FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

Chengdu USEE Digital Technology Co., Ltd.

No.6 Chuangye Road, Chengdu, Sichuan, P. R. China

FCC ID: OLIKT-IH0932I
Model Number: KT-IH0932I

Report Type:	**Product Type:**
Original Report	IPTV HD STB with Wi-Fi

Test Engnieer:	Kate Yang
Report Number:	RSC120702001
Report Date:	2012-07-16 to 2012-07-17
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1 - GENERAL INFORMATION

1.1 Product Description for Equipment under Test (EUT)

The *Chengdu USEE Digital Technology Co., Ltd.'s* product, model number: *KT-IH0932I (FCC ID: OLIKT-IH0932I))* or the "EUT" as referred to in this report is a *IPTV HD STB*, rated input voltage: DC 12V.

1.2 Mechanical Description of EUT

The EUT is measured approximately 145 mm L x 189 mm W x 36 mm H.

Power Adapter:
Manufacturer: GSP
Model: GSCU1500S012V18A
Input: 100-240V ~ 50/60Hz max. 0.6A
Output: 12V ⎓ 1.5A

All measurement and test data in this report was gathered from production sample serial number: 0932SL0100000049 provied by manufacturer. The EUT was received on 2012-05-16.

1.3 Objective

This type approval report is prepared on behalf of *Chengdu USEE Digital Technology Co., Ltd.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

1.4 Related Submittal(s)/Grant(s)

N/A.

1.5 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

1.6 Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Chnegdu) to collect test data is located in 5040, HuiLong Wan Plaza, No.1, ShaWan Road, JinNiu District, Chengdu, China

Test site at Bay Area Compliance Laboratories Corp. (Chnegdu) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 21, 2007. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

2 - SYSTEM TEST CONFIGURATION

2.1 Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

2.2 Equipment Modifications

No modification was made to the unit tested.

2.3 EUT Exercise Software

REALTEK 11n Single Chip 9xC USB WLAN NIC Massproduction Kit.

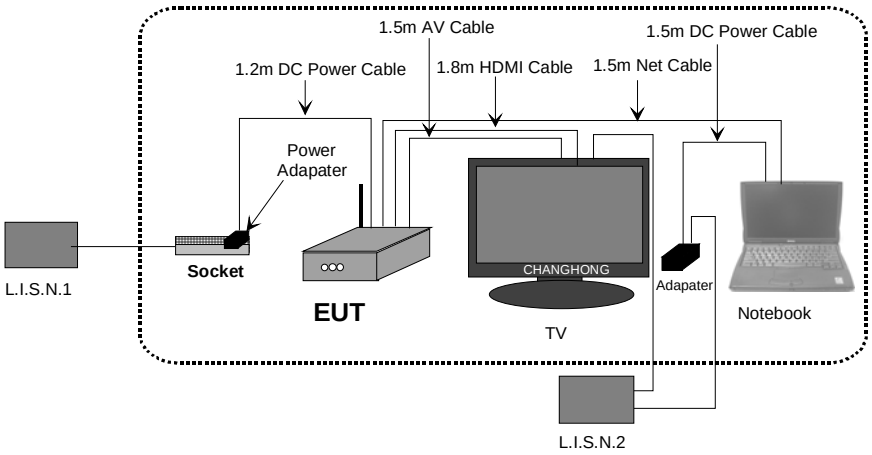
2.4 Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
ChangHong	TV	LT19610	N/A
Lenovo	Notebook	V370	WB04529060

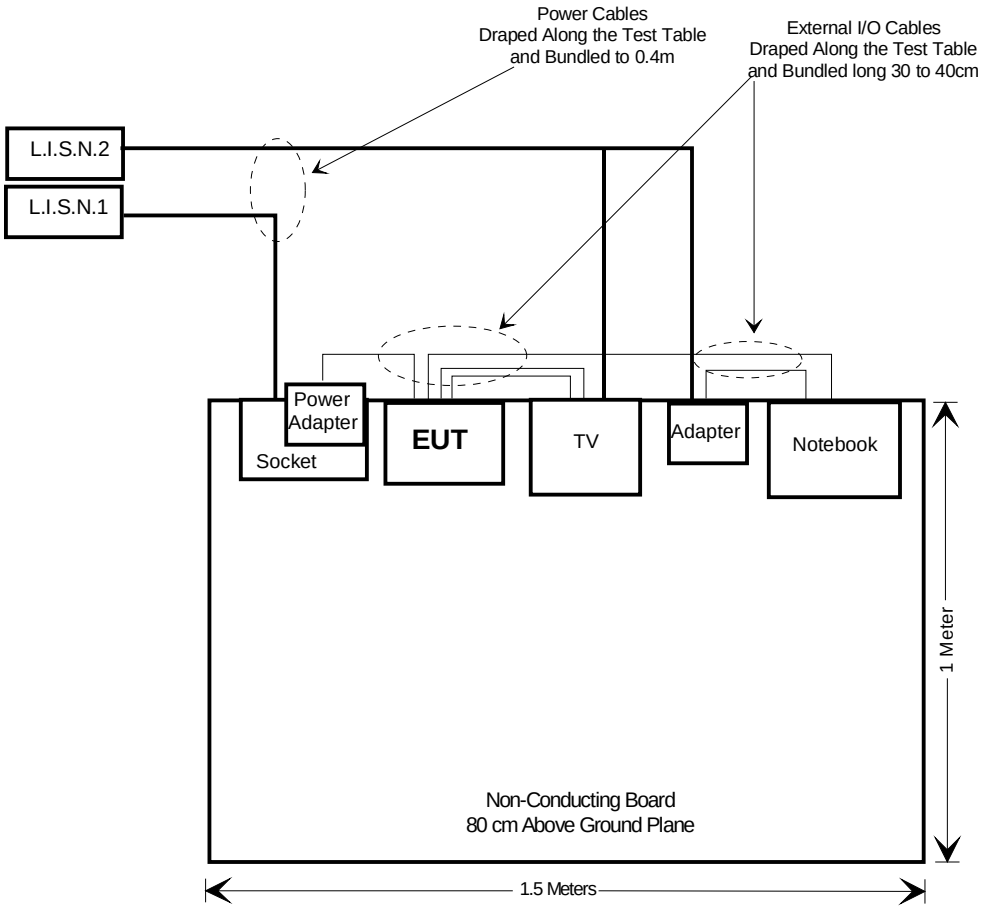
2.5 External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable AV Cable	1.0	EUT	TV
Unshielded Detachable Net Cable	1.5	Notebook	EUT

2.6 Configuration of Test Setup



2.7 Block Diagram of Test Setup



3 - SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliant
§15.207(a)	Conducted Emission	Compliant
§15.247(d)	Spurious Emission At Antenna Port	Compliant
§15.209, §15.205(a)	Restricted Bands and Spurious Emission	Compliant
§15.247(a)(2)	6 dB Emission Bandwidth	Compliant
§15.247(b)(3)	Maximum Peak Output Power	Compliant
§15.247(d)	100 kHz Bandwidth Of Frequency Band Edge	Compliant
§15.247(e)	Power Spectral Density	Compliant

4 - FCC §15.247 (i) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

4.1 Applicable Standard

According to subpart 15.247(i)and subpart §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density;

According to §1.1310 and §2.1091 RF exposure is calculated.

4.2 MPE Calculation

The MPE is predicated at a given distance using the following formulary

$$S = PG/4\pi R^2$$

Where:

S = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = Antenna Gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Mode	**Frequency (MHz)**	**Antenna Gain**		**Conducted Output Power**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
		(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
802.11b	2437	2.0	1.58	14.86	30.61	20	0.096545	1.0
802.11g	2462	2.0	1.58	13.94	24.77	20	0.078114	1.0
802.11n20	2437	2.0	1.58	12.93	19.64	20	0.061906	1.0
802.11n40	2437	2.0	1.58	12.62	18.28	20	0.057641	1.0

Result: The device meets FCC MPE at 20 cm distance.

5 - FCC §15.203 – ANTENNA REQUIREMENT

5.1 Standard Applicable

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

5.2 Antenna Connector Construction

The EUT has one dipole antenna use a unique type of connector to attach to the EUT, which complied with 15.203, the maximum gain is 2.0 dBi, please refer to the EUT photos.

Result: Compliant.

6 - FCC§ 15.207(a) - CONDUCTED EMISSIONS

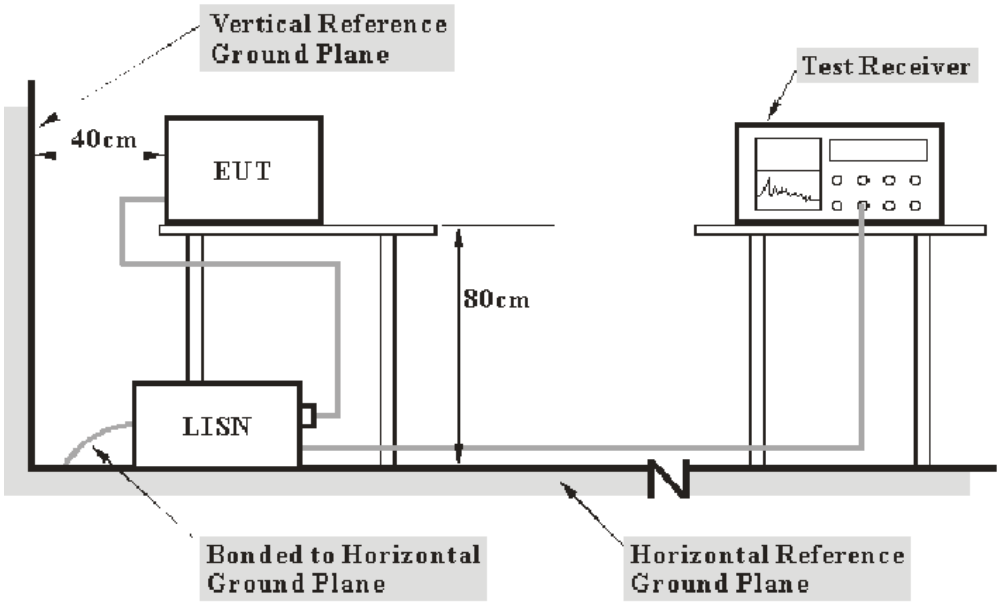
6.1 Applicable Standard

According to FCC § 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dBμV)	
	Quasi-Peak	Average
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5	56	46
5 – 30	60	50

Note: * Decreases with the logarithm of the frequency.

6.2 EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The specification used was in accordance with FCC §15.207(a) limits.

6.3 EMI Test Receiver

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	***IF B/W***
150 kHz – 30 MHz	9 kHz

6.4 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2012-03-26	2013-03-26

6.5 Test Procedure

Maximizing procedure is performed on the six (6) highest emissions to ensure EUT compliance using all installation combination. All data is recorded in the Quasi-peak mode.

Final test data for this test configuration is recorded in the section below.

6.6 Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC §15.207(a), with the worst margin reading of:

12.04 dB at **0.510 MHz** in the **Line** conducted mode
12.31 dB at **0.465 MHz** in the **Neutral** conducted mode

6.7 Conducted Emissions Test Data & Plots

Environmental Conditions

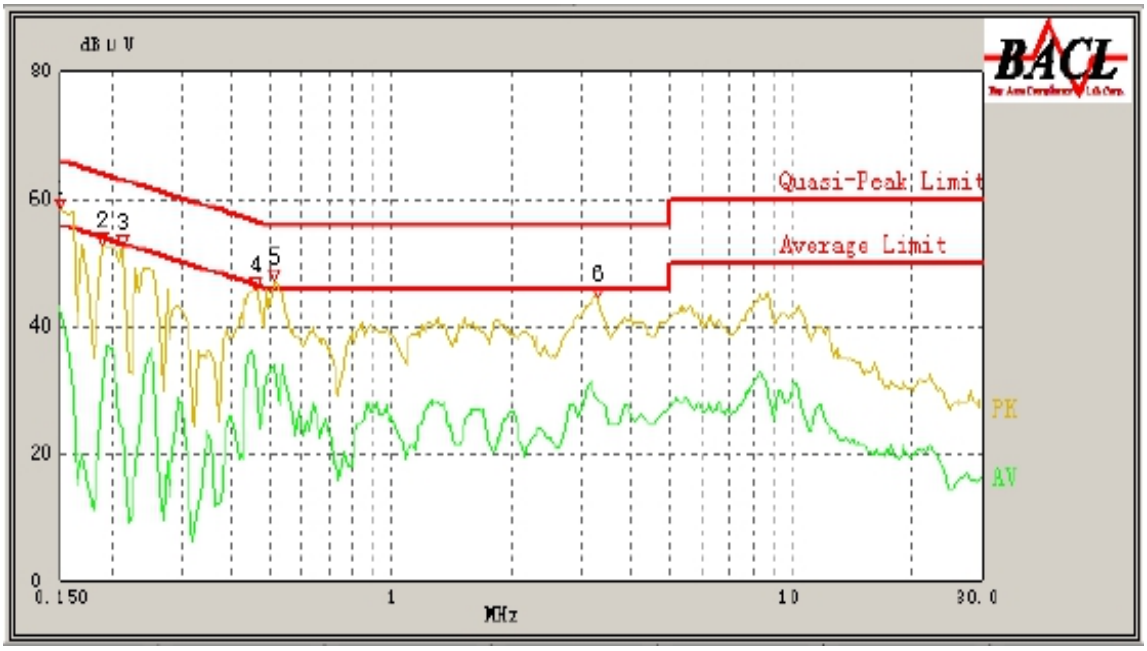
Temperature:	25 ° C
Relative Humidity:	56%
ATM Pressure:	100.0 KPa

The testing was performed by Kate Yang.

Test Result: Compliant, Please see the following tables and plots.

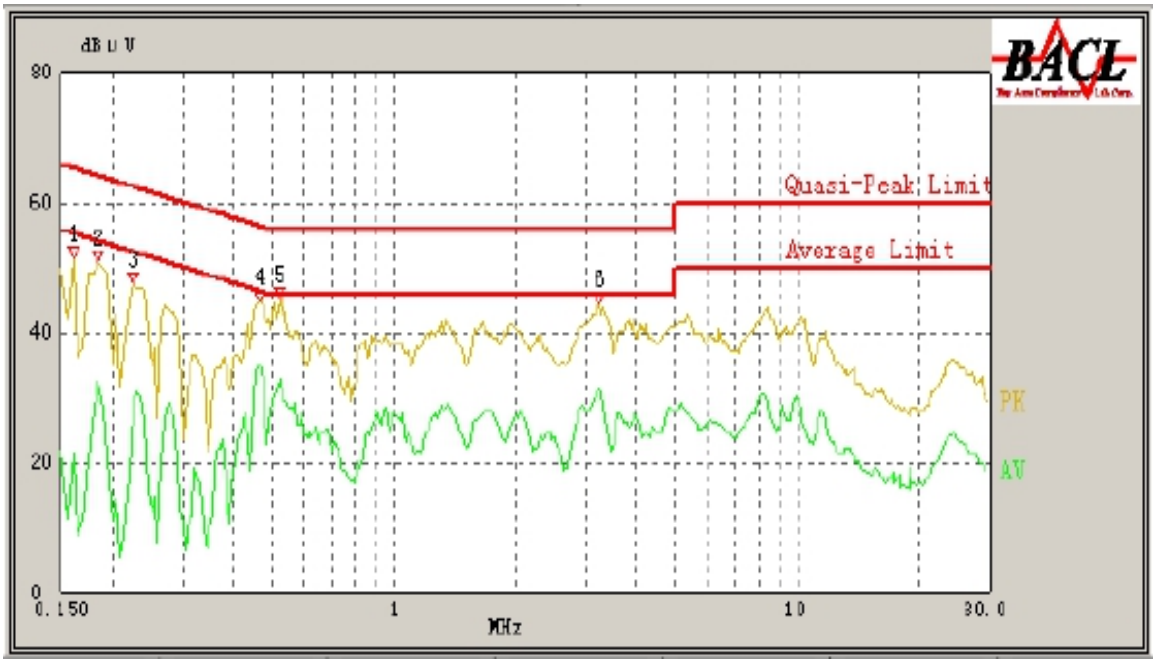
Test mode: transmitting

AC 120 V/60 Hz, Line:



AC Line Conducted Emissions			FCC §15.207		
Frequency (MHz)	**Corrected Amplitude (dBμV)**	**Correction Factor (dB)**	**Limit (dBμV)**	**Margin (dB)**	**Detector (PK/Av/QP)**
0.510	33.96	0.42	46.00	12.04	AV
0.150	53.36	0.40	66.00	12.64	QP
0.150	43.03	0.40	56.00	12.97	AV
0.460	31.62	0.42	47.14	15.52	AV
0.510	40.09	0.42	56.00	15.91	QP
0.190	48.83	0.42	64.86	16.03	QP
3.255	28.99	0.49	46.00	17.01	AV
3.280	37.31	0.49	56.00	18.69	QP
0.460	38.32	0.42	57.14	18.82	QP
0.215	40.97	0.42	64.14	23.17	QP
0.190	30.48	0.42	54.86	24.38	AV
0.215	23.82	0.42	54.14	30.32	AV

AC 120 V/60 Hz, Neutral:



AC Line Conducted Emissions			FCC §15.207		
Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Av/QP)
0.465	34.69	0.42	47.00	12.31	AV
0.520	32.96	0.42	46.00	13.04	AV
0.465	42.09	0.42	57.00	14.91	QP
3.225	31.08	0.49	46.00	14.92	AV
0.520	41.02	0.42	56.00	14.98	QP
3.240	38.92	0.49	56.00	17.08	QP
0.185	47.05	0.41	65.00	17.95	QP
0.225	42.32	0.42	63.86	21.54	QP
0.185	32.44	0.41	55.00	22.56	AV
0.225	28.19	0.42	53.86	25.67	AV
0.160	40.03	0.40	65.71	25.68	QP
0.160	21.56	0.40	55.71	34.15	AV

7 - FCC §15.247(d) & §2.1051 – SPURIOUS EMISSIONS AT ANTENNA PORT

7.1 Applicable Standard

For §15.247(d) in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Requirements: CFR 47, §2.1051.

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in §2.1057.

