Test Report No. 7191048238-EEC12/01
dated 04 Dec 2012

PSB Singapore

Choose certainty.
Add value.

Note: This report is issued subject to the Testing and Certification Regulations of the TÜV SÜD Group and the General Terms and Conditions of Business of TÜV SÜD PSB Pte Ltd. In addition, this report is governed by the terms set out within this report.

FORMAL REPORT ON TESTING IN ACCORDANCE WITH
47 CFR FCC Parts 15B & C : 2011
OF AN
INMARSAT FLEETBROADBAND SYSTEM
[Model : FX 500]
[FCC ID : QO4-AVIFX500BDE]

TEST FACILITY	TÜV SÜD PSB Pte Ltd, Electrical & Electronics Centre (EEC), Product Services, No. 1 Science Park Drive, Singapore 118221 TÜV SÜD PSB Pte Ltd, Electrical & Electronics Centre (EEC), Product Services, 13 International Business Park #01-01, Singapore 609932
FCC REG. NO.	99142 (3m and 10m Semi-Anechoic Chamber, Science Park) 160581 (3m and 10m Semi-Anechoic Chamber, International Business Park)
IND. CANADA REG. NO.	2932I-1 (3m and 10m Semi-Anechoic Chamber, Science Park) 2932N-1 (10m Semi-Anechoic Chamber, International Business Park)
PREPARED FOR	Addvalue Innovation Pte Ltd 28 Tai Seng Street , #06-02 Singapore 534106 Tel : +65 6509 5721 Fax : +65 6509 5701
QUOTATION NUMBER	219146087 & 219163271
JOB NUMBER	7191027290 & 7191048238
TEST PERIOD	24 Feb 2012 – 14 Mar 2012

PREPARED BY

Quek Keng Huat
Associate Engineer

APPROVED BY

Lim Cher Hwee
Assistant Vice President

TÜV SÜD PSB

ilac-MRA SAC-SINGLAS ACCREDITED LABORATORY

LA-2007-0380-A
LA-2007-0381-F
LA-2007-0382-B
LA-2007-0383-G
LA-2007-0384-G
LA-2007-0385-E
LA-2007-0386-C
LA-2010-0464-D

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.

Laboratory:
TÜV SÜD PSB Pte. Ltd.
No.1 Science Park Drive
Singapore 118221

Phone : +65-6885 1333
Fax : +65-6776 8670
E-mail: testing@tuv-sud-psb.sg
www.tuv-sud-psb.sg
Co. Reg : 199002667R

Regional Head Office:
TÜV SÜD Asia Pacific Pte. Ltd.
3 Science Park Drive, #04-01/05
The Franklin, Singapore 118223

TABLE OF CONTENTS

TEST SUMMARY

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

Test Results Summary

Test Standard	Description	Pass / Fail
47 CFR FCC Part 15: 2011		
15.107(a), 15.207	Conducted Emissions	Not Applicable *See Note 6
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 88 for details

Notes

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

Transmit Channel	Frequency (GHz)	Modulation	Data Rate
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.

Transmit Channel	Frequency (GHz)	Modulation	Data Rate
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
		16QAM	
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 except:
   - Transmitter Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement)
   - Receiver Radiated Emissions
   - Band Edge Compliance (Radiated)
   - Maximum Permissible Exposure

4. The EUT is a Class B device when in non-transmitting state and meets the 47 CFR FCC Part15B Class B requirements.

5. All test measurement procedures are according to ANSI C63.4: 2003.

6. The Equipment Under Test (EUT) is a DC operated device and contains no provision for public utility connections.

Notes (continued)

7. The maximum measured RF power of the Equipment Under Test is 16.7dBm.

8. The Equipment Under Test (EUT) was configured to transmit in continuous mode, ie 0 duty cycle.

9. This report 7191048238-EEC12/01 was generated from the report 7191027290-EEC12/04 based on the following declaration from Addvalue Innovation Pte Ltd:

We, Addvalue Innovation Pte Ltd, sole designer, manufacturer and supplier of the products here by declaring that both FX range & FX series products are identically same, in the aspect of design and construction, the applicable change only in product brand name , ownership and responsibility.
See below change log differentiate between the two product range:

Items	Product 1	Product 2
Brand Name	Sea Tel	Wideye
Ownership & Responsibility	Sea Tel Inc.	Addvalue Innovation Pte Ltd

Notes (continued)

10. See below for External photo provided by Addvalue Innovation Pte Ltd

AVI FX Series – Model: FX 500
Inmarsat FleetBroadband System

BDU (Below Deck Unit) +HANDSET+ANTENNA

Notes (continued)

10. See below for External photo provided by Addvalue Innovation Pte Ltd

BDU Top view + Handset

BDU Bottom view + Handset

BDU Rating label close-up view

Notes (continued)

10. See below for External photo provided by Addvalue Innovation Pte Ltd

BDU Front view+Handset

BDU Rear view + Handset

BDU Left side view

BDU Right Side view

Handset Top view

Handset Bottom view

Notes (continued)

10. See below for External photo provided by Addvalue Innovation Pte Ltd

Handset Label close-up view

11. See below for FCC Label provided by Addvalue Innovation Pte Ltd

Modifications

No modifications were made.

PRODUCT DESCRIPTION

Description	:	The Equipment Under Test (EUT) is a **INMARSAT FLEETBROADBAND SYSTEM.**
Applicant	:	Addvalue Innovation Pte Ltd 28 Tai Seng Street , #06-02 Singapore 534106
Manufacturer	:	Addvalue Innovation Pte Ltd 28 Tai Seng Street , #06-02 Singapore 534106
Factor(ies)	:	Beyonics Technology (Senai) Sdn Bhd Lot 3627,Jalan Harmoni 1,Batu 22 81000 Kulai, Johor, Malaysia
Model Number	:	FX 500
FCC ID	:	QO4-AVIFX500BDE
Brand	:	Wideye
Serial Number	:	MB5001A120500011
Operating / Transmitting Frequency	:	2.412MHz (lower channel) to 2.462MHz (upper channel) 11 channels.
Clock / Oscillator Frequency	:	25.0MHz
Modulation	:	DBPSK, DQPSK, CCK, BPSK, QPSK, 16QAM, 64QAM (802.11b/g)
Antenna Gain	:	0.0 dBi
Port / Connectors	:	4 RJ 45 (2 PoE, 2 LAN) 2 RJ11 (1 FAX , 1 Phone) 1 Offset latch RJ11
Rated Input Power	:	12V,15A / 24V,7.5A(180W)
Accessories	:	Primary Handset, 3m DC Power Cable.

SUPPORTING EQUIPMENT DESCRIPTION

Equipment Description (Including Brand Name)	Model, Serial & FCC ID Number	Cable Description (List Length, Type & Purpose)
Acer Laptop PC	M/N: Travelmate 2420 S/N: XTB205106613077CFKS00 FCC ID: DoC	2.00m unshielded power cable 2.00m communication cable
Delta Electronics Power Adapter (Laptop)	M/N: SADP-65KB D S/N: 94W0610190186 FCC ID: Nil	2.00m unshielded power cable
SeaTel Primary Handset	M/N: SAFARI-PH S/N: AVHSS1P113800071 FCC ID: Nil	1x 1m shielded telephone cord
Above Deck Unit Antenna	M/N: BGAN-FB500 S/N: 41104 FCC ID: Nil	1x 25m shielded RF cable 1x 15m shielded RF cable
Wideye Wired Telephone	M/N: SB/AH-100 S/N: Nil FCC ID: Nil	1x 1.5m telephone cable
2x12Vdc Battery	M/N: MF160G51 S/N: Nil FCC ID: Nil	2.00m unshielded battery cable

EUT OPERATING CONDITIONS

47 CFR FCC Part 15
1. Radiated Emissions (Spurious Emissions inclusive Restricted Bands Requirement) **2. Spectrum Bandwidth (6dB Bandwidth Measurement)** **3. Maximum Peak Power** **4. RF Conducted Spurious Emissions** **5. Band Edge Compliance (Conducted)** **6. Band Edge Compliance (Radiated)** **7. Peak Power Spectral Density** **8. Maximum Permissible Exposure**
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.

47 CFR 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									

47 CFR 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.	

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

Instrument	Model	S/No	Cal Due Date
EMCO Horn Antenna – H15	3115	0003-6088	20 May 2012
ESCO Loop Antenna	6502	00134413	27 May 2012
Rohde & Schwarz EMI Test Receiver (20Hz – 26.5GHz)	ESMI	849182/003 848926/007	16 Aug 2012
TDK RF Solutions Hybrid Log Periodic Antenna (30MHz-3GHz)	HLP-3003C	130238	19 Mar 2012
Sonoma Preamplifier (9kHz – 1GHz)	310N	270640	03 Jan 2013
Toyo MicroWave Preamplifier (1GHz - 18GHz)	TPA0188-36	1005	24 Jun 2012
ETS Horn Antenna(18GHz-40GHz)(Ref)	3116	0004-2474	19 Apr 2012
Toyo Preamplifier (26.5GHz-40GHz)	HAP26-40W	00000005	19 Apr 2012
Micro-Tronics Bluetooth Notch Filter (Stopband 2.4 - 2.5GHz)	BRM50701-02	007	13 Aug 2012

47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Test Setup

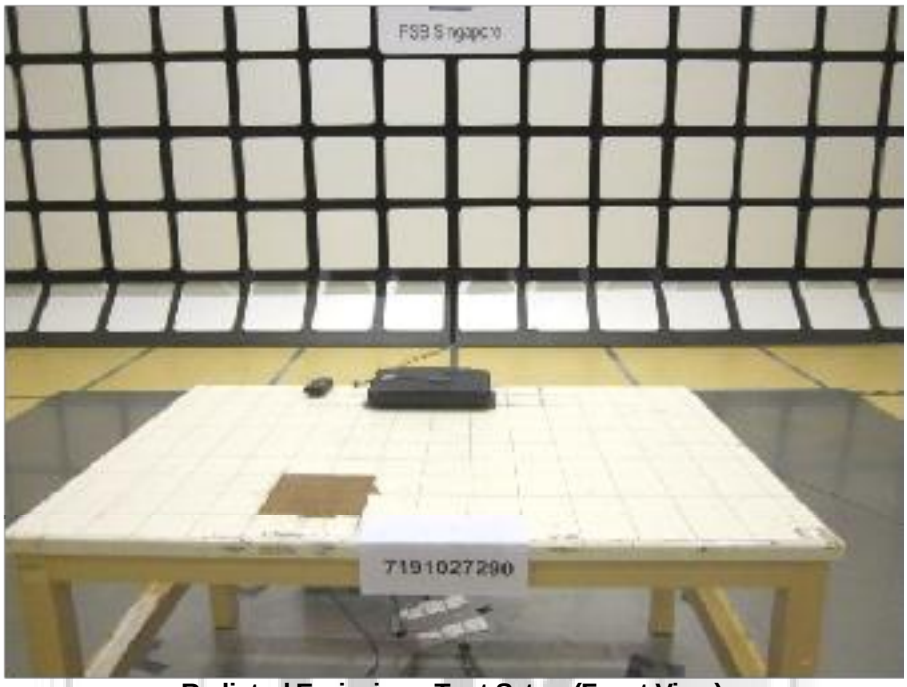
1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table.
2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
3. The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

47 CFR FCC Parts 15.109(a) and 15.209 Radiated Emission Test Method

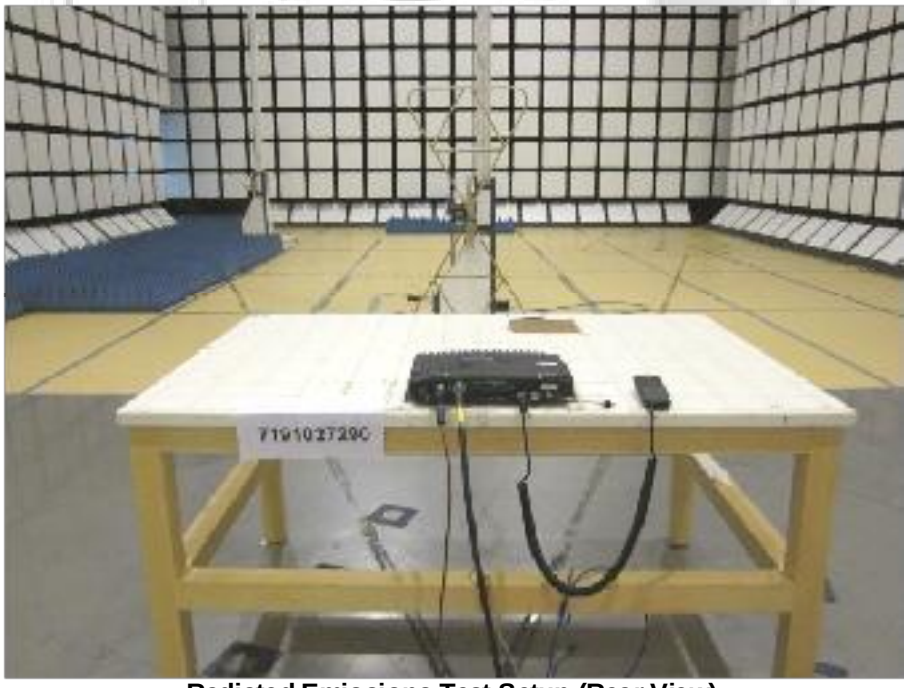
1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A prescan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the prescan was carried out by rotating the EUT through three orthogonal axes to determine which altitude 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 10th harmonics of the EUT fundamental frequency, using the Bi-log antenna for frequencies from 30MHz up to 1GHz, and the Horn antenna above 1GHz.

Sample Calculation Example

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



Radiated Emissions Test Setup (Front View)



Radiated Emissions Test Setup (Rear View)

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

Operating Mode	Continuous WIFI transmit	Temperature	18°C
Test Input Power	24Vdc (Worst Voltage)	Relative Humidity	58%
Test Distance	3m	Atmospheric Pressure	1030mbar
Data Rate	802.11g 54Mbps (Worst Rate)	Tested By	Kelvin Cheng, Jason Lai

Spurious Emissions ranging from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBµV/m)	Q-P Limit (dBµV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Channel
59.1350	31.7	40.0	8.3	104	20	V	1
84.0840	25.1	40.0	14.9	128	228	V	1
276.0020	35.4	46.0	10.6	102	332	H	1
327.5980	31.3	46.0	14.7	102	225	H	1
875.1070	24.4	46.0	21.6	113	325	V	1
968.7140	17.9	54.0	36.1	275	8	H	1

Spurious Emissions above 1GHz

Freq (GHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	AV Value (dBµV/m)	AV Limit (dBµV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
8.8549	57.0	74.0	17.0	43.2	54.0	10.8	101	172	V	1
10.6729	56.4	74.0	17.6	43.0	54.0	11.0	398	13	V	1
13.5009	62.7	74.0	11.3	49.7	54.0	4.3	275	61	V	1
14.1069	63.1	74.0	10.9	49.8	54.0	4.2	101	304	H	1
16.5578	60.5	74.0	13.5	47.4	54.0	6.6	101	231	H	1
17.8910	66.9	74.0	7.1	53.8	54.0	0.2	399	28	V	1

Spurious Emissions above 1GHz

Freq (GHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	AV Value (dBµV/m)	AV Limit (dBµV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
1.8403	45.9	74.0	28.1	35.9	54.0	18.1	137	195	V	6
1.8457	43.7	74.0	30.3	33.7	54.0	20.3	101	359	V	6
2.3326	46.6	74.0	27.4	36.6	54.0	17.4	370	336	V	6
2.5161	47.1	74.0	26.9	37.1	54.0	16.9	289	102	V	6
2.5768	48.2	74.0	25.8	38.2	54.0	15.8	203	149	V	6
4.2968	54.2	74.0	19.8	34.2	54.0	19.8	152	335	V	6

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

Spurious Emissions above 1GHz

Freq (GHz)	Peak Value (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin (dB)	AV Value (dBµV/m)	AV Limit (dBµV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)	Ch
1.0110	41.1	74.0	32.9	31.1	54.0	22.9	101	102	H	11
1.8403	45.9	74.0	28.1	35.9	54.0	18.1	137	195	V	11
1.8457	43.7	74.0	30.3	33.7	54.0	20.3	101	359	V	11
2.3326	46.6	74.0	27.4	36.6	54.0	17.4	370	336	V	11
2.5161	47.1	74.0	26.9	37.1	54.0	16.9	289	102	V	11
2.5768	48.2	74.0	25.8	38.2	54.0	15.8	203	149	V	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. The transmitting antenna was found to be in the worst case condition when it was orientated in a vertical position.
3. 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 measuring the absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
4. A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
5. EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings:
   30MHz - 1GHz
   RBW: 120kHz VBW: 1MHz
   >1GHz
   RBW: 1MHz VBW: 1MHz
6. 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.
7. The channel in the table refers to the transmit channel of the EUT.
8. 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 is ±4.0dB.

SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

47 CFR 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.

47 CFR FCC Part 15.247(a)(2) Spectrum Bandwidth (6dB Bandwidth Measurement) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	25 May 2012
GW Instek Programmable Power Supply	PSH-3630A	RK200168	30 Jan 2013

47 CFR 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.

47 CFR 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 Setup

SPECTRUM BANDWIDTH (6dB BANDWIDTH MEASUREMENT) TEST

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

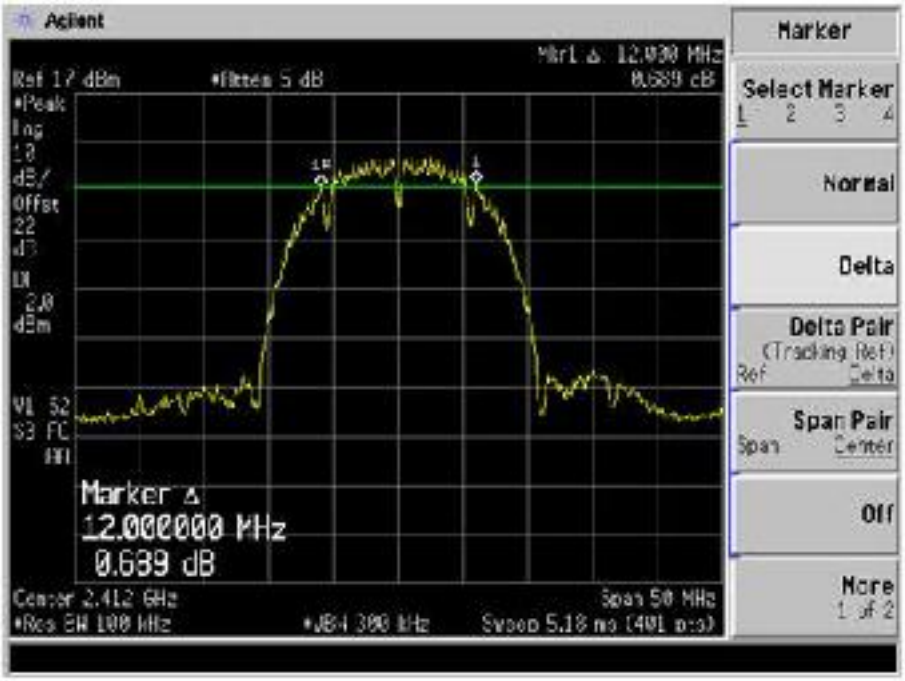
Operating Mode	Continuous WIFI transmit	Temperature	24°C
Test Input Power	24Vdc (Worst Voltage)	Relative Humidity	54%
Attached Plots	1 – 12	Atmospheric Pressure	1027mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)	802.11b Modulation @ Data Rate
1	2.412	12.000	DBPSK @ 1Mbps
		10.375	DQPSK @ 2Mbps
		12.625	CCK @ 5.5Mbps
		12.625	CCK @ 11Mbps
6	2.437	12.250	DBPSK @ 1Mbps
		10.250	DQPSK @ 2Mbps
		12.250	CCK @ 5.5Mbps
		12.125	CCK @ 11Mbps
11	2.462	11.375	DBPSK @ 1Mbps
		11.750	DQPSK @ 2Mbps
		11.125	CCK @ 5.5Mbps
		13.000	CCK @ 11Mbps

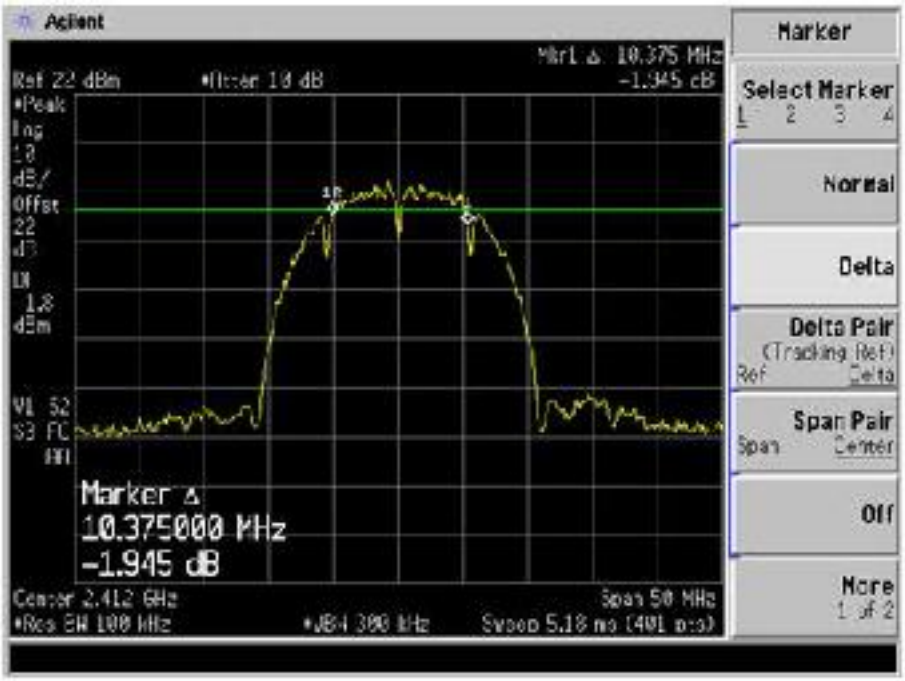
Operating Mode	Continuous WIFI transmit	Temperature	24°C
Test Input Power	24Vdc (Worst Voltage)	Relative Humidity	54%
Attached Plots	13 – 24	Atmospheric Pressure	1027mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	6dB Bandwidth (MHz)	802.11g Modulation @ Data Rate
1	2.412	16.500	BPSK @ 9Mbps
		16.625	QPSK @ 18Mbps
		16.625	16QAM @ 36Mbps
		16.750	64QAM @ 54Mbps
6	2.437	16.625	BPSK @ 9Mbps
		16.625	QPSK @ 18Mbps
		16.750	16QAM @ 36Mbps
		16.750	64QAM @ 54Mbps
11	2.462	16.500	BPSK @ 9Mbps
		16.625	QPSK @ 18Mbps
		16.750	16QAM @ 36Mbps
		16.750	64QAM @ 54Mbps

