EMT
ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

FCC PART 15.247, SUBPART C
AND

for

the

WIFI MODULE

MODEL: BLUEFIN 2G

Prepared for

Tropos Networks, Inc.
555 Del Rey Avenue
Sunnyvale, CA, 94085

Prepared by: George Hsu
GEORGE HSU

Approved by: Kevin Bothmann
KEVIN BOTHMANN

ELECTRO MAGNETIC TEST, INC.
1547 PLYMOUTH STREET
MOUNTAIN VIEW, CALIFORNIA 94043
(650) 965-4000

DATE: October 18, 2015

	REPORT BODY	APPENDICES				TOTAL
		A	***B***	***C***	***D***	
PAGES	29	63	3	2	2	**99**

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

TABLE OF CONTENTS

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

TABLE OF CONTENTS (CONTINUED)

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

LIST OF APPENDICES

APPENDIX	TITLE
A	Radiated and Conducted Data Sheets • Radiated Emissions Test Data (General Requirements, and Restricted Bands) • Emissions in Non-Restricted Frequency Bands Test Data • Occupied Bandwidth Test Data • Maximum Average Output Power Test Data • Maximum Average Power Spectral Density Test Data • Band Edge Test Data
B	Test Setup Diagrams
C	Modifications To The EUT
D	Additional Models Covered Under This Report

LIST OF FIGURES

FIGURE	TITLE
1	Conducted Emissions Test Setup
2	Plot Map And Layout of Test Site
3	Layout of 5 Meter Semi-Anechoic Chamber

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

GENERAL REPORT SUMMARY

This electromagnetic emission test report is generated by Electro Magnetic Test, Inc., which is an independent testing and consulting firm. The test report is based on testing performed Electro Magnetic Test, Inc. personnel according to the measurement procedure described in the test specification given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full.

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Federal Government.

The measurement data and conclusions contained in this test report are deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003, Issue 5, August 2012.

Electro Magnetic Test, Inc. is recognized by the following agencies for performing EMI/EMC testing:

COUNTRY	AGENCY	IDENTIFYING #
USA	Federal Communications Commission (FCC) (EMT's test site is recognized by the FCC)	Registration Number: 90576
USA, Canada, Taiwan, Australia/New Zealand, European Community	National Voluntary Lab Accreditation Program (NVLAP) (EMT is accredited by NVLAP. A copy of the NVLAP Scope Of Accreditation is available upon request.)	Lab Code: 200147-0
Canada	Industry Canada	File No.: IC 2804
Japan	Voluntary Control Council For Interference (VCCI)	A-0118
	Open Field Test Site "A"	-
	Mains Conducted Emissions Test Site "C"	-
	Telecom Conducted Emissions Test Site "C"	-
	3 Meter Semi-Anechoic Chamber Site "E"	-
	3 Meter Semi-Anechoic Chamber Site "E" (1GHz – 40GHz)	-
	Mains Conducted Emissions Test Site "E"	-
	Telecom Conducted Emissions Test Site "E"	-
Korea	Ministry of Information and Communication's Radio Research Laboratory (RRL) under the Asia Pacific Economic Cooperation (APEC) Mutual Recognition Arrangement (A copy of the Scope Of Accreditation is available upon request)	US0036
Taiwan	Bureau Of Standards, Metrology and Inspection (BSMI)	Reference Number: SL2-IN-E-1024
Australia / New Zealand	Australian Communications Authority (AUSTEL)	*

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

*These agencies do not issue an identifying number to test labs.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

GENERAL REPORT SUMMARY (CONTINUED)

Device Tested: WIFI Module
Model: BLUEFIN 2G
S/N: N/A

Product Description: The EUT is a 802.11 b/g/n RF module that operates in the 2.4 GHz ISM band.

Modifications: The EUT was not modified during the testing.

Manufacturer: Tropos Networks, Inc.
555 Del Rey Avenue
Sunnyvale, CA 94085

Test Date(s): Septemeber 15, October 7, and 8, 2015

Test Specifications: EMI requirements
Limits: FCC Title 47, Part 15 Subpart C
Test Procedure: ANSI C63.4: 2009

Test Deviations: The test procedure was not deviated from during the testing.

SUMMARY OF TEST RESULTS

TEST	DESCRIPTION	FCC STANDARD	REMARKS	RESULTS
7.1	Radiated Emissions (General Requirements and Emissions in Restricted Freqeuency Bands)	15.209, 15.247	Radiated**	**PASS****
7.2	Conducted Emissions	15.207(a)	N/A*	**N/A***
7.3	Occupied Bandwidth	15.247(a)(2)	Conducted	**PASS**
7.4	Maximum Average Output Power	15.247 (b)	Conducted	**PASS**
7.5	Maximum Average Power Spectral Density	15.247(e)	Conducted	**PASS**
7.6	Emissions in Non-Restricted Frequency Bands	15.247(d)	Conducted	**PASS**
7.7	Bandedge	15.247(d)	Conducted	**PASS**
7.8	Antenna Requirement	15.203,15.247(b)(4))	N/A	**PASS**

*No hardware changes were made in this permissive change, that would effect conducted emissions

**The worst case modes where chosen for radiated emissions

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

TECHNICAL DESCRIPTION OF THE EUT

Manufacturer:	Tropos Networks, Inc.
Manufacturer Address:	298 S. Sunnyvale Ave, Ste 205, Sunnyvale, CA 94086
EUT Name:	WIFI Module
Model No:	BLUEFIN 2G
Operation frequency:	2412 MHz to 2462 MHz
Channel Number:	11
Modulation Technology:	DSSS
Antenna Type:	Patch Antenna
Antenna Gain:	7.5 dBi @ 2.4 GHz
Maximum Output Power:	25.421 dBm

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Description of Channel:			
802.11b/g			
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

1. PURPOSE

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the WIFI Module Model: BLUEFIN 2G. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 2009. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the specification limits defined in FCC Title 47, Part 15, Subpart C.

2. ADMINISTRATIVE DATA

2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Electro Magnetic Test, Inc., 1547 Plymouth Street, Mountain View, California, 94043.

2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The measurement results in this report and the calibration of the test equipment are traceable to the National Institute of Standards and Technology (NIST).

2.3 Cognizant Personnel

Tropos Networks, Inc.

Maxim Bakaleynik	Senior Director , Hardware Engineering

Electro Magnetic Test, Inc.

David Vivanco	Test Technician
George Hsu	Test Technician
Kevin Bothmann	Lab Manager

2.4 Date Test Sample was Received

The test sample was received on September 9, 2015.

2.5 Disposition of the Test Sample

The test sample has not yet been returned Tropos Networks, Inc.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
CISPR	International Special Committee On Radio Interference
FCC	Federal Communications Commission

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

3. APPLICABLE DOCUMENTS

The following documents are referenced or used in the preparation of this EMI Test Report.

SPEC	TITLE
FCC Title 47, Part 15, Subpart C	FCC Rules - Radio frequency devices (including digital devices).
FCC Publication KDB558074	Guidance for Performing Compliance Measurments on Digital Transmissions Systems (DTS) Operating Under 15.247, June 9, 2015
ANSI C63.4 2009	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

4. DESCRIPTION OF TEST CONFIGURATION

4.1 Description of Test Configuration – EMI

The EUT was connected to the remote Ethernet switch and remote laptop computer via its Ethernet port and Ethernet POE port, respectively. The remote Ethernet switch and remote laptop computer were located outside the test site. During the testing process, traffic was running at its maximum workload at the network interfaces and the intentional radiator was transmitting constantly.

It was determined that the emissions were at their highest level when the EUT was operating in the above configuration. The cables were moved to maximize the emissions. The final conducted as well as radiated data was taken in this mode of operation. All initial investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the photographs in Appendix B.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

4.1.1 Cable Construction and Termination

Cable #1

This is a 10 foot shielded CAT 5 Ethernet cable connecting the EUT to the POE adapter. They have metallic RJ45 plastic connectors at both ends of the cables. The shields of the connectors were grounded to the chassis via the connectors. The cable was bundled to a length of 4 feet.

Cable #2

This is a 50 foot shielded CAT 5 Ethernet cable connecting the EUT to the ethernet switch. They have metallic RJ45 plastic connectors at both ends of the cables. The shields of the connectors were grounded to the chassis via the connectors.

Cable #3

This is a 50 foot shielded CAT 5 Ethernet cable connecting the EUT to the remote laptop computer. They have metallic RJ45 plastic connectors at both ends of the cables. The shields of the connectors were grounded to the chassis via the connectors.

Cables #4

This is a 6 foot unshielded power cables connecting the POE to the AC outlet.

.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT

5.1 EUT and Accessory List

EQUIPMENT TYPE	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID
Bluefin 2G (EUT)	Tropos Networks, Inc.	Bluefin 2G	301304	P9J-642401
POE Adapter	Cincon Electronics	TR60A-POE-L	006516	DoC
Laptop Computer	Dell	Lattitude E5430	100PYW1	DoC
Laptop Powersupply	Dell	LA90PE1-01	CN-0J62H3-71615-09K-7D70-A01	DoC
Ethernet Switch	Linksys	EZXS55W	R9160KS13148	DoC
Ethernet Switch AC Adapter	N/A	SJ-0510-U	N/A	DoC

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

5.2 EMI Test Equipment

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
Spectrum Analyzer	Hewlett Packard	8566B	3024A20115	September 2, 2015	1 Year
RF Preselector	Hewlett Packard	85685A	3010A01157	September 2, 2015	1 Year
Quasi-Peak Adapter	Hewlett Packard	85650A	2430A00451	September 2, 2015	1 Year
RF Attenuator	Mini-Circuits	CAT-10	Asset #1000	December 11, 2014	1 Year
Radiated EMI Software	Sector Design	N/A	Ver.1.4.6	N/A	N/A
Conducted EMI Software	ETS-Lindgren	Tile!	Rev. 7.0.12.697	N/A	N/A
Preamplifier	Com Power	PA-102	1482	March 4, 2015	1 Year
RF Attenuator	Mini-Circuits	CAT-10	Asset #1000	December 11, 2014	1 Year
LISN	Solar Electronics	Type 21107-50-TS-50-N	21107150701	July 16, 2015	1 Year
LISN	Solar Electronics	Type 21107-50-TS-50-N	21107150702	July 16, 2015	1 Year
LISN	Solar Electronics	Type 21107-50-TS-50-N	21107150703	July 16, 2015	1 Year
LISN	Solar Electronics	Type 21107-50-TS-50-N	21107150704	July 16, 2015	1 Year
Biconical Antenna	Com Power	AB-900	15026	June 17, 2015	1 Year
Log Periodic Antenna	Com Power	AL-100	16037	June 17, 2015	1 Year
Horn Antenna	Com Power	AHA-118	711054	December 11, 2014	1 Year
Antenna Mast	Com Power	AM-400	N/A	N/A	N/A
Turntable	Com Power	TT-100	N/A	N/A	N/A
Computer	Dell, Inc.	DHS	DNSV641	N/A	N/A
Printer	Hewlett Packard	C8124A	CN39A220ZD	N/A	N/A

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

5.2 EMI Test Equipment (Continued)

EQUIPMENT TYPE	MANU-FACTURER	MODEL NUMBER	SERIAL NUMBER	CAL. DATE	CAL. CYCLE
EMI Receiver	Rohde & Schwarz	ESU40	100127	January 16, 2015	1 Year
EMI Test Software	Rohde & Schwarz	EMC32	V8.40.0	N/A	N/A
MXA Signal Analyzer	Agilent	N9020A	MY53420778	September 4, 2015	1 Year
Passive Loop Antenna (9kHz – 30MHz)	ETS-Lindgren	6512	00128210	April 23, 2015	2 Years
BiConiLog Antenna (30 MHz – 1 GHz)	ETS-Lindgren	3142D	00109337	July 8, 2015	1 Year
Horn Antenna (1 GHz – 18 GHz)	ETS-Lindgren	3117	00109294	July 8, 2015	1 Year
Preamplifier (1 GHz – 18 GHz)	Rohde & Schwarz	TS-PR18	100056	December 12, 2014	1 Year
Horn Antenna (18-26.5GHz)	ETS-Lindgren	3160-09	102646	June 19, 2015	1 Year
Preamplifier (18-26.5GHz)	Rohde & Schwarz	TS-PR26	100034	June 18, 2015	1 Year
Horn Antenna (26.5-40GHz)	ETS-Lindgren	3160-10	109153	June 19, 2015	1 Year
Preamplifier (26.5-40GHz)	Rohde & Schwarz	TS-PR40	100030	June 18, 2015	1 Year
Antenna Mast	ETS-Lindgren	2175	00095727	N/A	N/A
Turntable	ETS-Lindgren	2187-3.0	00118231	N/A	N/A
Computer	Dell, Inc.	OPTIPLEX 745	4T50WC1	N/A	N/A
Multi-Function Controller	ETS-Lindgren	2090	00102270	N/A	N/A

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

6. TEST SITE DESCRIPTION

6.1 Test Facility Description

Please refer to the table below and section 7 of this report for the details of which sites were used for testing. All sites are located at 1547 Plymouth Street, Mountain View, California 94043.

Site Used For Test	Site Description
	Open Field Test Site "A"
	Mains Conducted Emissions Test Site "C"
	Telecom Conducted Emissions Test Site "C"
X	3 Meter Semi-Anechoic Chamber Site "E"
	Mains Conducted Emissions Test Site "E"
	Telecom Conducted Emissions Test Site "E"

6.2 EUT Mounting, Bonding and Grounding

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 1.5 meters above the ground plane.

The EUT was grounded only through the safety ground in its power cable(s).

6.3 Facility Environmental Characteristics

All tests were performed in a climate controlled building. The temperature was 23° C, humidity 45%, and barometric pressure 102.3 kPa.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7. TEST PROCEDURES

7.1 Radiated Emissions Test – Semi-Anechoic Chamber

7.1.1 General Requirements Limit (FCC PART 15 Section 15.209(a)(1))

Frequency of Emission (MHz)	Field Strength		Measurement Distance (Meters)
	µV/m	dBµV/m	
0.009-0.49	2400/F(kHz)		300
0.49-1.705	24000/F(kHz)		30
1.705-30	30		30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

7.1.2 Emissions in Restricted Bands Limit (FCC PART 15 Section 15.247(d))

15.247(d):

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Limit
See General Limits Requirement In Above Chart

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7.1.3 Test Procedure

The Rohde & Schwarz ESU40 EMI receiver was used as a measuring meter while under software control by the Rohde & Schwarz EMC32 software. To increase the sensitivity of the instrument, the built in preamplifier was used from 9 KHz to 1 GHz and an external preamplifier was used from 1 GHz to 40 GHz. The EMI receiver was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the EMI receiver records the highest measured reading over all the sweeps. The built in quasi-peak or average detector was used only for those readings which are marked accordingly on the data sheets. The effective measurement bandwidth used for the radiated emissions test was 100 kHz from 9 kHz to to 40 GHz.

The Loop Antenna, Broadband BiConiLog and horn antennas were used as transducers during the measurement. The Loop antenna was used from 9 KHz to 30 MHz, the BiConiLog antenna was used from 30 MHz to 1000 MHz and horn antennas were used from 1GHz – 26.5 GHz. The frequency spans were wide (9 kHz to 150 kHz, 150 kHz to 30 MHz, 30 MHz to 88 MHz, 88 MHz to 216 MHz, 216 to 300 MHz, 300 MHz to 1 GHz, 1 GHz to 18 GHz and 18 GHz to 26.5 GHz) during preliminary investigations. The final data was taken with a frequency span of 1 MHz. Furthermore, the frequency span was reduced during the preliminary investigations as deemed necessary.

The 5 meter semi-anechoic chamber of Electro Magnetic Test, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 2009. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. The EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength).

The presence of non EUT signals was verified by turning the EUT off. In case a non EUT signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the other signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance from 9 kHz to 26.5 GHz. to obtain final test data.

Calculation Of Radiated Emission Test Data:

Amplitude - Gain + Antenna Factor + Cable Loss = Corrected Amplitude

Corrected Amplitude - Limit = Margin

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7.2 Conducted Emissions Test – Mains Ports

7.2.1 Limit (FCC PART 15 Section 15.207(a))

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

*Note: Decreases with the logarithm of the frequency

7.2.2 Test Procedure

The HP 8566B spectrum analyzer was used as a measuring meter along with the HP 85650A quasi-peak adapter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak detector was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the spectrum analyzer offset was adjusted accordingly to read the actual data measured. The LISN output was read by the HP 8566B spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for the conducted emissions test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 2009. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The initial test data was taken in manual mode while scanning the frequency ranges of 0.15 MHz to 1.6 MHz, 1.6 MHz to 5 MHz and 5 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable and peripheral placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the spectrum analyzer span adjusted to 1 MHz.

