

**DATE: 01 February 2011**

**I.T.L. (PRODUCT TESTING) LTD.**  
**FCC Radio Test Report**  
for  
**ConnectOne Ltd.**

**Equipment under test:**

**WiFi Module**

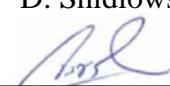
**iW-SM2144N2BIO**

Written by:



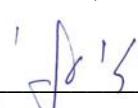
D. Shidowsky, Documentation

Approved by:



A. Sharabi, Test Engineer

Approved by:



I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

## Measurement/Technical Report for ConnectOne Ltd.

### WiFi Module

iW-SM2144N2BIO

**FCC ID: XM5-SM2144N2BIO**

**IC: 8516A-SM2144N2BIO**

This report concerns:                      Original Grant:              X

Class I Change:

Class II Change:

Equipment type:                      Digital Transmission System

Limits used:

47CFR15 Section 15.247

Measurement procedure used is ANSI C63.4-2003.

Application for Certification  
prepared by:

Ishaishou Raz

ITL (Product Testing) Ltd.

Kfar Bin Nun

D.N. Shimshon 99780

Israel

e-mail Sraz@itl.co.il

Applicant for this device:  
(different from "prepared by")

Avi Provizor

ConnectOne Ltd.

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e-mail: avip@connectone.com

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## 1. General Information

### 1.1 Administrative Information

Manufacturer: ConnectOne Ltd.

Manufacturer's Address: 20 Atir Yeda St., Kfar Saba, 44643, Israel  
Tel: +972-9-766-0456  
Fax: +972-9-766-0461

Manufacturer's Representative: Avi Provizor

Equipment Under Test (E.U.T): WiFi Module

Equipment Model No.: iW-SM2144N2BIO

Equipment Serial No.: Not Designated

Date of Receipt of E.U.T: 08/11/10

Start of Test: 08/11/10

End of Test: 11/11/10

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.

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***

WIREACH BK is a secure serial-to-Wireless LAN device server module that also acts as a bridge to connect serial devices to 802.11b/g Wireless LANs. It includes the iChip™ CO2144 IP Communication Controller™ chip and Marvell 88W8686 WiFi chipset. It is packaged in RoHS-compliant ultra-slim form factor and uses an industry standard pin-out.

WIREACH BK offers much more than many other device servers on the market. It acts as a security gap between the application and the network; supports up to 10 simultaneous TCP/UDP sockets; two listening sockets; a web server with two websites; SMTP and POP3 clients; MIME attachments; FTP and TELNET clients, and SerialNET™ mode for serial-to-IP bridging.

WIREACH BK supports the SSL3/TLS1 protocol for secure sockets, HTTPS and FTPS, WEP, WPA and WPA2 WiFi encryption.

WIREACH BK minimizes the need to redesign the host device hardware. It easily inserts into headers on the host PCB and connects to an external antenna. Minimal or no software configuration is needed for WIREACH BK to access the Wireless LAN.

Connect One's high-level AT+i™ API eliminates the need to add WiFi drivers, security and networking protocols and tasks to the host application. The AT+i SerialNET operating mode offers a true plug-and-play mode that eliminates any changes to the host application.

WIREACH BK firmware – the IP stack and Internet configuration parameters – are stored in an external flash memory. The module is power-efficient: the core operates at 1.2V, while I/Os operate at 3.3V. Power Save mode further reduces power consumption.

### 1.4 ***Test Methodology***

Radiated testing was 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 September 03, 2009).

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 placed in an evaluation board powered from 9 VDC in order to perform the tests. The E.U.T. transmitted continuously.

The evaluation board was placed in a typical position on the table.

### 2.2 ***EUT Exercise Software***

iChip Config (ConnectOne's Utility) and Hyper Terminal software were used.

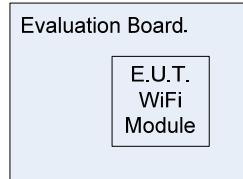
### 2.3 ***Special Accessories***

No special accessories were needed to achieve compliance.

### 2.4 ***Equipment Modifications***

No modifications were necessary in order to achieve compliance.

## 2.5 Configuration of Tested System



**Figure 1. Configuration of Tested System**

### 3. Conducted and Radiated Measurement Test Set-up Photos

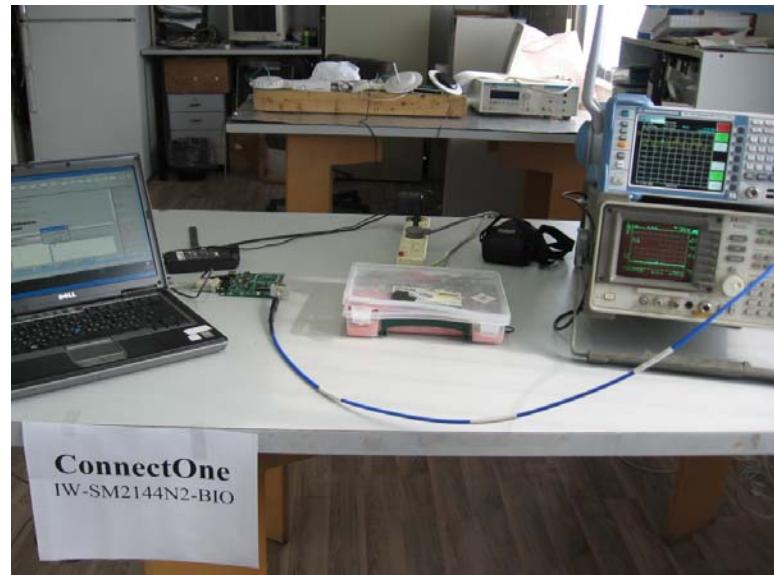


Figure 2. Conducted Emission From Antenna Port Test



Figure 3. Radiated Emission Test

## 4. 6 dB Minimum Bandwidth

### 4.1 Test procedure

The E.U.T. was set to the applicable test frequency. 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 100 kHz resolution BW. The spectrum bandwidth of the E.U.T. at the point of 6 dB below maximum peak power was measured and recorded.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: 1, 11, 6 and 54 Mbps.

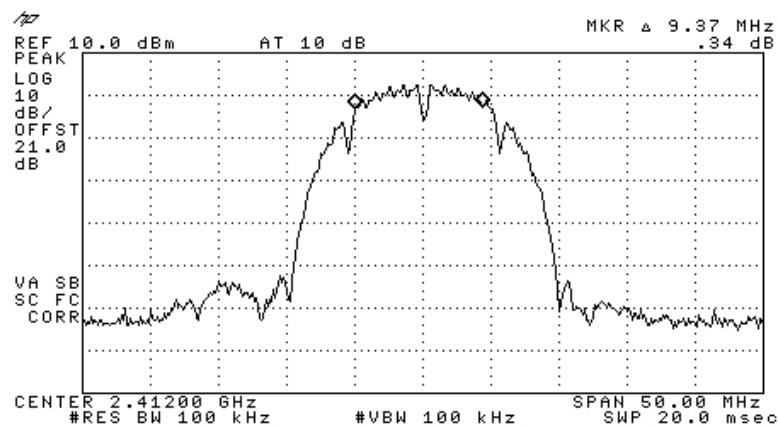
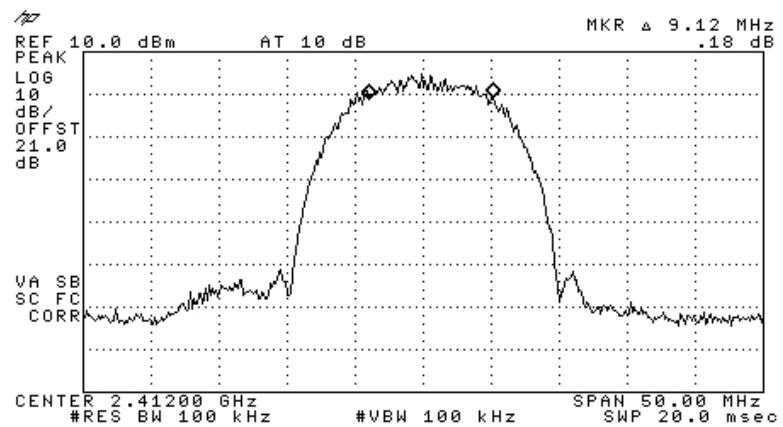
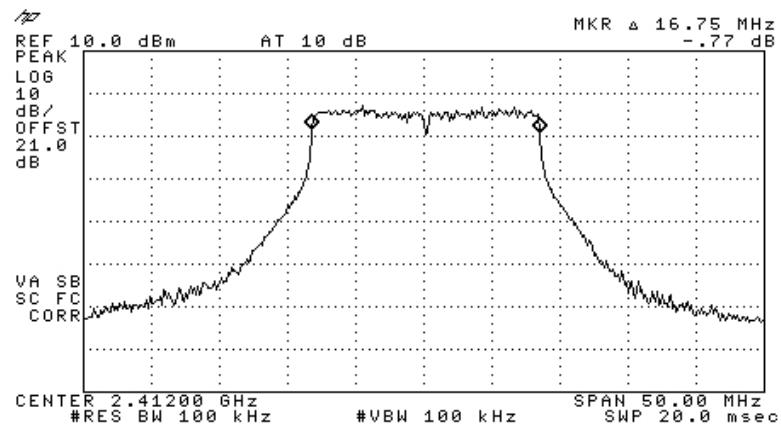


Figure 4 —Channel 1, 1Mbps



**Figure 5 — Channel 1, 11Mbps**



**Figure 6 — Channel 1, 6Mbps**

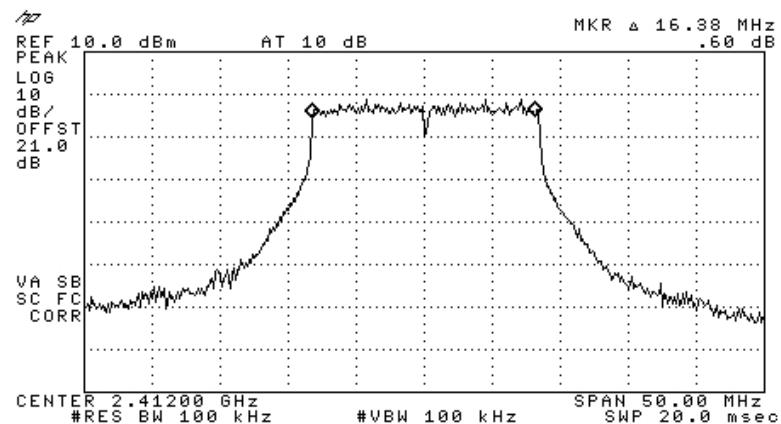


Figure 7 — Channel 1, 54Mbps

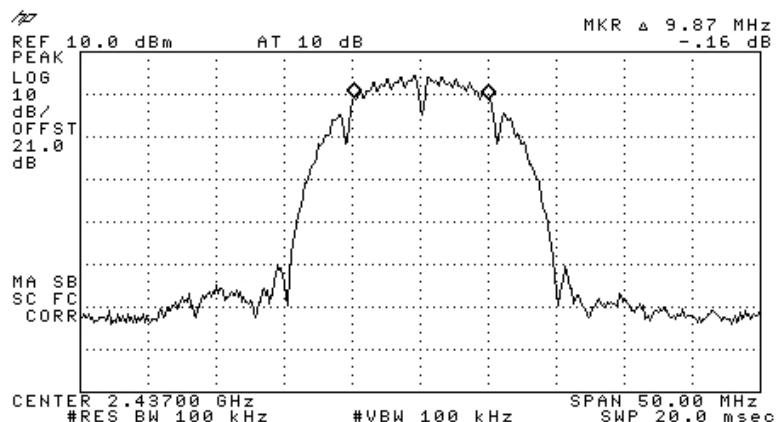
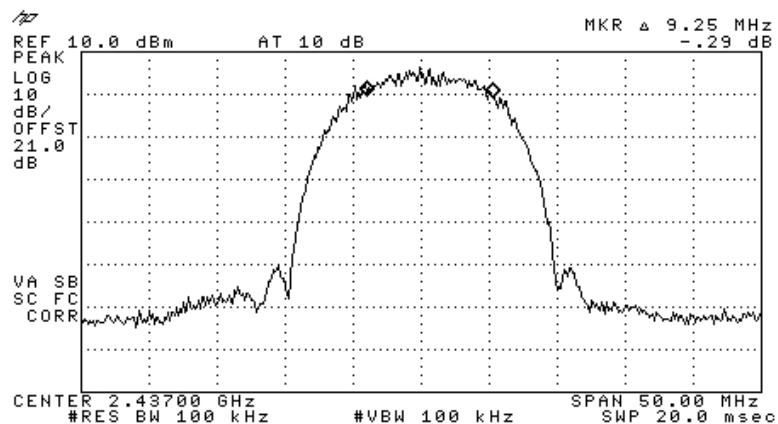
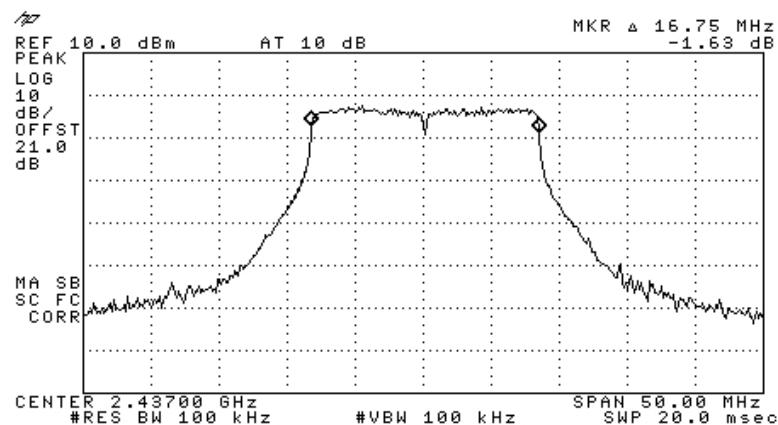


Figure 8 — Channel 6, 1Mbps



**Figure 9 — Channel 6, 11Mbps**



**Figure 10 — Channel 6, 6Mbps**

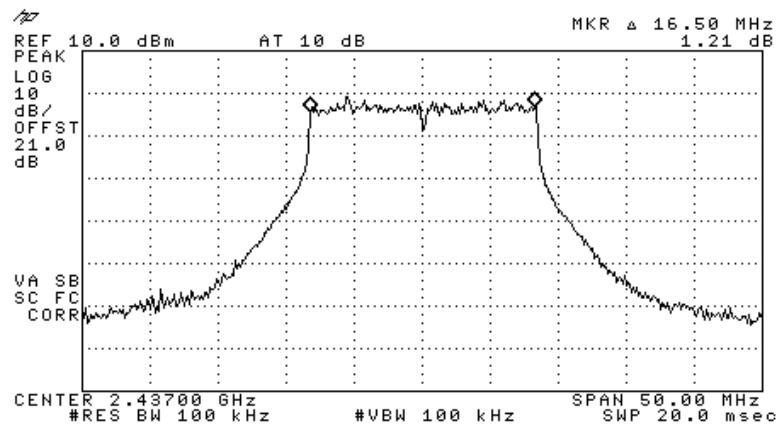


Figure 11 — Channel 6, 54Mbps

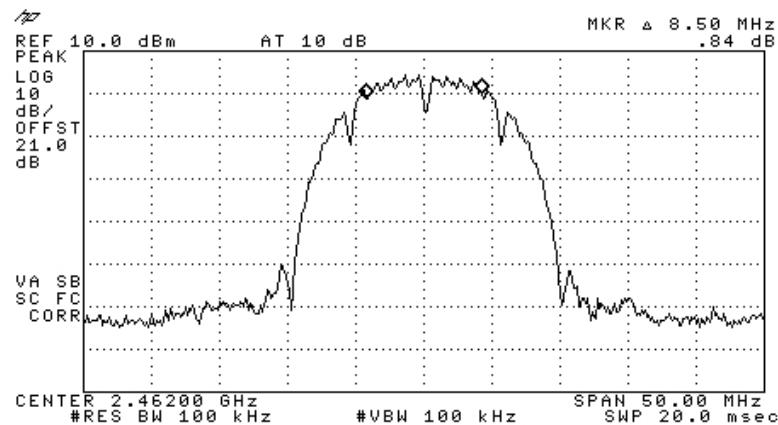
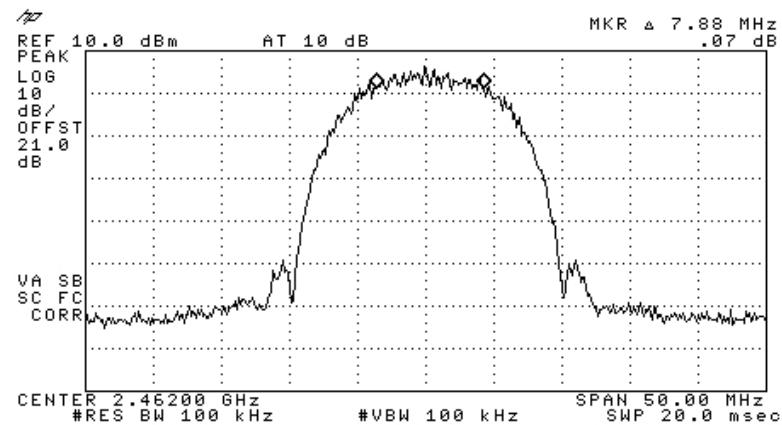
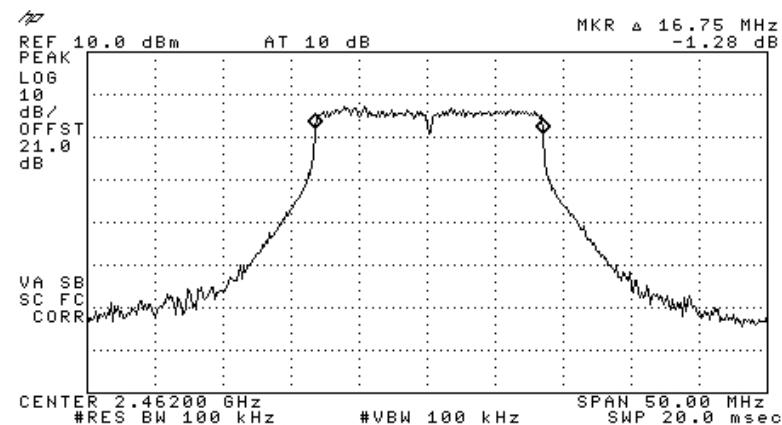


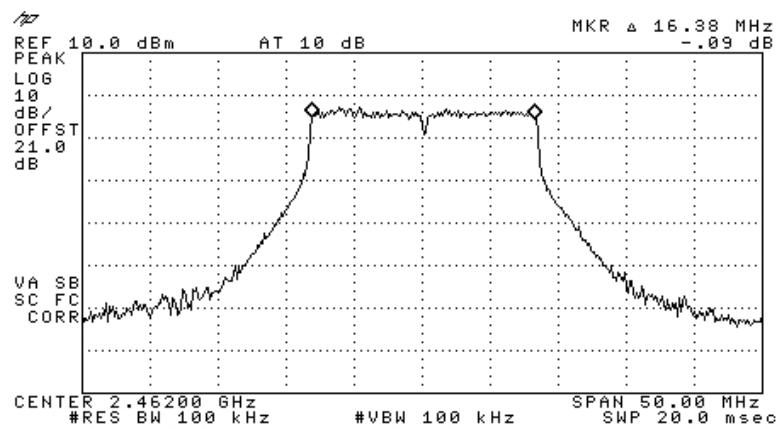
Figure 12 — Channel 11, 1Mbps



**Figure 13 — Channel 11, 11Mbps**



**Figure 14 — Channel 11, 6Mbps**



**Figure 15 — Channel 11, 54Mbps**

## 4.2 Results table

E.U.T Description: WiFi Module

Model No.: iW-SM2144N2BIO

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Modulation (Mbps)	Reading (MHz)	Specification (MHz)
2412	1	9.37	0.5
	11	9.12	0.5
	6	16.75	0.5
	54	16.38	0.5
2437	1	9.87	0.5
	11	9.25	0.5
	6	16.75	0.5
	54	16.50	0.5
2462	1	8.50	0.5
	11	7.88	0.5
	6	16.75	0.5
	54	16.38	0.5

**Figure 16 6 dB Minimum Bandwidth**

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 03.02.11

Typed/Printed Name: A. Sharabi

#### 4.3 **Test Equipment Used.**

6 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

**Figure 17 Test Equipment Used**

## 5. 26 dB Minimum Bandwidth

### 5.1 *Test procedure*

The E.U.T. was set to the applicable test frequency. 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 100 kHz resolution BW. The spectrum bandwidth of the E.U.T. at the point of 26 dB below maximum peak power was measured and recorded.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: 1, 11, 6 and 54 Mbps.