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

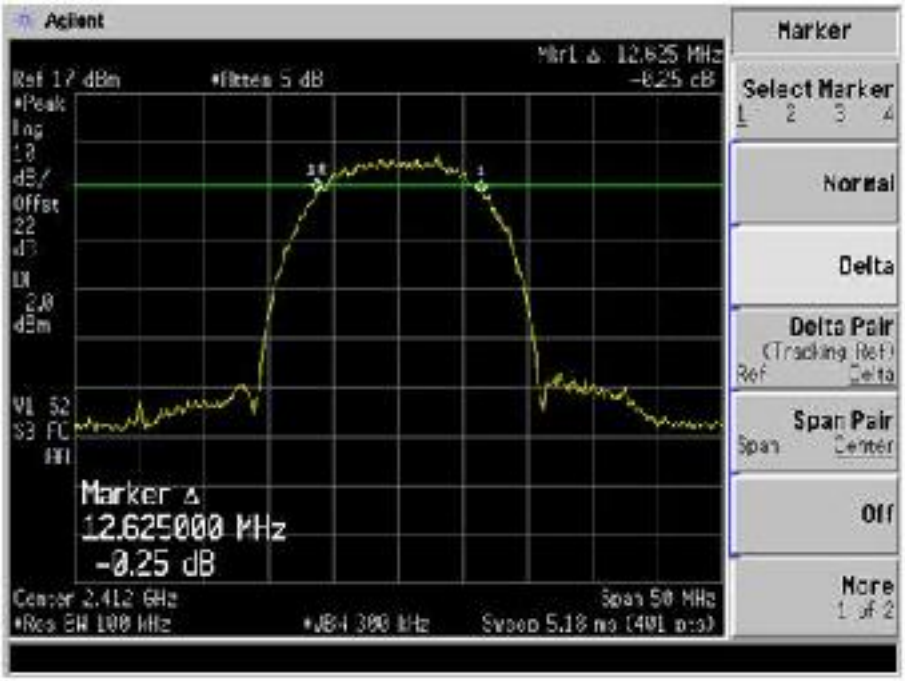


Plot 1 - Channel 1 @ DBPSK 1Mbps

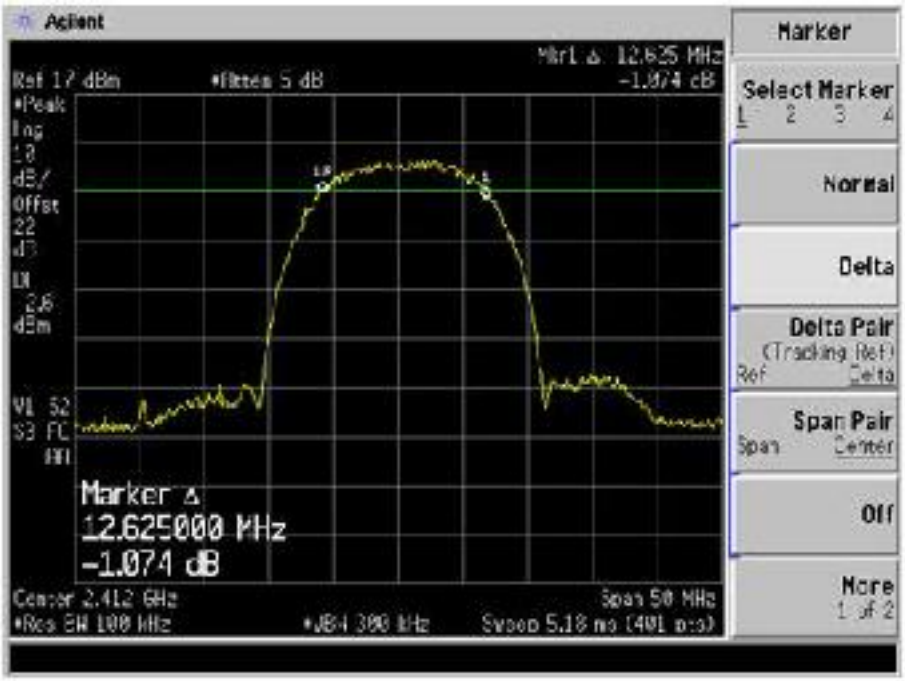


Plot 2 - Channel 1 @ DQPSK 2Mbps

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

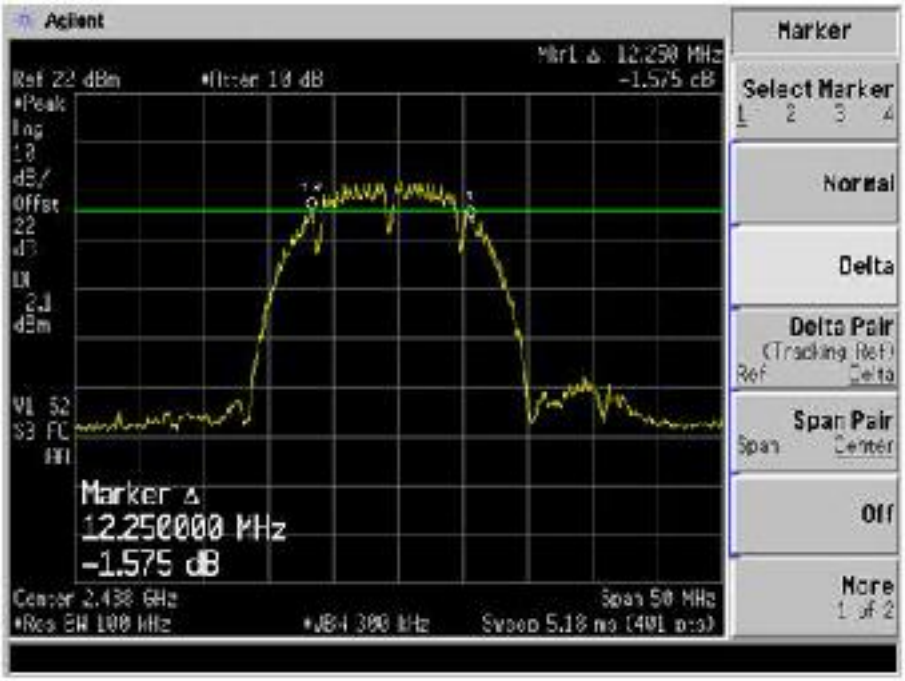


Plot 3 - Channel 1 @ CCK 5.5Mbps

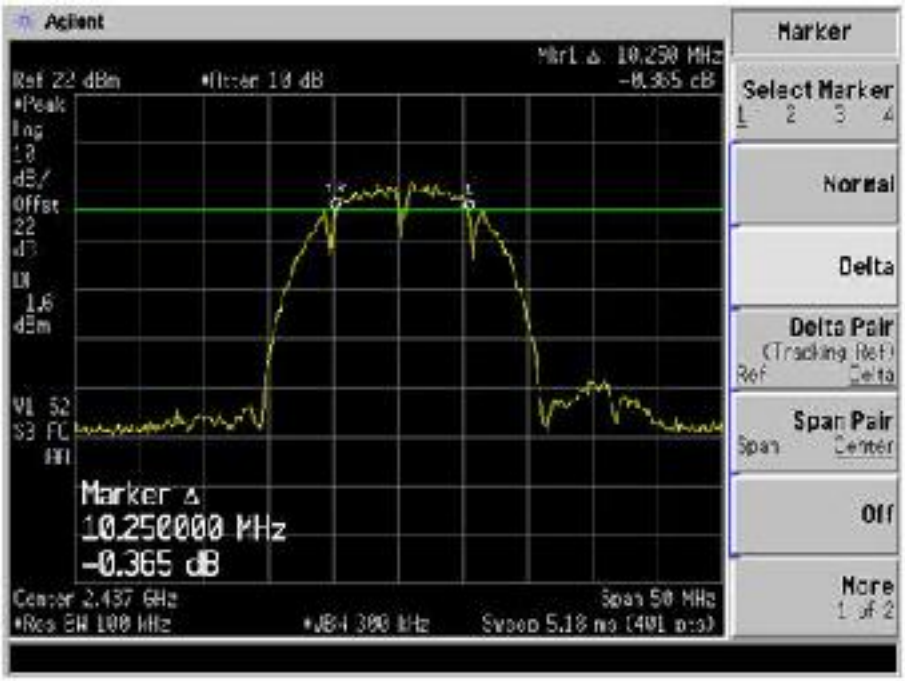


Plot 4 - Channel 1 @ CCK 11Mbps

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

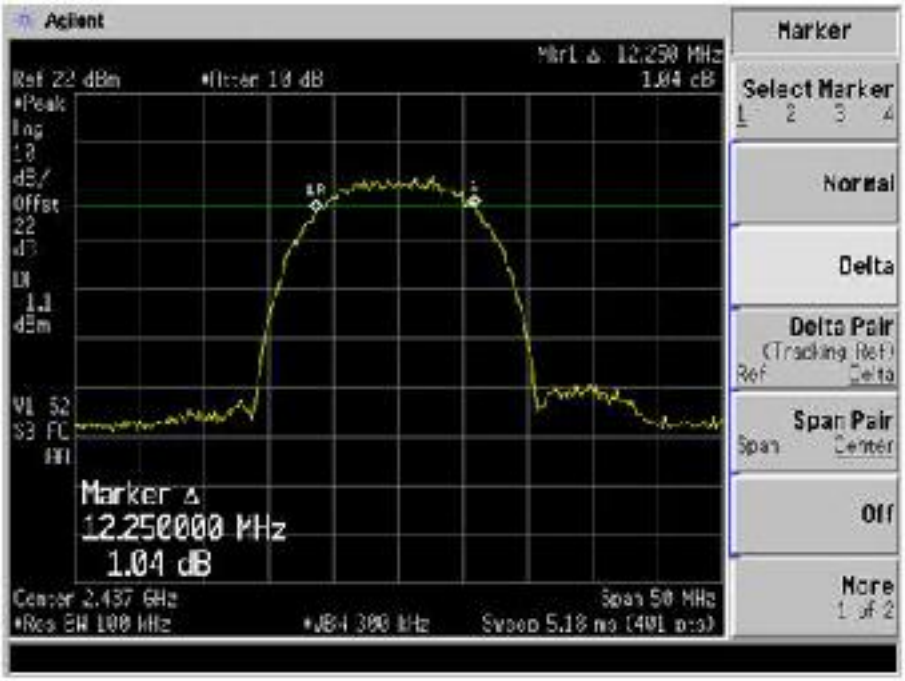


Plot 5 - Channel 6 @ DBPSK 1Mbps

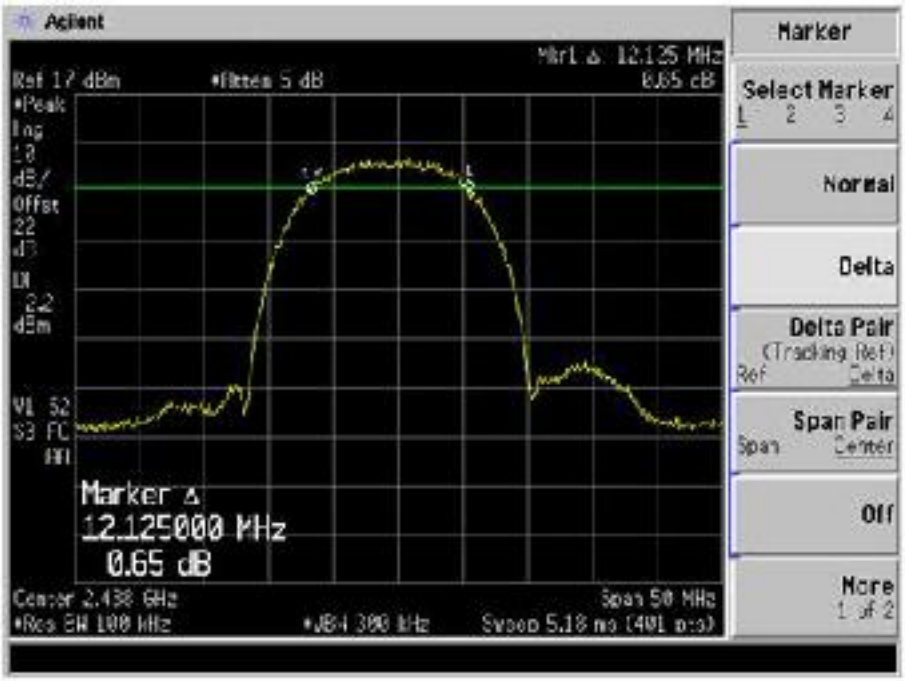


Plot 6 - Channel 6 @ DQPSK 2Mbps

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

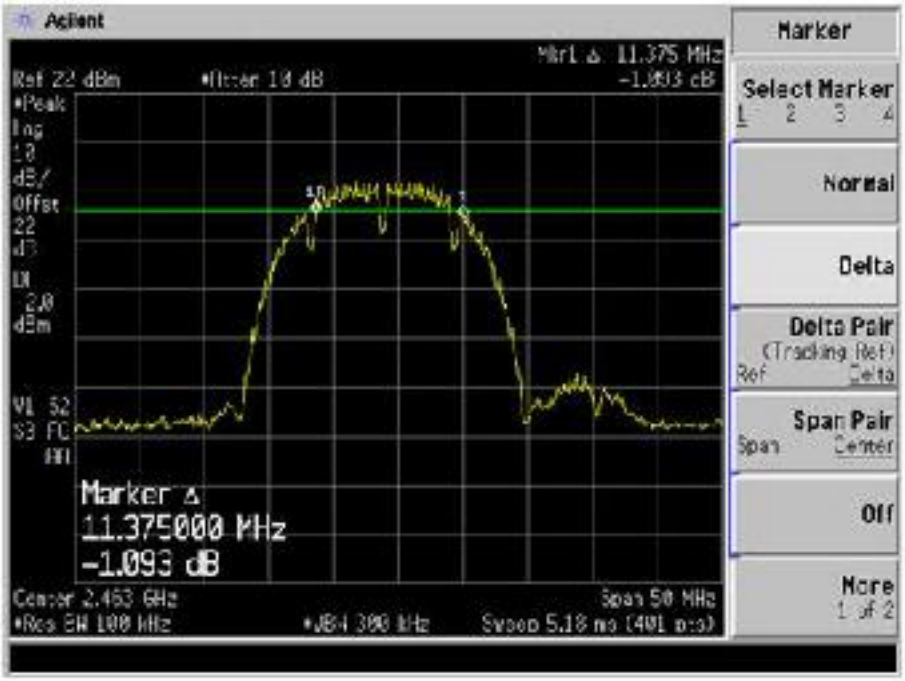


Plot 7 - Channel 6 @ CCK 5.5Mbps

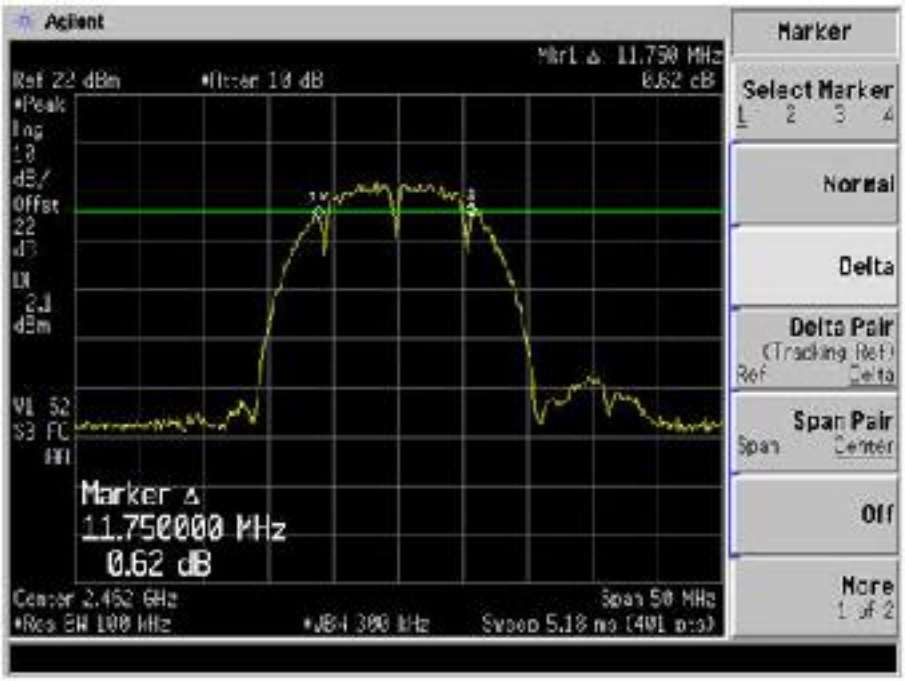


Plot 8 - Channel 6 @ CCK 11Mbps

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

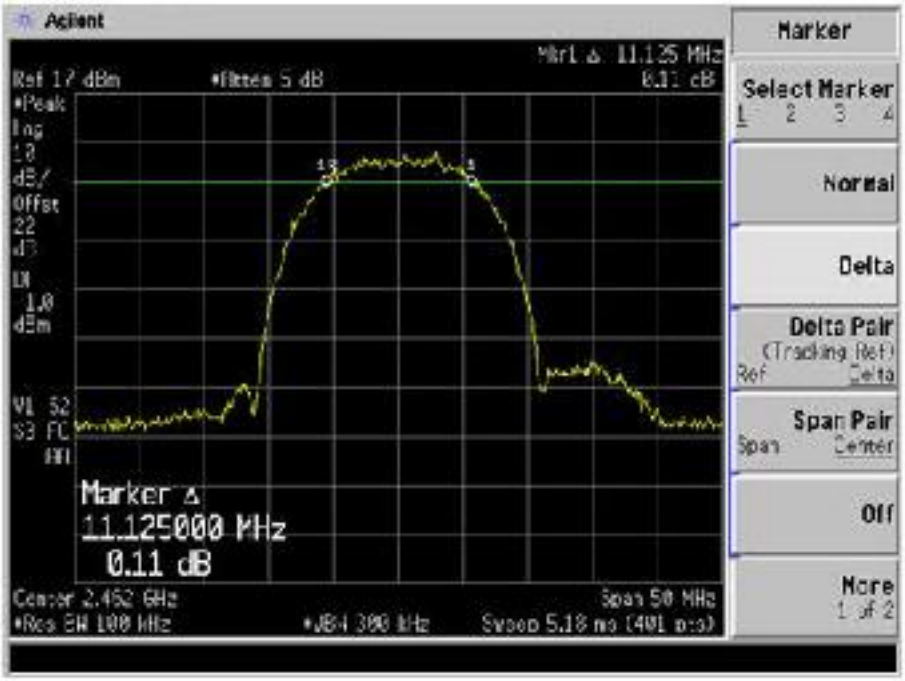


Plot 9 - Channel 11 @ DBPSK 1Mbps

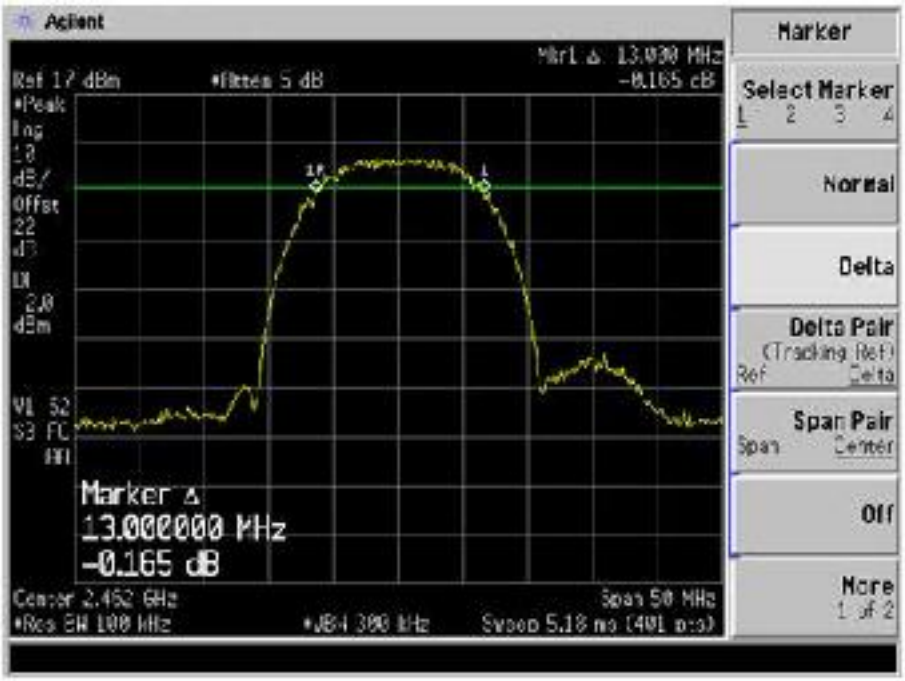


Plot 10 - Channel 11 @ DQPSK 2Mbps

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

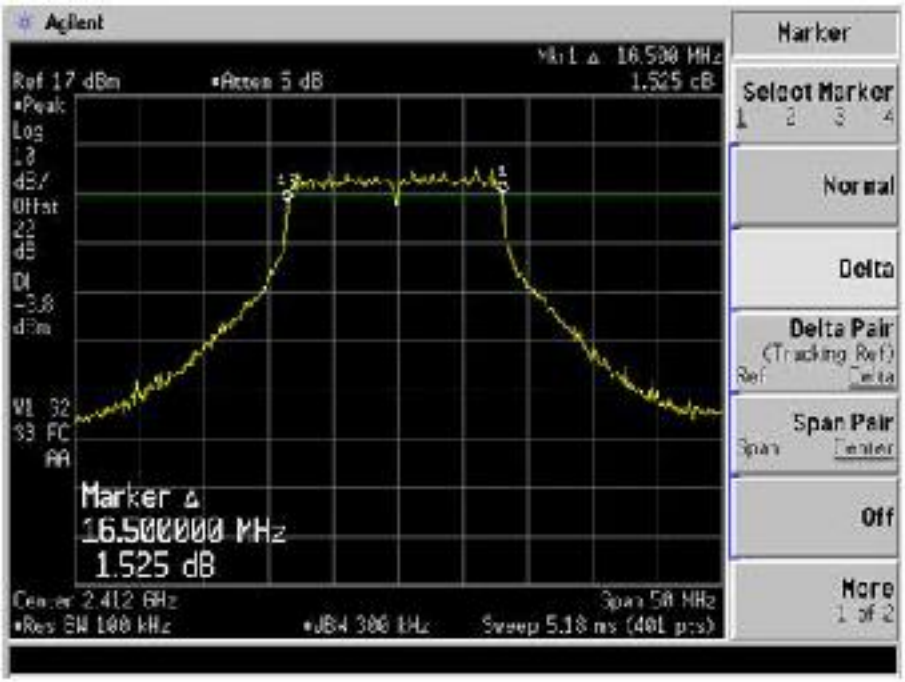


Plot 11 - Channel 11 @ CCK 5.5Mbps

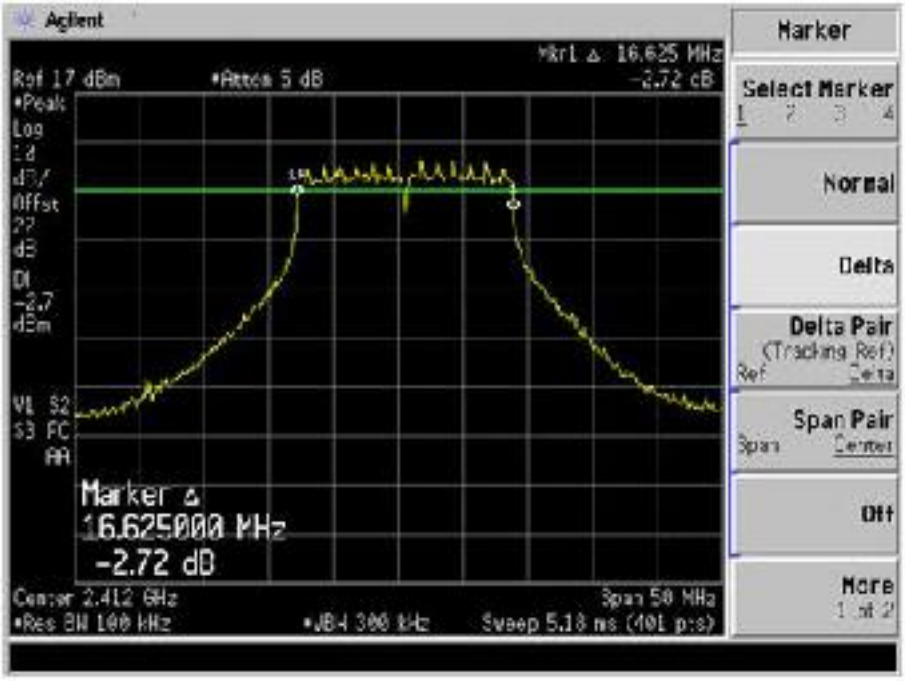


Plot 12 - Channel 11 @ CCK 11Mbps

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

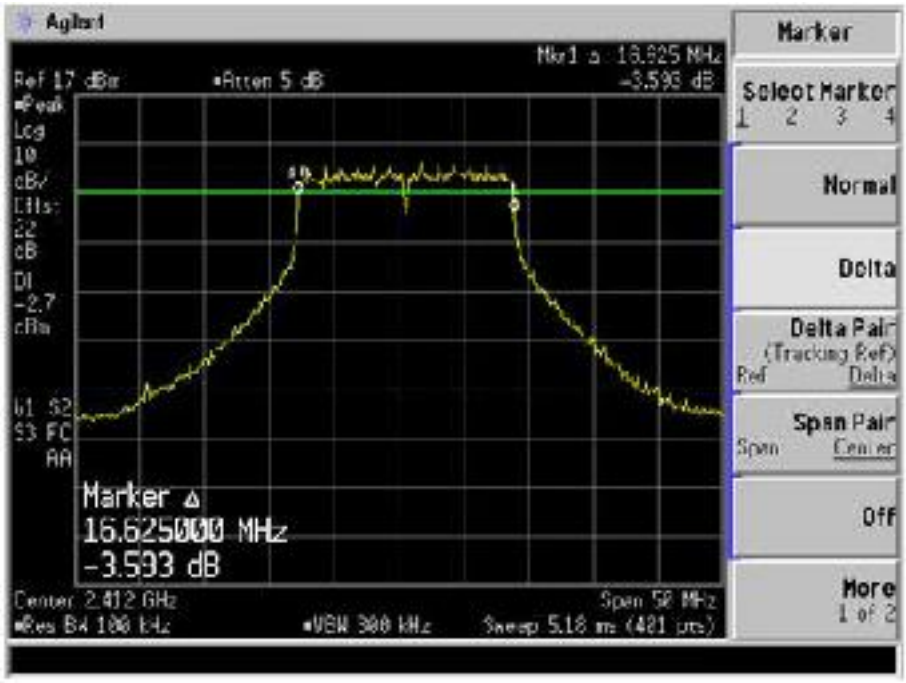


Plot 13 - Channel 1 @ BPSK 9Mbps

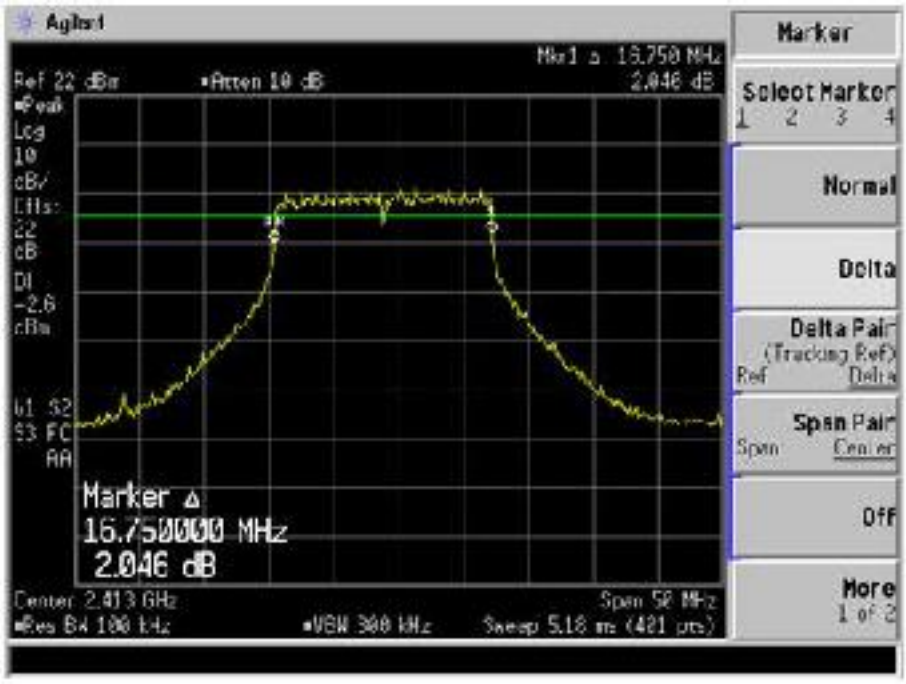


Plot 14 - Channel 1 @ QPSK 18Mbps

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

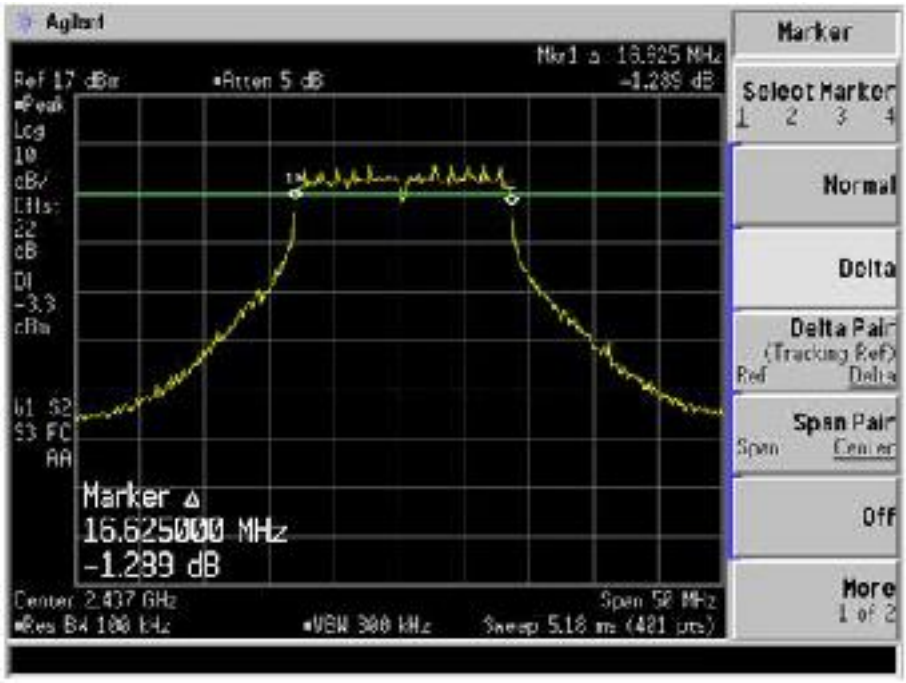


Plot 15 - Channel 1 @ 16QAM 36Mbps

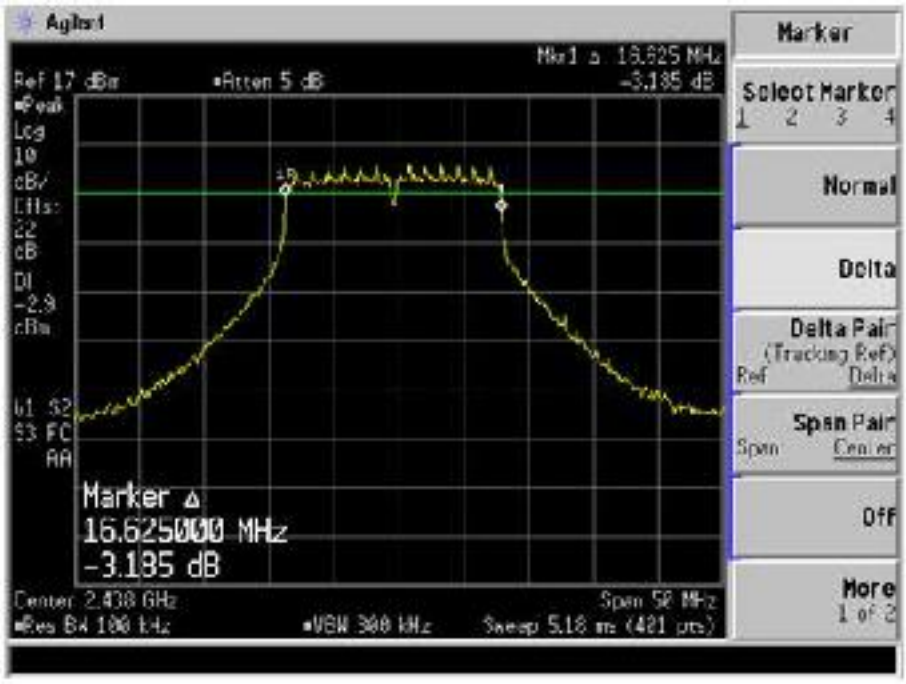


Plot 16 - Channel 1 @ 64QAM 54Mbps

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

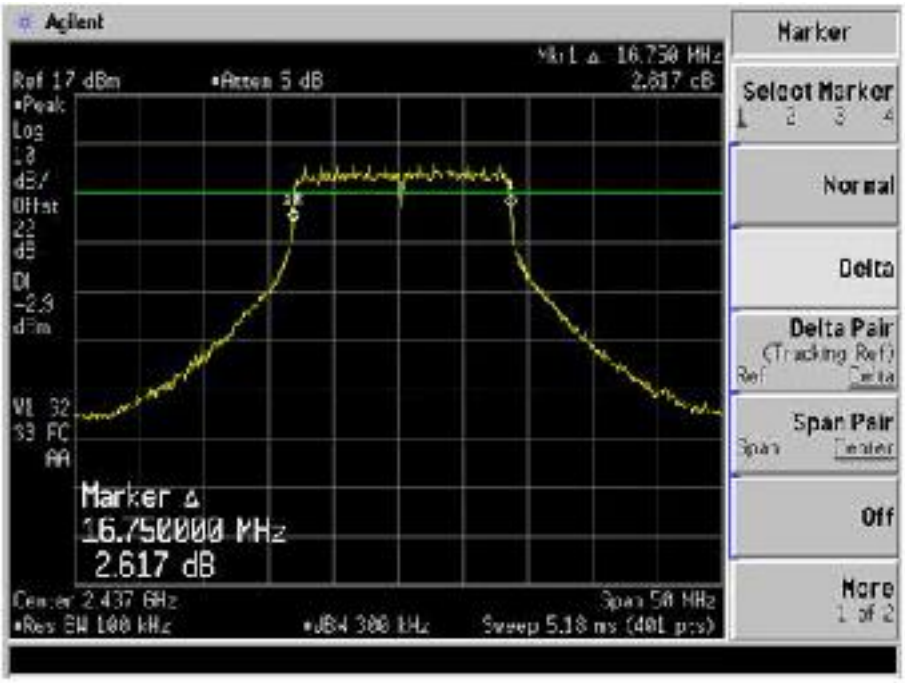


Plot 17 - Channel 6 @ BPSK 9Mbps

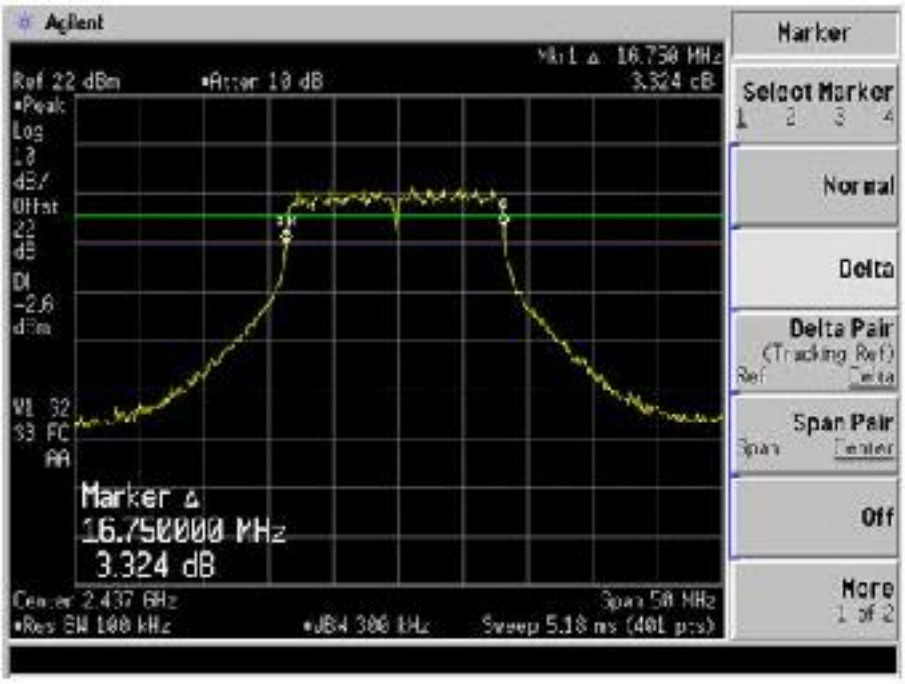


Plot 18 - Channel 6 @ QPSK 18Mbps

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

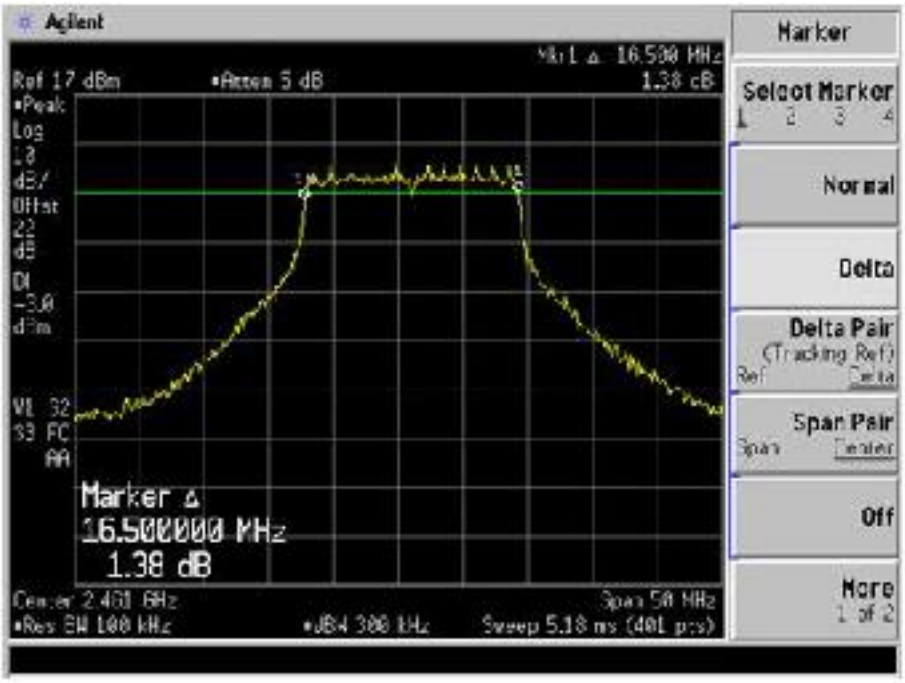


Plot 19 - Channel 6 @ 16QAM 36Mbps

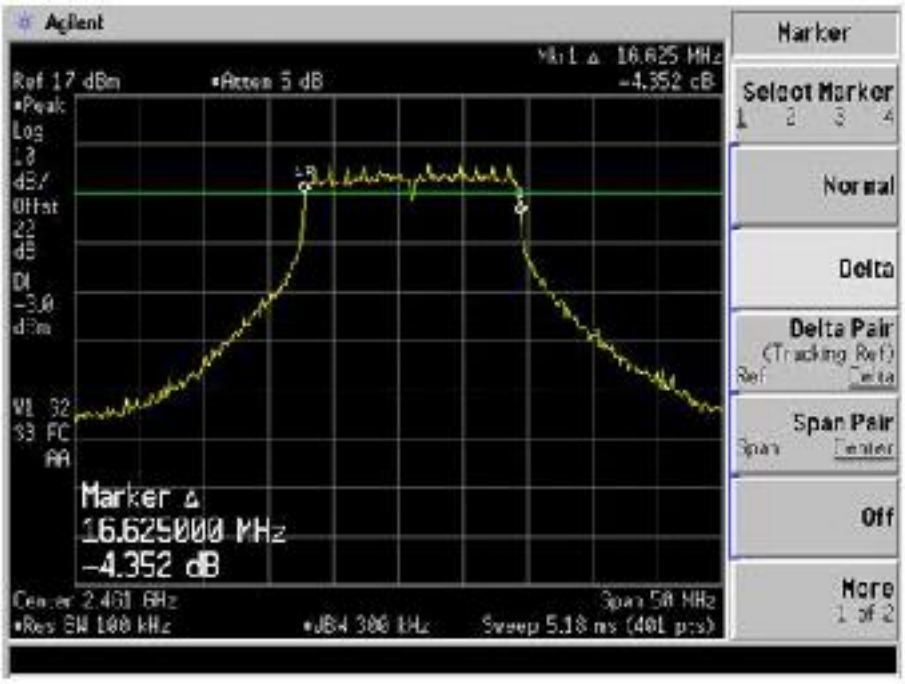


Plot 20 - Channel 6 @ 64QAM 54Mbps

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

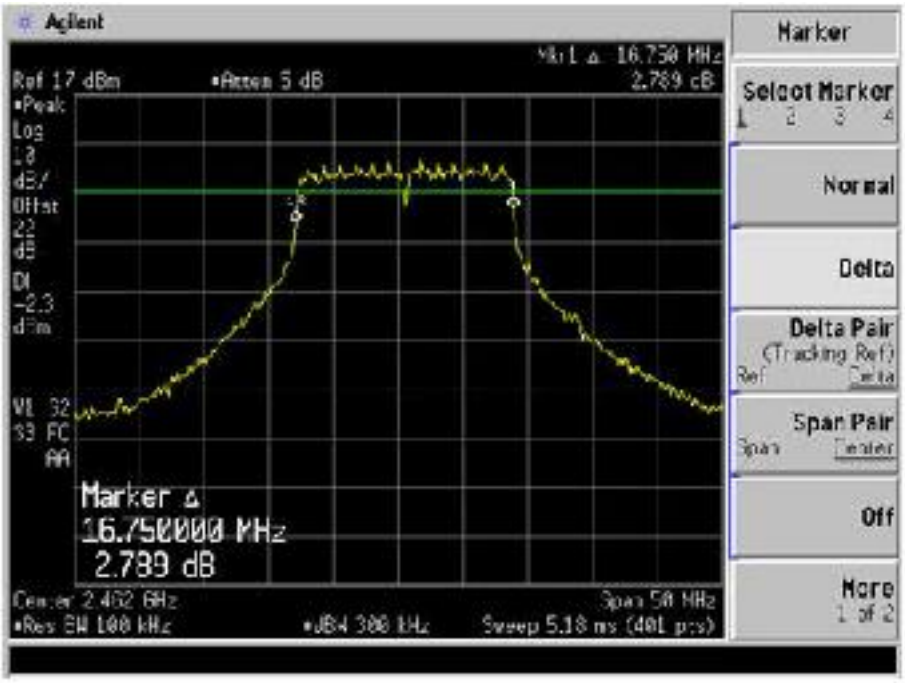


Plot 21 - Channel 11 @ BPSK 9Mbps

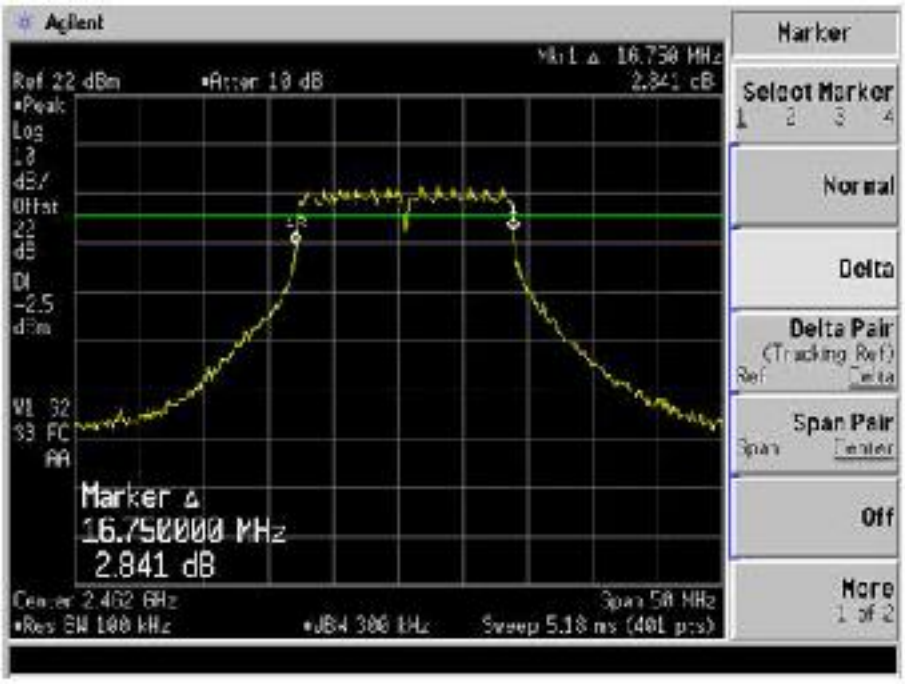


Plot 22 - Channel 11 @ QPSK 18Mbps

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



Plot 23 - Channel 11 @ 16QAM 36Mbps



Plot 24 - Channel 11 @ 64QAM 54Mbps

47 CFR 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).

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

Instrument	Model	S/No	Cal Due Date
Boonton RF Power Meter	4532	72901	25 May 2012
Boonton Power Sensor	56218-S/1	1417	25 May 2012
GW Instek Programmable Power Supply	PSH-3630A	RK200168	30 Jan 2013

47 CFR 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 power meter via a low-loss coaxial cable.
4. All other supporting equipment were powered separately from another filtered mains.

47 CFR 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. The Equivalent Isotropic Radiated Power (EIRP) of the EUT was computed by adding its antenna gain to the measured maximum peak power.
4. Repeat steps 1 to 3 with all possible modulations and data rates.
5. The steps 2 to 4 were repeated with the transmitting frequency was set to Channel 6 (2.437GHz) and Channel 11 (2.462GHz) respectively.

Maximum Peak Power Test Setup

47 CFR FCC Part 15.247(b)(3) Maximum Peak Power Results

Operating Mode	Continuous WIFI transmit	Temperature	24°C
Test Input Power	24Vdc (Worst Voltage)	Relative Humidity	54%
Antenna Gain	0.0 dBi	Atmospheric Pressure	1027mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Maximum EIRP (W)	Limit (W)	802.11b Modulation @ Data Rate
1	2.412	0.0089	0.0089	1.0	DBPSK @ 1Mbps
		0.0093	0.0093	1.0	DQPSK @ 2Mbps
		0.0089	0.0089	1.0	CCK @ 5.5Mbps
		0.0091	0.0091	1.0	CCK @ 11Mbps
6	2.437	0.0083	0.0083	1.0	DBPSK @ 1Mbps
		0.0085	0.0085	1.0	DQPSK @ 2Mbps
		0.0083	0.0083	1.0	CCK @ 5.5Mbps
		0.0085	0.0085	1.0	CCK @ 11Mbps
11	2.462	0.0066	0.0066	1.0	DBPSK @ 1Mbps
		0.0068	0.0068	1.0	DQPSK @ 2Mbps
		0.0068	0.0068	1.0	CCK @ 5.5Mbps
		0.0076	0.0076	1.0	CCK @ 11Mbps

Channel	Channel Frequency (GHz)	Maximum Peak Power (W)	Maximum EIRP (W)	Limit (W)	802.11g Modulation @ Data Rate
1	2.412	0.0468	0.0468	1.0	BPSK @ 9Mbps
		0.0316	0.0316	1.0	QPSK @ 18Mbps
		0.0437	0.0437	1.0	16QAM @ 36Mbps
		0.0437	0.0437	1.0	64QAM @ 54Mbps
6	2.437	0.0437	0.0437	1.0	BPSK @ 9Mbps
		0.0302	0.0302	1.0	QPSK @ 18Mbps
		0.0380	0.0380	1.0	16QAM @ 36Mbps
		0.0427	0.0427	1.0	64QAM @ 54Mbps
11	2.462	0.0324	0.0324	1.0	BPSK @ 9Mbps
		0.0224	0.0224	1.0	QPSK @ 18Mbps
		0.0302	0.0302	1.0	16QAM @ 36Mbps
		0.0316	0.0316	1.0	64QAM @ 54Mbps

47 CFR 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.

47 CFR FCC Part 15.247(d) RF Conducted Spurious Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	25 May 2012
GW Instek Programmable Power Supply	PSH-3630A	RK200168	30 Jan 2013

47 CFR 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.

47 CFR 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.

RF Conducted Spurious Emissions Test Setup

47 CFR FCC Part 15.247(d) RF Conducted Spurious Emissions Results

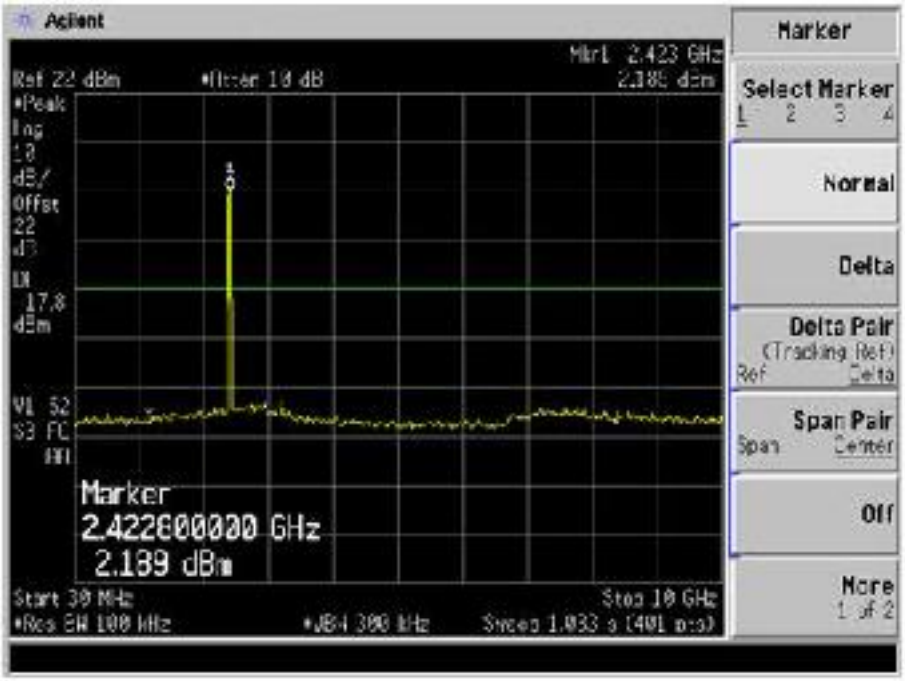
Operating Mode	Continuous WIFI transmit	Temperature	24°C
Test Input Power	24Vdc (Worst Voltage)	Relative Humidity	54%
Attached Plots	25 – 48 (802.11b)	Atmospheric Pressure	1027mbar
		Tested By	Kyaw Soe Hein

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

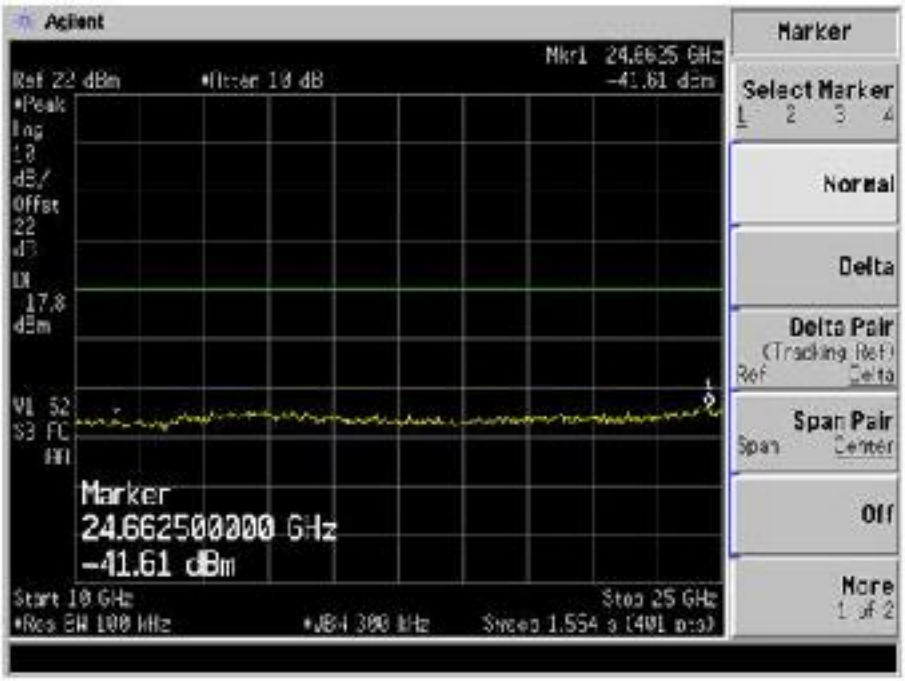
Operating Mode	Continuous WIFI transmit	Temperature	24°C
Test Input Power	24Vdc (Worst Voltage)	Relative Humidity	54%
Attached Plots	49 – 72 (802.11g)	Atmospheric Pressure	1027mbar
		Tested By	Kyaw Soe Hein

