Cisco Systems, Inc.

TEST REPORT FOR

IR509 915MHz WPAN Router w/2 Serial, 1 FE LAN
Model: IR509UWP-915/K9
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna
Model: IR529UBWP-915S/K9
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna
Model: IR529UBWP-915D/K9

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)
15.207 and 15.247

Report No.: 95599-10

Date of issue: October 10, 2014

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

TABLE OF CONTENTS

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Cisco Systems, Inc.
Bldg. 23 170 W. Tasman Dr.
San Jose, CA 95134-1706

Representative: Charles Troia
Customer Reference Number: US201950761

REPORT PREPARED BY:

Morgan Tramontin
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 95599

DATE OF EQUIPMENT RECEIPT: May 14, 2014
DATE(S) OF TESTING: May 14 - September 9, 2014

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.00.14
Immunity	5.00.07

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Mariposa A	US0103	SL2-IN-E-1147R	3082A-2	90477	A-0136

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C

Test Procedure/Method	Description	Modifications*	Results
15.207 / ANSI C63.4	Conducted Emissions	NA	Pass
15.205(e)	Restricted Bands	NA	Pass
15.247(a)(1)/558074 DO1 DTS MEAS GUIDANCE V01	Carrier Frequency Separation	NA	Pass
15.247(a)(1)(i)/558074 DO1 DTS MEAS GUIDANCE V01	20dB Bandwidth	NA	Pass
15.247(a)(1)(i)/558074 DO1 DTS MEAS GUIDANCE V01	Dwell Time	NA	Pass
15.247(a)(1)(i) /558074 DO1 DTS MEAS GUIDANCE V01	Number of Hopping Channels	NA	Pass
15.247(b)(2)/558074 DO1 DTS MEAS GUIDANCE V01	Conducted Output Power	NA	Pass
15.247(d)/558074 DO1 DTS MEAS GUIDANCE V01	Conducted Spurious Emissions and Band Edge	NA	Pass

Modifications*/Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.
The three devices depicted throughout the report all employ the same transmitter, but each device uses different transmit antennas. Transmitter requirements that do not change from device to device were evaluated on the model IR509UWP-915/K9 only, because this device displayed the greatest output power.

***Modifications listed above must be incorporated into all production units.**

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

IR509 915MHz WPAN Router w/2 serial, 1 FE LAN
Manuf: Cisco Systems, Inc.
Model: IR509UWP-915S/K9
Serial: JMX1802X013

IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna
Manuf: Cisco Systems, Inc.
Model: IR529UBWP-915D/K9
Serial: JMX1828X00L

IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna
Manuf: Cisco Systems, Inc.
Model: IR529UBWP-915S/K9
Serial: JMX1813X01G

Range Extender-Advanced with Dual Antenna
Manuf: Cisco Systems, Inc.
Model: IR529UBWP-915D/K9
Serial: JMX1813X00V

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Laptop Computer
Manuf: Toshiba
Model: Portege
Serial: G66C0002GC10

AC-DC Power Converter
Manuf: Cisco Systems, Inc.
Model: 341-0304-01
Serial: DTM170704Z2

FCC PART 15 SUBPART C

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) CFR 47 Section 15 Subpart C requirements for Intentional Radiators.

15.207 AC Conducted Emissions

Test Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer: **Cisco Systems**
Specification: **15.207 AC Mains - Average**
Work Order #: **95599** Date: 5/16/2014
Test Type: **Conducted Emissions** Time: 3:03:18 PM
Equipment: **IR509 915MHz WPAN router w/2 serial, 1 FE LAN** Sequence#: 9
Manufacturer: Cisco Systems, Inc. Tested By: Eddie Mariscal
Model: IR509UWP-915S/K9 120V 60Hz
S/N: JMX1802X013

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014
T1	ANP05624	Attenuator	PE7010-10	8/13/2012	8/13/2014
T2	ANMACOND	Cable		8/17/2012	8/17/2014
T3	AN02609	High Pass Filter	HE9615-150K-50-720B	3/25/2014	3/25/2016
T4	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015
	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR509 915MHz WPAN router w/2 serial, 1 FE LAN*	Cisco Systems, Inc.	IR509UWP-915S/K9	JMX1802X013

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10
AC-DC Power converter	Cisco Systems, Inc.	341-0304-01	DTM170704Z2

Test Conditions / Notes:

EUT antenna port is terminated into a 50 ohm termination. The radio of the EUT is in constant transmit mode with frequency hopping enabled.

Frequency Range of Interest:
0.15-30MHz

RBW = 9kHz; VBW > RBW;

Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

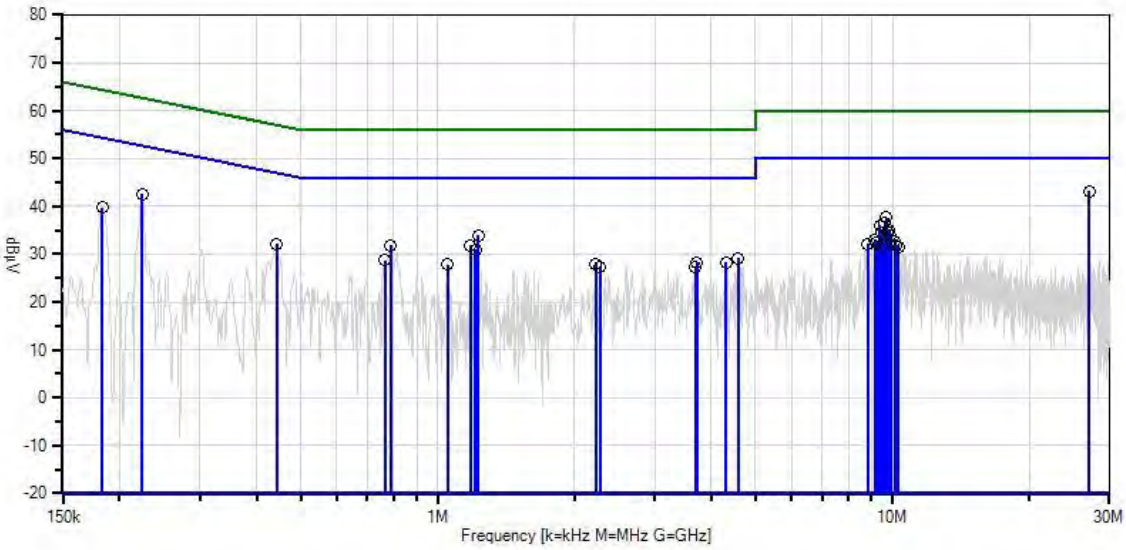
Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	27.026M	30.9	+10.0	+1.5	+0.2	+0.6	+0.0	43.2	50.0	-6.8	Black
2	223.950k	31.3	+10.0	+0.2	+0.2	+0.9	+0.0	42.6	52.7	-10.1	Black
3	1.229M	23.2	+10.0	+0.3	+0.2	+0.3	+0.0	34.0	46.0	-12.0	Black
4	9.707M	26.4	+10.0	+0.9	+0.1	+0.3	+0.0	37.7	50.0	-12.3	Black
5	9.613M	25.1	+10.0	+0.9	+0.1	+0.3	+0.0	36.4	50.0	-13.6	Black
6	9.392M	24.8	+10.0	+0.9	+0.1	+0.3	+0.0	36.1	50.0	-13.9	Black
7	790.137k	21.0	+10.0	+0.3	+0.2	+0.3	+0.0	31.8	46.0	-14.2	Black
8	1.181M	21.0	+10.0	+0.3	+0.2	+0.3	+0.0	31.8	46.0	-14.2	Black
9	183.000k	28.2	+10.0	+0.1	+0.3	+1.2	+0.0	39.8	54.3	-14.5	Black
10	9.826M	23.9	+10.0	+0.9	+0.1	+0.3	+0.0	35.2	50.0	-14.8	Black
11	442.532k	21.2	+10.0	+0.2	+0.2	+0.5	+0.0	32.1	47.0	-14.9	Black
12	1.209M	20.1	+10.0	+0.3	+0.2	+0.3	+0.0	30.9	46.0	-15.1	Black
13	9.733M	23.5	+10.0	+0.9	+0.1	+0.3	+0.0	34.8	50.0	-15.2	Black
14	9.494M	23.3	+10.0	+0.9	+0.1	+0.3	+0.0	34.6	50.0	-15.4	Black
15	9.903M	22.7	+10.0	+0.9	+0.1	+0.3	+0.0	34.0	50.0	-16.0	Black
16	4.587M	18.3	+9.9	+0.6	+0.1	+0.3	+0.0	29.2	46.0	-16.8	Black
17	9.137M	21.8	+10.0	+0.9	+0.1	+0.3	+0.0	33.1	50.0	-16.9	Black

18	10.115M	21.5	+10.0	+0.9	+0.1	+0.3	+0.0	32.8	50.0	-17.2	Black
19	766.866k	17.9	+10.0	+0.3	+0.2	+0.3	+0.0	28.7	46.0	-17.3	Black
20	3.711M	17.4	+9.9	+0.6	+0.1	+0.3	+0.0	28.3	46.0	-17.7	Black
21	4.315M	17.4	+9.9	+0.6	+0.1	+0.3	+0.0	28.3	46.0	-17.7	Black
22	9.205M	21.0	+10.0	+0.9	+0.1	+0.3	+0.0	32.3	50.0	-17.7	Black
23	8.822M	20.9	+10.0	+0.9	+0.1	+0.3	+0.0	32.2	50.0	-17.8	Black
24	2.231M	17.2	+9.9	+0.5	+0.1	+0.3	+0.0	28.0	46.0	-18.0	Black
25	1.050M	17.1	+10.0	+0.3	+0.2	+0.3	+0.0	27.9	46.0	-18.1	Black
26	10.200M	20.5	+10.0	+0.9	+0.1	+0.3	+0.0	31.8	50.0	-18.2	Black
27	9.443M	20.4	+10.0	+0.9	+0.1	+0.3	+0.0	31.7	50.0	-18.3	Black
28	10.314M	20.3	+10.0	+0.9	+0.1	+0.3	+0.0	31.6	50.0	-18.4	Black
29	2.273M	16.6	+9.9	+0.5	+0.1	+0.3	+0.0	27.4	46.0	-18.6	Black
30	3.694M	16.5	+9.9	+0.6	+0.1	+0.3	+0.0	27.4	46.0	-18.6	Black

CKC Laboratories, Inc. Date: 5/16/2014 Time: 3:03:18 PM Cisco Systems WO#: 95599
15.207 AC Mains - Average Test Lead: Black 120V 60Hz Sequence#: 9 Ext ATTN: 0 dB



Sweep Data
Peak Readings
Average Readings
1 - 15.207 AC Mains - Average
Readings
QP Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**95599**	Date:	5/16/2014
Test Type:	**Conducted Emissions**	Time:	3:19:48 PM
Equipment:	**IR509 915MHz WPAN router w/2 serial, 1 FE LAN**	Sequence#:	10
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR509UWP-915S/K9		120V 60Hz
S/N:	JMX1802X013		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014
T1	ANP05624	Attenuator	PE7010-10	8/13/2012	8/13/2014
T2	ANMACOND	Cable		8/17/2012	8/17/2014
T3	AN02609	High Pass Filter	HE9615-150K-50-720B	3/25/2014	3/25/2016
	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015
T4	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR509 915MHz WPAN router w/2 serial, 1 FE LAN*	Cisco Systems, Inc.	IR509UWP-915S/K9	JMX1802X013

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10
AC-DC Power converter	Cisco Systems, Inc.	341-0304-01	DTM170704Z2

Test Conditions / Notes:

EUT antenna port is terminated into a 50 ohm termination. The radio of the EUT is in constant transmit mode with frequency hopping enabled.

Frequency Range of Interest:
0.15-30MHz

RBW = 9kHz; VBW > RBW;

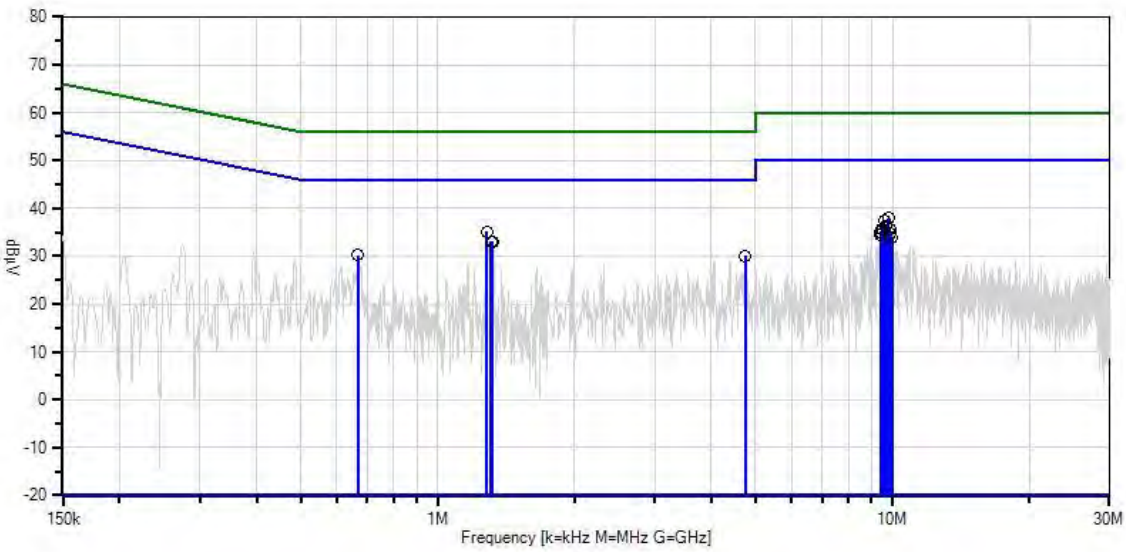
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: White

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	1.283M	24.3	+10.0	+0.3	+0.2	+0.3	+0.0	35.1	46.0	-10.9	White
2	9.792M	26.6	+10.0	+0.9	+0.1	+0.4	+0.0	38.0	50.0	-12.0	White
3	9.571M	26.1	+10.0	+0.9	+0.1	+0.4	+0.0	37.5	50.0	-12.5	White
4	1.311M	22.2	+10.0	+0.4	+0.2	+0.3	+0.0	33.1	46.0	-12.9	White
5	1.322M	22.2	+10.0	+0.4	+0.2	+0.3	+0.0	33.1	46.0	-12.9	White
6	9.707M	24.9	+10.0	+0.9	+0.1	+0.4	+0.0	36.3	50.0	-13.7	White
7	9.477M	24.4	+10.0	+0.9	+0.1	+0.4	+0.0	35.8	50.0	-14.2	White
8	9.886M	24.3	+10.0	+0.9	+0.1	+0.4	+0.0	35.7	50.0	-14.3	White
9	9.426M	23.8	+10.0	+0.9	+0.1	+0.4	+0.0	35.2	50.0	-14.8	White
10	9.452M	23.5	+10.0	+0.9	+0.1	+0.4	+0.0	34.9	50.0	-15.1	White
11	9.920M	23.5	+10.0	+0.9	+0.1	+0.4	+0.0	34.9	50.0	-15.1	White
12	9.401M	23.1	+10.0	+0.9	+0.1	+0.4	+0.0	34.5	50.0	-15.5	White
13	669.421k	19.4	+10.0	+0.2	+0.2	+0.4	+0.0	30.2	46.0	-15.8	White
14	4.748M	19.2	+9.9	+0.6	+0.1	+0.3	+0.0	30.1	46.0	-15.9	White
15	9.979M	22.6	+10.0	+0.9	+0.1	+0.4	+0.0	34.0	50.0	-16.0	White

CKC Laboratories, Inc. Date: 5/16/2014 Time: 3:19:48 PM Cisco Systems WO#: 95599
15.207 AC Mains - Average Test Lead: White 120V 60Hz Sequence#: 10 Ext ATTN: 0 dB



Sweep Data
Peak Readings
Average Readings
1 - 15.207 AC Mains - Average
Readings
QP Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**95599**	Date:	5/16/2014
Test Type:	**Conducted Emissions**	Time:	10:42:23
Equipment:	**IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna**	Sequence#:	1
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR529UBWP-915D/K9		120V 60Hz
S/N:	JMX1828X00L		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014
T1	ANP05624	Attenuator	PE7010-10	8/13/2012	8/13/2014
T2	ANMACOND	Cable		8/17/2012	8/17/2014
T3	AN02609	High Pass Filter	HE9615-150K-50-720B	3/25/2014	3/25/2016
T4	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015
	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna*	Cisco Systems, Inc.	IR529UBWP-915D/K9	JMX1828X00L

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT antenna ports are both terminated into 50 ohm terminations. EUT is in constant transmit mode with frequency hopping function enabled.

Frequency Range of Interest:
0.15-30MHz

RBW = 9kHz; VBW > RBW;

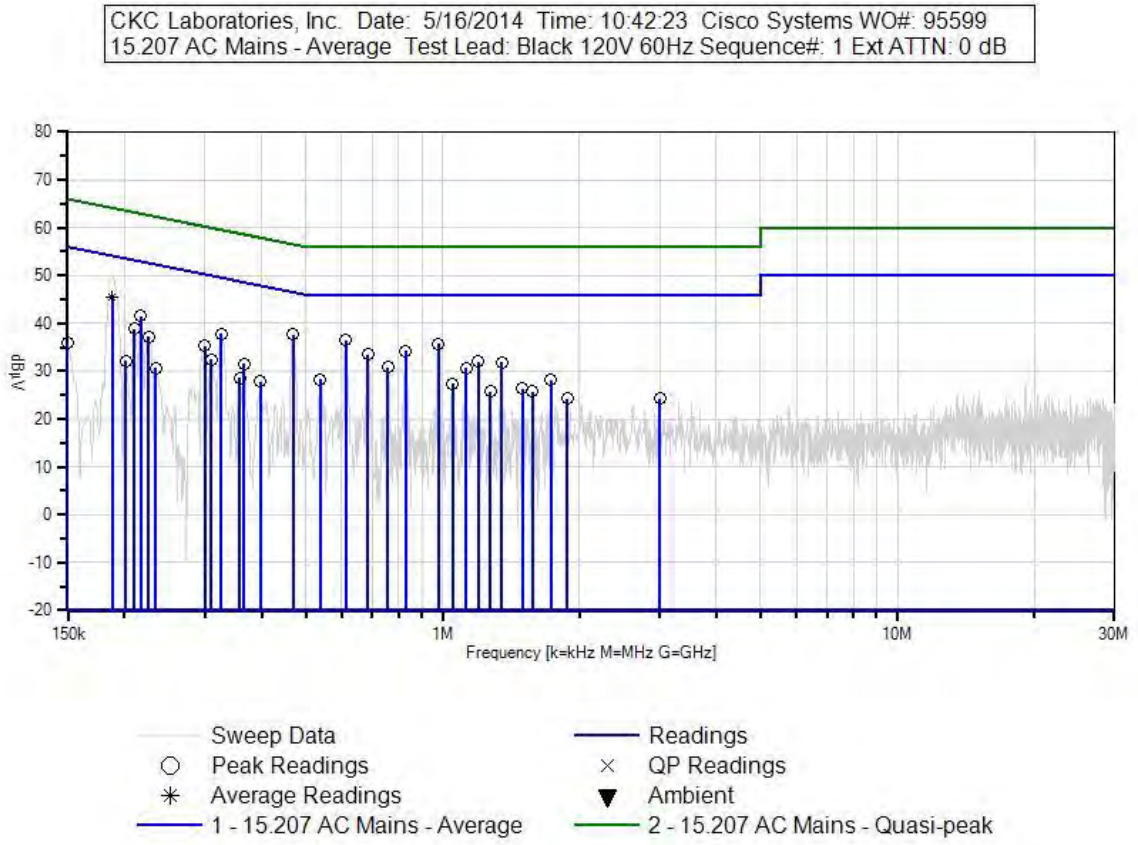
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	187.650k Ave	34.1	+10.0	+0.1	+0.3	+1.1	+0.0	45.6	54.1	-8.5	Black
^	187.650k	38.8	+10.0	+0.1	+0.3	+1.1	+0.0	50.3	54.1	-3.8	Black
3	468.712k	26.8	+10.0	+0.2	+0.2	+0.4	+0.0	37.6	46.5	-8.9	Black
4	612.699k	25.7	+10.0	+0.2	+0.2	+0.4	+0.0	36.5	46.0	-9.5	Black
5	977.756k	25.0	+10.0	+0.3	+0.2	+0.3	+0.0	35.8	46.0	-10.2	Black
6	217.200k	30.1	+10.0	+0.2	+0.2	+1.0	+0.0	41.5	52.9	-11.4	Black
7	829.406k	23.5	+10.0	+0.3	+0.2	+0.3	+0.0	34.3	46.0	-11.7	Black
8	326.179k	26.9	+10.0	+0.2	+0.1	+0.6	+0.0	37.8	49.5	-11.7	Black
9	685.419k	22.7	+10.0	+0.2	+0.2	+0.4	+0.0	33.5	46.0	-12.5	Black
10	1.199M	21.2	+10.0	+0.3	+0.2	+0.3	+0.0	32.0	46.0	-14.0	Black
11	1.349M	21.0	+10.0	+0.4	+0.2	+0.3	+0.0	31.9	46.0	-14.1	Black
12	210.450k	27.5	+10.0	+0.2	+0.2	+1.0	+0.0	38.9	53.2	-14.3	Black
13	299.850k	24.4	+10.0	+0.2	+0.1	+0.6	+0.0	35.3	50.2	-14.9	Black
14	758.140k	20.0	+10.0	+0.3	+0.2	+0.3	+0.0	30.8	46.0	-15.2	Black
15	1.126M	19.9	+10.0	+0.3	+0.2	+0.3	+0.0	30.7	46.0	-15.3	Black
16	225.900k	25.9	+10.0	+0.2	+0.2	+0.9	+0.0	37.2	52.6	-15.4	Black
17	365.449k	20.8	+10.0	+0.2	+0.1	+0.5	+0.0	31.6	48.6	-17.0	Black
18	310.181k	21.5	+10.0	+0.2	+0.1	+0.6	+0.0	32.4	50.0	-17.6	Black
19	538.524k	17.5	+10.0	+0.2	+0.2	+0.4	+0.0	28.3	46.0	-17.7	Black
20	1.728M	17.4	+9.9	+0.4	+0.2	+0.3	+0.0	28.2	46.0	-17.8	Black
21	1.050M	16.6	+10.0	+0.3	+0.2	+0.3	+0.0	27.4	46.0	-18.6	Black
22	1.496M	15.5	+10.0	+0.4	+0.2	+0.3	+0.0	26.4	46.0	-19.6	Black
23	150.000k	21.6	+10.0	+0.1	+2.8	+1.5	+0.0	36.0	56.0	-20.0	Black
24	397.446k	16.9	+10.0	+0.2	+0.2	+0.5	+0.0	27.8	47.9	-20.1	Black

