FCC PART 15.247

TEST REPORT

For

Chengdu Xgimi Technology Co., Ltd.

5F, Building A7, Tianfu Software Park, Tianfu Avenue,
Hi-tech Zone, Chengdu, China

FCC ID: 2AFENXF09G

Report Type:	Product Name:
Original Report	LED Projector

Test Engineer:	Mill Chen
Report Number:	RSC160411001-0A
Report Date:	2016-09-10
Reviewed By:	Henry Ding EMC Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China Tel: 028-65523123, Fax: 028-65525125 www.baclcorp.com

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Chengdu Xgimi Technology Co., Ltd.***'s product, model number: ***XF09G (FCC ID: 2AFENXF09G)*** *or* ("EUT") in this report was the ***LED Projector***, which was measured approximately: 245mm (L) x 245mm (W) x 216mm (H). Rated input voltage: DC 17V from adapter.

The products, test model: XF09G, multiple model: XF10G, XF11G, XF12G, XF13G, XF14G, XF15G, XF16G, XF17G, XF18G, XF19G, XF20G, XF21G, XF22G, XF23G, XF24G, XF25G, XF26G, XF27G, XF28G, XF29G, XF30G, XF31G, XF32G, XF33G, XF34G, XF35G, XF36G, XF37G, XF38G, XF39G, XF40G, XF41G, XF42G, XF43G, XF44G, XF45G, XF46G, XF47G, XF48G, XF49G, XF50G. Their differences were presented in Product Difference Statement provided by the applicant. And we selected XF09G to fully test.

**All measurement and test data in this report was gathered from final production sample, serial number: 160411001/01 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-04-01, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of ***Chengdu Xgimi Technology Co., Ltd.*** 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 the compliance of the EUT with FCC Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

FCC Part 15B JBP submissions with FCC ID: 2AFENXF09G.
FCC Part 15.407 NII submissions with FCC ID: 2AFENXF09G.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

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.

The uncertainty of any RF tests which use conducted method measurement is ±3.17 dB, the uncertainty of any radiation on emissions measurement is:

30M~200MHz: ±4.7 dB;
200M~1GHz: ±6.0 dB;
1G-6GHz:: ±5.13dB；
6G~25GHz: ±5.47dB；

And the uncertainty will not be taken into consideration for all test data recorded in the report.

Test Facility

The test site used by BACL to collect test data is located in the 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China

Test site at BACL 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 April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

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.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for test in testing mode, which was provided by manufacturer.

For 2.4GHz Wi-Fi mode, 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437	/	/

For 802.11b, 802.11g, and 802.11n HT20 modes were tested with Channel 1, 6 and 11.

The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power, PSD across all data rates bandwidths and modulations.

For Bluetooth LE mode, 40 channels are provided for testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	…	…
…	…	…	…
…	…	…	…
..	…	38	2478
19	2440	39	2480

EUT was tested with channel 0, 19 and 39.

EUT Exercise Software

The software “Ampak RFtest tool V5.3” was used for testing, which was provided by manufacturer. The maximum power with duty cylce(100%) was set by default configuration.

Test Mode	Test Software Version	Ampak RFtest tool V5.3		
802.11b	Test Frequency	2412 MHz	2437 MHz	2462 MHz
	Data Rate	1Mbps	1 Mbps	1 Mbps
	Power Level Antenna 1	N/A	N/A	N/A
	Power Level Antenna 2	N/A	N/A	N/A
802.11g	Test Frequency	2412 MHz	2437 MHz	2462 MHz
	Data Rate	6 Mbps	6 Mbps	6 Mbps
	Power Level Antenna 1	N/A	N/A	N/A
	Power Level Antenna 2	N/A	N/A	N/A
802.11n HT20	Test Frequency	2412 MHz	2437 MHz	2462 MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Antenna 1	N/A	N/A	N/A
	Power Level Antenna 2	N/A	N/A	N/A
BLE	Test Frequency	2402 MHz	2440 MHz	2480 MHz
	BLE	N/A	N/A	N/A

Note: No power level parameter configuration, it was set by default configuration.