7.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ 26	8386001028	2011-11-24	2012-11-23

7.3 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

7.4 Test Data

Environmental Conditions

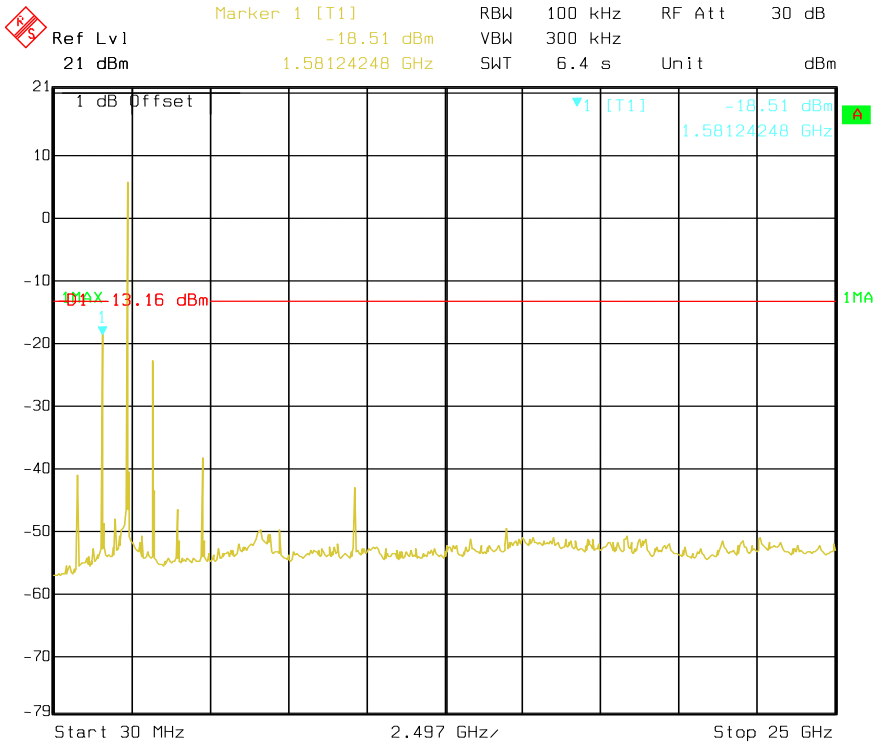
Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	100.9 kPa

** The testing was performed by Kate Yang.*

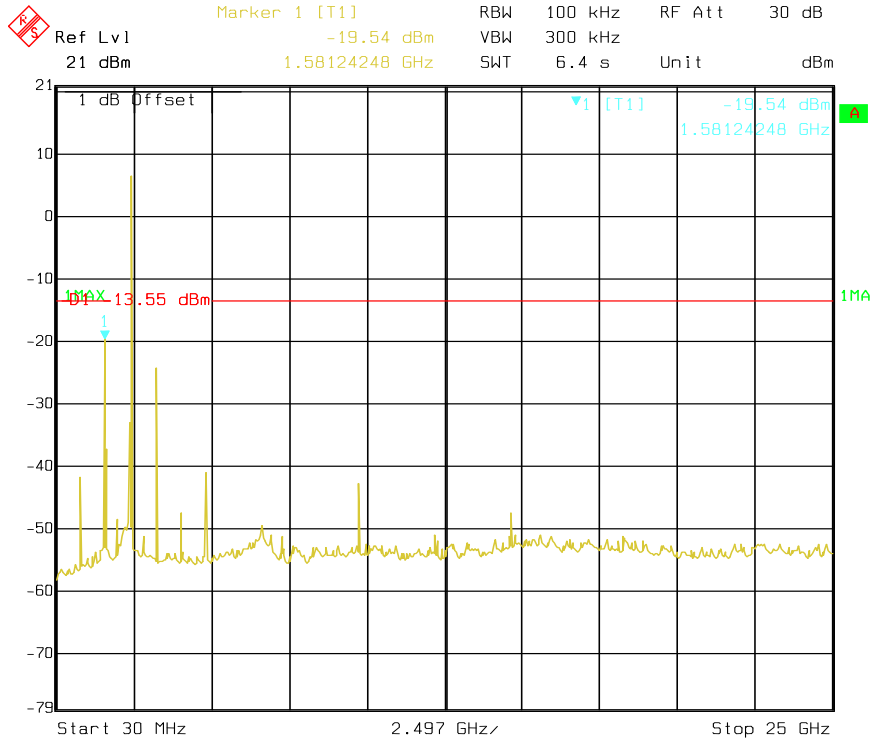
Test Result: Compliant, Please refer to following plots.