The final data was collected under program control by the HP 85869PC software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7.3 Occupied Bandwidth

7.3.1 Limit (FCC PART 15 Section 15.247(a)(2))

15.247(a)(2):

Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz

Limit
6 dB Bandwidth ≥ 500 kHz

7.3.2 Test Procedure

Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator, set the Spectrum Analyzer as below:

RBW: 100 kHz
VBW: ≥ 3 X RBW
Detector: Peak
Trace Mode: Max Hold

(1) When the trace is completed, mark the peak value

(2) Measure the 6db bandwidth using Xdb down function, If this does not encompass the full bandwidth, then “Measure the maximum width of the emission that is constraiended by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission”

7.3.3 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7.4 Maximum Average Output Power

7.4.1 Limit (FCC PART 15 Section 15.247(b)(3), 15.407 (a)(1)(i), 15.407 (a)(3))

15.247(b)(3)

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

Limit
Maximum Average Output Power (Digital Modulation) ≤ 1Watt or 30 dBm

7.4.2 Test Procedure

Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator and set the Spectrum Analyzer as below:

RBW = 1-5% of Occupied Bandwidth, not exceeding 1 MHz
VBW ≥ 3 x RBW
Span = 1.5 * Occupied Bandwidth
Sweep Time: Auto
Number of pints in sweep ≥ 2 x Span/RBW
Detector: RMS average
Trace Mode: Average at least 100 traces

(1) When the trace is completed switch to channel power mode

(2) Record Data

7.4.3 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

7.5 Maximum Average Power Spectral Density

7.5.1 Limit (FCC PART 15 Section 15.247(e))

15.247(e):

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density

Limit
8 dBm/3 kHz

7.5.2 Test Procedure

Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator and set the Spectrum Analyzer as below:

3 kHz ≤ RBW ≤ 100 kHz
VBW ≥ 3 x RBW
Span = 1.5 * Occupied Bandwidth
Sweep Time: Auto
Number of pints in sweep ≥ 2 x Span/RBW
Detector: RMS average
Trace Mode: Average at least 100 traces

(1) In spectrum analyzer mode, use peak marker function to mark the maximum average power spectral density.

(2) If value Exceeds limit, reduce RBW (no less than 3 kHz).

7.5.3 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7.6 Emissions in Non-Restricted Frequency Bands

7.6.1 Limit (FCC PART 15 Section 15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Limit
20db Below Peak Power Spectral Density
30db Below Average Power Spectral Density

7.6.2 Test Procedure

(1) Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator, set the Spectrum Analyzer as below:

RBW: 100 KHz
VBW: ≥ 3 x RBW
Detector: Peak
Trace Mode: Max Hold
Span ≥ 1.5 DTS Bandwidth

(2) Set Frequency Span to DTS Channel Center Frequency

(3) Use Peak Marker Function, This is your reference PSD

RBW: 100 KHz
VBW: ≥ 3 x RBW
Detector: Peak
Trace Mode: Max Hold

(4) Set Span to encompass frequency range

(5) Report 3 highest emissions

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7.6.3 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7.7 Bandedge

7.7.1 Limit (FCC PART 15 Section 15.247(d),)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

Limit
20db Below Peak Power Spectral Density
30db Below Average Power Spectral Density

7.7.2 Test Procedure

(1) Connect the antenna port of the EUT to the spectrum analyzer via an Attenuator, set the Spectrum Analyzer as below:

RBW: 100 KHz
VBW: ≥ 3 x RBW
Detector: Peak
Trace Mode: Max Hold
Span ≥ 1.5 DTS Bandwidth

(2)Set Frequency Span to DTS Channel Center Frequency

(3)Use Peak Marker Function, This is your reference PSD

RBW: 100 KHz
VBW: ≥ 3 x RBW
Detector: Peak
Trace Mode: Max Hold

(4) Set Span to encomapass the bandedge

(5) Report 3 highest emissions

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7.7.3 Test Result

The EUT meets the requirements. Please see the datasheets in Appendix A for the measurement results.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

7.8 Antenna Requirement

7.8.1 Requirement (FCC PART 15 SECTION 15.203,15.247(b)(4))

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

7.8.2 Test Result

The antennas are secured using special connectors and furthermore, the unit is secured together using torx screws.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

8. CONCLUSIONS / COMPLIANCE STATEMENT

Based upon the results contained in this report, Electro Magnetic Test, Inc. has determined that the WIFI Module, Model: BLUEFIN 2G meets all of the specification limits defined in FCC Title 47, Part 15, Subpart C.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

APPENDIX A

RADIATED AND CONDUCTED DATA SHEETS

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Radiated Emissions

EUT:	WIFI Module	Model Name:	BLUEFIN 2G
Test Mode:	-	Test Date:	10/5/15
Test Engineer:	George Hsu	Measurement:	9 KHz to 30 MHz

The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators were attenuated more than 20 dB below the permissible value

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Radiated Emissions

EUT:	WIFI Module	Model Name:	BLUEFIN 2G
Test Mode:	Channel 6, 802.11b, 5 MHz	Test Date:	10/7/15
Test Engineer:	George Hsu	Measurement:	30 MHz to 1 GHz

Peak Measurement:

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
47.100000	39.8	100.0	V	257.0	9.8	0.20	40.00
47.580000	35.5	100.0	V	270.0	9.7	4.50	40.00
54.150000	38.0	114.0	V	9.0	8.4	2.00	40.00
66.300000	30.3	113.0	V	331.0	8.0	9.70	40.00
146.250000	42.7	197.0	H	193.0	9.1	0.80	43.50
375.000000	43.4	100.0	H	172.0	17.8	2.60	46.00
375.000000	47.4	119.0	V	190.0	17.8	-1.40	46.00
630.030000	43.5	250.0	V	60.0	23.8	2.50	46.00

Quasipeak Measurement:

Frequency (MHz)	QuasiPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
47.100000	34.6	100.0	V	257.0	9.8	5.40	40.00
47.580000	30.4	100.0	V	270.0	9.7	9.60	40.00
54.150000	33.8	114.0	V	9.0	8.4	6.20	40.00
66.300000	25.9	113.0	V	331.0	8.0	14.10	40.00
146.250000	37.6	197.0	H	193.0	9.1	5.90	43.50
375.000000	41.9	100.0	H	172.0	17.8	4.10	46.00
375.000000	45.8	106.7	V	180.6	17.8	0.20	46.00
630.030000	31.6	250.0	V	60.0	23.8	14.40	46.00

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Radiated Emissions

EUT:	WIFI Module	Model Name:	BLUEFIN 2G
Test Mode:	Channel 6, 802.11b, 5 MHz	Test Date:	10/7/15
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

Peak Measurement:

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1259.533333	46.6	135.0	V	275.0	-3.1	27.40	74.00
4874.300000	50.3	131.0	V	114.0	5.7	23.70	74.00
4874.300000	46.1	257.0	H	90.0	5.7	27.90	74.00
5782.666667	47.3	153.0	H	318.0	7.3	26.70	74.00
7311.533333	52.7	100.0	V	258.0	9.9	21.30	74.00
10615.200000	48.1	234.0	V	236.0	15.4	25.90	74.00
12304.433333	52.4	149.0	H	260.0	18.5	21.60	74.00
17181.166667	57.6	265.0	V	170.0	25.0	16.40	74.00
17672.466667	57.2	228.0	H	259.0	25.4	16.80	74.00

Average Measurement:

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
1259.533333	38.9	135.0	V	275.0	-3.1	15.10	54.00
4874.300000	45.0	131.0	V	114.0	5.7	9.00	54.00
4874.300000	37.8	257.0	H	90.0	5.7	16.20	54.00
5782.666667	28.5	153.0	H	318.0	7.3	25.50	54.00
7311.533333	43.6	100.0	V	258.0	9.9	10.40	54.00
10615.200000	34.9	234.0	V	236.0	15.4	19.10	54.00
12304.433333	37.5	149.0	H	260.0	18.5	16.50	54.00
17181.166667	43.6	265.0	V	170.0	25.0	10.40	54.00
17672.466667	43.8	228.0	H	259.0	25.4	10.20	54.00

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Radiated Emissions

EUT:	WIFI Module	Model Name:	BLUEFIN 2G
Test Mode:	Channel 6, 802.11g, 10 MHz	Test Date:	10/8/15
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

Peak Measurement:

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4870.900000	51.8	201.0	V	323.0	5.7	22.20	74.00
4874.300000	47.8	255.0	H	91.0	5.7	26.20	74.00
7290.566667	45.4	192.0	V	169.0	9.9	28.60	74.00
12302.166667	51.3	120.0	V	188.0	18.5	22.70	74.00
15725.966667	54.6	268.0	H	77.0	23.0	19.40	74.00
16478.500000	56.0	258.0	V	179.0	24.3	18.00	74.00
17785.233333	57.1	134.0	V	63.0	25.7	16.90	74.00

Average Measurement:

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4870.900000	33.7	201.0	V	323.0	5.7	20.30	54.00
4874.300000	32.3	255.0	H	91.0	5.7	21.70	54.00
7290.566667	31.9	192.0	V	169.0	9.9	22.10	54.00
12302.166667	38.0	120.0	V	188.0	18.5	16.00	54.00
15725.966667	41.5	268.0	H	77.0	23.0	12.50	54.00
16478.500000	42.6	258.0	V	179.0	24.3	11.40	54.00
17785.233333	43.8	134.0	V	63.0	25.7	10.20	54.00

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Radiated Emissions

EUT:	WIFI Module	Model Name:	BLUEFIN 2G
Test Mode:	Channel 11, 802.11b, 10 MHz	Test Date:	10/8/15
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

Peak Measurement:

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4923.600000	46.9	161.0	H	300.0	5.7	27.10	74.00
4924.166667	50.3	143.0	V	115.0	5.7	23.70	74.00
7387.466667	50.0	100.0	V	258.0	10.1	24.00	74.00
12221.700000	51.1	307.0	V	0.0	18.5	22.90	74.00
13281.366667	51.0	376.0	V	196.0	19.4	23.00	74.00
15338.933333	53.5	250.0	V	33.0	21.4	20.50	74.00
17730.266667	57.1	294.0	H	107.0	25.5	16.90	74.00

Average Measurement:

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4923.600000	39.7	161.0	H	300.0	5.7	14.30	54.00
4924.166667	45.6	143.0	V	115.0	5.7	8.40	54.00
7387.466667	41.2	100.0	V	258.0	10.1	12.80	54.00
12221.700000	37.5	307.0	V	0.0	18.5	16.50	54.00
13281.366667	37.7	376.0	V	196.0	19.4	16.30	54.00
15338.933333	40.2	250.0	V	33.0	21.4	13.80	54.00
17730.266667	43.8	294.0	H	107.0	25.5	10.20	54.00

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Radiated Emissions

EUT:	WIFI Module	Model Name:	BLUEFIN 2G
Test Mode:	Channel 11, 802.11g, 5 MHz	Test Date:	10/8/15
Test Engineer:	George Hsu	Measurement:	1 GHz to 18 GHz

Peak Measurement:

Frequency (MHz)	MaxPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4925.300000	55.9	168.0	V	308.0	5.7	18.20	74.00
4925.300000	51.1	246.0	H	91.0	5.7	22.90	74.00
7386.333333	55.0	140.0	V	279.0	10.1	19.00	74.00
7386.900000	50.8	127.0	H	159.0	10.1	23.20	74.00
12293.100000	50.4	217.0	H	64.0	18.5	23.60	74.00
15791.133333	54.7	174.0	V	248.0	23.1	19.30	74.00
16807.733333	55.5	291.0	V	6.0	24.1	18.50	74.00
17174.366667	57.0	294.0	V	78.0	25.0	17.00	74.00

Average Measurement:

Frequency (MHz)	Average (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
4925.300000	39.6	168.0	V	308.0	5.7	14.40	54.00
4925.300000	32.6	246.0	H	91.0	5.7	21.40	54.00
7386.333333	40.1	140.0	V	279.0	10.1	13.90	54.00
7386.900000	35.8	127.0	H	159.0	10.1	18.20	54.00
12293.100000	37.5	217.0	H	64.0	18.5	16.50	54.00
15791.133333	41.4	174.0	V	248.0	23.1	12.60	54.00
16807.733333	42.2	291.0	V	6.0	24.1	11.80	54.00
17174.366667	43.5	294.0	V	78.0	25.0	10.50	54.00

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Radiated Emissions

EUT:	WIFI Module	Model Name:	BLUEFIN 2G
Test Mode:	-	Test Date:	10/7/15
Test Engineer:	George Hsu	Measurement:	18 GHz to 26.5 GHz

The amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators were attenuated more than 20 dB below the permissible value

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

6dB Bandwidth Test (Conducted)

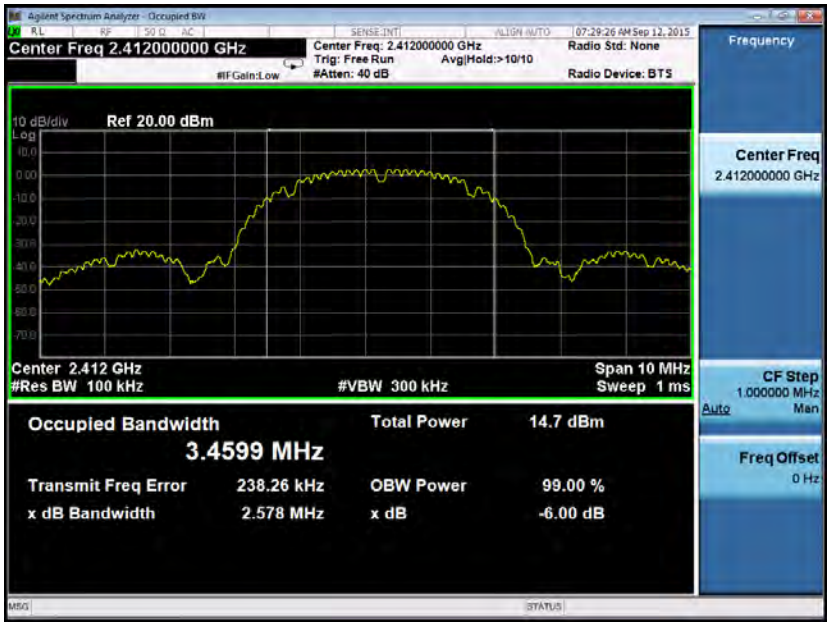
Company:	Tropos Networks, Inc.	**Test Date:**	9/15/15
EUT Name:	WIFI Module	**Test Engineer:**	George Hsu
Model:	BLUEFIN 2G	**Test Result:**	PASS
Operating Mode:	TX Mode		

Mode	Test CH	Frequency (MHz)	6 dB Bandwidth (KHz)	Limit (KHz)	Conclusion
802.11b, 5 MHz	1	2412	2578	≥ 500	PASS
	6	2437	2579	≥ 500	PASS
	11	2462	2578	≥ 500	PASS
802.11b, 10 MHz	1	2412	5087	≥ 500	PASS
	6	2437	5087	≥ 500	PASS
	11	2462	5092	≥ 500	PASS
802.11g, 5 MHz	1	2412	4154	≥ 500	PASS
	6	2437	4152	≥ 500	PASS
	11	2462	4145	≥ 500	PASS
802.11g, 10 MHz	1	2412	8228	≥ 500	PASS
	6	2437	8225	≥ 500	PASS
	11	2462	8231	≥ 500	PASS

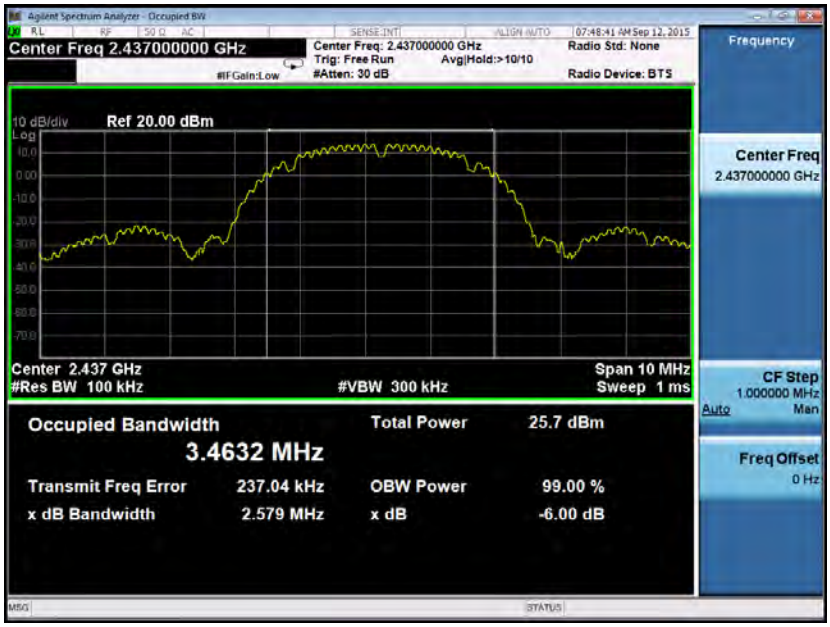
Test Equipment: Please refer to section 5.2

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

6dB Bandwidth Test (Conducted)



