

**DATE: 18 February 2009**

**I.T.L. (PRODUCT TESTING) LTD.**

**FCC Radio Test Report**

for

**MobileAccess Networks**

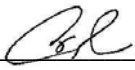
**Equipment under test:**

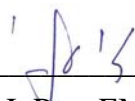
**WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points**

**860M-AU With WCE-AU**

**5 GHz Transmitter**

Written by:   
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Approved by:   
I. Raz, EMC Laboratory Manager

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This report relates only to items tested.



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# 1. General Information

## 1.1 Administrative Information

Manufacturer:	MobileAccess Networks
Manufacturer's Address:	8391 Old Courthouse Rd. Suite #300 Vienna, VA 22182 U.S.A. Tel: +1-541-758-2880 Fax: +1-703-848-0260
Manufacturer's Representative:	Steve Blum
Equipment Under Test (E.U.T):	WLAN Module With WCE (WiFi Coverage Extender) for DAS With Four Cisco 1242 Access Points
Equipment Model No.:	860M-AU With WCE-AU
Equipment Serial No.:	860M-AU: 0837453; WCE-AU: 0847A54
Date of Receipt of E.U.T:	01.02.09
Start of Test:	01.02.09
End of Test:	05.02.09
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	See Section 2

## **1.2 List of Accreditations**

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

### **1.3 Product Description**

The MobileAccess 860 WLAN Solution delivers pervasive WLAN coverage throughout enterprise environments using a unique multi-service wireless architecture. With the MA-860 approach, enterprises can seamlessly translate their WLAN investments and design expertise into a comprehensive, multi-service wireless solution.

The MA-860 combines WLAN services with signals from other wireless sources, including voice and data services from multiple wireless operators, public safety, and building automation applications. It then distributes the combined RF signals over a common set of broadband cables and antennas. One-Click calibration between the MA-860 module and the MobileAccess Wi-Fi Coverage Expander (WCE) ensures optimal coverage by mirroring the coverage footprint and system behavior of “AP-on-Ceiling” deployments for 802.11a and 802.11b/g WLAN services.

This Wire-it-Once™ approach spreads WLAN deployment costs across multiple wireless service needs, providing facility-wide coverage for WLAN and all other wireless services while creating a flexible infrastructure that adapts to evolving technology requirements.

In addition, the MA-860 WLAN solution locates Access Points (APs) in secure telecom closets alongside other LAN internetworking equipment, yielding significant operational benefits:

- Provides physical security of the APs
- Makes APs more accessible to IT staff
- Reduces ongoing operational expenses

### **1.4 Test Methodology**

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

### **1.5 Test Facility**

The radiated emissions tests were performed at I.T.L.’s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing August 22, 2006).

I.T.L.’s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

### **1.6 Measurement Uncertainty**

Radiated Emission

The Open Site complies with the  $\pm 4$  dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

## 2. System Test Configuration

### 2.1 Justification

The E.U.T. was originally authorized for FCC under FCC ID OJFMA860WCE. Due to changes in both the 860M and the WCE a new certification is required. Testing was performed according to correspondence with Mr. Joe Dichoso of the FCC dated 29 May 2008 :

“**From:** Steve Blum [mailto:sblum@mobileaccess.com]

**Sent:** Thursday, May 29, 2008 3:06 PM

**To:** Joe Dichoso

**Subject:** RE: FCC Guidance

Yes, we have two issues: summary of test data attached. Let me know if you need more details.

1. MobileAccess is requesting updated guidance on the part 15 testing for the model 860. The 860 is essentially a part 15 subpart C amplifier for 802.11 b/g/a WLAN services.

a. Main difference is the 860 couples licensed services (via certificated transmitters) onto the coax with the 802.11b/g and a services.

1. Licensed services are passively coupled and all services are filtered to prevent interference.

b. Previous guidance from FCC from March 2006, requires 3 sets of tests, b/g only, b/g and a, b/g with a and cell/pcs.

c. Test data from all submissions to date (summary attached) shows that “b/g and a” is worse case while passing all b/g and a tests.

**d. Request that guidance be modified to require only “b/g and a” test for future submissions**

1. MobileAccess agrees that the 860 is professionally installed and must be tested and sold with labels on transmitter for the specific transmitter approved.

**Reply: As before, the amplifier must be certified with a specific transmitter FCC ID XXXXXX it was tested with. Please note marketing requirements per 15.204(d). The amplifier must be marketed with the transmitter or designed in such a fashion that it can be used only with that transmitter. You can submit full tests with all “b/g and a” and cell/pcs active. Prescan tests can be made in all other modes.**

Steve Blum

Product Manager

MobileAccess

Office 541 758-2880

Mobile 541 990-3470

[Making Wireless an Indoor State of Mind](#)

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The EUT consists of the 860M, WCE and 4 identical access points. The system combines 802.11 signals with the cellular signals. The cellular signal are represented in the setup by the WMTS and AWS portion of the setup, which were connected to the EUT through MobileAccess standard infrastructure (i.e. RIU, BU, RHU and a controller) to represent a normal installation of the EUT. An “Exercise” SW on the laptops was used to trigger the access points to transmit continuously, while the EUT output was connected to the spectrum analyzer.

## **2.2 EUT Exercise Software**

The Acces Point (AP) (as part of the EUT) was triggered to transmit using an “Exercise SW”.

The program “Air Magnet” was used to trigger the AP to continuously transmit packets.

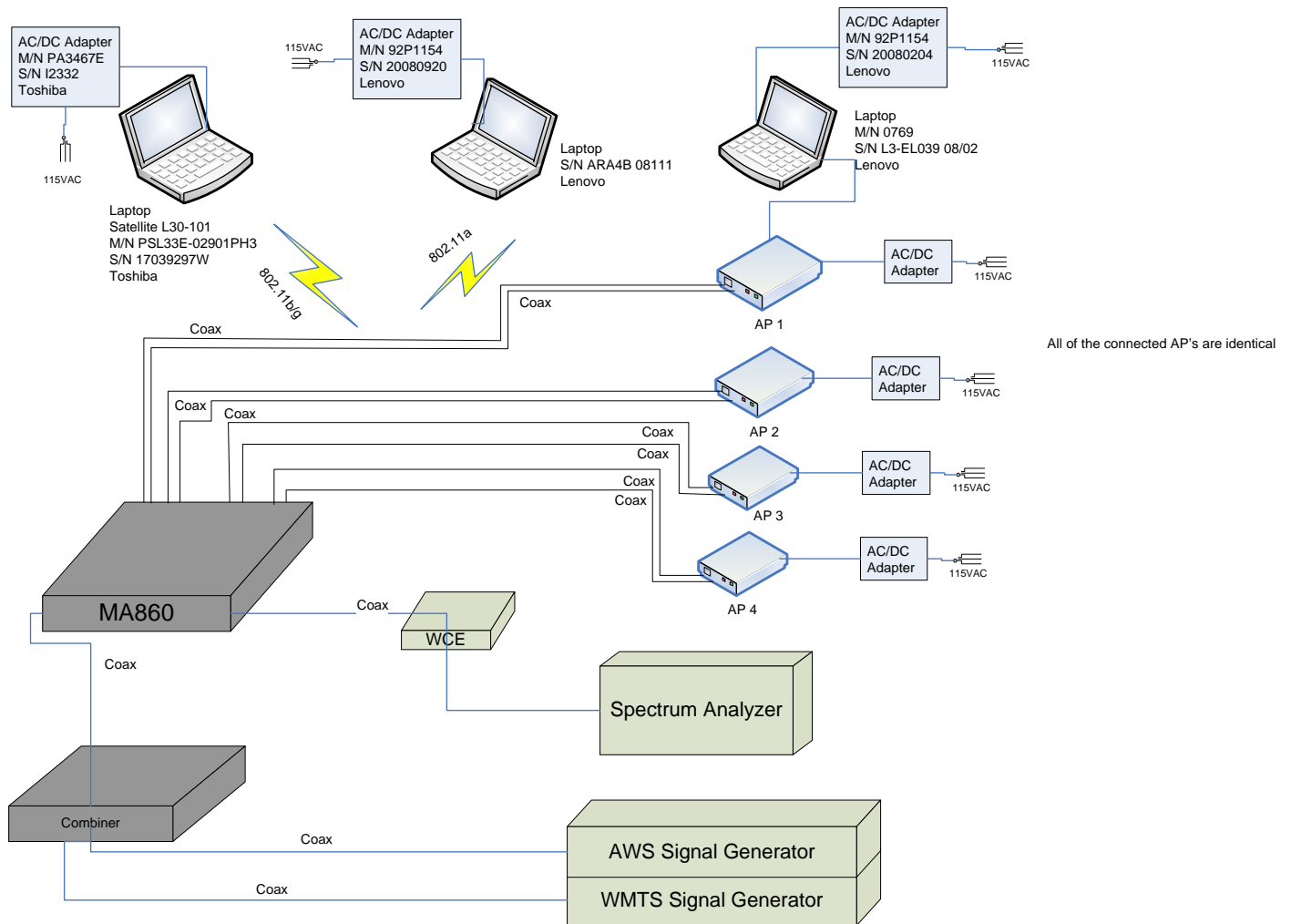
## **2.3 Special Accessories**

No special accessories were needed to achieve compliance.

## **2.4 Equipment Modifications**

No modifications were necessary in order o achieve compliance.

## 2.5 Configuration of Tested System



**Figure 1. Configuration of Tested System**

Note: The system was tested using four identical Cisco Access Points M/N 1242, S/N FTX1108B616, S/N FTX11013B13Q, S/N FTX1108B60Z, S/N FTX1108B605, FCC ID: LDK102056.

## 3. Theory of Operation

### 3.1 Theory of Operation



Making Wireless an Indoor State of Mind

#### ▶ MA-860 WLAN Solution

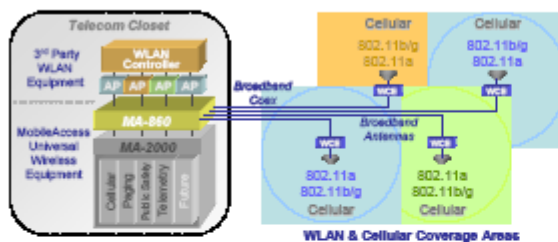
#### MobileAccess 860 WLAN Module

#### MA-860 Solution Overview

The MobileAccess 860 WLAN Solution delivers pervasive WLAN coverage throughout enterprise environments using a unique multi-service wireless architecture. With the MA-860 approach, enterprises can seamlessly translate their WLAN investments and design expertise into a comprehensive, multi-service wireless solution.

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This Wire-it-Once™ approach spreads WLAN deployment costs across multiple wireless service needs, providing facility-wide coverage for WLAN and all other wireless services while creating a flexible infrastructure that adapts to evolving technology requirements.



In addition, the MA-860 WLAN solution locates Access Points (APs) in secure telecom closets alongside other LAN internetworking equipment, yielding significant operational benefits:

- ▶ Provides physical security of the APs
- ▶ Makes APs more accessible to IT staff
- ▶ Reduces ongoing operational expenses



#### Benefits

##### Cost-Effective Multi-Service Solution

- ▶ Delivers WLAN and other wireless RF signals over a single multi-service infrastructure
- ▶ Spreads WLAN deployment costs across multiple wireless services

##### Dependable WLAN Coverage

- ▶ MobileAccess WLAN architecture mirrors the behaviors and coverage footprint of "AP-on-Ceiling" deployment
- ▶ One-Click compensation ensures optimal 802.11b/g and 802.11a coverage
- ▶ Dedicated AP to antenna relationships ensure transparent support for WLAN applications such as VOIP and location services (RTLS)
- ▶ Redundant power option

##### Centralized & Secure AP Management

- ▶ Lowers operating expenses
- ▶ Provides physical security and simplifies management

##### Proactive End-to-End Monitoring

- ▶ Remote SNMP monitoring for status, alerting, and fault detection
- ▶ Monitoring extends to attached multi-service antennas

##### Simplified IT Deployment Model

- ▶ Uses standard WLAN design techniques



8391 Old Courthouse Road, Suite 300, Vienna, VA 22182

Tel: (866)438-9288, (703) 848-0200 TAC: (800) 787-1268 Fax: (703) 848-0280

[www.mobileaccess.com](http://www.mobileaccess.com)

## MA-860 Product Specifications

### 802.11 RF Parameters Power

860(M/R) with Wi-Fi Coverage Expander (WCE):

	802.11a	802.11b/g
Gain TX (dB)	0	0
Output Power (dBm)	17	b: 20 g: 17
Gain RX (dB)	4	4
NF RX (dB)	5	5
Flatness (dB)	+/- 2.0	+/- 1.5

860(M/R) Module Standalone:

	802.11a	802.11b/g
Insertion Loss (dB)	3	2
Flatness (dB)	+/- 1.0	+/- 1.0

### Mobile Services Parameters

	Cell		PCS
Band (MHz)	698-960		1710-1990
Insertion Loss (dB)			
MA-860	1.0		2.5
WCE	1.2		3.5
System	2.2		6.0

### RF Connections

860(M/R)

802.11 b/g	(4) SMA Female, 50 ohm
802.11 a	(4) SMA Female, 50 ohm
Mobile Services	(4) SMA Female, 50 ohm
Antenna Ports	(4) N-type Female, 50 ohm

WCE

Coax (860 facing)	(1) N-type Male
Coax (Ant facing)	(1) N-type Female

### Standards and Approvals

FCC-47, CFR 15.109, Part 15 Sections B, C, and E  
UL / IEC 60950 -1  
UL1950 Fire Safety requirements  
UL2043 Fire/Plenum (WCE)  
CE EN 60950  
CAN/CSA C22.2 No 60950

### Management

The 860(M/R) can be configured and monitored through either a local RS-485 connection or a Web browser application via an RJ-45 Ethernet connection

### Power

2 DC Power Inputs  
DC-1 = 28V Mandatory DC Power, 66 Watts  
DC-2= 9.8V Optional Redundant Power, 40 Watts

### Physical Specifications

Dimensions 860(M/R): 242 mm x 279 mm x 38 mm  
(9.54 in x 10.98 in x 1.5 in)  
WCE: 130 mm x 120 mm x 20 mm  
(5.12 in x 4.73in x 0.8 in)

Weight 860(M/R): 2.82 kg (6.2 lb)  
WCE: 0.80 kg (1.8 lb)

### Environmental Specifications

Temperature  
Operating 0°C to +50°C (32°F to 122°F)  
Storage -20°C to +85°C (-4°C to 185°C)  
Humidity  
Operating 95% (non-condensing)  
Storage 95% (non-condensing)

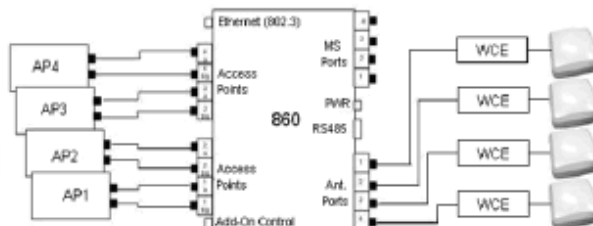
### Ordering Information

860M 860 WLAN Module  
860R 860 WLAN Module  
- Redundant Power Supply Option  
WCE Wi-Fi Coverage Expander

Accessory Kits for mounting 860(M/R):

AK-860-1000	860 with MA-1000
AK-860-1200	860 with MA-1200
AK-860-MDLT	860 with ModuLite
AK-860-2000	860 with MA-2000
AK-860-SA	860 stand alone
AK-860-2000L	860 with MA-2000 Lite
AK-860-PWR	Redundant Power Supply

### Wiring Diagram



8391 Old Courthouse Road, Suite 300, Vienna, VA 22182  
Tel: (866)436-9286, (703) 848-0200 TAC: (800) 787-1288 Fax: (703) 848-0280  
[www.mobileaccess.com](http://www.mobileaccess.com)

## 4. Conducted Emission Data

### 4.1 Test Specification

F.C.C., Part 15, Subpart C

### 4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50  $\mu$ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

### 4.3 Measured Data

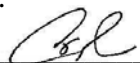
JUDGEMENT: Passed by 1.6 dB

The margin between the emission levels and the specification limit was, in the worst case, 1.6 dB for the phase line at 1.23 MHz and 9.7 dB for the neutral line at 9.88 MHz.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 2* to *Figure 5*.

TEST PERSONNEL:

Tester Signature:  Date: 22.02.09

Typed/Printed Name: A. Sharabi

## Conducted Emission

E.U.T Description      WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points  
Type                      860M-AU With WCE-AU  
Serial Number:         860M-AU: 0837453; WCE-AU: 0847A54

Specification:    FCC Part 15, Subpart C  
Lead:              Phase  
Detectors:        Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.168282	43.7	36.0	-29.1	31.3	-23.8	0.0
2	0.341864	41.6	40.5	-18.7	39.4	-9.8	0.0
3	1.230928	48.0	45.7	-10.3	44.3	-1.6	0.0
4	2.496622	45.5	42.4	-13.6	39.5	-6.4	0.0
5	5.202922	49.4	45.2	-14.8	29.4	-20.6	0.0
6	9.886600	43.5	42.5	-17.5	36.7	-13.4	0.0

**Figure 2. Detectors: Peak, Quasi-peak, AVERAGE .**

*Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*

## Conducted Emission

E.U.T Description WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points


Type 860M-AU With WCE-AU

Serial Number: 860M-AU: 0837453; WCE-AU: 0847A54

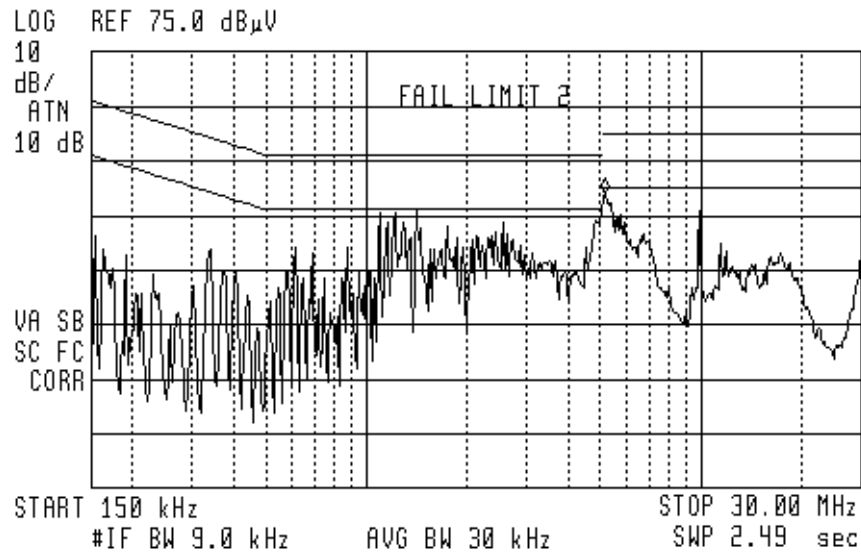
Specification: FCC Part 15, Subpart C

Lead: Phase

Detectors: Peak, Quasi-peak, Average

 10:32:47 FEB 05, 2009

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 5.12 MHz  
48.80 dB $\mu$ V



**Figure 3. Detectors: Peak, Quasi-peak, Average**

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.

## Conducted Emission

E.U.T Description WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points

Type 860M-AU With WCE-AU

Serial Number: 860M-AU: 0837453; WCE-AU: 0847A54

Specification: FCC Part 15, Subpart C

Lead: Neutral

Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.167876	41.8	33.3	-31.8	11.9	-43.2	0.0
2	1.037234	12.9	5.1	-50.9	-3.1	-49.1	0.0
3	1.230733	31.8	30.1	-25.9	29.3	-16.7	0.0
4	5.272493	40.8	35.7	-24.3	20.7	-29.3	0.0
5	6.862503	34.8	30.3	-29.7	16.7	-33.3	0.0
6	9.884819	45.5	42.7	-17.4	40.3	-9.7	0.0

**Figure 4. Detectors: Peak, Quasi-peak, AVERAGE**

*Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*



# Conducted Emission

E.U.T Description WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points

Type 860M-AU With WCE-AU

Serial Number: 860M-AU: 0837453; WCE-AU: 0847A54

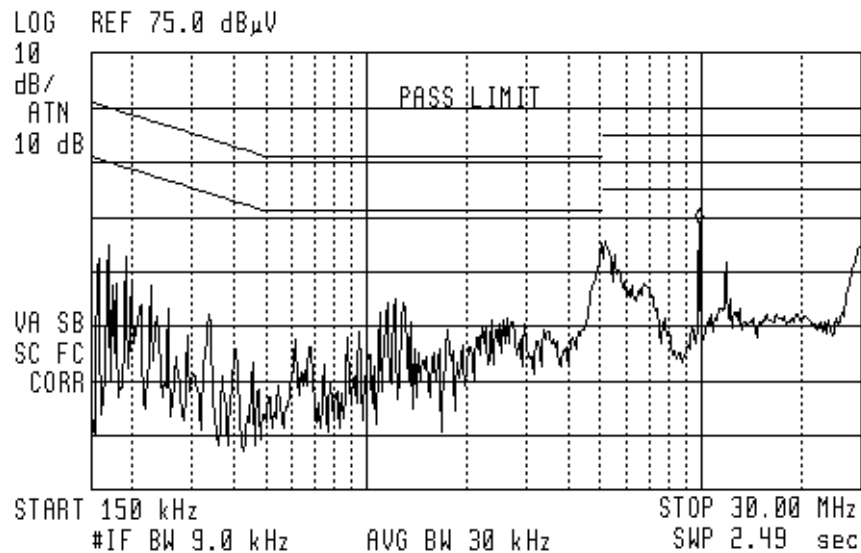
Specification: FCC Part 15, Subpart C

Lead: Neutral

Detectors: Peak, Quasi-peak, Average

 10:37:36 FEB 05, 2009

ACTV DET: PEAK  
MEAS DET: PEAK QP AVG  
MKR 9.87 MHz  
43.50 dB $\mu$ V



**Figure 5 Conducted Emission: NEUTRAL**  
**Detectors: Peak, Quasi-peak, Average**

#### 4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 8, 2008	1 Year
LISN	Fischer	FCC-LISN-2A	128	March 8, 2008	1 Year
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 Year
RF Filter Section	HP	85420E	3705A00248	November 16, 2008	1 Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

## **5. Spurious Radiated Emission in the Restricted Band, Below 1 GHz 802.11b/g+802.11a + WMTS + AWS Signals**

### **5.1 Test Specification**

9kHz-1000 MHz, F.C.C., Part 15, Subpart C

### **5.2 Test Procedure**

The E.U.T. operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30 MHz, the loop antenna was rotated on its vertical axis, The antenna height (center of loop) was 1 meter.

In the frequency range 30-1000 MHz, the readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

- Turning the E.U.T on and off.

- Using a frequency span less than 10 MHz.

- Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The E.U.T. was tested at the operating frequencies of, 5180, 5200, 5240, 5745, 5765, and 5805 MHz using the following modulations: 64QAM, and BPSK.

### 5.3 **Test Data**

JUDGEMENT: Passed

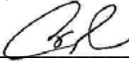
The signals in the band 9 kHz – 1.0 GHz were below the spectrum analyzer noise level, at least 20 dB below the specification limit.

The results for all operating frequencies and modulations were the same.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

The results for all operating frequencies and modulations were the same.

TEST PERSONNEL:

Tester Signature: 

Date: 22.02.09

Typed/Printed Name: A. Sharabi

#### 5.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 17, 2008	1 year
RF Section	HP	85420E	3705A00248	November 16, 2008	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 23, 2008	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 06, 2008	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2008	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

## 5.5 **Field Strength Calculation**

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[\text{dB}\mu\text{v}/\text{m}] \text{ FS} = \text{RA} + \text{AF} + \text{CF}$$

- FS: Field Strength [dB $\mu$ v/m]
- RA: Receiver Amplitude [dB $\mu$ v]
- AF: Receiving Antenna Correction Factor [dB/m]
- CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

## 6. Spurious Radiated Emission in the Restricted Band, Above 1 GHz 802.11b/g+802.11a + WMTS + AWS Signals

### 6.1 Radiated Emission Above 1 GHz

The E.U.T operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.

In the frequency range 2.9-40.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

The test distance was 3 meters.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The E.U.T. was tested at the operating frequencies of, 5180, 5200, 5240, 5745, 5765, and 5805 MHz using the following modulations: 64QAM, and BPSK.