Test mode: 802.11b mode

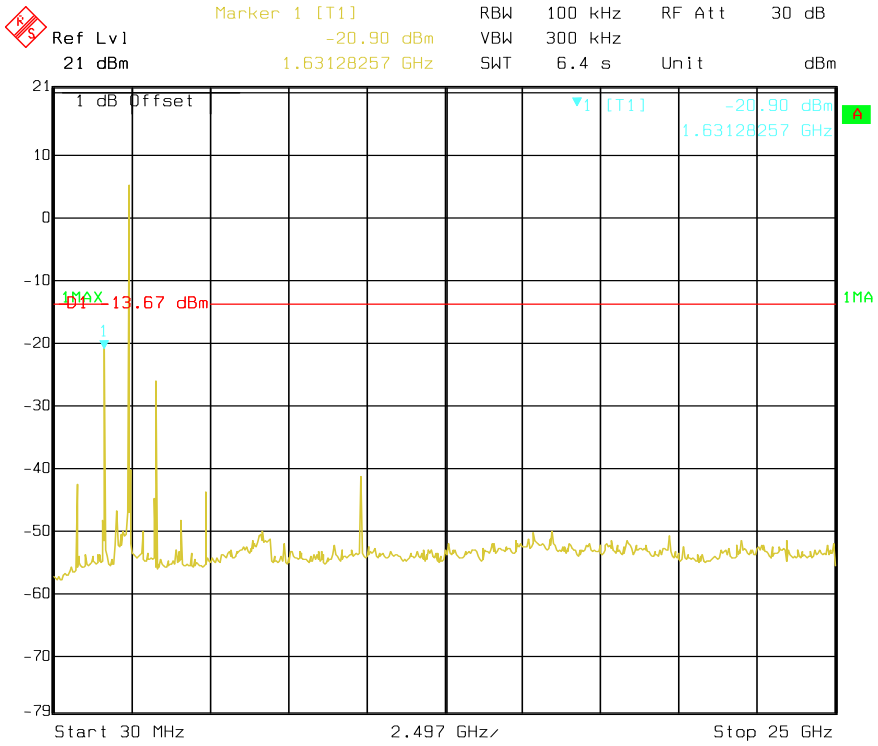
Low Channel



Middle Channel

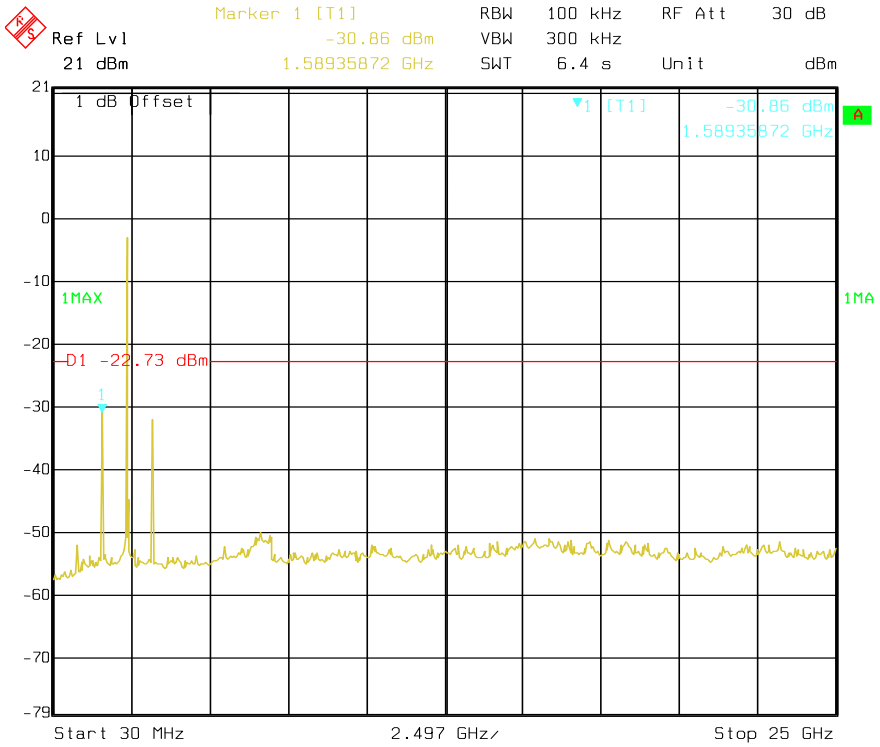


High Channel

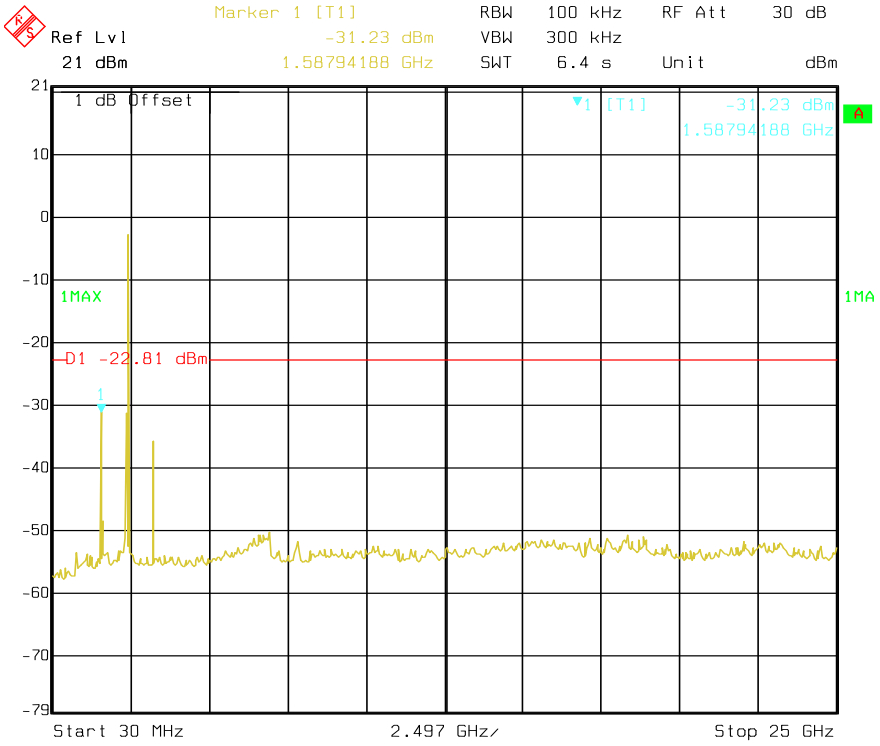


Test mode: 802.11g mode

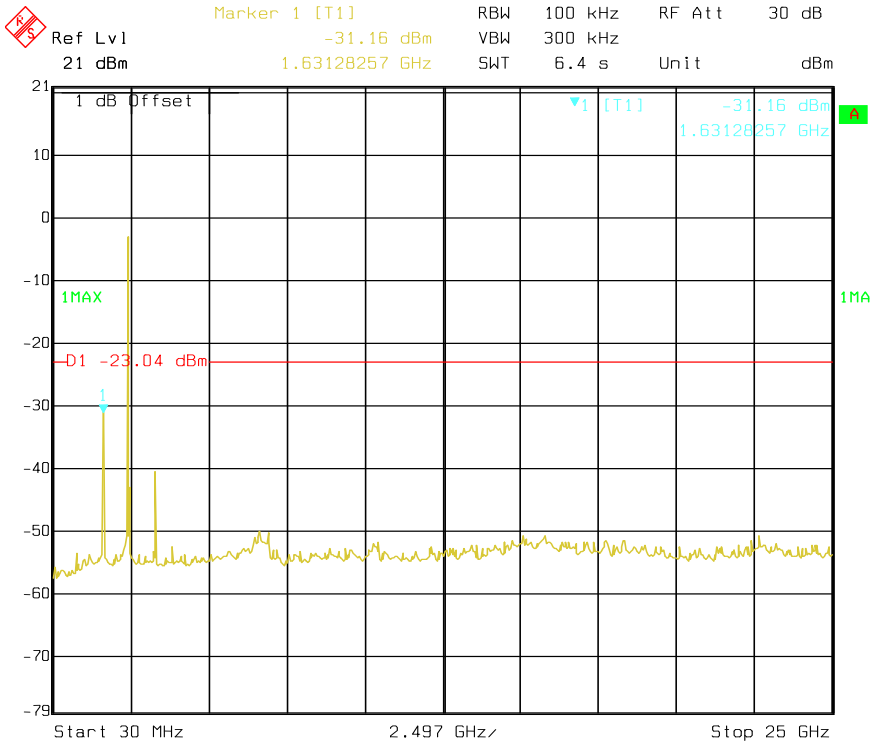
Low Channel



Middle Channel

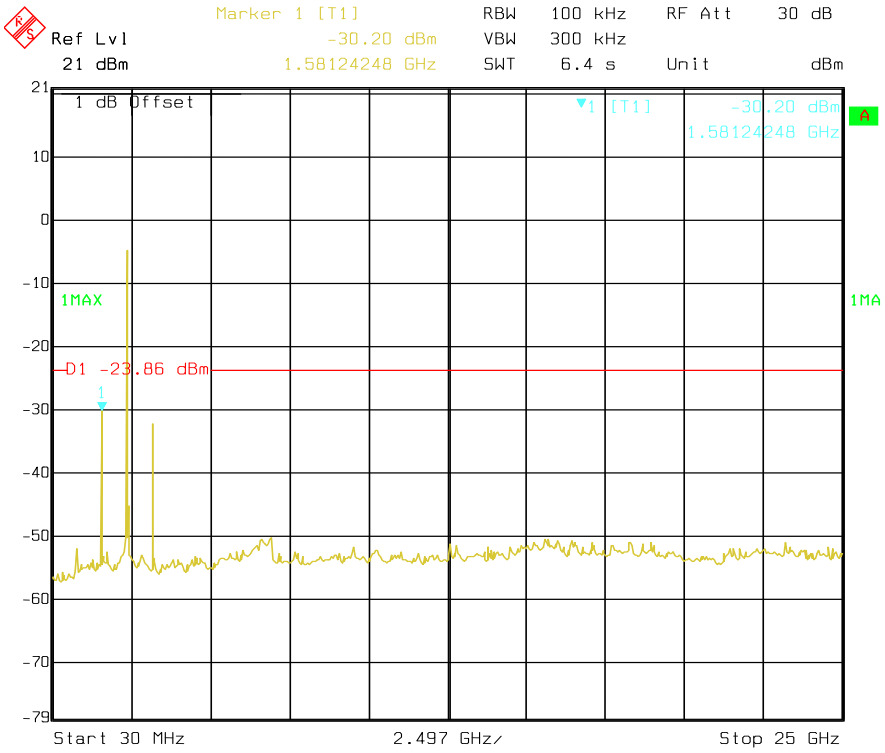


High Channel

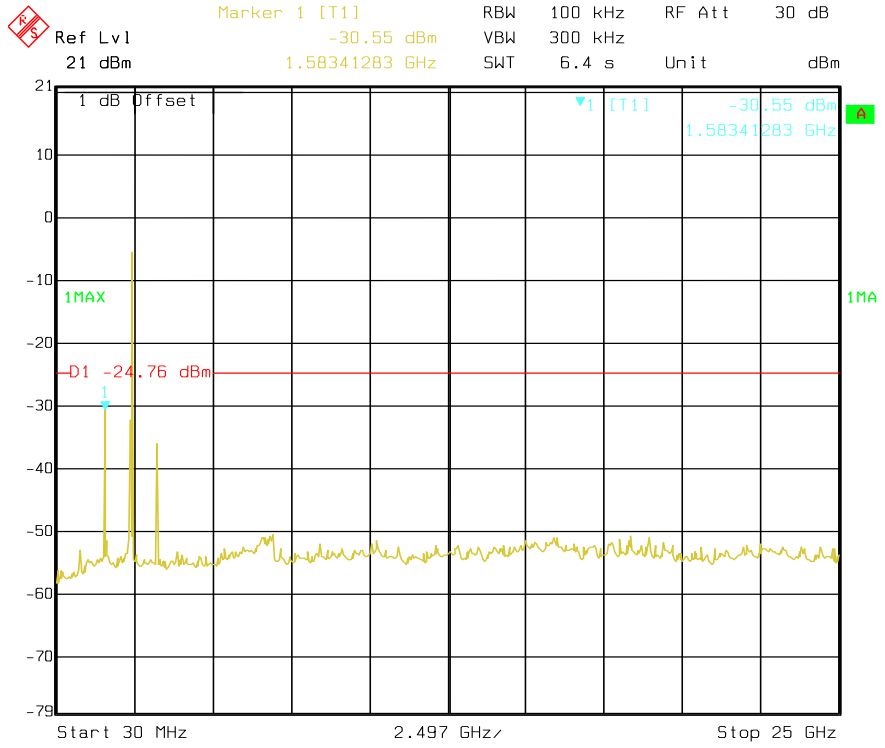


Test mode: 802.11n20 mode

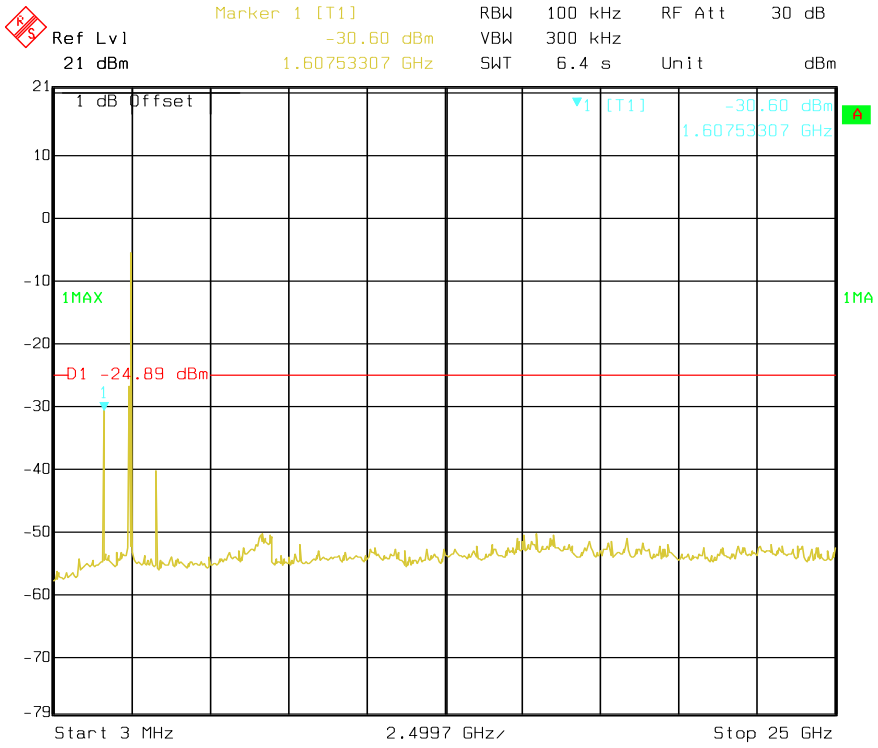
Low Channel



Middle Channel

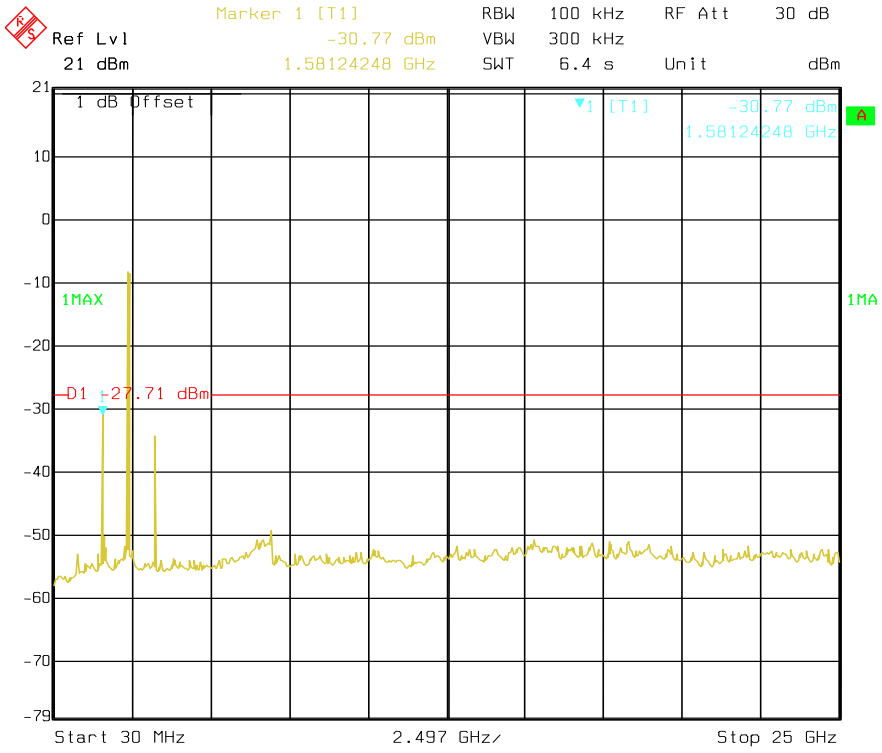


High Channel

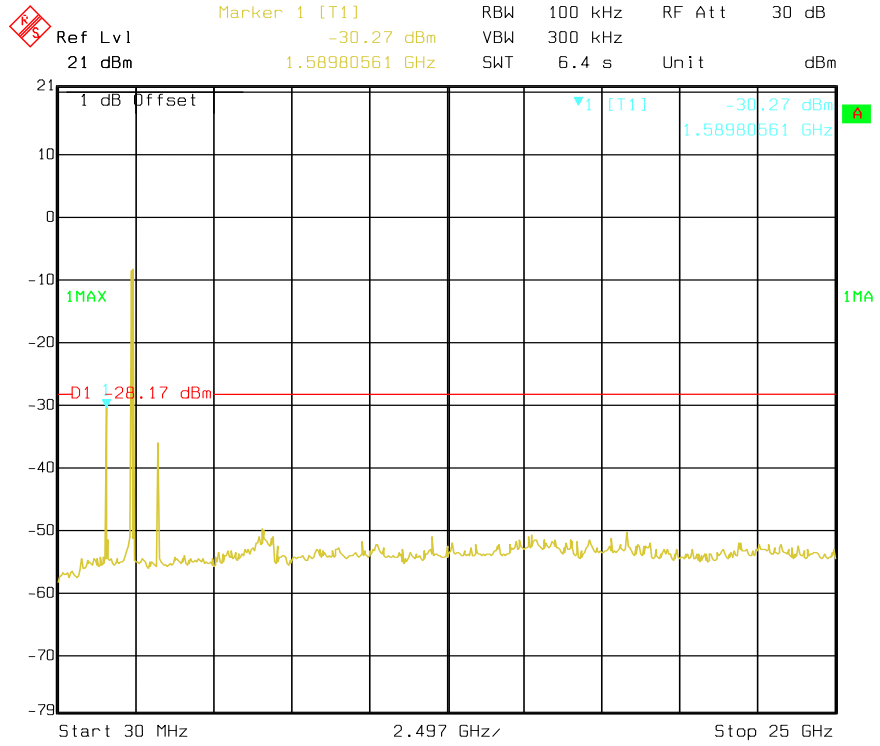


Test mode: 802.11n40 mode

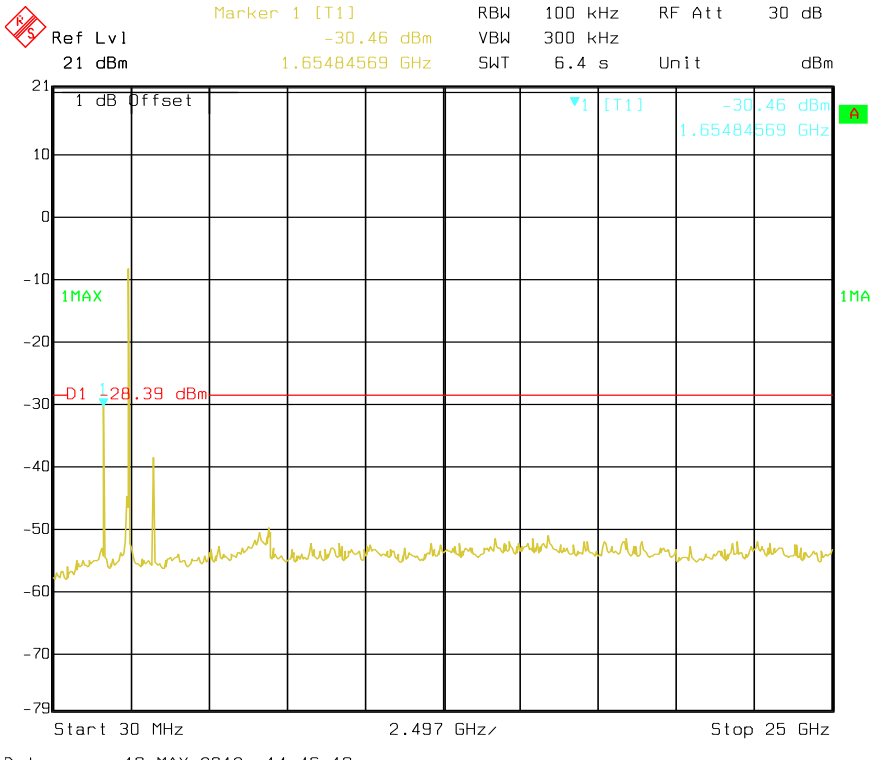
Low Channel



Middle Channel



High Channel



8 - FCC §15.205 & §15.247(d) – RESTRICTED BANDS AND SPURIOUS EMISSION

8.1 Applicable Standard

As per 15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function.

Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per 15.205(a) except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

f (MHz)	f (MHz)	f (MHz)	f (GHz)
0.090 – 0.110	16.42 – 16.423	960 – 1240	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5.46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108-121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.5	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 – 167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	240 – 285	3.3458 – 3.358	23.6 – 24.0
12.29 – 12.293	322 – 335.4	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	399.9 – 410	-	36.43 – 36.5
12.57675 – 12.57725	608-614	-	Above 38.6
13.36 – 13.41	-	-	-

As per 15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.
However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

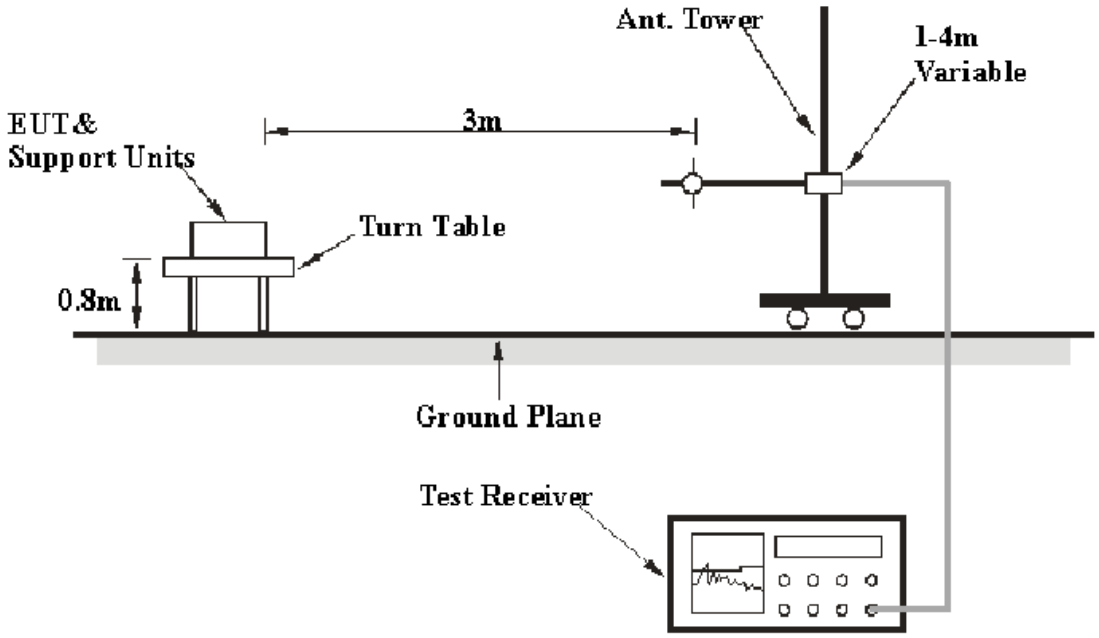
As per 15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

8.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Chengdu) is $\pm$4.0 dB.

8.3 EUT Setup



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC §15.247(d), §15.205(a) and §15.209(a) limits.

The power cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

A 120VAC/60Hz power source was provided to the power adapter.

8.4 EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	***RBW***	***Video B/W***	***Detector***
30 MHz – 1000 MHz	100 kHz	300 kHz	QP
1000 MHz – 25 GHz	1 MHz	3 MHz	PK
1000 MHz – 25 GHz	1 MHz	10 Hz	AV

8.5 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Pre-amplifier	HP8447D	2944A09795	2011-11-24	2012-11-23
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26
Sunol Sciences	Broadband Antenna	JB1	A040904-2	2011-11-28	2012-11-27
DUCOMMUN Technologies	Pre-amplifier	ALN-09173030-01	991396-01	2011-11-24	2012-12-23
Sunol Sciences	Horn Antenna	DRH-118	A052304	2012-12-01	2012-11-30
Rohde & Schwarz	Signal Analyzer	FSIQ 26	8386001028	2011-11-24	2012-11-23

8.6 Test Procedure

During the restricted bands and spurious emission test, the adapter was connected to the outlet of the AC power socket.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz and peak and Average detection modes for frequencies above 1 GHz.

8.7 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss- Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Limit - Corrected Amplitude

8.8 Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205(a), 15.209(a) and 15.247(d), with the worst margin reading of:

3.23 dB at **2483.5 MHz** in the **Vertical** polarization for 802.11g mode

8.9 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0kPa

**The testing was performed by Kate Yang..*

Test Result: Compliant, Please refer to following tables.

30 MHz - 25 GHz:

Test mode: 802.11b mode

Frequency (MHz)	SA Reading (dBμV)	Detector (PK/QP /AV)	Ant. Polar (H/V)	Cord. Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)								
2390	15.72	Ave.	V	34.8	50.52	54	3.48	Spurious
4824	35.3	Ave.	V	10.79	46.09	54	7.91	Harmonic
2390	27.6	PK	V	34.8	62.4	74	11.6	Spurious
9648	18.73	AV	V	20.87	39.60	54.00	14.40	Harmonic
7236	20.37	AV	V	18.71	39.08	54.00	14.92	Harmonic
7236	35.46	PK	V	18.71	54.17	74.00	19.83	Harmonic
9648	32.01	PK	V	20.87	52.88	74.00	21.12	Harmonic
4824	40.47	PK	V	10.79	51.26	74	22.74	Harmonic
325.26	26.85	QP	V	-4.81	22.04	46.00	23.96	Spurious
2412	75.56	PK	V	35	110.56	N/A	N/A	Fund.
2412	67.85	Ave.	V	35	102.85	N/A	N/A	Fund.
Middle Channel (2437 MHz)								
7311	28.19	AV	H	18.91	47.10	54.00	6.90	Harmonic
4874	35.81	Ave.	V	11.08	46.89	54	7.11	Harmonic
9748	18.38	AV	V	20.87	39.25	54.00	14.75	Harmonic
7311	34.36	PK	H	18.91	53.27	74.00	20.73	Harmonic
9748	32.12	PK	V	20.87	52.99	74.00	21.01	Harmonic
4874	41.23	PK	V	11.08	52.31	74	21.69	Harmonic
327.39	27.14	QP	V	-4.79	22.35	46.00	23.65	Spurious
2437	76.61	PK	V	35.2	111.81	N/A	N/A	Fund.
2437	68.97	Ave.	V	35.2	104.17	N/A	N/A	Fund.
High Channel (2462 MHz)								
2483.5	15.43	Ave.	V	35.3	50.73	54	3.27	Spurious
4924	35.69	Ave.	V	10.98	46.67	54	7.33	Harmonic
2483.5	27.3	PK	V	35.3	62.6	74	11.4	Spurious
7386	18.95	AV	H	19.11	38.06	54.00	15.94	Harmonic
7386	34.37	PK	H	19.11	53.48	74.00	20.52	Harmonic
9848	31.65	PK	V	20.86	52.51	74.00	21.49	Harmonic
4924	41.23	PK	V	10.98	52.21	74	21.79	Harmonic
357.36	26.89	QP	V	-3.87	23.02	46.00	22.98	Spurious
9848	18.36	AV	V	20.86	39.22	74.00	34.78	Harmonic
2462	76.25	PK	V	35.3	111.55	N/A	N/A	Fund.
2462	68.29	Ave.	V	35.3	103.59	N/A	N/A	Fund.

Test mode: 802.11g mode

Frequency (MHz)	SA Reading (dBμV)	Detector (PK/QP /AV)	Ant. Polar (H/V)	Cord. Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)								
2390	15.69	Ave.	V	34.8	50.49	54	3.51	Spurious
2390	27.6	PK	V	34.8	62.4	74	11.6	Spurious
9648	18.09	AV	V	20.87	38.96	54.00	15.04	Harmonic
7236	20.16	AV	H	18.71	38.87	54.00	15.13	Harmonic
4824	27.41	Ave.	V	10.79	38.2	54	15.8	Harmonic
7236	34.65	PK	H	18.71	53.36	74.00	20.64	Harmonic
9648	31.34	PK	V	20.87	52.21	74.00	21.79	Harmonic
343.89	26.94	QP	V	-4.48	22.46	46.00	23.54	Spurious
4824	38.65	PK	V	10.79	49.44	74	24.56	Harmonic
2412	73.52	PK	V	35	108.52	N/A	N/A	Fund.
2412	58.27	Ave.	V	35	93.27	N/A	N/A	Fund.
Middle Channel (2437 MHz)								
9748	18.35	AV	V	20.87	39.22	54.00	14.78	Harmonic
4847	27.55	Ave.	V	11.08	38.63	54	15.37	Harmonic
7311	18.65	AV	H	18.91	37.56	54.00	16.44	Harmonic
9748	32.84	PK	V	20.87	53.71	74.00	20.29	Harmonic
327.39	27.63	QP	V	-4.79	22.84	46.00	23.16	Spurious
7311	31.38	PK	H	18.91	50.29	74.00	23.71	Harmonic
4847	38.02	PK	V	11.08	49.1	74	24.9	Harmonic
2437	68.34	PK	V	35.2	103.54	N/A	N/A	Fund.
2437	53.43	Ave.	V	35.2	88.63	N/A	N/A	Fund.
High Channel (2462 MHz)								
2483.5	15.47	Ave.	V	35.3	50.77	54	*3.23	Spurious
2483.5	25.68	PK	V	35.3	60.98	74	13.02	Spurious
4924	27.19	Ave.	V	10.98	38.17	54	15.83	Harmonic
7386	18.46	AV	H	19.11	37.57	54.00	16.43	Harmonic
9848	32.34	PK	V	20.86	53.20	74.00	20.80	Harmonic
7386	32.69	PK	H	19.11	51.80	74.00	22.20	Harmonic
357.36	27.35	QP	V	-3.87	23.48	46.00	22.52	Spurious
4924	38.43	PK	V	10.98	49.41	74	24.59	Harmonic
2462	71.05	PK	V	35.3	106.35	N/A	N/A	Fund.
9848	18.01	AV	V	20.86	38.87	74.00	35.13	Harmonic
2462	55.71	Ave.	V	35.3	91.01	N/A	N/A	Fund.

Test mode: 802.11n20 mode

Frequency (MHz)	SA Reading (dBμV)	Detector (PK/QP /AV)	Ant. Polar (H/V)	Cord. Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2412 MHz)								
2390	15.05	Ave.	V	34.8	49.85	54	4.15	Spurious
2390	25.63	PK	V	34.8	60.43	74	13.57	Spurious
9648	18.37	AV	V	20.87	39.24	54.00	14.76	Harmonic
4824	26.35	Ave.	V	10.79	37.14	54	16.86	Harmonic
7236	18.19	AV	H	18.71	36.90	54.00	17.10	Harmonic
9648	32.14	PK	V	20.87	53.01	74.00	20.99	Harmonic
7236	32.36	PK	H	18.71	51.07	74.00	22.93	Harmonic
314.89	27.34	QP	V	-4.48	22.86	46.00	23.14	Spurious
4824	36.87	PK	V	10.79	47.66	74	26.34	Harmonic
2412	70.98	PK	V	35	105.98	N/A	N/A	Fund.
2412	55.11	Ave.	V	35	90.11	N/A	N/A	Fund.
Middle Channel (2437 MHz)								
9748	31.68	PK	V	20.87	39.18	54.00	14.82	Harmonic
7311	31.54	PK	H	18.91	37.16	54.00	16.84	Harmonic
327.48	27.54	QP	V	-4.79	37.16	54.00	16.84	Spurious
4847	25.96	Ave.	V	11.08	37.04	54	16.96	Harmonic
7311	18.25	AV	H	18.91	52.55	74.00	21.45	Harmonic
9748	18.31	AV	V	20.87	22.75	46.00	23.25	Harmonic
4847	36.5	PK	V	11.08	47.58	74	26.42	Harmonic
2437	69.49	PK	V	35.2	104.69	N/A	N/A	Fund.
2437	54.47	Ave.	V	35.2	89.67	N/A	N/A	Fund.
High Channel (2462 MHz)								
2483.5	15.27	Ave.	V	35.3	50.57	54	3.43	Spurious
2483.5	25.63	PK	V	35.3	60.93	74	13.07	Spurious
7386	18.05	AV	H	19.11	37.16	54.00	16.84	Harmonic
4924	25.46	Ave.	V	10.98	36.44	54	17.56	Harmonic
9848	31.39	PK	V	20.86	52.25	74.00	21.75	Harmonic
357.36	26.85	QP	V	-3.87	22.98	46.00	23.02	Spurious
7386	31.38	PK	H	19.11	50.49	74.00	23.51	Harmonic
4924	36.37	PK	V	10.98	47.35	74	26.65	Harmonic
2462	69.06	PK	V	35.3	104.36	N/A	N/A	Fund.
2462	52.25	Ave.	V	35.3	87.55	N/A	N/A	Fund.
9848	18.64	AV	V	20.86	39.50	74.00	34.50	Harmonic

Test mode: 802.11n40 mode

Frequency (MHz)	SA Reading (dBμV)	Detector (PK/QP /AV)	Ant. Polar (H/V)	Cord. Factor (dB/m)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel (2422 MHz)								
2390	15.96	Ave.	V	34.8	50.76	54	3.24	Spurious
2390	26.36	PK	V	34.8	61.16	74	12.84	Spurious
9688	18.19	AV	V	20.87	39.06	54.00	14.94	Harmonic
7266	18.24	AV	H	18.71	36.95	54.00	17.05	Harmonic
9688	32.33	PK	V	20.87	53.20	74.00	20.80	Harmonic
4844	22.03	Ave.	V	11.03	33.06	54	20.94	Harmonic
7266	32.14	PK	H	18.71	50.85	74.00	23.15	Harmonic
326.37	26.94	QP	V	-4.48	22.46	46.00	23.54	Spurious
2422	67.55	PK	V	35.08	102.63	N/A	N/A	Fund.
4844	33.69	PK	V	11.03	44.72	74	29.28	Harmonic
2422	52.18	Ave.	V	35.08	87.26	N/A	N/A	Fund.
Middle Channel (2437 MHz)								
9748	18.04	AV	V	20.87	39.22	54.00	14.78	Harmonic
7311	18.64	AV	H	18.91	37.56	54.00	16.44	Harmonic
9748	31.34	PK	V	20.87	53.71	74.00	20.29	Harmonic
4874	20.69	Ave.	V	11.08	31.77	54	22.23	Harmonic
329.34	27.34	QP	V	-4.79	22.84	46.00	23.16	Spurious
7311	31.35	PK	H	18.91	50.29	74.00	23.71	Harmonic
2437	66.38	PK	V	35.2	101.58	N/A	N/A	Fund.
4874	33.97	PK	V	11.08	45.05	74	28.95	Harmonic
2437	51.25	Ave.	V	35.2	86.45	N/A	N/A	Fund.
High Channel (2452 MHz)								
2483.5	15.01	Ave.	V	35.3	50.31	54	3.69	Spurious
2483.5	24.98	PK	V	35.3	60.28	74	13.72	Spurious
7356	18.39	AV	H	19.11	37.50	54.00	16.50	Harmonic
9808	32.31	PK	V	20.86	53.17	74.00	20.83	Harmonic
4904	21.69	Ave.	V	11.05	32.74	54	21.26	Harmonic
343.65	27.36	QP	V	-3.87	23.49	46.00	22.51	Spurious
7356	32.36	PK	H	19.11	51.47	74.00	22.53	Harmonic
2452	66.54	PK	V	35.31	101.85	N/A	N/A	Fund.
4904	33.26	PK	V	11.05	44.31	74	29.69	Harmonic
2452	51.08	Ave.	V	35.31	86.39	N/A	N/A	Fund.
9808	18.25	AV	V	20.86	39.11	74.00	34.89	Harmonic

9 - FCC §15.247(e) – POWER SPECTRAL DENSITY

9.1 Applicable Standard

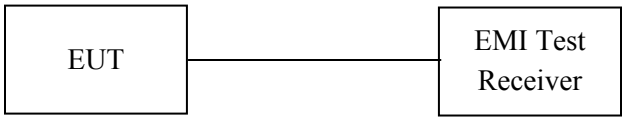
According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

9.2 Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26

9.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. According to KDB 558074 D01 DTS Meas Guidance v01, set the RBW = 100 kHz, VBW ≥ 300 kHz, set the span to 5-30 % greater than the EBW.
4. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
5. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).