25	1.276M	15.0	+10.0	+0.3	+0.2	+0.3	+0.0	25.8	46.0	-20.2	Black
26	358.176k	17.8	+10.0	+0.2	+0.1	+0.5	+0.0	28.6	48.8	-20.2	Black
27	1.576M	14.9	+9.9	+0.4	+0.2	+0.3	+0.0	25.7	46.0	-20.3	Black
28	201.300k	20.8	+10.0	+0.1	+0.2	+1.0	+0.0	32.1	53.6	-21.5	Black
29	233.850k	19.4	+10.0	+0.2	+0.2	+0.9	+0.0	30.7	52.3	-21.6	Black
30	3.005M	13.4	+10.0	+0.5	+0.1	+0.3	+0.0	24.3	46.0	-21.7	Black
31	1.882M	13.5	+9.9	+0.4	+0.1	+0.3	+0.0	24.2	46.0	-21.8	Black



Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**95599**	Date:	5/16/2014
Test Type:	**Conducted Emissions**	Time:	10:44:45 AM
Equipment:	**IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna**	Sequence#:	2
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR529UBWP-915D/K9		120V 60Hz
S/N:	JMX1828X00L		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014
T1	ANP05624	Attenuator	PE7010-10	8/13/2012	8/13/2014
T2	ANMACOND	Cable		8/17/2012	8/17/2014
T3	AN02609	High Pass Filter	HE9615-150K-50-720B	3/25/2014	3/25/2016
	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015
T4	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna*	Cisco Systems, Inc.	IR529UBWP-915D/K9	JMX1828X00L

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT antenna ports are both terminated into 50 ohm terminations. EUT is in constant transmit mode with frequency hopping function enabled.

Frequency Range of Interest:
0.15-30MHz

RBW = 9kHz; VBW > RBW;

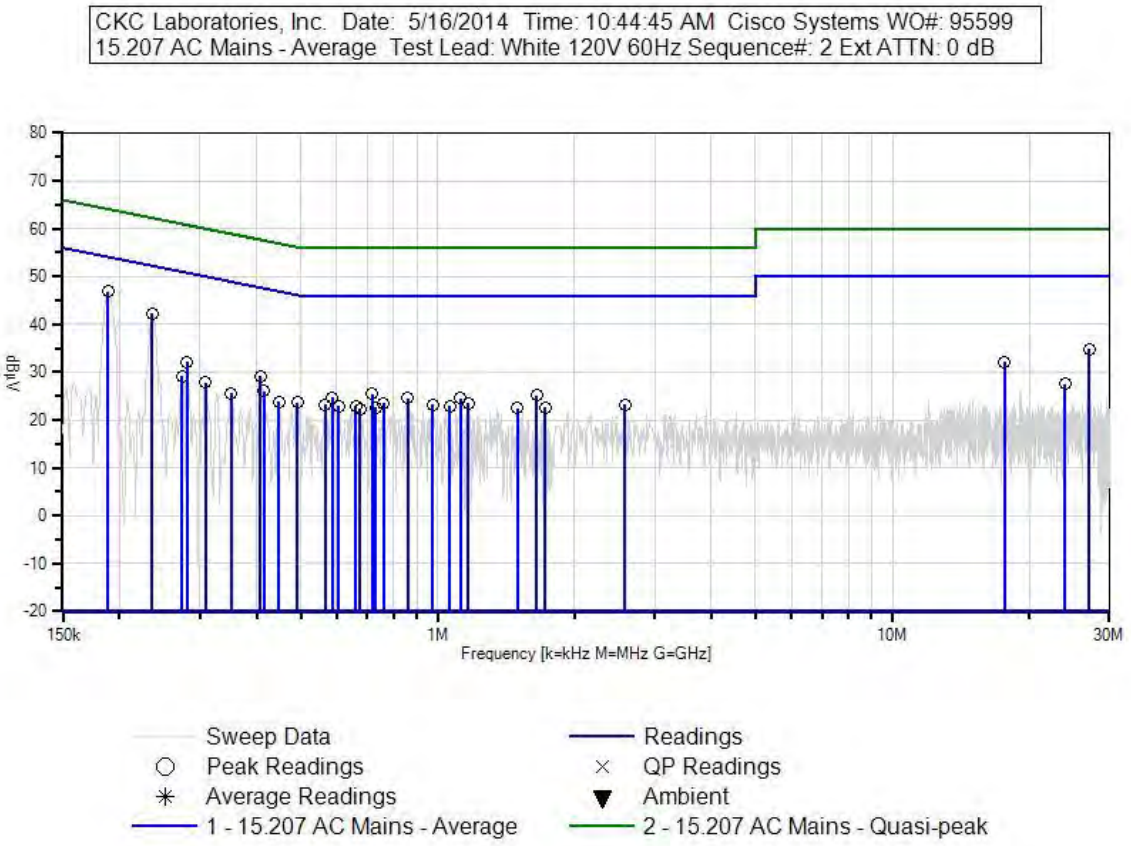
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: White

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	188.550k	35.4	+10.0	+0.1	+0.2	+1.2	+0.0	46.9	54.1	-7.2	White
2	235.800k	31.0	+10.0	+0.2	+0.2	+0.9	+0.0	42.3	52.2	-9.9	White
3	27.026M	22.6	+10.0	+1.5	+0.2	+0.5	+0.0	34.8	50.0	-15.2	White
4	17.611M	20.4	+10.0	+1.2	+0.1	+0.5	+0.0	32.2	50.0	-17.8	White
5	407.626k	18.3	+10.0	+0.2	+0.2	+0.5	+0.0	29.2	47.7	-18.5	White
6	281.250k	21.0	+10.0	+0.2	+0.2	+0.7	+0.0	32.1	50.8	-18.7	White
7	717.416k	14.6	+10.0	+0.3	+0.2	+0.4	+0.0	25.5	46.0	-20.5	White
8	1.651M	14.3	+9.9	+0.4	+0.2	+0.3	+0.0	25.1	46.0	-20.9	White
9	586.519k	13.9	+10.0	+0.2	+0.2	+0.4	+0.0	24.7	46.0	-21.3	White
10	859.949k	13.7	+10.0	+0.3	+0.2	+0.4	+0.0	24.6	46.0	-21.4	White
11	414.899k	15.1	+10.0	+0.2	+0.2	+0.5	+0.0	26.0	47.5	-21.5	White
12	1.125M	13.7	+10.0	+0.3	+0.2	+0.3	+0.0	24.5	46.0	-21.5	White
13	274.650k	18.1	+10.0	+0.2	+0.2	+0.7	+0.0	29.2	51.0	-21.8	White
14	308.726k	16.9	+10.0	+0.2	+0.1	+0.7	+0.0	27.9	50.0	-22.1	White
15	23.990M	15.5	+10.0	+1.4	+0.2	+0.5	+0.0	27.6	50.0	-22.4	White
16	491.982k	12.8	+10.0	+0.2	+0.2	+0.5	+0.0	23.7	46.1	-22.4	White
17	1.170M	12.8	+10.0	+0.3	+0.2	+0.3	+0.0	23.6	46.0	-22.4	White
18	761.049k	12.6	+10.0	+0.3	+0.2	+0.4	+0.0	23.5	46.0	-22.5	White
19	2.579M	12.4	+10.0	+0.5	+0.1	+0.3	+0.0	23.3	46.0	-22.7	White
20	566.157k	12.4	+10.0	+0.2	+0.2	+0.4	+0.0	23.2	46.0	-22.8	White
21	976.302k	12.4	+10.0	+0.3	+0.2	+0.3	+0.0	23.2	46.0	-22.8	White
22	660.694k	12.2	+10.0	+0.2	+0.2	+0.4	+0.0	23.0	46.0	-23.0	White
23	1.062M	12.2	+10.0	+0.3	+0.2	+0.3	+0.0	23.0	46.0	-23.0	White
24	448.350k	12.9	+10.0	+0.2	+0.2	+0.5	+0.0	23.8	46.9	-23.1	White

25	606.881k	12.1	+10.0	+0.2	+0.2	+0.4	+0.0	22.9	46.0	-23.1	White
26	352.359k	14.7	+10.0	+0.2	+0.1	+0.6	+0.0	25.6	48.9	-23.3	White
27	730.506k	11.7	+10.0	+0.3	+0.2	+0.4	+0.0	22.6	46.0	-23.4	White
28	1.727M	11.8	+9.9	+0.4	+0.2	+0.3	+0.0	22.6	46.0	-23.4	White
29	1.500M	11.6	+10.0	+0.4	+0.2	+0.3	+0.0	22.5	46.0	-23.5	White
30	675.238k	11.6	+10.0	+0.2	+0.2	+0.4	+0.0	22.4	46.0	-23.6	White



Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**95599**	Date:	5/16/2014
Test Type:	**Conducted Emissions**	Time:	2:03:06 PM
Equipment:	**IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna**	Sequence#:	8
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR529UBWP-915S/K9		120V 60Hz
S/N:	JMX1813X01G		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014
T1	ANP05624	Attenuator	PE7010-10	8/13/2012	8/13/2014
T2	ANMACOND	Cable		8/17/2012	8/17/2014
T3	AN02609	High Pass Filter	HE9615-150K-50-720B	3/25/2014	3/25/2016
T4	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015
	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna*	Cisco Systems, Inc.	IR529UBWP-915S/K9	JMX1813X01G

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT antenna ports are both terminated into 50 ohm terminations. The radio of the EUT is in constant transmit mode with frequency hopping enabled.

Frequency Range of Interest:
0.15-30MHz

RBW = 9kHz; VBW > RBW;

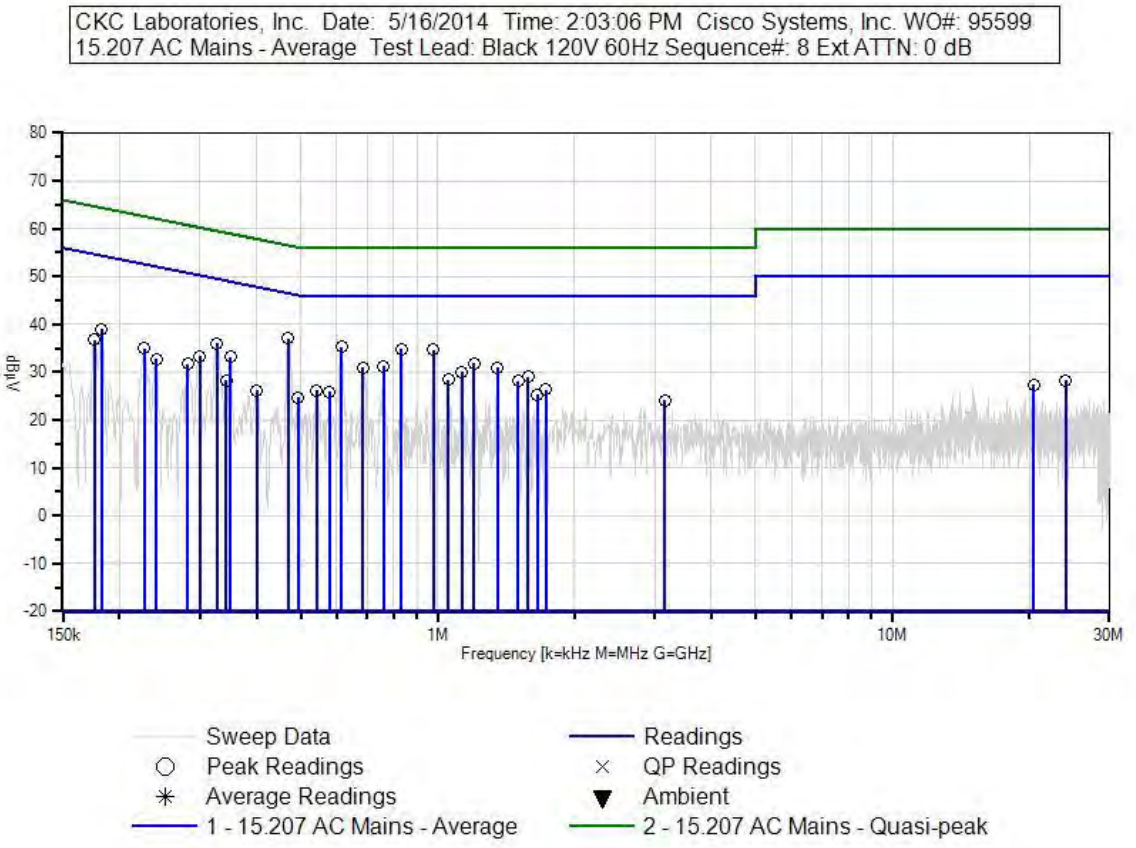
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: Black

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	470.166k	26.2	+10.0	+0.2	+0.2	+0.4	+0.0	37.0	46.5	-9.5	Black
2	614.153k	24.5	+10.0	+0.2	+0.2	+0.4	+0.0	35.3	46.0	-10.7	Black
3	832.315k	24.1	+10.0	+0.3	+0.2	+0.3	+0.0	34.9	46.0	-11.1	Black
4	979.210k	23.9	+10.0	+0.3	+0.2	+0.3	+0.0	34.7	46.0	-11.3	Black
5	327.634k	25.2	+10.0	+0.2	+0.1	+0.6	+0.0	36.1	49.5	-13.4	Black
6	1.202M	21.1	+10.0	+0.3	+0.2	+0.3	+0.0	31.9	46.0	-14.1	Black
7	759.594k	20.4	+10.0	+0.3	+0.2	+0.3	+0.0	31.2	46.0	-14.8	Black
8	685.419k	20.1	+10.0	+0.2	+0.2	+0.4	+0.0	30.9	46.0	-15.1	Black
9	1.353M	20.0	+10.0	+0.4	+0.2	+0.3	+0.0	30.9	46.0	-15.1	Black
10	182.400k	27.4	+10.0	+0.1	+0.3	+1.2	+0.0	39.0	54.4	-15.4	Black
11	350.904k	22.3	+10.0	+0.2	+0.1	+0.6	+0.0	33.2	48.9	-15.7	Black
12	1.129M	19.2	+10.0	+0.3	+0.2	+0.3	+0.0	30.0	46.0	-16.0	Black
13	299.850k	22.5	+10.0	+0.2	+0.1	+0.6	+0.0	33.4	50.2	-16.8	Black
14	1.580M	18.3	+9.9	+0.4	+0.2	+0.3	+0.0	29.1	46.0	-16.9	Black
15	1.055M	17.7	+10.0	+0.3	+0.2	+0.3	+0.0	28.5	46.0	-17.5	Black
16	226.650k	23.7	+10.0	+0.2	+0.2	+0.9	+0.0	35.0	52.6	-17.6	Black
17	1.503M	17.3	+10.0	+0.4	+0.2	+0.3	+0.0	28.2	46.0	-17.8	Black
18	175.950k	25.1	+10.0	+0.1	+0.3	+1.2	+0.0	36.7	54.7	-18.0	Black
19	282.450k	20.6	+10.0	+0.2	+0.2	+0.7	+0.0	31.7	50.7	-19.0	Black
20	240.600k	21.5	+10.0	+0.2	+0.2	+0.8	+0.0	32.7	52.1	-19.4	Black
21	1.733M	15.5	+9.9	+0.4	+0.2	+0.3	+0.0	26.3	46.0	-19.7	Black
22	541.432k	15.4	+10.0	+0.2	+0.2	+0.4	+0.0	26.2	46.0	-19.8	Black
23	579.247k	15.1	+10.0	+0.2	+0.2	+0.4	+0.0	25.9	46.0	-20.1	Black
24	1.657M	14.5	+9.9	+0.4	+0.2	+0.3	+0.0	25.3	46.0	-20.7	Black

25	343.632k	17.4	+10.0	+0.2	+0.1	+0.6	+0.0	28.3	49.1	-20.8	Black
26	493.437k	13.9	+10.0	+0.2	+0.2	+0.4	+0.0	24.7	46.1	-21.4	Black
27	400.354k	15.3	+10.0	+0.2	+0.2	+0.5	+0.0	26.2	47.8	-21.6	Black
28	23.999M	16.1	+10.0	+1.4	+0.2	+0.6	+0.0	28.3	50.0	-21.7	Black
29	3.158M	13.2	+10.0	+0.5	+0.1	+0.3	+0.0	24.1	46.0	-21.9	Black
30	20.458M	15.4	+10.0	+1.3	+0.2	+0.5	+0.0	27.4	50.0	-22.6	Black



Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**95599**	Date:	5/16/2014
Test Type:	**Conducted Emissions**	Time:	1:56:47 PM
Equipment:	**IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna**	Sequence#:	7
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR529UBWP-915S/K9		120V 60Hz
S/N:	JMX1813X01G		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014
T1	ANP05624	Attenuator	PE7010-10	8/13/2012	8/13/2014
T2	ANMACOND	Cable		8/17/2012	8/17/2014
T3	AN02609	High Pass Filter	HE9615-150K-50-720B	3/25/2014	3/25/2016
	AN00374	50uH LISN-Black Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015
T4	AN00374	50uH LISN-White Lead Amplitude (dB)	8028-TS-50-BNC	3/15/2013	3/15/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna*	Cisco Systems, Inc.	IR529UBWP-915S/K9	JMX1813X01G

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT antenna ports are both terminated into 50 ohm terminations. The radio of the EUT is in constant transmit mode with frequency hopping enabled.