Equipment Modifications

No modification was made to the EUT.

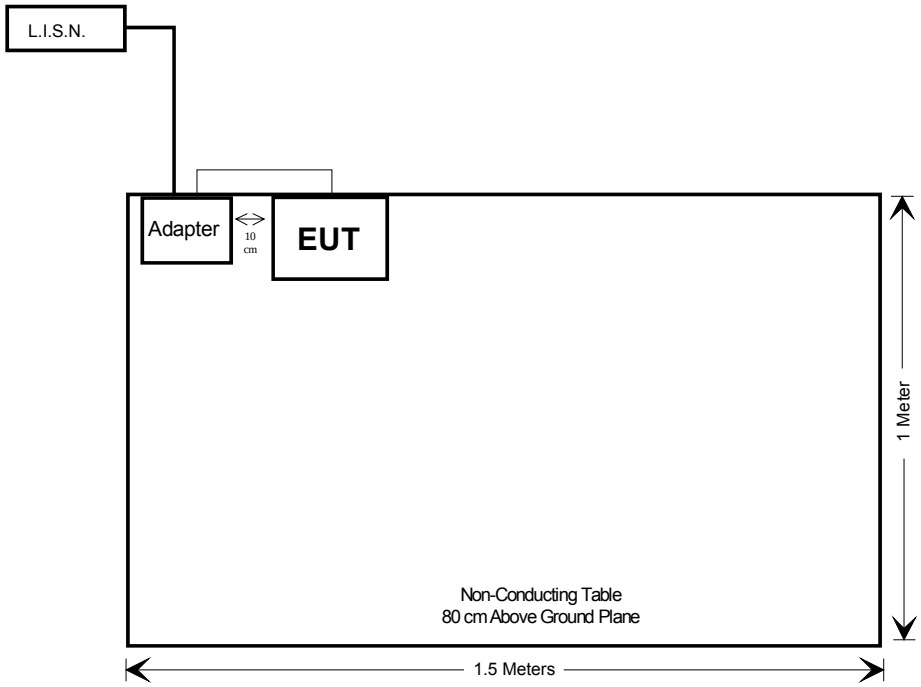
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
-	-	-	-

External I/O Cable

Cable Description	Length (m)	From	To
Unshielded DC Power Cable	1.8	EUT	Adapter

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247(i), §2.1091 & §1.1307(b)(1)	Maximum Permissible exposure (MPE)	Compliant
§15.203	Antenna Requirement	Compliant
§15.207(a)	AC Line Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Spurious Emissions	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

FCC §15.247 (I), §2.1091 & §1.1307(B)(1) - MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, 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/f²)	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.

Calculated Formulary:

Predication of MPE limit at a given distance

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

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 = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \le 1$$

The rated tune-up output power and antenna gain in the below table:

Calculated Data:

MPE evaluation for single transmission:

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
WLAN	2412-2462	4.10	2.57	18.0	63.10	20	0.032	1.0
	5150-5250	4.32	2.70	16.0	39.81	20	0.021	1.0
	5725-5850	4.32	2.70	15.5	35.48	20	0.019	1.0
BLE	2402-2480	3.72	2.36	4.0	2.51	20	0.001	1.0

Note: The WiFi(2.4G) and WiFi(5G) can not tansmit simultaneously.

MPE evaluation for simultaneous transmission:

2.4 G(BT) and 5G(WiFi) or 2.4 G(BT) and 2.4G(WiFi) can transmit at the same time, MPE evaluation is as below formula:

PD1/Limit1+PD2/Limit2+……＜1, PD (Power Density)

MPE evaluation:

2.4 G(BT) and 2.4G(WiFi):

Max MPE of 2.4G(WiFi) + Max MPE of 2.4G(BT) = 0.032/1+0.001/1=0.033＜1

2.4 G(BT) and 5G(WiFi):

Max MPE of 5G(WiFi) + Max MPE of 2.4G(BT) = 0.021/1+0.001/1=0.022＜1

Result: MPE evaluation of single and simultaneous transmission meet the requirement of standard.