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

RF Conducted Spurious Emissions Plots – 802.11b

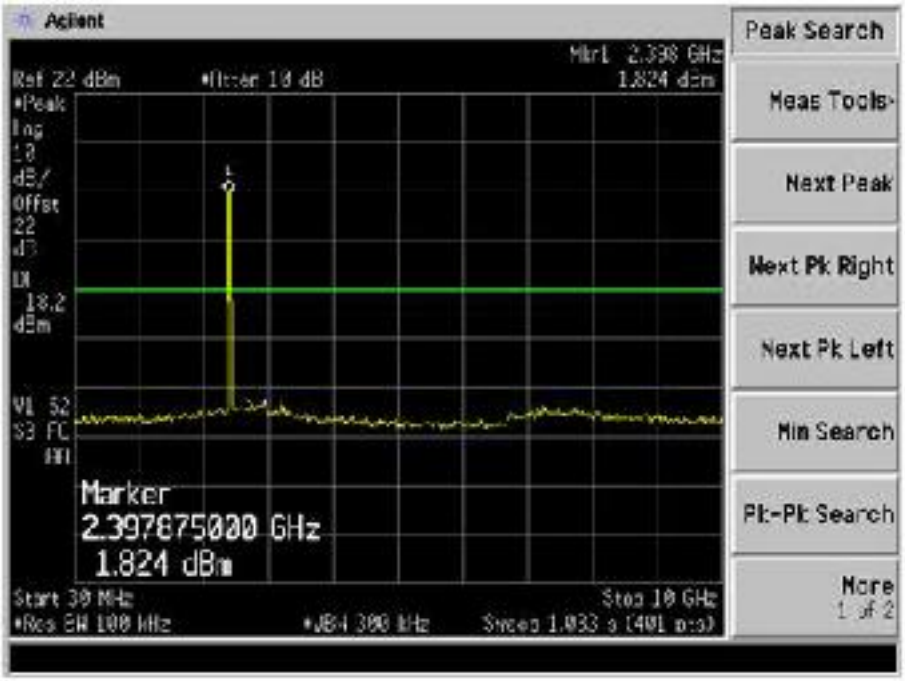


Plot 25 – Channel 1 @ DBPSK 1Mbps

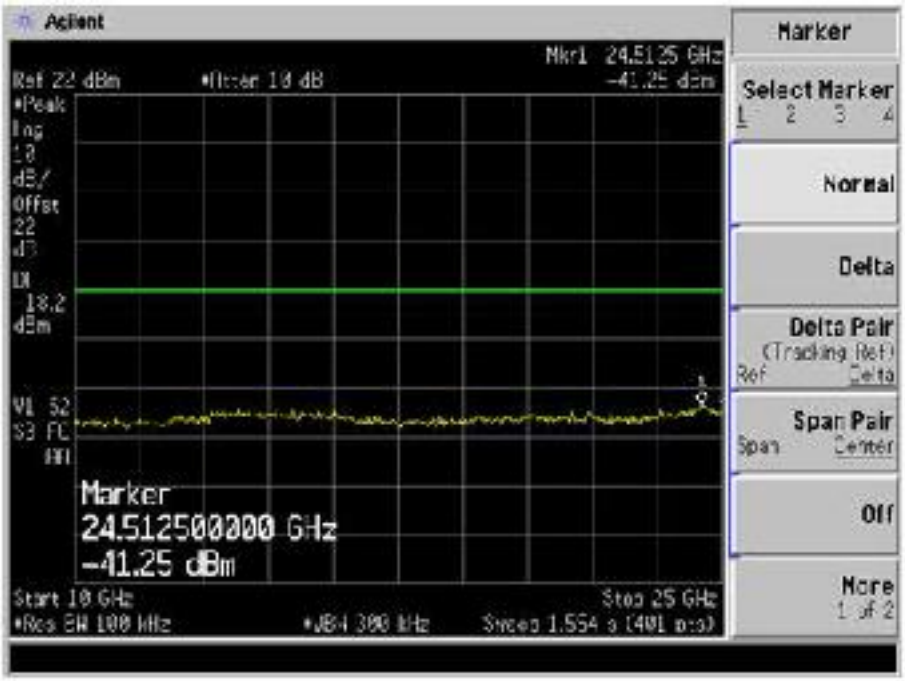


Plot 26 – Channel 1 @ DBPSK 1Mbps

RF Conducted Spurious Emissions Plots – 802.11b

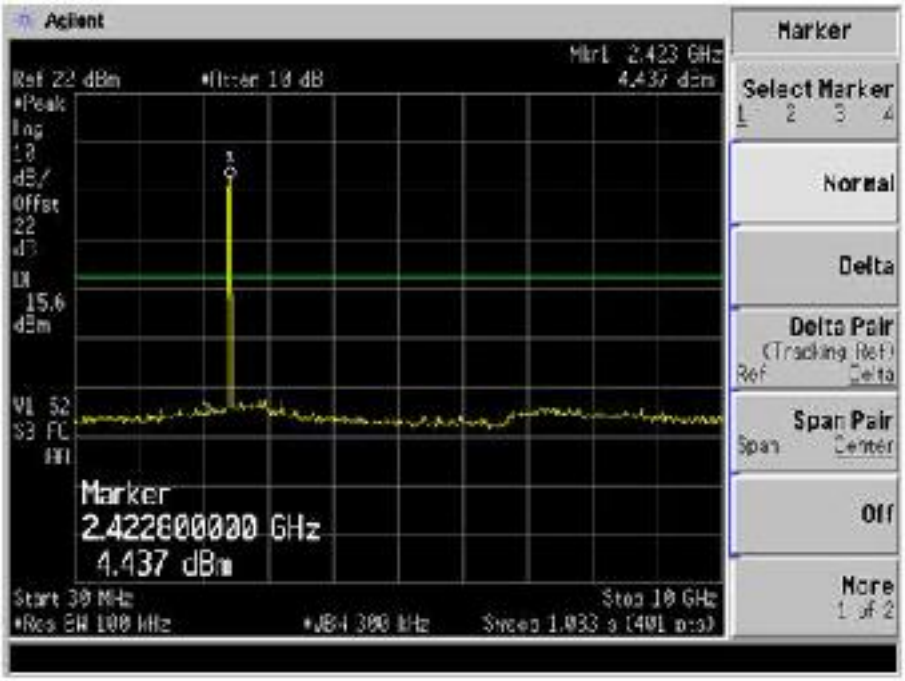


Plot 27 – Channel 1 @ DQPSK 2Mbps

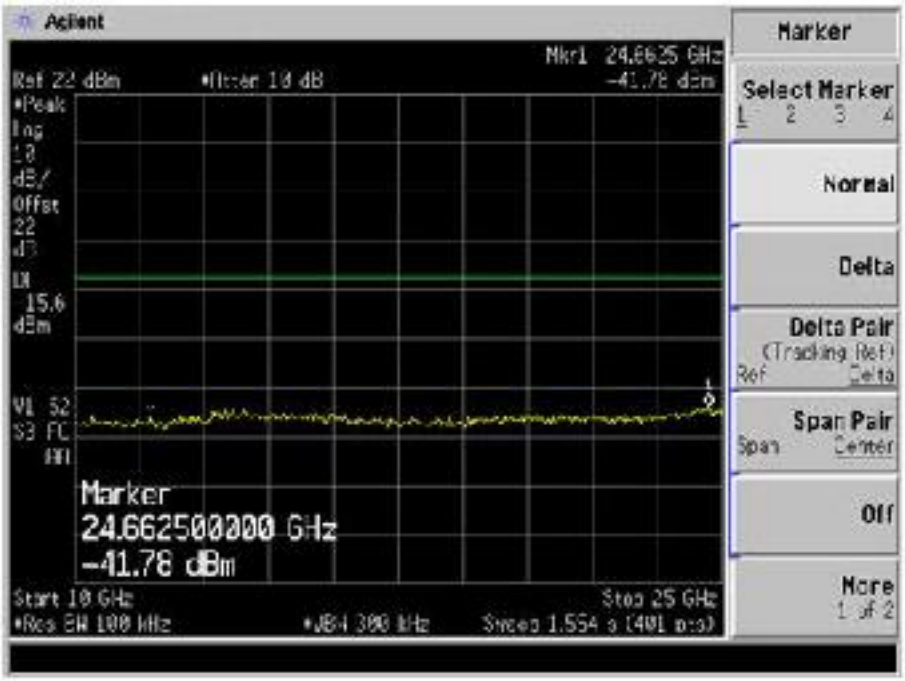


Plot 28 – Channel 1 @ DQPSK 2Mbps

RF Conducted Spurious Emissions Plots – 802.11b

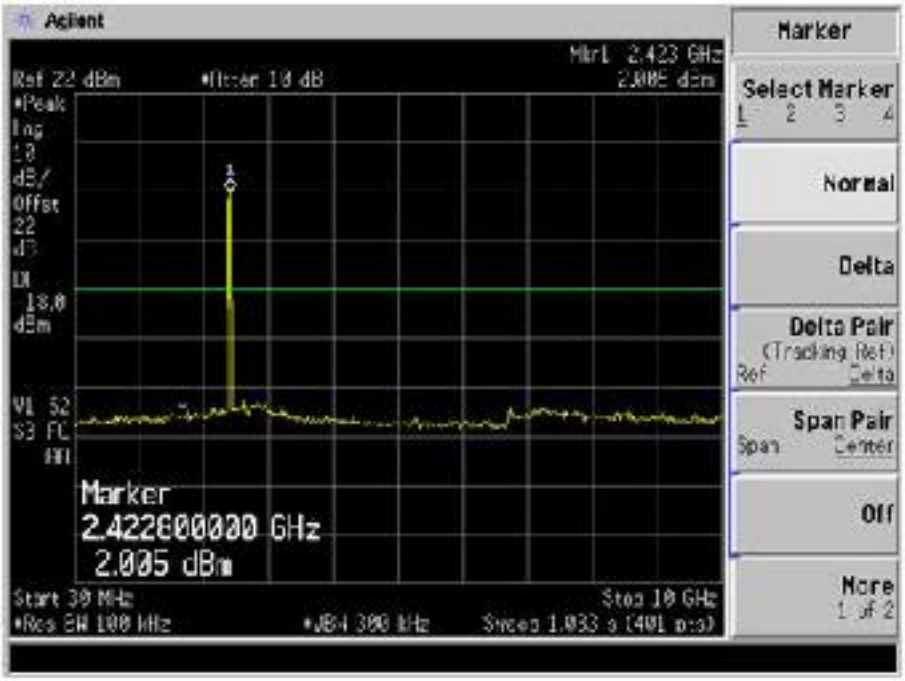


Plot 29 – Channel 1 @ CCK 5.5Mbps

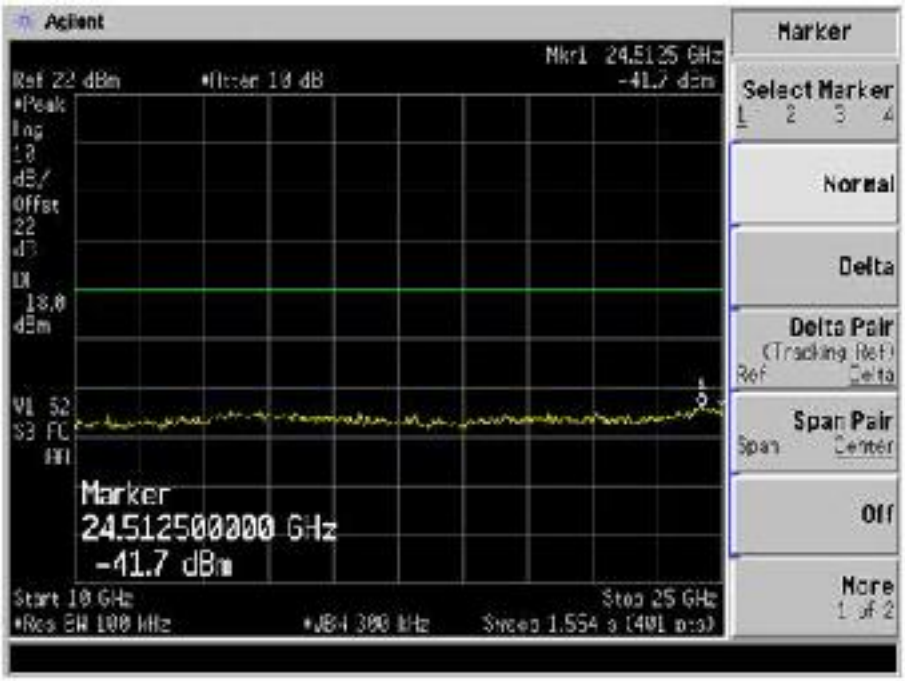


Plot 30 – Channel 1 @ CCK 5.5Mbps

RF Conducted Spurious Emissions Plots – 802.11b

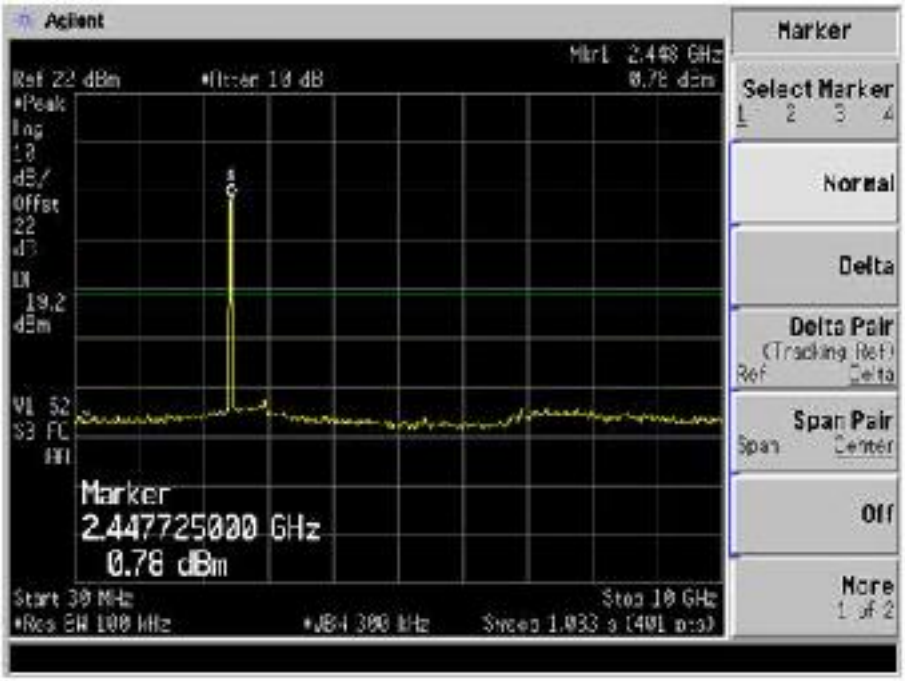


Plot 31 – Channel 1 @ CCK 11Mbps

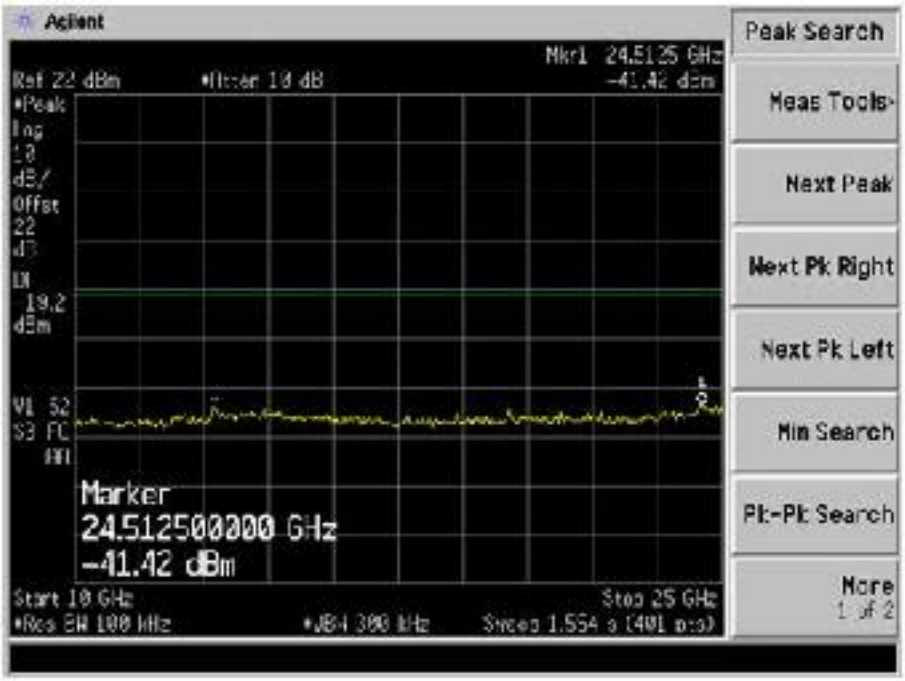


Plot 32 – Channel 1 @ CCK 11Mbps

RF Conducted Spurious Emissions Plots – 802.11b

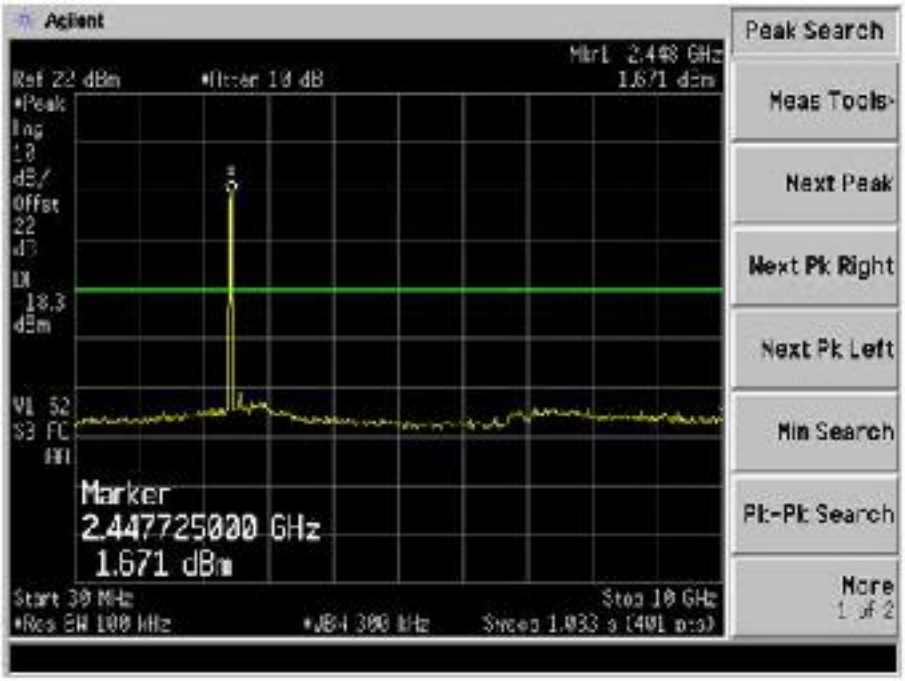


Plot 33 – Channel 6 @ DBPSK 1Mbps

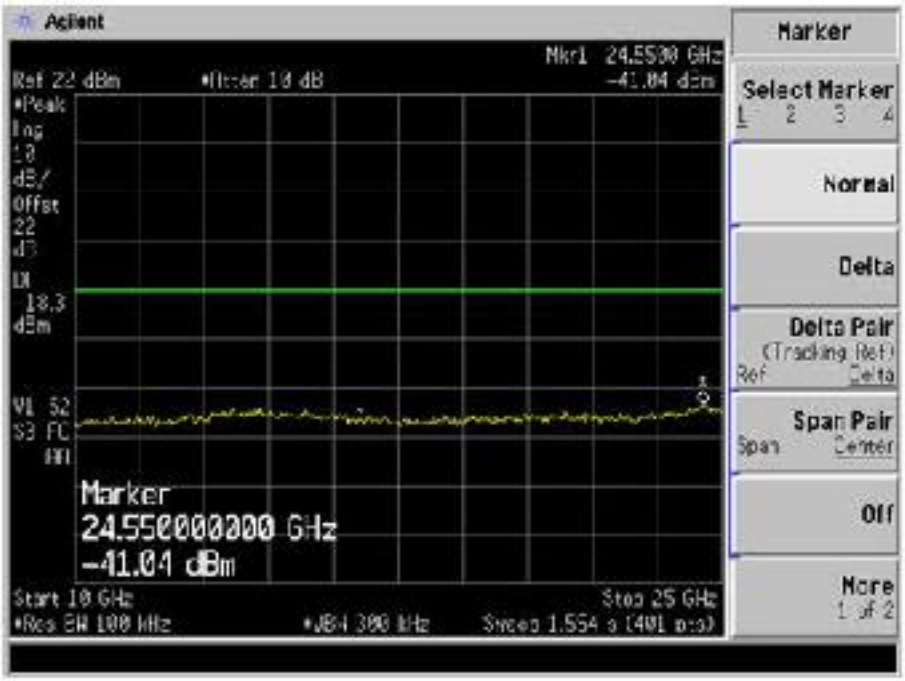


Plot 34 – Channel 6 @ DBPSK 1Mbps

RF Conducted Spurious Emissions Plots – 802.11b

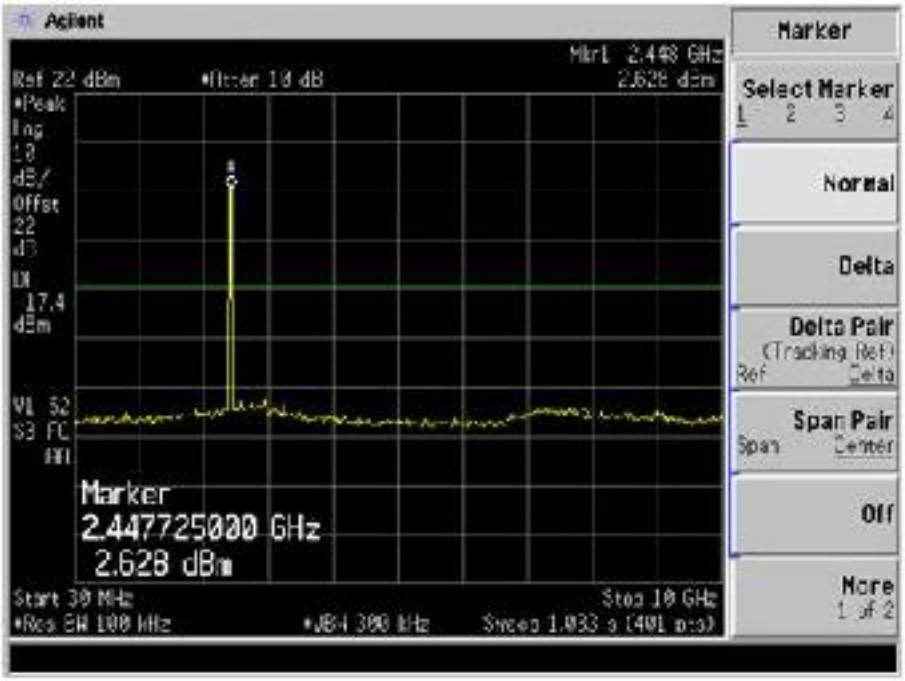


Plot 35 – Channel 6 @ DQPSK 2Mbps

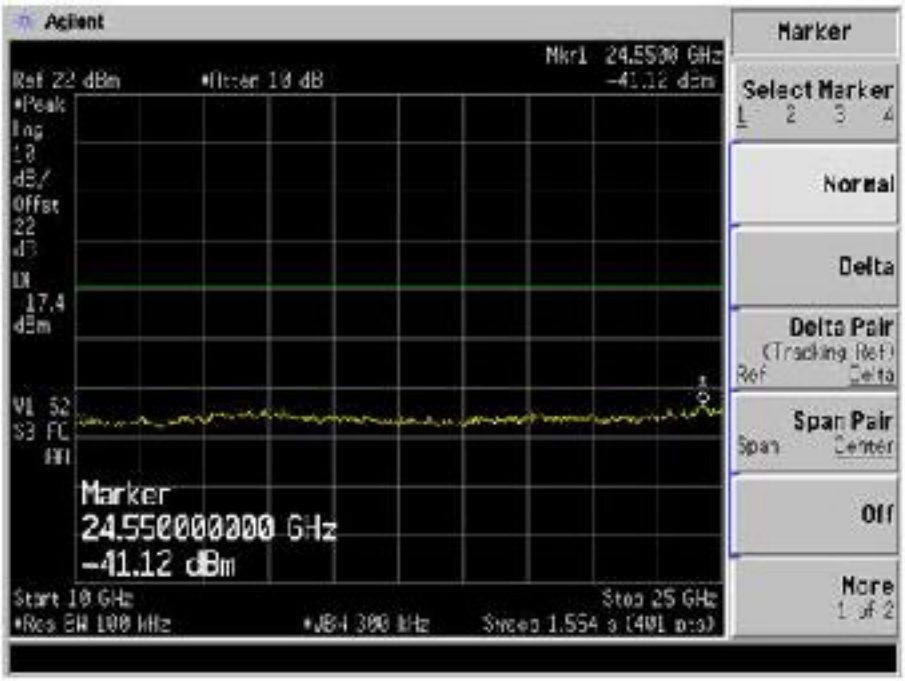


Plot 36 – Channel 6 @ DQPSK 2Mbps

RF Conducted Spurious Emissions Plots – 802.11b

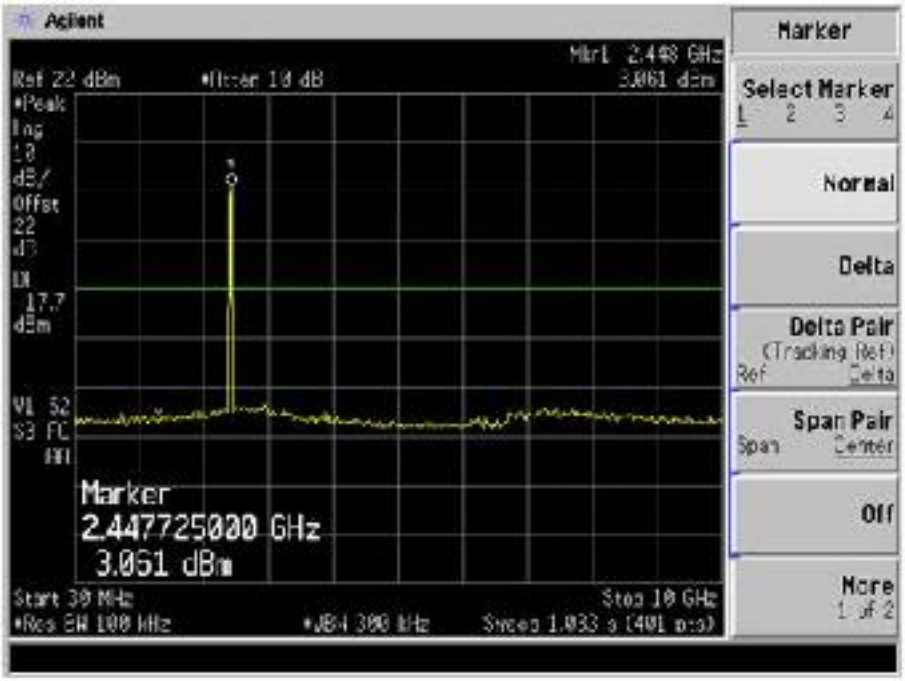


Plot 37 – Channel 6 @ CCK 5.5Mbps

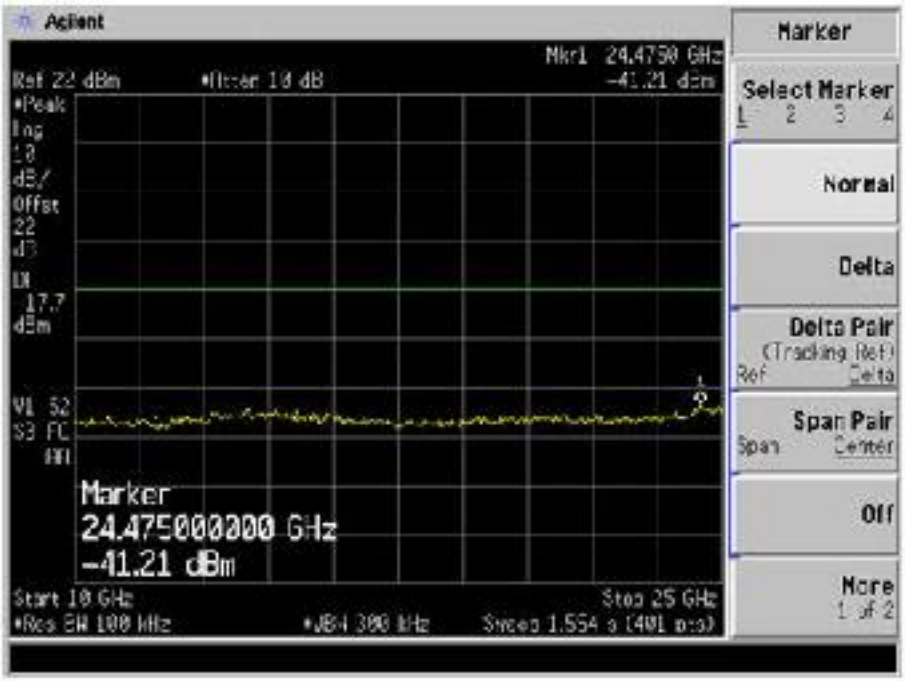


Plot 38 – Channel 6 @ CCK 5.5Mbps

RF Conducted Spurious Emissions Plots – 802.11b

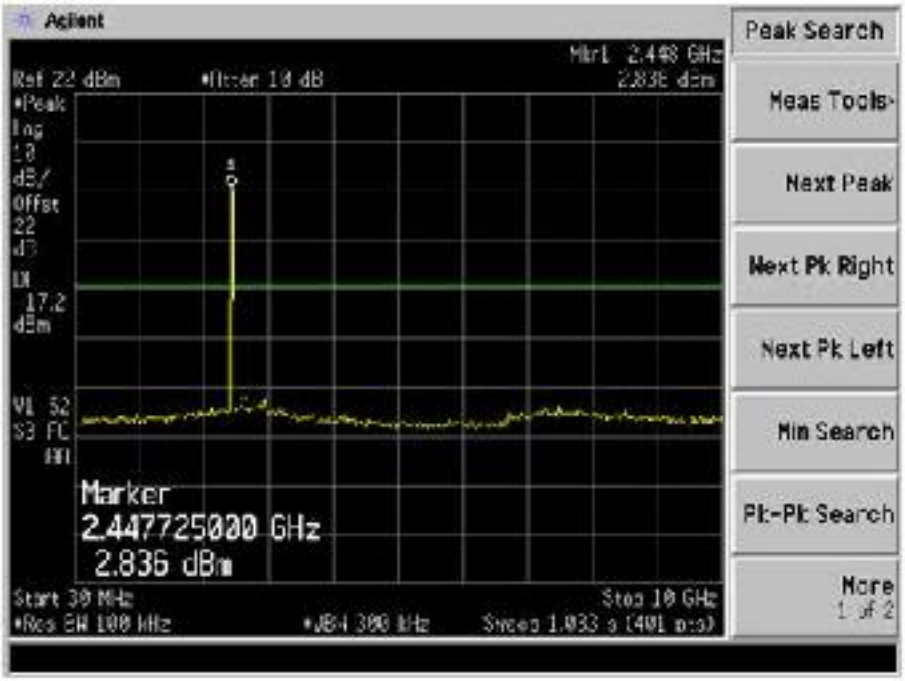


Plot 39 – Channel 6 @ CCK 11Mbps

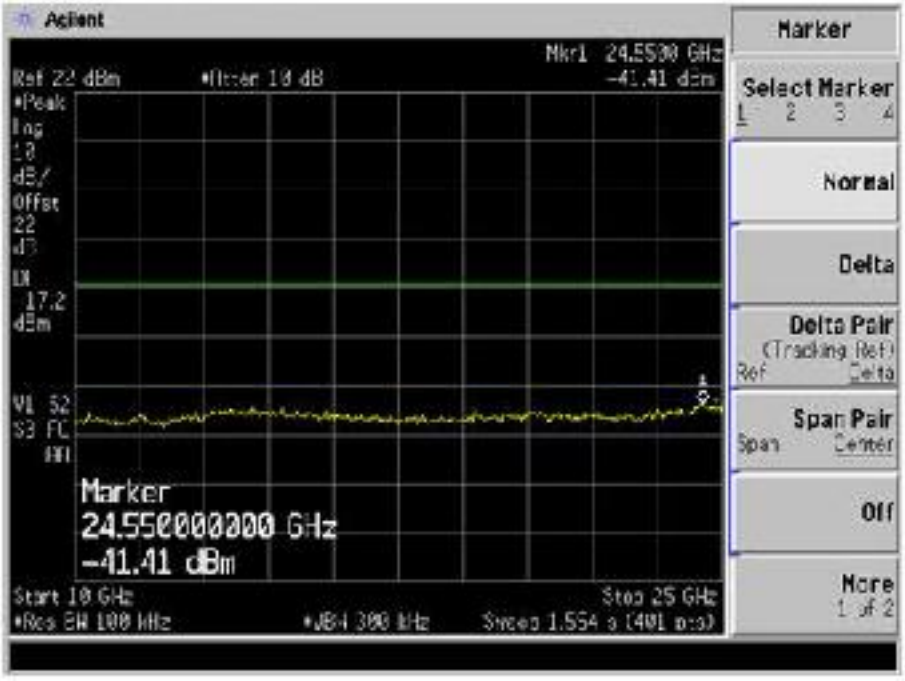


Plot 40 – Channel 6 @ CCK 11Mbps

RF Conducted Spurious Emissions Plots – 802.11b

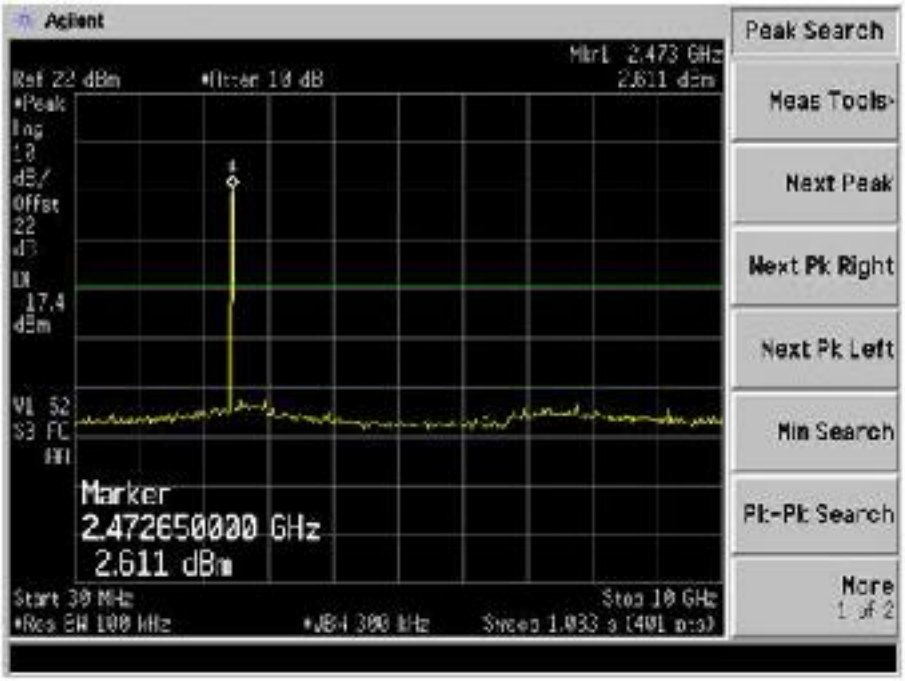


Plot 41 – Channel 11 @ DBPSK 1Mbps

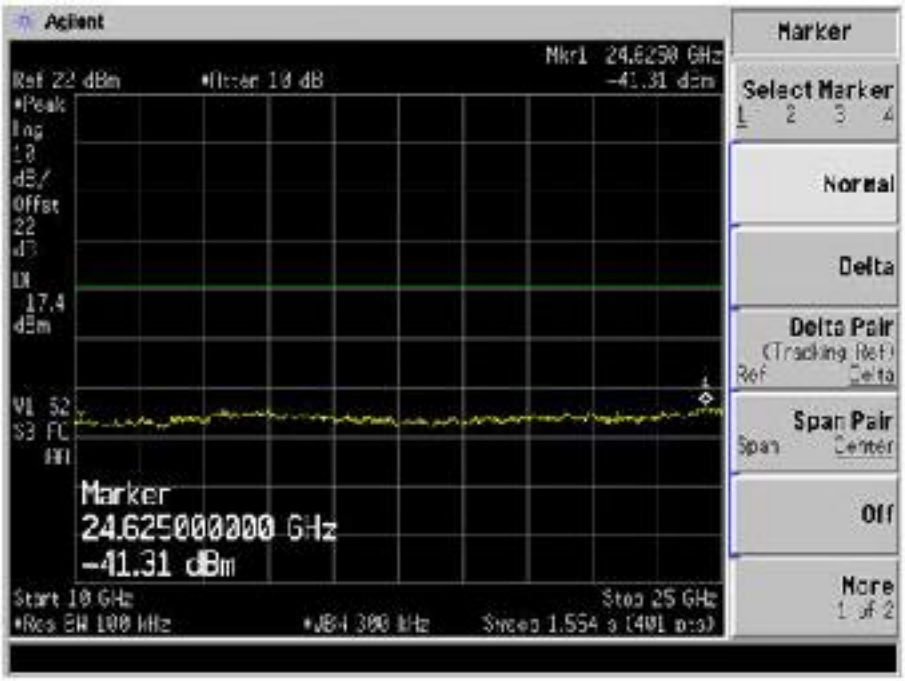


Plot 42 – Channel 11 @ DBPSK 1Mbps

RF Conducted Spurious Emissions Plots – 802.11b

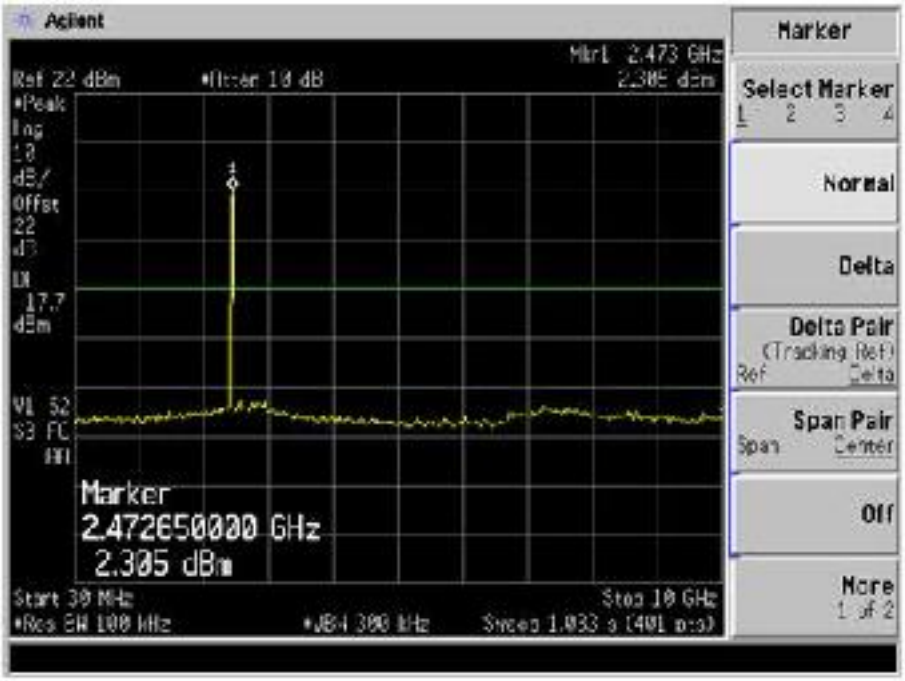


Plot 43 – Channel 11 @ DQPSK 2Mbps

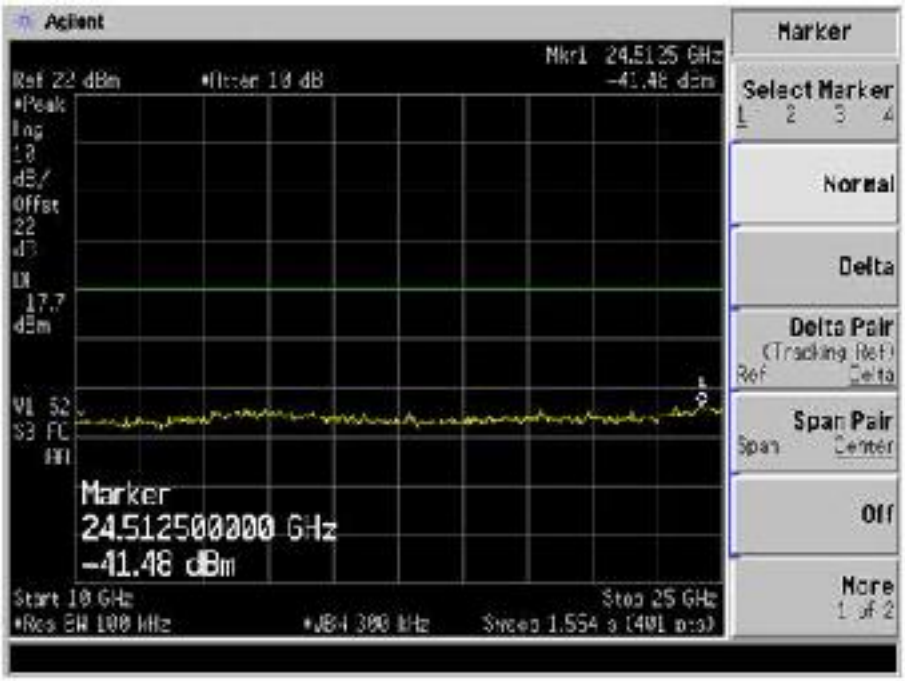


Plot 44 – Channel 11 @ DQPSK 2Mbps

RF Conducted Spurious Emissions Plots – 802.11b

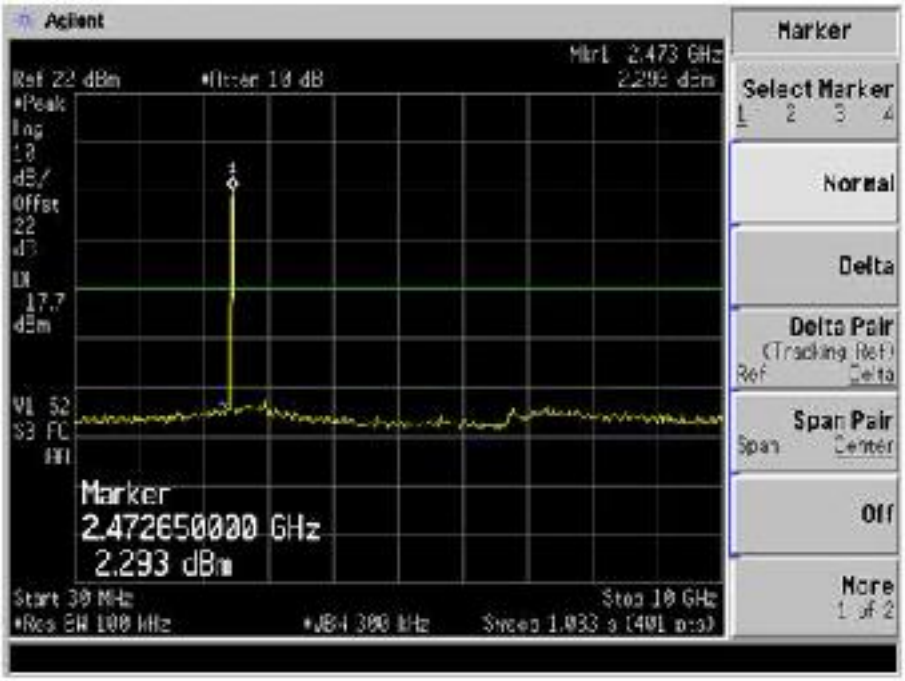


Plot 45 – Channel 11 @ CCK 5.5Mbps

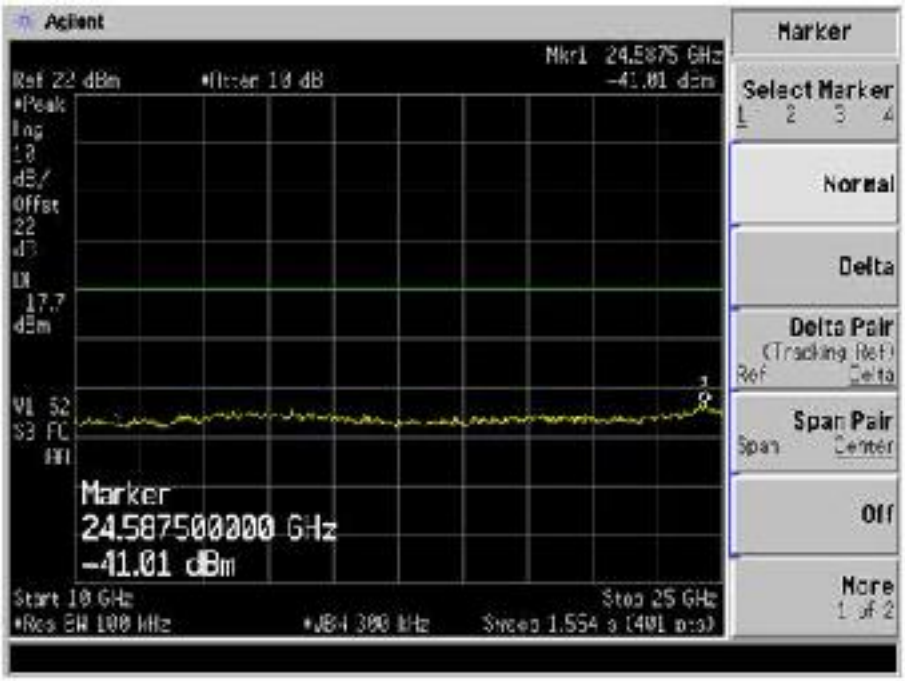


Plot 46 – Channel 11 @ CCK 5.5Mbps

RF Conducted Spurious Emissions Plots – 802.11b

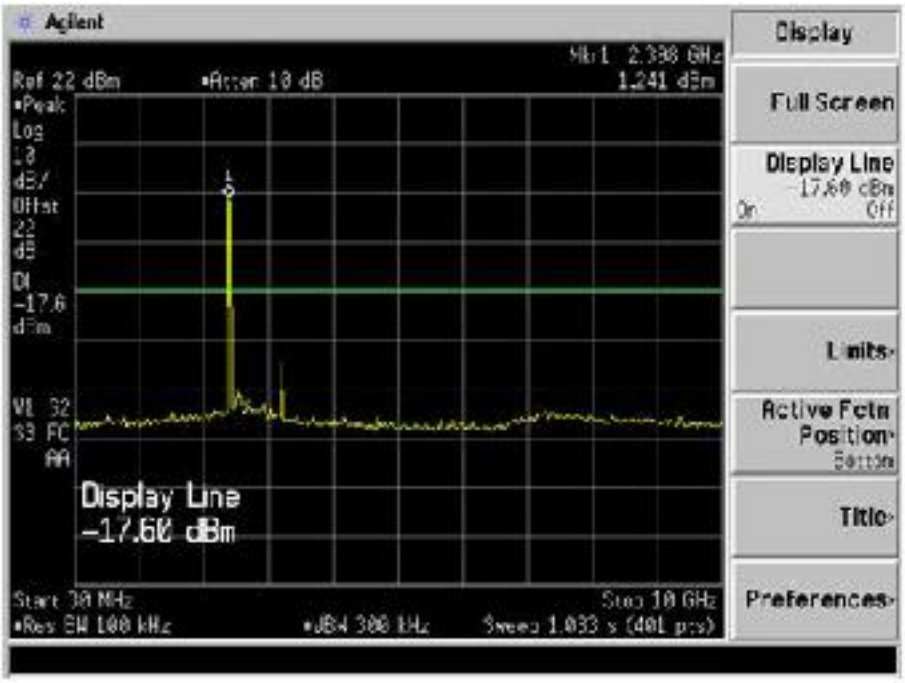


Plot 47 – Channel 11 @ CCK 11Mbps

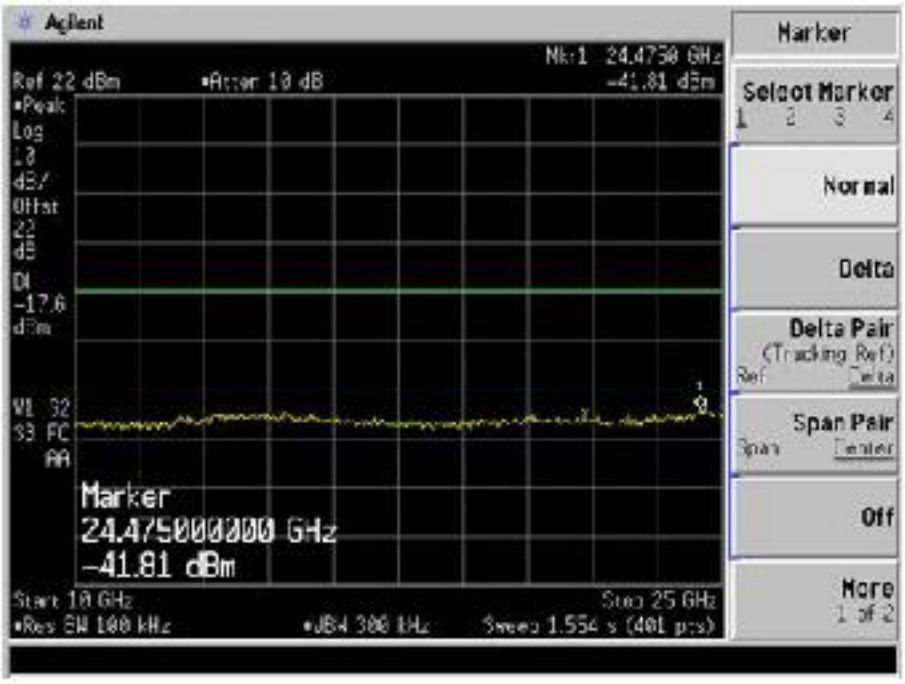


Plot 48 – Channel 11 @ CCK 11Mbps

RF Conducted Spurious Emissions Plots – 802.11g

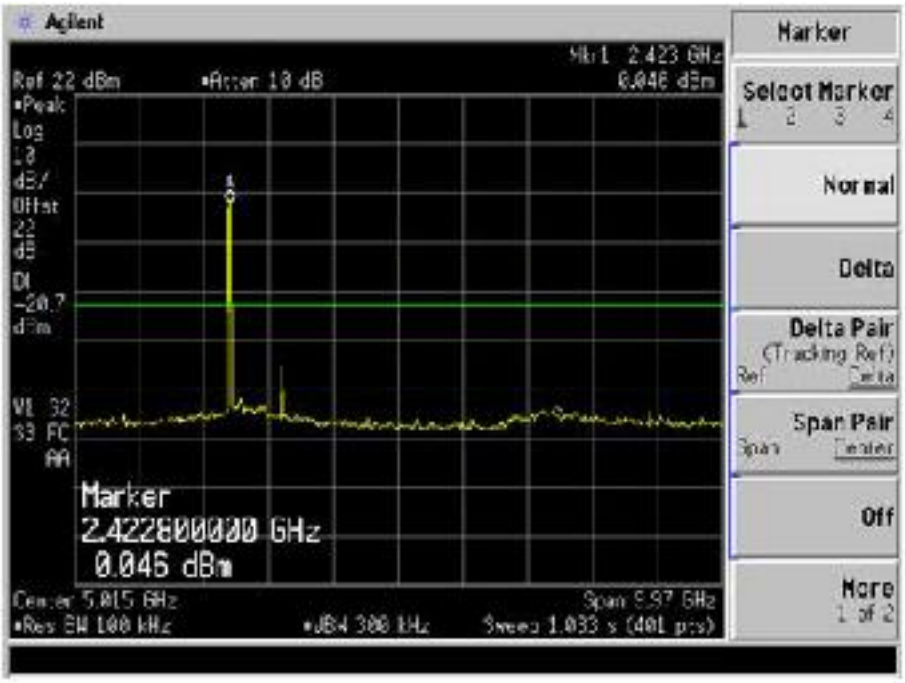


Plot 49 – Channel 1 @ BPSK 9Mbps

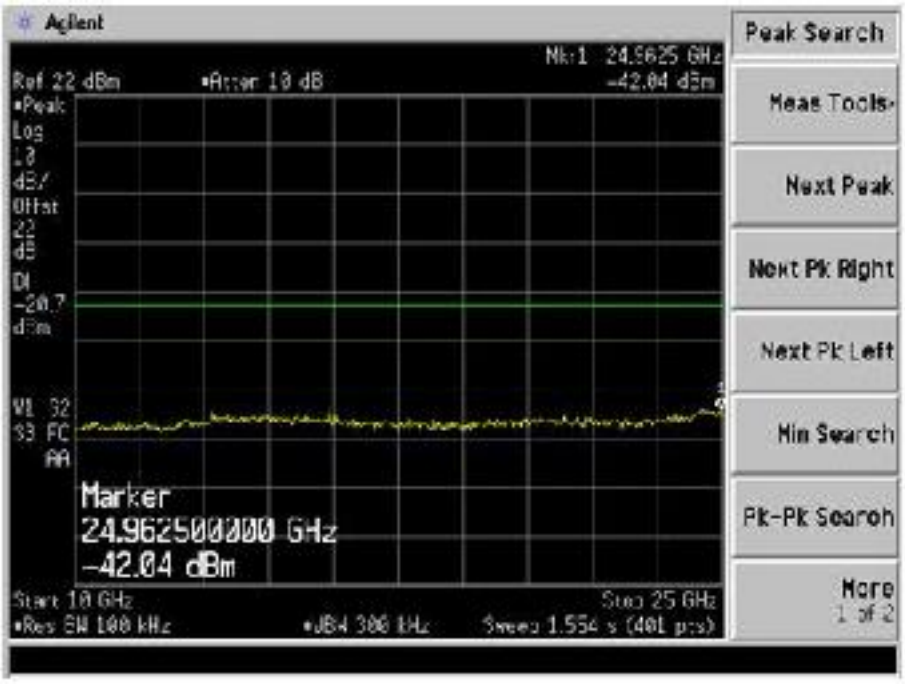


Plot 50 – Channel 1 @ BPSK 9Mbps

RF Conducted Spurious Emissions Plots – 802.11g