Frequency Range of Interest:
0.15-30MHz

RBW = 9kHz; VBW > RBW;

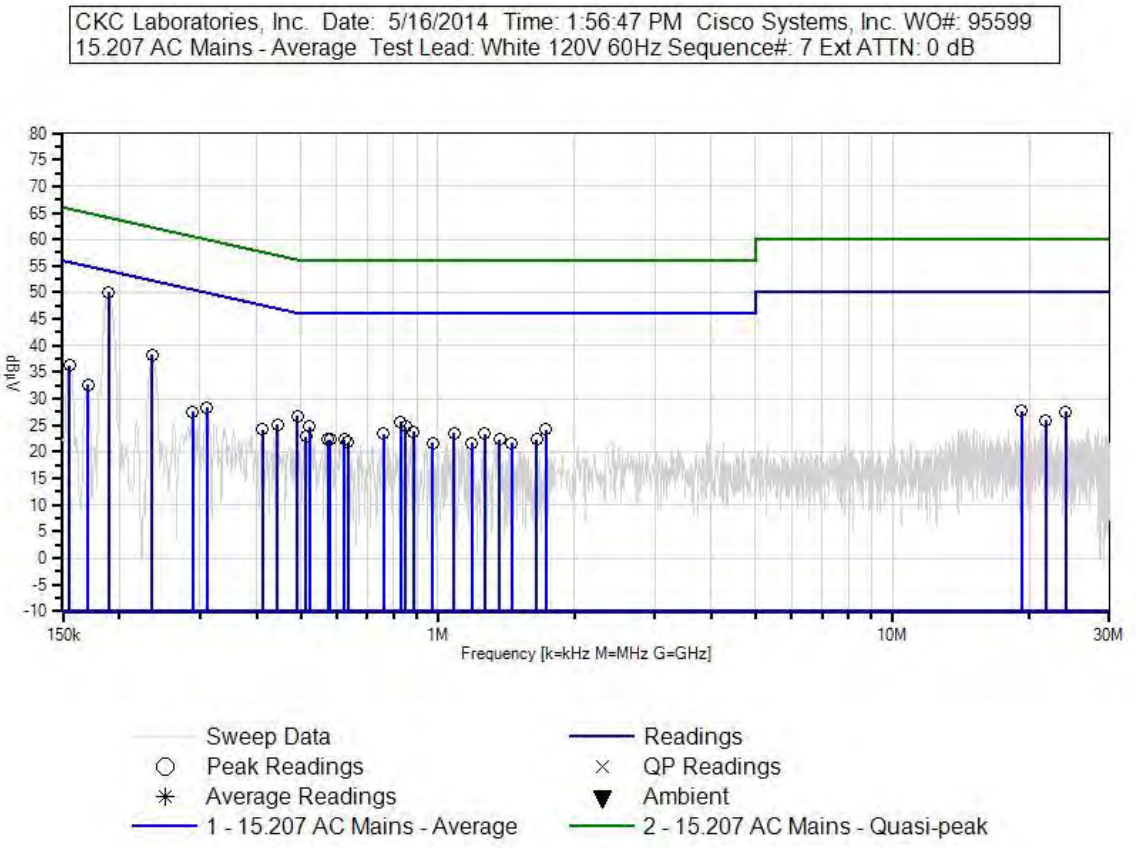
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: White

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	189.000k	38.6	+10.0	+0.1	+0.2	+1.2	+0.0	50.1	54.1	-4.0	White
2	235.800k	27.0	+10.0	+0.2	+0.2	+0.9	+0.0	38.3	52.2	-13.9	White
3	491.982k	15.9	+10.0	+0.2	+0.2	+0.5	+0.0	26.8	46.1	-19.3	White
4	154.950k	23.0	+10.0	+0.1	+1.7	+1.5	+0.0	36.3	55.7	-19.4	White
5	829.406k	14.8	+10.0	+0.3	+0.2	+0.4	+0.0	25.7	46.0	-20.3	White
6	522.525k	14.0	+10.0	+0.2	+0.2	+0.4	+0.0	24.8	46.0	-21.2	White
7	851.222k	13.8	+10.0	+0.3	+0.2	+0.4	+0.0	24.7	46.0	-21.3	White
8	311.635k	17.5	+10.0	+0.2	+0.1	+0.6	+0.0	28.4	49.9	-21.5	White
9	445.441k	14.3	+10.0	+0.2	+0.2	+0.5	+0.0	25.2	47.0	-21.8	White
10	1.728M	13.4	+9.9	+0.4	+0.2	+0.3	+0.0	24.2	46.0	-21.8	White
11	884.674k	12.9	+10.0	+0.3	+0.2	+0.4	+0.0	23.8	46.0	-22.2	White
12	170.250k	20.9	+10.0	+0.1	+0.3	+1.3	+0.0	32.6	54.9	-22.3	White
13	19.215M	15.7	+10.0	+1.3	+0.2	+0.5	+0.0	27.7	50.0	-22.3	White
14	1.087M	12.7	+10.0	+0.3	+0.2	+0.3	+0.0	23.5	46.0	-22.5	White
15	23.999M	15.4	+10.0	+1.4	+0.2	+0.5	+0.0	27.5	50.0	-22.5	White
16	759.594k	12.5	+10.0	+0.3	+0.2	+0.4	+0.0	23.4	46.0	-22.6	White
17	1.269M	12.6	+10.0	+0.3	+0.2	+0.3	+0.0	23.4	46.0	-22.6	White
18	289.800k	16.6	+10.0	+0.2	+0.1	+0.7	+0.0	27.6	50.5	-22.9	White
19	513.799k	12.1	+10.0	+0.2	+0.2	+0.4	+0.0	22.9	46.0	-23.1	White
20	411.990k	13.3	+10.0	+0.2	+0.2	+0.5	+0.0	24.2	47.6	-23.4	White
21	580.702k	11.6	+10.0	+0.2	+0.2	+0.4	+0.0	22.4	46.0	-23.6	White
22	1.369M	11.5	+10.0	+0.4	+0.2	+0.3	+0.0	22.4	46.0	-23.6	White
23	574.884k	11.5	+10.0	+0.2	+0.2	+0.4	+0.0	22.3	46.0	-23.7	White
24	622.879k	11.5	+10.0	+0.2	+0.2	+0.4	+0.0	22.3	46.0	-23.7	White

25	1.654M	11.5	+9.9	+0.4	+0.2	+0.3	+0.0	22.3	46.0	-23.7	White
26	21.692M	14.0	+10.0	+1.3	+0.2	+0.5	+0.0	26.0	50.0	-24.0	White
27	635.969k	11.0	+10.0	+0.2	+0.2	+0.4	+0.0	21.8	46.0	-24.2	White
28	976.302k	10.9	+10.0	+0.3	+0.2	+0.3	+0.0	21.7	46.0	-24.3	White
29	1.192M	10.9	+10.0	+0.3	+0.2	+0.3	+0.0	21.7	46.0	-24.3	White
30	1.456M	10.8	+10.0	+0.4	+0.2	+0.3	+0.0	21.7	46.0	-24.3	White



Test Setup Photo(s)

DA Gateway

Dual Antenna

Single Antenna

15.205(e) Restricted Bands

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer: **Cisco Systems, Inc.**
Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
Work Order #: **95599** Date: 6/2/2014
Test Type: **Maximized Emissions** Time: 11:02:14
Equipment: **IR509 915MHz WPAN router w/2 serial, 1 FE LAN** Sequence#: 1
Manufacturer: Cisco Systems, Inc. Tested By: Eddie Mariscal
Model: IR509UWP-915/K9
S/N: JMX1802X013

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN01991	Biconilog Antenna	CBL6111C	3/7/2014	3/7/2016
T2	ANP01224	Cable	32	8/16/2012	8/16/2014
T3	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014
T4	ANP05624	Attenuator	PE7010-10	8/13/2012	8/13/2014
T5	AN00449	Preamp-Bottom Amp (dB)	8447F	4/7/2014	4/7/2016
	AN00226	Loop Antenna	6502	3/28/2014	3/28/2016
T6	AN03155	Preamp	83017A	6/26/2013	6/26/2015
T7	AN00327	Horn Antenna	3115	3/18/2014	3/18/2016
T8	AN03355	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T9	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015
T10	AN03359	Cable		2/4/2013	2/4/2015
T11	AN03360	Cable	32022-2-29094-36TC	2/4/2013	2/4/2015
T12	ANP05904	Cable	32022-2-29094K-144TC	2/15/2013	2/15/2015
T13	AN03171	High Pass Filter	HM1155-11SS	2/26/2013	2/26/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR509 915MHz WPAN router w/2 serial, 1 FE LAN*	Cisco Systems, Inc.	IR509UWP-915/K9	JMX1802X013

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10
AC-DC Power converter	Cisco Systems, Inc.	341-0304-01	DTM170704Z2

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is rated for 12V-48VDC. EUT is powered by AC to DC power supply. This power supply is not sold with the EUT. Spurious emissions were investigated while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode.

Frequency Range of Interest:
0.009-9280MHz

0.009-0.15MHz RBW = 200kHz; VBW > RBW;
0.15-30MHz RBW = 9kHz; VBW > RBW;
30-1000MHz RBW = 120kHz; VBW > RBW;
1 - 9.28GHz RBW = 1MHz; VBW > RBW;

Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

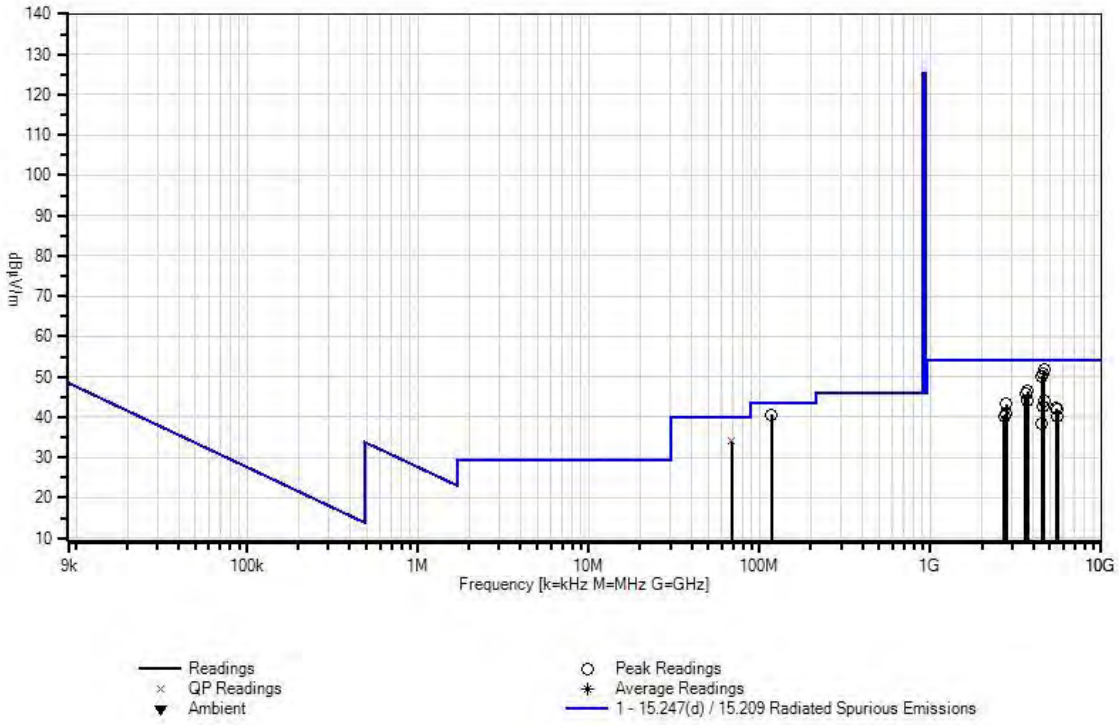
Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	4638.200M	48.0	+0.0 +0.0 +1.2 +0.3	+0.0 -33.0 +0.8	+0.0 +29.6 +0.9	+0.0 +0.8 +3.2	+0.0	51.8	54.0 Transmit High	-2.2	Vert
2	117.170M	40.6	+11.5 -22.3 +0.0 +0.0	+0.8 +0.0 +0.0	+0.0 +0.0 +0.0	+10.0 +0.0 +0.0	+0.0	40.6	43.5 Transmit Hopping	-2.9	Vert
3	4578.200M	47.1	+0.0 +0.0 +1.2 +0.3	+0.0 -33.0 +0.8	+0.0 +29.5 +0.9	+0.0 +0.8 +3.1	+0.0	50.7	54.0 Transmit Mid	-3.3	Vert
4	4511.800M	46.9	+0.0 +0.0 +1.2 +0.3	+0.0 -33.1 +0.7	+0.0 +29.3 +0.9	+0.0 +0.8 +3.1	+0.0	50.1	54.0 Transmit Low	-3.9	Vert
5	68.833M QP	39.6	+6.2 -22.3 +0.0 +0.0	+0.6 +0.0 +0.0	+0.0 +0.0 +0.0	+10.0 +0.0 +0.0	+0.0	34.1	40.0 Transmit Hopping	-5.9	Vert

^	68.833M	43.8	+6.2 -22.3 +0.0 +0.0	+0.6 +0.0 +0.0	+0.0 +0.0 +0.0	+10.0 +0.0 +0.0	+0.0	38.3	40.0 Transmit Hopping	-1.7	Vert
7	3712.000M	44.6	+0.0 +0.0 +1.1 +0.1	+0.0 -32.7 +0.7	+0.0 +28.3 +0.8	+0.0 +0.7 +2.8	+0.0	46.4	54.0 Transmit High	-7.6	Vert
8	3609.500M	44.2	+0.0 +0.0 +1.1 +0.1	+0.0 -32.7 +0.6	+0.0 +28.3 +0.8	+0.0 +0.7 +2.7	+0.0	45.8	54.0 Transmit Low	-8.2	Vert
9	3662.200M	42.2	+0.0 +0.0 +1.1 +0.1	+0.0 -32.7 +0.7	+0.0 +28.3 +0.8	+0.0 +0.7 +2.8	+0.0	44.0	54.0 Transmit Mid	-10.0	Vert
10	4638.000M	40.1	+0.0 +0.0 +1.2 +0.3	+0.0 -33.0 +0.8	+0.0 +29.6 +0.9	+0.0 +0.8 +3.2	+0.0	43.9	54.0 Transmit High	-10.1	Horiz
11	2783.000M	44.7	+0.0 +0.0 +0.8 +0.3	+0.0 -32.8 +0.6	+0.0 +26.0 +0.8	+0.0 +0.5 +2.4	+0.0	43.3	54.0 Transmit High	-10.7	Vert
12	4578.000M	39.0	+0.0 +0.0 +1.2 +0.3	+0.0 -33.0 +0.8	+0.0 +29.5 +0.9	+0.0 +0.8 +3.1	+0.0	42.6	54.0 Transmit Mid	-11.4	Horiz
13	5414.500M	37.2	+0.0 +0.0 +1.1 +0.3	+0.0 -33.4 +1.0	+0.0 +30.7 +1.0	+0.0 +0.9 +3.4	+0.0	42.2	54.0 Transmit Low	-11.8	Vert
14	5565.800M	36.7	+0.0 +0.0 +1.1 +0.3	+0.0 -33.3 +0.9	+0.0 +30.8 +1.0	+0.0 +0.9 +3.5	+0.0	41.9	54.0 Transmit High	-12.1	Vert
15	2747.000M	42.5	+0.0 +0.0 +0.8 +0.3	+0.0 -32.9 +0.6	+0.0 +25.9 +0.8	+0.0 +0.5 +2.3	+0.0	40.8	54.0 Transmit Mid	-13.2	Vert
16	2707.000M	42.3	+0.0 +0.0 +0.7 +0.3	+0.0 -32.9 +0.6	+0.0 +25.7 +0.7	+0.0 +0.5 +2.3	+0.0	40.2	54.0 Transmit Low	-13.8	Vert
17	5494.200M	35.3	+0.0 +0.0 +1.1 +0.3	+0.0 -33.4 +0.9	+0.0 +30.7 +1.0	+0.0 +0.9 +3.4	+0.0	40.2	54.0 Transmit Mid	-13.8	Vert
18	4511.000M	35.3	+0.0 +0.0 +1.2 +0.3	+0.0 -33.1 +0.7	+0.0 +29.3 +0.9	+0.0 +0.8 +3.1	+0.0	38.5	54.0 Transmit Low	-15.5	Horiz

CKC Laboratories, Inc. Date: 6/2/2014 Time: 11:02:14 Cisco Systems, Inc. WO#: 95599
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Sequence#: 1 Ext ATTN: 0 dB



Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer: **Cisco Systems, Inc.**
Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
Work Order #: **95599** Date: 9/5/2014
Test Type: **Maximized Emissions** Time: 15:21:00
Equipment: **IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna** Sequence#: 1
Manufacturer: Cisco Systems, Inc. Tested By: Eddie Mariscal
Model: IR529UBWP-915D/K9
S/N: JMX1828X00L

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN00226	Loop Antenna	6502	3/28/2014	3/28/2016
T1	AN03155	Preamp	83017A	6/26/2013	6/26/2015
T2	AN00327	Horn Antenna	3115	3/18/2014	3/18/2016
T3	AN03355	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T4	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015
T5	AN03359	Cable		2/4/2013	2/4/2015
T6	AN03360	Cable	32022-2-29094-36TC	2/4/2013	2/4/2015
T7	ANP05904	Cable	32022-2-29094K-144TC	2/15/2013	2/15/2015
T8	AN02668	Spectrum Analyzer	E4446A	8/4/2014	8/4/2015
T9	ANP02271	High Pass Filter	2.6-3.95	6/25/2014	6/25/2016
	AN01991	Biconilog Antenna	CBL6111C	3/7/2014	3/7/2016
	ANP06232	Cable	CXTA04A-35	9/5/2014	9/5/2016

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna*	Cisco Systems, Inc.	IR529UBWP-915D/K9	JMX1828X00L

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT uses two removable antennas, both of gain 9dBi, thus peak power measurements will be gathered via conducted measurements. Radiated spurious emissions will be gathered for the restricted bands as defined in FCC 15.205. EUT operates on 64 channels. EUT is powered by 120VAC/60Hz. Spurious emissions were investigated while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode.

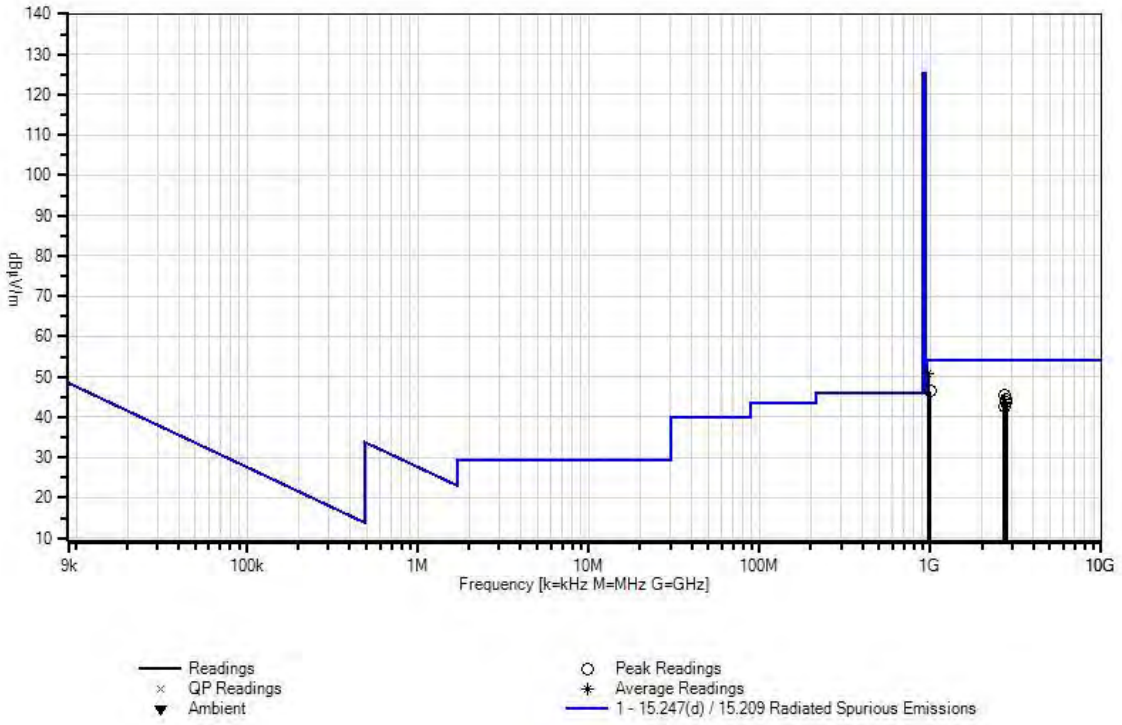
Frequency Range of Interest:
0.009-9280MHz
0.009-0.15MHz RBW = 200kHz; VBW > RBW;
0.15-30MHz RBW = 9kHz; VBW > RBW;
30-1000MHz RBW = 120kHz; VBW > RBW;
1 - 9.28GHz RBW = 1MHz; VBW > RBW;
Environmental Conditions: Temperature: 21°C, Relative Humidity: 40%, Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	966.483M Ave	61.9	-35.8 +0.4 +0.0	+21.5 +0.5	+0.4 +1.5	+0.4 +0.0	+0.0	50.8	54.0 Channel 63	-3.2	Vert
^	966.483M	65.2	-35.8 +0.4 +0.0	+21.5 +0.5	+0.4 +1.5	+0.4 +0.0	+0.0	54.1	54.0 Channel 63	+0.1	Vert
3	992.525M	57.4	-35.6 +0.4 +0.0	+21.5 +0.5	+0.4 +1.5	+0.4 +0.0	+0.0	46.5	54.0 Channel 31	-7.5	Vert
4	2707.467M	46.6	-32.9 +0.6 +1.4	+25.7 +0.7	+0.5 +2.3	+0.7 +0.0	+0.0	45.6	54.0 Channel 0	-8.4	Horiz
5	2744.600M	45.4	-32.9 +0.6 +1.1	+25.9 +0.8	+0.5 +2.3	+0.8 +0.0	+0.0	44.5	54.0 Channel 31	-9.5	Horiz
6	2783.000M	44.5	-32.8 +0.6 +0.9	+26.0 +0.8	+0.5 +2.4	+0.8 +0.0	+0.0	43.7	54.0 Channel 63	-10.3	Horiz
7	2744.230M	44.5	-32.9 +0.6 +1.1	+25.9 +0.8	+0.5 +2.3	+0.8 +0.0	+0.0	43.6	54.0 Channel 31	-10.4	Vert
8	2782.770M	44.4	-32.8 +0.6 +0.9	+26.0 +0.8	+0.5 +2.4	+0.8 +0.0	+0.0	43.6	54.0 Channel 63	-10.4	Vert
9	2707.060M	43.5	-32.9 +0.6 +0.0	+25.7 +0.7	+0.5 +2.3	+0.7 +0.0	+0.0	42.5	54.0 Channel 0	-11.5	Vert

CKC Laboratories, Inc. Date: 9/5/2014 Time: 15:21:00 Cisco Systems, Inc. WO#: 95599
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Sequence#: 1 Ext ATTN: 0 dB



Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer: **Cisco Systems, Inc.**
Specification: **15.247(d) / 15.209 Radiated Spurious Emissions**
Work Order #: **95599** Date: 7/7/2014
Test Type: **Maximized Emissions** Time: 13:27:08
Equipment: **IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna** Sequence#: 1
Manufacturer: Cisco Systems, Inc. Tested By: Eddie Mariscal
Model: IR529UBWP-915S/K9
S/N: JMX1813X01G

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN01991	Biconilog Antenna	CBL6111C	3/7/2014	3/7/2016
	ANP01224	Cable	32	8/16/2012	8/16/2014
T1	AN02660	Spectrum Analyzer	E4446A	8/23/2012	8/23/2014
	ANP05624	Attenuator	PE7010-10	8/13/2012	8/13/2014
	AN00449	Preamp-Bottom Amp (dB)	8447F	4/7/2014	4/7/2016
	AN00226	Loop Antenna	6502	3/28/2014	3/28/2016
T2	AN03155	Preamp	83017A	6/26/2013	6/26/2015
T3	AN00327	Horn Antenna	3115	3/18/2014	3/18/2016
T4	AN03355	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T5	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015
T6	AN03359	Cable		2/4/2013	2/4/2015
T7	AN03360	Cable	32022-2-29094-36TC	2/4/2013	2/4/2015
T8	ANP05904	Cable	32022-2-29094K-144TC	2/15/2013	2/15/2015
T9	AN03171	High Pass Filter	HM1155-11SS	2/26/2013	2/26/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna*	Cisco Systems, Inc.	IR529UBWP-915S/K9	JMX1813X01G

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. Radiated spurious emissions will be gathered for the restricted bands as defined in FCC 15.205. EUT operates on 64 channels. EUT is powered by 120VAC/60Hz. Spurious emissions were investigated while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode.