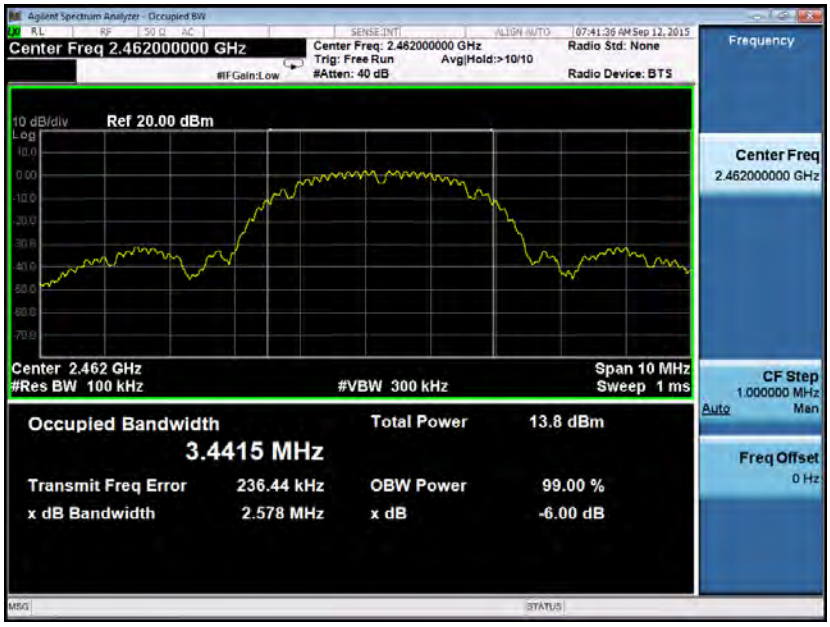
5 Mhz, 802.11b, Channel 1



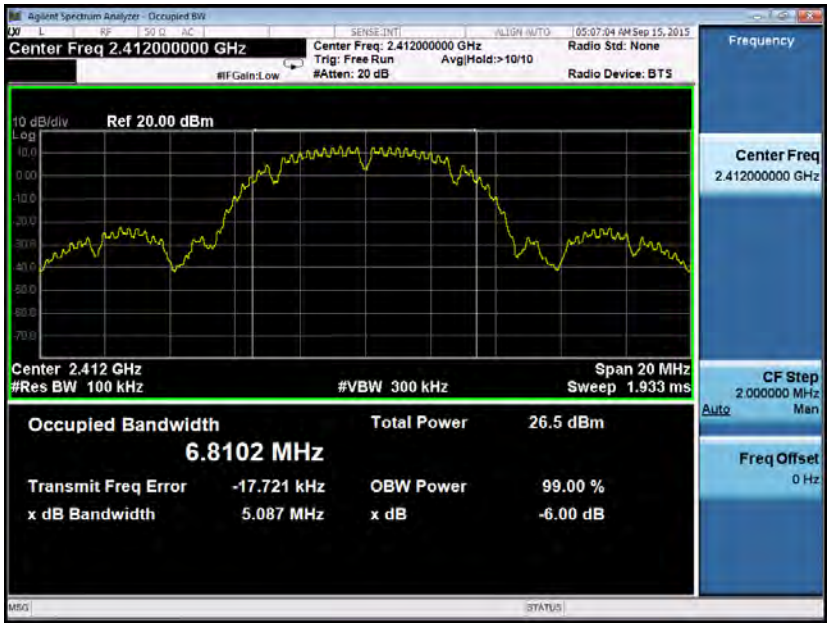
5 Mhz, 802.11b, Channel 6

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

6dB Bandwidth Test (Conducted)



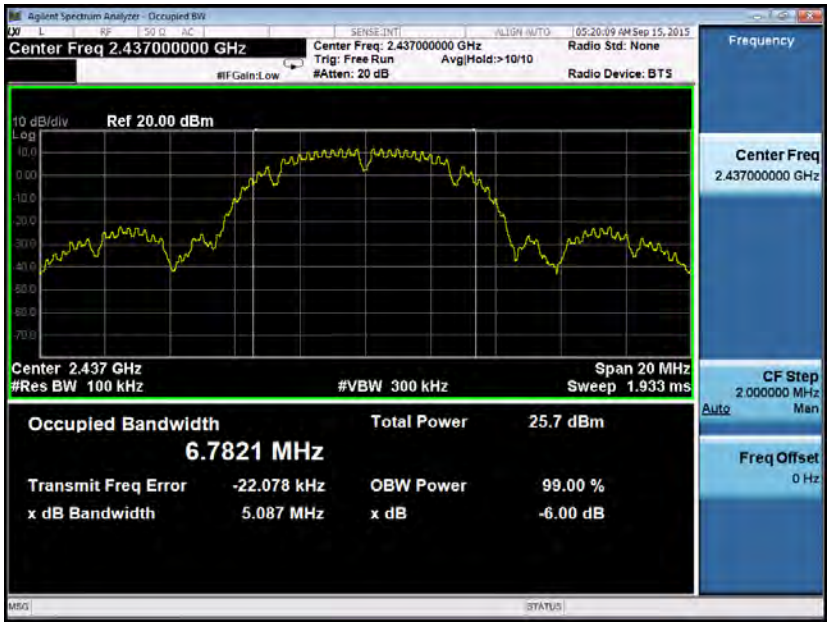
5 Mhz, 802.11b, Channel 11



10 Mhz, 802.11b, Channel 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

6dB Bandwidth Test (Conducted)

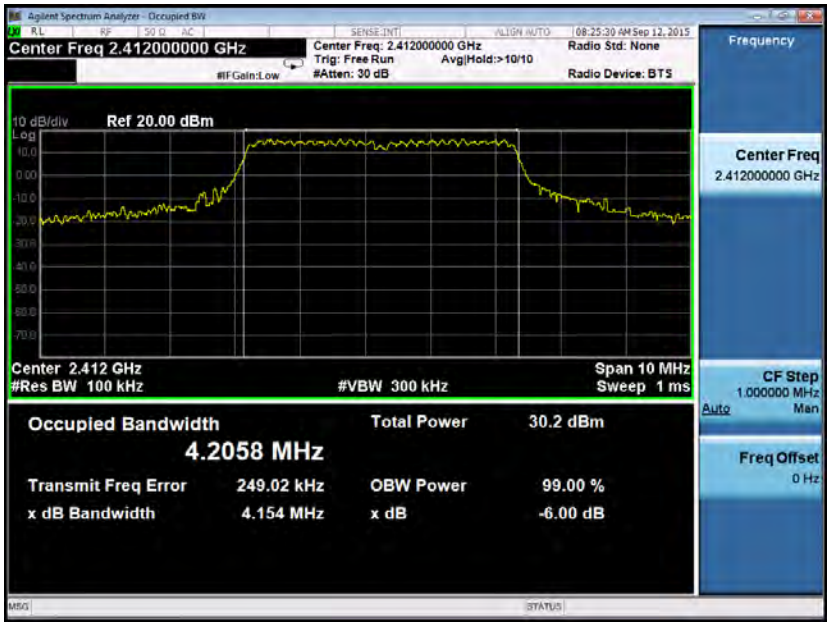


10 Mhz, 802.11b, Channel 6

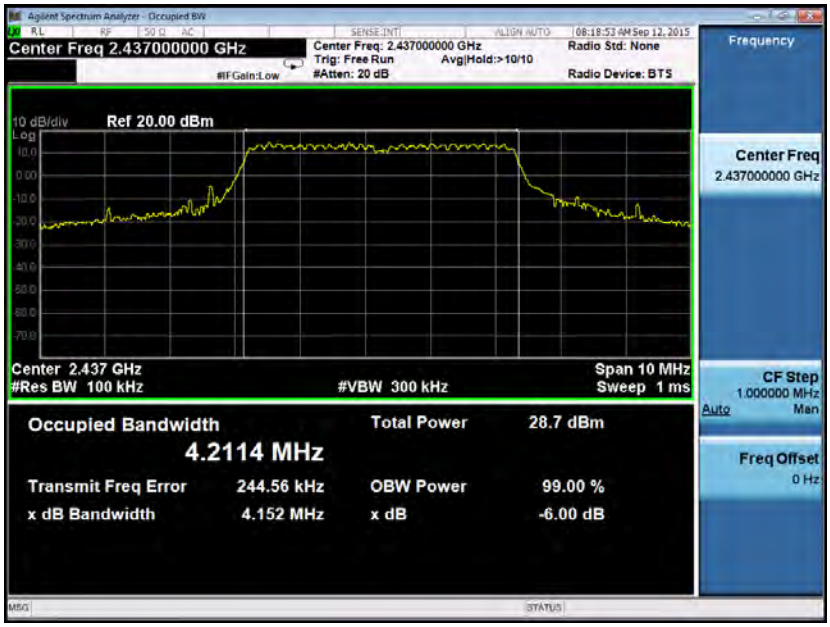
10 Mhz, 802.11b, Channel 11

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

6dB Bandwidth Test (Conducted)



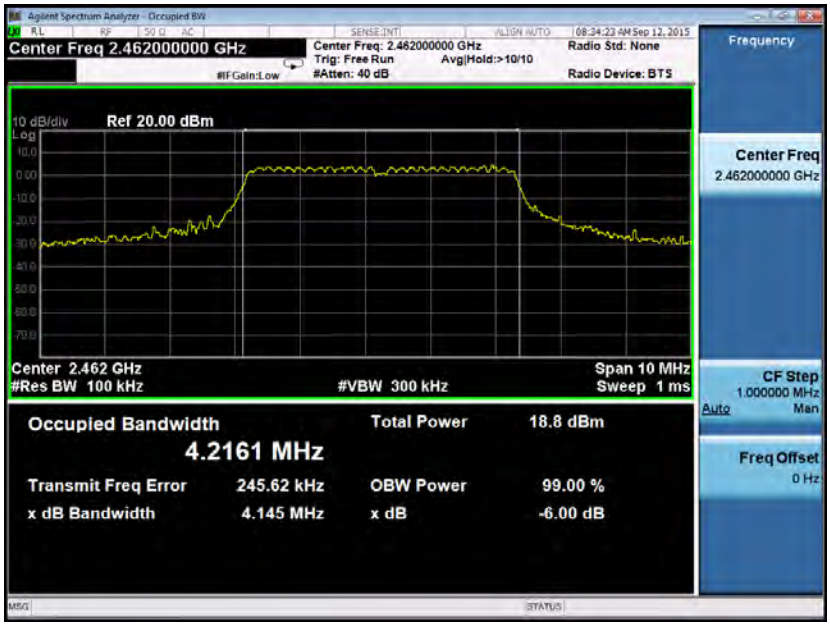
5 Mhz, 802.11g, Channel 1



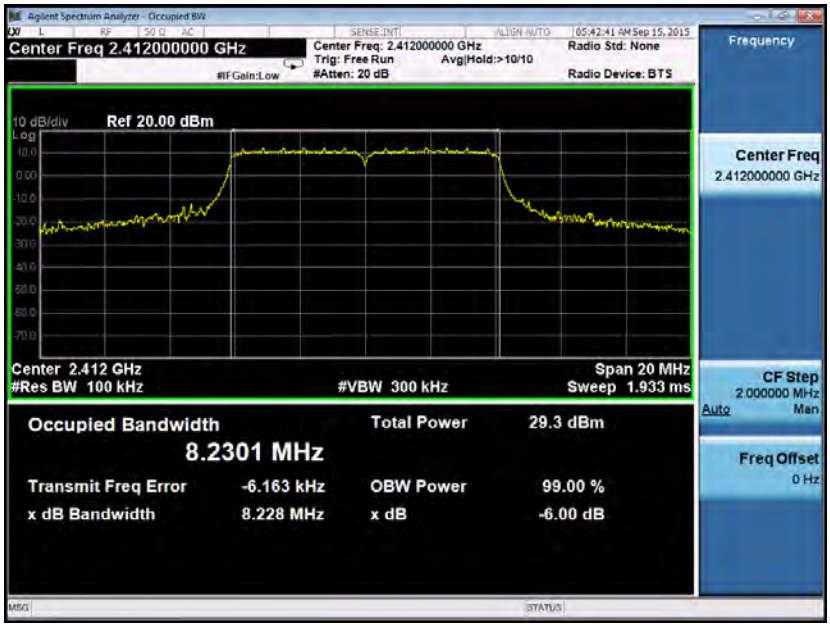
5 Mhz, 802.11g, Channel 6

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

6dB Bandwidth Test (Conducted)



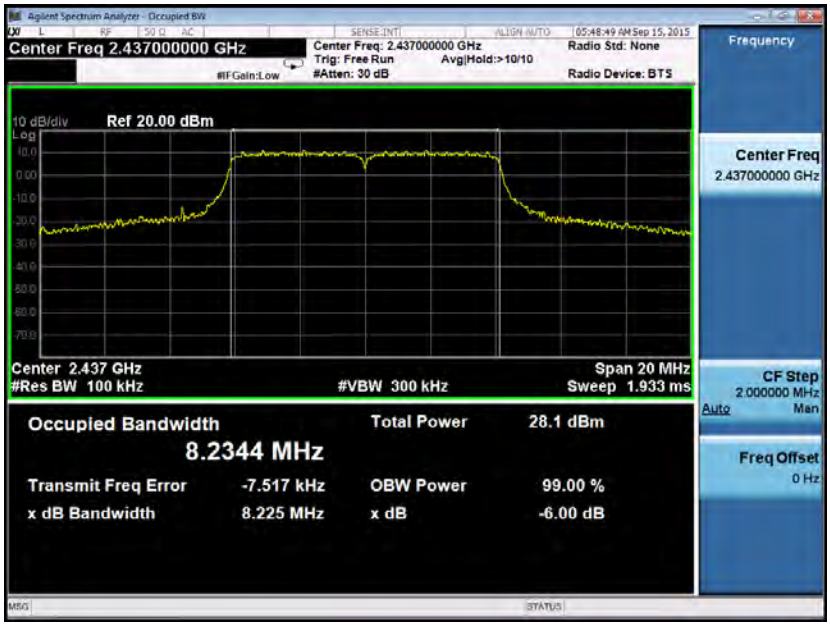
5 Mhz, 802.11g, Channel 11



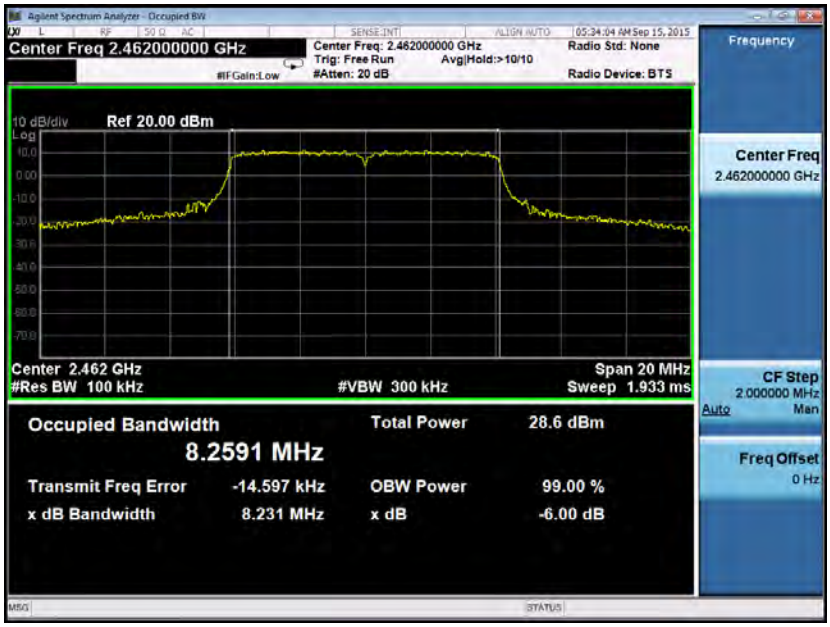
10 Mhz, 802.11g, Channel 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

6dB Bandwidth Test (Conducted)



10 Mhz, 802.11g, Channel 6



10 Mhz, 802.11g, Channel 11

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)

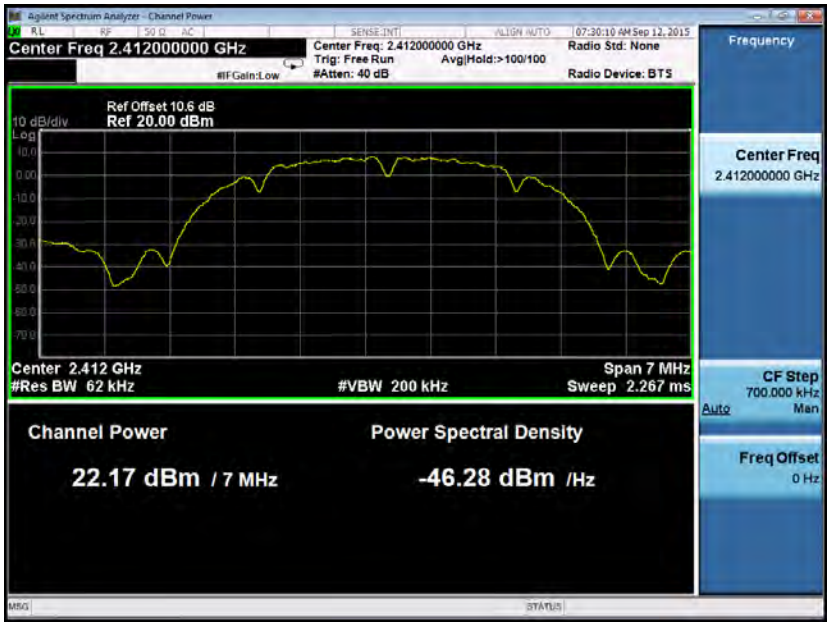
Company:	Tropos Networks, Inc.	**Test Date:**	9/15/15
EUT Name:	WIFI Module	**Test Engineer:**	George Hsu
Model:	BLUEFIN 2G	**Test Result:**	PASS
Operating Mode:	TX Mode		