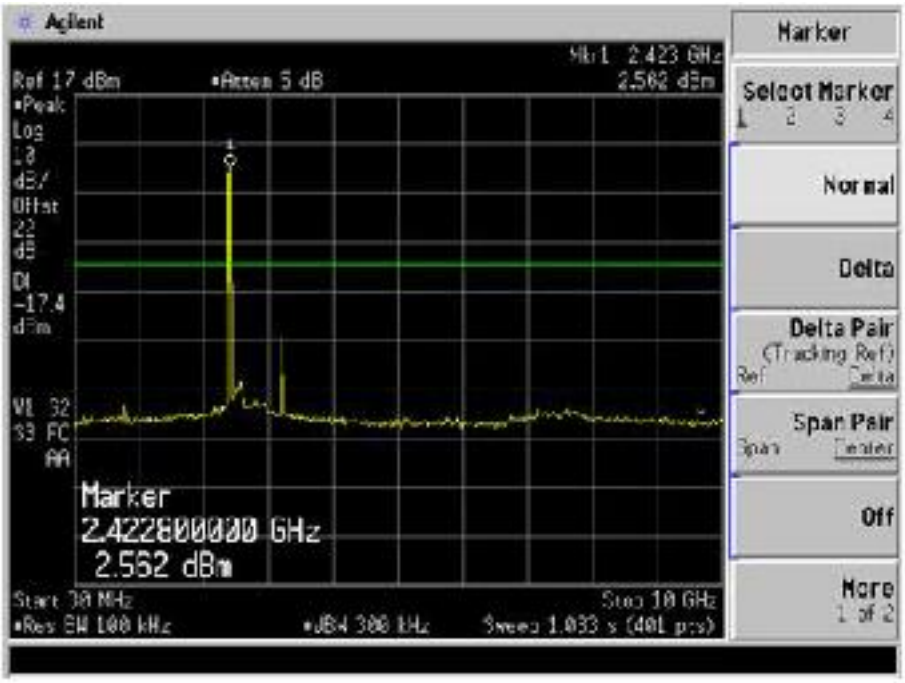


Plot 51 – Channel 1 @ QPSK 18Mbps

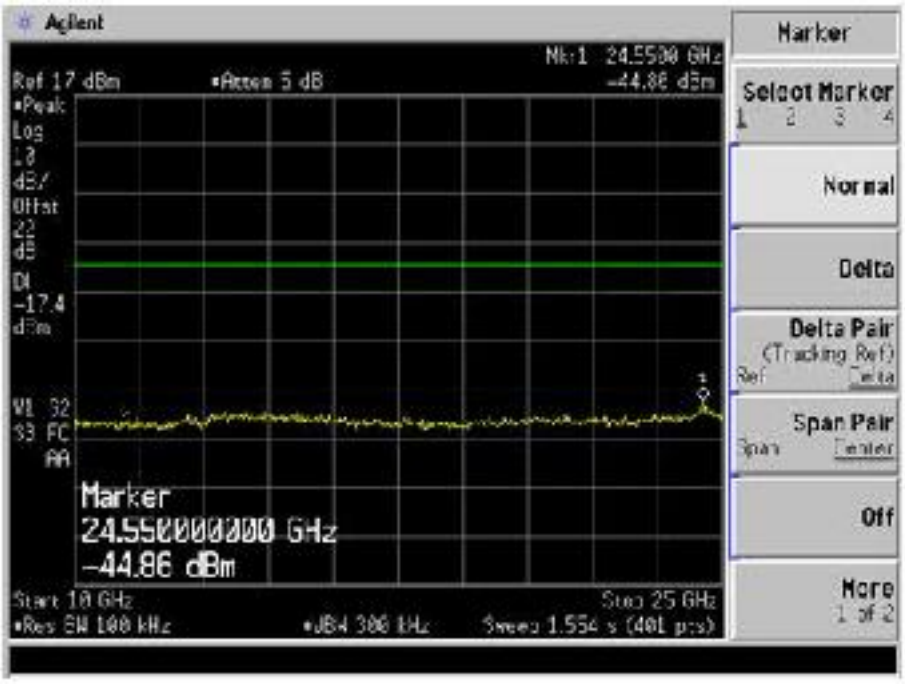


Plot 52 – Channel 1 @ QPSK 18Mbps

RF Conducted Spurious Emissions Plots – 802.11g

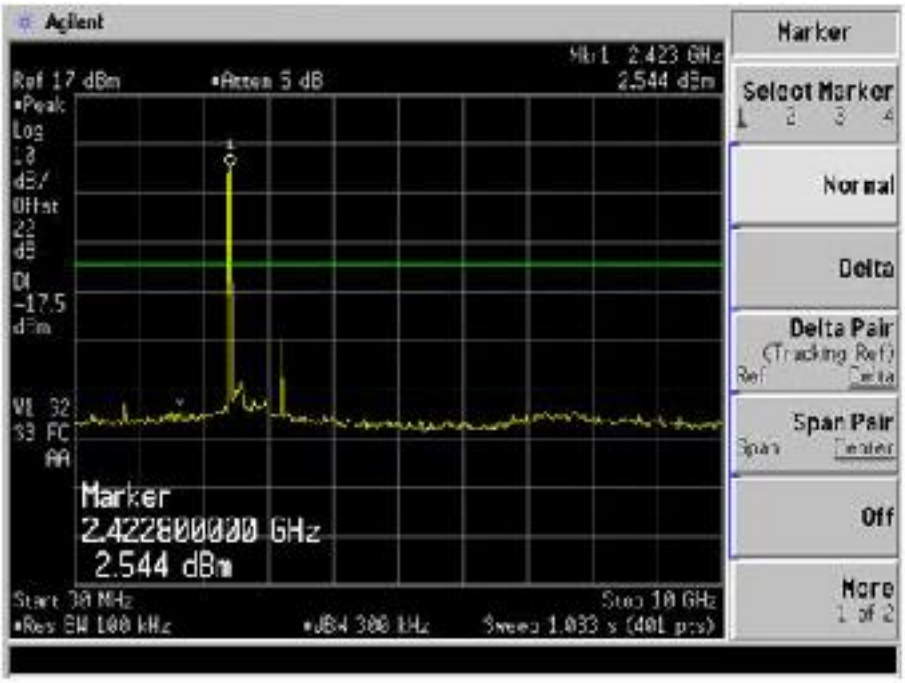


Plot 53 – Channel 1 @ 16QAM 36Mbps

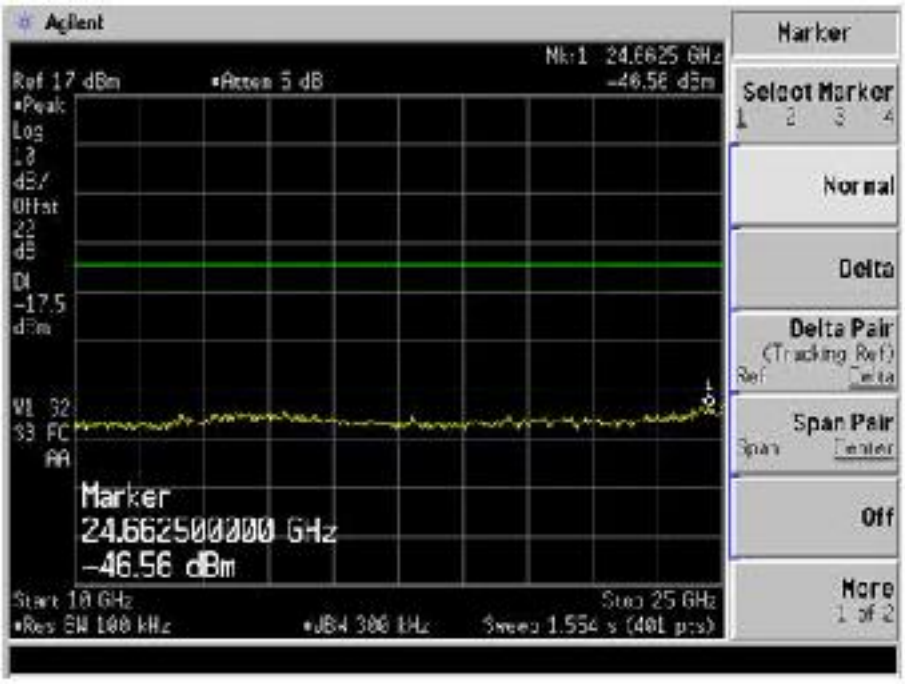


Plot 54 – Channel 1 @ 16QAM 36Mbps

RF Conducted Spurious Emissions Plots – 802.11g

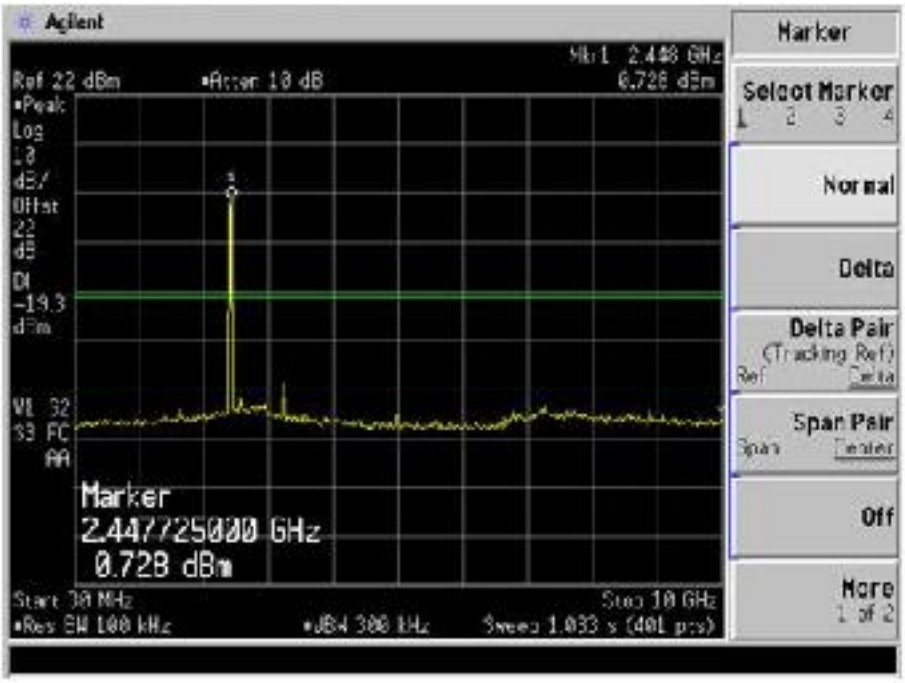


Plot 55 – Channel 1 @ 64QAM 54Mbps

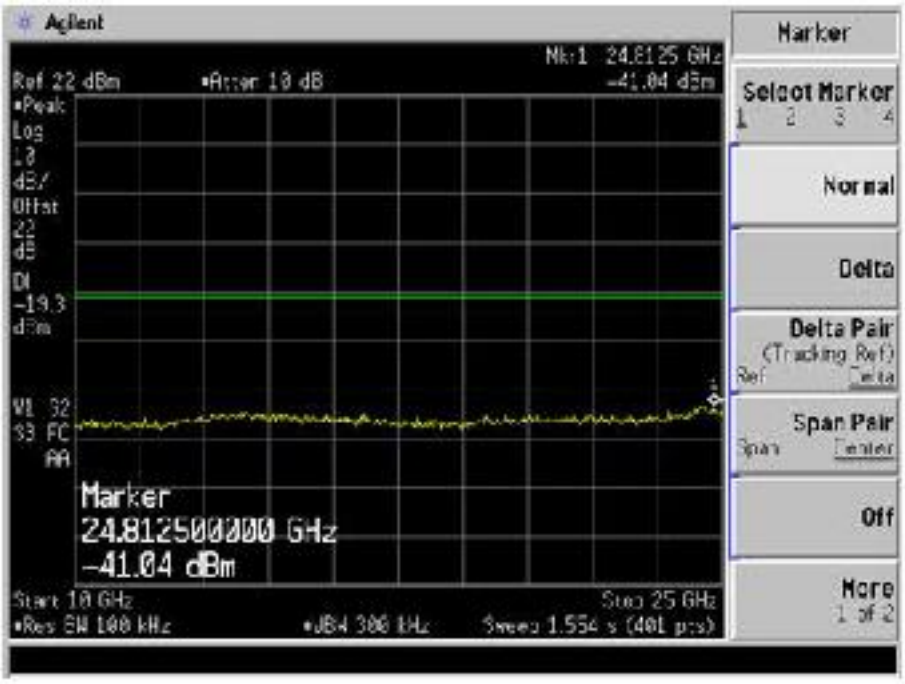


Plot 56 – Channel 1 @ 64QAM 54Mbps

RF Conducted Spurious Emissions Plots – 802.11g

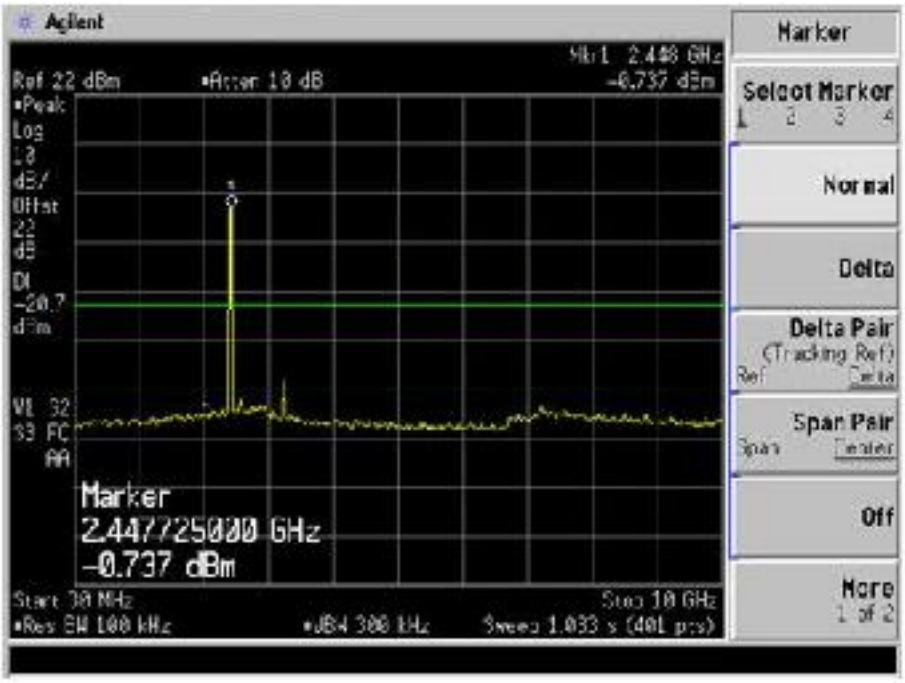


Plot 57 – Channel 6 @ BPSK 9Mbps

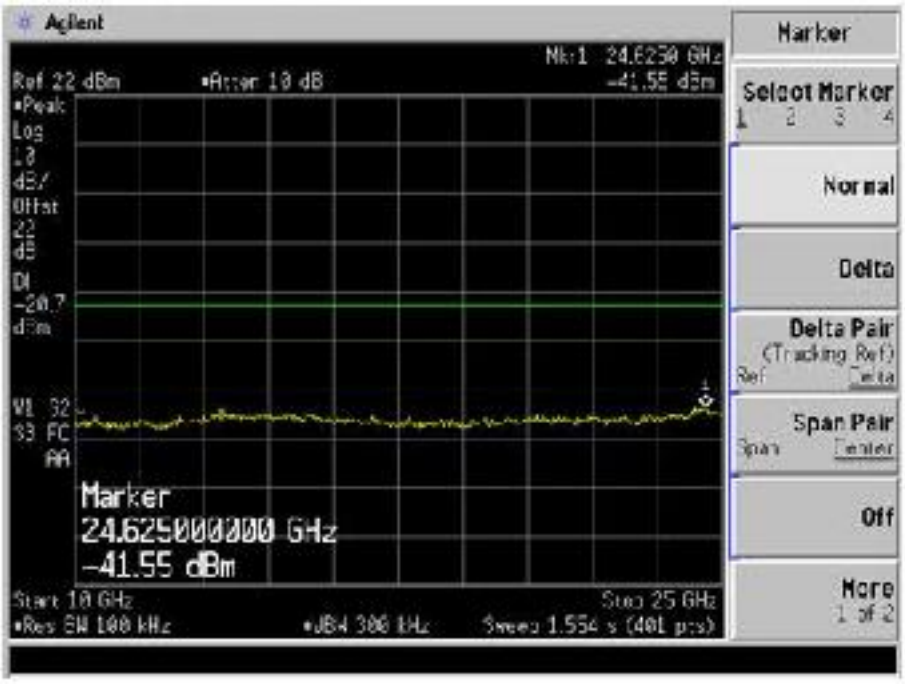


Plot 58 – Channel 6 @ BPSK 9Mbps

RF Conducted Spurious Emissions Plots – 802.11g

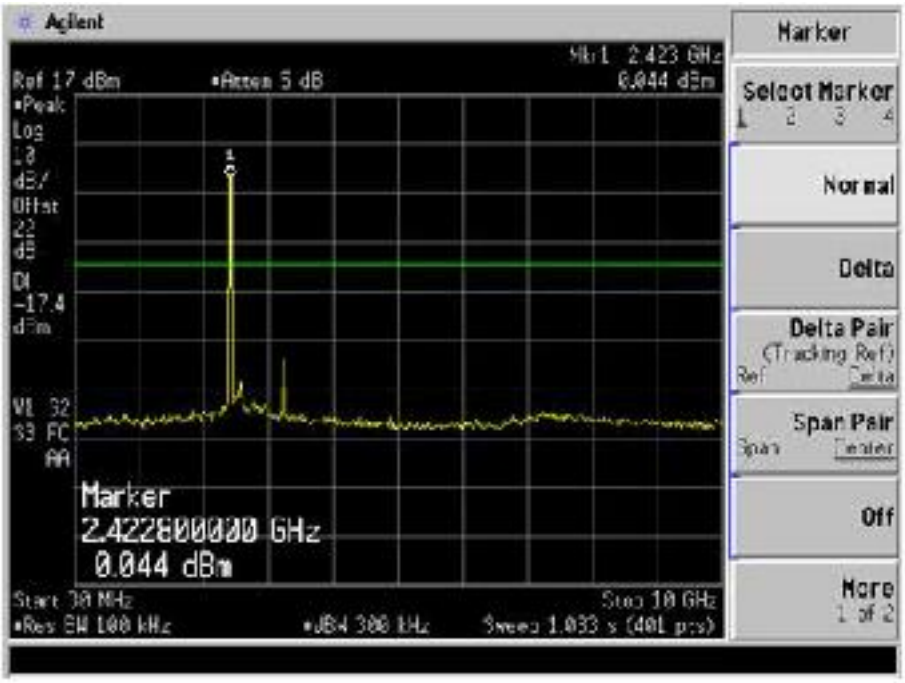


Plot 59 – Channel 6 @ QPSK 18Mbps

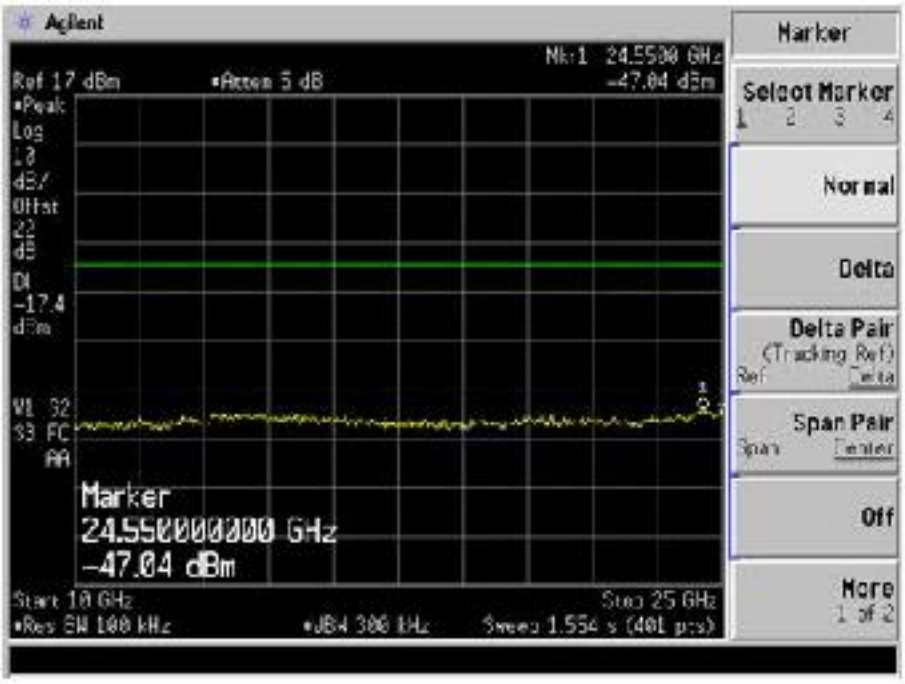


Plot 60 – Channel 6 @ QPSK 18Mbps

RF Conducted Spurious Emissions Plots – 802.11g

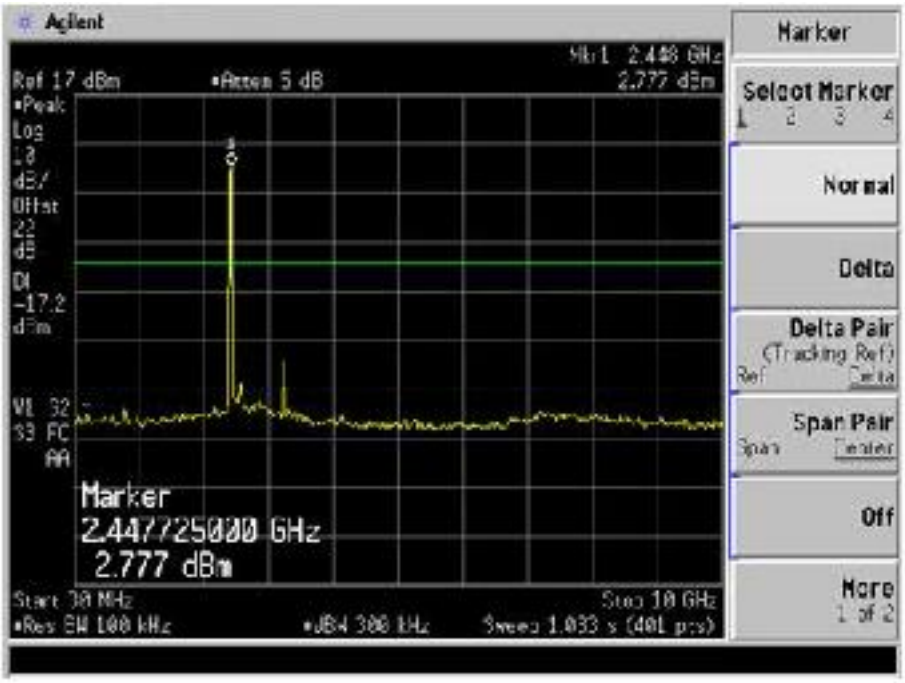


Plot 61 – Channel 6 @ 16QAM 36Mbps

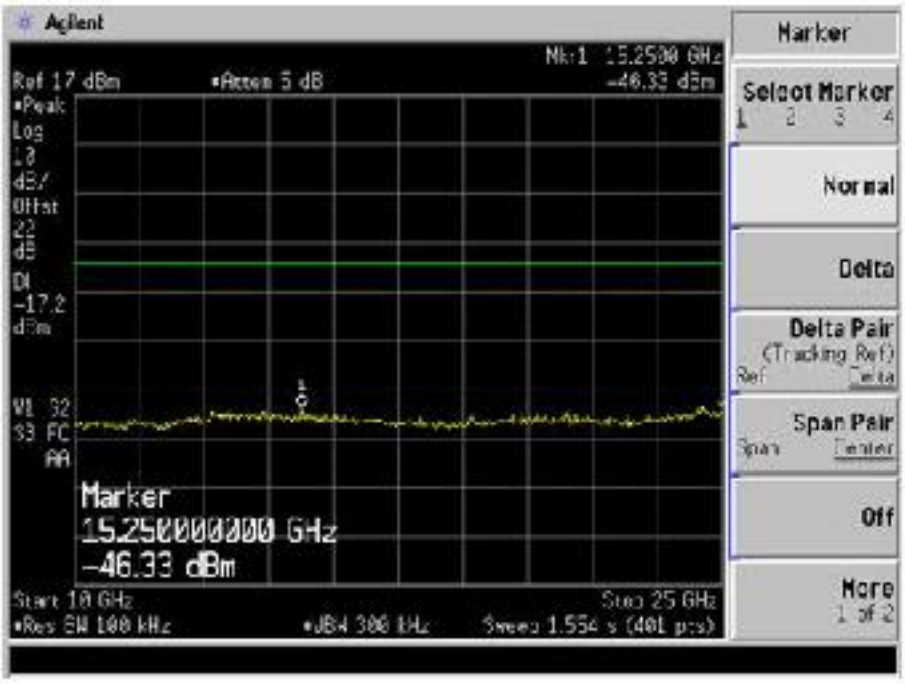


Plot 62 – Channel 6 @ 16QAM 36Mbps

RF Conducted Spurious Emissions Plots – 802.11g

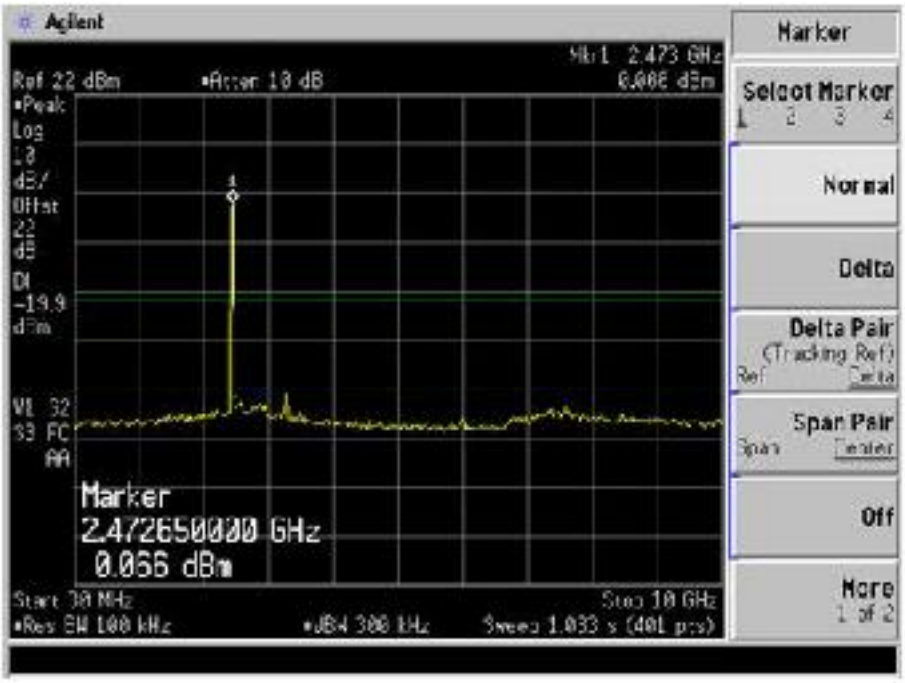


Plot 63 – Channel 6 @ 64QAM 54Mbps

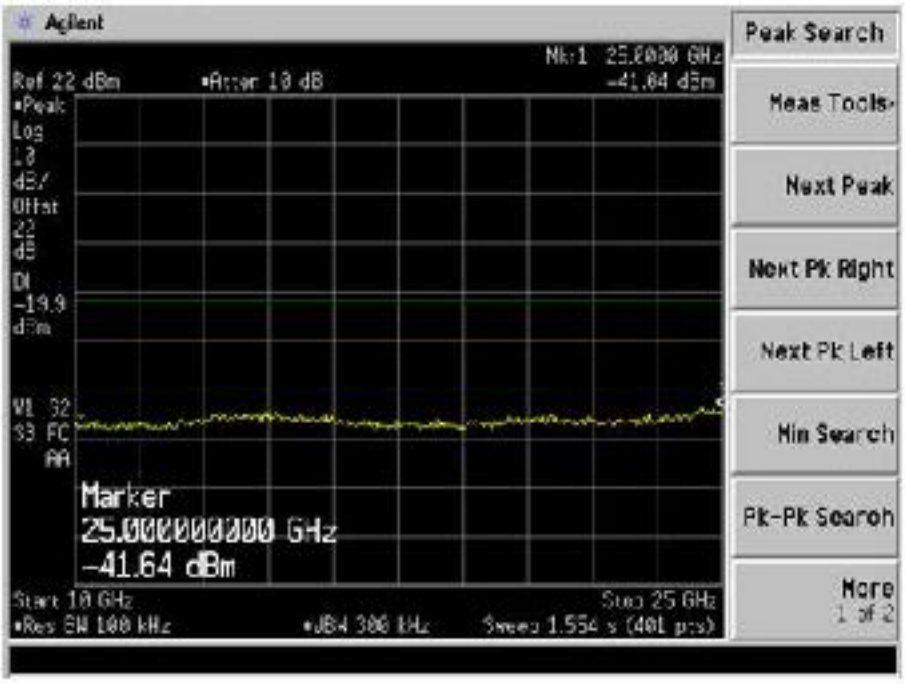


Plot 64 – Channel 6 @ 64QAM 54Mbps

RF Conducted Spurious Emissions Plots – 802.11g

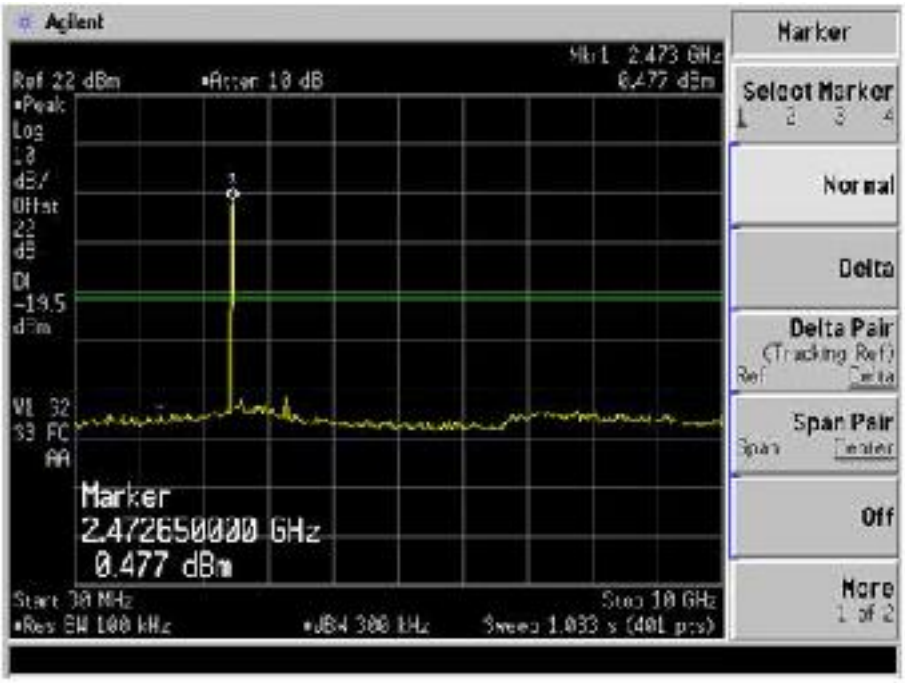


Plot 65 – Channel 11 @ BPSK 9Mbps

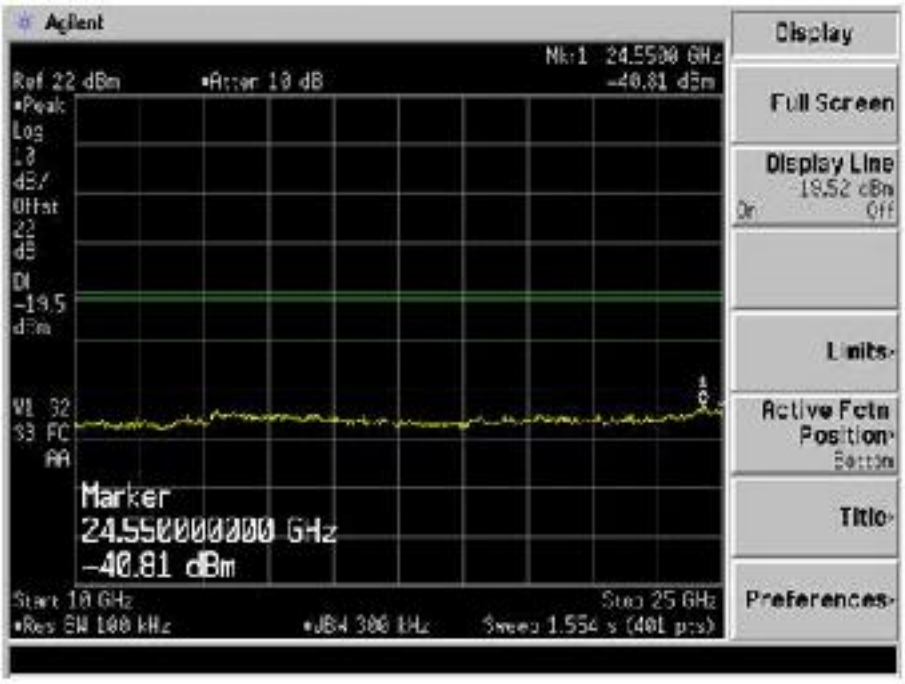


Plot 66 – Channel 11 @ BPSK 9Mbps

RF Conducted Spurious Emissions Plots – 802.11g

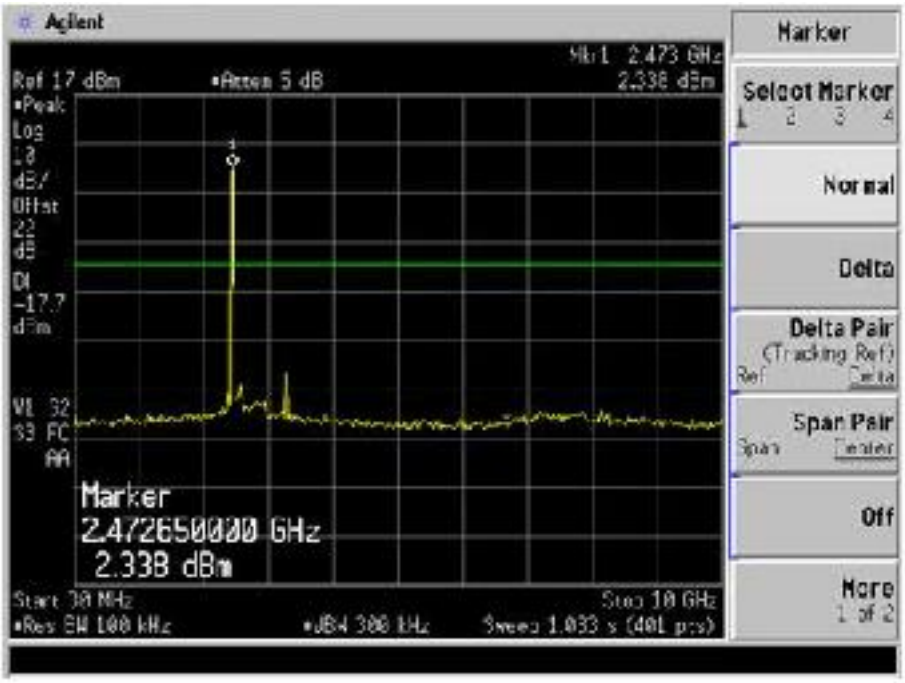


Plot 67 – Channel 11@ QPSK 18Mbps

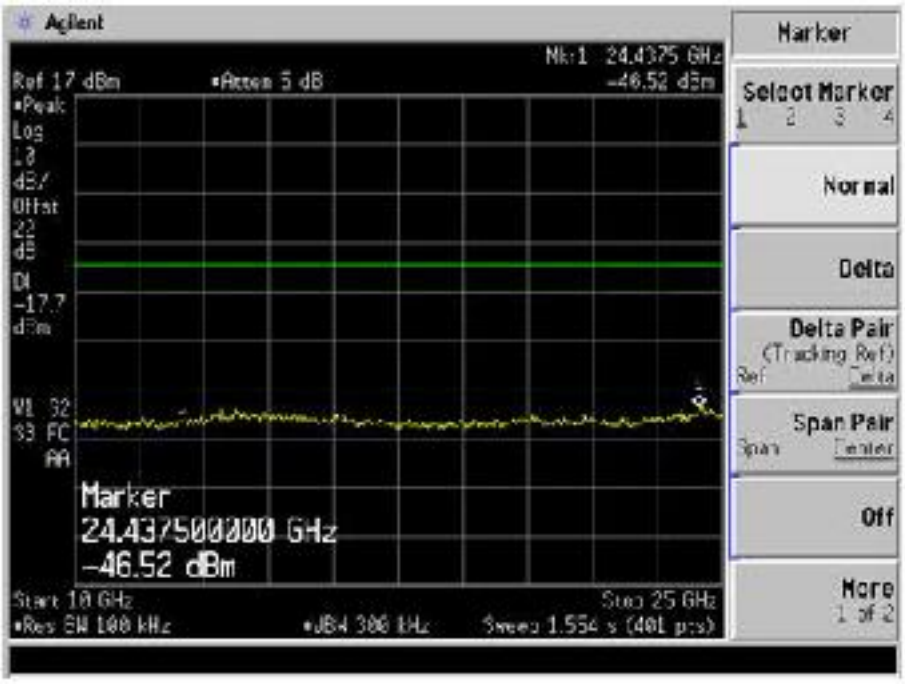


Plot 68 – Channel 11 @ QPSK 18Mbps

RF Conducted Spurious Emissions Plots – 802.11g

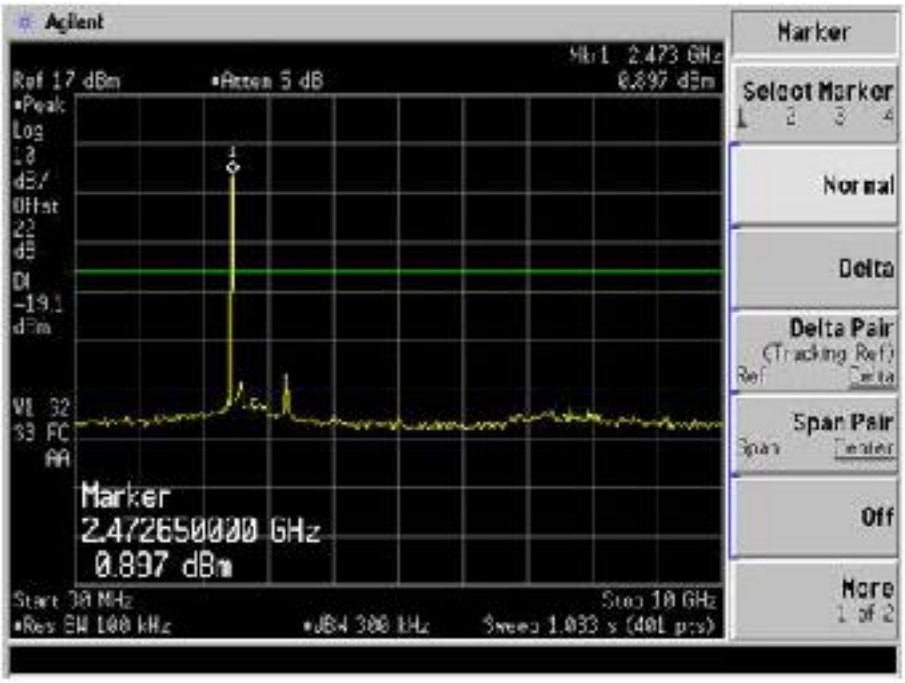


Plot 69 – Channel 11 @ 16QAM 36Mbps

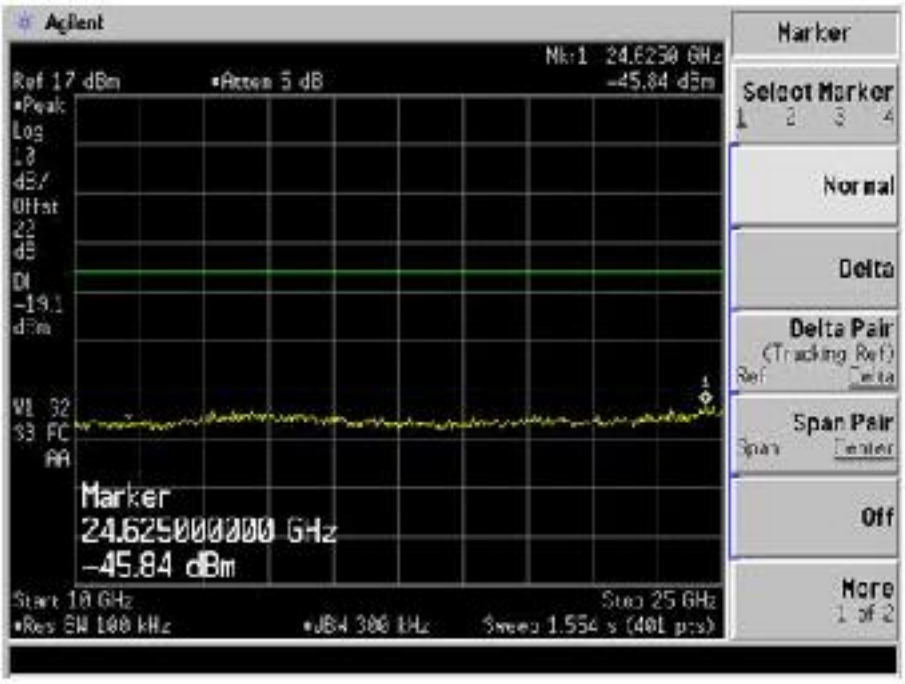


Plot 70 – Channel 11 @ 16QAM 36Mbps

RF Conducted Spurious Emissions Plots – 802.11g



Plot 71 – Channel 11 @ 64QAM 54Mbps



Plot 72 – Channel 11 @ 64QAM 54Mbps

47 CFR 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.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	25 May 2012
GW Instek Programmable Power Supply	PSH-3630A	RK200168	30 Jan 2013

47 CFR 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.

47 CFR 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.

Band Edge Compliance (Conducted) Test Setup

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Results

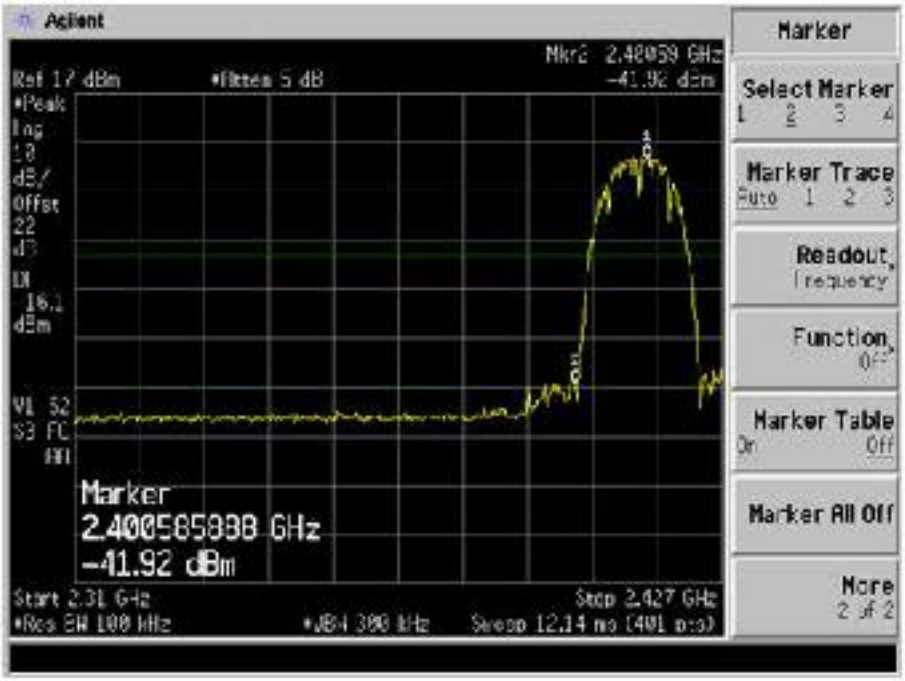
Operating Mode	Continuous WiFi transmit	Temperature	24°C
Test Input Power	24Vdc (Worst Voltage)	Relative Humidity	54%
