

**Test Report No. 56S070446/05**  
**dated 22 Jun 2007**



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**FORMAL REPORT ON TESTING IN ACCORDANCE WITH**  
**FCC Parts 15B & C : 2006**  
**OF A**  
**802.11b/g VoIP WiFi SIP PHONE**  
**[ Model : CYBERPHONE xx ]**  
**[ FCC ID : VDQCYBER80211 ]**

**TEST FACILITY** TÜV SÜD PSB Pte Ltd,  
Telecoms & EMC, Testing Group,  
1 Science Park Drive, Singapore 118221

**FCC REG. NO.** 90937 (3m & 10m OATS)  
99142 (10m Anechoic Chamber)  
871638 (5m Anechoic Chamber)  
325572 (10m Anechoic Chamber)

**IND. CANADA REG. NO.** IC 4257 (3m and 10m Anechoic Chambers)

**PREPARED FOR** Daviscomms (S) Pte Ltd  
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**QUOTATION NUMBER** 56Q0700202

**JOB NUMBER** 56S070446

**TEST PERIOD** 30 May 2007 – 19 Jun 2007

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LA-2007-0380-A-1  
LA-2007-0381-F  
LA-2007-0382-B  
LA-2007-0383-G  
LA-2007-0384-G  
LA-2007-0385-E  
LA-2007-0386-C

The results reported herein have been performed in accordance with the laboratory's terms of accreditation under the Singapore Accreditation Council - Singapore Laboratory Accreditation Scheme. Tests/Calibrations marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our laboratory.



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**TEST SUMMARY**

The product was tested in accordance with the customer's specifications.

**Test Results Summary**

Test Standard	Description	Pass / Fail
FCC Part 15: 2006		
15.107(a), 15.207	Conducted Emissions	Pass
15.109(a), 15.205, 15.209	Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)	Pass
15.247(a)(2)	Spectrum Bandwidth (6dB Bandwidth Measurement)	Pass
15.247(b)(3)	Maximum Peak Power	Pass
15.247(d)	RF Conducted Spurious Emissions	Pass
15.247(d)	Band Edge Compliance (Conducted)	Pass
15.247(d)	Band Edge Compliance (Radiated)	Pass
15.247(e)	Peak Power Spectral Density	Pass
1.1310	Maximum Permissible Exposure	Refer to page 99 for details

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**TEST SUMMARY**

**Notes**

1. The channels as listed below, under the different configurations were tested for 802.11b WLAN.

<u>Transmit Channel</u>	<u>Frequency (GHz)</u>	<u>Modulation</u>	<u>Data Rate</u>
Channel 1	2.412	DBPSK	1Mbps
Channel 6	2.437	DBPSK	1Mbps
Channel 11	2.462	DBPSK	1Mbps
Channel 1	2.412	DQPSK	2Mbps
Channel 6	2.437	DQPSK	2Mbps
Channel 11	2.462	DQPSK	2Mbps
Channel 1	2.412	CCK	5.5Mbps
Channel 6	2.437	CCK	5.5Mbps
Channel 11	2.462	CCK	5.5Mbps
Channel 1	2.412	CCK	11Mbps
Channel 6	2.437	CCK	11Mbps
Channel 11	2.462	CCK	11Mbps

2. The channels as listed below, under the different configurations were tested for 802.11g WLAN.

<u>Transmit Channel</u>	<u>Frequency (GHz)</u>	<u>Modulation</u>	<u>Data Rate</u>
Channel 1	2.412	BPSK	9Mbps
Channel 6	2.437	BPSK	9Mbps
Channel 11	2.462	BPSK	9Mbps
Channel 1	2.412	QPSK	18Mbps
Channel 6	2.437	QPSK	18Mbps
Channel 11	2.462	QPSK	18Mbps
Channel 1	2.412	16QAM	36Mbps
Channel 6	2.437	16QAM	36Mbps
Channel 11	2.462	16QAM	36Mbps
Channel 1	2.412	64QAM	54Mbps
Channel 6	2.437	64QAM	54Mbps
Channel 11	2.462	64QAM	54Mbps

3. All the measurements in section 15.247 were done based on conducted measurements.
4. The EUT is a Class B device when in non-transmitting state and meets the FCC Part15B Class B requirements.
5. All test measurement procedures are according to ANSI C63.4: 2003.



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**TEST SUMMARY**

**Modifications**

1. The EUT was brought to compliance to Radiated Emissions test by adding a ferrite choke on the USB cable which bears the part number: K5a RH10.5\*5.5\*20.

## PRODUCT DESCRIPTION

Description	: The Equipment Under Test (EUT) is a <b>802.11b/g VoIP WiFi SIP PHONE.</b>	
Manufacturer	: Daviscomms (S) Pte Ltd Blk 70 Ubi Crescent #01-07, Ubi Techpark Singapore 408570	
Model Number	: CYBERPHONE xx	
FCC ID	: VDQCYBER80211	
Serial Number	: CW1Xxxxxxx	
Microprocessor	: AT76C902	
Operating / Transmitting Frequency	: 2.412GHz - 2.462GHz	
Clock / Oscillator Frequency	: 32kHz (RTC Clock), 78MHz (System clock), 40MHz (Crystal oscillator)	
Modulation	: <u>802.11b WLAN</u> DBPSK @ 1Mbps DQPSK @ 2Mbps CCK @ 5.5Mbps CCK @ 11Mbps	: <u>802.11g WLAN</u> BPSK @ 9Mbps QPSK @ 18Mbps 16QAM @ 36Mbps 64QAM @ 54Mbps
Antenna Gain	: 1.9dBi	
Port / Connectors	: 1 x USB port	
Rated Input Power	: 3.7V, 650mAh-Li-ion battery 100V -240V, 43Hz – 63Hz, 0.2A	
Accessories	: <u>Li-ion battery</u> Model 000D15-065AA Output 3.7V 650mAh  <u>Vansonc (S) Pte Ltd Earpiece</u> Model VHF015S-MC16-BK  <u>Round-pin switching power adapter</u> Model TC101-0506A20 Input 100V-240V, 47Hz-63Hz, 0.2A, Output 5Vdc, 600mA	



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**SUPPORTING EQUIPMENT DESCRIPTION**

The EUT was tested as a stand-alone unit without any supporting equipment.



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**EUT OPERATING CONDITIONS**

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<b>FCC Part 15</b>
<ol style="list-style-type: none"><li>1. <b>Conducted Emissions</b></li><li>2. <b>Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)</b></li><li>3. <b>Spectrum Bandwidth (6dB Bandwidth Measurement)</b></li><li>4. <b>Maximum Peak Power</b></li><li>5. <b>RF Conducted Spurious Emissions</b></li><li>6. <b>Band Edge Compliance (Conducted)</b></li><li>7. <b>Band Edge Compliance (Radiated)</b></li><li>8. <b>Peak Power Spectral Density</b></li><li>9. <b>Maximum Permissible Exposure</b></li></ol>
<p>The EUT was exercised by operating in maximum continuous transmission in test mode, i.e transmitting at lower, middle and upper channels respectively at one time.</p>



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**CONDUCTED EMISSION TEST**

**FCC Parts 15.107(a) and 15.207 Conducted Emission Limits**

Frequency Range (MHz)	Limit Values (dBµV)	
	Quasi-peak (QP)	Average (AV)
0.15 - 0.5	66 – 56 *	56 – 46 *
0.5 - 5.0	56	46
5.0 - 30.0	60	50

\* Decreasing linearly with the logarithm of the frequency

**FCC Parts 15.107(a) and 15.207 Conducted Emission Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
R&S Test Receiver – ESI1	ESI40	100010	04 Aug 2007
R&S Pulse Limiter – PL2	ESH3-Z2	100347	13 Apr 2008
Schaffner LISN – LISN7 (for EUT)	NNB42	00008	15 Aug 2007

## CONDUCTED EMISSION TEST

### FCC Parts 15.107(a) and 15.207 Conducted Emission Test Setup

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table.
2. The power supply for the EUT was fed through a 50 $\Omega$ /50 $\mu$ H EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another LISN.

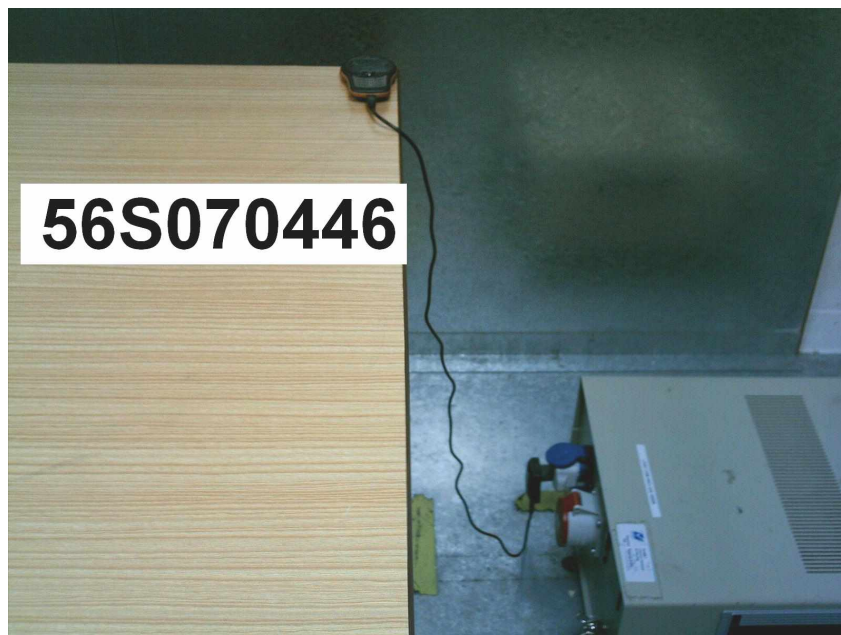
### FCC Parts 15.107(a) and 15.207 Conducted Emission Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10kHz. Both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line.

### **Sample Calculation Example**

At 20 MHz	Q-P limit (Class B) = 1000 $\mu$ V = 60.0 dB $\mu$ V
Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.2 dB	
Q-P reading obtained directly from EMI Receiver = 40.0 dB $\mu$ V (Calibrated for system losses)	
Therefore, Q-P margin = 40.0 - 60.0 = -20.0	i.e. <b>20.0 dB below Q-P limit</b>

**CONDUCTED EMISSION TEST**



**Conducted Emissions Test Setup (Front View)**



**Conducted Emissions Test Setup (Rear View)**

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**CONDUCTED EMISSION TEST**

**FCC Parts 15.107(a) and 15.207 Conducted Emission Results**

Test Input Power	110V 60Hz	Temperature	23°C
Line Under Test	AC Mains	Relative Humidity	55%
Serial Number	WFGXHG2227	Atmospheric Pressure	1030mbar
		Tested By	Thor Wen Lei

Frequency (MHz)	Q-P Value (dBμV)	Q-P Margin (dB)	AV Value (dBμV)	AV Margin (dB)	Line	Channel
0.2175	46.0	-16.9	35.0	-17.9	Neutral	1
0.2936	38.8	-21.6	20.2	-30.2	Neutral	1
0.3027	35.1	-25.1	17.0	-33.2	Live	1
0.3977	35.1	-22.8	20.8	-27.1	Live	1
1.4912	33.3	-22.7	12.4	-33.6	Neutral	1
2.4323	35.9	-20.1	18.0	-28.0	Neutral	1

Notes

1. All possible modes of operation were investigated from 150kHz to 30MHz. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
9kHz - 30MHz  
RBW: 10kHz VBW: 30kHz
4. Conducted Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.0dB.

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**RADIATED EMISSION TEST**

**FCC Part 15.205 Restricted Bands**

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	Above 38.6
13.36 - 13.41			

**FCC Parts 15.109(a) and 15.209 Radiated Emission Limits**

Frequency Range (MHz)	Quasi-Peak Limit Values (dBμV/m) @ 3m
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
Above 960	54.0*
* Above 1GHz, average detector was used. A peak limit of 20dB above the average limit does apply.	

**FCC Parts 15.109(a) and 15.209 Radiated Emission Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
R&S Test Receiver (20Hz-26.5GHz) – ESMI3	ESMI	829214/005 829550/004	24 Nov 2007
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
Schaffner Bilog Antenna –BL	CBL6112D	22020	14 May 2008
EMCO Horn Antenna – H14	3115	0003-6087	18 May 2008
Bandstop Filter (2.4-2.5 GHz)	BRM50701	017	13 Aug 2007

## **RADIATED EMISSION TEST**

### **FCC Parts 15.109(a) and 15.209 Radiated Emission Test Setup**

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

### **FCC Parts 15.109(a) and 15.209 Radiated Emission Test Method**

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces such emissions.
3. The test was carried out at the selected frequency points obtained from the prescan in step 2. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
  - a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
  - b. The EUT was then rotated to the direction that gave the maximum emission.
  - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
4. A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point that above 1GHz, both Peak and Average measurements were carried out.
5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured.
6. The frequency range covered was from 30MHz to 10<sup>th</sup> harmonics of the EUT fundamental frequency, using the Bi-log antenna for frequencies from 30MHz up to 3GHz, and the Horn antenna above 3GHz.

### **Sample Calculation Example**

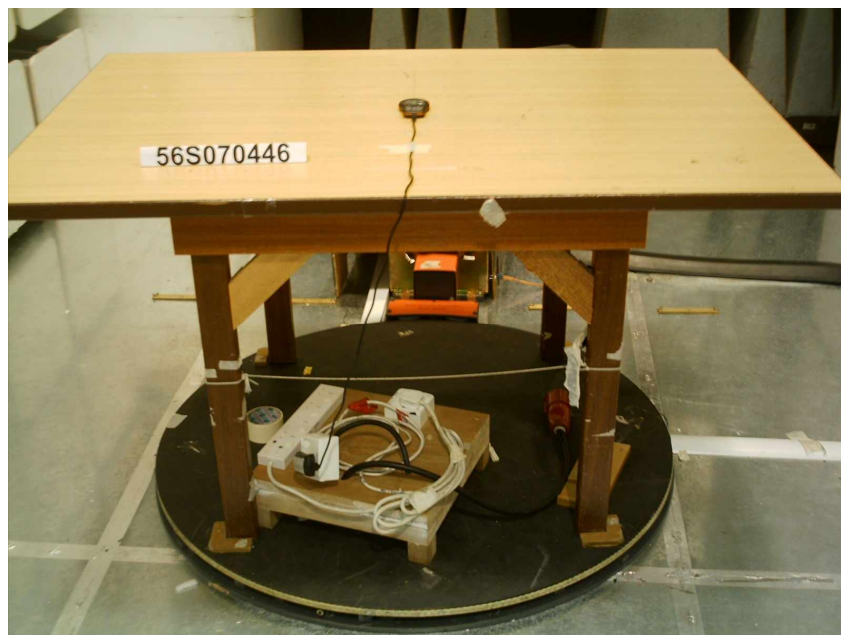
At 300 MHz	Q-P limit (Class B) = 200 $\mu$ V/m = 46.0 dB $\mu$ V/m
Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB	
Q-P reading obtained directly from EMI Receiver = 40.0 dB $\mu$ V/m (Calibrated level including antenna factors & cable losses)	
Therefore, Q-P margin = 40.0 - 46.0 = -6.0	i.e. <b>6 dB below Q-P limit</b>



**RADIATED EMISSION TEST**



**Radiated Emissions Test Setup (Front View)**



**Radiated Emissions Test Setup (Rear View)**

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**RADIATED EMISSION TEST**

**FCC Parts 15.109(a), 15.205 and 15.209 Radiated Emission Results**

Test Input Power	110V 60Hz	Temperature	23°C
Test Distance	3m	Relative Humidity	55%
Serial Number	WFGXHG2227	Atmospheric Pressure	1030mbar
		Tested By	Thor Wen Lei

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBμV/m)	Q-P Margin (dB)	Azimuth (Degrees)	Height (cm)	Polarisation (H/V)	Channel
36.3441	18.9	-21.1	73	100	V	6
61.9580	20.6	-19.4	147	101	V	6
276.0011	16.8	-29.2	252	100	V	6
281.4931	15.2	-30.8	326	100	H	6
389.9820	28.3	-17.7	234	100	V	6
898.1180	21.2	-24.8	244	100	V	6

Spurious Emissions above 1GHz

Frequency (GHz)	Peak Value (dBμV/m)	Average Value (dBμV/m) *See Note 2	Average Margin (dB) *See Note 3	Azimuth (Degrees)	Height (cm)	Pol (H/V)	Channel
4.8241	46.6	--	-7.4	10	100	H	1
4.8741	47.2	--	-6.8	45	100	H	6
4.9243	47.5	--	-6.5	33	101	H	11
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--

Notes

1. All possible modes of operation were investigated. Only the worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. As the measured peak shows compliance to the average limit, as such no average measurement was required.
3. The average margin indicates the margin of the measured peak value below the average limit.
4. "--" indicates no emissions were found and shows compliance to the limits.
5. Quasi-peak measurement was used for frequency measurement up to 1GHz. Average and peak measurements were used for emissions above 1GHz. The average measurement was done by averaging over a complete cycle of the pulse train, including the blanking interval as the pulse train duration does not exceed 0.1 second.
6. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.





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**RADIATED EMISSION TEST**

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7. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:  
30MHz - 1GHz  
RBW: 120kHz      VBW: 1MHz  
>1GHz  
RBW: 1MHz      VBW: 1MHz
8. The upper frequency of radiated emission investigations was according to requirements stated in Section 15.33(a) for intentional radiators & Section 15.33(b) for unintentional radiators.
9. The channel in the table refers to the transmit channel of the EUT.
10. Radiated Emissions Measurement Uncertainty  
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 30MHz – 25GHz (QP only @ 3m & 10m) is  $\pm 4.6\text{dB}$  (for EUTs < 0.5m X 0.5m X 0.5m).

### **SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

#### **FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Limits**

The EUT shows compliance to the requirements of this section, which states that the minimum bandwidth of the EUT employing digital modulation techniques shall be at least 500kHz.

#### **FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
Agilent EMC Analyzer	E7405A	US40240195	18 Jan 2008

#### **FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Test Setup**

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

#### **FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Test Method**

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode at Channel 1 (2.412GHz) with specified modulation and data rate.
2. The center frequency of the spectrum analyser was set to the transmitting frequency with the frequency span wide enough to capture the 6dB bandwidth of the transmitting frequency.
3. The spectrum analyser was set to max hold to capture the transmitting frequency. The signal capturing was continuous until no further changes were observed.
4. The peak of the transmitting frequency was detected with the marker peak function of the spectrum analyser. The frequencies below the 6dB peak frequency at lower ( $f_L$ ) and upper ( $f_H$ ) sides of the transmitting frequency were marked and measured by using the marker-delta function of the spectrum analyser.
5. The 6dB bandwidth of the transmitting frequency is the frequency difference between the marked lower and upper frequencies,  $|f_H - f_L|$ .
6. Repeat steps 1 to 5 with all possible modulations and data rates.
7. The steps 2 to 6 were repeated with the transmitting frequency was set to Channel 6 (2.437GHz) and Channel 11 (2.462GHz) respectively.

**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

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**Spectrum Bandwidth (6dB Bandwidth Measurement) Test Setup**

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**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Results**

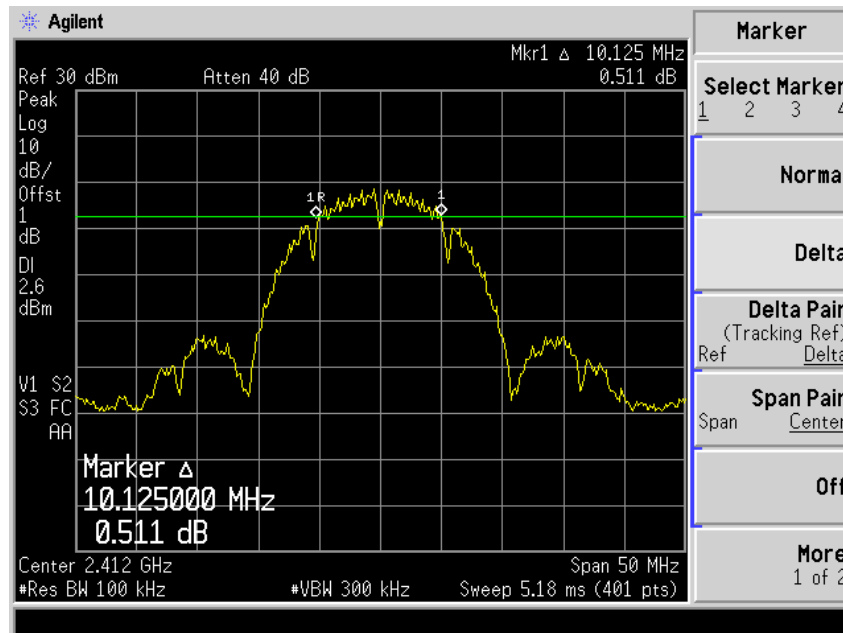
Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	1 - 24	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Thor Wen Lei / Lucas Beh

Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)	802.11b Modulation @ Data Rate
1	2.412	10.125	DBPSK @ 1Mbps
		10.125	DQPSK @ 2Mbps
		10.125	CCK @ 5.5Mbps
		10.375	CCK @ 11Mbps
6	2.437	9.875	DBPSK @ 1Mbps
		10.000	DQPSK @ 2Mbps
		10.000	CCK @ 5.5Mbps
		9.625	CCK @ 11Mbps
11	2.462	10.000	DBPSK @ 1Mbps
		10.125	DQPSK @ 2Mbps
		9.875	CCK @ 5.5Mbps
		10.125	CCK @ 11Mbps

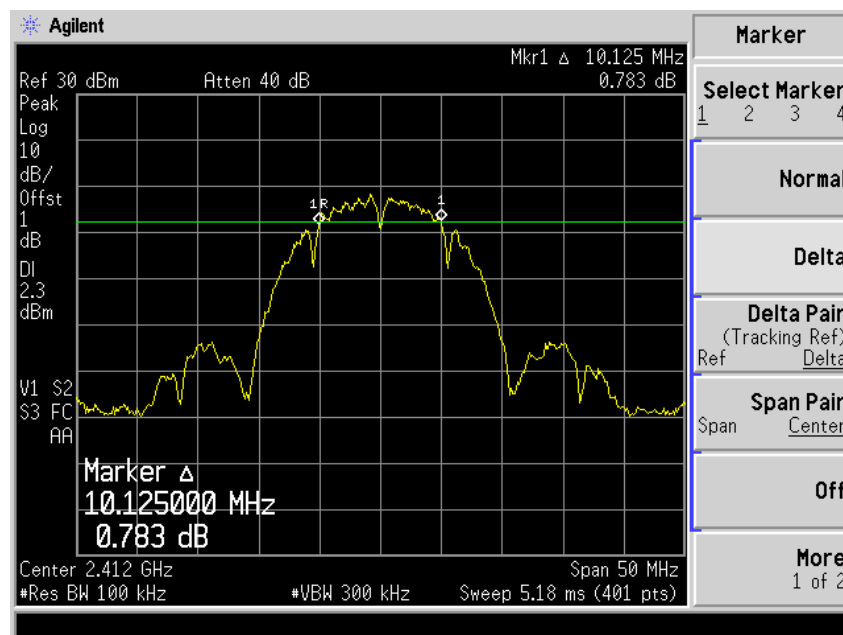
Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)	802.11g Modulation @ Data Rate
1	2.412	16.800	BPSK @ 9Mbps
		16.800	QPSK @ 18Mbps
		16.800	16QAM @ 36Mbps
		16.800	64QAM @ 54Mbps
6	2.437	16.650	BPSK @ 9Mbps
		16.800	QPSK @ 18Mbps
		16.650	16QAM @ 36Mbps
		16.800	64QAM @ 54Mbps
11	2.462	16.650	BPSK @ 9Mbps
		16.800	QPSK @ 18Mbps
		16.800	16QAM @ 36Mbps
		16.800	64QAM @ 54Mbps

## SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

### Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11b



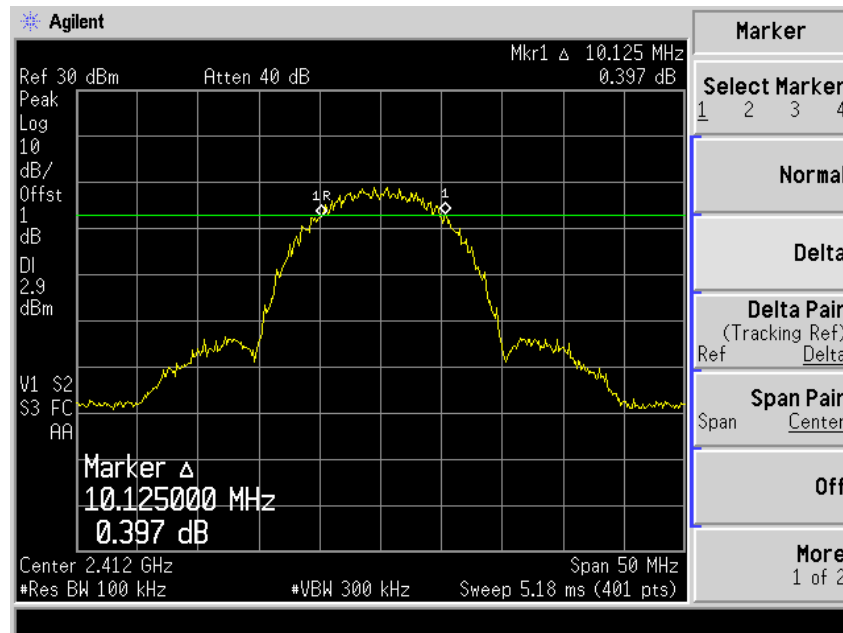
Plot 1 - Channel 1 @ DBPSK 1Mbps



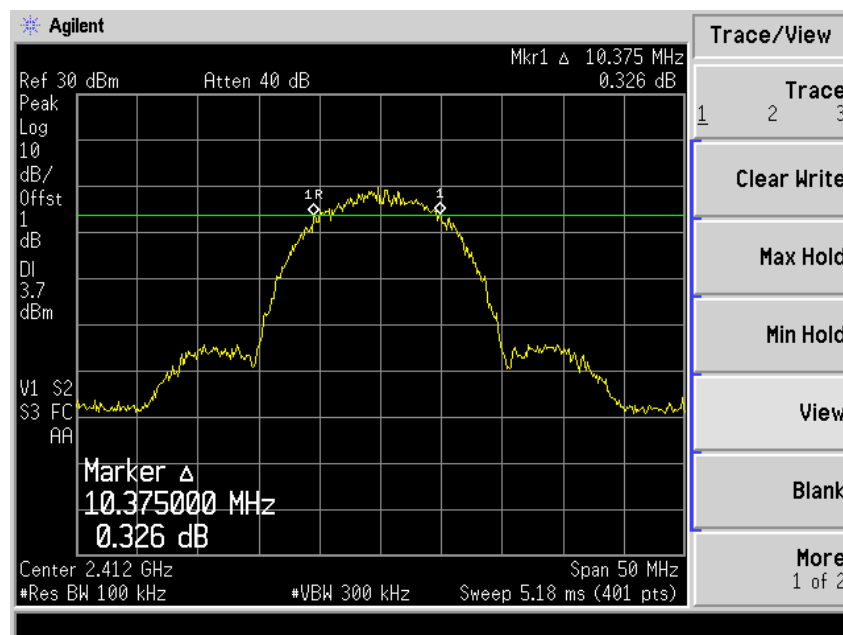
Plot 2 - Channel 1 @ DQPSK 2Mbps

## SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

### Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11b



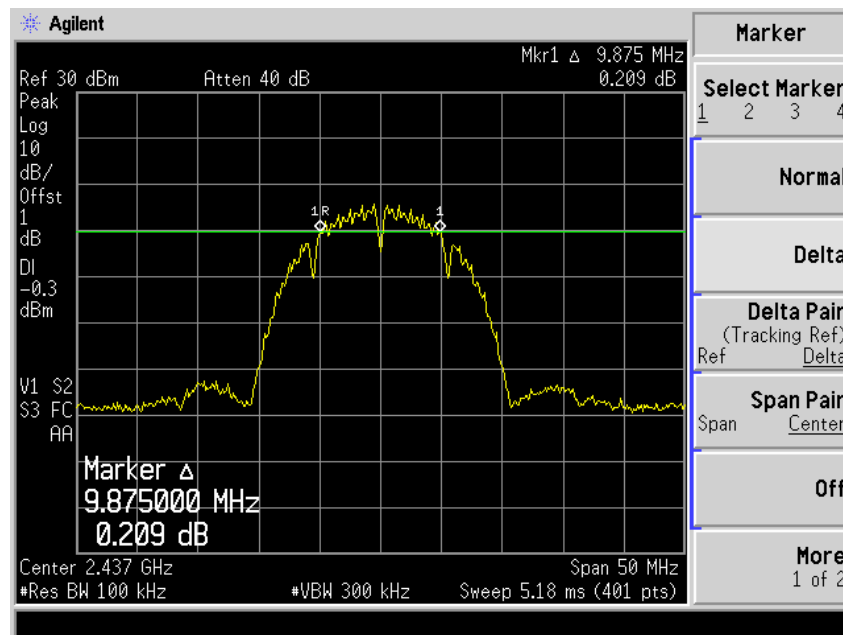
Plot 3 - Channel 1 @ CCK 5.5Mbps



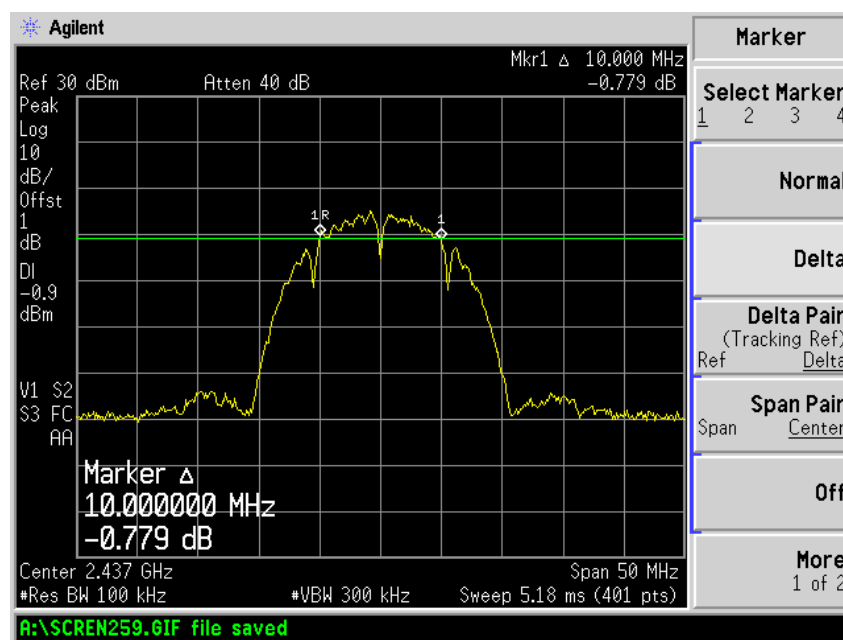
Plot 4 - Channel 1 @ CCK 11Mbps

**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11b**



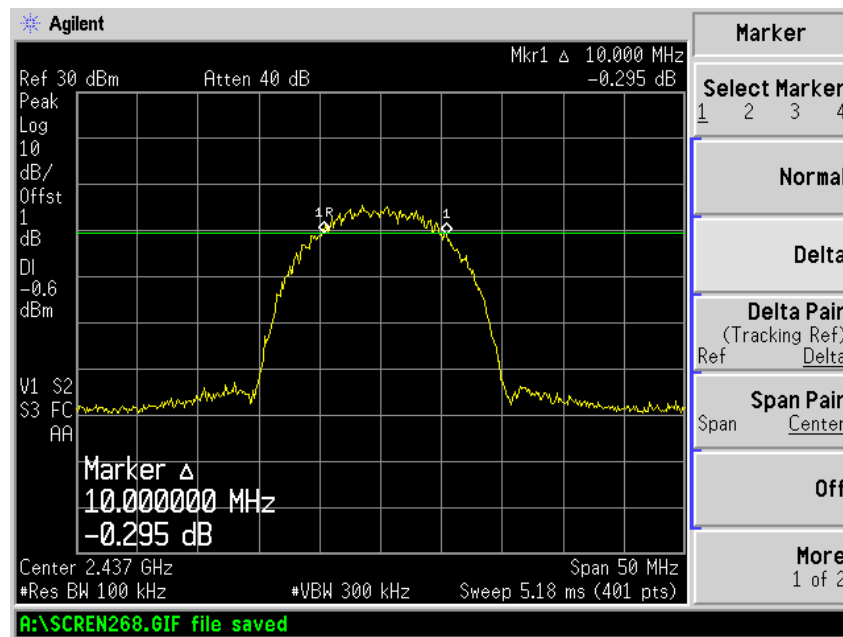
**Plot 5 - Channel 6 @ DBPSK 1Mbps**



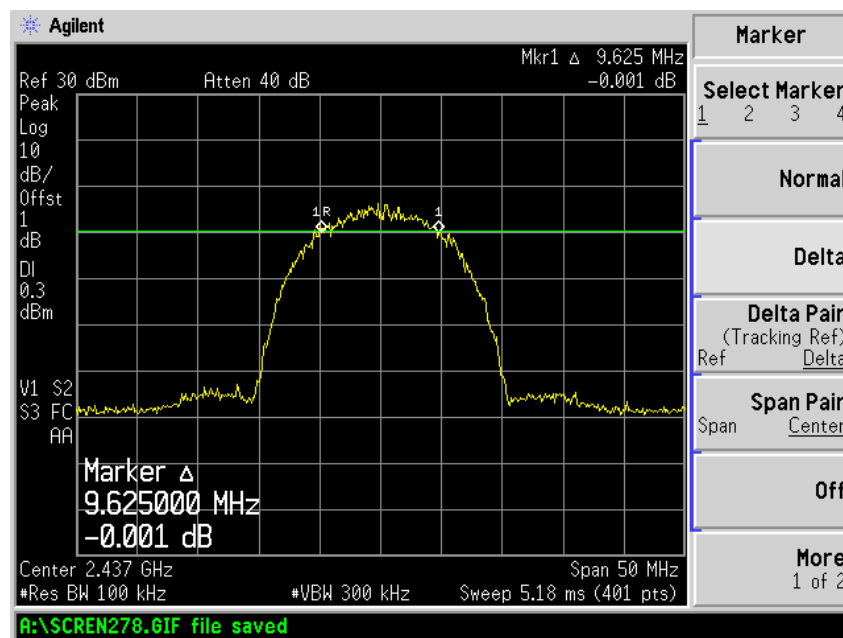
**Plot 6 - Channel 6 @ DQPSK 2Mbps**

**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11b**



**Plot 7 - Channel 6 @ CCK 5.5Mbps**

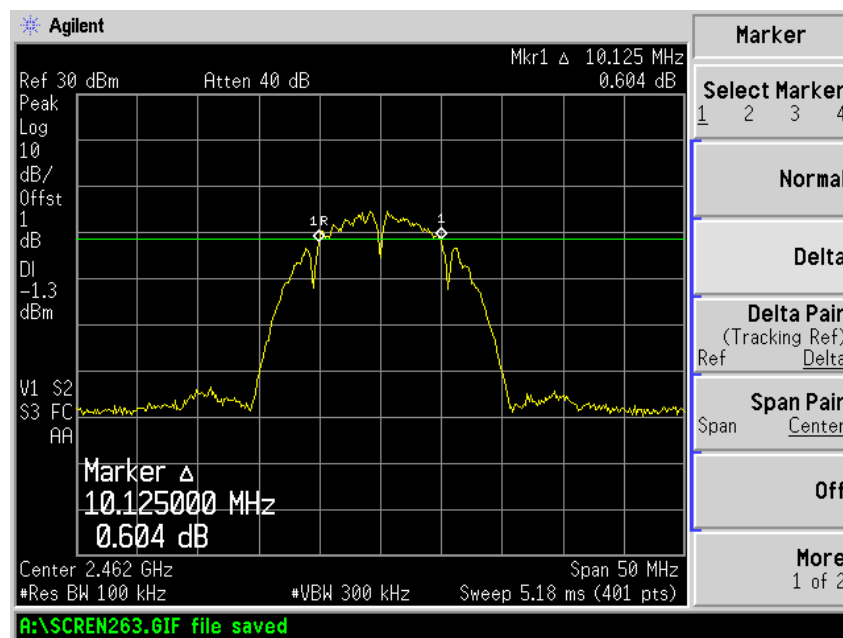
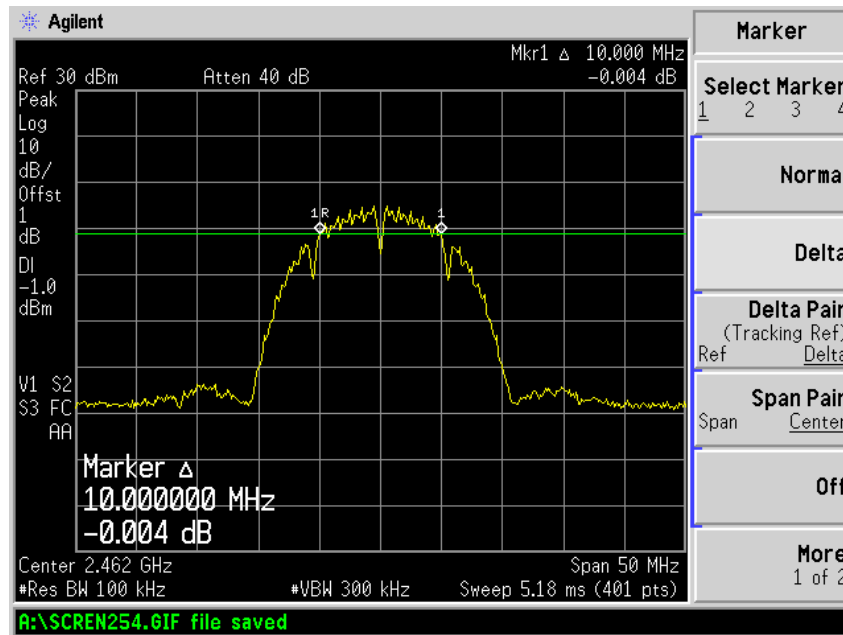