## 6.2 Test Data

JUDGEMENT: Passed by 6.1 dB

For the operating frequencies of 5180, 5200, and 5240, the signals in the frequency range of 1.0 – 40.0 GHz were more than 20 dB below the specification limit.

For the operation frequency of 5745 MHz, the margin between the emission level and the specification limit is 7.6 dB in the worst case at the frequency of 11490.00 MHz, vertical polarization.

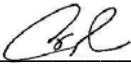
For the operation frequency of 5765 MHz, the margin between the emission level and the specification limit is 8.6 dB in the worst case at the frequency of 11530.00 MHz, vertical polarization.

For the operation frequency of 5805 MHz, the margin between the emission level and the specification limit is 6.1 dB in the worst case at the frequency of 11610.00 MHz, vertical polarization.

The results for all modulations were the same.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

TEST PERSONNEL:

Tester Signature: 

Date: 22.02.09

Typed/Printed Name: A. Sharabi



## Radiated Emission Above 1 GHz

E.U.T Description    WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points  
Type                    860M-AU With WCE-AU  
Serial Number:        860M-AU: 0837453; WCE-AU: 0847A54

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical    Frequency range: 1.0 GHz to 40.0 GHz  
Test Distance: 3 meters                            Detector: Peak  
Operation Frequency: 5745 MHz

<b>Freq.</b>	<b>Polarity</b>	<b>Peak Reading</b>	<b>Peak. Specification</b>	<b>Peak. Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
11490.00	H	54.6	74.0	-19.4
11490.00	V	56.8	74.0	-17.2

**Figure 6. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Reading” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

## Radiated Emission Above 1 GHz

E.U.T Description    WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points  
Type                    860M-AU With WCE-AU  
Serial Number:        860M-AU: 0837453; WCE-AU: 0847A54

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 1.0 GHz to 40.0 GHz  
Test Distance: 3 meters                              Detector: Average  
Operation Frequency: 5745 MHz

<b>Freq.</b>	<b>Polarity</b>	<b>Average Reading</b>	<b>Average Specification</b>	<b>Peak. Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
11490.00	H	45.3	54.0	-8.7
11490.00	V	46.4	54.0	-7.6

**Figure 7. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Average**

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Reading” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

## Radiated Emission Above 1 GHz

E.U.T Description    WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points  
Type                    860M-AU With WCE-AU  
Serial Number:        860M-AU: 0837453; WCE-AU: 0847A54

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical    Frequency range: 1.0 GHz to 40.0 GHz  
Test Distance: 3 meters                            Detector: Peak  
Operation Frequency: 5765 MHz

<b>Freq.</b>	<b>Polarity</b>	<b>Peak Reading</b>	<b>Peak. Specification</b>	<b>Peak. Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
11530.00	H	54.6	74.0	-19.4
11530.00	V	57.6	74.0	-16.4

**Figure 8. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Reading” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

## Radiated Emission Above 1 GHz

E.U.T Description    WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points  
Type                    860M-AU With WCE-AU  
Serial Number:        860M-AU: 0837453; WCE-AU: 0847A54

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 1.0 GHz to 40.0 GHz  
Test Distance: 3 meters                              Detector: Average  
Operation Frequency: 5765 MHz

<b>Freq.</b>	<b>Polarity</b>	<b>Average Reading</b>	<b>Average Specification</b>	<b>Peak. Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
11530.00	H	43.9	54.0	-10.1
11530.00	V	45.4	54.0	-8.6

**Figure 9. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Average**

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Reading” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

## Radiated Emission Above 1 GHz

E.U.T Description    WLAN Module With WCE (WiFi Coverage Extender)  
for DAS With Four Cisco 1242 Access Points  
Type                      860M-AU With WCE-AU  
Serial Number:        860M-AU: 0837453; WCE-AU: 0847A54

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical    Frequency range: 1.0 GHz to 40.0 GHz  
Test Distance: 3 meters                            Detector: Peak  
Operation Frequency: 5805 MHz

<b>Freq.</b>	<b>Polarity</b>	<b>Peak Reading</b>	<b>Peak. Specification</b>	<b>Peak. Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
11610.00	H	57.5	74.0	-16.5
11610.00	V	58.5	74.0	-15.5

**Figure 10. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Peak**

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Reading” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

## Radiated Emission Above 1 GHz

E.U.T Description    WLAN Module With WCE (WiFi Coverage Extender) for  
DAS With Four Cisco 1242 Access Points  
Type                    860M-AU With WCE-AU  
Serial Number:        860M-AU: 0837453; WCE-AU: 0847A54

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 1.0 GHz to 40.0 GHz  
Test Distance: 3 meters                              Detector: Average  
Operation Frequency: 5805 MHz

<b>Freq.</b>	<b>Polarity</b>	<b>Average Reading</b>	<b>Average Specification</b>	<b>Peak. Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
11610.00	H	45.3	54.0	-8.7
11610.00	V	47.9	54.0	-6.1

**Figure 11. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL.  
Detector: Average**

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Average Reading” includes correction factor.

“Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

### 6.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3411A00102	November 17, 2008	1 year
RF Section	HP	85420E	3427A00103	November 16, 2008	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	January 29, 2009	2 years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 15, 2006	2 years
Horn Antenna	ARA	SWH-28	1008	December 23, 2008	2 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 3, 2008	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 8, 2009	1 year
Low Noise Amplifier	MK Milliwave	MKT6-3000 400-30-13P	399	January 8, 2009	1 year
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Spectrum Analyzer	HP	8546E	3442A00275	December 15, 2008	1 year
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A







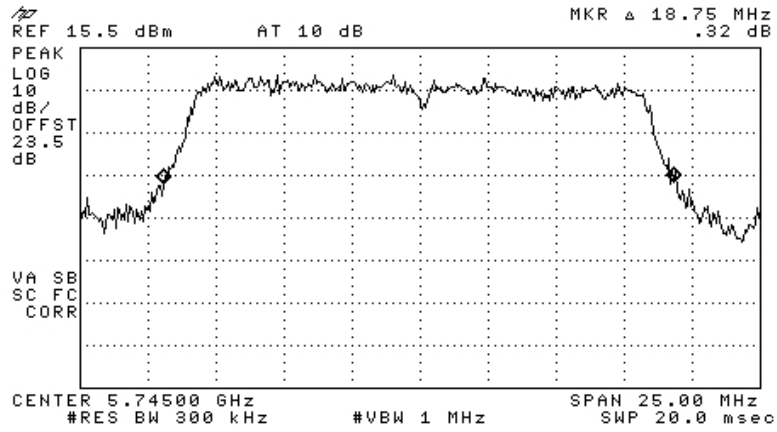


Figure 15 —5745 MHz 64QAM

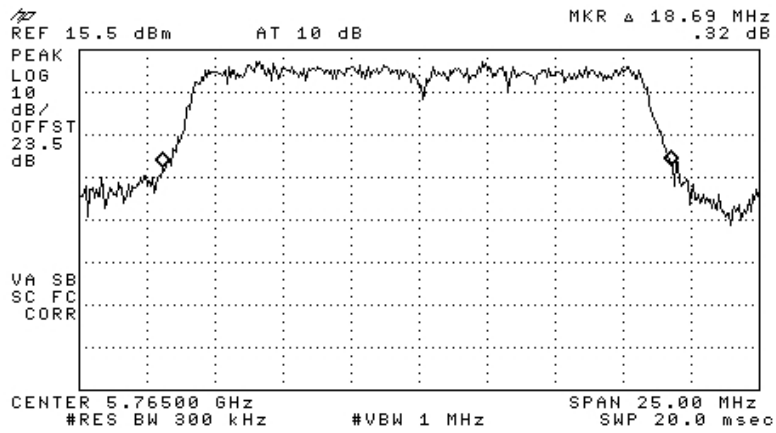


Figure 16 —5765 MHz 64QAM

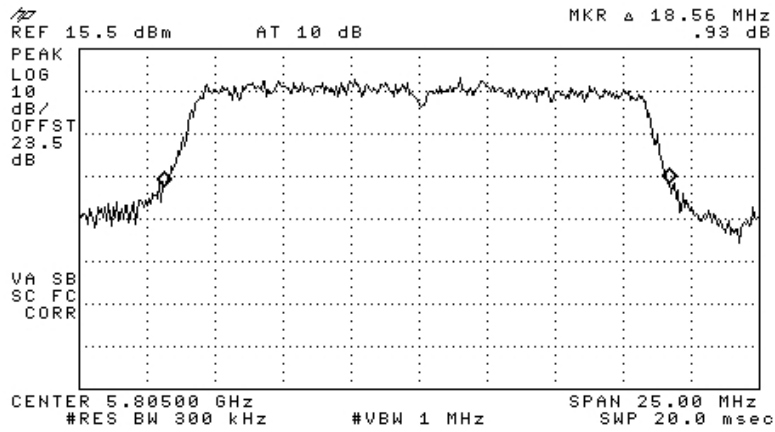


Figure 17 —5805 MHz 64QAM

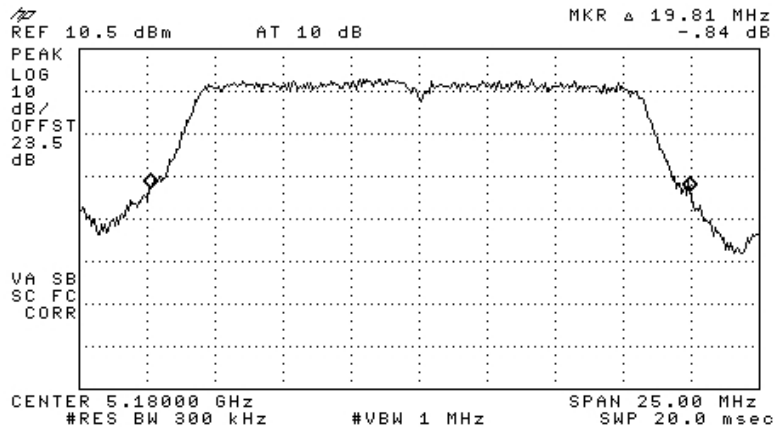


Figure 18 —5180 MHz BPSK

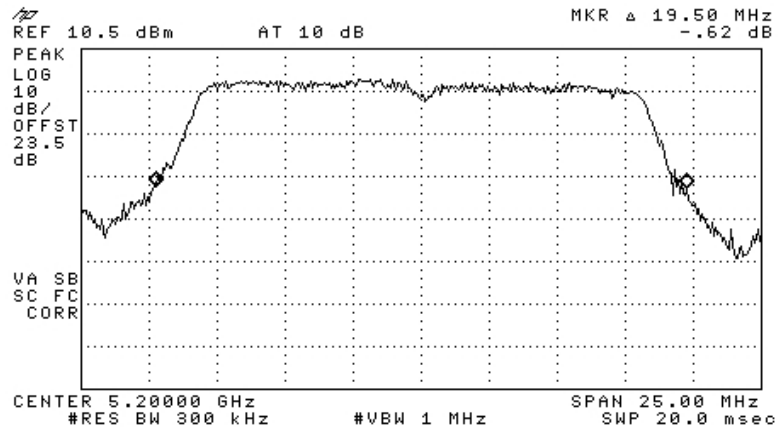


Figure 19 —5200 MHZ BPSK

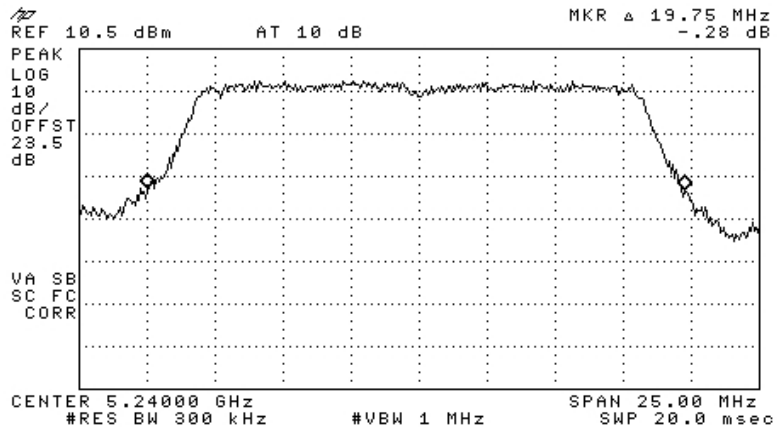


Figure 20 —5240 MHZ BPSK

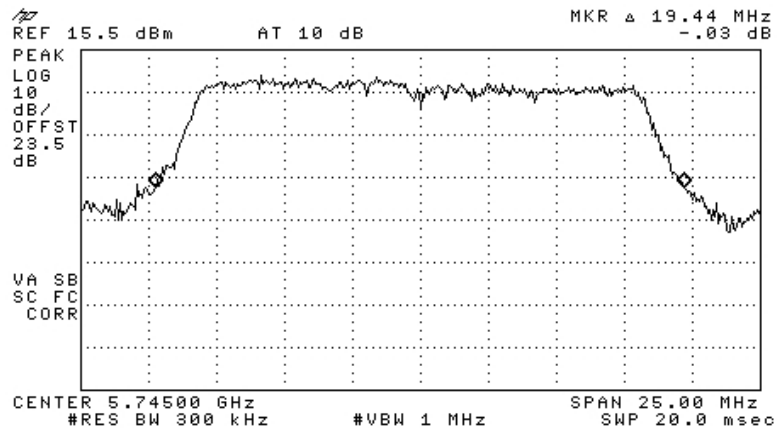


Figure 21 —5745 MHz BPSK

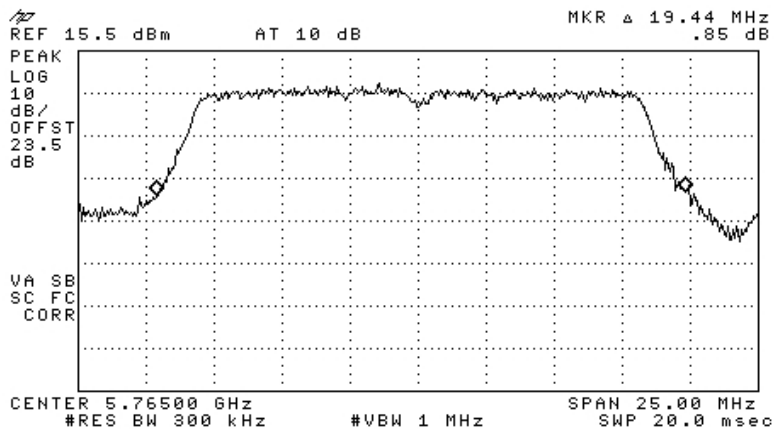


Figure 22 —5765 MHz BPSK

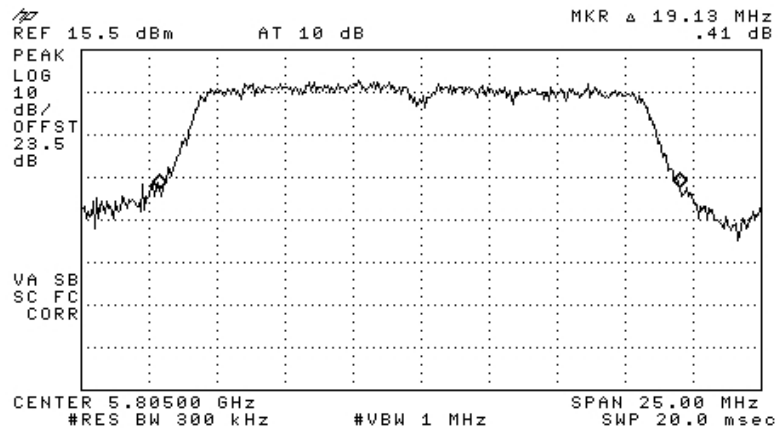
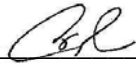


Figure 23 — 5805 MHz BPSK

Operation Frequency (MHz)	Modulation	26 dB Bandwidth (dBm)
5180	64QAM	18.8
	BPSK	19.8
5200	64QAM	18.7
	BPSK	19.5
5240	64QAM	18.6
	BPSK	19.8
5745	64QAM	18.8
	BPSK	19.5
5765	64QAM	18.7
	BPSK	19.5
5805	64QAM	18.6
	BPSK	19.1

TEST PERSONNEL:

Tester Signature: 

Date: 22.02.09

Typed/Printed Name: A. Sharabi

## 7.2 Test Equipment Used.

26 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	February 1, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	February 1, 2009	1 year
Cable	Rhophase	KPS-1501-1000	A1675	February 1, 2009	1 year

**Figure 24 Test Equipment Used**





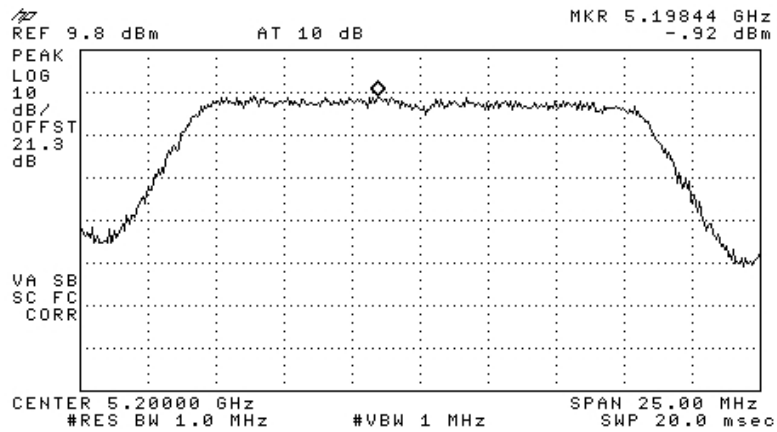


Figure 26 5200 MHz 64QAM

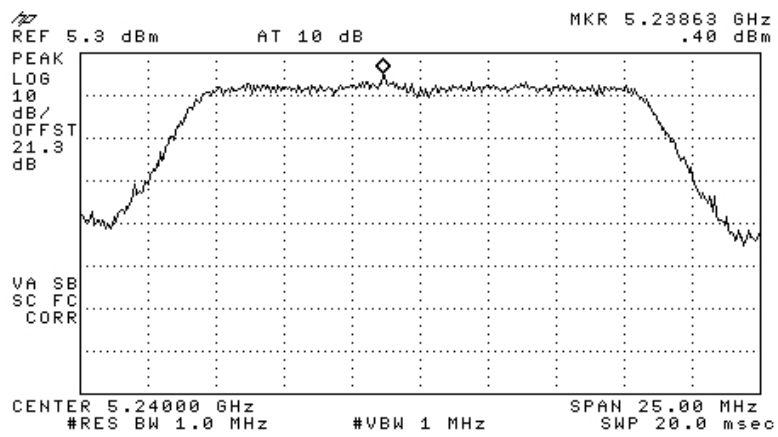


Figure 27 5240 MHz 64QAM



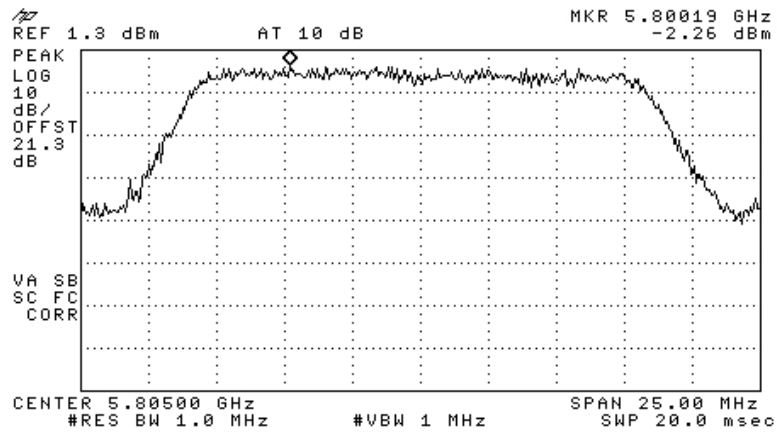


Figure 30 5805 MHz 64QAM

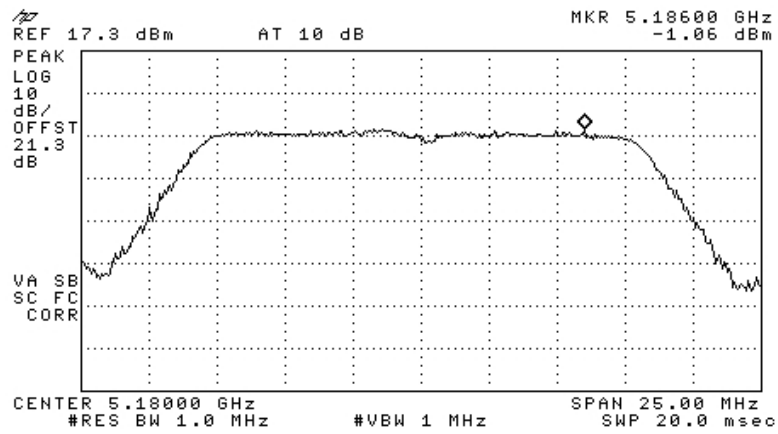
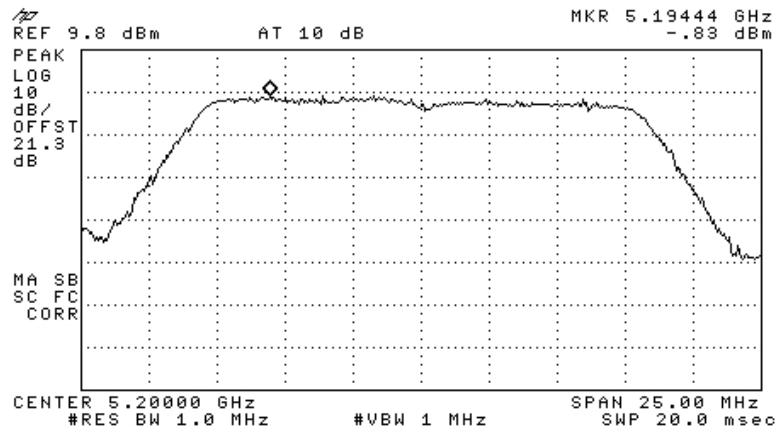
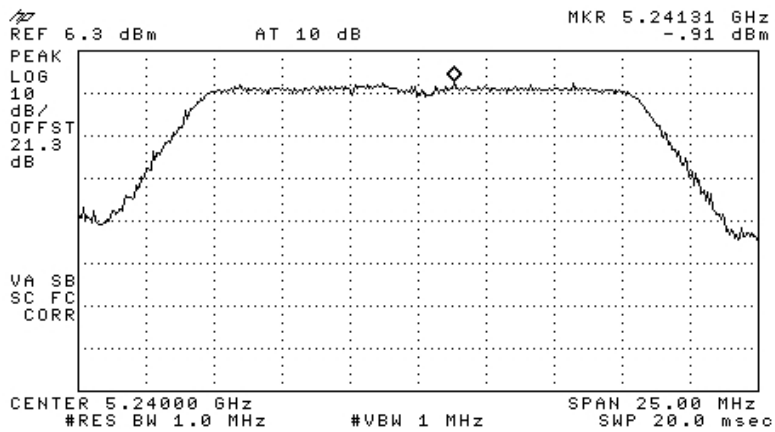


Figure 31 5180 MHz BPSK



**Figure 32 5200 MHz BPSK**



**Figure 33 5240 MHz BPSK**





## 8.2 Results table

E.U.T. Description: WLAN Module With WCE (WiFi Coverage Extender) for DAS  
With Four Cisco 1242 Access Points

Model No.: 860M-AU With WCE-AU

Serial Number: 860M-AU: 0837453; WCE-AU: 0847A54

Specification: F.C.C. Part 15, Subpart E

Operation Frequency (MHz)	Modulation	Power (dBm)	Specification (dBm)	Margin (dB)
5180	64QAM	11.87158	15.74158	-3.87
	BPSK	11.90665	15.96665	-4.06
5200	64QAM	11.79842	15.71842	-3.92
	BPSK	12.07035	15.90035	-3.83
5240	64QAM	13.09513	15.69513	-2.6
	BPSK	12.05665	15.96665	-3.91
5745	64QAM	10.60158	28.74158	-18.14
	BPSK	11.10035	28.90035	-17.8
5765	64QAM	9.098416	28.71842	-19.62
	BPSK	9.820346	28.90035	-19.08
5805	64QAM	10.43513	28.69513	-18.26
	BPSK	10.39033	28.81033	-18.42

