

**DATE: 23 January 2011**

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

**FCC Radio Test Report**

**for**

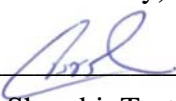
**Micronet Ltd.**

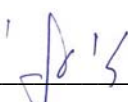
**Equipment under test:**

**Bluetooth and WiFi Module (WiFi Radio)**

**NBOARD811**

Written by:   
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Approved by:   
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This report relates only to items tested.



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# 1. General Information

## 1.1 Administrative Information

Manufacturer:	Micronet Ltd.
Manufacturer's Address:	P.O.B. 11524 27 Hametsuda St., Azor, 58001, Israel Tel: +972-3-558 4884 Fax: +972-3-558 4885
Manufacturer's Representative:	Natan Shvarts
Equipment Under Test (E.U.T):	Bluetooth and WiFi Module (WiFi Radio)
Equipment Model No.:	NBOARD811
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	24/10/10
Start of Test:	24/10/10
End of Test:	17/11/10
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15 Subpart C

## **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**

NBOARD811 is a small board PCB which provide W-LAN (WiFi) + Bluetooth (hereinafter: BT) feature. This feature provided by embedded module IC which manufacture by "Azurewave" in Taiwan and consists of wireless LAN connection feature according to IEEE802.11 b/g and bluetooth 2.1+EDR connection protocol (two protocols in one IC).

### **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 3, 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 WiFi & BT radio module was embedded inside the Micronet CE-507 full configuration Mobile Data Terminal. During the tests, the module worked in continuous transmit/receive mode, on one channel (as we choose), without frequencies hopping, according to the manufacturer tools (based on "Marvel" 8688 chipset) which runs on the above terminal and provides full control of the terminal.

Bidirectional communication which operates the WiFi & BT module in a required channel was used.

To select the worst case host to be tested for Limited Modular Approval certification, an exploratory radiated emission test, 2<sup>nd</sup> harmonic -4<sup>th</sup> harmonic, was performed inside the shielded room.

The hosts, with the radio module in constant transmission, were placed on a 0.8 meter high wooden table, 1m meter from the tests antennas, which were 1 m high.

The results of the exploratory radiated emission tests are shown in the table below.

Host Model	Peak (dB $\mu$ V)	
	CE-504	CE-507
2 <sup>nd</sup> Harmonic	33.5	36.7
3 <sup>rd</sup> Harmonic	31.4	34.5
4 <sup>th</sup> Harmonic	-	-

Based on the above exploratory radiated emission screening and the construction of the host models which is differ only by the size of the screen, the CE-507 was selected as the ‘worst’ case host.

The E.U.T. was tested simulating vehicle installation.



## **2.2 EUT Exercise Software**

The Software that operates the module was received from the manufacturer and run on the Micronet CE-507 full configuration Mobile Data Terminal.

The software operated the module in continuous mode in any channel, baud & modulation were needed.

All the commands were given through a laptop that was connected by "Active sync" (mobile connection of Microsoft) protocol, to the EUT by USB OTG input.

Intermodulation testing was performed on order to examine all the radio devices transmitting simultaneously by WiFi, BT, and GSM.

## **2.3 Special Accessories**

No special accessories were needed to achieve compliance.

## **2.4 Equipment Modifications**

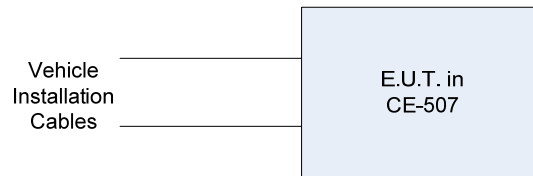
No modifications were necessary in order to achieve compliance.

## 2.5 Configuration of Tested System



Note: For conducted tests a temporary antenna connection was used. Normal use is with an integral antenna.

**Figure 1. Conducted Tests Setup**



**Figure 2. Radiated Tests Setup**

### 3. Test Set-up Photos



Figure 3. Screening Test CE-504



Figure 4. Screening Test CE-507



**Figure 5. Radiated Emission Test**



**Figure 6. Conducted Emission from Antenna Port Tests**

## 4. 26 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 and 300 kHz video 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 modulation.

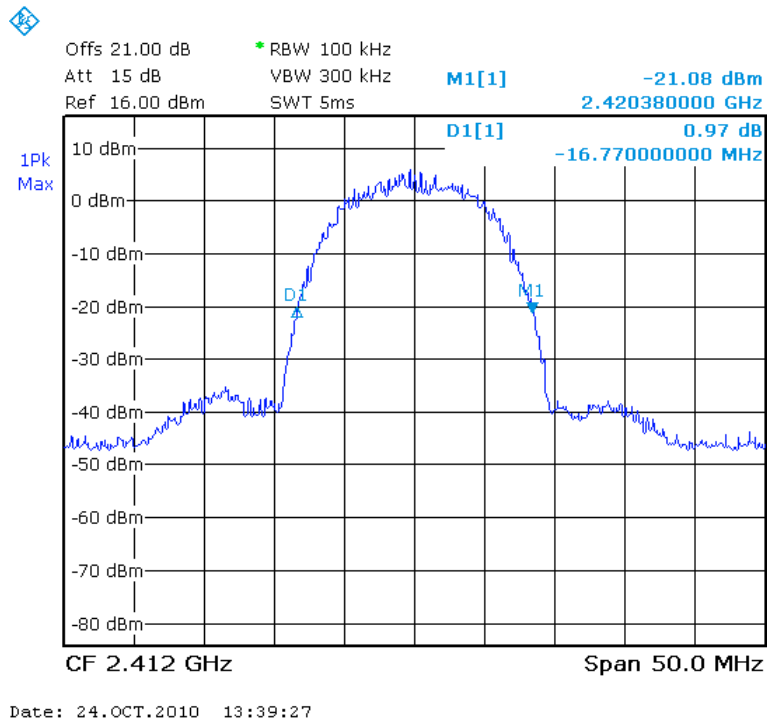
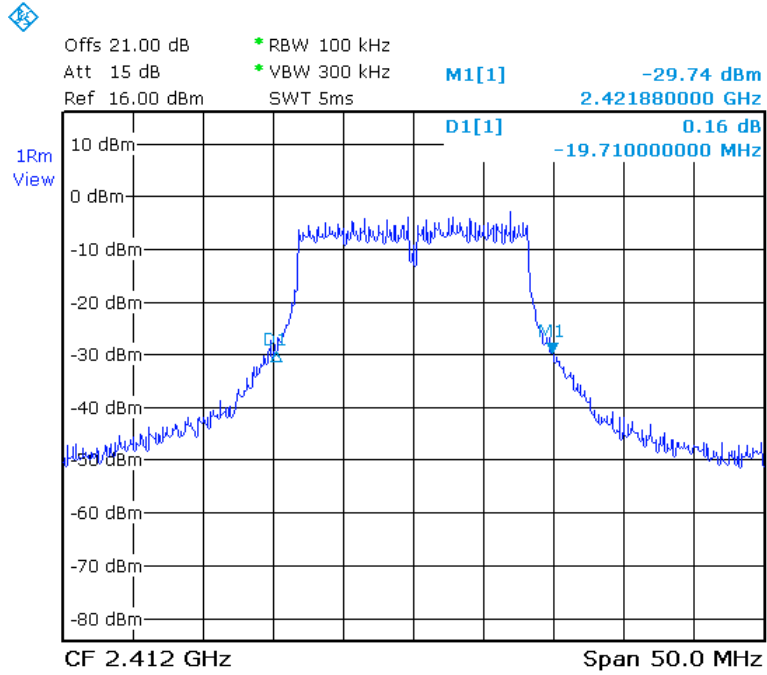


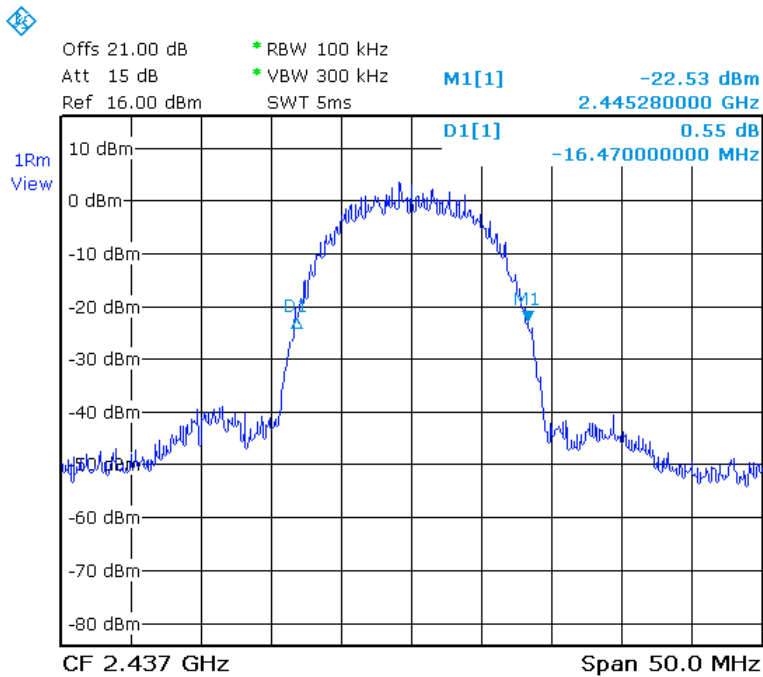
Figure 7 —2412 MHz 1Mbps





Date: 24.OCT.2010 15:17:51

**Figure 10 —2412 MHz 54Mbps**



Date: 24.OCT.2010 15:22:07

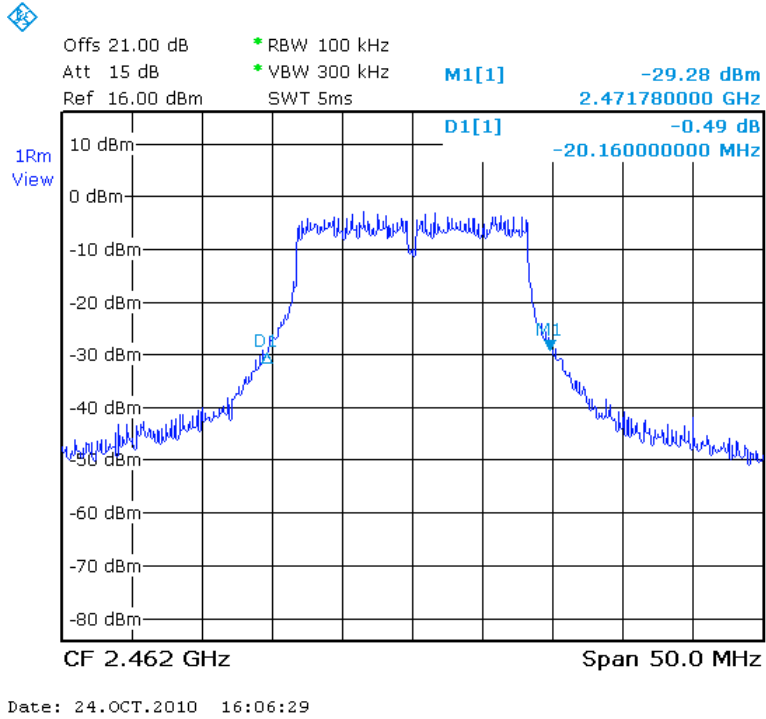
**Figure 11 —2437 MHz 1Mbps**











**Figure 18 —2462 MHz 54Mbps**

## 4.2 Results

E.U.T Description: Bluetooth and WiFi Module (WiFi Radio)

Model No.: NBOARD811

Serial Number: Not designated


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

Operation Frequency (MHz)	Frequency Reading (MHz)	Modulation (Mbps)	Reading (MHz)	Specification (MHz)
2412	2420.38	1	-16.77	0.5
2412	2420.38	11	-16.77	0.5
2412	2421.78	6	-20.00	0.5
2412	2421.88	54	-19.71	0.5
2437	2445.28	1	-16.47	0.5
2437	2.445.28	11	-16.67	0.5
2437	2447.08	6	-19.96	0.5
2437	2446.88	54	-20.16	0.5
2462	2470.38	1	-16.87	0.5
2462	2470.18	11	-16.37	0.5
2462	2472.78	6	-21.16	0.5
2462	2471.78	54	-20.16	0.5

**Figure 19 26 dB Minimum Bandwidth**

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 07.02.11

Typed/Printed Name: A. Sharabi

#### 4.1 Test Equipment Used.

26 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	RHODE&SCHWARZ	FSL6	100194	July 22, 2010	1 Year
Attenuator	Jyebao	-	FAT-AM5AF5G 6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

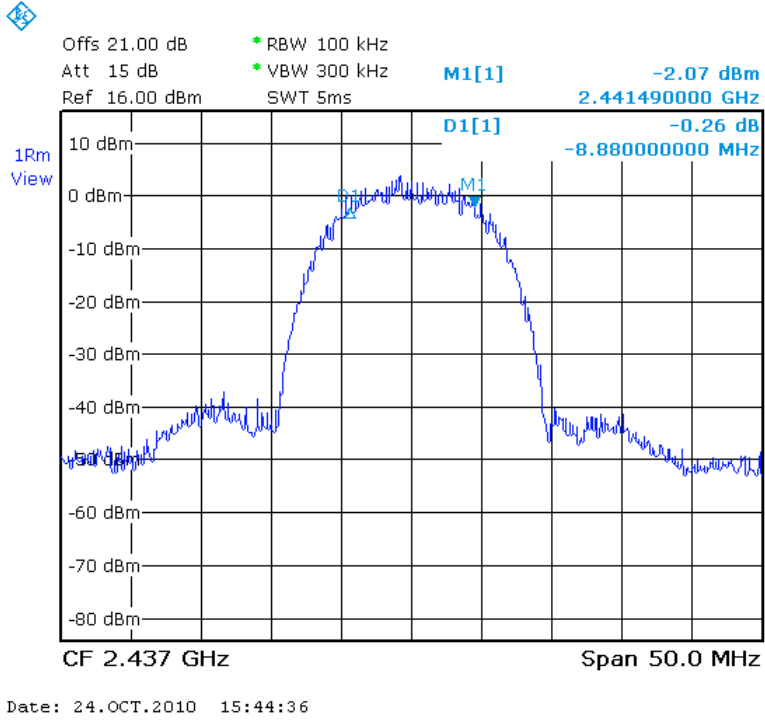
**Figure 20 Test Equipment Used**



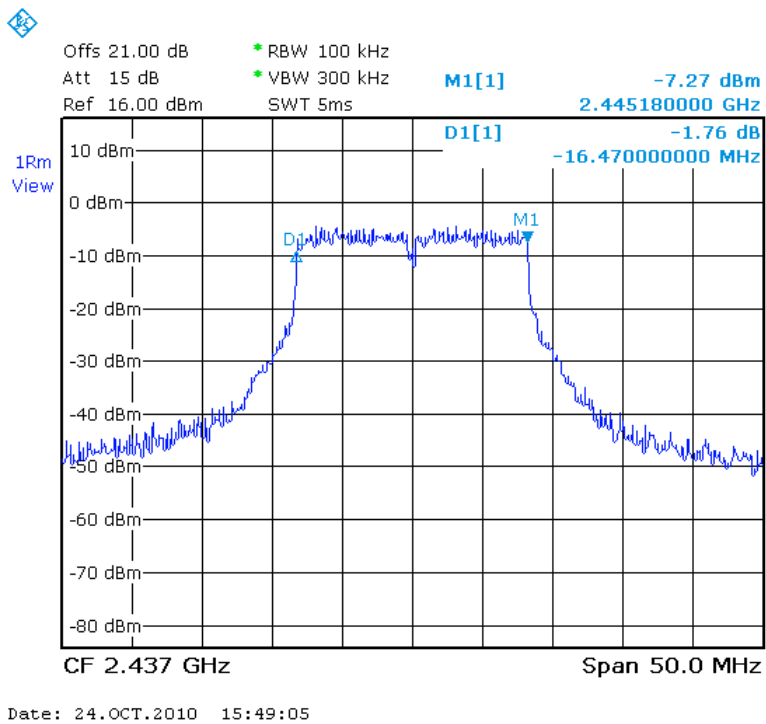




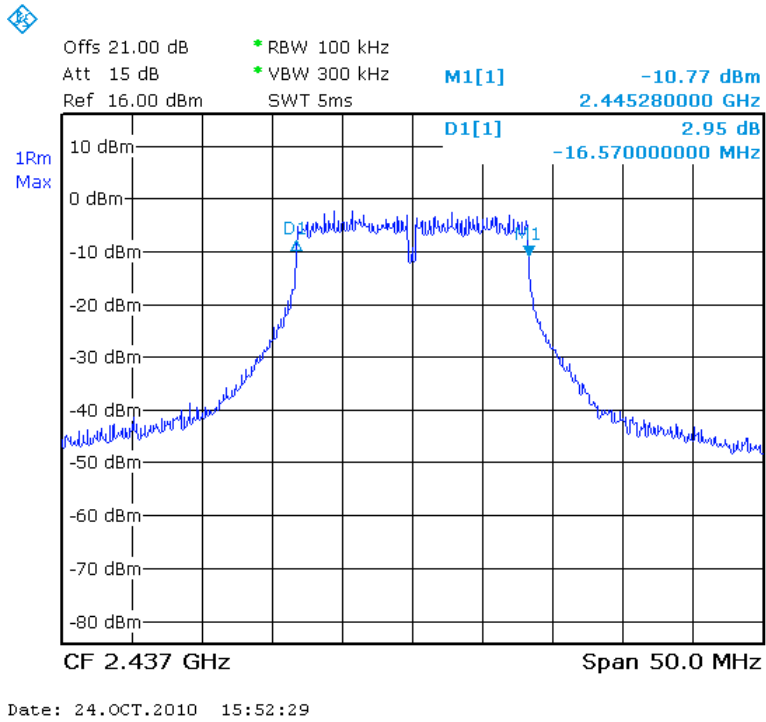




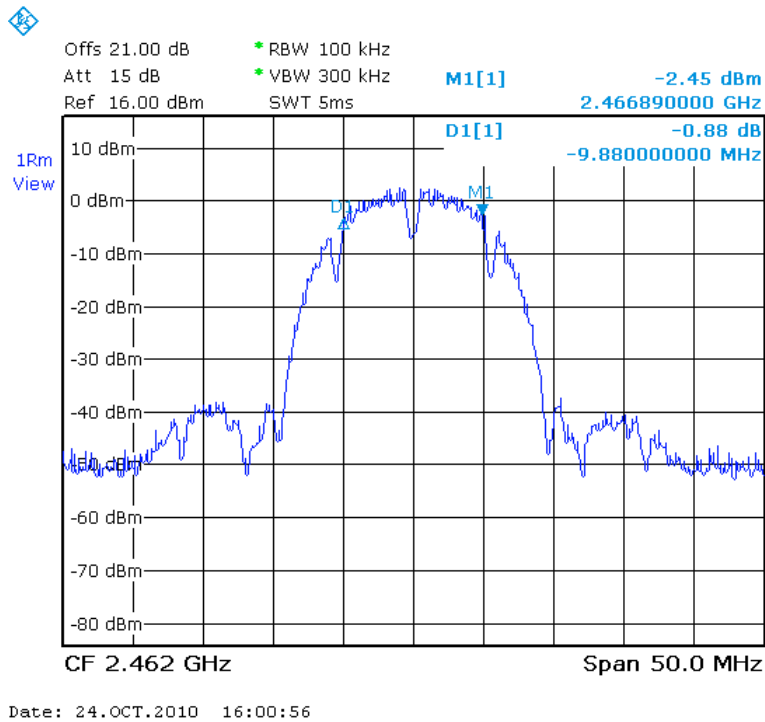
**Figure 26 —2437 MHz 11Mbps**



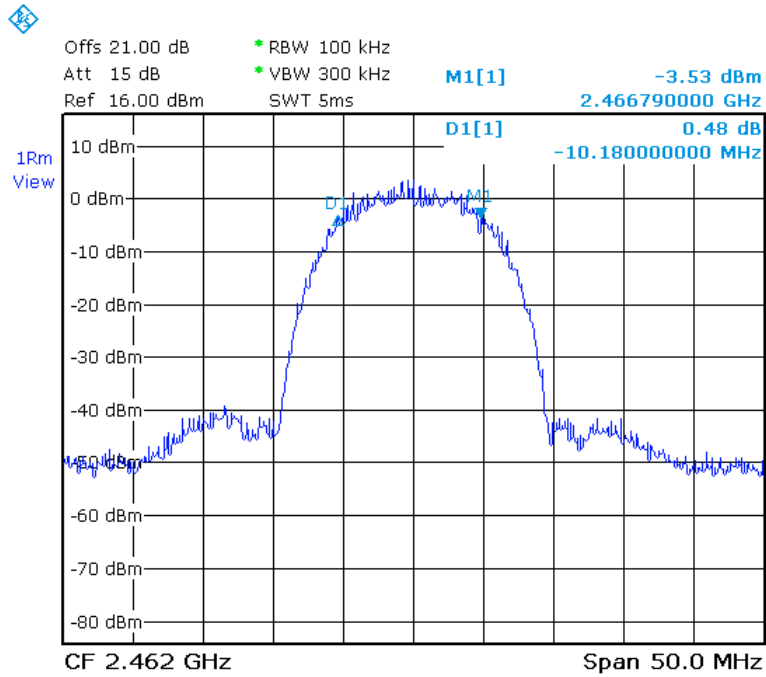
**Figure 27 —2437 MHz 6Mbps**



**Figure 28 —2437 MHz 54Mbps**

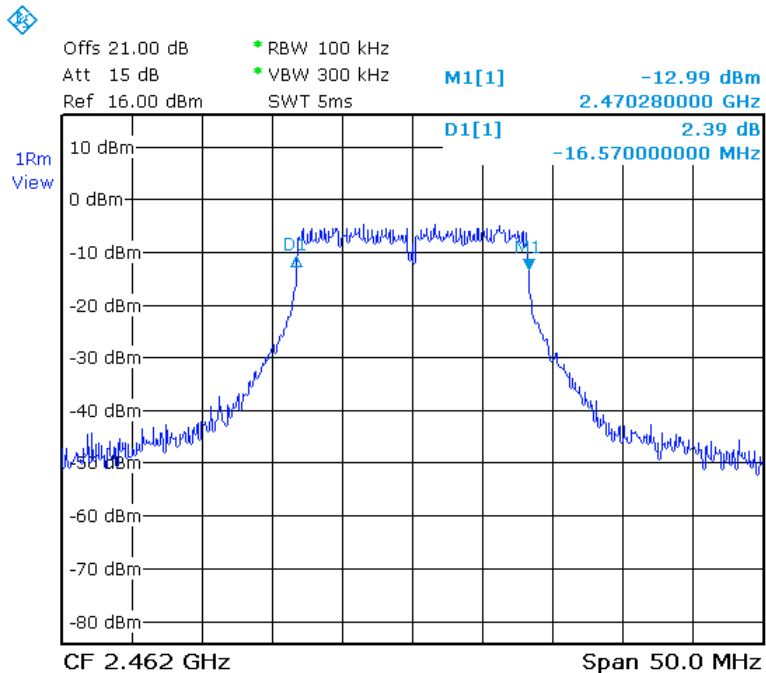


**Figure 29 —2462 MHz 1Mbps**



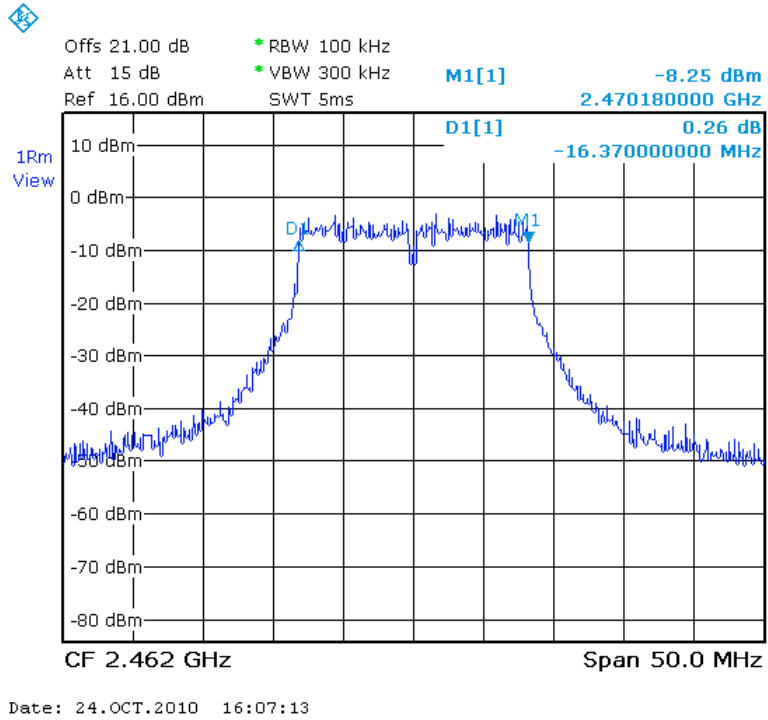
Date: 24.OCT.2010 16:02:24

**Figure 30 —2462MHz 11Mbps**



Date: 24.OCT.2010 16:04:42

**Figure 31 —2462 MHz 6Mbps**



**Figure 32 —2462 MHz 54Mbps**

## 5.2 Results

E.U.T Description: Bluetooth and WiFi Module (WiFi Radio)

Model No.: NBOARD811

Serial Number: Not designated


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

Operation Frequency (MHz)	Frequency Reading (MHz)	Modulation (Mbps)	Reading (MHz)	Specification (MHz)
2412	2416.99	1	-9.28	0.5
2412	2416.89	11	-9.88	0.5
2412	2420.28	6	-16.61	0.5
2412	2420.18	54	-16.21	0.5
2437	2441.49	1	-8.88	0.5
2437	2441.49	11	-8.88	0.5
2437	2445.18	6	-16.47	0.5
2437	2445.28	54	-16.57	0.5
2462	2466.89	1	-9.88	0.5
2462	2466.79	11	-10.18	0.5
2462	2470.28	6	-16.57	0.5
2462	2470.18	54	-16.37	0.5

**Figure 33 6 dB Minimum Bandwidth**

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 07.02.11

Typed/Printed Name: A. Sharabi

### 5.3 Test Equipment Used.

6 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	RHODE&SCHWARZ	FSL6	100194	July 22, 2010	1 Year
Attenuator	Jyebao	-	FAT-AM5AF5G 6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

**Figure 34 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 and 3 MHz video BW. Peak power level was measured at selected operation frequencies.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the modulation.