**Plot 8 - Channel 6 @ CCK 11Mbps**



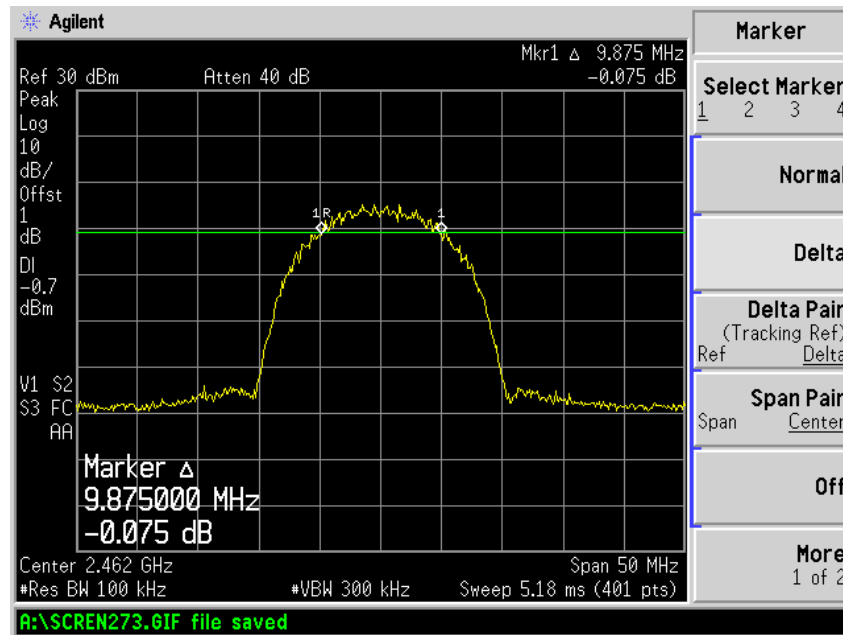
**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11b**

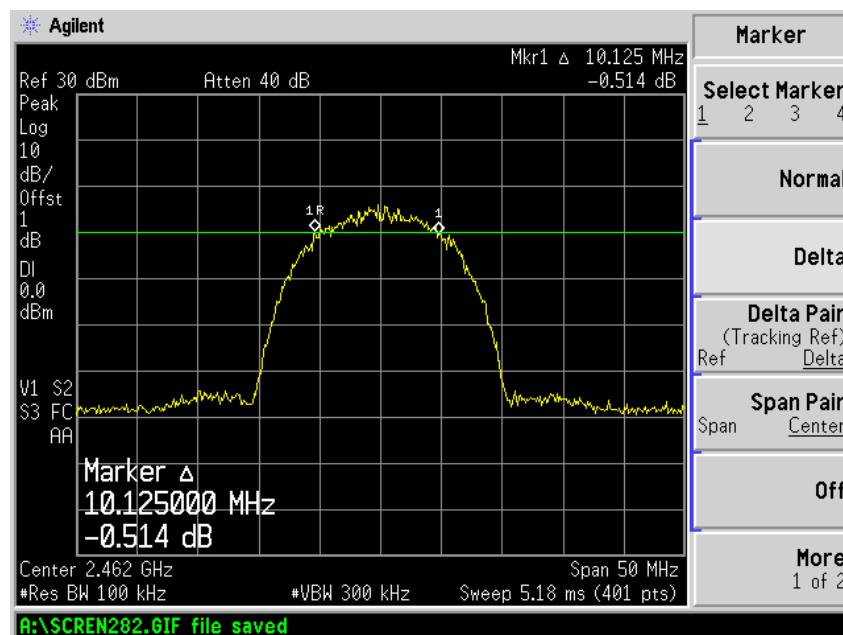


**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11b**



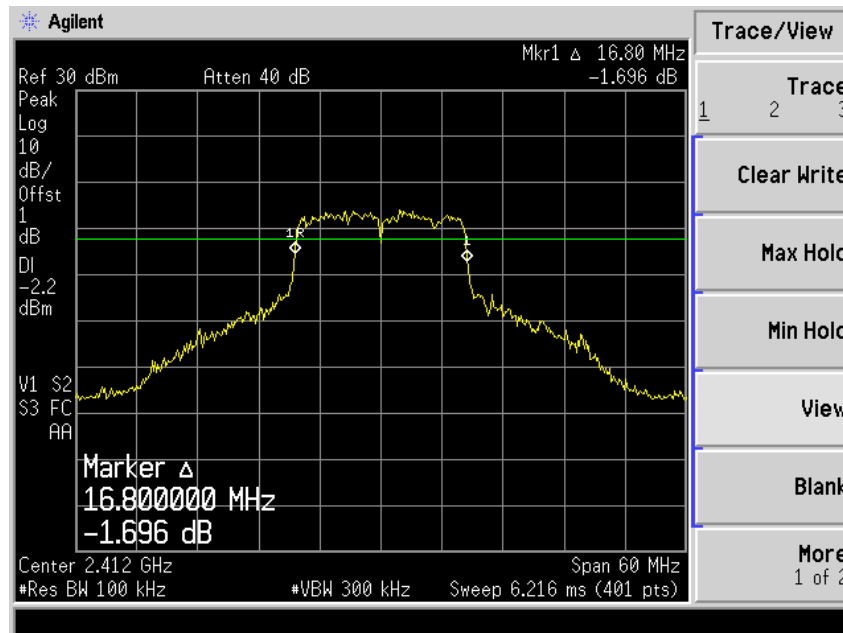
**Plot 11 - Channel 11 @ CCK 5.5Mbps**



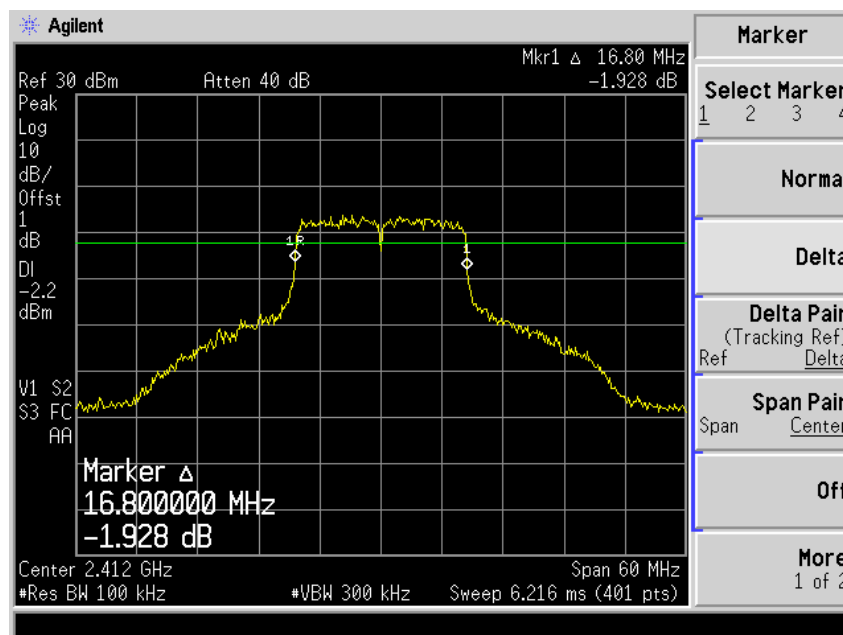
**Plot 12 - Channel 11 @ CCK 11Mbps**

**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11g**



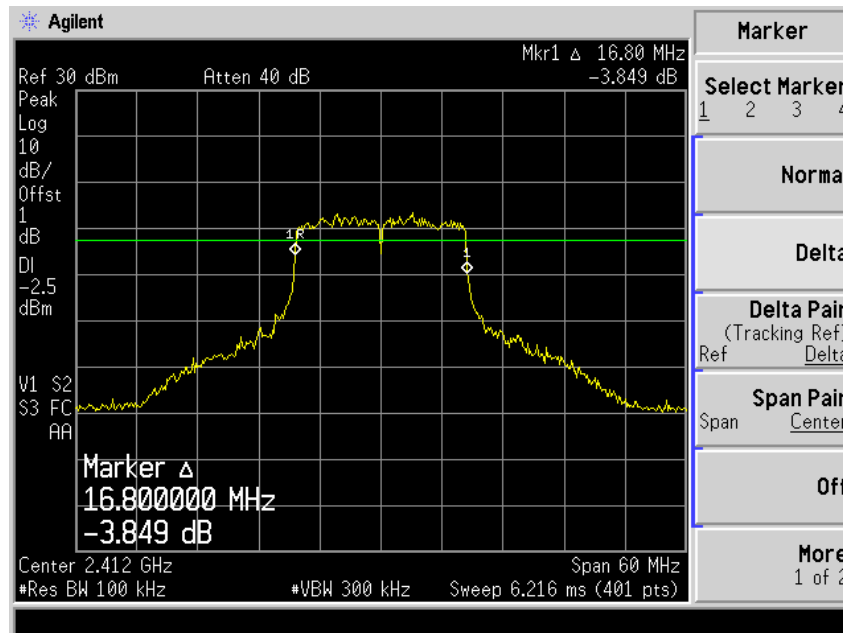
**Plot 13 - Channel 1 @ BPSK 9Mbps**



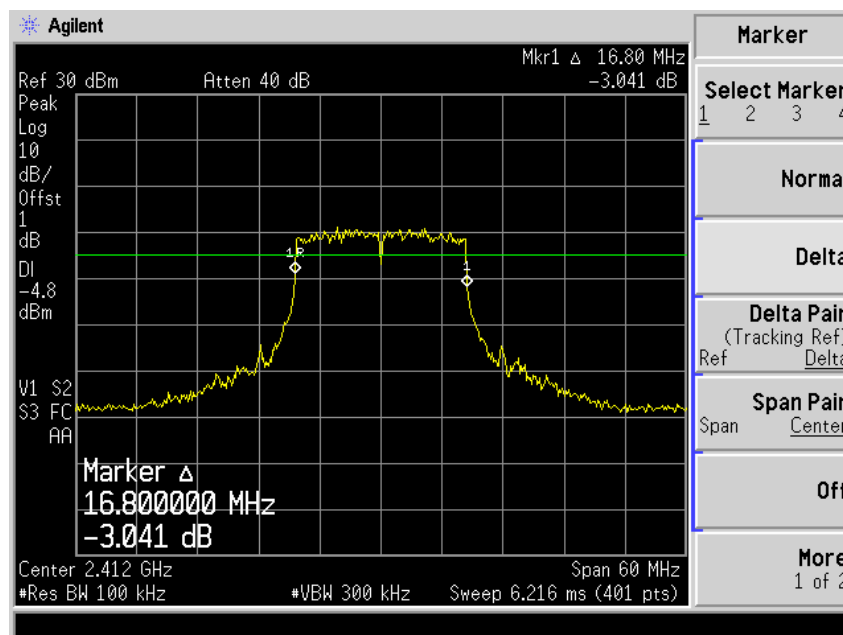
**Plot 14 - Channel 1 @ QPSK 18Mbps**

**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11g**



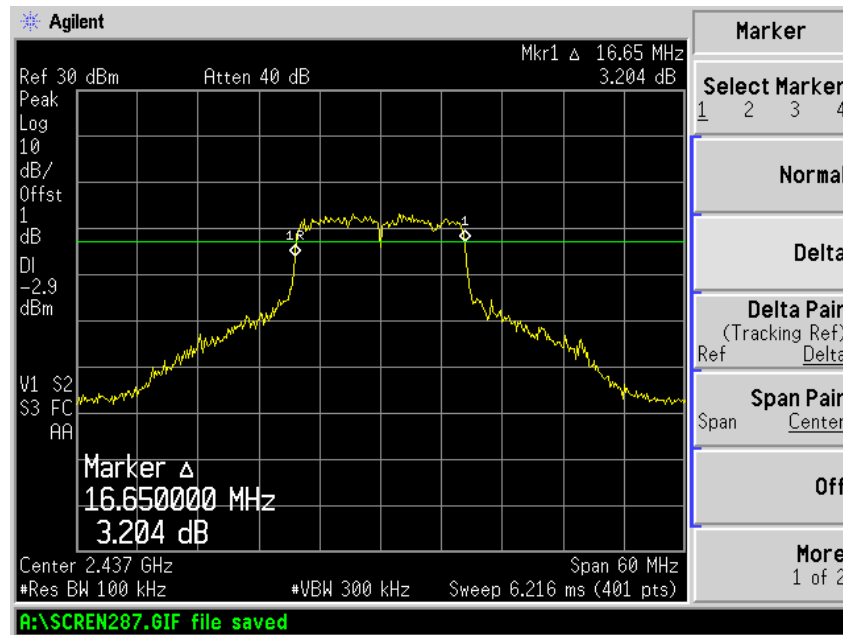
**Plot 15 - Channel 1 @ 16QAM 36Mbps**



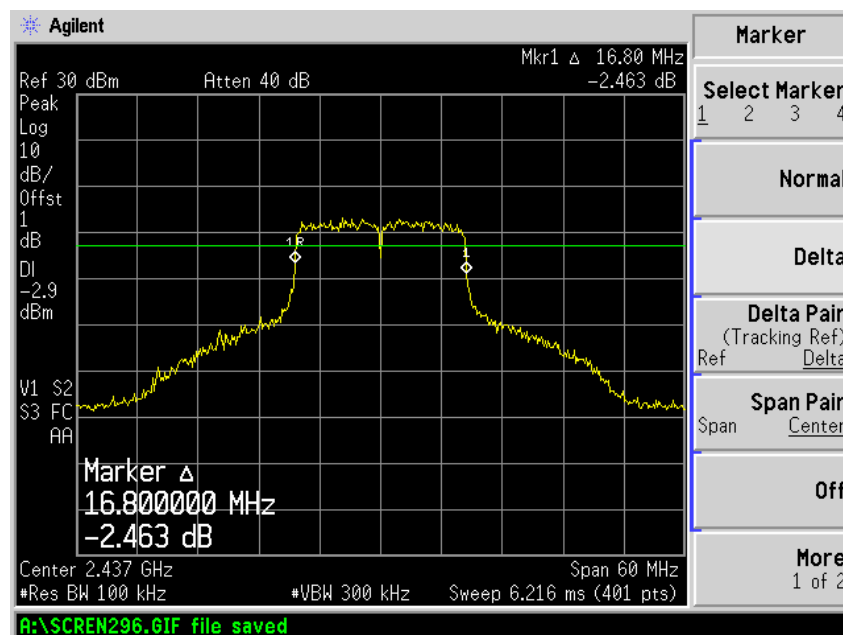
**Plot 16 - Channel 1 @ 64QAM 54Mbps**

# SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

## Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11g



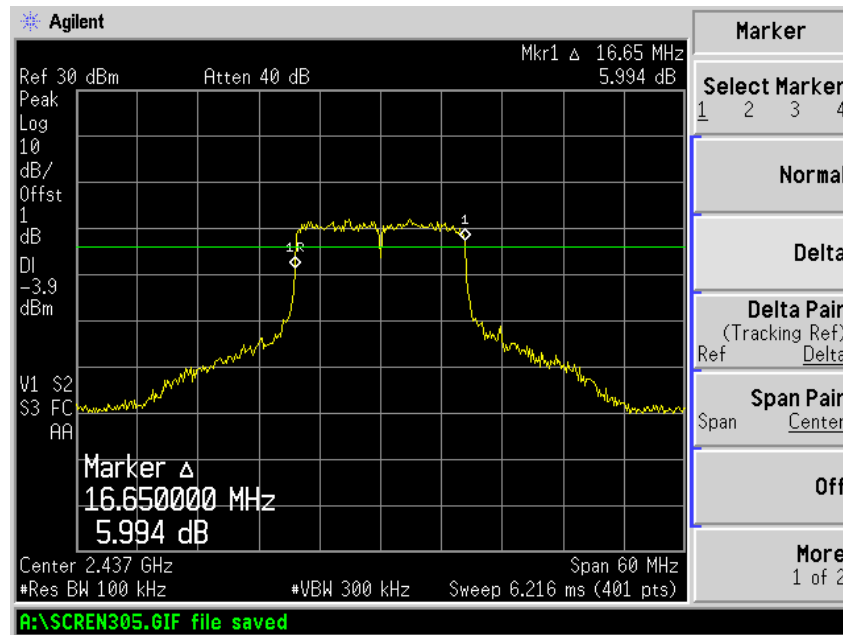
Plot 17 - Channel 6 @ BPSK 9Mbps



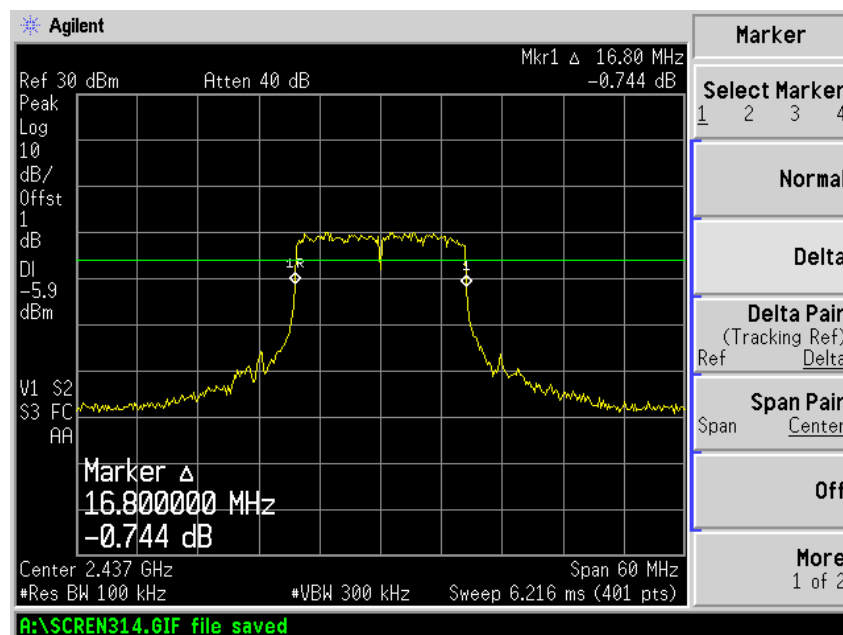
Plot 18 - Channel 6 @ QPSK 18Mbps

**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11g**



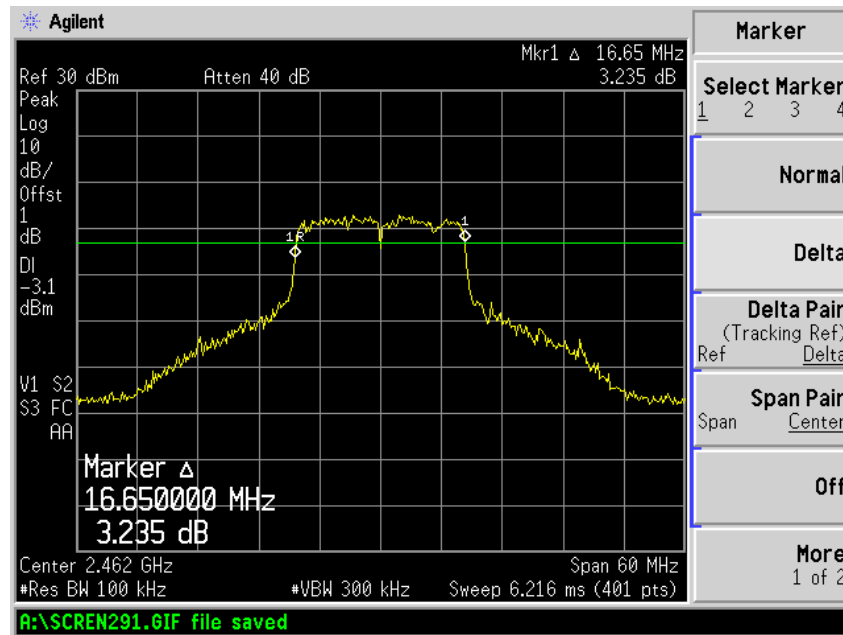
**Plot 19 - Channel 6 @ 16QAM 36Mbps**



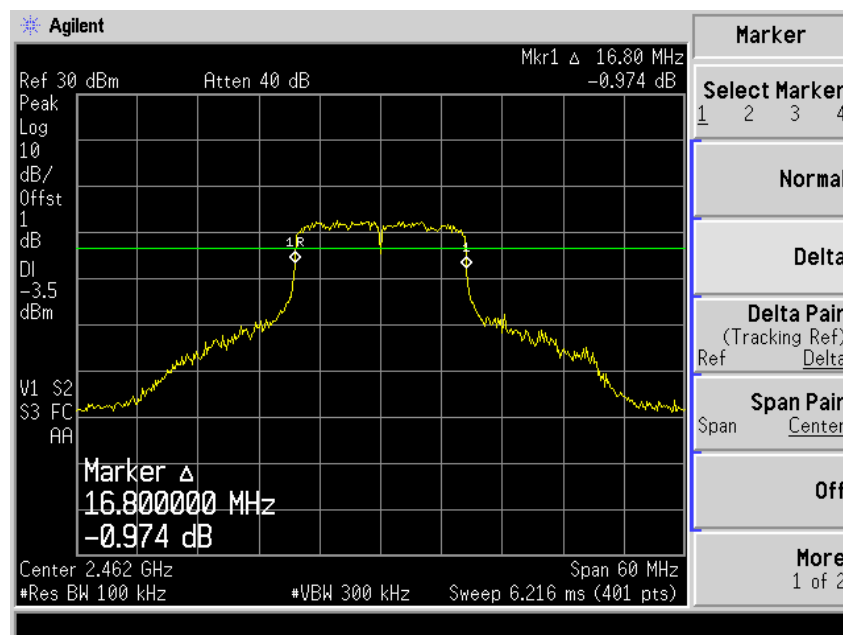
**Plot 20 - Channel 6 @ 64QAM 54Mbps**

**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11g**



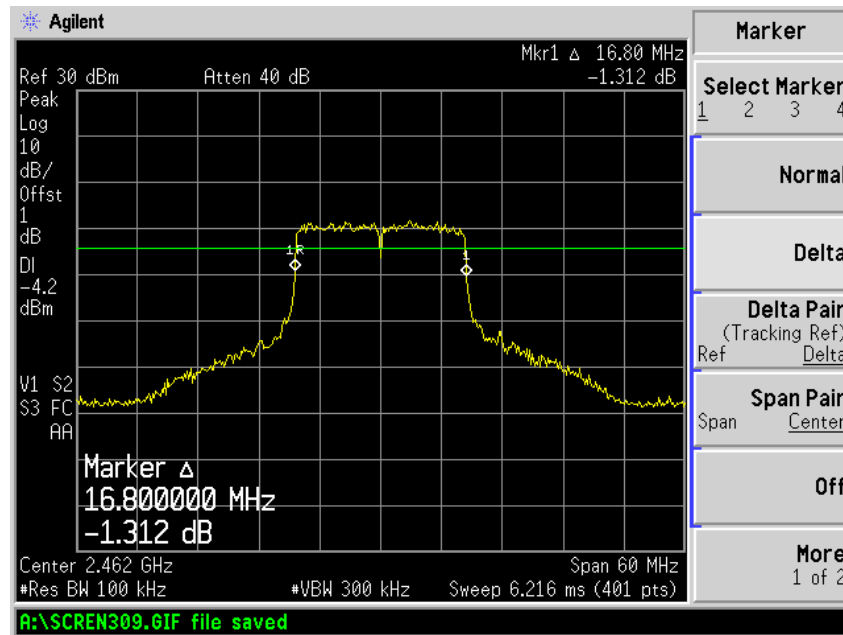
**Plot 21 - Channel 11 @ BPSK 9Mbps**



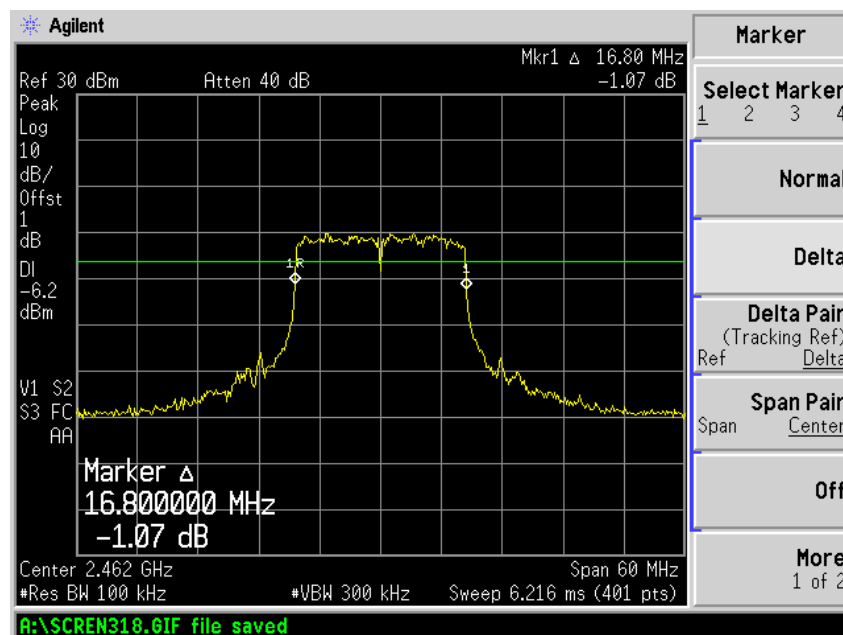
**Plot 22 - Channel 11 @ QPSK 18Mbps**

**SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST**

**Spectrum Bandwidth (6dB Bandwidth Measurement) Plots – 802.11g**



**Plot 23 - Channel 11 @ 16QAM 36Mbps**



**Plot 24 - Channel 11 @ 64QAM 54Mbps**





## MAXIMUM PEAK POWER TEST

### FCC Part 15.247(b)(3) Maximum Peak Power Limits

The EUT shows compliance to the requirements of this section, which states the maximum peak power of the EUT employing digital modulation shall not exceed 1W (30dBm).

### FCC Part 15.247(b)(3) Maximum Peak Power Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Boonton RF Power Meter	4532	97701	28 Oct 2007
Boonton Power Sensor	51075	32002	28 Oct 2007

### FCC Part 15.247(b)(3) Maximum Peak Power Test Setup

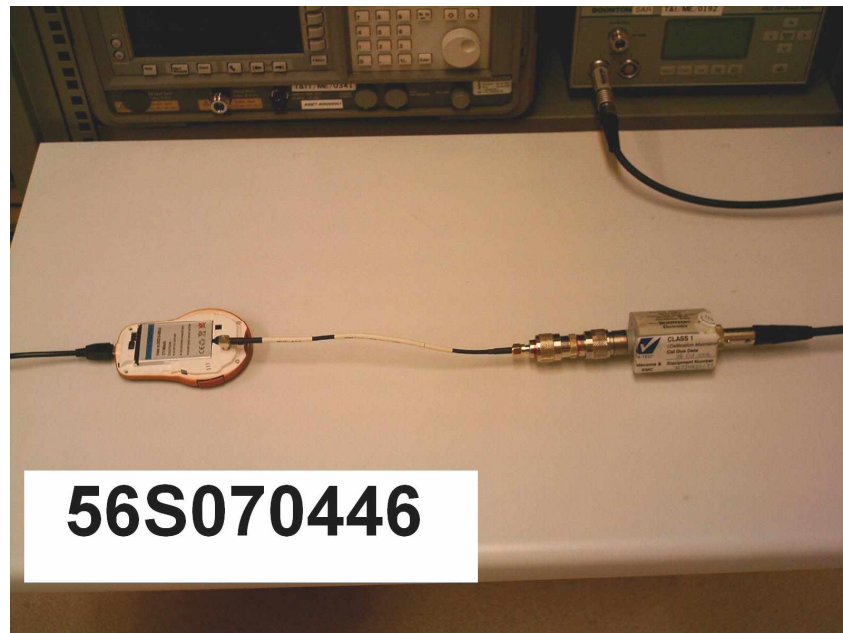
1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the Universal Radio Communication Tester, which set into power analyser mode via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another filtered mains.

### FCC Part 15.247(b)(3) Maximum Peak Power Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode at Channel 1 (2.412GHz) with specified modulation and data rate.
2. The maximum peak power of the transmitting frequency was detected and recorded.
3. Repeat steps 1 to 2 with all possible modulations and data rates.
4. The steps 2 to 3 were repeated with the transmitting frequency was set to Channel 6 (2.437GHz) and Channel 11 (2.462GHz) respectively.

**MAXIMUM PEAK POWER TEST**

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**Maximum Peak Power Test Setup**

**Test Report No. 56S070446/05**  
dated 22 Jun 2007



**MAXIMUM PEAK POWER TEST**

**FCC Part 15.247(b)(3) Maximum Peak Power Results**

Test Input Power	110V 60Hz	Temperature	23°C
		Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Thor Wen Lei / Lucas Beh

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Limit (W)	802.11b Modulation @ Data Rate
1	2.412	0.0354	1.0	DBPSK @ 1Mbps
		0.0347	1.0	DQPSK @ 2Mbps
		0.0306	1.0	CCK @ 5.5Mbps
		0.0326	1.0	CCK @ 11Mbps
6	2.437	0.0328	1.0	DBPSK @ 1Mbps
		0.0322	1.0	DQPSK @ 2Mbps
		0.0282	1.0	CCK @ 5.5Mbps
		0.0282	1.0	CCK @ 11Mbps
11	2.462	0.0298	1.0	DBPSK @ 1Mbps
		0.0292	1.0	DQPSK @ 2Mbps
		0.0258	1.0	CCK @ 5.5Mbps
		0.0257	1.0	CCK @ 11Mbps

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Limit (W)	802.11g Modulation @ Data Rate
1	2.412	0.0568	1.0	BPSK @ 9Mbps
		0.0564	1.0	QPSK @ 18Mbps
		0.0414	1.0	16QAM @ 36Mbps
		0.0267	1.0	64QAM @ 54Mbps
6	2.437	0.0531	1.0	BPSK @ 9Mbps
		0.0528	1.0	QPSK @ 18Mbps
		0.0386	1.0	16QAM @ 36Mbps
		0.0248	1.0	64QAM @ 54Mbps
11	2.462	0.0494	1.0	BPSK @ 9Mbps
		0.0494	1.0	QPSK @ 18Mbps
		0.0355	1.0	16QAM @ 36Mbps
		0.0226	1.0	64QAM @ 54Mbps

Notes

1. Nil.



## RF CONDUCTED SPURIOUS EMISSIONS TEST

### FCC Part 15.247(d) RF Conducted Spurious Emissions Limits

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

### FCC Part 15.247(d) RF Conducted Spurious Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent EMC Analyzer	E7405A	US40240195	18 Jan 2008

### FCC Part 15.247(d) RF Conducted Spurious Emissions Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

### FCC Part 15.247(d) RF Conducted Spurious Emissions Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode, non-hopping with transmitting frequency at Channel 1 (2.412GHz) with specified modulation and data rate.
2. The start and stop frequencies of the spectrum analyser were set to 30MHz and 10GHz.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. The steps 2 to 3 were repeated with frequency span was set from 10GHz to 25GHz.
5. Repeat steps 1 to 4 with all possible modulations and data rates.
6. The steps 2 to 5 were repeated with the transmitting frequency was set to Channel 6 (2.437GHz) and Channel 11 (2.462GHz) respectively.