**Figure 37 Maximum Peak Power Output**

Note: Antenna Gain is 7 dBi

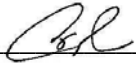
Peak Output Power = Reading + 10log EBW

For 5.18; 5.20, 5.24 GHz Peak Output Power Limit = 4 + 10log EBW – (Antenna Gain –6)

For 5.745; 5.765, 5.805 GHz Peak Output Power Limit = 17 + 10log EBW – (Antenna Gain –6)

JUDGEMENT: Passed by 2.6 dB

TEST PERSONNEL:

Tester Signature: 

Date: 22.02.09

Typed/Printed Name: A. Sharabi

### 8.3 Test Equipment Used.

#### Peak Power Output

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	February 1, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	February 1, 2009	1 year

Figure 38 Test Equipment Used



## 9. Peak Power Spectral Density 802.11b/g+802.11a + WMTS + AWS Signals

[In accordance with section 15.407(a)]

### 9.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20dB) and an appropriate coaxial cable (Cable Loss = 1 dB). The spectrum analyzer was set to 1 MHz resolution BW. and 1 MHz video BW. The spectrum peaks were located at at 5180, 5200, 5240, 5745, 5765, and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

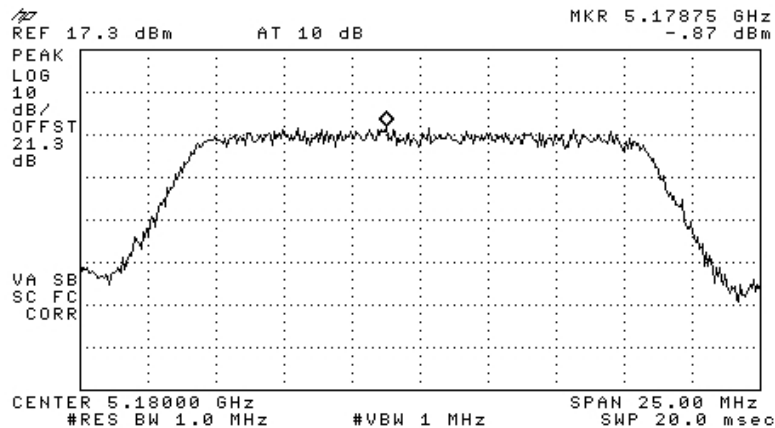


Figure 39 —5180 MHz 64QAM

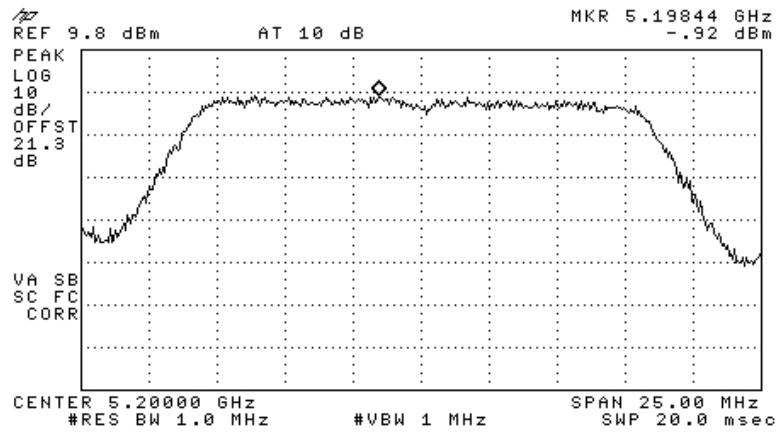


Figure 40 —5200 MHz 64QAM

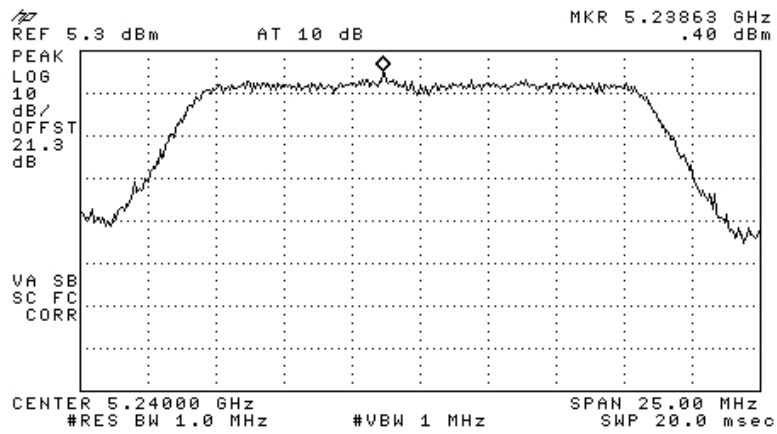


Figure 41 —5240 MHz 64QAM

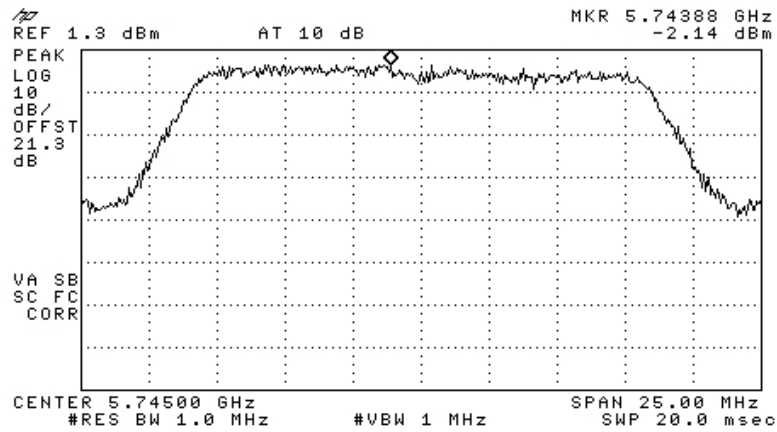


Figure 42 —5745 MHz 64QAM

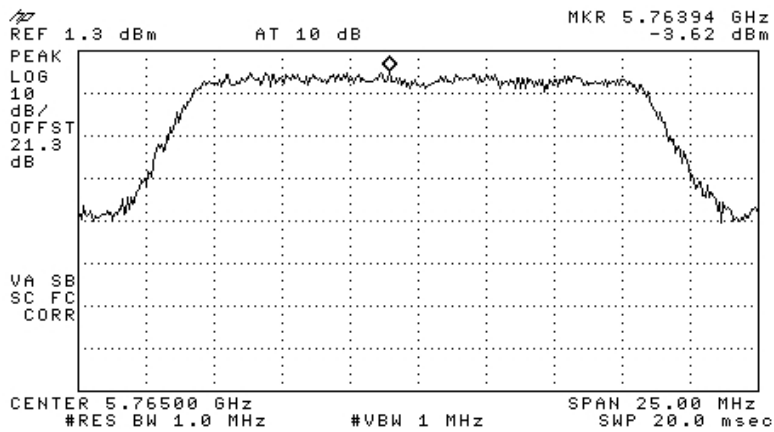


Figure 43 —5765 MHz 64QAM



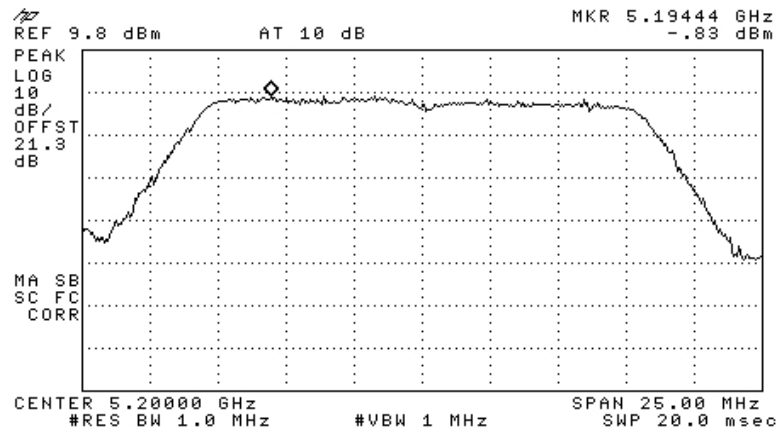


Figure 46 — 5200 MHz BPSK

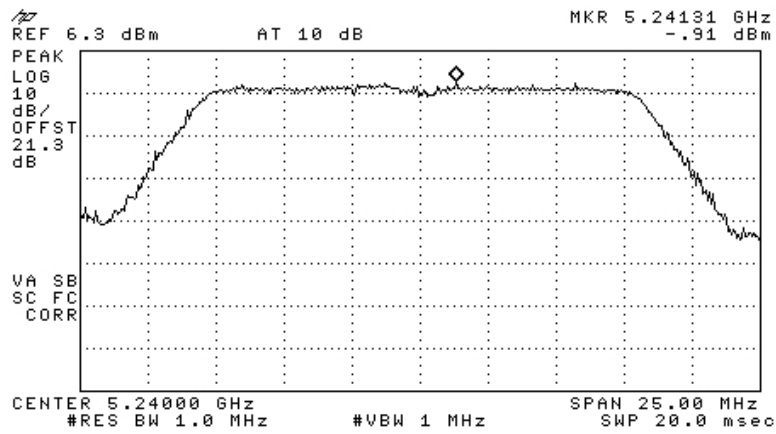


Figure 47 — 5240 MHz BPSK



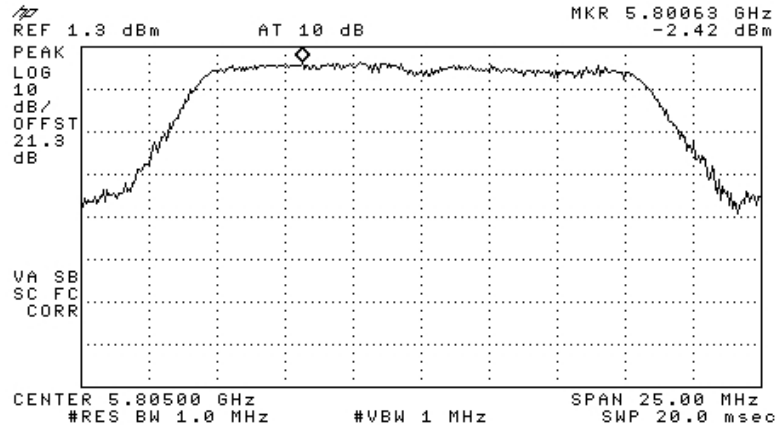


Figure 50 —5805 MHz BPSK

## 9.2 Results table

E.U.T. Description: WLAN Module With WCE (WiFi Coverage Extender) for DAS  
With Four Cisco 1242 Access Points

Model No.: 860M-AU With WCE-AU

Serial Number: 860M-AU: 0837453; WCE-AU: 0847A54

Specification: F.C.C. Part 15, Subpart E (15.407(a))

Operation Frequency (MHz)	Modulation	Reading Spectrum Analyzer (dBm)	Specification (dBm)	Margin (dB)
5180	64QAM	-0.87	3	-3.87
	BPSK	-1.06	3	-4.06
5200	64QAM	-0.92	3	-3.92
	BPSK	-0.83	3	-3.83
5240	64QAM	0.4	3	-2.6
	BPSK	-0.91	3	-3.91
5745	64QAM	-2.14	16	-18.214
	BPSK	-1.8	16	-17.8
5765	64QAM	-3.62	16	-19.62
	BPSK	-3.08	16	-19.08
5805	64QAM	-2.26	16	-18.26
	BPSK	-2.42	16	-18.42

Figure 51 Test Results





## 10. Ratio of Peak Excursion of Modulation Envelope to Maximum Conducted Output Power 802.11b/g+802.11a + WMTS + AWS Signals

[In accordance with section 15.407(a)(6)]

### 10.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20dB) and an appropriate coaxial cable (Cable Loss = 1.3 dB). The spectrum analyzer was set to 1 MHz resolution BW. and 1 MHz video BW.

Trace A: Sample Detector

Trace B: Peak Detector

The E.U.T. was tested at 5180, 5200, 5240, 5745, 5765, and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

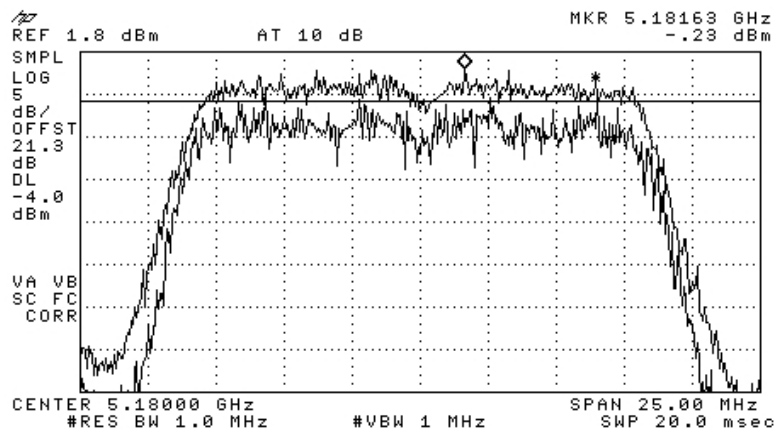


Figure 53 —5180 MHz 64QAM

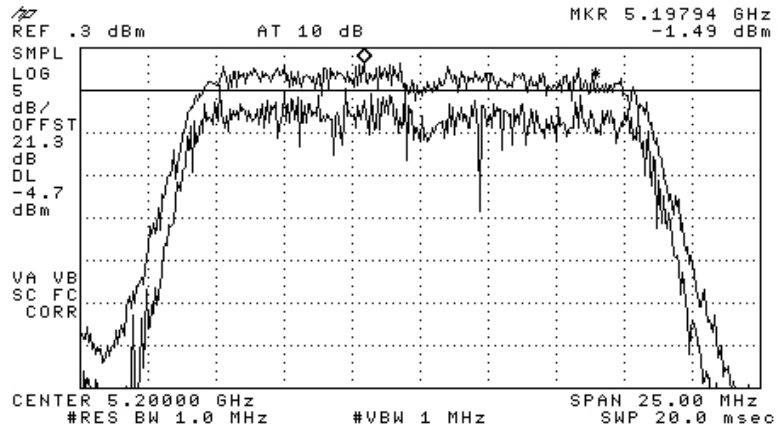


Figure 54 —5200 MHz 64QAM

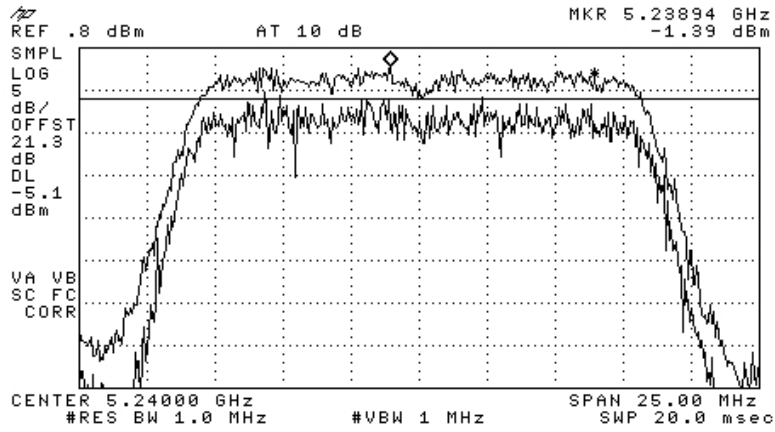


Figure 55 —5240 MHz 64QAM

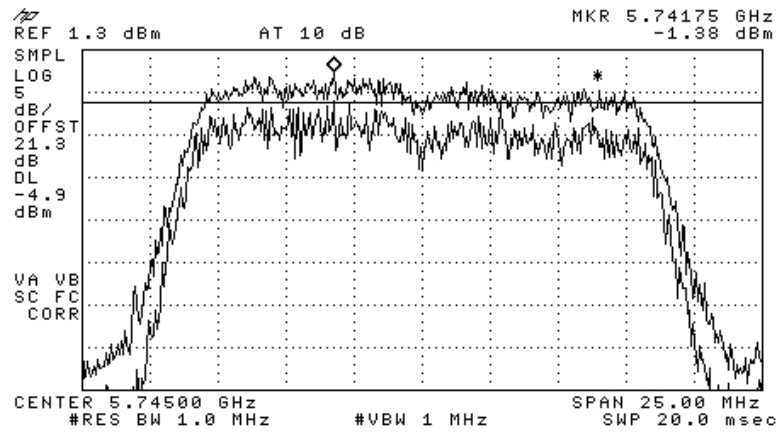


Figure 56 —5745 MHz 64QAM

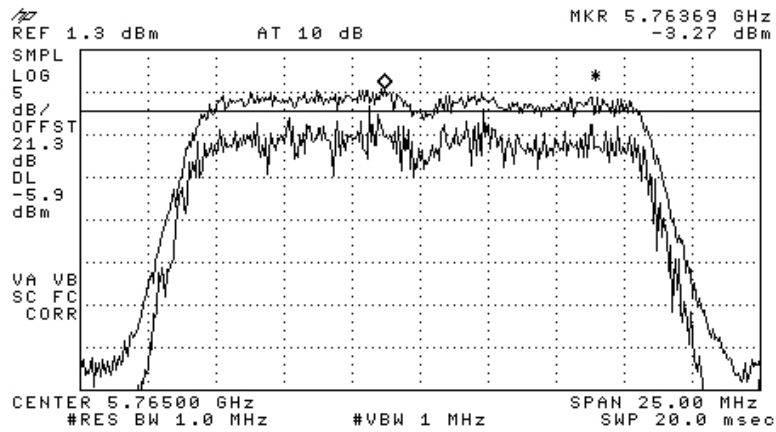


Figure 57 —5765 MHz 64QAM



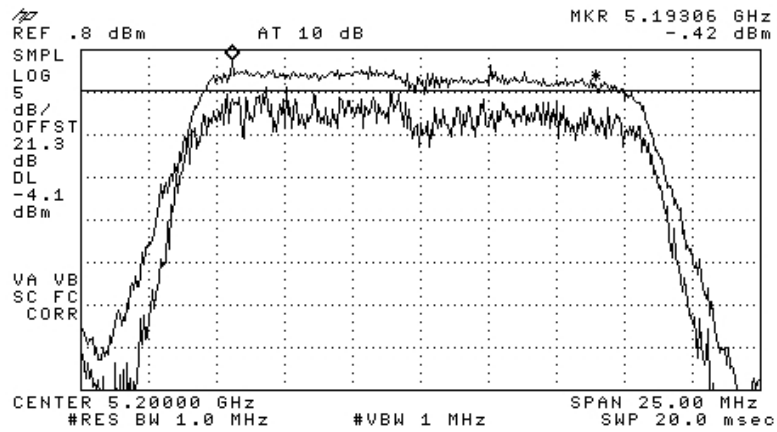


Figure 60 —5200 MHz BPSK

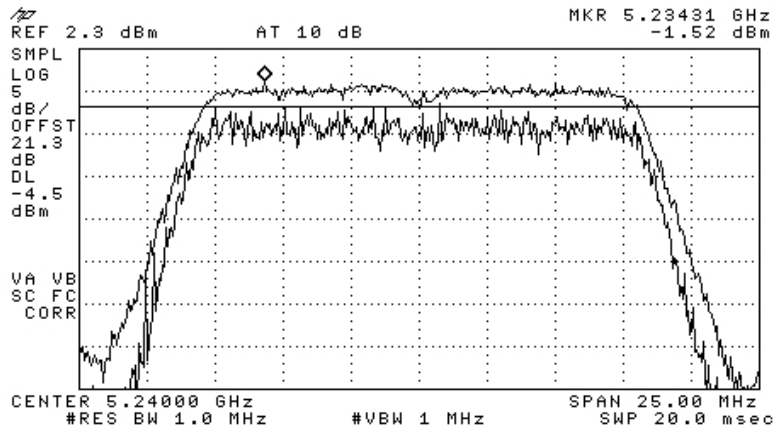


Figure 61 —5240 MHz BPSK

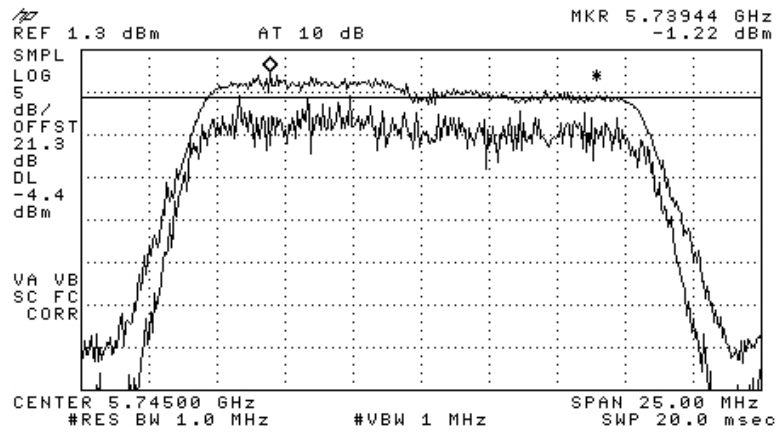


Figure 62 —5745 MHz BPSK

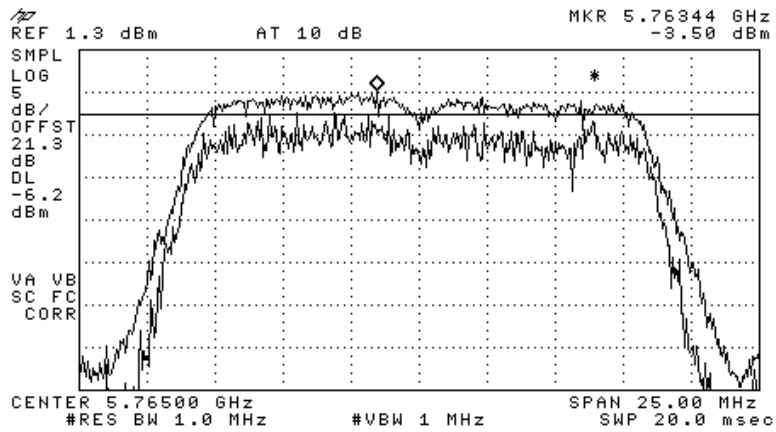


Figure 63 —5765 MHz BPSK

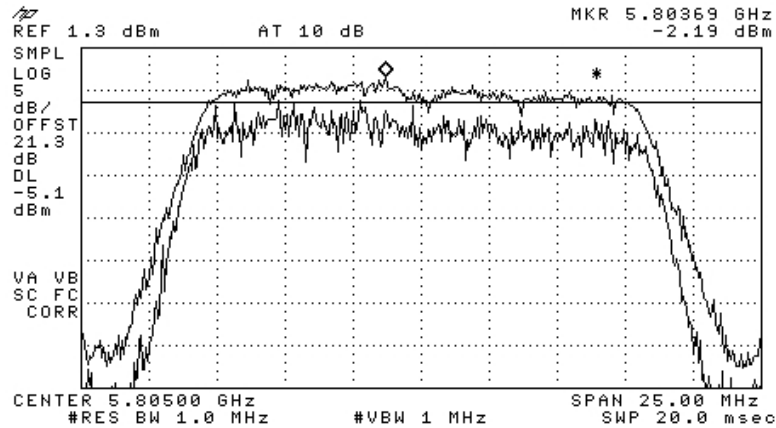


Figure 64 —5805 MHz BPSK

## 10.2 Results table

E.U.T Description: WLAN Module With WCE (WiFi Coverage Extender) for DAS With Four Cisco 1242 Access Points

Model No.: 860M-AU With WCE-AU

Serial Number: 860M-AU: 0837453; WCE-AU: 0847A54

Specification: F.C.C. Part 15, Subpart E (15.407(a)(6))

Operation Frequency (MHz)	Modulation	Delta (dB)	Specification (dB)	Margin (dB)
5180	64QAM	3.77	13	-9.23
	BPSK	3.69	13	-9.31
5200	64QAM	3.21	13	-9.79
	BPSK	3.68	13	-9.32
5240	64QAM	3.71	13	-9.29
	BPSK	2.98	13	-10.02
5745	64QAM	3.52	13	-9.48
	BPSK	3.18	13	-9.82
5765	64QAM	2.63	13	-10.37
	BPSK	2.70	13	-10.3
5805	64QAM	2.99	13	-10.01
	BPSK	2.91	13	-10.09

Figure 65 Test Results





# 11. Peak Power Output Out of 5150-5250; 5725-5825 MHz Bands 802.11b/g+802.11a + WMTS + AWS Signals

## 11.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an appropriate coaxial cable. The spectrum analyzer was set to 1 MHz resolution BW except for the frequency range 9 kHz-150 kHz where the RBW was set to 1kHz and the frequency range 150 kHz-10.0 MHz where the RBW was set to 10kHz. The frequency range from 9 kHz to 40 GHz was scanned. Level of spectrum components out of the 5150-5250; 5725-5825 MHz bands was measured at the selected operation frequencies.