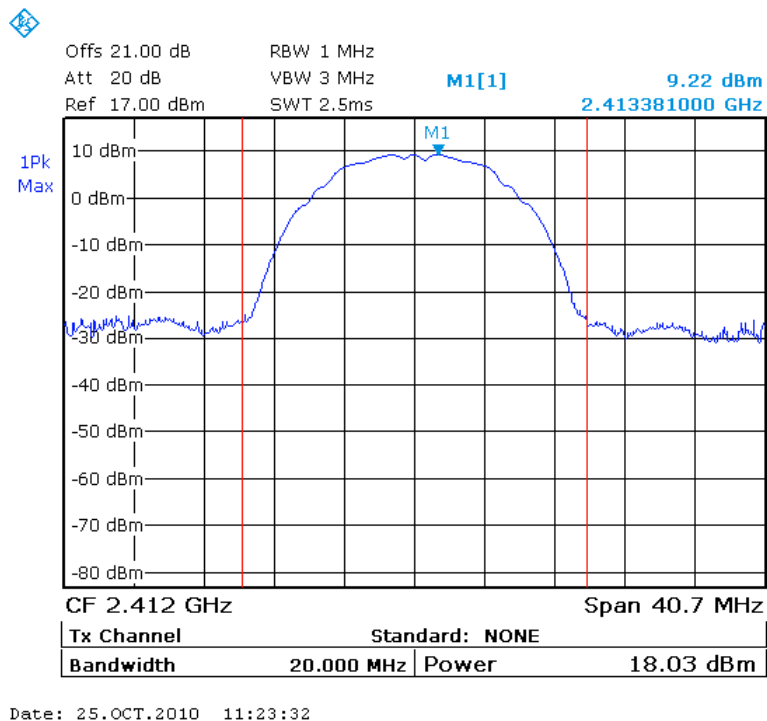
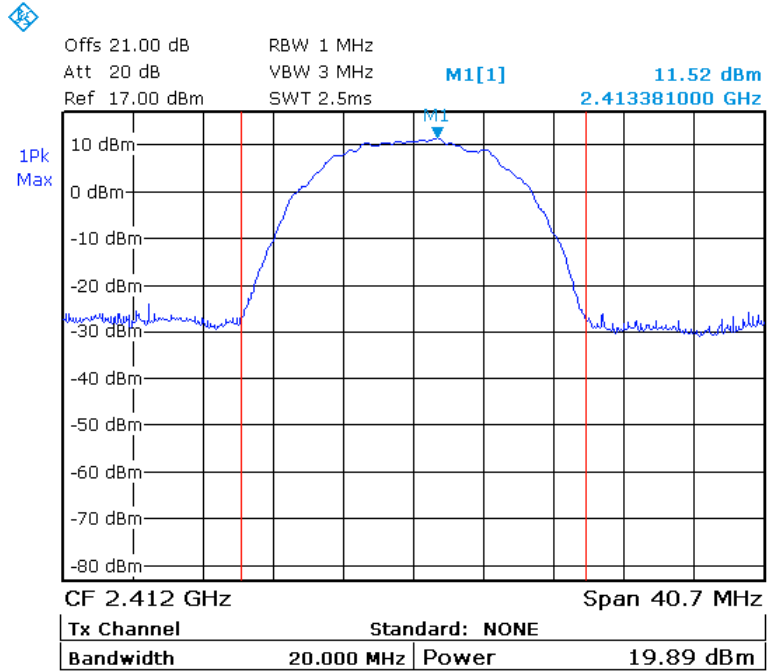
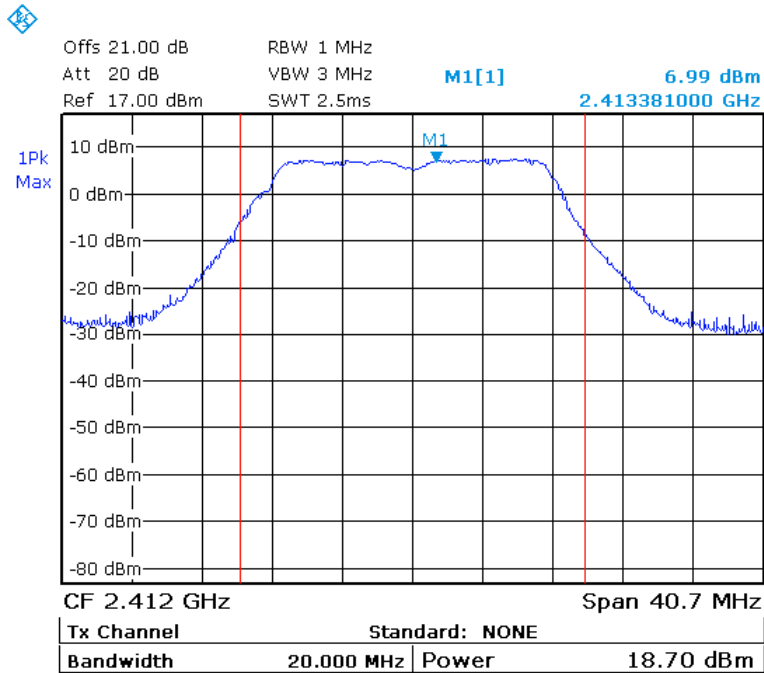


Figure 35 —2412 MHz 1Mbps



Date: 25.OCT.2010 11:22:23

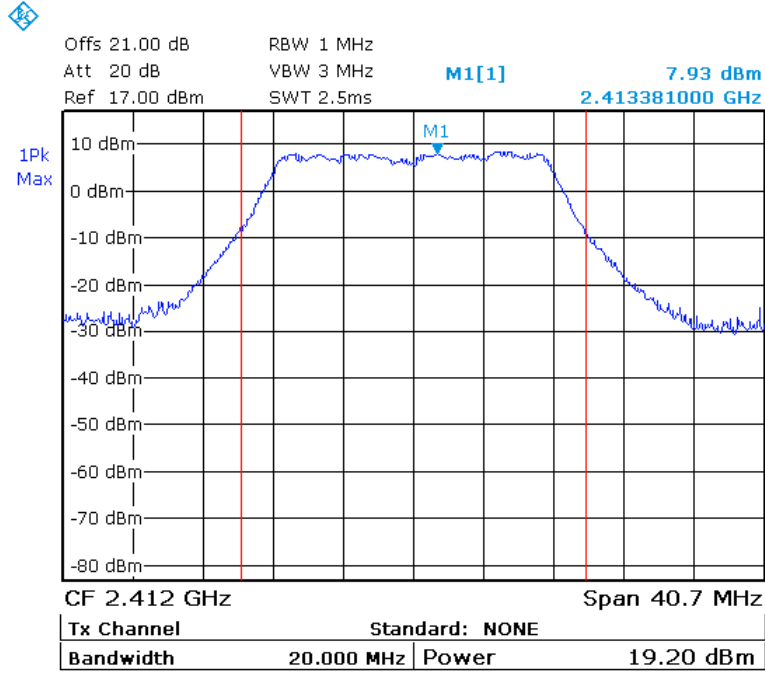
Figure 36 —2412 MHz 11Mbps



Date: 25.OCT.2010 11:25:08

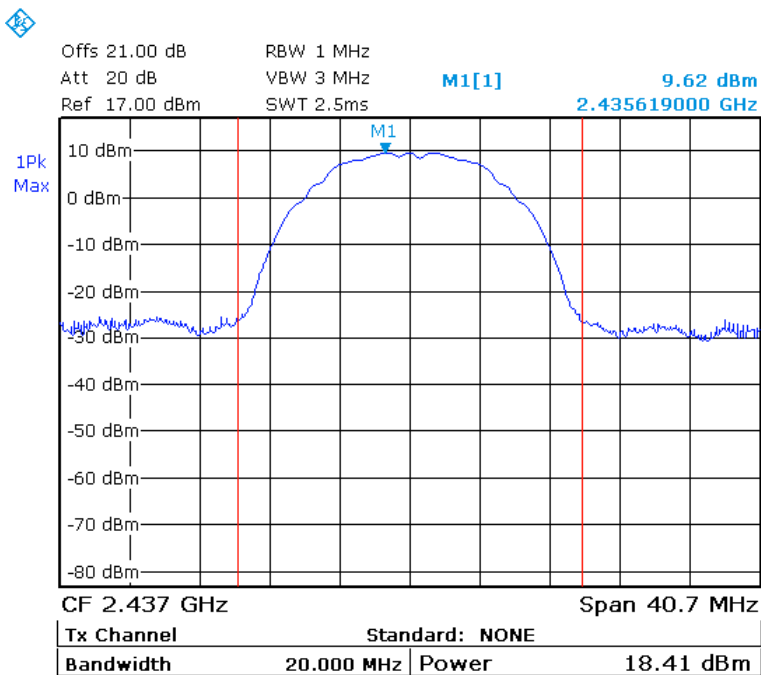
Figure 37 —2412 MHz 6Mbps





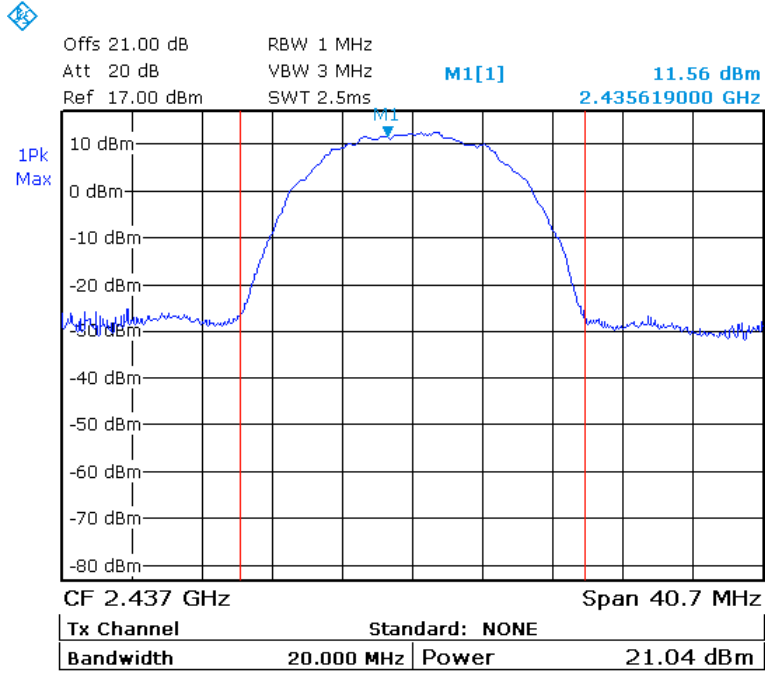
Date: 25.OCT.2010 11:26:01

**Figure 38 —2412 MHz 54Mbps**



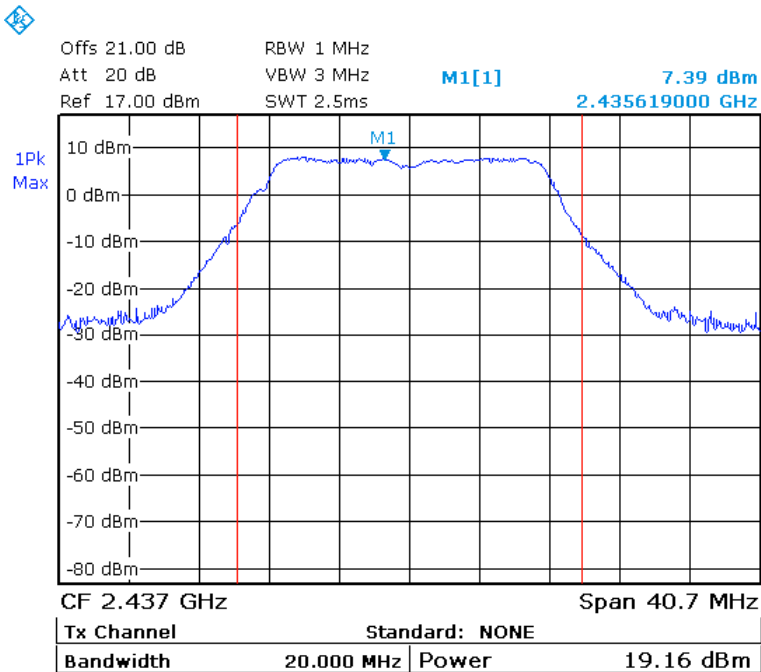
Date: 25.OCT.2010 11:27:13

**Figure 39 —2437 MHz 1Mbps**



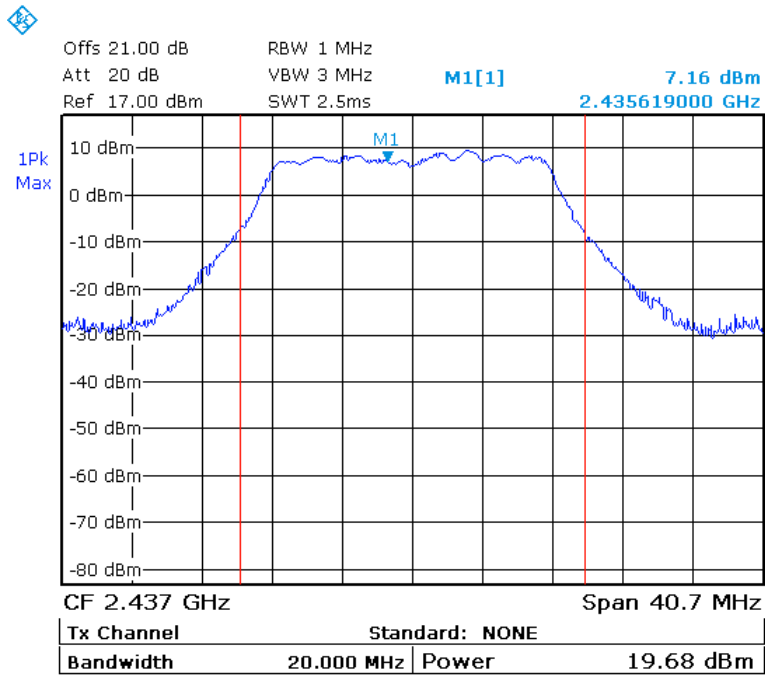
Date: 25.OCT.2010 11:28:10

**Figure 40 —2437 MHz 11Mbps**



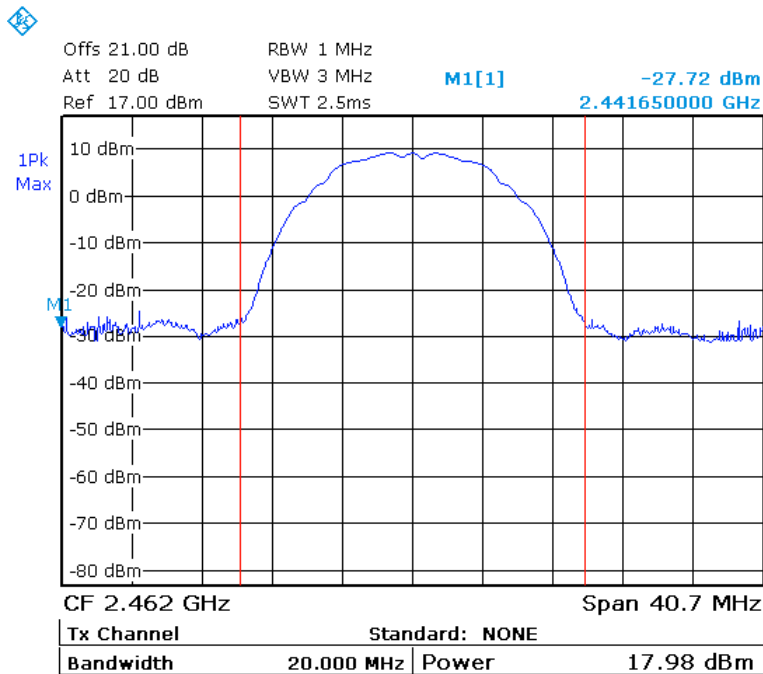
Date: 25.OCT.2010 11:33:38

**Figure 41 —2437 MHz 6Mbps**



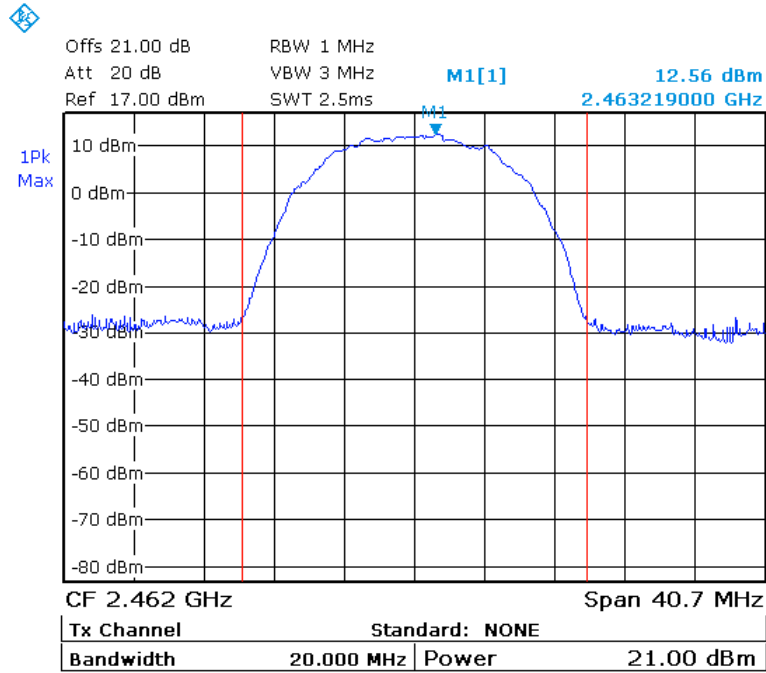
Date: 25.OCT.2010 11:34:34

**Figure 42 —2437 MHz 54Mbps**



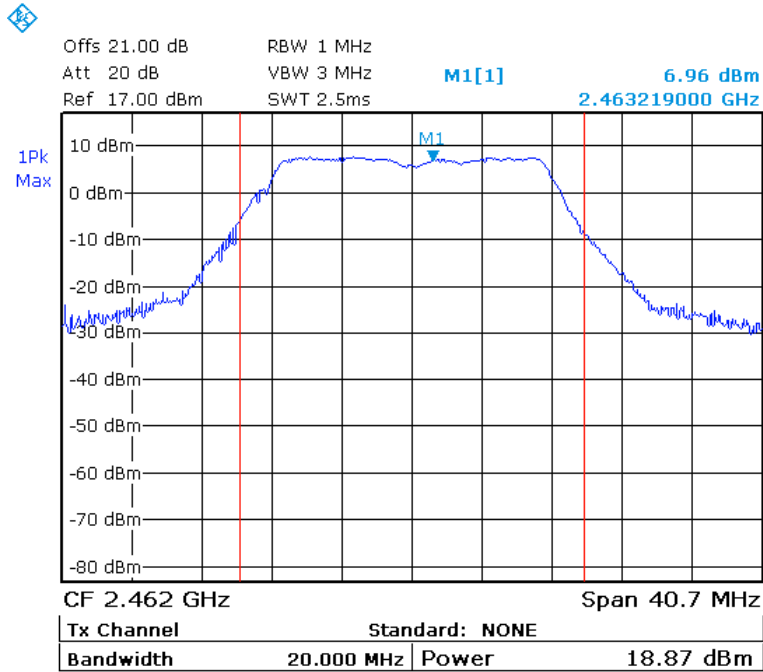
Date: 25.OCT.2010 11:37:17

**Figure 43 —2462 MHz 1Mbps**



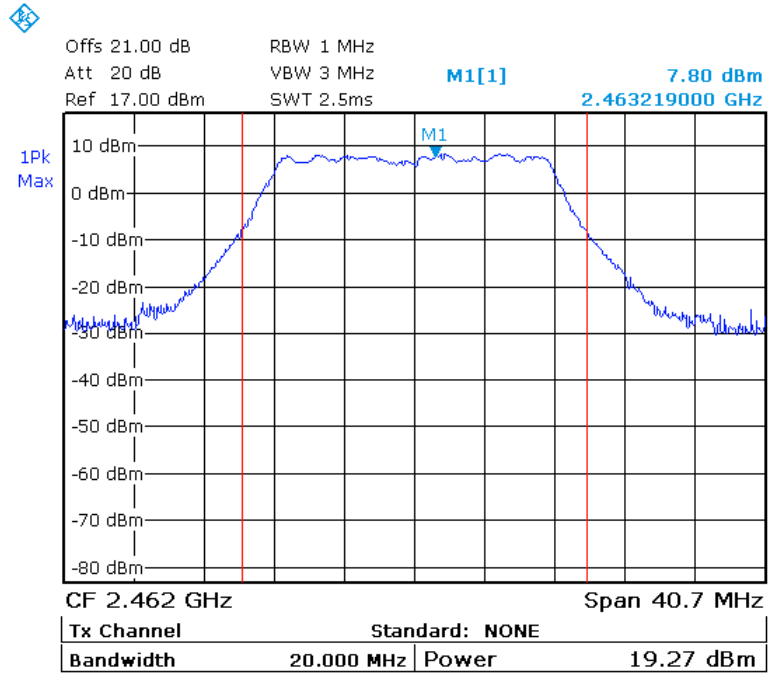
Date: 25.OCT.2010 11:38:26

**Figure 44 —2462MHz 11Mbps**



Date: 25.OCT.2010 11:46:48

**Figure 45 —2462 MHz 6Mbps**



Date: 25.OCT.2010 11:47:37

**Figure 46 —2462 MHz 54Mbps**

## 6.2 Results

E.U.T. Description: Bluetooth and WiFi Module (WiFi Radio)

Model No.: NBOARD811

Serial Number: Not designated


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

Operation Frequency (MHz)	Modulation (Mbps)	Power (dBm)	Specification (dBm)	Margin (dB)
2412	1	18.03	30.0	-11.97
2412	11	19.89	30.0	-10.11
2412	6	18.70	30.0	-11.30
2412	54	19.20	30.0	-10.80
2437	1	18.41	30.0	-11.59
2437	11	21.04	30.0	-8.96
2437	6	19.16	30.0	-10.84
2437	54	19.68	30.0	-10.32
2462	1	17.98	30.0	-12.02
2462	11	21.00	30.0	-9.00
2462	6	18.87	30.0	-11.13
2462	54	19.27	30.0	-10.73

**Figure 47 Maximum Peak Power Output**

JUDGEMENT: Passed by 8.96 dB

TEST PERSONNEL:

Tester Signature: 

Date: 07.02.11

Typed/Printed Name: A. Sharabi

### 6.3 Test Equipment Used.

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	RHODE&SCHWARZ	FSL6	100194	July 22, 2010	1 Year
Attenuator	Jyebao	-	FAT-AM5AF5G 6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

**Figure 48 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 100 kHz resolution BW except for the frequency range 9 kHz-150 kHz where the RBW was set to 1 kHz and the frequency range 150 kHz-10 MHz where the RBW was set to 10 kHz. 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 modulation.

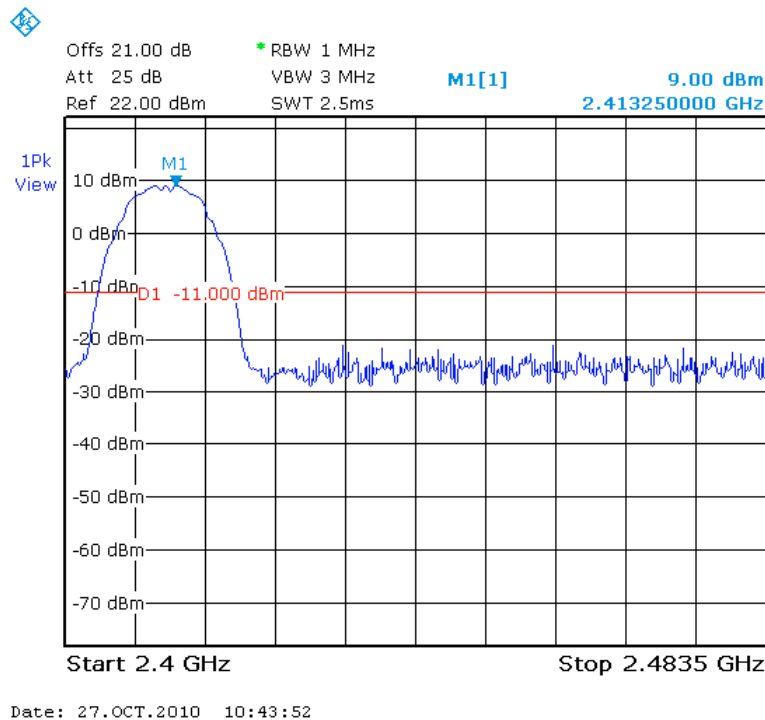
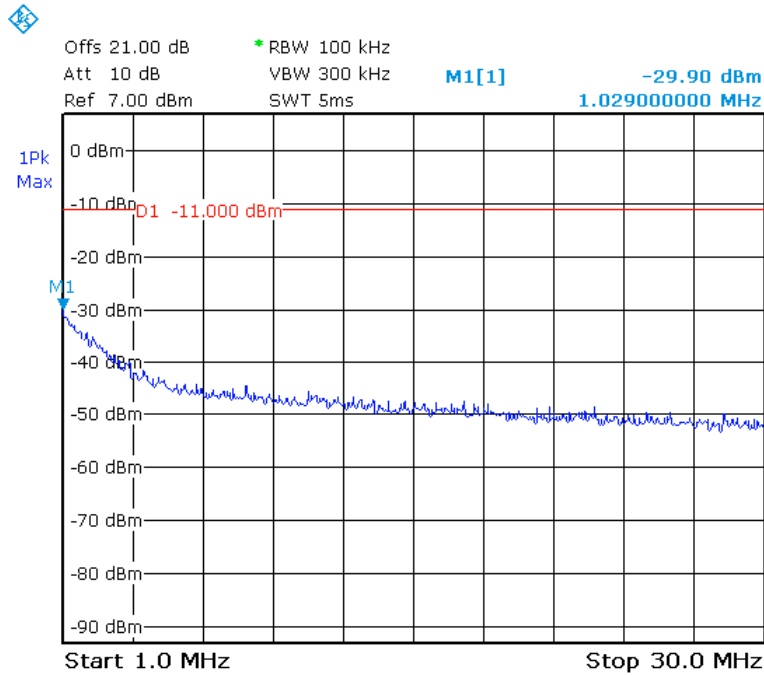