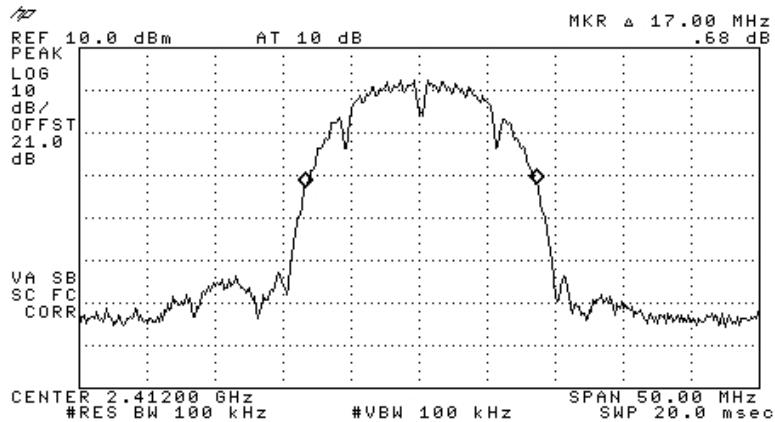


Figure 18 —Channel 1 , 1Mbps

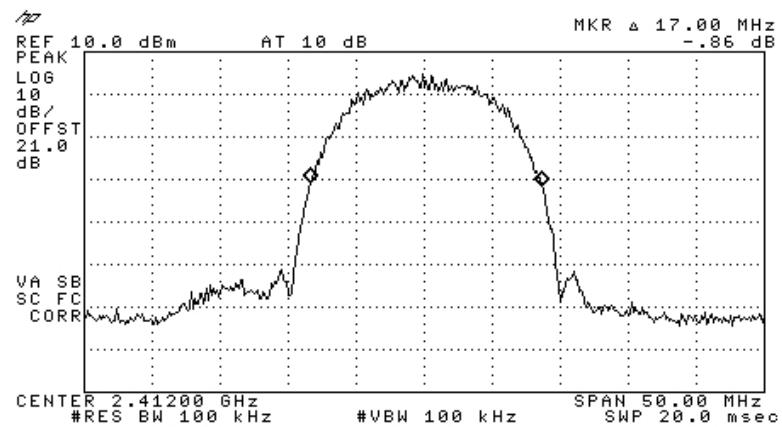


Figure 19 —Channel 1, 11Mbps

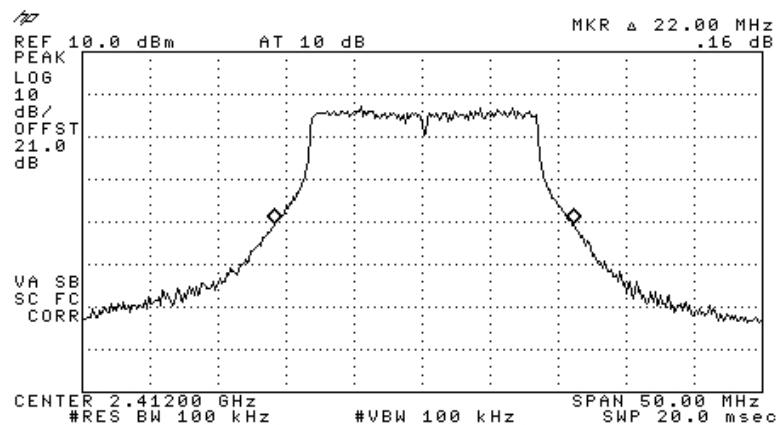
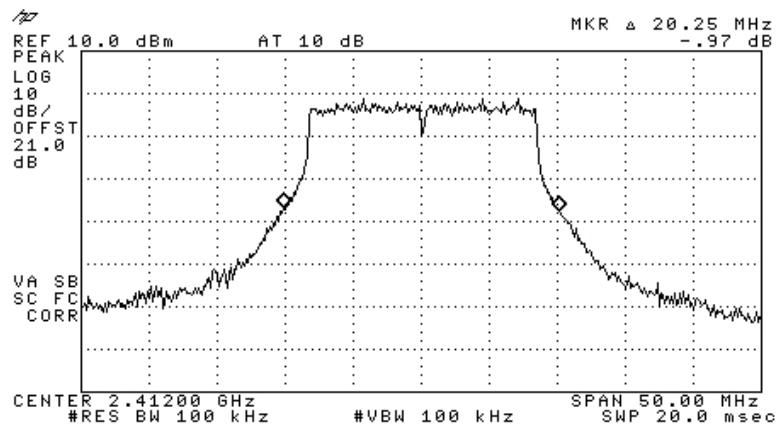
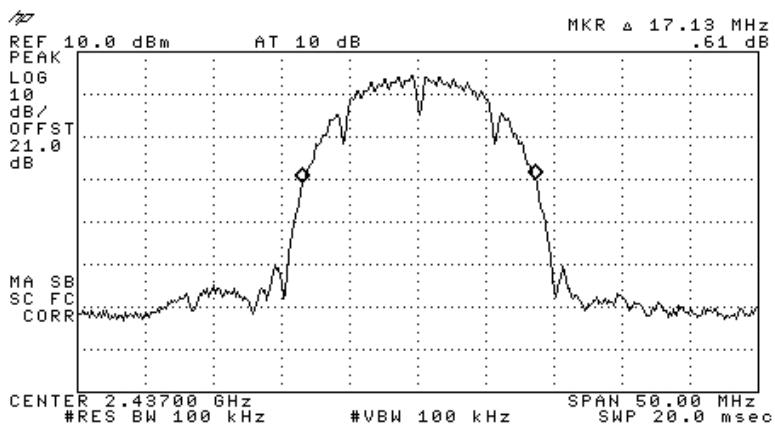


Figure 20 — Channel 1, 6Mbps



**Figure 21 — Channel 1, 54Mbps**



**Figure 22 — Channel 6, 1Mbps**

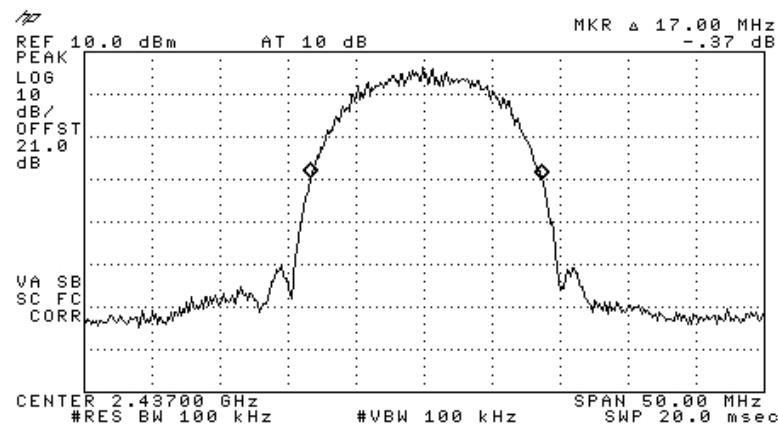


Figure 23 — Channel 6, 11Mbps

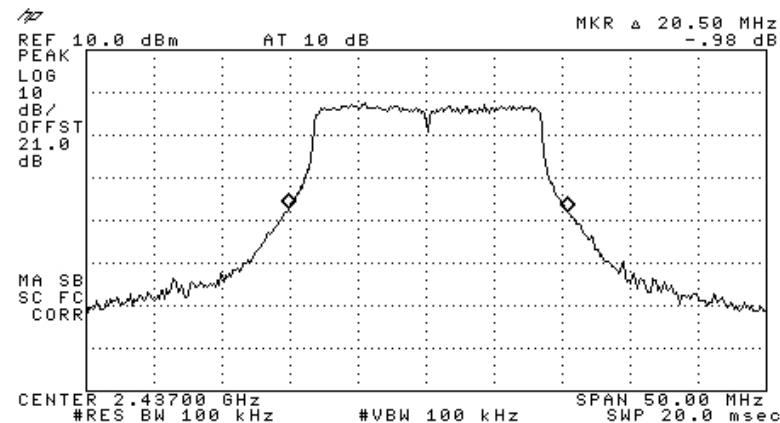


Figure 24 — Channel 6, 6Mbps

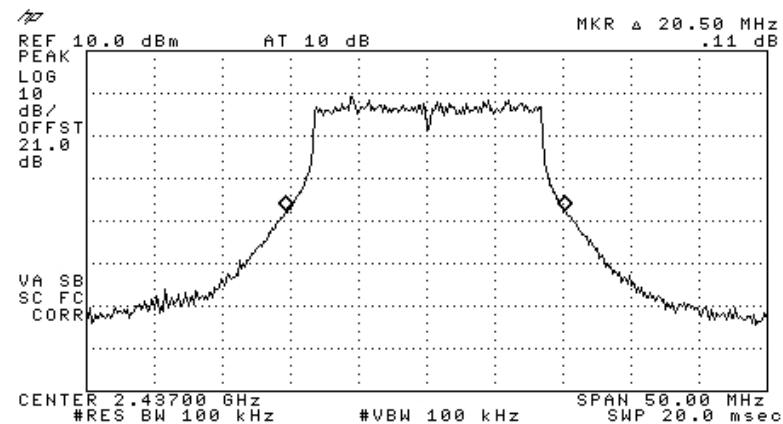


Figure 25 — Channel 6, 54Mbps

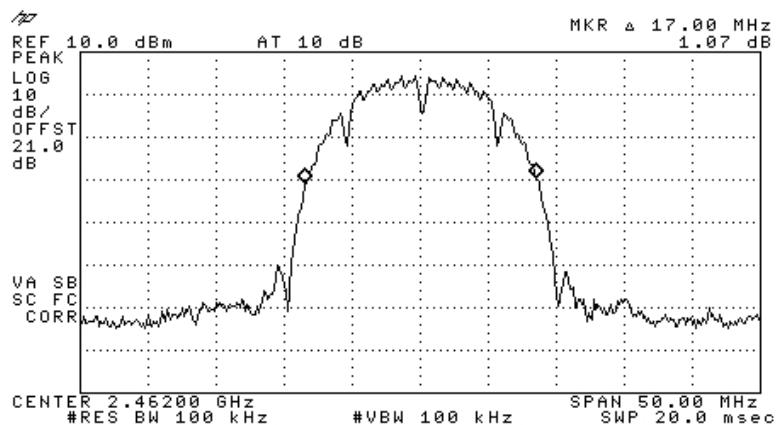


Figure 26 — Channel 11, 1Mbps

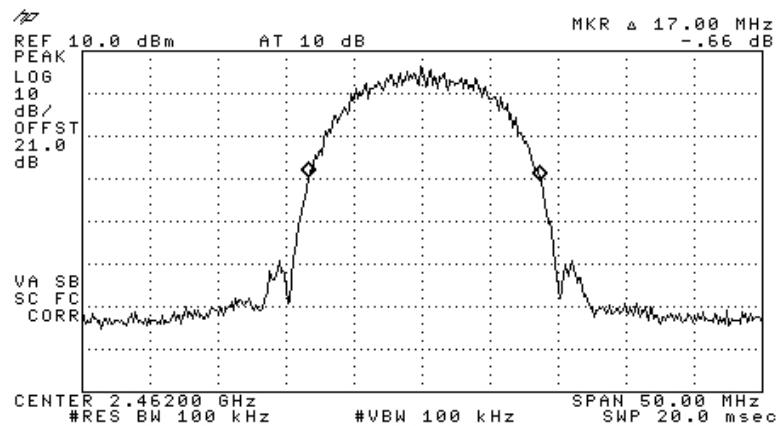


Figure 27 — Channel 11, 11Mbps

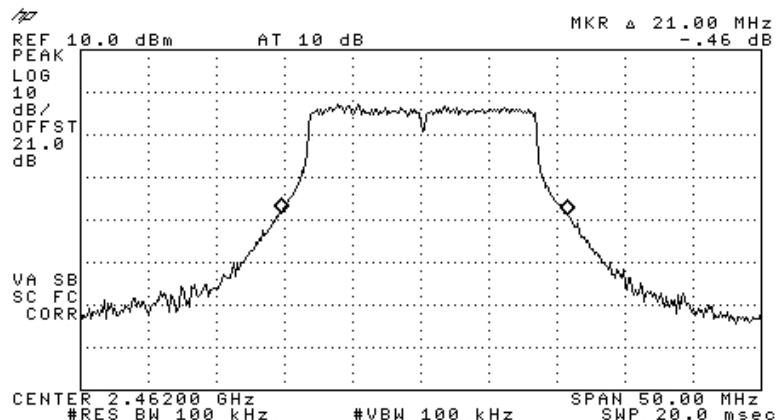
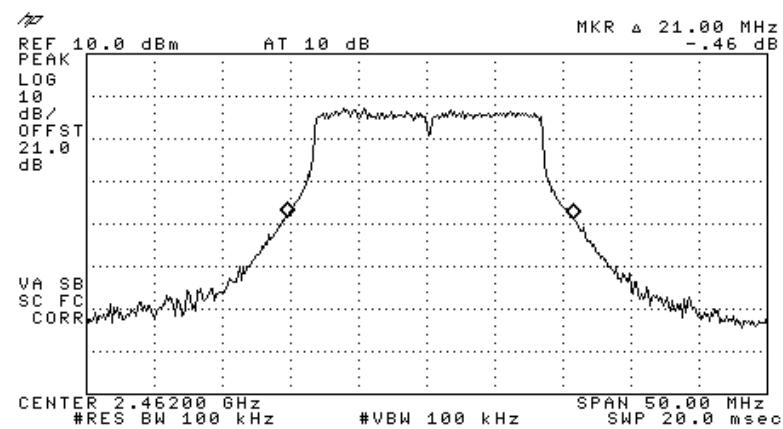


Figure 28 — Channel 11, 6Mbps



**Figure 29 — Channel 11, 54Mbps**

## 5.2 Results table

E.U.T Description: WiFi Module

Model No.: iW-SM2144N2BIO

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Modulation (Mbps)	Reading (MHz)	Specification (MHz)
2412	1	17.00	0.5
	11	17.00	0.5
	6	22.00	0.5
	54	20.25	0.5
2437	1	17.13	0.5
	11	17.00	0.5
	6	20.50	0.5
	54	20.50	0.5
2462	1	17.00	0.5
	11	17.00	0.5
	6	21.00	0.5
	54	21.00	0.5

**Figure 30 26 dB Minimum Bandwidth**

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 03.02.11

Typed/Printed Name: A. Sharabi

### 5.3 **Test Equipment Used.**

26 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

**Figure 31 Test Equipment Used**

## 6. Maximum Transmitted Peak Power Output

### 6.1 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 dB). The Spectrum Analyzer was set to 1.0 MHz resolution BW. Peak power level was measured at selected operation frequencies.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: 1, 11, 6 and 54 Mbps.

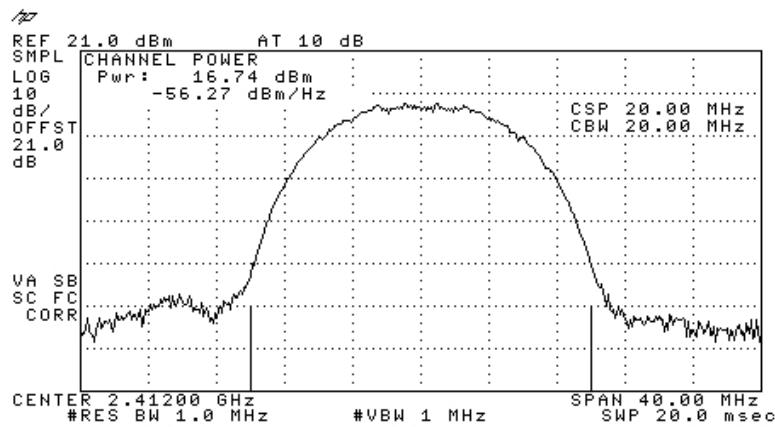


Figure 32 – Channel 1 , 1Mbps

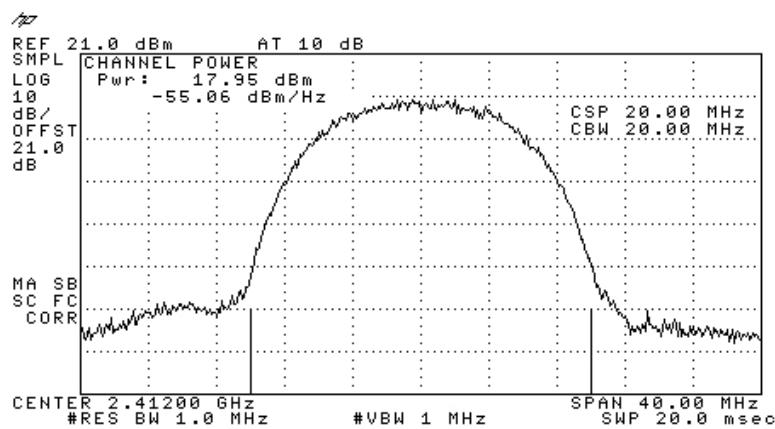


Figure 33- Channel 1 , 11Mbps

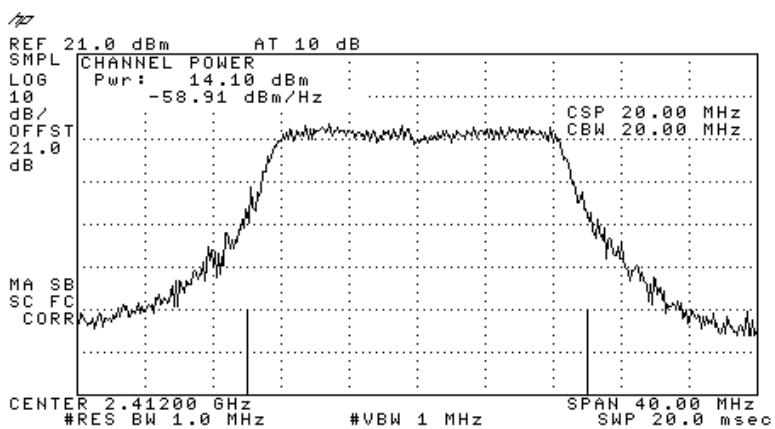


Figure 34 - Channel 1 , 6Mbps

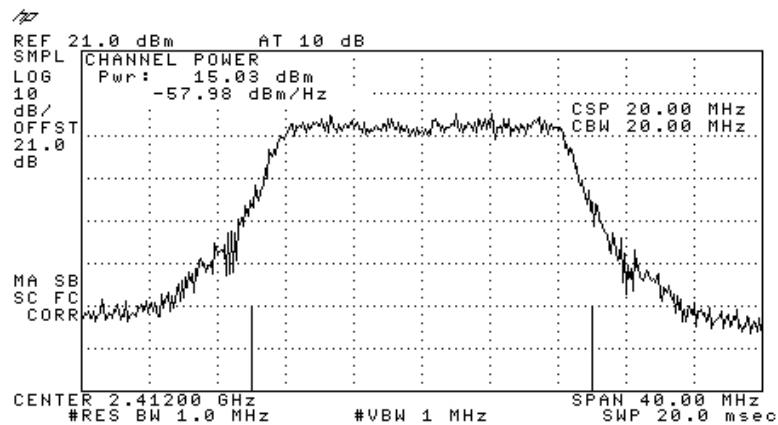


Figure 35 - Channel 1 , 54Mbps

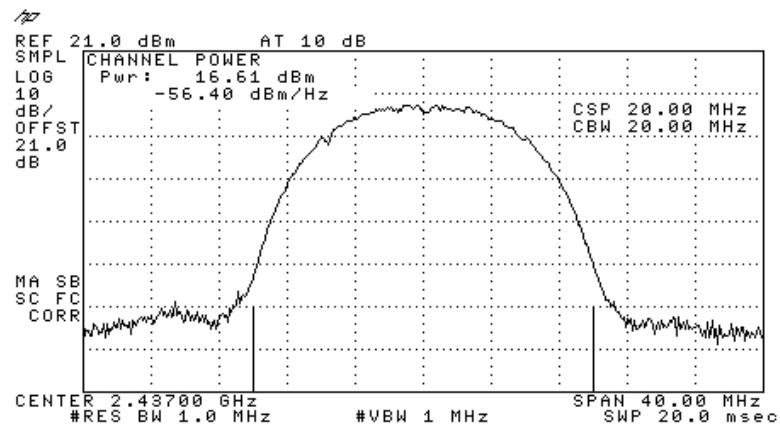


Figure 36 - Channel 6 , 1Mbps

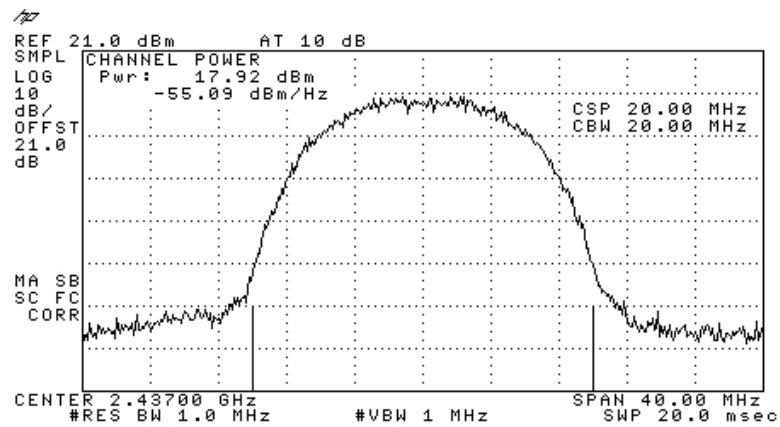


Figure 37 - Channel 6 , 11Mbps

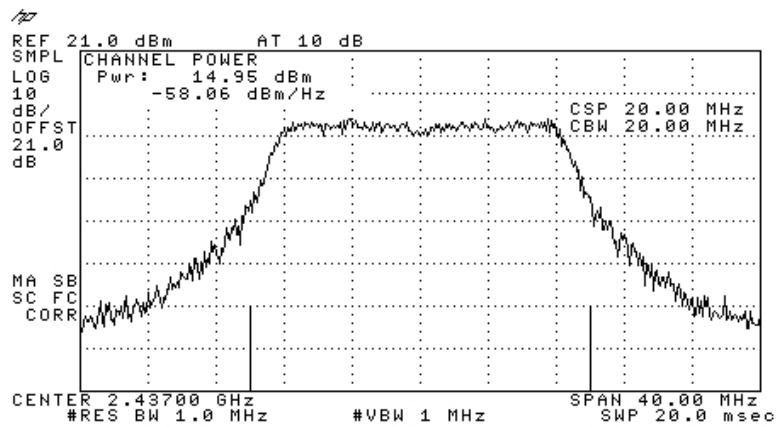


Figure 38 - Channel 6 , 6Mbps

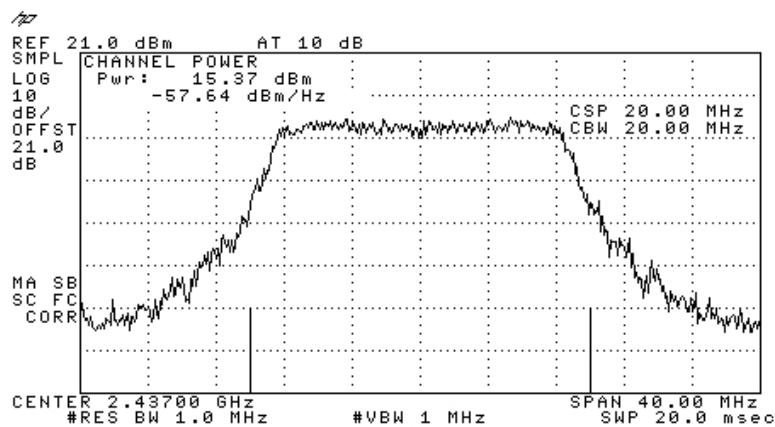


Figure 39 - Channel 6 , 54Mbps

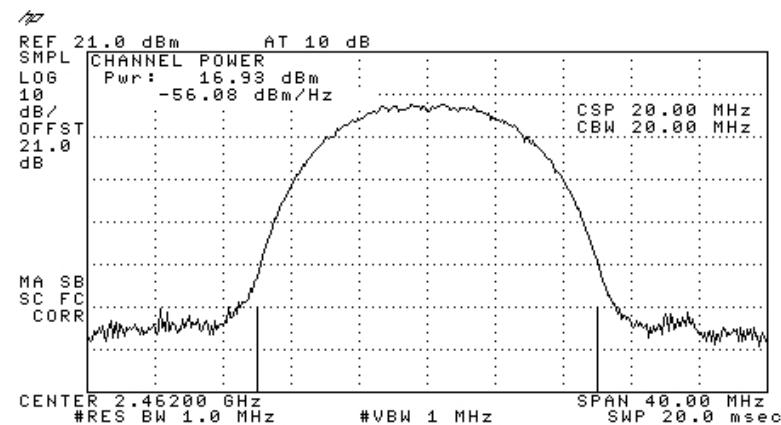
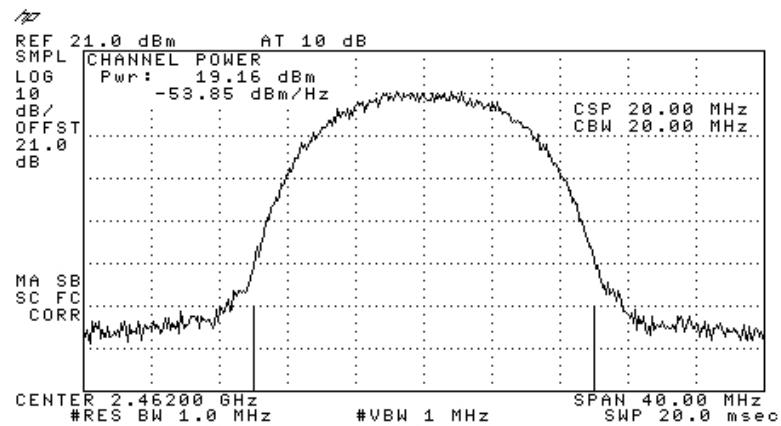
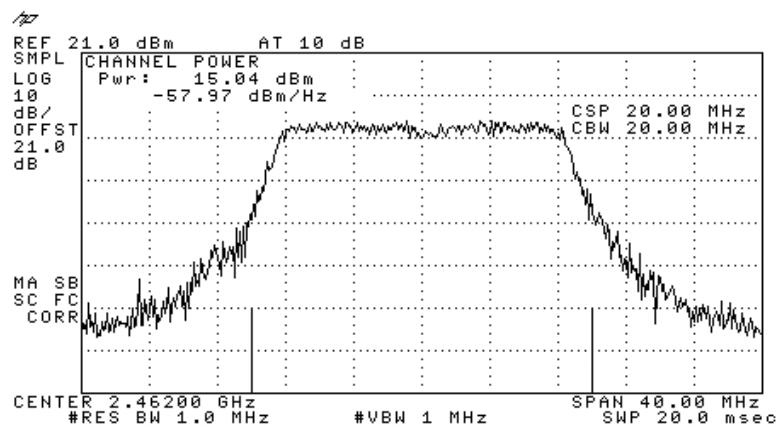