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RF CONDUCTED SPURIOUS EMISSIONS TEST



RF Conducted Spurious Emissions Test Setup

**Test Report No. 56S070446/05**  
dated 22 Jun 2007



**RF CONDUCTED SPURIOUS EMISSIONS TEST**

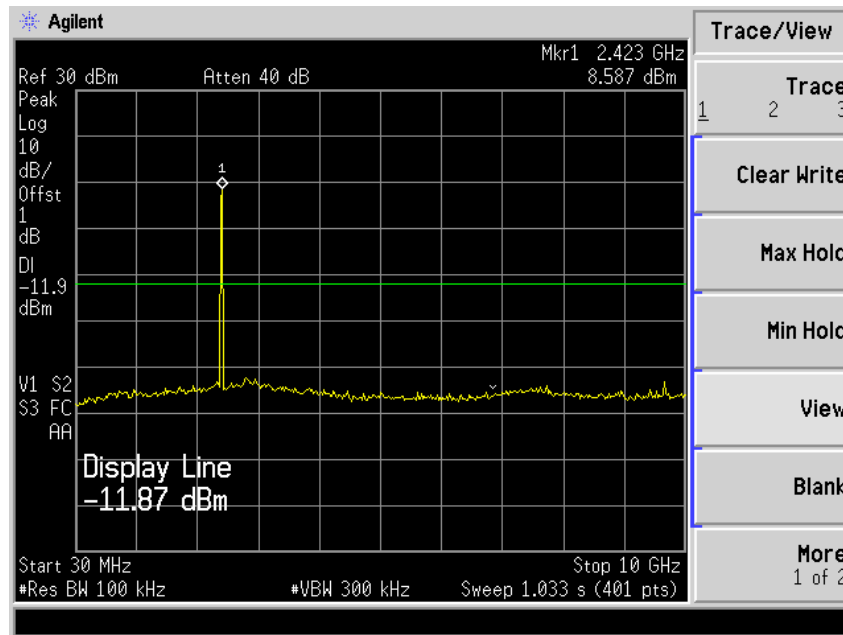
**FCC Part 15.247(d) RF Conducted Spurious Emissions Results**

Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	25 –72	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Thor Wen Lei

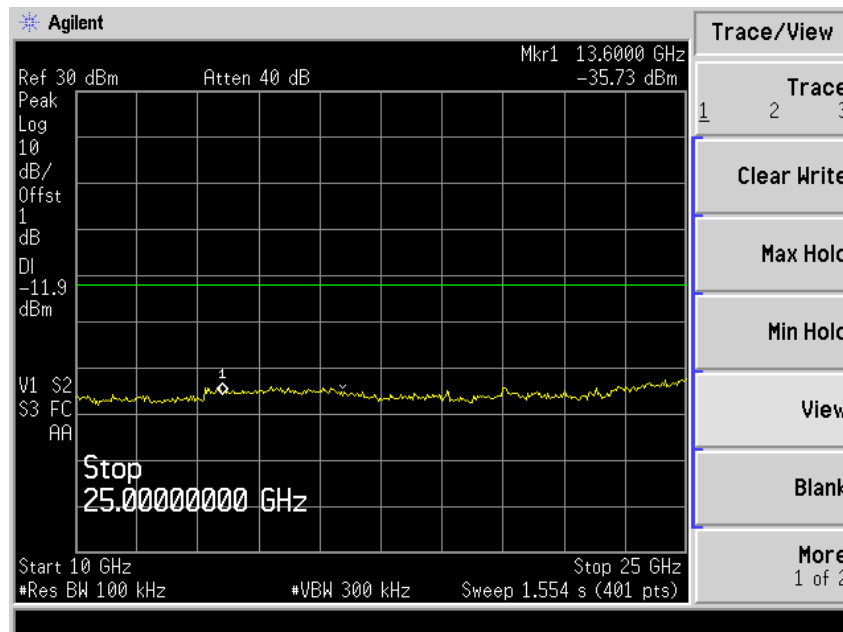
All spurious signals found were below the specified limit. Please refer to the attached plots.

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



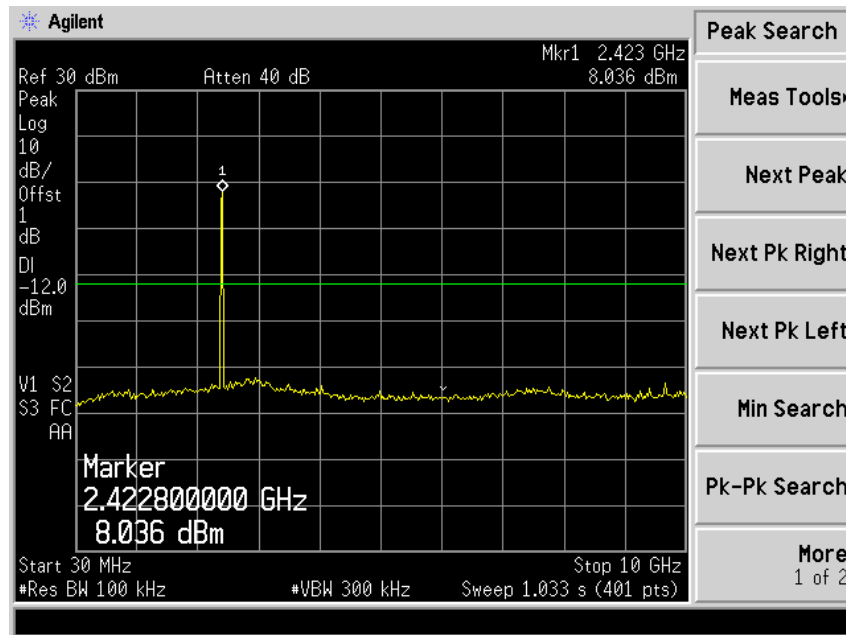
Plot 25 – Channel 1 @ DBPSK 1Mbps



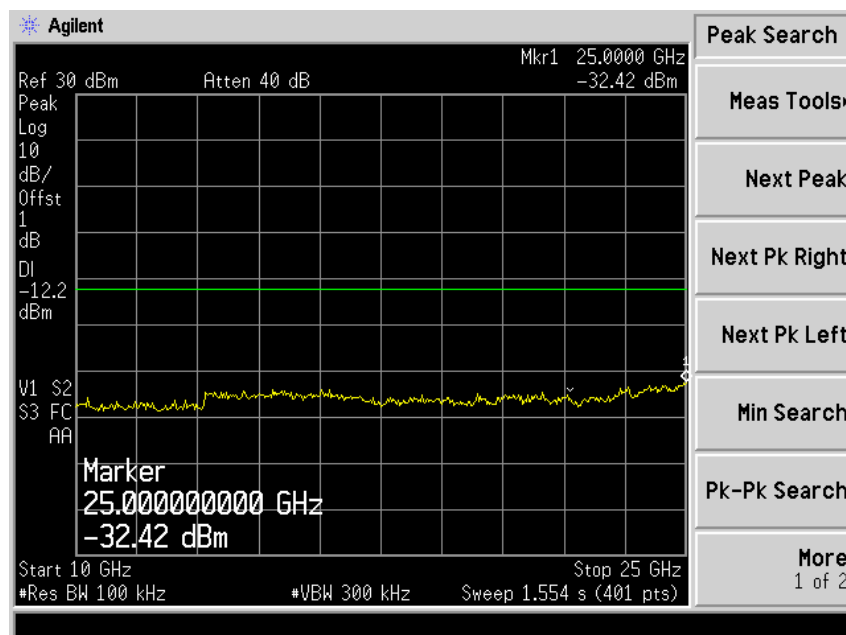
Plot 26 – Channel 1 @ DBPSK 1Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



Plot 27 – Channel 1 @ DQPSK 2Mbps

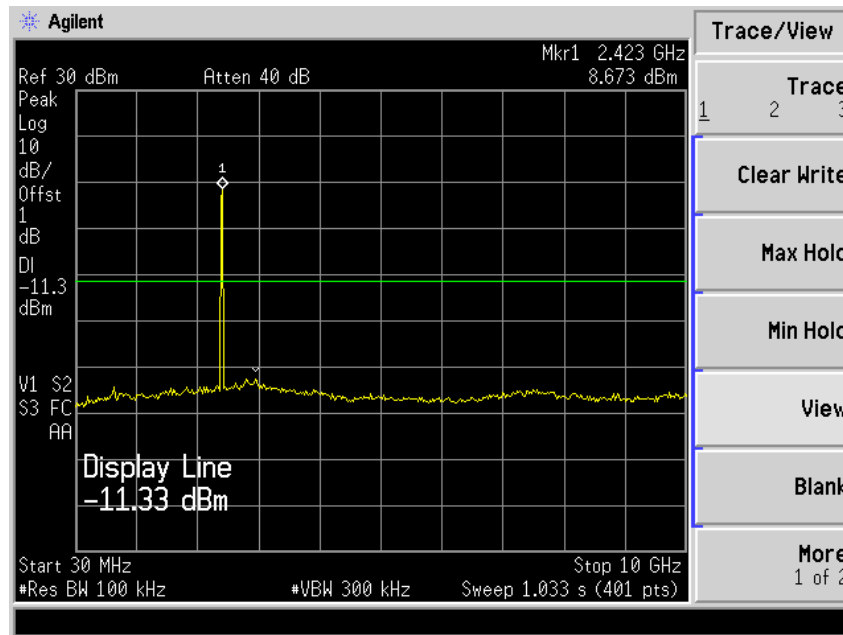


Plot 28 – Channel 1 @ DQPSK 2Mbps

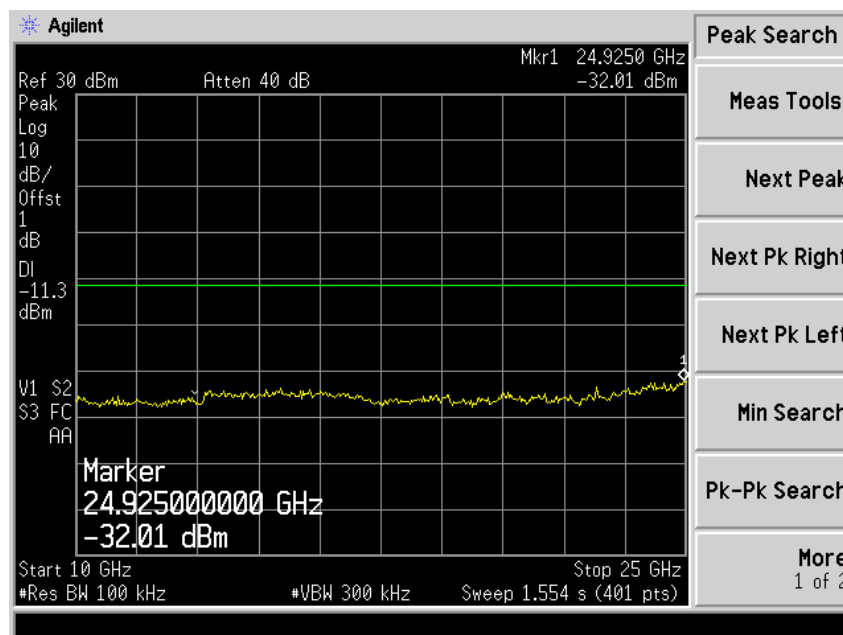


RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



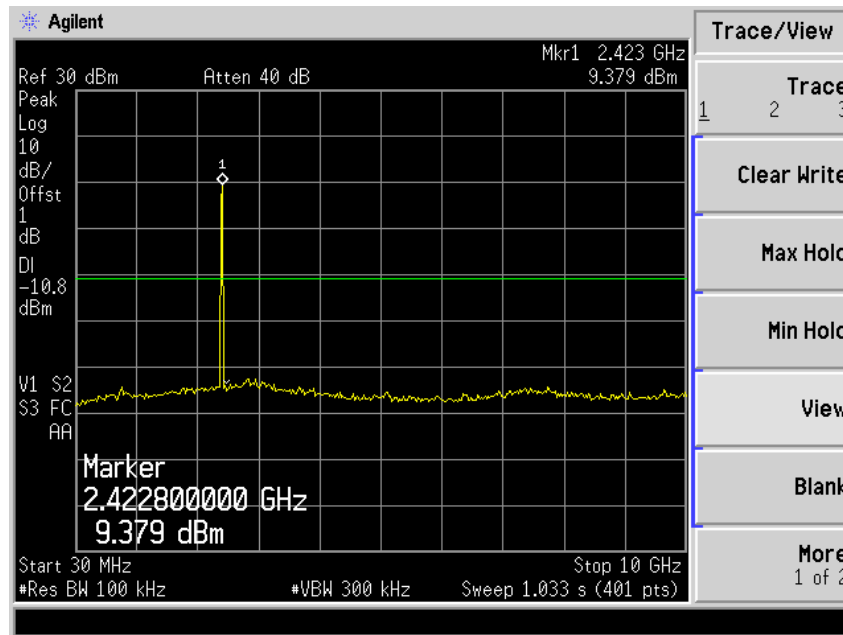
Plot 29 – Channel 1 @ CCK 5.5Mbps



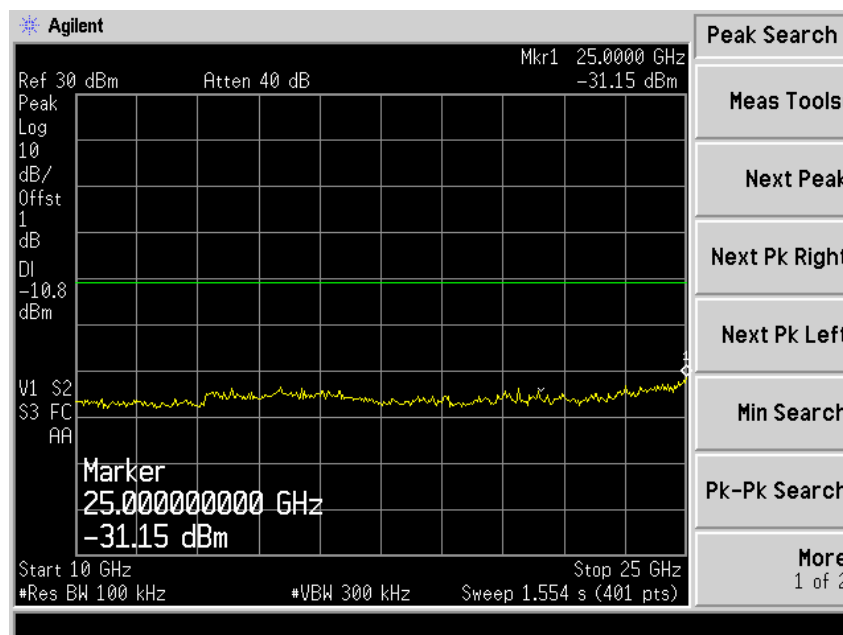
Plot 30 – Channel 1 @ CCK 5.5Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



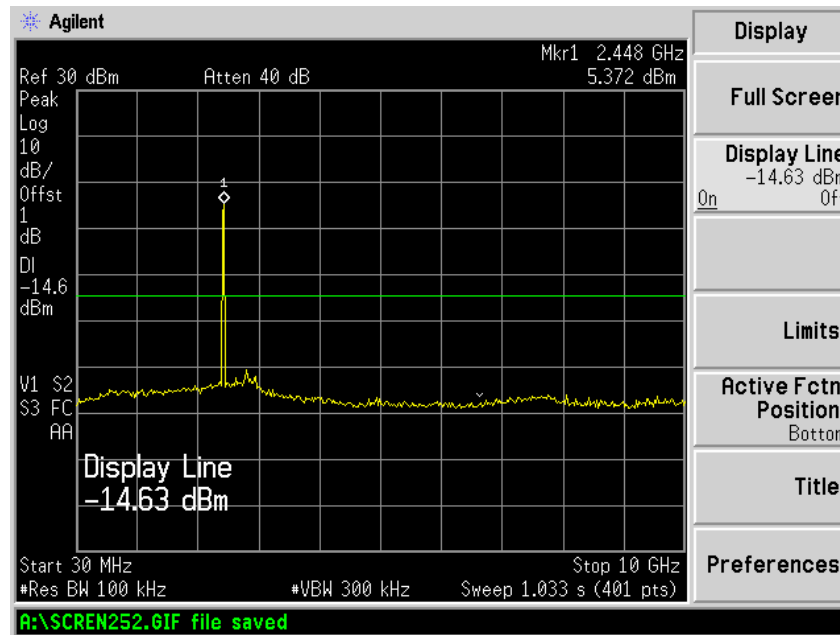
Plot 31 – Channel 1 @ CCK 11Mbps



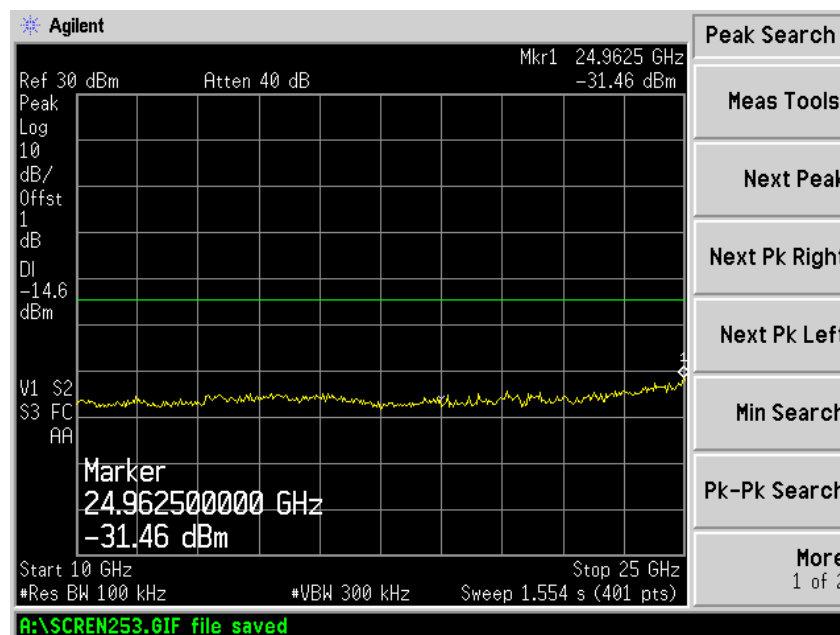
Plot 32 – Channel 1 @ CCK 11Mbps

## RF CONDUCTED SPURIOUS EMISSIONS TEST

### RF Conducted Spurious Emissions Plots – 802.11b



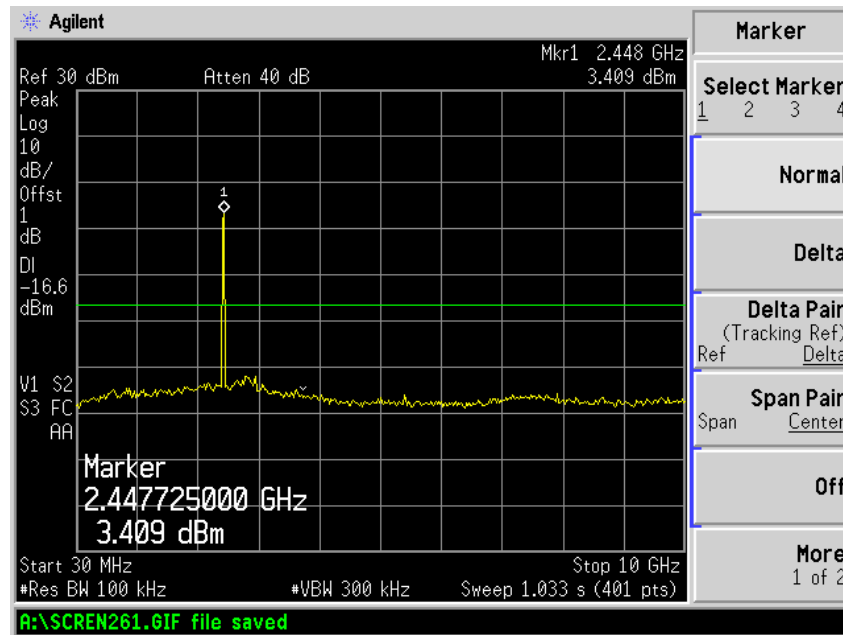
Plot 33 – Channel 6 @ DBPSK 1Mbps



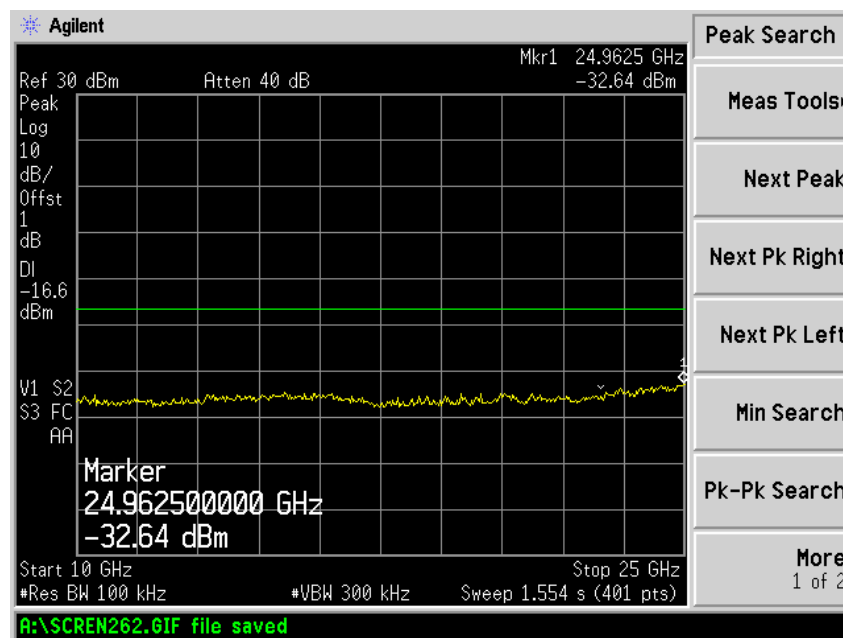
Plot 34 – Channel 6 @ DBPSK 1Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



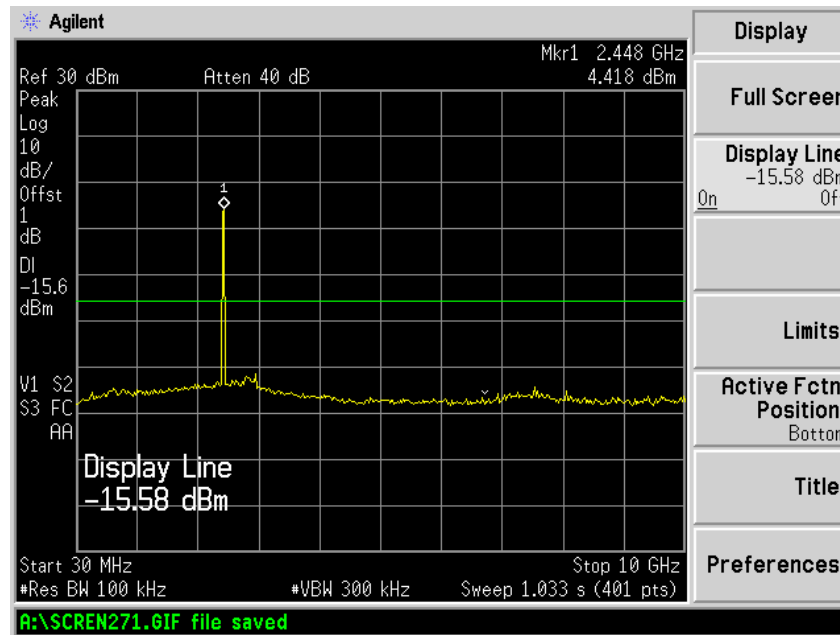
Plot 35 – Channel 6 @ DQPSK 2Mbps



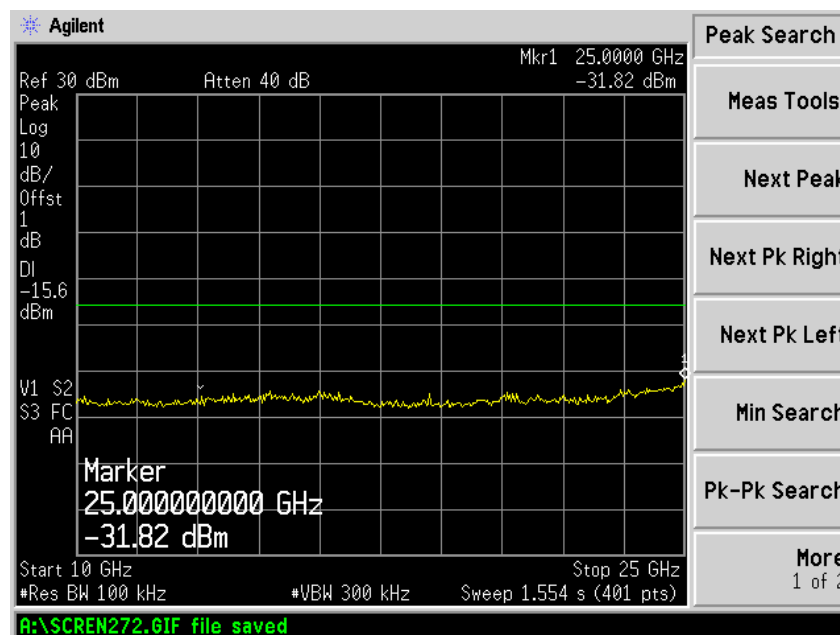
Plot 36 – Channel 6 @ DQPSK 2Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



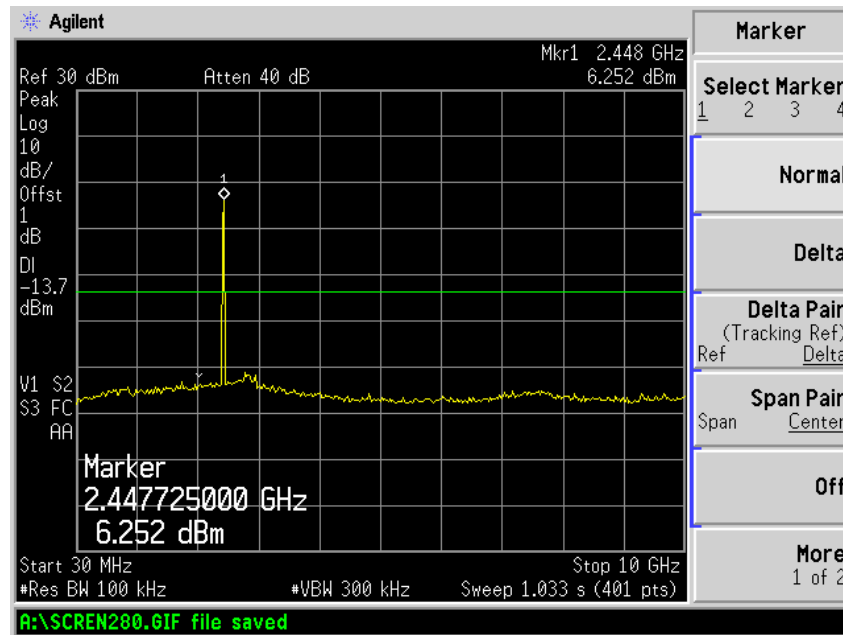
Plot 37 – Channel 6 @ CCK 5.5Mbps



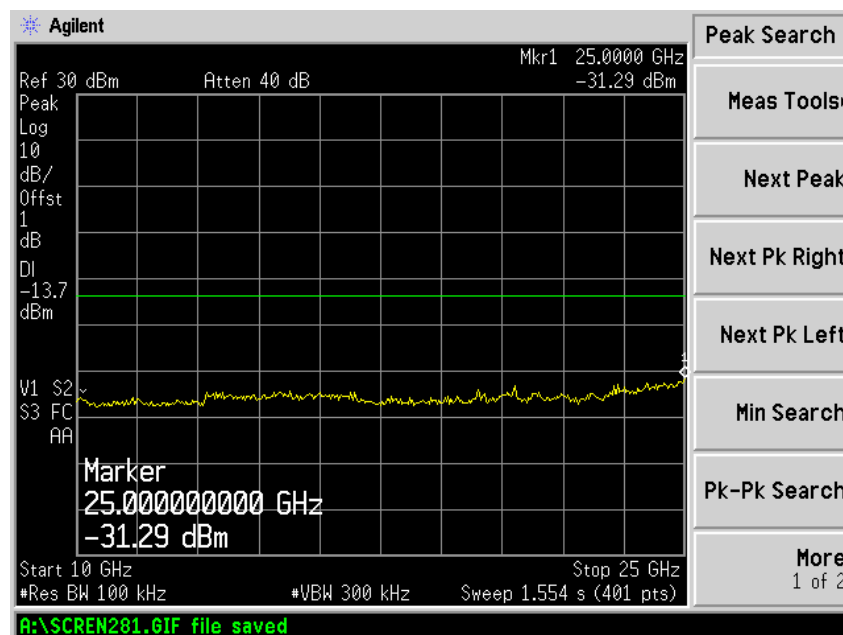
Plot 38 – Channel 6 @ CCK 5.5Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



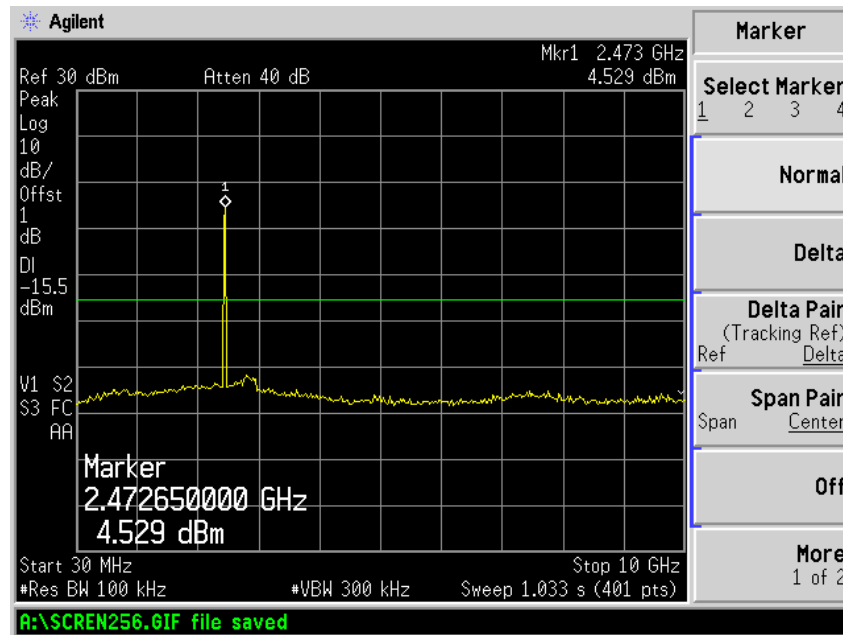
Plot 39 – Channel 6 @ CCK 11Mbps



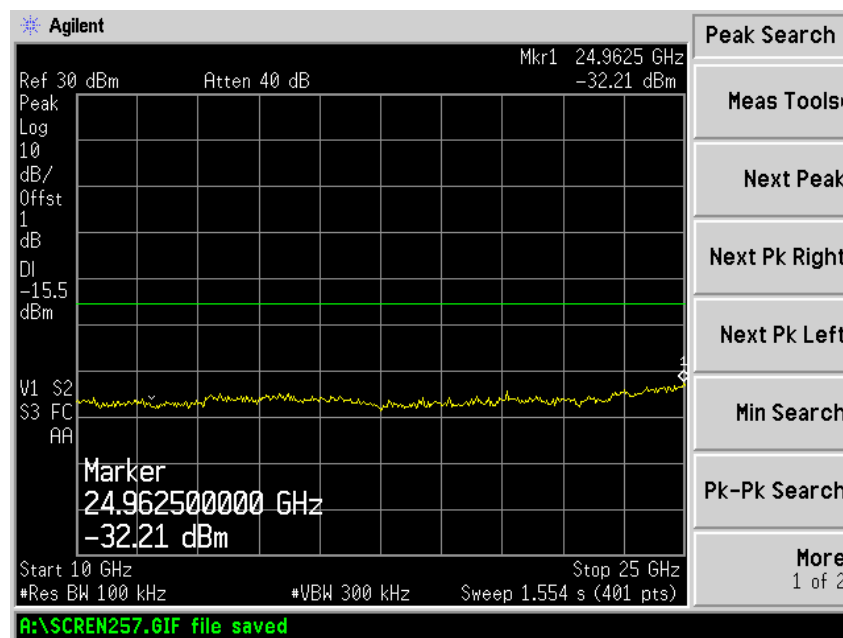
Plot 40 – Channel 6 @ CCK 11Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