Frequency Range of Interest:
0.009-9280MHz

0.009-0.15MHz RBW = 200kHz; VBW > RBW;
0.15-30MHz RBW = 9kHz; VBW > RBW;
30-1000MHz RBW = 120kHz; VBW > RBW;
1 - 9.28GHz RBW = 1MHz; VBW > RBW;

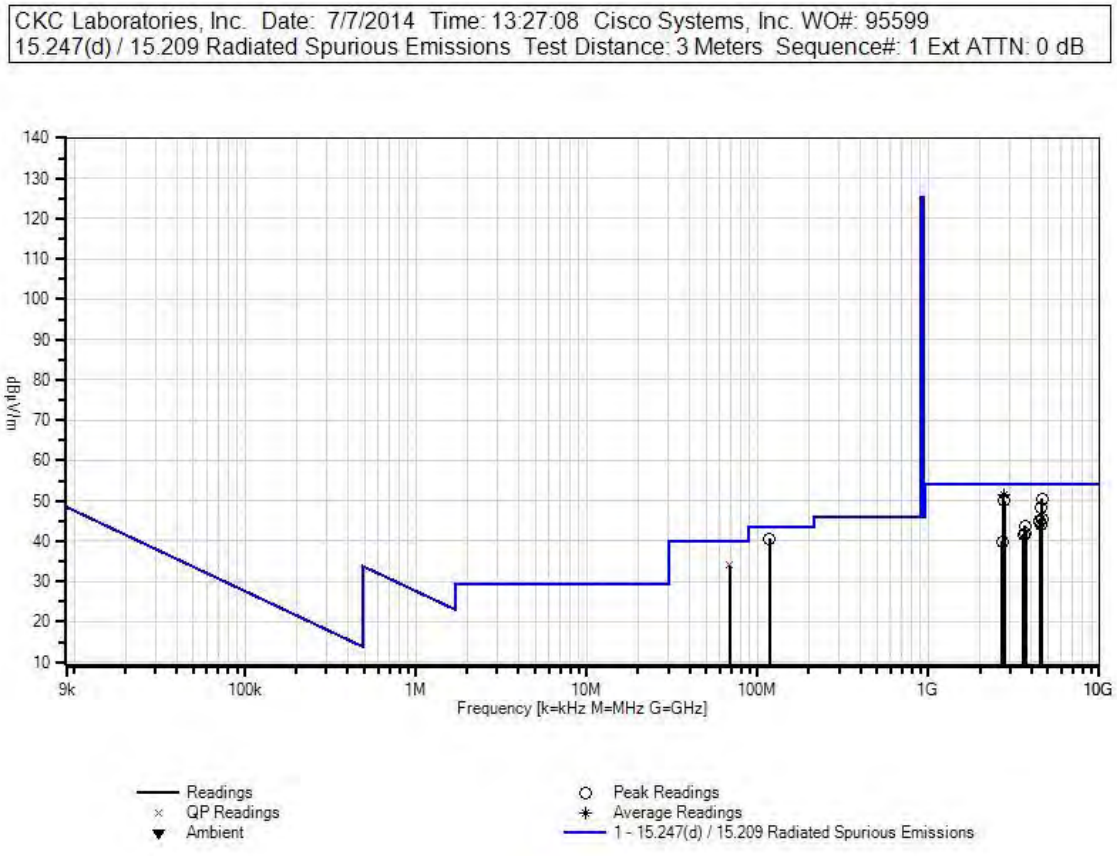
Environmental Conditions: Temperature: 21°C, Relative Humidity: 40%, Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2744.358M Ave	53.2	+0.0 +0.8 +0.3	-32.9 +0.6	+25.9 +0.8	+0.5 +2.3	+0.0	51.5	54.0 Transmit Mid	-2.5	Vert
^	2744.358M	54.5	+0.0 +0.8 +0.3	-32.9 +0.6	+25.9 +0.8	+0.5 +2.3	+0.0	52.8	54.0 Transmit Mid	-1.2	Vert
3	117.170M	40.6	+0.0 +0.0 +0.0	+0.0 +0.0	+0.0 +0.0	+0.0 +0.0	+0.0	40.6	43.5 Transmit Hopping	-2.9	Vert
4	4638.300M	46.7	+0.0 +1.2 +0.3	-33.0 +0.8	+29.6 +0.9	+0.8 +3.2	+0.0	50.5	54.0 Transmit High	-3.5	Vert
5	2744.358M	51.7	+0.0 +0.8 +0.3	-32.9 +0.6	+25.9 +0.8	+0.5 +2.3	+0.0	50.0	54.0 Transmit Mid	-4.0	Horiz
6	2782.830M	51.3	+0.0 +0.8 +0.3	-32.8 +0.6	+26.0 +0.8	+0.5 +2.4	+0.0	49.9	54.0 Transmit High	-4.1	Vert
7	4578.000M	44.6	+0.0 +1.2 +0.3	-33.0 +0.8	+29.5 +0.9	+0.8 +3.1	+0.0	48.2	54.0 Transmit Mid	-5.8	Vert
8	68.833M QP	39.6	+0.0 +0.0 +0.0	+0.0 +0.0	+0.0 +0.0	+0.0 +0.0	+0.0	34.1	40.0 Transmit Hopping	-5.9	Vert
^	68.833M	43.8	+0.0 +0.0 +0.0	+0.0 +0.0	+0.0 +0.0	+0.0 +0.0	+0.0	38.3	40.0 Transmit Hopping	-1.7	Vert
10	4638.200M	41.7	+0.0 +1.2 +0.3	-33.0 +0.8	+29.6 +0.9	+0.8 +3.2	+0.0	45.5	54.0 Transmit High	-8.5	Horiz

11	4511.700M	42.0	+0.0 +1.2 +0.3	-33.1 +0.7	+29.3 +0.9	+0.8 +3.1	+0.0	45.2	54.0 Transmit Low	-8.8	Vert
12	4512.000M	41.5	+0.0 +1.2 +0.3	-33.1 +0.7	+29.3 +0.9	+0.8 +3.1	+0.0	44.7	54.0 Transmit Low	-9.3	Horiz
13	4577.800M	40.6	+0.0 +1.2 +0.3	-33.0 +0.8	+29.5 +0.9	+0.8 +3.1	+0.0	44.2	54.0 Transmit Mid	-9.8	Horiz
14	3662.300M	42.0	+0.0 +1.1 +0.1	-32.7 +0.7	+28.3 +0.8	+0.7 +2.8	+0.0	43.8	54.0 Transmit Mid	-10.2	Vert
15	3710.600M	40.2	+0.0 +1.1 +0.1	-32.7 +0.7	+28.3 +0.8	+0.7 +2.8	+0.0	42.0	54.0 Transmit High	-12.0	Vert
16	3609.400M	40.0	+0.0 +1.1 +0.1	-32.7 +0.6	+28.3 +0.8	+0.7 +2.7	+0.0	41.6	54.0 Transmit Low	-12.4	Vert
17	2706.830M	42.0	+0.0 +0.7 +0.3	-32.9 +0.6	+25.7 +0.7	+0.5 +2.3	+0.0	39.9	54.0 Transmit Low	-14.1	Vert



Test Setup Photo(s)

Low, DA Gateway

Middle, DA Gateway

High, DA Gateway

Low, Dual Antenna

Middle, Dual Antenna

High, Dual Antenna

Low, Single Antenna

Middle, Single Antenna

High, Single Antenna

15.247(a)(1) Carrier Frequency Separation

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems, Inc.**		
Specification:	**15.247(a)(1) Channel Separation**		
Work Order #:	**95599**	Date:	9/8/2014
Test Type:	**Conducted Emissions**	Time:	11:02:13
Equipment:	**IR509 915MHz WPAN router w/2 serial, 1 FE LAN**	Sequence#:	1
Manufacturer:	**Cisco Systems, Inc.**	Tested By:	Eddie Mariscal
Model:	**IR509UWP-915S/K9**		
S/N:	**JMX1802X013**		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
T2	ANP02229	Attenuator	PE7010-10	2/13/2013	2/13/2015
T3	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR509 915MHz WPAN router w/2 serial, 1 FE LAN*	Cisco Systems, Inc.	IR509UWP-915/K9	JMX1802X013

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

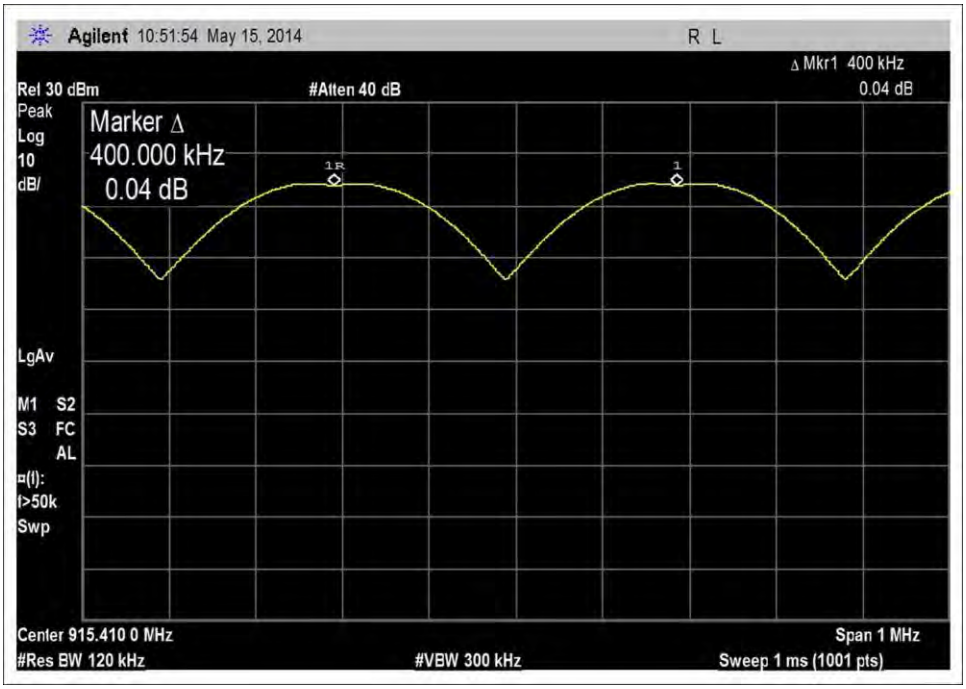
Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is operating on 120VAC/60Hz. Carrier frequency separation measurements were taken while the EUT is operating with hopping mode enabled.

Power level setting: 30
Software used: Tera Term Version 4.76
Frequency Range of Interest:
Fundamental (902MHz, 915MHz, 928MHz)
RBW = 120kHz; VBW > RBW;

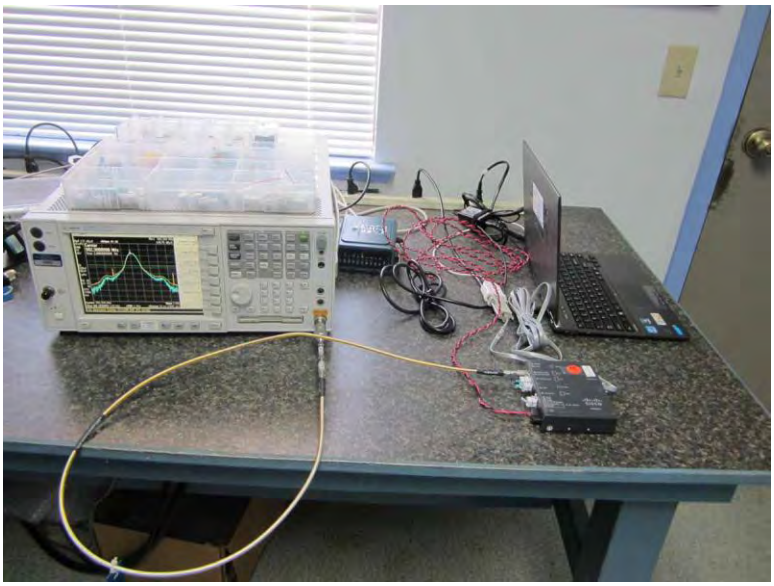
Environmental Conditions: Temperature: 21°C, Relative Humidity: 40%, Atmospheric Pressure: 97.7kPa

Test Data



Measured Channel Separation (kHz)	Minimum Channel Separation (kHz)	Test Result
400	25	Pass

Test Setup Photo



DA Gateway

15.247(a)(1)(i) 20dB Bandwidth

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems, Inc.**		
Specification:	**15.247(a)(1)(i) 20dB Occupied Bandwidth**		
Work Order #:	**95599**	Date:	9/8/2014
Test Type:	**Conducted Emissions**	Time:	11:02:13
Equipment:	**IR509 915MHz WPAN router w/2 serial, 1 FE LAN**	Sequence#:	1
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR509UWP-915/K9		
S/N:	JMX1802X013		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
T2	ANP02229	Attenuator	PE7010-10	2/13/2013	2/13/2015
T3	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR509 915MHz WPAN router w/2 serial, 1 FE LAN*	Cisco Systems, Inc.	IR509UWP-915/K9	JMX1802X013

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

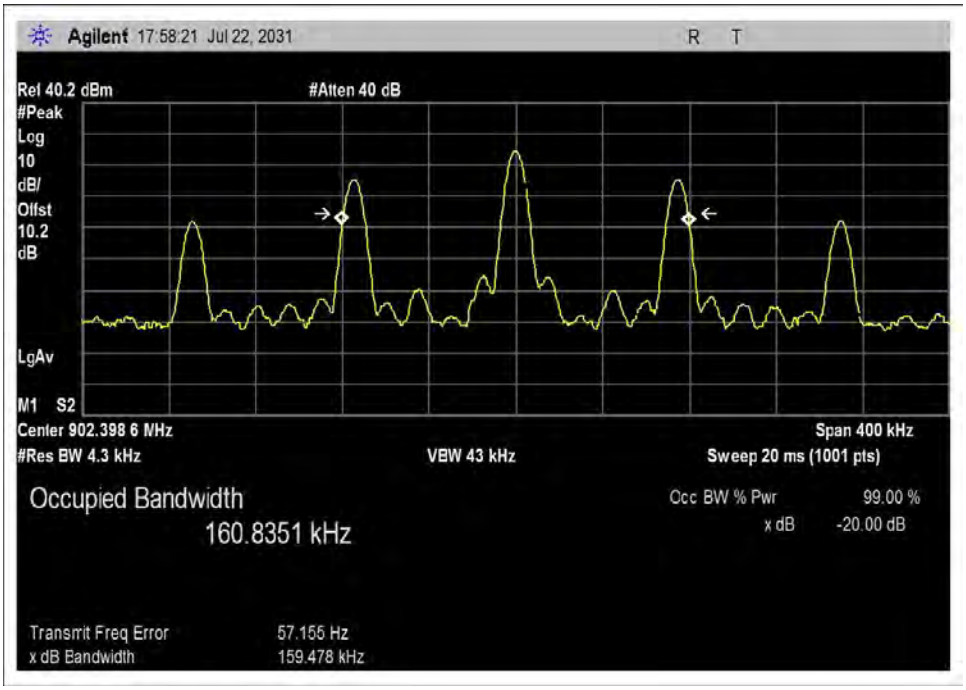
Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is operating on 120VAC/60Hz. Occupied Bandwidth measurements were taken while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode.

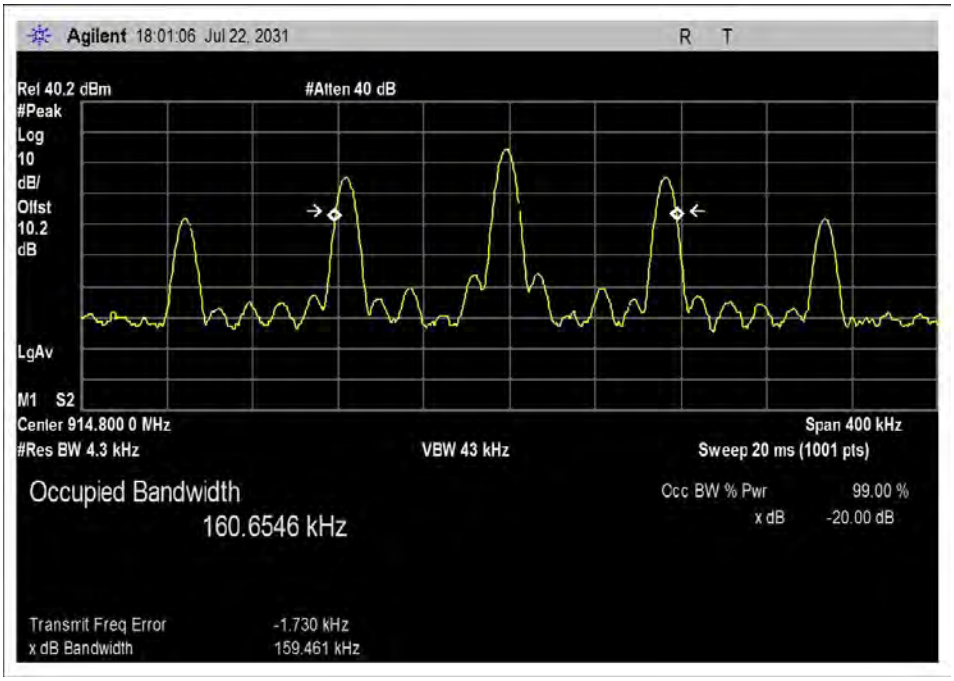
Power level setting: 30
Software used: Teraterm

Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

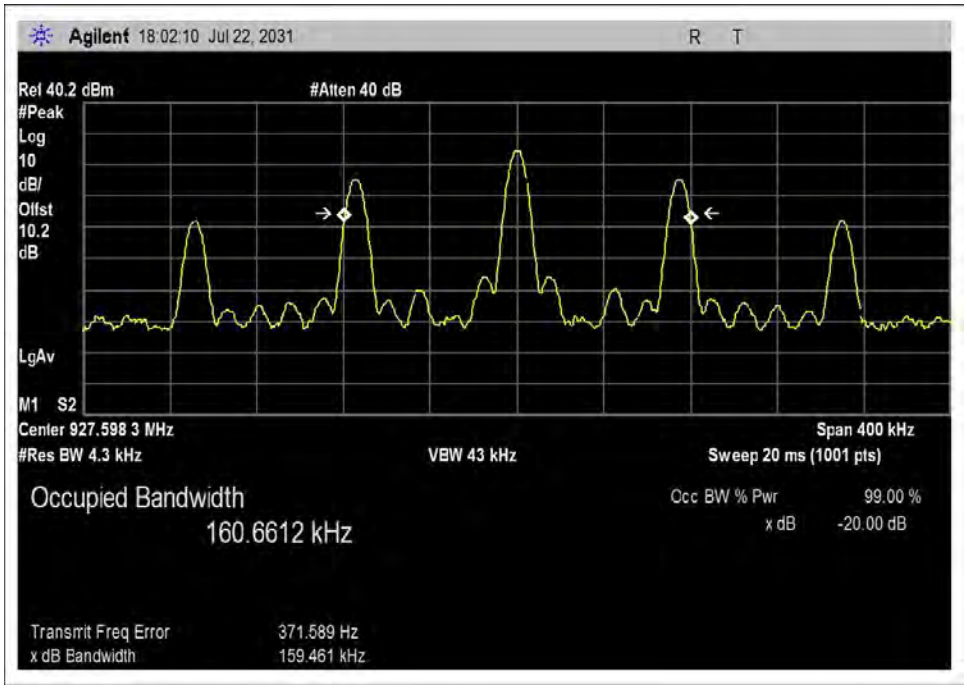
Test Data



Low



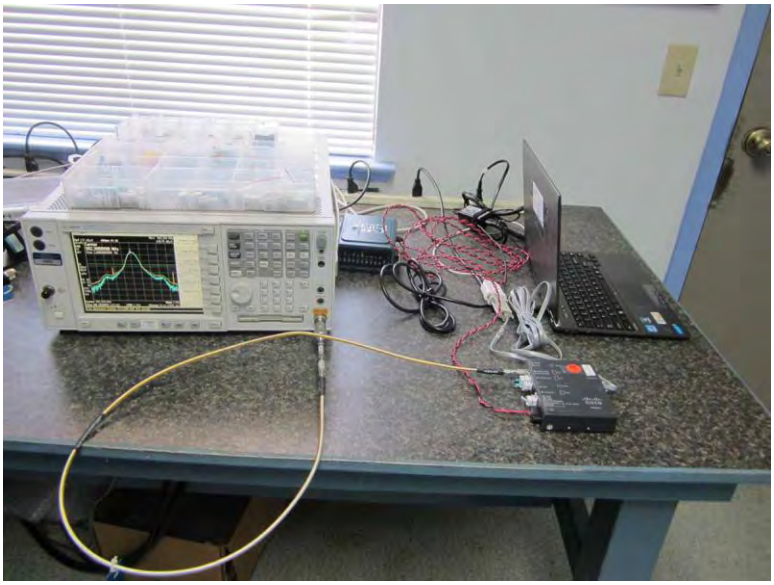
Middle



High

Transmit Frequency (MHz)	Measured 20dB Occupied Bandwidth (kHz)	Test Result
902.4	159.478	< 250kHz
914.8	159.461	< 250kHz
927.6	159.461	< 250kHz

Test Setup Photo



DA Gateway

15.247(a)(1)(i) Dwell Time

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer: **Cisco Systems, Inc.**
Specification: **15.247(a)(1)(i) Dwell Time**
Work Order #: **95599** Date: 9/8/2014
Test Type: **Conducted Emissions** Time: 11:02:13
Equipment: **IR509 915MHz WPAN router w/2 serial, 1 FE LAN** Sequence#: 1
Manufacturer: Cisco Systems, Inc. Tested By: Eddie Mariscal
Model: IR509UWP-915/K9
S/N: JMX1802X013

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
T2	ANP02229	Attenuator	PE7010-10	2/13/2013	2/13/2015
T3	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR509 915MHz WPAN router w/2 serial, 1 FE LAN*	Cisco Systems, Inc.	IR509UWP-915/K9	JMX1802X013

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is operating on 120VAC/60Hz. Dwell time measurements were taken while the EUT is operating with hopping mode enabled.