Figure 40 - Channel 11 , 1Mbps



**Figure 41 - Channel 11 , 11Mbps**



**Figure 42 - Channel 11 , 6Mbps**

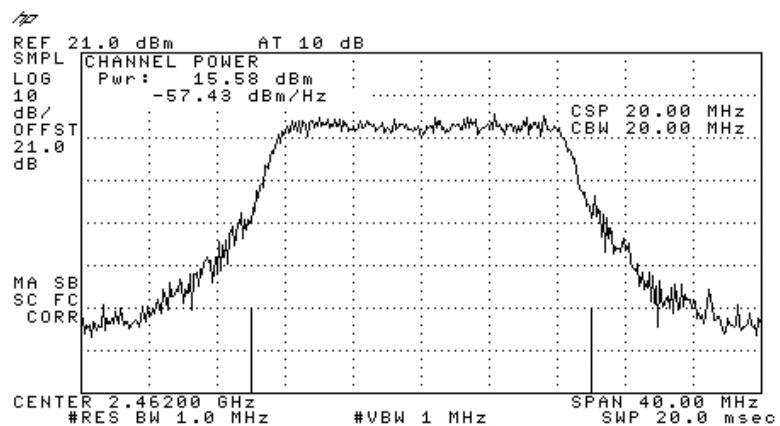


Figure 43 - Channel 11 , 54Mbps

## 6.2 Results table

E.U.T. Description: WiFi Module  
 Model No.: iW-SM2144N2BIO  
 Serial Number: Not Designated  
 Specification: F.C.C. Part 15, Subpart C Section 15.247(b)

Operation Frequency (MHz)	Modulation (Mbps)	Reading (dBm)	Specification (dBm)	Margin (dB)
2412	1	16.74	30.0	-13.26
	11	17.95	30.0	-12.05
	6	14.10	30.0	-15.90
	54	15.03	30.0	-14.97
2437	1	16.61	30.0	-13.39
	11	17.92	30.0	-12.08
	6	14.95	30.0	-15.05
	54	15.37	30.0	-14.63
2462	1	16.93	30.0	-13.07
	11	19.16	30.0	-10.84
	6	15.04	30.0	-14.96
	54	15.58	30.0	-14.42

**Figure 44 Maximum Peak Power Output**

JUDGEMENT: Passed by 10.84 dB

TEST PERSONNEL:

Tester Signature:  Date: 03.02.11

Typed/Printed Name: A. Sharabi

### 6.3 **Test Equipment Used.**

#### Peak Power Output

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

**Figure 45 Test Equipment Used**

## 7. Peak Power Output Out of 2400-2483.5 MHz Band

### 7.1 *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 dB). The spectrum analyzer was set to 1MHz 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 MHz where the RBW was set to 10kHz. The frequency range from 9 kHz to 25 GHz was scanned. Level of spectrum components out of the 2400-2483.5 MHz was measured at the selected operation frequencies.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: 1, 11, 6 and 54 Mbps.

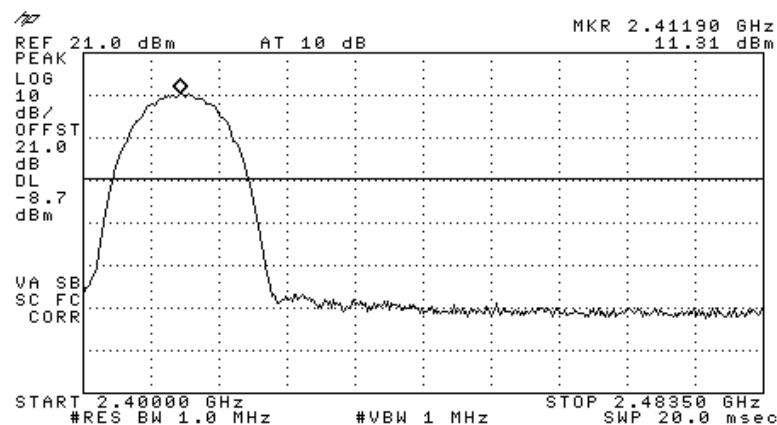
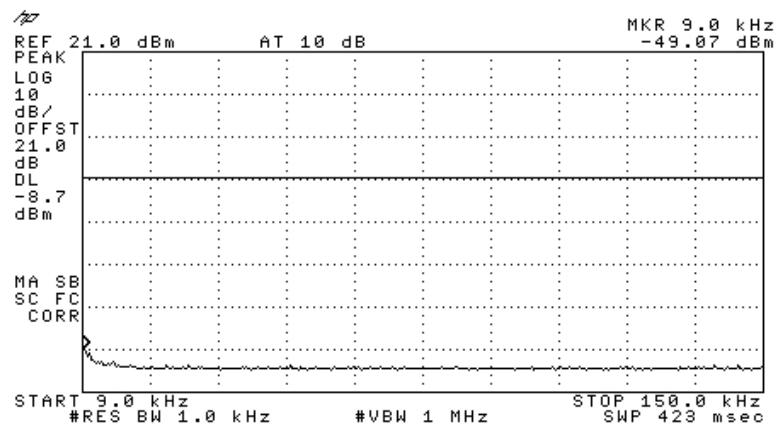
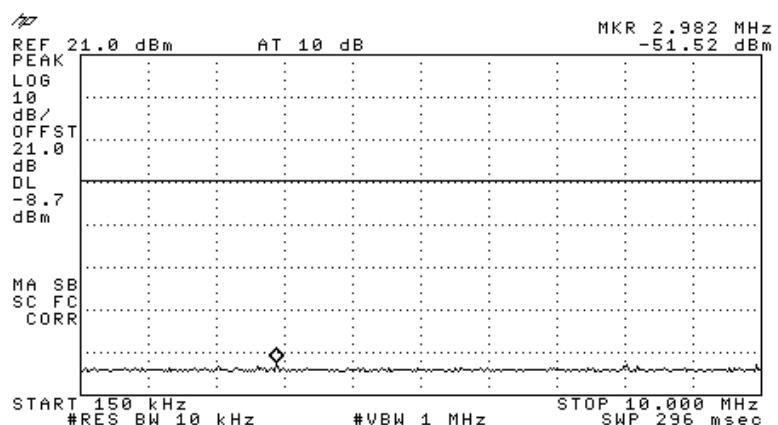


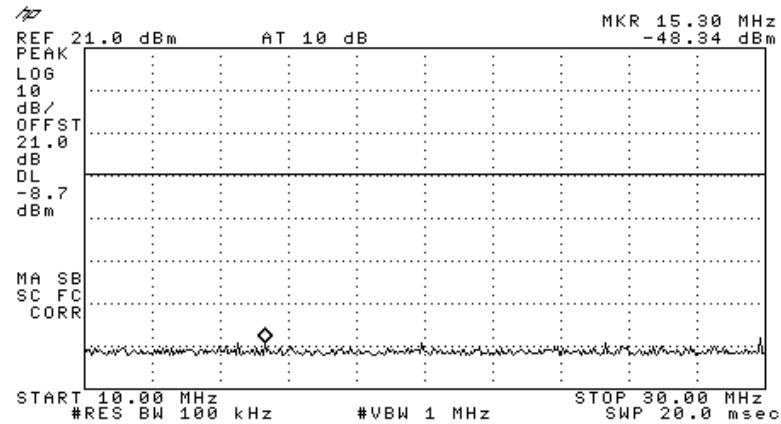
Figure 46 – Channel 1 , 1Mbps



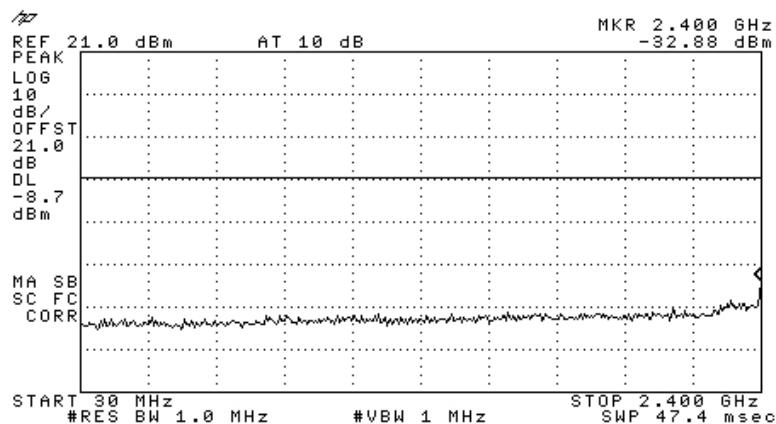
**Figure 47 – Channel 1 , 1Mbps**



**Figure 48 – Channel 1 , 1Mbps**



**Figure 49 – Channel 1 , 1Mbps**



**Figure 50 – Channel 1 , 1Mbps**

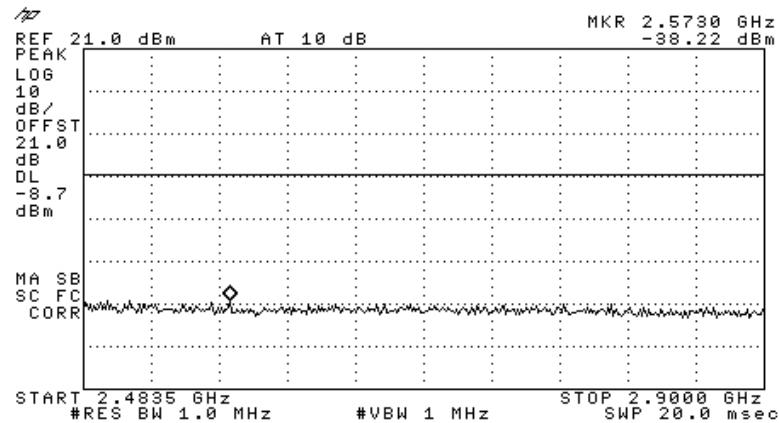


Figure 51 – Channel 1 , 1Mbps

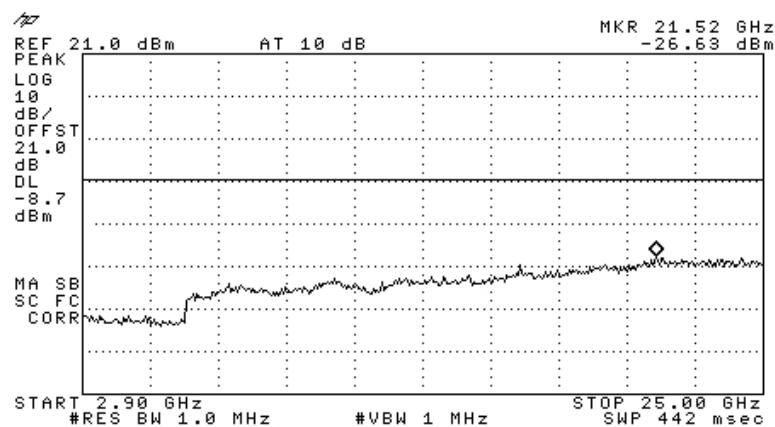


Figure 52- Channel 1 , 1Mbps

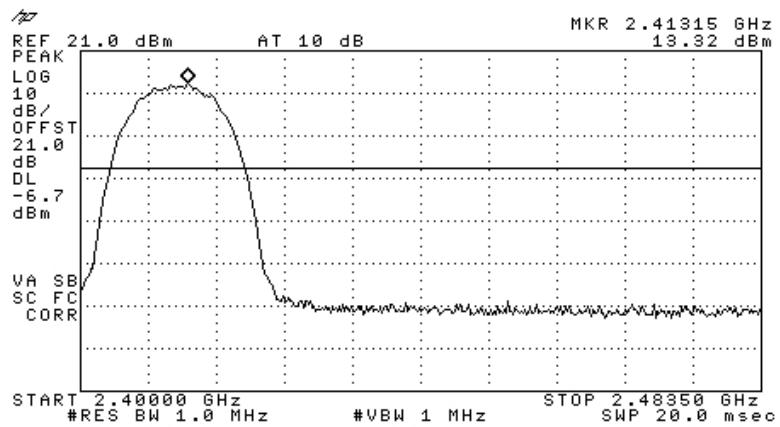


Figure 53- Channel 1 , 11Mbps

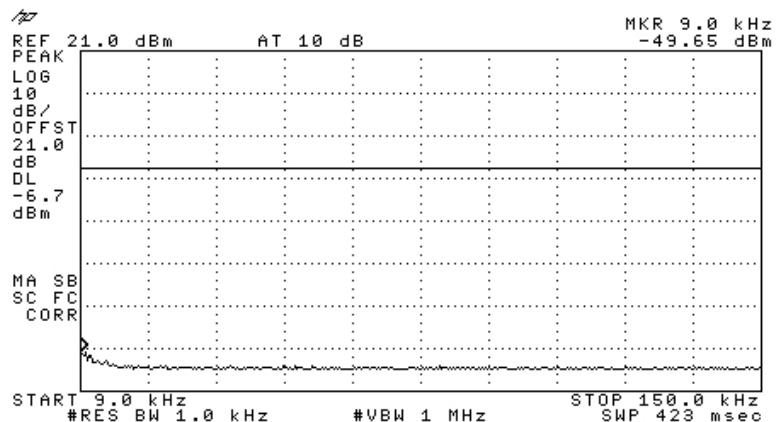


Figure 54- Channel 1 , 11Mbps

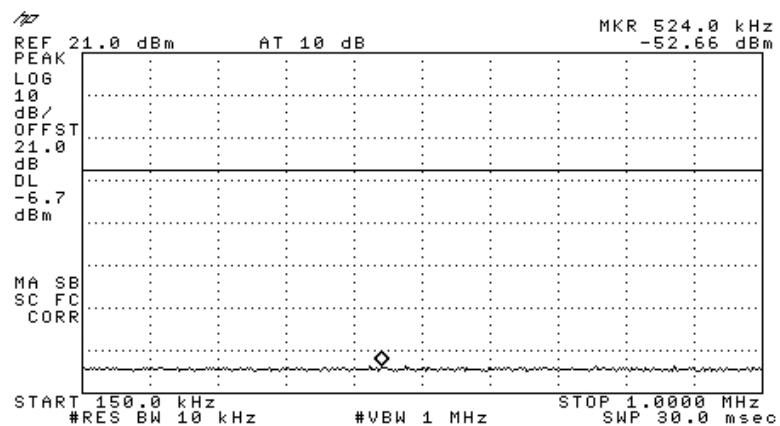


Figure 55- Channel 1 , 11Mbps

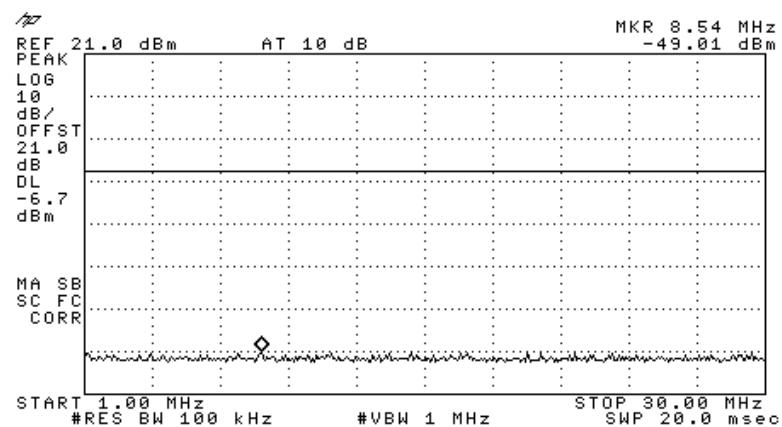


Figure 56- Channel 1 , 11Mbps

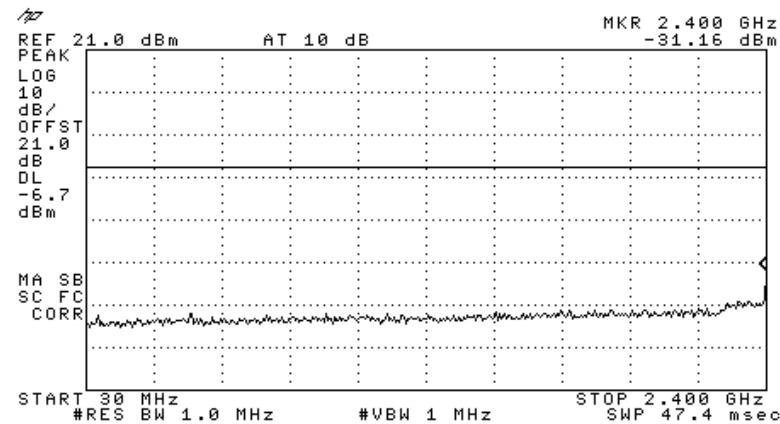


Figure 57- Channel 1 , 11Mbps

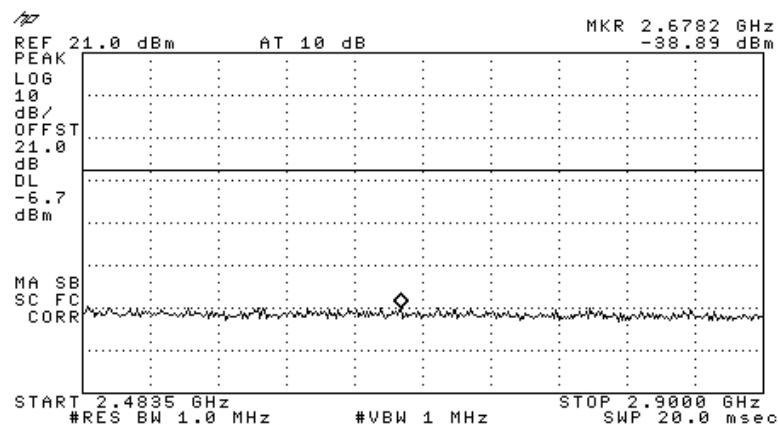
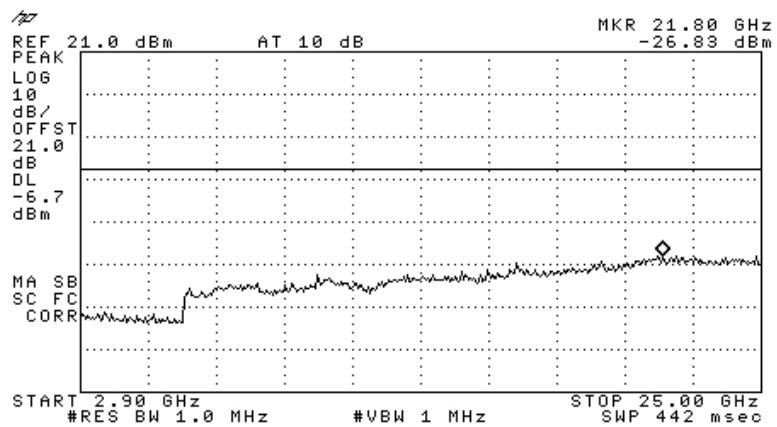
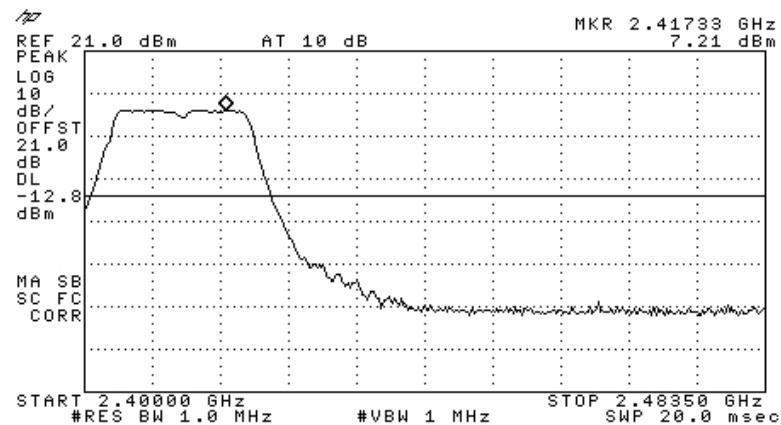