The E.U.T. was tested at 5180, 5200, 5240, 5745, 5765, and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

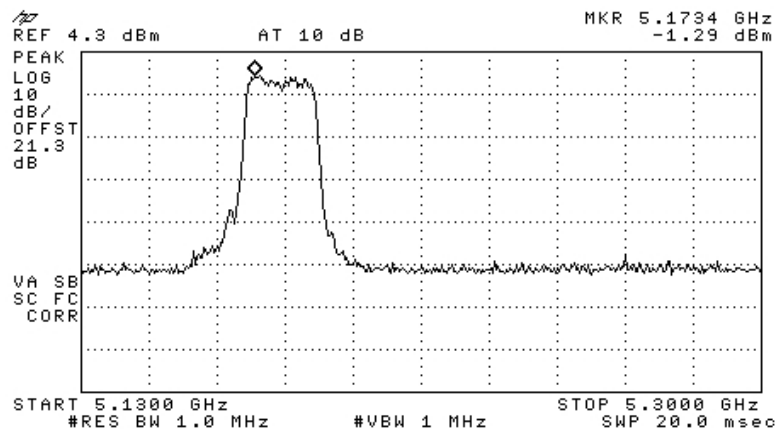


Figure 67 —5180 MHz 64QAM

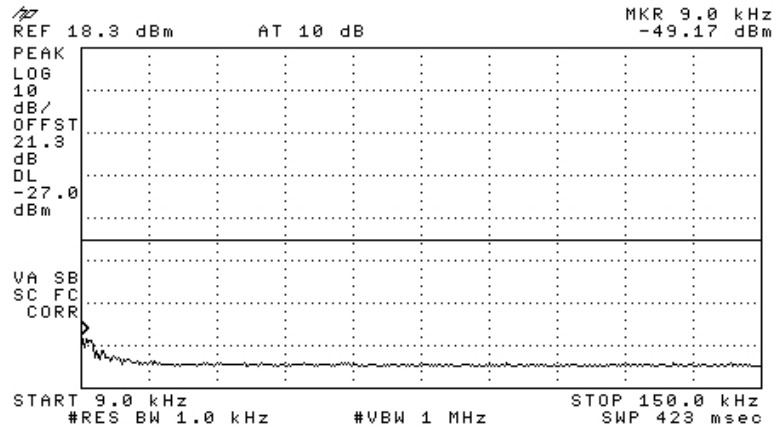


Figure 68 —5180 MHz 64QAM

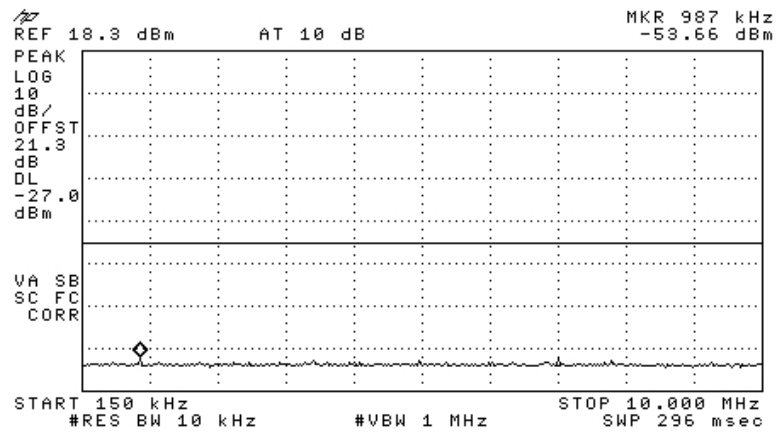


Figure 69 —5180 MHz 64QAM

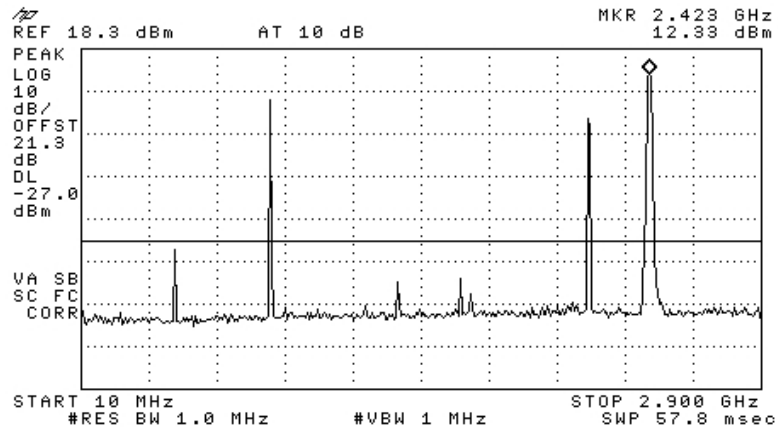


Figure 70 —5180 MHz 64QAM

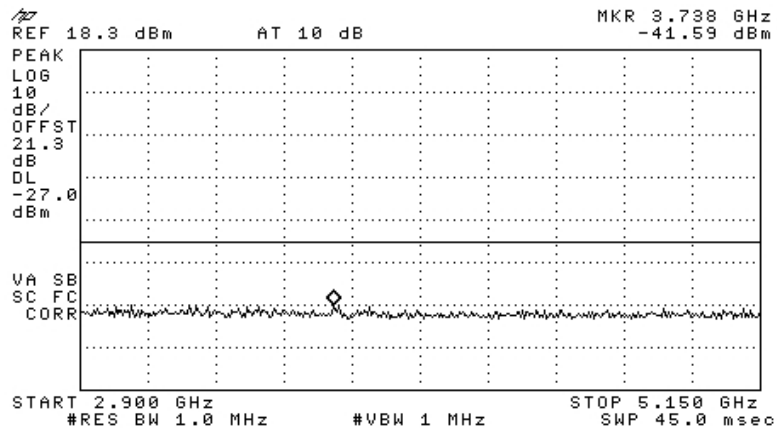


Figure 71 —5180 MHz 64QAM

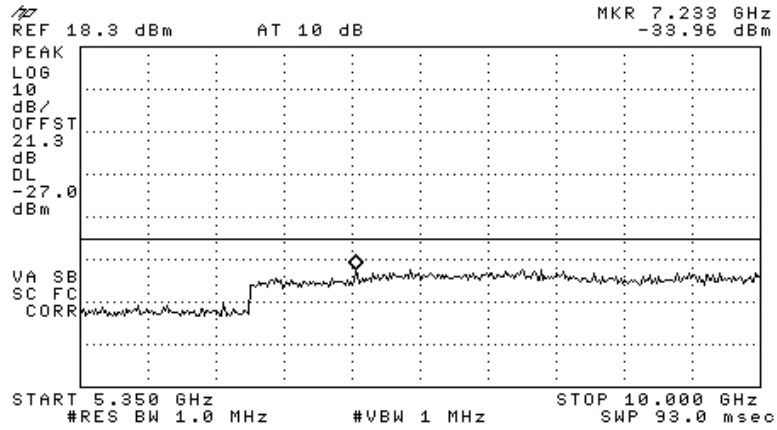


Figure 72 —5180 MHz 64QAM

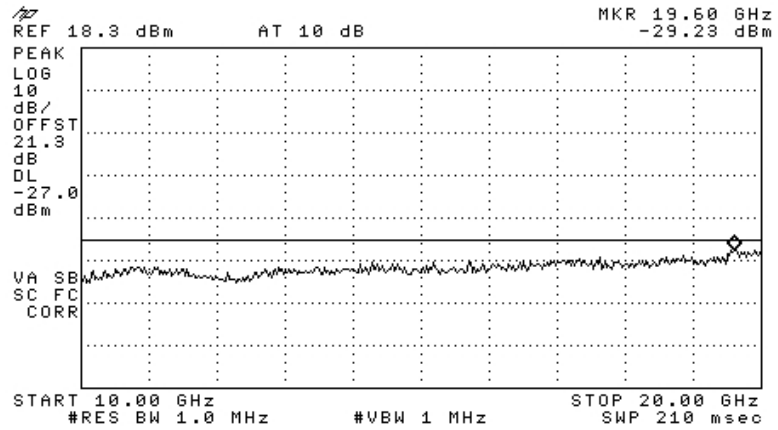


Figure 73 —5180 MHz 64QAM

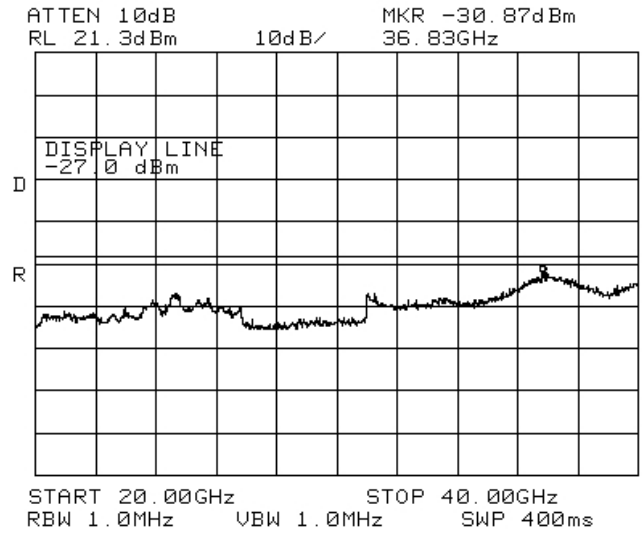


Figure 74 —5180 MHz 64QAM

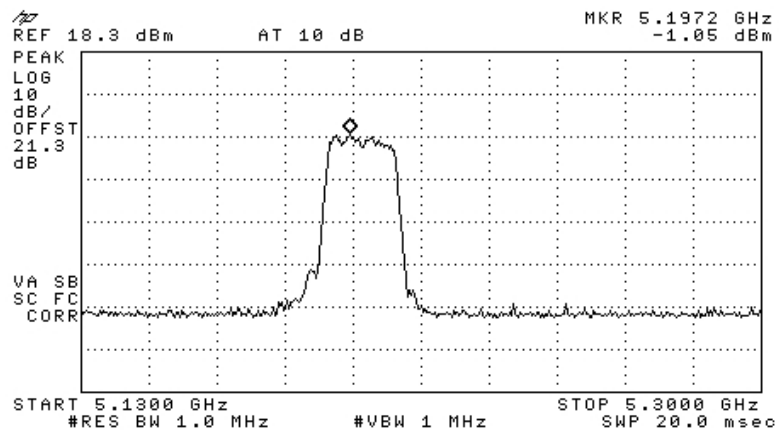


Figure 75 —5200 MHz 64QAM

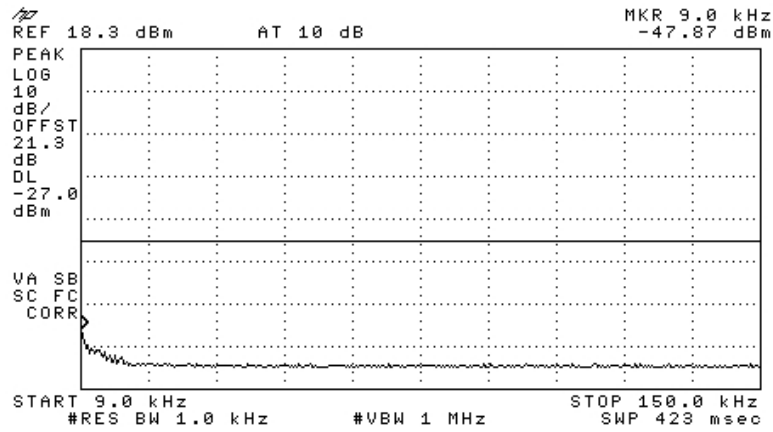


Figure 76 —5200 MHz 64QAM

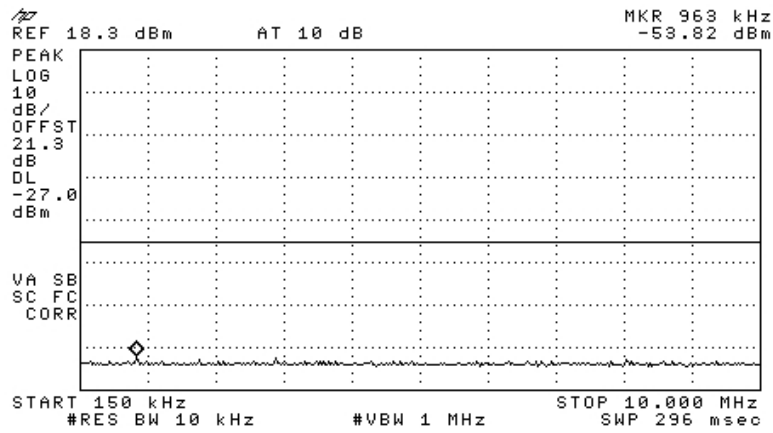


Figure 77 —5200 MHz 64QAM

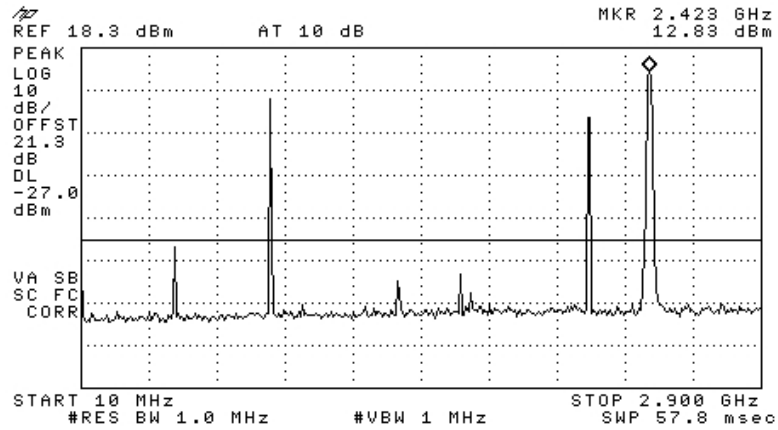


Figure 78 —5200 MHz 64QAM

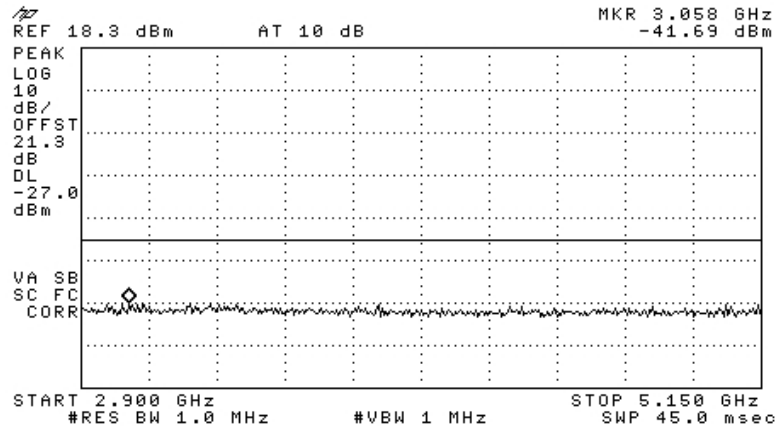


Figure 79 —5200 MHz 64QAM

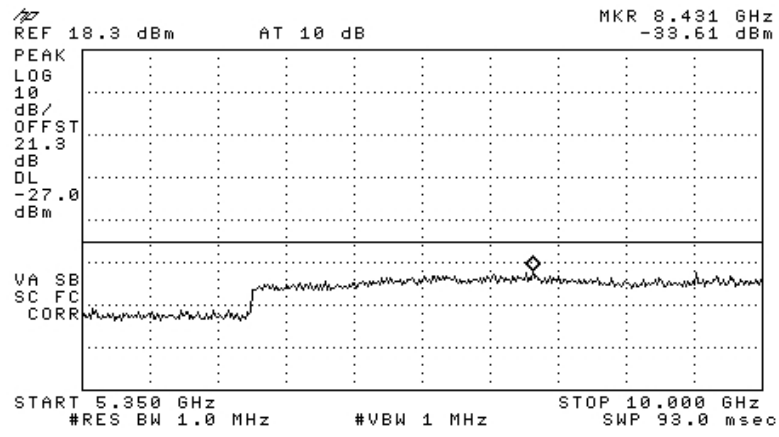


Figure 80 — 5200 MHz 64QAM

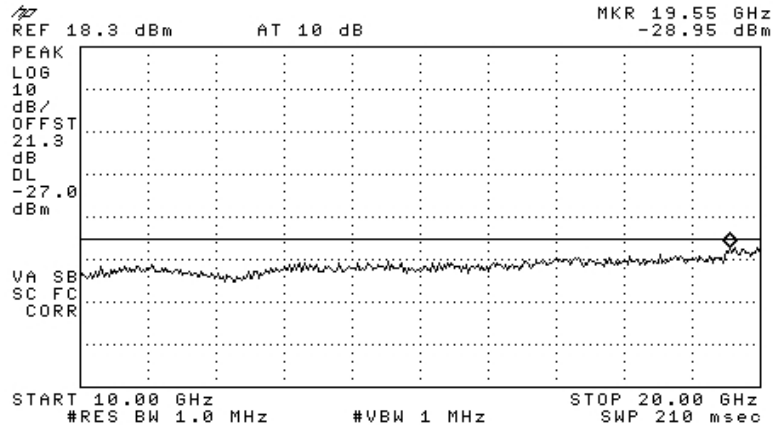


Figure 81 — 5200 MHz 64QAM



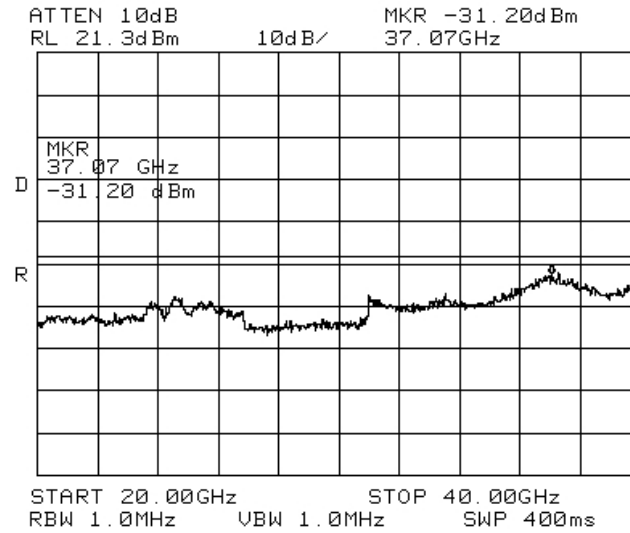


Figure 82 — 5200 MHz 64QAM

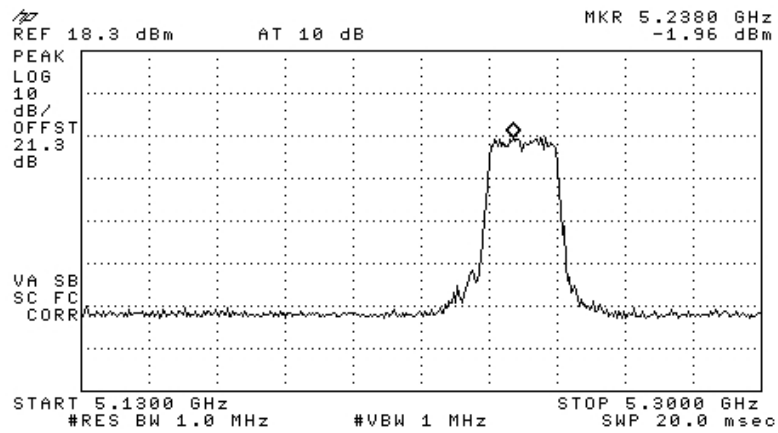


Figure 83 — 5240 MHz 64QAM

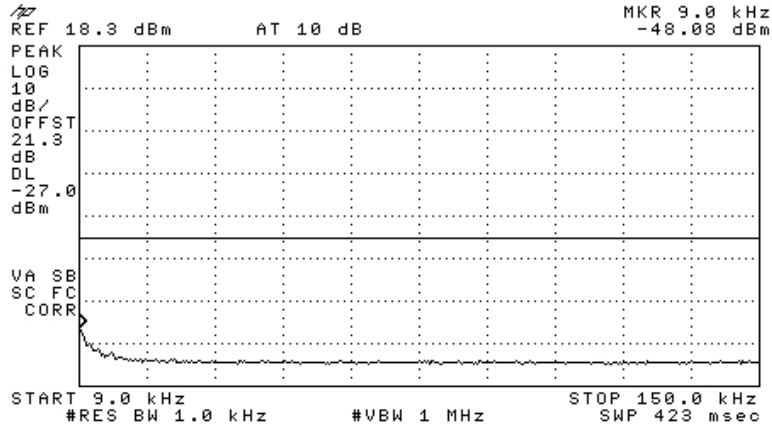


Figure 84 —5240 MHz 64QAM

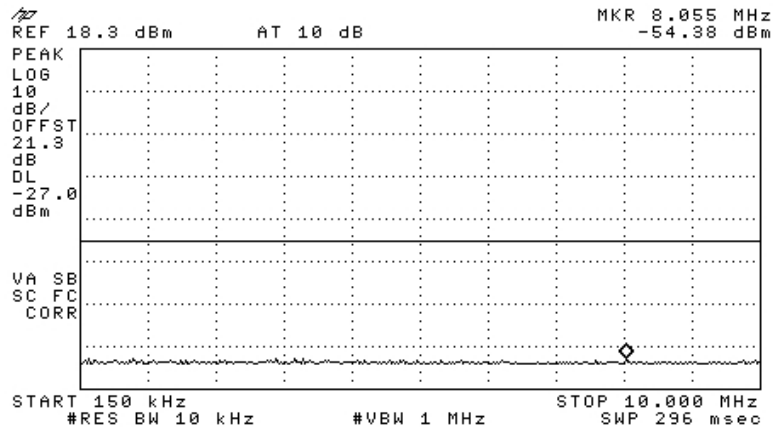


Figure 85 —5240 MHz 64QAM

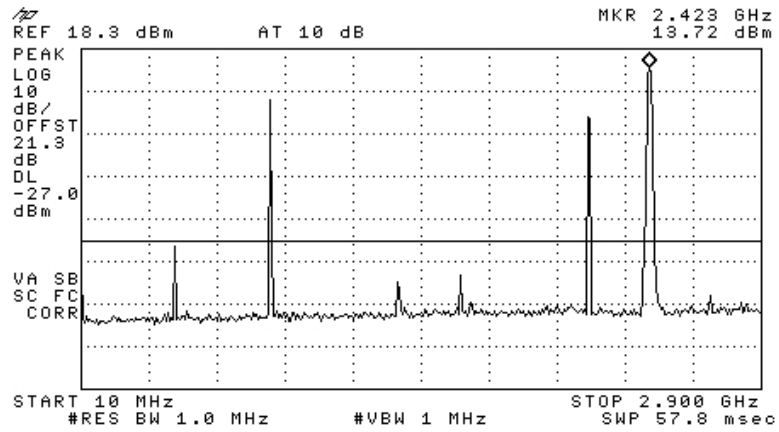


Figure 86 —5240 MHz 64QAM

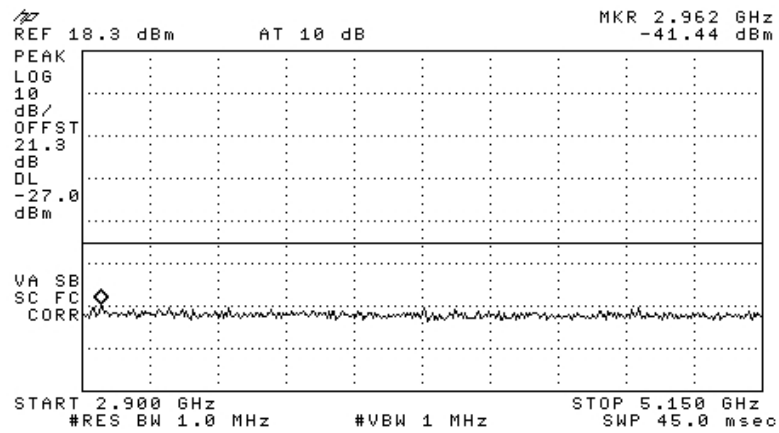


Figure 87 —5240 MHz 64QAM

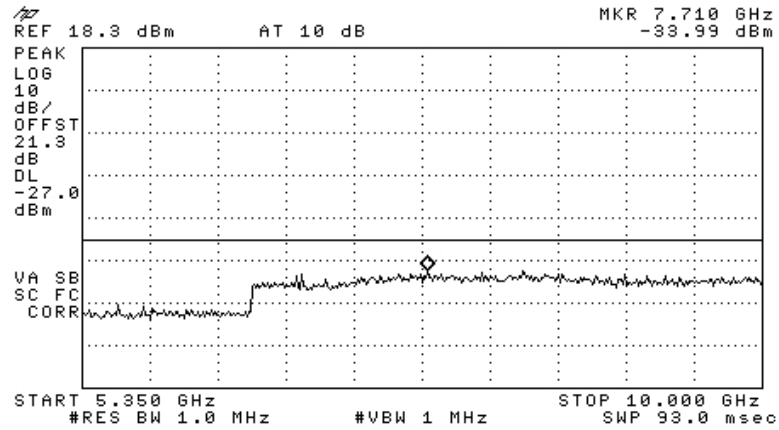


Figure 88 —5240 MHz 64QAM

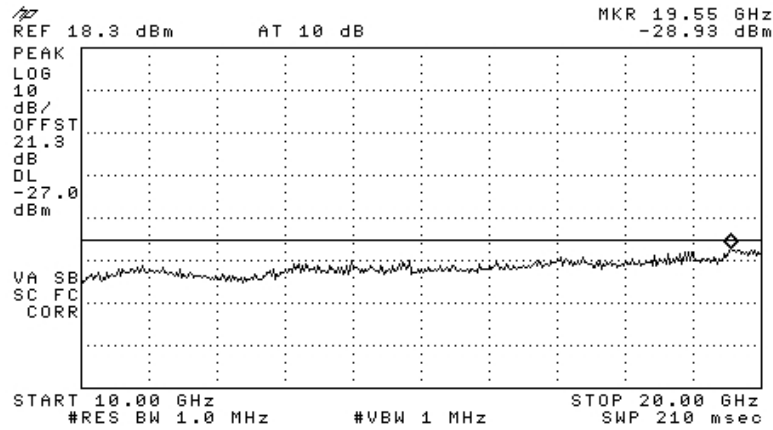


Figure 89 —5240 MHz 64QAM



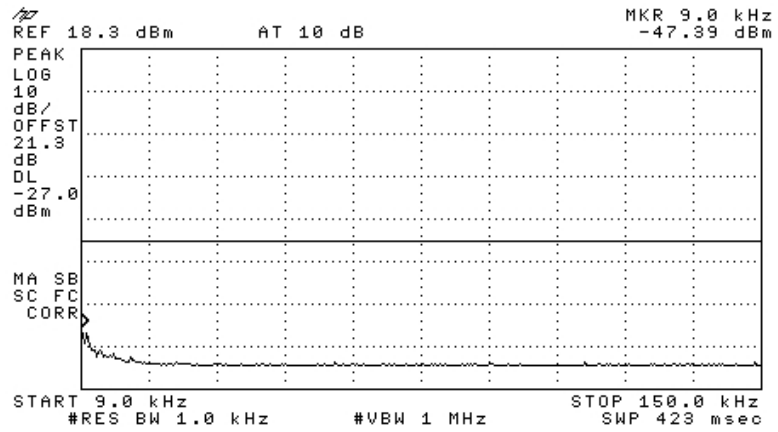


Figure 92 —5745 MHz 64QAM

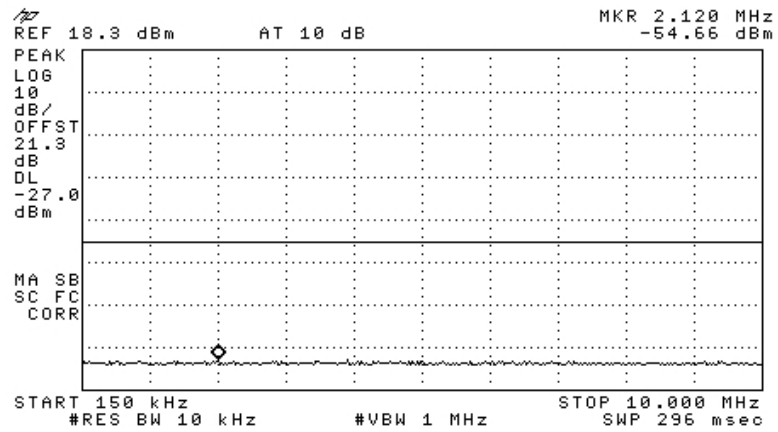


Figure 93 —5745 MHz 64QAM

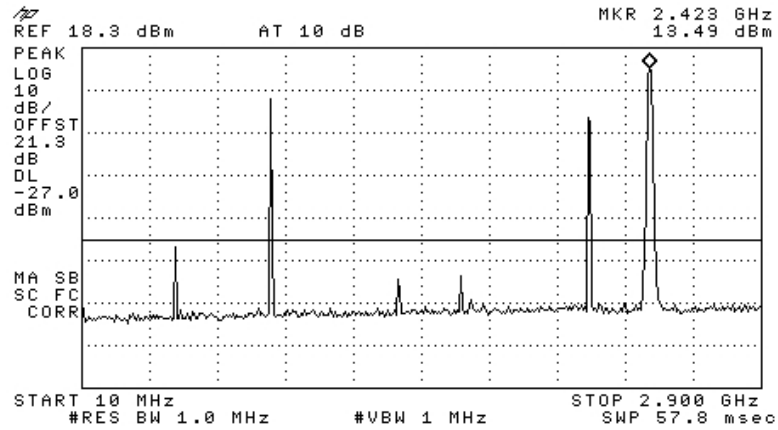