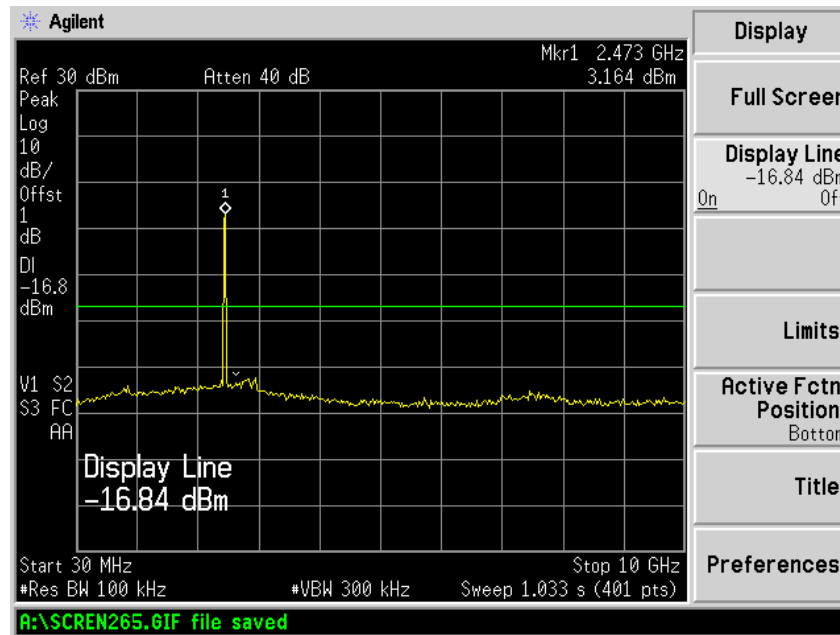
Plot 41 – Channel 11 @ DBPSK 1Mbps



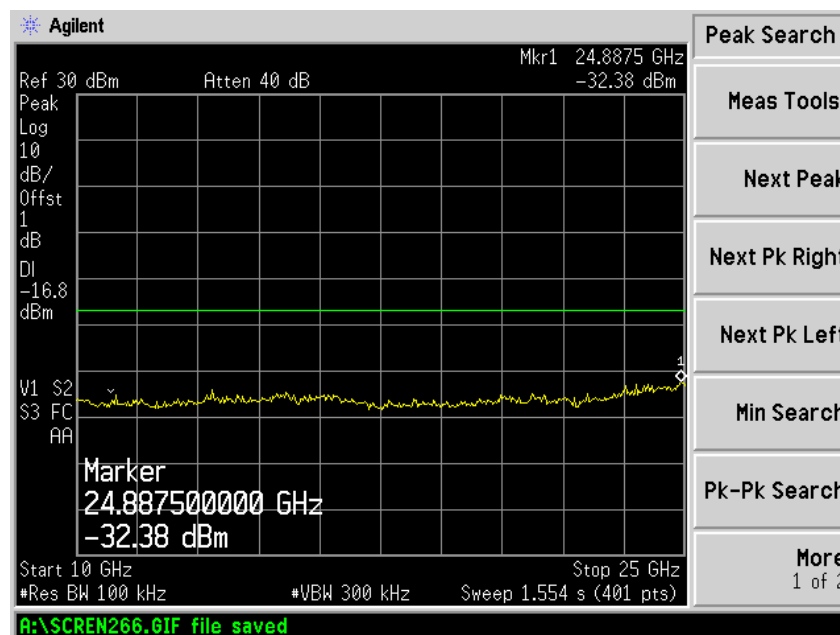
Plot 42 – Channel 11 @ DBPSK 1Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



Plot 43 – Channel 11 @ DQPSK 2Mbps

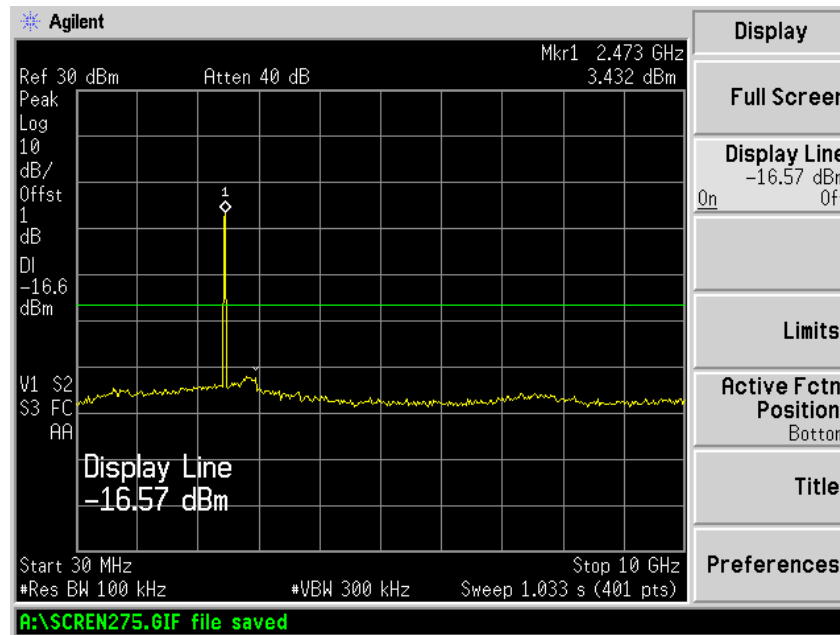


Plot 44 – Channel 11 @ DQPSK 2Mbps

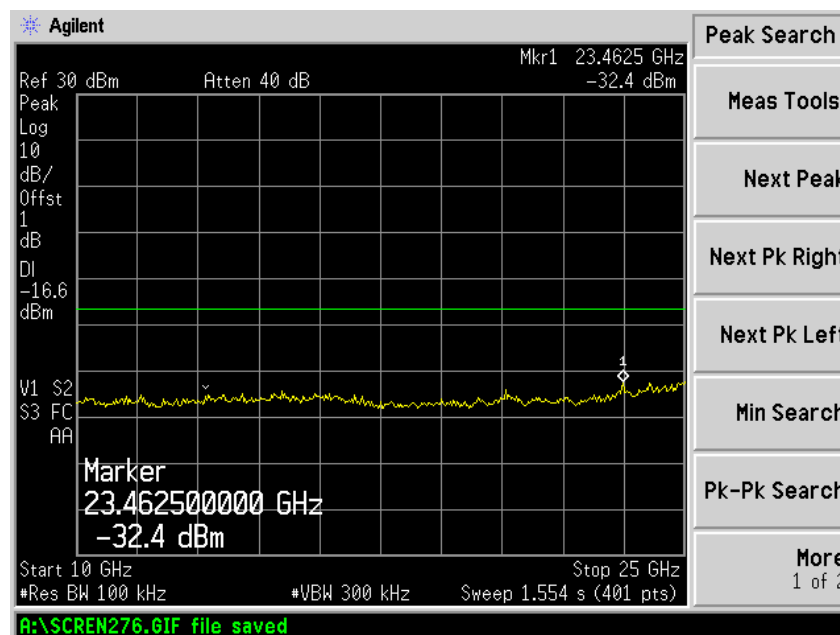


RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



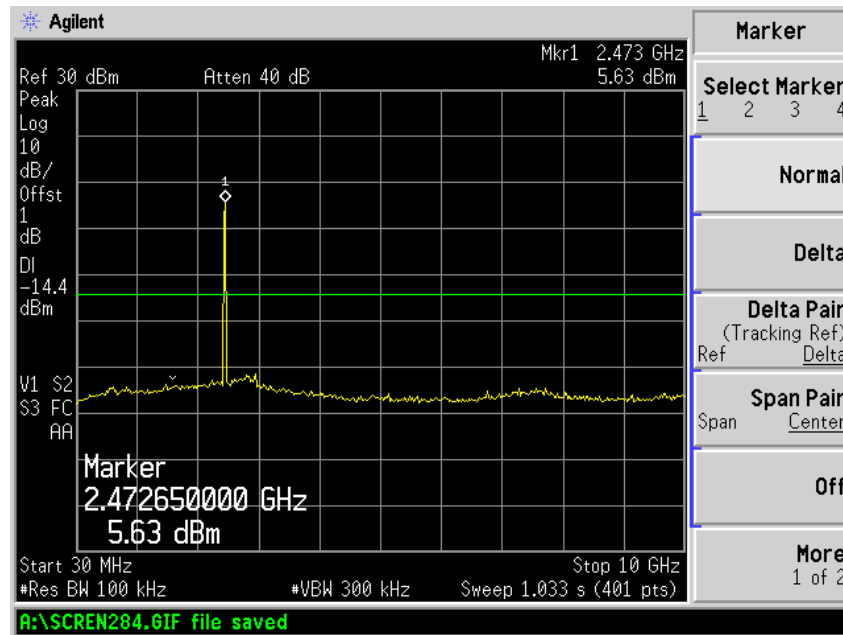
Plot 45 – Channel 11 @ CCK 5.5Mbps



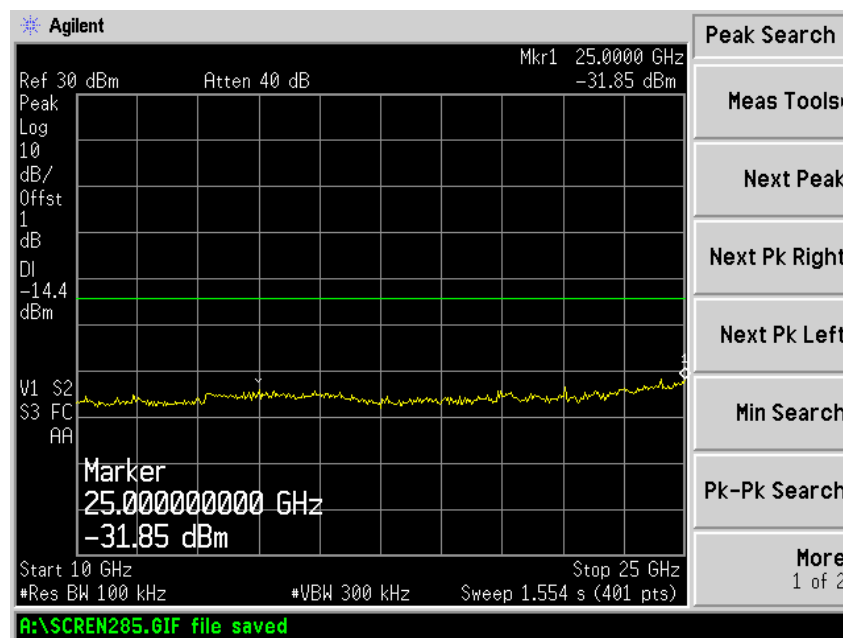
Plot 46 – Channel 11 @ CCK 5.5Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11b



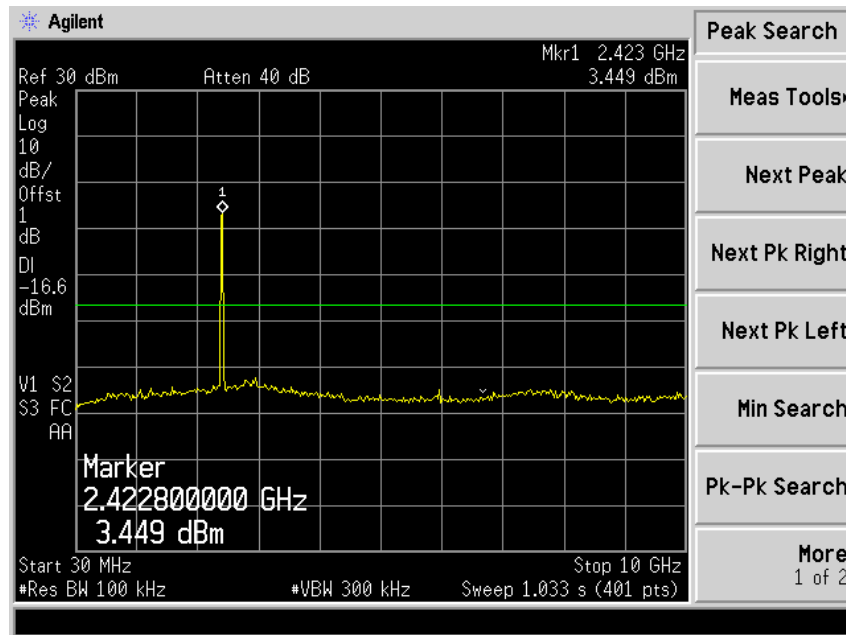
Plot 47 – Channel 11 @ CCK 11Mbps



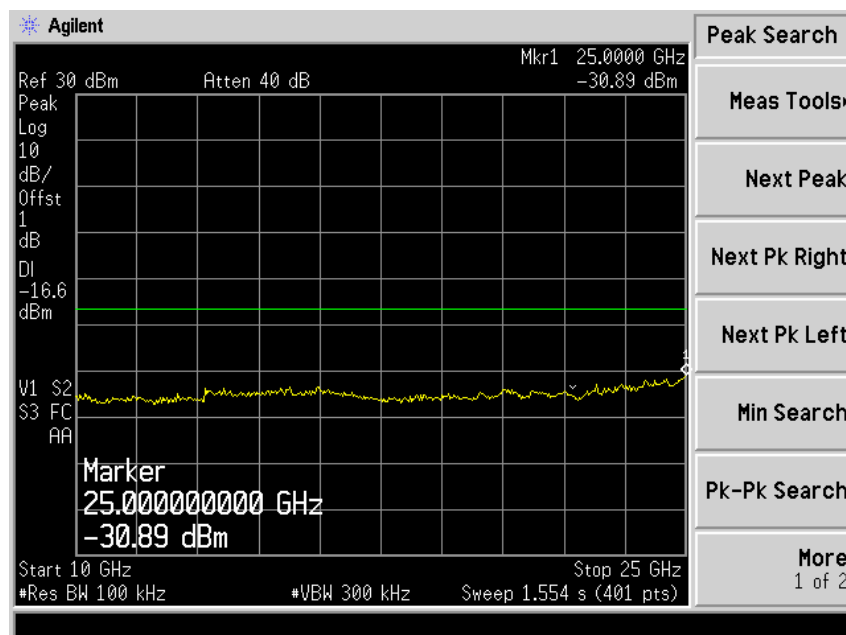
Plot 48 – Channel 11 @ CCK 11Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



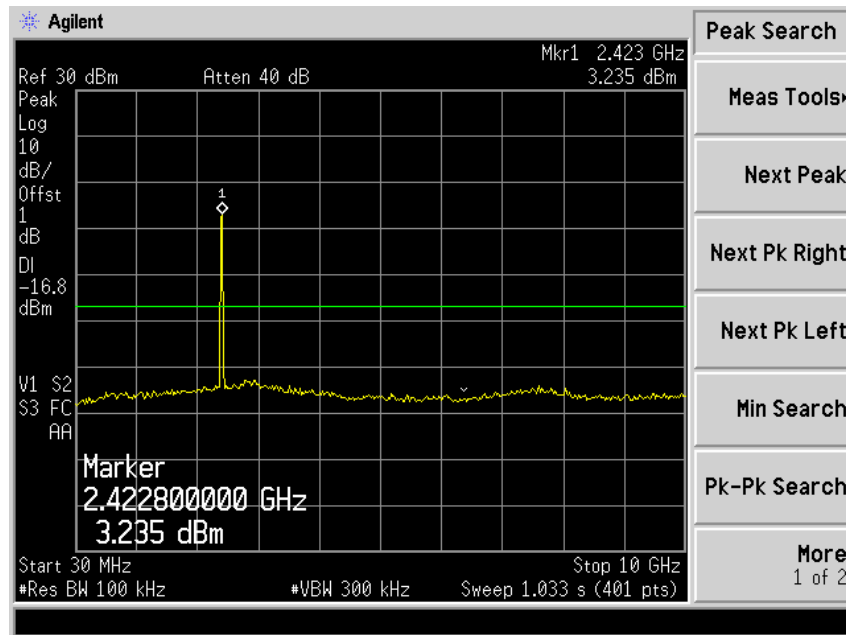
Plot 49 – Channel 1 @ BPSK 9Mbps



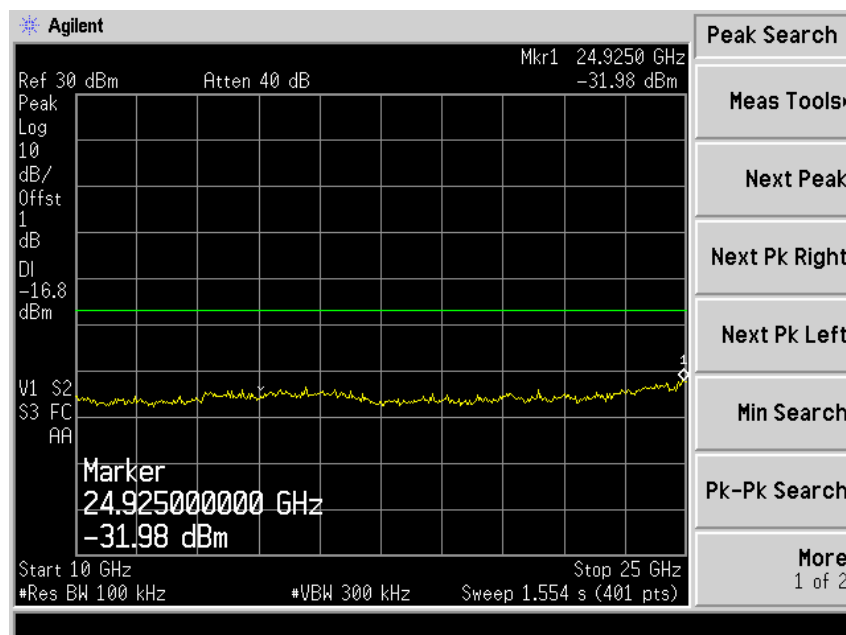
Plot 50 – Channel 1 @ BPSK 9Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



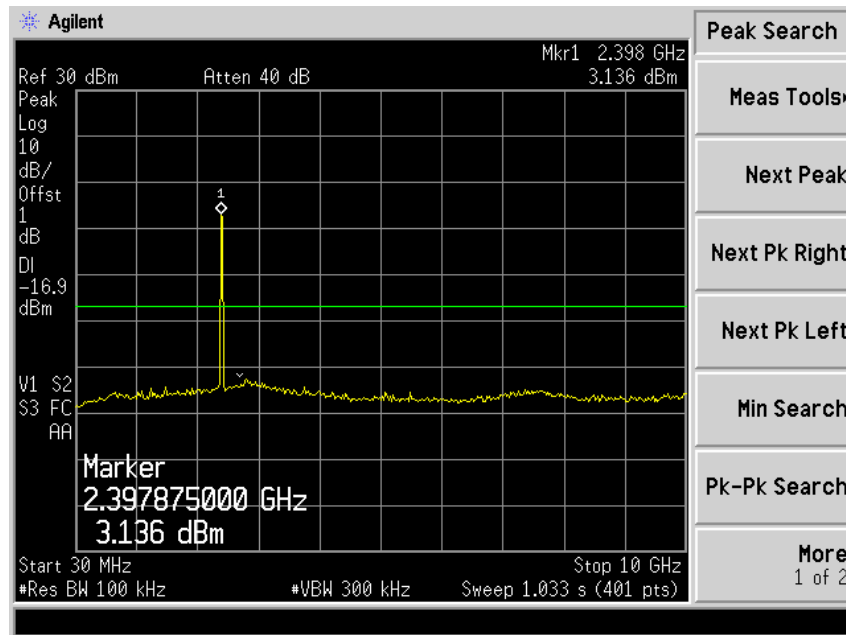
Plot 51 – Channel 1 @ QPSK 18Mbps



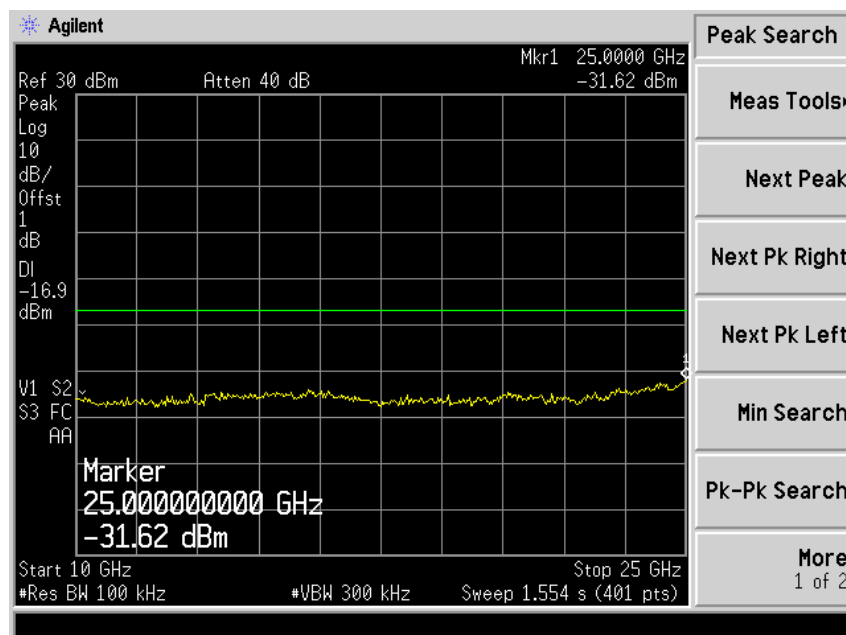
Plot 52 – Channel 1 @ QPSK 18Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



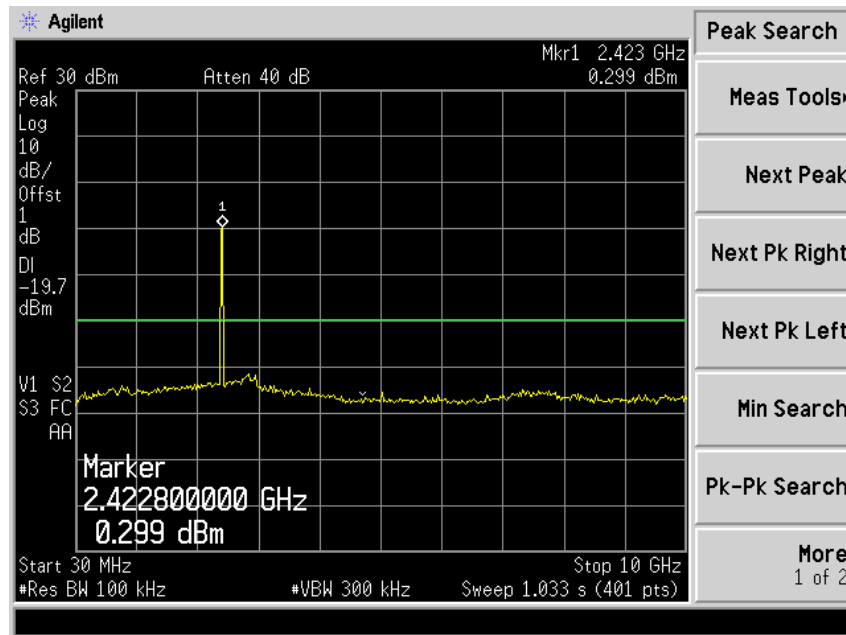
Plot 53 – Channel 1 @ 16QAM 36Mbps



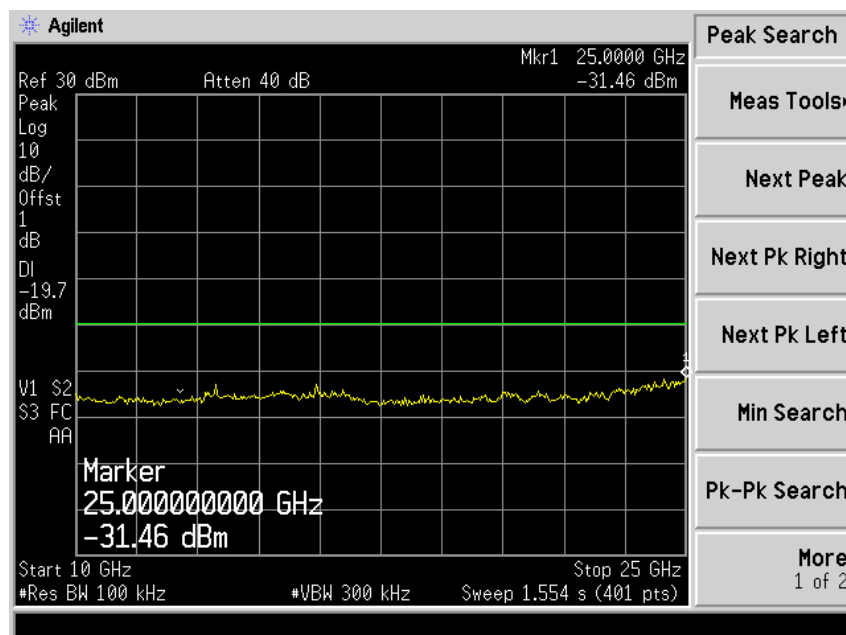
Plot 54 – Channel 1 @ 16QAM 36Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



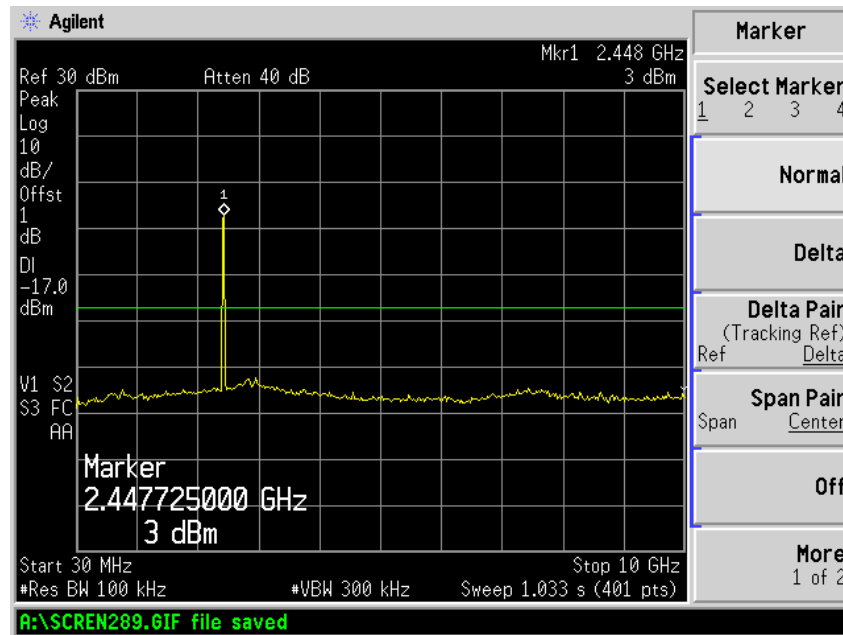
Plot 55 – Channel 1 @ 64QAM 54Mbps



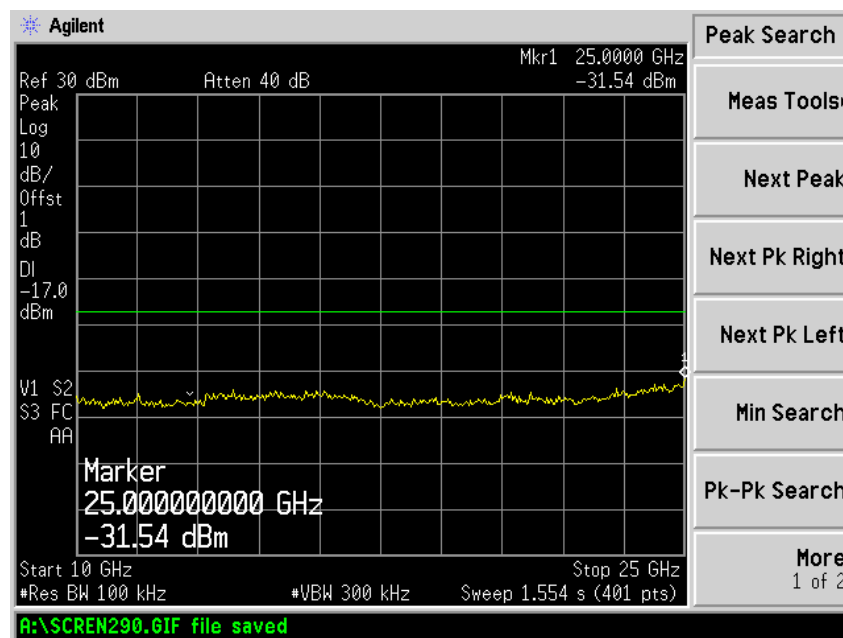
Plot 56 – Channel 1 @ 64QAM 54Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



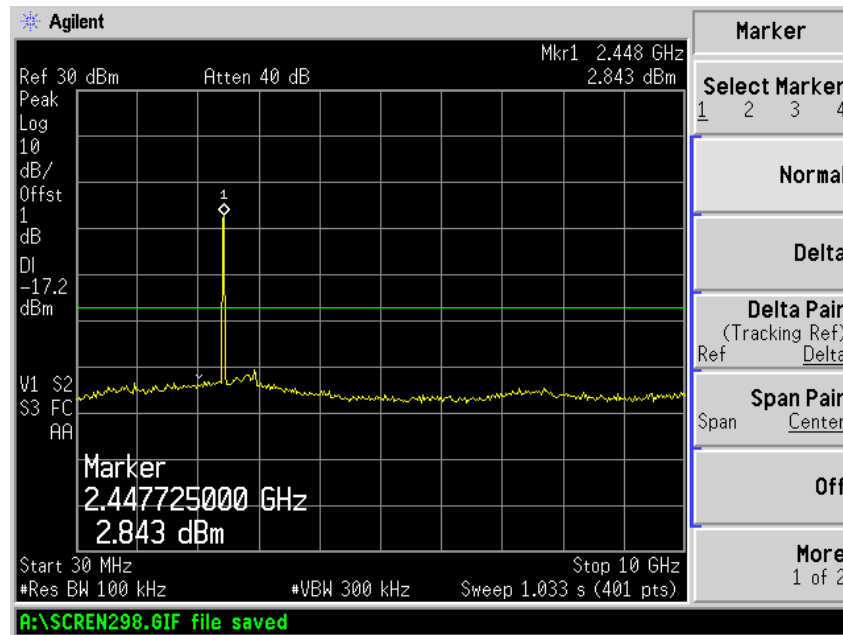
Plot 57 – Channel 6 @ BPSK 9Mbps



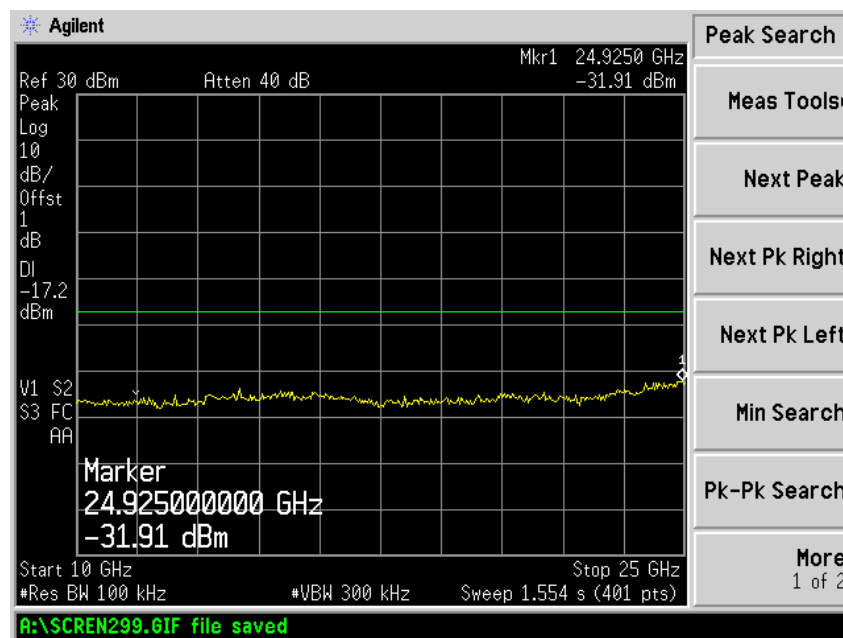
Plot 58 – Channel 6 @ BPSK 9Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