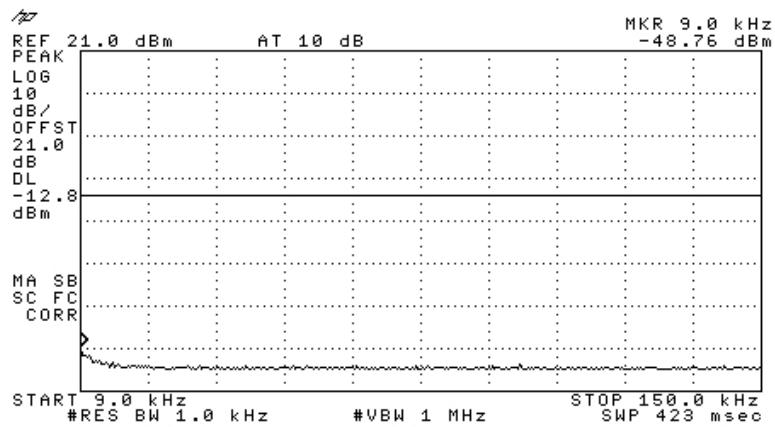
Figure 58- Channel 1 , 11Mbps



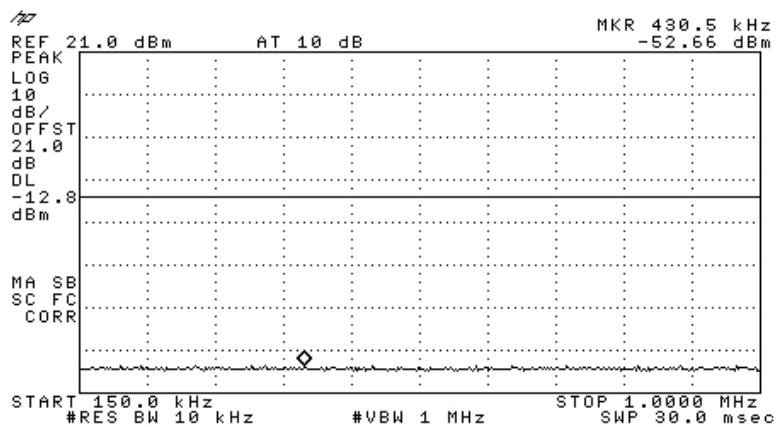
**Figure 59 - Channel 1 , 11Mbps**



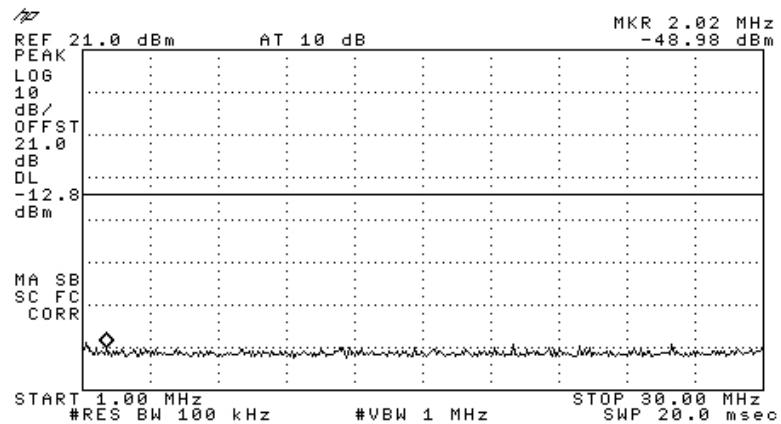
**Figure 60 - Channel 1 , 6Mbps**



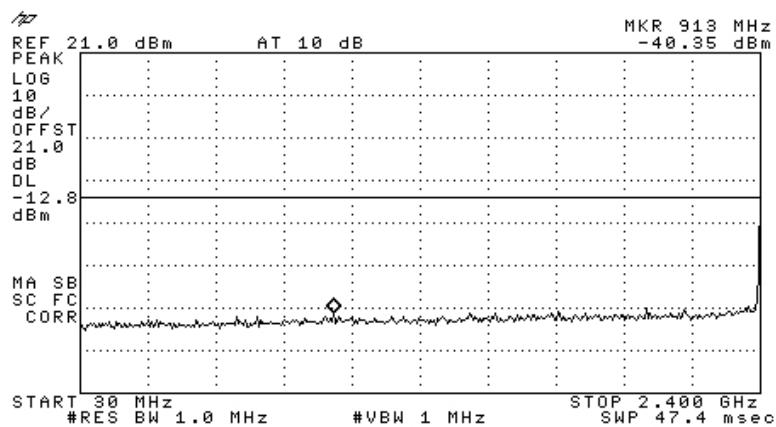
**Figure 61 - Channel 1 , 6Mbps**



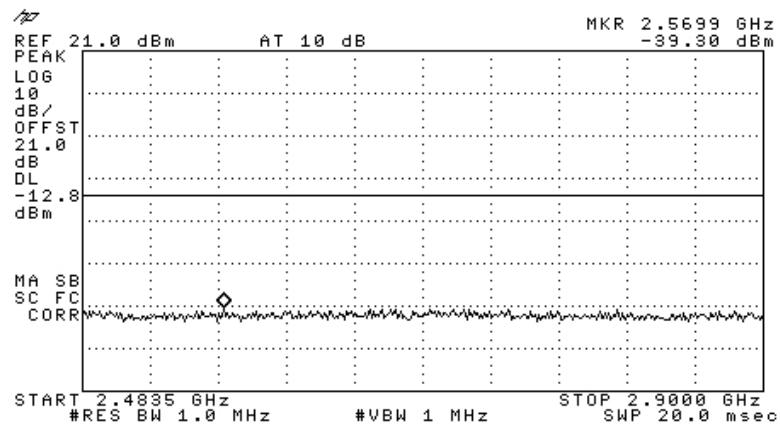
**Figure 62 - Channel 1 , 6Mbps**



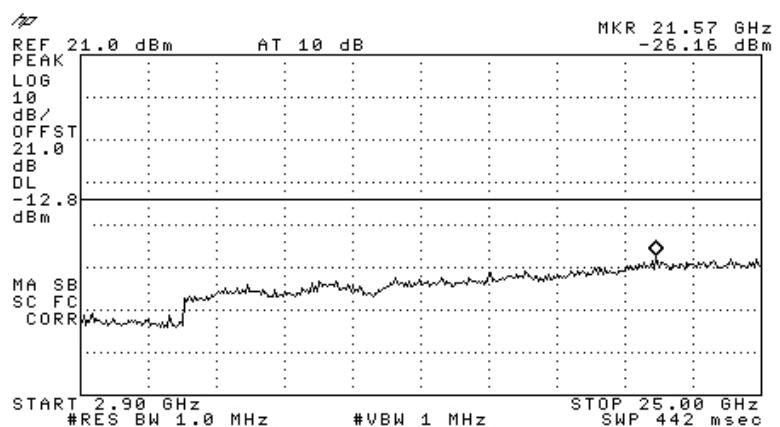
**Figure 63 - Channel 1 , 6Mbps**



**Figure 64 - Channel 1 , 6Mbps**



**Figure 65 - Channel 1 , 6Mbps**



**Figure 66 - Channel 1 , 6Mbps**

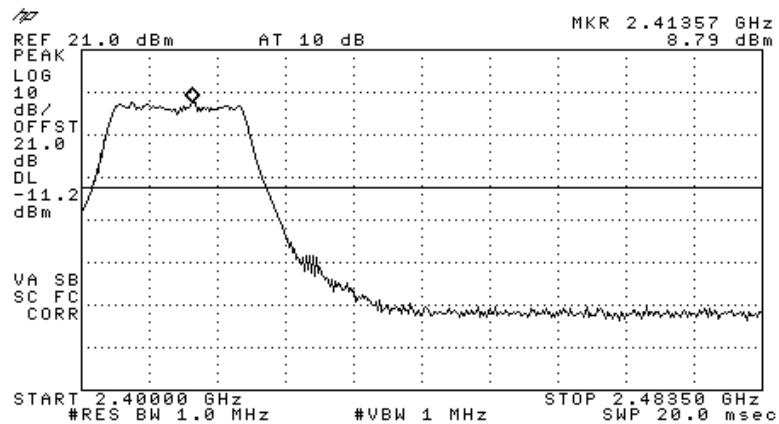


Figure 67 - Channel 1 , 54Mbps

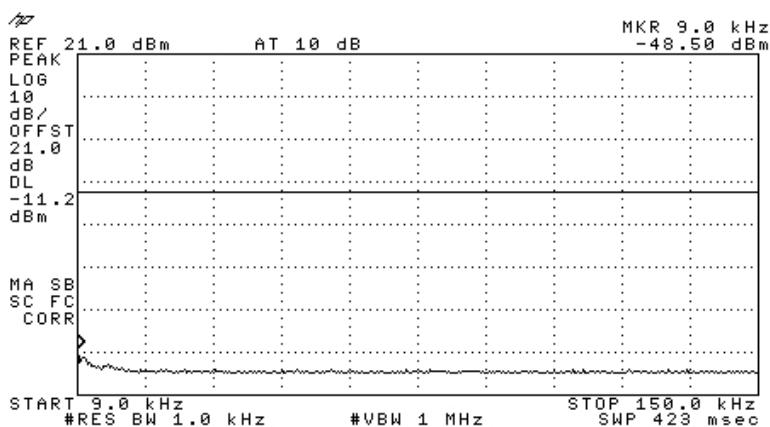
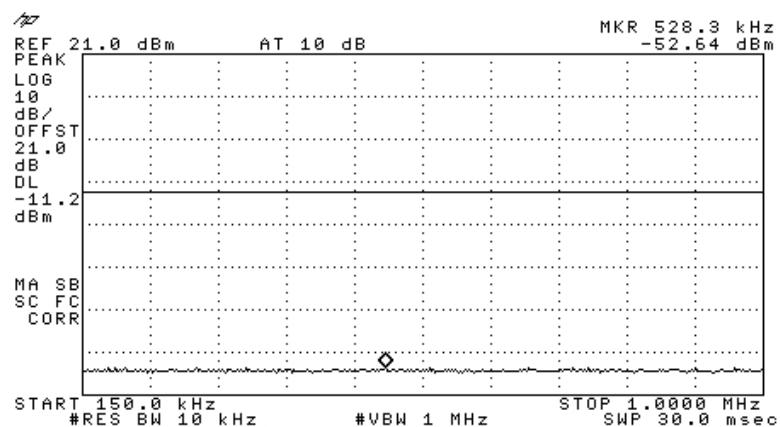
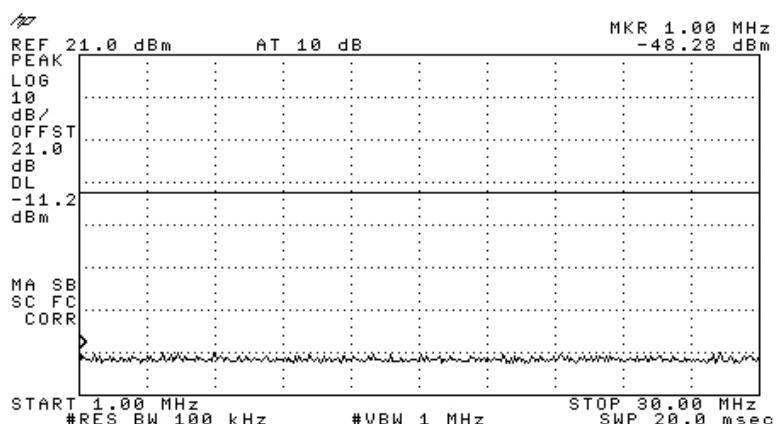


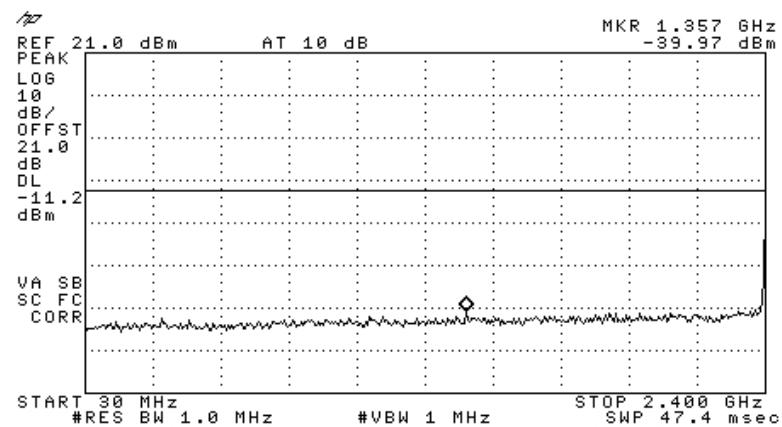
Figure 68 - Channel 1 , 54Mbps



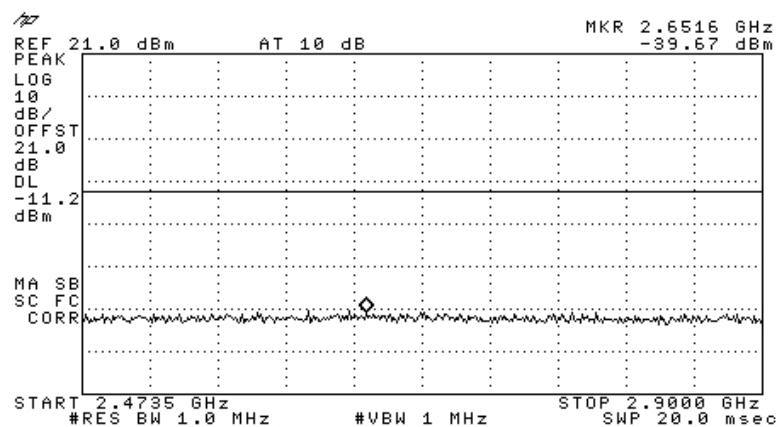
**Figure 69 - Channel 1 , 54Mbps**



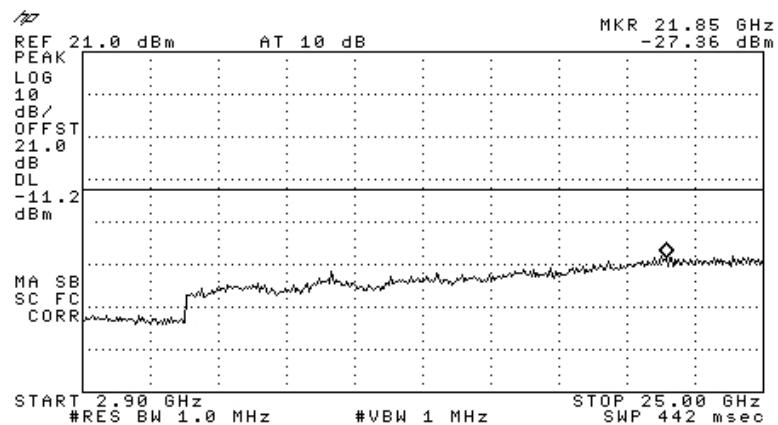
**Figure 70 - Channel 1 , 54Mbps**



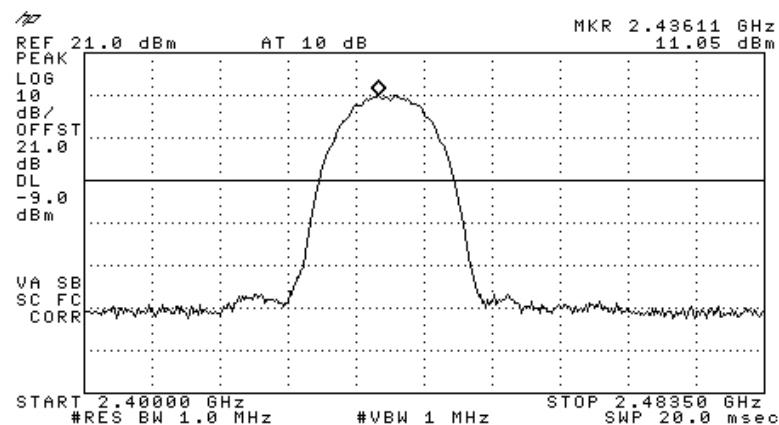
**Figure 71 - Channel 1 , 54Mbps**



**Figure 72 - Channel 1 , 54Mbps**



**Figure 73 - Channel 1 , 54Mbps**



**Figure 74 - Channel 6 , 1Mbps**

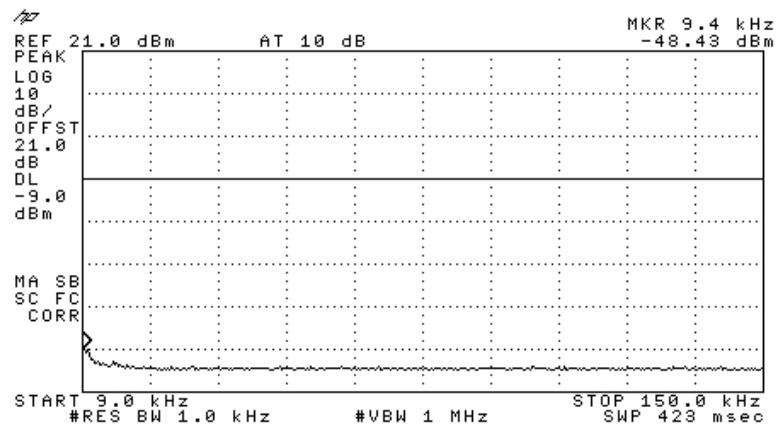


Figure 75 - Channel 6 , 1Mbps

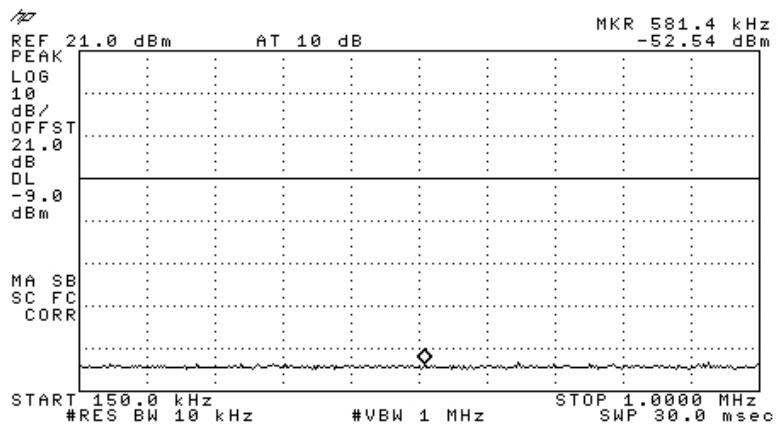
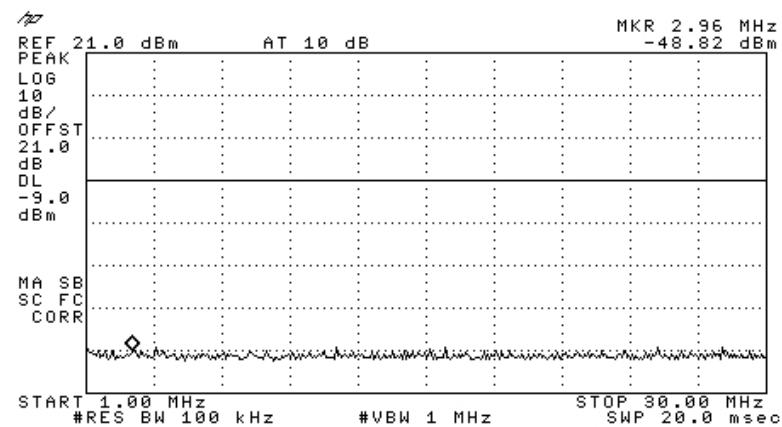
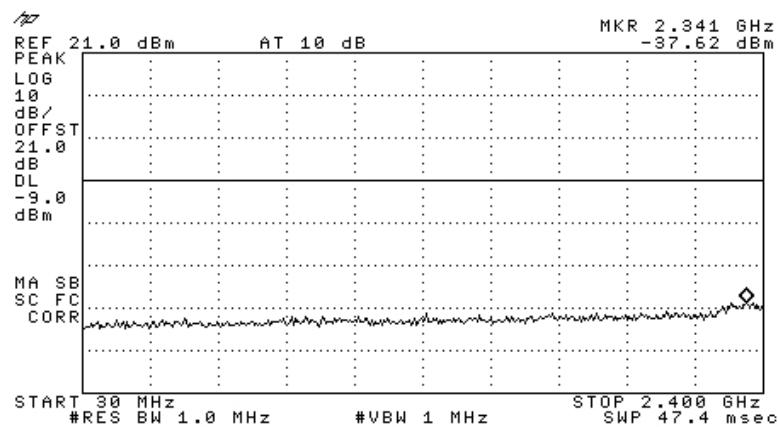


Figure 76 - Channel 6 , 1Mbps



**Figure 77 - Channel 6 , 1Mbps**



**Figure 78 - Channel 6 , 1Mbps**

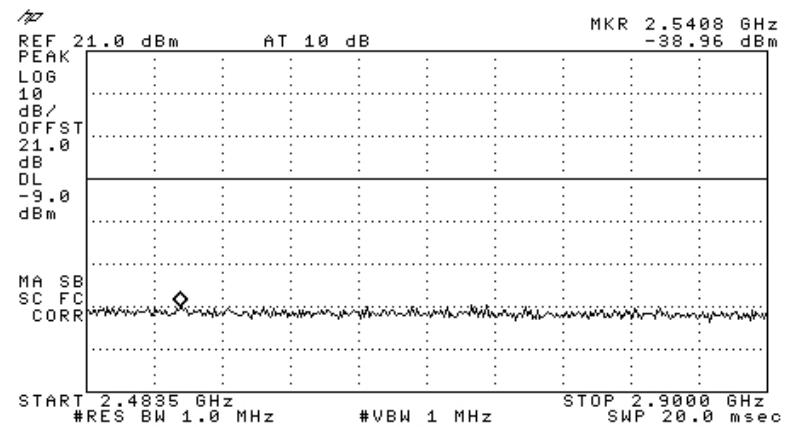


Figure 79 - Channel 6 , 1Mbps

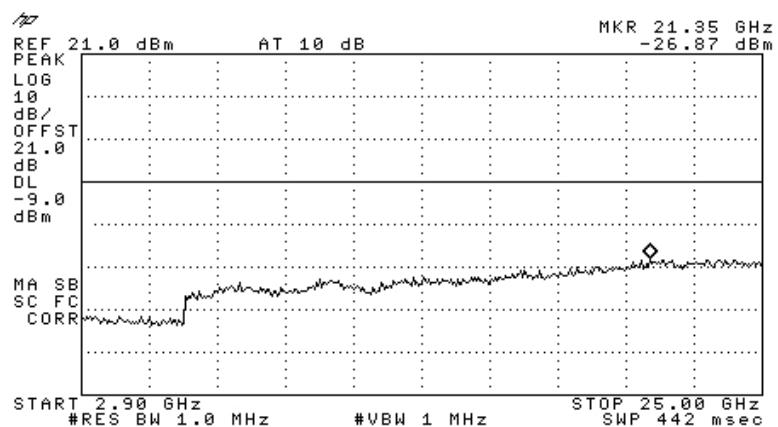
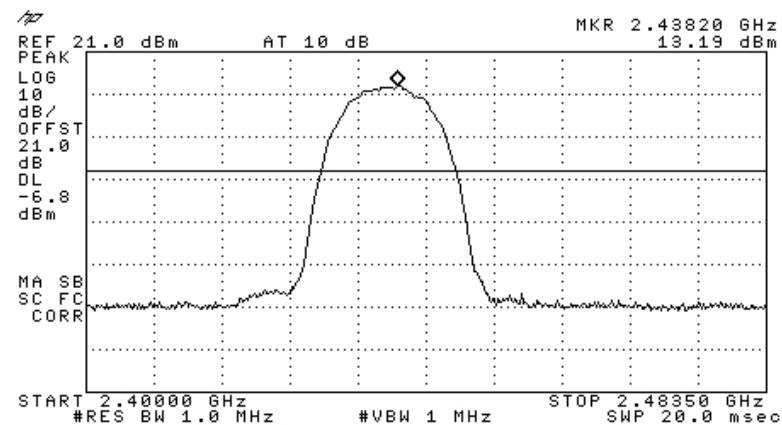
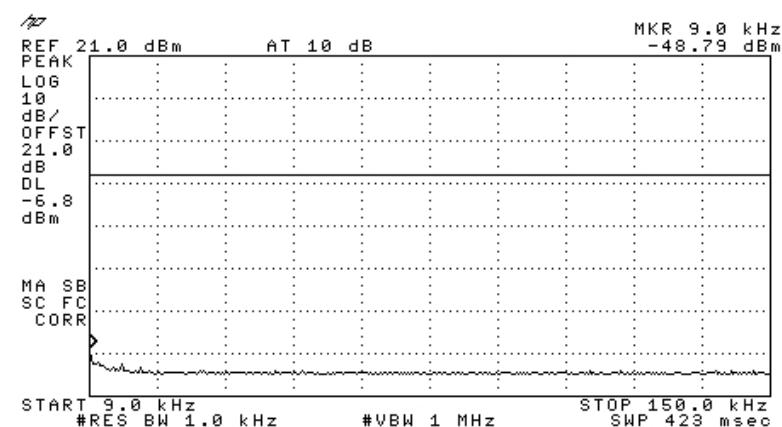


