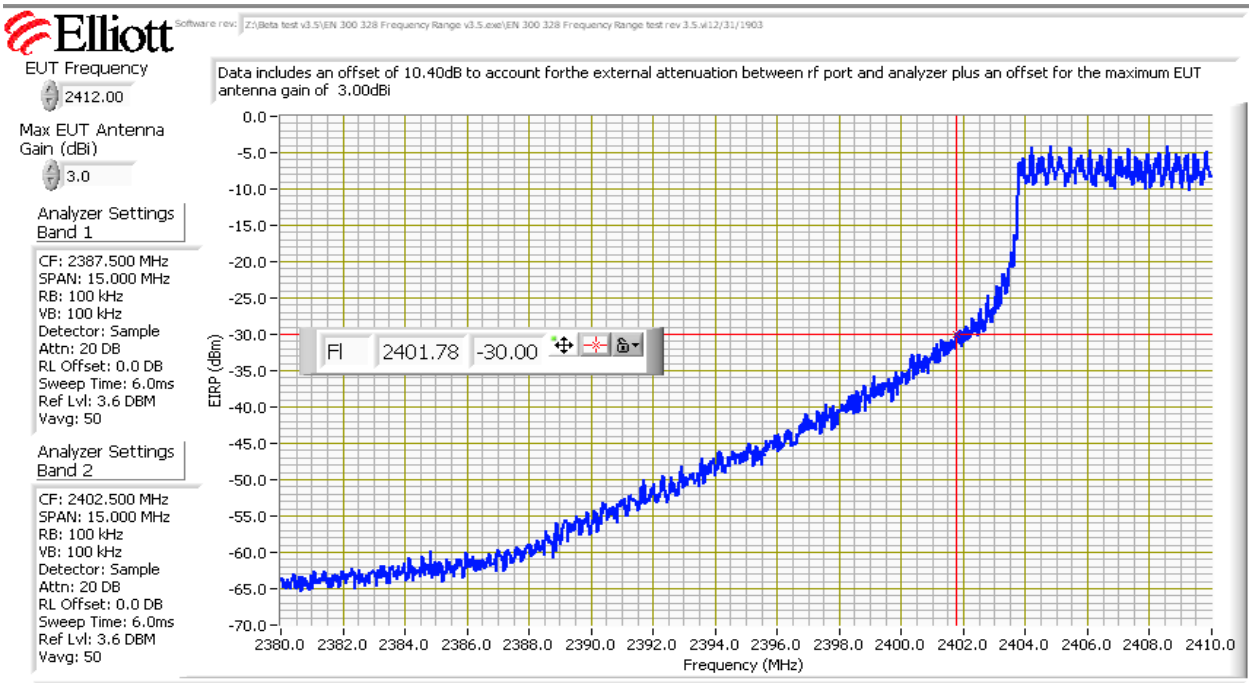
If the device meets the frequency range requirements at the highest power setting and with the highest gain antenna then no further tests are required. If it does not then tests are made for each power setting using the highest gain that can be used with each power setting.



Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

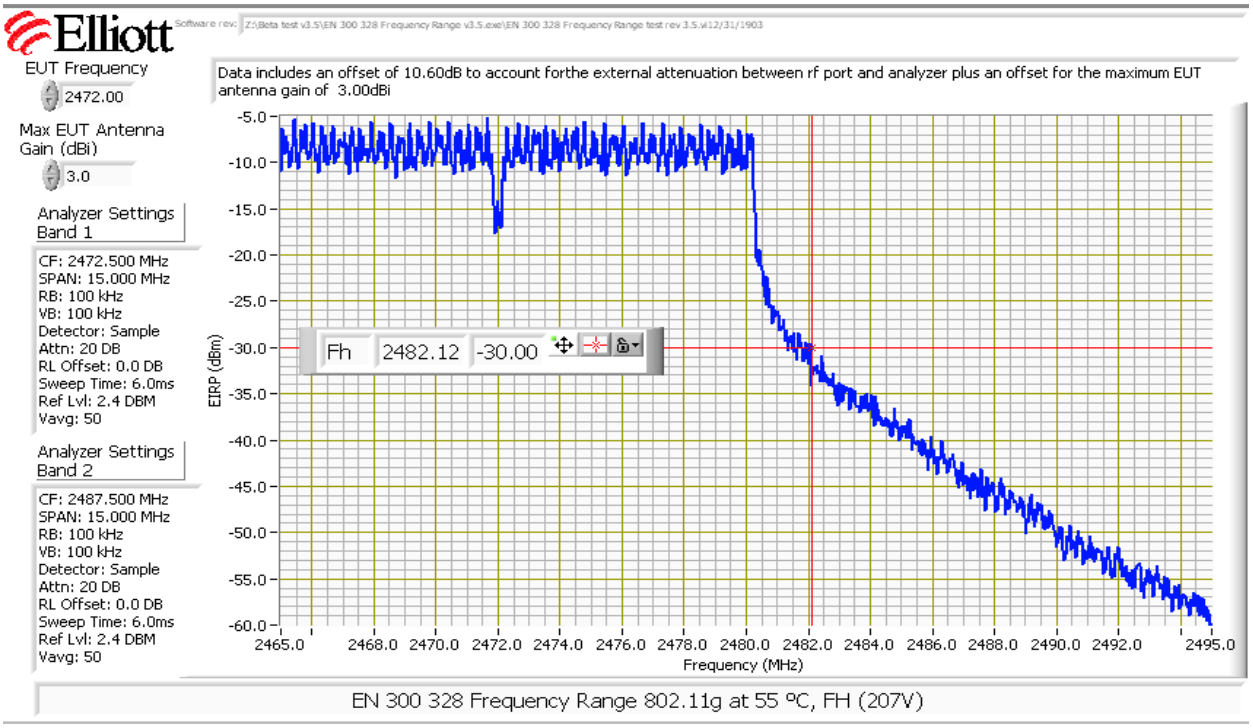


EN 300 328 Frequency Range 802.11b at -10 ºC, FH (253V)