Figure 49 —2412 MHz 1Mbps

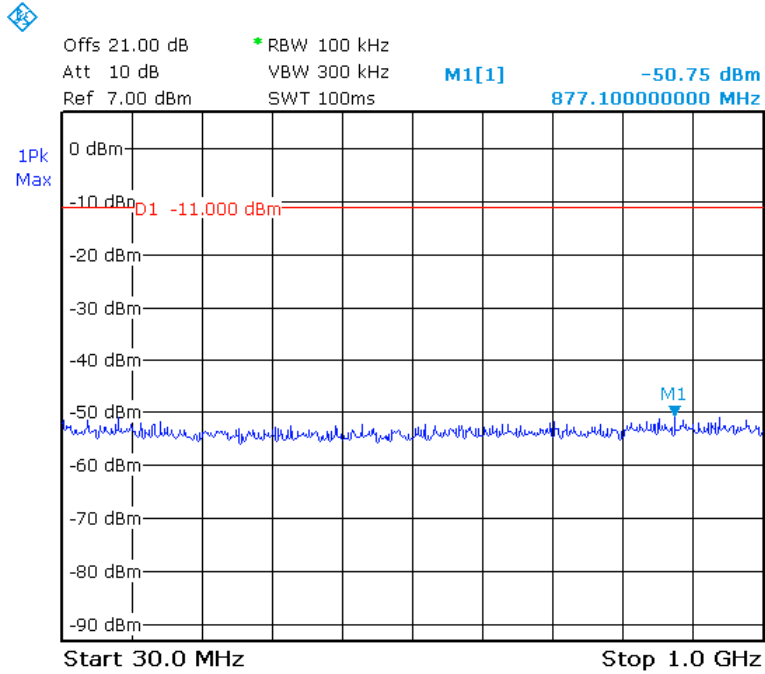






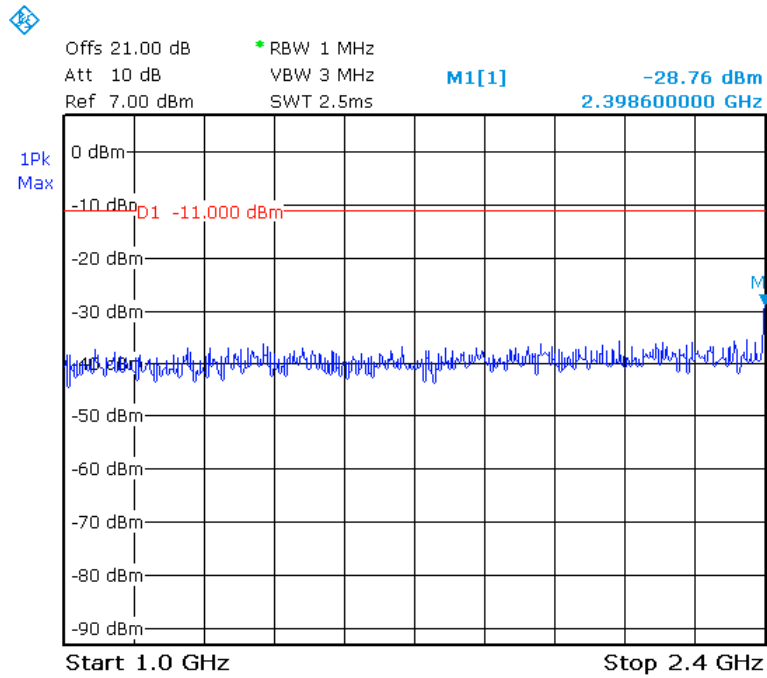
Date: 27.OCT.2010 10:48:06

**Figure 52 —2412 MHz 1Mbps**



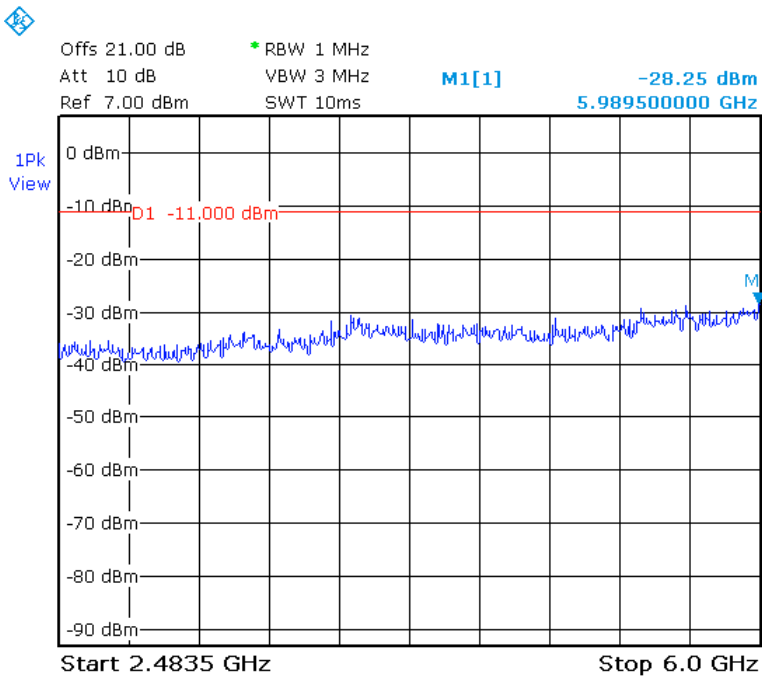
Date: 27.OCT.2010 10:48:59

**Figure 53 —2412 MHz 1Mbps**



Date: 27.OCT.2010 10:50:01

**Figure 54 —2412 MHz 1Mbps**



Date: 27.OCT.2010 10:51:15

**Figure 55 —2412 MHz 1Mbps**

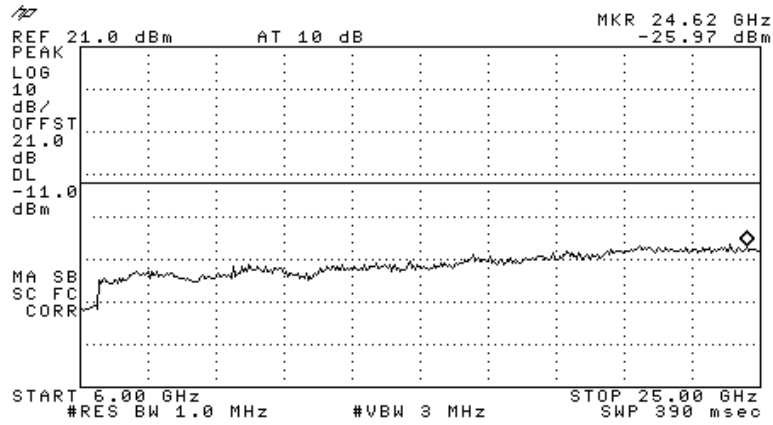
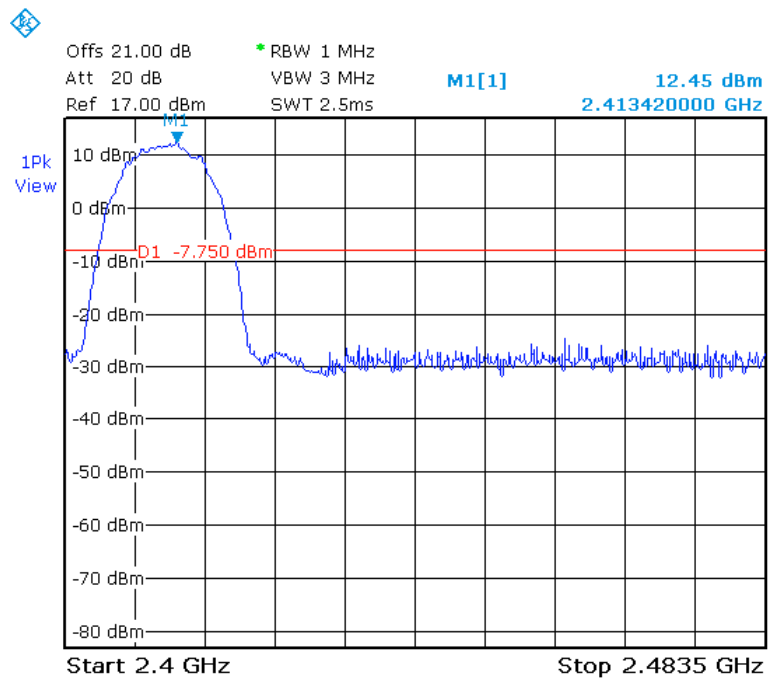
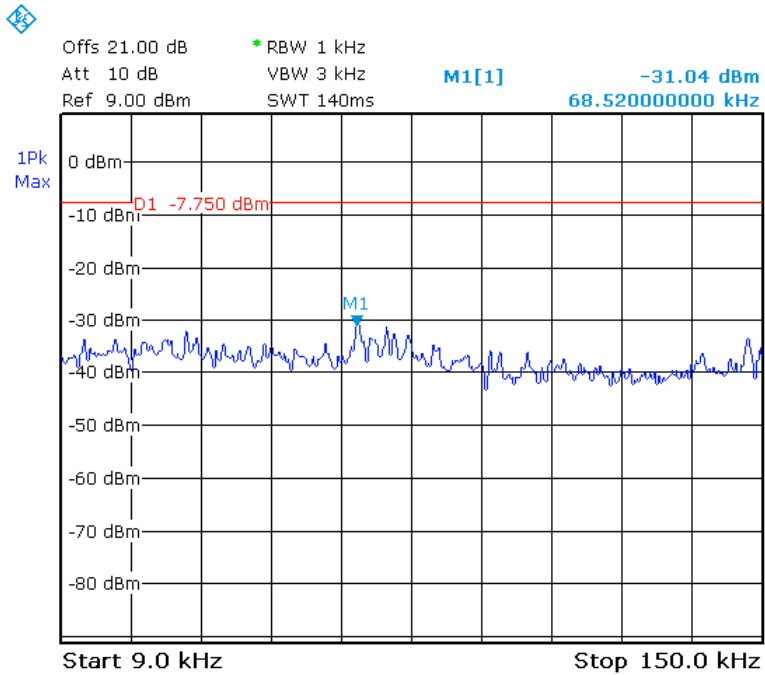