9.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	100.9 kPa

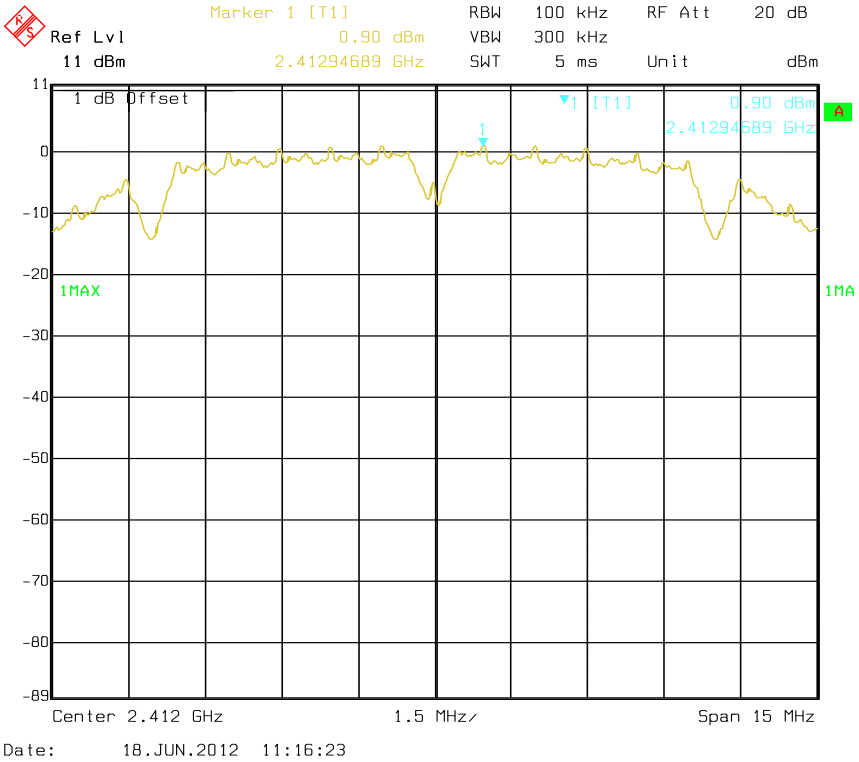
** The testing was performed by Kate Yang.*

Test Result: Compliant, Please refer to following tables and Plots

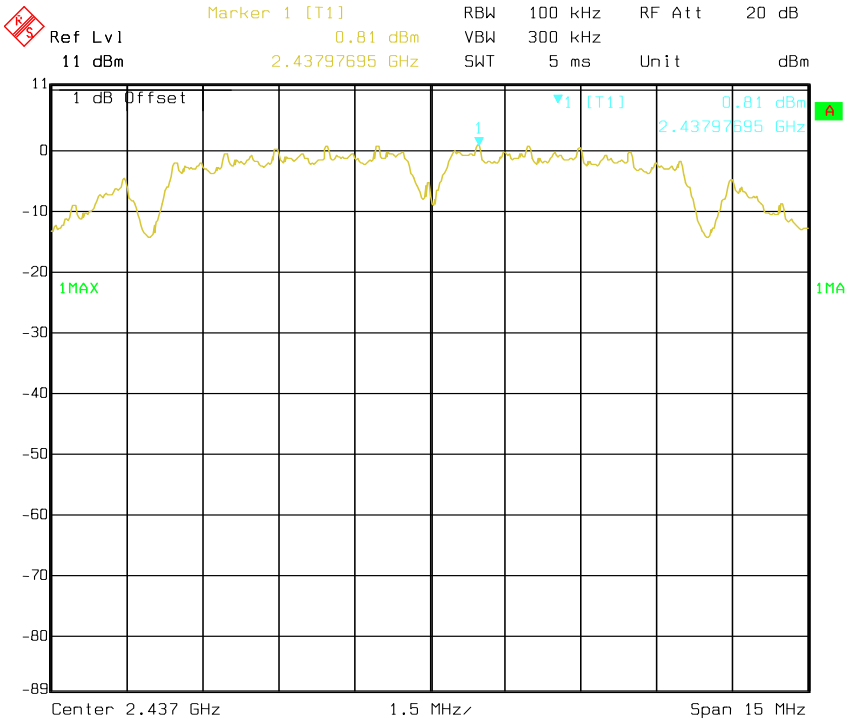
Channel	Frequency (MHz)	Data Rate (Mbps)	Reading Level (dBm/100 kHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
802.11b						
Low	2412	1	0.9	-14.3	8	Pass
Middle	2437	1	0.81	-14.39	8	Pass
High	2462	1	0.73	-14.47	8	Pass
802.11g						
Low	2412	6	-7.43	-22.63	8	Pass
Middle	2437	6	-6.85	-22.05	8	Pass
High	2462	6	-6.93	-22.13	8	Pass
802.11n20						
Low	2412	6.5	-8.26	-23.46	8	Pass
Middle	2437	6.5	-8.52	-23.72	8	Pass
High	2462	6.5	-8.67	-23.87	8	Pass
802.11n40						
Low	2422	13.5	-11.55	-26.75	8	Pass
Middle	2437	13.5	-11.41	-26.61	8	Pass
High	2452	13.5	-11.51	-26.71	8	Pass