EN 300 328 Frequency Range 802.11g at -10 ºC, FL (207V)

Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

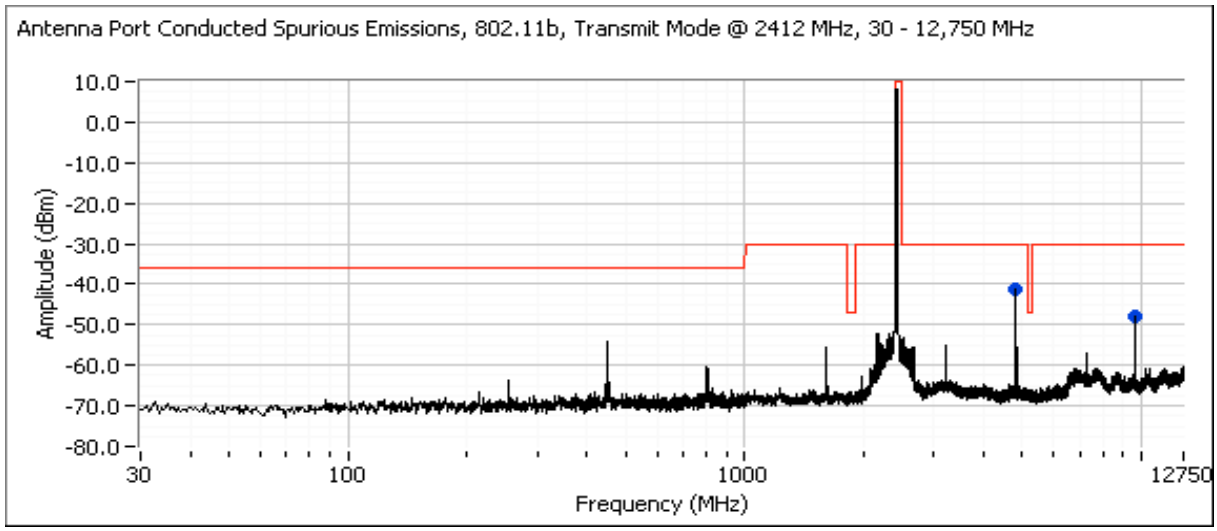


EN 300 328 Frequency Range 802.11g at 55 ºC, FH (207V)

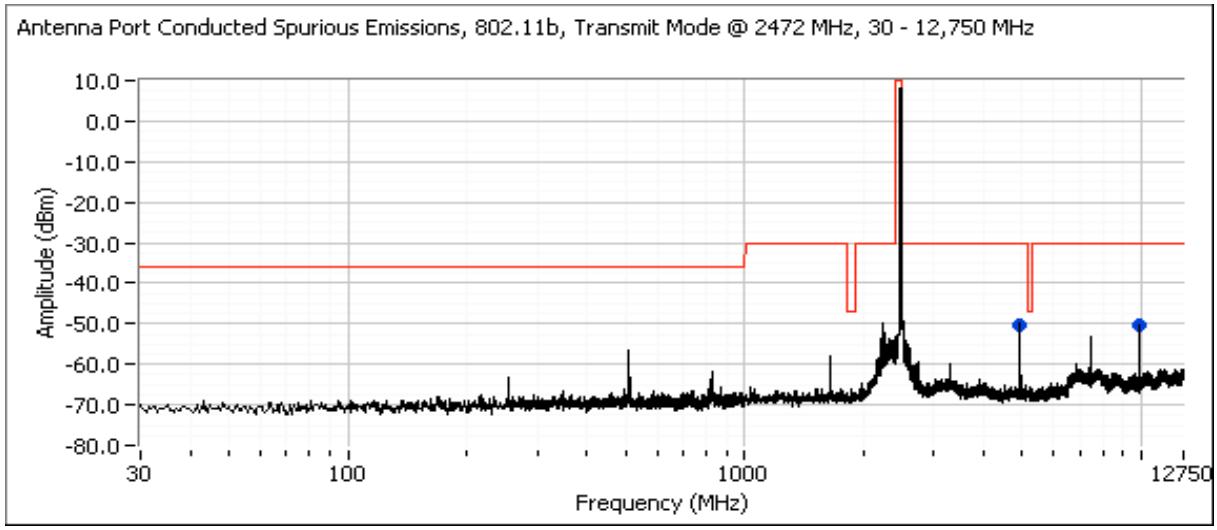
Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Run #3: Antenna Port Conducted Spurious Emissions, Transmit Mode, 30 - 12750 MHz