Mode	Test CH	Frequency (MHz)	Chain 0 Average Output Power (dBm)	Chain 1 Average Output Power (dBm)	Total Average Output Power (dBm)	Limit (dBm)	Conclusion
802.11b, 5 MHz	1	2412	22.170	20.880	24.583	≤ 28.5	Pass
	6	2437	22.580	20.760	24.775	≤ 28.5	Pass
	11	2462	22.440	21.230	24.887	≤ 28.5	Pass
802.11b, 10 MHz	1	2412	22.320	20.760	24.620	≤ 28.5	Pass
	6	2437	22.670	20.700	24.806	≤ 28.5	Pass
	11	2462	22.610	21.370	25.044	≤ 28.5	Pass
802.11g, 5 MHz	1	2412	22.500	21.180	24.900	≤ 28.5	Pass
	6	2437	23.170	20.930	24.900	≤ 28.5	Pass
	11	2462	23.280	21.600	25.231	≤ 28.5	Pass
802.11g, 10 MHz	1	2412	22.510	21.290	24.953	≤ 28.5	Pass
	6	2437	23.360	21.300	25.461	≤ 28.5	Pass
	11	2462	23.050	21.660	25.421	≤ 28.5	Pass

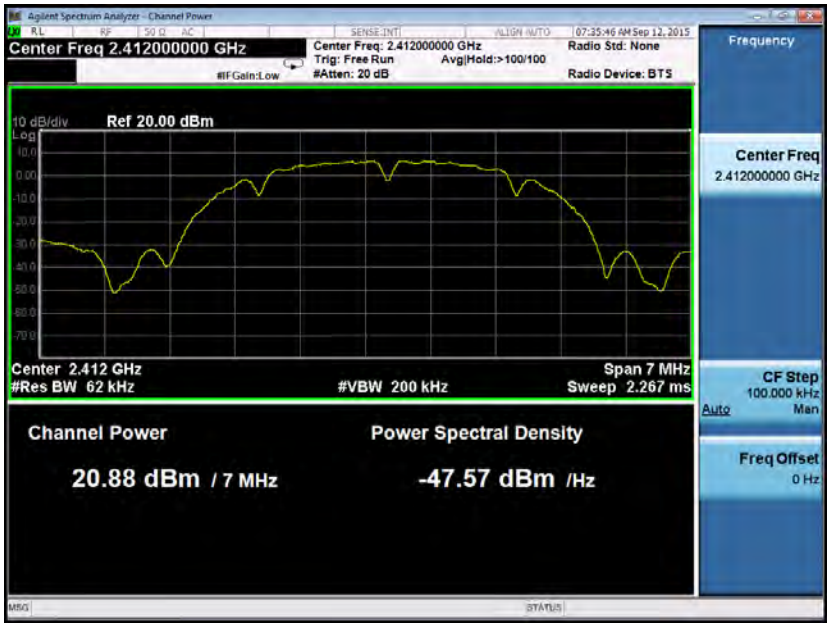
Test Equipment: Please refer to section 5.2

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



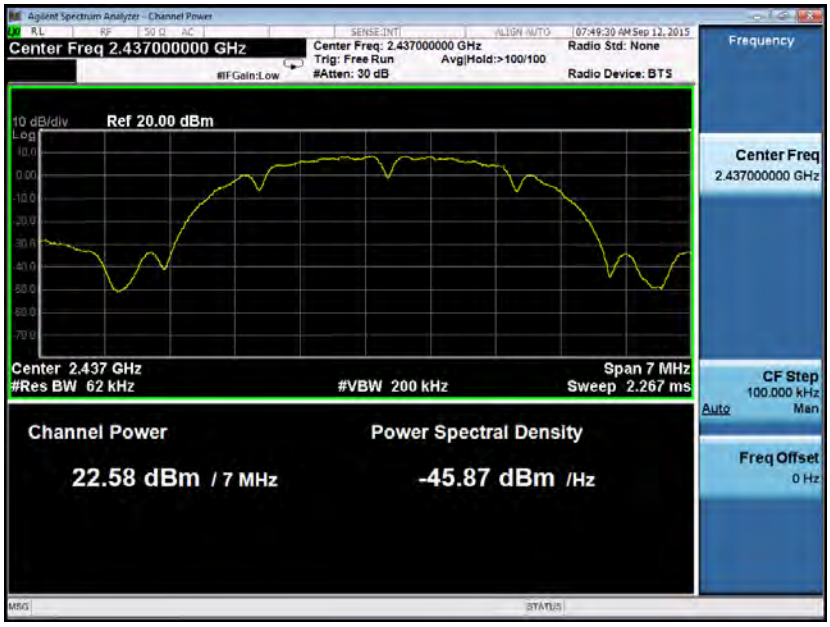
5 MHz, 802.11b, Channel 1, Chain 0



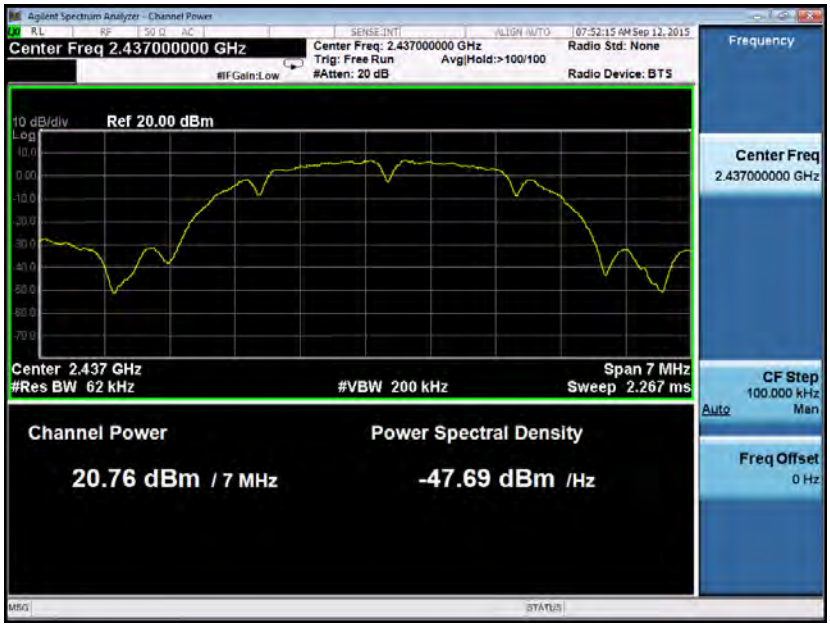
5 MHz, 802.11b, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



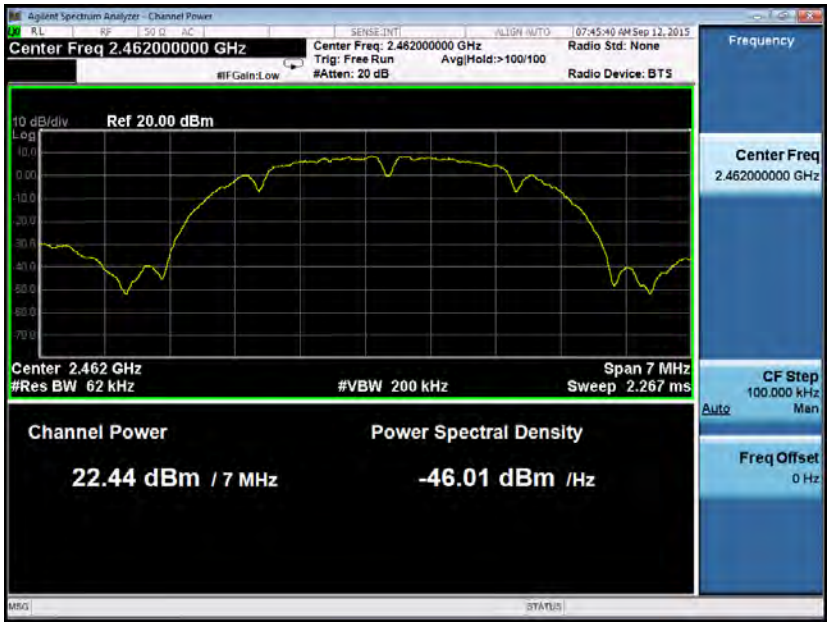
5 MHz, 802.11b, Channel 6, Chain 0



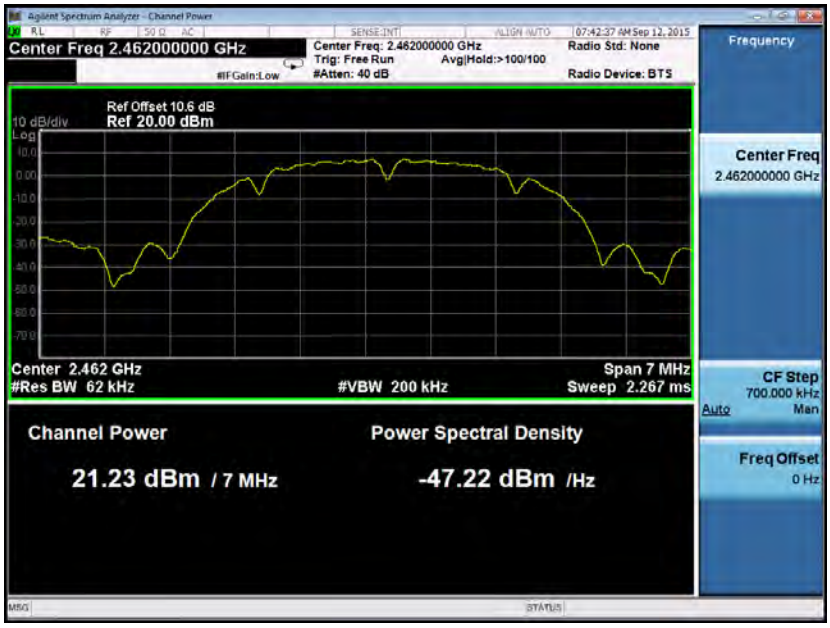
5 MHz, 802.11b, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



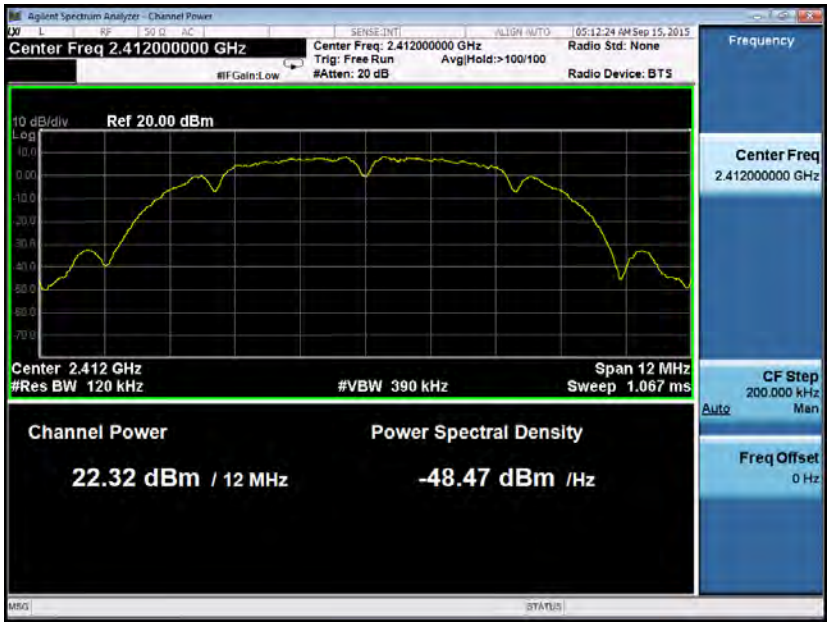
5 MHz, 802.11b, Channel 11, Chain 0



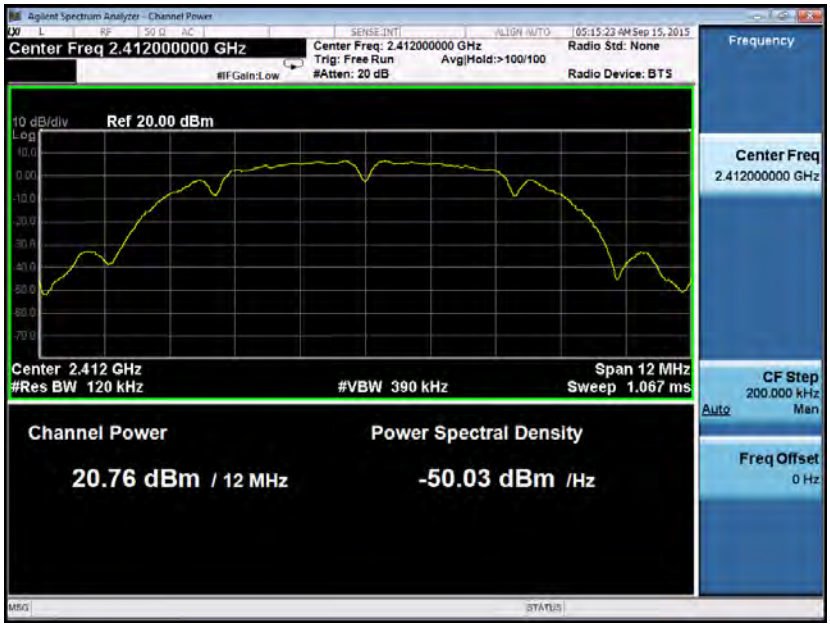
5 MHz, 802.11b, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



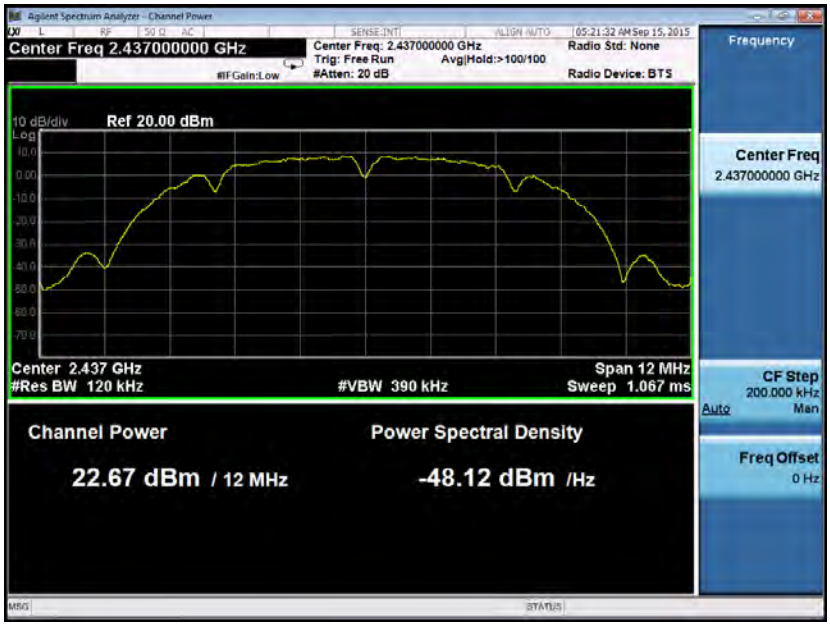
10 MHz, 802.11b, Channel 1, Chain 0



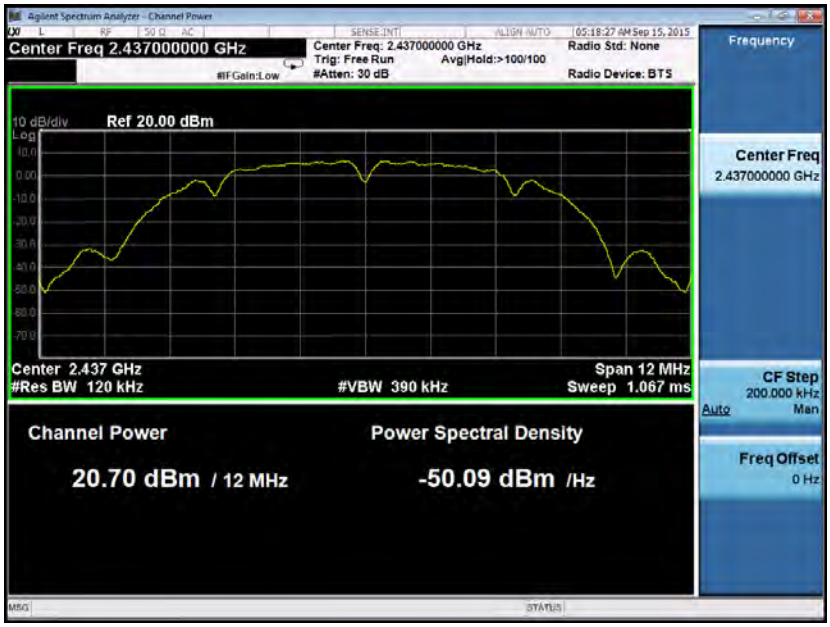
10 MHz, 802.11b, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