Test mode: 802.11b mode

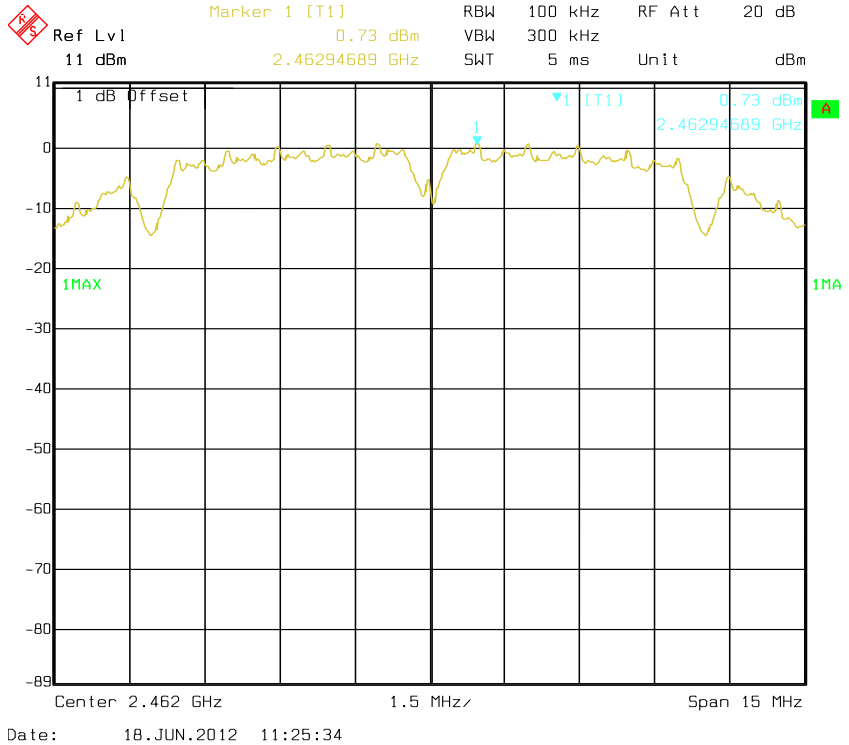
Low Channel



Middle Channel

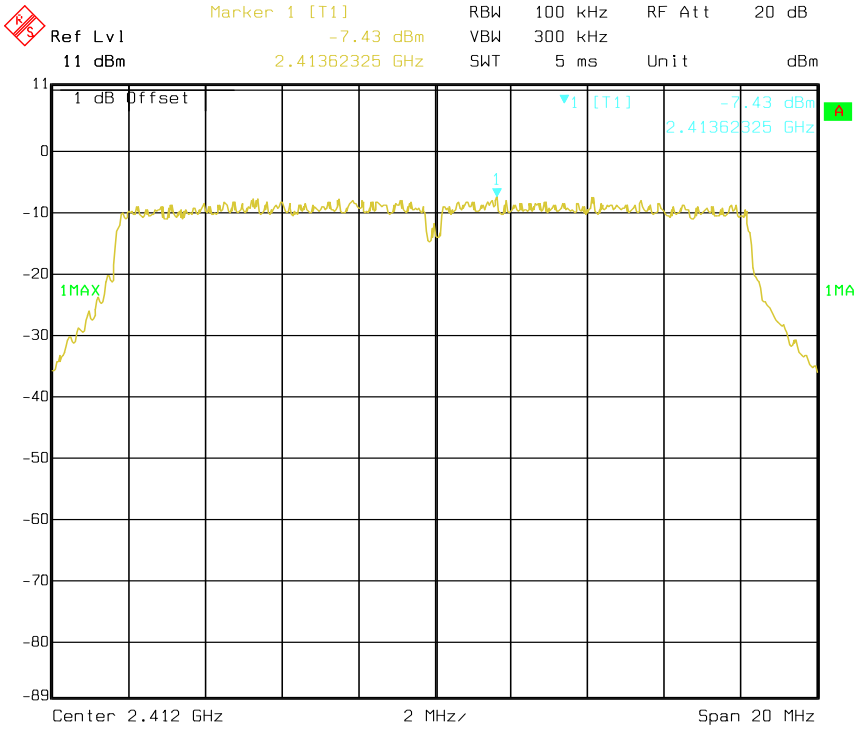


High Channel

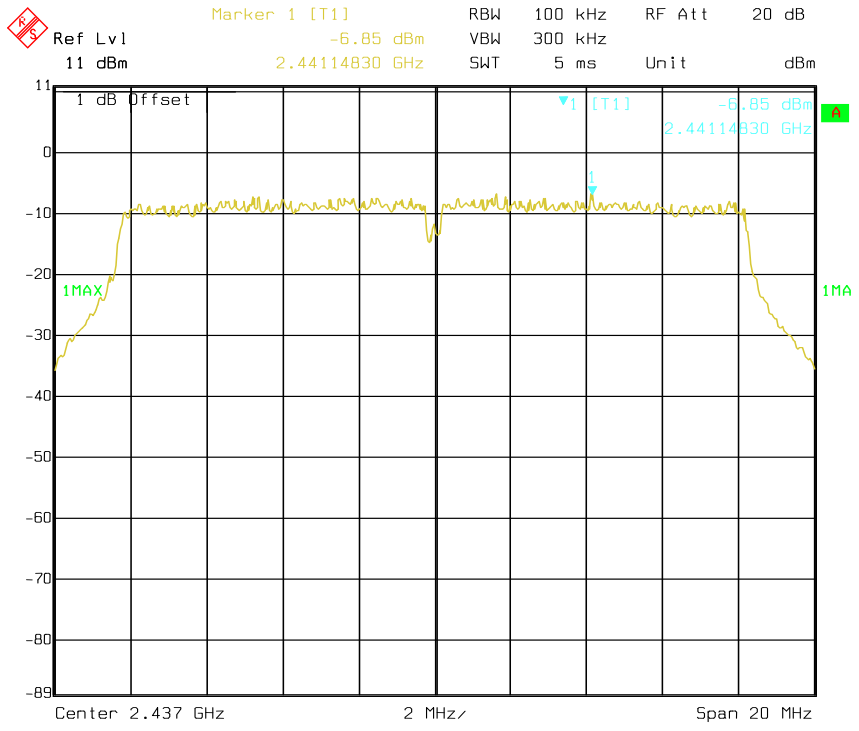


Test mode: 802.11g mode

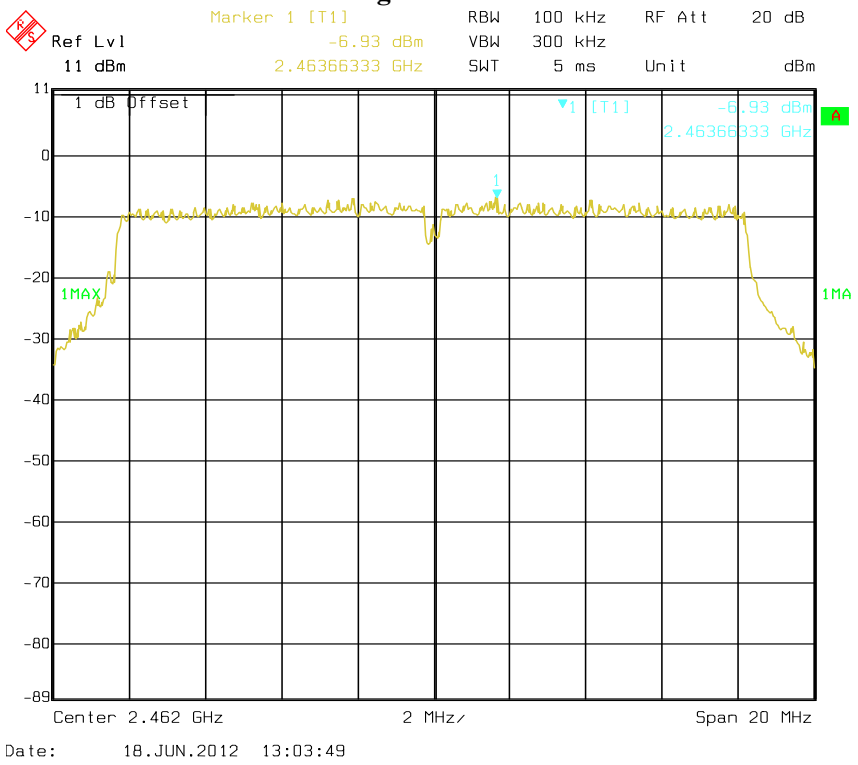
Low Channel



Middle Channel

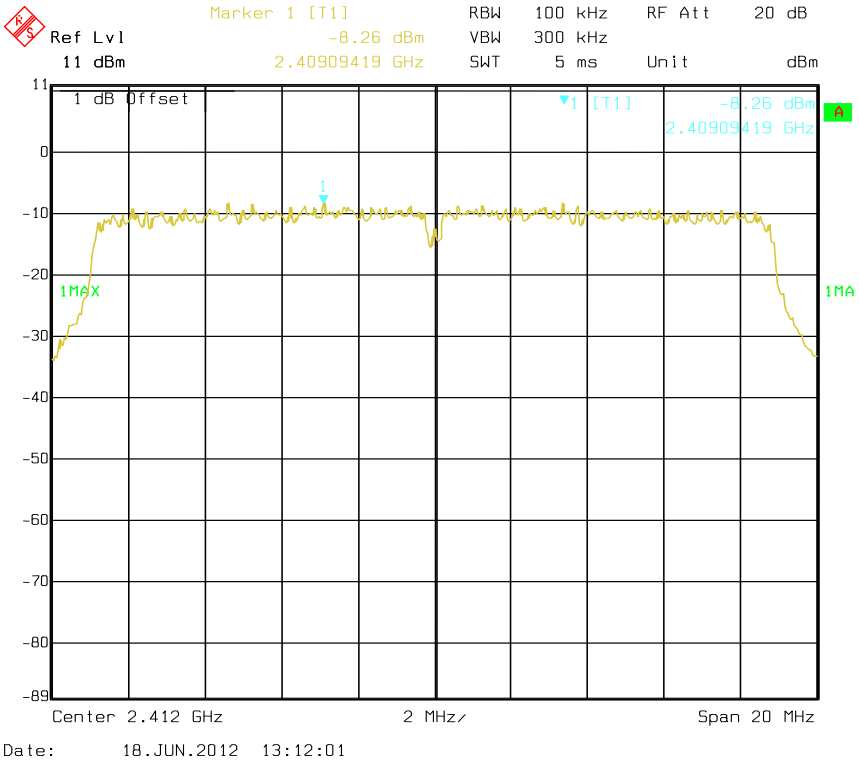


High Channel

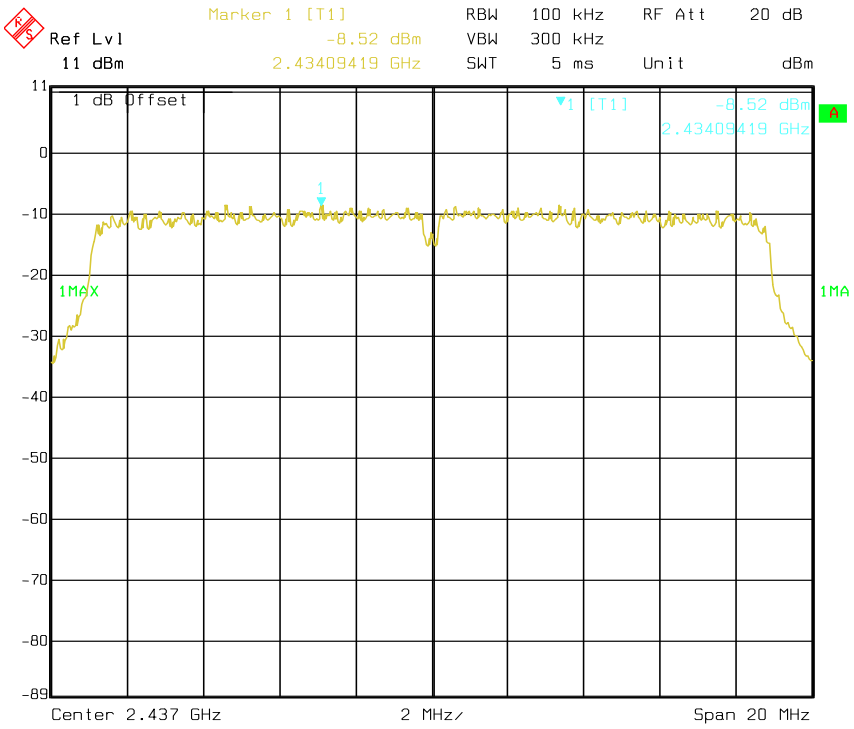


Test mode: 802.11n20 mode

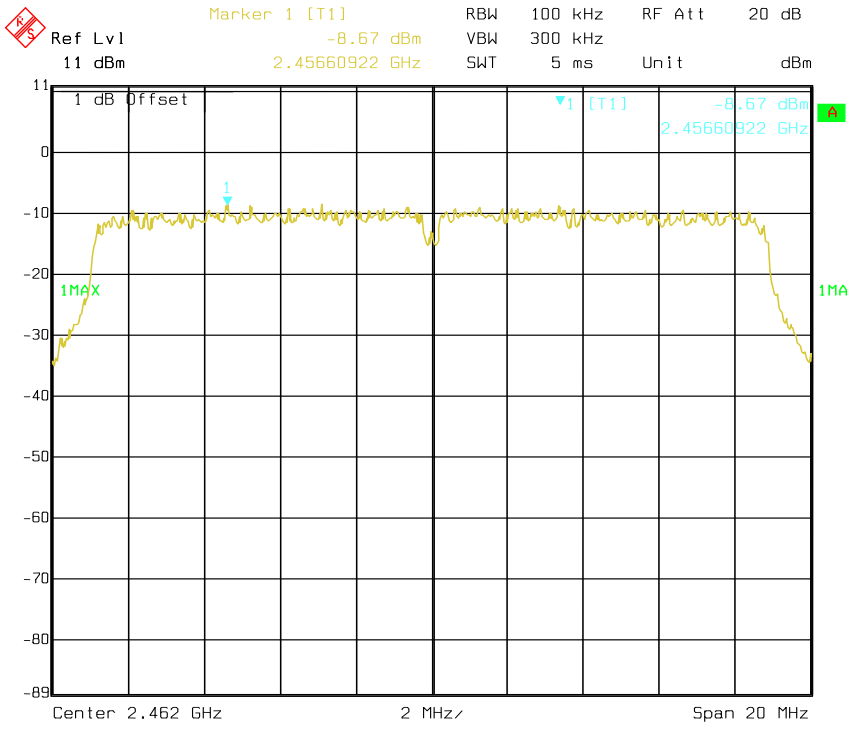
Low Channel



Middle Channel

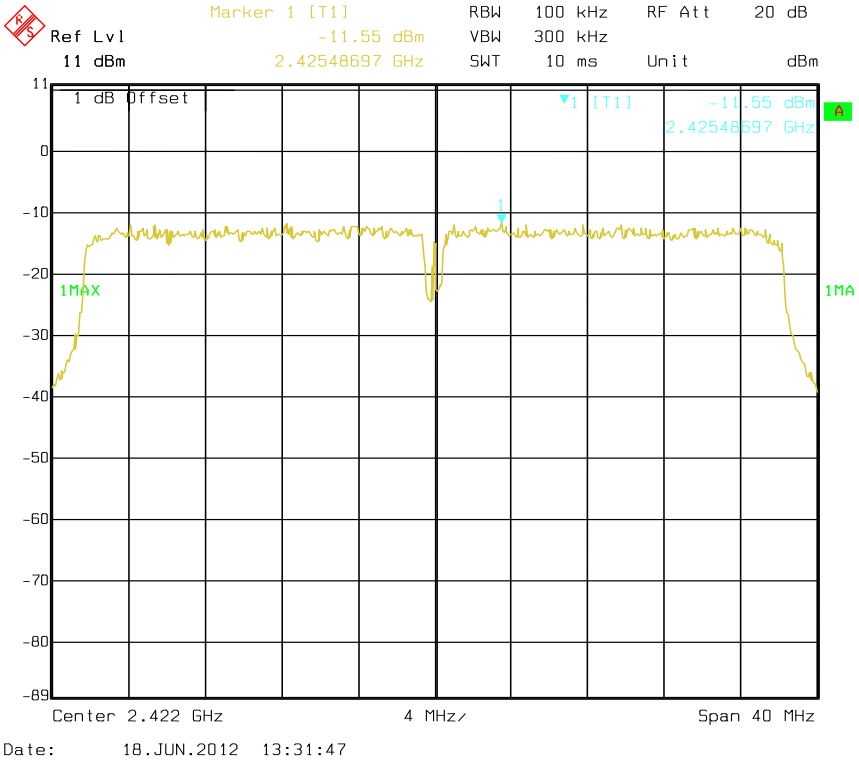


High Channel

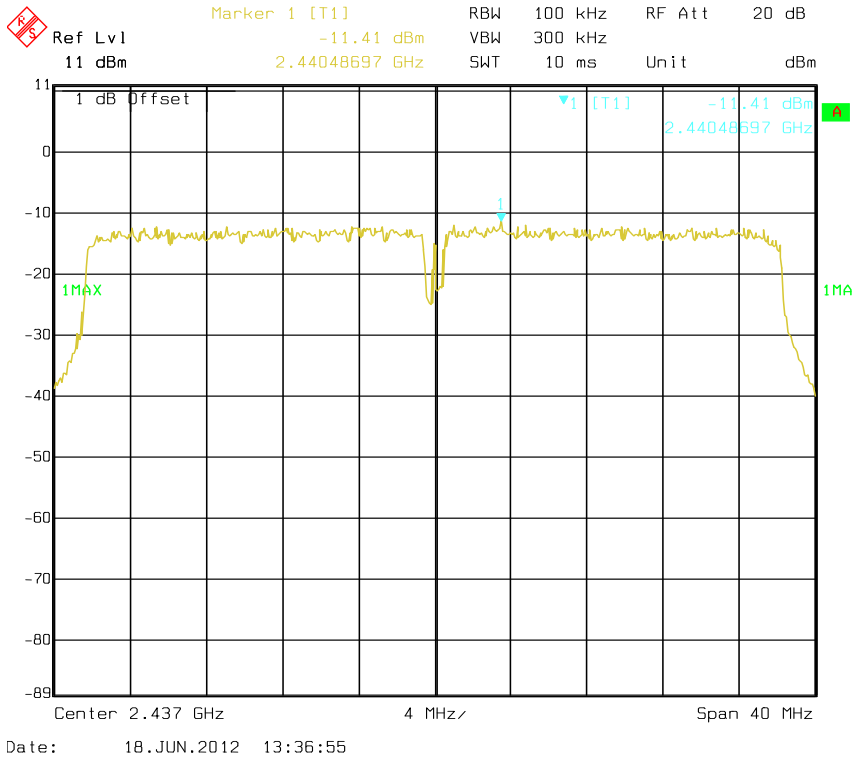


Test mode: 802.11n40 mode

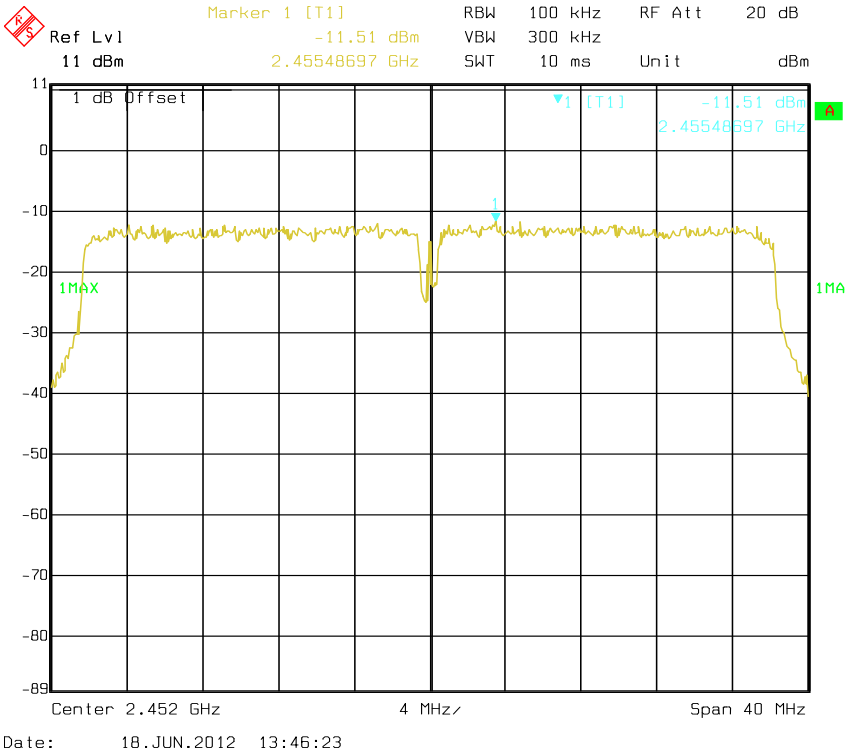
Low Channel



Middle Channel



High Channel



10 - FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH TESTING

10.1 Applicable Standard

According to §15.247(a) (2), systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

10.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26

10.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

10.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	100.9 kPa

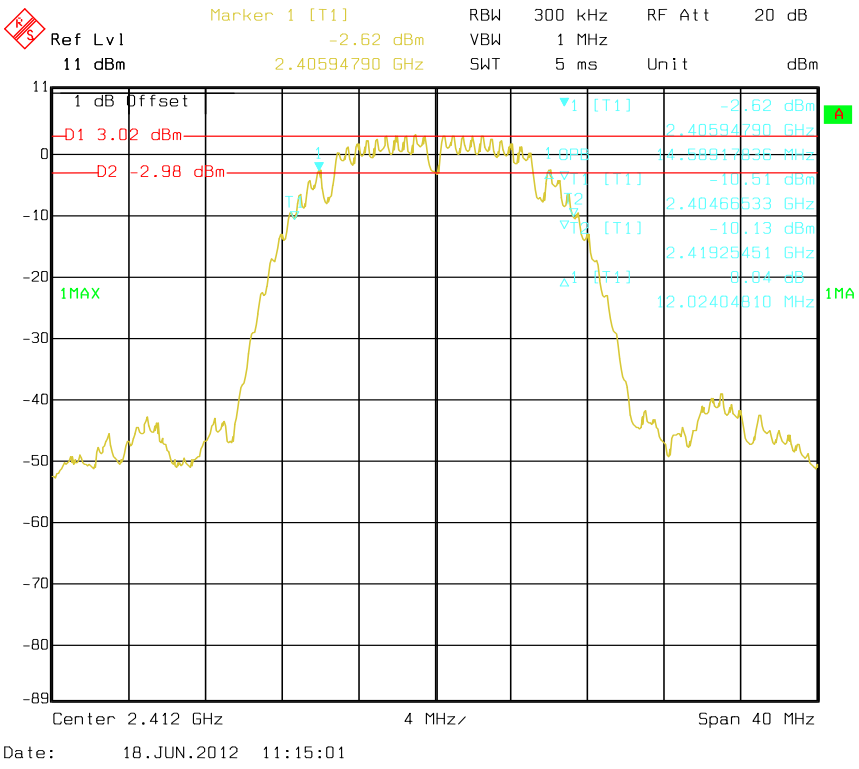
** The testing was performed by Kate Yang.*

Test Result: Compliant,
Please refer to following tables and plots

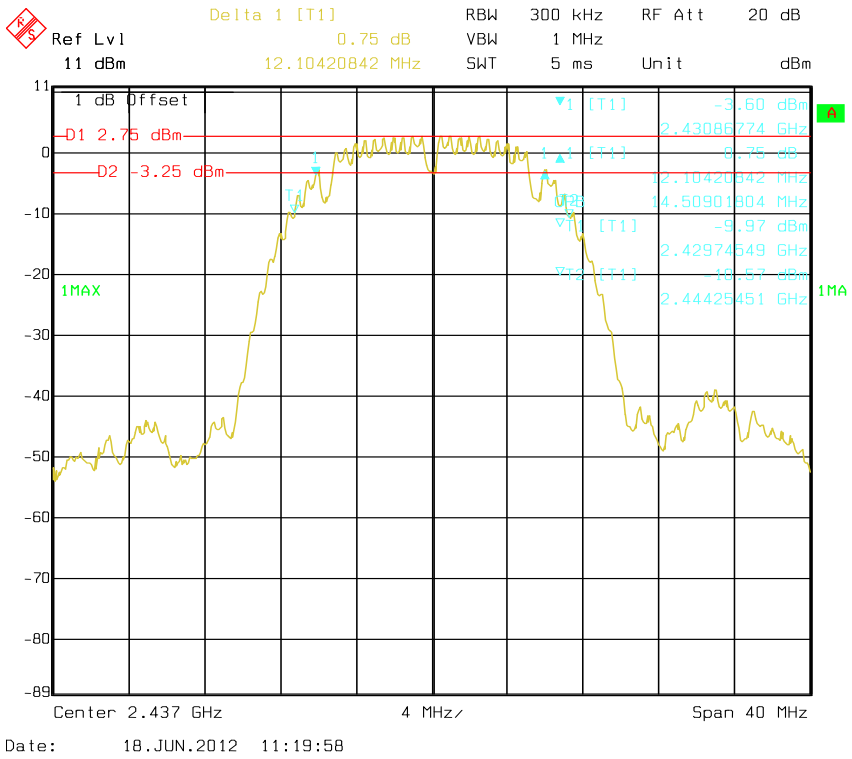
Test mode: 802.11b mode

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	FCC Limit (kHz)	Result
Low	2412	12.02	> 500	Compliant
Middle	2437	12.1	> 500	Compliant
High	2462	12.1	> 500	Compliant

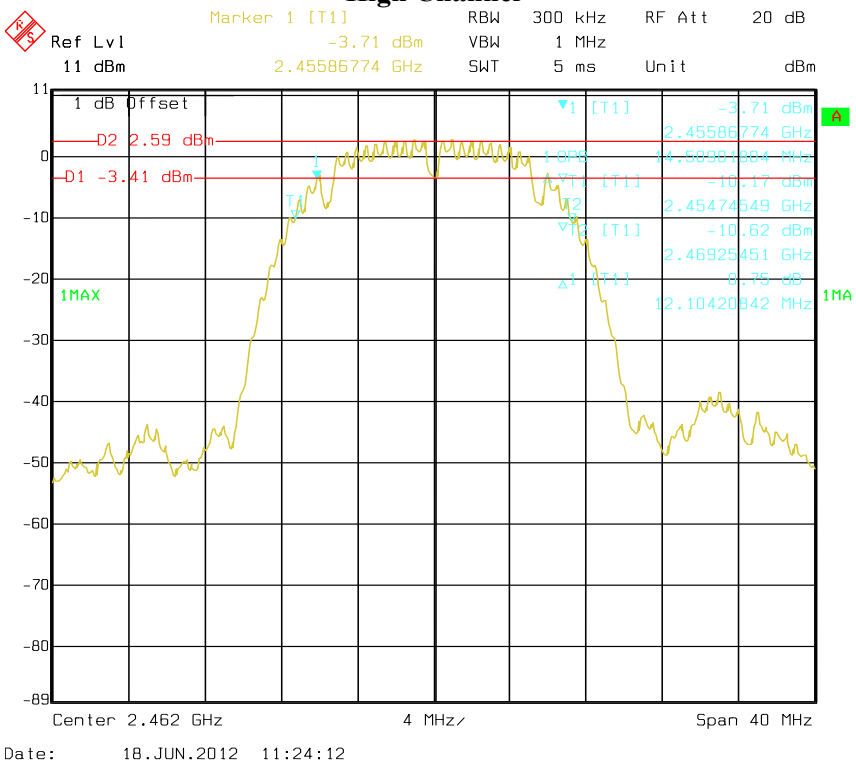
Low Channel



Middle Channel



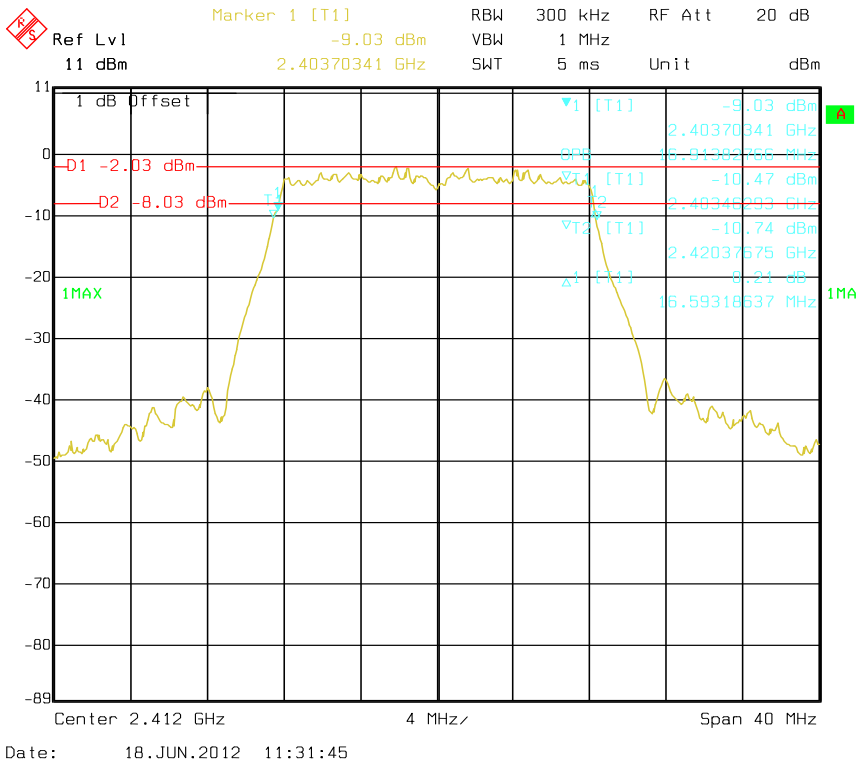
High Channel



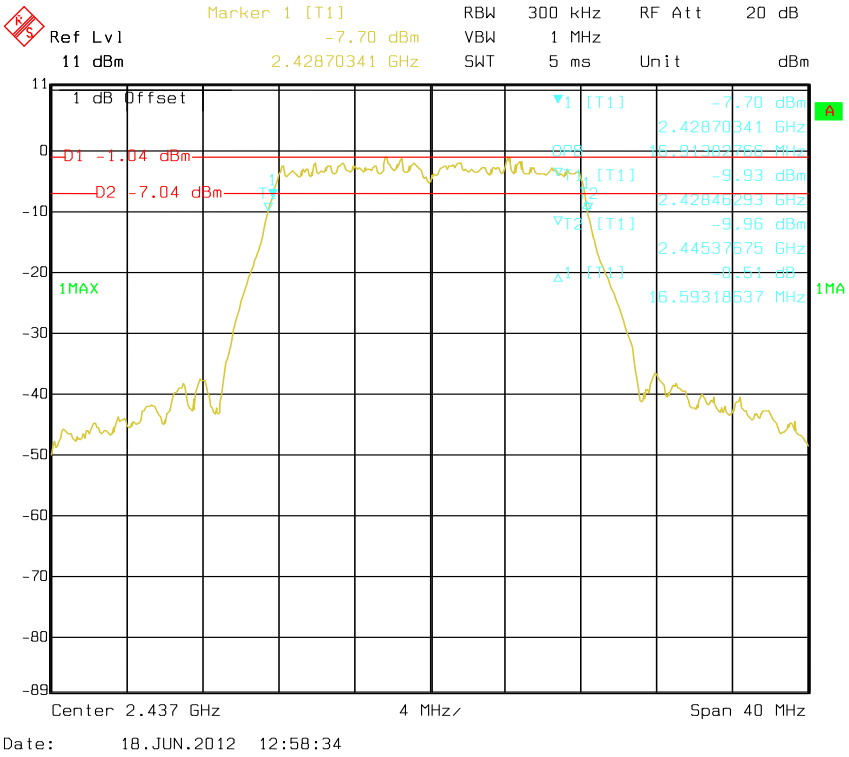
Test mode: 802.11g mode

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	FCC Limit (kHz)	Result
Low	2412	16.59	> 500	Compliant
Middle	2437	16.59	> 500	Compliant
High	2462	16.59	> 500	Compliant