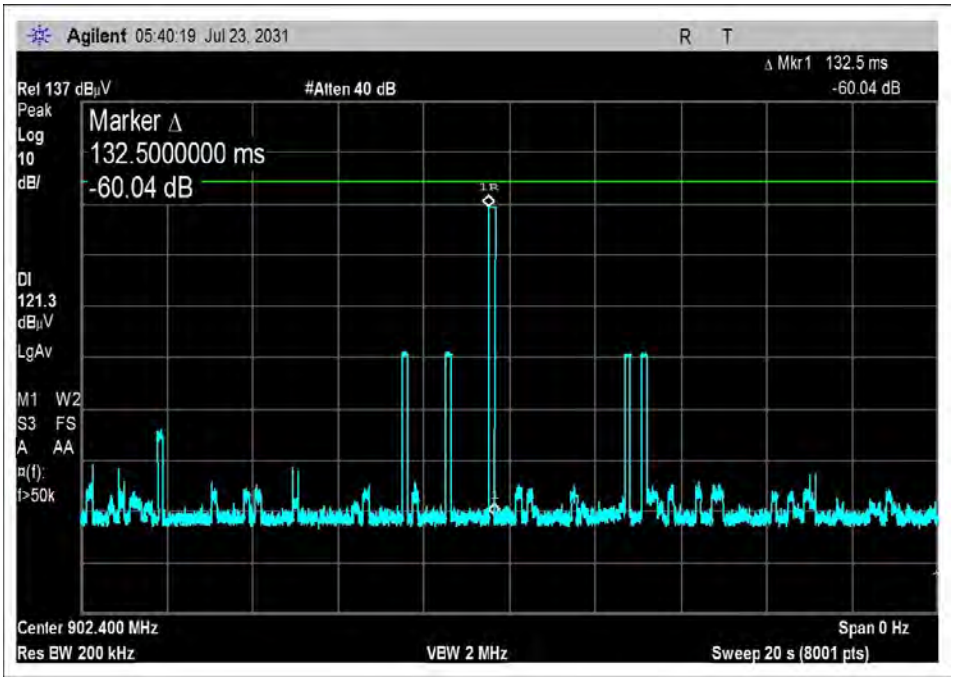
Power level setting: 30
Software used: Teraterm

Frequency Range of Interest:
Fundamental (902MHz, 915MHz, 928MHz)

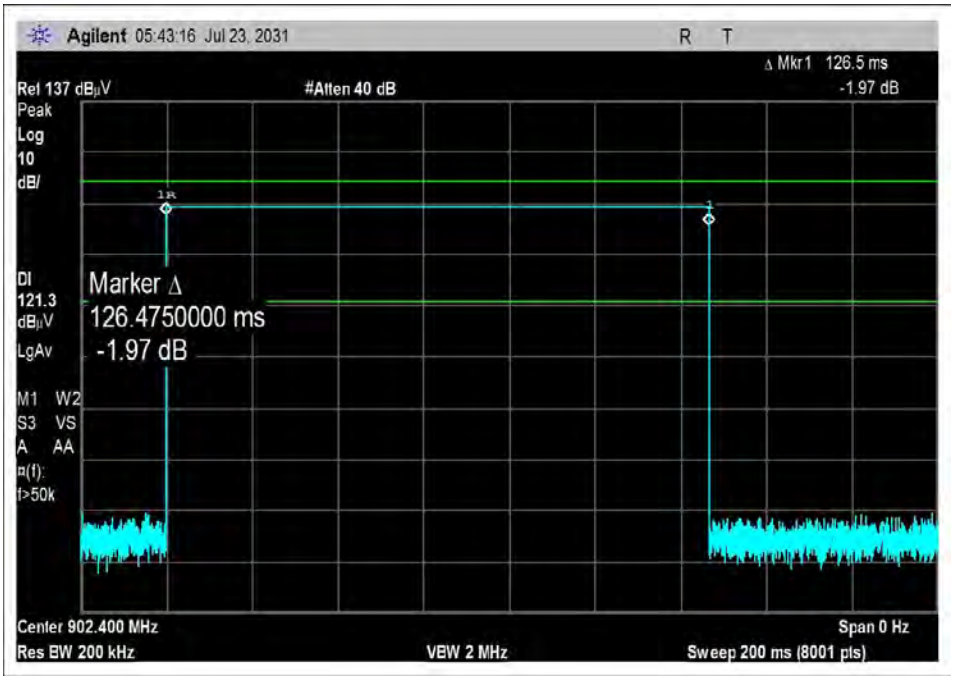
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Sweep time (s)	Measured time of occupancy (ms)	Limit (ms)	Test Result
20	126.475	400	PASS

Test Data

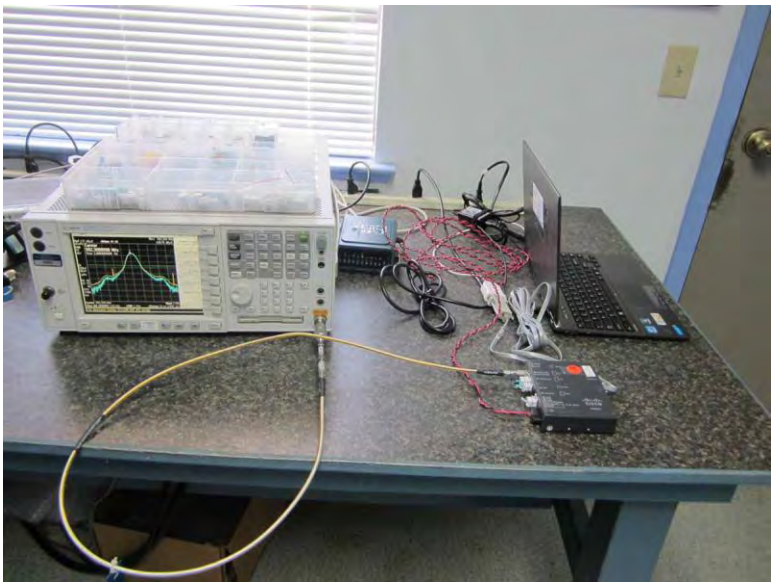


Dwell Time 1



Dwell Time 2

Test Setup Photo



DA Gateway

15.247(a)(1)(i) Number of Hopping Channels

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer: **Cisco Systems, Inc.**
Specification: **15.247(a)(1)(i) Number of hopping channels**
Work Order #: **95599** Date: 9/8/2014
Test Type: **Conducted Emissions** Time: 11:02:13
Equipment: **IR509 915MHz WPAN router w/2 serial, 1 FE LAN** Sequence#: 1
Manufacturer: Cisco Systems, Inc. Tested By: Eddie Mariscal
Model: IR509UWP-915/K9
S/N: JMX1802X013

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
T2	ANP02229	Attenuator	PE7010-10	2/13/2013	2/13/2015
T3	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR509 915MHz WPAN router w/2 serial, 1 FE LAN*	Cisco Systems, Inc.	IR509UWP-915/K9	JMX1802X013

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is operating on 120VAC/60Hz. Carrier frequency separation measurements were taken while the EUT is operating with hopping mode enabled.

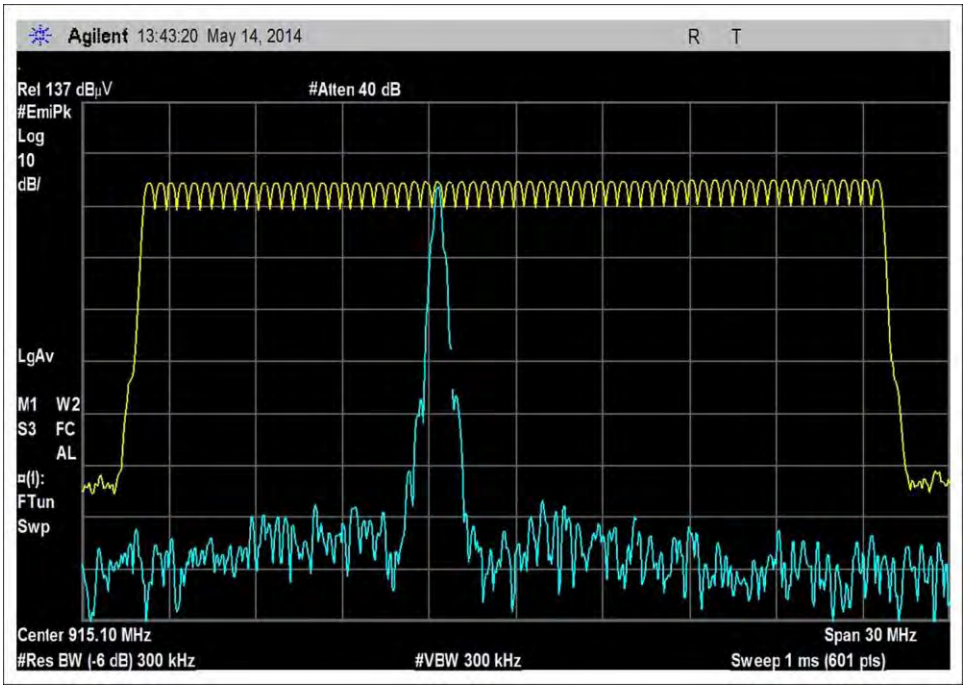
Power level setting: 30
Software used: Tera Term Version 4.76

Frequency Range of Interest:
Fundamental (902MHz, 915MHz, 928MHz)

Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

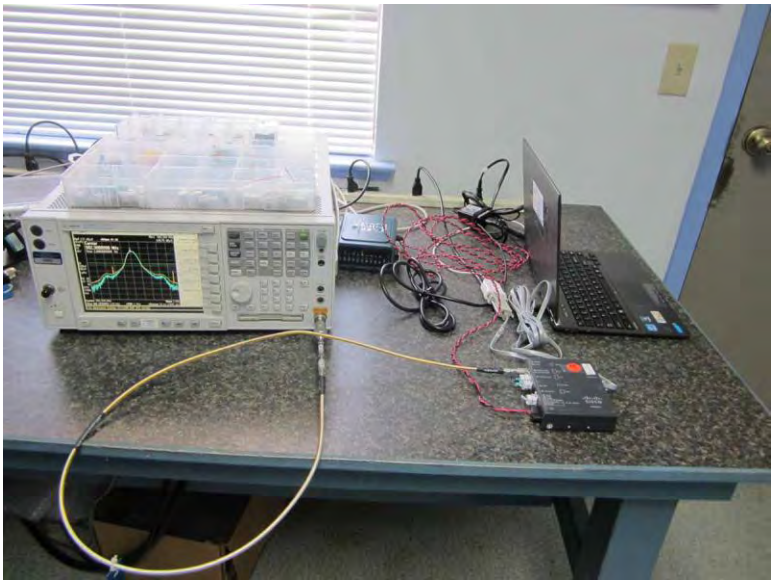
Measured number of channels	Minimum number of channels	Test Result
64	50	PASS

Test Data



Number of Hopping Channels

Test Setup Photo



DA Gateway

15.247(b)(2) Conducted Output Power

Test Data

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems, Inc.**		
Specification:	**15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**		
Work Order #:	**95599**	Date:	10/3/2014
Test Type:	**Conducted Emissions**	Time:	09:24:08
Equipment:	**IR509 915MHz WPAN router w/2 serial, 1 FE LAN**	Sequence#:	1
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR509UWP-915/K9		24VDC
S/N:	JMX1802X013		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
	ANP01949	Attenuator	54A-6	2/7/2013	2/7/2015
	AN03361	Cable	32022-2-29094-48TC	2/7/2013	2/7/2015
T2	ANP02229	Attenuator	PE7010-10	2/13/2013	2/13/2015
T3	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR509 915MHz WPAN router w/2 serial, 1 FE LAN*	Cisco Systems, Inc.	IR509UWP-915/K9	JMX1802X013

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10
AC-DC Power converter	Cisco Systems, Inc.	341-0304-01	DTM170704Z2

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is rated for 12V-48VDC. Peak power measurements were taken while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode.

Frequency Range of Interest:
Fundamental (902MHz, 915MHz, 928MHz)
RBW = 200kHz; VBW > RBW;

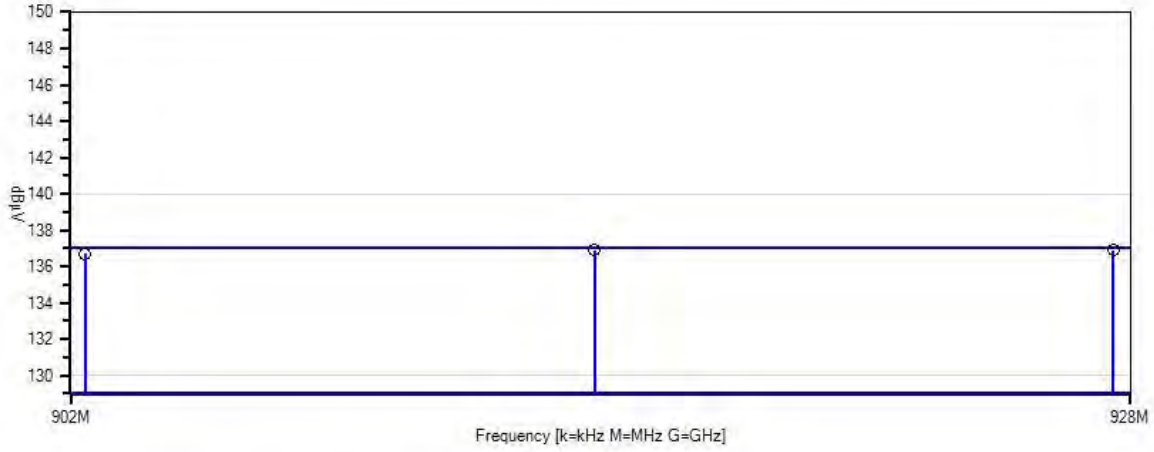
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: RF Output Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	914.758M	117.0	+9.6	+9.9	+0.4		+0.0	136.9	137.0	-0.1	RF Ou
2	927.558M	117.0	+9.6	+9.9	+0.4		+0.0	136.9	137.0	-0.1	RF Ou
3	902.359M	116.8	+9.6	+9.9	+0.4		+0.0	136.7	137.0	-0.3	RF Ou

CKC Laboratories, Inc. Date: 10/3/2014 Time: 09:24:08 Cisco Systems, Inc. WO#: 95599
15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: RF Output Port 24VDC Sequence#: 1 Ext ATTN: 0 dB



Sweep Data
Readings
Peak Readings
QP Readings
Average Readings
Ambient
1 - 15.247(b) Power Output (902-928 MHz FHSS >50 Channels)

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems**		
Specification:	**FCC 15.247 Power Output (902-928 MHz FHSS >50 Channels)**		
Work Order #:	**95599**	Date:	10/3/2014
Test Type:	**Conducted Emissions**	Time:	08:56:12
Equipment:	**Range Extender-Advanced with Dual Antenna**	Sequence#:	1
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR529UBWP-915D/K9		120V 60Hz
S/N:	JMX1813X00V		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
T2	ANP02229	Attenuator	PE7010-10	2/13/2013	2/13/2015
T3	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Range Extender-Advanced with Dual Antenna*	Cisco Systems, Inc.	IR529UBWP-915D/K9	JMX1813X00V

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is operating on 120VAC/60Hz. Peak power measurements were taken while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode.

Two antennas of 9dBi will be used with the EUT. KDB 662911 gives guidance on measurements of devices that employ a single transmitter with multiple outputs in the same band. The transmit signals of the two output ports are correlated as defined in section (F) (1) of KDB 662911. The same information is sent to the two ports via an internal splitter. The aggregate conducted power must not exceed 1W or 30dBm, therefore, because the ports are identical the conducted power limit of each individual port is 27dBm.

EUT was tested in accordance with 15.31(e). Input power was varied to 85% and 115% and no change in the output power was observed.

Power level setting: 30
Software used: Tera Term Version 4.76

Frequency Range of Interest:
Fundamental (902MHz, 915MHz, 928MHz)
RBW = 200kHz; VBW > RBW;

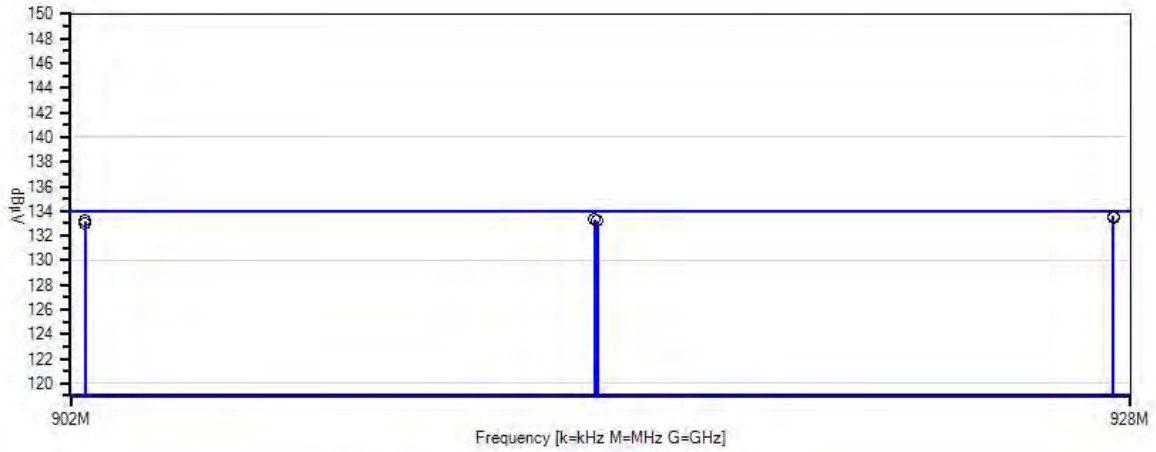
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: RF Output Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	927.561M	113.7	+9.6	+9.9	+0.4		+0.0	133.6	134.0 Port 1	-0.4	RF Ou
2	927.561M	113.6	+9.6	+9.9	+0.4		+0.0	133.5	134.0 Port 2	-0.5	RF Ou
3	914.758M	113.4	+9.6	+9.9	+0.4		+0.0	133.3	134.0 Port 1	-0.7	RF Ou
4	902.359M	113.3	+9.6	+9.9	+0.4		+0.0	133.2	134.0 Port 1	-0.8	RF Ou
5	914.836M	113.3	+9.6	+9.9	+0.4		+0.0	133.2	134.0 Port 2	-0.8	RF Ou
6	902.356M	113.1	+9.6	+9.9	+0.4		+0.0	133.0	134.0 Port 2	-1.0	RF Ou

CKC Laboratories, Inc. Date: 10/3/2014 Time: 08:56:12 Cisco Systems WO#: 95599
FCC 15.247 Power Output (902-928 MHz FHSS >50 Channels) Test Lead: RF Output Port 120V 60Hz Sequence#: 1 Ext ATTN: 0 dB



Sweep Data
Readings
Peak Readings
QP Readings
Average Readings
Ambient
1 - FCC 15.247 Power Output (902-928 MHz FHSS >50 Channels)

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems**		
Specification:	**15.247(b) Power Output (902-928 MHz FHSS >50 Channels)**		
Work Order #:	**95599**	Date:	10/3/2014
Test Type:	**Conducted Emissions**	Time:	09:29:10
Equipment:	**Range Extender-Advanced with Single Antenna**	Sequence#:	1
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR529UBWP-915S/K9		120V 60Hz
S/N:	JMX1813X01G		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
T2	ANP02229	Attenuator	PE7010-10	2/13/2013	2/13/2015
T3	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Range Extender-Advanced with Single Antenna*	Cisco Systems, Inc.	IR529UBWP-915S/K9	JMX1813X01G

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10
AC-DC Power converter	Cisco Systems, Inc.	341-0304-01	DTM170704Z2

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is operating on 120VAC/60Hz. Peak power measurements were taken while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode.