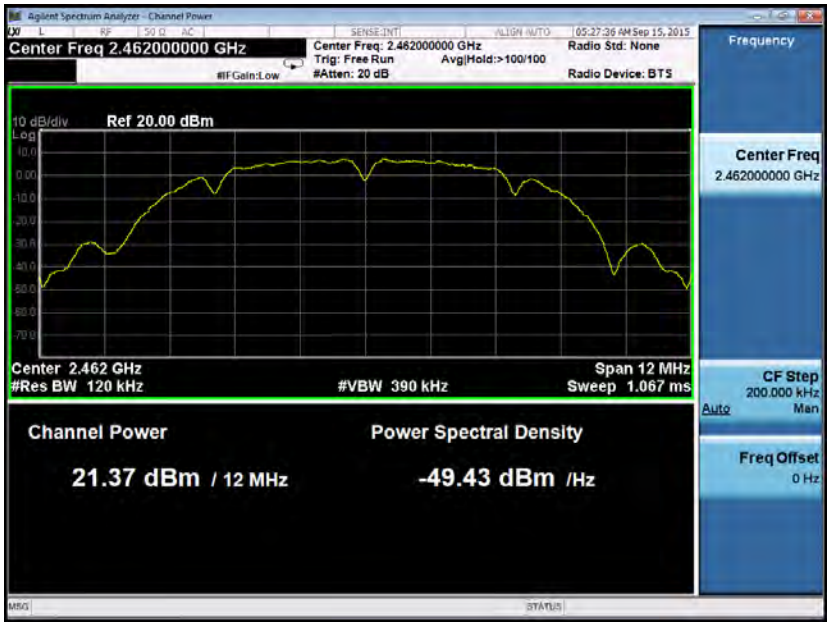
10 MHz, 802.11b, Channel 6, Chain 0



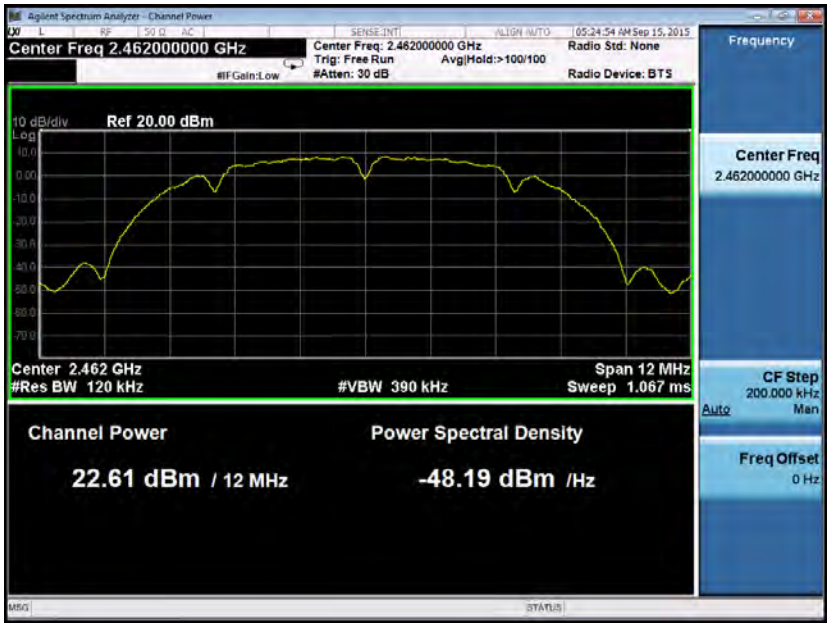
10 MHz, 802.11b, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



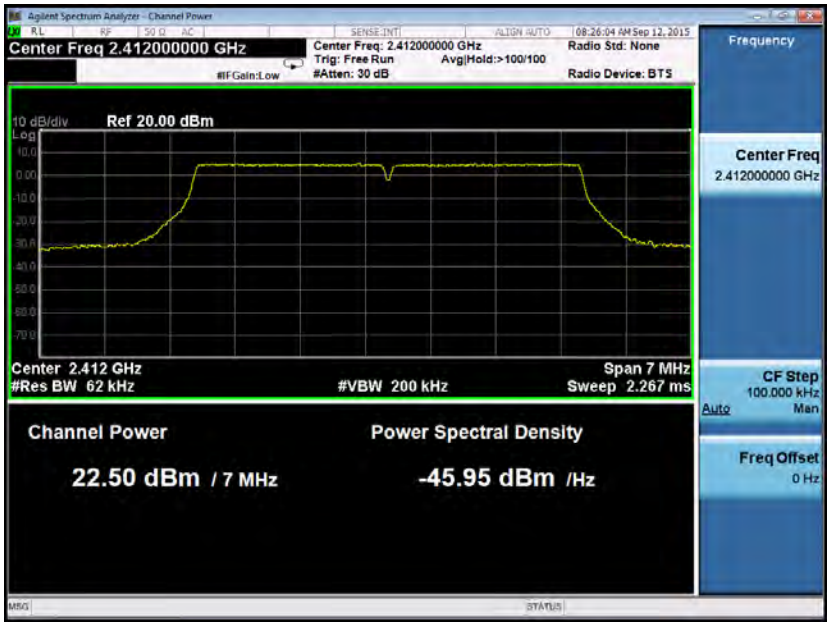
10 MHz, 802.11b, Channel 11, Chain 0



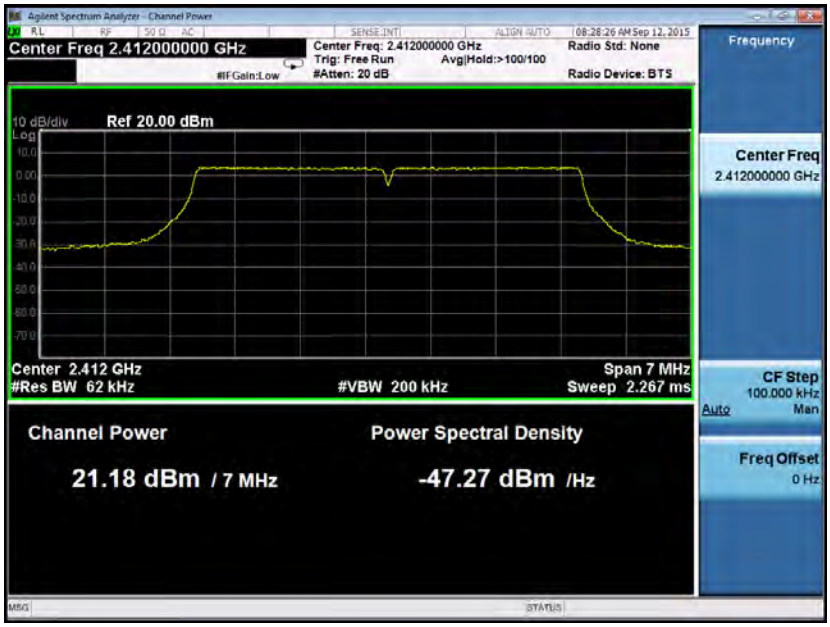
10 MHz, 802.11b, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



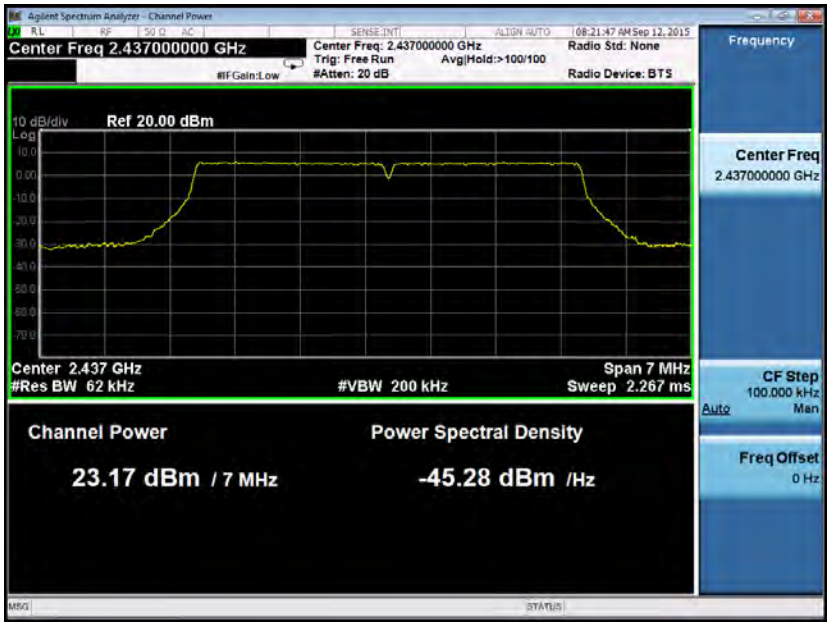
5 MHz, 802.11g, Channel 1, Chain 0



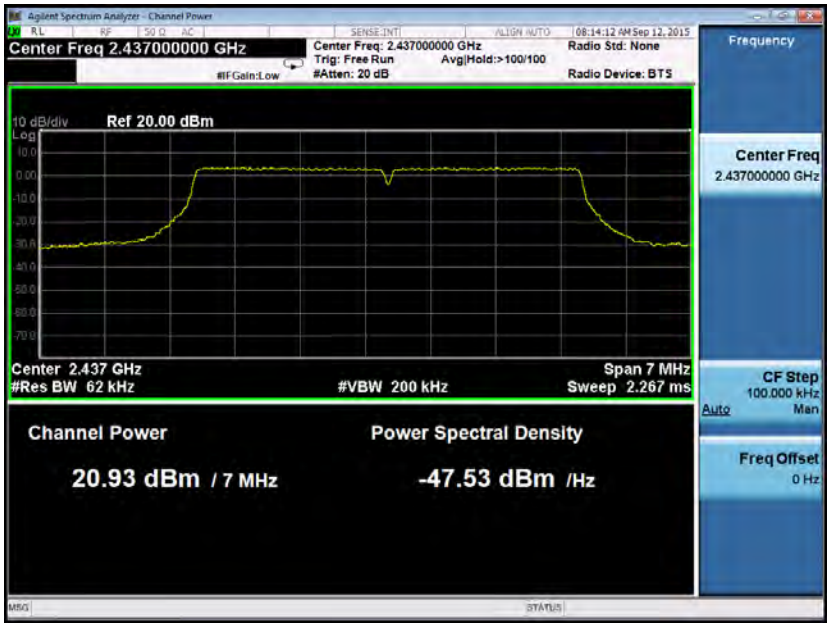
5 MHz, 802.11g, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



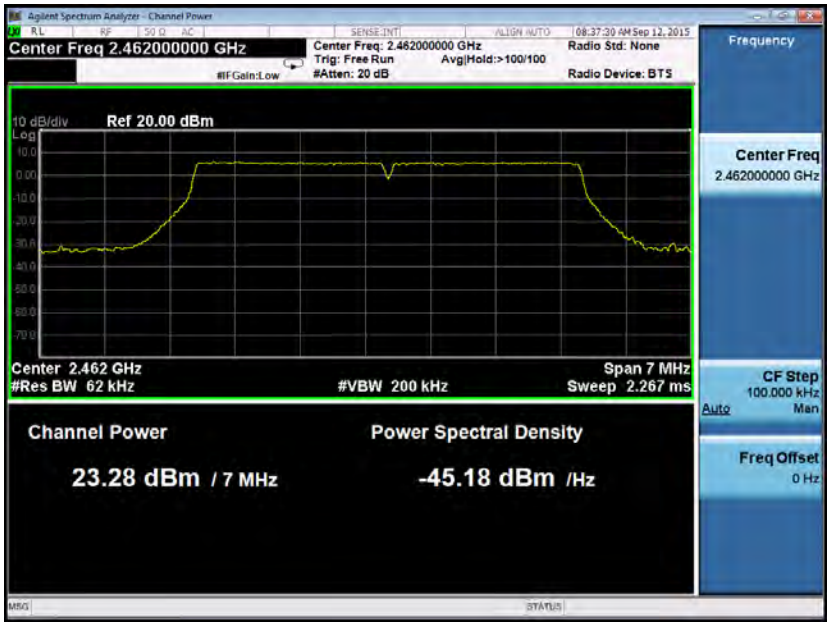
5 MHz, 802.11g, Channel 6, Chain 0



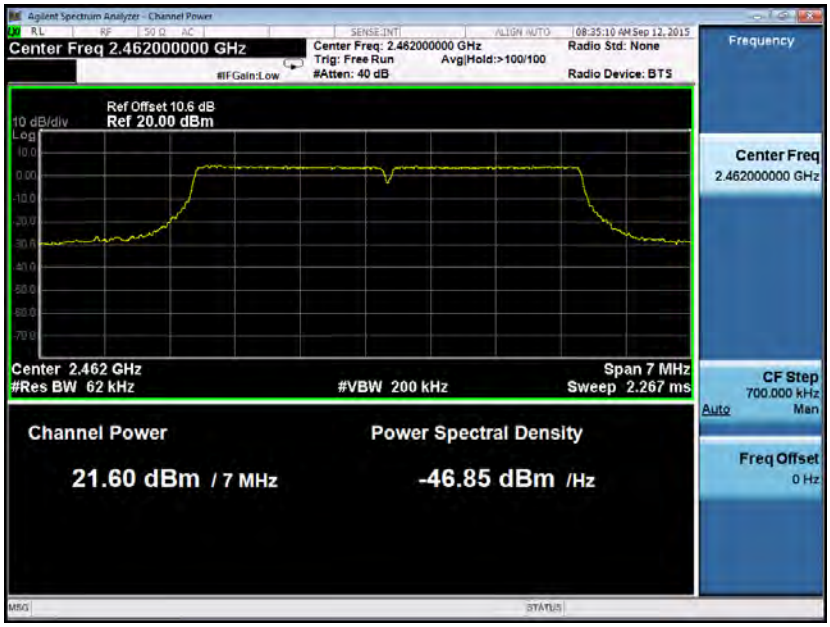
5 MHz, 802.11g, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



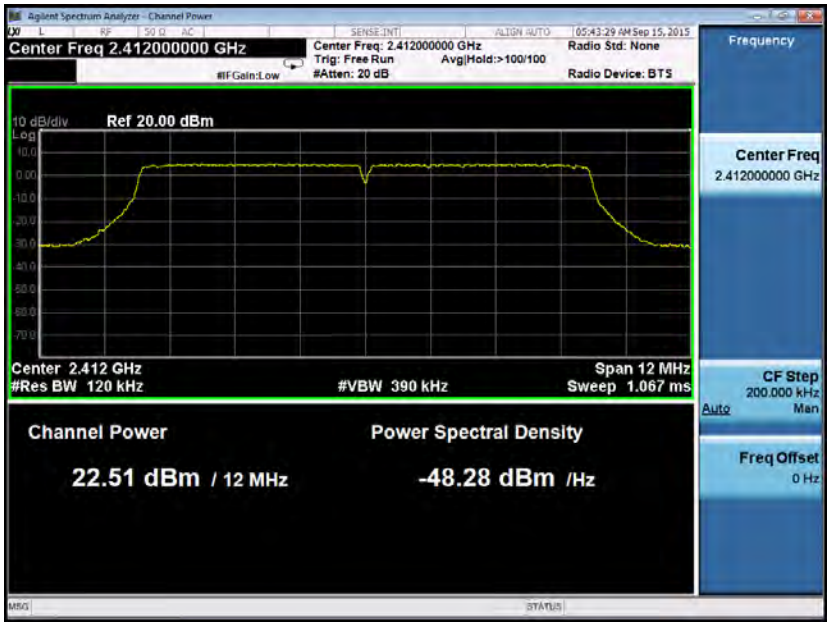
5 MHz, 802.11g, Channel 11, Chain 0



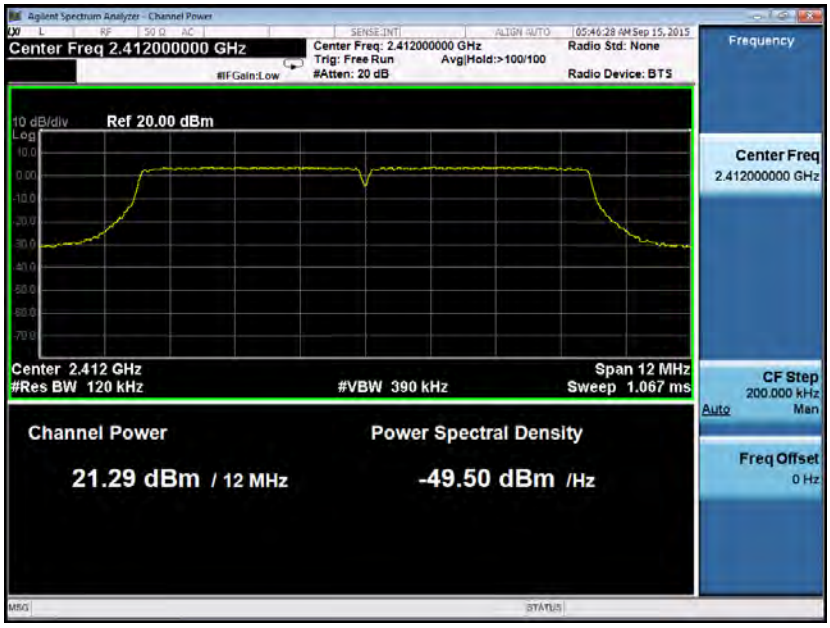
5 MHz, 802.11g, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