Figure 56 —2412 MHz 1Mbps



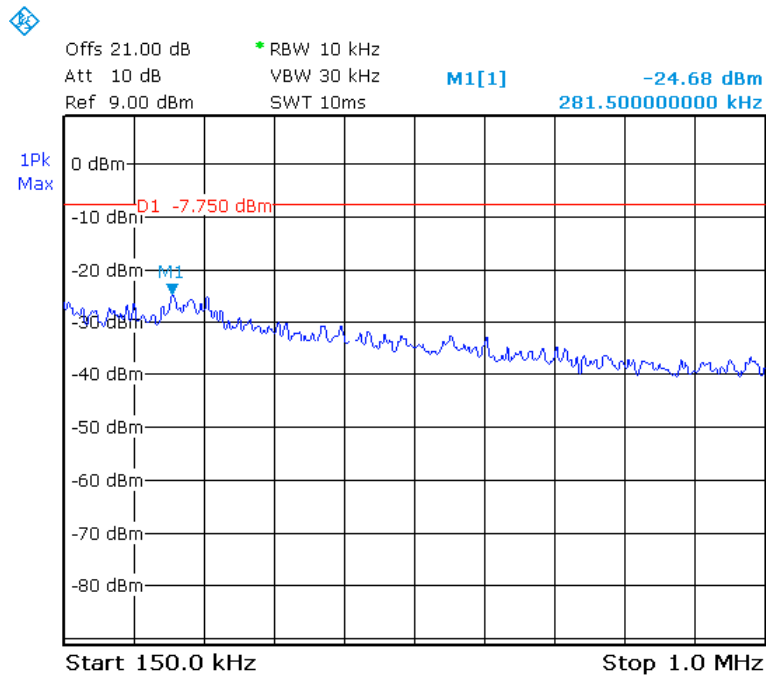
Date: 27.OCT.2010 10:57:29

Figure 57 —2412 MHz 11Mbps



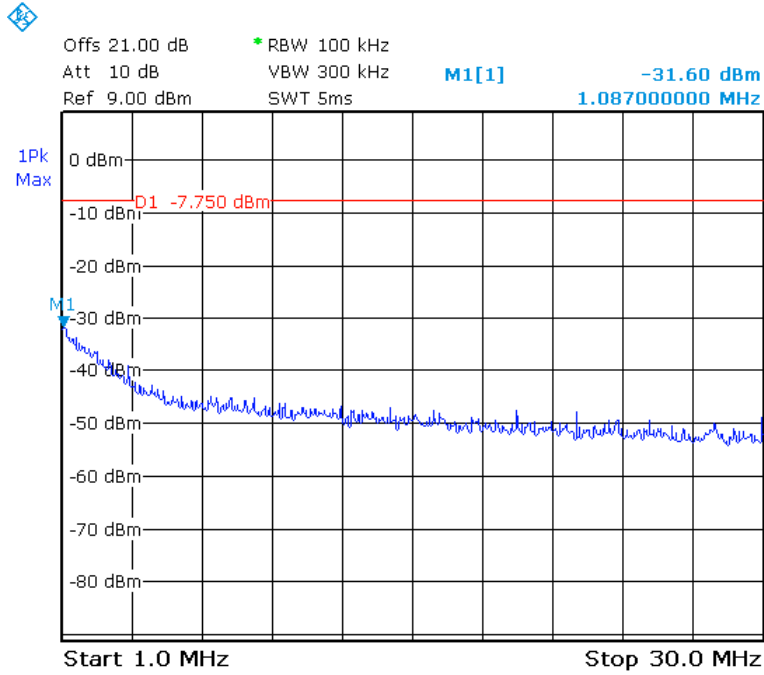
Date: 27.OCT.2010 10:58:26

**Figure 58 —2412 MHz 11Mbps**



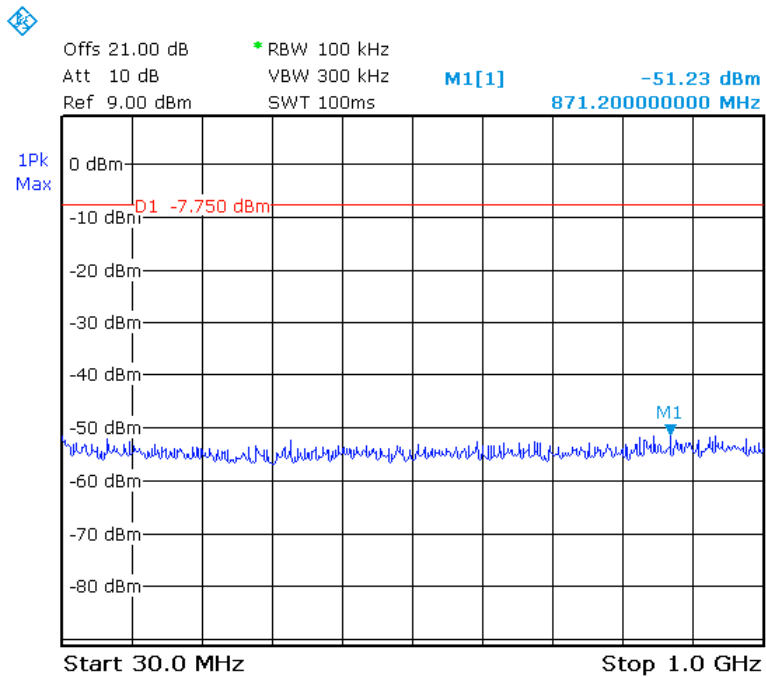
Date: 27.OCT.2010 10:59:18

**Figure 59 —2412 MHz 11Mbps**



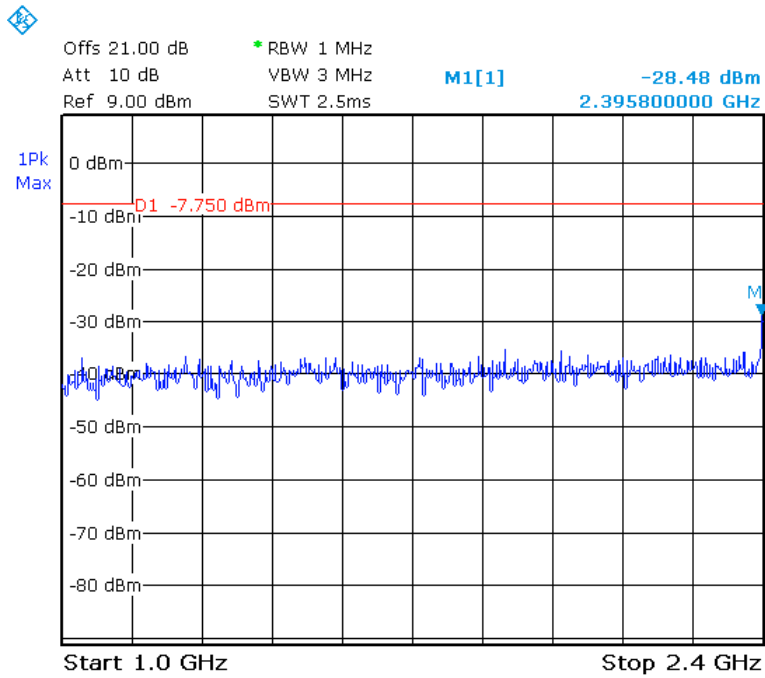
Date: 27.OCT.2010 10:59:59

**Figure 60 —2412 MHz 11Mbps**



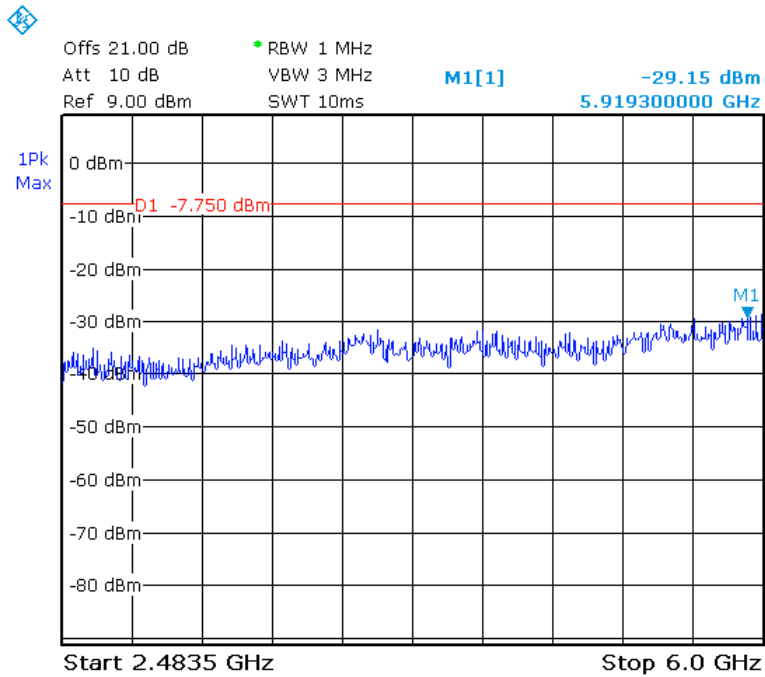
Date: 27.OCT.2010 11:01:19

**Figure 61 —2412 MHz 11Mbps**



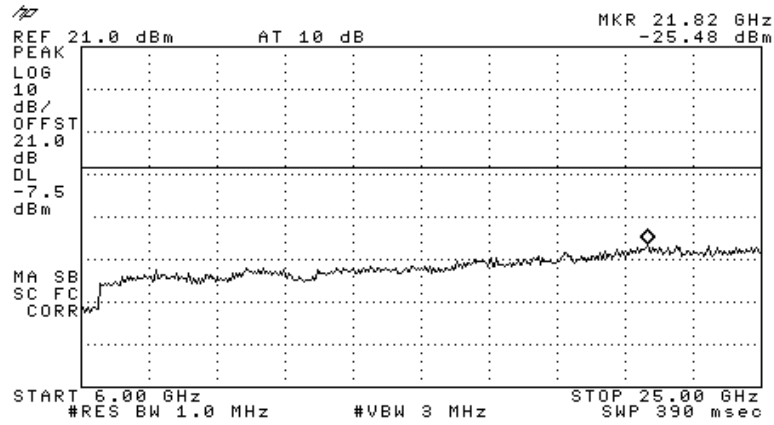
Date: 27.OCT.2010 11:03:04

**Figure 62 —2412 MHz 11Mbps**

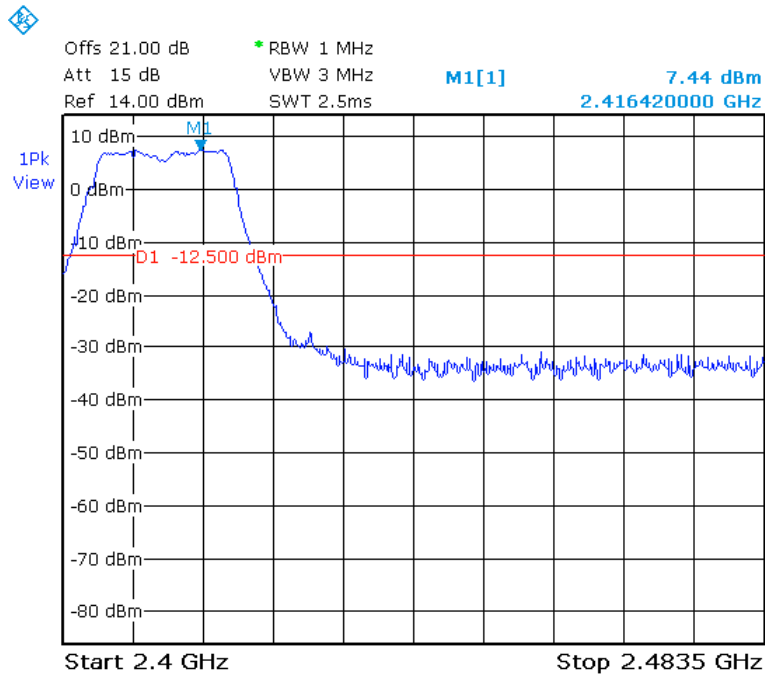


Date: 27.OCT.2010 11:03:58

**Figure 63 —2412 MHz 11Mbps**



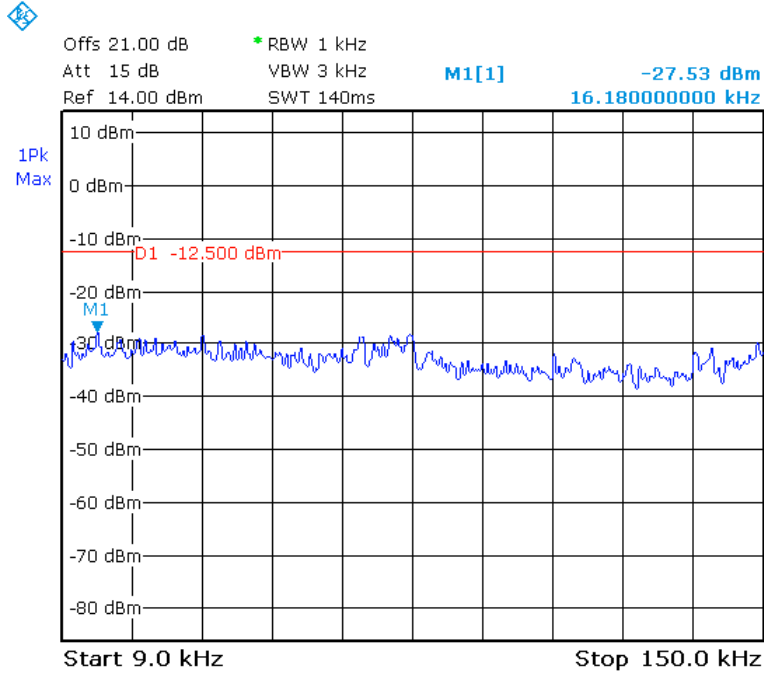
**Figure 64 —2412 MHz 11Mbps**



Date: 27.OCT.2010 11:10:17

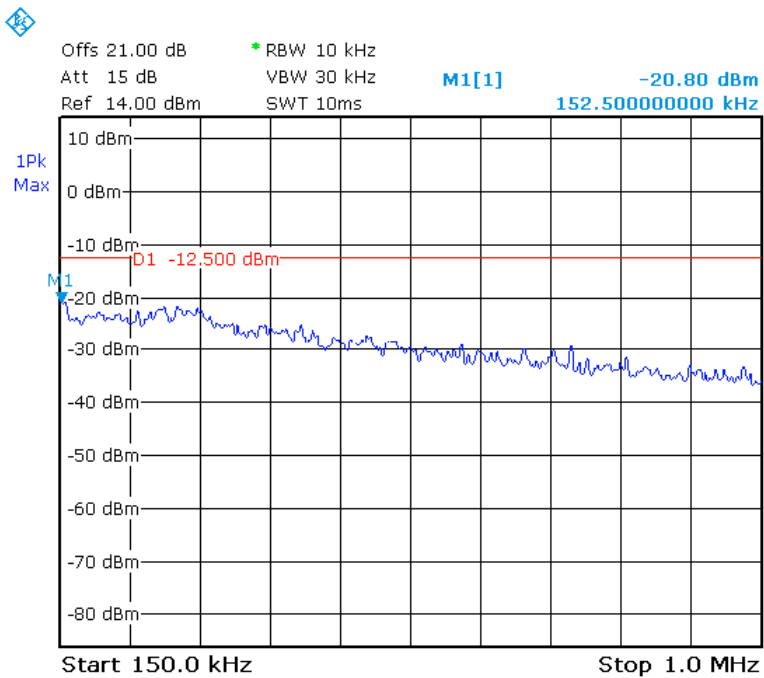
**Figure 65 —2412 MHz 6Mbps**





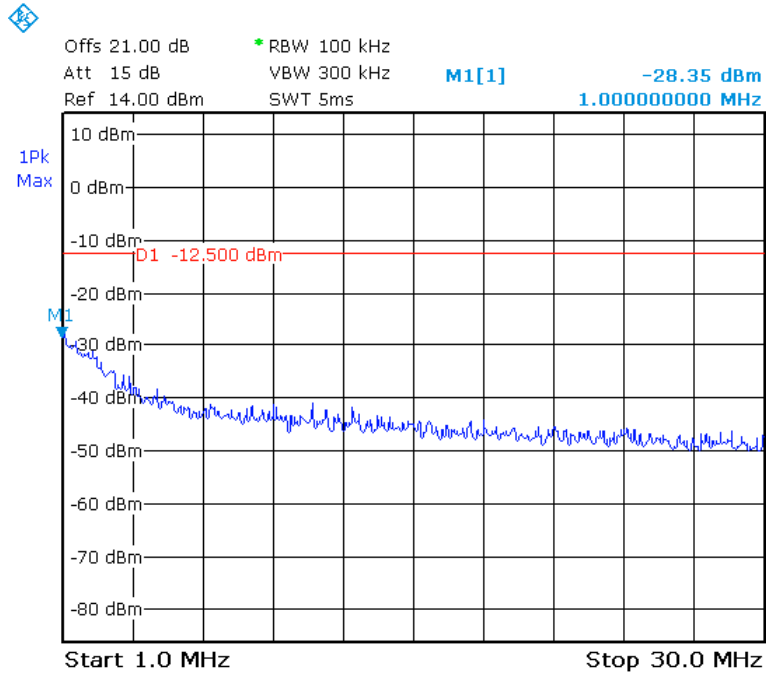
Date: 27.OCT.2010 11:10:54

**Figure 66 —2412 MHz 6Mbps**



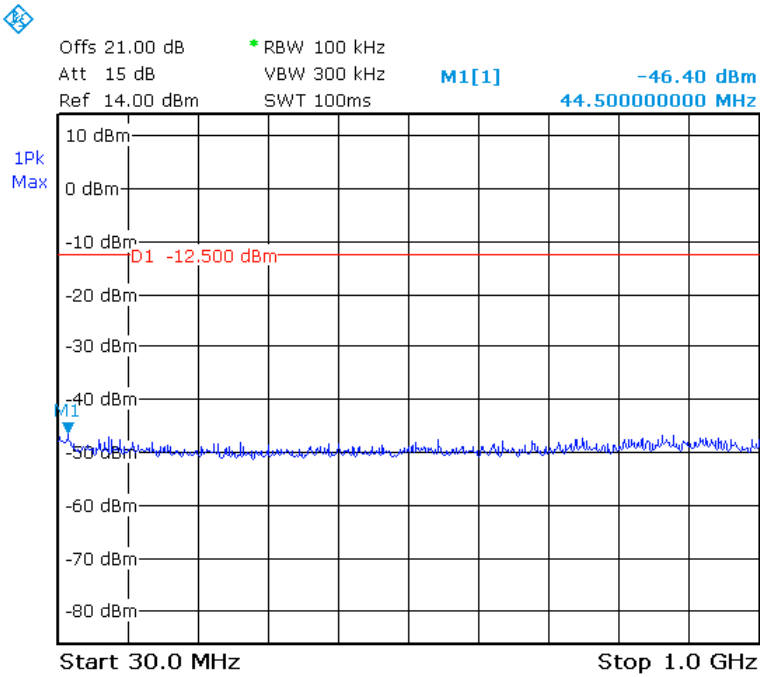
Date: 27.OCT.2010 11:11:33

**Figure 67 —2412 MHz 6Mbps**



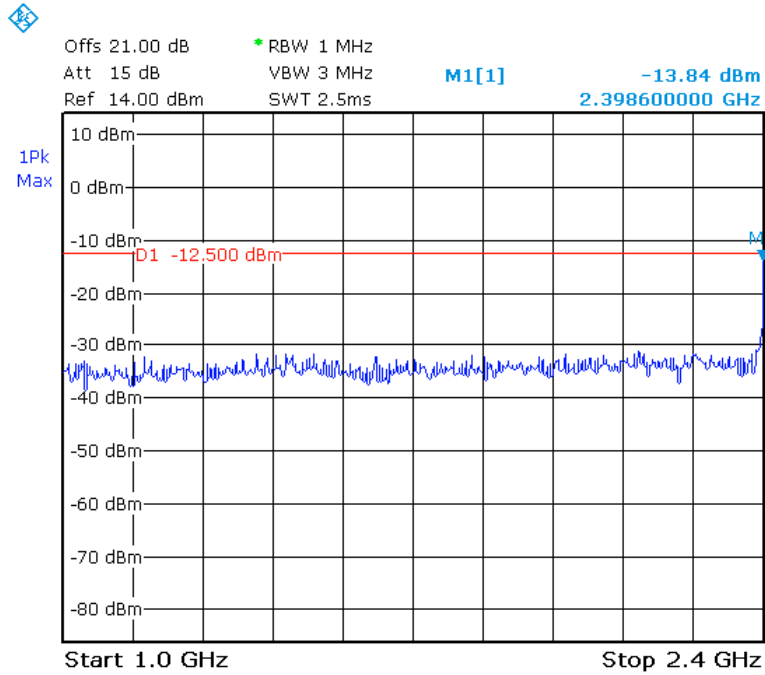
Date: 27.OCT.2010 11:12:07

**Figure 68 —2412 MHz 6Mbps**



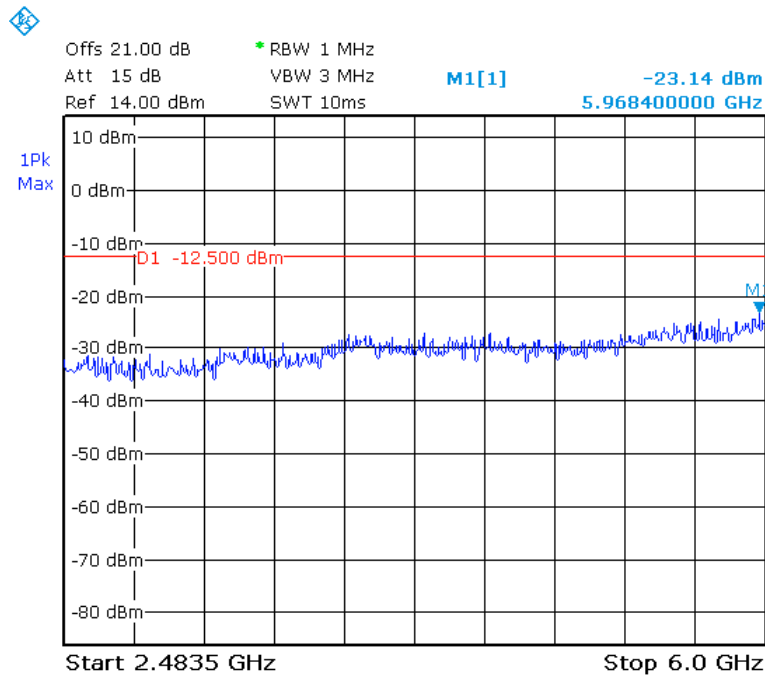
Date: 27.OCT.2010 11:13:08

**Figure 69 —2412 MHz 6Mbps**



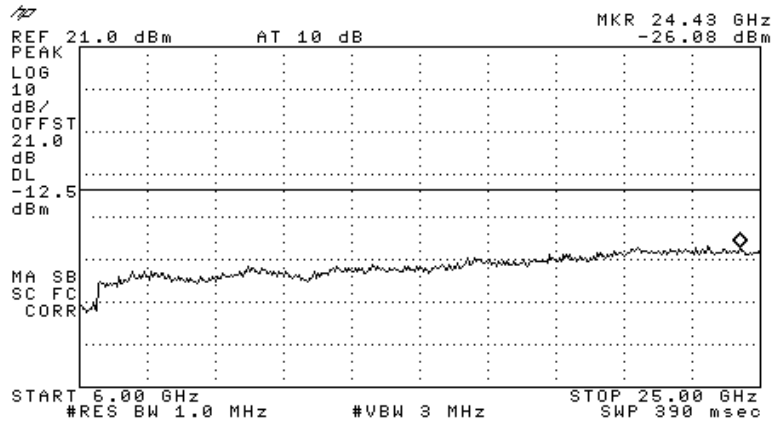
Date: 27.OCT.2010 11:15:51

**Figure 70 —2412 MHz 6Mbps**

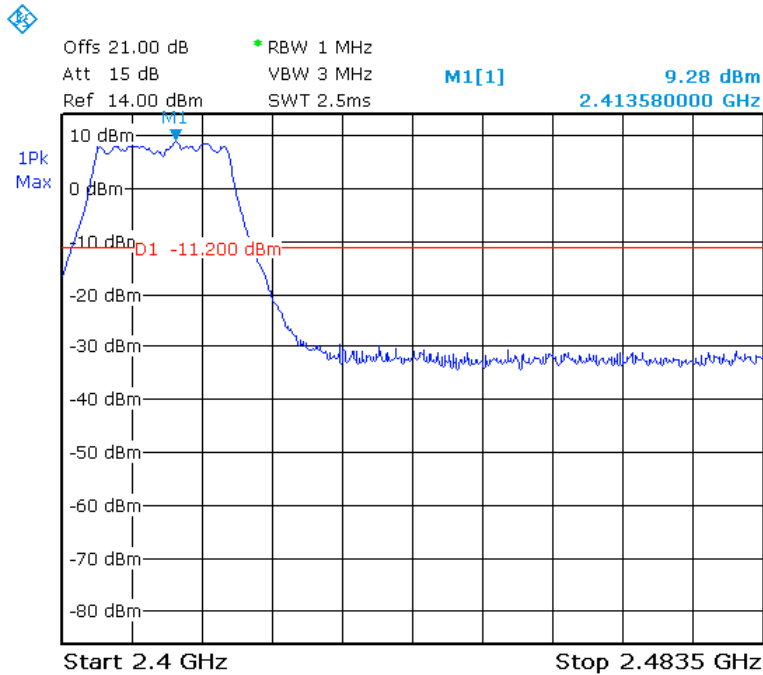


Date: 27.OCT.2010 11:14:52

**Figure 71 —2412 MHz 6Mbps**

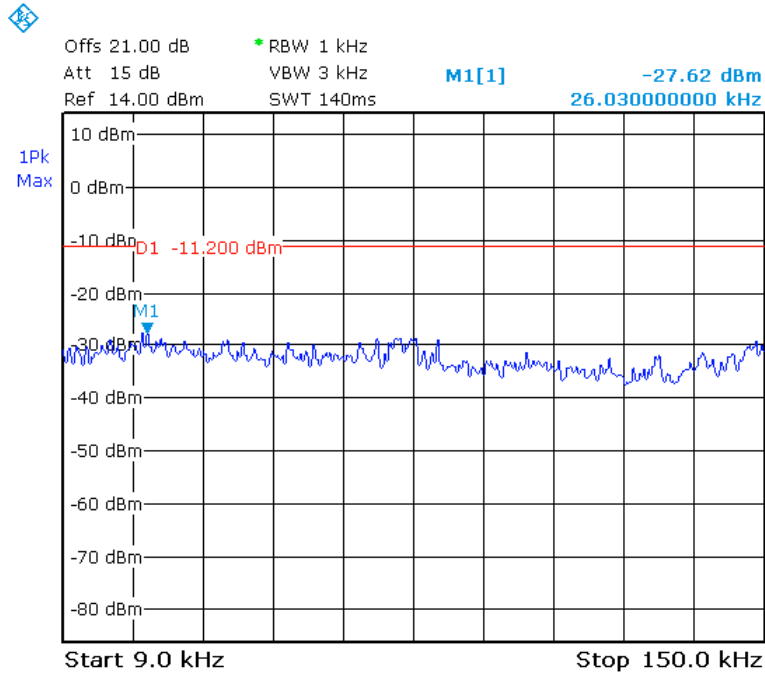


**Figure 72 —2412 MHz 6Mbps**



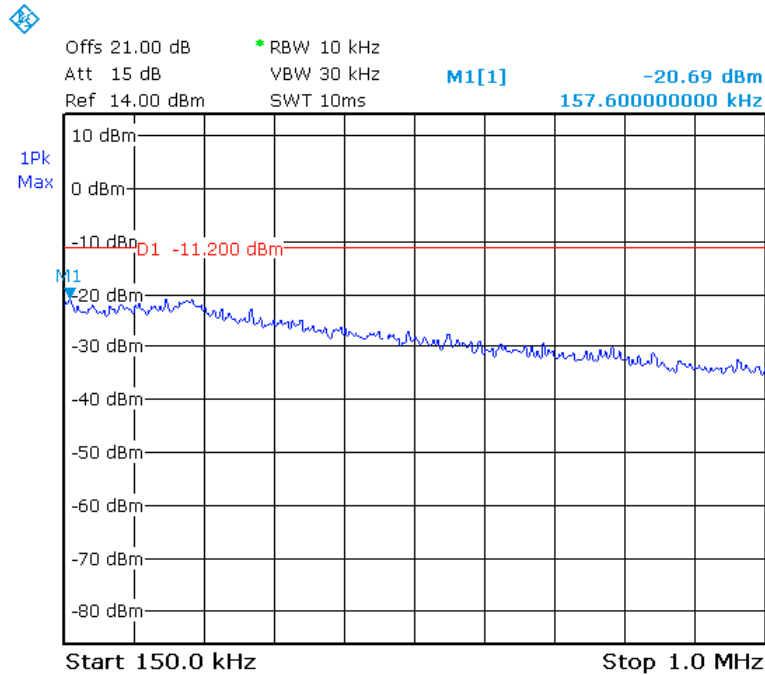
Date: 27.OCT.2010 11:18:29

**Figure 73 —2412 MHz 54Mbps**



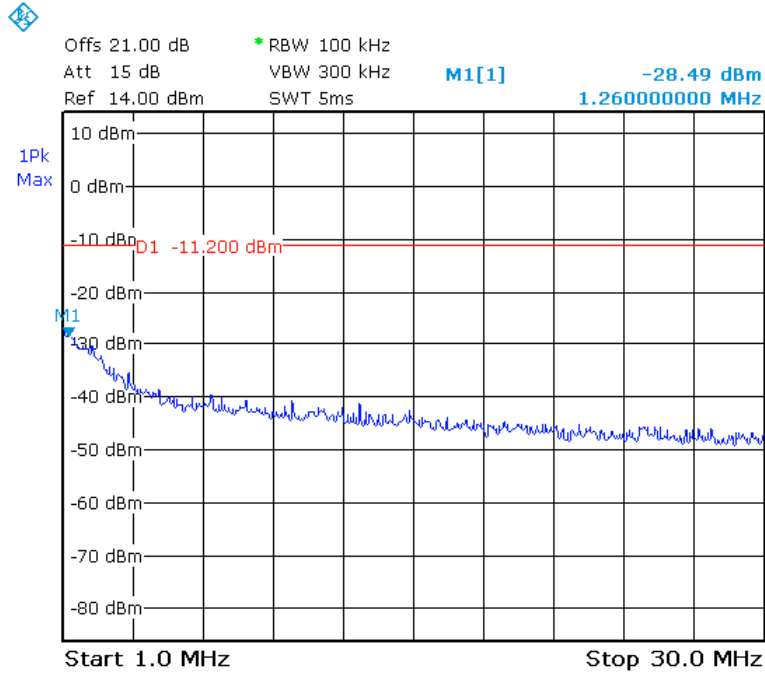
Date: 27.OCT.2010 11:19:11

**Figure 74 —2412 MHz 54Mbps**



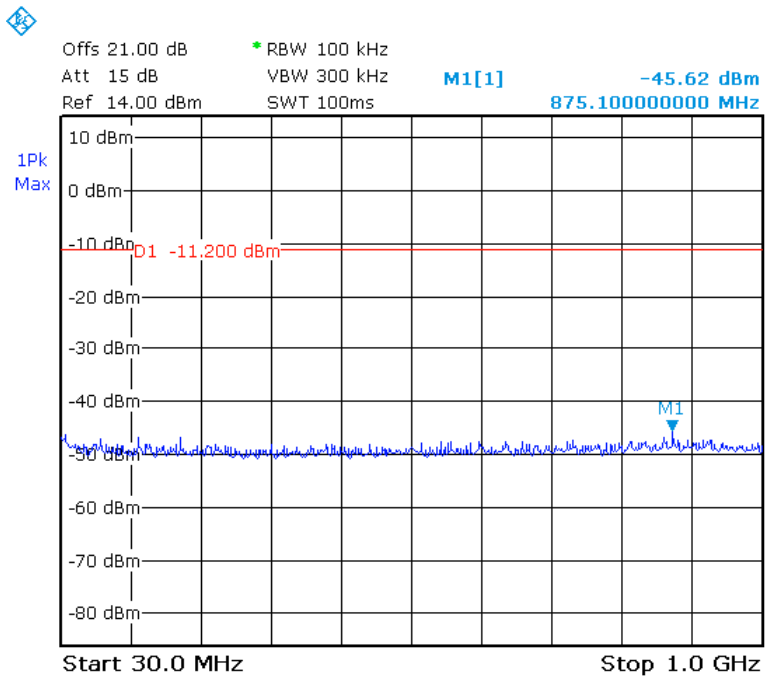
Date: 27.OCT.2010 11:19:53

**Figure 75 —2412 MHz 54Mbps**



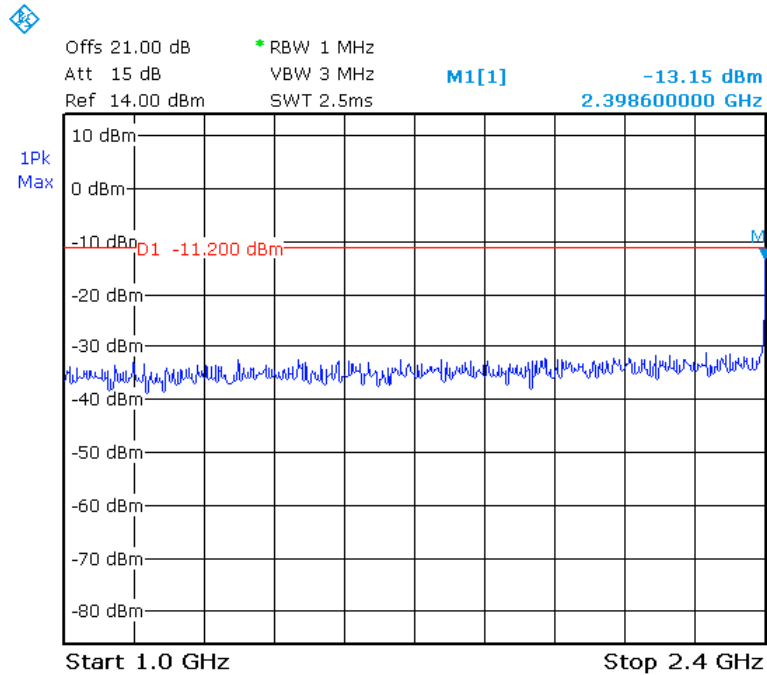
Date: 27.OCT.2010 11:20:34

**Figure 76 —2412 MHz 54Mbps**



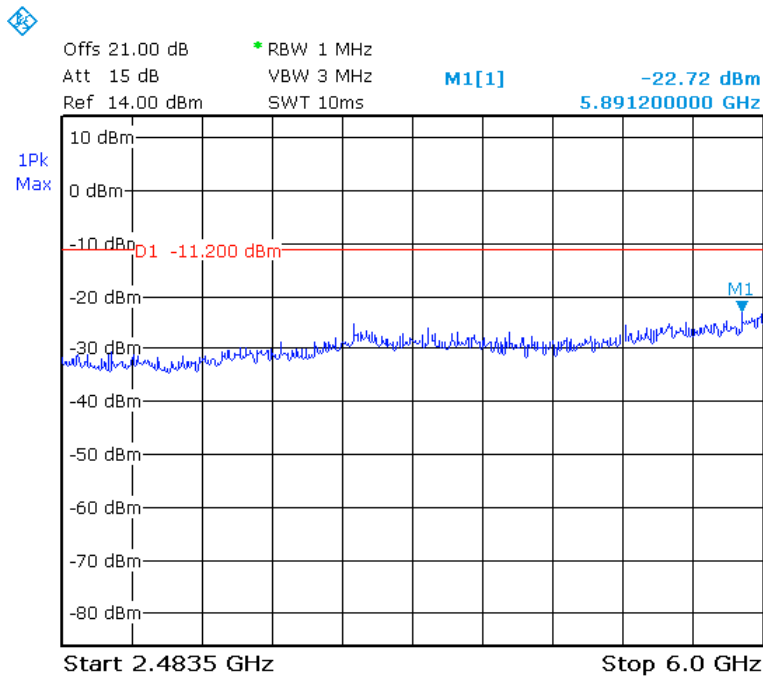
Date: 27.OCT.2010 11:21:29

**Figure 77 —2412 MHz 54Mbps**



Date: 27.OCT.2010 11:22:26

Figure 78 —2412 MHz 54Mbps



Date: 27.OCT.2010 11:23:40

Figure 79 —2412 MHz 54Mbps

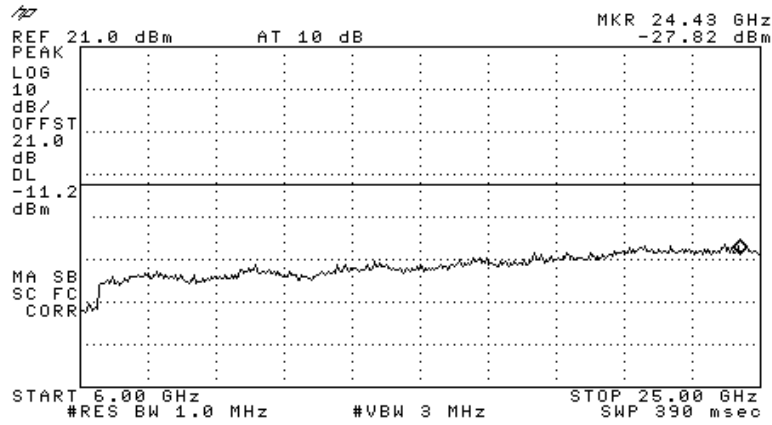


Figure 80 —2412 MHz 54Mbps

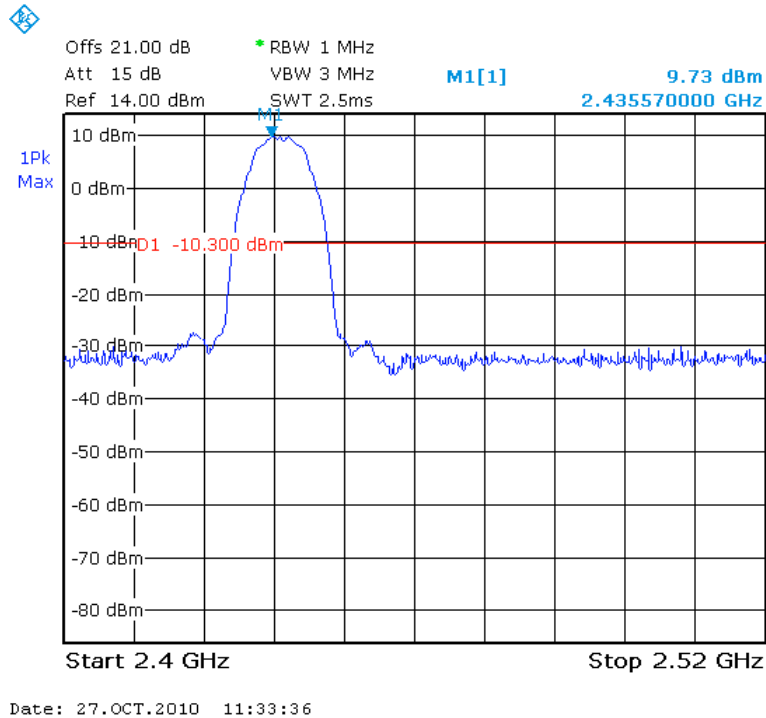
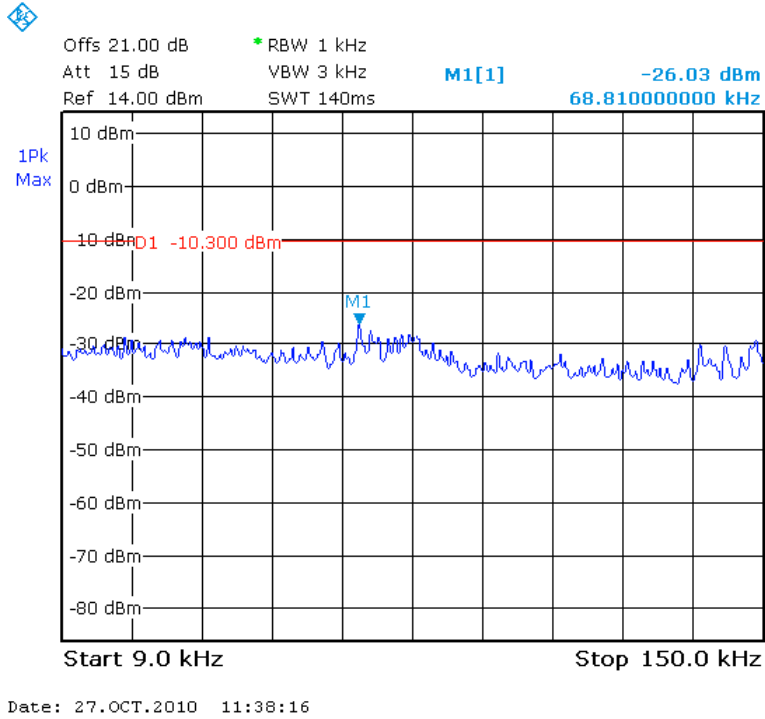
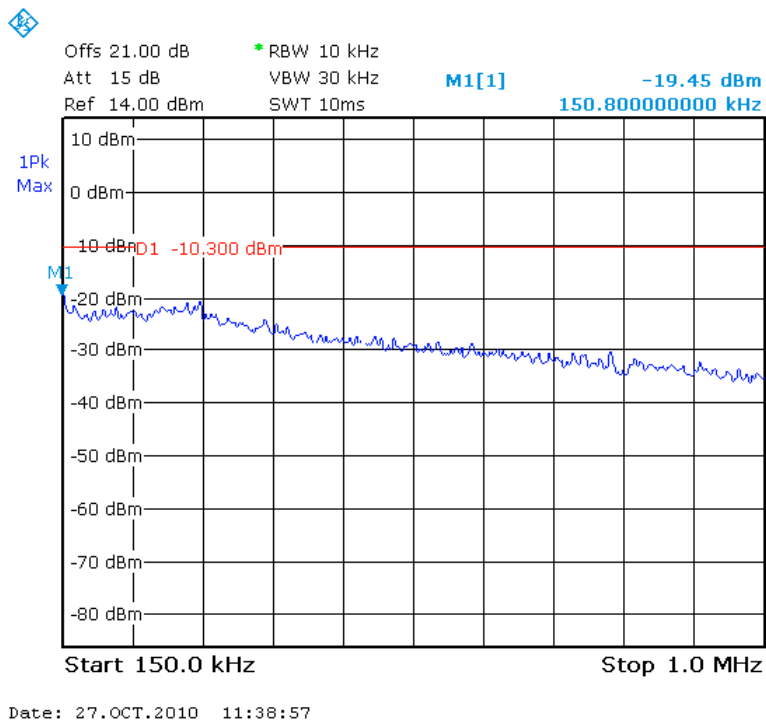


Figure 81 —2437 MHz 1Mbps

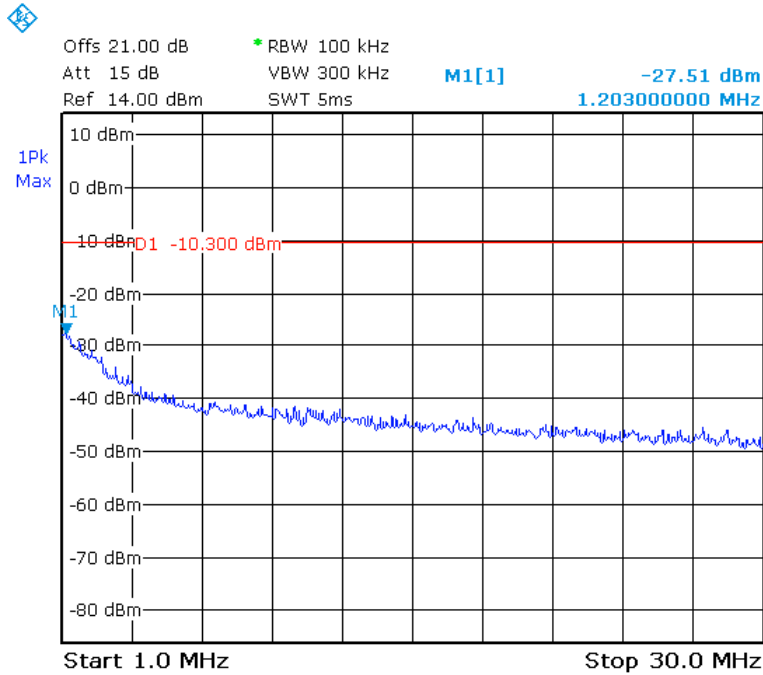




**Figure 82 —2437 MHz 1Mbps**

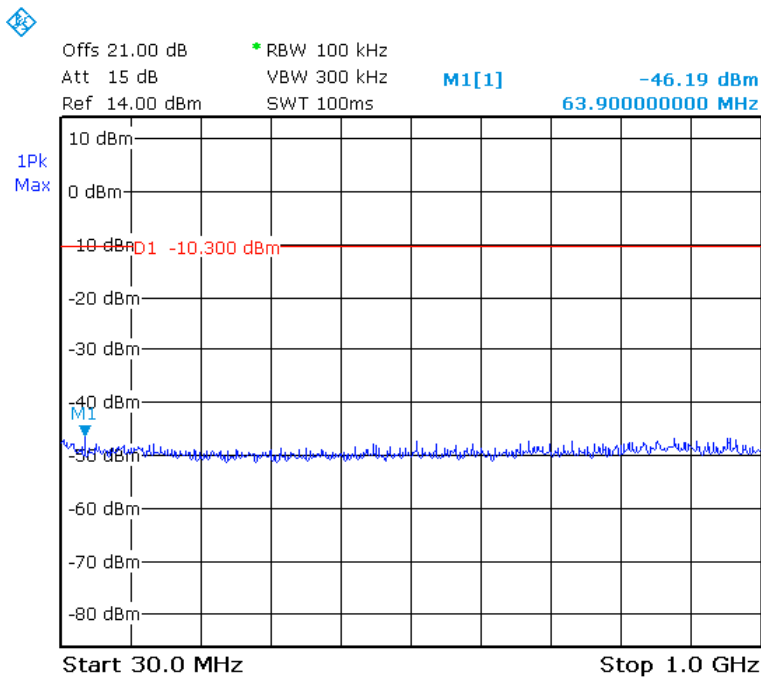


**Figure 83 —2437 MHz 1Mbps**



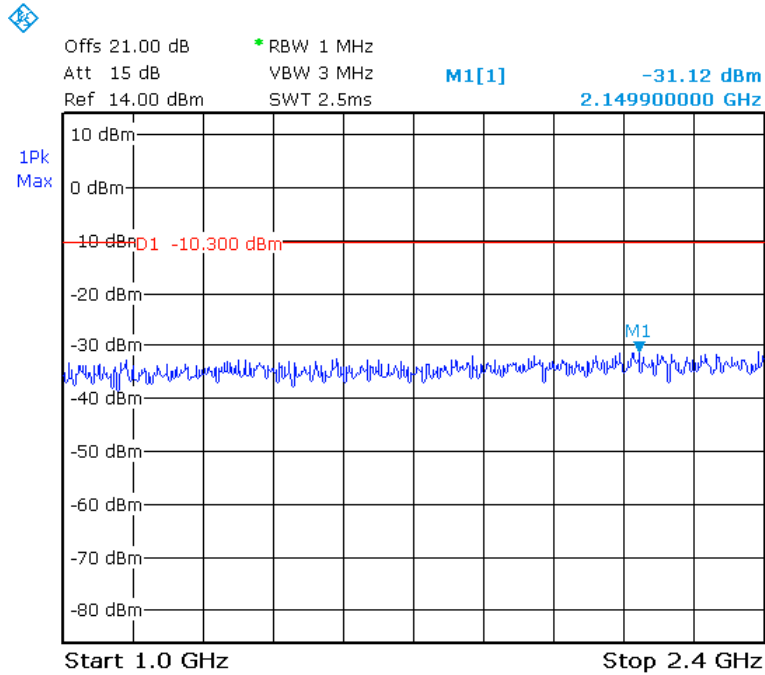
Date: 27.OCT.2010 11:39:54

**Figure 84 —2437 MHz 1Mbps**



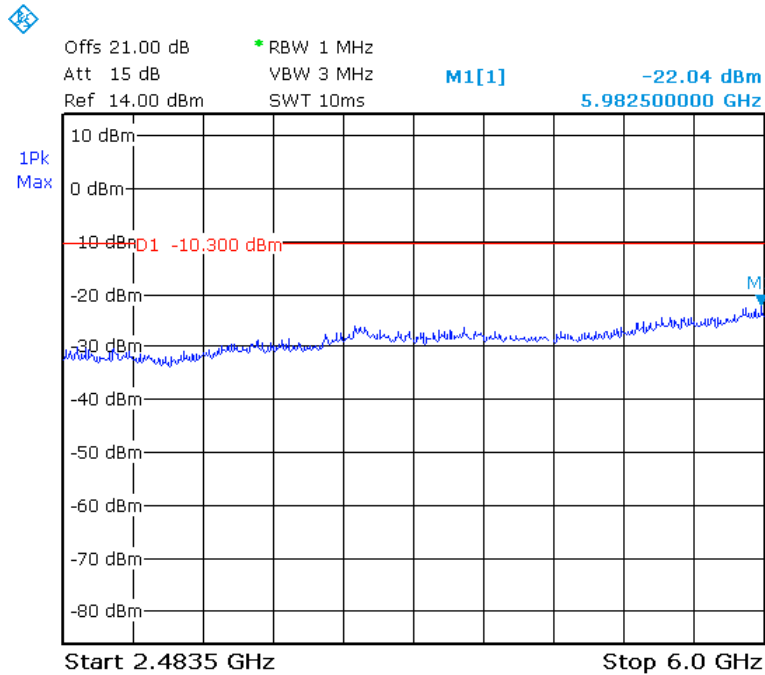
Date: 27.OCT.2010 11:40:37

**Figure 85 —2437 MHz 1Mbps**



Date: 27.OCT.2010 11:42:54

**Figure 86 —2437 MHz 1Mbps**



Date: 27.OCT.2010 11:47:16

**Figure 87 —2437 MHz 1Mbps**

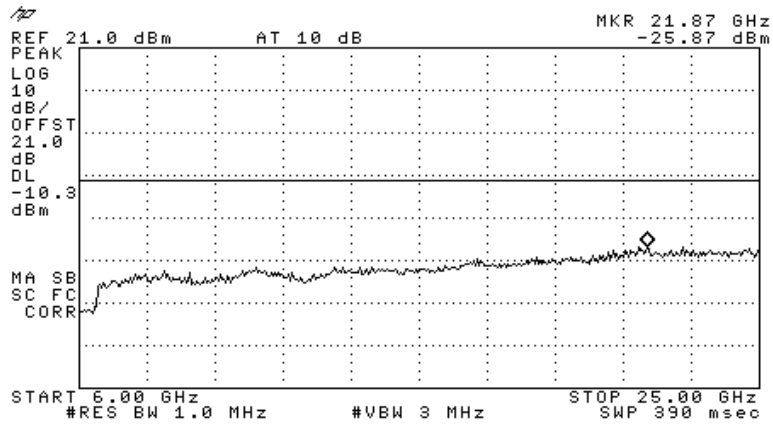
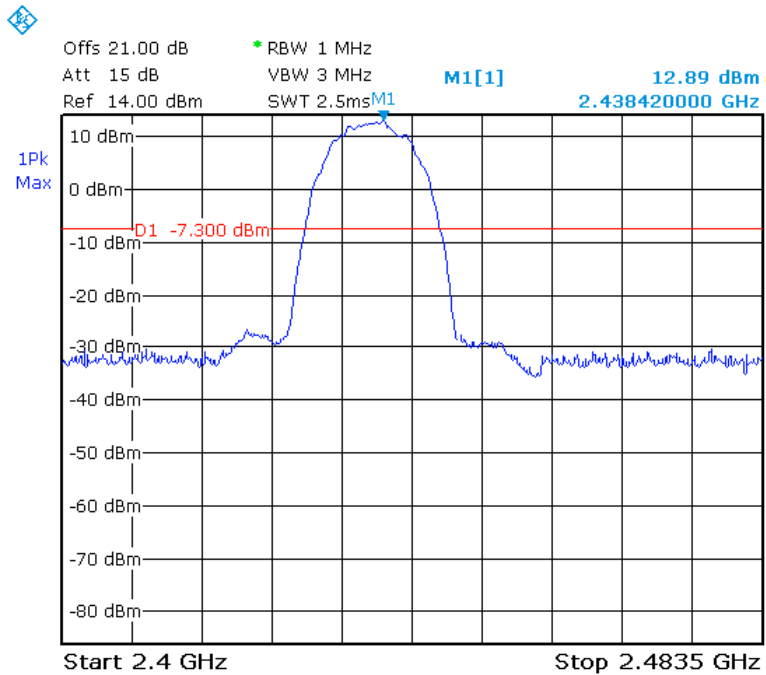