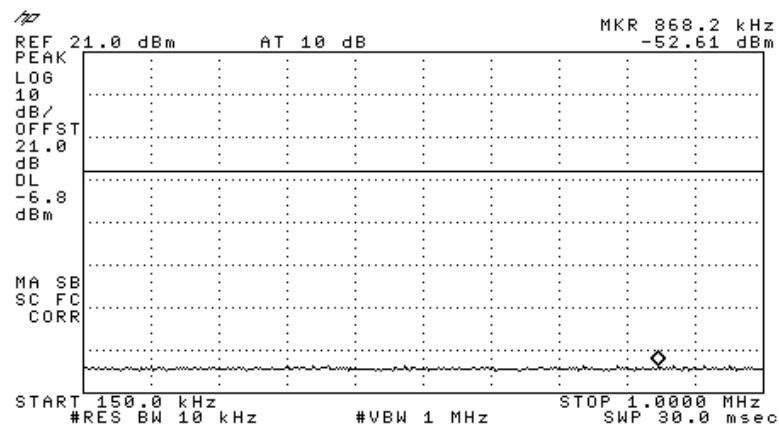
Figure 80 - Channel 6 , 1Mbps



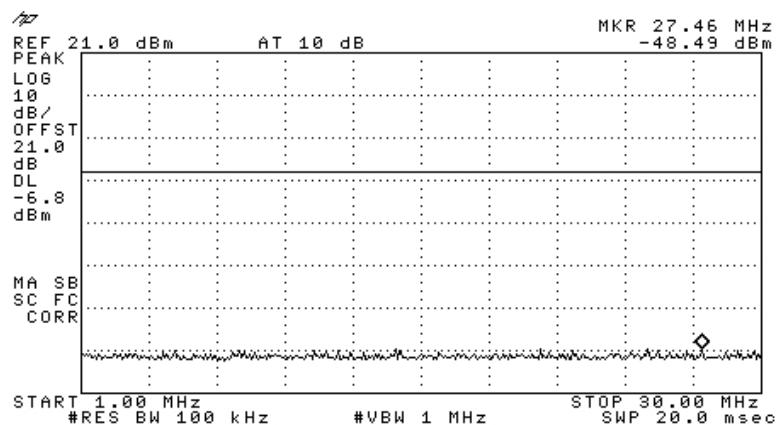
**Figure 81 - Channel 6 , 11Mbps**



**Figure 82 - Channel 6 , 11Mbps**



**Figure 83 - Channel 6 , 11Mbps**



**Figure 84 - Channel 6 , 11Mbps**

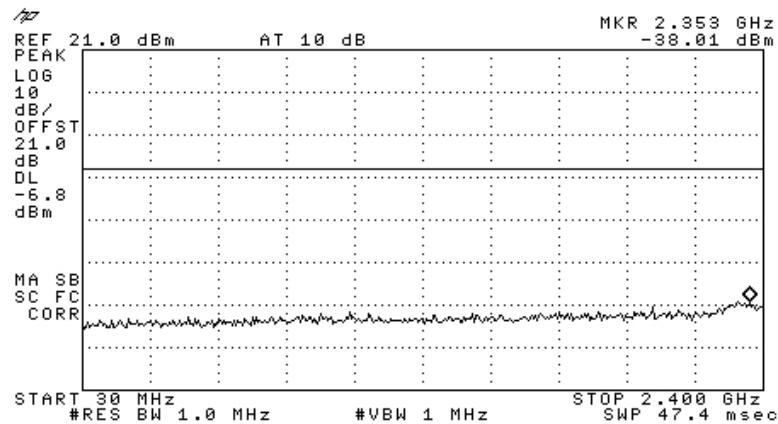


Figure 85 - Channel 6 , 11Mbps

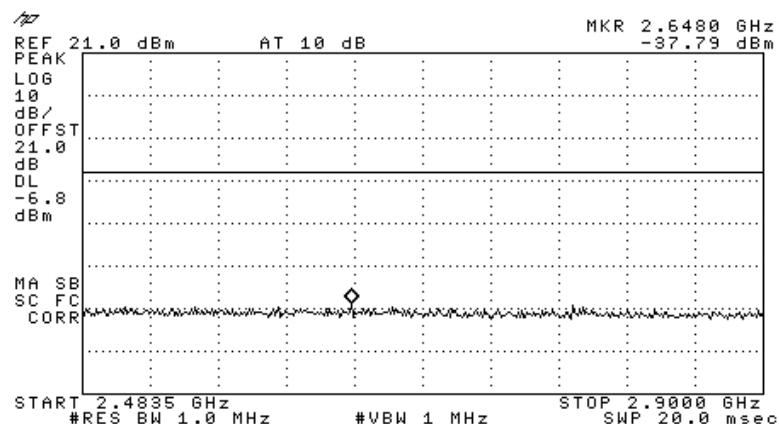
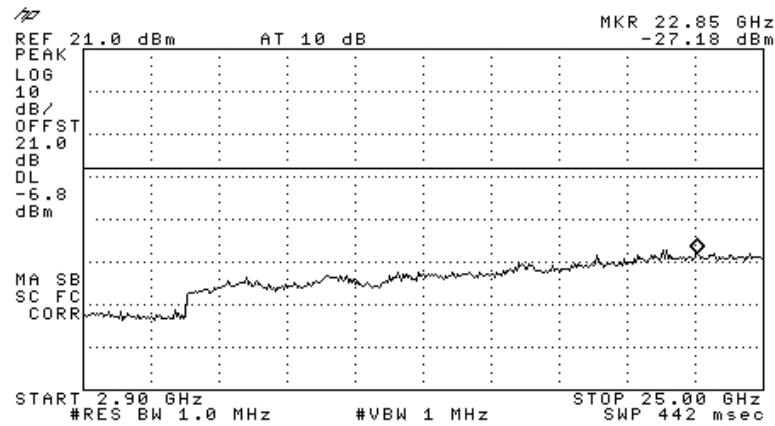
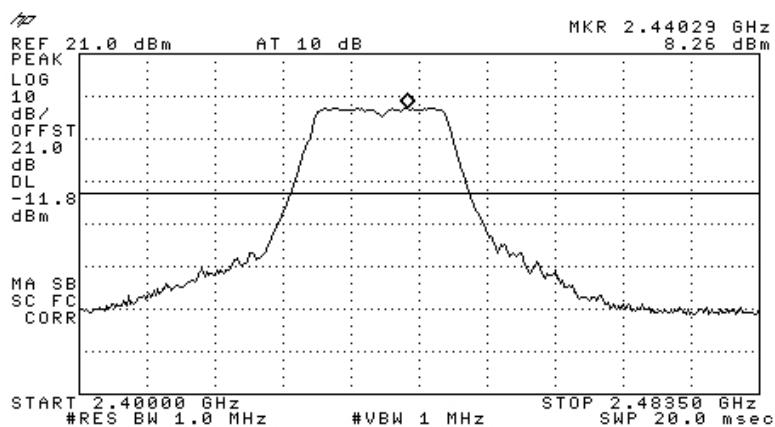


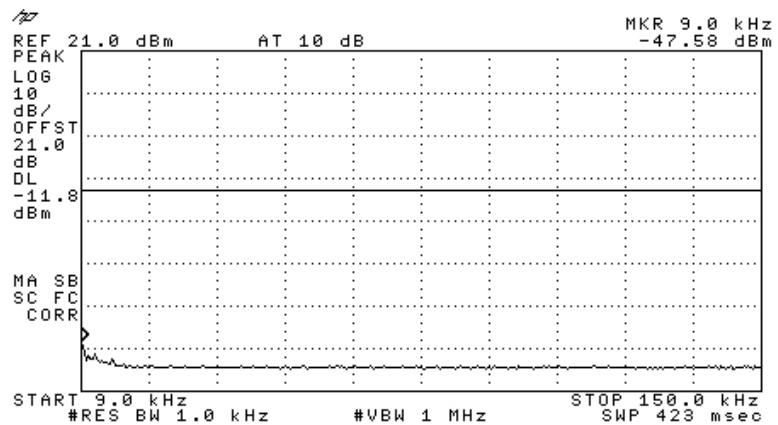
Figure 86 - Channel 6 , 11Mbps



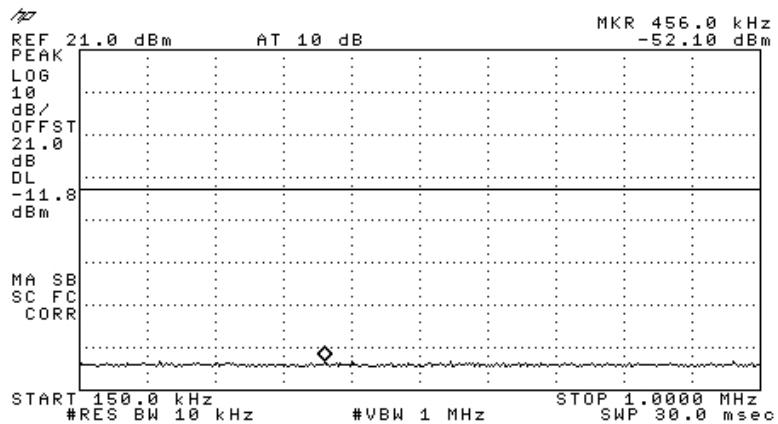
**Figure 87 - Channel 6 ,11Mbps**



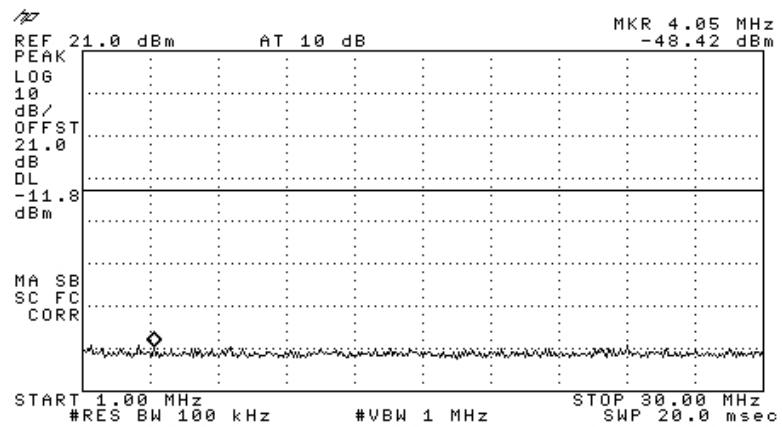
**Figure 88 - Channel 6 ,6Mbps**



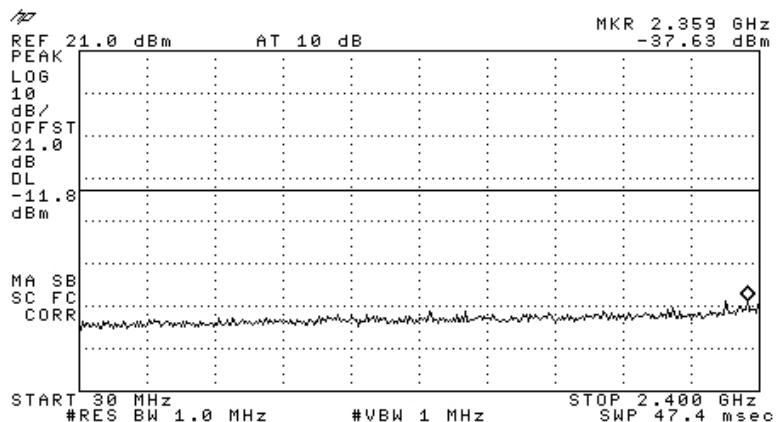
**Figure 89 - Channel 6 ,6Mbps**



**Figure 90 - Channel 6 ,6Mbps**



**Figure 91 - Channel 6 ,6Mbps**



**Figure 92 - Channel 6 ,6Mbps**

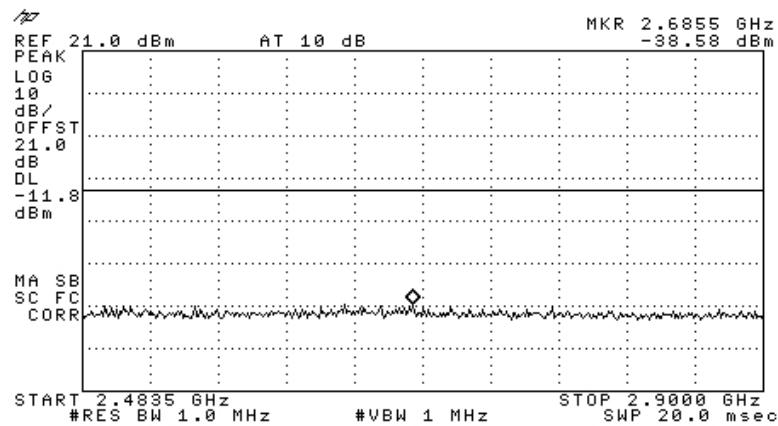


Figure 93 - Channel 6 ,6Mbps

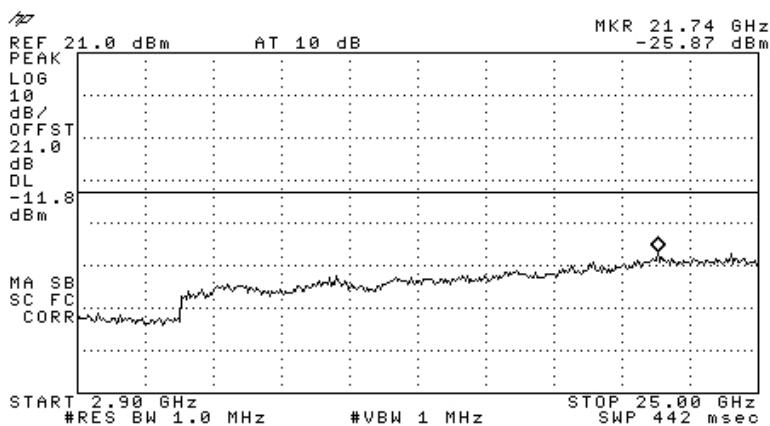


Figure 94 - Channel 6 ,6Mbps

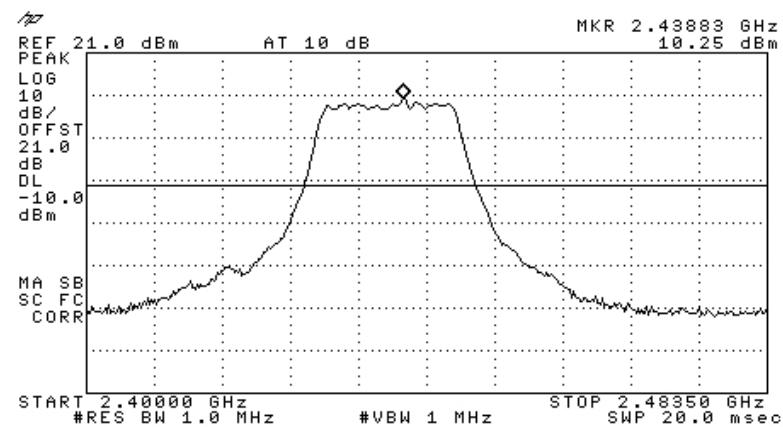


Figure 95 - Channel 6 ,54Mbps

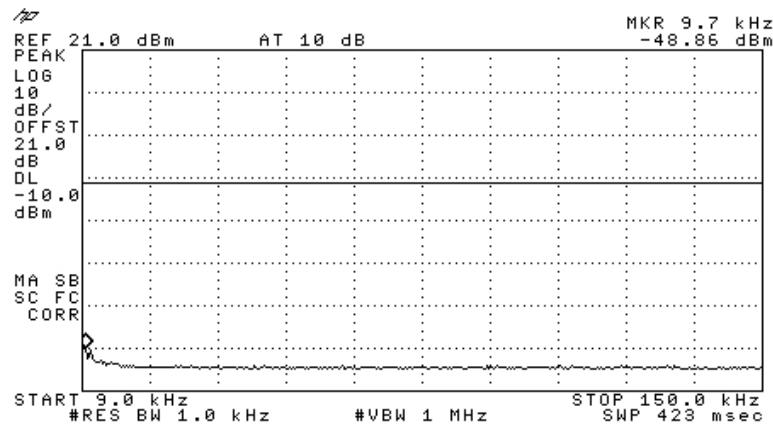


Figure 96 - Channel 6 ,54Mbps

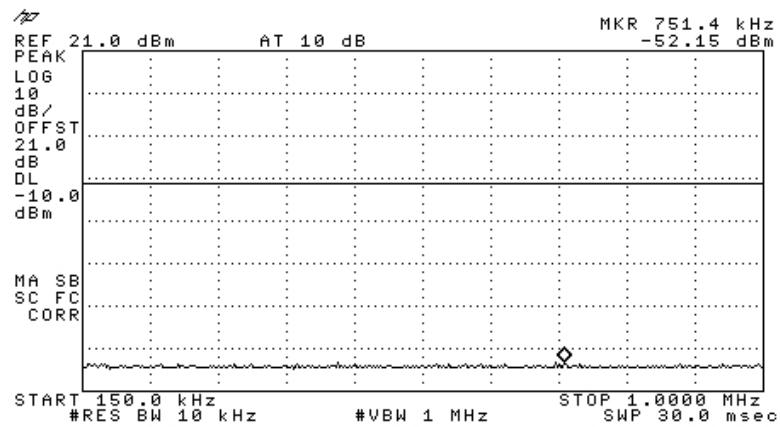


Figure 97 - Channel 6 ,54Mbps

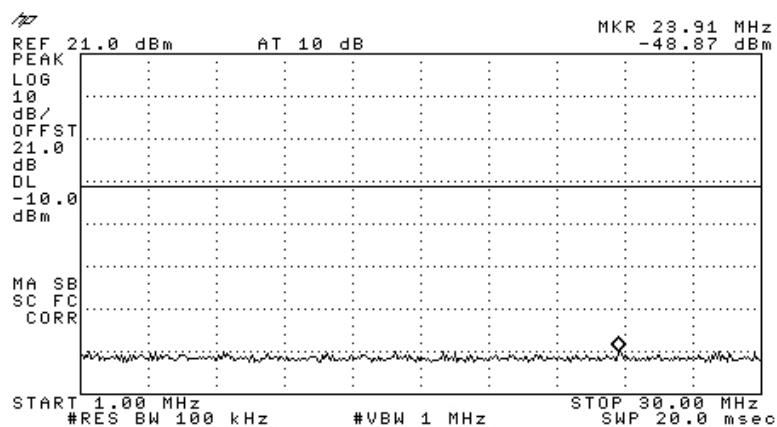


Figure 98 - Channel 6 ,54Mbps

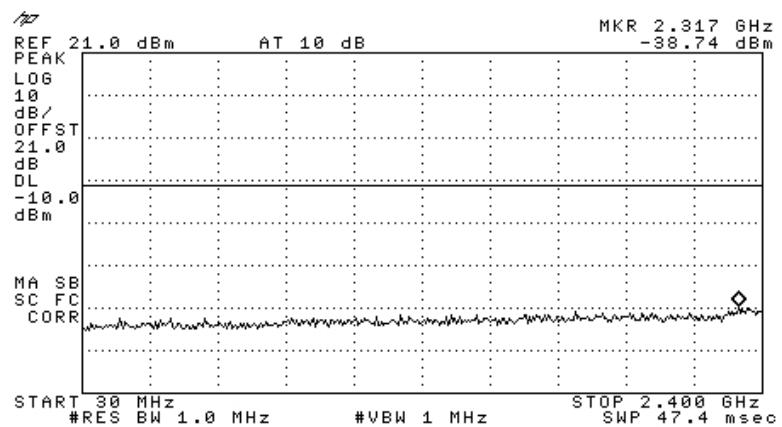


Figure 99 - Channel 6 ,54Mbps

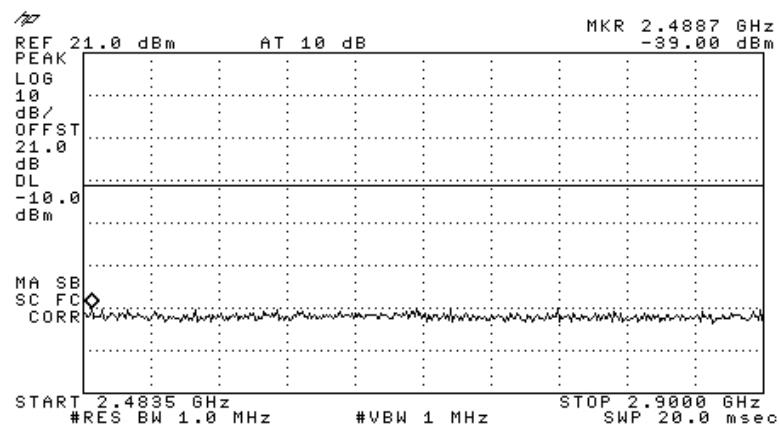
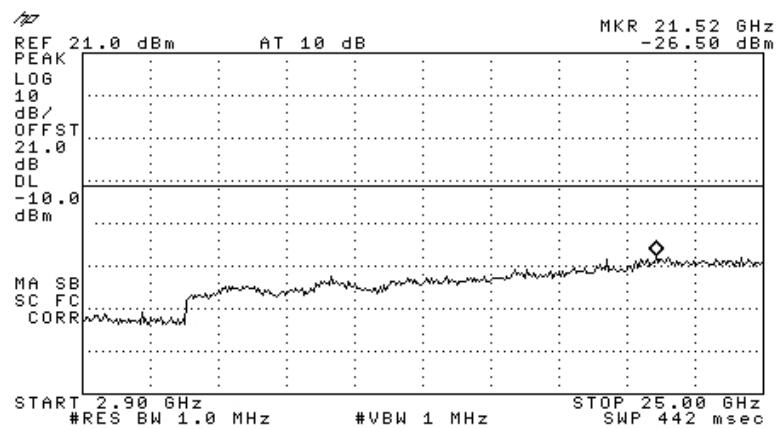
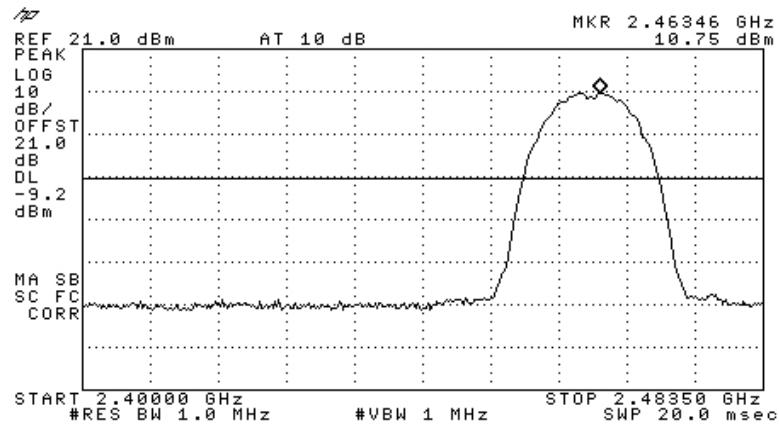