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to FCC §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.

Antenna Connector Construction

The EUT used three internal FPC antennas and with I-PEX connector, two of them are for Wi-Fi (2.4GHz/5GHz), the other is for Bluetooth LE, which were permanently attached, fulfill the requirement of this section. Please refer to the EUT internal photos and the below table for detail.

Type	Antenna Model Number	Antenna Gain
Wi-Fi Antenna1	AG-041533-0991	2.4G 3.95 dBi, 5.8G 3.84 dBi
Wi-Fi Antenna 2	AG-041533-0992	2.4G 4.10 dBi, 5.8G 4.32 dBi
Bluetooth LE Antenna	AG-041333-0993	3.72 dBi

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

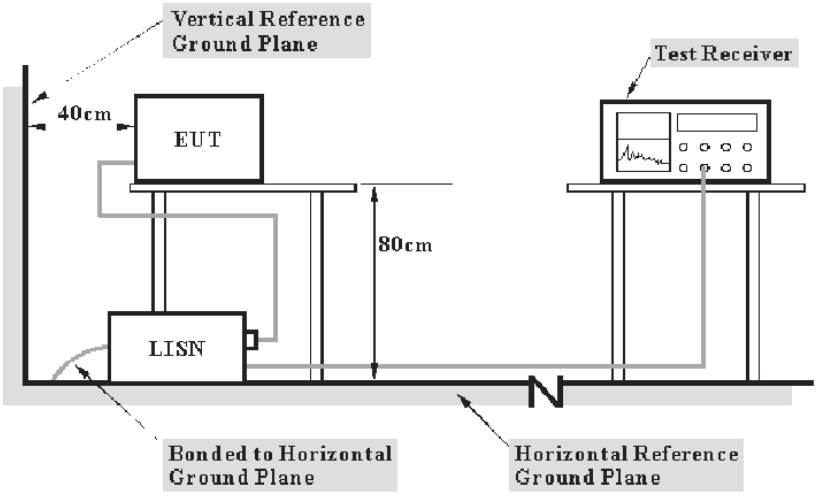
If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit.

Based on CISPR 16-4-2:2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Chengdu) is ±3.17 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cispr}

Measurement		U_{cispr}
Conducted disturbance at mains port using AMN	(150 kHz to 30 MHz)	3.4 dB

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 setup of EUT was according to ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

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

The spacing between the peripherals was 10 cm.

The adapter was connected to AC 120V/60Hz power source.

EMI Test Receiver Setup

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

Test Procedure

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

$V_C = V_R + A_C + VDF$

Herein,s
V_C: corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN or ISN

The "**Margin**" column of the following data tables indicates the degree of compliance within 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

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2015-12-02	2016-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2015-12-02	2016-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.12	None	None
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	357.8810.52	2015-10-31	2016-10-30
N/A	Conducted Cable	NO.5	N/A	2015-11-10	2016-11-09

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207.