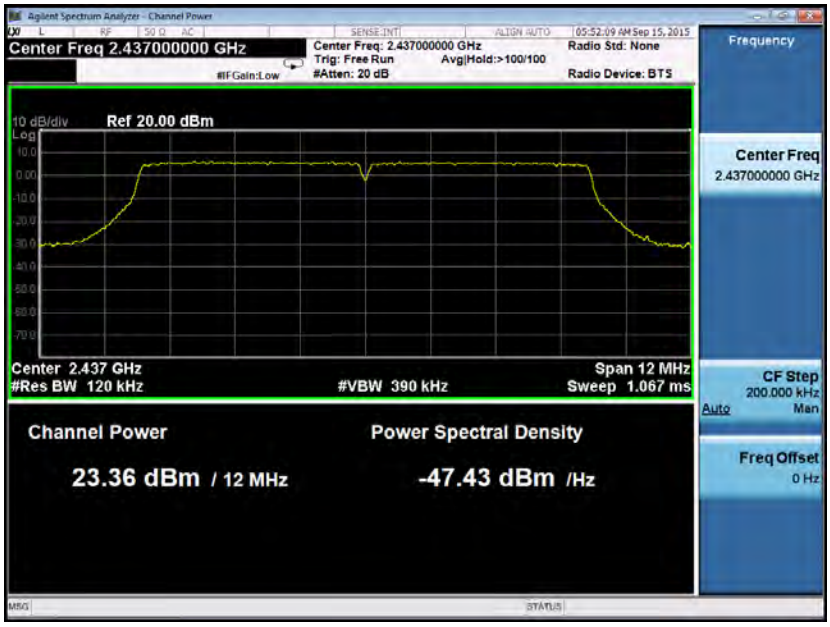
10 MHz, 802.11g, Channel 1, Chain 0



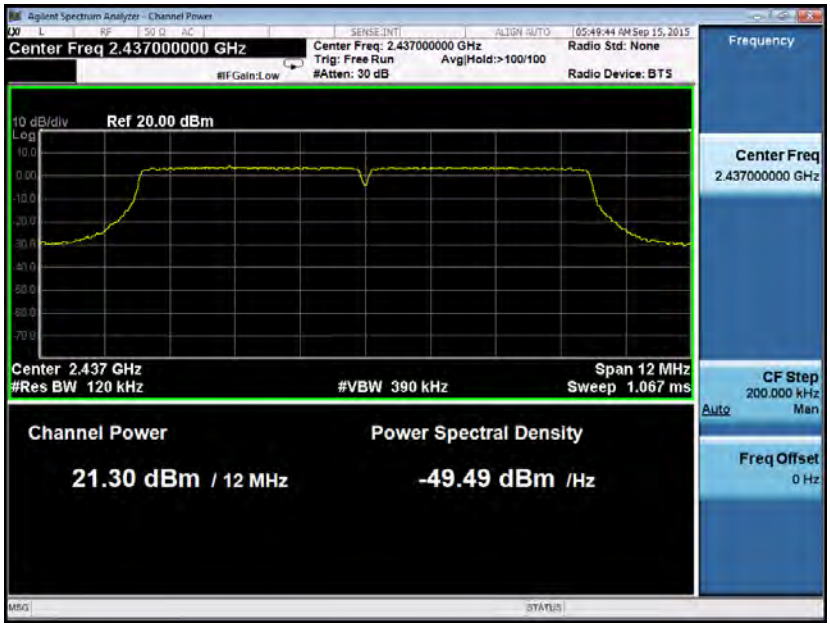
10 MHz, 802.11g, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



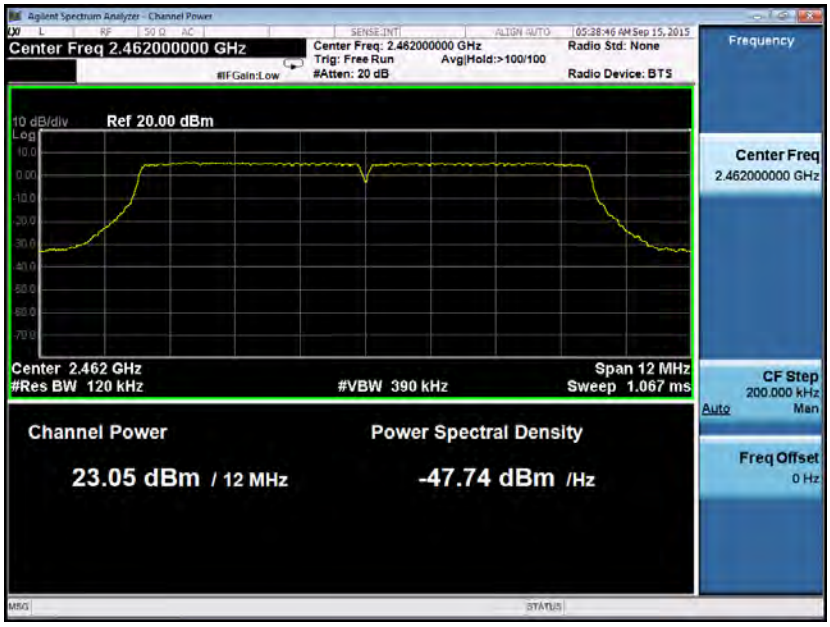
10 MHz, 802.11g, Channel 6, Chain 0



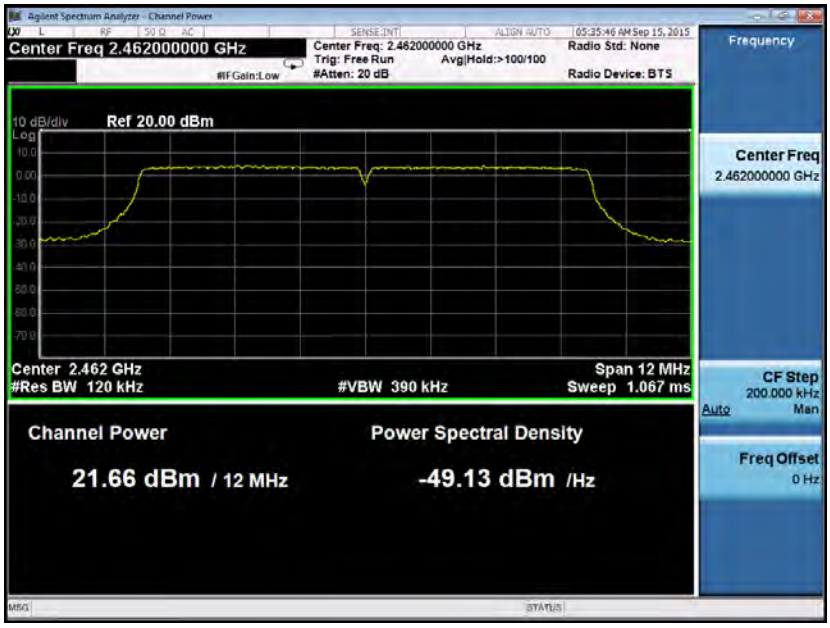
10 MHz, 802.11g, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Output Power Test Data (Conducted)



10 MHz, 802.11g, Channel 11, Chain 0



10 MHz, 802.11g, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)

Company:	Tropos Networks, Inc.	**Test Date:**	9/15/15
EUT Name:	WIFI Module	**Test Engineer:**	George Hsu
Model:	BLUEFIN 2G	**Test Result:**	PASS
Operating Mode:	TX Mode		

Mode	Test CH	Frequency (MHz)	Chain 0 Average PSD (dBm)	Chain 1 Average PSD (dBm)	Total Average PSD (dBm)	Limit (dBm)	Conclusion
802.11b, 5 MHz	1	2412	-6.852	-7.562	-4.182	≤ 6.5	Pass
	6	2437	-1.252	-2.961	0.987	≤ 6.5	Pass
	11	2462	-2.038	-2.662	0.671	≤ 6.5	Pass
802.11b, 10 MHz	1	2412	-3.411	-5.027	-1.134	≤ 6.5	Pass
	6	2437	-3.014	-4.816	-0.812	≤ 6.5	Pass
	11	2462	-3.012	-4.254	-0.578	≤ 6.5	Pass
802.11g, 5 MHz	1	2412	-3.909	-5.191	-1.493	≤ 6.5	Pass
	6	2437	-3.462	-4.867	-1.098	≤ 6.5	Pass
	11	2462	-2.706	-4.524	-0.510	≤ 6.5	Pass
802.11g, 10 MHz	1	2412	-5.587	-6.823	-3.151	≤ 6.5	Pass
	6	2437	-4.463	-6.523	-2.362	≤ 6.5	Pass
	11	2462	-4.920	-6.155	-2.483	≤ 6.5	Pass

Test Equipment: Please refer to section 5.2

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)

5 MHz, 802.11b, Channel 1, Chain 0

5 MHz, 802.11b, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)

5 MHz, 802.11b, Channel 6, Chain 0

5 MHz, 802.11b, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)

5 MHz, 802.11b, Channel 11, Chain 0

5 MHz, 802.11b, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)

10 MHz, 802.11b, Channel 1, Chain 0

10 MHz, 802.11b, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)

10 MHz, 802.11b, Channel 6, Chain 0

10 MHz, 802.11b, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

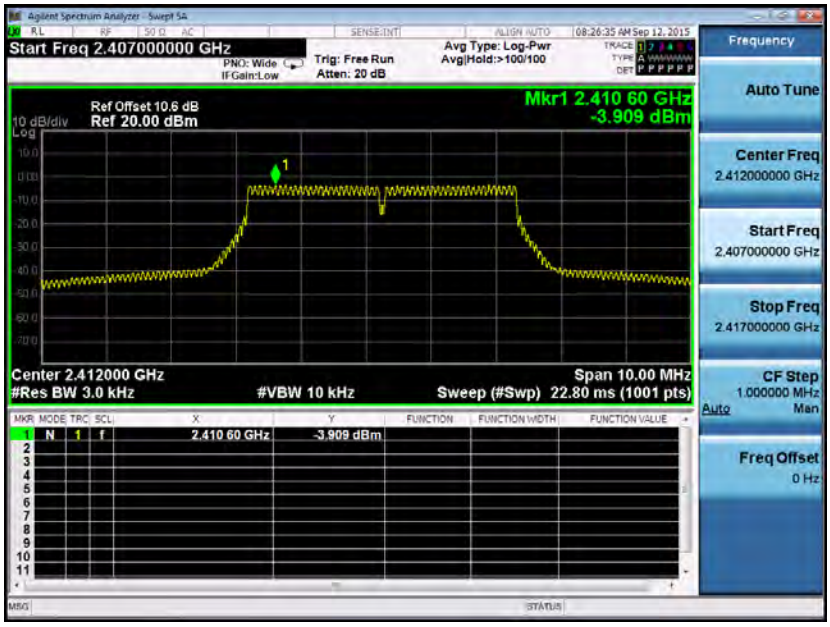
Maximum Average Power Spectral Density Test Data (Conducted)