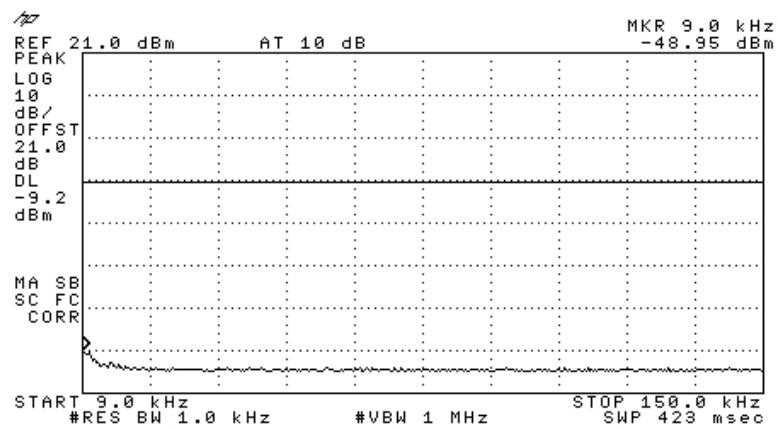
Figure 100 - Channel 6 ,54Mbps



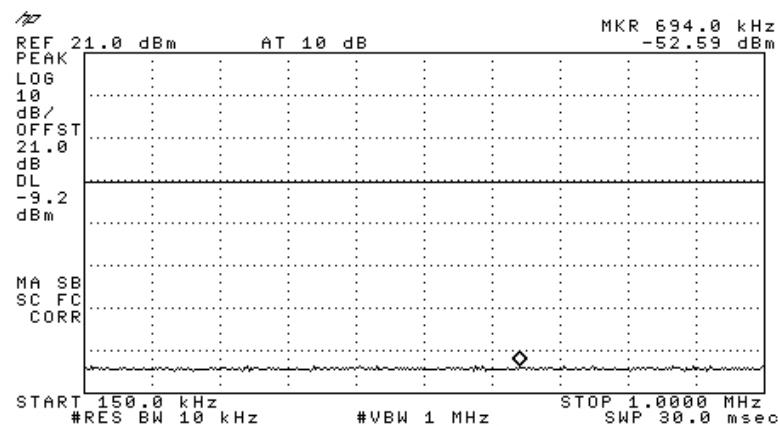
**Figure 101 - Channel 6 ,54Mbps**



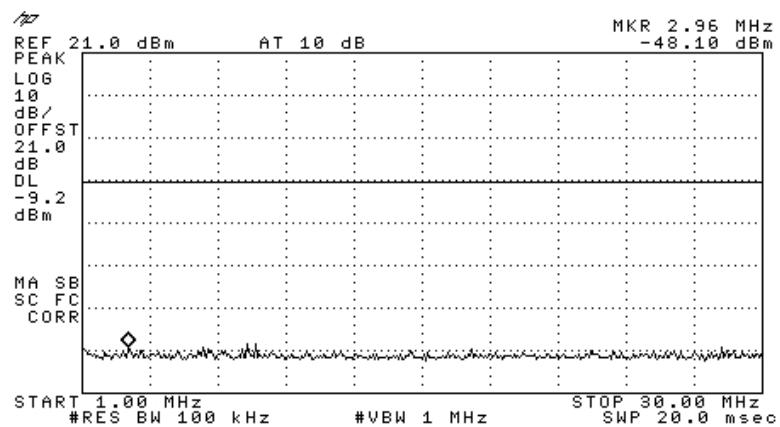
**Figure 102 - Channel 11 , 1Mbps**



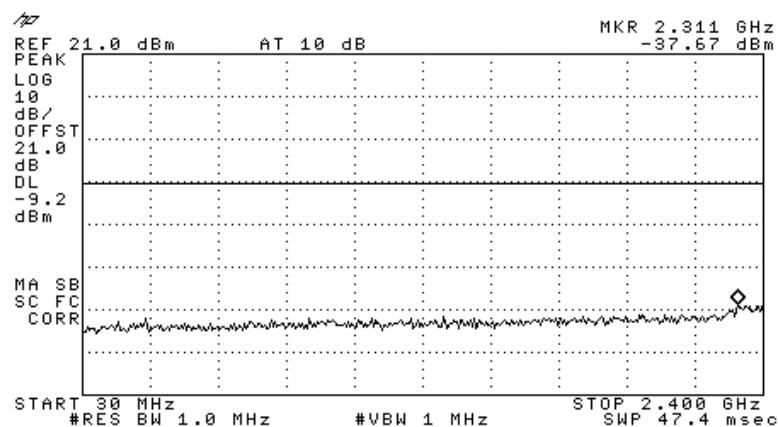
**Figure 103 - Channel 11 , 1Mbps**



**Figure 104 - Channel 11 , 1Mbps**



**Figure 105 - Channel 11 , 1Mbps**



**Figure 106 - Channel 11 , 1Mbps**

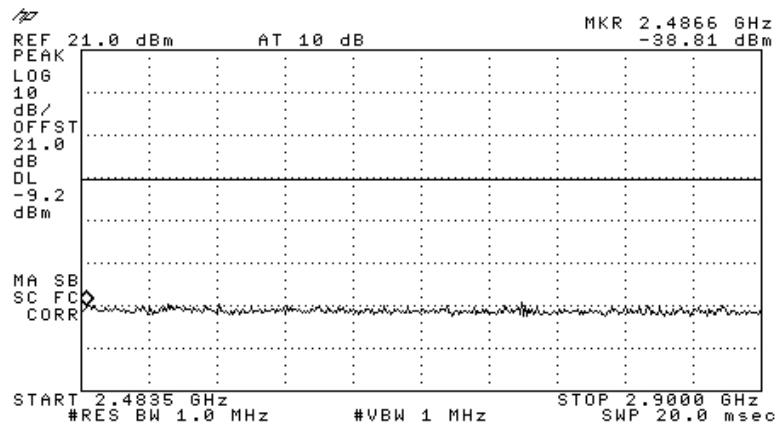


Figure 107 - Channel 11 , 1Mbps

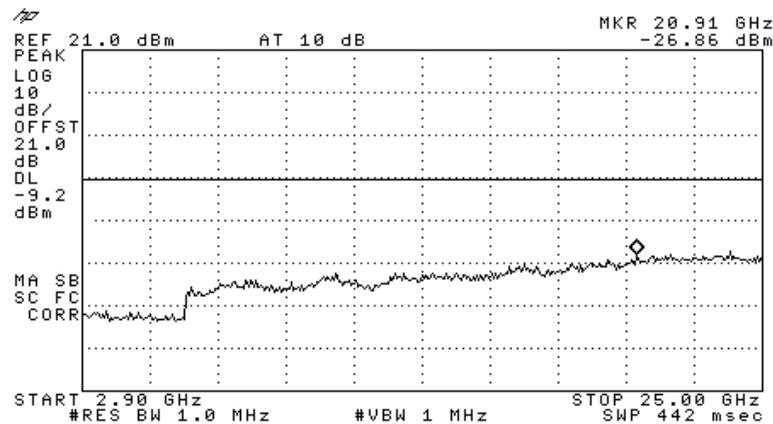
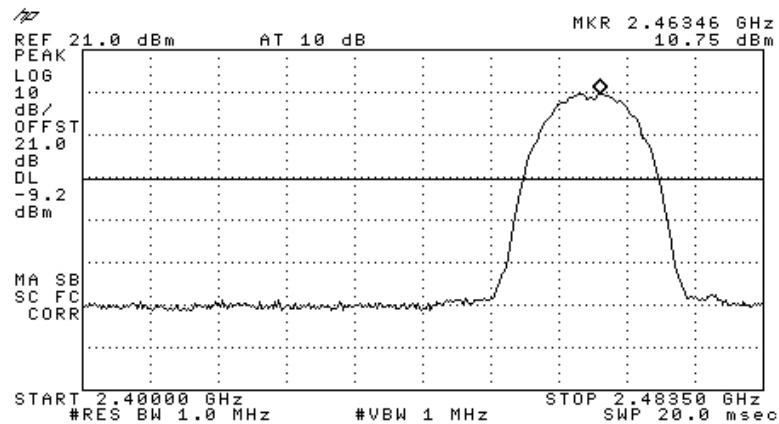
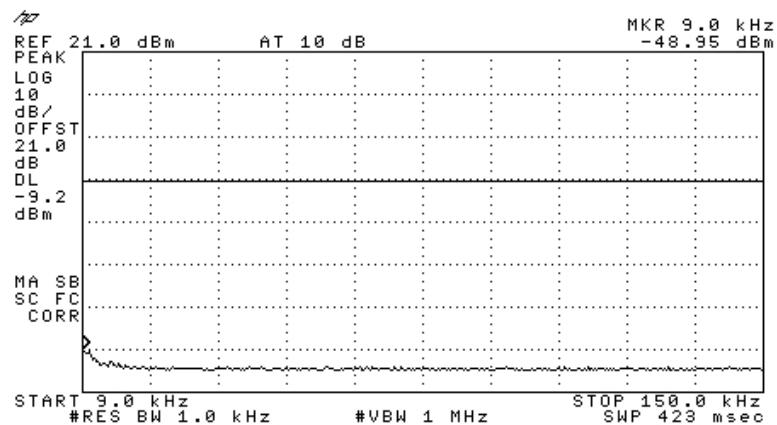


Figure 108 - Channel 11 , 1Mbps



**Figure 109 - Channel 11 , 11Mbps**



**Figure 110 - Channel 11 , 11Mbps**

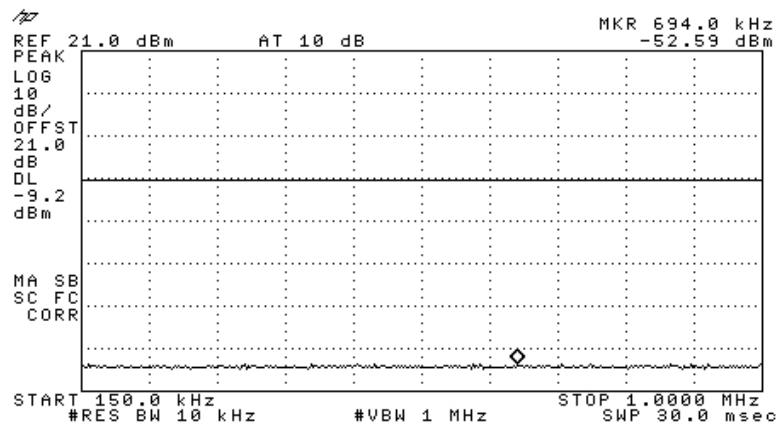


Figure 111 - Channel 11 , 11Mbps

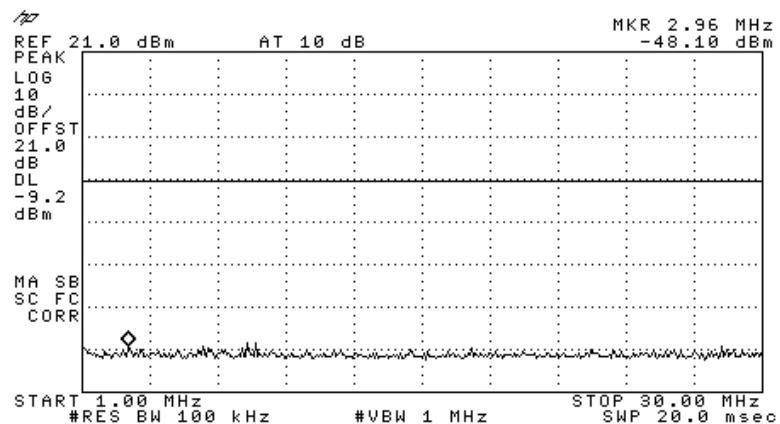
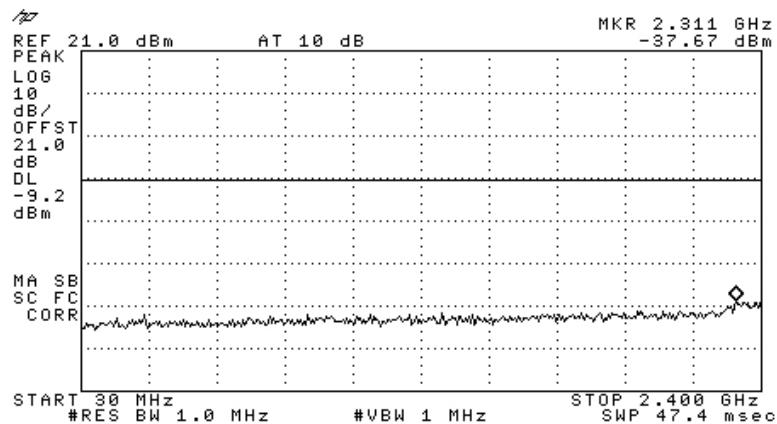
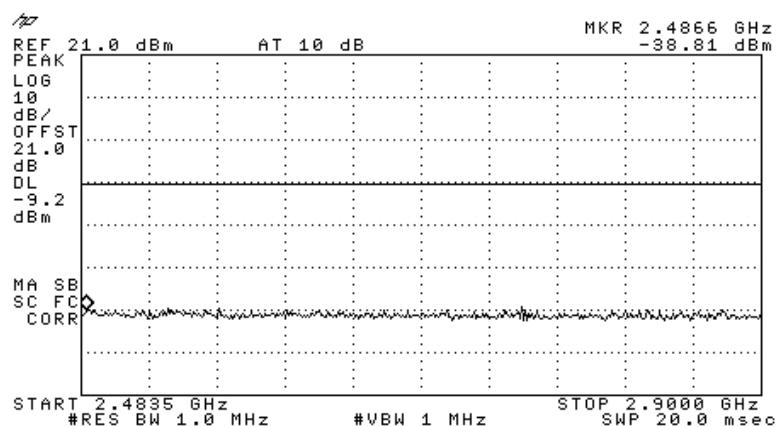


Figure 112 - Channel 11 , 11Mbps



**Figure 113 - Channel 11 , 11Mbps**



**Figure 114 - Channel 11 , 11Mbps**

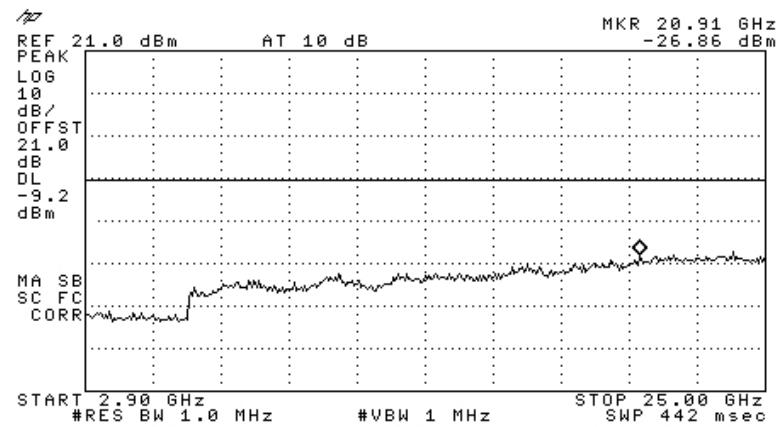


Figure 115 - Channel 11 , 11Mbps

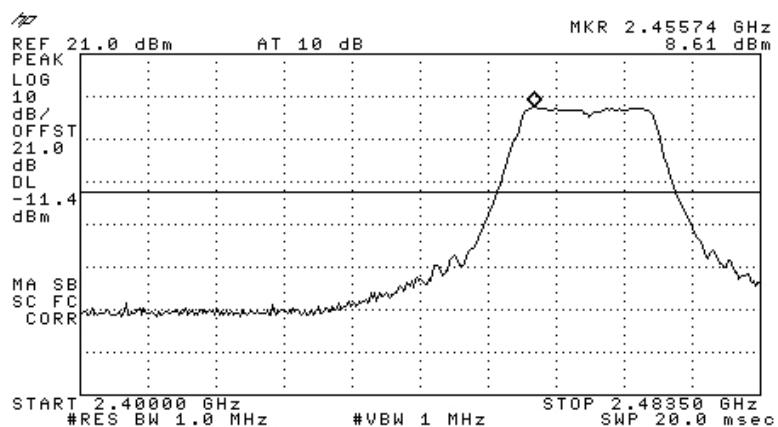


Figure 116 - Channel 11 , 6Mbps

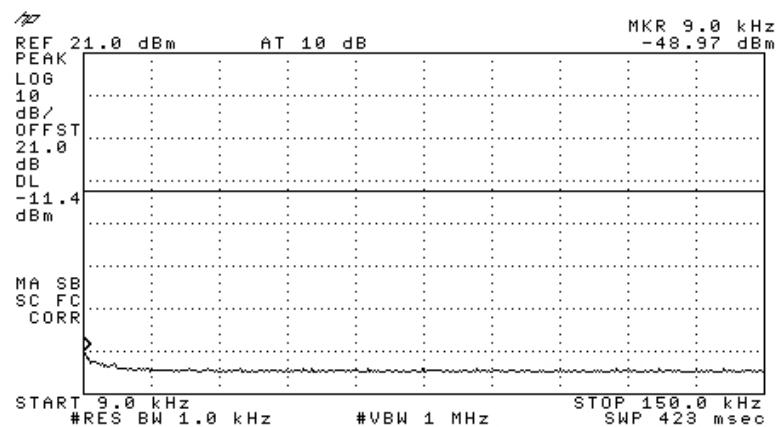


Figure 117 - Channel 11 , 6Mbps

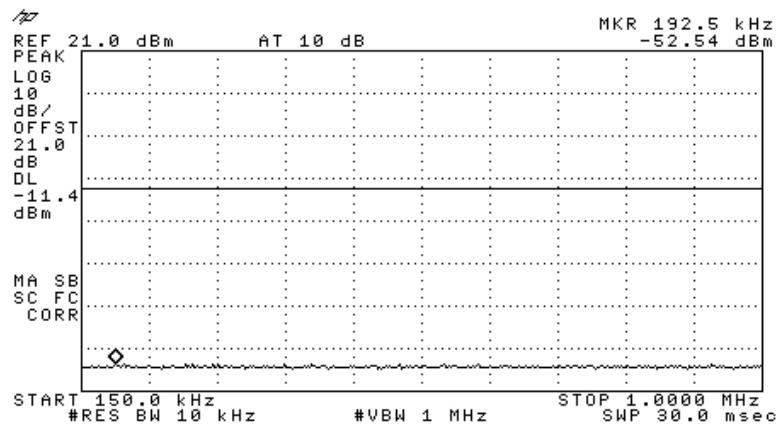
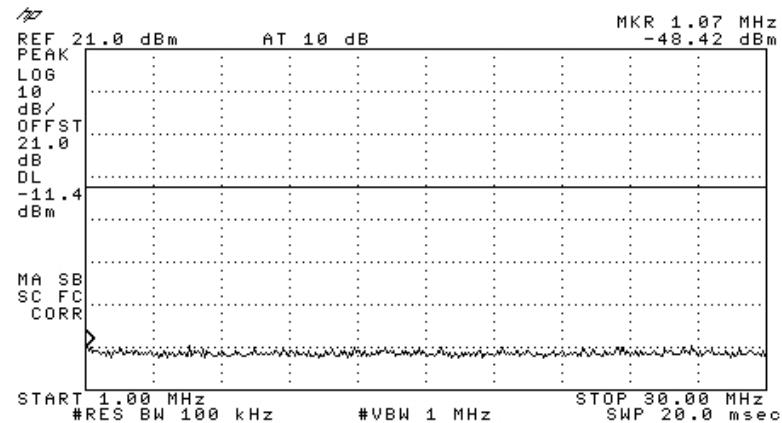