EUT was tested in accordance with 15.31(e). Input power was varied to 85% and 115% and no change in the output power was observed.

Power level setting: 30
Software used: Tera Term Version 4.76

Frequency Range of Interest:
Fundamental (902MHz, 915MHz, 928MHz)
RBW = 200kHz; VBW > RBW;

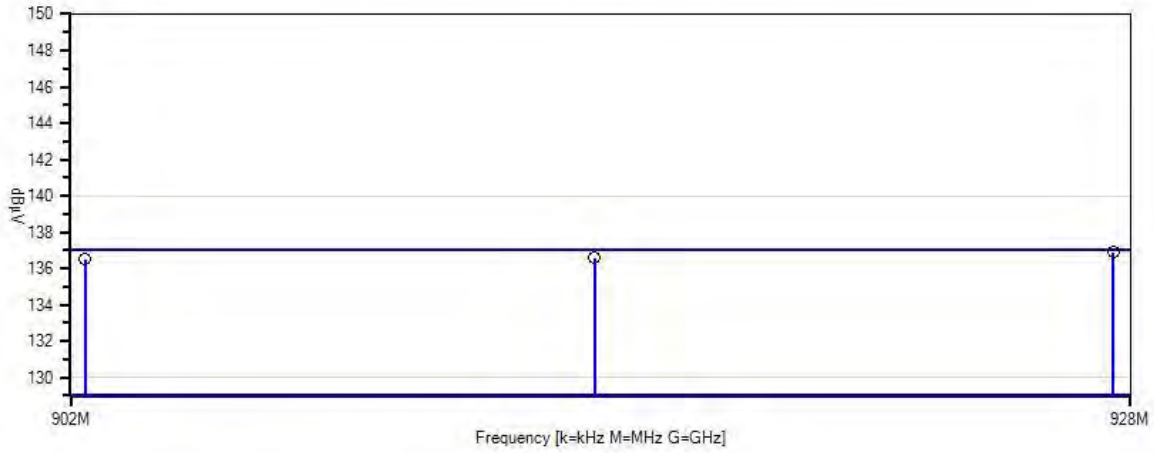
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: RF Output Port

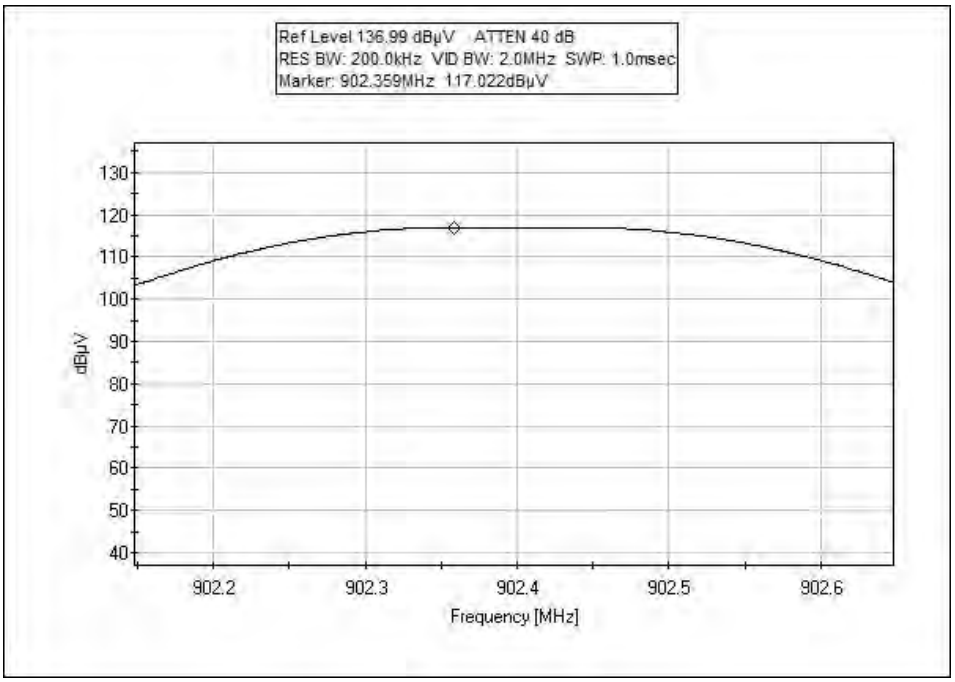
#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	927.558M	117.0	+9.6	+9.9	+0.4		+0.0	136.9	137.0	-0.1	RF Ou
2	914.760M	116.7	+9.6	+9.9	+0.4		+0.0	136.6	137.0	-0.4	RF Ou
3	902.358M	116.6	+9.6	+9.9	+0.4		+0.0	136.5	137.0	-0.5	RF Ou

CKC Laboratories, Inc. Date: 10/3/2014 Time: 09:29:10 Cisco Systems WO#: 95599
15.247(b) Power Output (902-928 MHz FHSS >50 Channels) Test Lead: RF Output Port 120V 60Hz Sequence#: 1
Ext ATTN: 0 dB

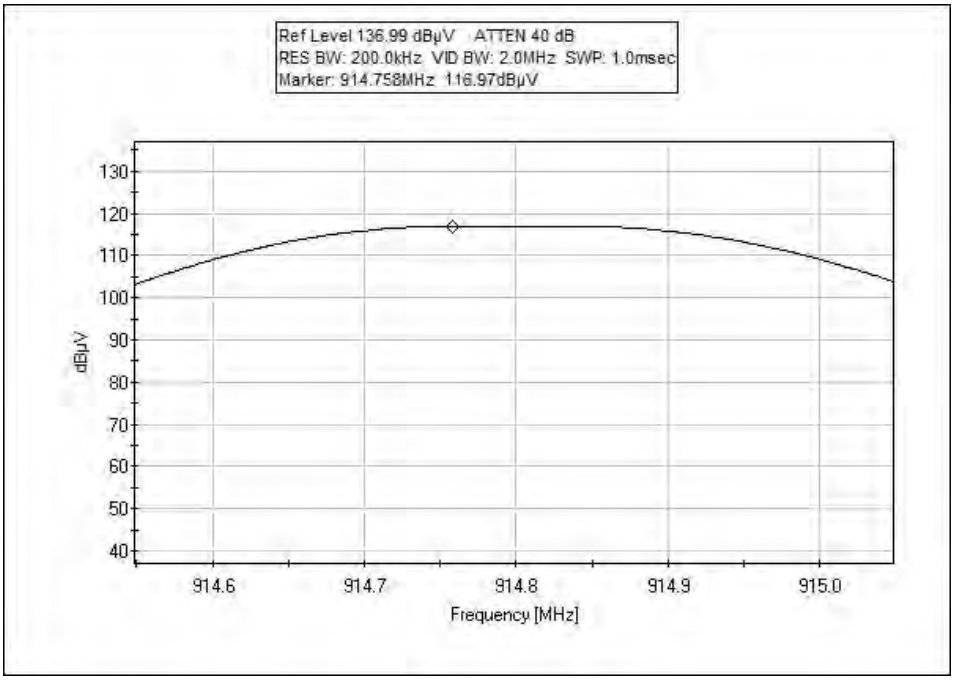


Sweep Data
Readings
Peak Readings
QP Readings
Average Readings
Ambient
1 - 15.247(b) Power Output (902-928 MHz FHSS >50 Channels)