Test Data

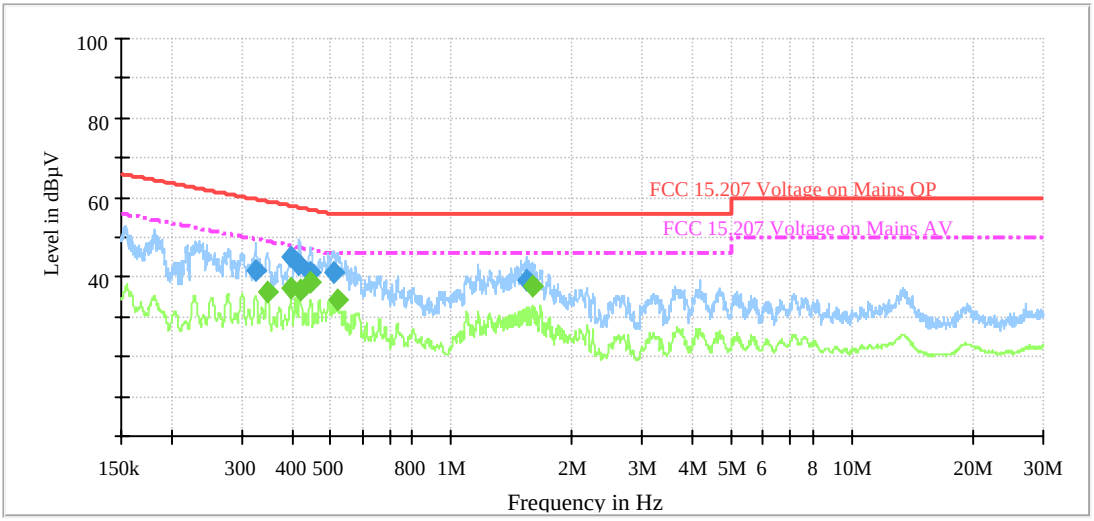
Environmental Conditions

Temperature:	27 °C
Relative Humidity:	62 %
ATM Pressure:	94.8 kPa

The testing was performed by Mill Chen on 2016-06-27.

Test Mode: Transmitting (Wi-Fi)

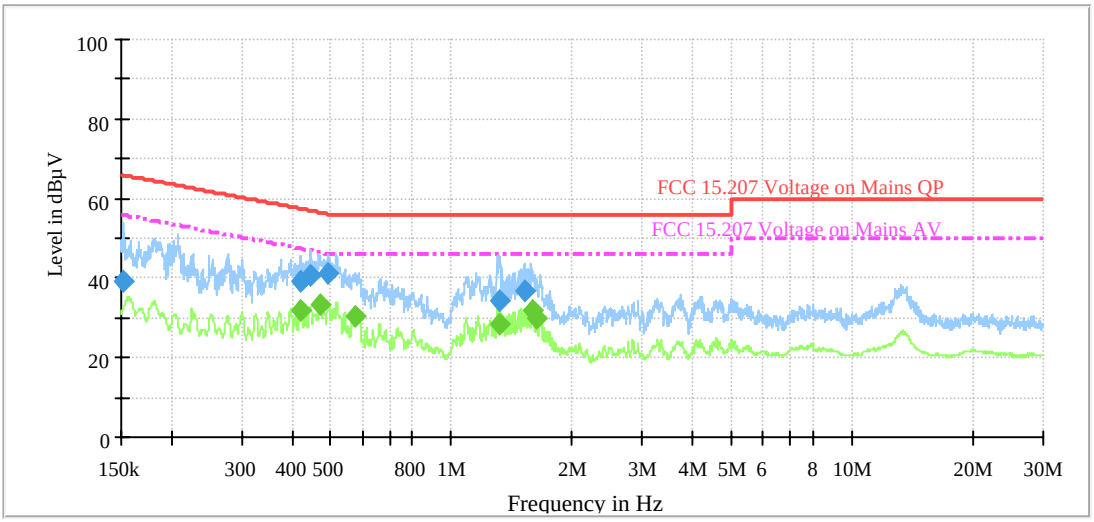
AC120V/60Hz, Line



Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.325012	41.7	9.000	L1	19.6	17.9	59.6
0.397685	45.1	9.000	L1	19.9	12.8	57.9
0.417220	43.2	9.000	L1	19.9	14.3	57.5
0.444766	41.0	9.000	L1	19.9	16.0	57.0
0.506447	41.2	9.000	L1	20.0	14.8	56.0
1.538109	39.2	9.000	L1	20.0	16.8	56.0

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.347858	36.5	9.000	L1	19.7	12.5	49.0
0.396892	37.4	9.000	L1	19.9	10.5	47.9
0.418054	36.5	9.000	L1	19.9	11.0	47.5
0.444766	38.8	9.000	L1	19.9	8.2	47.0
0.517701	34.4	9.000	L1	20.0	11.6	46.0
1.588074	37.5	9.000	L1	20.0	8.5	46.0