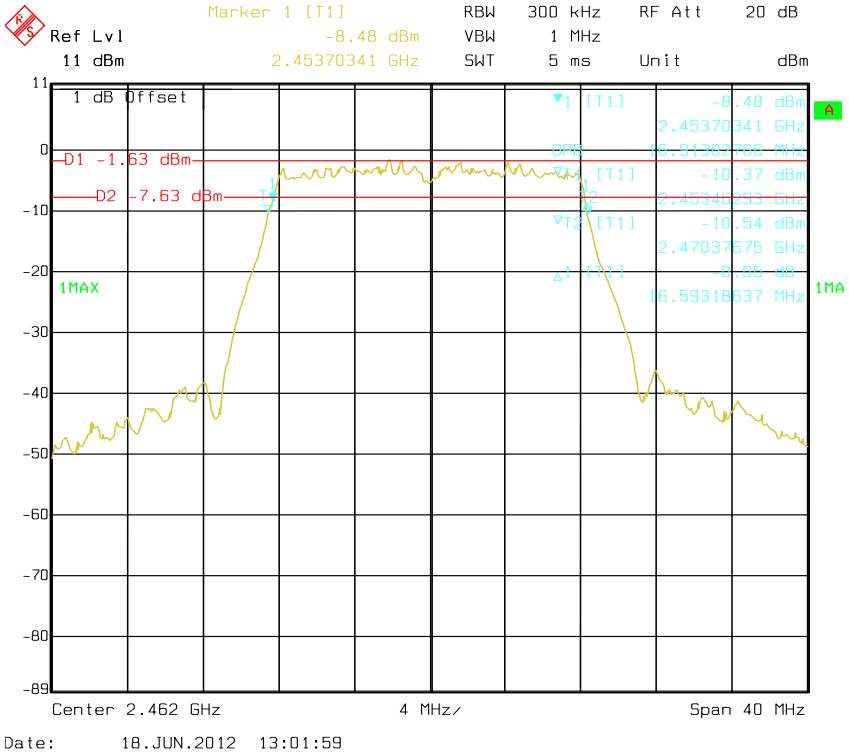
Low Channel



Middle Channel



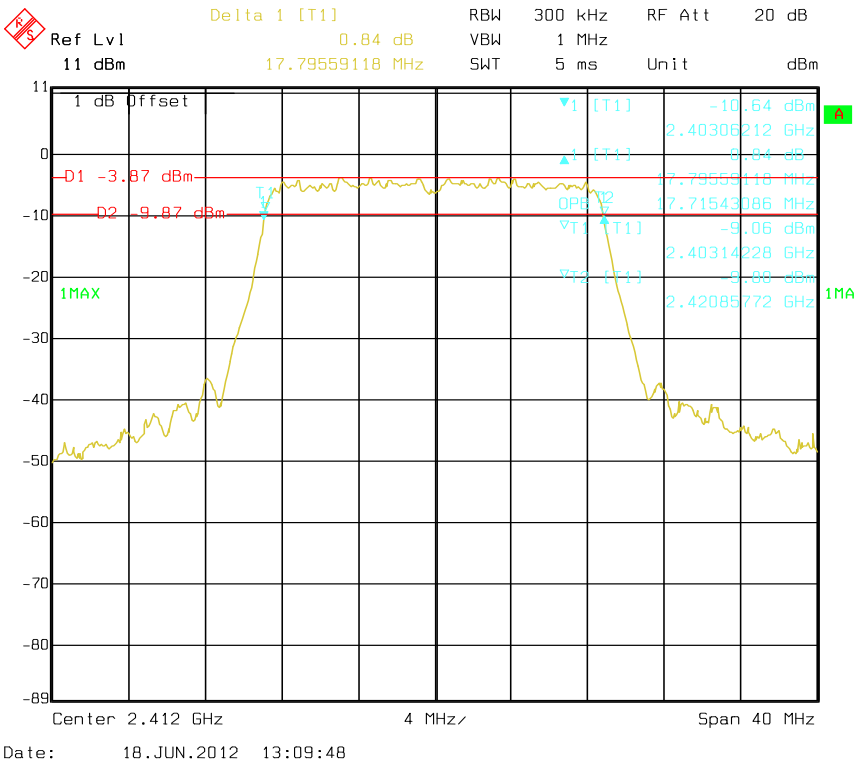
High Channel



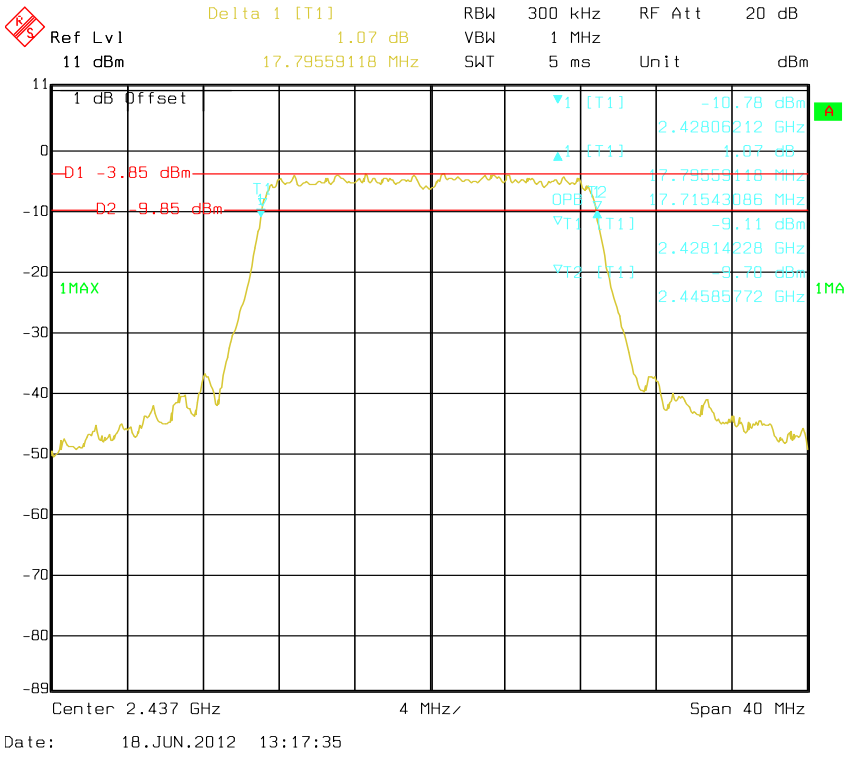
Test mode: 802.11n20 mode

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	FCC Limit (kHz)	Result
Low	2412	17.8	> 500	Compliant
Middle	2437	17.8	> 500	Compliant
High	2462	17.8	> 500	Compliant

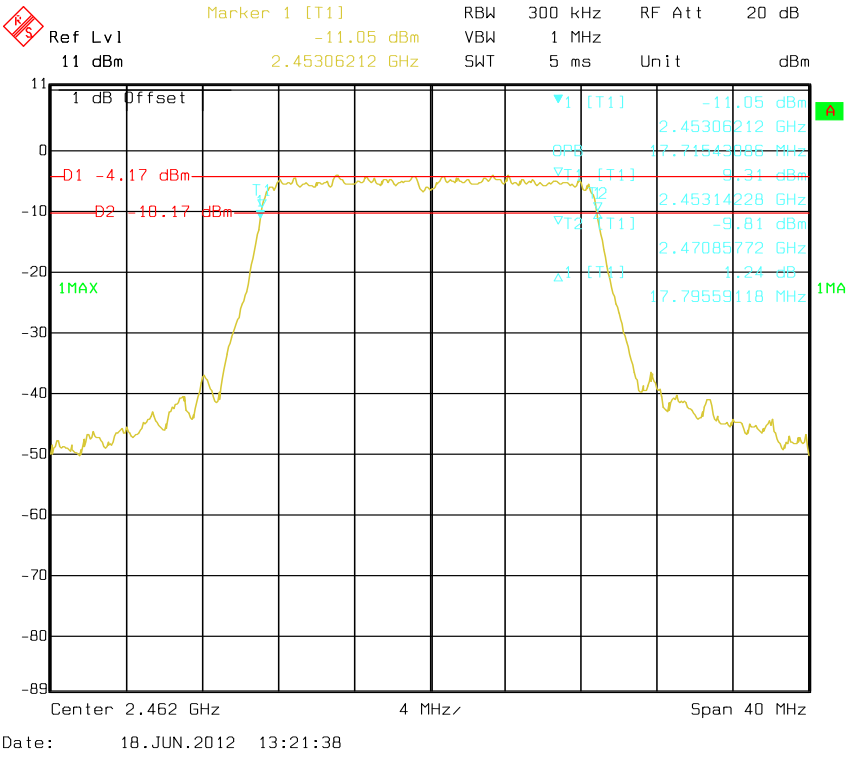
Low Channel



Middle Channel



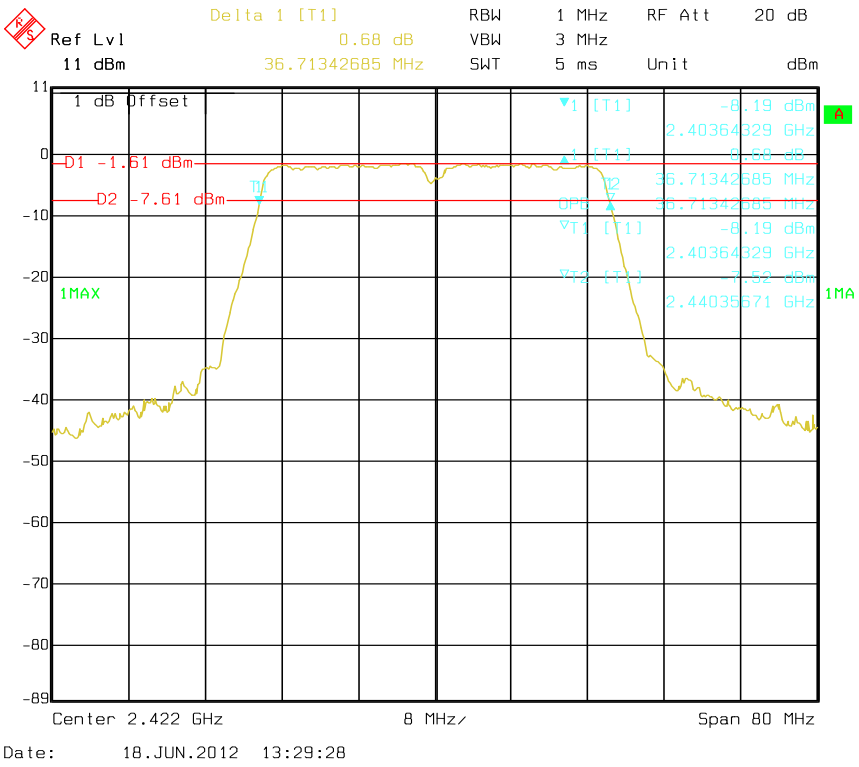
High Channel



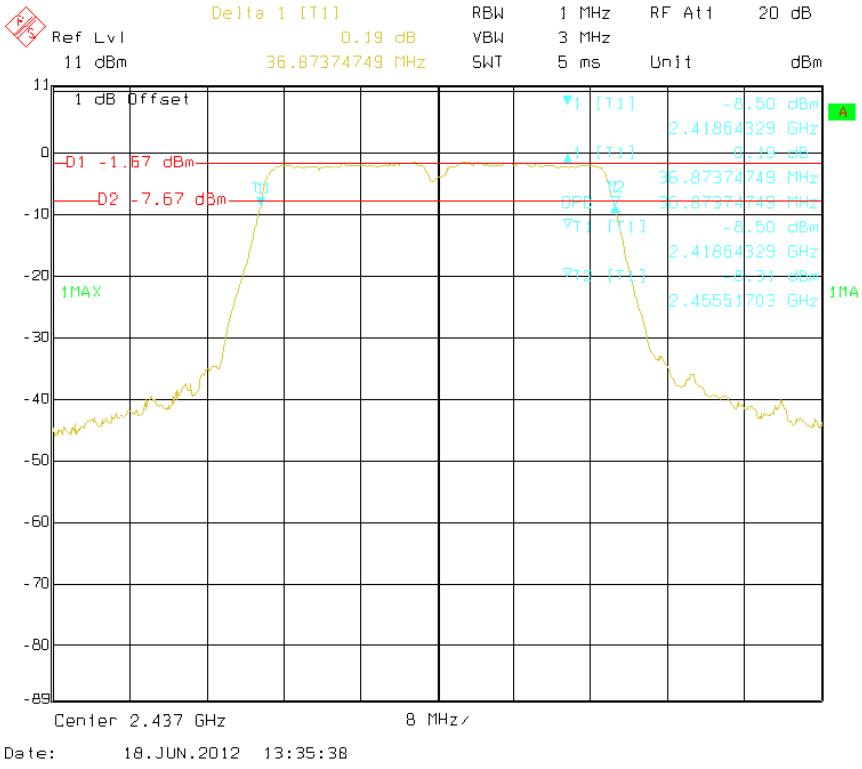
Test mode: 802.11n40 mode

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	FCC Limit (kHz)	Result
Low	2422	36.71	> 500	Compliant
Middle	2437	36.87	> 500	Compliant
High	2452	36.87	> 500	Compliant

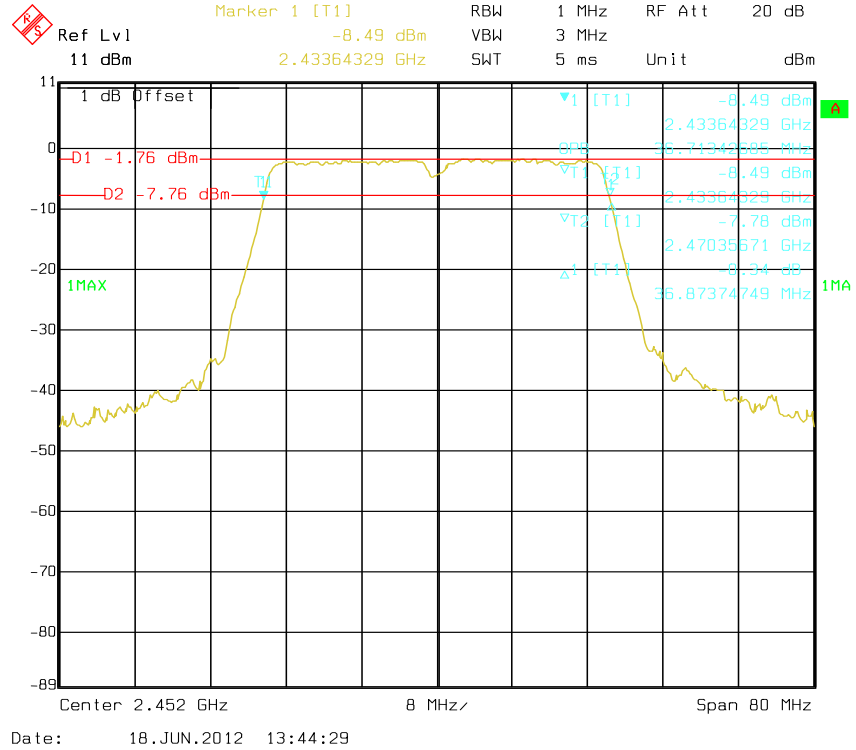
Low Channel



Middle Channel



High Channel



11 - FCC §15.247(b) (3) - PEAK OUTPUT POWER MEASUREMENT

11.1 Applicable Standard

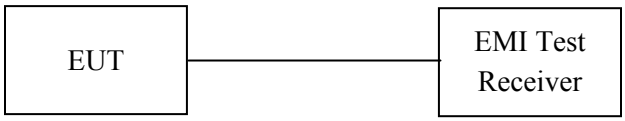
According to §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

11.2 Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26

11.3 Test Procedure

1. Place the EUT on a bench and set in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to an EMI test receiver.
3. Add a correction factor to the display.



11.4 Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	100.9 kPa

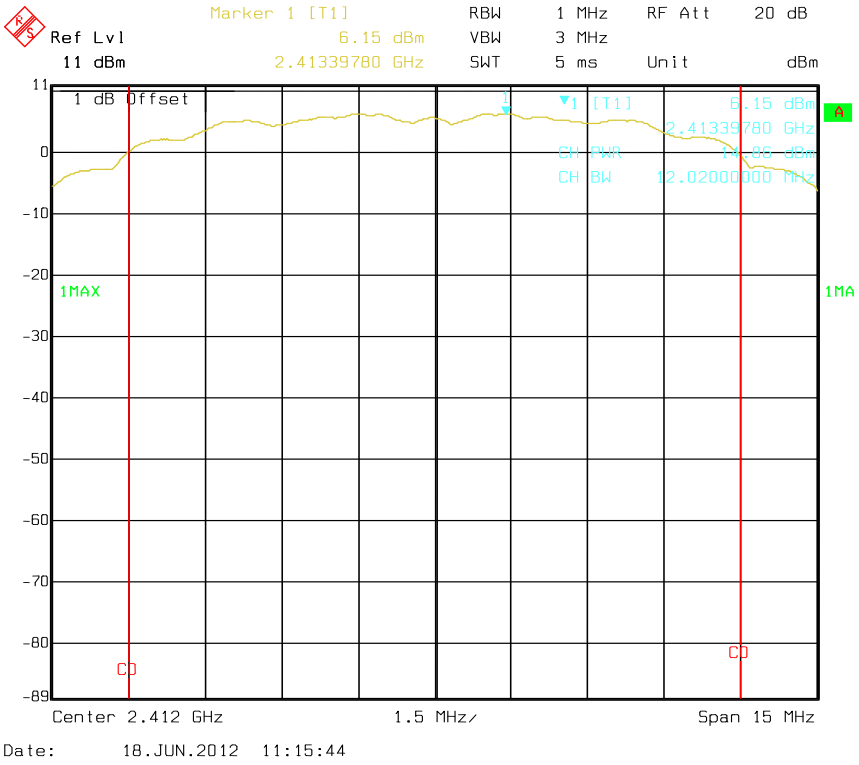
** The testing was performed by Fisher He and July Yang.*

Test Result: Compliant, Please refer to following tables and plots.