Figure 118 - Channel 11 , 6Mbps



**Figure 119 - Channel 11 , 6Mbps**

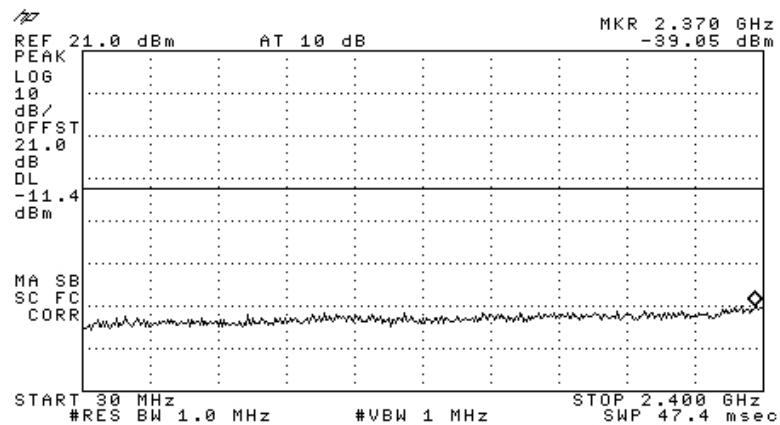


Figure 120 - Channel 11 , 6Mbps

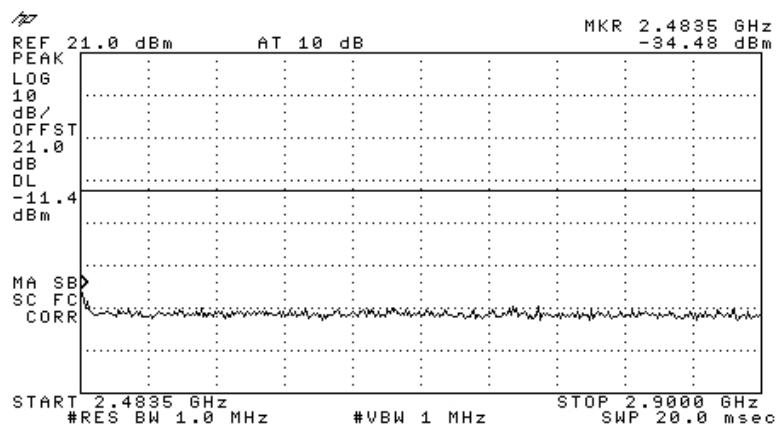
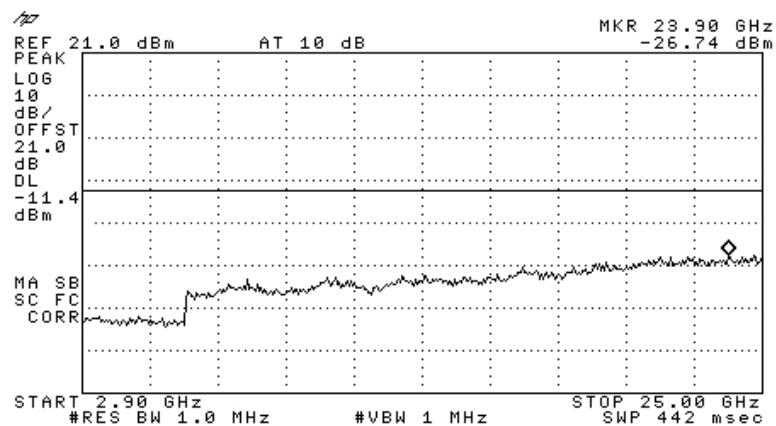
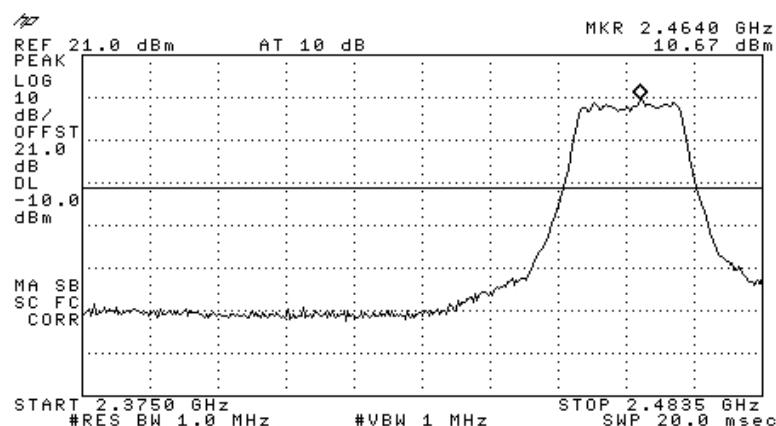


Figure 121 - Channel 11 , 6Mbps



**Figure 122 - Channel 11 , 6Mbps**



**Figure 123 — Channel 11, 54Mbps**

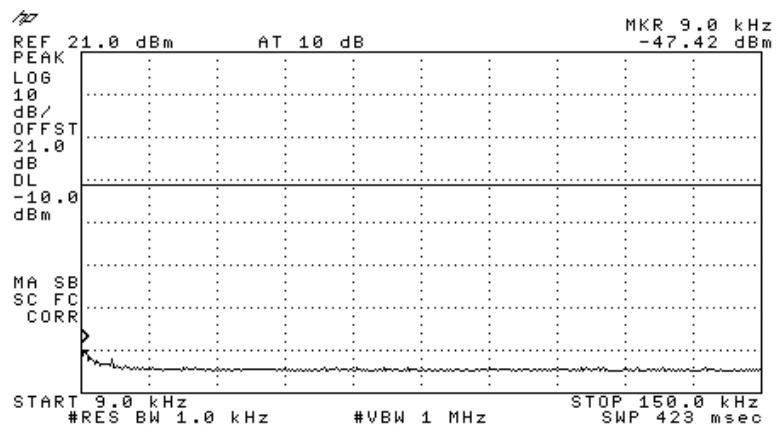


Figure 124 — Channel 11, 54Mbps

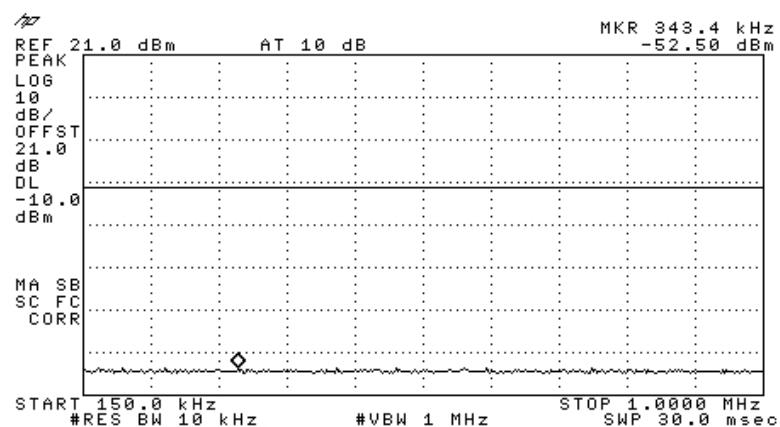


Figure 125 — Channel 11, 54Mbps

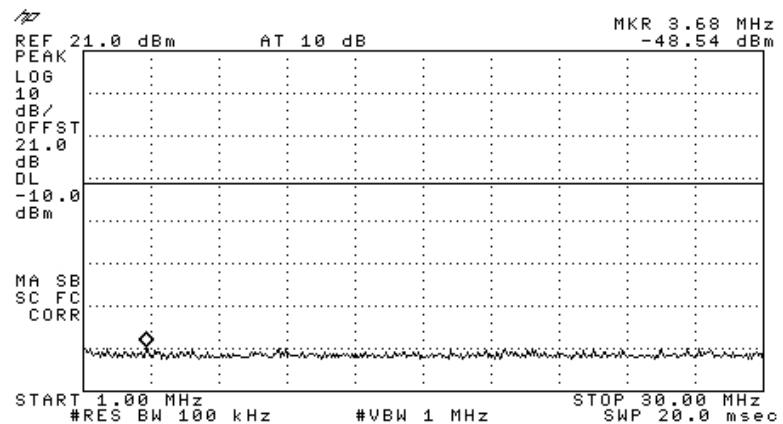


Figure 126 — Channel 11, 54Mbps

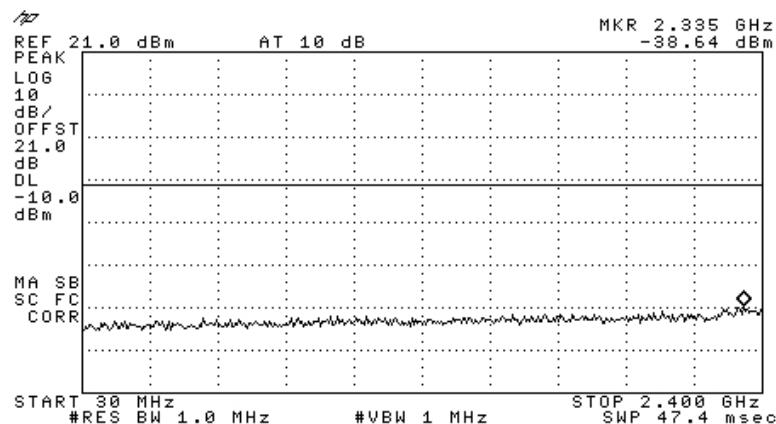
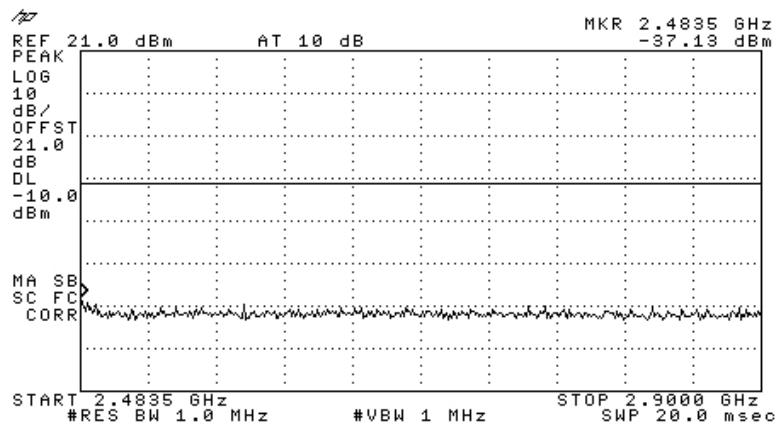
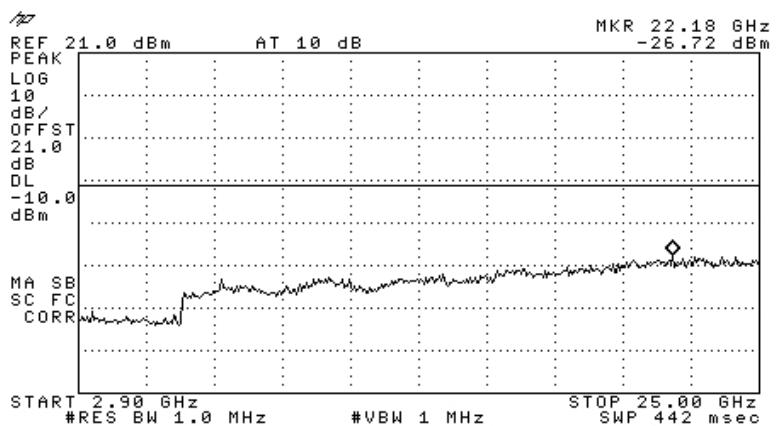


Figure 127 — Channel 11, 54Mbps



**Figure 128 — Channel 11, 54Mbps**



**Figure 129 — Channel 11, 54Mbps**

## 7.2 Results table

E.U.T Description: WiFi Module

Model No.: iW-SM2144N2BIO

Serial Number: Not Designated

Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation (Mbps)	Reading (dBm)	Specification (dBm)	Margin (dB)
2412	1	-26.63	-8.7	-17.93
	11	-26.83	-6.7	-20.13
	6	-26.16	-12.8	-13.36
	54	-27.36	-11.2	-16.16
2437	1	-26.87	-9.0	-17.87
	11	-27.18	-6.8	-20.38
	6	-25.87	-11.8	-14.07
	54	-26.50	-10.0	-16.50
2462	1	-26.86	-9.2	-17.86
	11	-26.86	-9.2	-17.86
	6	-26.74	-11.4	-15.34
	54	-26.72	-10.0	-16.72

Figure 130 Peak Power Output of 2400-2483.5 MHz Band

JUDGEMENT: Passed by 20.38 dB

TEST PERSONNEL:

Tester Signature: 

Date: 03.02.11

Typed/Printed Name: A. Sharabi

### 7.3 **Test Equipment Used.**

Peak Power Output of 2400-2438.5 MHz Band

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

**Figure 131 Test Equipment Used**

## 8. Band Edge Spectrum

[In Accordance with section 15.247(c)]

### 8.1 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 dB). The spectrum analyzer was set to 100 kHz resolution BW. Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2400 MHz, and 2483.5 MHz correspondingly. The E.U.T. was tested at 2412 and 2462 MHz with the following modulations: 1, 11, 6 and 54 Mbps.

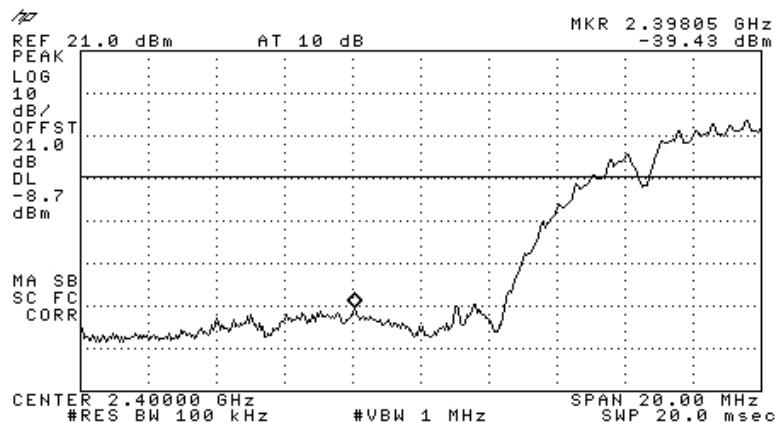


Figure 132 — Channel 1, 1Mbps

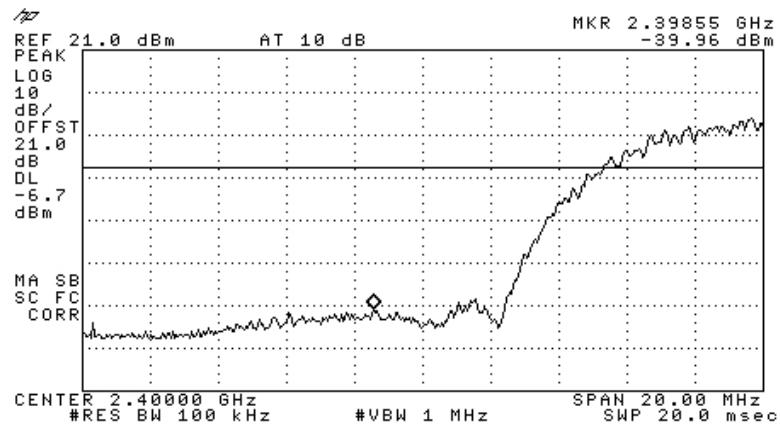


Figure 133 — Channel 1, 11Mbps

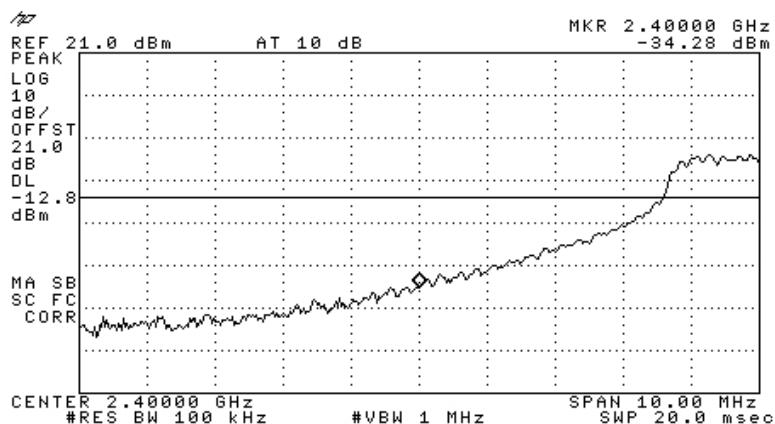


Figure 134 — Channel 1, 6Mbps

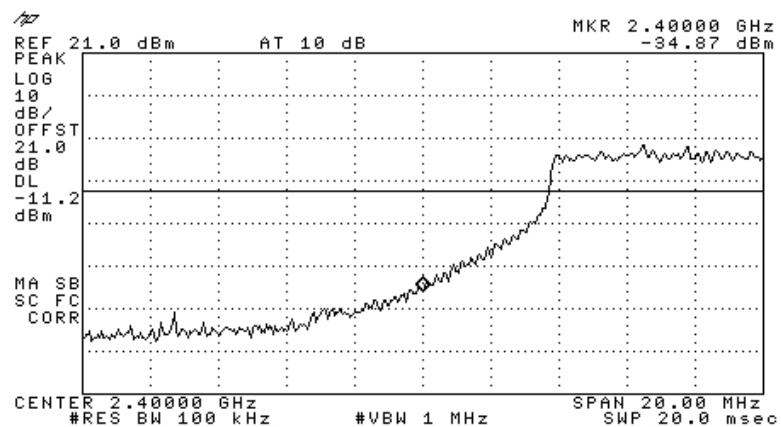


Figure 135 — Channel 1, 54Mbps

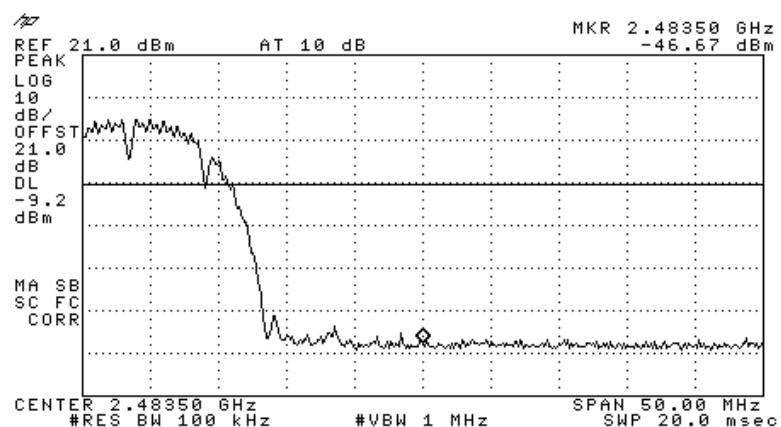
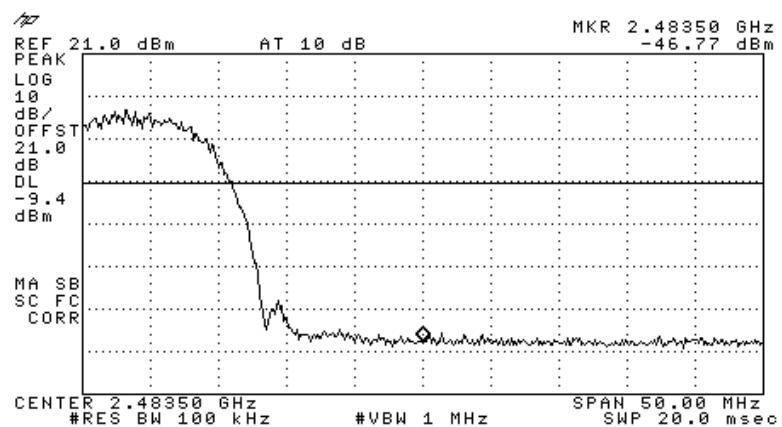
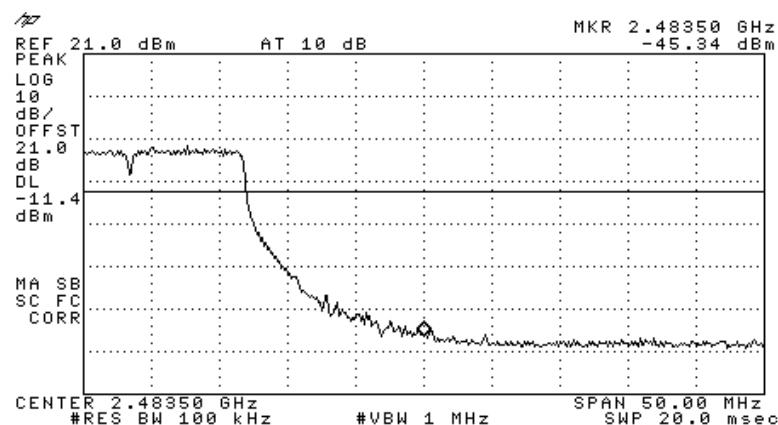


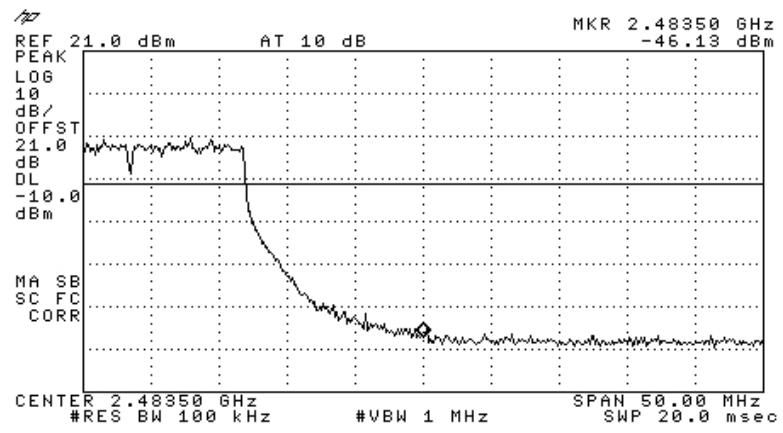
Figure 136 — Channel 11, 1Mbps



**Figure 137 — Channel 11, 11Mbps**



**Figure 138 — Channel 11, 6Mbps**



**Figure 139 — Channel 11, 54Mbps**

## 8.2 Results table

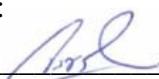
E.U.T. Description: WiFi Module  
 Model No.: iW-SM2144N2BIO  
 Serial Number: Not Designated  
 Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation (Mbps)	Band Edge Frequency (MHz)	Reading (dBm)	Specification (dBm)	Margin (dB)
2412	1	2398.05	-39.43	-8.7	-30.73
	11	2398.55	-39.96	-6.7	-33.26
	6	2400.00	-34.28	-12.8	-21.48
	54	2400.00	-34.87	-11.2	-23.67
2462	1	2483.50	-46.67	-9.2	-37.47
	11	2483.50	-46.77	-9.4	-37.37
	6	2483.50	-45.34	-11.4	-33.94
	54	2483.50	-46.13	-10.0	-36.13

**Figure 140 Band Edge Spectrum**

JUDGEMENT: Passed by 21.48 dB

TEST PERSONNEL:

Tester Signature:  Date: 03.02.11

Typed/Printed Name: A. Sharabi

### 8.3 **Test Equipment Used.**

Band edge Spectrum

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

**Figure 141 Test Equipment Used**

## 9. Radiated Emission, 9 kHz – 30 MHz

### 9.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

### 9.2 Test Procedure

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

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-30 MHz was scanned.

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-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: 1, 11, 6 and 54 Mbps.

Measurement was performed using a peak detector.

### 9.3 Measured Data

JUDGEMENT: Passed by dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The results for all 3 operation frequencies and modulations were the same.

No signals were detected in the frequency range of 9 kHz – 30 MHz.

TEST PERSONNEL:

Tester Signature: 

Date: 03.02.11

Typed/Printed Name: A. Sharabi

#### 9.4 **Test Instrumentation Used, Radiated Measurements**

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009*	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009*	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2010	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

\* Test was performed before 10 November 2010.