AC120V/60Hz, Neutral

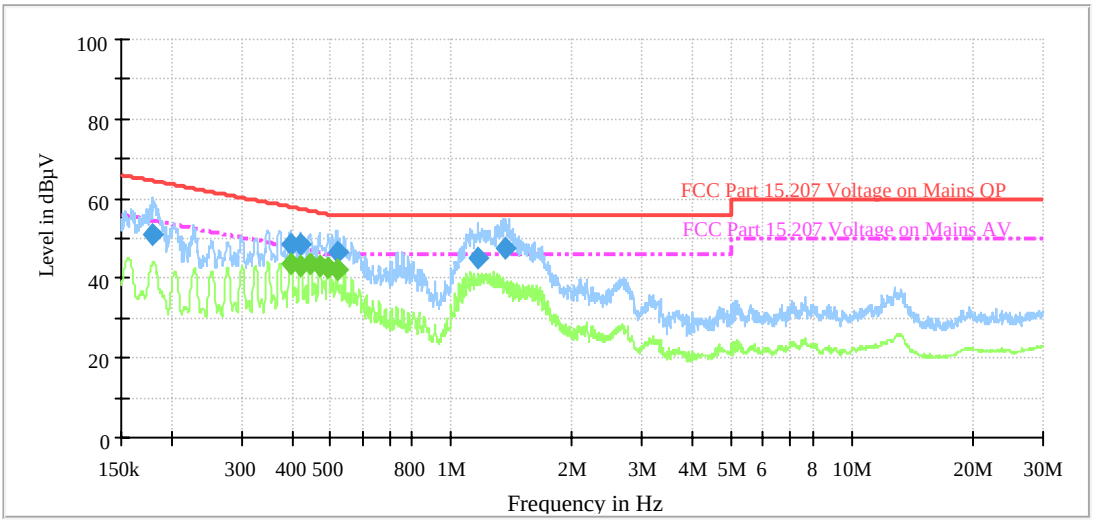


Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.151204	39.3	9.000	N	18.8	26.6	65.9
0.418890	39.4	9.000	N	19.9	18.1	57.5
0.444766	40.5	9.000	N	19.9	16.5	57.0
0.493462	41.2	9.000	N	19.9	14.9	56.1
1.324061	34.5	9.000	N	20.0	21.5	56.0
1.516747	36.9	9.000	N	20.0	19.1	56.0

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.420568	31.9	9.000	N	19.9	15.5	47.4
0.470358	33.6	9.000	N	19.9	12.9	46.5
0.577835	30.4	9.000	N	19.9	15.6	46.0
1.321418	28.5	9.000	N	20.0	17.5	46.0
1.588074	31.9	9.000	N	20.0	14.1	46.0
1.636389	30.0	9.000	N	20.0	16.0	46.0

Test Mode: Transmitting (BLE)