Figure 88 —2437 MHz 1Mbps



Date: 27.OCT.2010 12:53:45

Figure 89 —2437 MHz 11Mbps

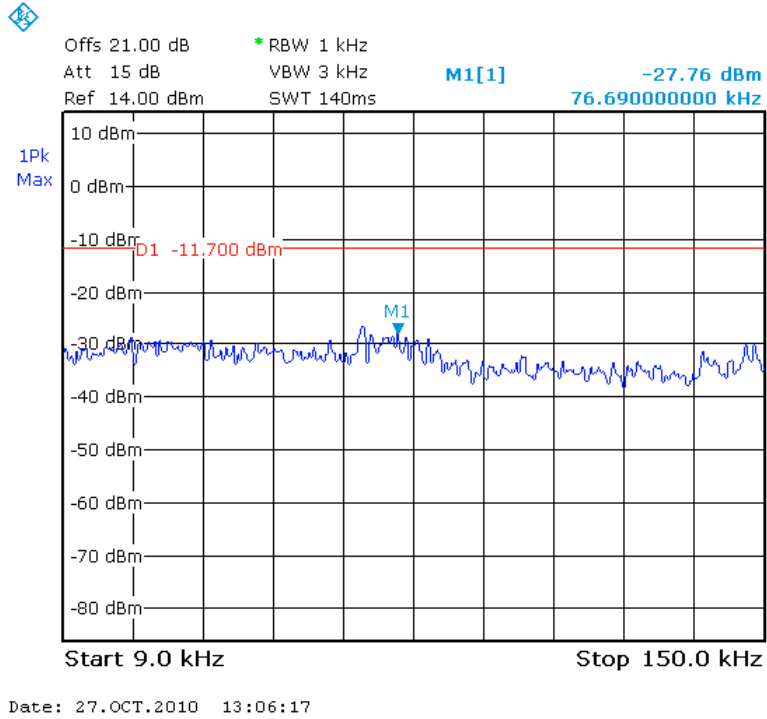




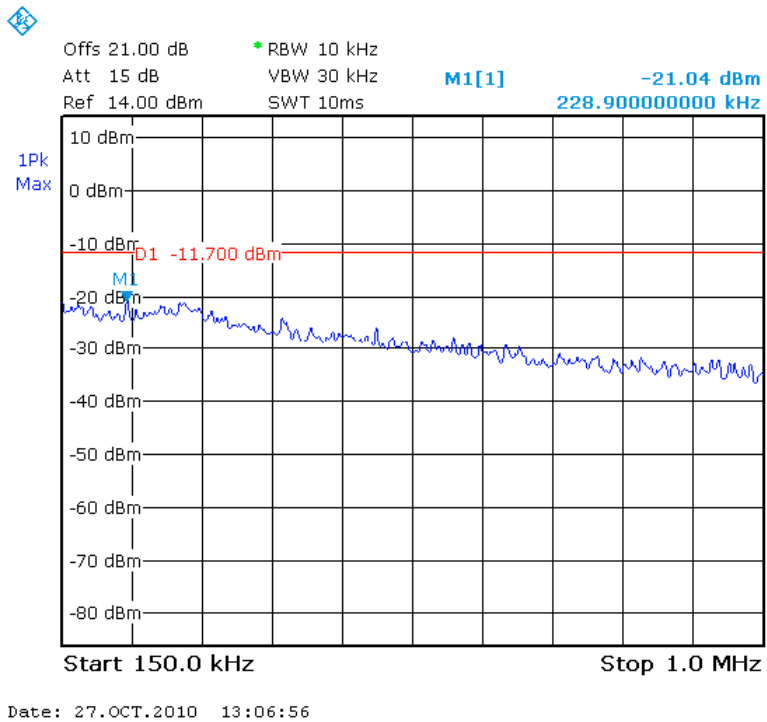






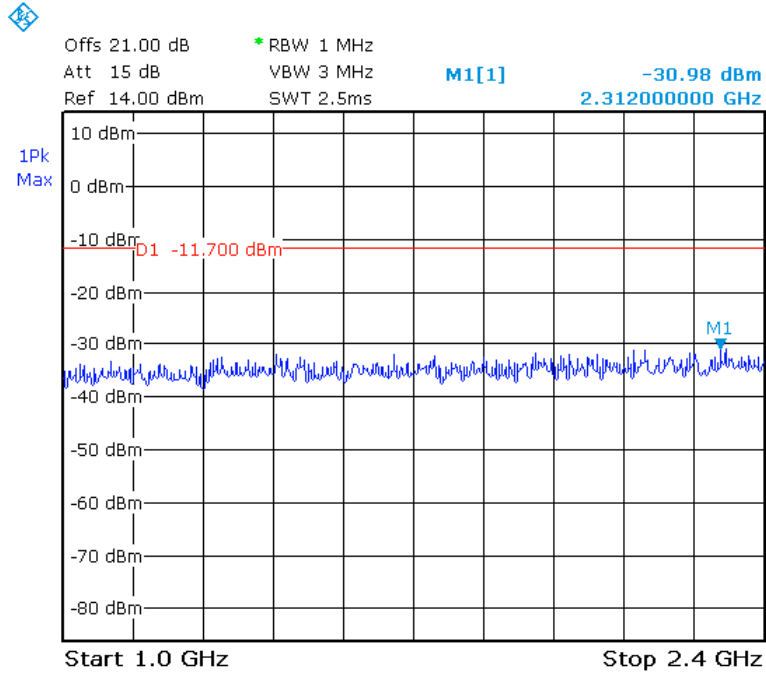


**Figure 98 —2437 MHz 6Mbps**



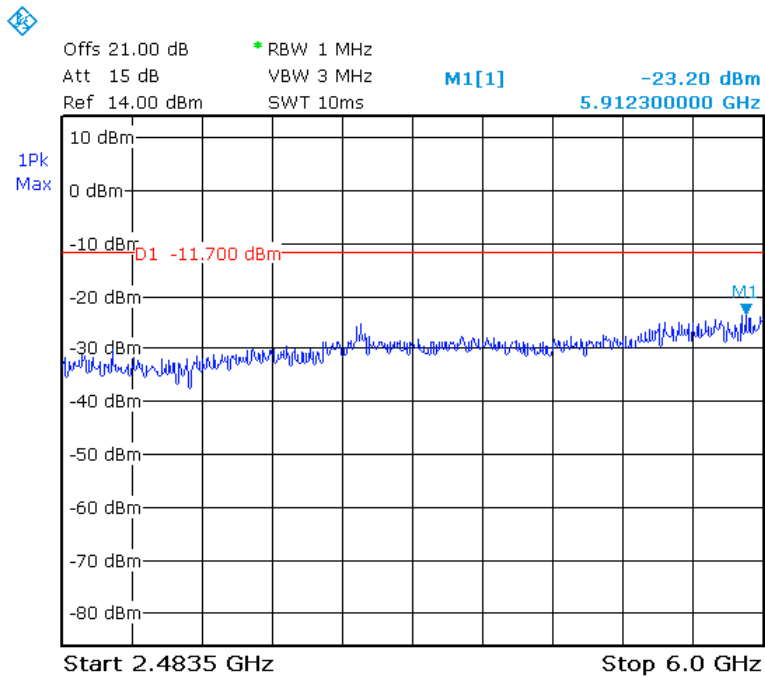
**Figure 99 —2437 MHz 6Mbps**





Date: 27.OCT.2010 13:09:06

**Figure 102 —2437 MHz 6Mbps**

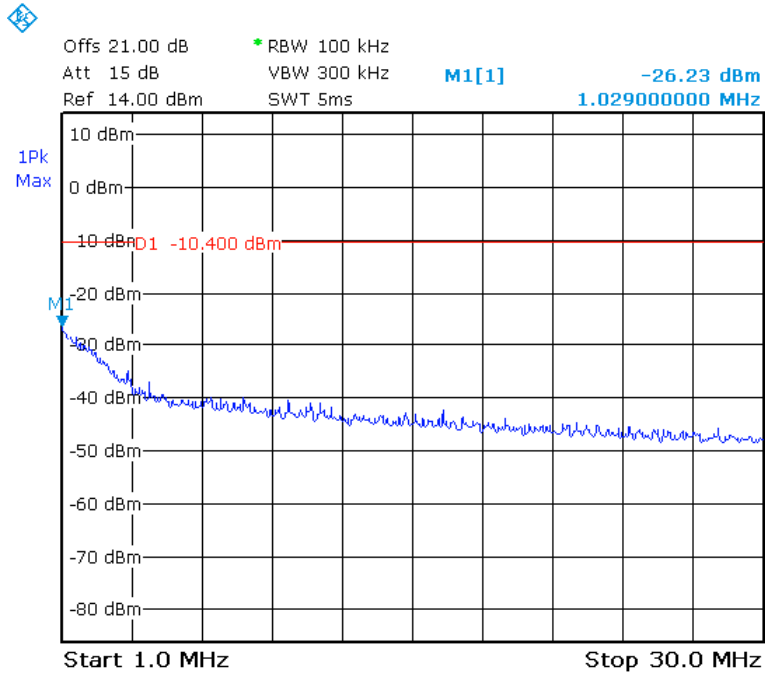


Date: 27.OCT.2010 13:10:05

**Figure 103 —2437 MHz 6Mbps**

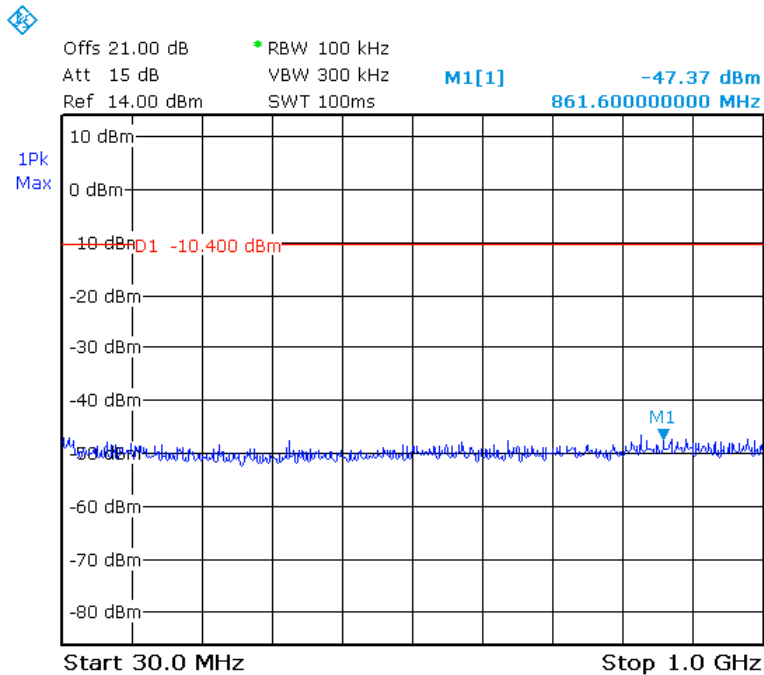






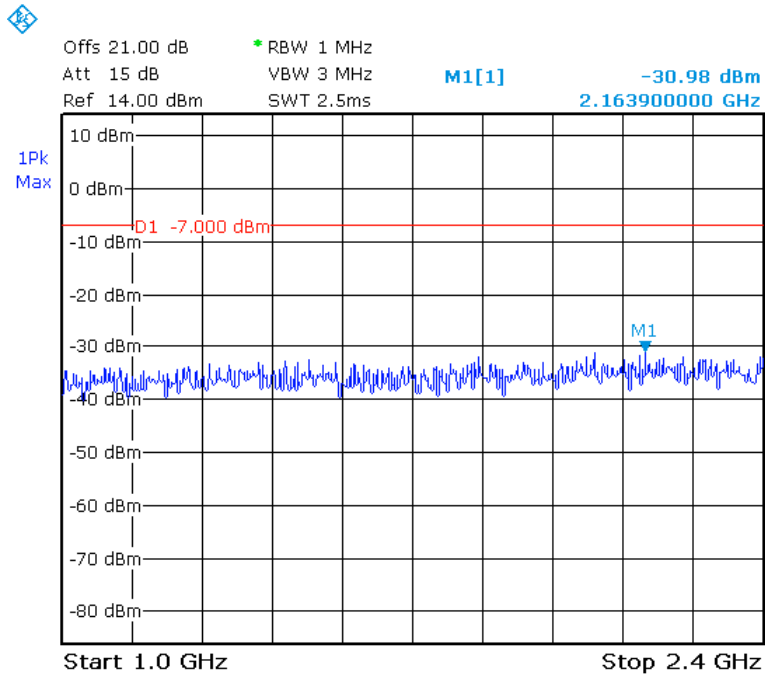
Date: 27.OCT.2010 13:19:25

**Figure 108 —2437 MHz 54Mbps**



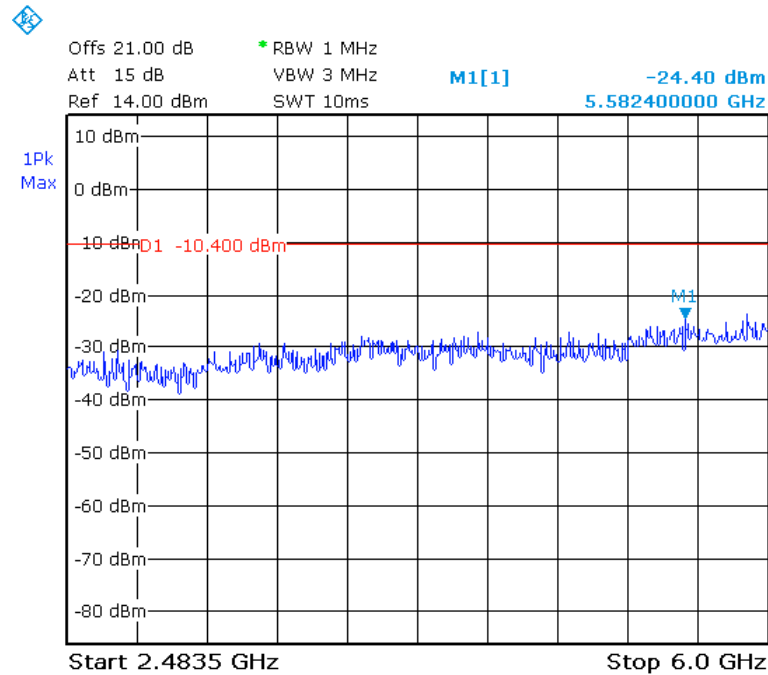
Date: 27.OCT.2010 13:20:01

**Figure 109 —2437 MHz 54Mbps**



Date: 27.OCT.2010 13:37:18

**Figure 110 —2437 MHz 54Mbps**



Date: 27.OCT.2010 13:21:32

**Figure 111 —2437 MHz 54Mbps**

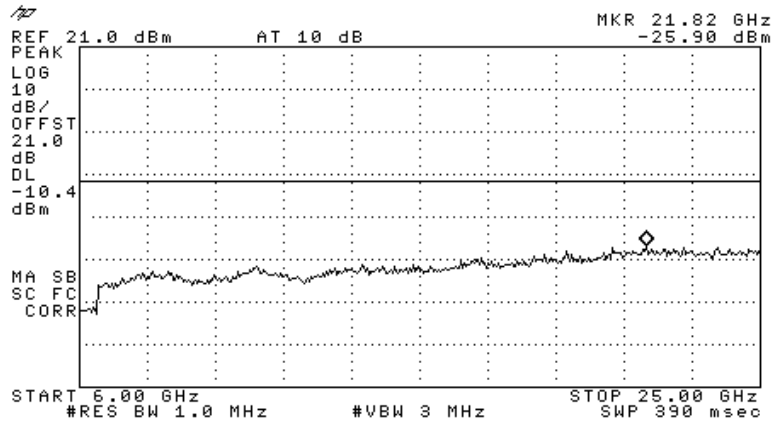
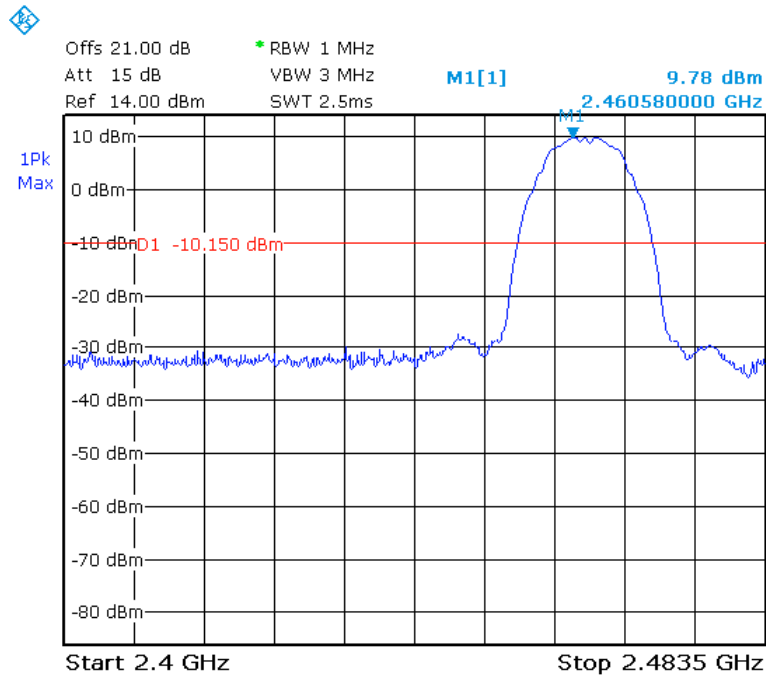


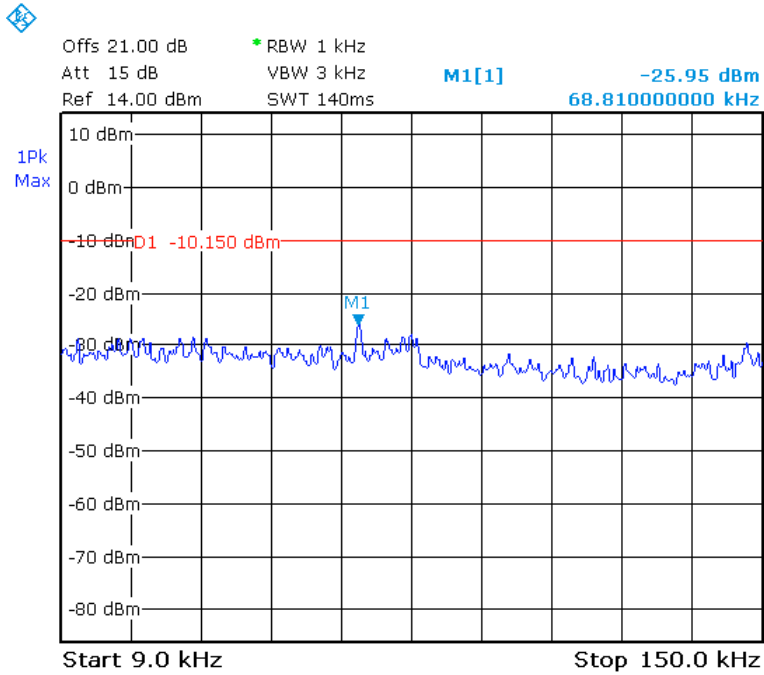
Figure 112 —2437 MHz 54Mbps



Date: 27.OCT.2010 13:27:08

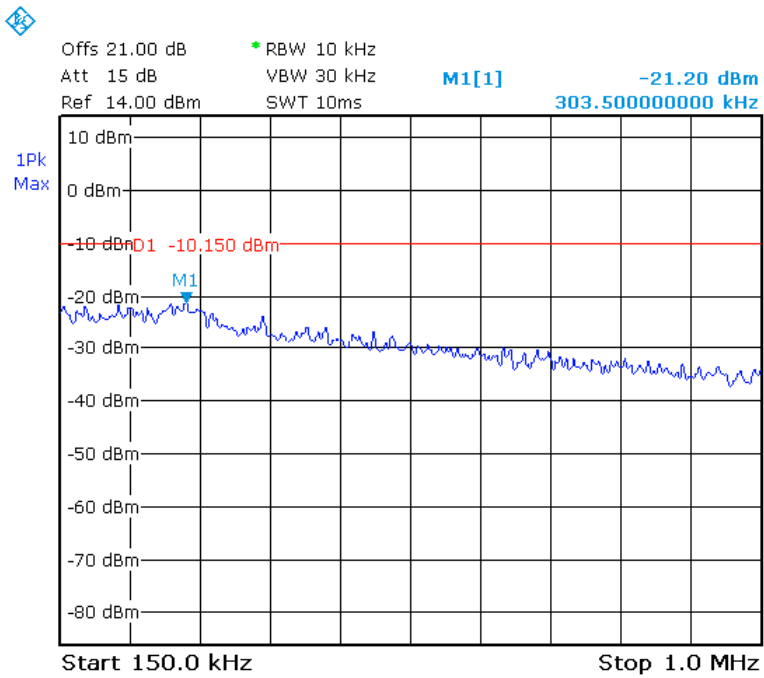
Figure 113 —2462 MHz 1Mbps





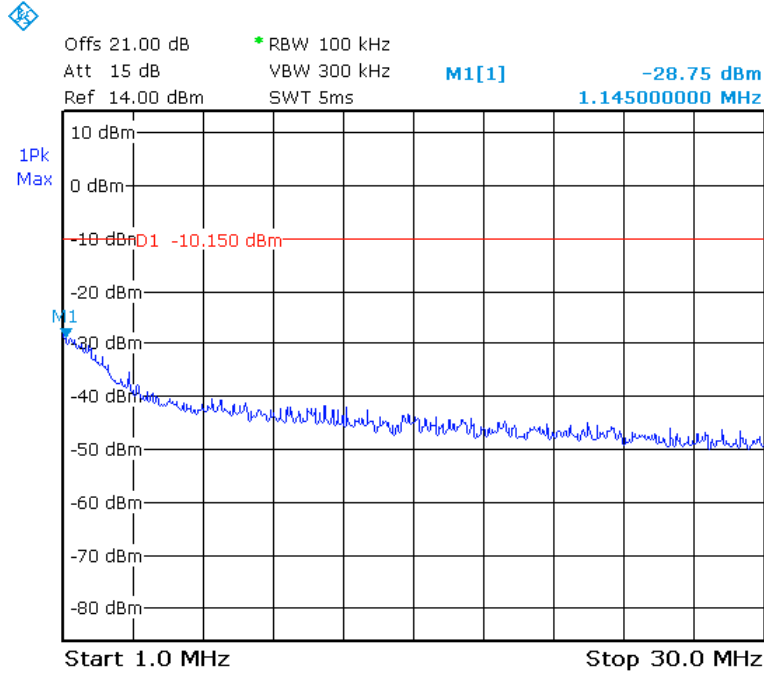
Date: 27.OCT.2010 13:27:57

**Figure 114 —2462 MHz 1Mbps**



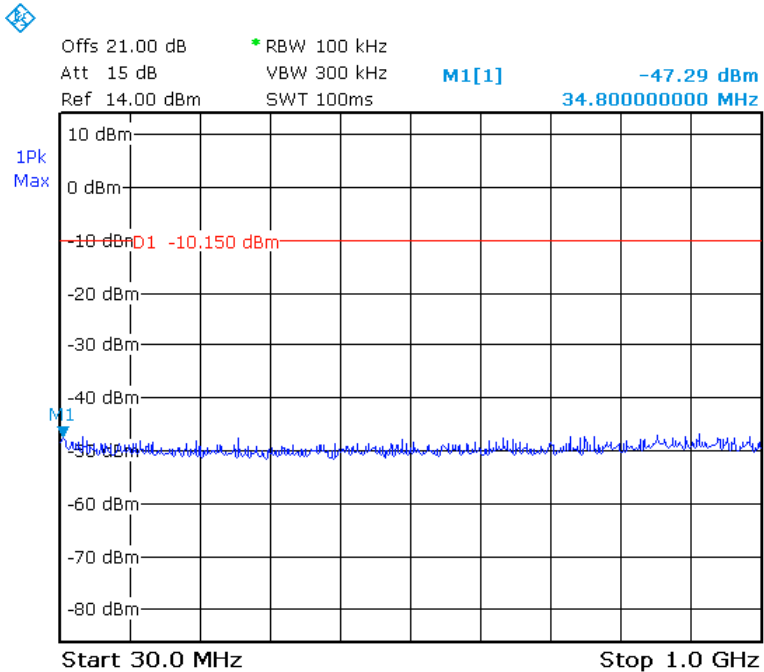
Date: 27.OCT.2010 13:28:28

**Figure 115 —2462 MHz 1Mbps**



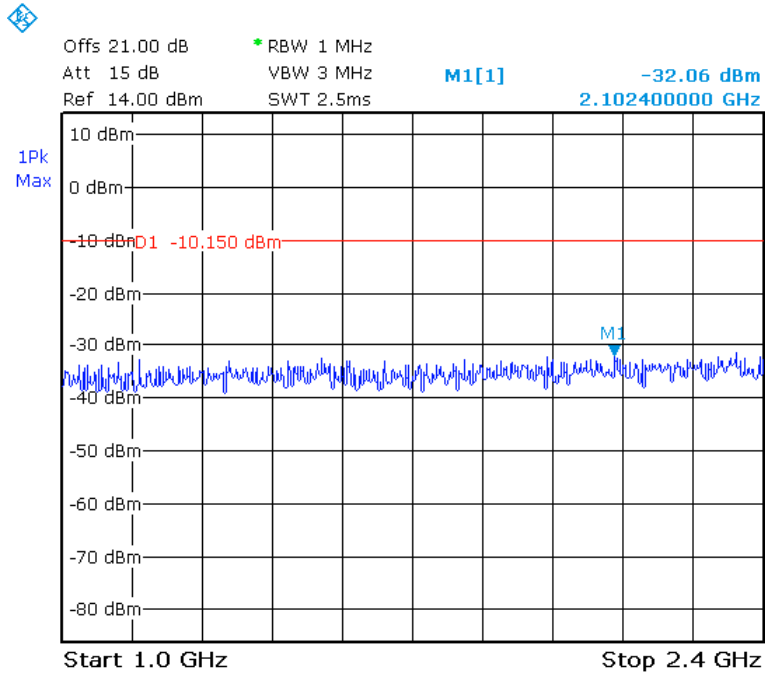
Date: 27.OCT.2010 13:29:01

Figure 116 —2462 MHz 1Mbps



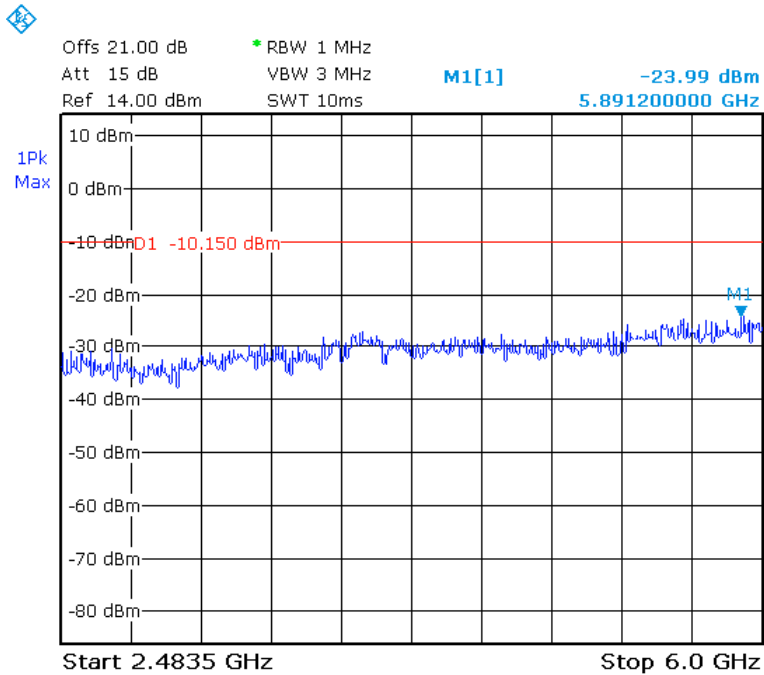
Date: 27.OCT.2010 13:29:38

Figure 117 —2462 MHz 1Mbps



Date: 27.OCT.2010 13:30:19

**Figure 118 —2462 MHz 1Mbps**



Date: 27.OCT.2010 13:31:03

**Figure 119 —2462 MHz 1Mbps**

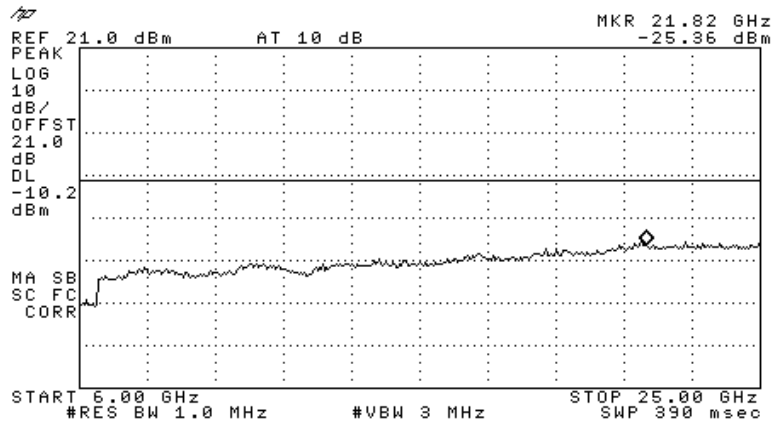
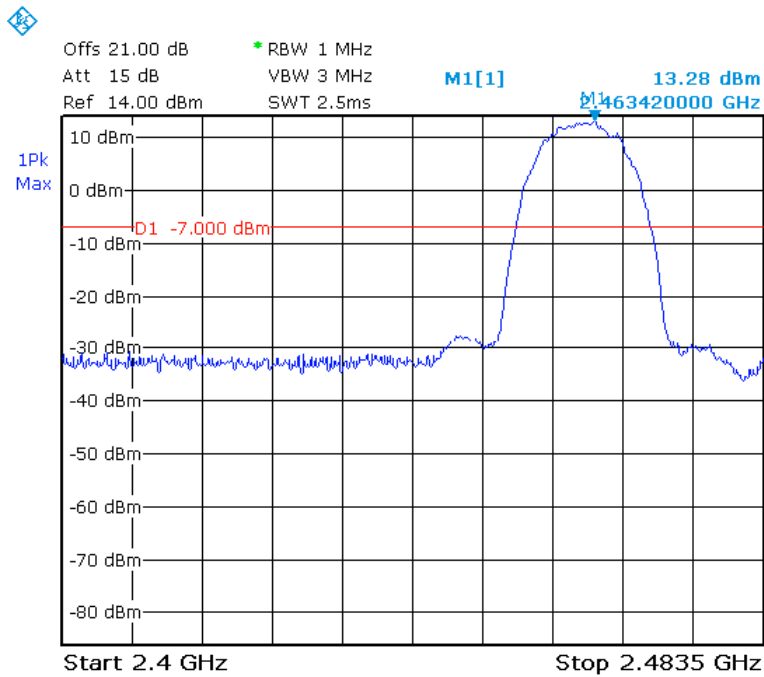