802.11b @ 2412 MHz with maximum power setting

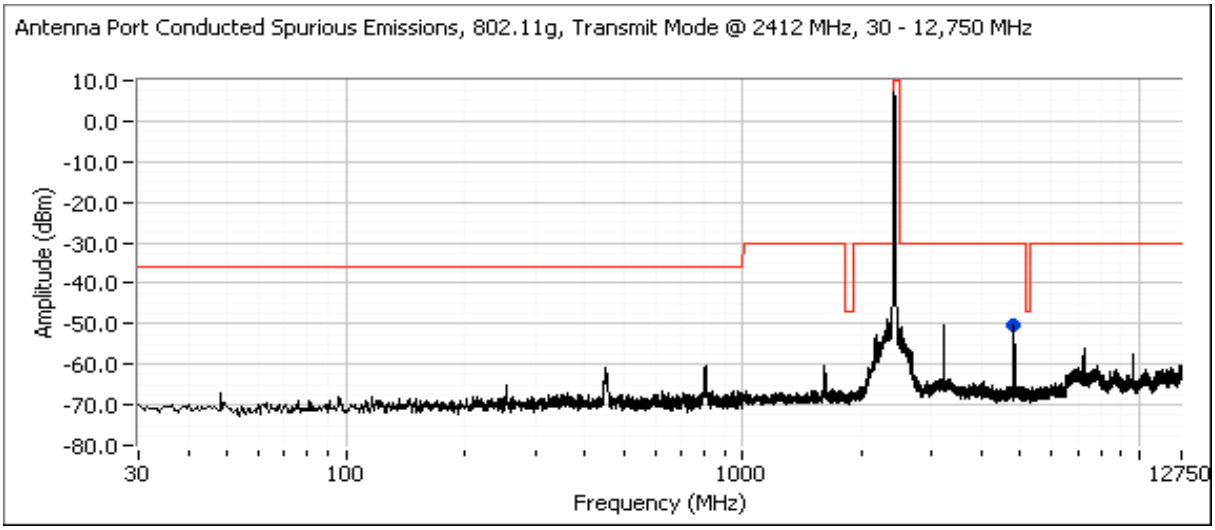


802.11b @ 2472 MHz with maximum power setting

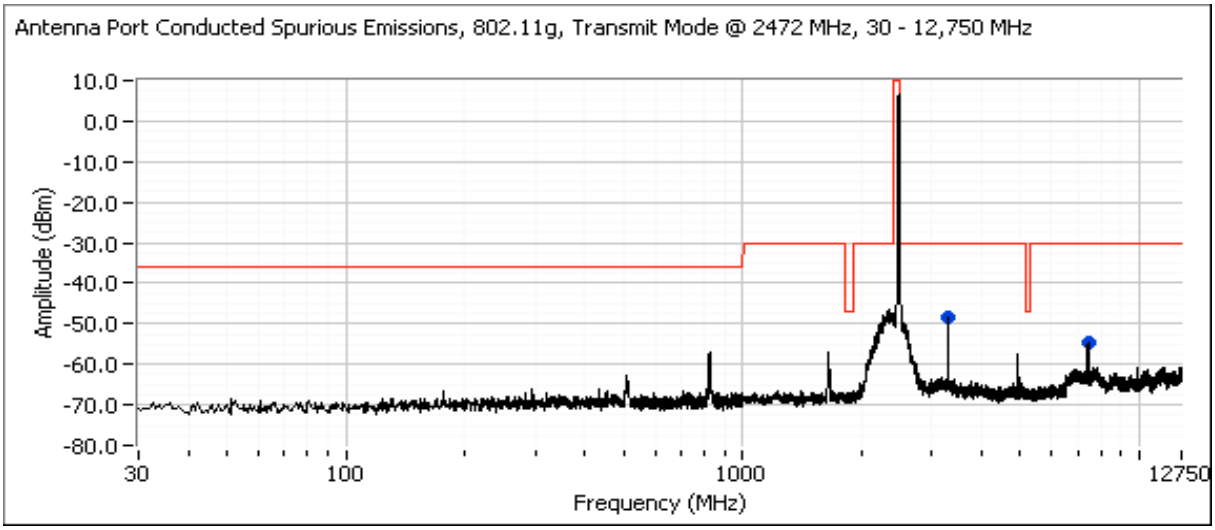


Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

802.11g @ 2412 MHz with maximum power setting



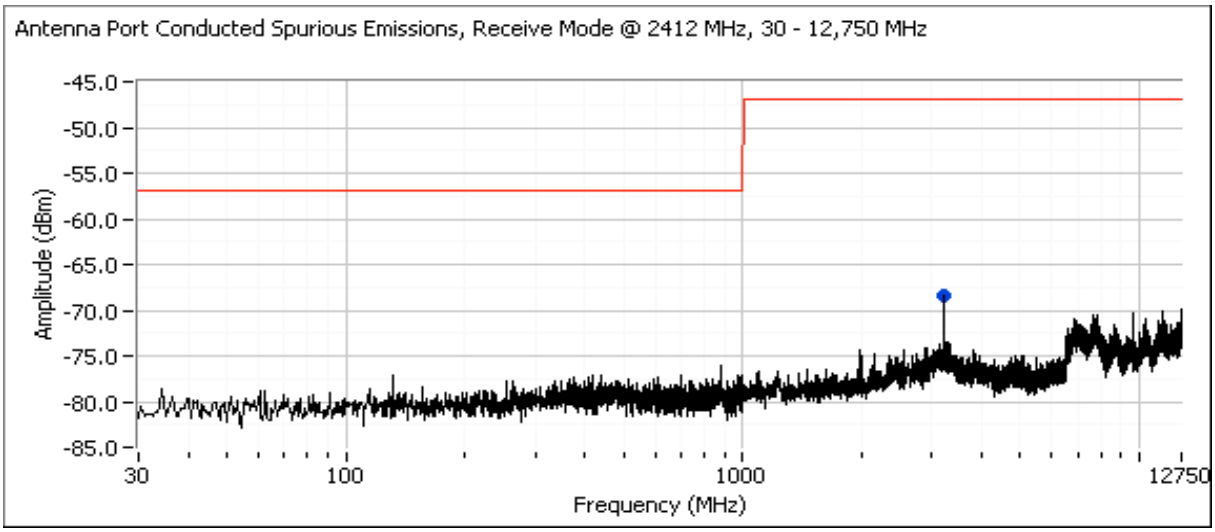
802.11g @ 2472 MHz with maximum power setting