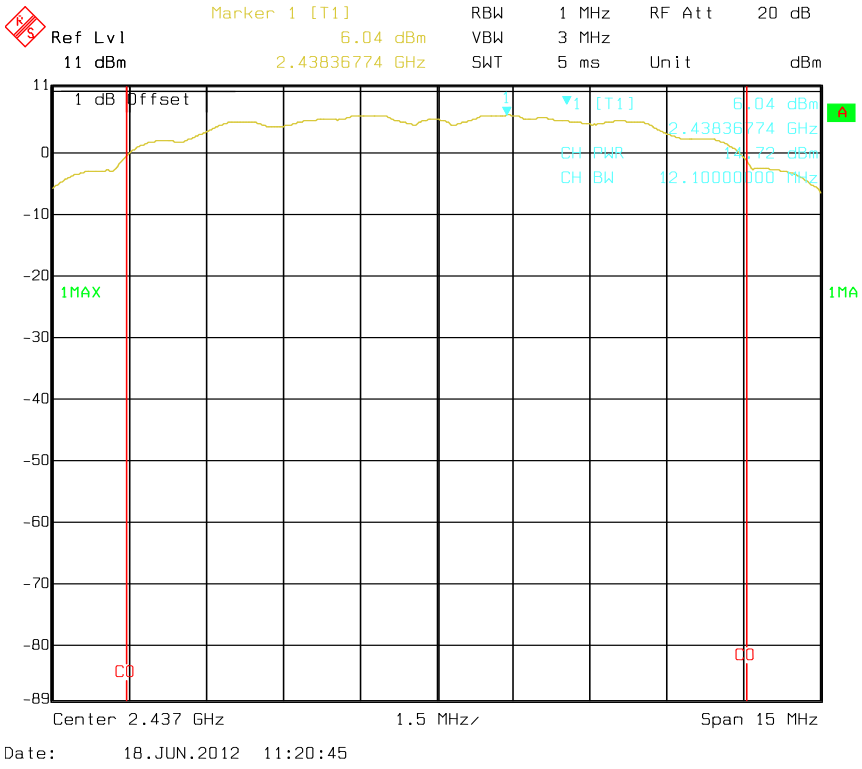
Test mode: 802.11b mode

Channel	Frequency (MHz)	Conducted Output Power (dBm)	FCC Limit (dBm)	Result
Low	2412	14.86	30	Compliant
Middle	2437	14.72	30	Compliant
High	2462	14.64	30	Compliant

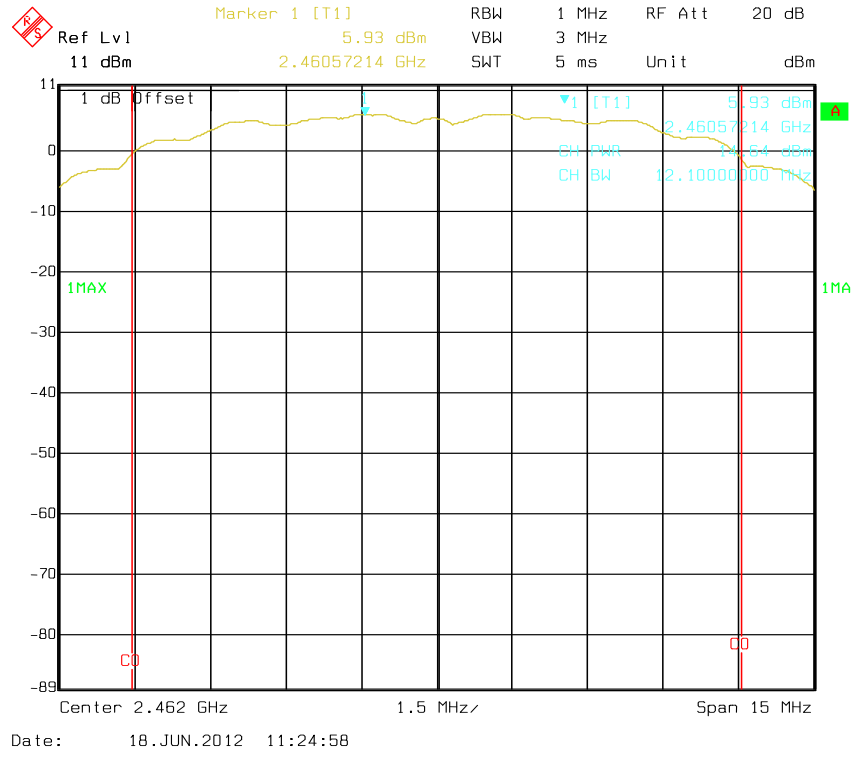
Low Channel



Middle Channel



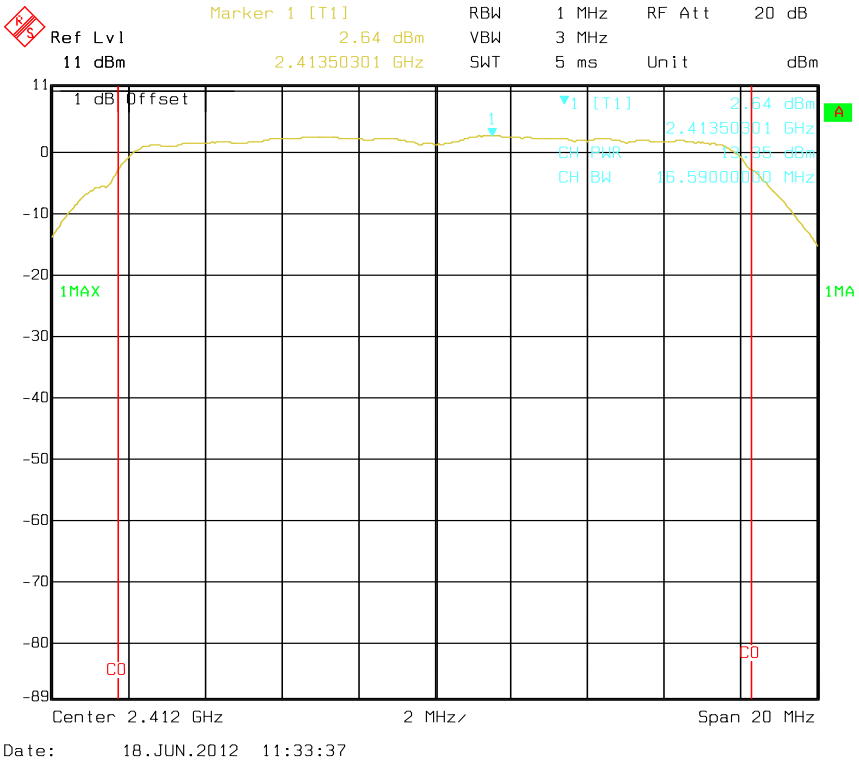
High Channel



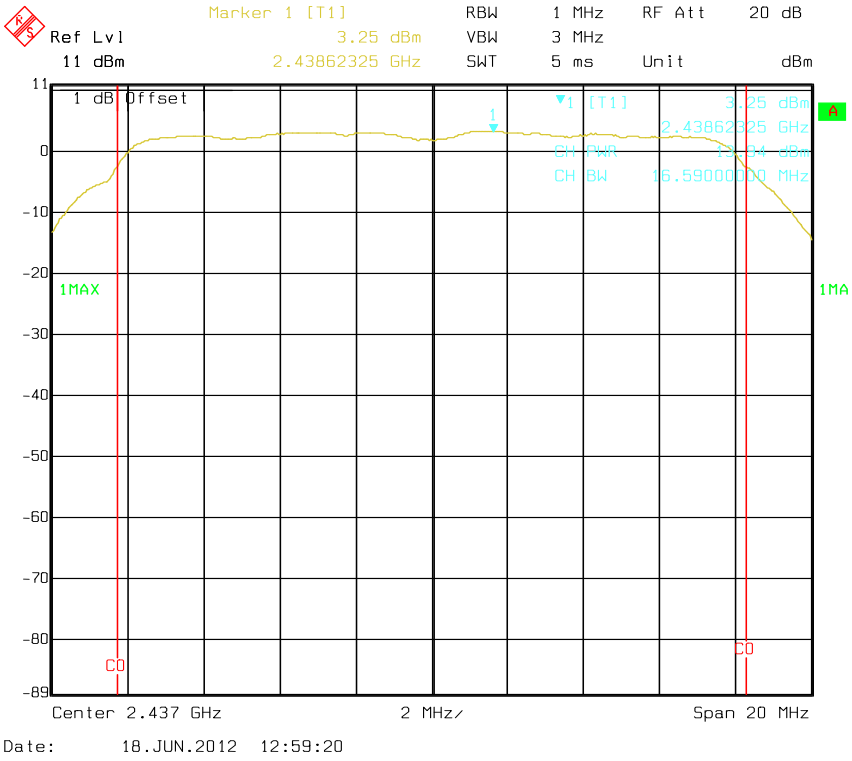
Test mode: 802.11g mode

Channel	Frequency (MHz)	Conducted Output Power (dBm)	FCC Limit (dBm)	Result
Low	2412	13.35	30	Compliant
Middle	2437	13.94	30	Compliant
High	2462	13.78	30	Compliant

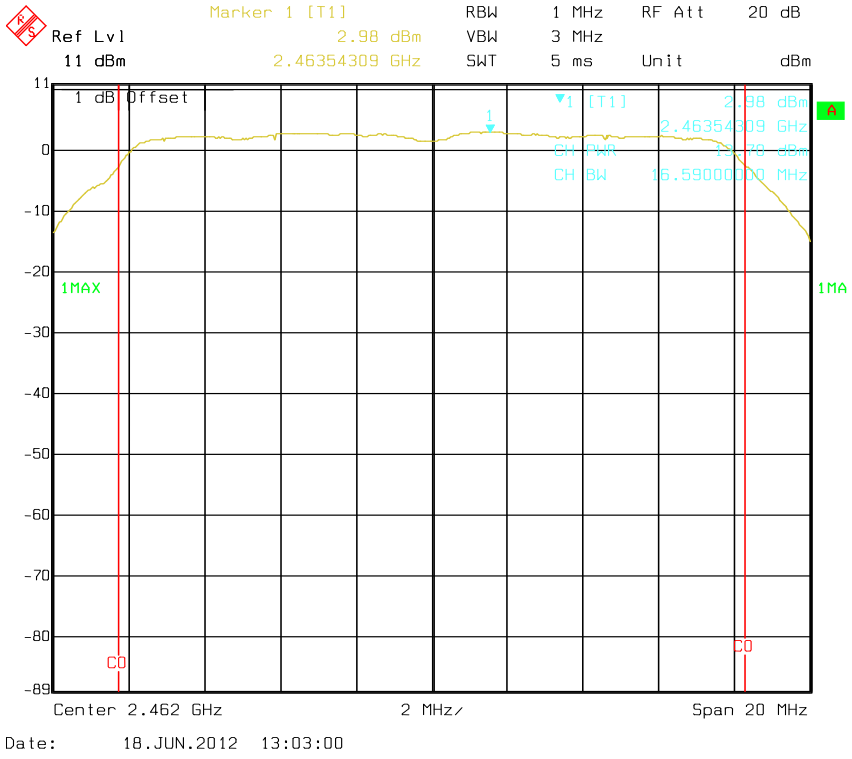
Low Channel



Middle Channel



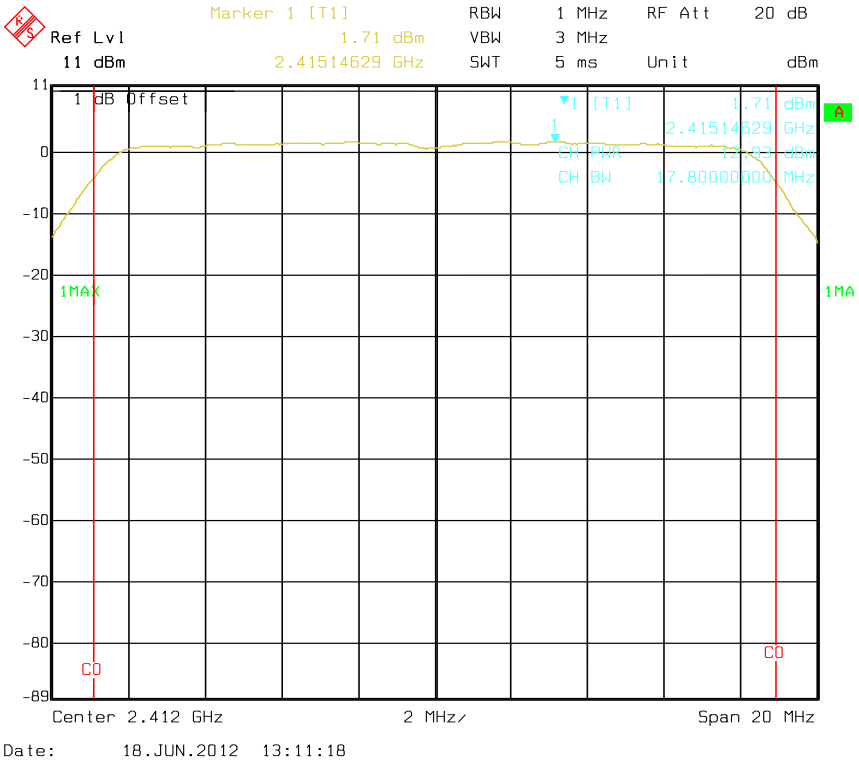
High Channel



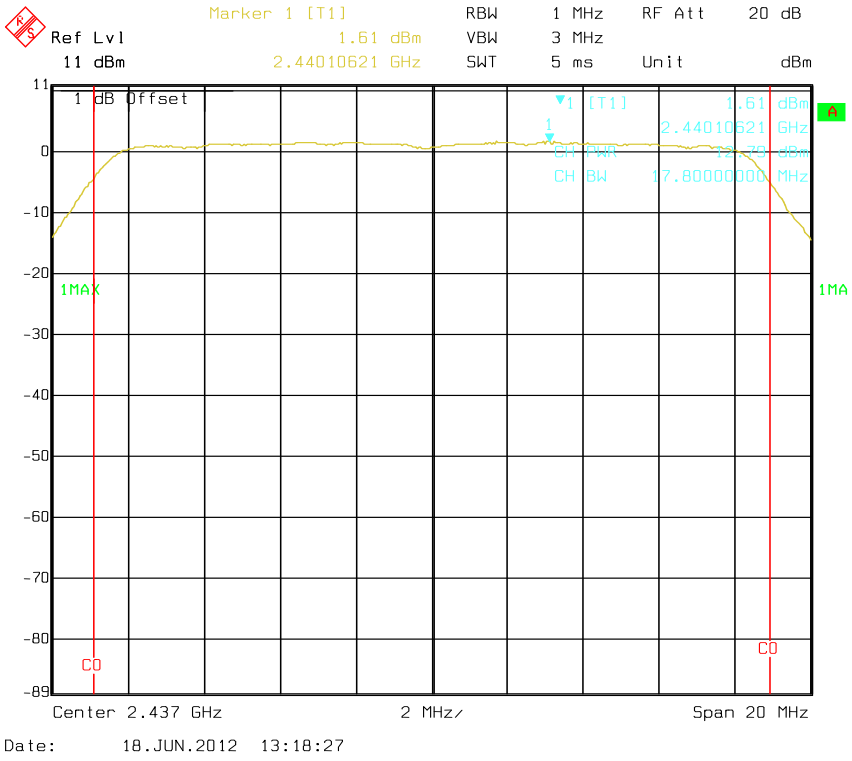
Test mode: 802.11n20 mode

Channel	Frequency (MHz)	Conducted Output Power (dBm)	FCC Limit (dBm)	Result
Low	2412	12.93	30	Compliant
Middle	2437	12.79	30	Compliant
High	2462	12.66	30	Compliant

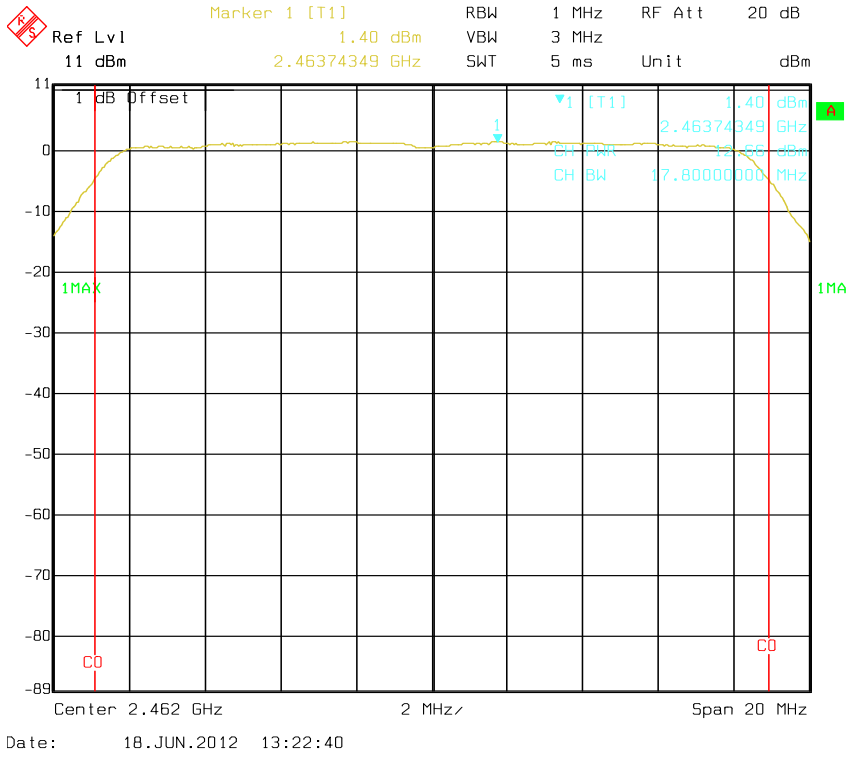
Low Channel



Middle Channel



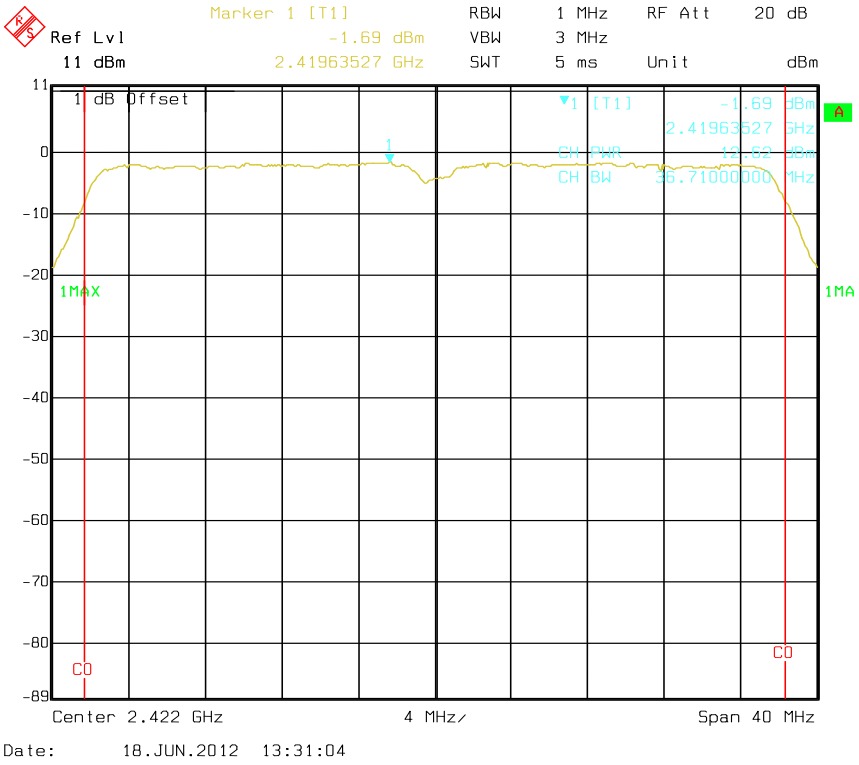
High Channel



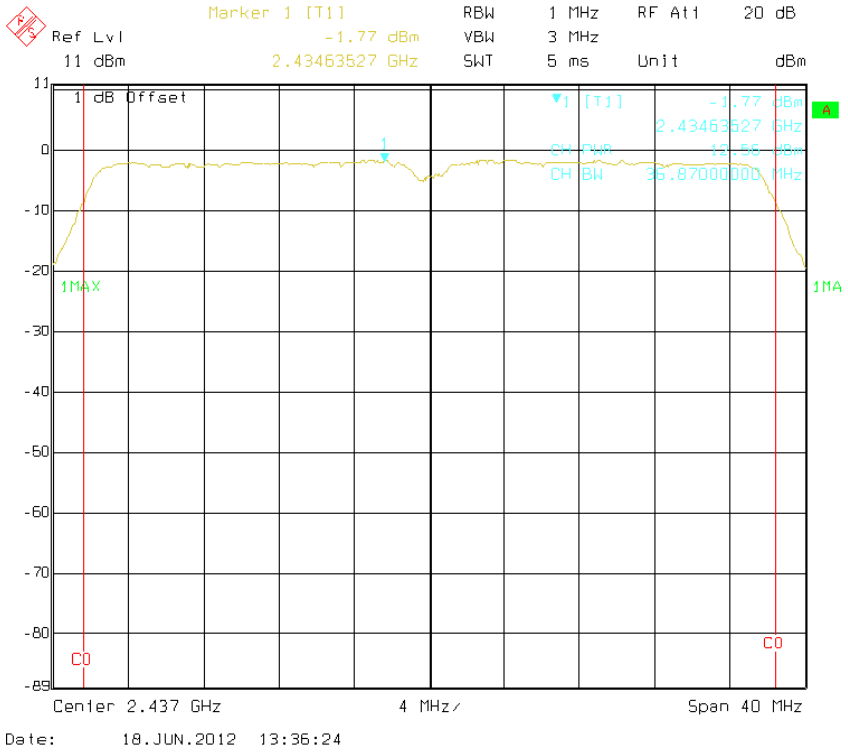
Test mode: 802.11n40 mode

Channel	Frequency (MHz)	Conducted Output Power (dBm)	FCC Limit (dBm)	Result
Low	2422	12.62	30	Compliant
Middle	2437	12.56	30	Compliant
High	2452	12.49	30	Compliant