10 MHz, 802.11b, Channel 11, Chain 0

10 MHz, 802.11b, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)



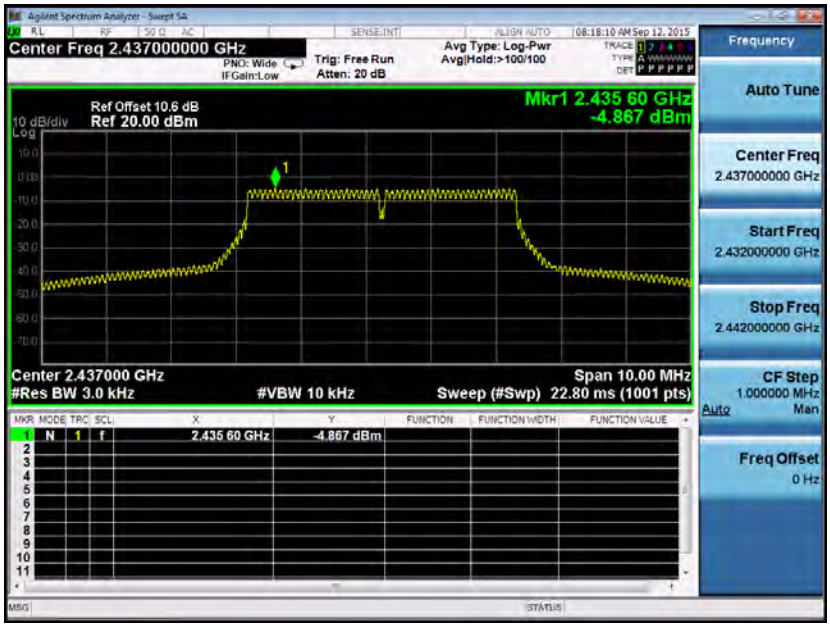
5 MHz, 802.11g, Channel 1, Chain 0

5 MHz, 802.11g, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)

5 MHz, 802.11g, Channel 6, Chain 0

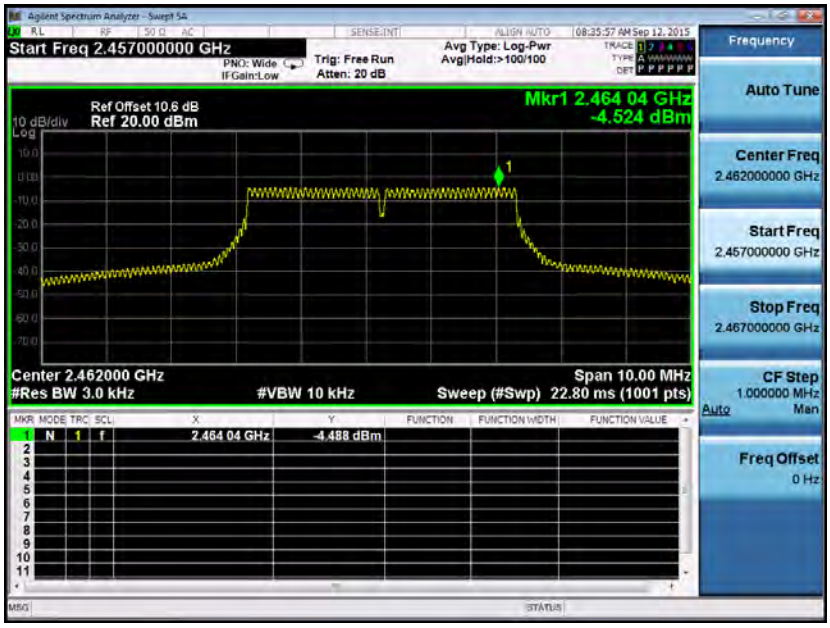


5 MHz, 802.11g, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)

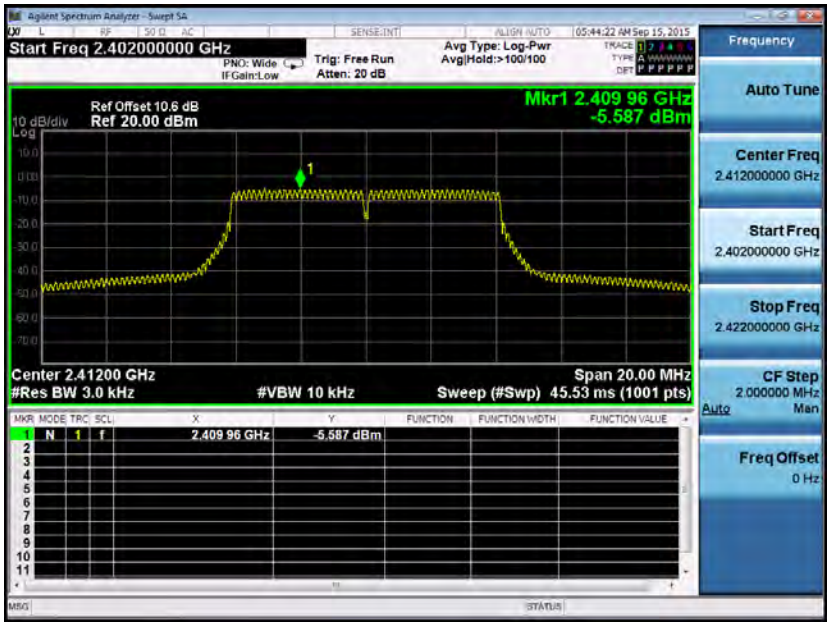
5 MHz, 802.11g, Channel 11, Chain 0



5 MHz, 802.11g, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)

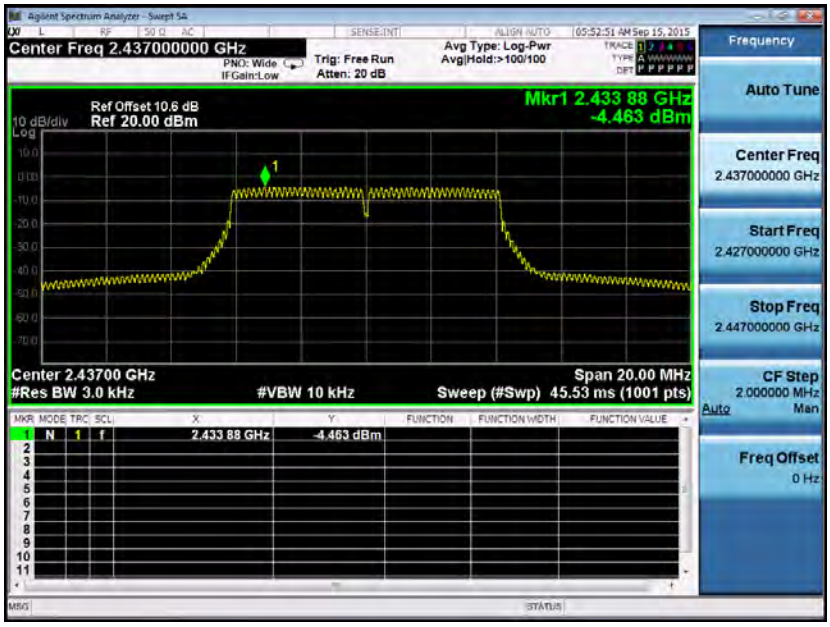


10 MHz, 802.11g, Channel 1, Chain 0

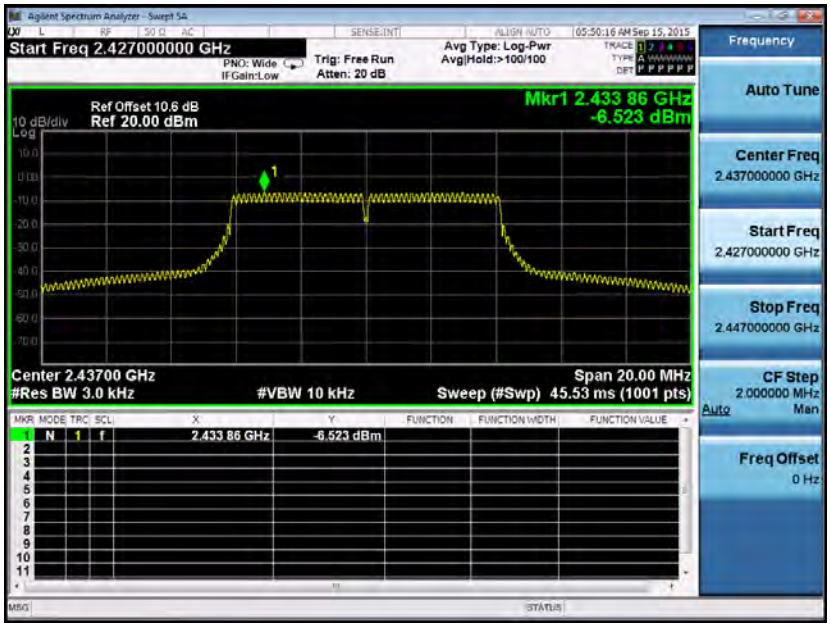
10 MHz, 802.11g, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)



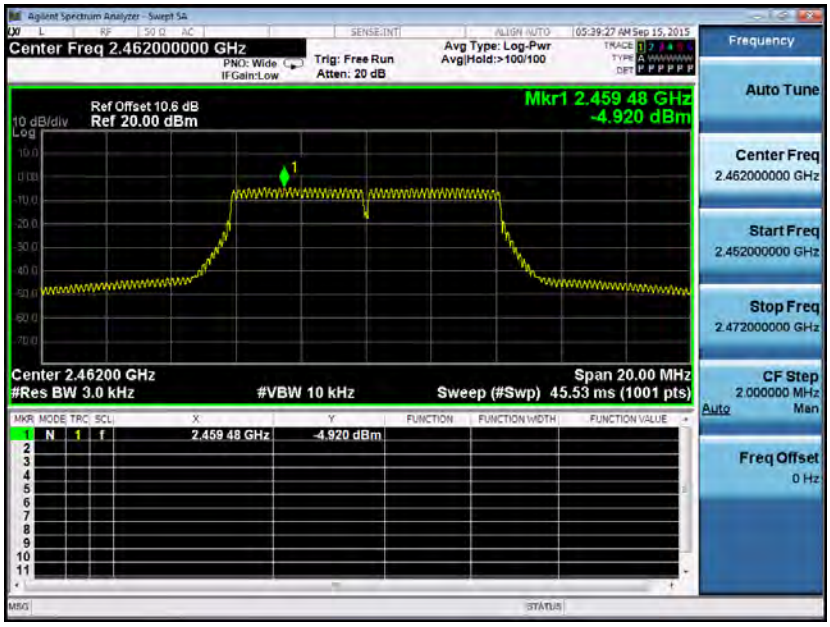
10 MHz, 802.11g, Channel 6, Chain 0



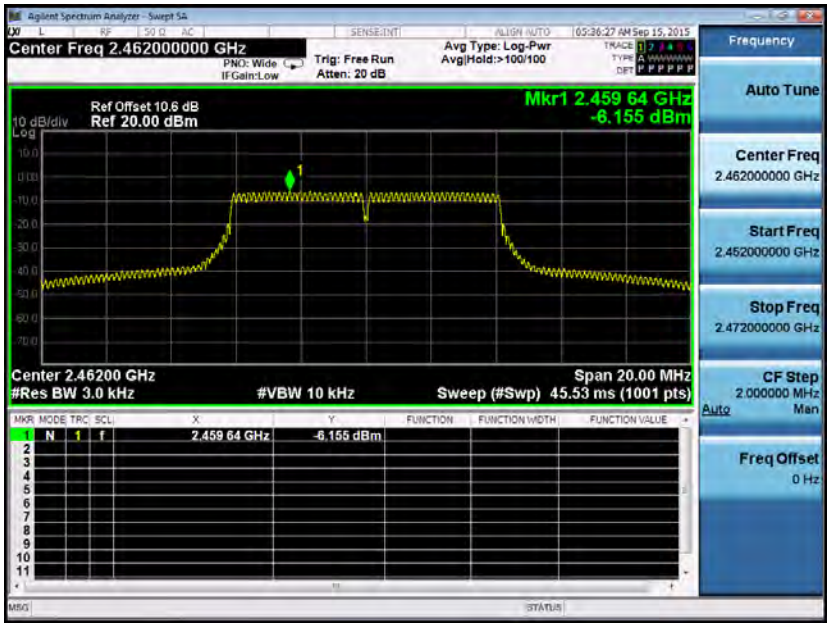
10 MHz, 802.11g, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Maximum Average Power Spectral Density Test Data (Conducted)



10 MHz, 802.11g, Channel 11, Chain 0



10 MHz, 802.11g, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)

Company:	Tropos Networks, Inc.	**Test Date:**	9/15/15
EUT Name:	WIFI Module	**Test Engineer:**	George Hsu
Model:	BLUEFIN 2G	**Test Result:**	PASS
Operating Mode:	TX Mode		

Mode	Test CH	Frequency (MHz)	Chain 0 Highest Emission (dBm)	Chain 1 Highest Emission (dBm)	Total Emission (dBm)	Limit (dBm)	Conclusion
802.11b, 5 MHz	1	14463	-66.853	-59.553	-58.811	≤ -29.013	Pass
	6	14612	-59.934	-63.484	-58.346	≤ -29.013	Pass
	11	14762	-63.966	-72.352	-63.378	≤ -29.013	Pass
802.11b, 10 MHz	1	14465.2	-65.233	-59.335	-58.341	≤ -30.578	Pass
	6	14615	-59.577	-63.199	-58.011	≤ -30.578	Pass
	11	14765	-63.422	-71.390	-62.779	≤ -30.578	Pass
802.11g, 5 MHz	1	14463	-71.471	-69.178	-67.165	≤ -30.510	Pass
	6	14612	-64.407	-66.027	-62.132	≤ -30.510	Pass
	11	14762	-70.735	-77.596	-69.921	≤ -30.510	Pass
802.11g, 10 MHz	1	9643	-74.775	-74.569	-71.660	≤ -32.362	Pass
	6	14612	-64.659	-68.842	-63.255	≤ -32.362	Pass
	11	14765	-71.859	-77.240	-70.754	≤ -32.362	Pass

Test Equipment: Please refer to section 5.2

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

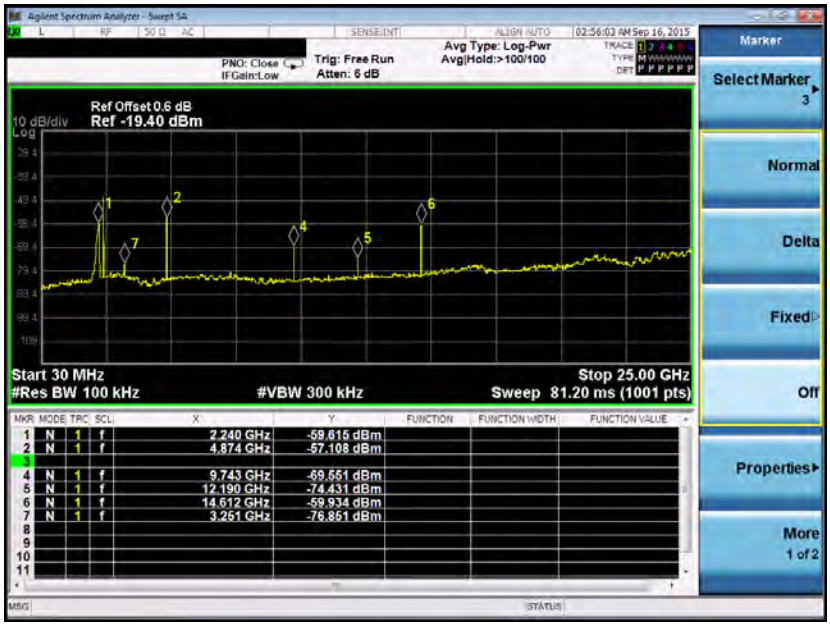
Emissions in Non-Restricted Frequency Bands (Conducted)

5 MHz, 802.11b, Channel 1, Chain 0

5 MHz, 802.11b, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)



5 MHz, 802.11b, Channel 6, Chain 0

5 MHz, 802.11b, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)

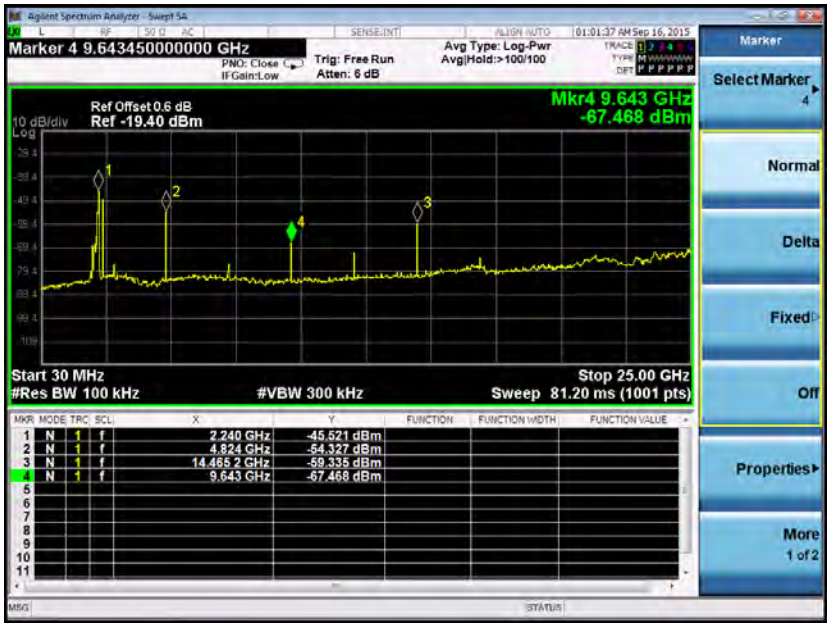
5 MHz, 802.11b, Channel 11, Chain 0

5 MHz, 802.11b, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)

10 MHz, 802.11b, Channel 1, Chain 0



10 MHz, 802.11b, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

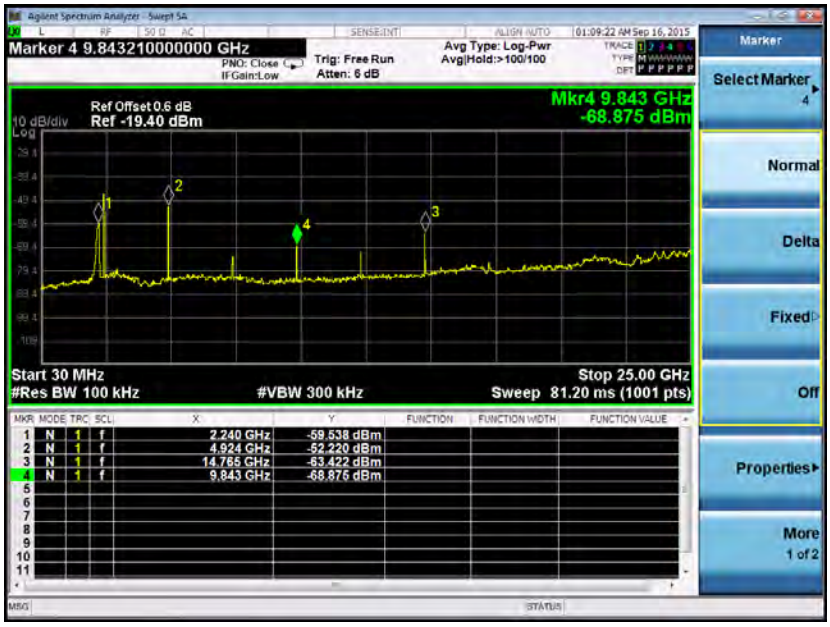
Emissions in Non-Restricted Frequency Bands (Conducted)

10 MHz, 802.11b, Channel 6, Chain 0

10 MHz, 802.11b, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)



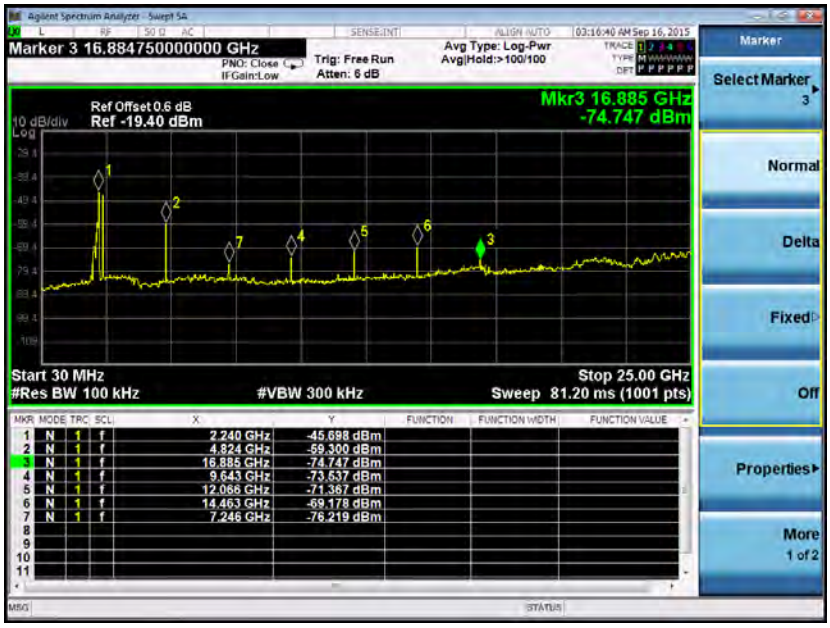
10 MHz, 802.11b, Channel 11, Chain 0

10 MHz, 802.11b, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)

5 MHz, 802.11g, Channel 1, Chain 0



5 MHz, 802.11g, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)

5 MHz, 802.11g, Channel 6, Chain 0

5 MHz, 802.11g, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)

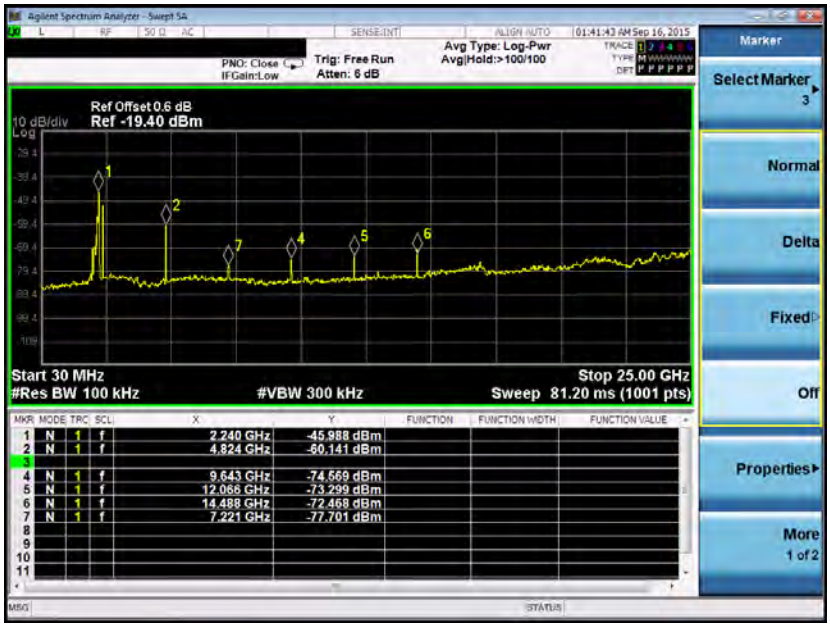
5 MHz, 802.11g, Channel 11, Chain 0

5 MHz, 802.11g, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)

10 MHz, 802.11g, Channel 1, Chain 0



10 MHz, 802.11g, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)

10 MHz, 802.11g, Channel 6, Chain 0

10 MHz, 802.11g, Channel 6, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Emissions in Non-Restricted Frequency Bands (Conducted)