Figure 94 —5745 MHz 64QAM

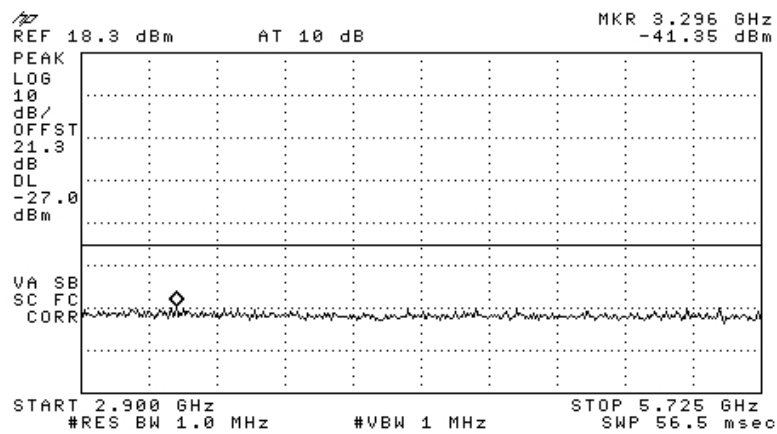


Figure 95 —5745 MHz 64QAM

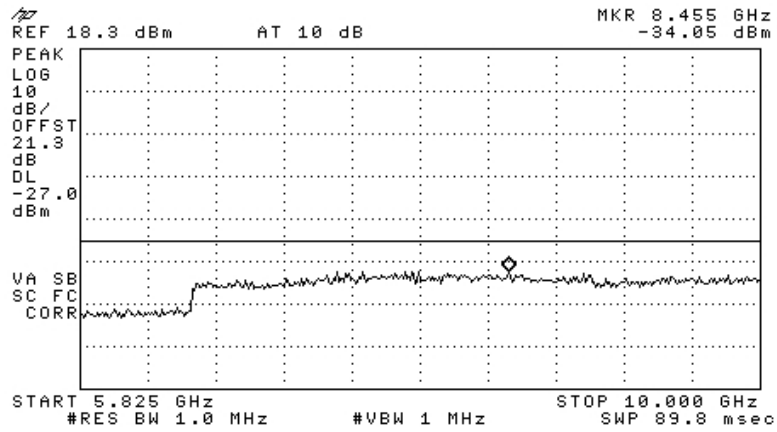


Figure 96 —5745 MHz 64QAM

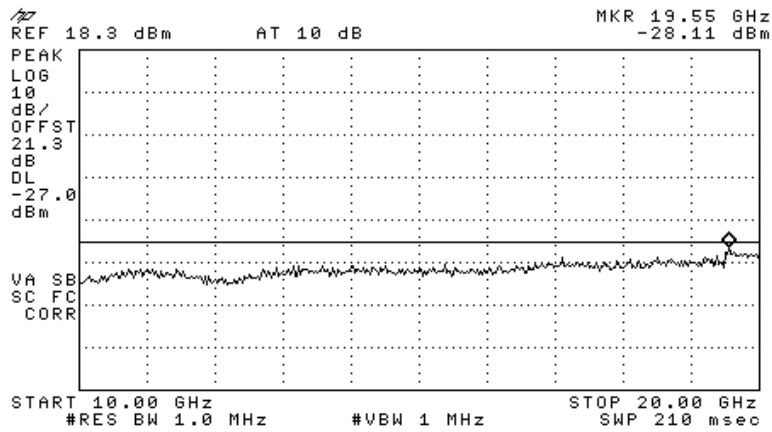


Figure 97 —5745 MHz 64QAM







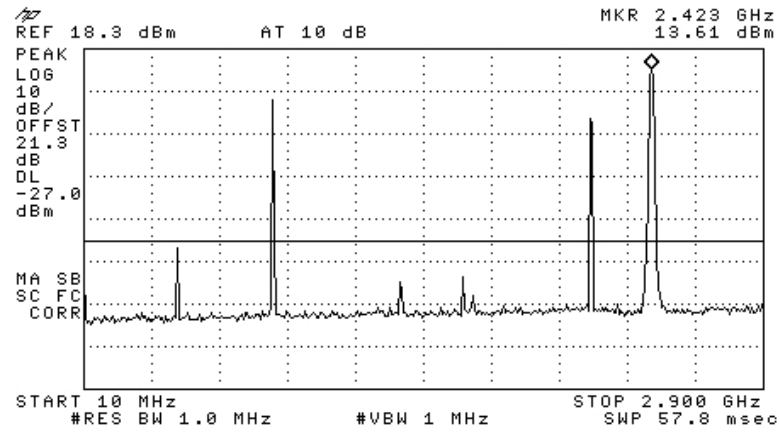


Figure 102 —5765 MHz 64QAM

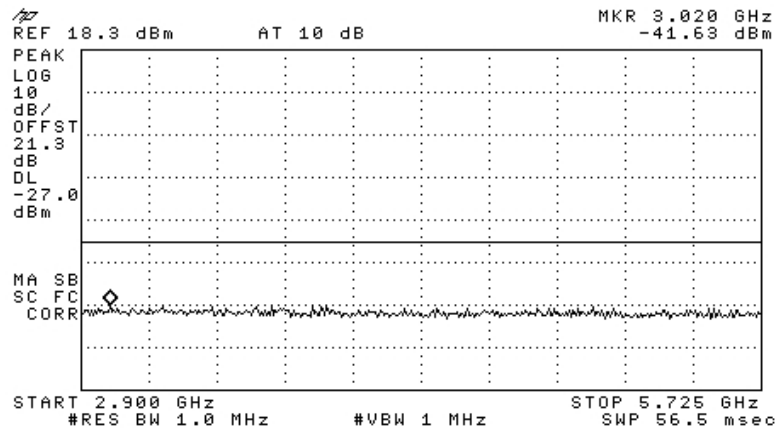


Figure 103 —5765 MHz 64QAM



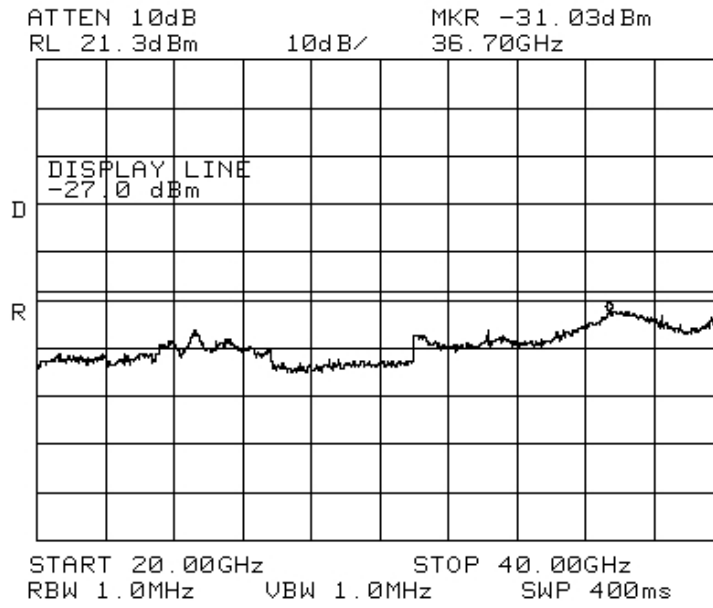


Figure 106 —5765 MHz 64QAM

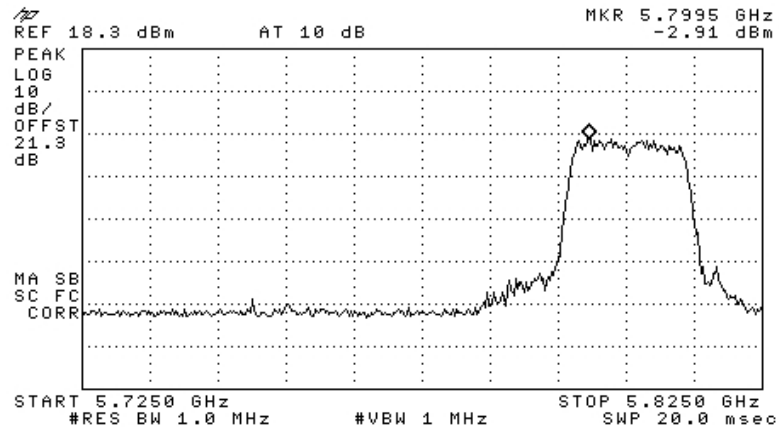


Figure 107 —5805 MHz 64QAM

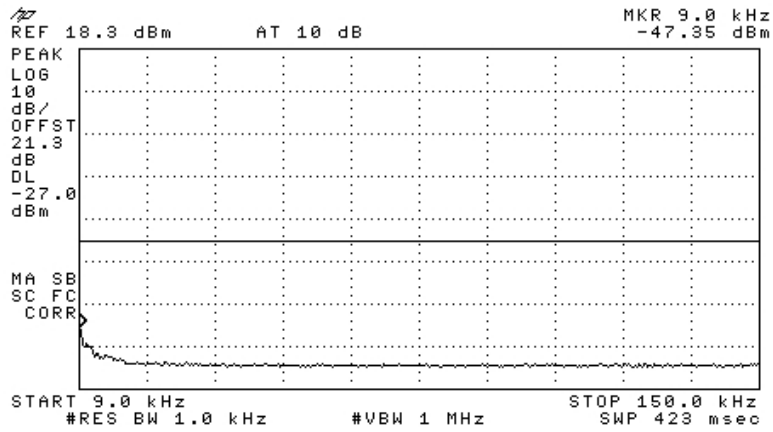


Figure 108 —5805 MHz 64QAM

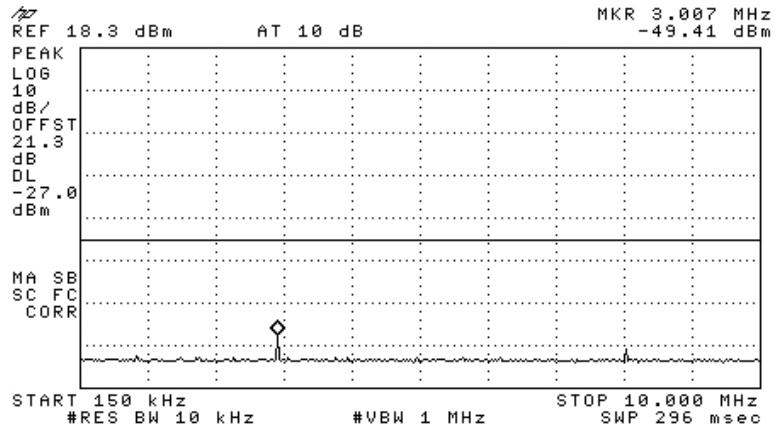


Figure 109 —5805 MHz 64QAM

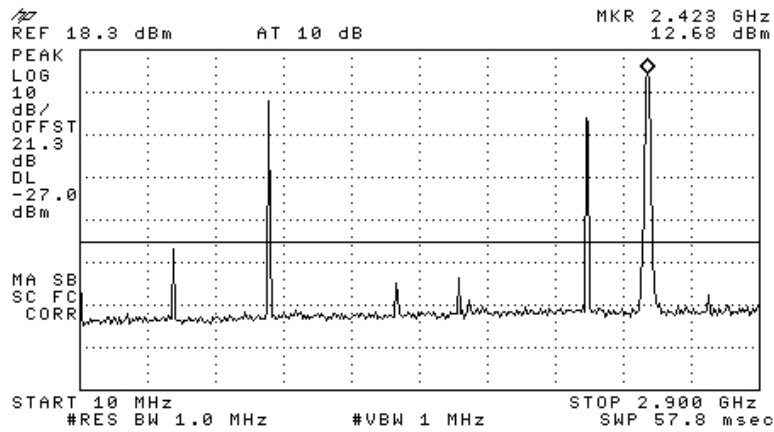


Figure 110 —5805 MHz 64QAM

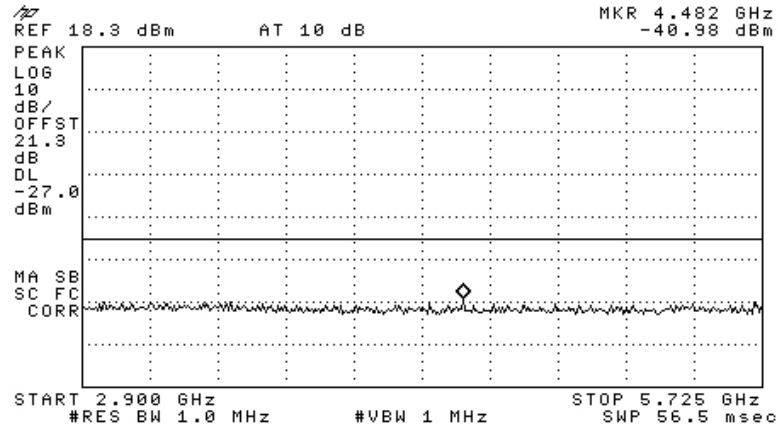


Figure 111 —5805 MHz 64QAM



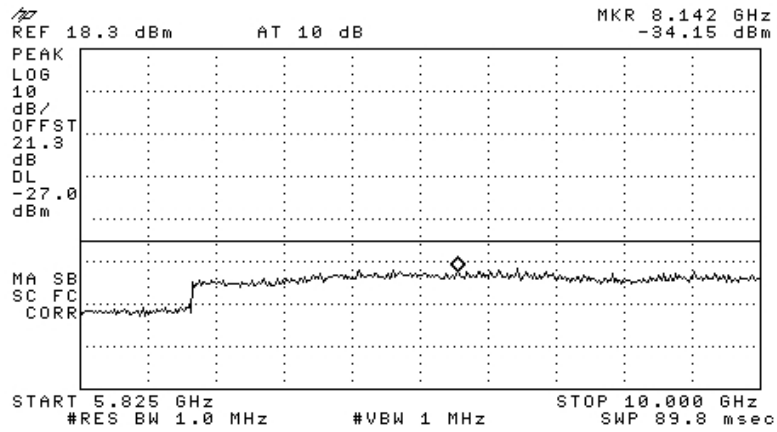


Figure 112 —5805 MHz 64QAM

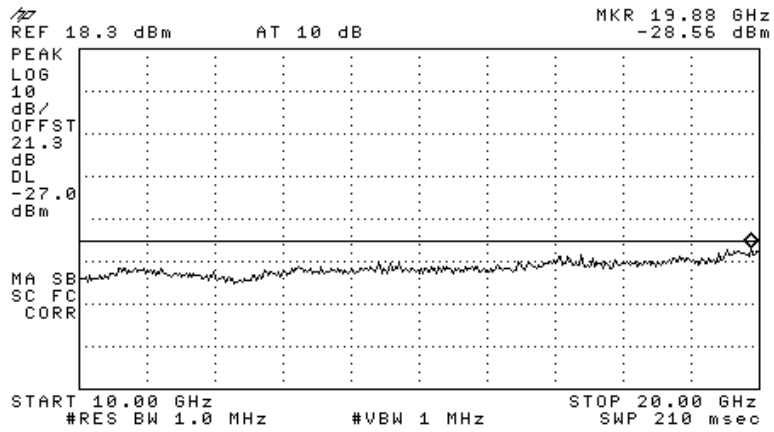


Figure 113 —5805 MHz 64QAM

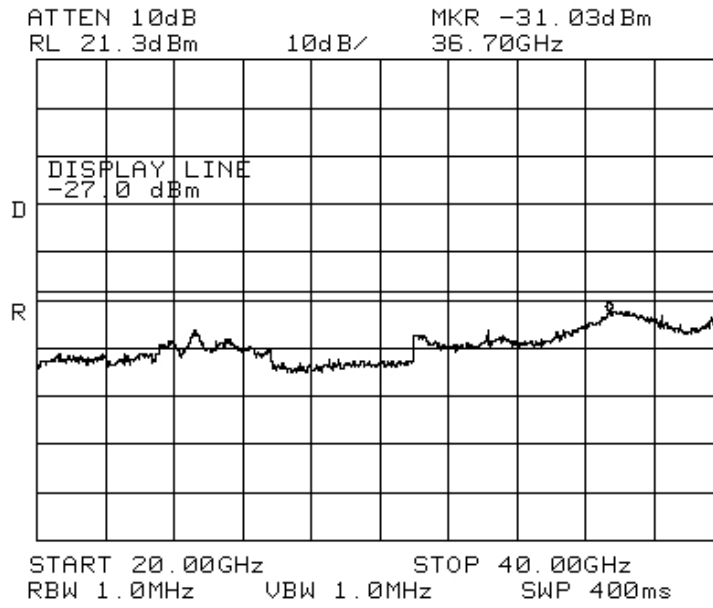


Figure 114 —5805 MHz 64QAM

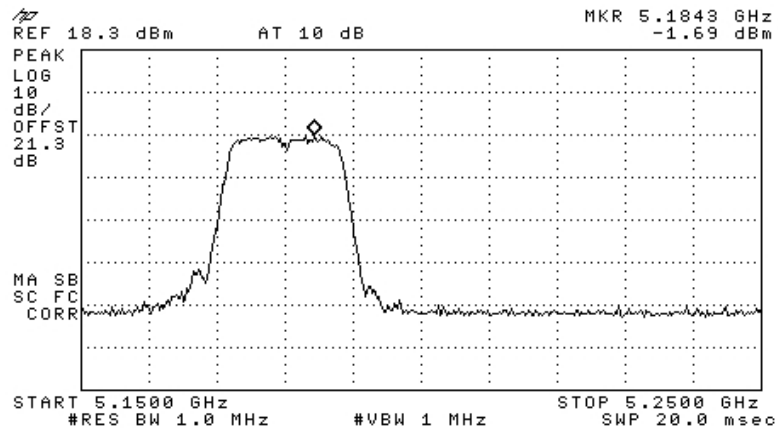


Figure 115 —5180 MHz BPSK

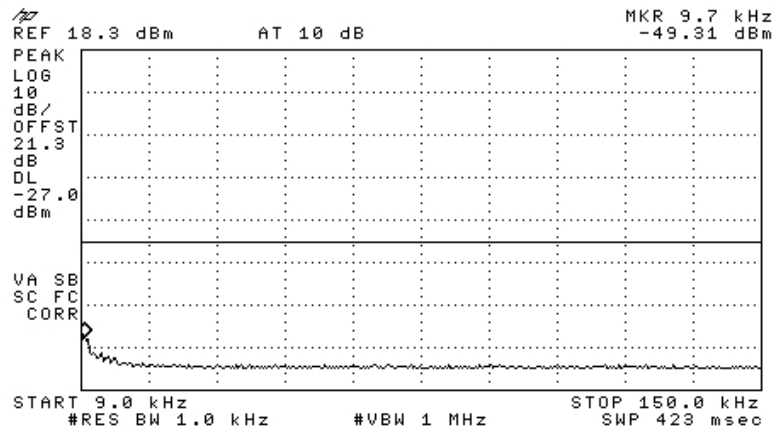


Figure 116 —5180 MHz BPSK

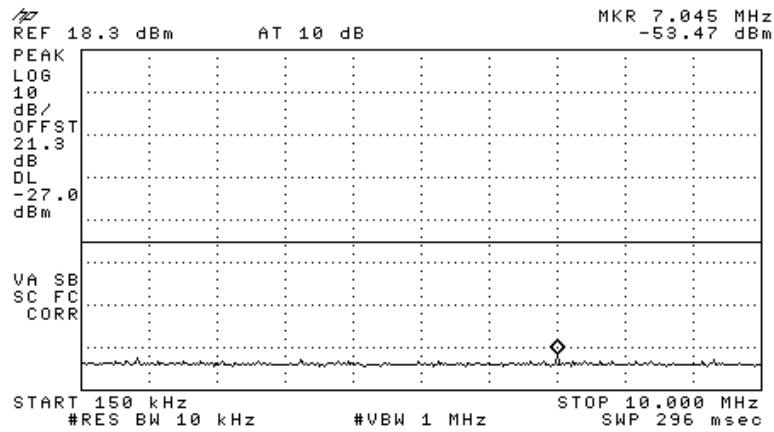


Figure 117 —5180 MHz BPSK

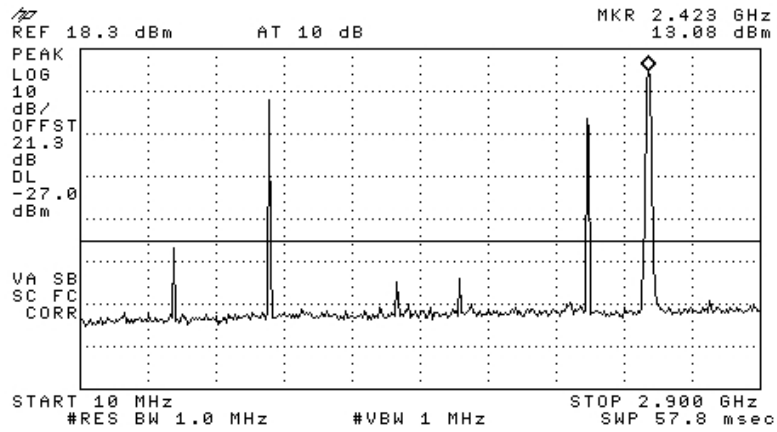


Figure 118 —5180 MHz BPSK

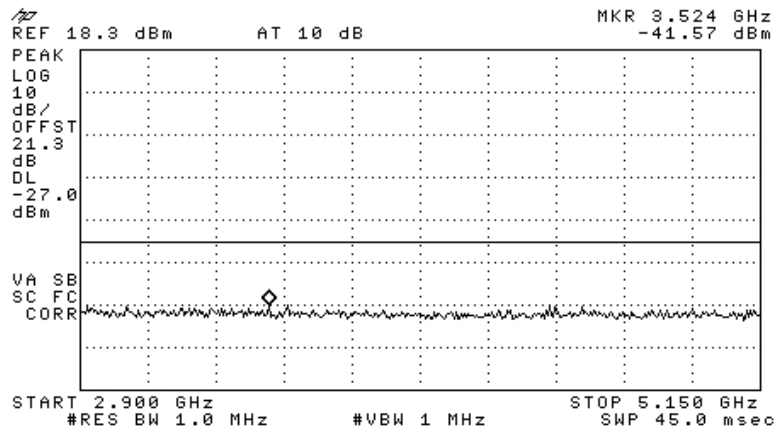


Figure 119 —5180 MHz BPSK

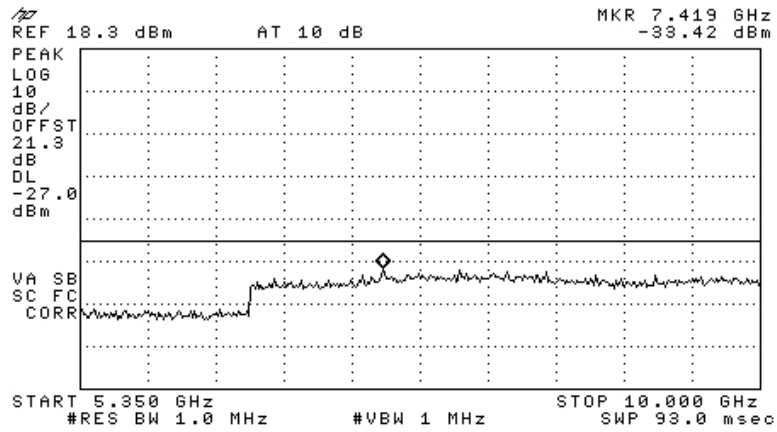


Figure 120 —5180 MHz BPSK

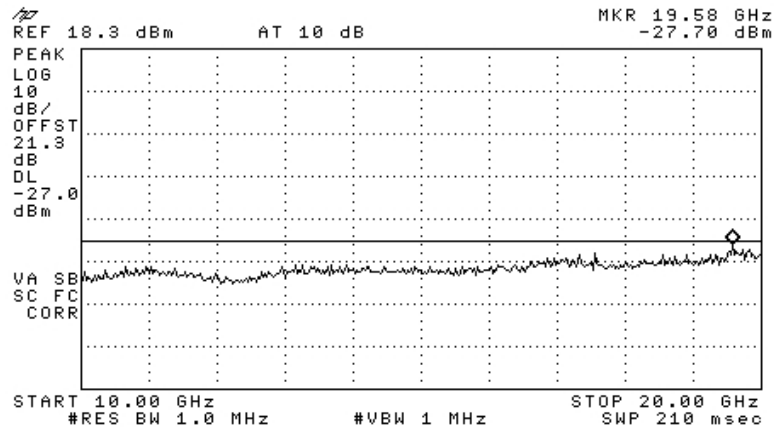


Figure 121 —5180 MHz BPSK

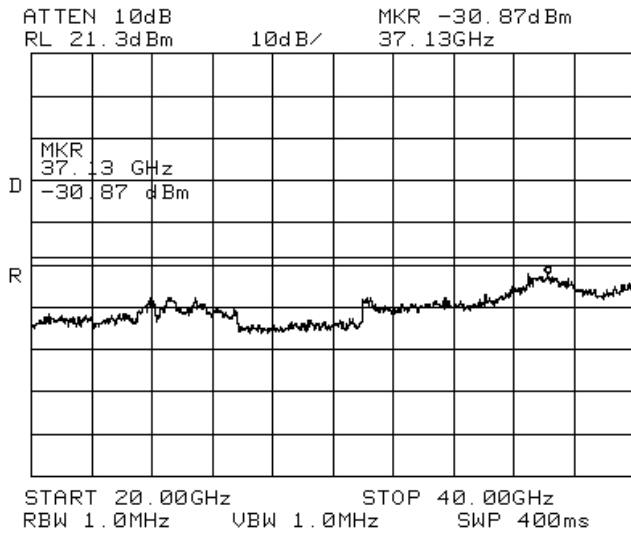


Figure 122 —5180 MHz BPSK

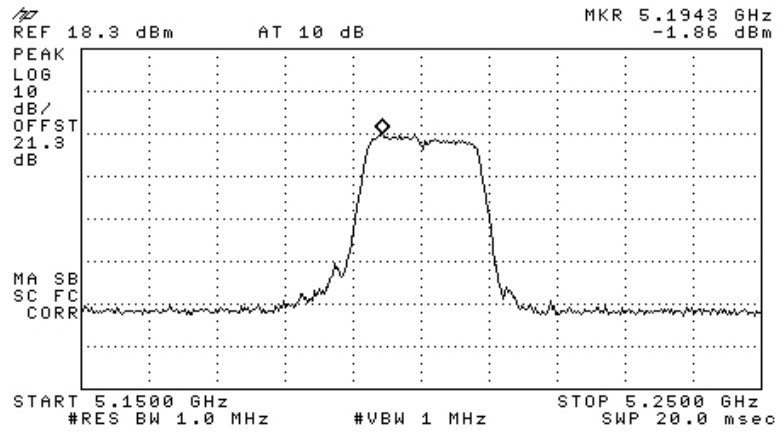


Figure 123 —5200 MHz BPSK

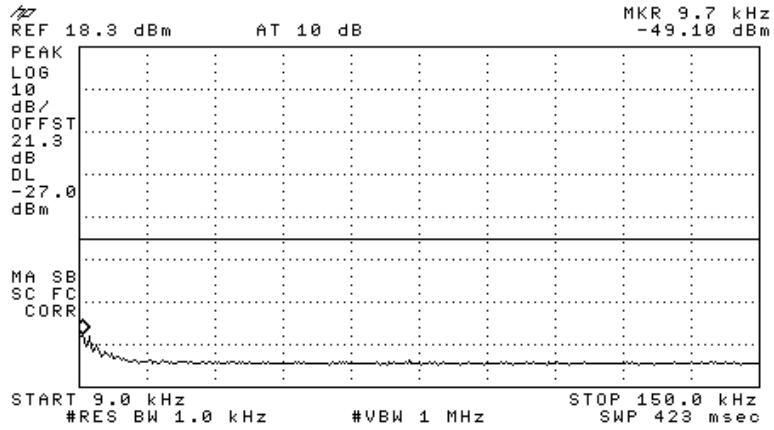


Figure 124 —5200 MHz BPSK

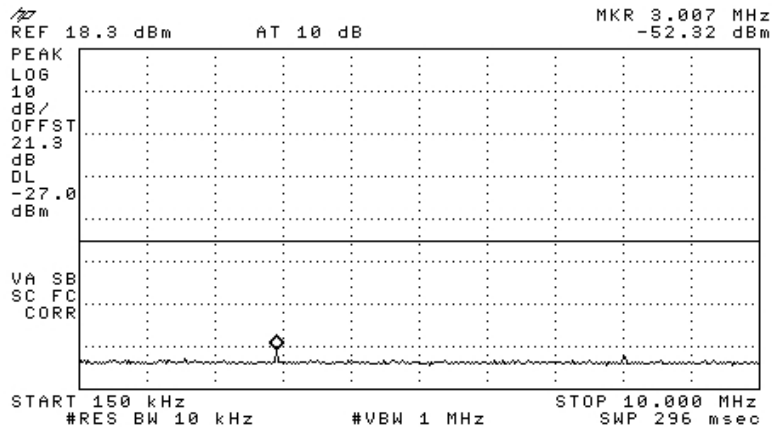


Figure 125 —5200 MHz BPSK

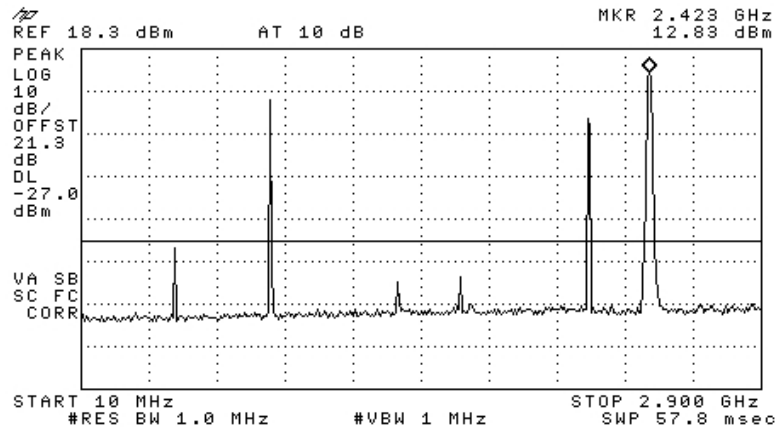


Figure 126 —5200 MHz BPSK

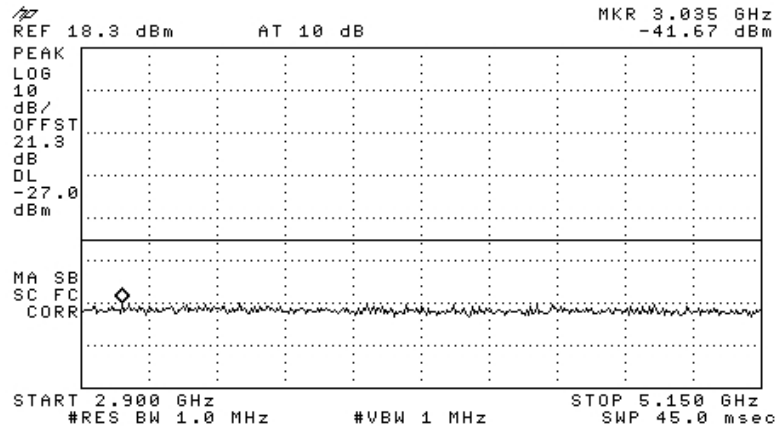