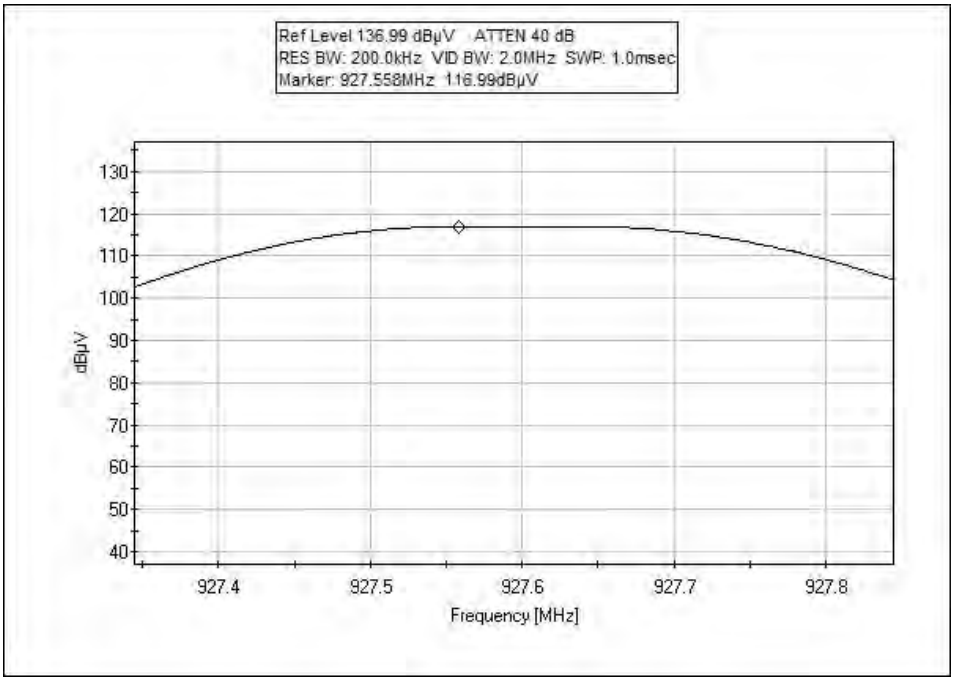
Test Plots



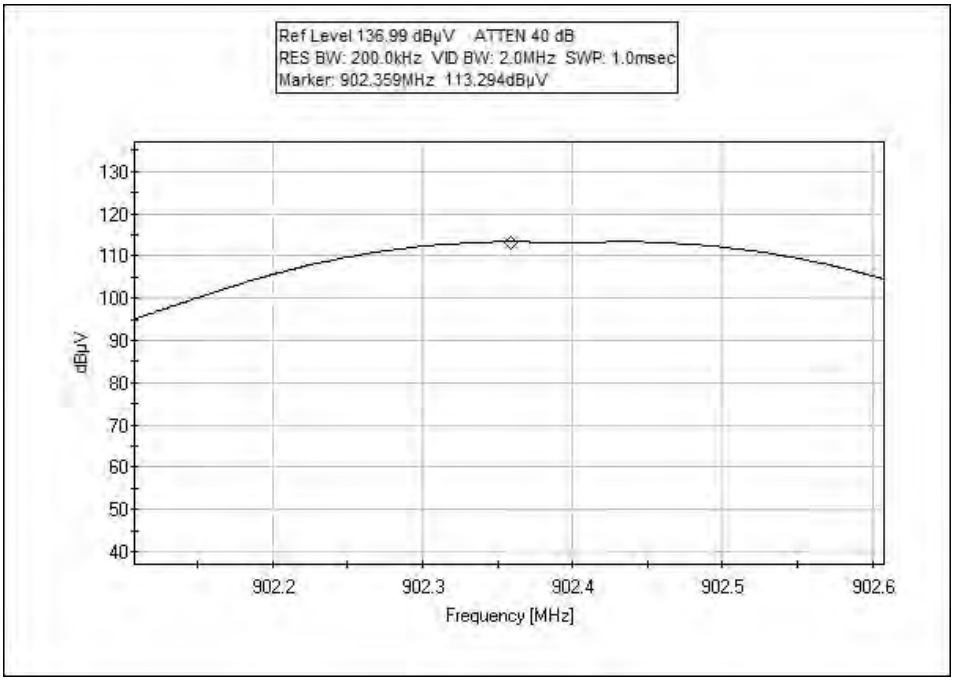
Low, DA Gateway



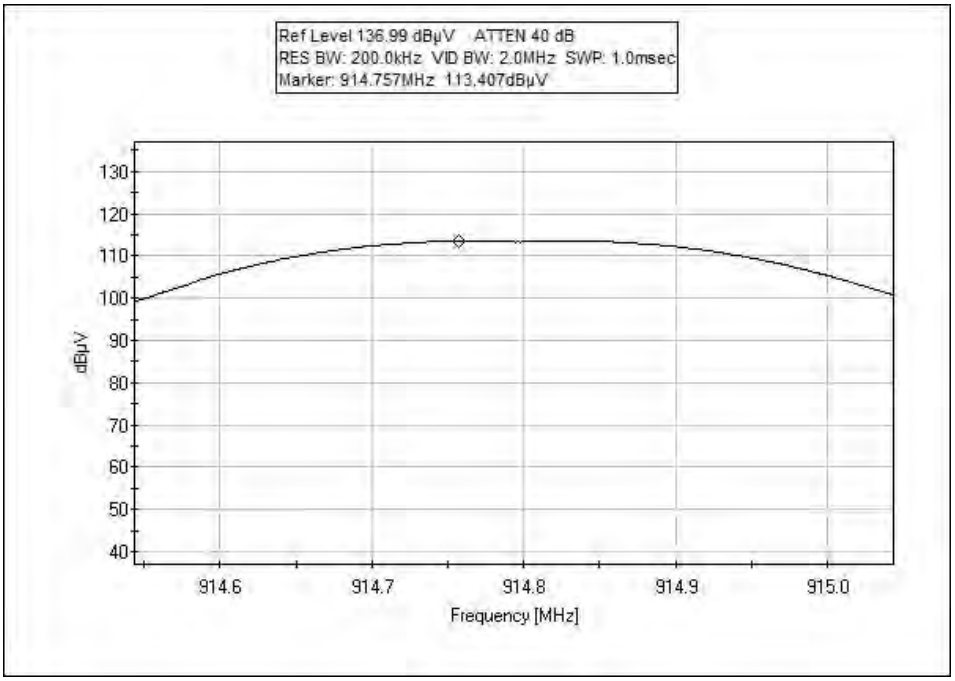
Middle, DA Gateway



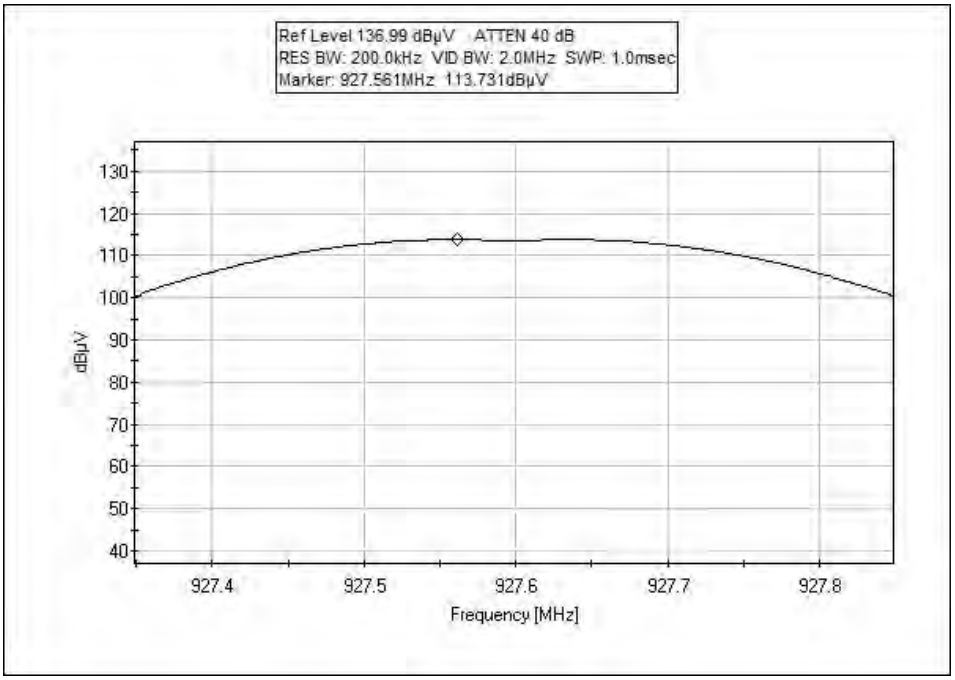
High, DA Gateway



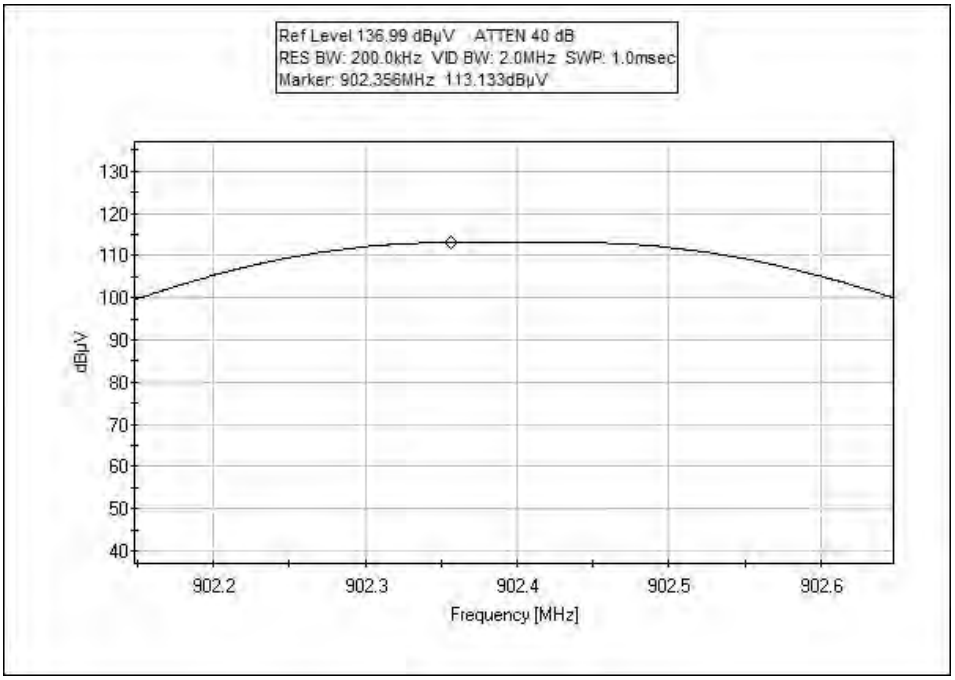
Low, Dual Antenna – Port 1



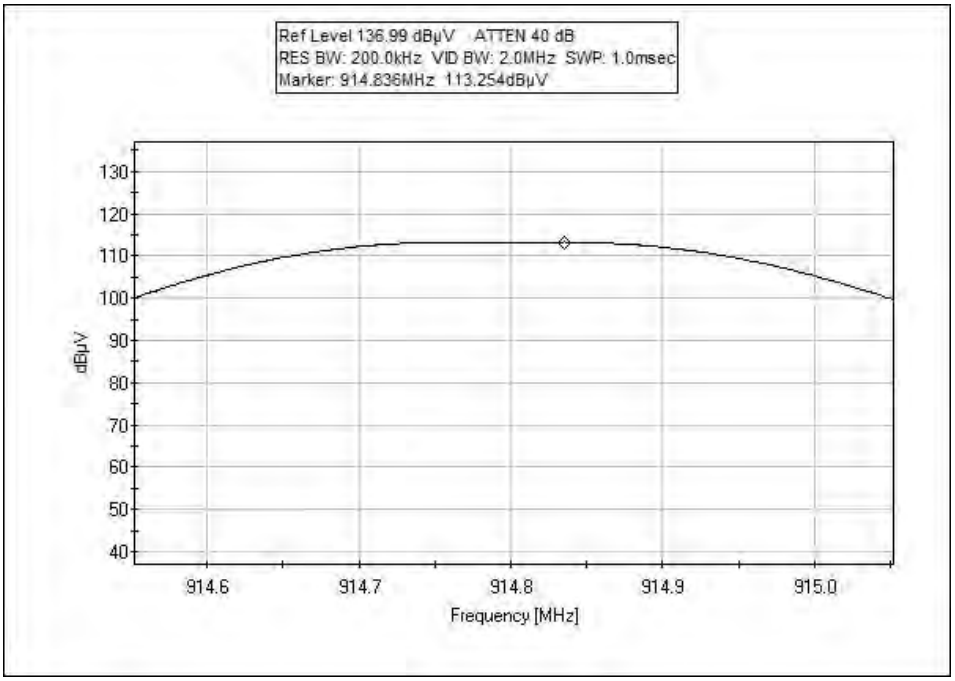
Middle, Dual Antenna - Port 1



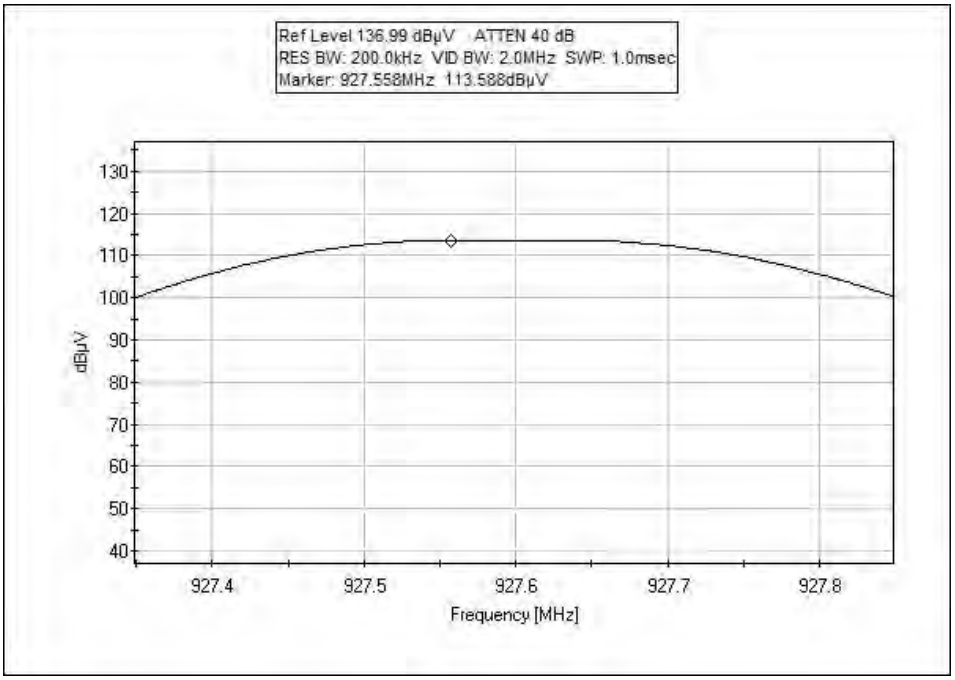
High, Dual Antenna – Port 1



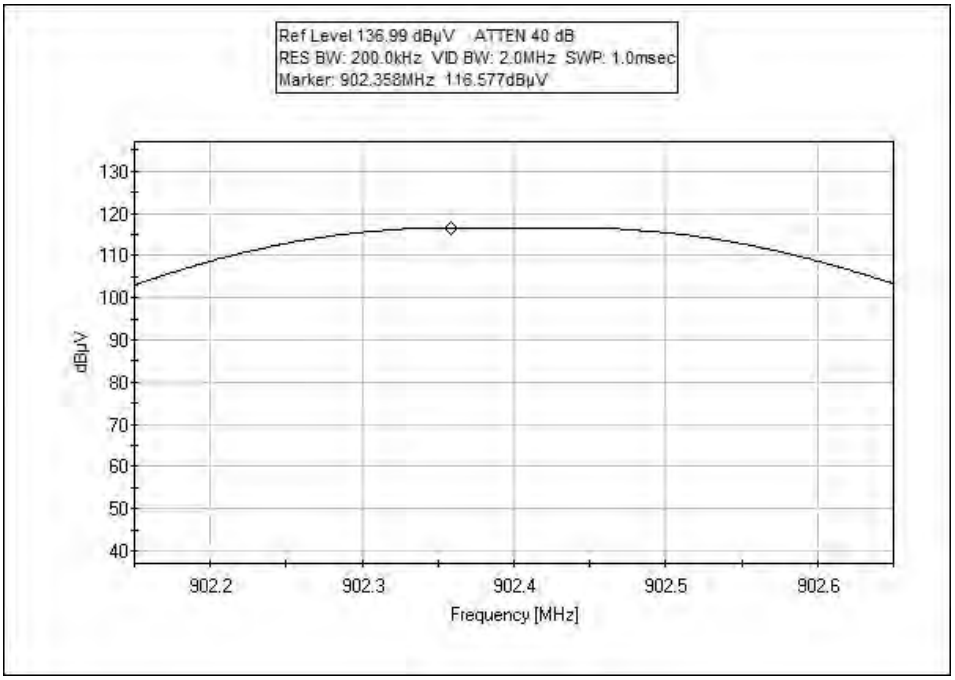
Low, Dual Antenna – Port 2



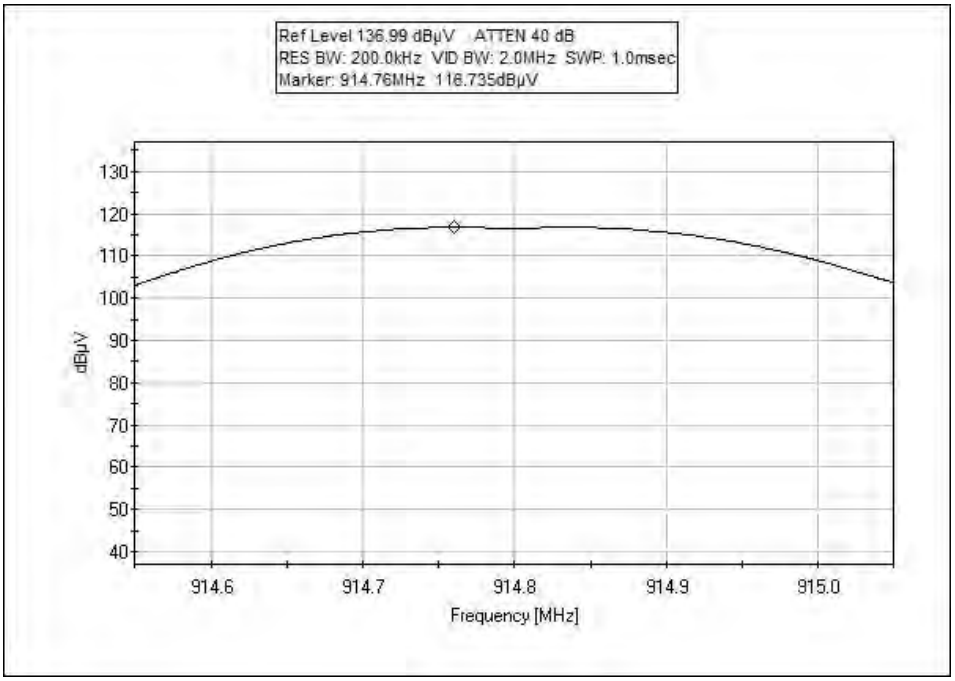
Middle, Dual Antenna – Port 2



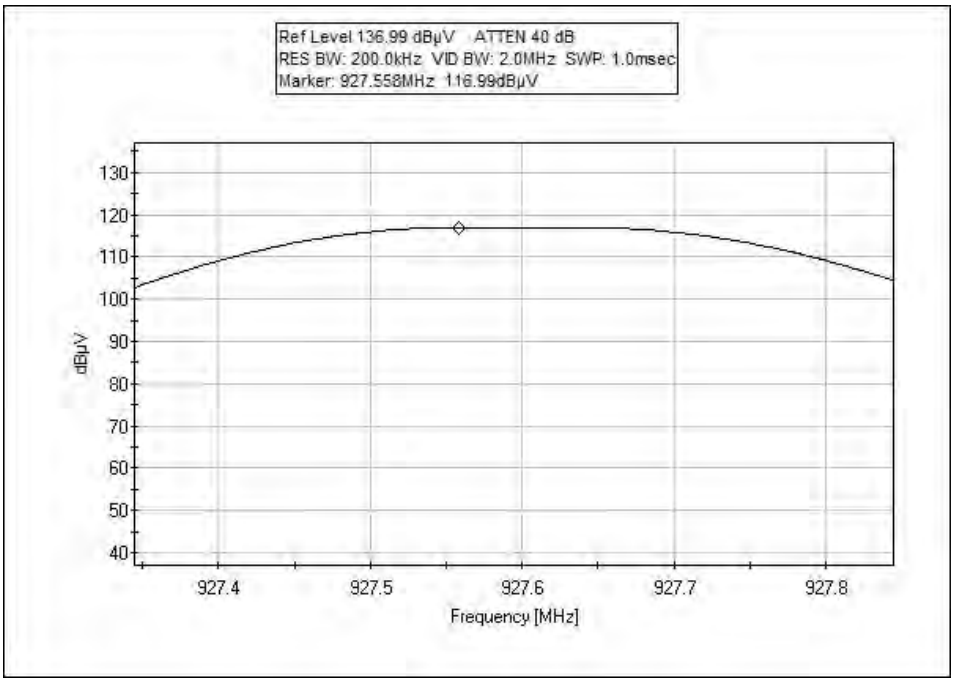
High, Dual Antenna – Port 2



Low, Single Antenna

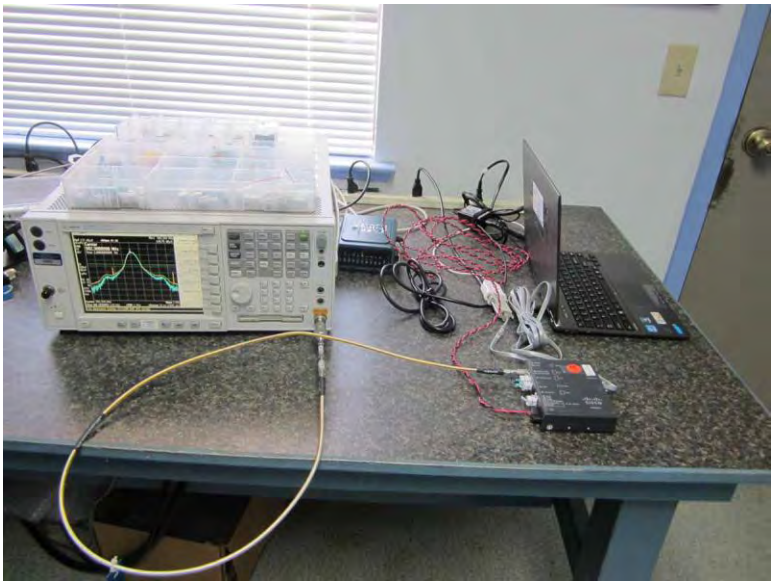


Middle, Single Antenna

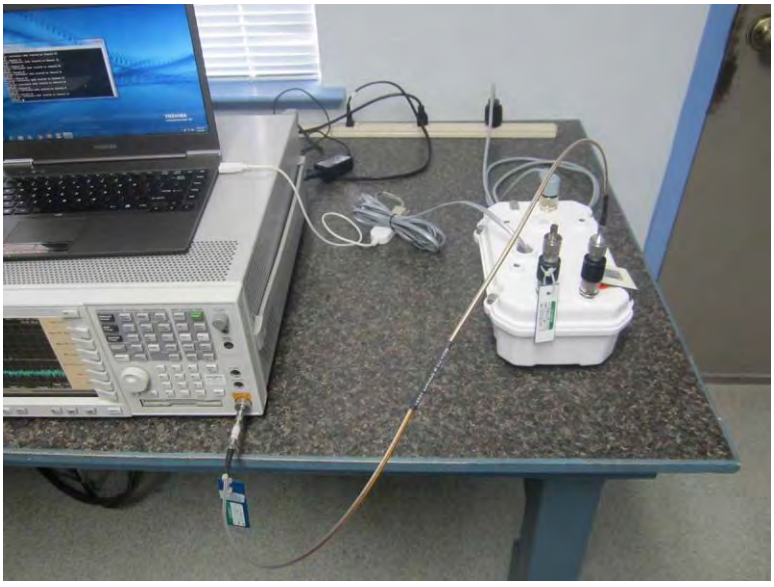


High, Single Antenna

Test Setup Photo(s)



DA Gateway



Dual Antenna

Single Antenna

15.247(d) Conducted Spurious Emissions and Band Edge

Test Conditions / Setup

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems**		
Specification:	**15.247(d) Spurious Emissions**		
Work Order #:	**95599**	Date:	5/14/2014
Test Type:	**Conducted Emissions**	Time:	13:13:36
Equipment:	**IR509 915MHz WPAN router w/2 serial, 1 FE LAN**	Sequence#:	1
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR509UWP-915/K9		24VDC
S/N:	JMX1802X013		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
T2	ANP01949	Attenuator	54A-6	2/7/2013	2/7/2015
T3	AN03356	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
	AN03361	Cable	32022-2-29094-48TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR509 915MHz WPAN router w/2 serial, 1 FE LAN*	Cisco Systems, Inc.	IR509UWP-915/K9	JMX1802X013

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10
AC-DC Power converter	Cisco Systems, Inc.	341-0304-01	DTM170704Z2

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is rated for 12V-48VDC. EUT is powered by AC to DC power supply. This power supply is not sold with the EUT. Spurious emissions were investigated while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode. Only those emissions not in a restricted band as defined in FCC 15.205 were measured.

Because the band-edges are not adjacent to any restricted bands as defined in FCC 15.205, band-edge measurements were taken via conducted measurements.

Frequency Range of Interest:
0.009-9280MHz

0.009-30MHz RBW = 100kHz; VBW > RBW;
30-1000MHz RBW = 120kHz; VBW > RBW;
1 - 9.28GHz RBW = 1MHz; VBW > RBW;

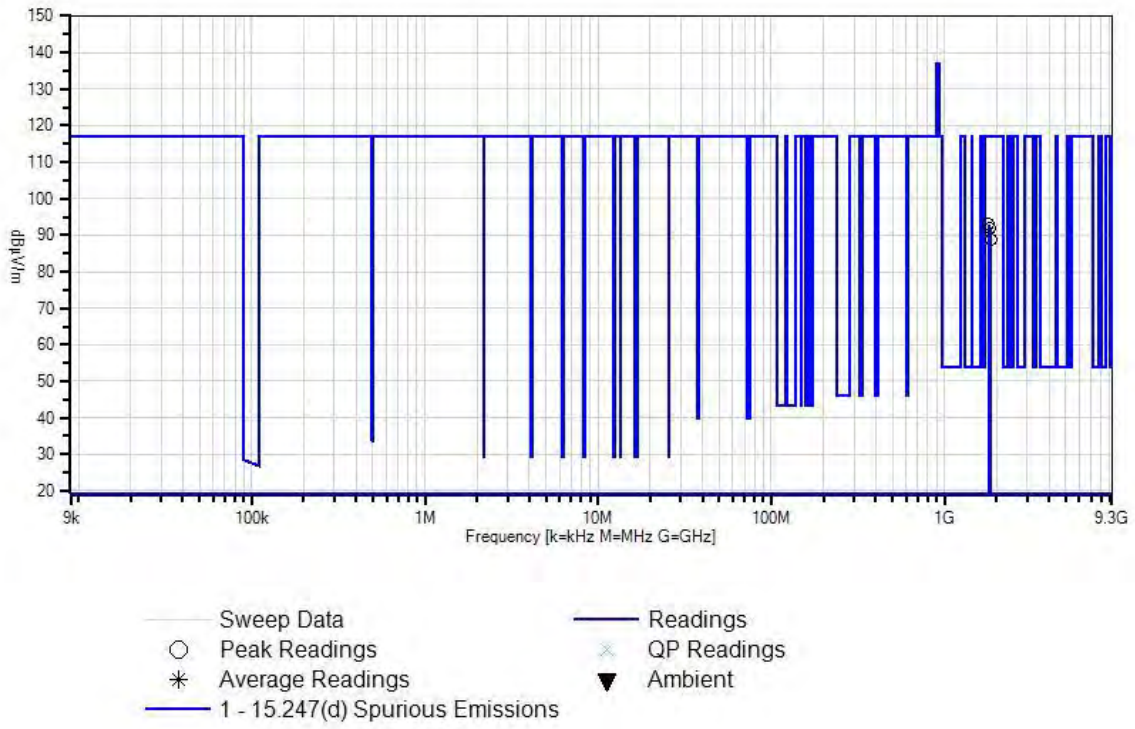
Environmental Conditions: Temperature: 21°C, Relative Humidity: 40%, Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: RF Output Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	1804.780M	76.5	+9.8	+5.7	+0.9		+0.0	92.9	116.9	-24.0	RF Ou
									Transmit Low		
2	1830.353M	75.4	+9.8	+5.7	+0.9		+0.0	91.8	116.9	-25.1	RF Ou
									Transmit Mid		
3	1855.140M	72.3	+9.9	+5.7	+0.9		+0.0	88.8	116.9	-28.1	RF Ou
									Transmit High		

CKC Laboratories, Inc. Date: 5/14/2014 Time: 13:13:36 Cisco Systems WO#: 95599
15.247(d) Spurious Emissions Test Lead: RF Output Port 24VDC Sequence#: 1 Ext ATTN: 0 dB



Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems, Inc.**		
Specification:	**15.247(d) / 15.209 Conducted Spurious Emissions**		
Work Order #:	**95599**	Date:	9/8/2014
Test Type:	**Conducted Emissions**	Time:	10:10:45
Equipment:	**IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna**	Sequence#:	1
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR529UBWP-915D/K9		120V 60Hz
S/N:	JMX1828X00L		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
	ANP01949	Attenuator	54A-6	2/7/2013	2/7/2015
	AN03356	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015
T2	ANP02229	Attenuator	PE7010-10	2/13/2013	2/13/2015
T3	AN03358	Cable	32022-2-29094K-36TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Dual Antenna*	Cisco Systems, Inc.	IR529UBWP-915D/K9	JMX1828X00L

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is powered by 120VAC. Spurious emissions were investigated while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode. Only those emissions outside of the restricted bands as defined in FCC 15.205 were measured.

Because the band-edges are not adjacent to any restricted bands as defined in FCC 15.205, band-edge measurements were taken via conducted measurements.

Frequency Range of Interest:
0.009-9280MHz

0.009-30MHz RBW = 100kHz; VBW > RBW;
30-1000MHz RBW = 120kHz; VBW > RBW;
1 - 9.28GHz RBW = 1MHz; VBW > RBW;

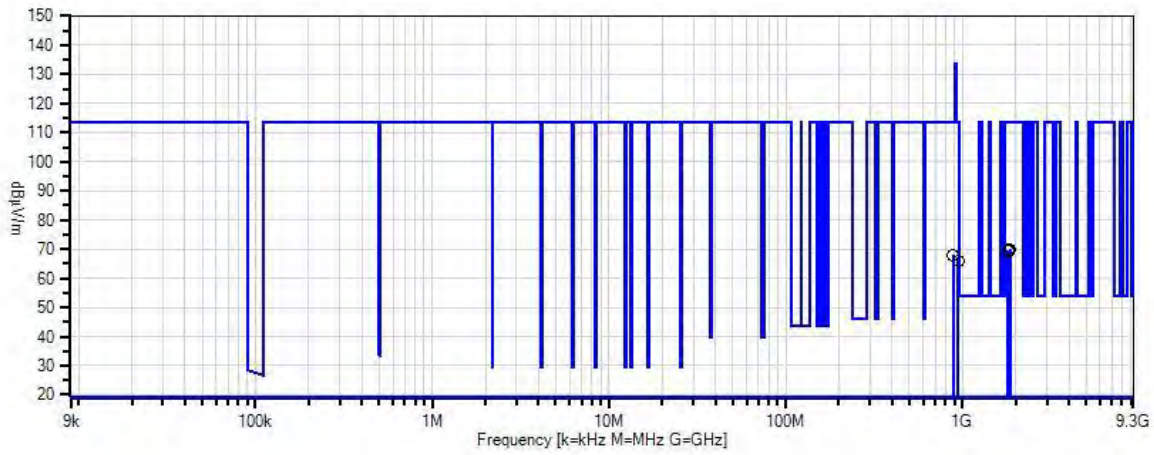
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: RF Output Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	1855.270M	49.5	+9.9	+10.0	+0.5		+0.0	69.9	113.6	-43.7	RF Ou
2	1829.583M	49.5	+9.8	+10.0	+0.5		+0.0	69.8	113.6	-43.8	RF Ou
3	1804.752M	49.2	+9.8	+9.9	+0.5		+0.0	69.4	113.6	-44.2	RF Ou
4	888.734M	48.0	+9.6	+9.9	+0.4		+0.0	67.9	113.6	-45.7	RF Ou
5	941.314M	46.0	+9.7	+9.9	+0.4		+0.0	66.0	113.6	-47.6	RF Ou

CKC Laboratories, Inc. Date: 9/8/2014 Time: 10:10:45 Cisco Systems, Inc. WO#: 95599
15.247(d) / 15.209 Conducted Spurious Emissions Test Lead: RF Output Port 120V 60Hz Sequence#: 1 Ext ATTN: 0 dB



Sweep Data
Readings
Peak Readings
QP Readings
Average Readings
Ambient
1 - 15.247(d) / 15.209 Conducted Spurious Emissions

Test Location: CKC Laboratories, Inc. • 5046 Sierra Pines Dr. • Mariposa, CA 93644 • (209) 966-5240

Customer:	**Cisco Systems, Inc.**		
Specification:	**15.247(d) / 15.209 Conducted Spurious Emissions**		
Work Order #:	**95599**	Date:	5/14/2014
Test Type:	**Conducted Emissions**	Time:	16:52:45
Equipment:	**IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna**	Sequence#:	1
Manufacturer:	Cisco Systems, Inc.	Tested By:	Eddie Mariscal
Model:	IR529UBWP-915S/K9		120V 60Hz
S/N:	JMX1813X01G		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02138	Attenuator	54-10	2/13/2013	2/13/2015
T2	ANP01949	Attenuator	54A-6	2/7/2013	2/7/2015
T3	AN03356	Cable	32026-2-29094K-48TC	2/7/2013	2/7/2015

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
IR529 915MHz WPAN IP67 Range Ext. BBU Adv PS Single Antenna*	Cisco Systems, Inc.	IR529UBWP-915S/K9	JMX1813X01G

Support Devices:

Function	Manufacturer	Model #	S/N
Laptop Computer	Toshiba	Portege	G66C0002GC10

Test Conditions / Notes:

EUT uses a removable antenna, thus peak power measurements will be gathered via conducted measurements. EUT operates on 64 channels and is rated for 120VAC/60Hz. Spurious emissions were investigated while the EUT was operating on the lowest, the middle and the highest channels in continuous transmit mode. Only those emissions not in a restricted band as defined by FCC 15.205 were measured.