10 MHz, 802.11g, Channel 11, Chain 0

10 MHz, 802.11g, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Bandedge Test Data (Conducted)

Company:	Tropos Networks, Inc.	**Test Date:**	9/15/15
EUT Name:	WIFI Module	**Test Engineer:**	George Hsu
Model:	BLUEFIN 2G	**Test Result:**	PASS
Operating Mode:	TX Mode		

Mode	Test CH	Frequency (MHz)	Results	Limit (dBm)	Conclusion
802.11b, 5 MHz	1	2412	See Plots Below	≤ -29.013	Pass
	11	2462		≤ -29.013	Pass
802.11b, 10 MHz	1	2412		≤ -30.578	Pass
	11	2462		≤ -30.578	Pass
802.11g, 5 MHz	1	2412		≤ -30.510	Pass
	11	2462		≤ -30.510	Pass
802.11g, 10 MHz	1	2412		≤ -32.362	Pass
	11	2462		≤ -32.362	Pass

Test Equipment: Please refer to section 5.2

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Bandedge Test Data (Conducted)

5 MHz, 802.11b, Channel 1, Chain 0

5 MHz, 802.11b, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Bandedge Test Data (Conducted)

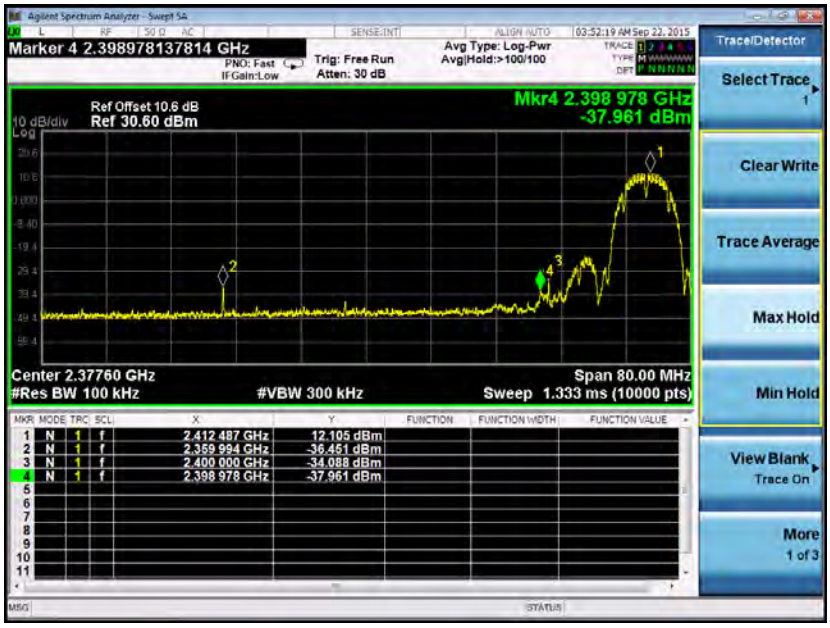
5 MHz, 802.11b, Channel 11, Chain 0

5 MHz, 802.11b, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Bandedge Test Data (Conducted)

10 MHz, 802.11b, Channel 1, Chain 0



10 MHz, 802.11b, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Bandedge Test Data (Conducted)

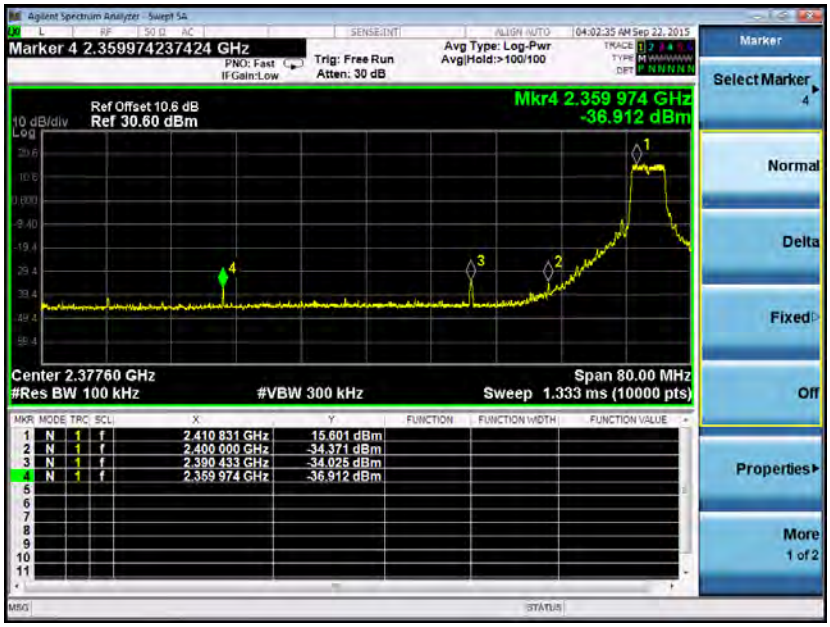
10 MHz, 802.11b, Channel 11, Chain 0

10 MHz, 802.11b, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Bandedge Test Data (Conducted)

5 MHz, 802.11g, Channel 1, Chain 0



5 MHz, 802.11g, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

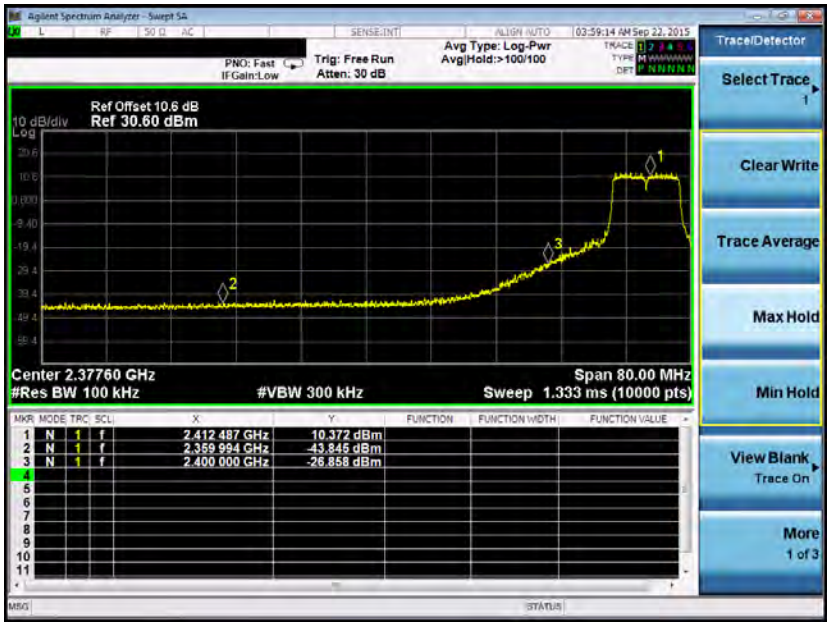
Bandedge Test Data (Conducted)

5 MHz, 802.11g, Channel 11, Chain 0

5 MHz, 802.11g, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Bandedge Test Data (Conducted)



10 MHz, 802.11g, Channel 1, Chain 0

10 MHz, 802.11g, Channel 1, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

Bandedge Test Data (Conducted)

10 MHz, 802.11g, Channel 11, Chain 0

10 MHz, 802.11g, Channel 11, Chain 1

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

APPENDIX B

TEST SETUP DIAGRAMS

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

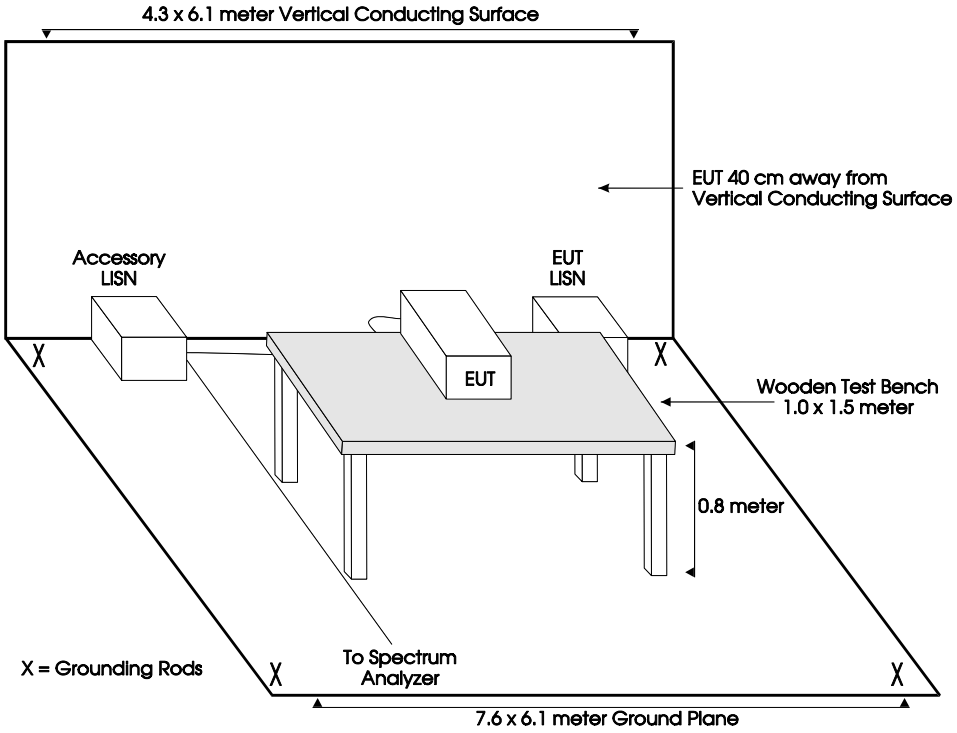


FIGURE 1 – TABLETOP CONDUCTED EMISSIONS TEST SETUP – SITE "D"

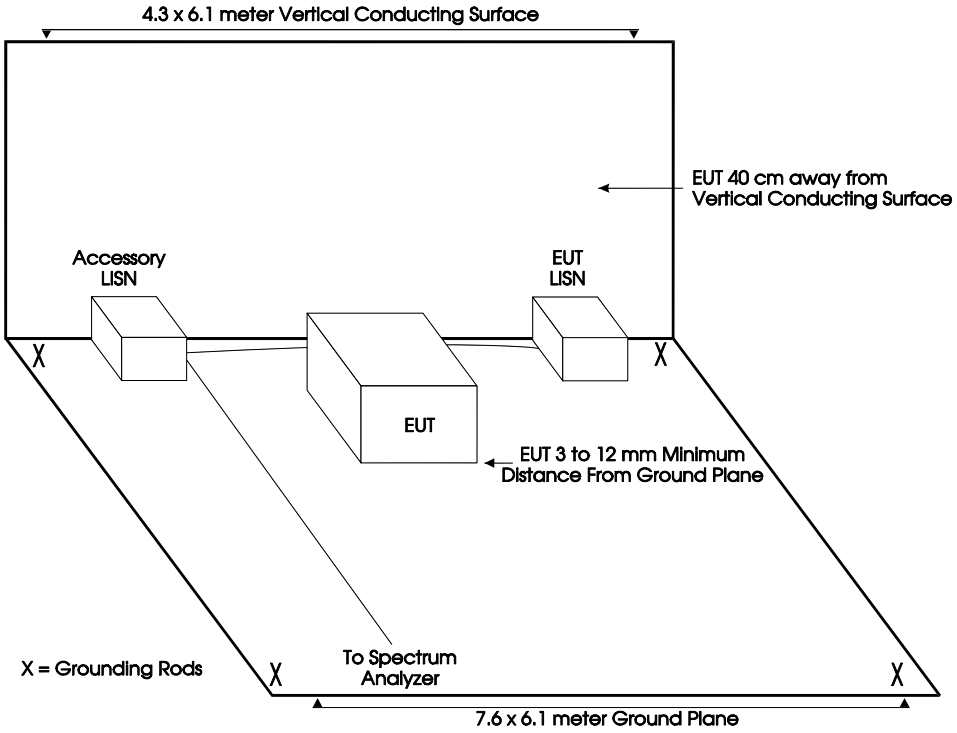


FIGURE 1a – FLOORSTANDING CONDUCTED EMISSIONS TEST SETUP – SITE "D"

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

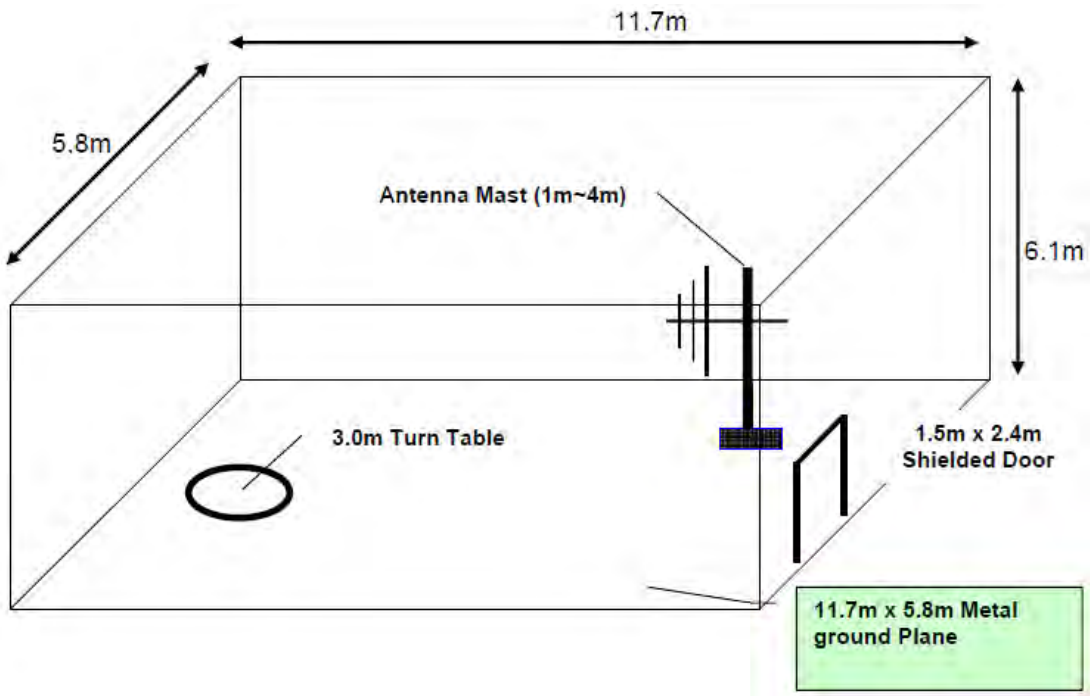


FIGURE 3 - LAYOUT OF 5 METER SEMI-ANECHOIC CHAMBER

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

APPENDIX C

MODIFICATIONS TO THE EUT

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

MODIFICATIONS TO THE EUT

No modifications were made to the EUT by Electro Magnetic Test, Inc. personnel during the testing.

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

APPENDIX D

ADDITIONAL MODELS COVERED UNDER THIS REPORT

EMT ELECTRO MAGNETIC TEST, INC.
1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

ADDITIONAL MODELS COVERED UNDER THIS REPORT

There are no additional models to be covered under this report.