Attached Plots	73 – 80 (802.11b)	Atmospheric Pressure	1027mbar
		Tested By	Kyaw Soe Hein

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

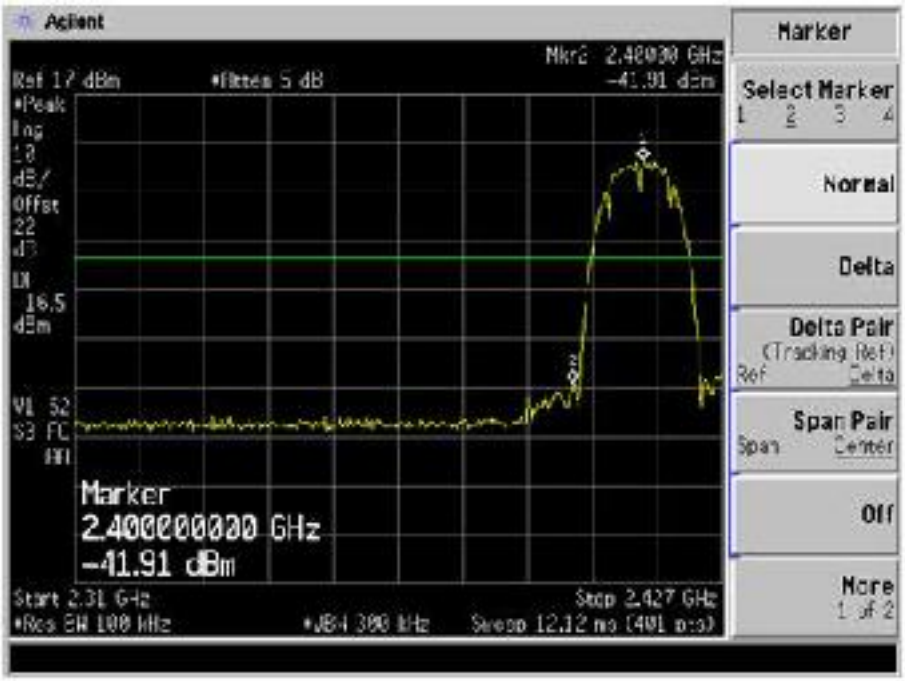
Operating Mode	Continuous WiFi transmit	Temperature	24°C
Test Input Power	24Vdc (Worst Voltage)	Relative Humidity	54%
Attached Plots	81 – 88 (802.11g)	Atmospheric Pressure	1027mbar
		Tested By	Kyaw Soe Hein

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

Band Edge Compliance (Conducted) Plots – 802.11b

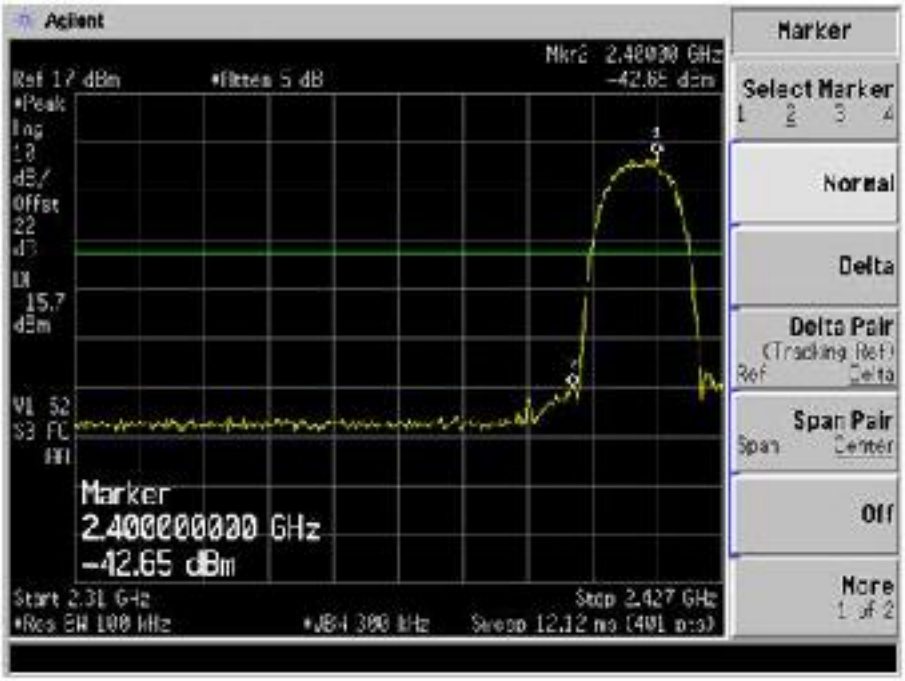


Plot 73 – Lower Band Edge at 2.4000GHz @ DBPSK 1Mbps

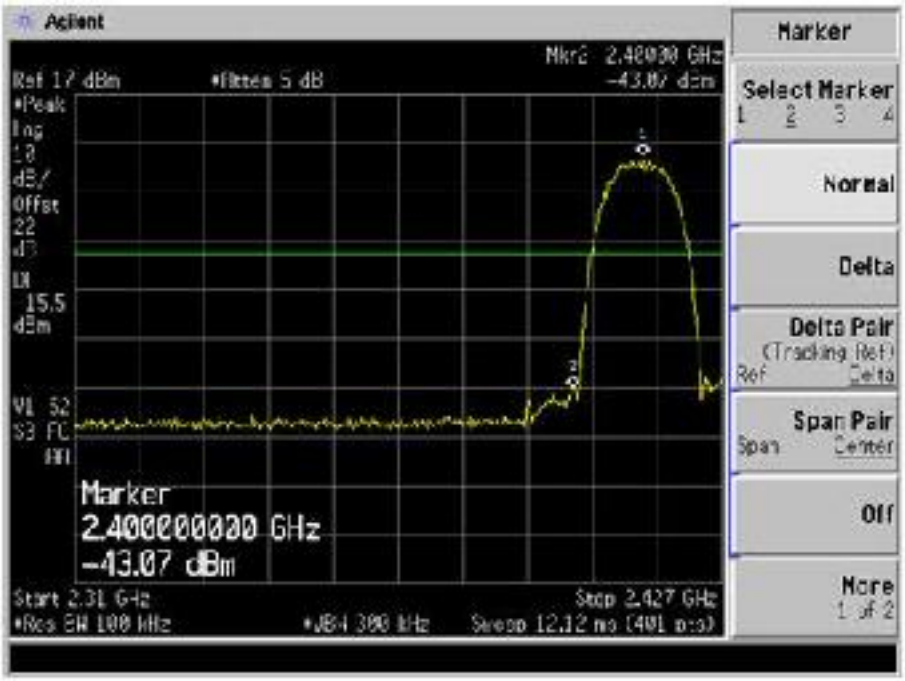


Plot 74 – Lower Band Edge at 2.4000GHz @ DQPSK 2Mbps

Band Edge Compliance (Conducted) Plots – 802.11b

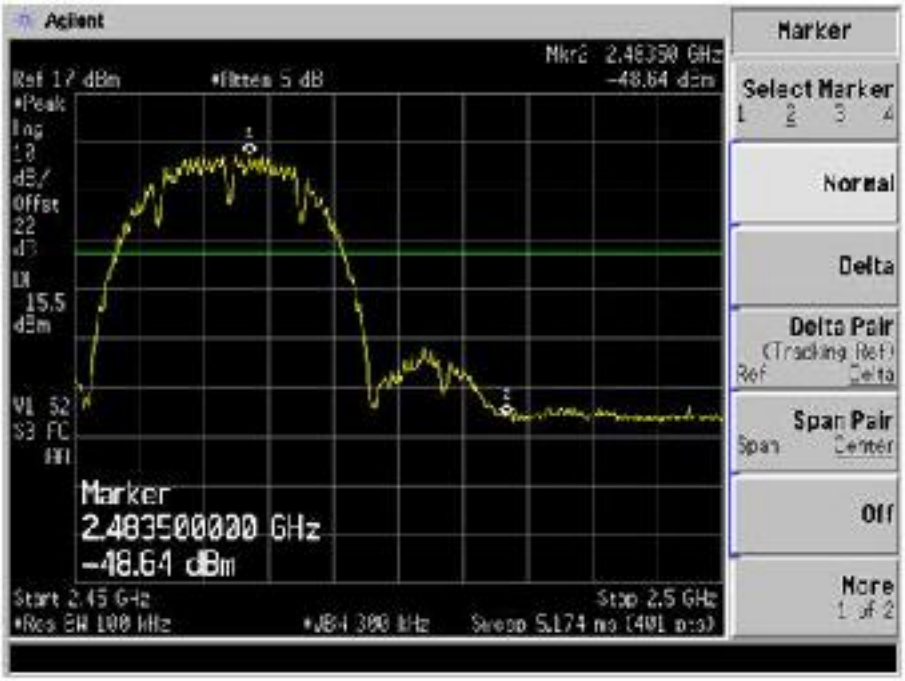


Plot 75 – Lower Band Edge at 2.4000GHz @ CCK 5.5Mbps

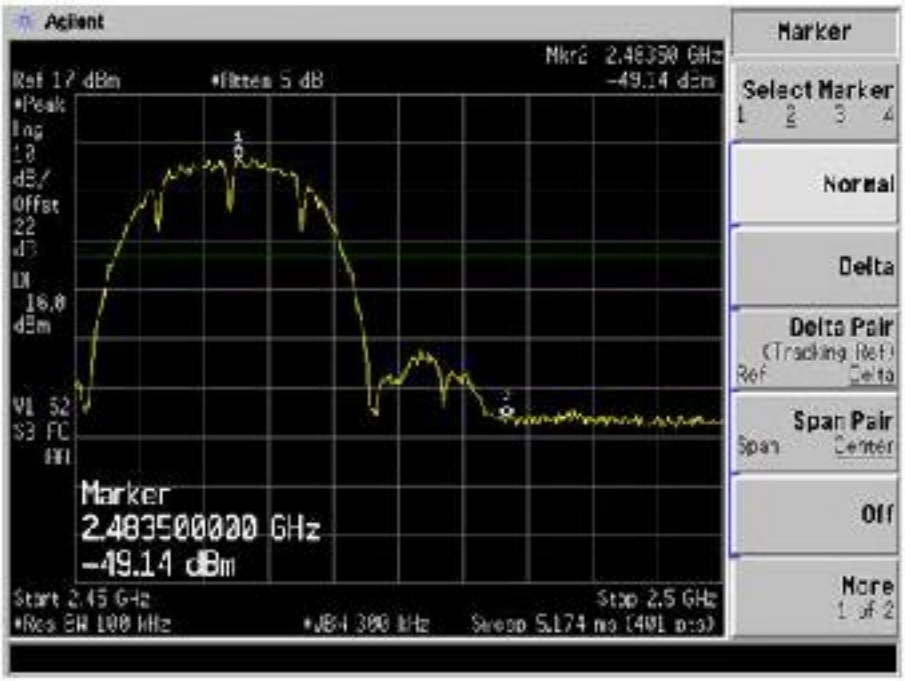


Plot 76 – Lower Band Edge at 2.4000GHz @ CCK 11Mbps

Band Edge Compliance (Conducted) Plots – 802.11b

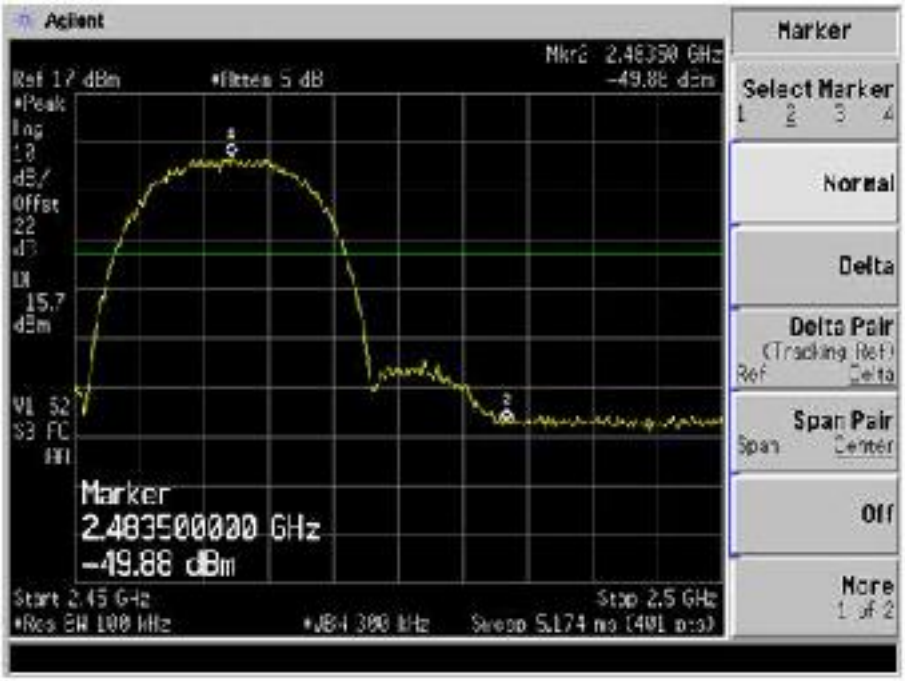


Plot 77 – Upper Band Edge at 2.4835GHz @ DBPSK 1Mbps

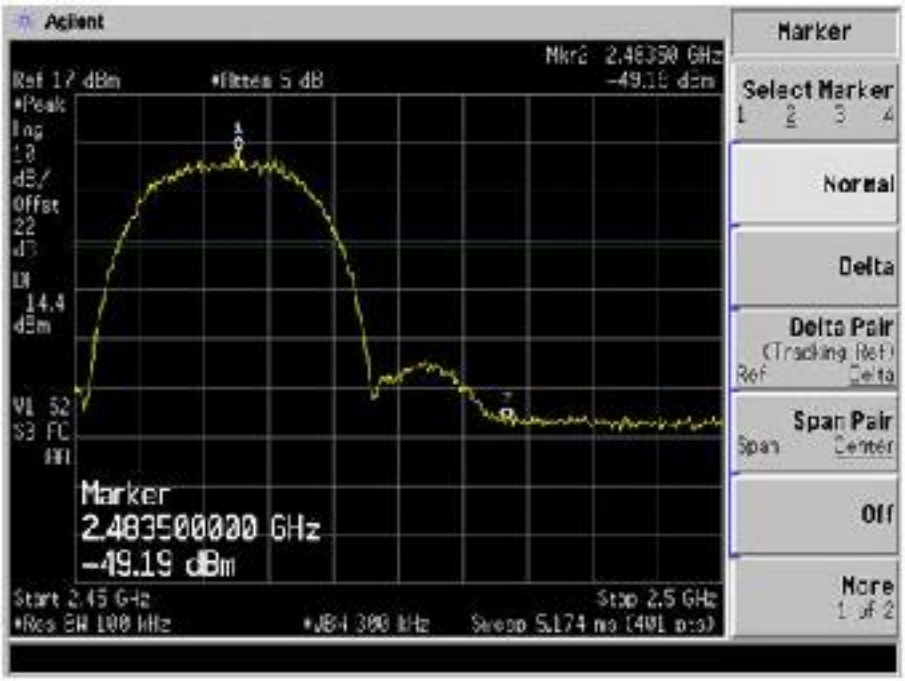


Plot 78 – Upper Band Edge at 2.4835GHz @ DQPSK 2Mbps

Band Edge Compliance (Conducted) Plots – 802.11b

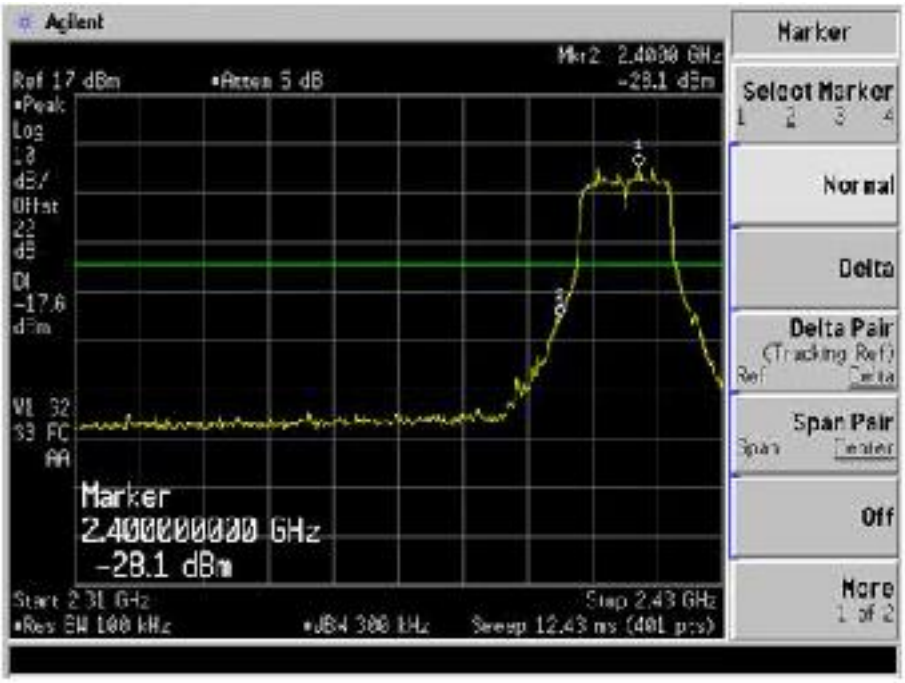


Plot 79 – Upper Band Edge at 2.4835GHz @ CCK 5.5Mbps

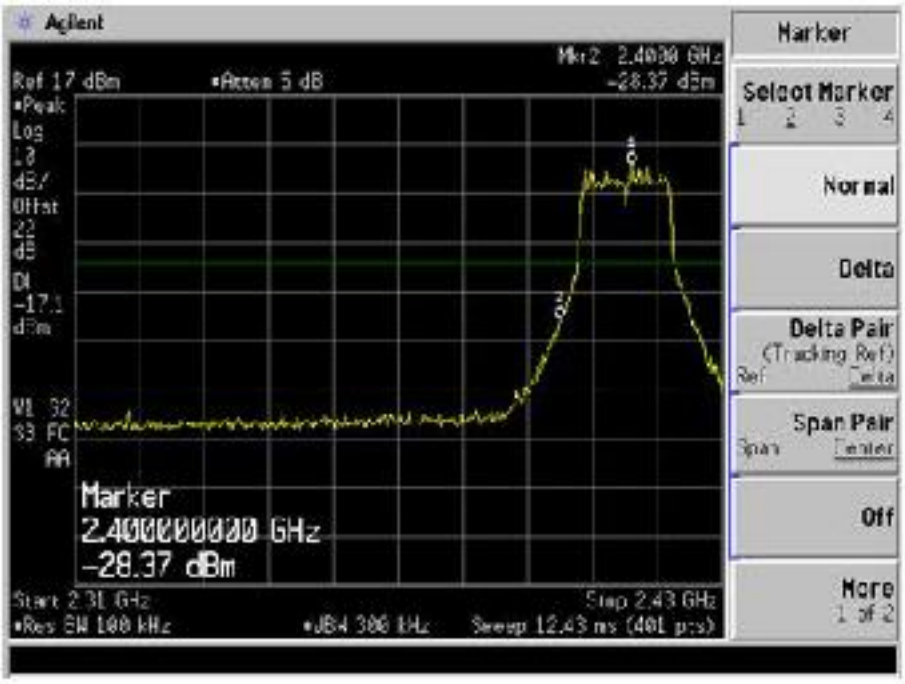


Plot 80 – Upper Band Edge at 2.4835GHz @ CCK 11Mbps

Band Edge Compliance (Conducted) Plots – 802.11g

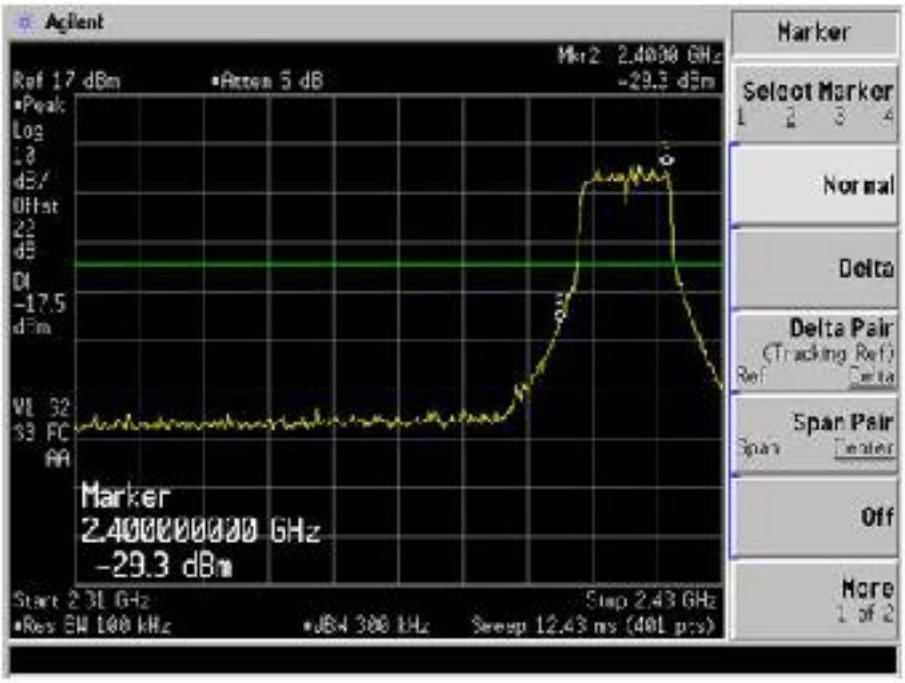


Plot 81 – Lower Band Edge at 2.4000GHz @ BPSK 9Mbps

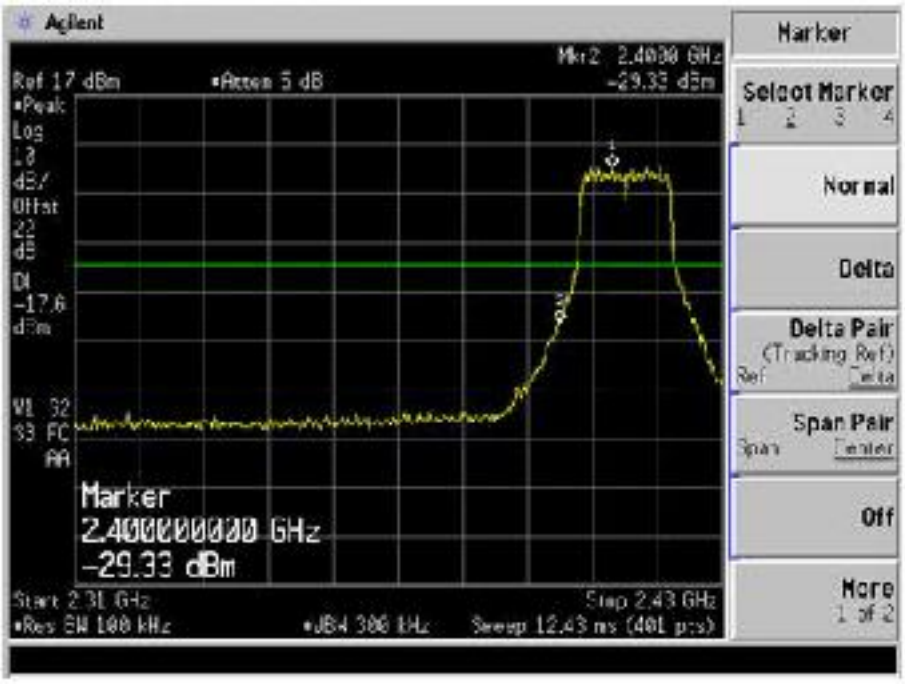


Plot 82 – Lower Band Edge at 2.4000GHz @ QPSK 18Mbps

Band Edge Compliance (Conducted) Plots – 802.11g

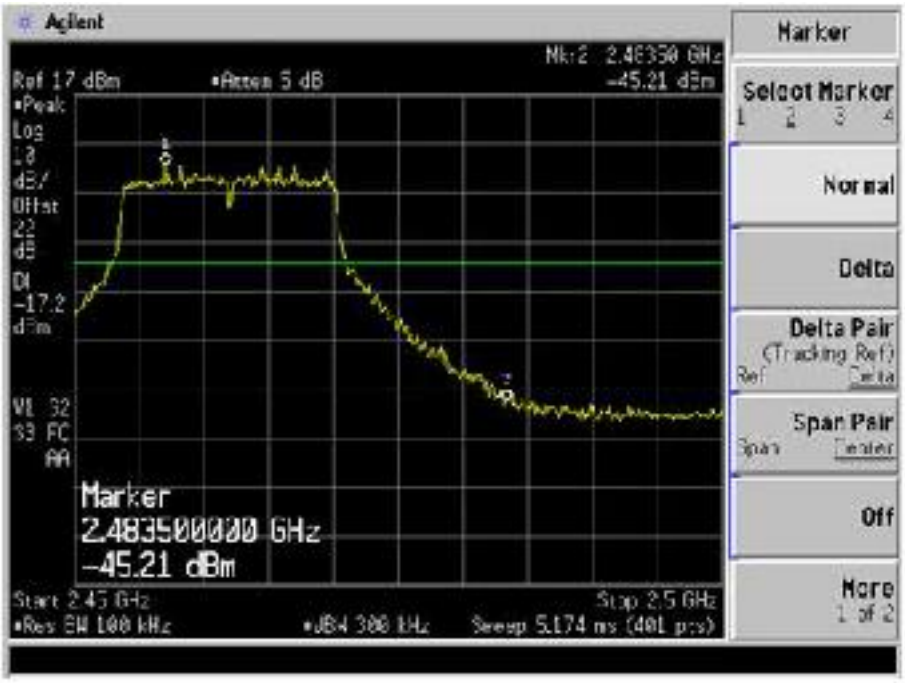


Plot 83 – Lower Band Edge at 2.4000GHz @ 16QAM 36Mbps

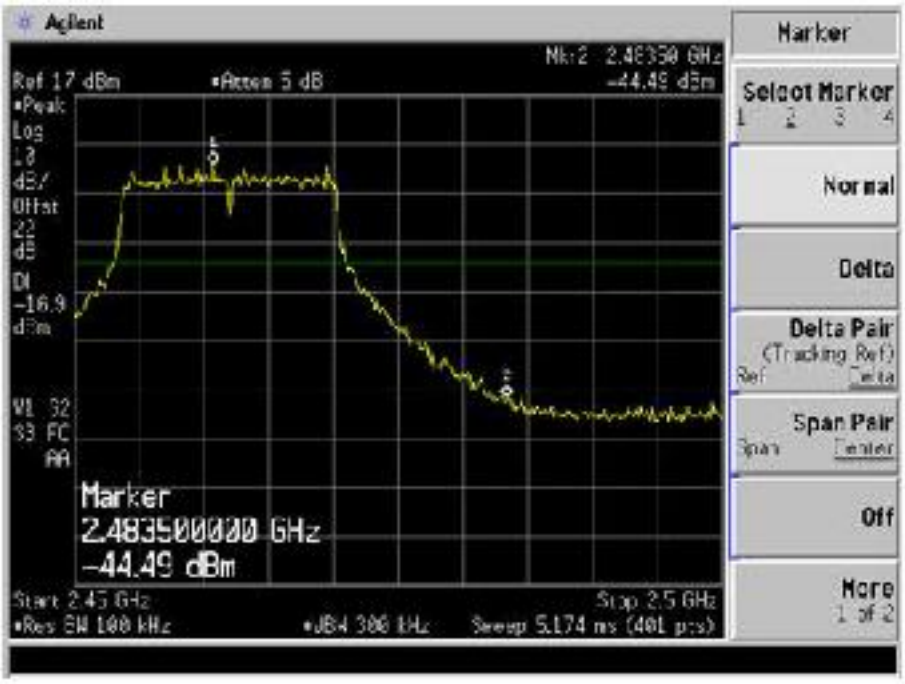


Plot 84 – Lower Band Edge at 2.4000GHz @ 64QAM 54Mbps

Band Edge Compliance (Conducted) Plots – 802.11g

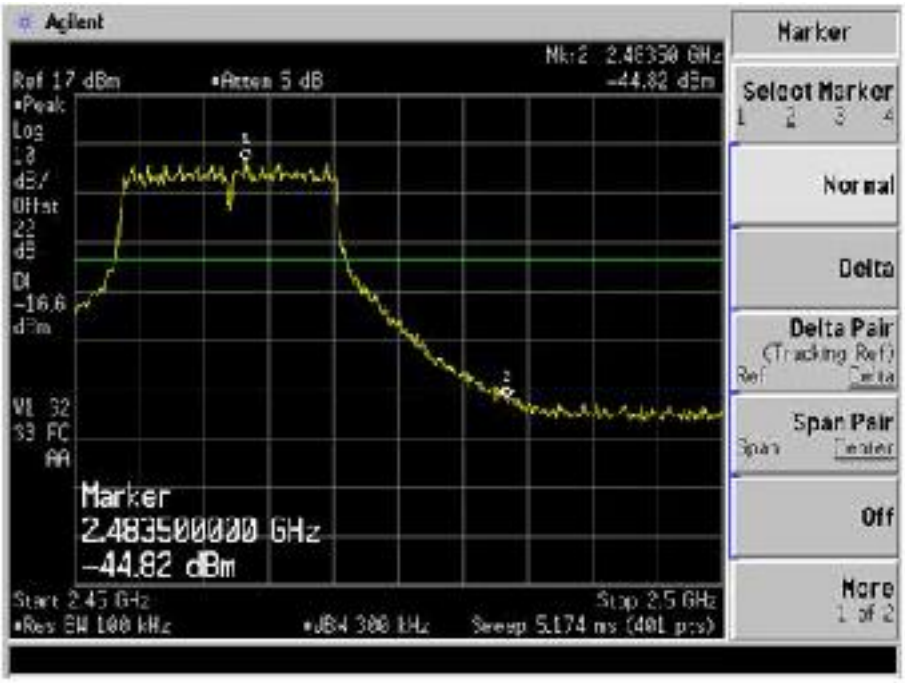


Plot 85 – Upper Band Edge at 2.4835GHz @ BPSK 9Mbps

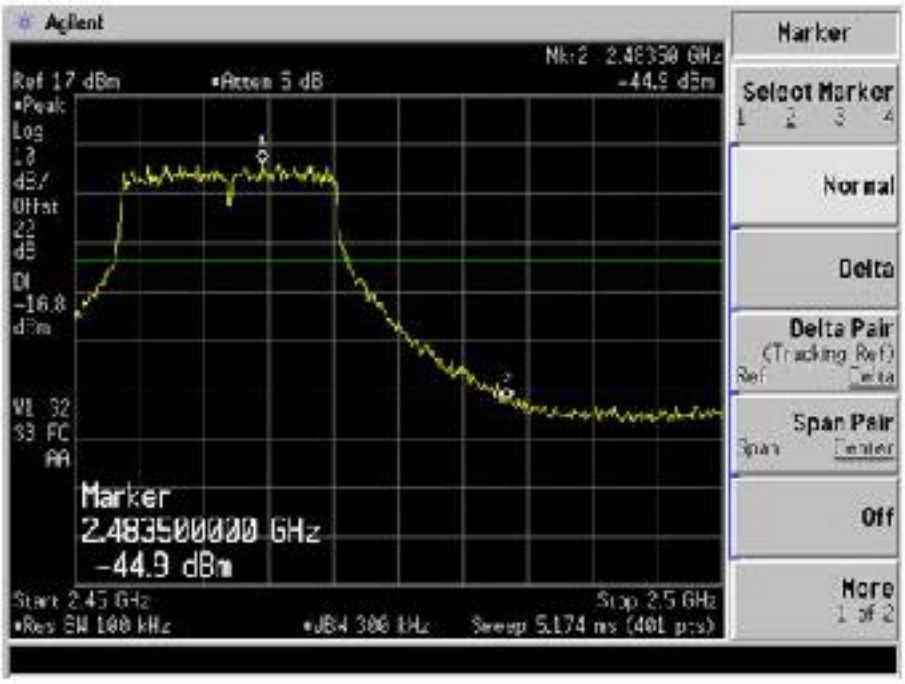


Plot 86 – Upper Band Edge at 2.4835GHz @ QPSK 18Mbps

Band Edge Compliance (Conducted) Plots – 802.11g



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



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

47 CFR 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.

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

Instrument	Model	S/No	Cal Due Date
EMCO Horn Antenna – H15	3115	0003-6088	20 May 2012
Agilent EMC Analyzer	E7403A	US41160165	04 Nov 2012
TDK RF Solutions Hybrid Log Periodic Antenna (30MHz-3GHz)	HLP-3003C	130238	19 Mar 2012
Sonoma Preamplifier (9kHz – 1GHz)	310N	270640	03 Jan 2013
Toyo MicroWave Preamplifier (1GHz - 18GHz)	TPA0188-36	1005	24 Jun 2012