Because the band-edges are not adjacent to any restricted bands as defined in FCC 15.205, band-edge measurements were taken via conducted measurements.

Frequency Range of Interest:
0.009-9280MHz

0.009-30MHz RBW = 100kHz; VBW > RBW;
30-1000MHz RBW = 120kHz; VBW > RBW;
1 - 9.28GHz RBW = 1MHz; VBW > RBW;

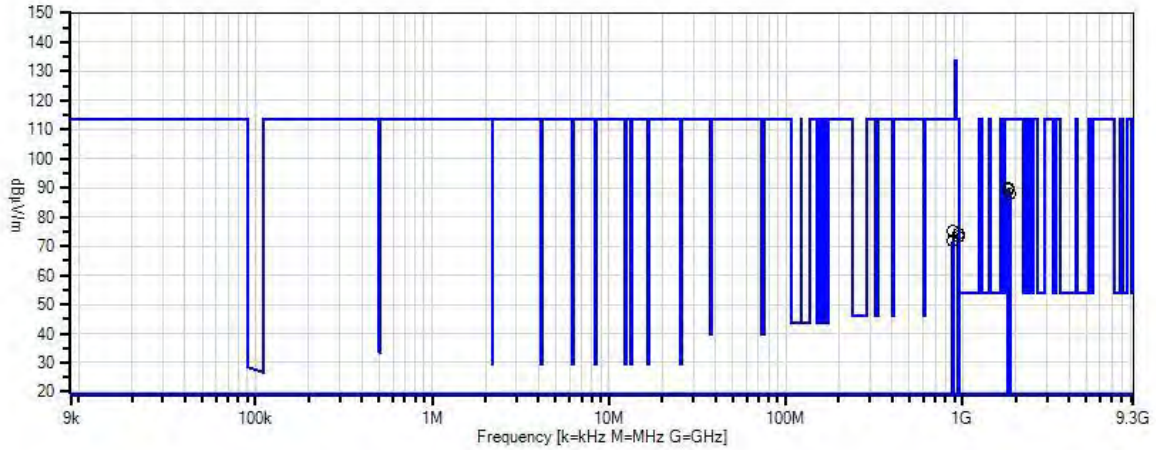
Environmental Conditions:
Temperature: 21°C
Relative Humidity: 40%
Atmospheric Pressure: 97.7kPa

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: RF Output Port

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	1829.543M	73.3	+9.8	+5.7	+0.9		+0.0	89.7	113.6	-23.9	RF Ou
									Transmit mid		
2	1804.849M	72.8	+9.8	+5.7	+0.9		+0.0	89.2	113.6	-24.4	RF Ou
									Transmit low		
3	1855.237M	71.2	+9.9	+5.7	+0.9		+0.0	87.7	113.6	-25.9	RF Ou
									Transmit high		
4	888.733M	59.0	+9.6	+5.7	+0.7		+0.0	75.0	113.6	-38.6	RF Ou
									Transmit high		
5	941.310M	57.9	+9.7	+5.7	+0.7		+0.0	74.0	113.6	-39.6	RF Ou
									Transmit low		
6	953.698M	57.2	+9.7	+5.7	+0.7		+0.0	73.3	113.6	-40.3	RF Ou
									Transmit mid		
7	875.948M	55.7	+9.6	+5.7	+0.7		+0.0	71.7	113.6	-41.9	RF Ou
									Transmit mid		

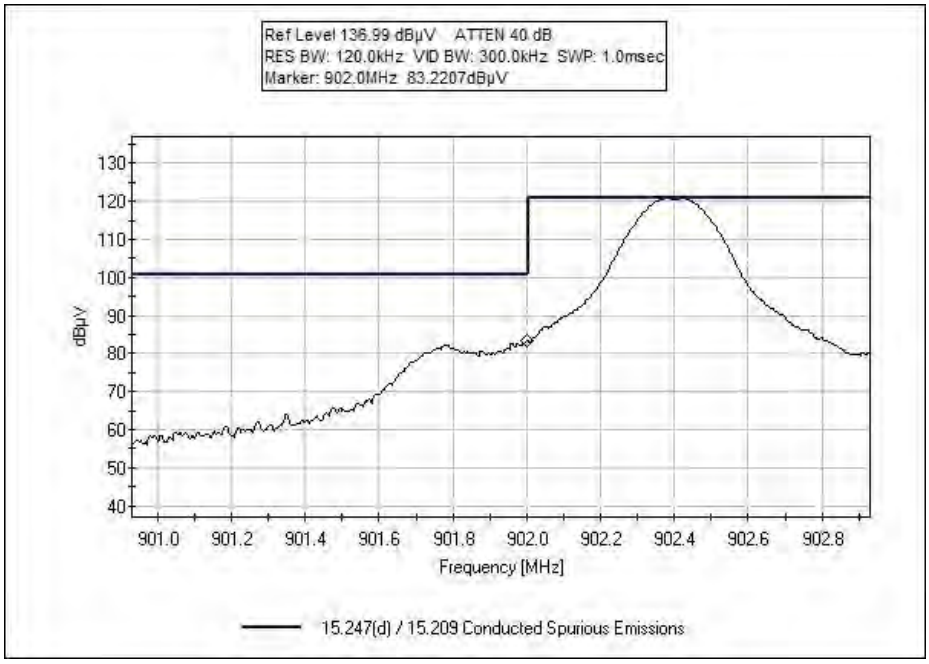
CKC Laboratories, Inc. Date: 5/14/2014 Time: 16:52:45 Cisco Systems, Inc. WO#: 95599
15.247(d) / 15.209 Conducted Spurious Emissions Test Lead: RF Output Port 120V 60Hz Sequence#: 1 Ext ATTN: 0 dB



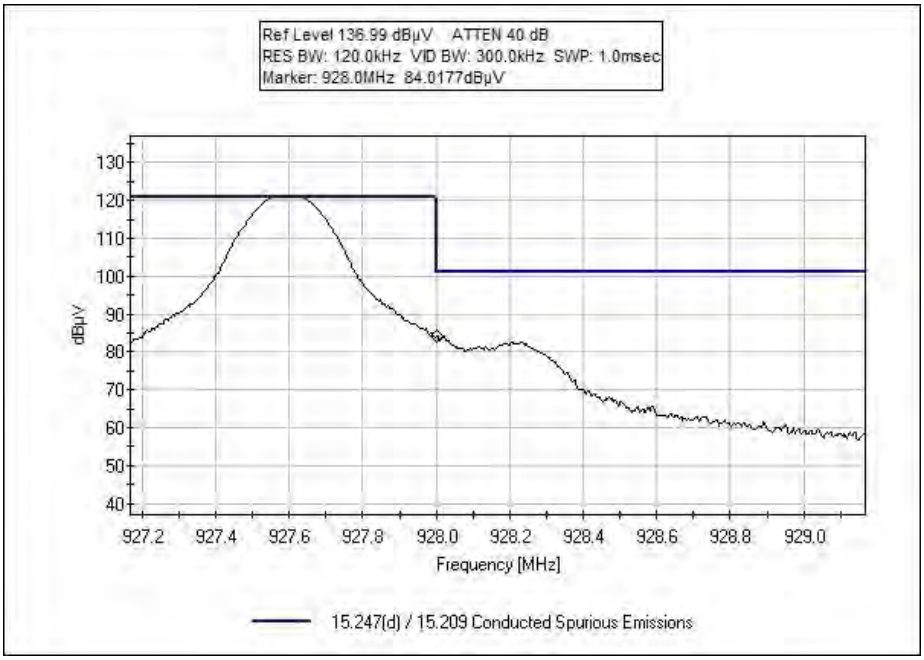
Sweep Data
Readings
Peak Readings
QP Readings
Average Readings
Ambient
1 - 15.247(d) / 15.209 Conducted Spurious Emissions

Band Edge

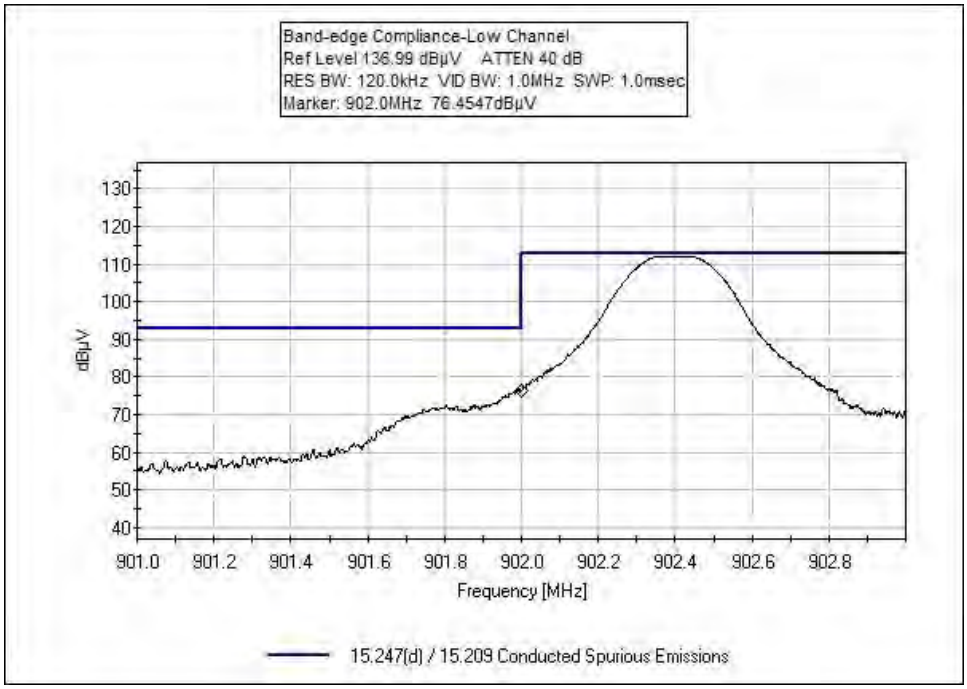
Test Data



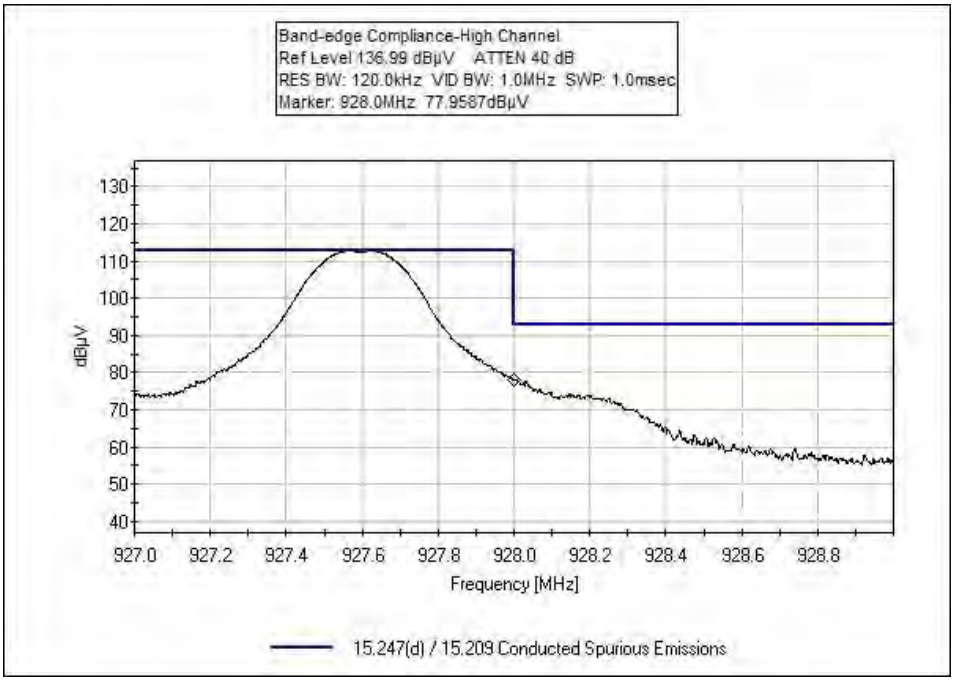
Low, DA Gateway



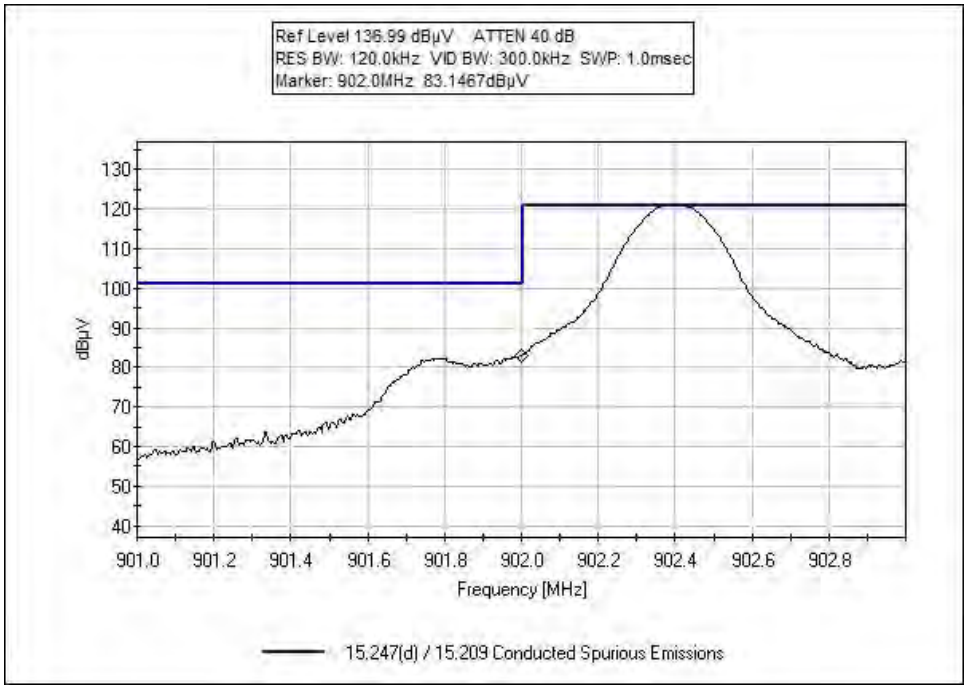
High, DA Gateway



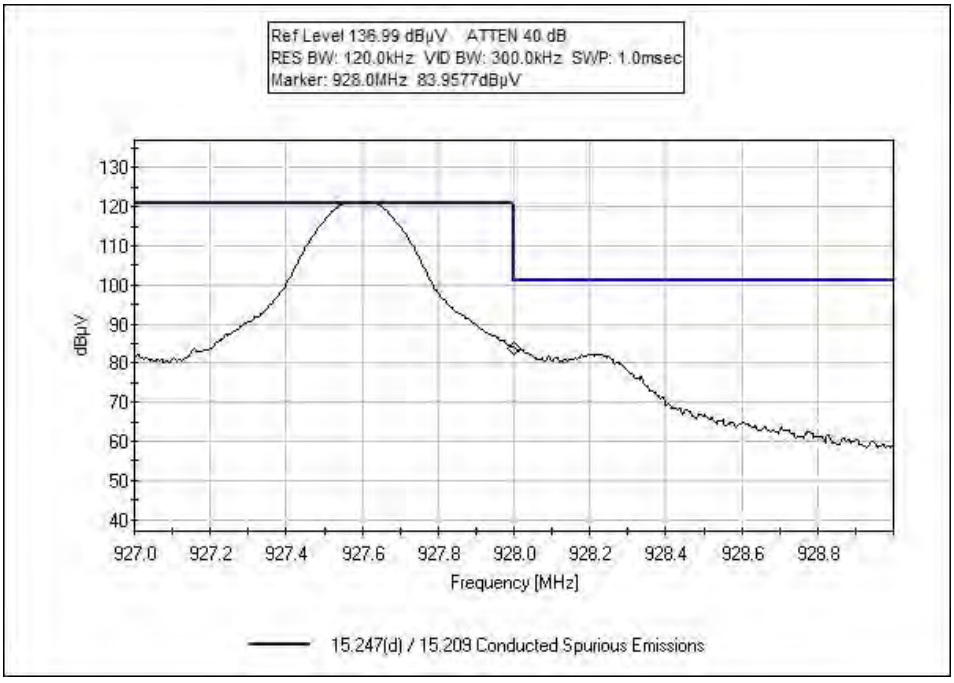
Low, Dual Antenna



High, Dual Antenna

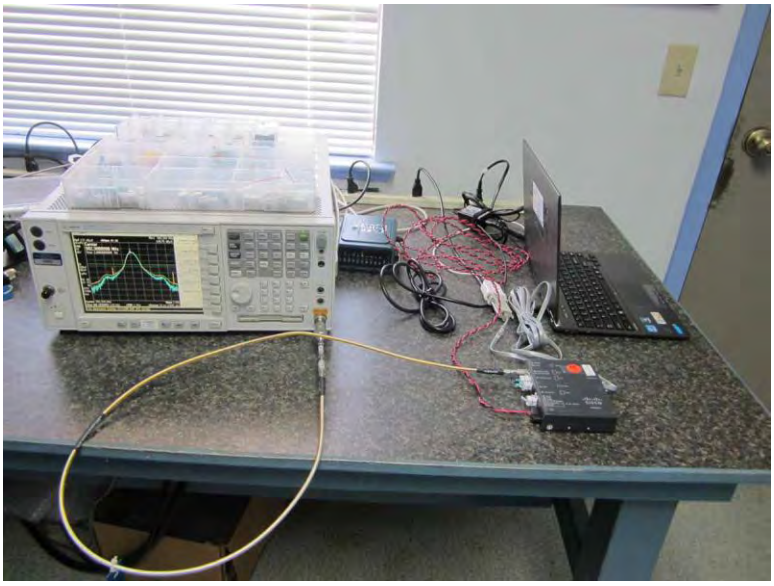


Low, Single Antenna

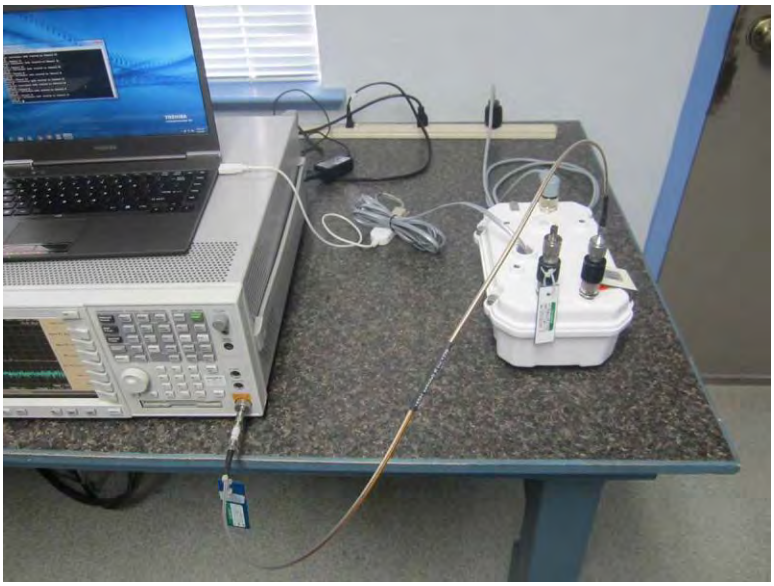


High, Single Antenna

Test Setup Photo(s)



DA Gateway



Dual Antenna

Single Antenna

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.