Figure 127 —5200 MHz BPSK



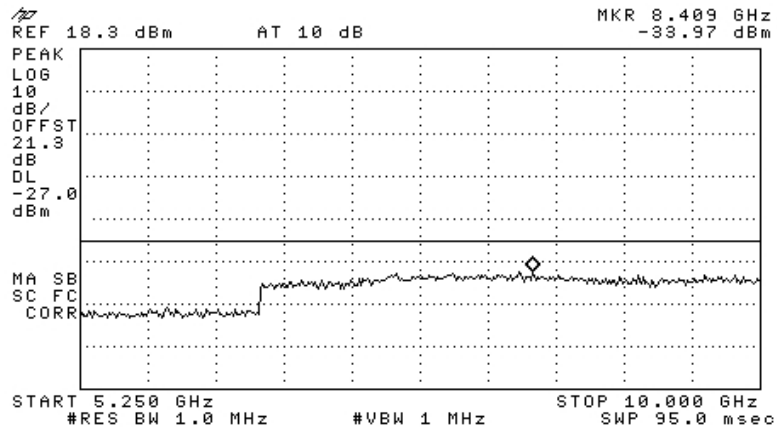


Figure 128 —5200 MHz BPSK

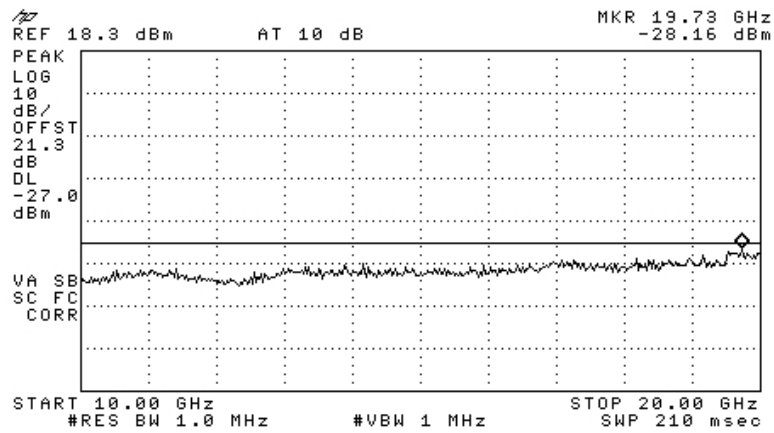


Figure 129 —5200 MHz BPSK



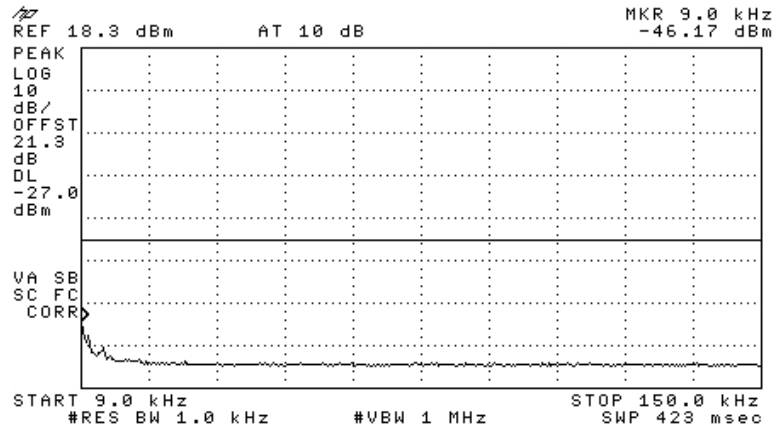


Figure 132 —5240 MHz BPSK

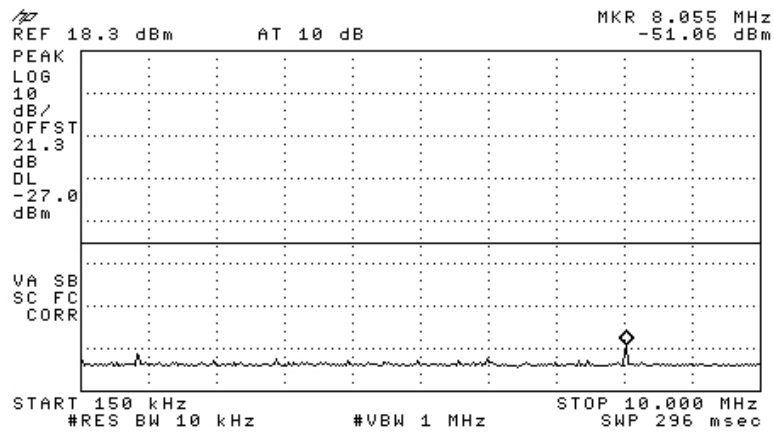


Figure 133 —5240 MHz BPSK

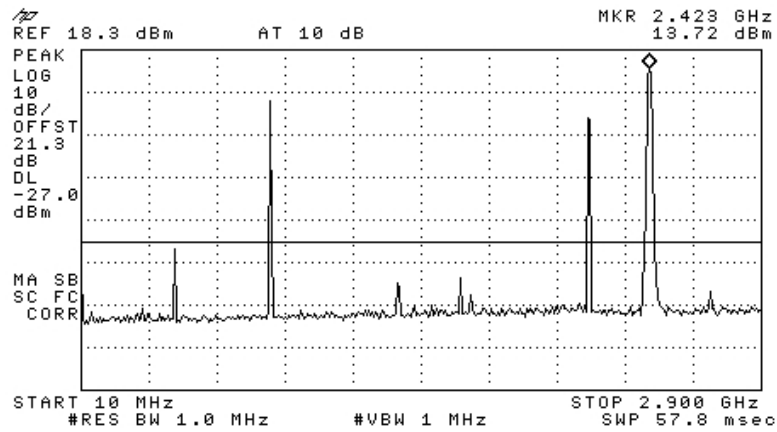


Figure 134 —5240 MHz BPSK

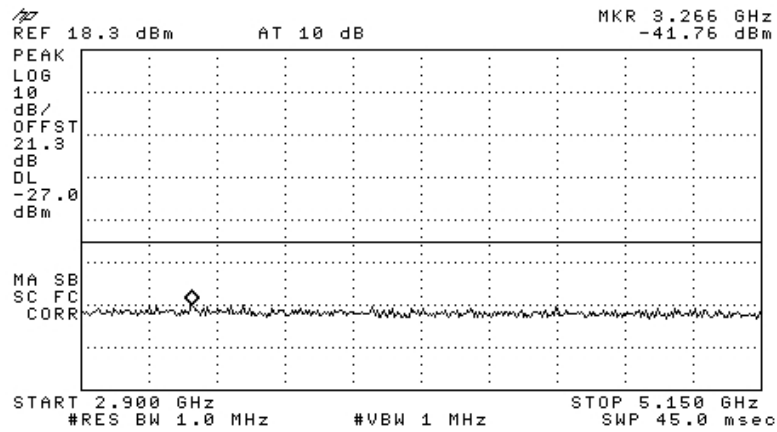


Figure 135 —5240 MHz BPSK

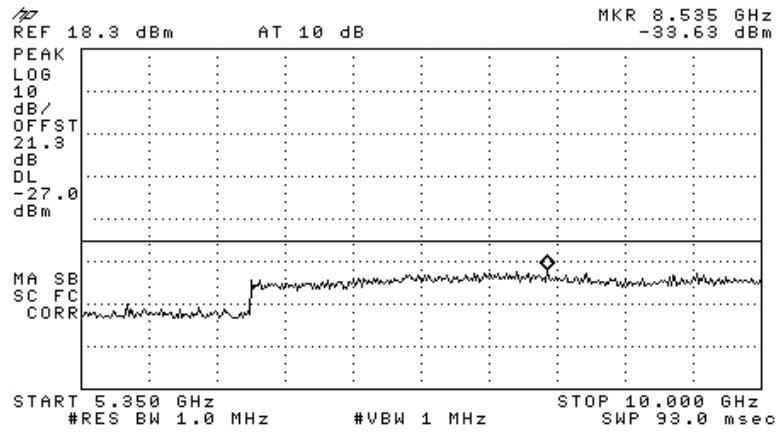


Figure 136 —5240 MHz BPSK

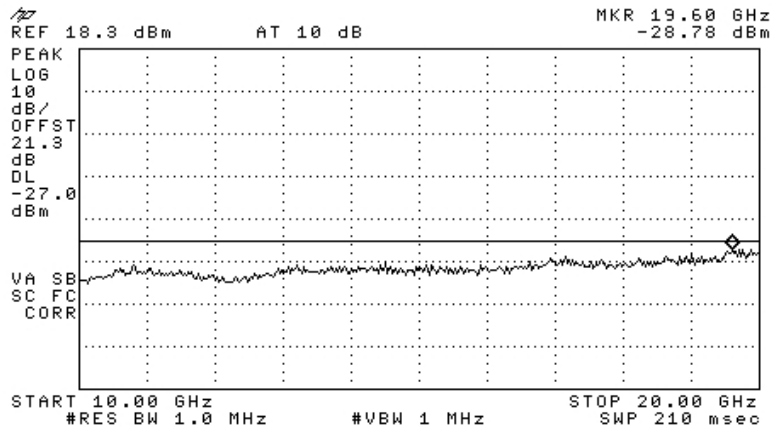


Figure 137 —5240 MHz BPSK



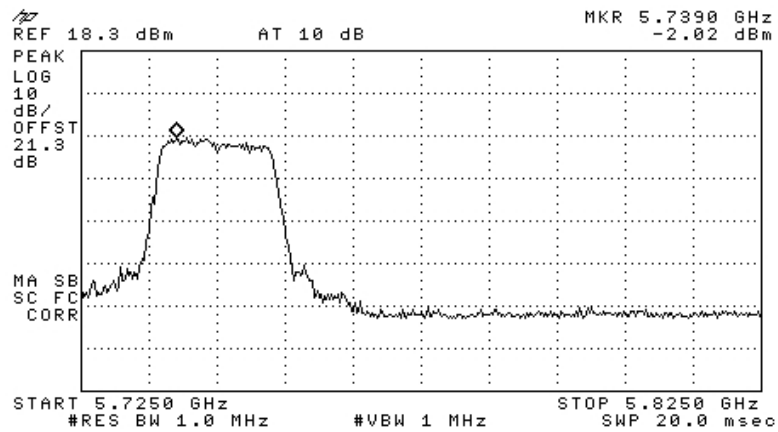


Figure 139 —5745 MHz BPSK

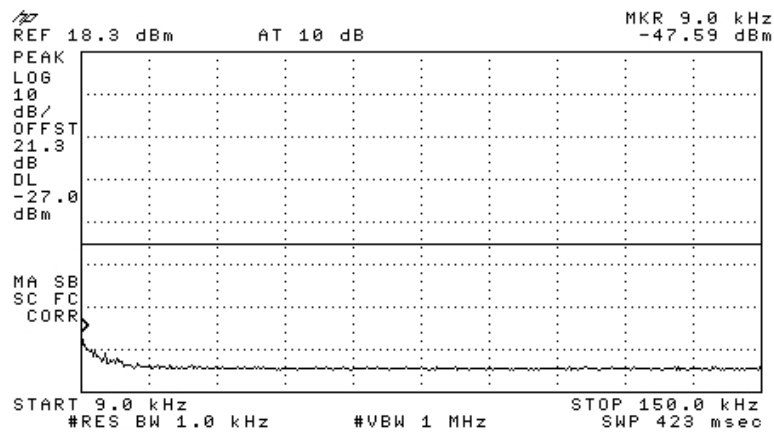


Figure 140 —5745 MHz BPSK





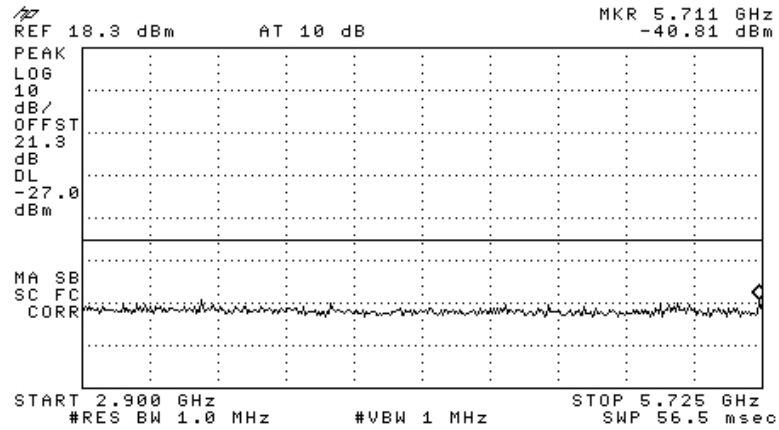


Figure 143 —5745 MHz BPSK

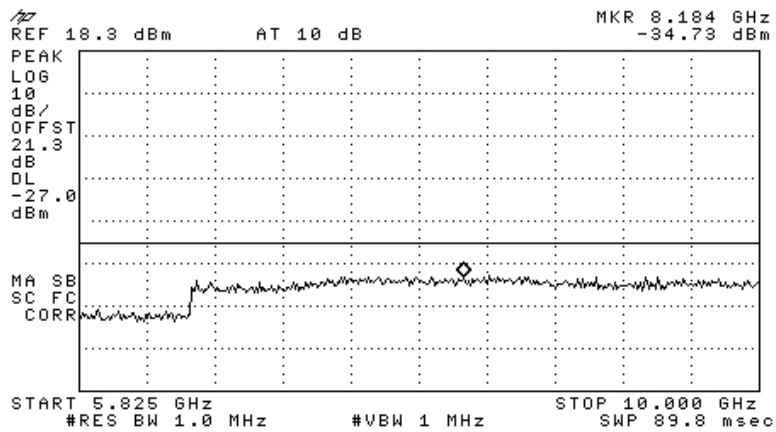


Figure 144 —5745 MHz BPSK

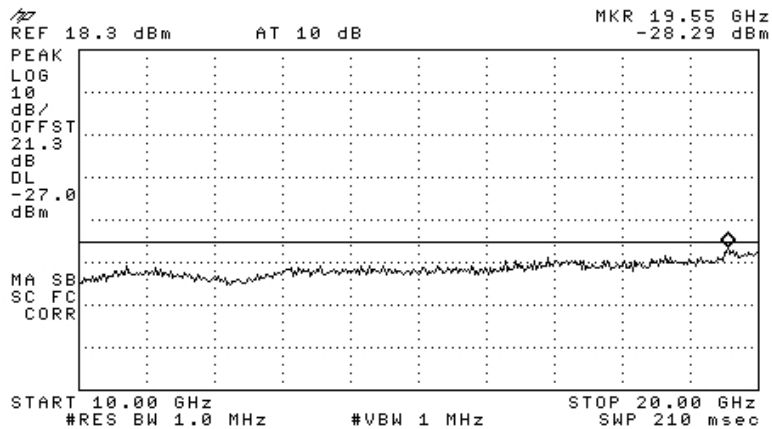


Figure 145 —5745 MHz BPSK

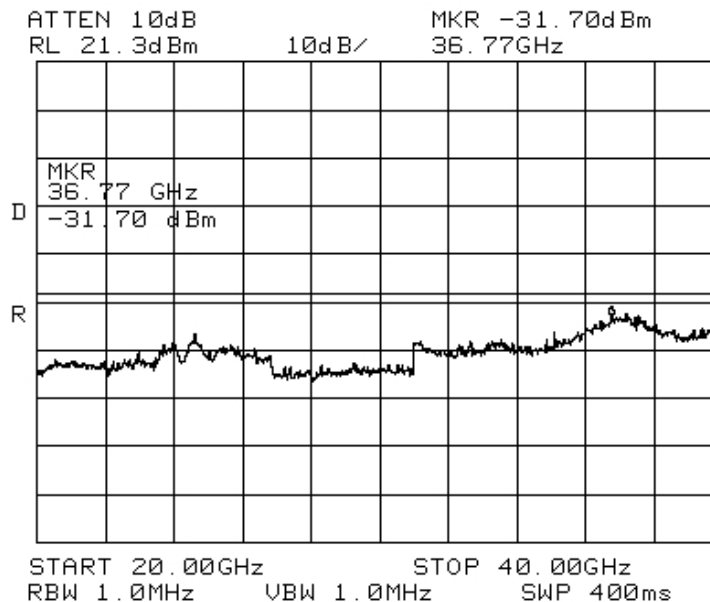


Figure 146 —5745 MHz BPSK

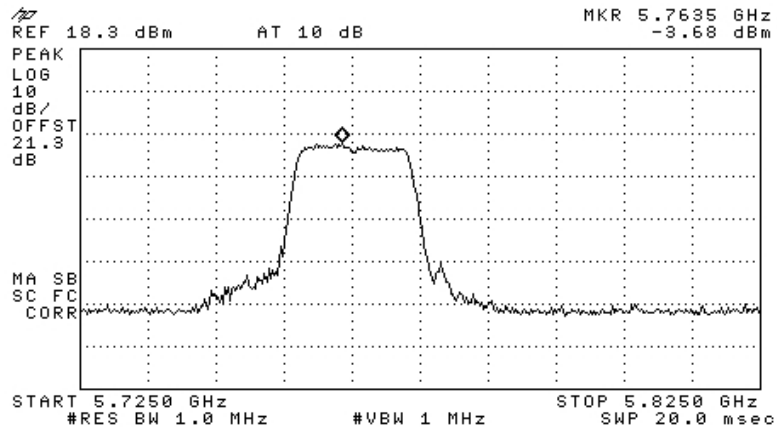


Figure 147 —5765 MHz BPSK

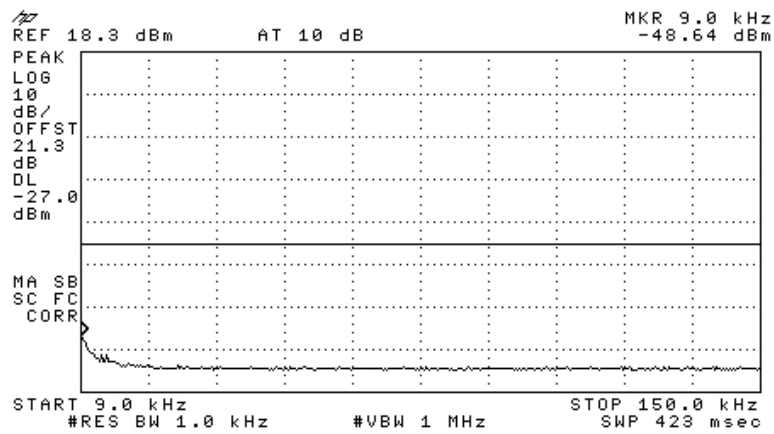


Figure 148 —5765 MHz BPSK

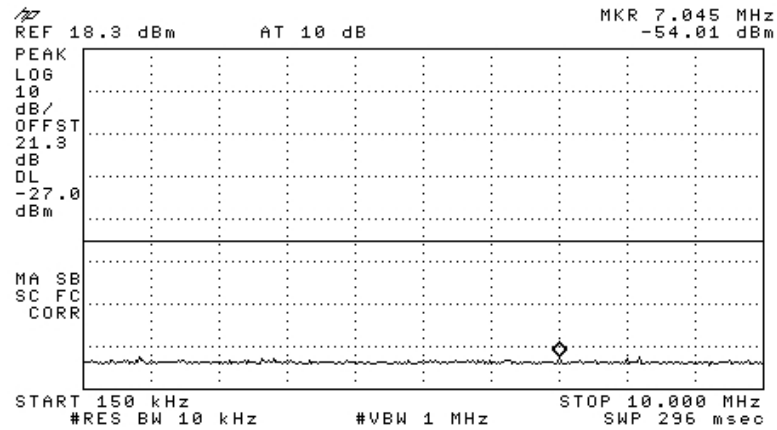


Figure 149 —5765 MHz BPSK

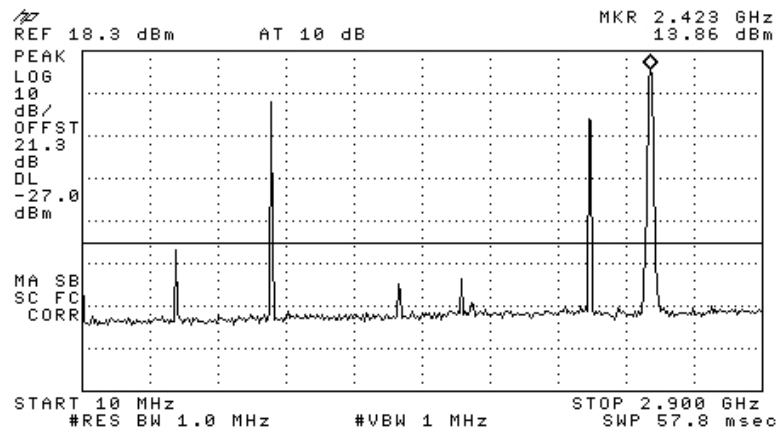


Figure 150 —5765 MHz BPSK

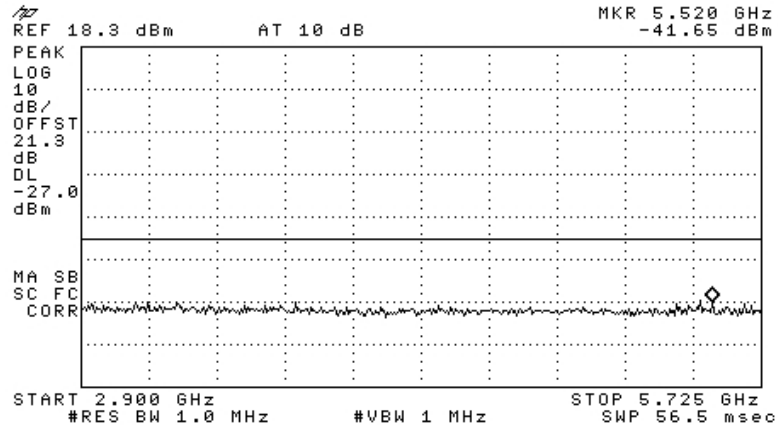


Figure 151 —5765 MHz BPSK

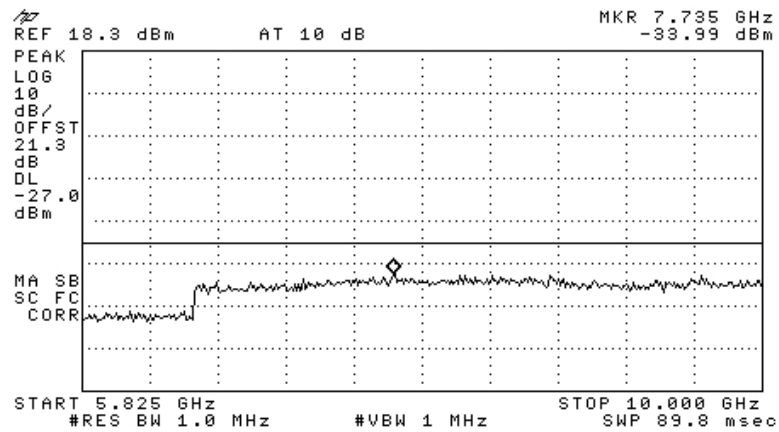


Figure 152 —5765 MHz BPSK

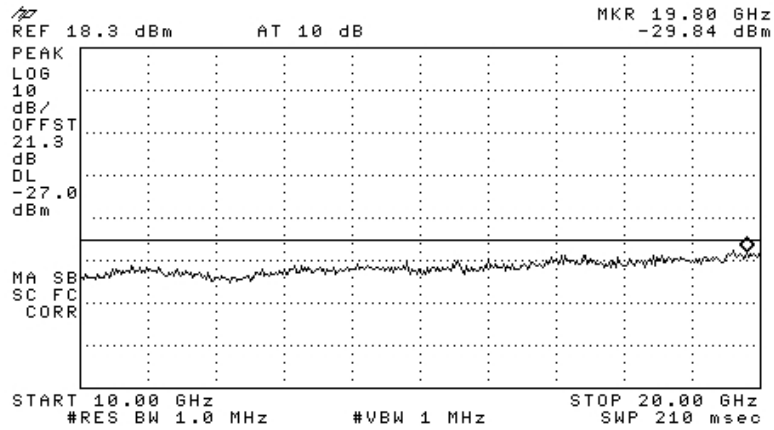


Figure 153 —5765 MHz BPSK

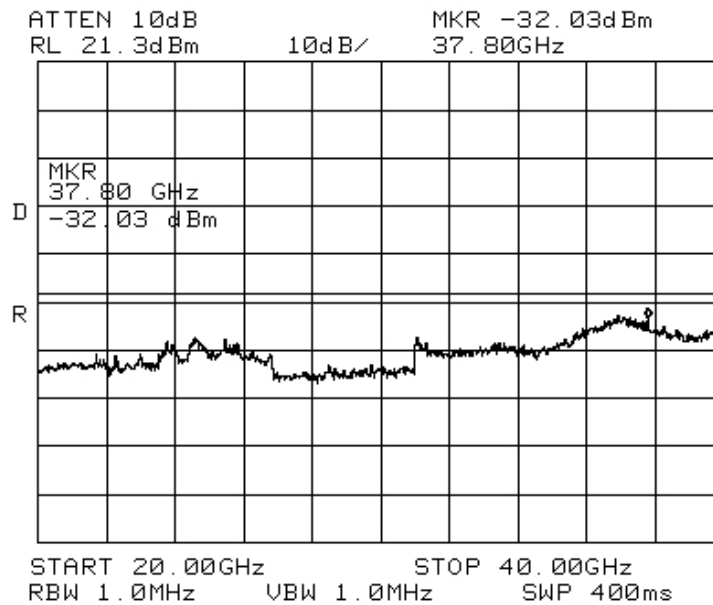


Figure 154 —5765 MHz BPSK

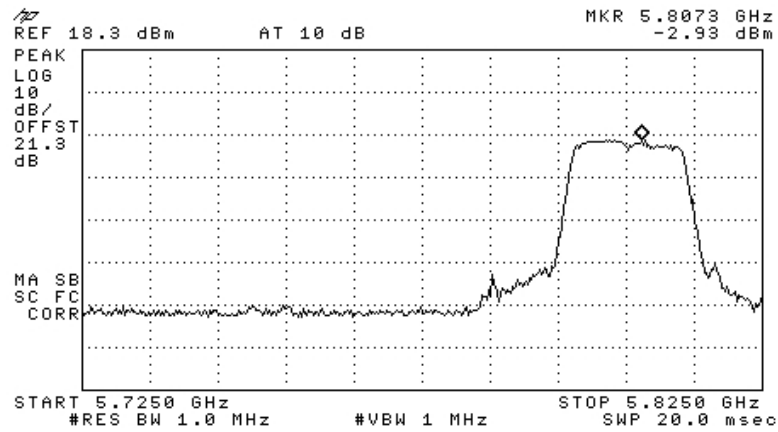


Figure 155 —5805 MHz BPSK

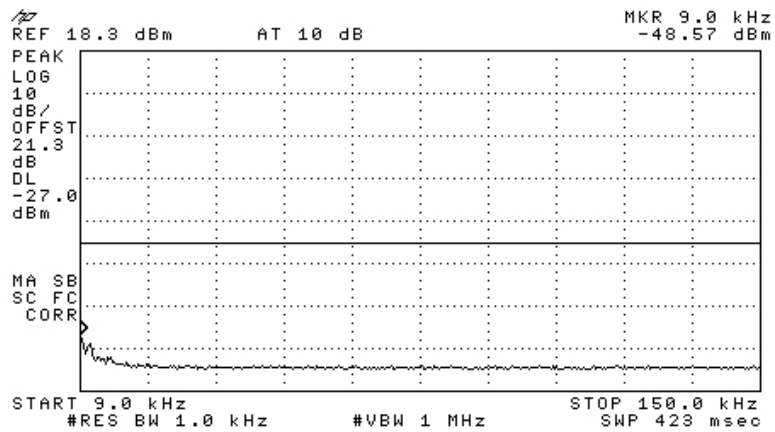


Figure 156 —5805 MHz BPSK

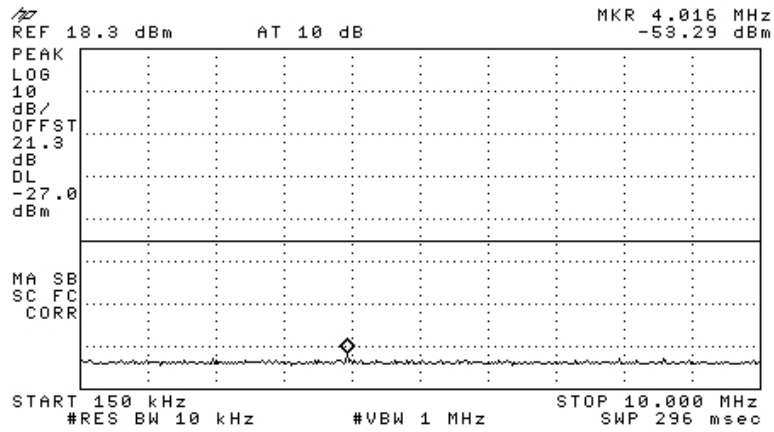


Figure 157 —5805 MHz BPSK

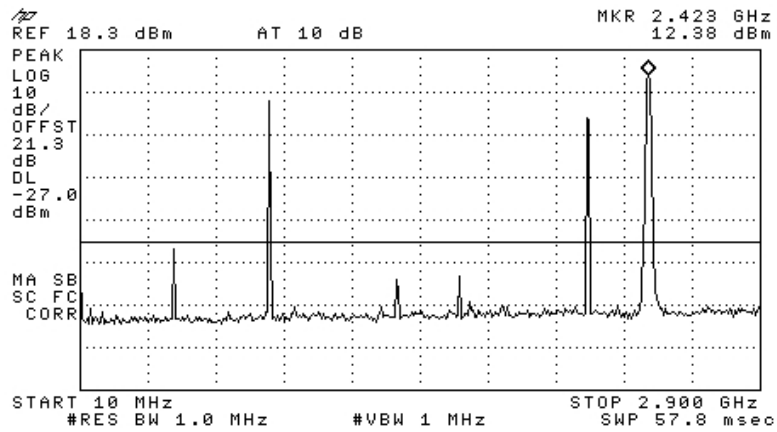


Figure 158 —5805 MHz BPSK



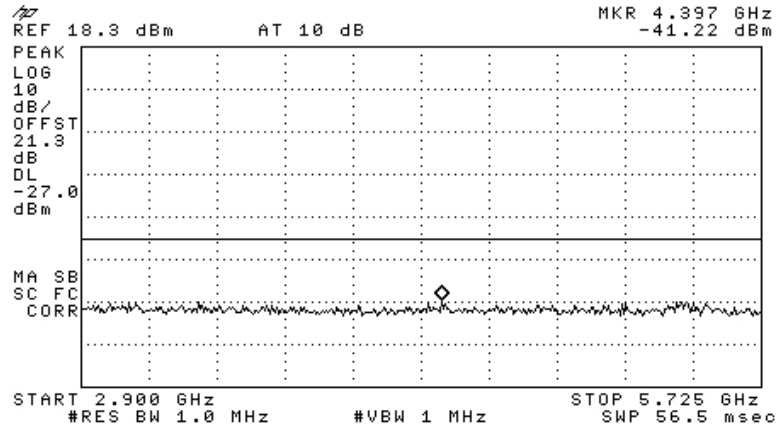