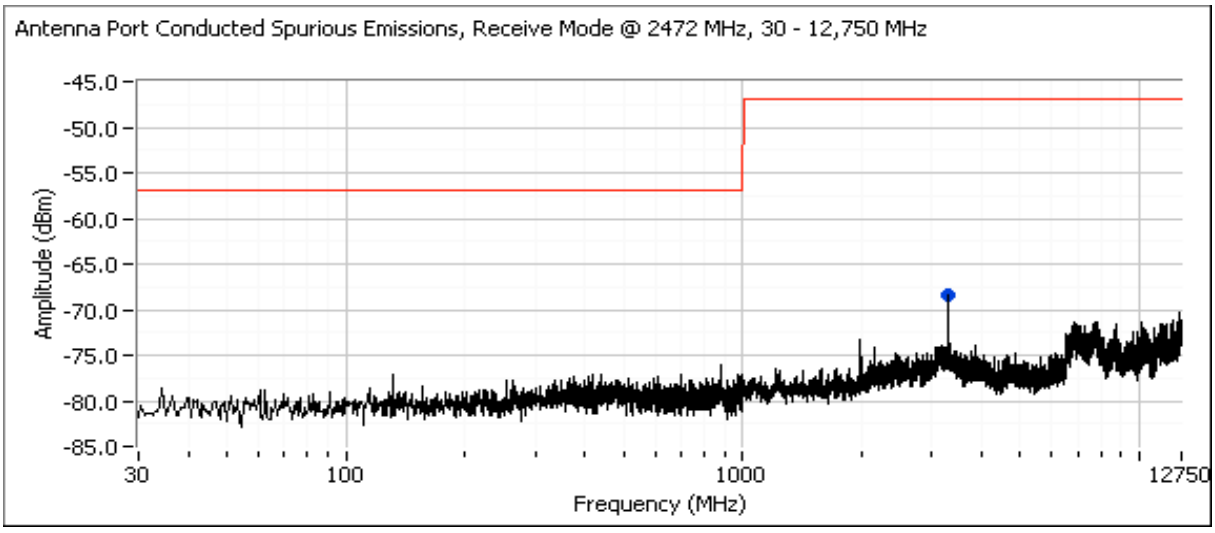


Frequency MHz	Level dBm	Port	EN 300 328 Limit	EN 300 328 Margin	Detector	Channel	Mode	Comments
4823.950	-41.4	RF Port	-30.0	-11.4	Peak	1	b	
9647.980	-47.7	RF Port	-30.0	-17.7	Peak	13	b	
4943.990	-50.2	RF Port	-30.0	-20.2	Peak	1	b	
4824.270	-50.1	RF Port	-30.0	-20.1	Peak	1	g	
3295.950	-48.6	RF Port	-30.0	-18.6	Peak	13	g	
7414.570	-54.4	RF Port	-30.0	-24.4	Peak	13	g	

Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Run #4: Antenna Port Conducted Spurious Emissions, Receive Mode, 30 - 12,750 MHz





Frequency MHz	Level dBm	Port	EN 300 328 Limit	EN 300 328 Margin	Detector	Channel	Mode	Comments
3216.020	-68.3	RF Port	-47.0	-21.3	Peak	1	-	
3296.020	-68.3	RF Port	-47.0	-21.3	Peak	13	-	

Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Radiated Spurious Emissions, EN 300 328

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

The measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 10-15 °C
Rel. Humidity: 40-60 %

Date of Test: Refer to each run
Test Engineer: Refer to each run
Test Location: Refer to each run

Config. Used: 1
Config Change: None
Host EUT Voltage: 230V/50Hz

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
2	Spurious Emissions Transmit Mode 25 - 12750 MHz	EN 300 328	Pass	54.0dBµV/m @ 4943.9MHz (-11.3dB)
4	Spurious Emissions Receive/Stand-By Mode 25 - 12750 MHz	EN 300 328	Pass	-49.4 dBm eirp @ 3296.2MHz (-2.4 dB Margin)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

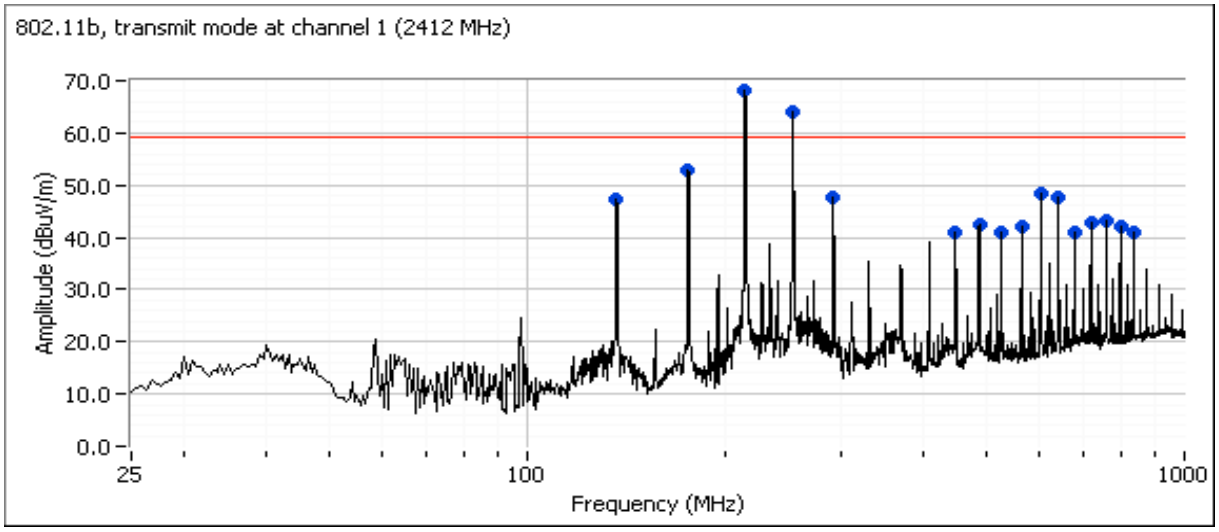
Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