47 CFR 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.

47 CFR 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.

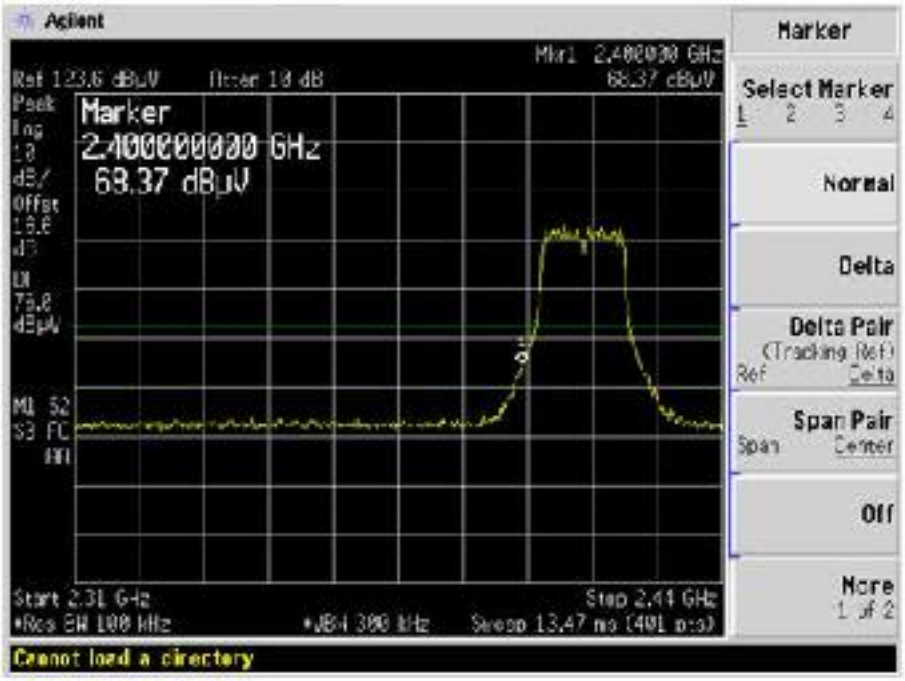
Band Edge Compliance (Radiated) Test Setup

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Results

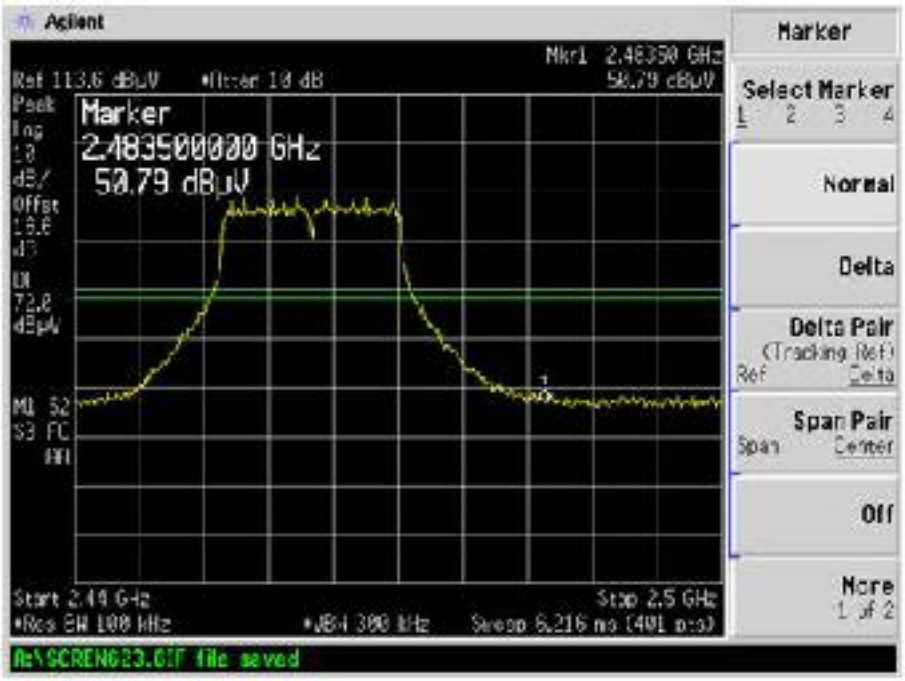
Operating Mode	Continuous WiFi transmit	Temperature	22°C
Test Input Power	24Vdc (Worst Voltage)	Relative Humidity	52%
Attached Plots	89 – 94	Atmospheric Pressure	1028mbar
		Tested By	Jason Lai

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

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

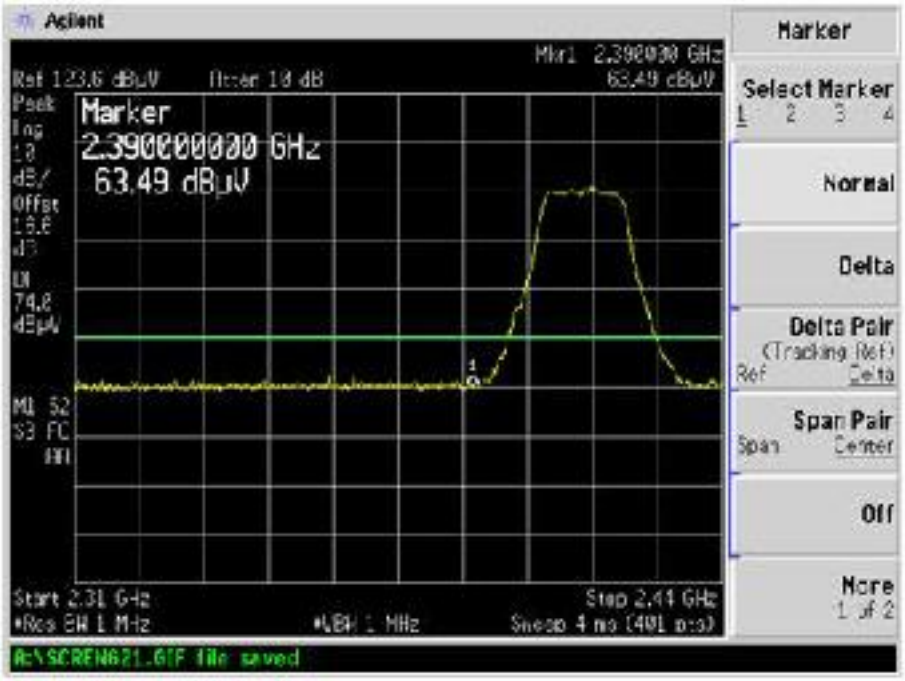


Plot 89 – Lower Band Edge at 2.4000GHz @ 64QAM 54Mbps (Worst Case)

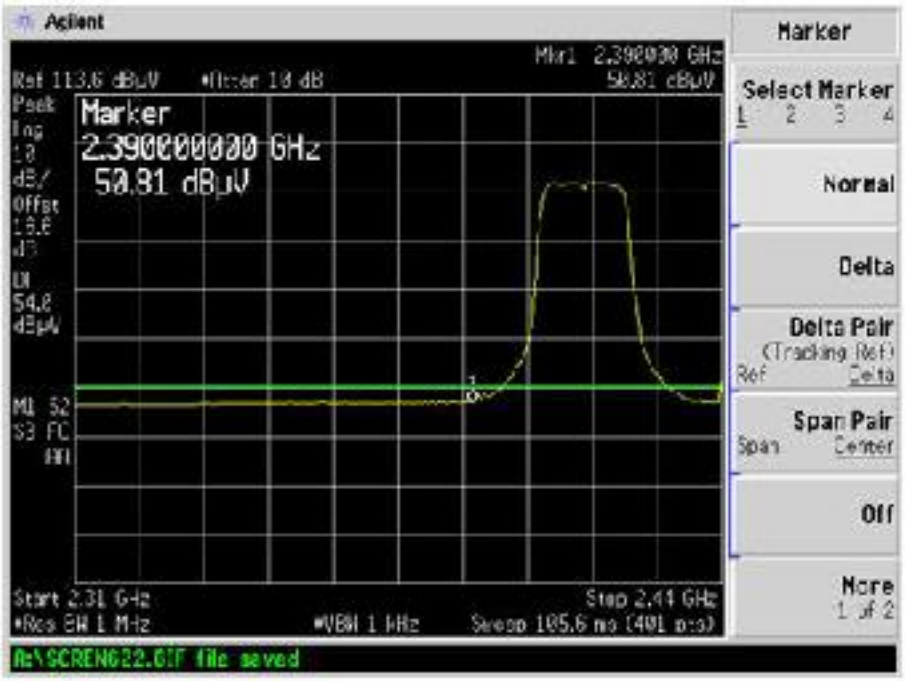


Plot 90 – Upper Band Edge at 2.4835GHz @ 64QAM 54Mbps (Worst Case)

Band Edge Compliance (Radiated) Plots (Restricted Band)

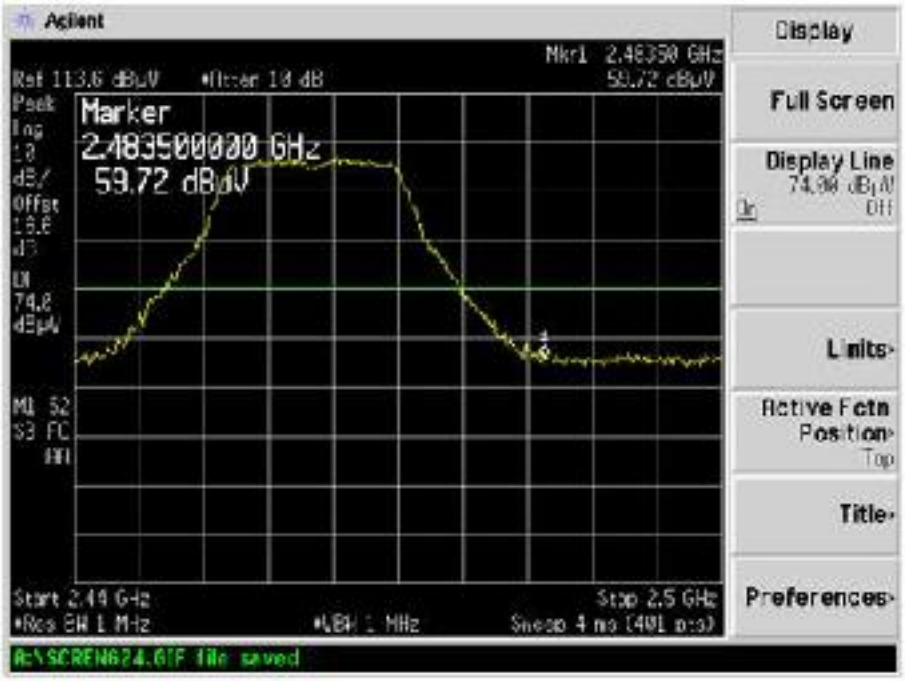


Plot 91 – Peak Plot at Lower Band Edge at 2.4000GHz @ 64QAM 54Mbps (Worst Case)

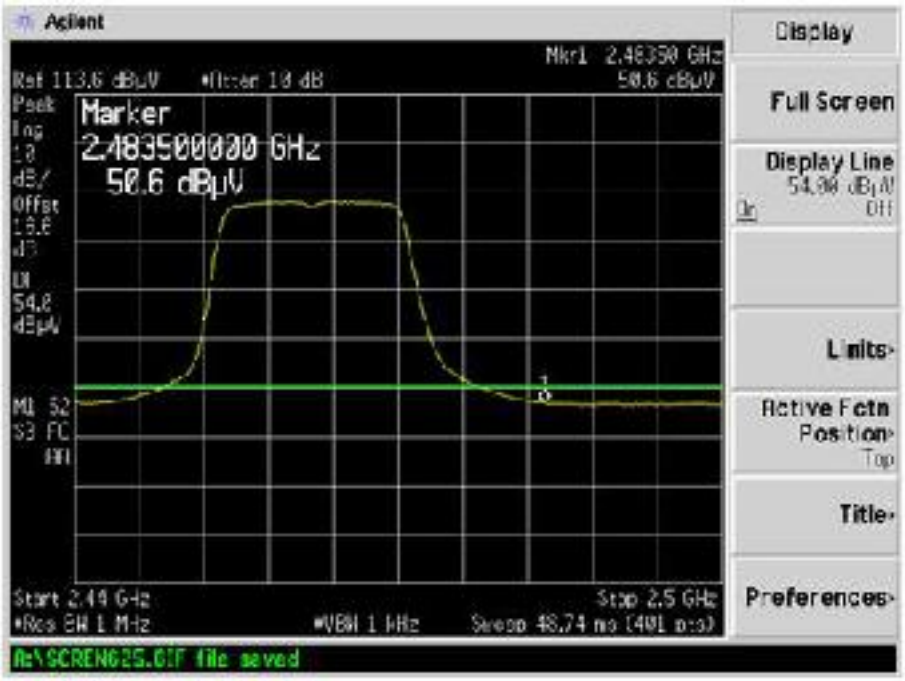


Plot 92 – Average Plot at Lower Band Edge at 2.4000GHz @ 64QAM 54Mbps (Worst Case)

Band Edge Compliance (Radiated) Plots (Restricted Band)



Plot 93 – Peak Plot at Upper Band Edge at 2.4835GHz @ 64QAM 54Mbps (Worst Case)



Plot 94 – Average Plot at Upper Band Edge at 2.4835GHz @ 64QAM 54Mbps (Worst Case)

47 CFR 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.

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	25 May 2012
GW Instek Programmable Power Supply	PSH-3630A	RK200168	30 Jan 2013

47 CFR 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.

47 CFR 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.

Peak Power Spectral Density Test Setup

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Results

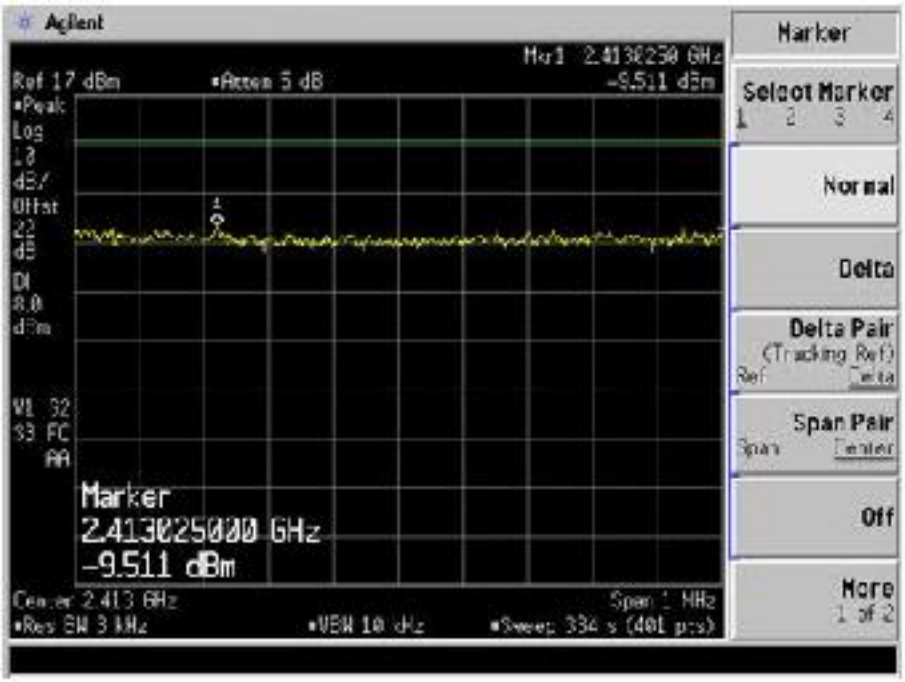
Operating Mode	Continuous WiFi transmit	Temperature	24°C
24Vdc (Worst Voltage)	24Vdc (Worst Voltage)	Relative Humidity	54%
Attached Plots	95 – 106 (802.11b)	Atmospheric Pressure	1027mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)	802.11b Modulation @ Data Rate
1	2.412	0.1119	6.3	DBPSK @ 1Mbps
		0.1157	6.3	DQPSK @ 2Mbps
		0.0881	6.3	CCK @ 5.5Mbps
		0.0982	6.3	CCK @ 11Mbps
6	2.437	0.1223	6.3	DBPSK @ 1Mbps
		0.1129	6.3	DQPSK @ 2Mbps
		0.1060	6.3	CCK @ 5.5Mbps
		0.1226	6.3	CCK @ 11Mbps
11	2.462	0.1406	6.3	DBPSK @ 1Mbps
		0.1240	6.3	DQPSK @ 2Mbps
		0.1127	6.3	CCK @ 5.5Mbps
		0.2396	6.3	CCK @ 11Mbps

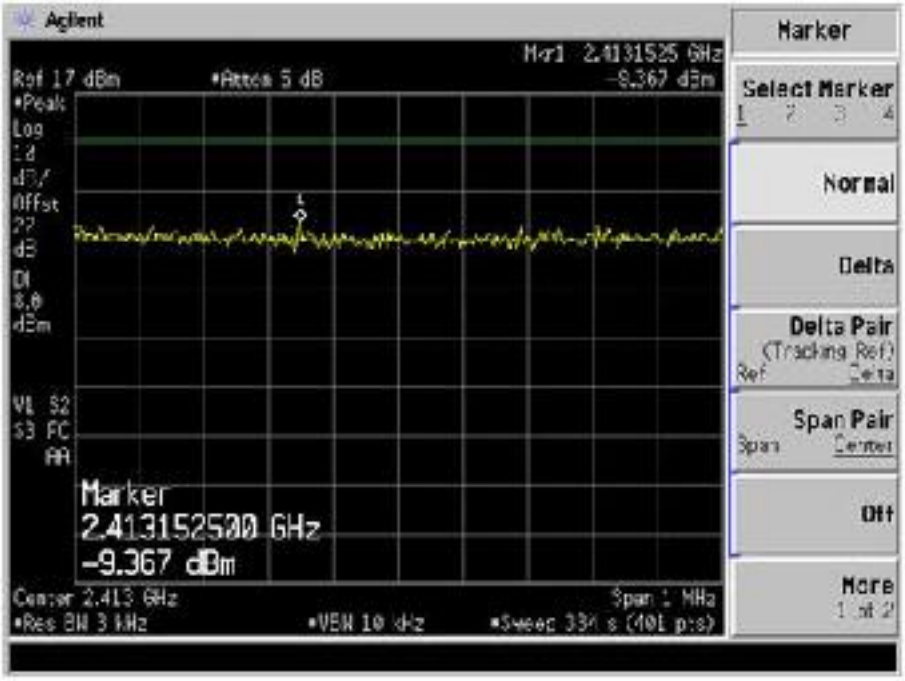
		Temperature	24°C
24Vdc (Worst Voltage)	24Vdc (Worst Voltage)	Relative Humidity	54%
Attached Plots	107 – 118 (802.11g)	Atmospheric Pressure	1027mbar
		Tested By	Kyaw Soe Hein

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)	802.11g Modulation @ Data Rate
1	2.412	0.0979	6.3	BPSK @ 9Mbps
		0.0935	6.3	QPSK @ 18Mbps
		0.0955	6.3	16QAM @ 36Mbps
		0.0855	6.3	64QAM @ 54Mbps
6	2.437	0.0977	6.3	BPSK @ 9Mbps
		0.1008	6.3	QPSK @ 18Mbps
		0.1046	6.3	16QAM @ 36Mbps
		0.0855	6.3	64QAM @ 54Mbps
11	2.462	0.1013	6.3	BPSK @ 9Mbps
		0.1020	6.3	QPSK @ 18Mbps
		0.1069	6.3	16QAM @ 36Mbps
		0.0859	6.3	64QAM @ 54Mbps