#### 9.5 **Field Strength Calculation**

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

$$FS = RA + AF + CF$$

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]

Example:  $FS = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.

## 10. Radiated Emission 30 – 25000 MHz

### 10.1 Test Specification

30 MHz-25000 MHz, F.C.C., Part 15, Subpart C

### 10.2 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 1.

The frequency range 30 MHz-25000 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.

In the frequency range of 30 MHz – 2.9 GHz, 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 2.9-25.0 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 2412, 2437, and 2462 MHz with the following modulations: 1, 11, 6 and 54 Mbps.

### 10.3 Test Data

JUDGEMENT: Passed by 6.0 dB

For the operation frequency of 2412 MHz, the margin between the emission level and the specification limit is 7.0 dB in the worst case at the frequency of 4824.00 MHz, vertical polarization.

For the operation frequency of 2437 MHz, the margin between the emission level and the specification limit is 6.0 dB in the worst case at the frequency of 4783.00 MHz, vertical polarization.

For the operation frequency of 2462 MHz, the margin between the emission level and the specification limit is 6.8 dB in the worst case at the frequency of 4924.00 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.

The details of the highest emissions are given in *Figure 142* to *Figure 147*.

#### TEST PERSONNEL:

Tester Signature:  Date: 03.02.11

Typed/Printed Name: A. Sharabi

## Radiated Emission 30 MHz – 25 GHz

E.U.T Description WiFi Module  
 Type iW-SM2144N2BIO  
 Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 1.0 GHz to 25.0 GHz  
 Test Distance: 3 meters      Detector: Peak  
 Operation Frequency: 2412 MHz

Frequency (MHz)	Polarity (H/V)	Peak Reading (dB $\mu$ V/m)	Peak. Specification (dB $\mu$ V/m)	Peak. Margin (dB)
2390.00	H	57.2**	74.0	-16.8
2390.00	V	57.4**	74.0	-16.6
4824.00	H	54.5*	74.0	-19.5
4824.00	V	58.0*	74.0	-16.0

**Figure 142. 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

\*\* “Correction Factor” = Antenna Factor + Cable Loss

## Radiated Emission 30 MHz – 25 GHz

E.U.T Description WiFi Module  
 Type iW-SM2144N2BIO  
 Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 1.0 GHz to 25.0 GHz  
 Test Distance: 3 meters      Detector: Average  
 Operation Frequency: 2412 MHz

Frequency (MHz)	Polarity (H/V)	Average Reading (dB $\mu$ V/m)	Average Specification (dB $\mu$ V/m)	Peak. Margin (dB)
2390.00	H	44.2**	54.0	-9.8
2390.00	V	45.3**	54.0	-8.7
4824.00	H	45.0*	54.0	-9.0
4824.00	V	47.0*	54.0	-7.0

**Figure 143. 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

\*\* “Correction Factor” = Antenna Factor + Cable Loss

## Radiated Emission 30 MHz – 25 GHz

E.U.T Description WiFi Module  
 Type iW-SM2144N2BIO  
 Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 1.0 GHz to 25.0 GHz  
 Test Distance: 3 meters      Detector: Peak  
 Operation Frequency: 2437 MHz

Frequency (MHz)	Polarity (H/V)	Peak Reading (dB $\mu$ V/m)	Peak. Specification (dB $\mu$ V/m)	Peak. Margin (dB)
4783.00	H	57.3*	74.0	-16.7
4783.00	V	60.1*	74.0	-13.9

**Figure 144. 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 30 MHz – 25 GHz

E.U.T Description WiFi Module  
 Type iW-SM2144N2BIO  
 Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 1.0 GHz to 25.0 GHz  
 Test Distance: 3 meters      Detector: Average  
 Operation Frequency: 2437 MHz

Frequency (MHz)	Polarity (H/V)	Average Reading (dB $\mu$ V/m)	Average Specification (dB $\mu$ V/m)	Peak. Margin (dB)
4783.00	H	45.6*	54.0	-8.4
4783.00	V	48.0*	54.0	-6.0

**Figure 145. 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 30 MHz – 25 GHz

E.U.T Description WiFi Module  
 Type iW-SM2144N2BIO  
 Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 1.0 GHz to 25.0 GHz  
 Test Distance: 3 meters      Detector: Peak  
 Operation Frequency: 2462 MHz

Frequency (MHz)	Polarity (H/V)	Peak Reading (dB $\mu$ V/m)	Peak. Specification (dB $\mu$ V/m)	Peak. Margin (dB)
2483.50	H	55.6**	74.0	-18.4
2483.50	V	54.3**	74.0	-19.7
4924.00	H	56.3*	74.0	-17.7
4924.00	V	59.7*	74.0	-14.3

**Figure 146. 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

\*\*“Correction Factor” = Antenna Factor + Cable Loss

## Radiated Emission Above 1 GHz

E.U.T Description WiFi Module  
 Type iW-SM2144N2BIO  
 Serial Number: Not Designated

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical      Frequency range: 1.0 GHz to 25.0 GHz  
 Test Distance: 3 meters      Detector: Average  
 Operation Frequency: 2462 MHz

Frequency (MHz)	Polarity (H/V)	Average Reading (dB $\mu$ V/m)	Average Specification (dB $\mu$ V/m)	Peak. Margin (dB)
2483.50	H	41.3**	54.0	-12.7
2483.50	V	42.5**	54.0	-11.5
4924.00	H	45.6*	54.0	-8.4
4924.00	V	47.2*	54.0	-6.8

**Figure 147. 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

\*\*“Correction Factor” = Antenna Factor + Cable Loss

#### 10.4 **Field Strength Calculation below 1 GHz**

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]

Example: FS = 30.7 dB $\mu$ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB $\mu$ V

No external pre-amplifiers are used.

**10.5 Test Instrumentation Used, Radiated Measurements  
30 MHz -25 GHz**

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009*	1 Year
RF Filter Section	HP	85420E	3705A00248	November 10, 2009-	1 Year
Antenna Biconical	ARA	BCD 235/B	1041	August 1, 2010	1 Year
Antenna Log Periodic	ARA	LPD-2010/A	1038	March 24, 2010	1 Year
Antenna Log Periodic	A.H. Systems	SAS-200/511	253	January 29, 2009	2 Years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 14, 2010	2 Years
Horn Antenna	ARA	SWH-28	1008	December 23, 2008	2 Years
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	January 13, 2010	1 Year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	January 13, 2010	1 Year
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 Year
Spectrum Analyzer	HP	8546E	3442A00275	January 11, 2010	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	JPKG C19982	N/A	N/A

## 11. Transmitted Power Density

[In accordance with section 15.247(d)]

### 11.1 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 3 kHz resolution BW. and sweep time of 1 second for each 3 kHz “window”. The spectrum peaks were located at each of the 3 operating frequencies.

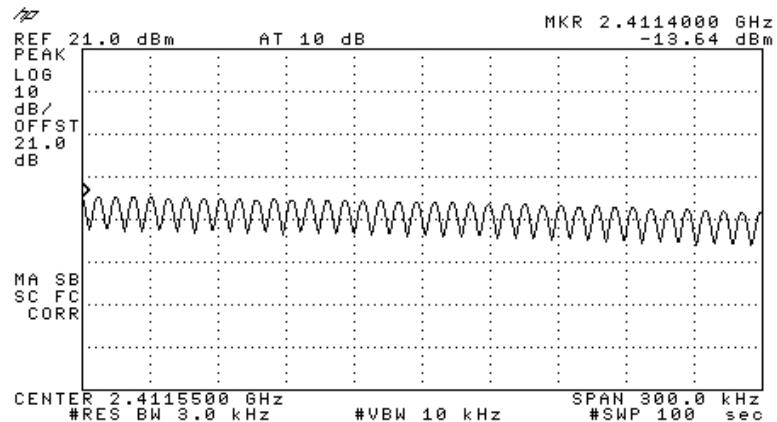


Figure 148 – Channel 1 , 1Mbps

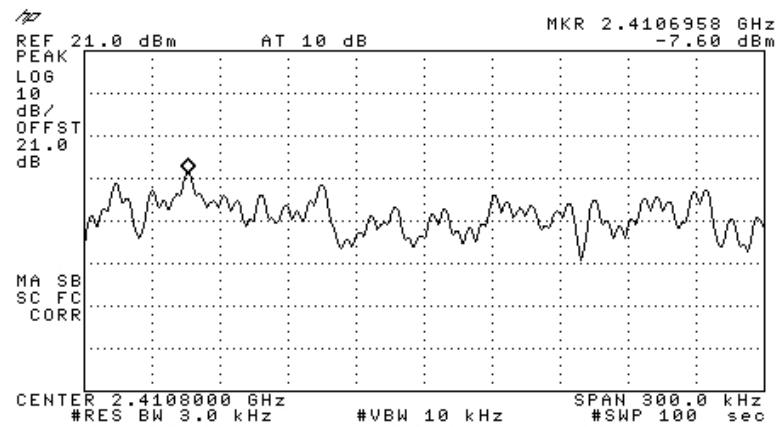


Figure 149- Channel 1 , 11Mbps

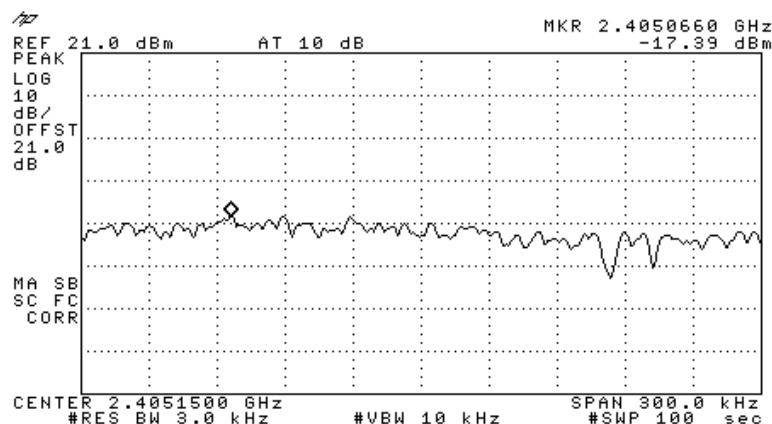


Figure 150 - Channel 1 , 6Mbps

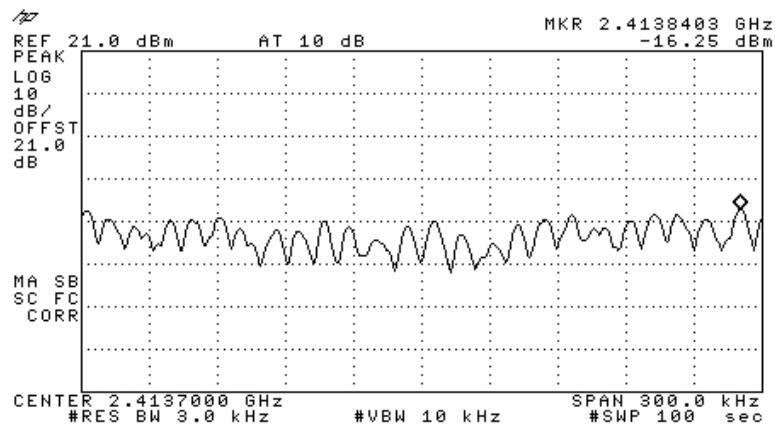


Figure 151 - Channel 1 , 54Mbps

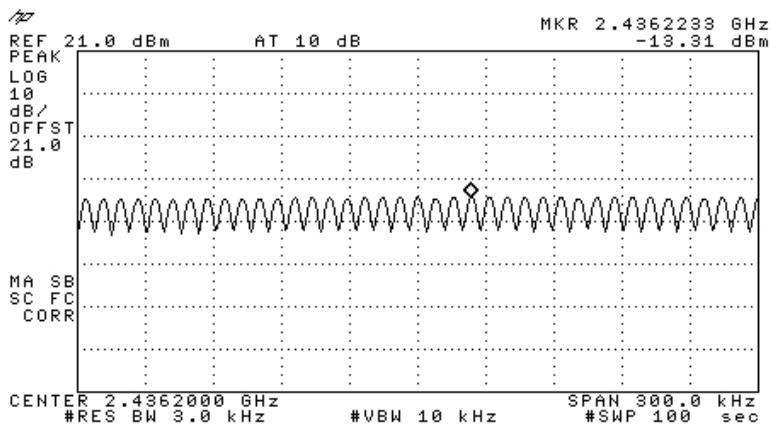


Figure 152 - Channel 6 , 1Mbps

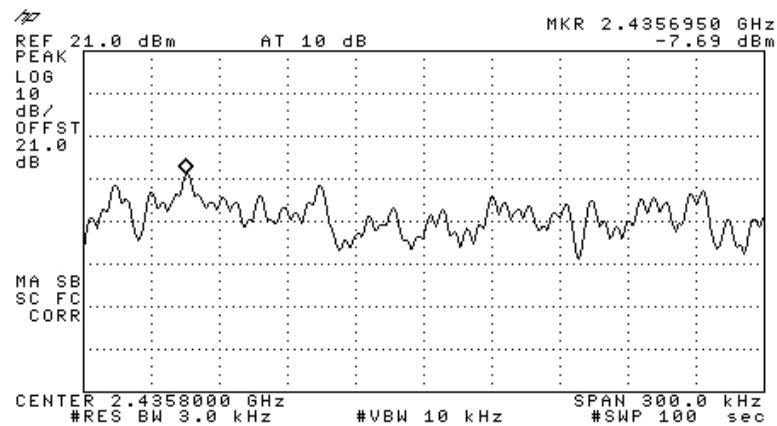


Figure 153 - Channel 6 , 11Mbps

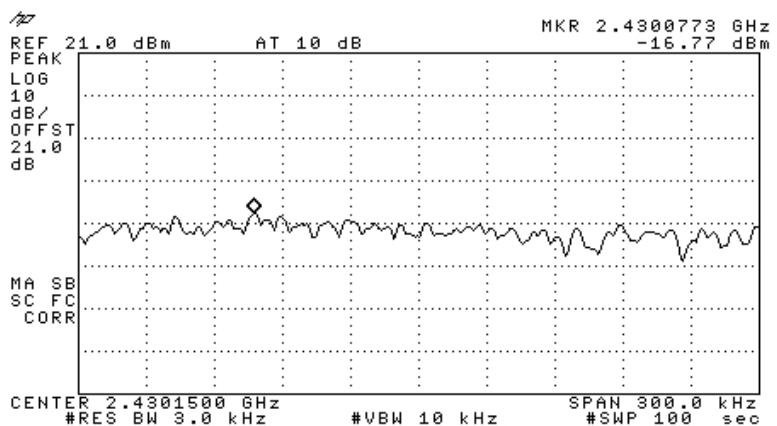
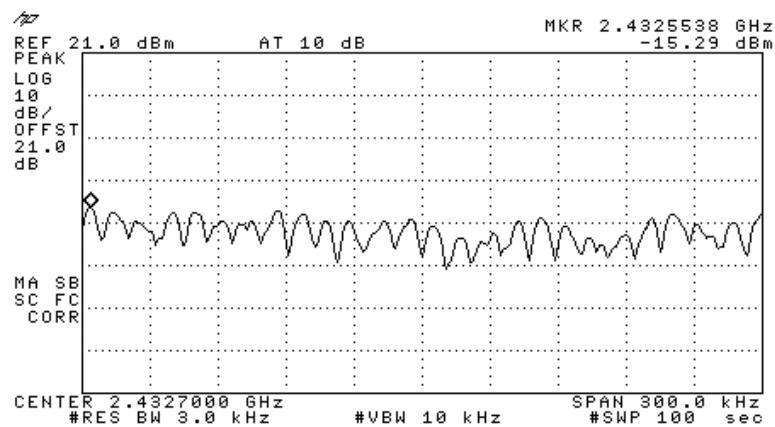
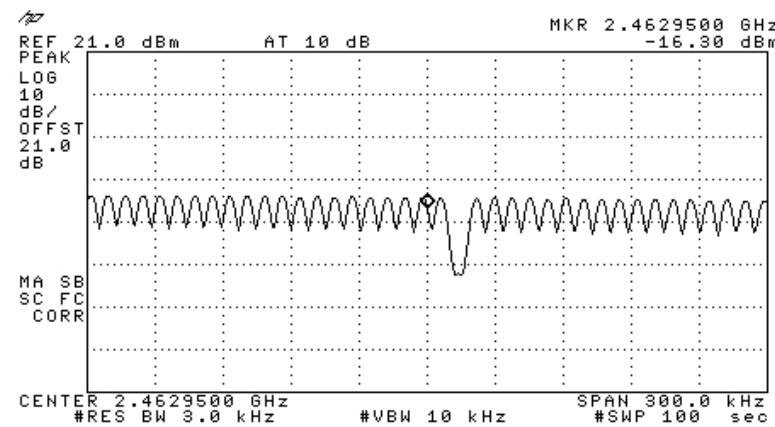


Figure 154 - Channel 6 , 6Mbps



**Figure 155 - Channel 6 , 54Mbps**



**Figure 156 - Channel 11 , 1Mbps**

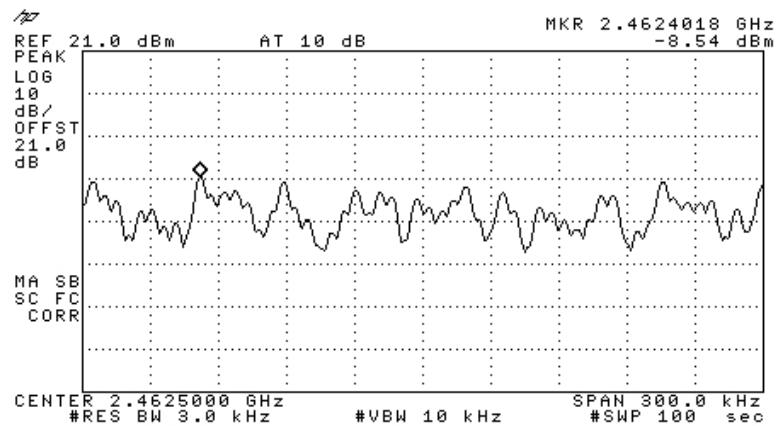


Figure 157 - Channel 11 , 11Mbps

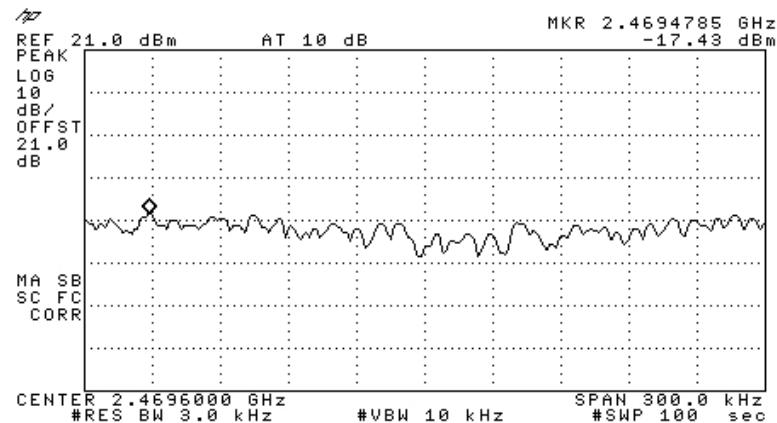
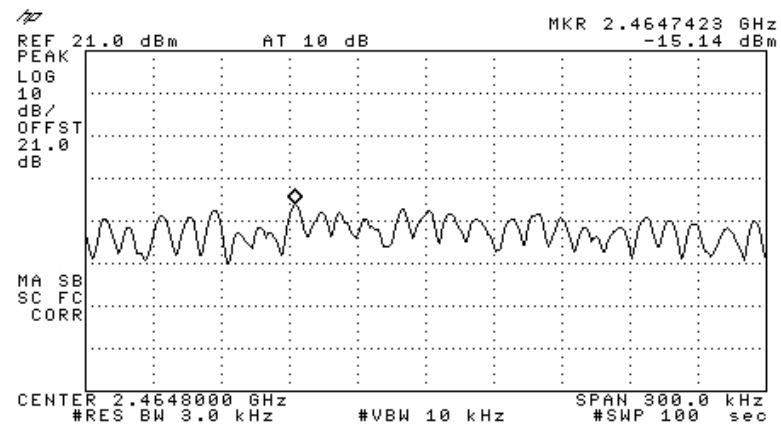


Figure 158 - Channel 11 , 6Mbps



**Figure 159 - Channel 11 , 54Mbps**

E.U.T. Description: WiFi Module  
 Model No.: iW-SM2144N2BIO  
 Serial Number: Not Designated  
 Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation (Mbps)	Reading (dBm)	Specification (dBm)	Margin (dB)
2412	1	-13.64	8.0	-21.64
	11	-7.60	8.0	-15.60
	6	-17.39	8.0	-25.39
	54	-16.25	8.0	-24.25
2437	1	-13.31	8.0	-21.31
	11	-7.69	8.0	-15.69
	6	-16.77	8.0	-24.77
	54	-15.29	8.0	-23.29
2462	1	-16.30	8.0	-24.30
	11	-8.54	8.0	-16.54
	6	-17.43	8.0	-25.43
	54	-15.14	8.0	-23.14

**Figure 160 Test Results**

JUDGEMENT: Passed by 15.60 dB

TEST PERSONNEL:

Tester Signature:  Date: 03.02.11

Typed/Printed Name: A. Sharabi

## 11.2 **Test Equipment Used.**

Transmitted Power Density

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

**Figure 161 Test Equipment Used**

## 12. Antenna Gain/Information

The antenna gain is 2 dBi.

## 13. R.F Exposure/Safety

The typical placement of the E.U.T. is on an OEM board. The typical distance between the E.U.T. and the user in the worst case application, is >10 cm .

### Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 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<sub>t</sub>- Transmitted Peak Power 19.16 dBm = 82.4 mw

G<sub>T</sub>- Antenna Gain, 2 dBi = 1.6

R- Distance from Transmitter using 10 cm worst case

(c) The peak power density is :

$$S_p = \frac{82.4 \times 1.6}{4\pi(10)^2} = 0.104 \frac{mW}{cm^2}$$

(f) This is below the FCC limit.

## 14. APPENDIX A - CORRECTION FACTORS

14.1 **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".

## 14.2 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.

### 14.3 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.

## 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".

#### 14.4 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".

**14.5 Correction factors for**

**BICONICAL ANTENNA**

**Type BCD-235/B,  
at 3 meter range**

FREQUENCY (MHz)	AFE (dB/m)
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".

## 14.6 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			

**14.7 Correction factors for**

**Horn Antenna**

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

<b>FREQUENCY</b> (GHz)	<b>AFE</b> (dB /m)	<b>Gain</b> (dB1)
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

**14.8 Correction factors for ACTIVE LOOP ANTENNA**

**Model 6502  
S/N 9506-2950**

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (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