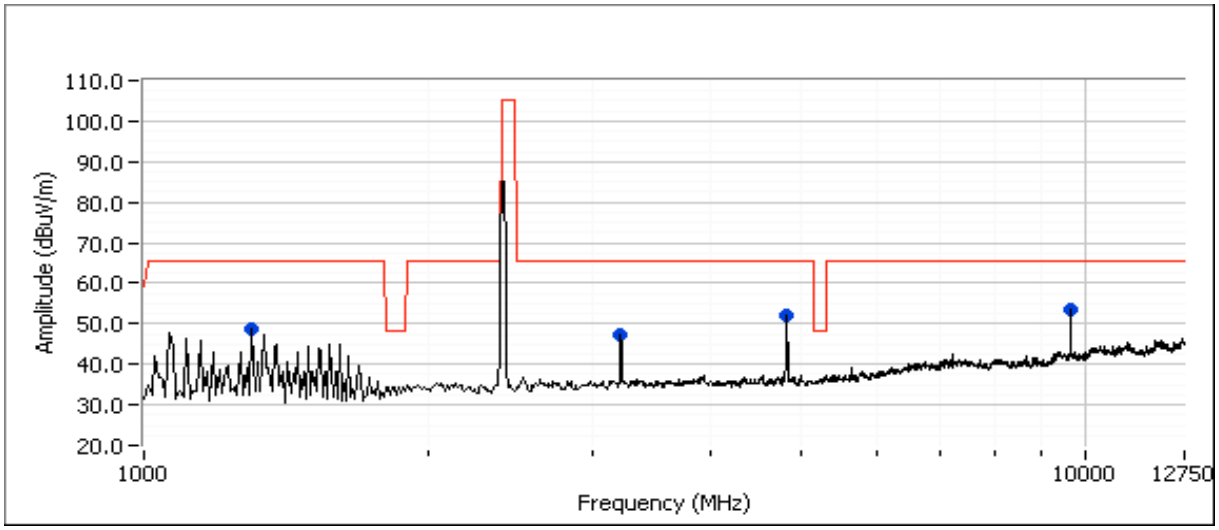
Run #1: Radiated Spurious Emissions, Transmit Mode, 25 - 12750 MHz

Date of Test: 01/22/10 Test Location: Chamber #2

Test Engineer: Rafael Varelas

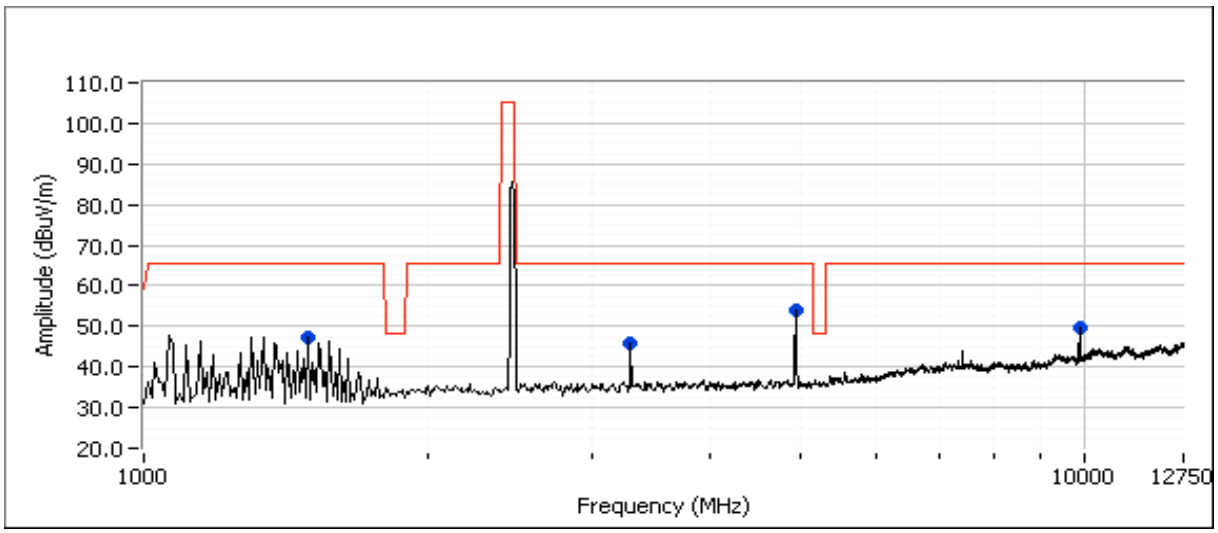
Graph - Channel: 1, 2412 MHz, Mode: 802.11b