Plot 59 – Channel 6 @ QPSK 18Mbps

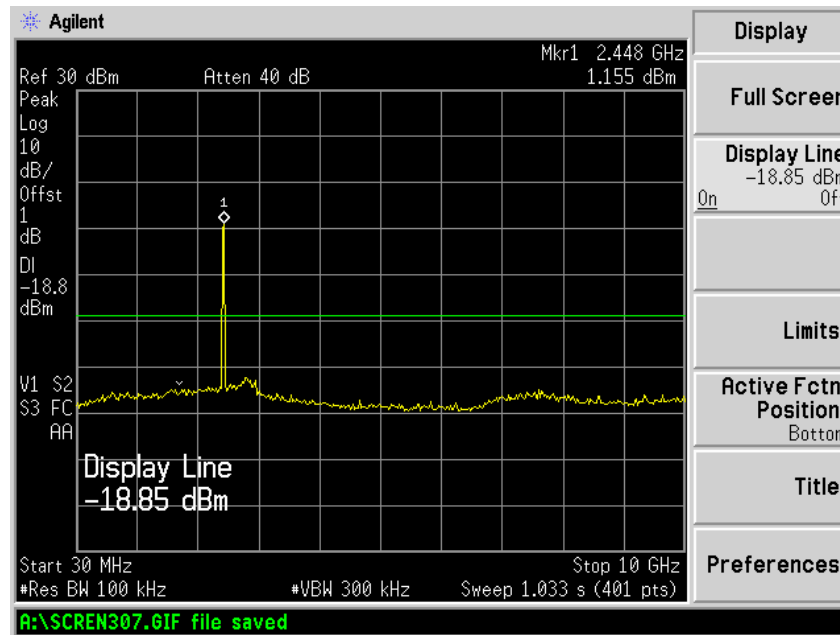


Plot 60 – Channel 6 @ QPSK 18Mbps

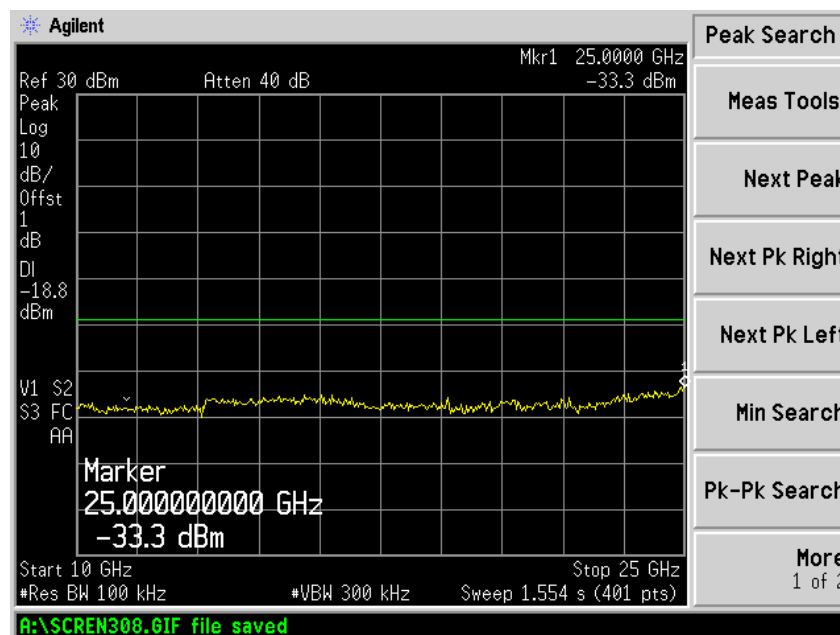


RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



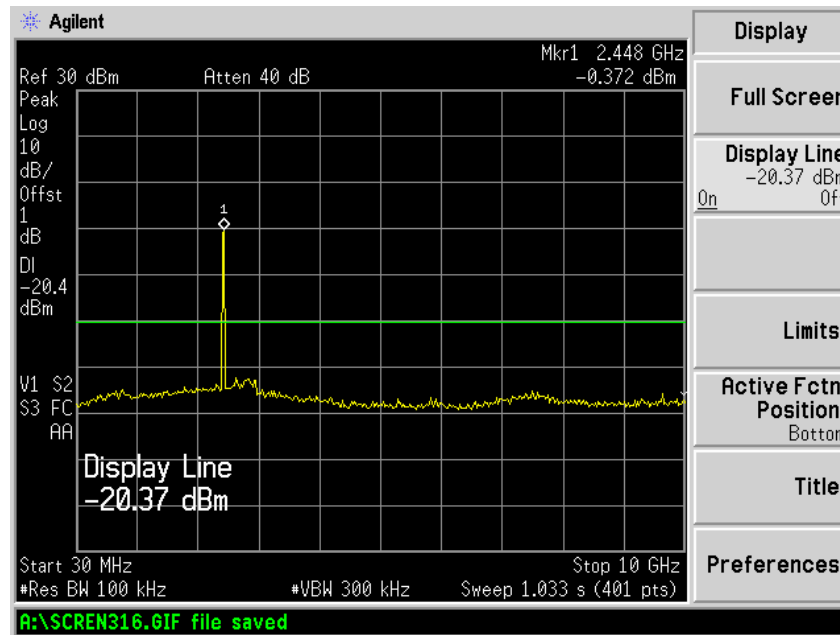
Plot 61 – Channel 6 @ 16QAM 36Mbps



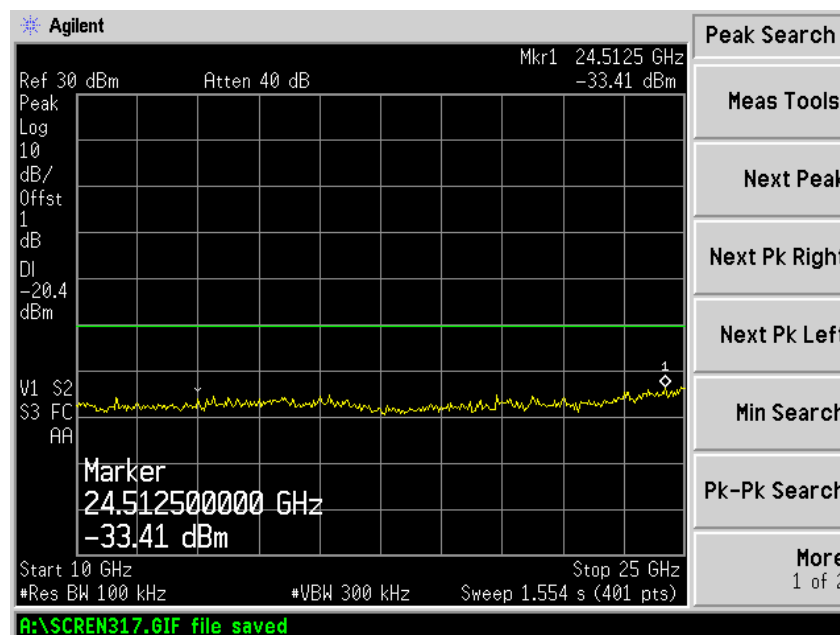
Plot 62 – Channel 6 @ 16QAM 36Mbps

## RF CONDUCTED SPURIOUS EMISSIONS TEST

### RF Conducted Spurious Emissions Plots – 802.11g



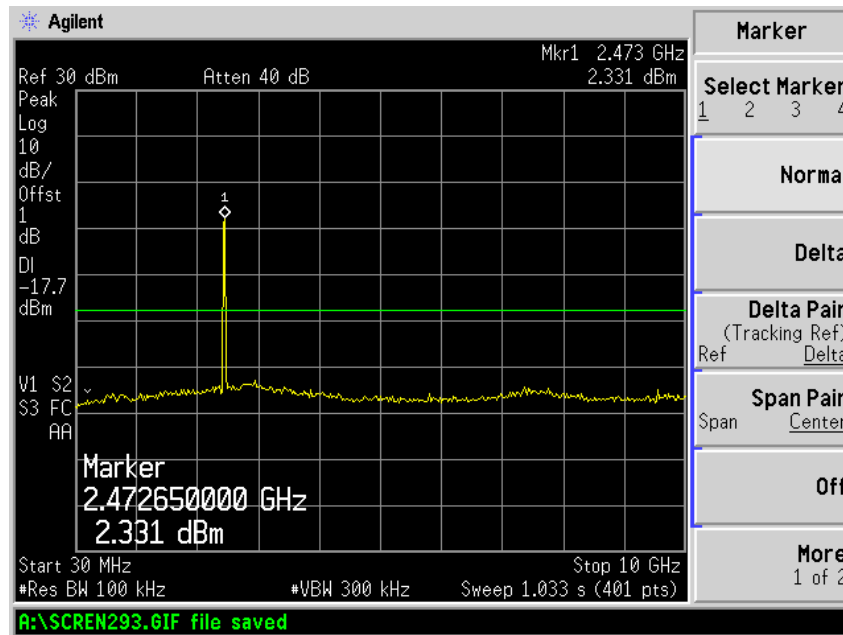
Plot 63 – Channel 6 @ 64QAM 54Mbps



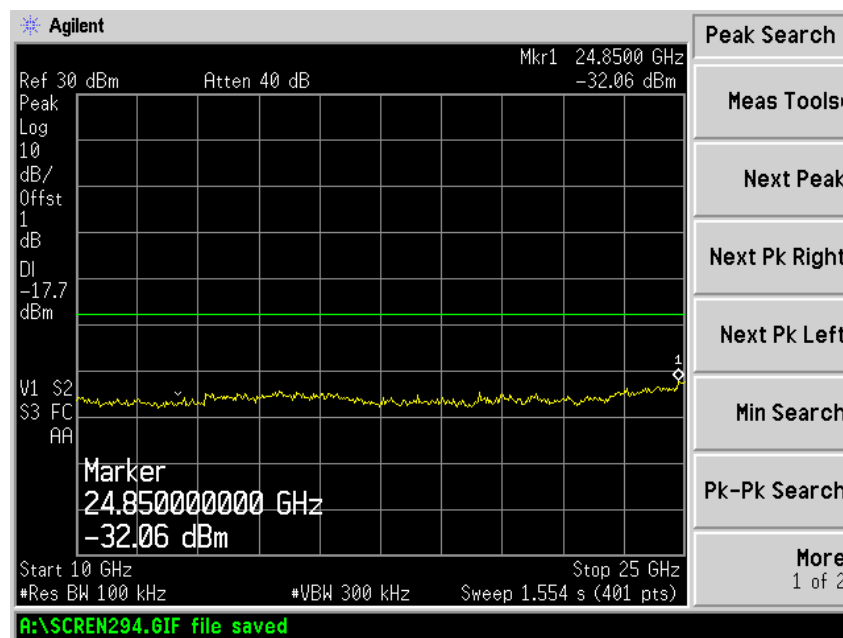
Plot 64 – Channel 6 @ 64QAM 54Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



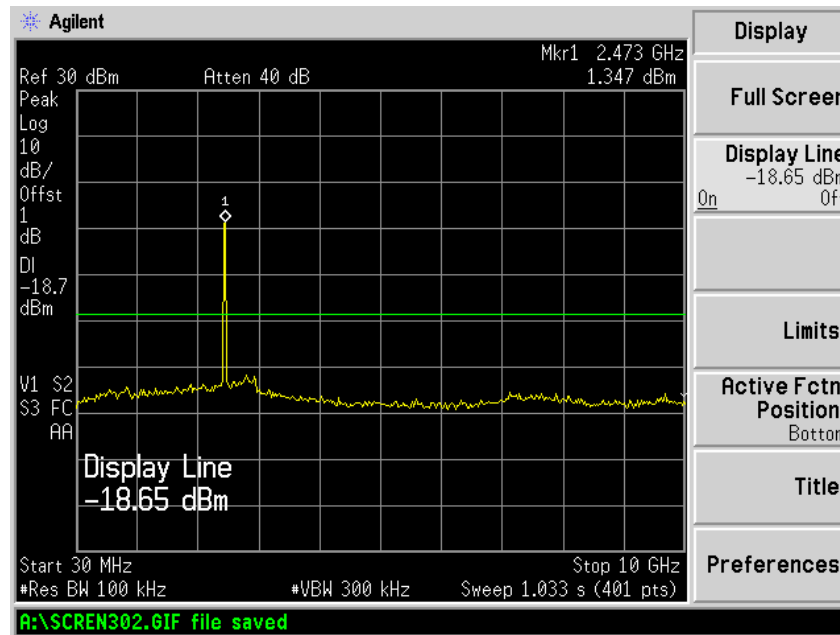
Plot 65 – Channel 11 @ BPSK 9Mbps



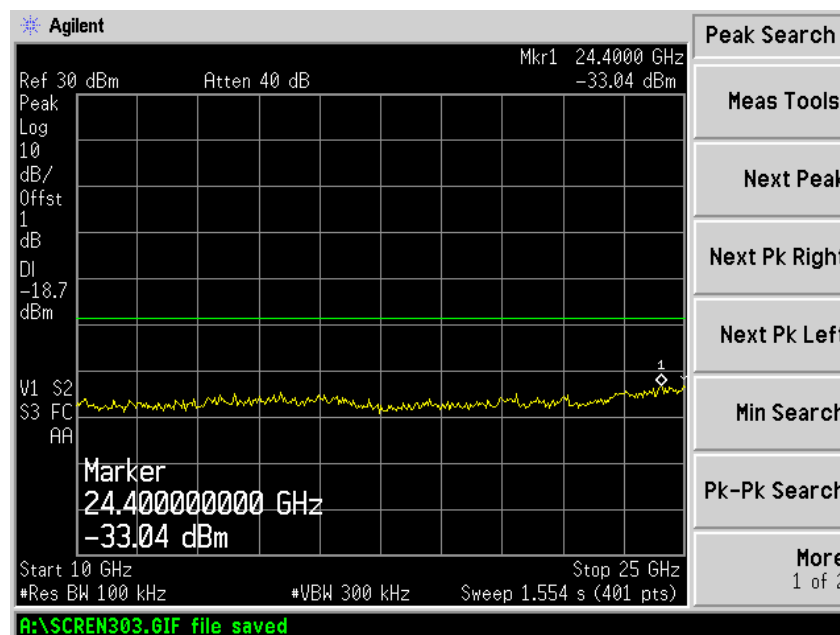
Plot 66 – Channel 11 @ BPSK 9Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



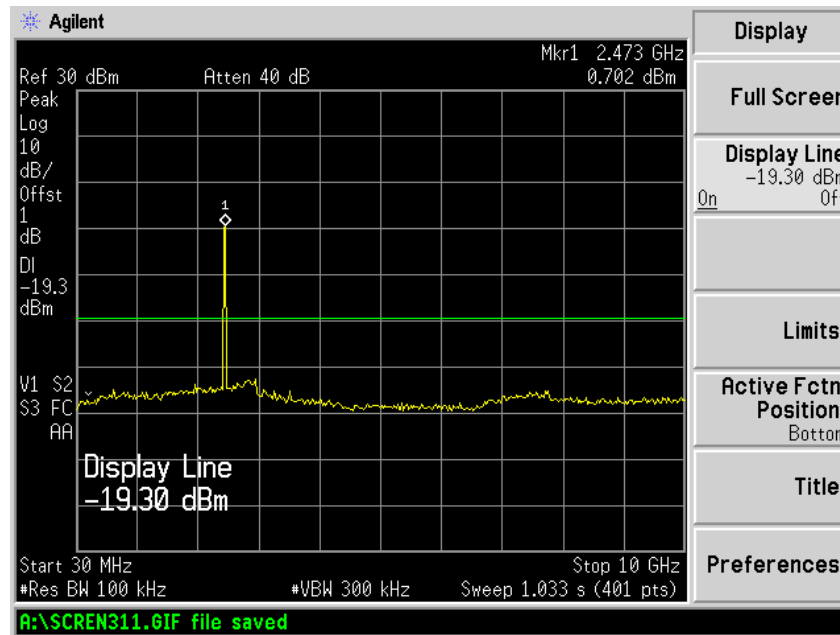
Plot 67 – Channel 11 @ QPSK 18Mbps



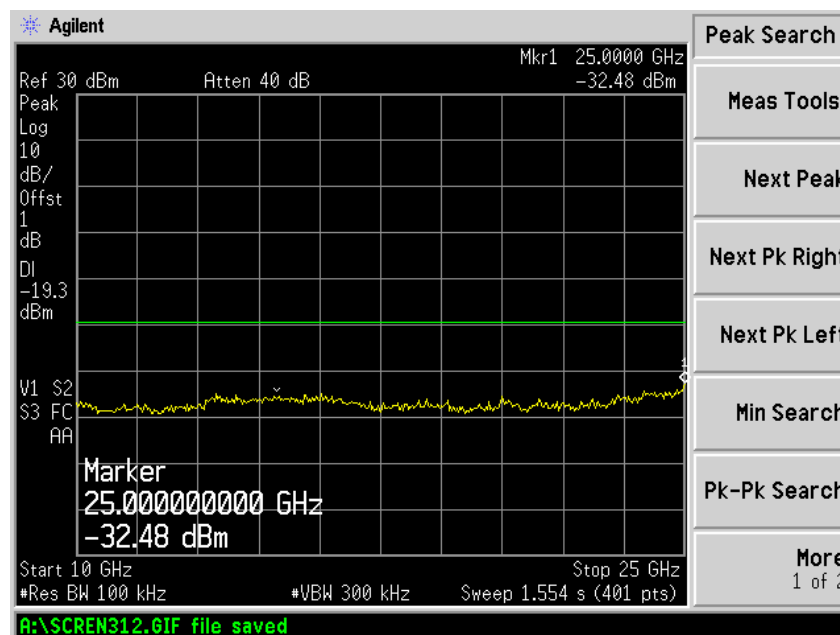
Plot 68 – Channel 11 @ QPSK 18Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



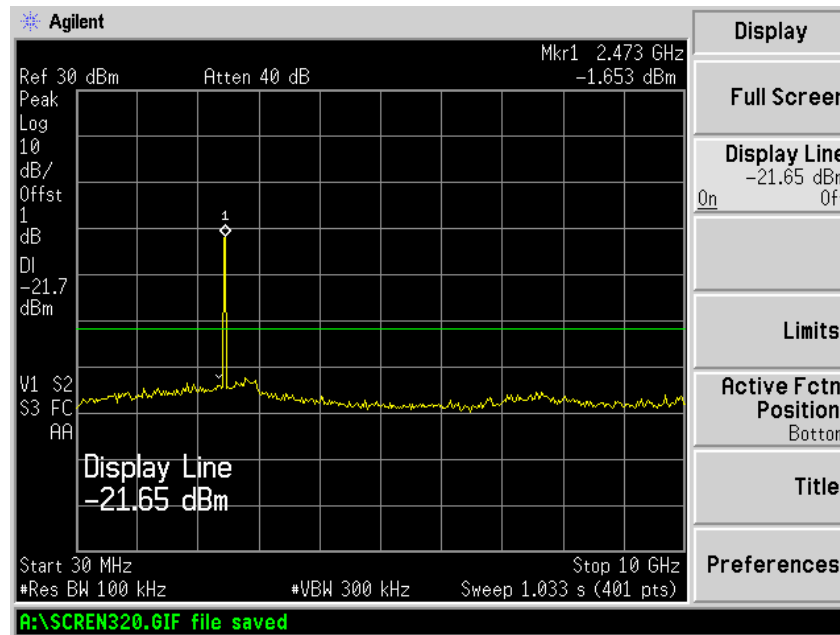
Plot 69 – Channel 11 @ 16QAM 36Mbps



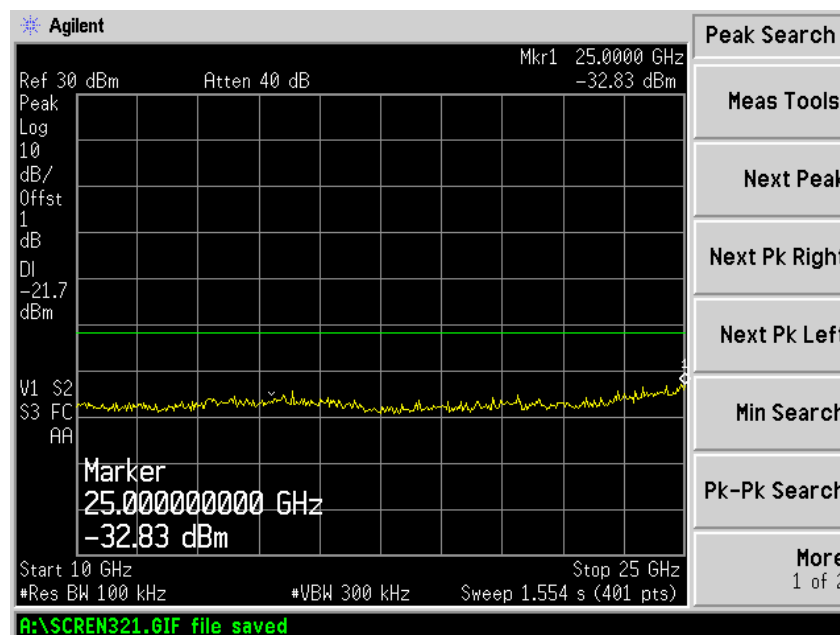
Plot 70 – Channel 11 @ 16QAM 36Mbps

RF CONDUCTED SPURIOUS EMISSIONS TEST

RF Conducted Spurious Emissions Plots – 802.11g



Plot 71 – Channel 11 @ 64QAM 54Mbps



Plot 72 – Channel 11 @ 64QAM 54Mbps



## **BAND EDGE COMPLIANCE (CONDUCTED) TEST**

### **FCC Part 15.247(d) Band Edge Compliance (Conducted) Limits**

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

### **FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
Agilent EMC Analyzer)	E7405A	US40240195	18 Jan 2008

### **FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Setup**

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

### **FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Method**

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with specified modulation and data rate.
2. The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. Repeat steps 1 to 3 with all possible modulations and data rates.
5. The steps 2 to 4 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.

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**BAND EDGE COMPLIANCE (CONDUCTED) TEST**



**Band Edge Compliance (Conducted) Test Setup**





**BAND EDGE COMPLIANCE (CONDUCTED) TEST**

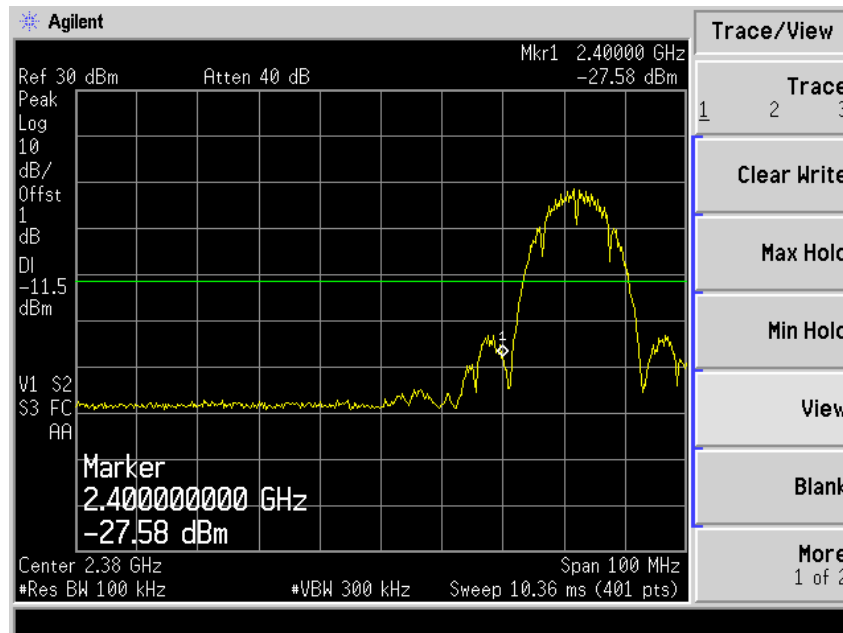
**FCC Part 15.247(d) Band Edge Compliance (Conducted) Results**

Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	73 – 88	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Thor Wen Lei / Lucas Beh

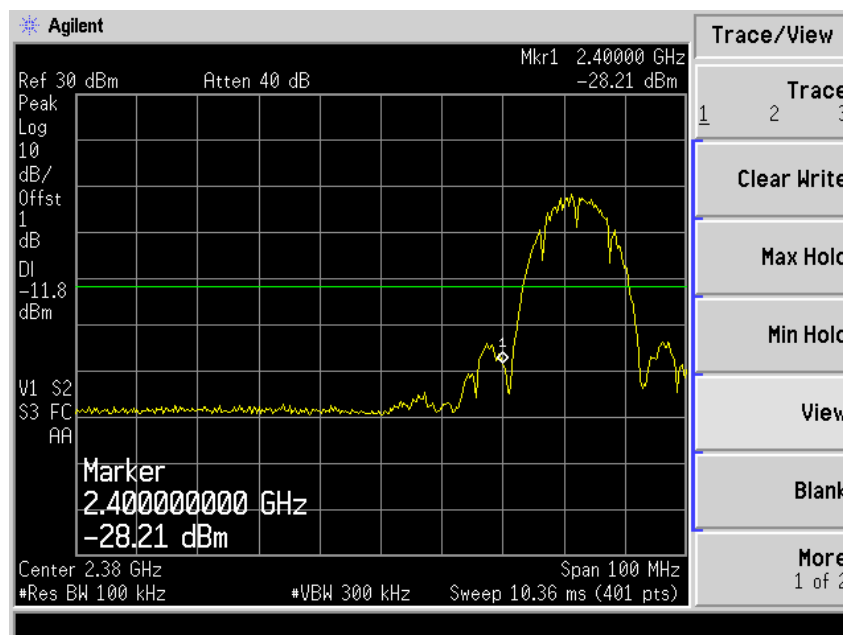
No significant signal was found and they were below the specified limit.

**BAND EDGE COMPLIANCE (CONDUCTED) TEST**

**Band Edge Compliance (Conducted) Plots – 802.11b**



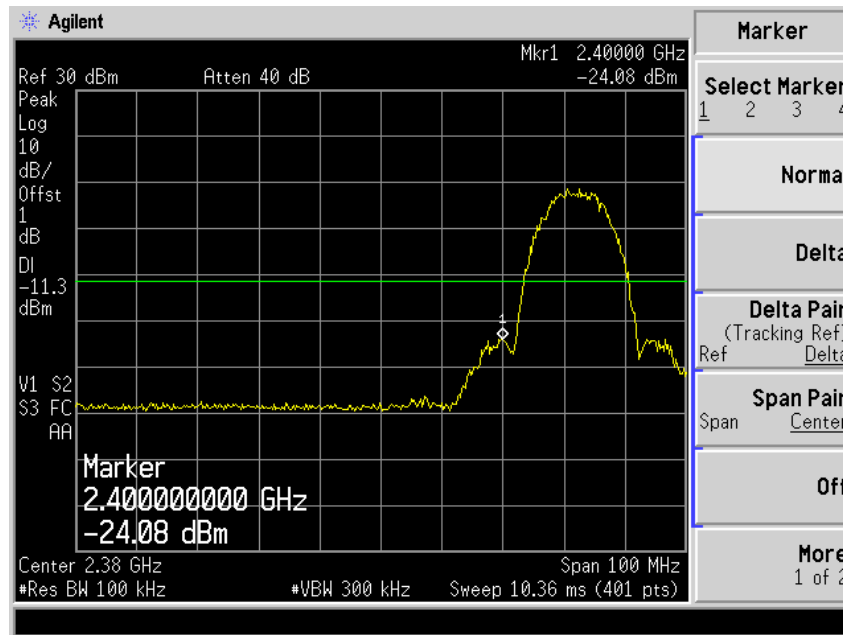
**Plot 73 – Lower Band Edge at 2.4000GHz @ DBPSK 1Mbps**



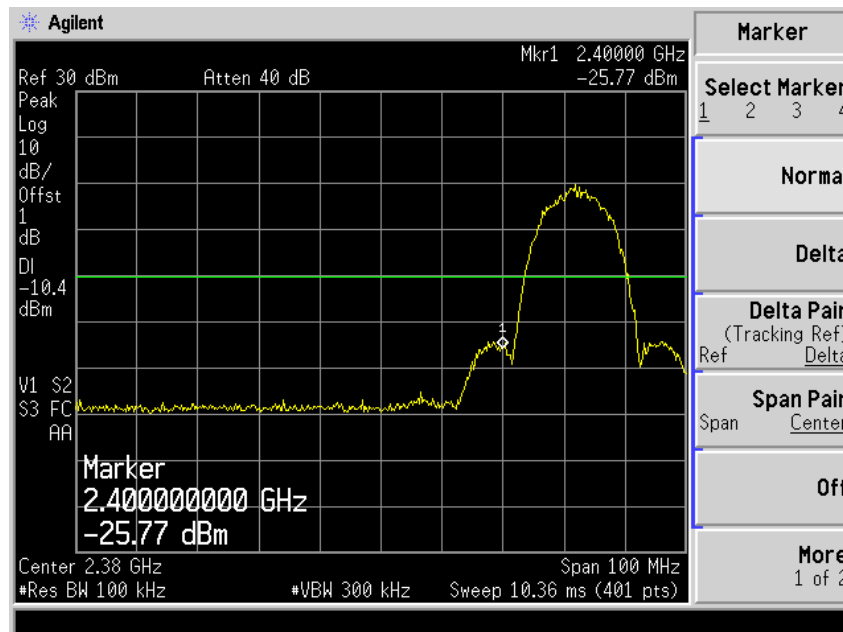
**Plot 74 – Lower Band Edge at 2.4000GHz @ DQPSK 2Mbps**

## BAND EDGE COMPLIANCE (CONDUCTED) TEST

### Band Edge Compliance (Conducted) Plots – 802.11b



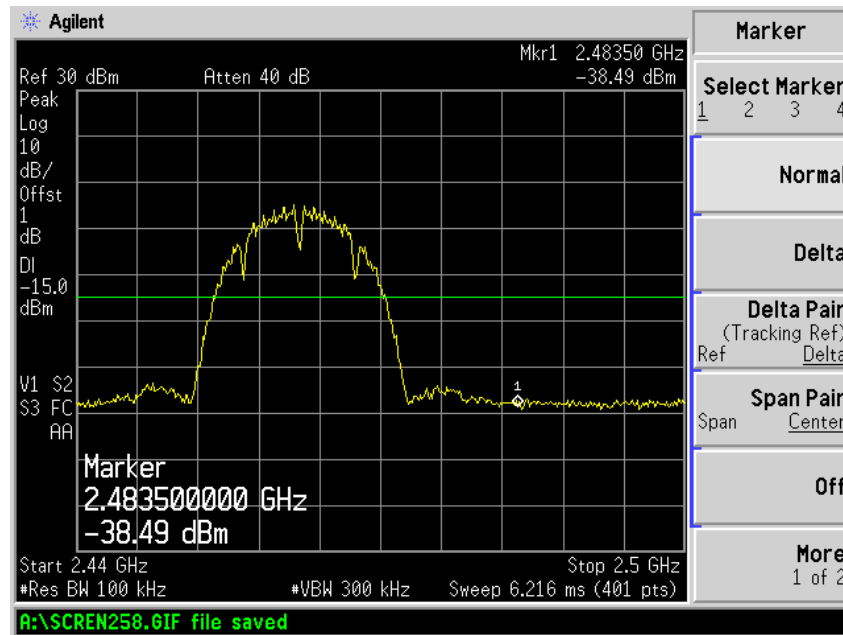
Plot 75 – Lower Band Edge at 2.4000GHz @ CCK 5.5Mbps



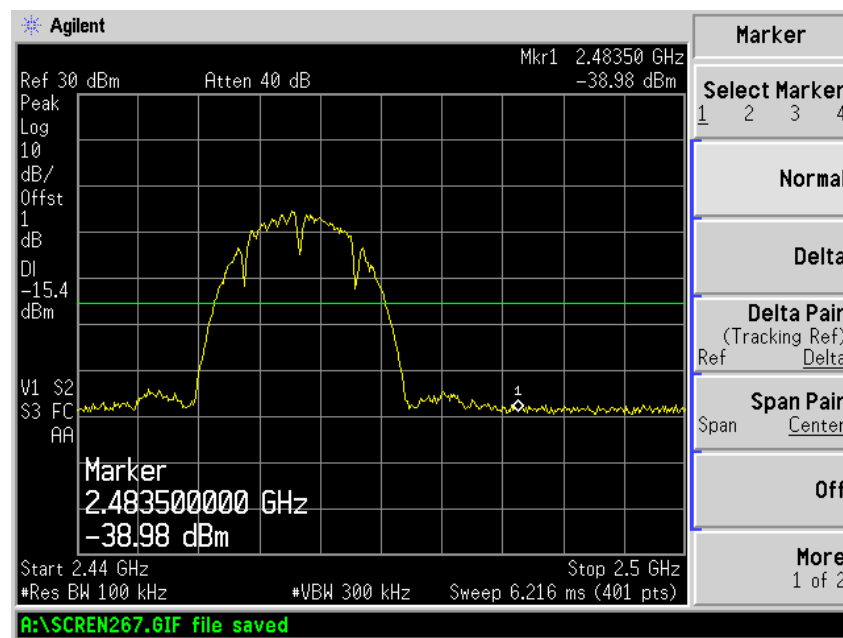
Plot 76 – Lower Band Edge at 2.4000GHz @ CCK 11Mbps

## BAND EDGE COMPLIANCE (CONDUCTED) TEST

### Band Edge Compliance (Conducted) Plots – 802.11b



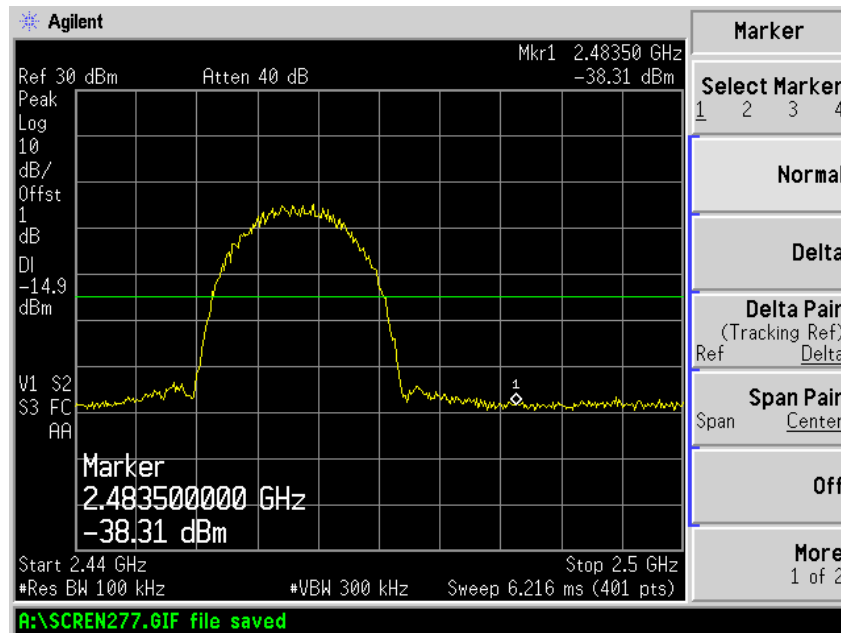
Plot 77 – Upper Band Edge at 2.4835GHz @ DBPSK 1Mbps



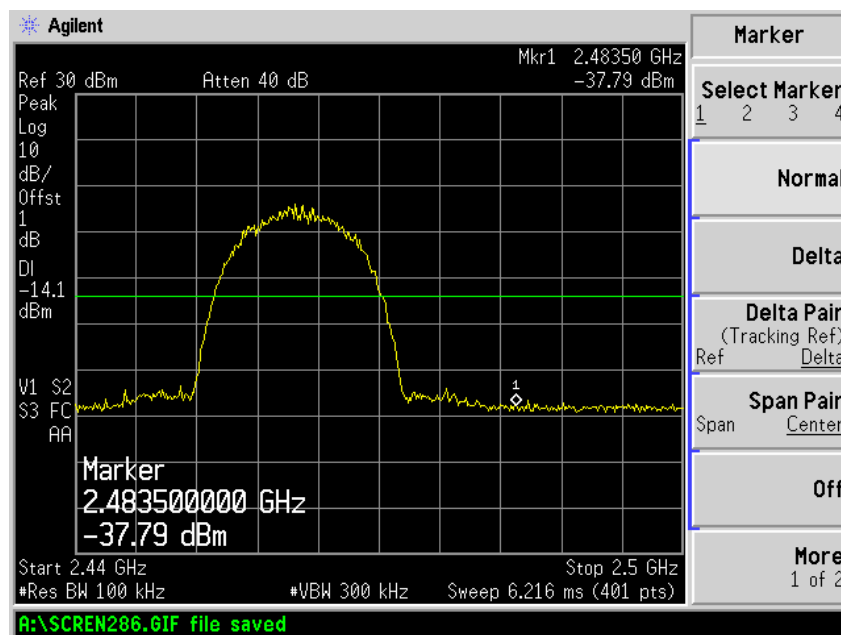
Plot 78 – Upper Band Edge at 2.4835GHz @ DQPSK 2Mbps