Figure 120 —2462 MHz 1Mbps



Date: 27.OCT.2010 13:34:11

Figure 121 —2462MHz 11Mbps

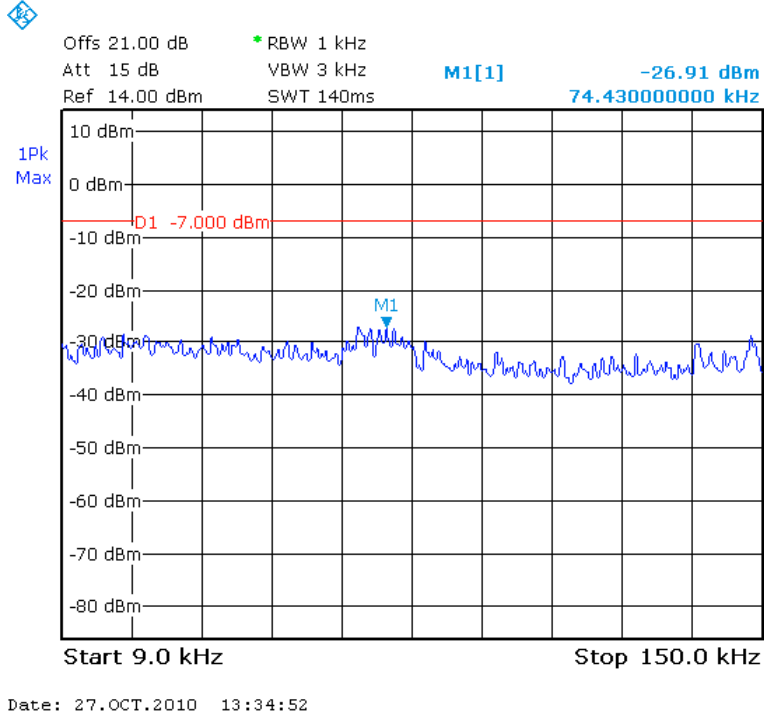


Figure 122 —2462MHz 11Mbps

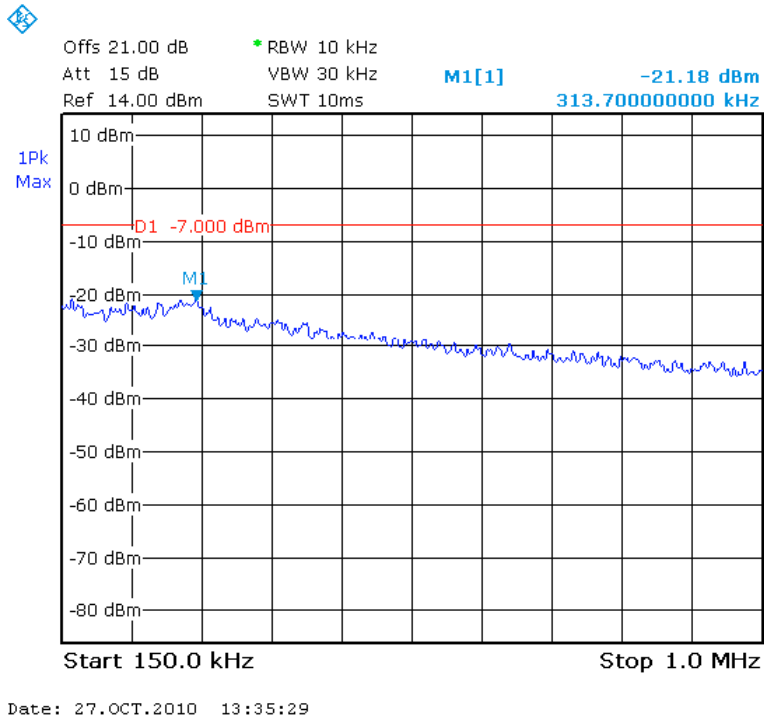
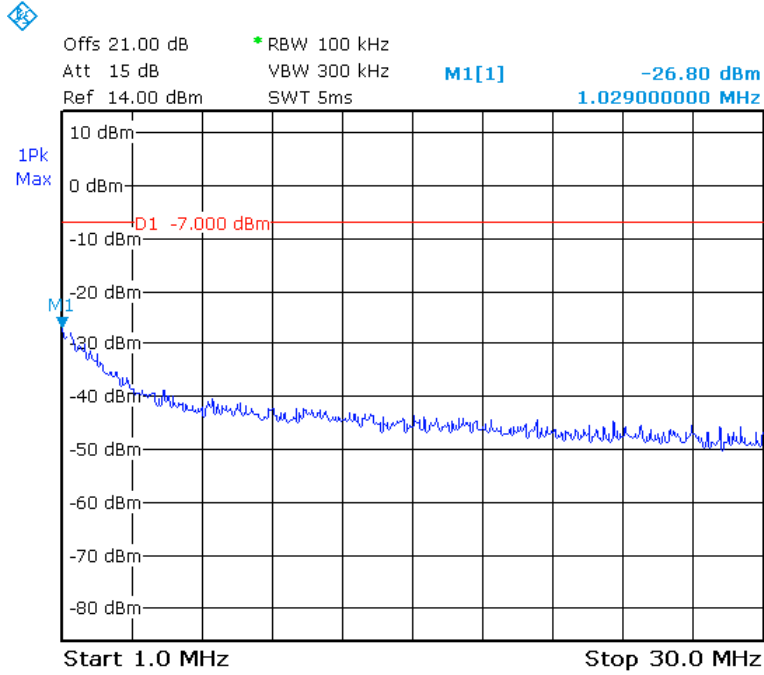
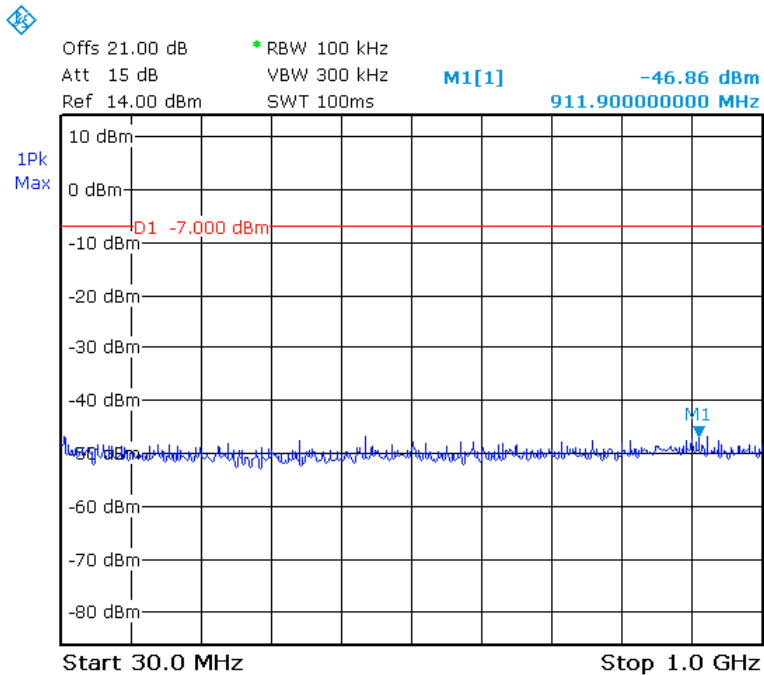


Figure 123 —2462MHz 11Mbps



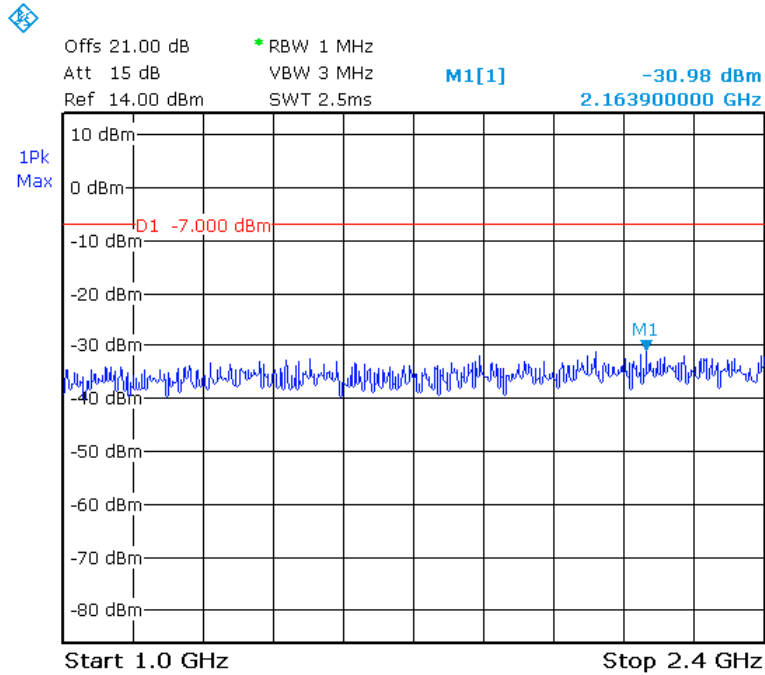
Date: 27.OCT.2010 13:36:08

**Figure 124 —2462MHz 11Mbps**



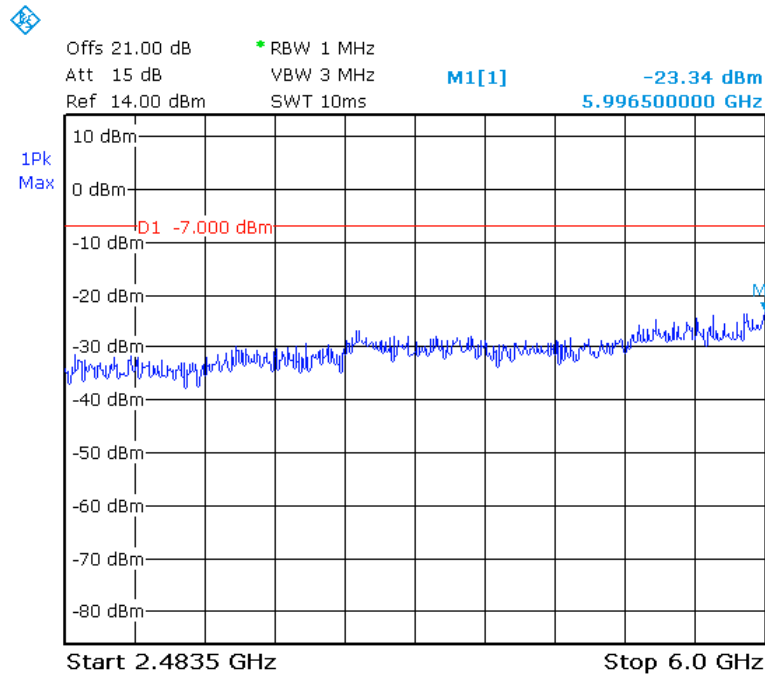
Date: 27.OCT.2010 13:36:39

**Figure 125 —2462MHz 11Mbps**



Date: 27.OCT.2010 13:37:18

**Figure 126 —2462MHz 11Mbps**



Date: 27.OCT.2010 13:38:03

**Figure 127 —2462MHz 11Mbps**

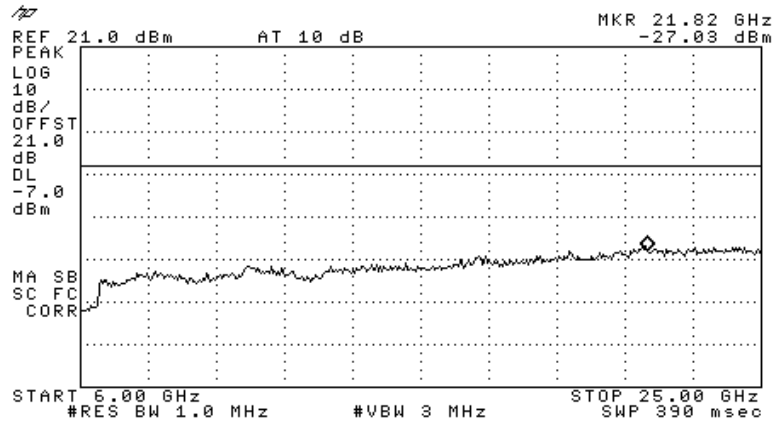


Figure 128 —2462MHz 11Mbps

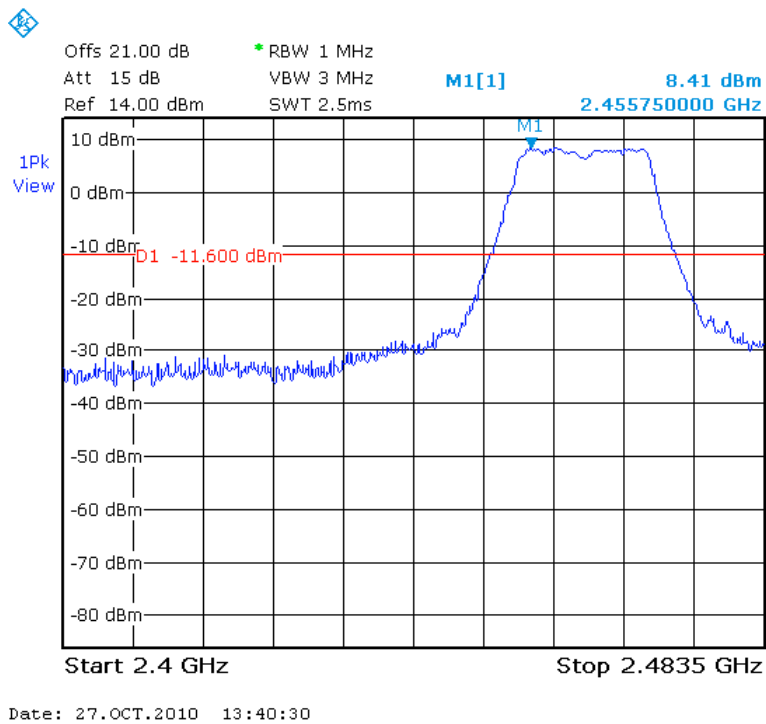
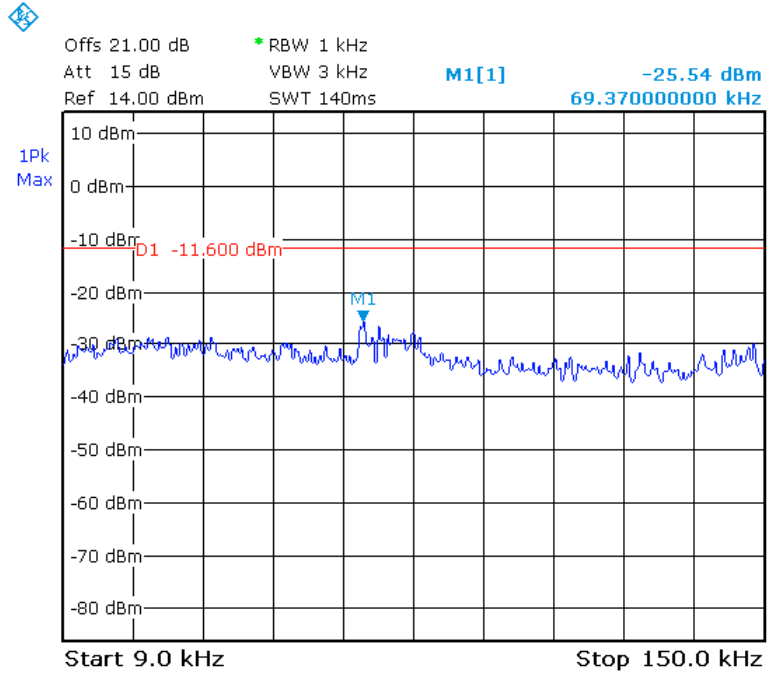


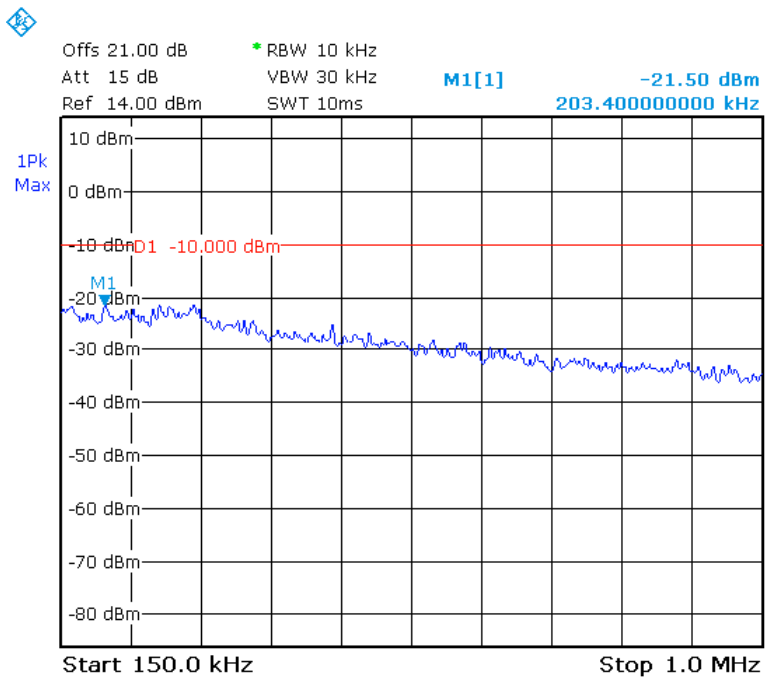
Figure 129 —2462 MHz 6Mbps





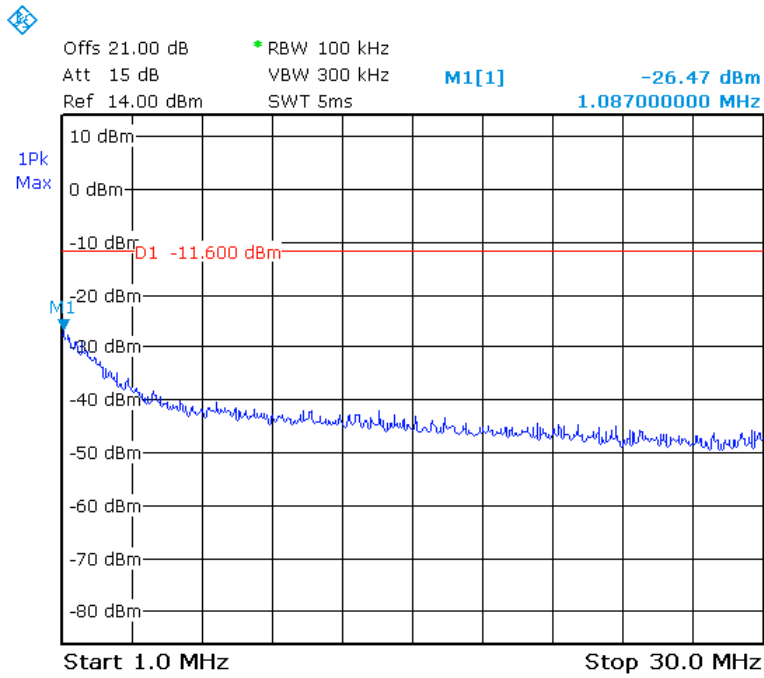
Date: 27.OCT.2010 13:41:12

**Figure 130 —2462 MHz 6Mbps**



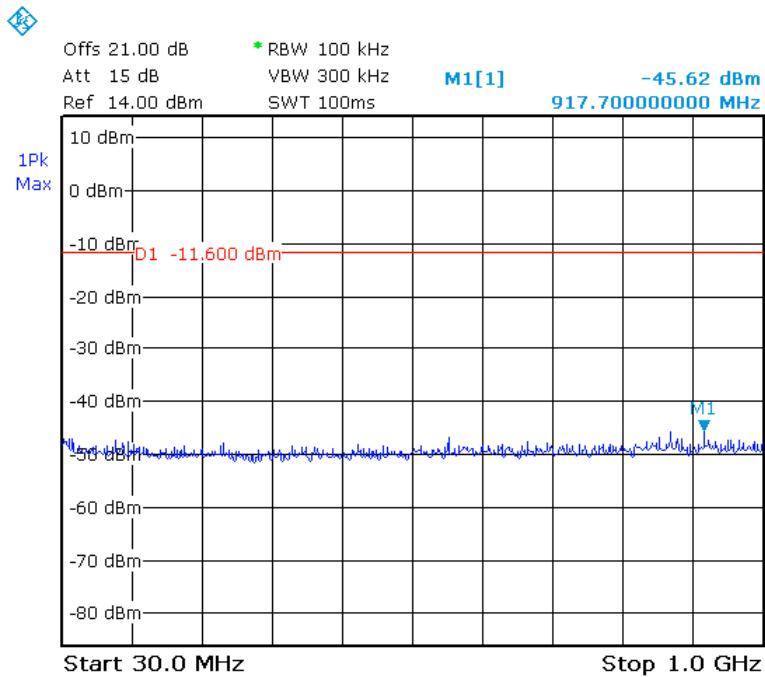
Date: 27.OCT.2010 13:48:27

**Figure 131 —2462 MHz 6Mbps**



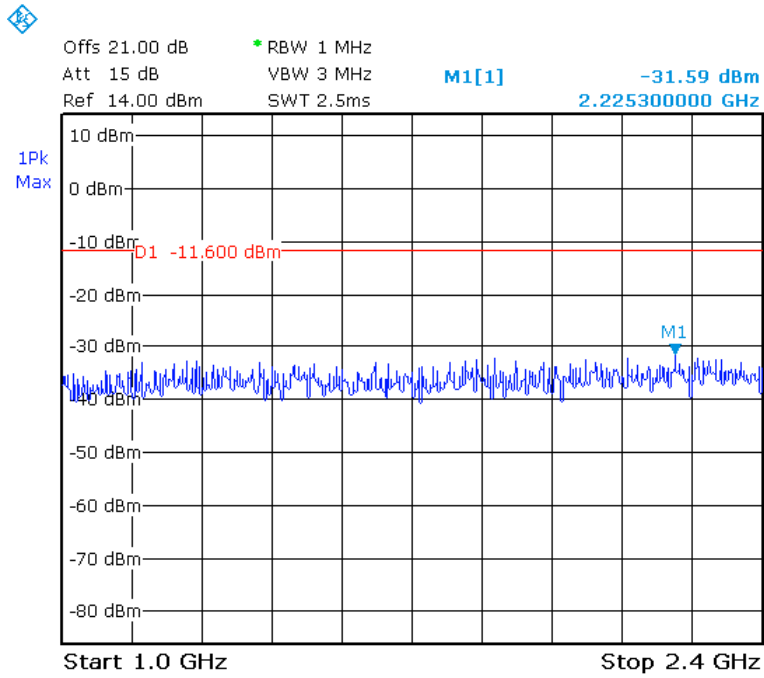
Date: 27.OCT.2010 13:42:22

Figure 132 —2462 MHz 6Mbps



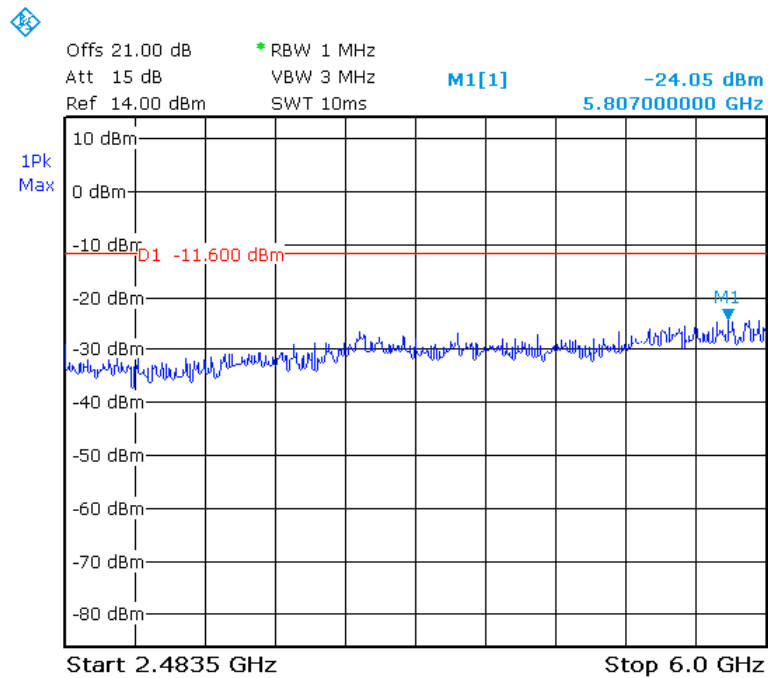
Date: 27.OCT.2010 13:43:06

Figure 133 —2462 MHz 6Mbps



Date: 27.OCT.2010 13:43:41

**Figure 134 —2462 MHz 6Mbps**



Date: 27.OCT.2010 13:44:33

**Figure 135 —2462 MHz 6Mbps**

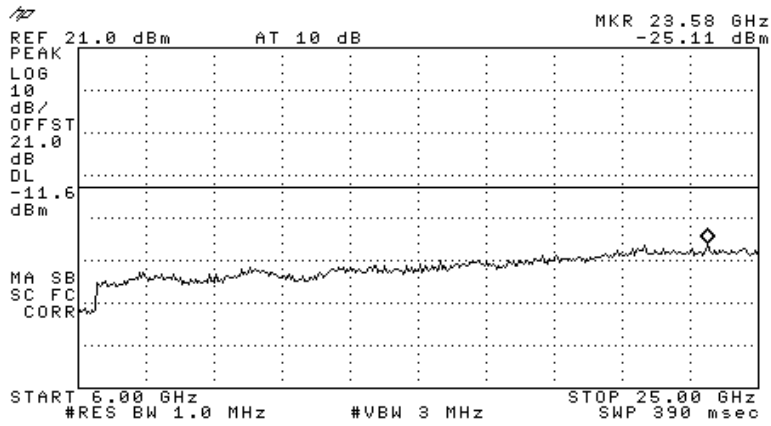
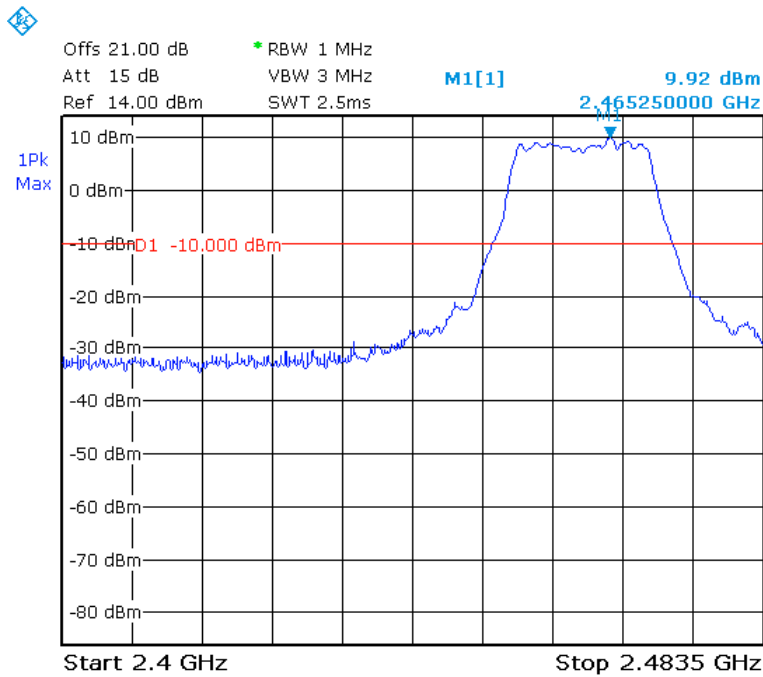
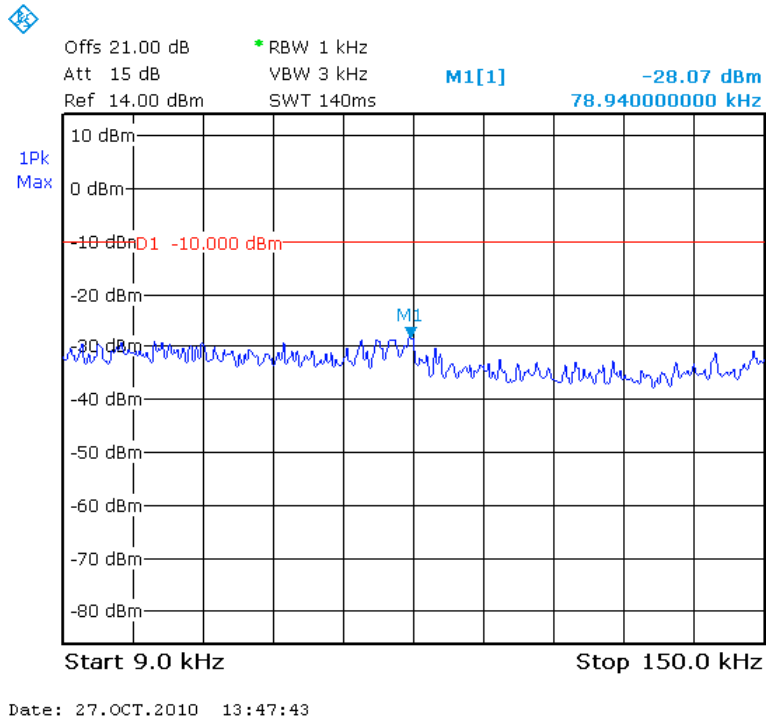