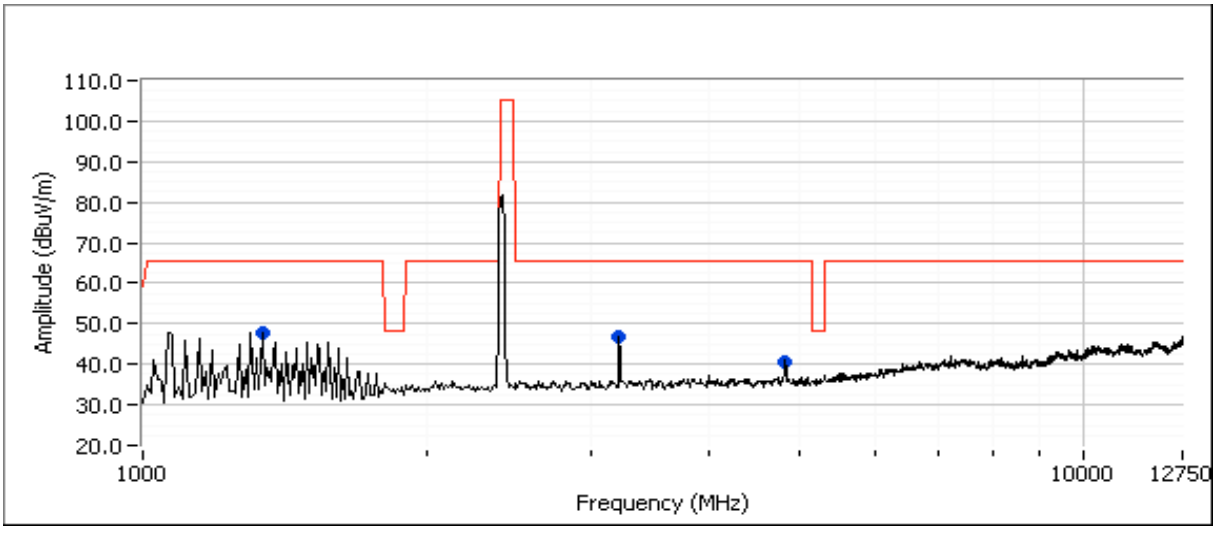


Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Graph - Channel: 13, 2472 MHz, Mode: 802.11b

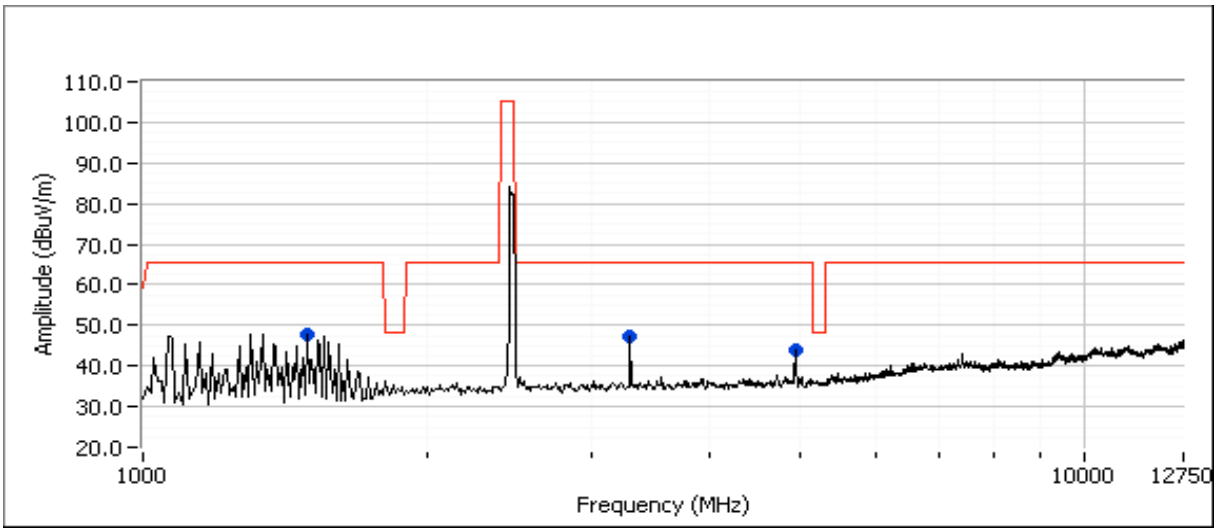


Graph - Channel: 1, 2412 MHz, Mode: 802.11g



Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Graph - Channel: 13, 2472 MHz, Mode: 802.11g



Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Results Table - All channels

Frequency	Level	Pol	EN 300 328 Note 1		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		and mode
4943.920	54.0	V	65.3	-11.3	Peak	224	1.7		13, b
9645.830	53.5	V	65.3	-11.8	Peak	87	1.7		1, b
4813.330	52.1	V	65.3	-13.2	Peak	230	1.7		1, b
9887.970	49.8	V	65.3	-15.5	Peak	80	1.7		13, b
1302.500	48.8	V	65.3	-16.5	Peak	345	1.7		1, b
1339.170	47.8	V	65.3	-17.5	Peak	287	1.7		1, g
1501.410	47.8	H	65.3	-17.5	Peak	334	1.7		13, g
1501.510	47.5	H	65.3	-17.8	Peak	329	1.7		13, b
3209.170	47.2	V	65.3	-18.1	Peak	286	1.7		1, b
3296.050	47.1	V	65.3	-18.2	Peak	284	1.7		13, g
3209.170	47.0	V	65.3	-18.3	Peak	287	1.7		1, g
3295.940	45.7	V	65.3	-19.6	Peak	283	1.7		13, b
4944.670	43.7	V	65.3	-21.6	Peak	263	1.7		13, g
4824.330	40.7	V	65.3	-24.6	Peak	341	1.7		1, g
214.488	68.1	H	59.3	8.8	Peak	241	1.7	Digital device emission	1, b
253.488	64.0	H	59.3	4.7	Peak	241	1.7	Digital device emission	1, b
175.493	53.0	H	59.3	-6.3	Peak	271	1.7	Digital device emission	1, b
604.469	48.4	H	59.3	-10.9	Peak	81	1.7	Digital device emission	1, b
292.487	47.5	H	59.3	-11.8	Peak	301	1.7	Digital device emission	1, b
643.431	47.5	H	59.3	-11.8	Peak	103	1.7	Digital device emission	1, b
136.491	47.4	H	59.3	-11.9	Peak	241	1.7	Digital device emission	1, b
760.432	43.2	H	59.3	-16.1	Peak	124	1.7	Digital device emission	1, b
721.415	42.7	H	59.3	-16.6	Peak	113	1.7	Digital device emission	1, b
487.484	42.3	H	59.3	-17.0	Peak	318	1.7	Digital device emission	1, b
565.476	42.1	H	59.3	-17.2	Peak	289	1.7	Digital device emission	1, b
799.414	42.1	H	59.3	-17.2	Peak	124	1.7	Digital device emission	1, b
448.491	41.1	H	59.3	-18.2	Peak	92	1.7	Digital device emission	1, b
682.419	41.1	H	59.3	-18.2	Peak	117	1.7	Digital device emission	1, b