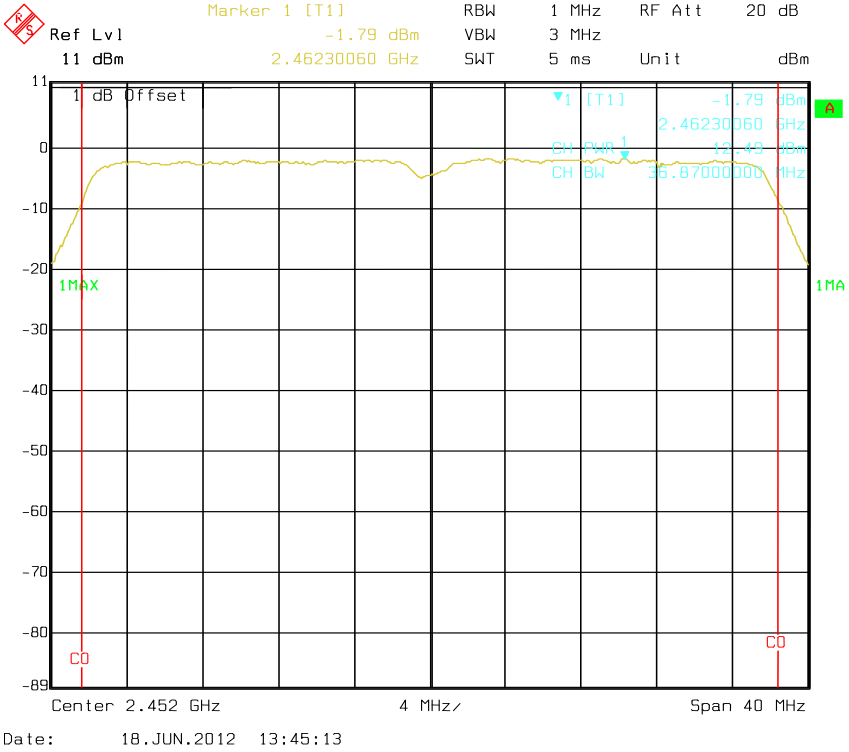
Low Channel



Middle Channel



High Channel



12 - FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGES TESTING

12.1 Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

12.2 Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	10028	2012-03-26	2013-03-26

12.3 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

12.4 Test Data

Environmental Conditions

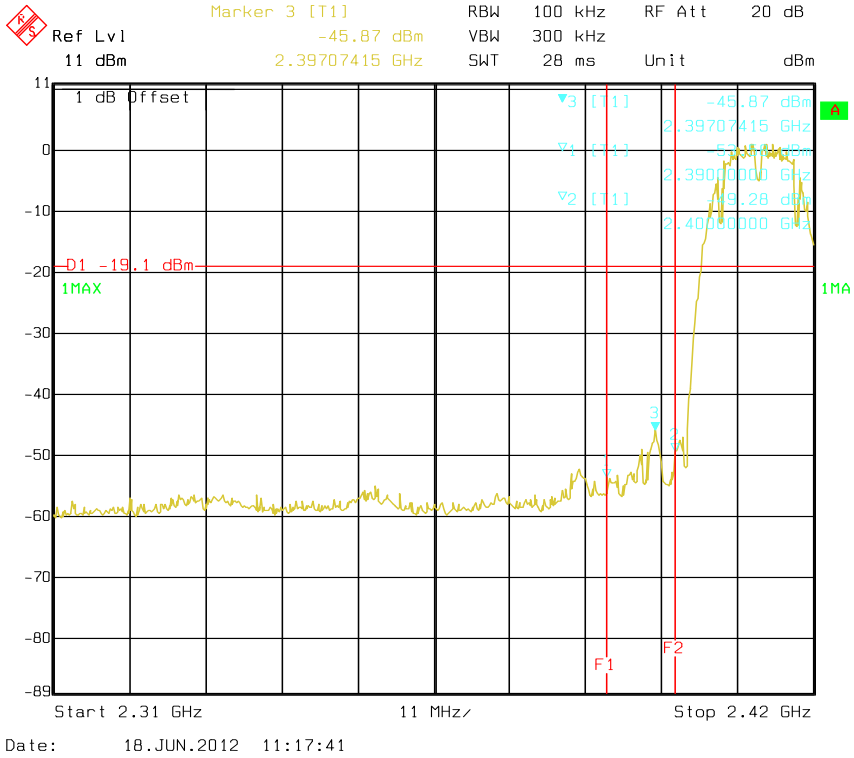
Temperature:	25 °C
Relative Humidity:	52 %
ATM Pressure:	100.9 kPa

**The testing was performed by Kate Yang.*

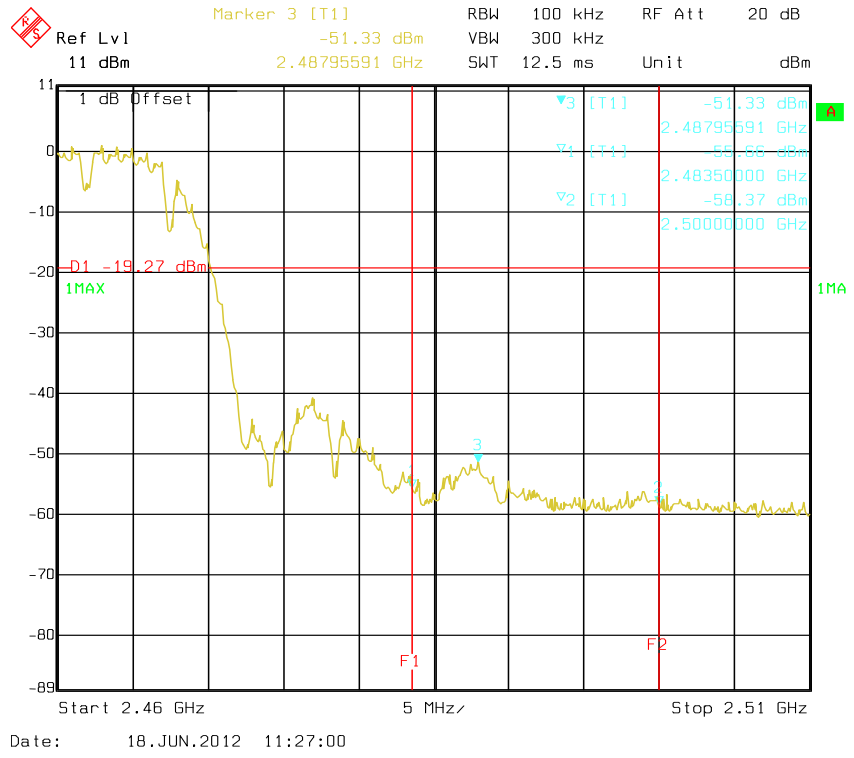
Test Result: Compliant, Please refer to the following plots.

Test mode: 802.11b mode

Band Edge, Left Side

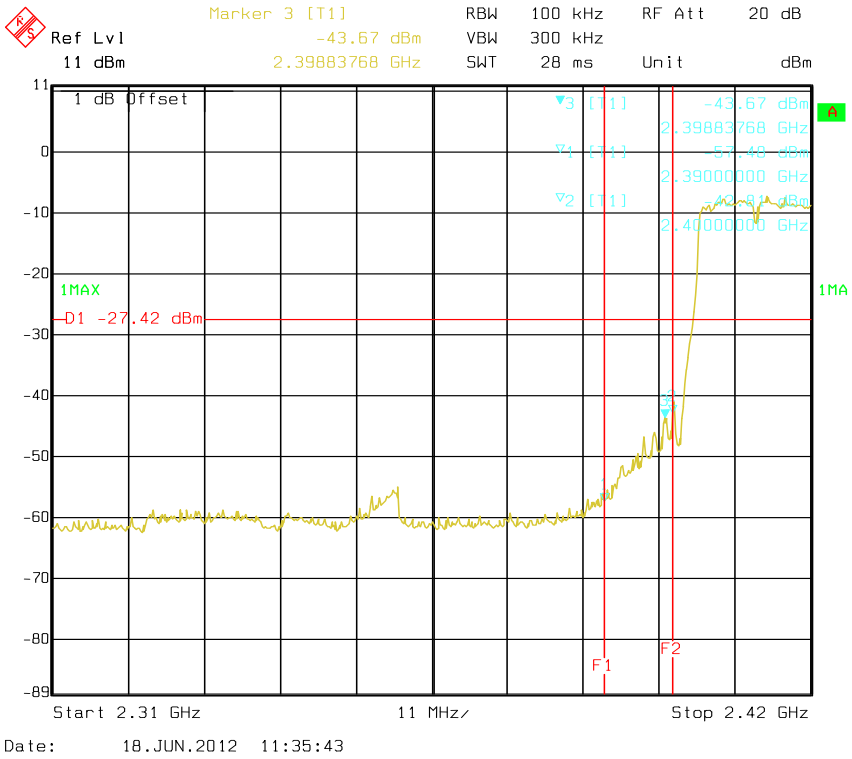


Band Edge, Right Side

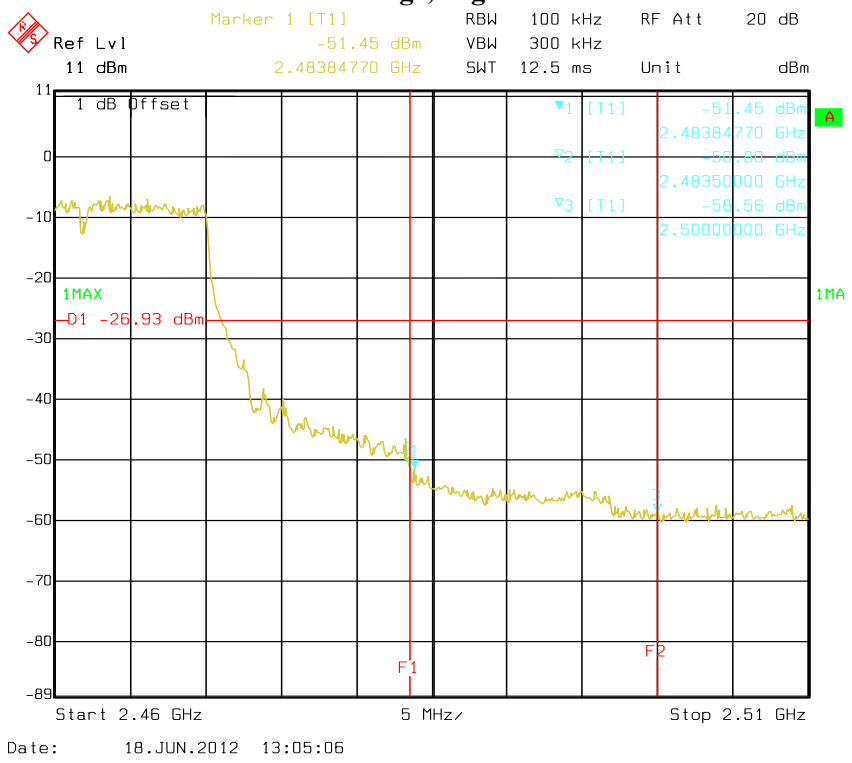


Test mode: 802.11g mode

Band Edge, Left Side

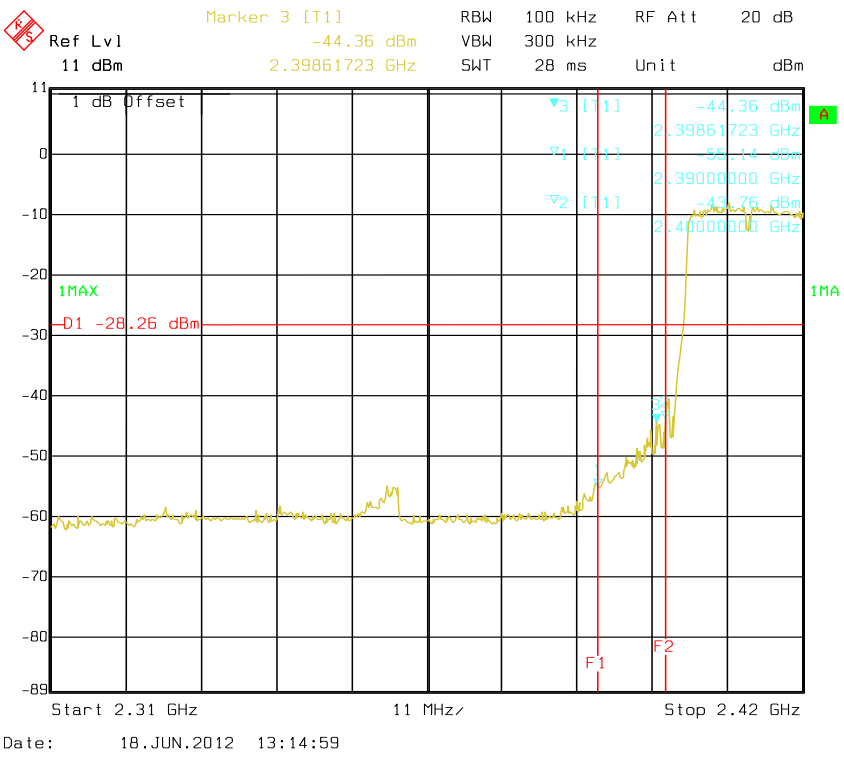


Band Edge, Right Side

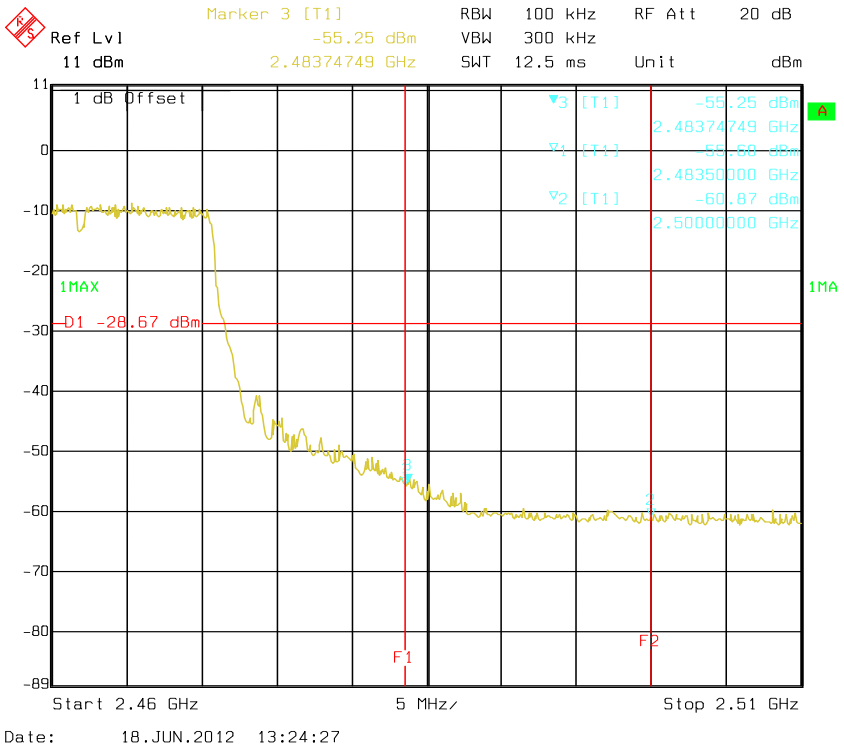


Test mode: 802.11n20 mode

Band Edge, Left Side

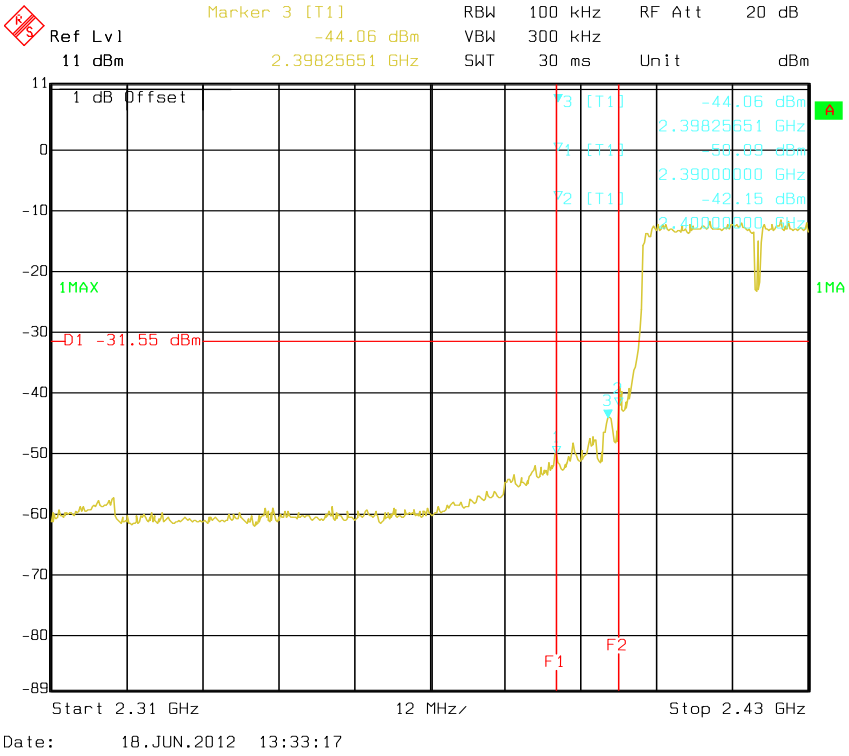


Band Edge, Right Side

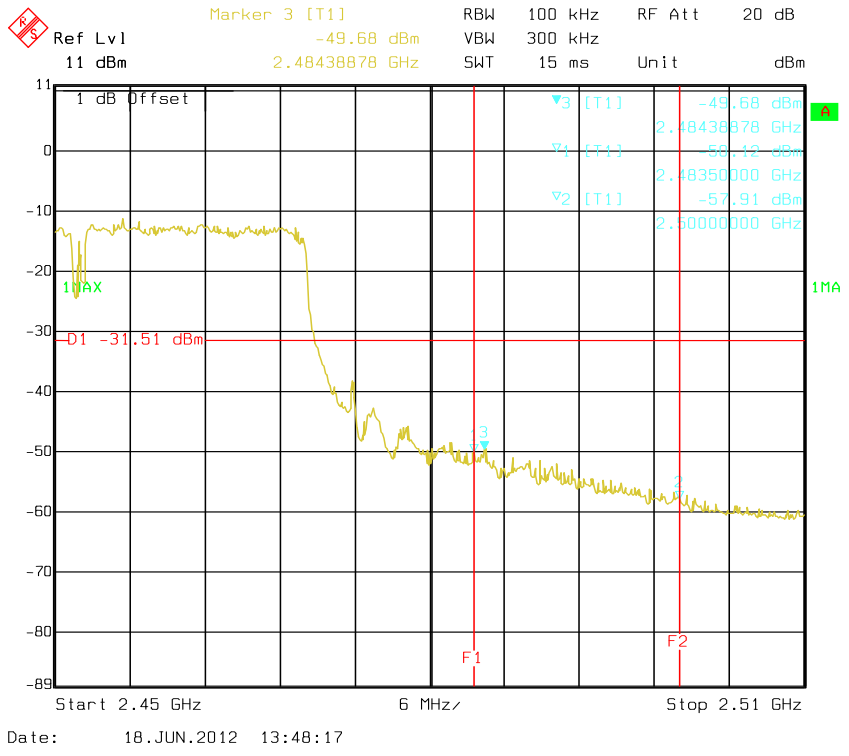


Test mode: 802.11n20 mode

Band Edge, Left Side



Band Edge, Right Side



******* END OF REPORT *******