## BAND EDGE COMPLIANCE (CONDUCTED) TEST

### Band Edge Compliance (Conducted) Plots – 802.11b



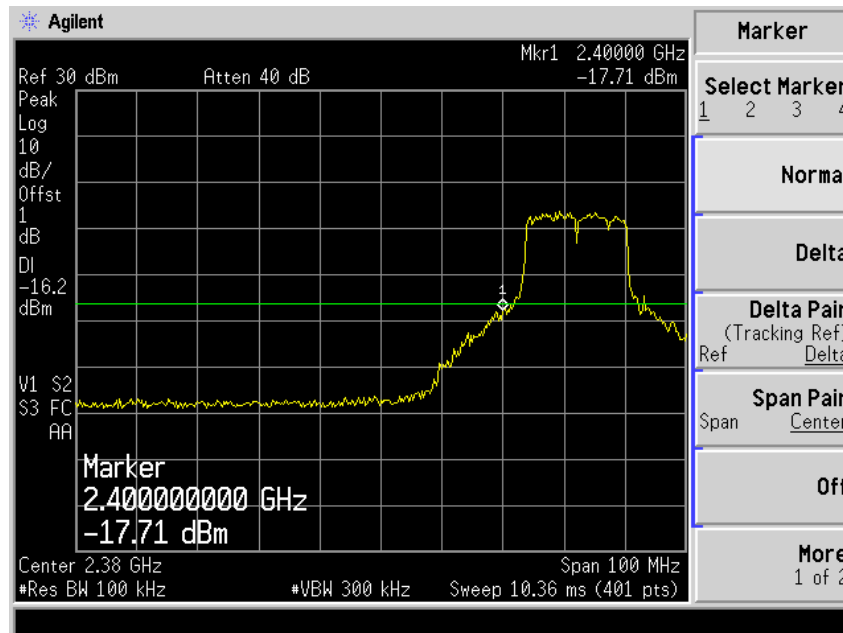
Plot 79 – Upper Band Edge at 2.4835GHz @ CCK 5.5Mbps



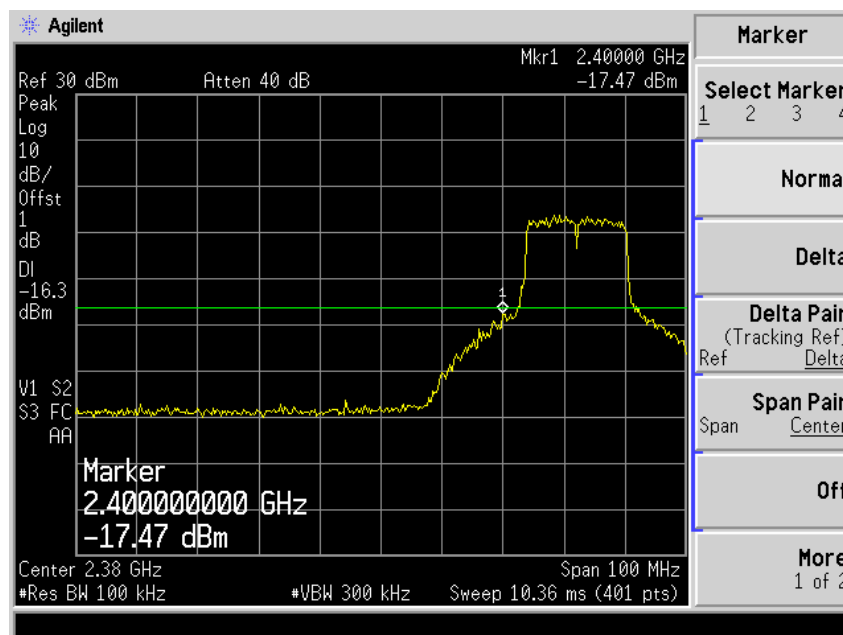
Plot 80 – Upper Band Edge at 2.4835GHz @ CCK 11Mbps

**BAND EDGE COMPLIANCE (CONDUCTED) TEST**

**Band Edge Compliance (Conducted) Plots – 802.11g**



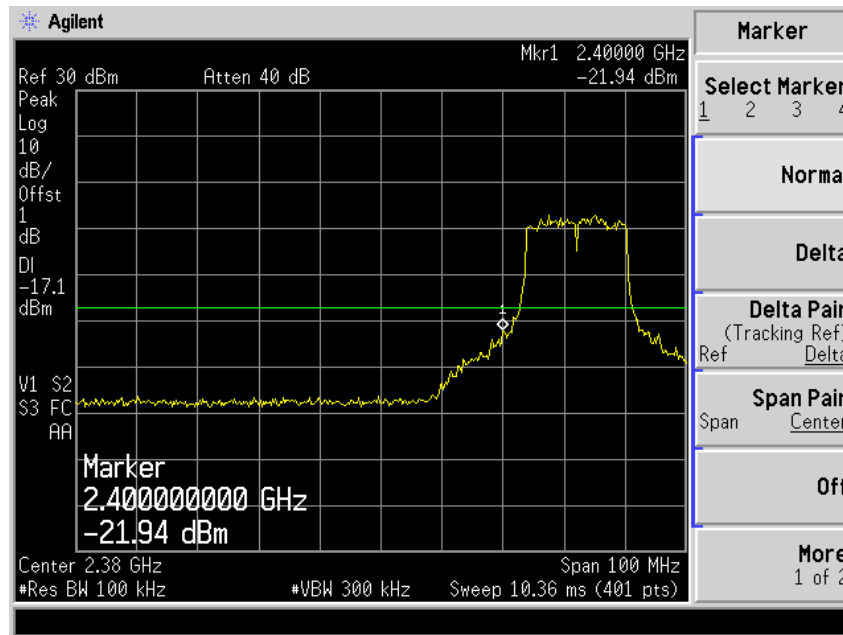
**Plot 81 – Lower Band Edge at 2.4000GHz @ BPSK 9Mbps**



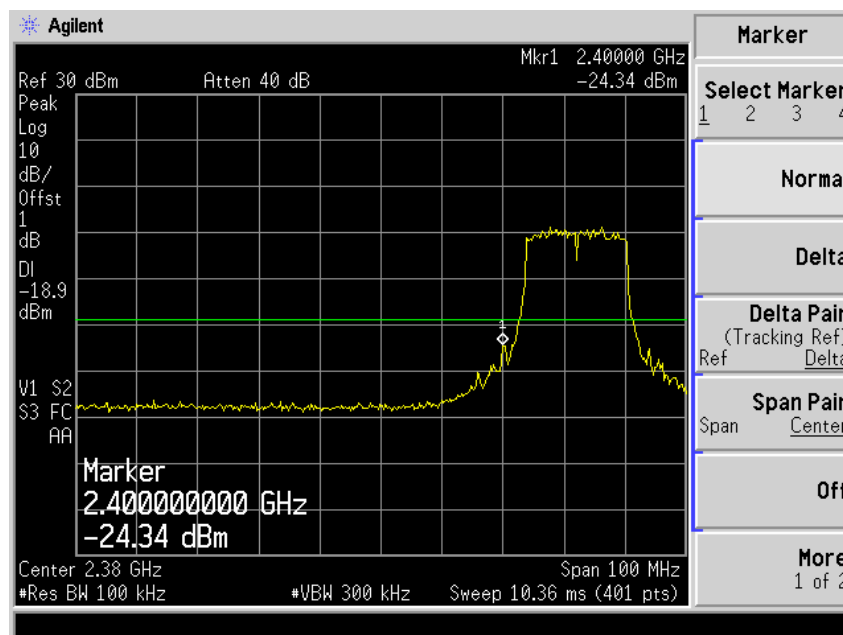
**Plot 82 – Lower Band Edge at 2.4000GHz @ QPSK 18Mbps**

## BAND EDGE COMPLIANCE (CONDUCTED) TEST

### Band Edge Compliance (Conducted) Plots – 802.11g



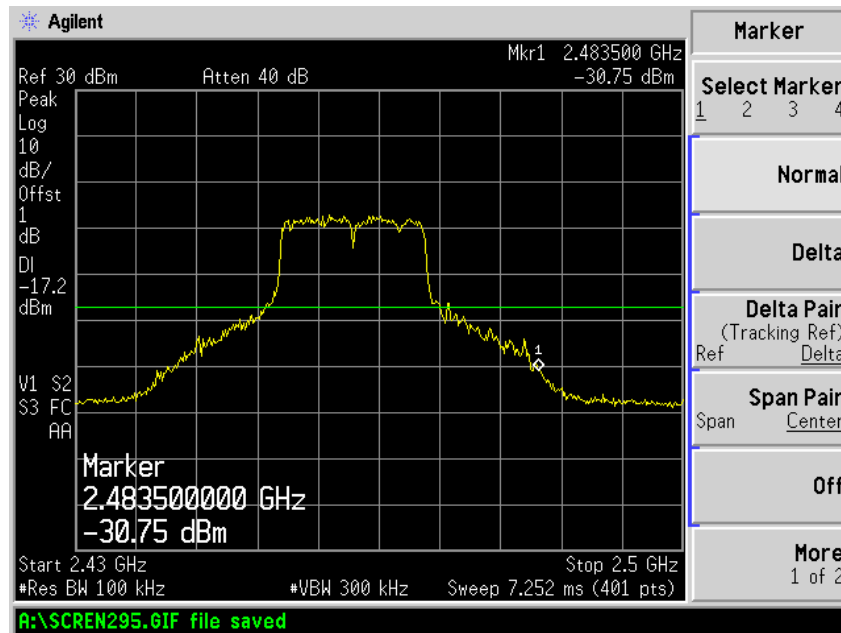
Plot 83 – Lower Band Edge at 2.4000GHz @ 16QAM 36Mbps



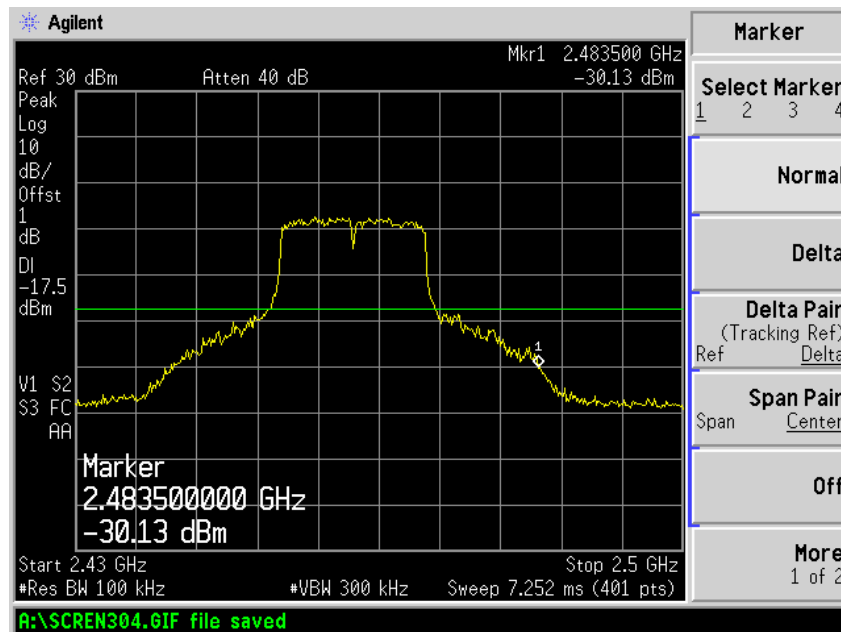
Plot 84 – Lower Band Edge at 2.4000GHz @ 64QAM 54Mbps

## BAND EDGE COMPLIANCE (CONDUCTED) TEST

### Band Edge Compliance (Conducted) Plots – 802.11g



Plot 85 – Upper Band Edge at 2.4835GHz @ BPSK 9Mbps

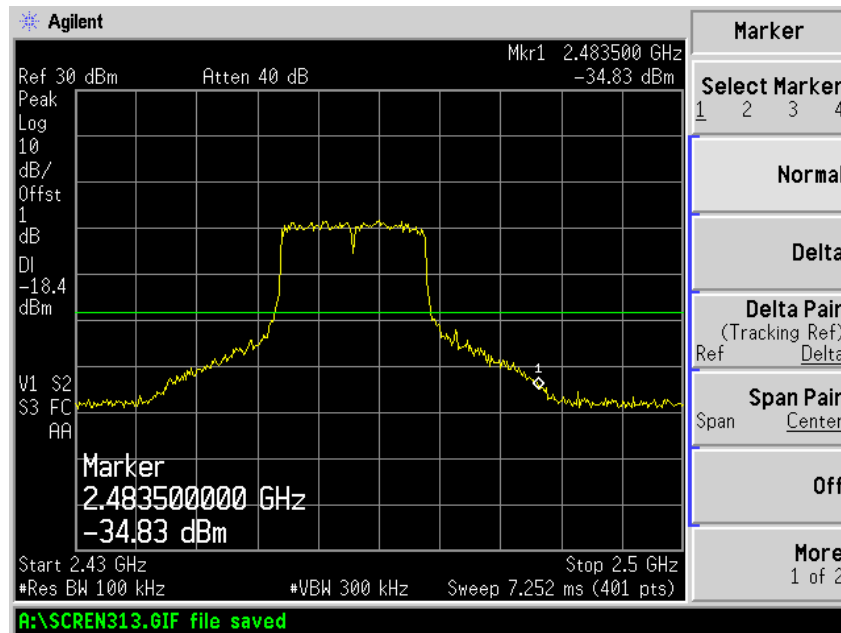


Plot 86 – Upper Band Edge at 2.4835GHz @ QPSK 18Mbps

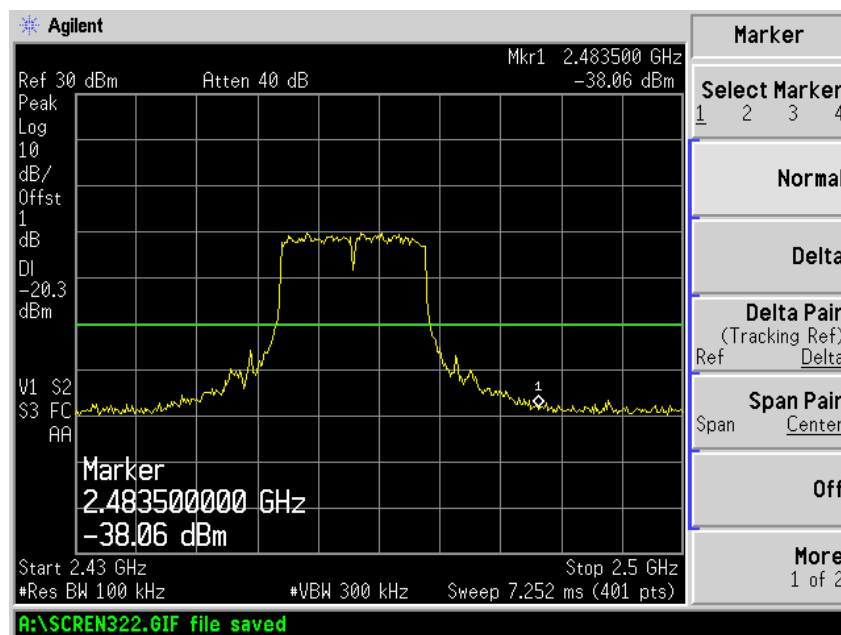


## BAND EDGE COMPLIANCE (CONDUCTED) TEST

### Band Edge Compliance (Conducted) Plots – 802.11g



Plot 87 – Upper Band Edge at 2.4835GHz @ 16QAM 36Mbps



Plot 88 – Upper Band Edge at 2.4835GHz @ 64QAM 54Mbps



**BAND EDGE COMPLIANCE (RADIATED) TEST**

**FCC Part 15.247(d) Band Edge Compliance (Radiated) Limits**

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power. In addition, radiated emissions which fall in the restricted bands shall comply to the radiated emission limits specified in 15.209.

**FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
R&S Test Receiver (20Hz-26.5GHz) – ESMI3	ESMI	829214/005 829550/004	24 Nov 2007
TESEQ Preamplifier (1GHz-18GHz) – PA16	LNA6018	70214	09 Jan 2008
Schaffner Preamplifier (9kHz-2GHz) – PA19	CPA9231A	18763	12 Jan 2008
Schaffner Bilog Antenna –BL	CBL6112D	22020	14 May 2008
EMCO Horn Antenna – H14	3115	0003-6087	18 May 2008



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**BAND EDGE COMPLIANCE (RADIATED) TEST**

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**FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Setup**

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz to show compliance of spurious at band edges are at least 20dB below the carriers. For restricted band spurious at band edges, peak and average measurement plots were taken using the following setting:
  - a. Peak Plot:  
RBW = VBW = 1MHz
  - b. Average Plot  
RBW = 1MHz, VBW = 10Hz
4. All other supporting equipment were powered separately from another filtered mains.

**FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Method**

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with specified modulation and data rate.
2. The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. Repeat steps 1 to 3 with all possible modulations and data rates.
5. The steps 2 to 4 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.

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**BAND EDGE COMPLIANCE (RADIATED) TEST**



**Band Edge Compliance (Radiated) Test Setup**

**Test Report No. 56S070446/05**  
dated 22 Jun 2007



**BAND EDGE COMPLIANCE (RADIATED) TEST**

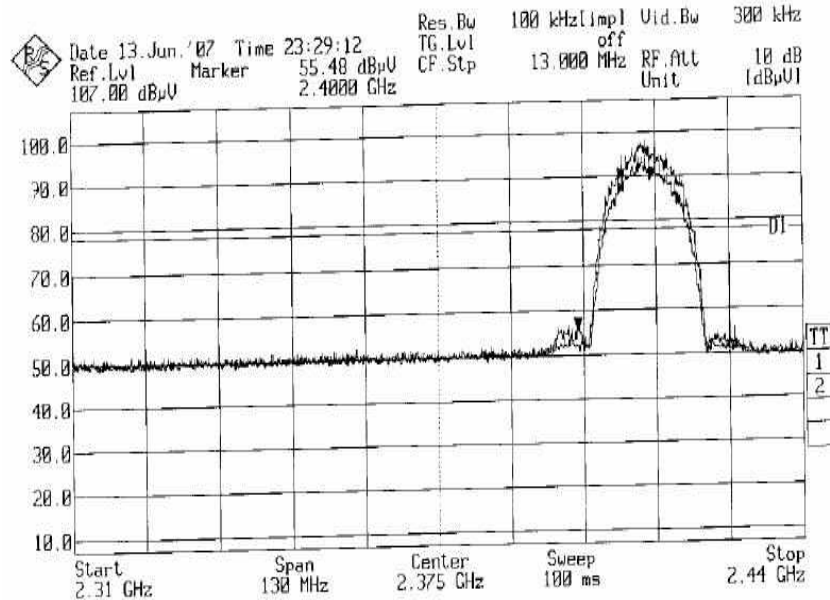
**FCC Part 15.247(d) Band Edge Compliance (Radiated) Results**

Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	89 –100	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Thor Wen Lei

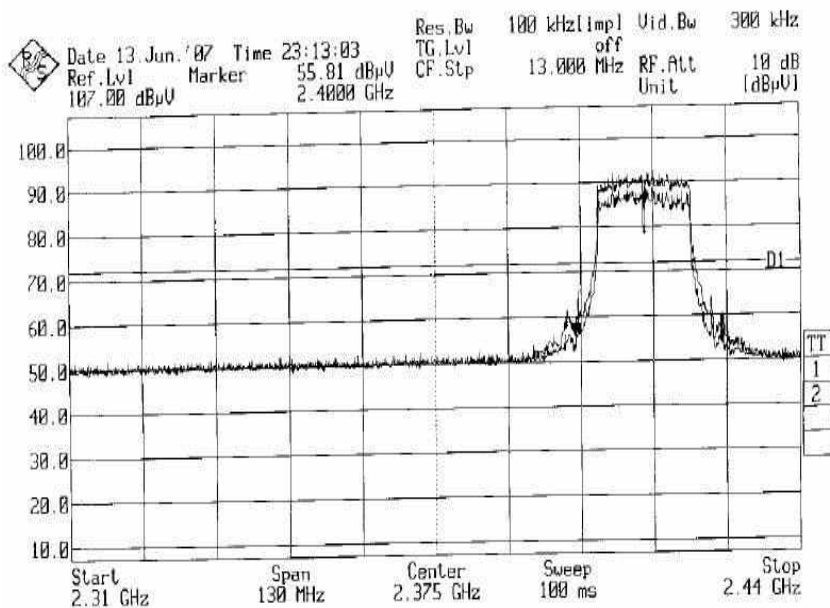
No significant signal was found and they were below the specified limit.

## BAND EDGE COMPLIANCE (RADIATED) TEST

### Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge)



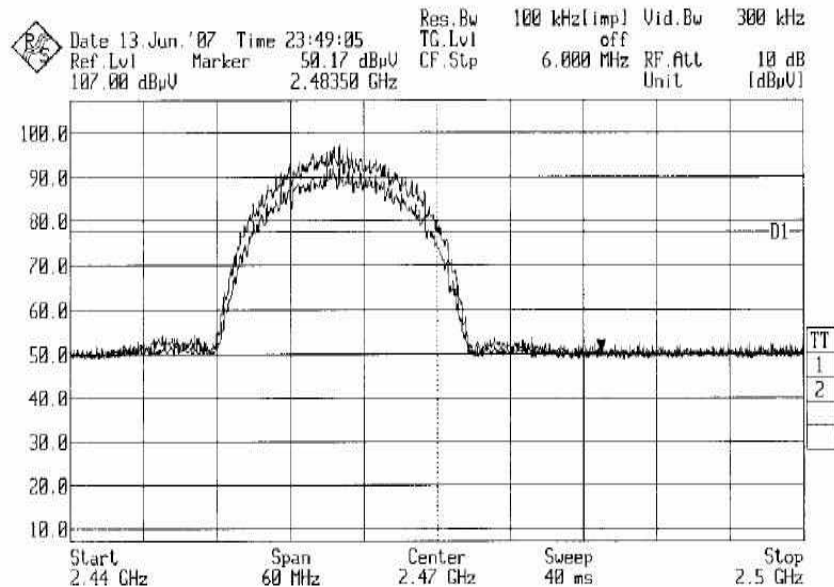
Plot 89 – Lower Band Edge at 2.4000GHz @ CCK 11Mbps (802.11b worst case)



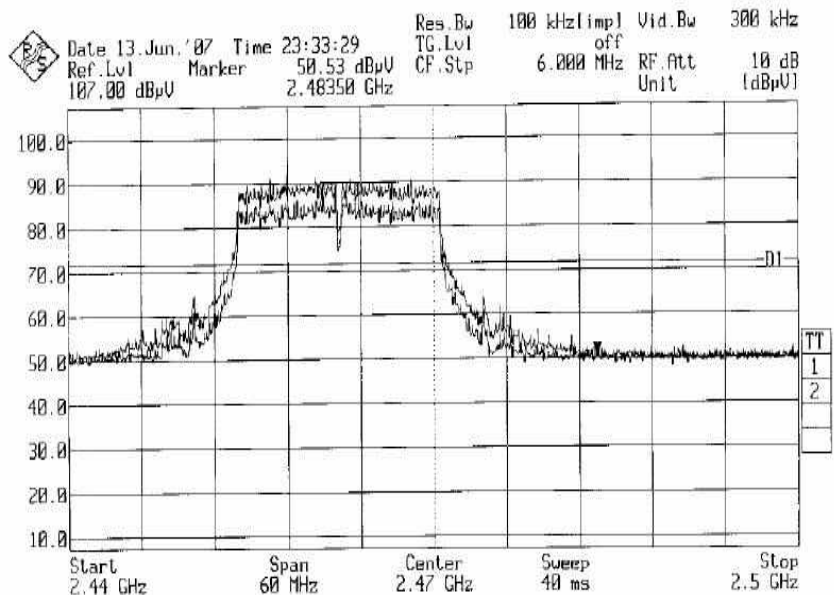
Plot 90 – Lower Band Edge at 2.4000GHz @ 64QAM 54Mbps (802.11g worst case)

## BAND EDGE COMPLIANCE (RADIATED) TEST

### Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge)



Plot 91 – Upper Band Edge at 2.4835GHz @ CCK 11Mbps (802.11b worst case)

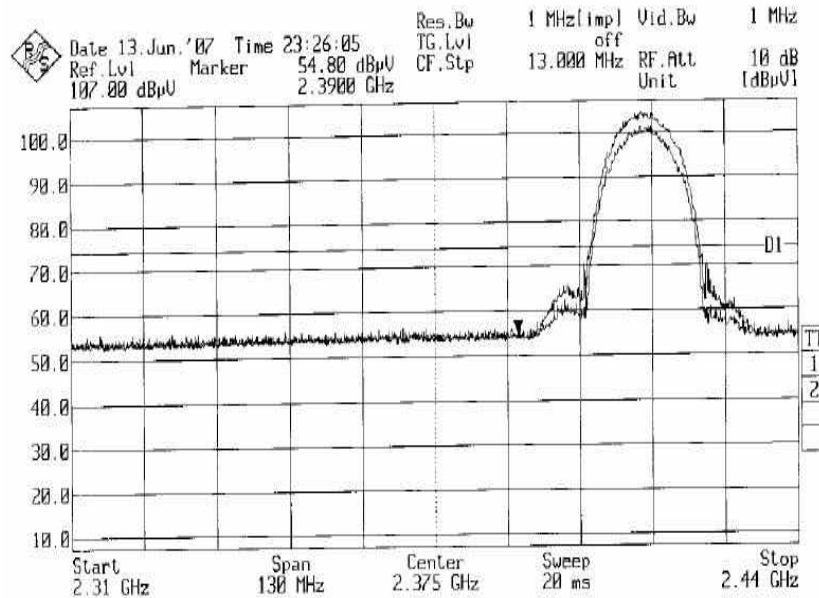


Plot 92 – Upper Band Edge at 2.4835GHz @ 64QAM 54Mbps (802.11g worst case)

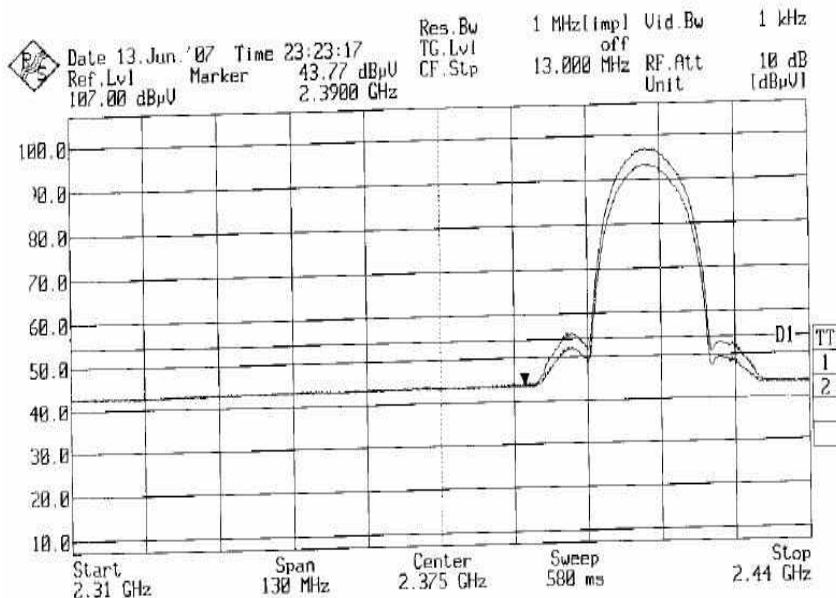


## BAND EDGE COMPLIANCE (RADIATED) TEST

### Band Edge Compliance (Radiated) Plots (Restricted Band)



Plot 93 – Peak Plot at Lower Band Edge at 2.4000GHz @ CCK 11Mbps (802.11b worst case)

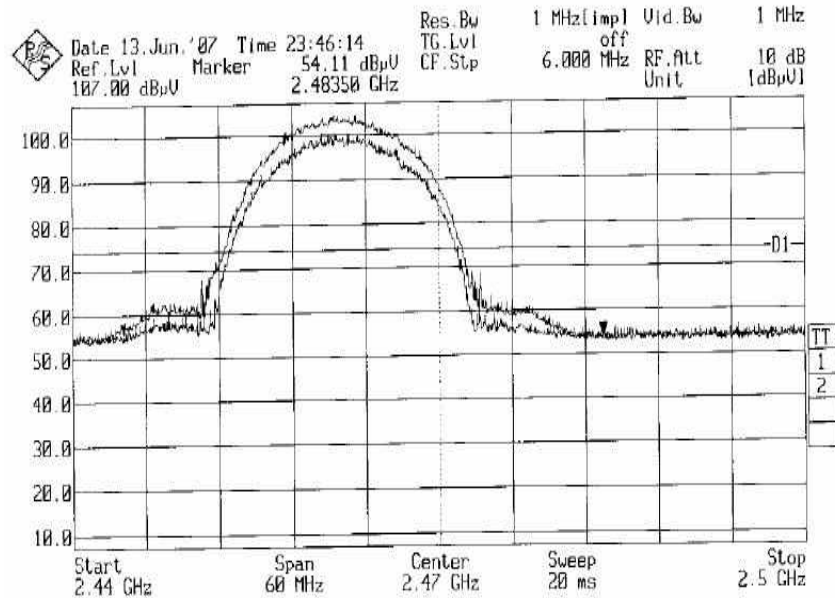


Plot 94 – Average Plot at Lower Band Edge at 2.4000GHz @ CCK 11Mbps (802.11b worst case)

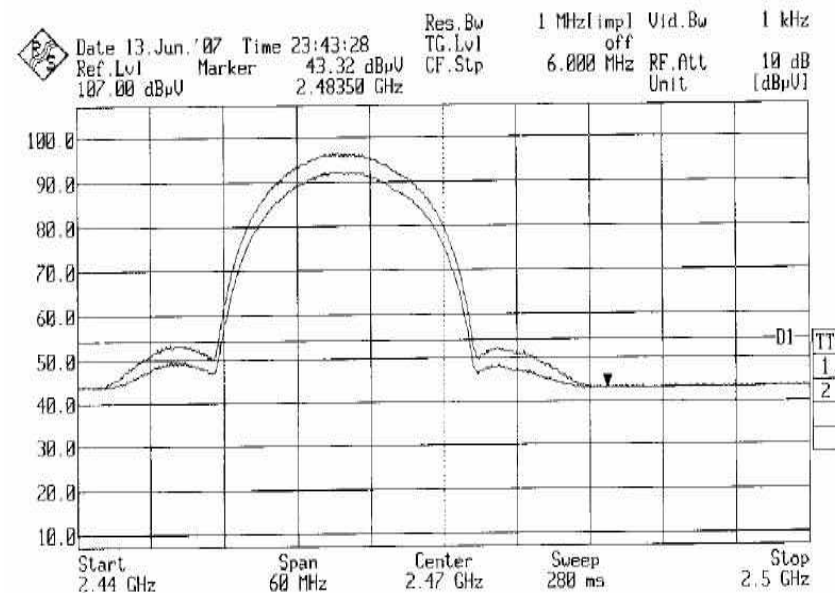


# BAND EDGE COMPLIANCE (RADIATED) TEST

## Band Edge Compliance (Radiated) Plots (Restricted Band)



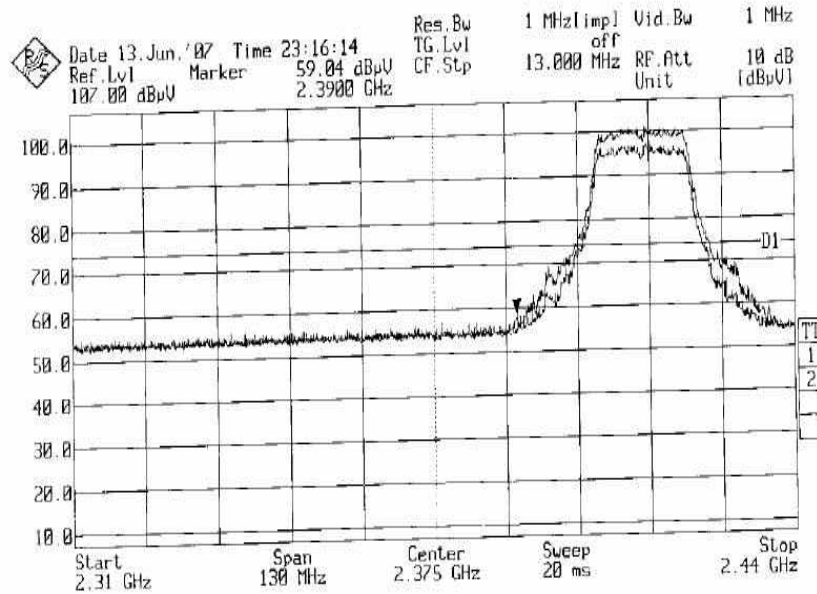
Plot 95 – Peak Plot at Upper Band Edge at 2.4835GHz @ CCK 11Mbps(802.11b worst case)



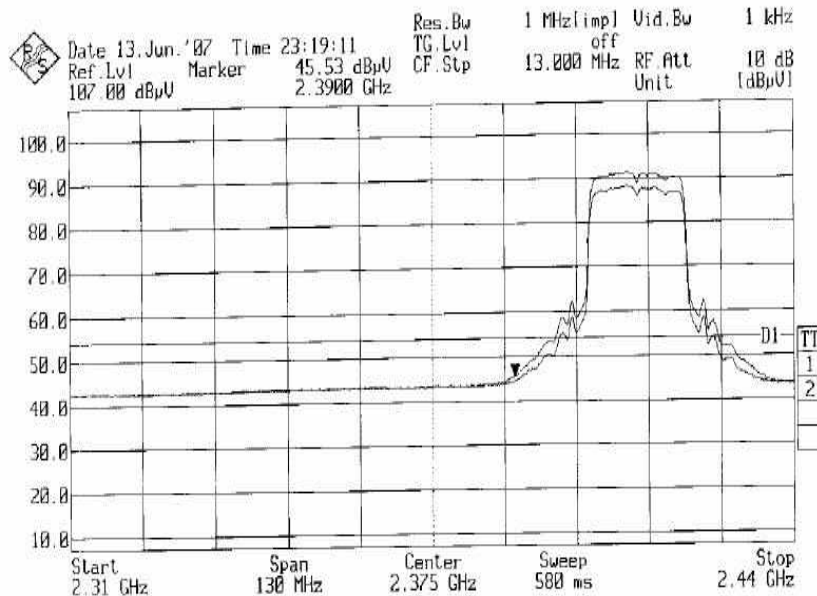
Plot 96 – Average Plot at Upper Band Edge at 2.4835GHz @ CCK 11Mbps (802.11b worst case)

## BAND EDGE COMPLIANCE (RADIATED) TEST

### Band Edge Compliance (Radiated) Plots (Restricted Band)



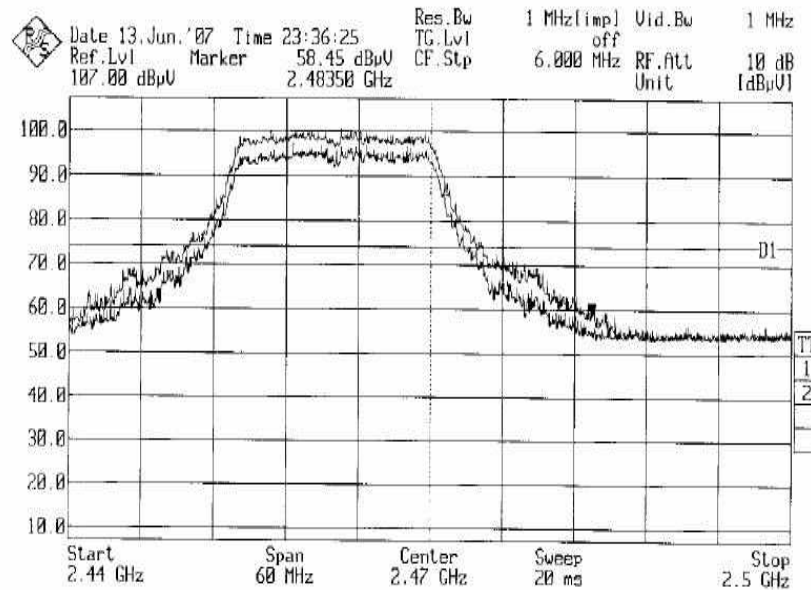
Plot 97 – Peak Plot at Lower Band Edge at 2.4000GHz @ 64QAM 54Mbps (802.11g worst case)



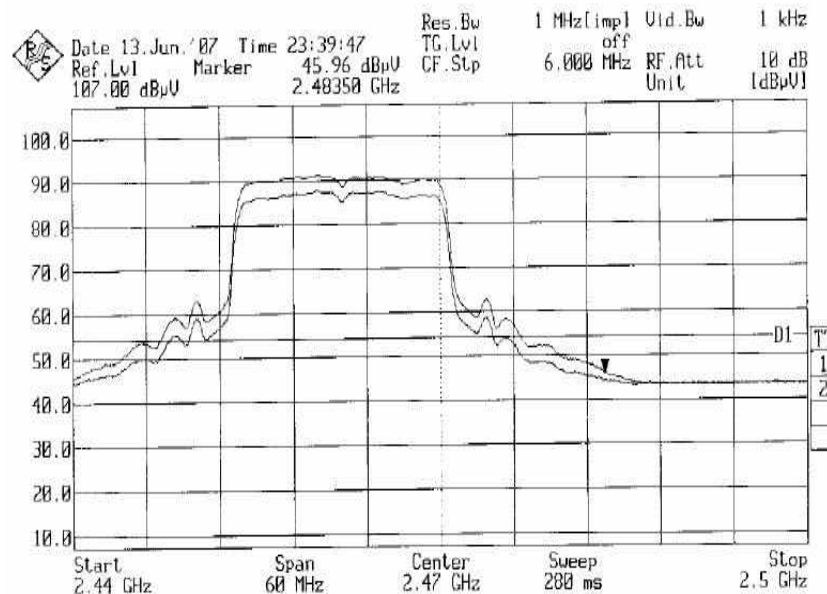
Plot 98 – Average Plot at Lower Band Edge at 2.4000GHz @ 64QAM 54Mbps (802.11g worst case)

# BAND EDGE COMPLIANCE (RADIATED) TEST

## Band Edge Compliance (Radiated) Plots (Restricted Band)



Plot 99 – Peak Plot at Upper Band Edge at 2.4835GHz @ 64QAM 54Mbps (802.11g worst case)



Plot 100\ – Average Plot at Upper Band Edge at 2.4835GHz @ 64QAM 54Mbps (802.11g worst case)



## **PEAK POWER SPECTRAL DENSITY TEST**

### **FCC Part 15.247(e) Peak Power Spectral Density Limits**

The EUT shows compliance to the requirements of this section, which states the peak power spectral density conducted from the intentional radiator (EUT) to the antenna shall not be greater than 8dBm (6.3mW) in any 3kHz band during any time interval of continuous transmission.