Note 1:	The field strength limit in the tables above was calculated from the erp/eirp limit detailed in the standard using the free space propagation equation: $E=\sqrt{(30PG)}/d$. This limit is conservative - it does not consider the presence of the ground plane and, for erp limits, the dipole gain (2.2dBi) has not been included. The erp or eirp for all signals with less than 10dB of margin relative to this field strength limit is determined using substitution measurements.

Run #2: Radiated Spurious Emissions, Transmit Mode: Final Field Strength and Substitution Measurements

Results: No final measurements performed. All preliminary measurements more than 10dB below the limit.

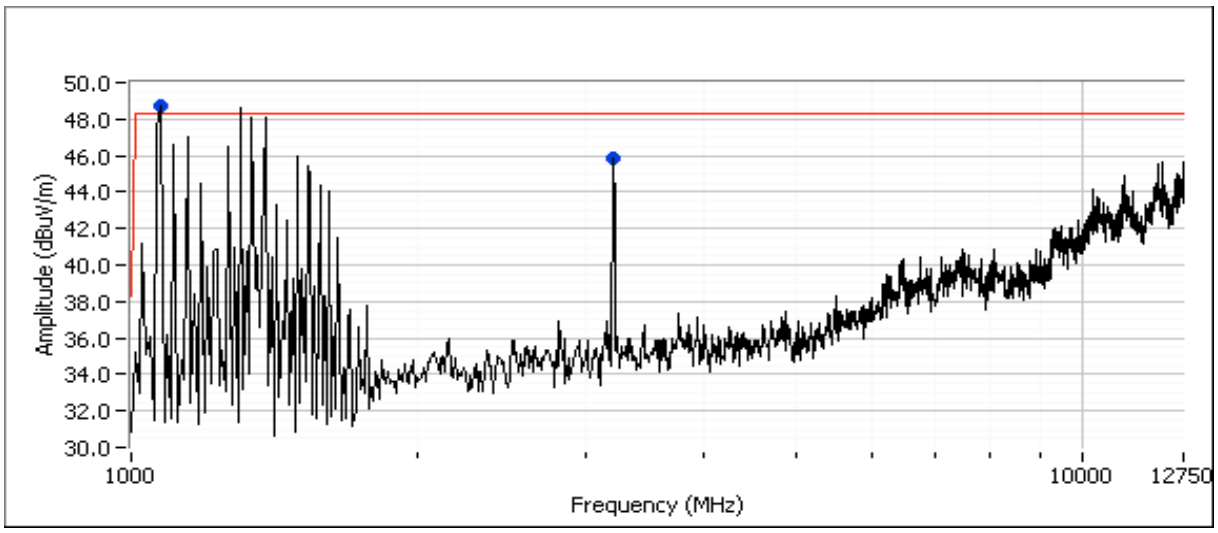
Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Run #3: Radiated Spurious Emissions, Receive Mode, 25 - 127500 MHz

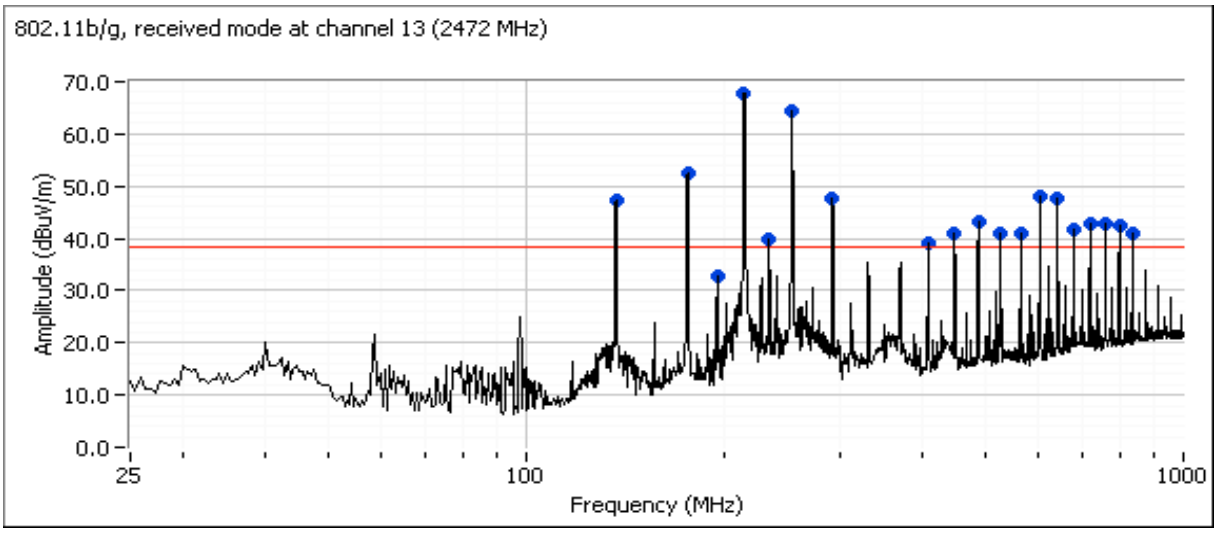
Date of Test: 01/22/10 Test Location: Chamber #2