Figure 159 —5805 MHz BPSK

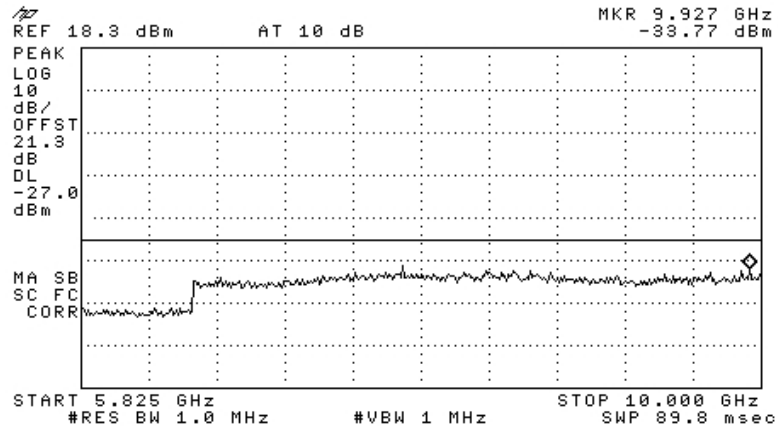


Figure 160 —5805 MHz BPSK



## 11.2 Results table

E.U.T Description: WLAN Module With WCE (WiFi Coverage Extender) for DAS With Four Cisco 1242 Access Points

Model No.: 860M-AU With WCE-AU

Serial Number: 860M-AU: 0837453; WCE-AU: 0847A54

Specification: F.C.C. Part 15, Subpart E

Operation Frequency (MHz)	Modulation	Reading (dBm)	Specification (dBm)	Margin (dB)
5180	64QAM	-29.23	-27.0	-2.23
	BPSK	-27.70	-27.0	-0.70
5200	64QAM	-28.95	-27.0	-1.95
	BPSK	-28.16	-27.0	-1.16
5240	64QAM	-28.93	-27.0	-1.93
	BPSK	-28.78	-27.0	-1.78
5745	64QAM	-28.11	-27.0	-1.11
	BPSK	-28.29	-27.0	-1.29
5765	64QAM	-28.66	-27.0	-1.66
	BPSK	-29.84	-27.0	-2.84
5805	64QAM	-28.56	-27.0	-1.56
	BPSK	-28.47	-27.0	-1.47

**Figure 163 Peak Power Output of 5150-5250; 5725-5825 MHz Bands**

JUDGEMENT: Passed by 0.7 dB

TEST PERSONNEL:

Tester Signature: 

Date: 22.02.09

Typed/Printed Name: A. Sharabi

### 11.3 Test Equipment Used.

Peak Power Output of 5150-5825 MHz Band

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Spectrum Analyzer	HP	8564E	3442A00275	December 15, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	February 1, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	February 9, 2009	1 year

**Figure 164 Test Equipment Used**

## 12. Band Edge Spectrum 802.11b/g+802.11a + WMTS + AWS Signals

[In Accordance with section 15.407)

### 12.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable (cable loss = 1.3B). The spectrum analyzer was set to 1 MHz resolution BW. Maximum power level below 5150 MHz and above 5350 MHz was measured at 5180 MHz and 5240MHz correspondingly. Maximum power level below 5725 MHz and above 5825 MHz was measured at 5745 MHz and 5805 MHz correspondingly.

The E.U.T. was tested at 5180, 5240, 5745, and 5805 MHz with the following modulations: 64QAM (54Mbit/sec) and BPSK (6Mbit/sec).