### **FCC Part 15.247(e) Peak Power Spectral Density Test Instrumentation**

Instrument	Model	S/No	Cal Due Date
Agilent EMC Analyzer (9kHz-26.5GHz)	E7405A	US40240195	18 Jan 2008

### **FCC Part 15.247(e) Peak Power Spectral Density Test Setup**

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 3kHz and 10kHz.
5. All other supporting equipment were powered separately from another filtered mains.

### **FCC Part 15.247(e) Peak Power Spectral Density Test Method**

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode at Channel 1 (2.412GHz) with specified modulation and data rate.
2. The sweep time of the spectrum analyser was set to the value of the ratio of the frequency span divided by the RBW.
3. The peak power density of the transmitting frequency was detected and recorded.
4. Repeat steps 1 to 3 with all possible modulations and data rates.
5. The steps 3 to 4 were repeated with the transmitting frequency was set to Channel 6 (2.437GHz) and Channel 11 (2.462GHz) respectively.

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**PEAK POWER SPECTRAL DENSITY TEST**



**Peak Power Spectral Density Test Setup**

**Test Report No. 56S070446/05**  
dated 22 Jun 2007



**PEAK POWER SPECTRAL DENSITY TEST**

**FCC Part 15.247(e) Peak Power Spectral Density Results**

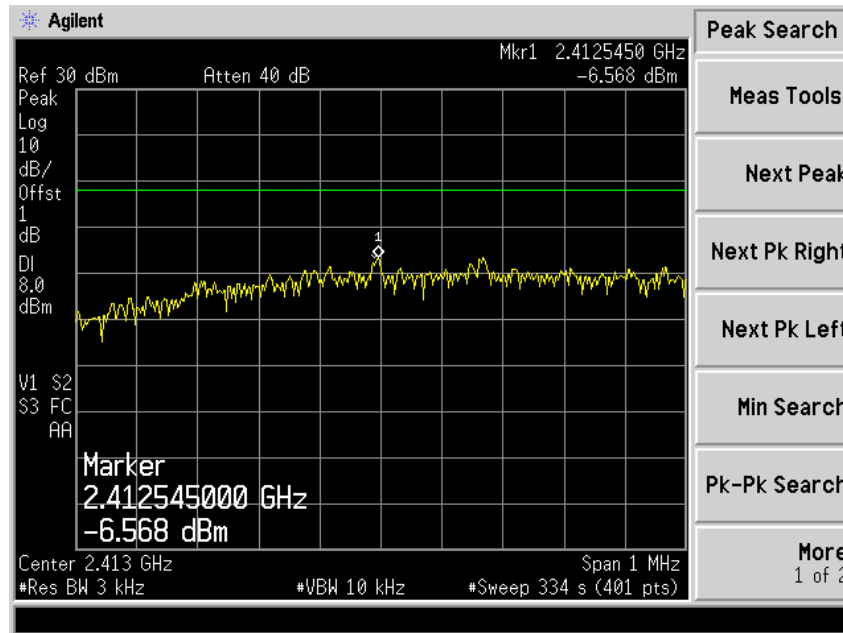
Test Input Power	110V 60Hz	Temperature	23°C
Attached Plots	101 - 124	Relative Humidity	55%
		Atmospheric Pressure	1030mbar
		Tested By	Thor Wen Lei / Lucas Beh

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)	802.11b Modulation @ Data Rate
1	2.412	0.2204	6.3	DBPSK @ 1Mbps
		0.3673	6.3	DQPSK @ 2Mbps
		0.3146	6.3	CCK @ 5.5Mbps
		0.3529	6.3	CCK @ 11Mbps
6	2.437	0.0784	6.3	DBPSK @ 1Mbps
		0.1152	6.3	DQPSK @ 2Mbps
		0.1391	6.3	CCK @ 5.5Mbps
		0.1418	6.3	CCK @ 11Mbps
11	2.462	0.0684	6.3	DBPSK @ 1Mbps
		0.1051	6.3	DQPSK @ 2Mbps
		0.1273	6.3	CCK @ 5.5Mbps
		0.1275	6.3	CCK @ 11Mbps

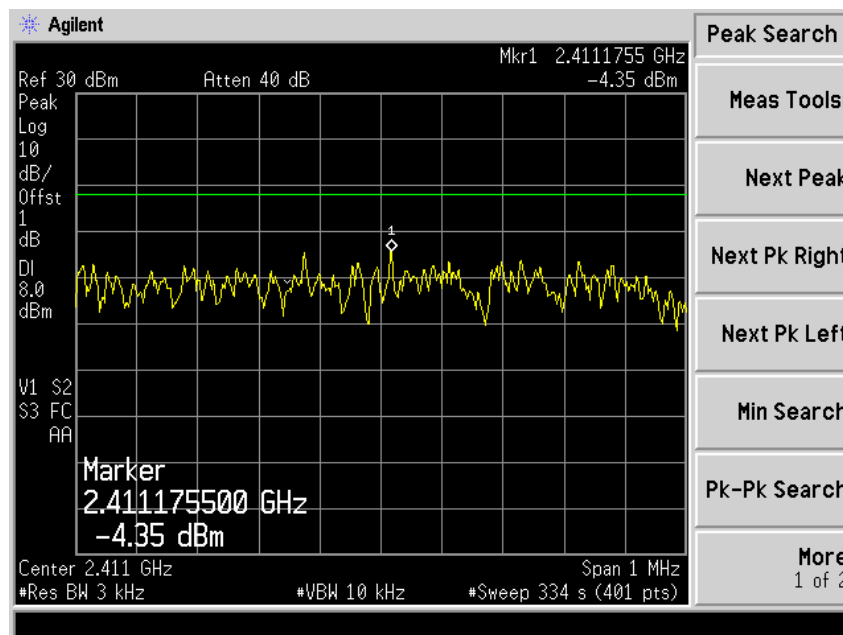
Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)	802.11g Modulation @ Data Rate
1	2.412	0.0643	6.3	BPSK @ 9Mbps
		0.0918	6.3	QPSK @ 18Mbps
		0.0760	6.3	16QAM @ 36Mbps
		0.0508	6.3	64QAM @ 54Mbps
6	2.437	0.0448	6.3	BPSK @ 9Mbps
		0.0576	6.3	QPSK @ 18Mbps
		0.0603	6.3	16QAM @ 36Mbps
		0.0427	6.3	64QAM @ 54Mbps
11	2.462	0.0423	6.3	BPSK @ 9Mbps
		0.0563	6.3	QPSK @ 18Mbps
		0.0543	6.3	16QAM @ 36Mbps
		0.0387	6.3	64QAM @ 54Mbps

## PEAK POWER SPECTRAL DENSITY TEST

### Peak Power Spectral Density Plots – 802.11b



Plot 101 – Channel 1 @ DBPSK 1Mbps

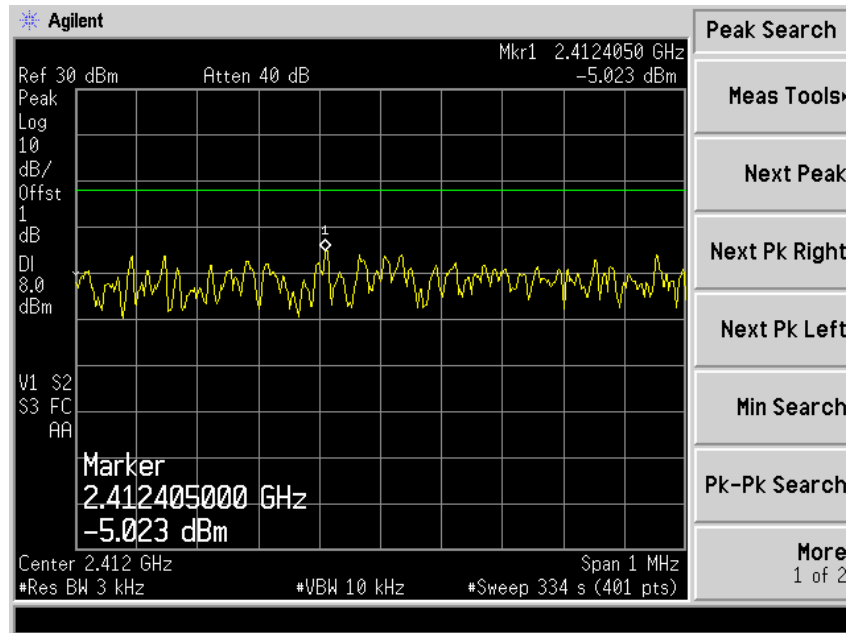


Plot 102 – Channel 1 @ DQPSK 2Mbps

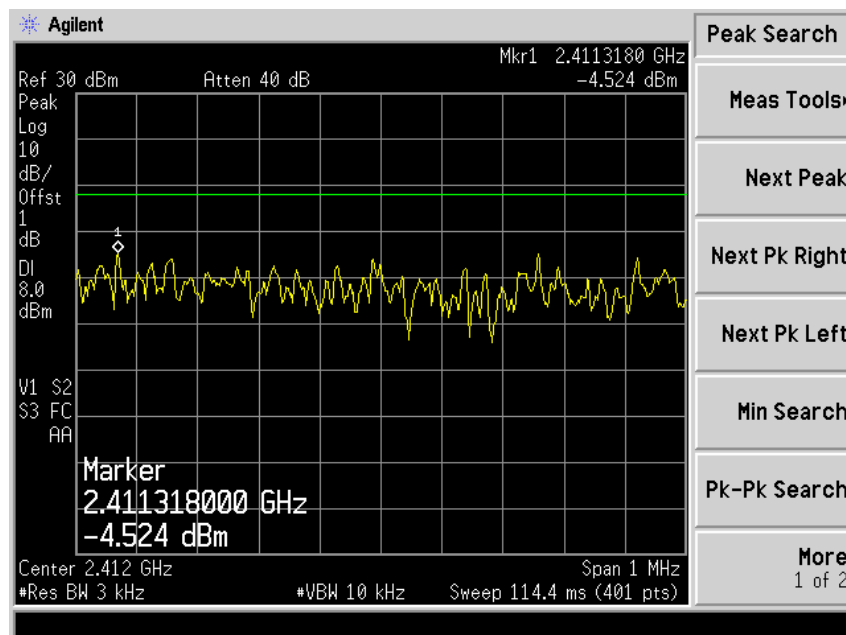


## PEAK POWER SPECTRAL DENSITY TEST

### Peak Power Spectral Density Plots – 802.11b



Plot 103 – Channel 1 @ CCK 5.5Mbps

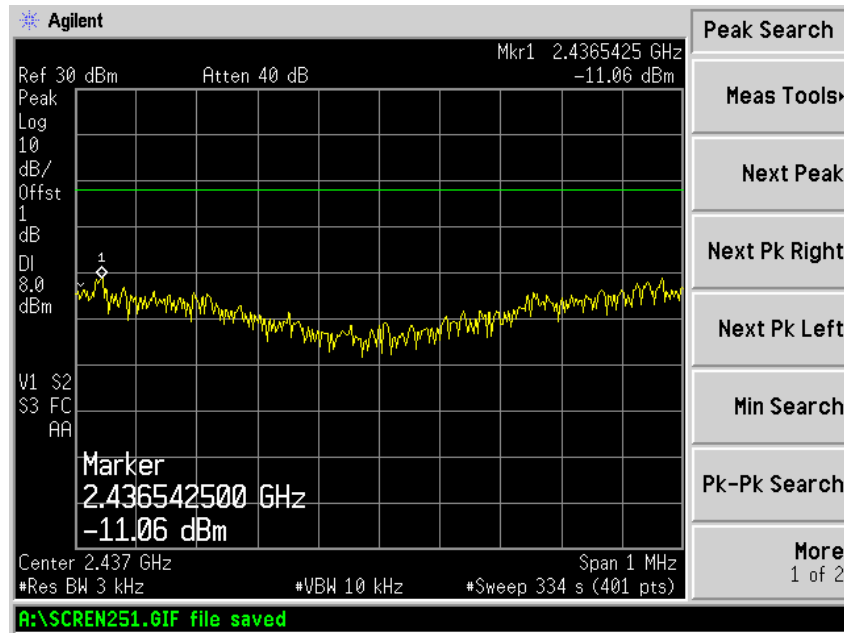


Plot 104 – Channel 1 @ CCK 11Mbps

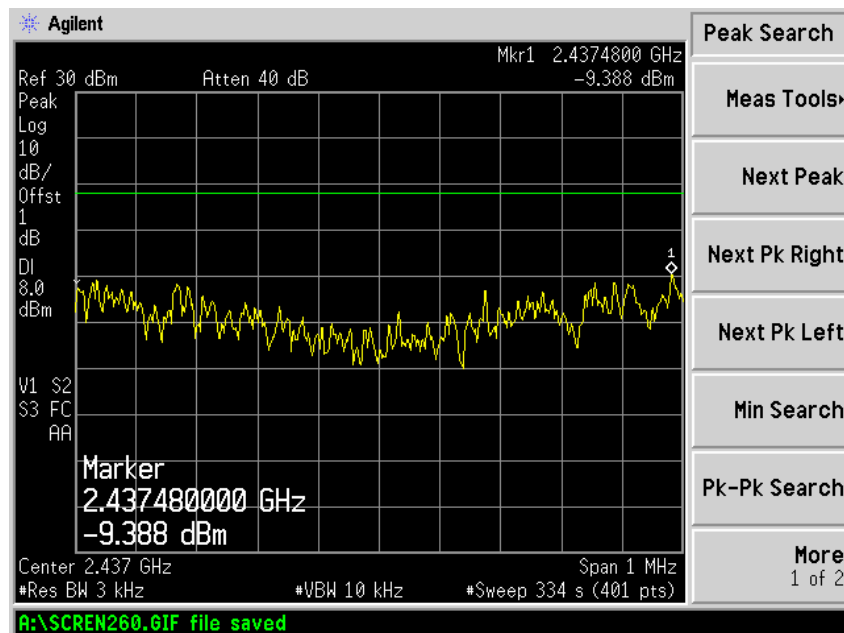


## PEAK POWER SPECTRAL DENSITY TEST

### Peak Power Spectral Density Plots – 802.11b



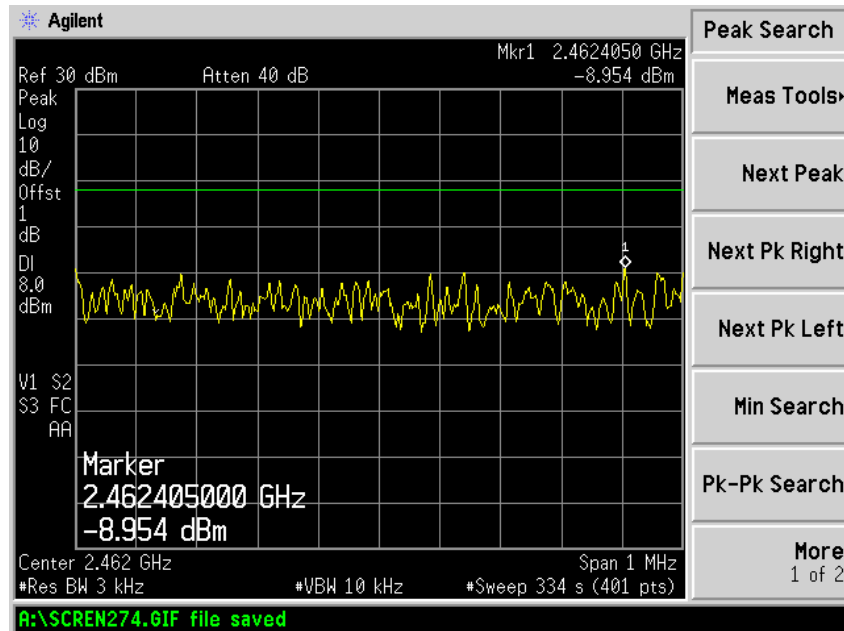
Plot 105 – Channel 6 @ DBPSK 1Mbps



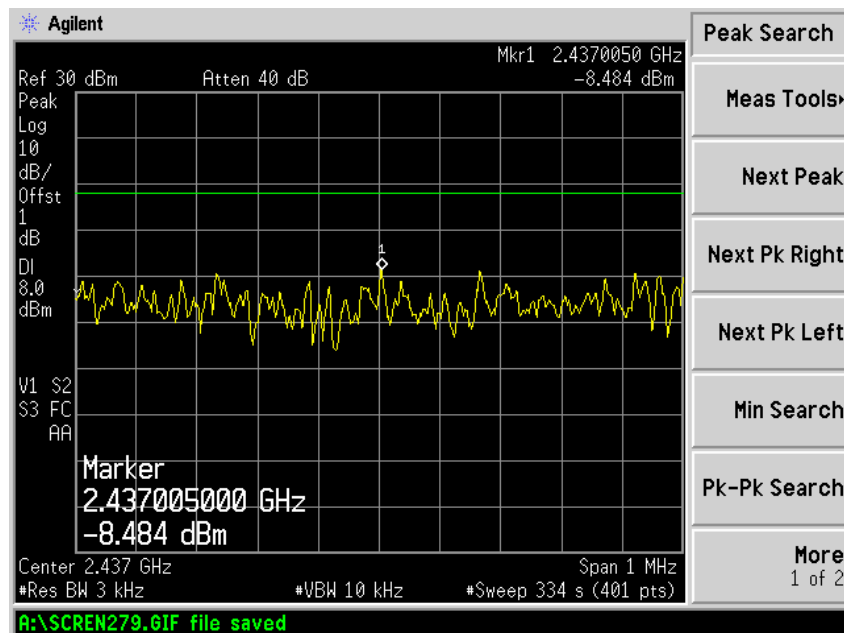
Plot 106 – Channel 6 @ DQPSK 2Mbps

PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots – 802.11b



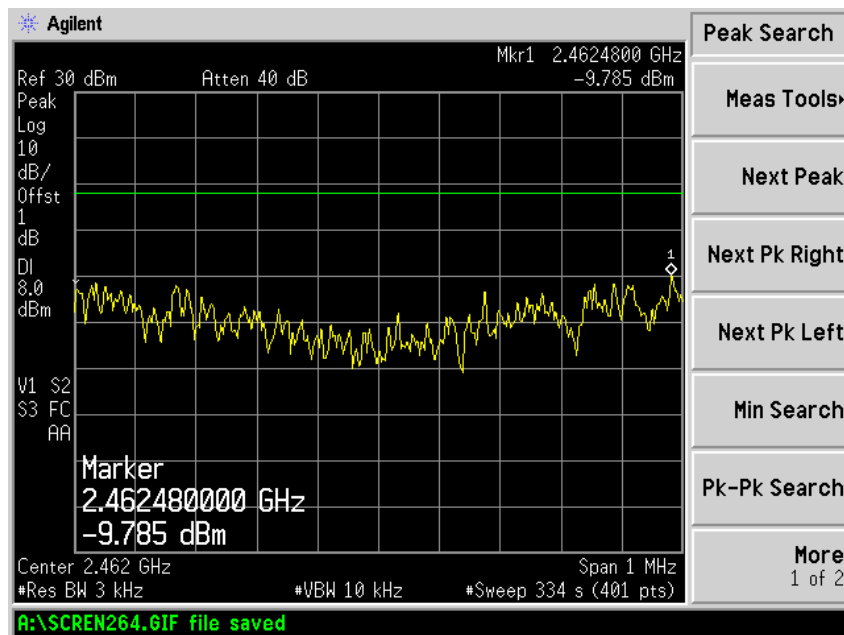
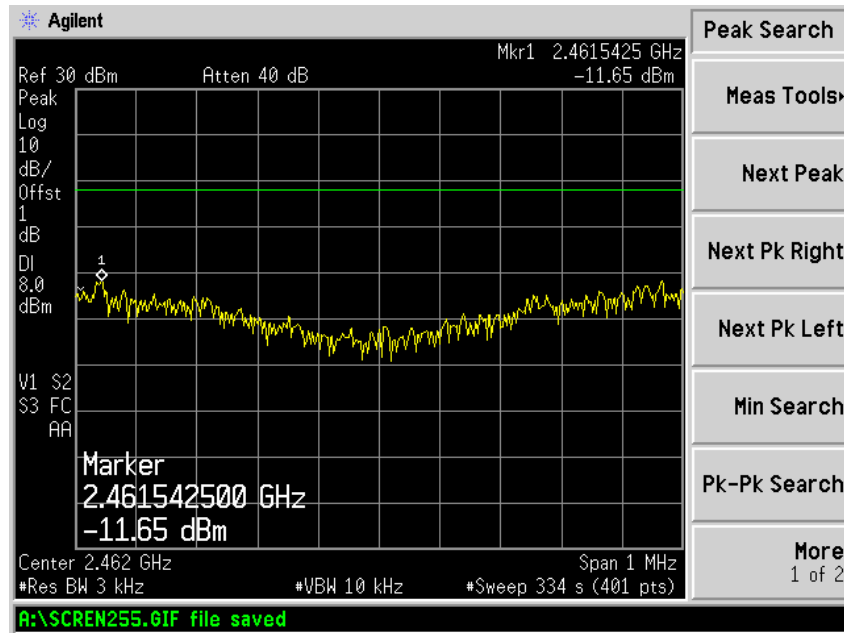
Plot 107 – Channel 6 @ CCK 5.5Mbps



Plot 108 – Channel 6 @ CCK 11Mbps

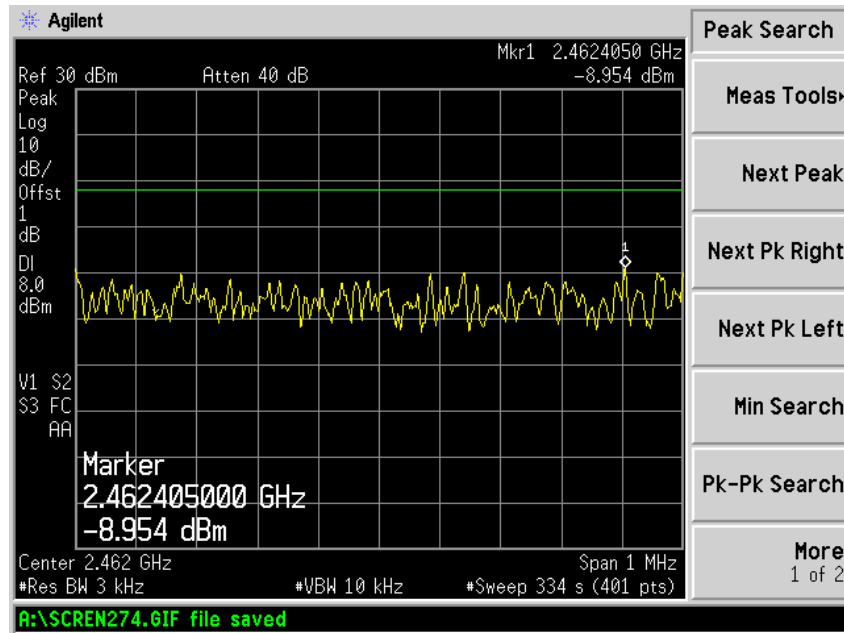
PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots – 802.11b