Figure 136 —2462 MHz 6Mbps

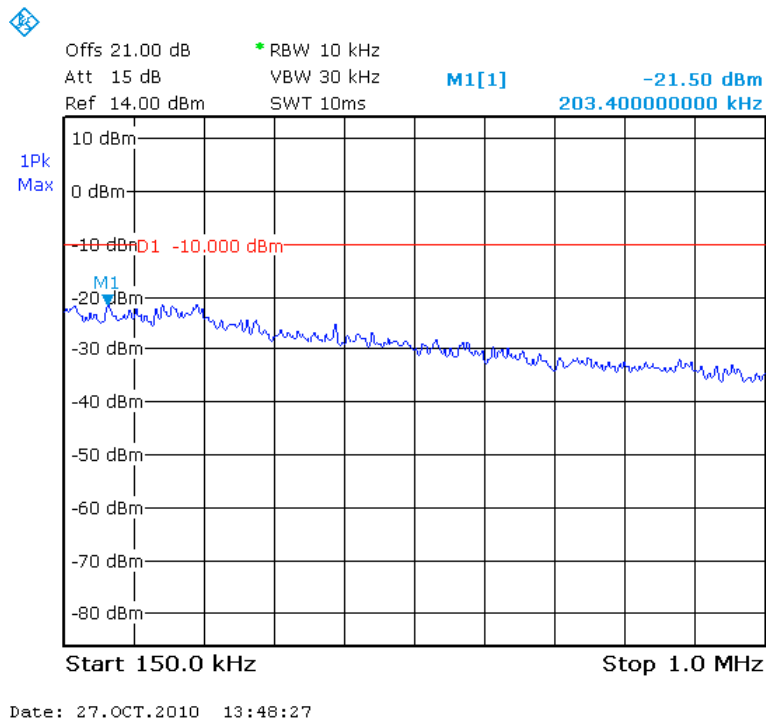


Date: 27.OCT.2010 13:46:59

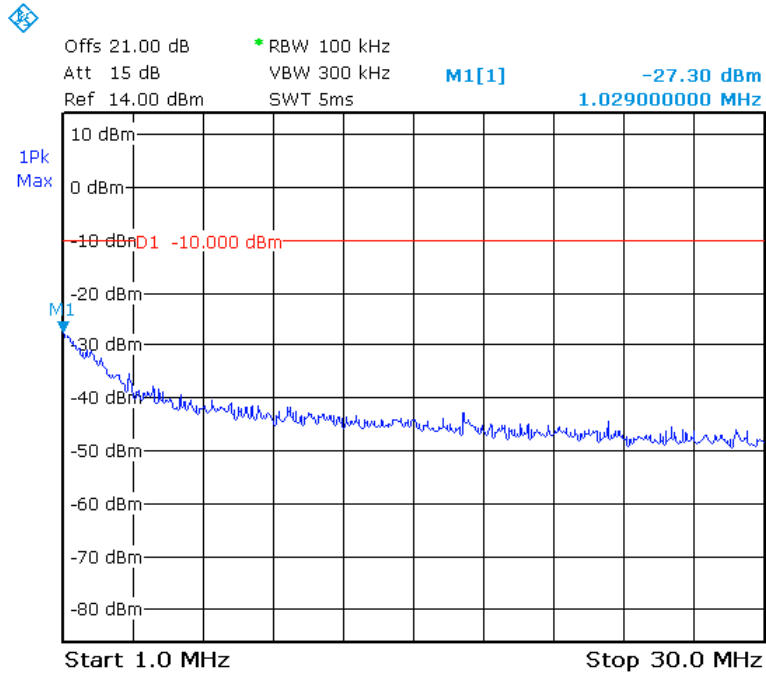
Figure 137 —2462 MHz 54Mbps



**Figure 138 —2462 MHz 54Mbps**

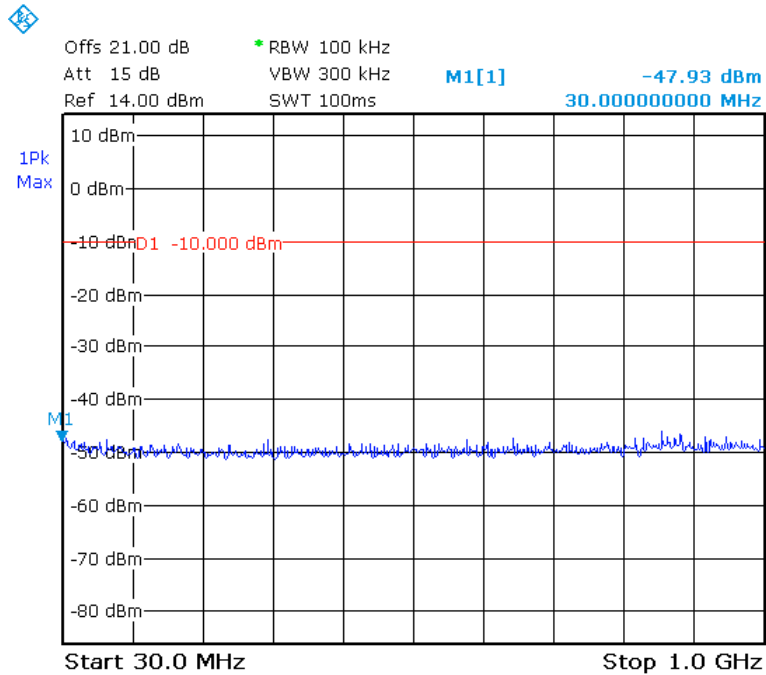


**Figure 139 —2462 MHz 54Mbps**



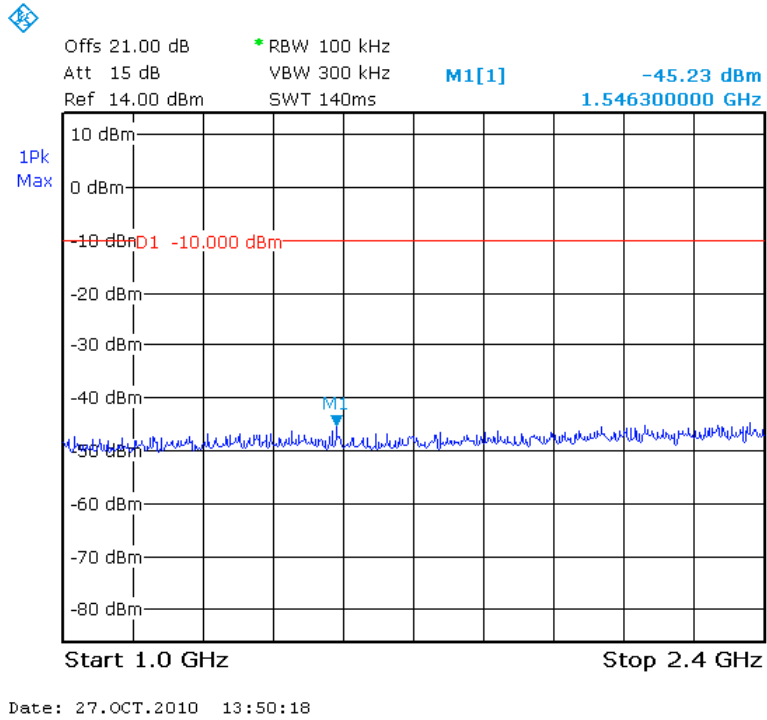
Date: 27.OCT.2010 13:49:03

**Figure 140 —2462 MHz 54Mbps**

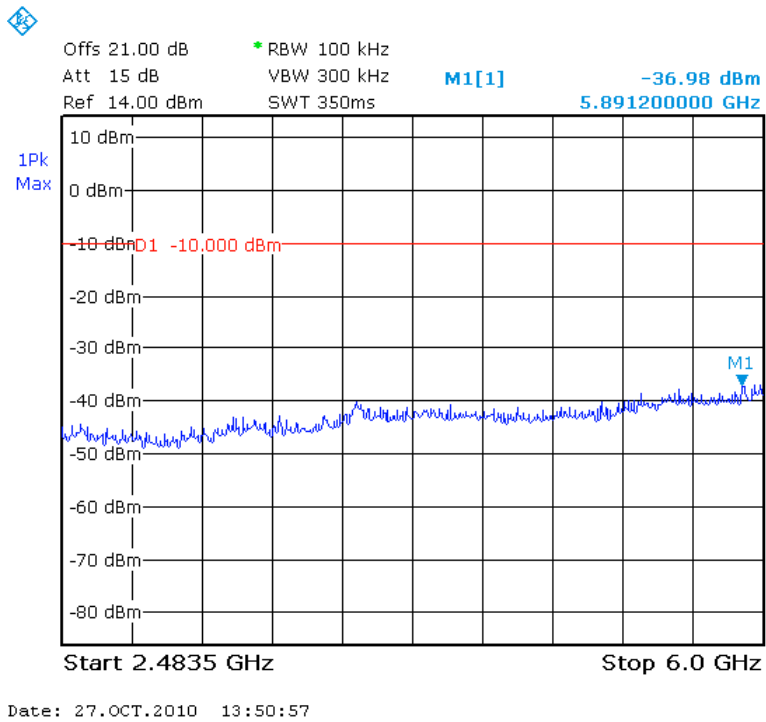


Date: 27.OCT.2010 13:49:42

**Figure 141 —2462 MHz 54Mbps**



**Figure 142 —2462 MHz 54Mbps**



**Figure 143 —2462 MHz 54Mbps**

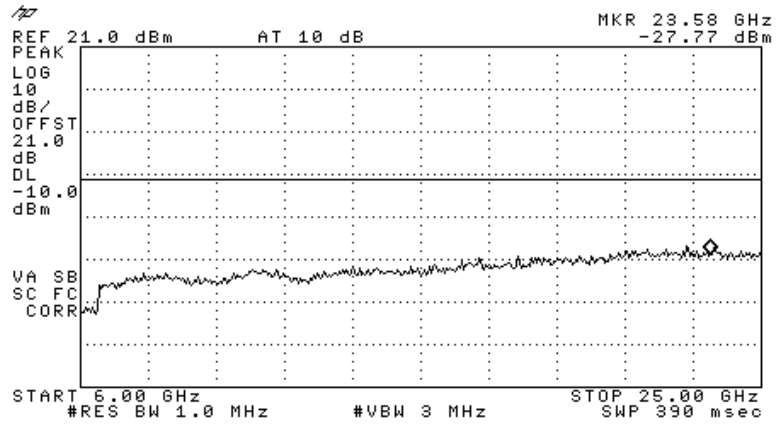


Figure 144 —2462 MHz 54Mbps



## 7.2 Results

E.U.T Description: Bluetooth and WiFi Module (WiFi Radio)

Model No.: NBOARD811

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	-25.97	-11.0	-14.97
2412	11	-24.68	-7.75	-16.93
2412	6	-13.84	-12.5	-1.34
2412	54	-13.15	-11.2	-1.95
2437	1	-19.45	-10.3	-9.15
2437	11	-20.65	-7.3	-13.35
2437	6	-21.04	-11.7	-9.34
2437	54	-22.05	-10.4	-11.65
2462	1	-21.20	-10.15	-11.05
2462	11	-21.18	-7.0	-14.18
2462	6	-21.50	-10.0	-11.50
2462	54	-21.50	-10.0	-11.50

**Figure 145 Peak Power Output of 2400-2483.5 MHz Band**

JUDGEMENT: Passed by 1.34 dB

TEST PERSONNEL:

Tester Signature: 

Date: 07.02.11

Typed/Printed Name: A. Sharabi

### 7.3 Test Equipment Used.

Peak Power Output of 2400-2438.5 MHz Band

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 14, 2010	1 Year
Spectrum Analyzer	RHODE&SCHWARZ	FSL6	100194	July 22, 2010	1 Year
Attenuator	Jyebao	-	FAT-AM5AF5G6 G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

Figure 146 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 and the video BW at 300 kHz. Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2412 MHz, and 2462 MHz correspondingly. The E.U.T. was tested using the modulation.

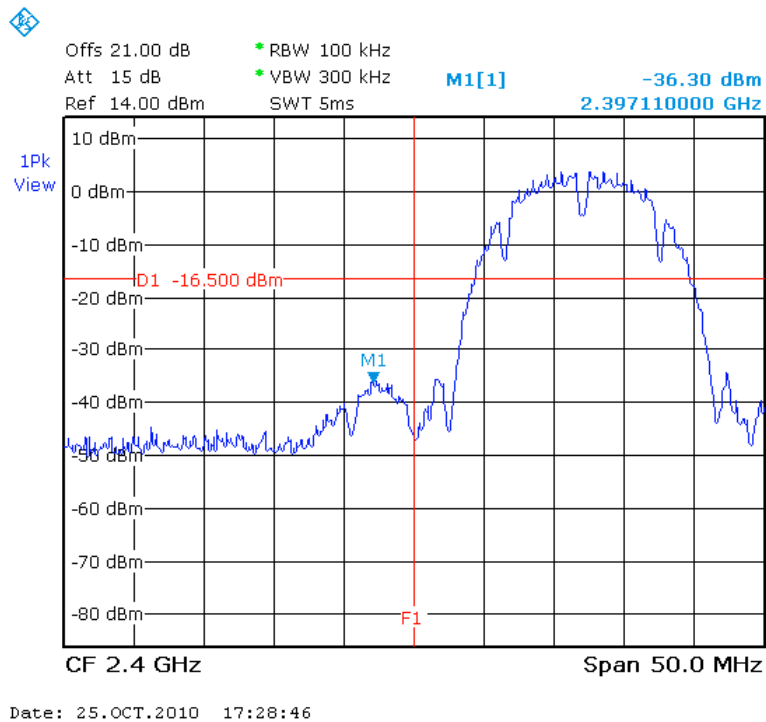
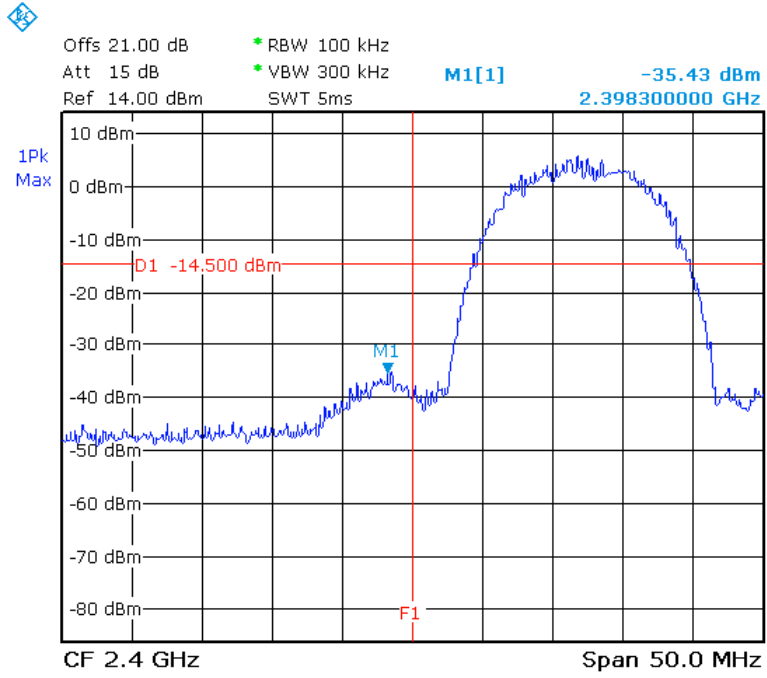
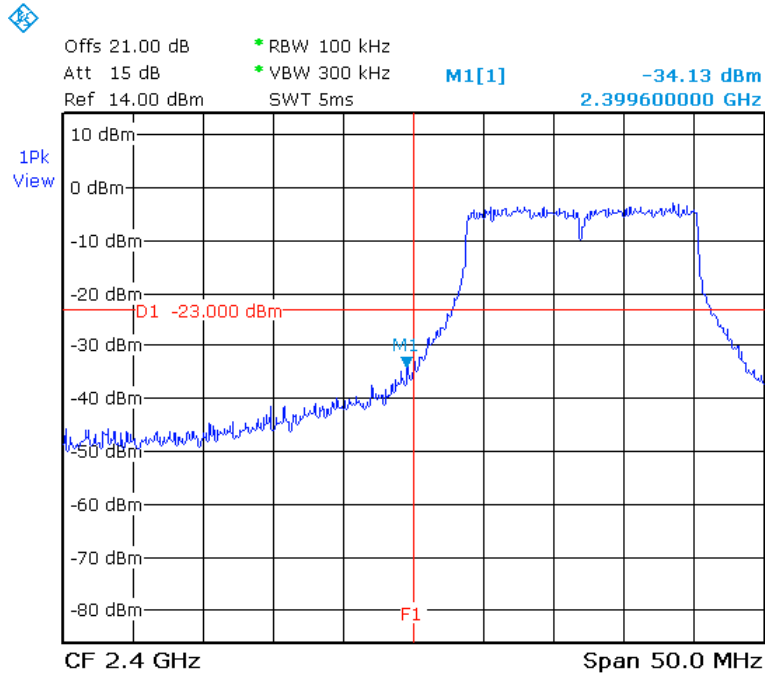


Figure 147 —2412 MHz 1Mbps



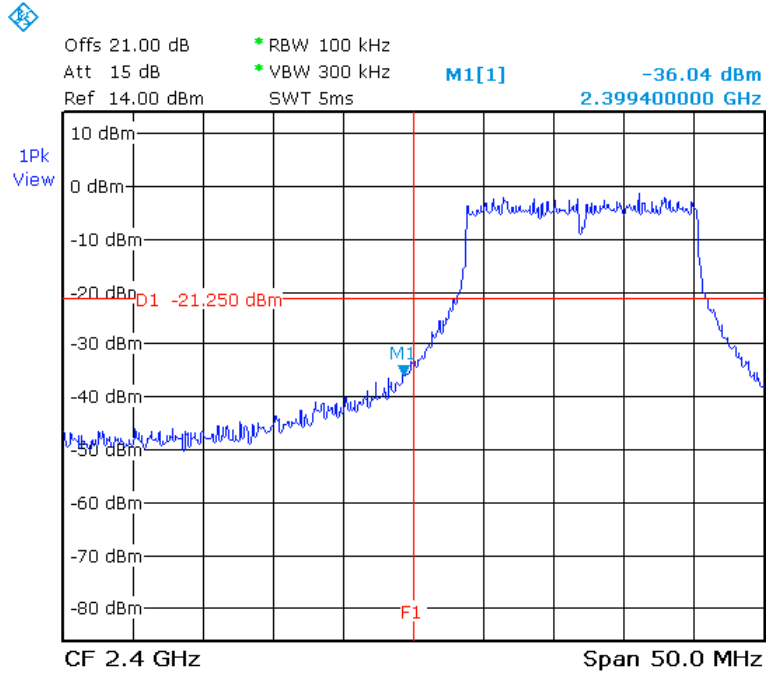
Date: 25.OCT.2010 17:29:51

**Figure 148 —2412 MHz 11Mbps**



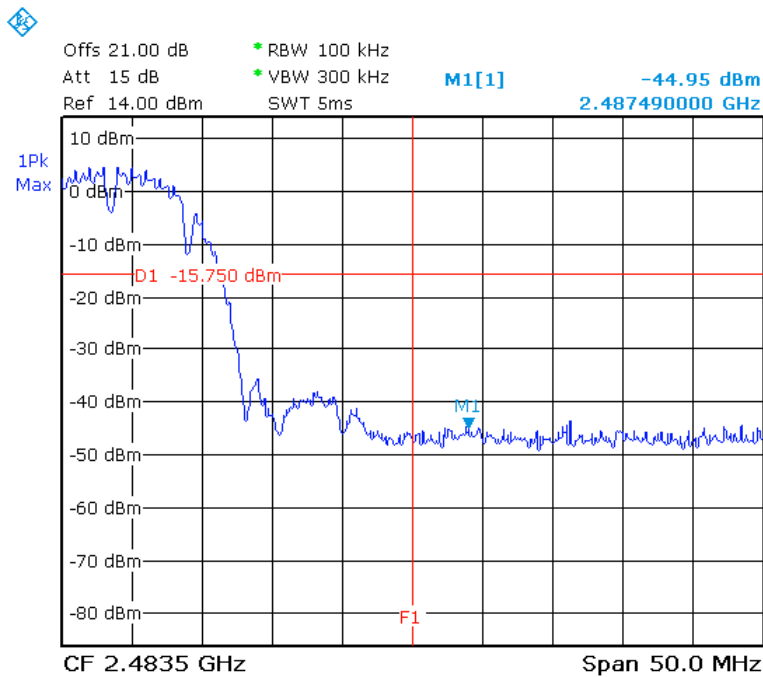
Date: 25.OCT.2010 17:26:05

**Figure 149 —2412 MHz 6Mbps**



Date: 25.OCT.2010 17:27:20

**Figure 150 —2412 MHz 54Mbps**



Date: 25.OCT.2010 17:31:26

**Figure 151 —2462 MHz 1Mbps**

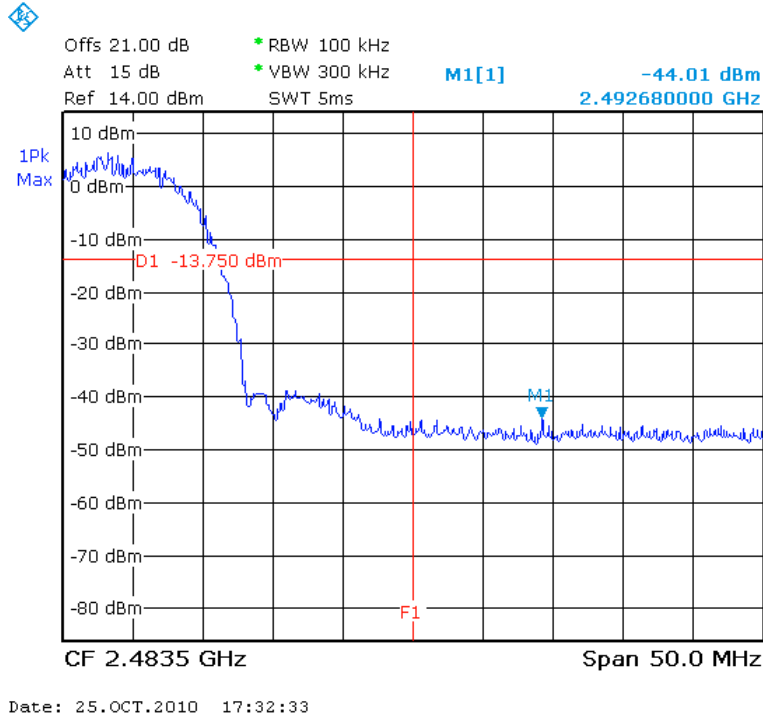


Figure 152 —2462MHz 11Mbps

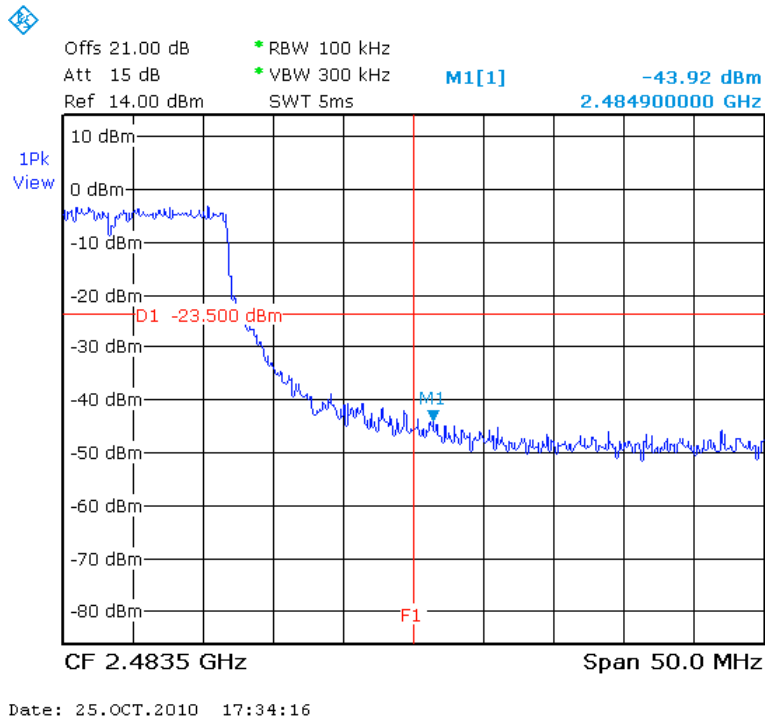
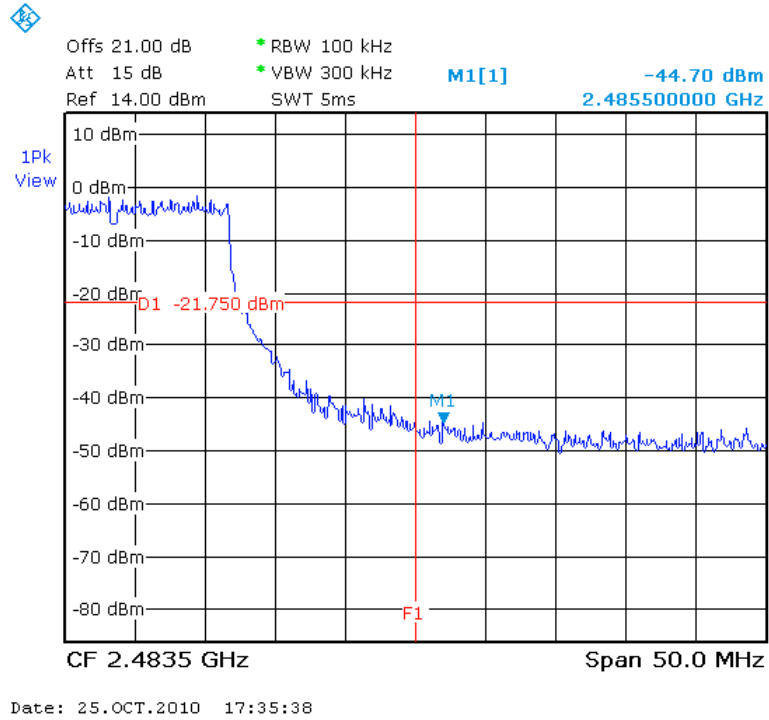


Figure 153 —2462 MHz 6Mbps



**Figure 154 —2462 MHz 54Mbps**

## 8.2 Results

E.U.T. Description: Bluetooth and WiFi Module (WiFi Radio)

Model No.: NBOARD811

Serial Number: Not designated


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

Operation Frequency (MHz)	Modulation (Mbps)	Band Edge Frequency (MHz)	Spectrum Level (dBm)	Specification (dBm)	Margin (dB)
2412	1	2397.11	-36.30	-16.50	-19.80
2412	11	2398.30	-35.43	-14.50	-20.93
2412	6	2399.60	-34.13	-23.00	-11.13
2412	54	2399.40	-36.04	-21.25	-14.79
2462	1	2487.49	-44.95	-15.75	-29.20
2462	11	2492.68	-44.01	-13.75	-30.26
2462	6	2484.90	-43.92	-23.50	-20.42
2462	54	2485.50	-44.70	-21.75	-22.95

**Figure 155 Band Edge Spectrum**

JUDGEMENT: Passed by 11.13 dB

TEST PERSONNEL:

Tester Signature: 

Date: 07.02.11

Typed/Printed Name: A. Sharabi



### 8.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	RHODE&SCHWARZ	FSL6	100194	July 22, 2010	1 Year
Attenuator	Jyebao	-	FAT-AM5AF5G 6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

**Figure 156 Test Equipment Used**

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

### 9.1 Test Specification

9 kHz-30 MHz, F.C.C., Part 15, Subpart C

### 9.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 2.

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 2. Radiated Tests Setup.