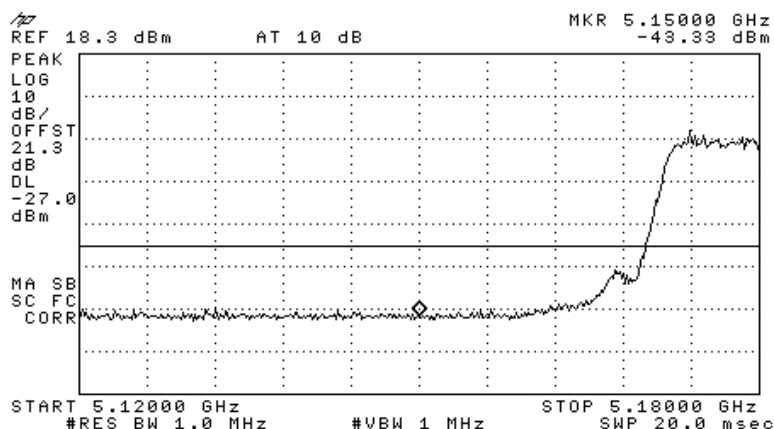


Figure 165 —5180 MHz 64QAM

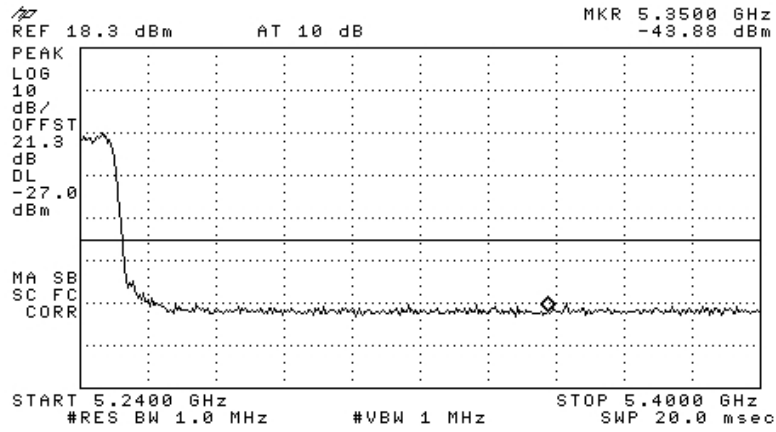


Figure 166 —5240 MHz 64QAM

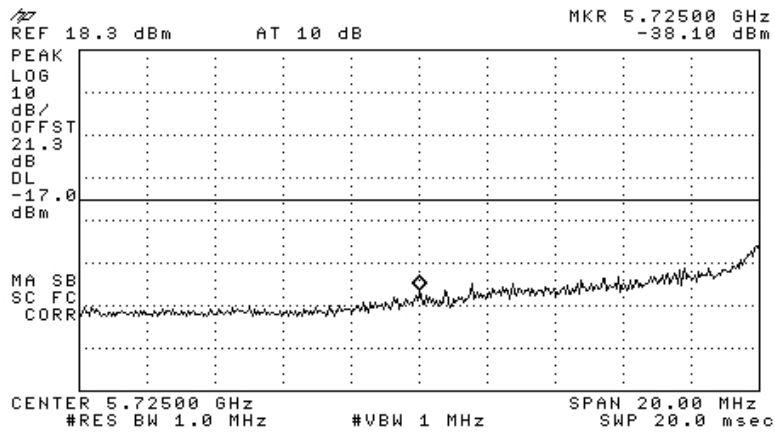


Figure 167 —5745 MHz 64QAM

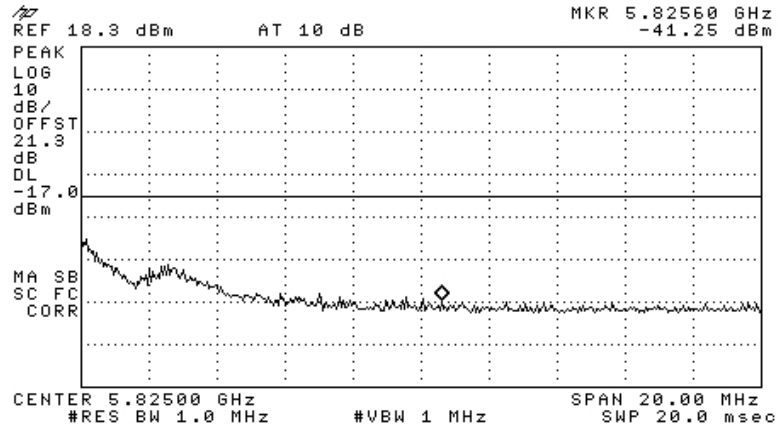


Figure 168 —5805 MHz 64QAM

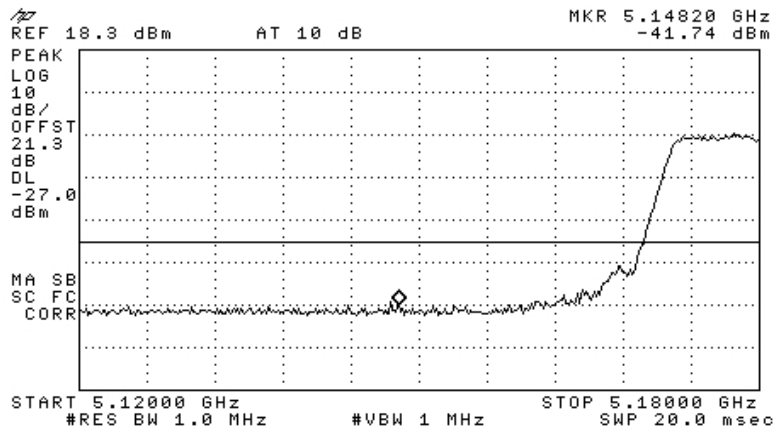


Figure 169 —5180 MHz BPSK

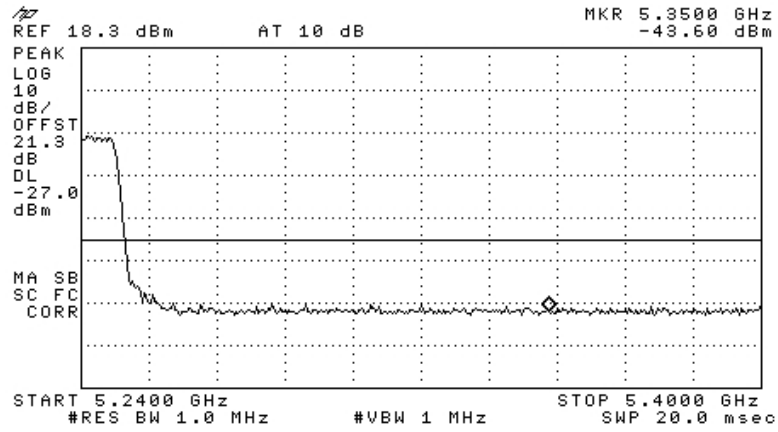


Figure 170 —5240 MHz BPSK

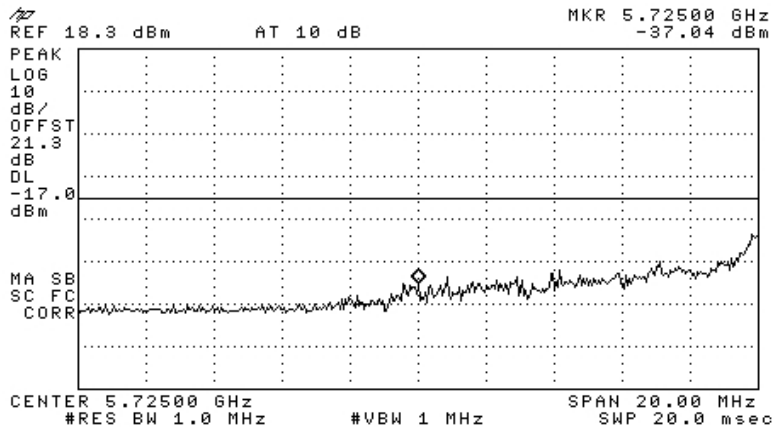


Figure 171 —5745 MHz BPSK





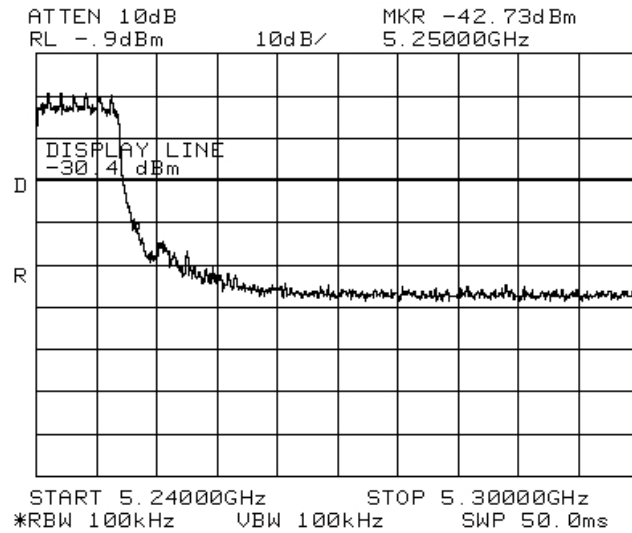


Figure 174 —Band Edge at 5.25 GHz Operation at 5.24 GHz BPSK (Section 15.215(c))

## 12.2 Results table

E.U.T. Description: WLAN Module With WCE (WiFi Coverage Extender) for DAS With Four Cisco 1242 Access Points

Model No.: 860M-AU With WCE-AU

Serial Number: 860M-AU: 0837453; WCE-AU: 0847A54


Specification: F.C.C. Part 15, Subpart C (15.215(c))

Operation Frequency (MHz)	Modulation	Band Edge Frequency (MHz)	Result (dBc)	Specification (dBc)	Margin (dB)
5240	64QAM	5250.00	32.5	20.0	-12.5
	BPSK	5250.00	32.33	20.0	-12.33

Figure 175 Band Edge at 5.25 GHz operation at 5.24 GHz

JUDGEMENT: Passed by 12.33 dB

TEST PERSONNEL:

Tester Signature: 

Date: 22.02.09

Typed/Printed Name: A. Sharabi

### 12.3 Results table

E.U.T. Description: WLAN Module With WCE (WiFi Coverage Extender) for DAS  
With Four Cisco 1242 Access Points

Model No.: 860M-AU With WCE-AU

Serial Number: 1. 860M: 73903D 2. WCE: 739038

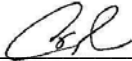
Specification: F.C.C. Part 15, Subpart C (15.407)

Operation Frequency (MHz)	Modulation	Band Edge Frequency (MHz)	Result (dBm)	Specification (dBm)	Margin (dB)
5180	64QAM	5150.00	-43.33	-27.0	-16.33
	BPSK	5148.20	-41.74	-27.0	-14.74
5240	64QAM	5350.00	-43.88	-27.0	-16.88
	BPSK	5350.00	-43.60	-27.0	-16.60
5745	64QAM	5725.00	-38.10	-17.0	-21.1
	BPSK	5725.00	-37.04	-17.0	-20.04
5805	64QAM	5825.60	-41.25	-17.0	-24.25
	BPSK	5825.00	-42.39	-17.0	-25.39

**Figure 176 Band Edge Spectrum**

JUDGEMENT: Passed by 14.74 dB

TEST PERSONNEL:

Tester Signature: 

Date: 22.02.09

Typed/Printed Name: A. Sharabi

## 12.4 Test Equipment Used.

### Band edge Spectrum

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Spectrum Analyzer	HP	8564E	3442A00275	December 15, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	February 1, 2009	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	February 9, 2009	1 year

**Figure 177 Test Equipment Used**

### **13. Antenna Gain 802.11b/g+802.11a + WMTS + AWS Signals**

The antenna gain is 7 dBi.

## 14. R.F Exposure/Safety 802.11b/g+802.11a + WMTS + AWS Signals

Typical use of the E.U.T. is repeating WiFi signals for DAS. The typical placement of the E.U.T. is on a wall near the ceiling. The typical distance between the E.U.T. and the user in the worst case application, is >1 m.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 5745 MHz is:  $1 \frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

$P_t$ - Transmitted Power (Peak) 20.41 mW= 13.1 dBm

$G_T$ - Antenna Gain, 7 dBi = 5

R- Distance from Transmitter using 1 m worst case

(c) The peak power density is :

$$S_p = \frac{20.41 \times 5}{4\pi(100)^2} = 8.1 \times 10^{-4} \frac{mW}{cm^2}$$

(d) This is 4 orders of magnitude below the FCC limit.

## 15. Intermodulation Tests

### 15.1 Test procedure

An access point having maximum RF output power was used for this test.

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable

(cable loss = 1 dB). The spectrum analyzer was set to 1 kHz resolution BW for the frequency range 9.0-150.0 kHz, 10kHz for the frequency range 10kHz-10.0MHz, 100kHz for the frequency range 10.0MHz-2.4385GHz, and 1MHz for the frequency range 2.4385-25.0GHz.

4 input signals were sent simultaneously to the E.U.T. as follows:

802.11b/g: in the frequency range 2400-2483 MHz, 2412MHz 64QAM

802.11a: in the frequency range 5150-5250 MHz, 5180MHz BPSK

WMTS: in the frequency range 608-614 MHz, 608 MHz CW

AWS: in the frequency range 2110-2155 MHz, 2155MHz CW

The frequency range of 9 kHz – 40.0GHz was scanned for unwanted signals.





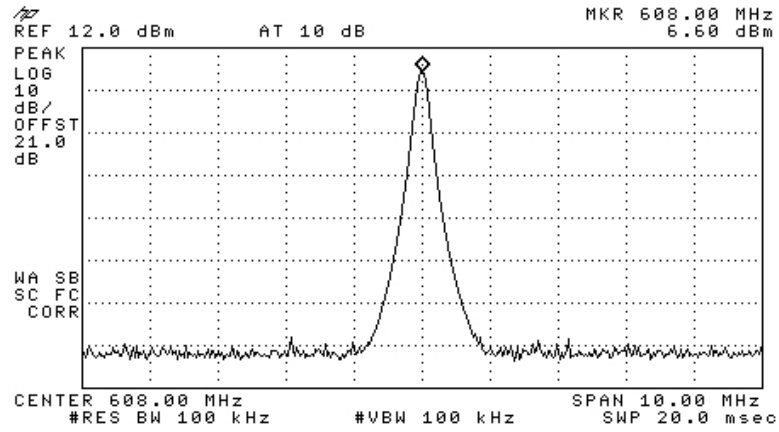


Figure 180 — 608MHz CW

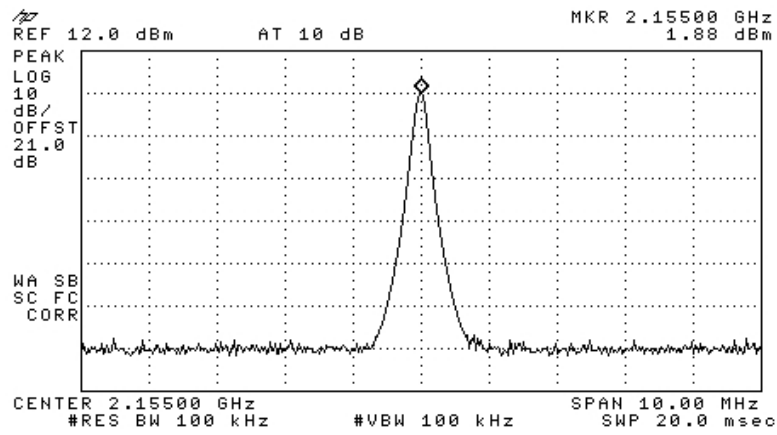


Figure 181 — 2155MHz CW

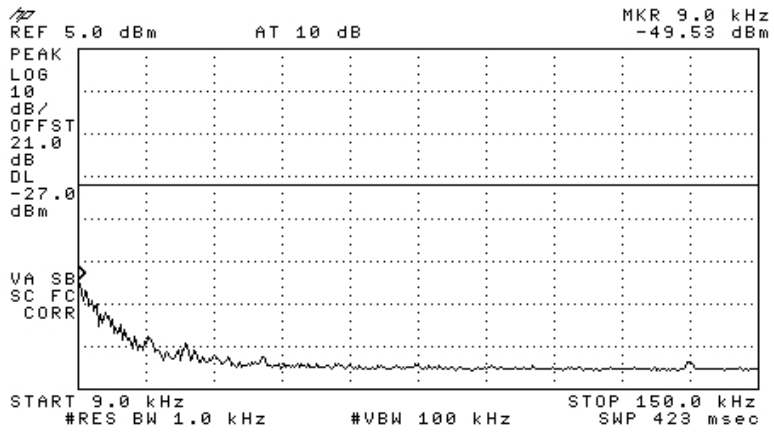


Figure 182

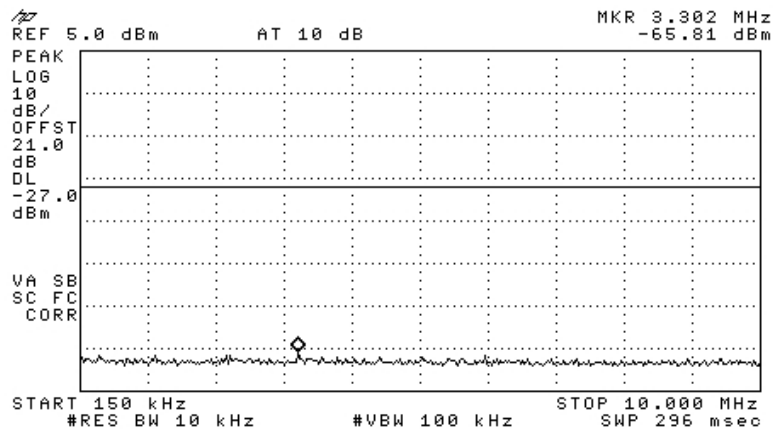


Figure 183

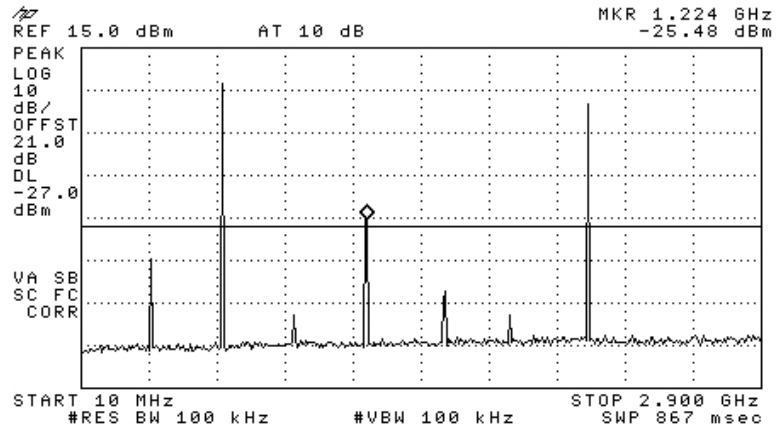


Figure 184 (Seconded harmonic of the 608MHz Signal generator)

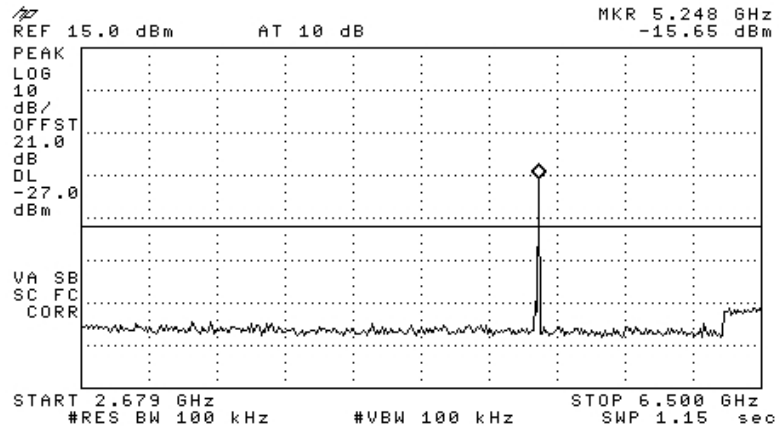


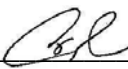
Figure 185





JUDGEMENT:                      Passed

TEST PERSONNEL:

Tester Signature: \_\_\_\_\_ 

Date: 22.02.09

Typed/Printed Name: A. Sharabi

**15.2 Test Equipment Used.**

Intermodulation

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Spectrum Analyzer	HP	8564E	3442A00275	December 15, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	February 1, 2009	1 year
Cable	Rhophase	KPS-1501-1000	A1675	February 1, 2009	1 year

**Figure 189 Test Equipment Used**

## 16. APPENDIX A - CORRECTION FACTORS

### 16.1 Correction factors for CABLE from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

**NOTES:**

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

**16.2 Correction factors for CABLE**  
**from EMI receiver**  
**to test antenna**  
**at 3 meter range.**

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

*NOTES:*

- 1. The cable type is RG-8.*
- 2. The overall length of the cable is 10 meters.*



**16.3 Correction factors for CABLE**  
**from spectrum analyzer**  
**to test antenna above 2.9 GHz**

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

**NOTES:**

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.
2. The cable is used for measurements above 2.9 GHz.
3. The overall length of the cable is 10 meters.

**16.4 Correction factors for CABLE**  
**from EMI receiver**  
**to test antenna**  
**at 10 meter range.**

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	9.8
20.0	0.8	1400.0	10.0
30.0	0.9	1600.0	11.3
40.0	1.2	1800.0	12.2
50.0	1.4	2000.0	13.1
60.0	1.6	2300.0	14.5
70.0	1.8	2600.0	15.9
80.0	1.9	2900.0	16.4
90.0	2.0		
100.0	2.1		
150.0	2.6		
200.0	3.2		
250.0	3.8		
300.0	4.2		
350.0	4.6		
400.0	5.1		
450.0	5.3		
500.0	5.6		
600.0	6.3		
700.0	7.0		
800.0	7.6		
900.0	8.0		
1000.0	8.7		

**NOTES:**

1. The cable type is RG-214.
2. The overall length of the cable is 34 meters.
3. The above data is located in file 34M10MO.CBL on the disk marked "Radiated Emissions Tests EMI Receiver".

## 12.6 Correction factors for LOG PERIODIC ANTENNA

### Type LPD 2010/A at 3 and 10 meter ranges.

#### Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

#### Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

**NOTES:**

1. Antenna serial number is 1038.
2. The above lists are located in file number 38M30.ANT for a 3 meter range,  
and file number 38M100.ANT for a 10 meter range.
3. The files mentioned above are located on the disk marked "Radiated Emission  
Test EMI Receiver".

**16.5 Correction factors for**

**LOG PERIODIC ANTENNA**

**Type SAS-200/511  
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

*NOTES:*

1. Antenna serial number is 253.
2. The above lists are located in file number SAS3M0.ANT for a 3 meter range.
3. The files mentioned above are located on the disk marked "Antenna Factors".

**16.6 Correction factors for BICONICAL ANTENNA  
Type BCD-235/B,  
at 3 meter range**

<b>FREQUENCY (MHz)</b>	<b>AFE (dB/m)</b>
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

**NOTES:**

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

**16.7 Correction factors for BICONICAL ANTENNA  
Type BCD-235/B,  
10 meter range**

<b>FREQUENCY (MHz)</b>	<b>AFE (dB/m)</b>
30.0	12.1
40.0	10.6
50.0	10.6
60.0	8.9
70.0	8.5
80.0	9.6
90.0	9.4
100.0	9.6
110.0	10.3
120.0	10.7
130.0	12.6
140.0	12.7
150.0	12.7
160.0	13.8
170.0	13.7
180.0	14.9
190.0	13.4
200.0	13.1
210.0	14.0
220.0	14.5
230.0	15.8
240.0	16.0
250.0	16.6
260.0	16.7
270.0	18.3
280.0	18.5
290.0	19.3
300.0	20.9

**NOTES:**

1. Antenna serial number is 1041.
2. The above list is located in file 41BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

### 16.8 Correction factors for Double-Ridged Waveguide Horn

**Model: 3115, S/N 29845  
at 3 meter range.**

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENN A Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

**16.9 Correction factors for**

**Horn Antenna  
Model: SWH-28  
at 1 meter range.**

<b>FREQUENCY (GHz)</b>	<b>AFE (dB /m)</b>	<b>Gain (dB1)</b>
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4



**16.10 Correction factors for**

**Horn Antenna  
Model: V637**

<b>FREQUENCY (GHz)</b>	<b>AFE (dB /m)</b>	<b>Gain (dB1)</b>
26.0	43.6	14.9
27.0	43.7	15.1
28.0	43.8	15.3
29.0	43.9	15.5
30.0	43.9	15.8
31.0	44.0	16.0
32.0	44.1	16.2
33.0	44.1	16.4
34.0	44.1	16.7
35.0	44.2	16.9
36.0	44.2	17.1
37.0	44.2	17.4
38.0	44.2	17.6
39.0	44.2	17.8
40.0	44.2	18.0

**16.11 Correction factors for ACTIVE LOOP ANTENNA**

**Model 6502**

**S/N 9506-2950**

<b>FREQUENCY</b> (MHz)	<b>Magnetic Antenna Factor</b> (dB)	<b>Electric Antenna Factor</b> (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2