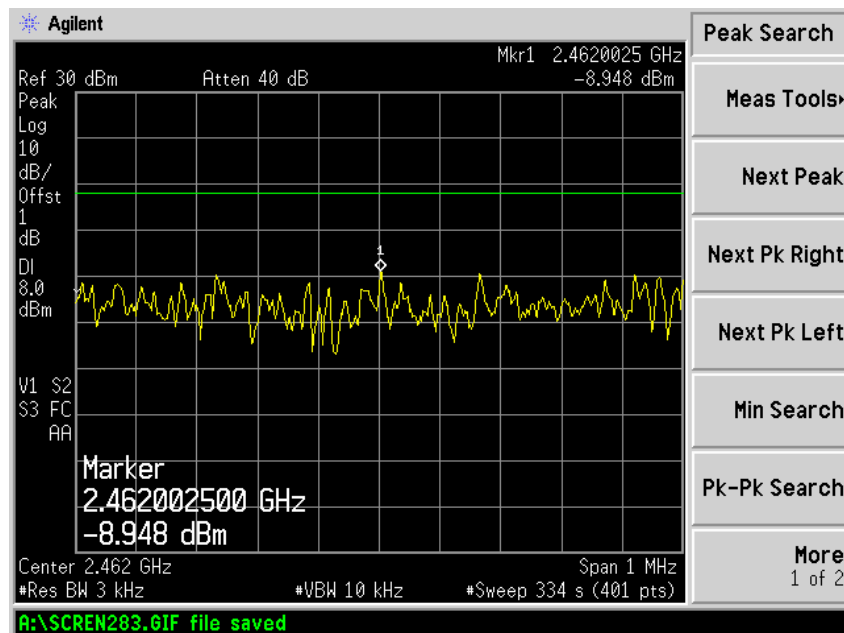


PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots – 802.11b



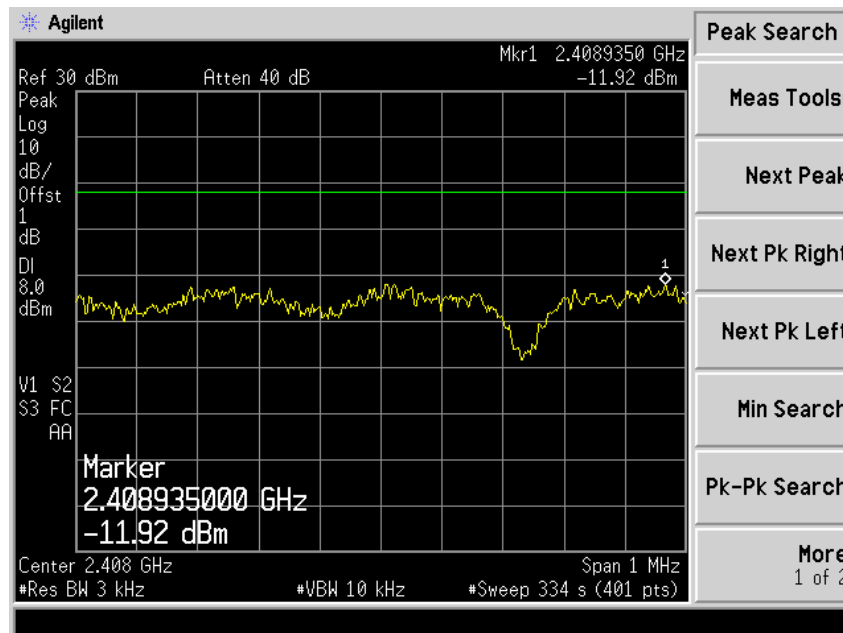
Plot 111 – Channel 11 @ CCK 5.5Mbps



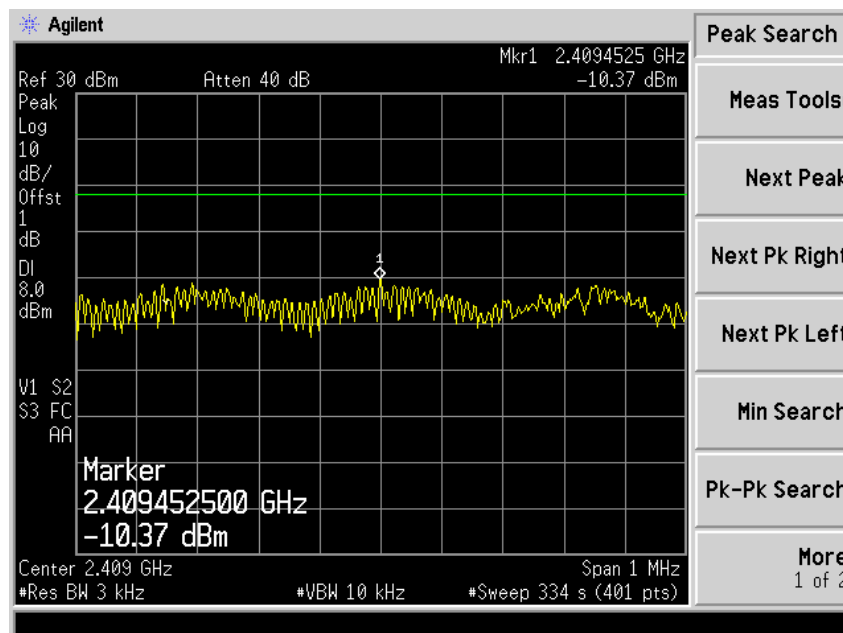
Plot 112 – Channel 11 @ CCK 11Mbps

## PEAK POWER SPECTRAL DENSITY TEST

### Peak Power Spectral Density Plots – 802.11g



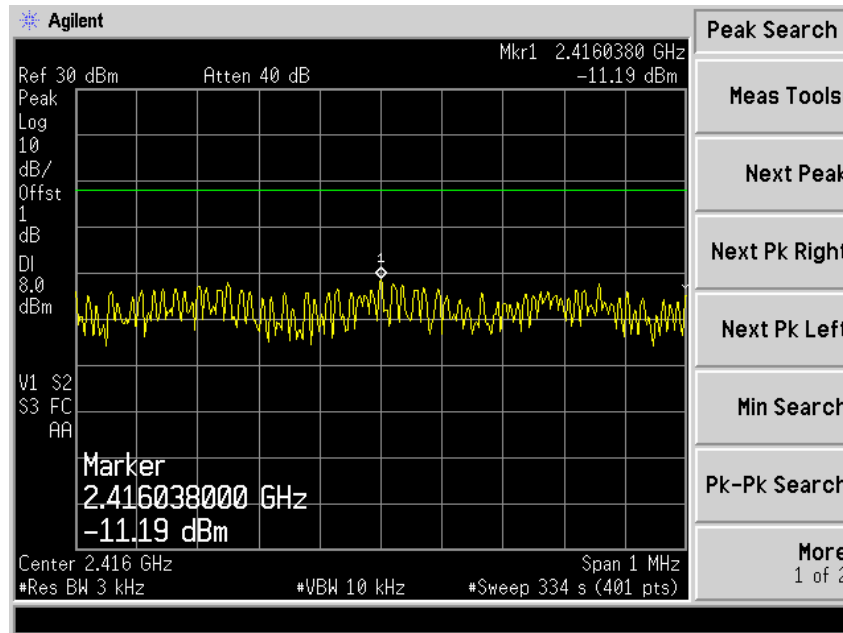
Plot 113 – Channel 1 @BPSK 9Mbps



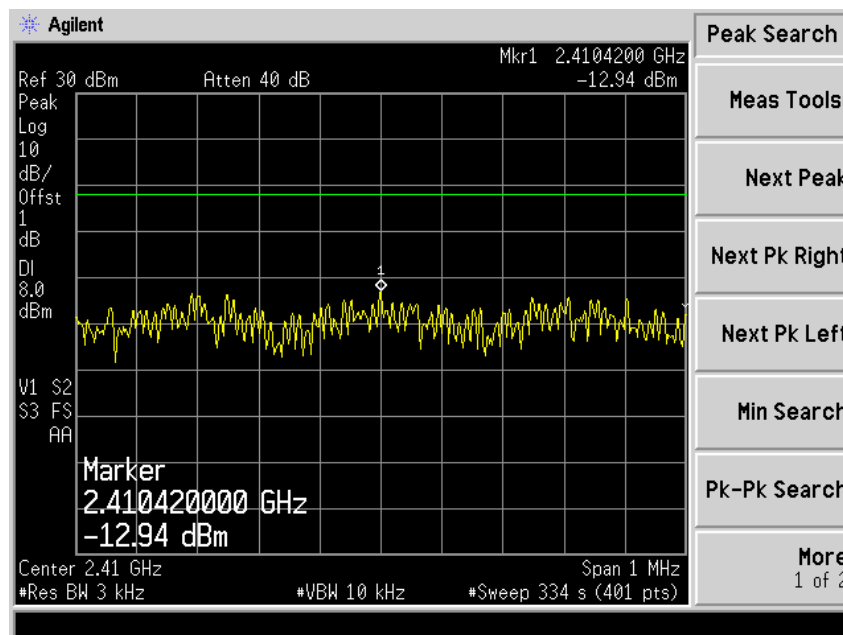
Plot 114 – Channel 1 @QPSK 18Mbps

PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots – 802.11g



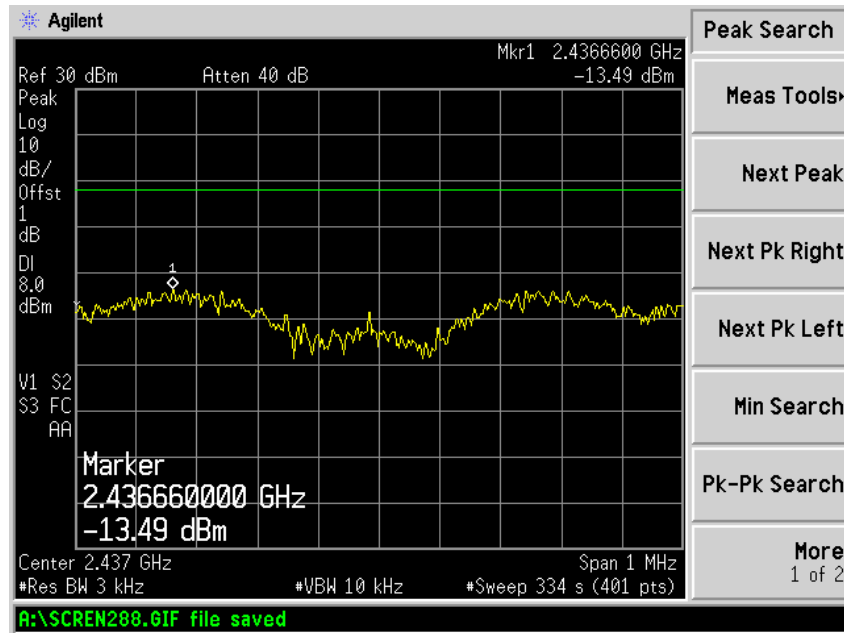
Plot 115 – Channel 1 @ 16QAM 36Mbps



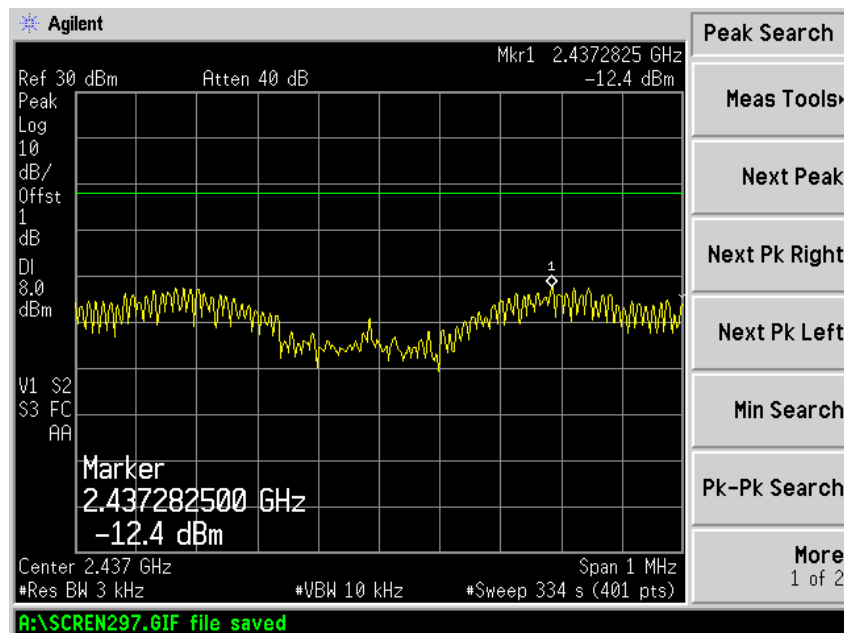
Plot 116 – Channel 1 @ 64QAM 54Mbps

PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots – 802.11g



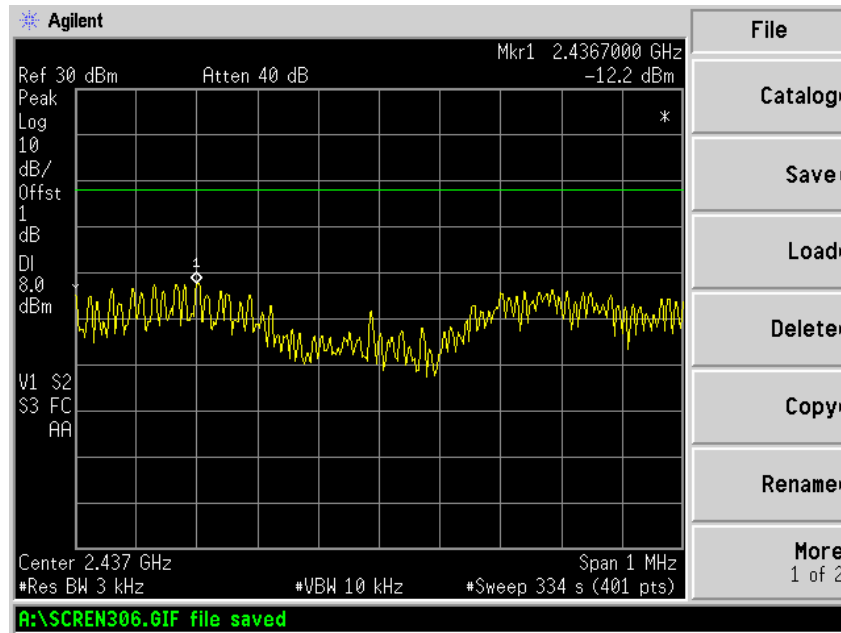
Plot 117 – Channel 6 @BPSK 9Mbps



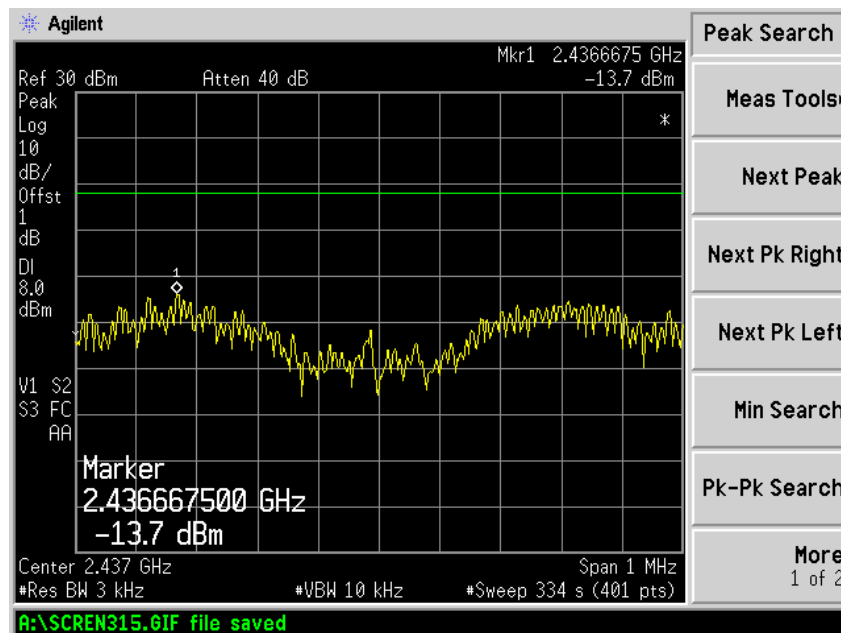
Plot 118 – Channel 6 @ QPSK 18Mbps

PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots – 802.11g



Plot 119 – Channel 6 @ 16QAM 36Mbps

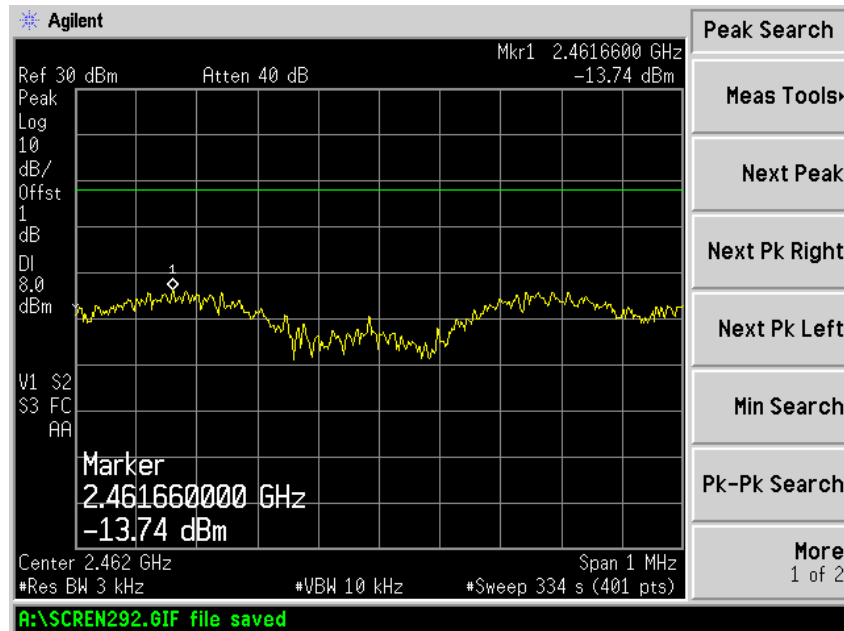


Plot 120 – Channel 6 @ 64QAM 54Mbps

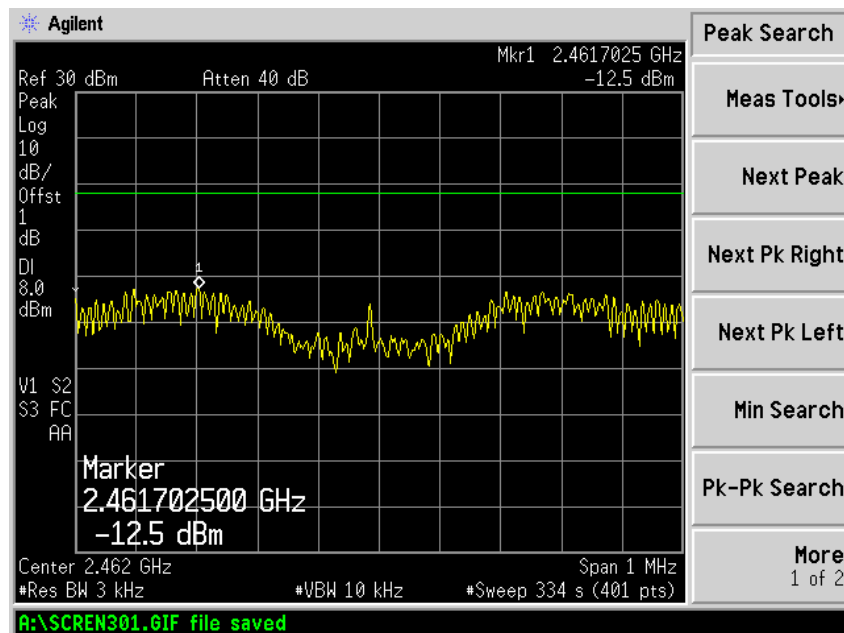


PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots – 802.11g



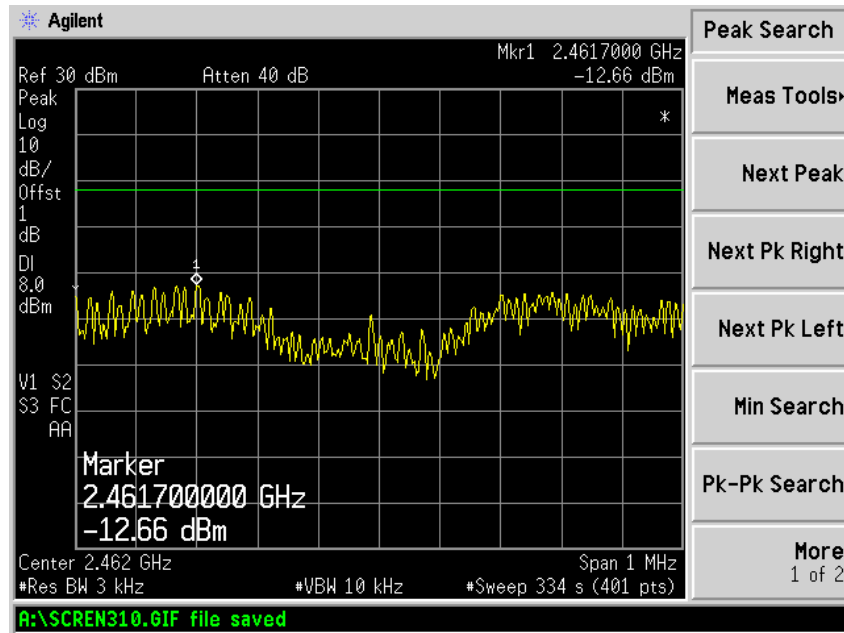
Plot 121 – Channel 11 @ BPSK 9Mbps



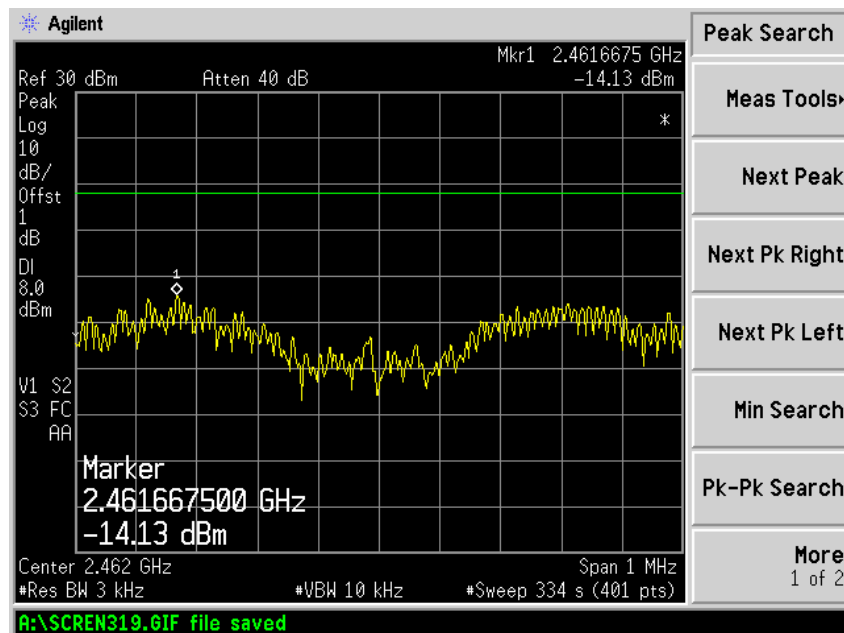
Plot 122 – Channel 11 @ QPSK 18Mbps

PEAK POWER SPECTRAL DENSITY TEST

Peak Power Spectral Density Plots – 802.11g



Plot 123 – Channel 11 @ 16QAM 36Mbps



Plot 124 – Channel 11 (upper ch) @ 64QAM 54Mbps

## MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST

### FCC Part 1.1310 Maximum Permissible Exposure (MPE) Limits

The EUT shows compliance to the requirements of this section, which states the MPE limits for general population / uncontrolled exposure are as shown below:

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Average Time (min)
0.3 - 1.34	614	1.63	100 <sup>Note 2</sup>	30
1.34 - 30	824 / f	2.19 / f	180 / f <sup>2</sup> <sup>Note 2</sup>	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	-	-	f / 1500	30
1500 - 100000	-	-	1.0	30
Notes				
1. f = frequency in MHz				
2. Plane wave equivalent power density				

### FCC Part 1.1310 Maximum Permissible Exposure Computation

The minimum safe distance between the EUT and field probe was computed from the following formula:

$$d = \sqrt{[(30GP) / 377S]}$$

where

S	=	Power density, 10W/m <sup>2</sup>
P	=	0.0568W
d	=	Minimum safety distance, m
G	=	Numerical isotropic gain, 1.55 (1.9dBi)

Substituting the relevant parameters into the formula:

$$d = \sqrt{[(30GP) / 377S]}$$

$$= 0.02657\text{m}$$

$$\approx 2.7\text{cm}$$

∴ The distance between users and the EUT shall be maintained at a minimum distance of 2.7cm during normal operation in order to ensure RF exposure to the users is within the allowable safety margin.

**Test Report No. 56S070446/05**  
**dated 22 Jun 2007**



This Report is issued under the following conditions:

1. Results of the testing/calibration in the form of a report will be issued immediately after the service has been completed or terminated.
2. Unless otherwise requested, a report shall contain only technical results. Analysis and interpretation of the results and professional opinion and recommendations expressed thereupon, if required, shall be clearly indicated and additional fee paid for, by the Client.
3. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way "guarantees" the later performance of the product/equipment.
4. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD PSB therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.
5. Additional copies of the report are available to the Client at an additional fee. No third party can obtain a copy of this report through TÜV SÜD PSB, unless the Client has authorised TÜV SÜD PSB in writing to do so.
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10. Unless otherwise stated, the tests are carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

May 2007



**EUT PHOTOGRAPHS / DIAGRAMS**

**ANNEX A**

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## **ANNEX A**

### **EUT PHOTOGRAPHS / DIAGRAMS**

**EUT PHOTOGRAPHS / DIAGRAMS**

**ANNEX A**

**EUT PHOTOGRAPHS**



**Front View**



**Rear View**

**EUT PHOTOGRAPHS / DIAGRAMS**

**ANNEX A**

**EUT PHOTOGRAPHS**



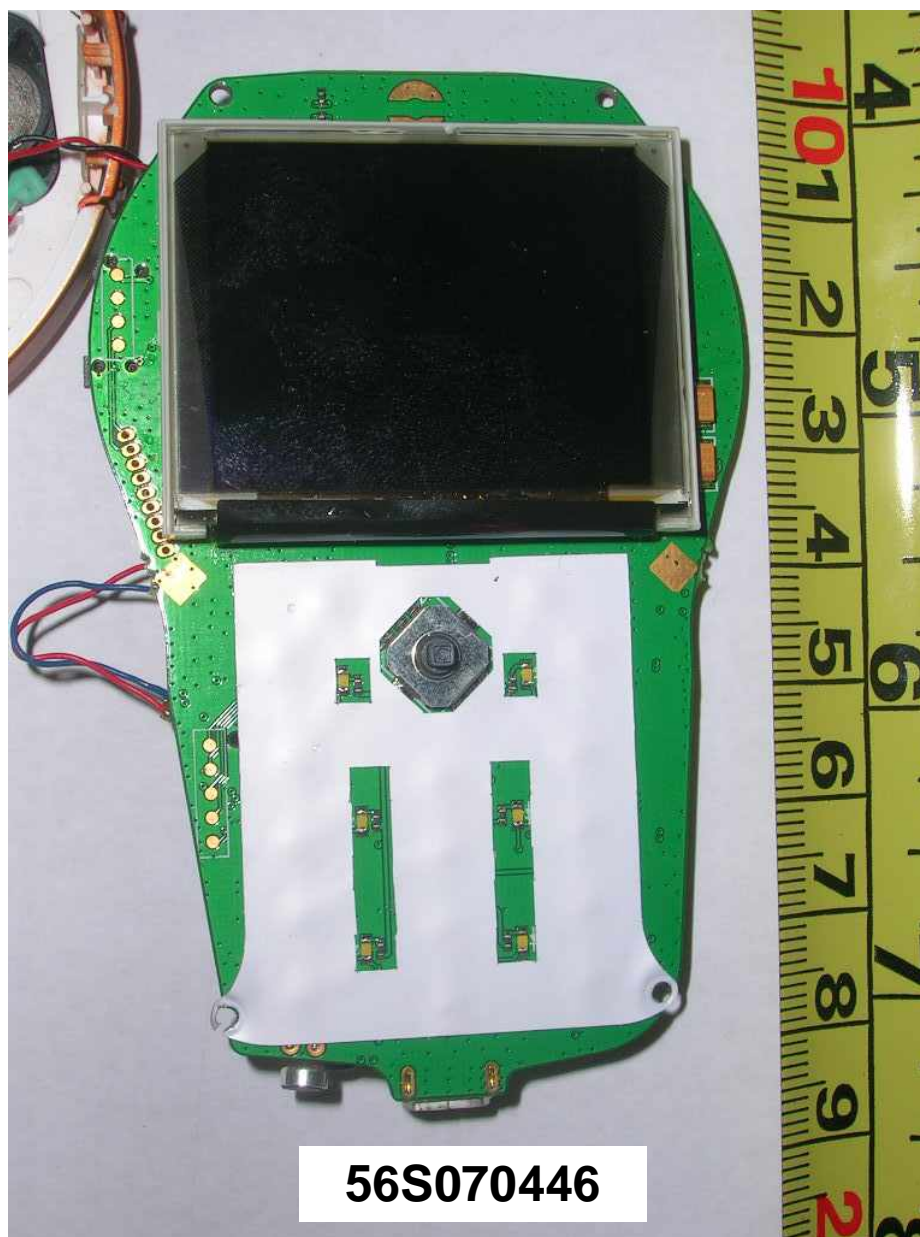
Internal View



**EUT PHOTOGRAPHS / DIAGRAMS**

**ANNEX A**

**EUT PHOTOGRAPHS**



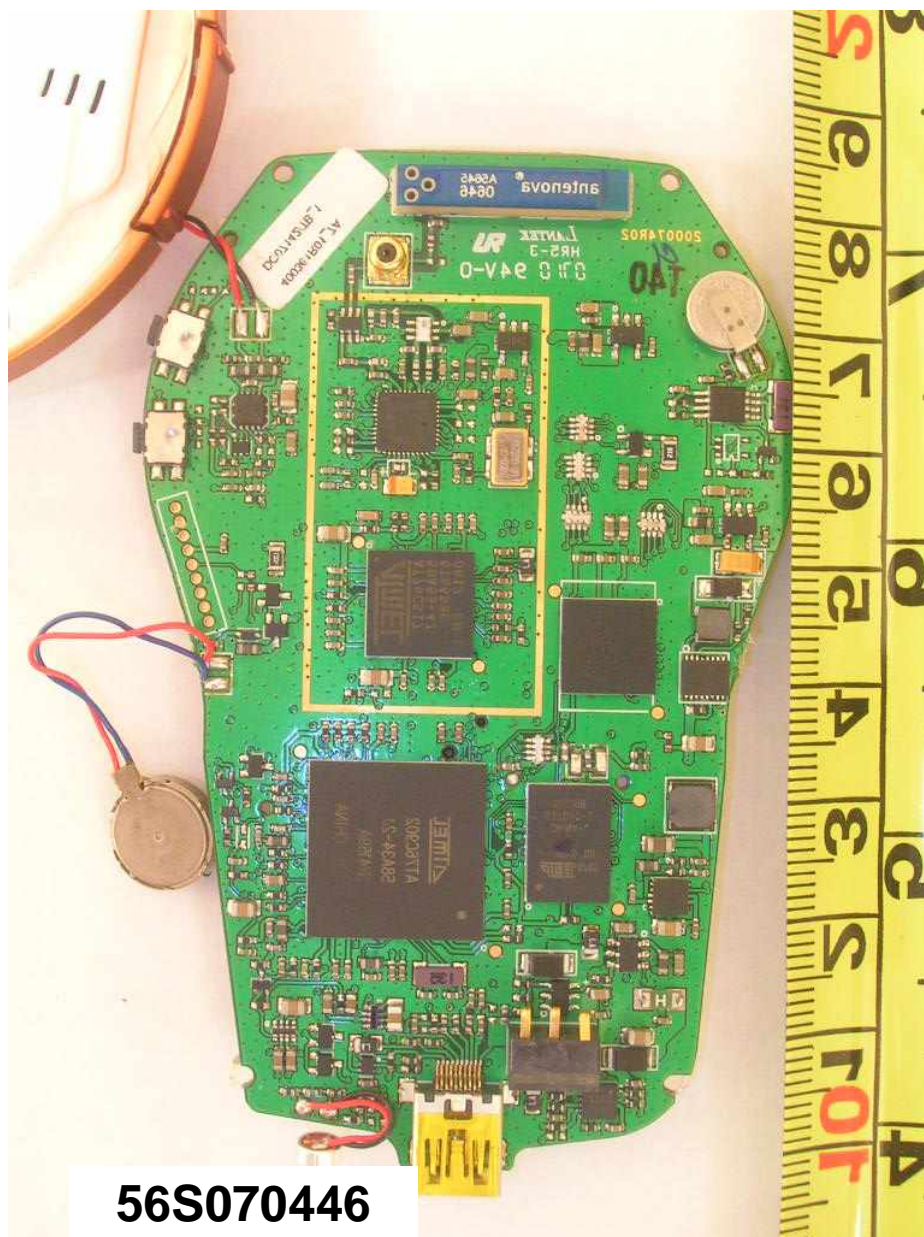
**Main Board – Top View**



EUT PHOTOGRAPHS / DIAGRAMS

ANNEX A

EUT PHOTOGRAPHS

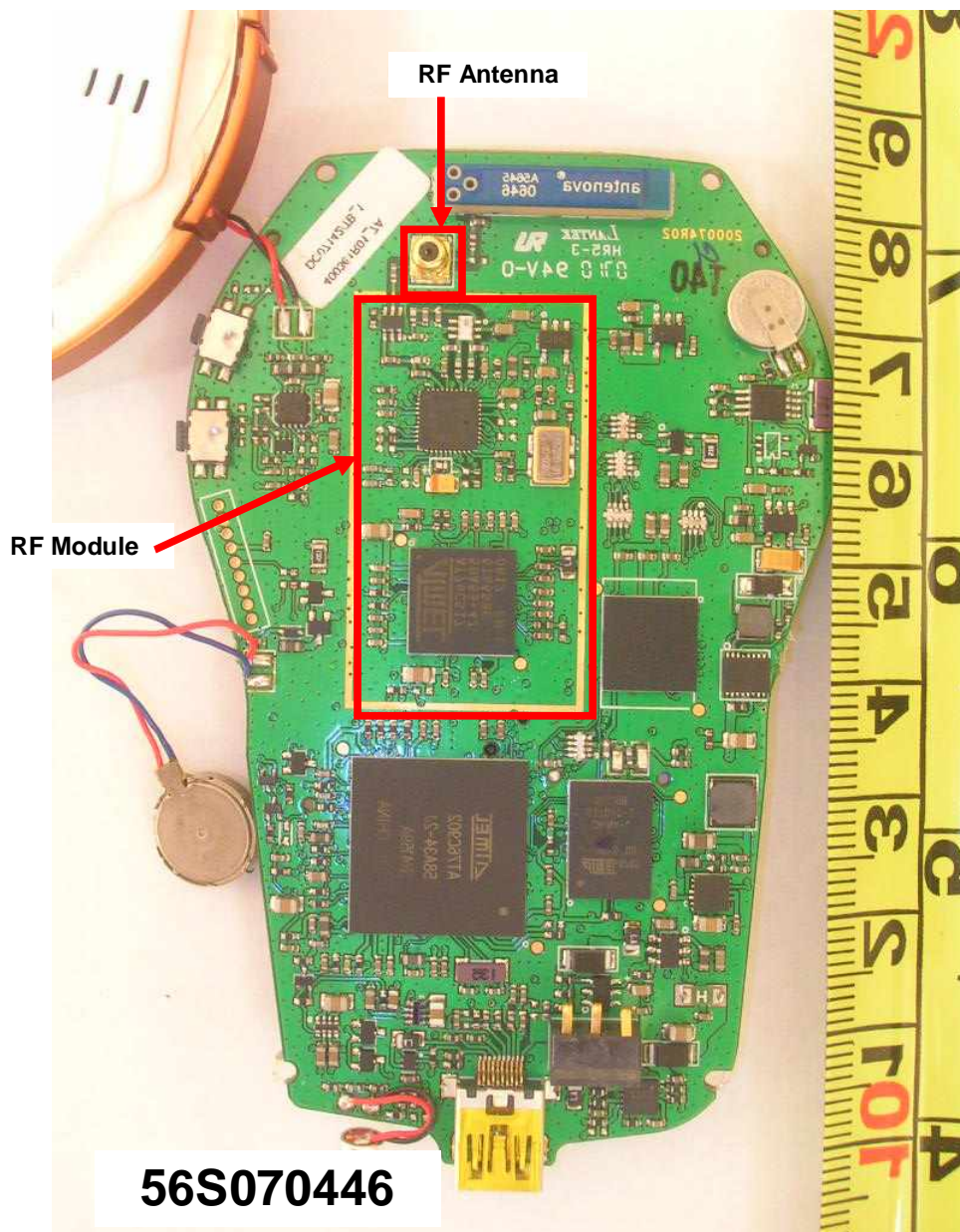


Main Board – Bottom View

EUT PHOTOGRAPHS / DIAGRAMS

ANNEX A

EUT PHOTOGRAPHS



RF Module Circuit with RF Shield Removed

**EUT PHOTOGRAPHS / DIAGRAMS**

**ANNEX A**

**EUT PHOTOGRAPHS**



**Power Adapter - Front View**



**Power Adapter - Rear View**



**EUT PHOTOGRAPHS / DIAGRAMS**

**ANNEX A**

**EUT PHOTOGRAPHS**



**USB Cable**



**FCC LABEL & POSITION**

**ANNEX B**

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## **ANNEX B**

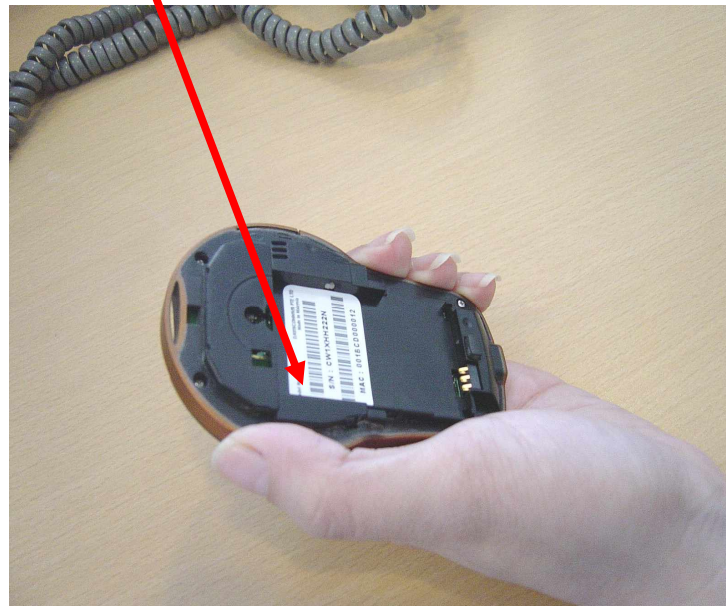
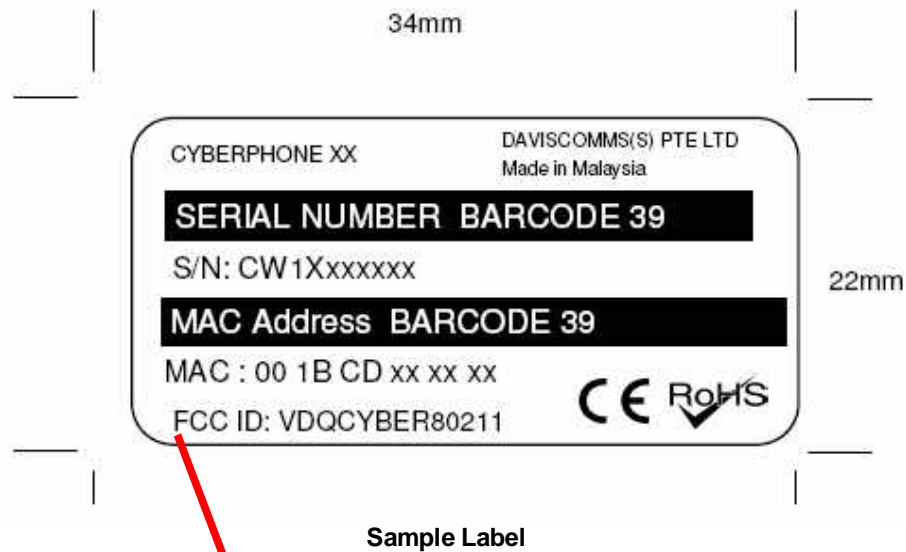
### **FCC LABEL & POSITION**

## FCC LABEL & POSITION

## ANNEX B

Labelling requirements per Section 2.925 & 15.19

The label shown will be permanently affixed at a conspicuous location on the device and be readily visible to the user at the time of purchase.



Physical Location of FCC Label on EUT



**USER MANUAL TECHNICAL DESCRIPTION BLOCK  
& CIRCUIT DIAGRAMS**

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**ANNEX C**

**ANNEX C**

**USER MANUAL  
TECHNICAL DESCRIPTION  
BLOCK & CIRCUIT DIAGRAMS**  
(Please refer to manufacturer for details)