Test Engineer: Rafael Varelas

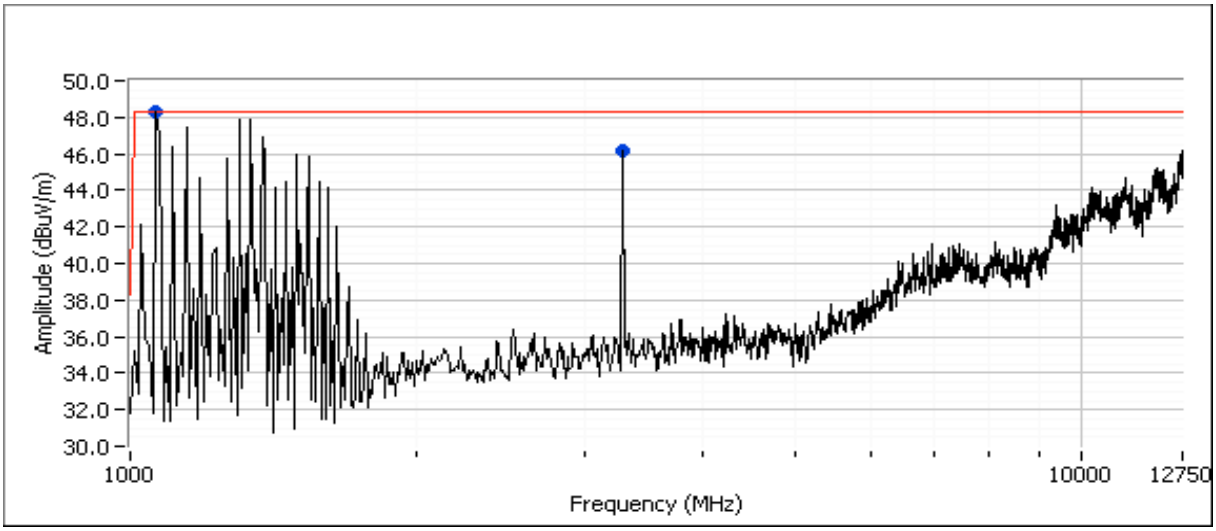
Graph - low channel at 2412 MHz



Graph - high channel at 2472 MHz



Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A



Results Table - All channels

Frequency MHz	Level dBµV/m	Pol v/h	EN 300 328 Note 1 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments	Channel Frequency
1072.480	48.7	H	48.3	0.4	Peak	328	1.7		2412
3216.110	45.8	V	48.3	-2.5	Peak	289	1.7		2412
214.491	67.8	H	38.3	29.5	Peak	239	1.7	Digital device emission	2472
253.488	64.3	H	38.3	26.0	Peak	239	1.7	Digital device emission	2472
175.490	52.5	H	38.3	14.2	Peak	269	1.7	Digital device emission	2472
292.487	47.6	H	38.3	9.3	Peak	299	1.7	Digital device emission	2472
136.496	47.4	H	38.3	9.1	Peak	239	1.7	Digital device emission	2472
233.985	39.9	H	38.3	1.6	Peak	209	1.7	Digital device emission	2472
194.988	32.9	H	38.3	-5.4	Peak	239	1.7	Digital device emission	2472
604.426	47.9	H	38.3	9.6	Peak	91	1.7	Digital device emission	2472
643.474	47.6	H	38.3	9.3	Peak	98	1.7	Digital device emission	2472
487.484	43.3	H	38.3	5.0	Peak	317	1.7	Digital device emission	2472
760.468	42.9	H	38.3	4.6	Peak	119	1.7	Digital device emission	2472
721.412	42.9	H	38.3	4.6	Peak	112	1.7	Digital device emission	2472
799.430	42.4	H	38.3	4.1	Peak	116	1.7	Digital device emission	2472
682.477	41.6	H	38.3	3.3	Peak	108	1.7	Digital device emission	2472
565.475	41.1	H	38.3	2.8	Peak	285	1.7	Digital device emission	2472
526.477	41.0	H	38.3	2.7	Peak	108	1.7	Digital device emission	2472
838.427	40.8	H	38.3	2.5	Peak	58	1.7	Digital device emission	2472
448.443	40.8	H	38.3	2.5	Peak	94	1.7	Digital device emission	2472
409.496	39.0	H	38.3	0.7	Peak	105	1.7	Digital device emission	2472
1072.500	48.3	H	48.3	0.0	Peak	325	1.7	Digital device emission	2472
3296.050	46.2	V	48.3	-2.1	Peak	107	1.7	Digital device emission	2472

Client:	Summit Data Communications	Job Number:	J77268
Model:	802.11abg Module	T-Log Number:	T78058
		Account Manager:	Christine Krebill
Contact:	Jerry Pohmurski		
Standard:	EN 300 328 v1.7.1/EN 301 893 v1.5.1	Class:	N/A

Run #4: Radiated Spurious Emissions, Receive Mode: Final Field Strength and Substitution Measurements

Date of Test: 01/28/10 Test Location: SV OATS #2

Test Engineer: Mehran Birgani

Measurements made at 3m

Frequency MHz	Level dBµV/m	Pol V/H	EN 300 328 Note 1 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments	Frequency (MHz)
3216.060	47.6	V	48.3	-0.7	PK	222	1.8		2412
3296.190	48.8	V	48.3	0.5	PK	3	1.0		2472

Vertical

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
3216.060	-20.0	9.3	87.2	97.9	47.6	-50.3	-52.5	-47.0		-3.3
3296.190	-20.0	9.3	87.5	98.2	48.8	-49.4	-51.6	-47.0		-2.4

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna. A dipole has a nominal gain of 2.2dBi, however the dipole balun loss may reduce the gain of the substitution dipole used.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna, maximized for receive antenna height and transmit antenna azimuth.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

Appendix C Photographs