Peak Power Spectral Density Plots - 802.11b

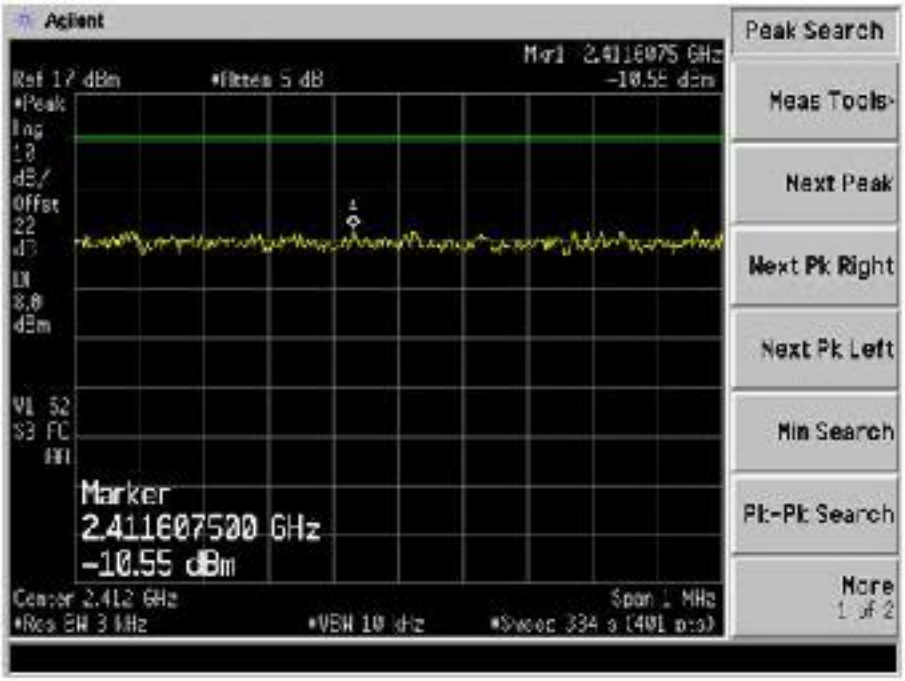


Plot 95 – Channel 1 @ DBPSK 1Mbps

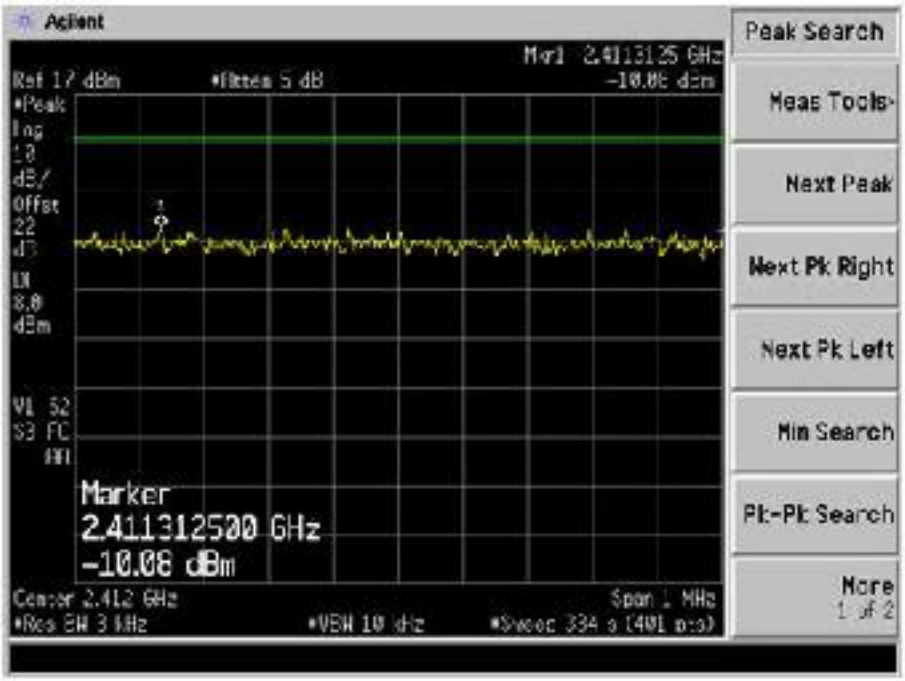


Plot 96 – Channel 1 @ DQPSK 2Mbps

Peak Power Spectral Density Plots - 802.11b

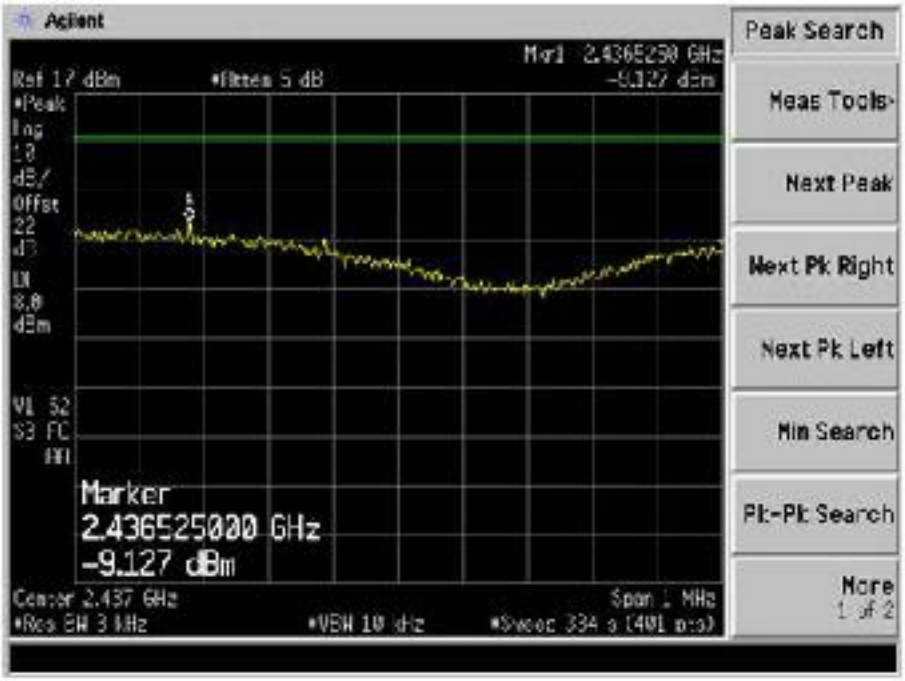


Plot 97 – Channel 1 @ CCK 5.5Mbps

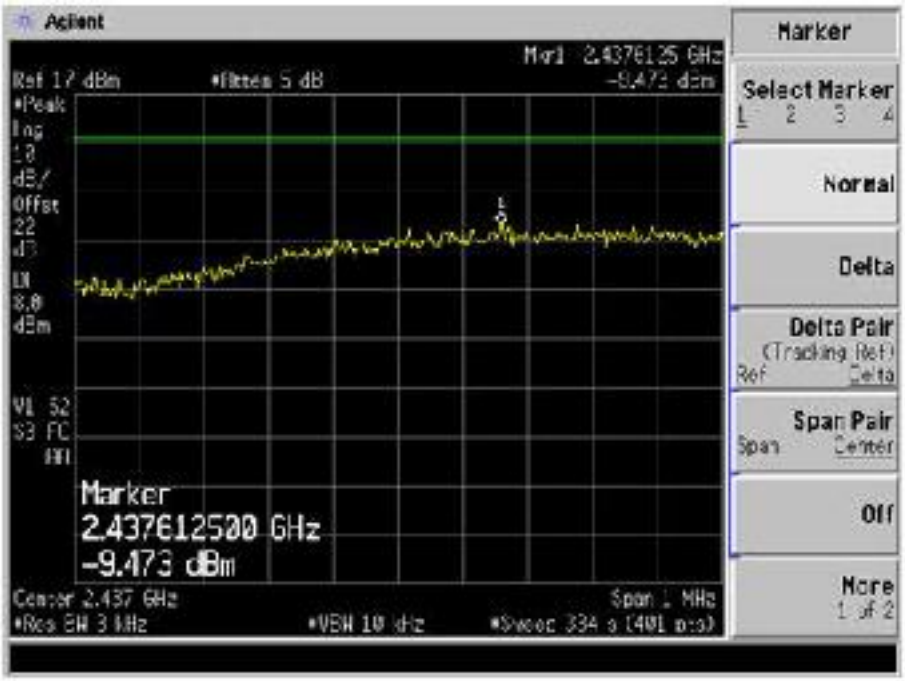


Plot 98 – Channel 1 @ CCK 11Mbps

Peak Power Spectral Density Plots - 802.11b

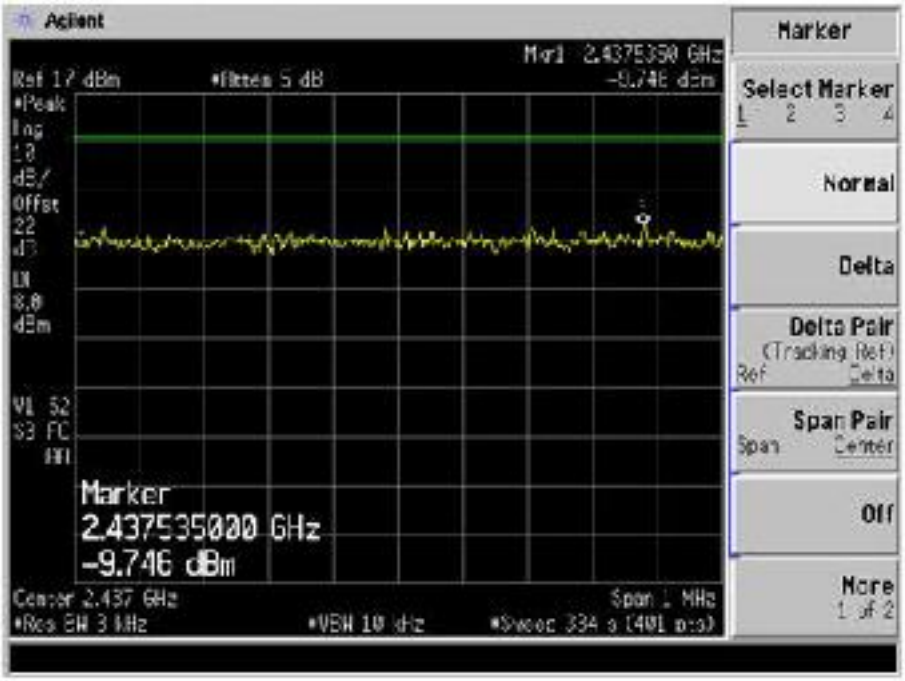


Plot 99 – Channel 6 @ DBPSK 1Mbps

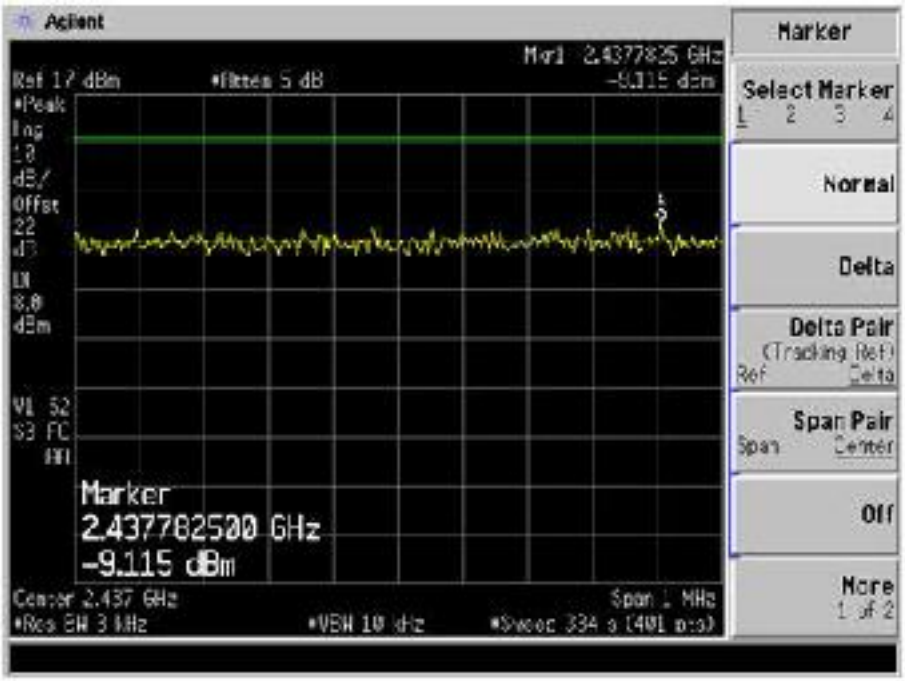


Plot 100 – Channel 6 @ DQPSK 2Mbps

Peak Power Spectral Density Plots - 802.11b

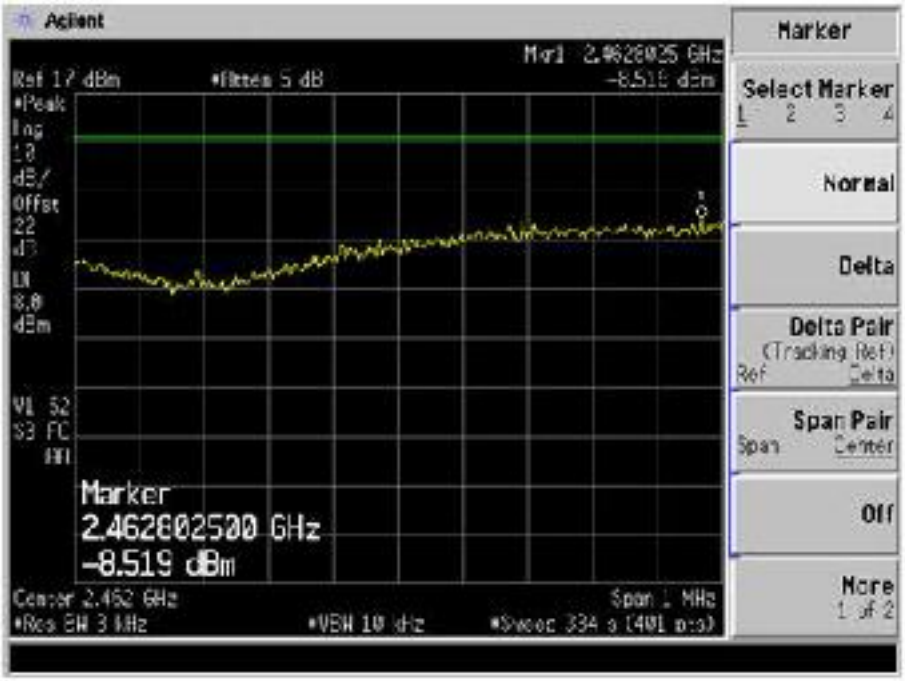


Plot 101 – Channel 6 @ CCK 5.5Mbps

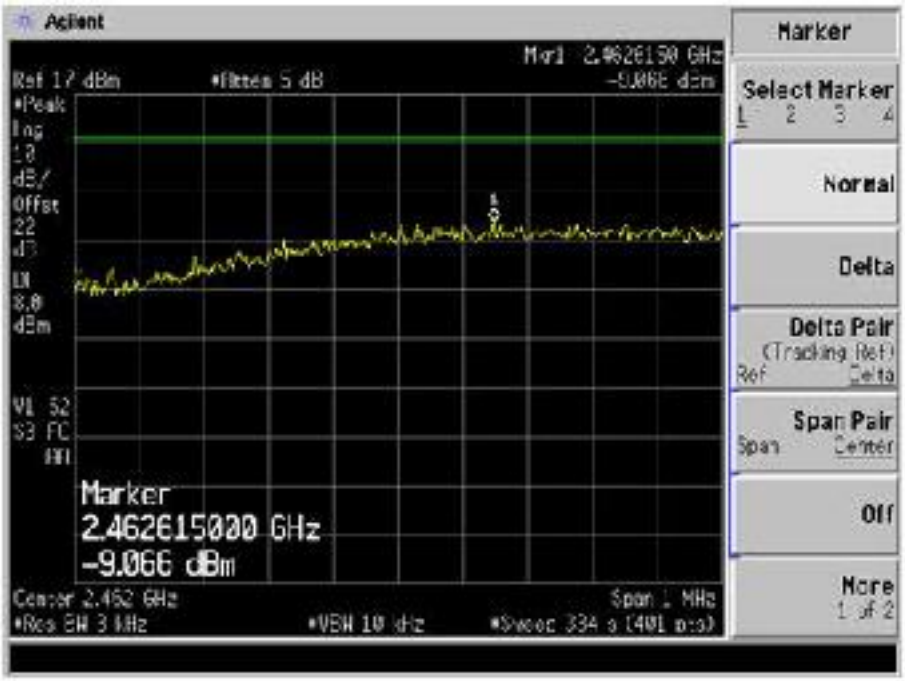


Plot 102 – Channel 6 @ CCK 11Mbps

Peak Power Spectral Density Plots - 802.11b

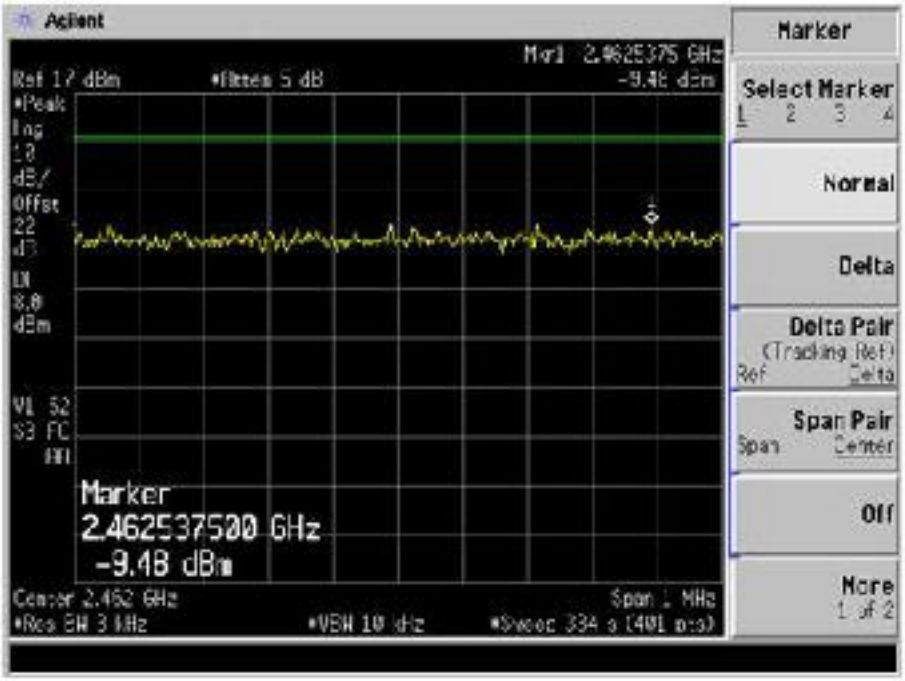


Plot 103 – Channel 11 @ DBPSK 1Mbps

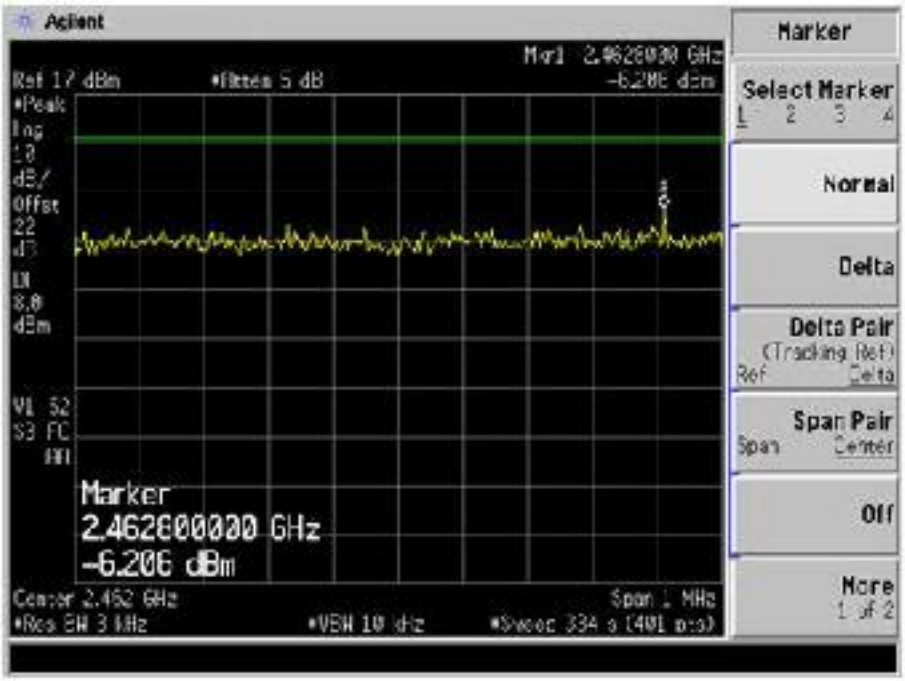


Plot 104 – Channel 11 @ DQPSK 2Mbps

Peak Power Spectral Density Plots - 802.11b

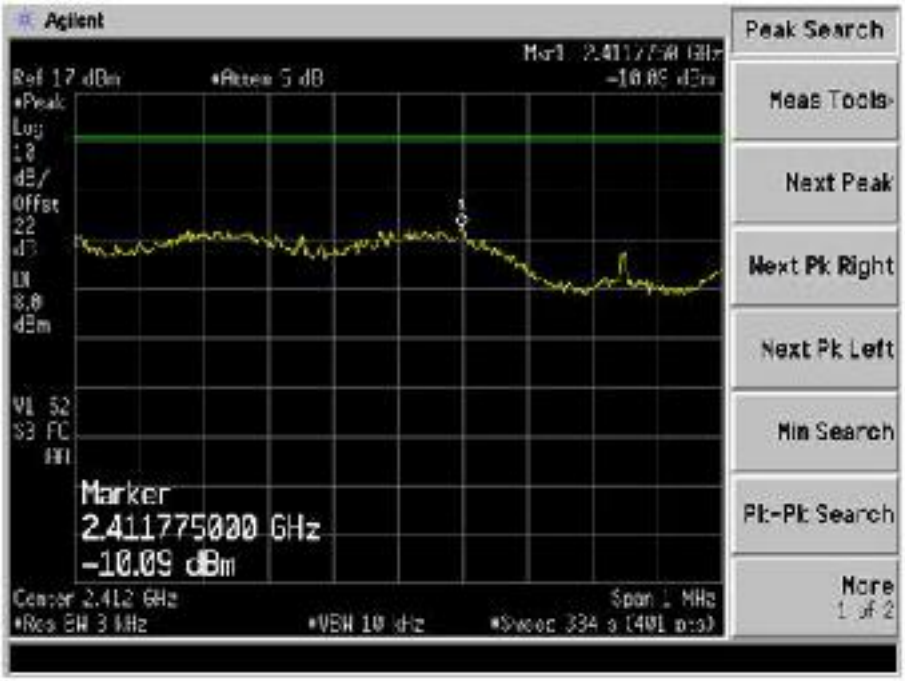


Plot 105 – Channel 11 @ CCK 5.5Mbps

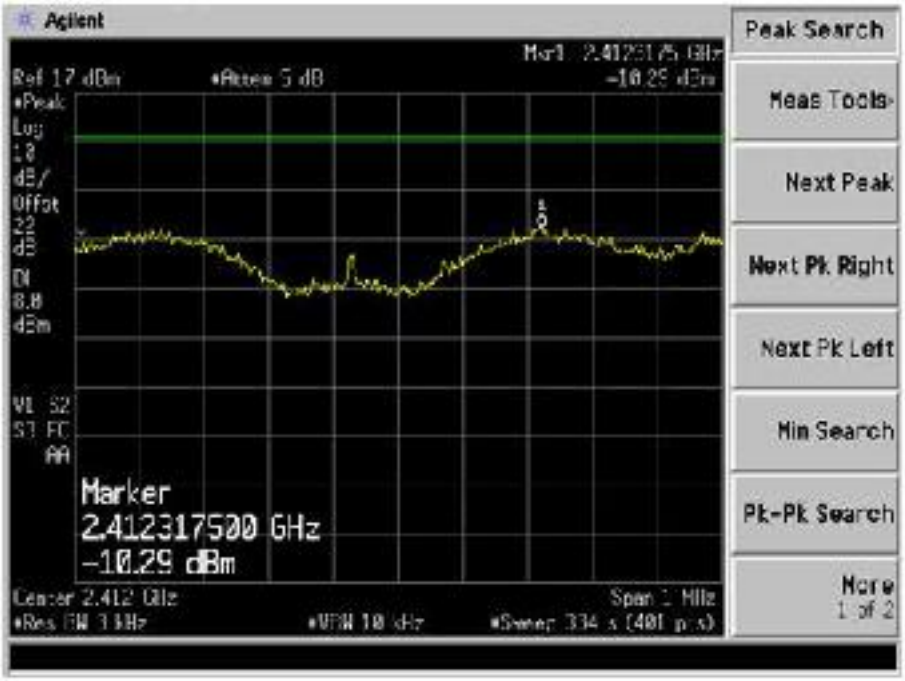


Plot 106 – Channel 11 @ CCK 11Mbps

Peak Power Spectral Density Plots – 802.11g

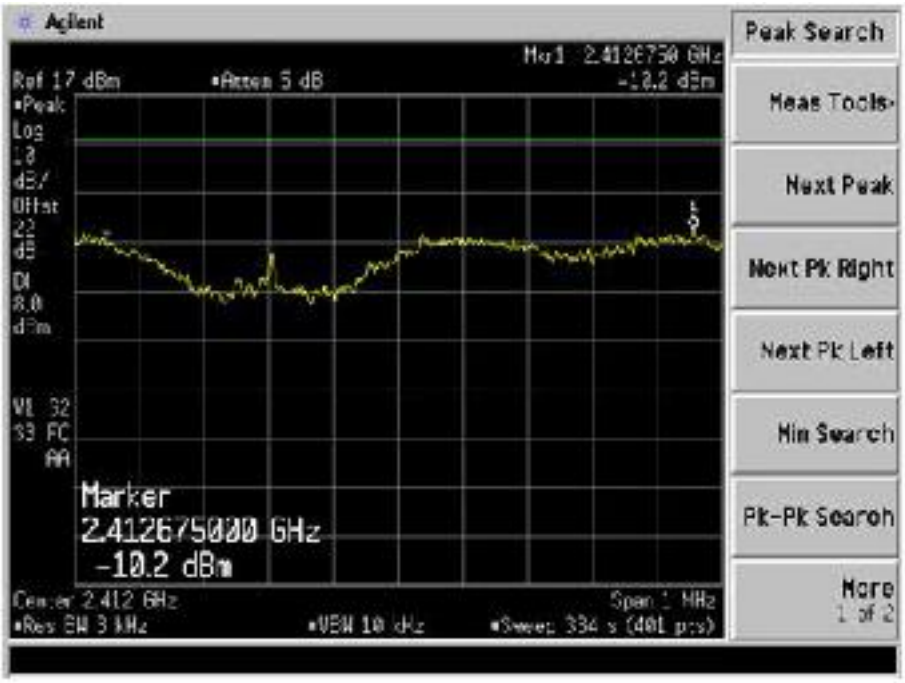


Plot 107 – Channel 1 @ BPSK 9Mbps

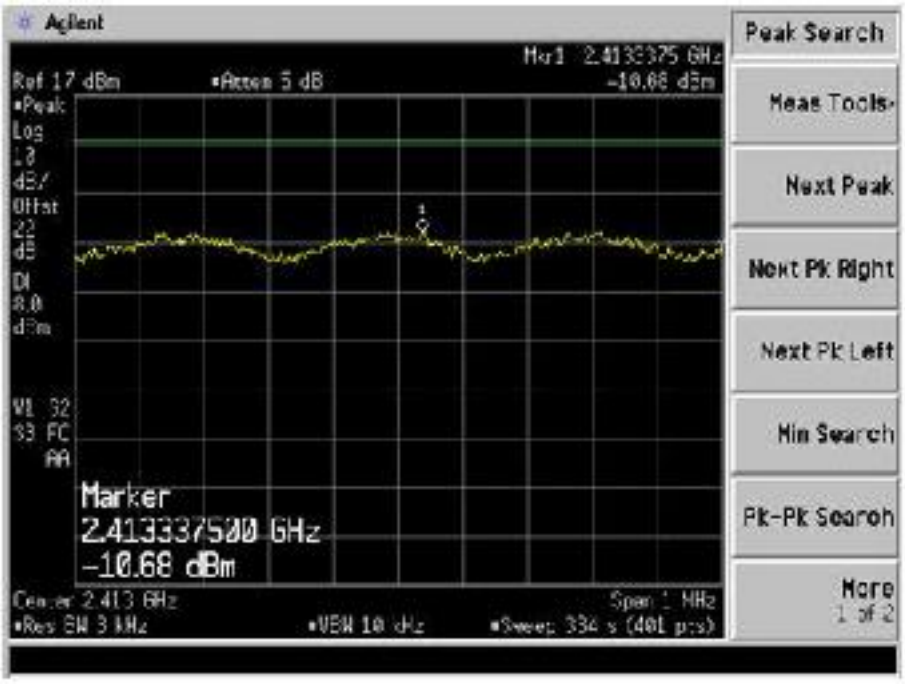


Plot 108 – Channel 1 @ QPSK 18Mbps

Peak Power Spectral Density Plots – 802.11g

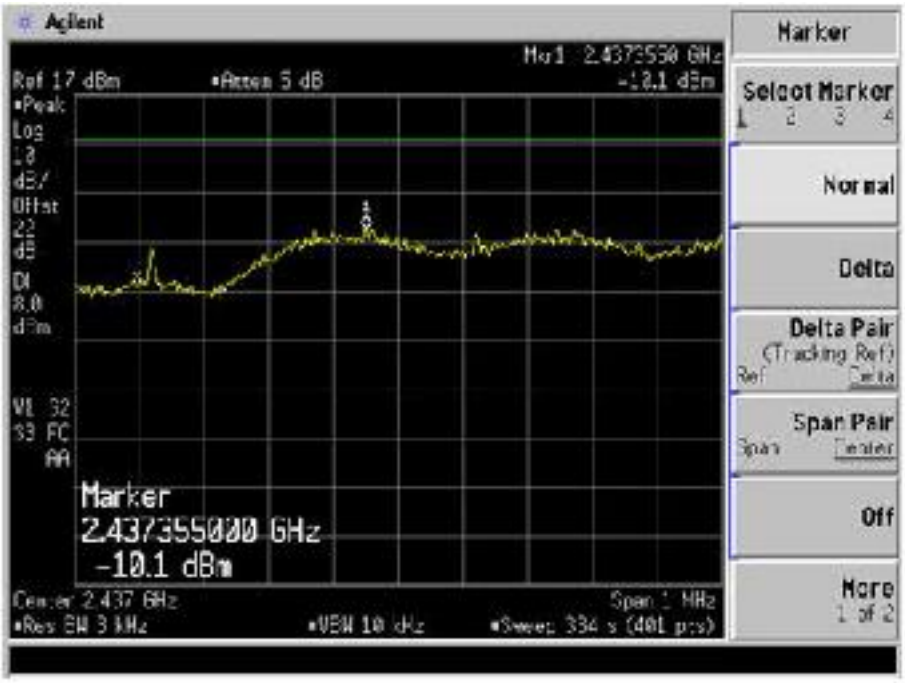


Plot 109 – Channel 1@ 16QAM 36Mbps

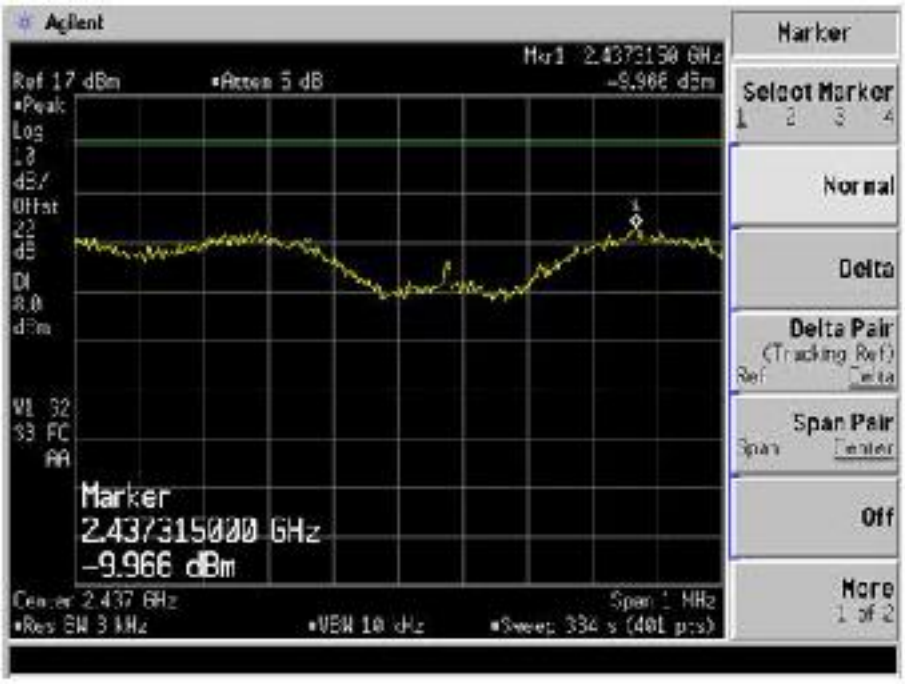


Plot 110 – Channel 1 @ 64QAM 54Mbps

Peak Power Spectral Density Plots – 802.11g

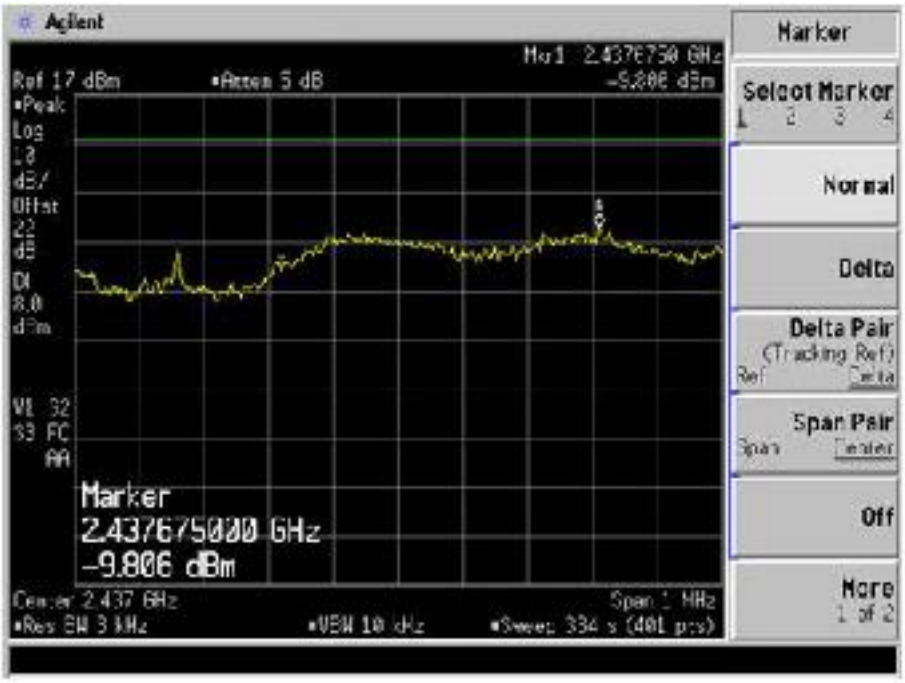


Plot 111 – Channel 6 @ BPSK 9Mbps

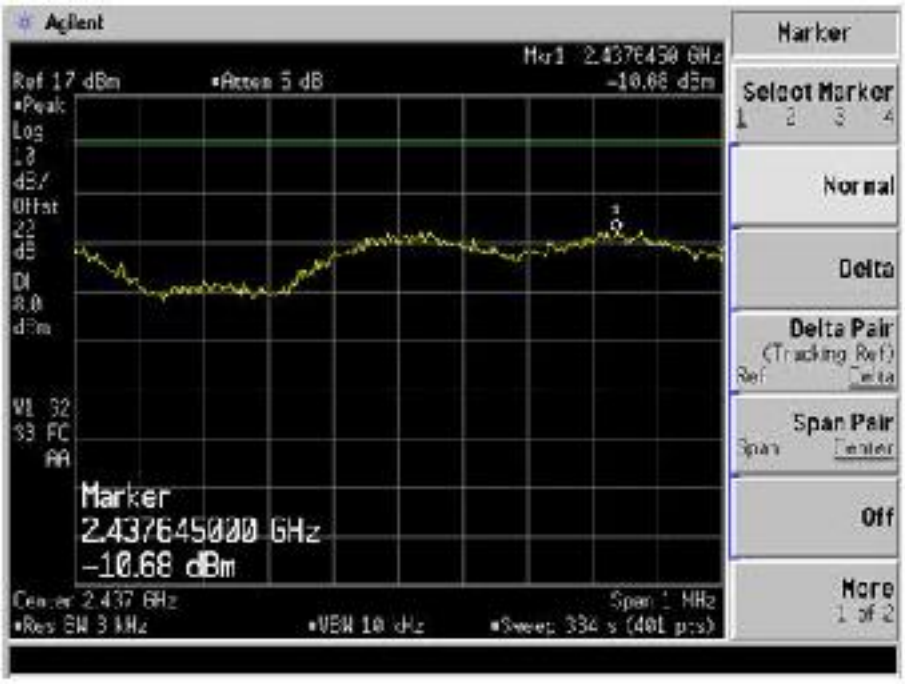


Plot 112 – Channel 6 @ QPSK 18Mbps

Peak Power Spectral Density Plots – 802.11g

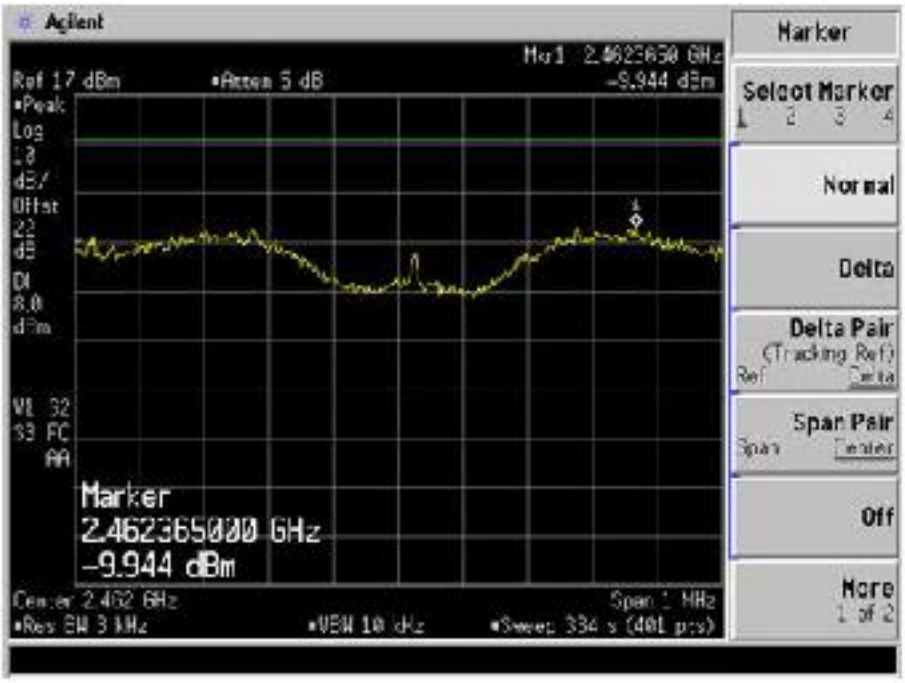


Plot 113 – Channel 6 @ 16QAM 36Mbps

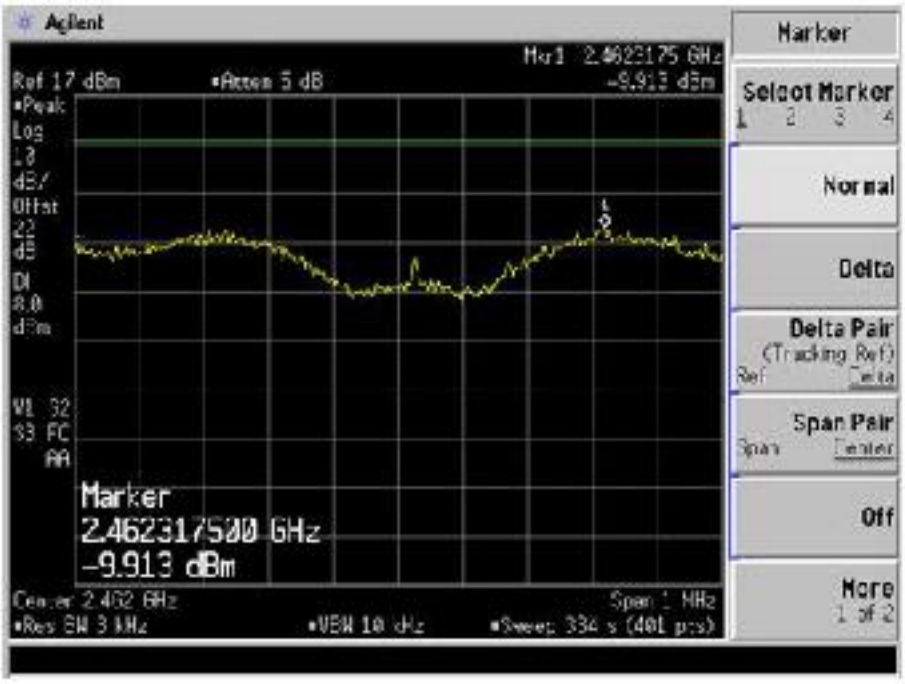


Plot 114 – Channel 6 @ 64QAM 54Mbps

Peak Power Spectral Density Plots – 802.11g

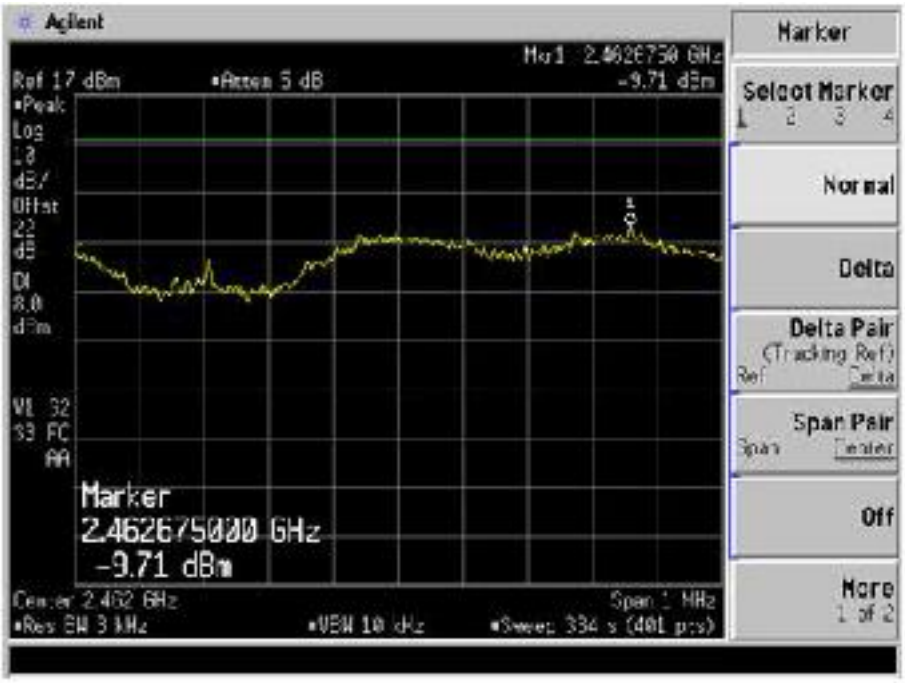


Plot 115 – Channel 11 @ BPSK 9Mbps

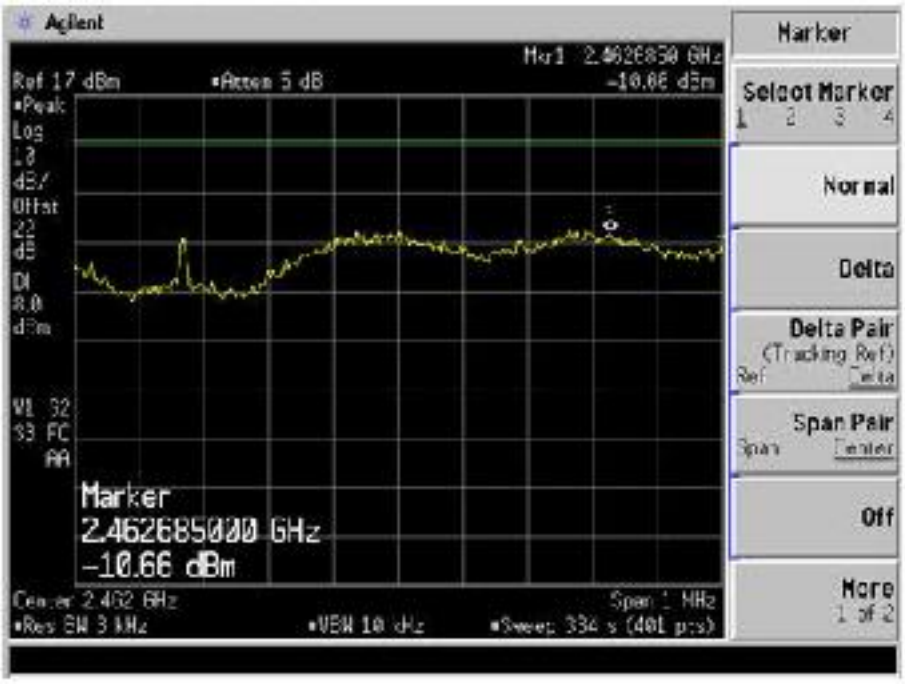


Plot 116 – Channel 11 @ QPSK 18Mbps

Peak Power Spectral Density Plots – 802.11g



Plot 117 – Channel 11 @ 16QAM 36Mbps



Plot 118 – Channel 11 @ 64QAM 54Mbps

47 CFR 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^2)	Average Time (min)
0.3 - 1.34	614	1.63	100 Note 2	30
1.34 - 30	824 / f	2.19 / f	$180 / f^2$ Note 2	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				

47 CFR FCC Part 1.1310 Maximum Permissible Exposure Computation

The power density at 20cm distance was computed from the following formula:

$S = (30GP) / (377d^2)$

where S = Power density in W/m^2
P = 0.0468W
d = Test distance at 0.2m
G = Numerical isotropic gain, 1.0 (0.0dBi)

Substituting the relevant parameters into the formula:

$S = [(30GP) / 377d^2]$
$= 0.0004 W/m^2$
$= 0.00004 mW/cm^2$

∴ The power density of the EUT at 20cm distance is $0.00004 mW/cm^2$ based on the above computation and found to be lower thant the power density limit of $1.0 mW/cm^2$.

Please note that this Report is issued under the following terms:

1. 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. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.

2. 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.

3. Nothing in this report shall be interpreted to mean that TÜV SÜD PSB has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.

4. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to TÜV SÜD PSB or to the report or results furnished by TÜV SÜD PSB in any advertisements or sales promotion.

5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

July 2011

ANNEX A

EUT PHOTOGRAPHS / DIAGRAMS

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS – MAIN UNIT

Front View

Rear View

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS - HANDSET

Front View

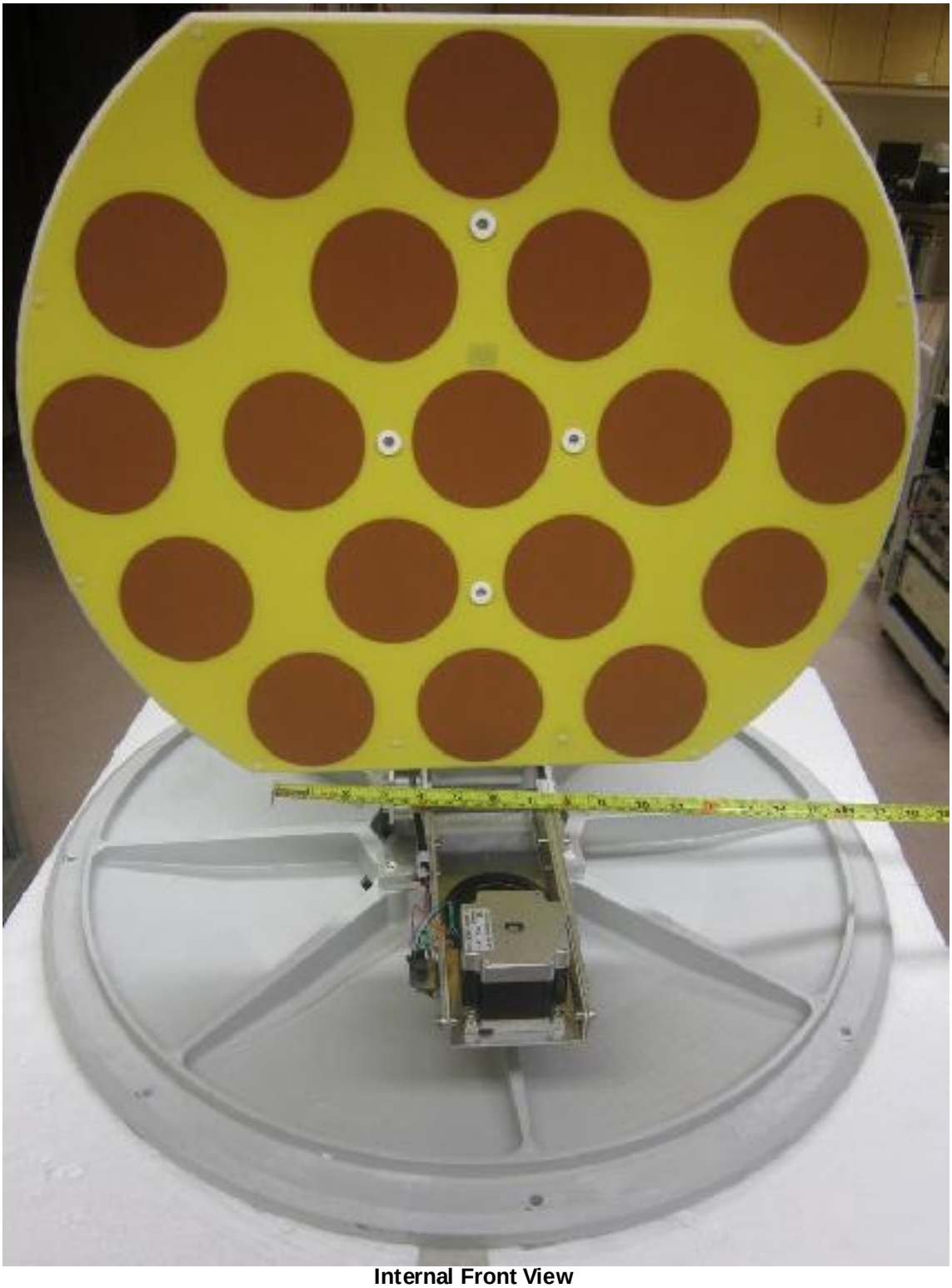
Rear View

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS – ANTENNA UNIT

Front View

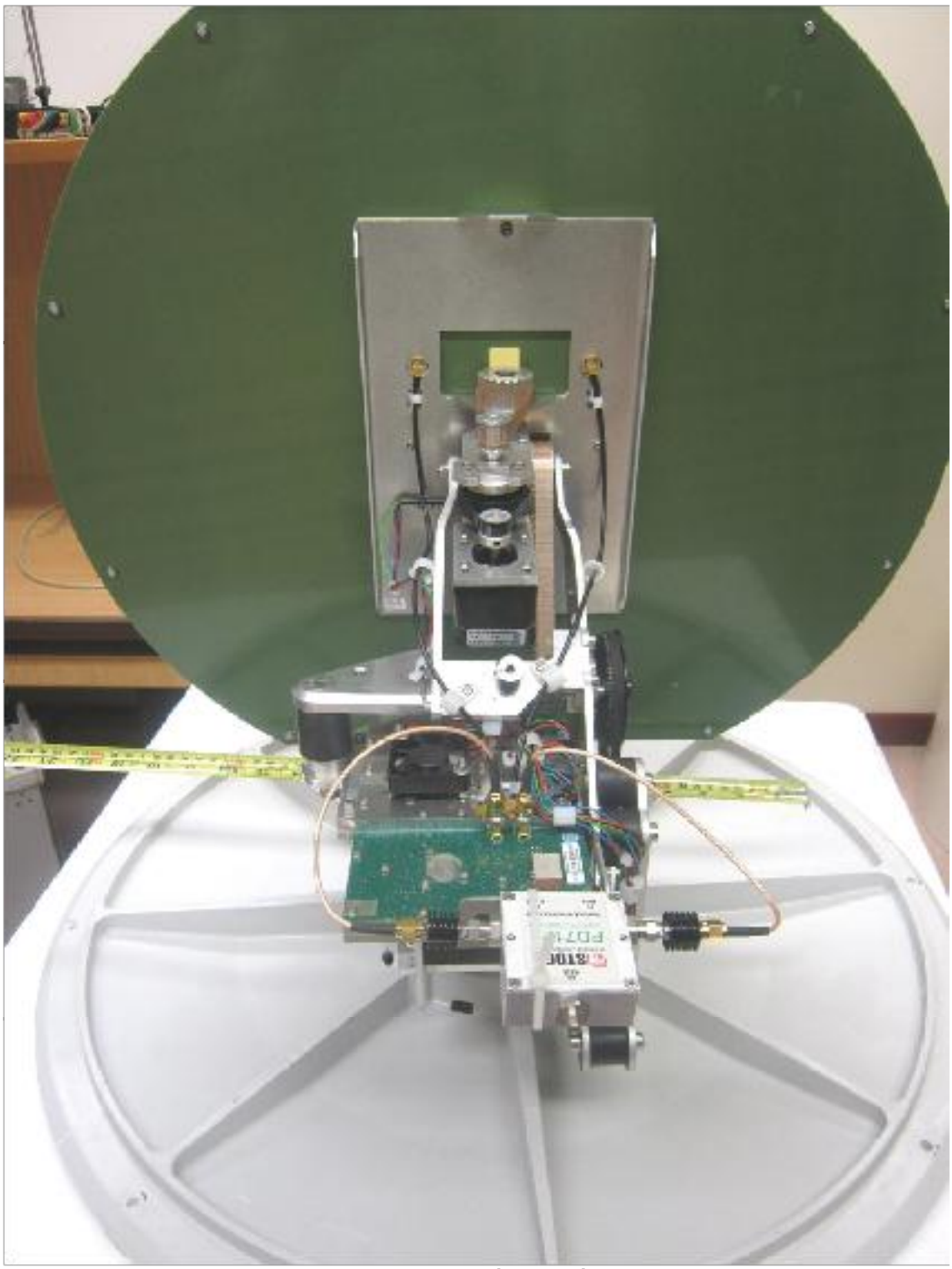
EUT PHOTOGRAPHS – ANTENNA UNIT



Internal Front View

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS – ANTENNA UNIT



Internal Rear View

EUT PHOTOGRAPHS – ANTENNA UNIT

RF ATC Board PCB Component Side

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS – MAIN UNIT

Internal View

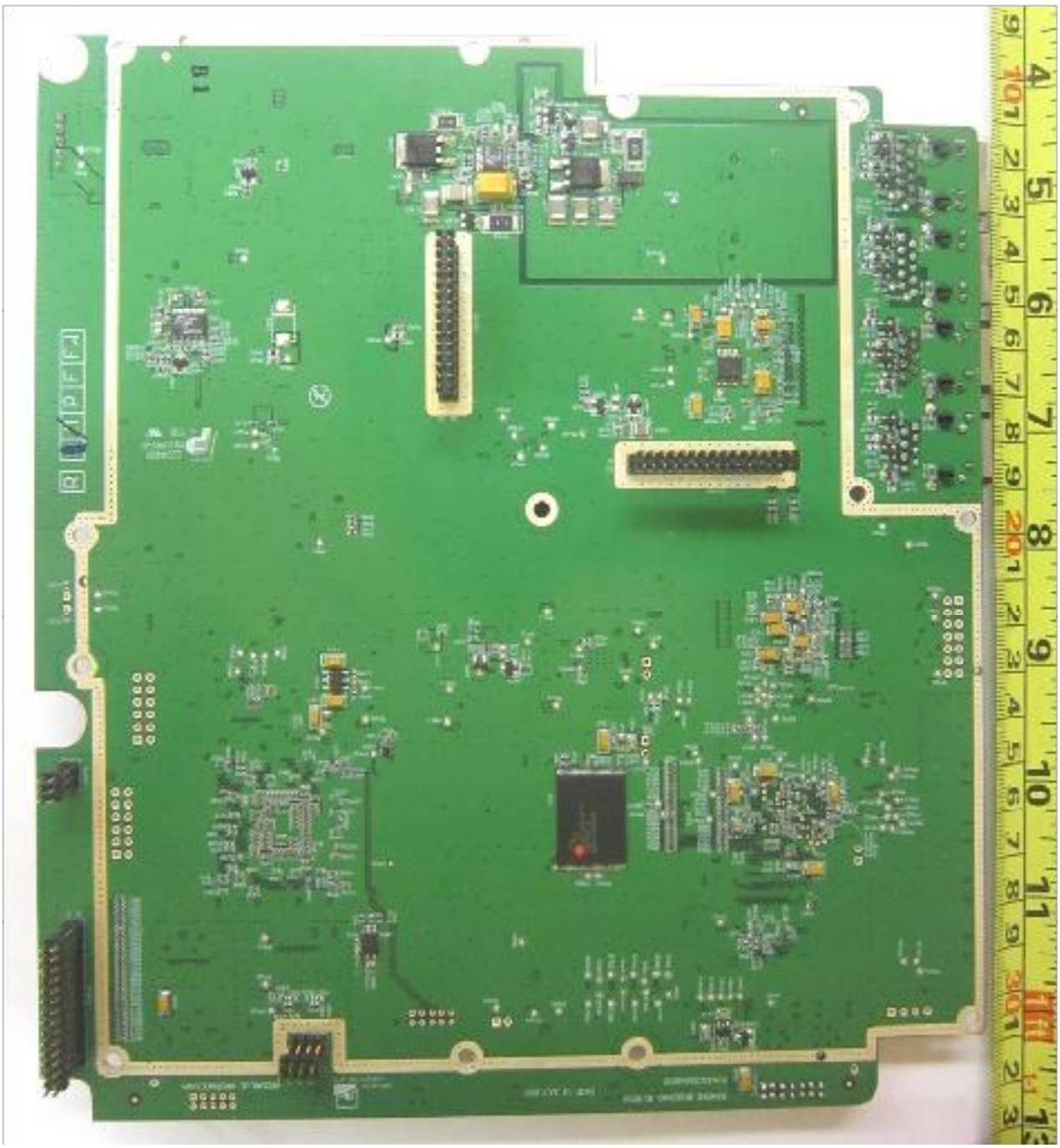
ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS – MAIN UNIT