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 in three operating frequencies 2.412, 2.437 and 2.462 GHz measured using peak detector and BPSK modulation.

### 9.3 Test Data

JUDGEMENT: Passed

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

The results for all three operating frequencies were the same.

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

TEST PERSONNEL:

Tester Signature: 

Date: 07.02.11

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

\* Testing 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:

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

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.

## 10. Spurious Radiated Emission 30 MHz – 25 GHz

### 10.1 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 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 plane.

The frequency range 30 MHz-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.

In the frequency range 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 the operating frequencies of 2412, 2442, and 2462 MHz using BPSK modulation.

## 10.2 Test Data

JUDGEMENT: Passed by 8.9 dB

No signals were detected in the frequency range of 30 – 1000 MHz.

For the operation frequency of 2412 MHz, the margin between the emission level and the specification limit is 9.7 dB in the worst case at the frequency of 2390.00 MHz, horizontal polarization.

For the operation frequency of 2437 MHz, the margin between the emission level and the specification limit is 22.1 dB in the worst case at the frequency of 4874.00 MHz, horizontal polarization.

For the operation frequency of 2462 MHz, the margin between the emission level and the specification limit is 8.9 dB in the worst case at the frequency of 2483.50 MHz, vertical polarization.

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

TEST PERSONNEL:

Tester Signature: 

Date: 07.02.11

Typed/Printed Name: A. Sharabi

## Radiated Emission Above 1 GHz

E.U.T Description Bluetooth and WiFi Module (WiFi Radio)  
 Type NBOARD811  
 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

<b>Freq.</b>	<b>Polarity</b>	<b>Peak Reading</b>	<b>Peak Specification</b>	<b>Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
2390.00	H	48.4	74.0	-25.6
2390.00	V	48.6	74.0	-25.4
4824.00	H	50.0*	74.0	-24.0
4824.00	V	51.3*	74.0	-22.7

**Figure 157. 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- Low Noise Amplifier Gain + Band Pass Filter

## Radiated Emission Above 1 GHz

E.U.T Description Bluetooth and WiFi Module (WiFi Radio)  
 Type NBOARD811  
 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

<b>Freq.</b>  (MHz)	<b>Polarity</b>  (H/V)	<b>Average Reading</b>  (dB $\mu$ V/m)	<b>Average Specification</b>  (dB $\mu$ V/m)	<b>Margin</b>  (dB)
2390.00	H	44.3	54.0	-9.7
2390.00	V	44.1	54.0	-9.9
4824.00	H	36.6*	54.0	-17.4
4824.00	V	37.2*	54.0	-16.8

**Figure 158. 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- Low Noise Amplifier Gain + Band Pass Filter

## Radiated Emission Above 1 GHz

E.U.T Description Bluetooth and WiFi Module (WiFi Radio)  
 Type NBOARD811  
 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

<b>Freq.</b>	<b>Polarity</b>	<b>Peak Reading</b>	<b>Peak Specification</b>	<b>Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
4874.00	H	50.6	74.0	-23.4
4874.00	V	51.9	74.0	-22.1

**Figure 159. 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 Margin” includes correction factor.

\* “Correction Factor” = Antenna Factor + Cable Loss- Low Noise Amplifier Gain + Band Pass Filter



## Radiated Emission Above 1 GHz

E.U.T Description Bluetooth and WiFi Module (WiFi Radio)  
 Type NBOARD811  
 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

<b>Freq.</b>	<b>Polarity</b>	<b>Average Reading</b>	<b>Average Specification</b>	<b>Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
4875.00	H	28.0	54.0	-26.0
4875.00	V	29.5	54.0	-24.5

**Figure 160. 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 + Band Pass Filter

## Radiated Emission Above 1 GHz

E.U.T Description Bluetooth and WiFi Module (WiFi Radio)  
 Type NBOARD811  
 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

<b>Freq.</b>	<b>Polarity</b>	<b>Peak Reading</b>	<b>Peak Specification</b>	<b>Margin</b>
(MHz)	(H/V)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)
2483.50	H	48.1	74.0	-25.9
2483.50	V	49.4	74.0	-24.6
4924.00	H	50.5*	74.0	-23.5
4924.00	V	52.4*	74.0	-21.6

**Figure 161. 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- Low Noise Amplifier Gain + Band Pass Filter

## Radiated Emission Above 1 GHz

E.U.T Description Bluetooth and WiFi Module (WiFi Radio)  
 Type NBOARD811  
 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

<b>Freq.</b>  (MHz)	<b>Polarity</b>  (H/V)	<b>Average Reading</b>  (dB $\mu$ V/m)	<b>Average Specification</b>  (dB $\mu$ V/m)	<b>Margin</b>  (dB)
2483.50	H	44.7	54.0	-9.3
2483.50	V	45.1	54.0	-8.9
4924.00	H	30.4*	54.0	-23.6
4924.00	V	29.9*	54.0	-24.1

**Figure 162. 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- Low Noise Amplifier Gain + Band Pass Filter

### 10.3 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 16, 2010	2 Years
Horn Antenna	ARA	SWH-28	1008	December 23, 2008	2 Years
Horn Antenna	Narda	V637	0410	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
Low Noise Amplifier	MK Milliwave	MKT6-3000 4000-30-13P	A0399	January 14, 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	JKGC19982	N/A	N/A

\* Testing was performed before 10 November 2010.

## 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 with modulation.

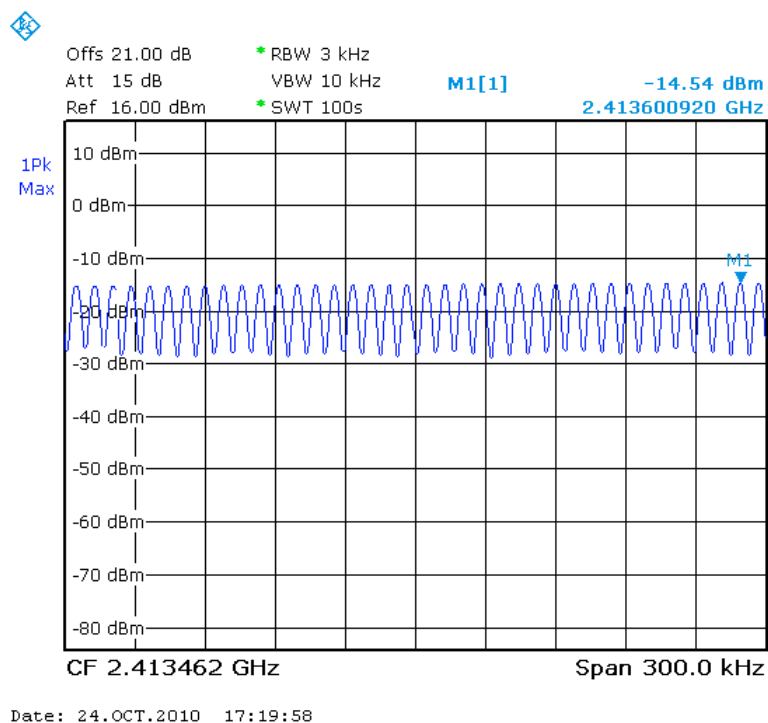
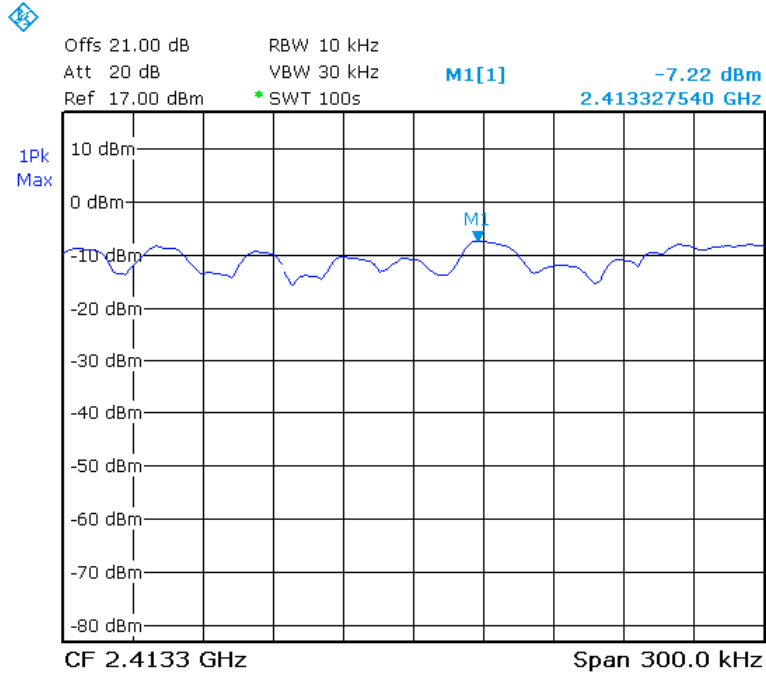
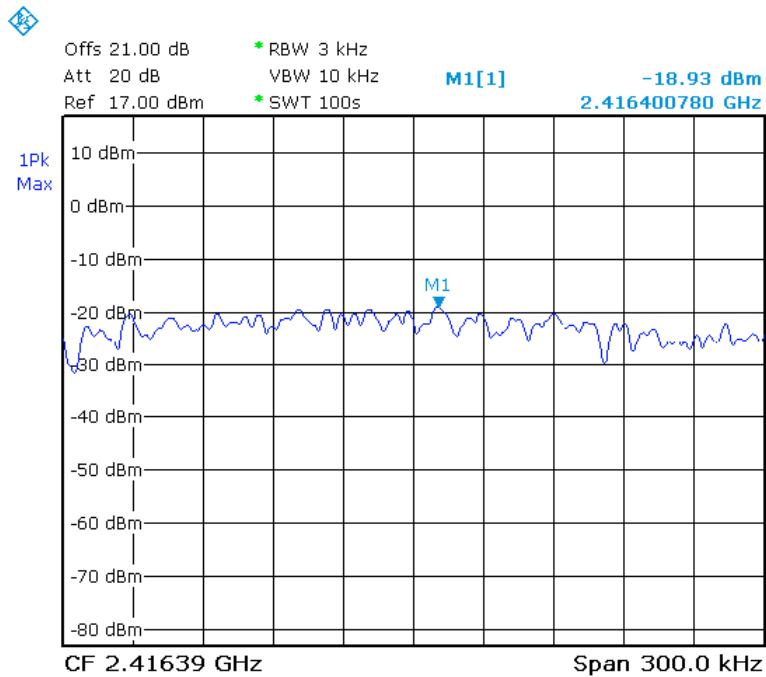


Figure 163 —2412 MHz 1Mbps



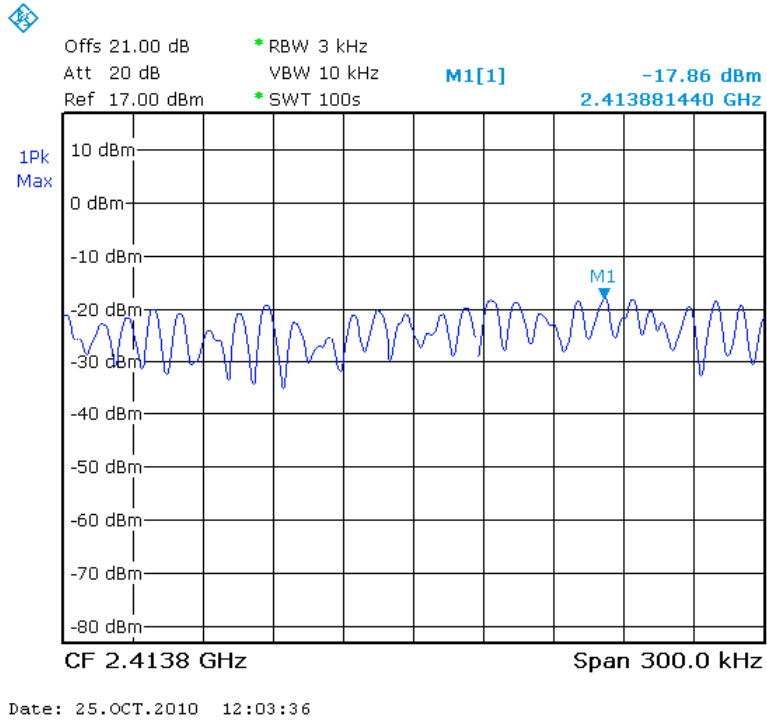
Date: 25.OCT.2010 11:55:11

**Figure 164 —2412 MHz 11Mbps**

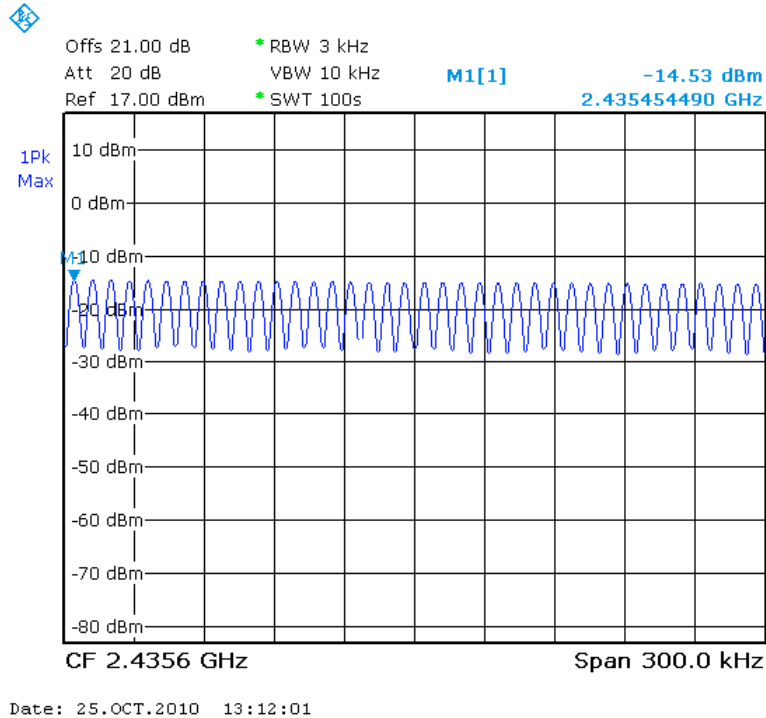


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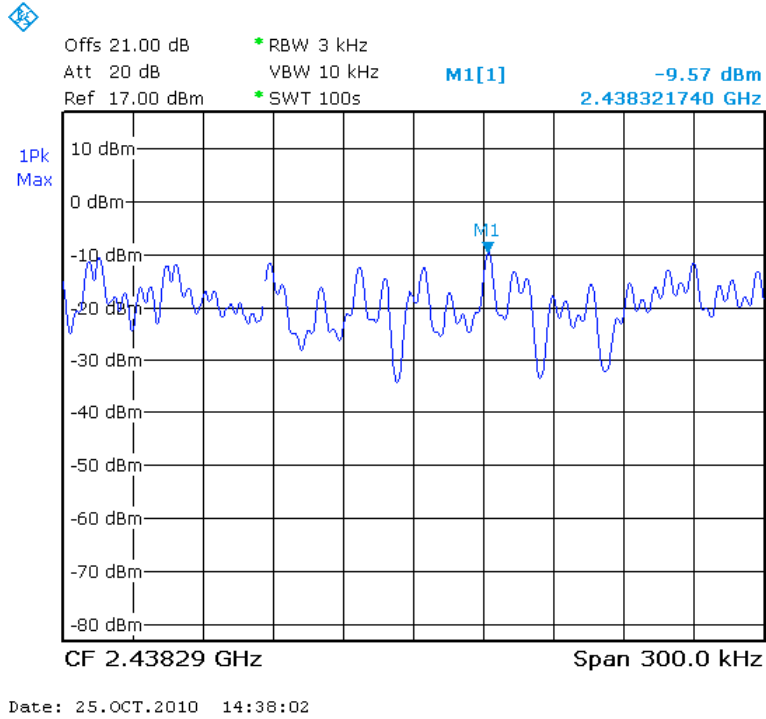
**Figure 165 —2412 MHz 6Mbps**



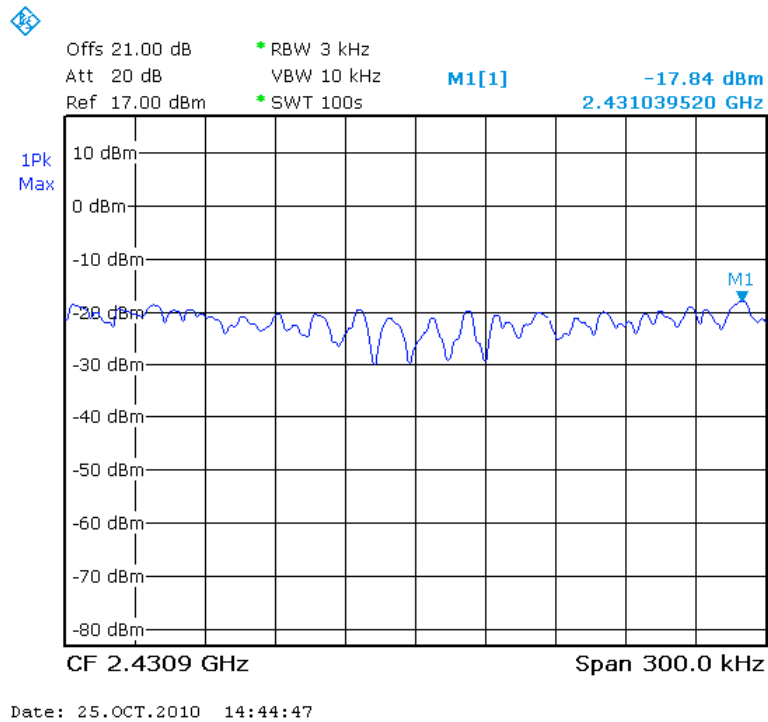
**Figure 166 —2412 MHz 54Mbps**



**Figure 167 —2437 MHz 1Mbps**

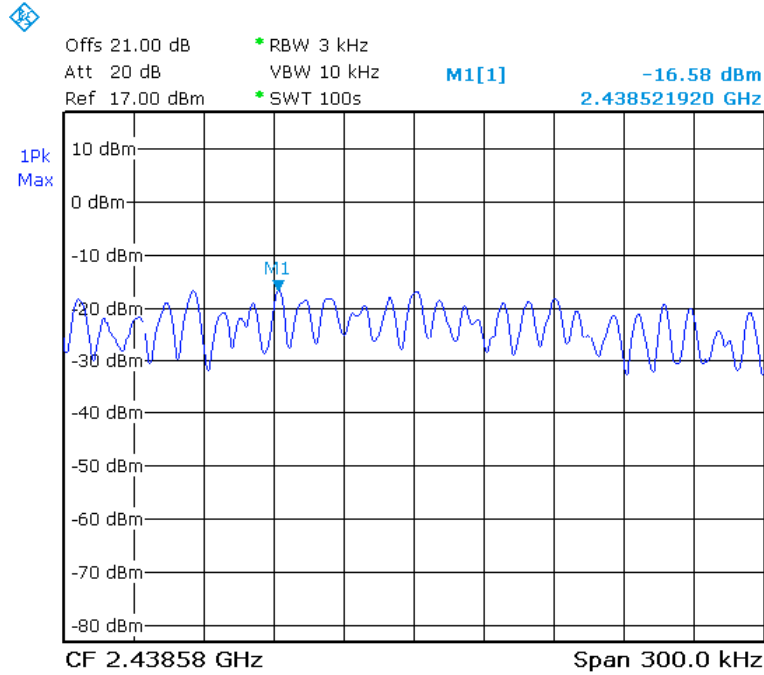


**Figure 168 —2437 MHz 11Mbps**



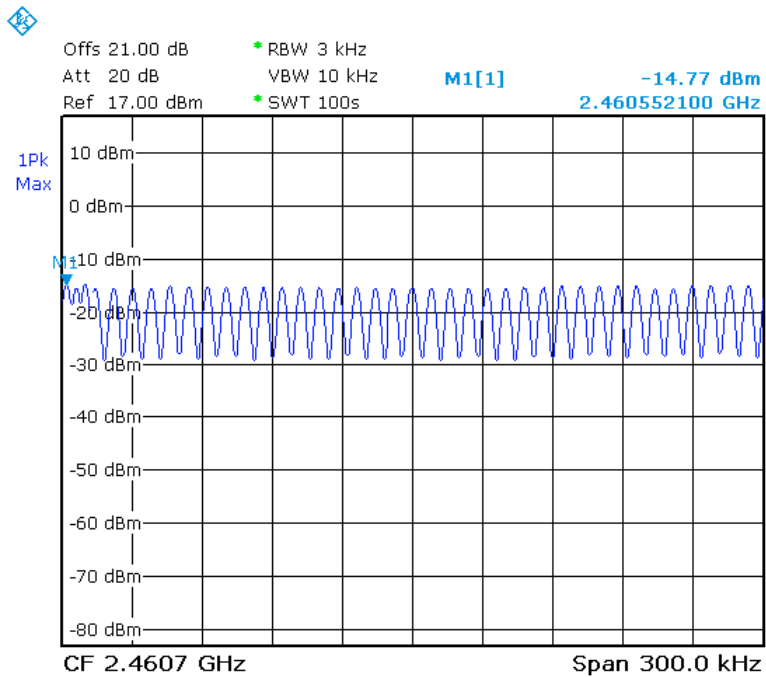
**Figure 169 —2437 MHz 6Mbps**





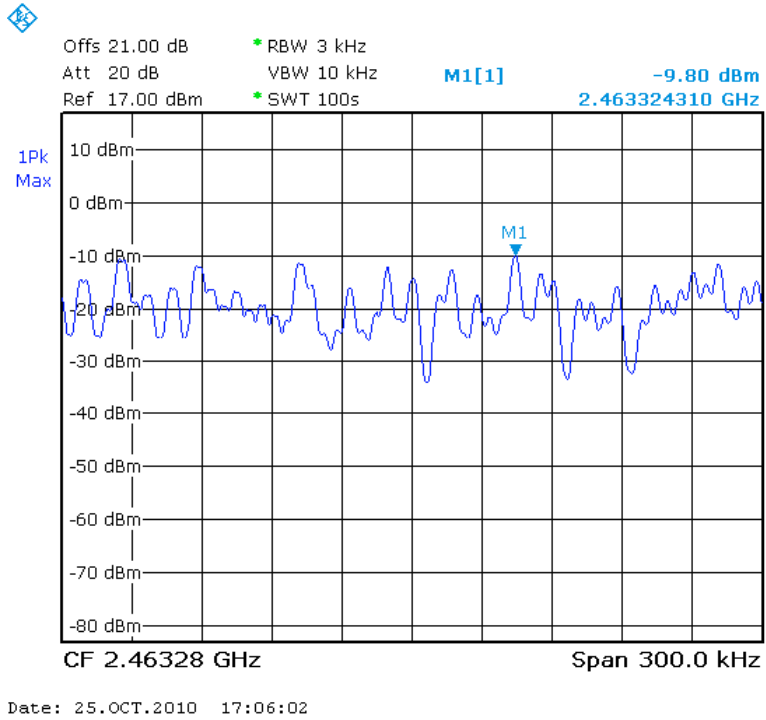
Date: 25.OCT.2010 14:47:57

**Figure 170 —2437 MHz 54Mbps**

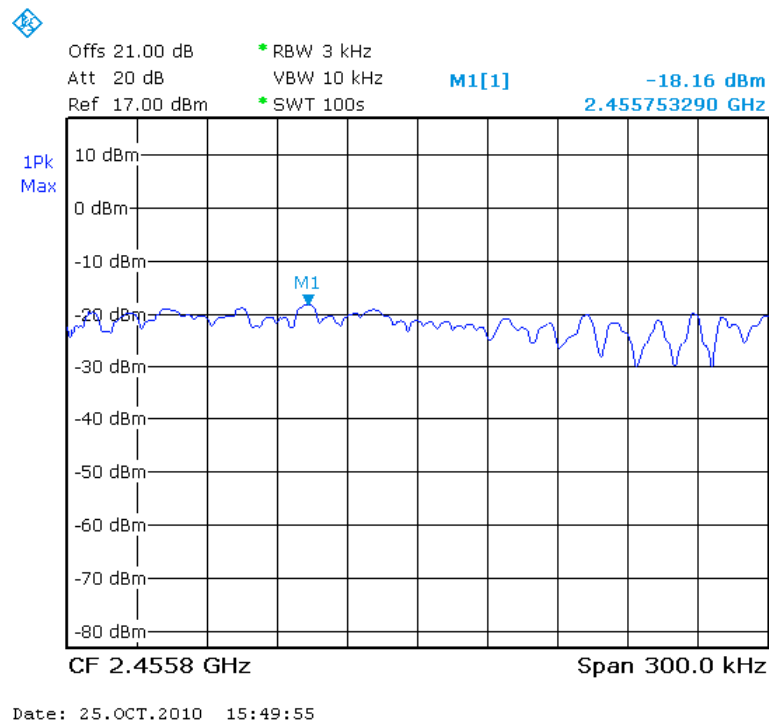


Date: 25.OCT.2010 15:15:08

**Figure 171 —2462 MHz 1Mbps**



**Figure 172 —2462MHz 11Mbps**



**Figure 173 —2462 MHz 6Mbps**



## 11.2 Results

E.U.T. Description: Bluetooth and WiFi Module (WiFi Radio)

Model No.: NBOARD811

Serial Number: Not designated


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

Operation Frequency (MHz)	Modulation (Mbps)	Reading Spectrum Analyzer (dBm)	Specification (dBm)	Margin (dB)
2412	1	-14.54	8.0	-22.54
2412	11	-7.22	8.0	-15.22
2412	6	-18.93	8.0	-26.93
2412	54	-17.86	8.0	-25.86
2437	1	-14.53	8.0	-22.53
2437	11	-9.57	8.0	-17.57
2437	6	-17.84	8.0	-25.84
2437	54	-16.58	8.0	-24.58
2462	1	-14.77	8.0	-22.77
2462	11	-9.80	8.0	-17.80
2462	6	-18.16	8.0	-26.16
2462	54	-17.27	8.0	-25.27

**Figure 175 Test Results**

JUDGEMENT: Passed by 15.22 dB

TEST PERSONNEL:

Tester Signature: 

Date: 07.02.11

Typed/Printed Name: A. Sharabi

### 11.3 Test Equipment Used.

#### Transmitted Power Density

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	RHODE&SCHWARZ	FSL6	100194	July 22, 2010	1 Year
Attenuator	Jyebao	-	FAT-AM5AF5G 6G2W20	October 12, 2010	1 year
Cable	TestLINE	18	11556	October 12, 2010	1 year

Figure 176 Test Equipment Used

## 12. Intermodulation within the band 9KHz to 25GHz

### 12.1 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 1 meter, 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 plane.

The frequency range 9KHz MHz-2500 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 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 following transmitters were operational during the test:

BT – channel 35 (2455MHz), Modulated.

WiFi – Channel 6 (2437MHz) , Modulated , 11Mbps.

Cellular – 816MHz channel, GSM Modulated.

## 12.2 Test Results

JUDGEMENT: Passed

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

The results for all three operating frequencies were the same.

No signals were detected in the frequency range of 9 kHz – 2500 MHz.

TEST PERSONNEL:

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

Date: 07.02.11

Typed/Printed Name: A. Sharabi

### 12.3 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
Antenna Bioconical	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, 2010	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	JPKG19982	N/A	N/A

\* Testing was performed before 10 November 2010.



## 13. Antenna Gain

The antenna gain is 0 dBi.

## 14. R.F Exposure/Safety

Typical use of the E.U.T. is inside a Micronet Mobile Data terminal which can be handheld or located inside a motor vehicle. The typical distance between the E.U.T. and the user is 3.5 cm .

Calculation of Maximum Permissible Exposure (MPE)  
Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 2437 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 Power 21.04 dBm (peak) = 127.06 mW

G<sub>T</sub>- Antenna Gain, 0 dBi = 1 numeric

R- Distance from Transmitter using 3.5 cm worst case

(c) The peak power density of the E.U.T. is:

$$S_{AV} = \frac{127.06 \times 1}{4\pi(2)^2} = 0.83 \frac{mW}{cm^2}$$

(d) This is below the FCC limit.

## 15. APPENDIX A - CORRECTION FACTORS

### 15.1 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".

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

<b>FREQUENCY</b> <b>(GHz)</b>	<b>CORRECTION</b> <b>FACTOR</b> <b>(dB)</b>
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.*

**15.3 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".

**15.4 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".

**15.5 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".



**15.6 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			

**15.7 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

**15.8 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