BaseBand PCB Component Side

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS – MAIN UNIT

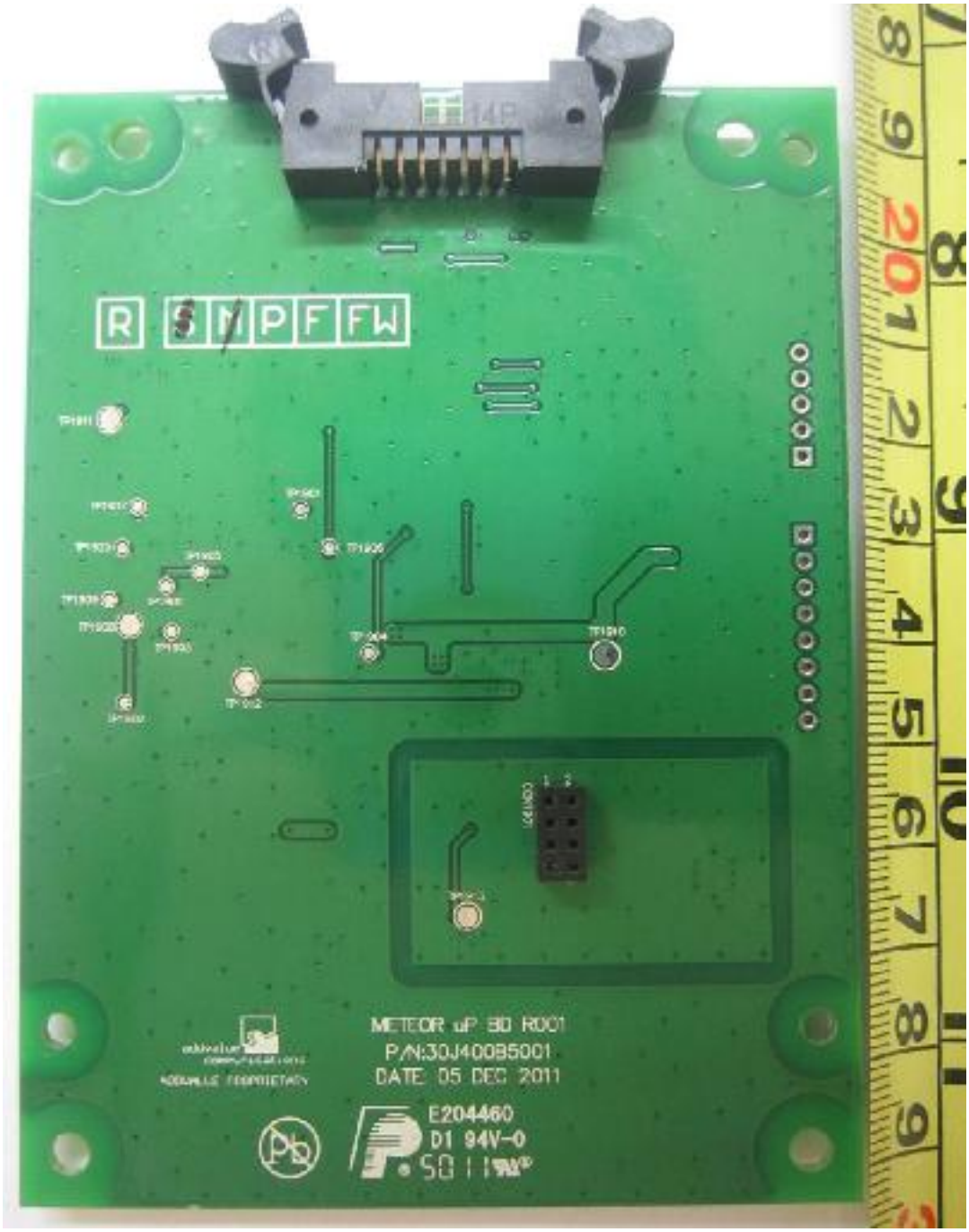


BaseBand PCB Trace Side

EUT PHOTOGRAPHS – MAIN UNIT

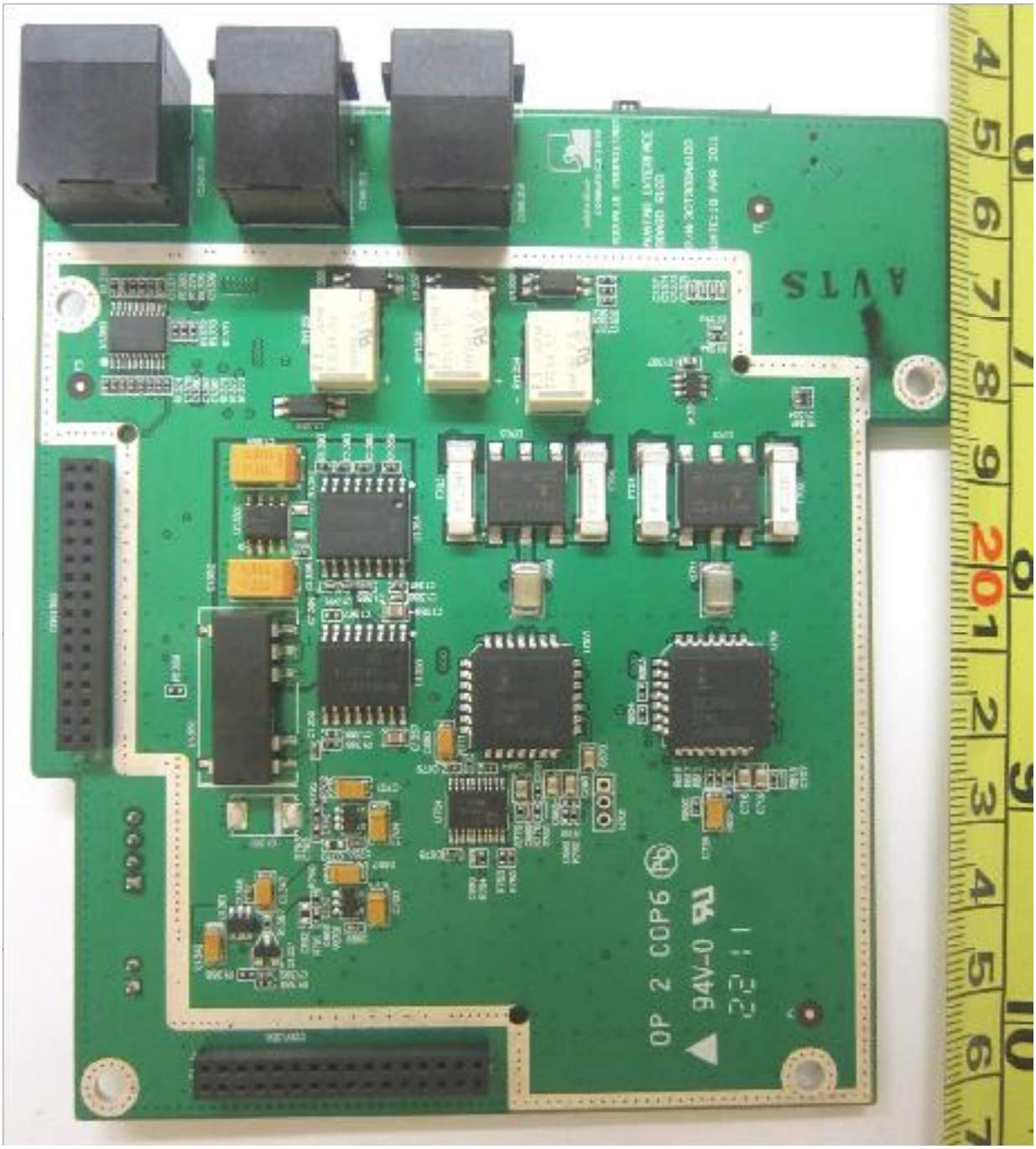
Microprocessor Board PCB Component Side

EUT PHOTOGRAPHS – MAIN UNIT



Microprocessor Board PCB Trace Side

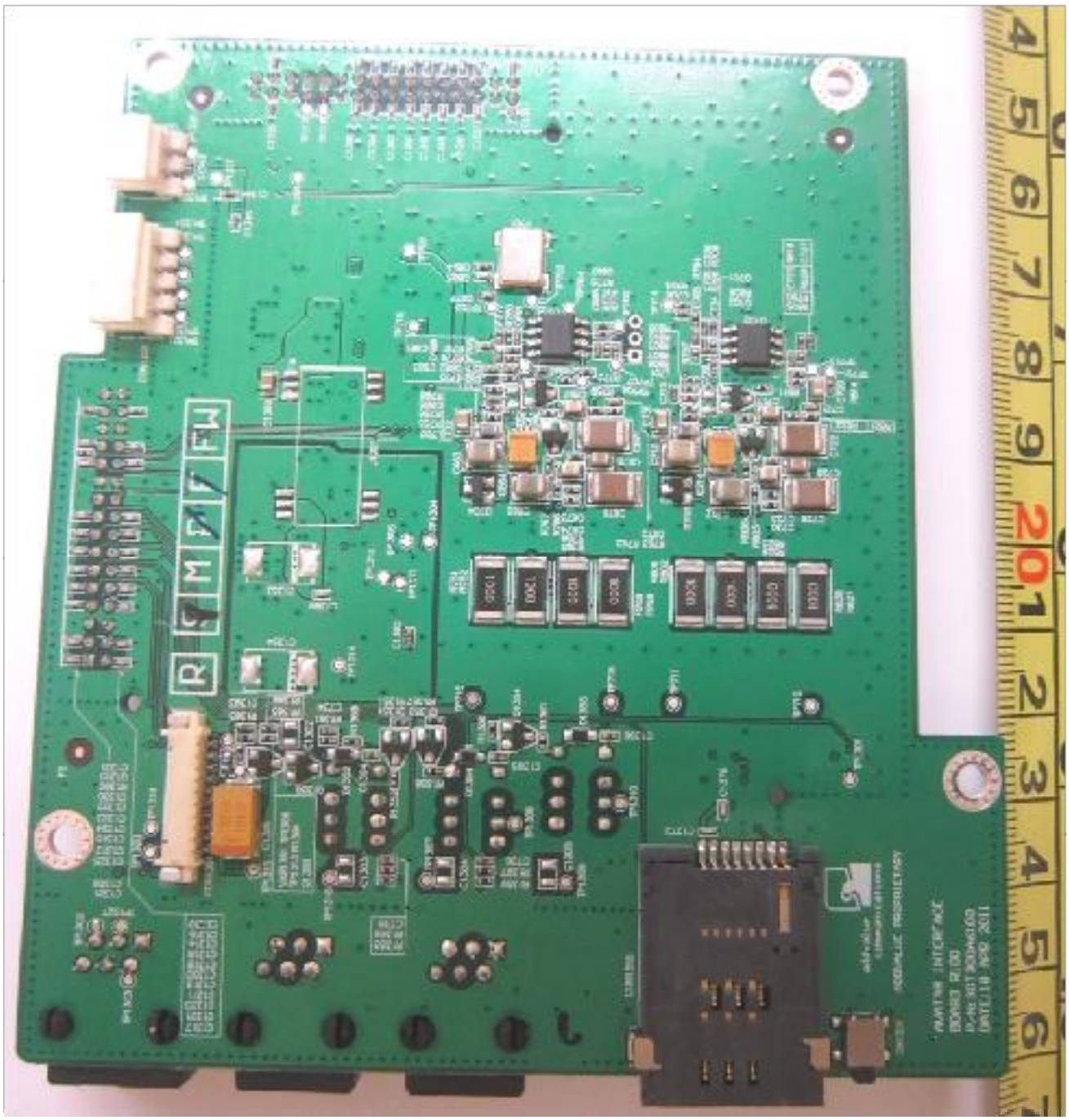
EUT PHOTOGRAPHS – MAIN UNIT



Interface Board PCB Component Side

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

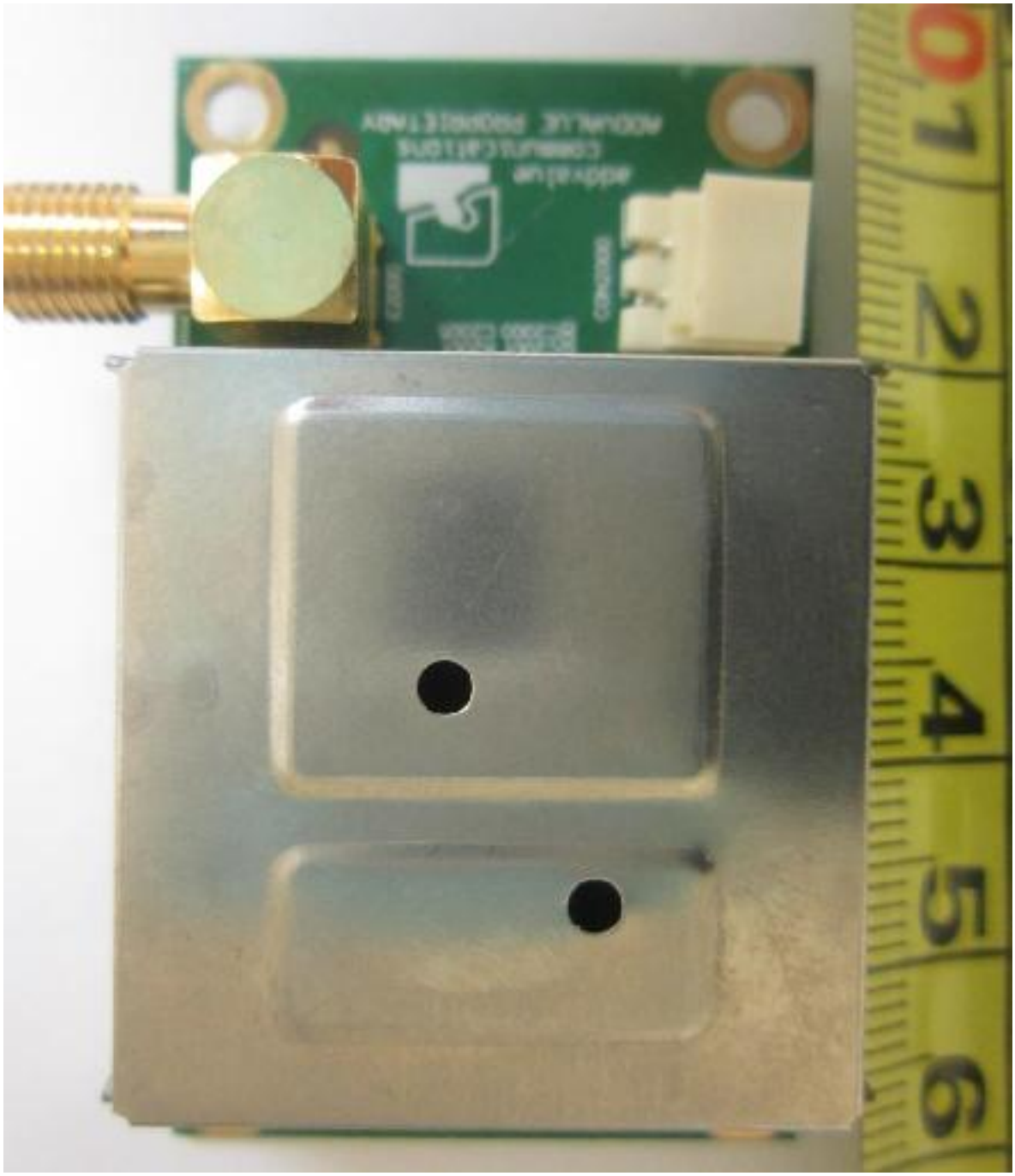
EUT PHOTOGRAPHS – MAIN UNIT



Interface Board PCB Trace Side

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS – MAIN UNIT



Crystal Board PCB Component Side

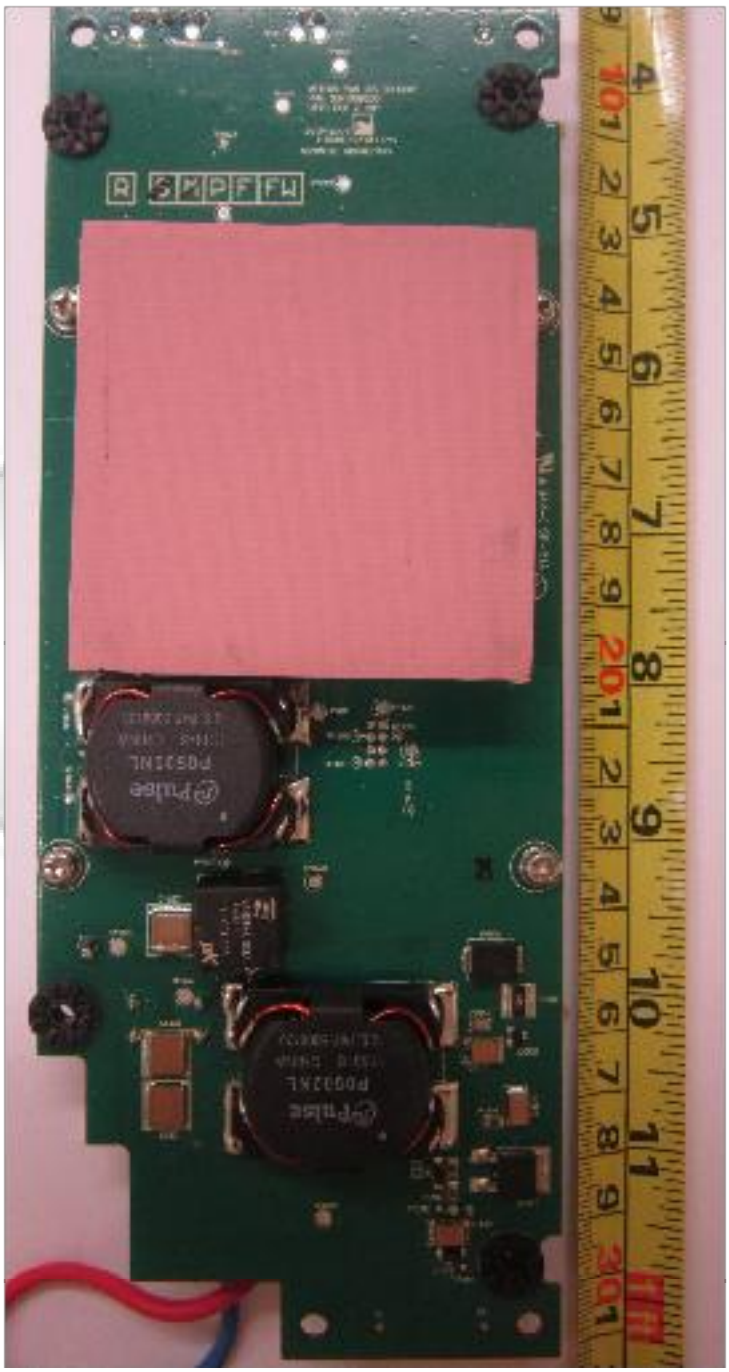
EUT PHOTOGRAPHS – MAIN UNIT

Crystal Board PCB Trace Side

EUT PHOTOGRAPHS – MAIN UNIT

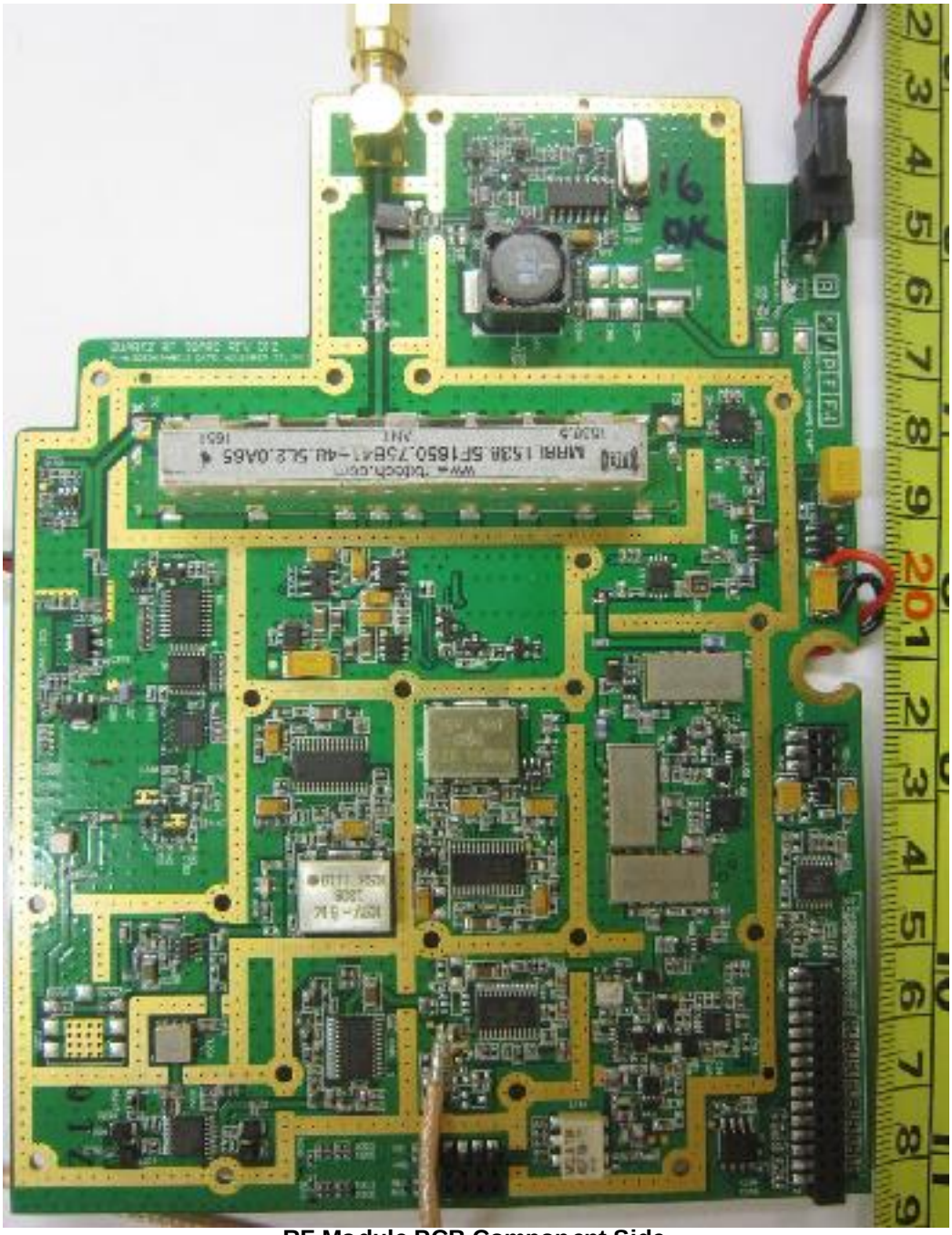
Power Supply PCB Component Side

EUT PHOTOGRAPHS – MAIN UNIT



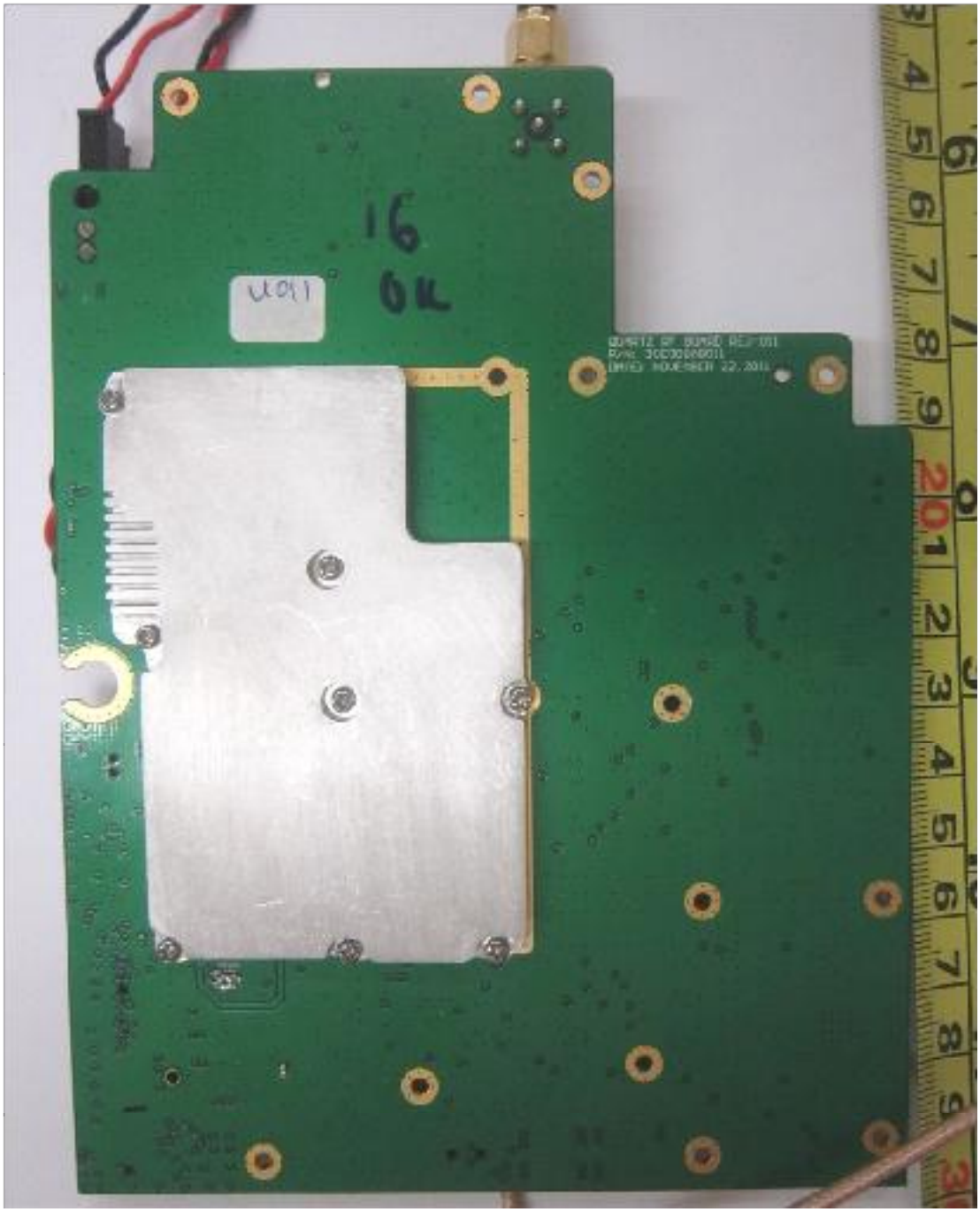
Power Supply PCB Trace Side

EUT PHOTOGRAPHS – MAIN UNIT



RF Module PCB Component Side

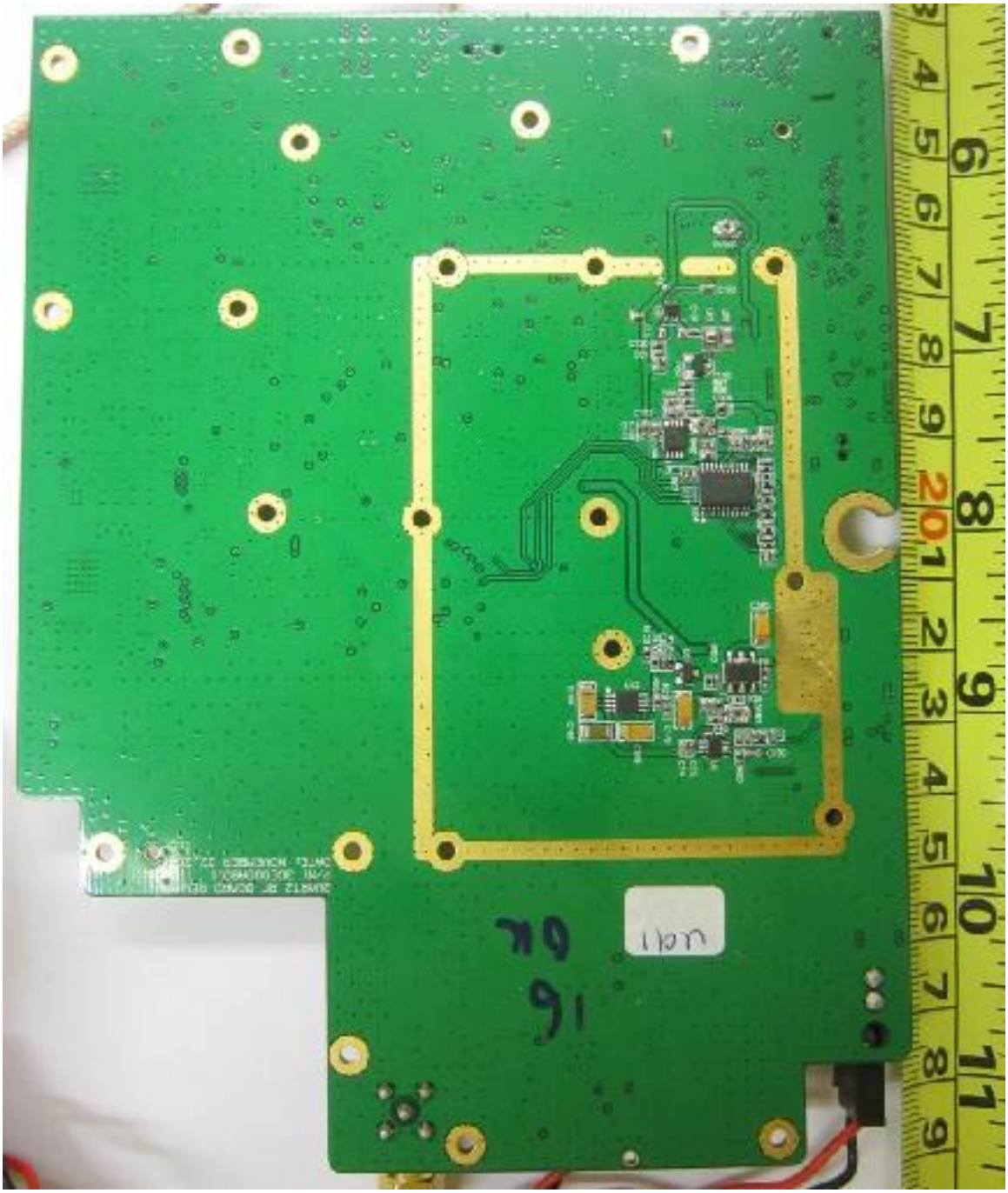
EUT PHOTOGRAPHS – MAIN UNIT



RF Module PCB Trace Side

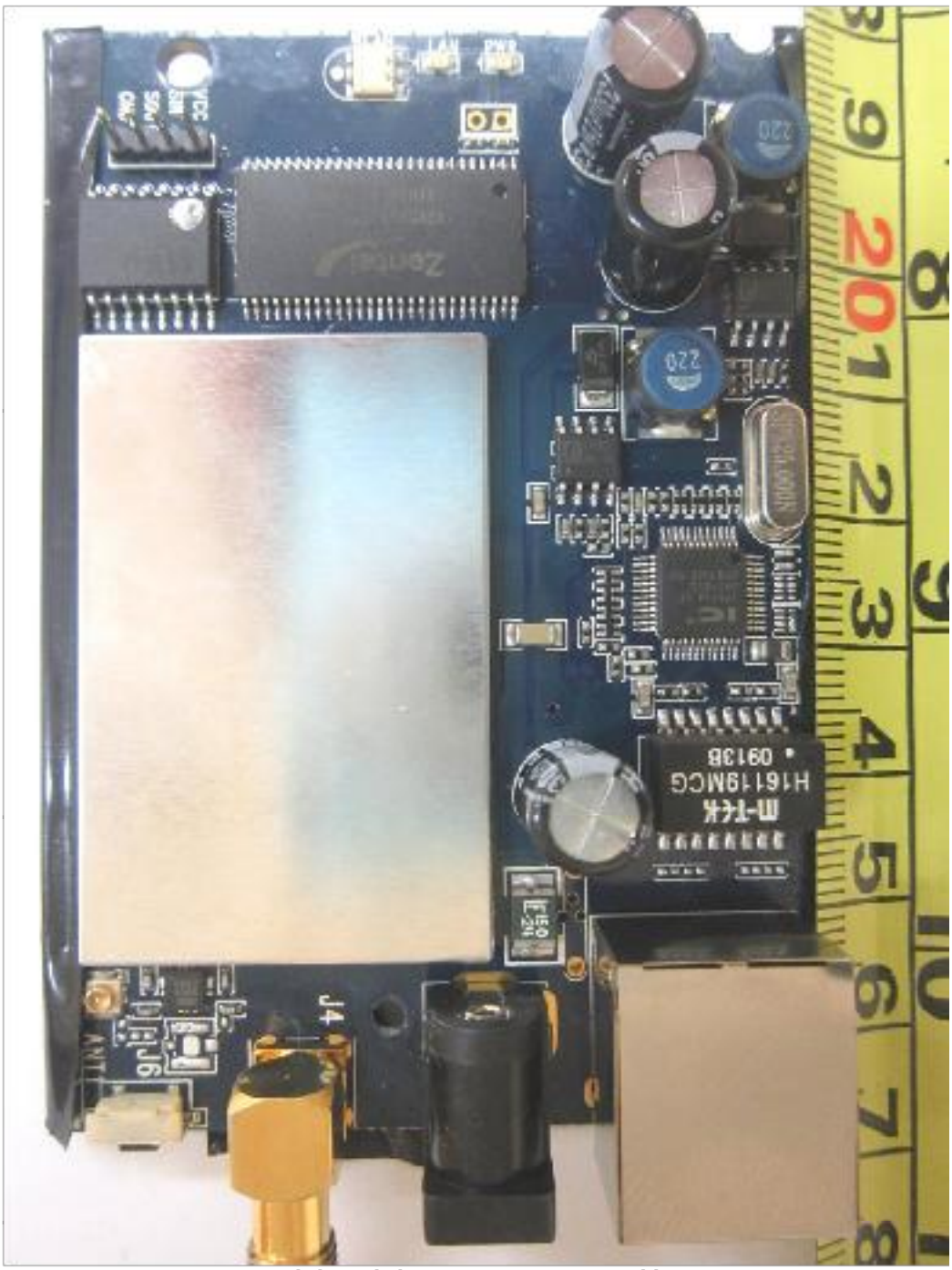
ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS



RF Module Circuit with RF Shield Removed

EUT PHOTOGRAPHS – MAIN UNIT



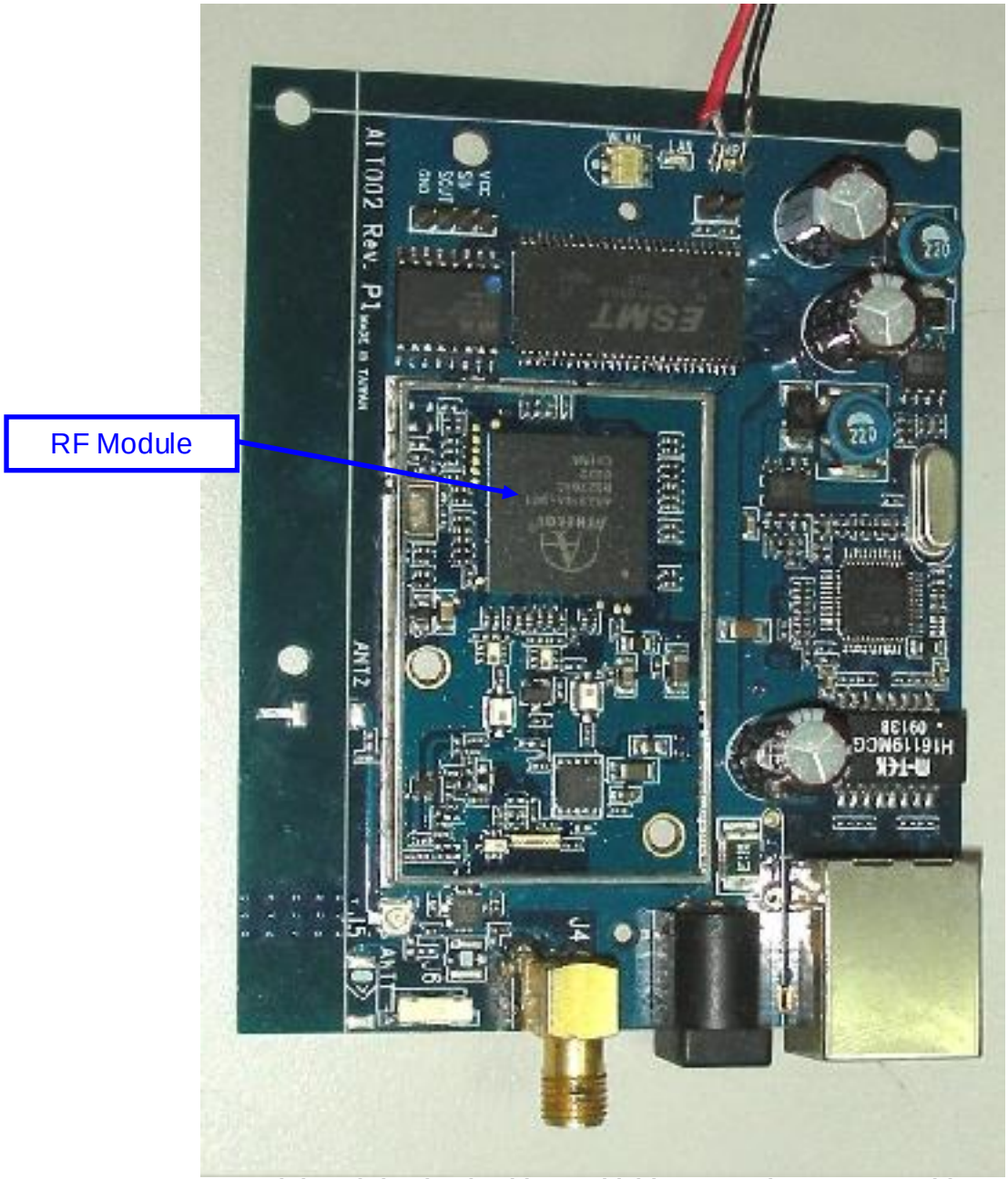
WiFi Module PCB Component Side

ANNEX A EUT PHOTOGRAPHS / DIAGRAMS

EUT PHOTOGRAPHS – MAIN UNIT

WiFi Module PCB Trace Side

EUT PHOTOGRAPHS



WiFi Module Circuit with RF Shield Removed Conponent Side

EUT PHOTOGRAPHS

WiFi Module Circuit with RF Shield Removed Trace Side

ANNEX B

FCC LABEL & POSITION

ANNEX B FCC LABEL & POSITION

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.

Sample Label

Physical Location of FCC Label on EUT

ANNEX C

USER MANUAL
TECHNICAL DESCRIPTION
BLOCK & CIRCUIT DIAGRAMS

(Please refer to manufacturer for details)