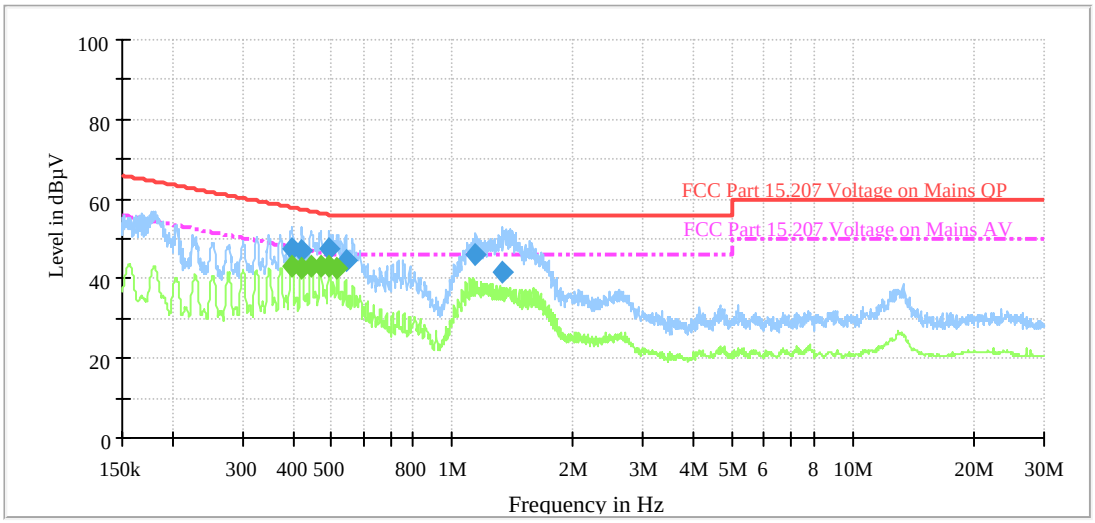
AC120V/60Hz, Line



Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.179550	50.8	9.000	L1	18.9	13.7	64.5
0.396099	48.5	9.000	L1	19.9	9.4	57.9
0.420568	48.6	9.000	L1	19.9	8.8	57.4
0.517701	46.7	9.000	L1	20.0	9.3	56.0
1.165129	45.0	9.000	L1	20.0	11.0	56.0
1.369807	47.3	9.000	L1	20.0	8.7	56.0

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.396892	43.8	9.000	L1	19.9	4.1	47.9
0.420568	43.0	9.000	L1	19.9	4.4	47.4
0.444766	43.4	9.000	L1	19.9	3.6	47.0
0.469419	43.3	9.000	L1	19.9	3.2	46.5
0.493462	42.6	9.000	L1	19.9	3.5	46.1
0.517701	42.2	9.000	L1	20.0	3.8	46.0

AC120V/60Hz,Neutral



Frequency (MHz)	QuasiPeak (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.396892	47.6	9.000	N	19.9	10.3	57.9
0.421409	47.1	9.000	N	19.9	10.3	57.4
0.493462	47.5	9.000	N	19.9	8.6	56.1
0.540965	44.4	9.000	N	19.9	11.6	56.0
1.144364	45.9	9.000	N	20.0	10.1	56.0
1.332021	41.7	9.000	N	20.0	14.3	56.0

Frequency (MHz)	Average (dBuV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)
0.396892	43.2	9.000	N	19.9	4.7	47.9
0.420568	42.4	9.000	N	19.9	5.0	47.4
0.444766	43.2	9.000	N	19.9	3.8	47.0
0.468482	43.2	9.000	N	19.9	3.3	46.5
0.492477	43.0	9.000	N	19.9	***3.1**	46.1
0.516668	42.6	9.000	N	19.9	3.4	46.0

***** *Within Measurement Uncertainty*

FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner：

If U_{lab} is less than or equal to U_{cispr} of Table 2, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 2, then:
–compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

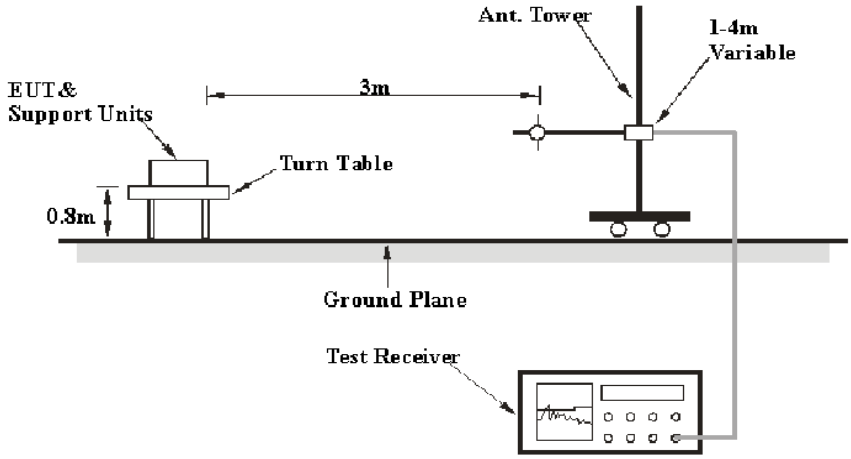
Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:
30M~200MHz: ±4.7 dB ;
200M~1GHz: ±6.0 dB ;
1G-6GHz: ±5.13dB;
6G~25GHz: ±5.47 dB;

Table 2 – Values of U_{cispr}

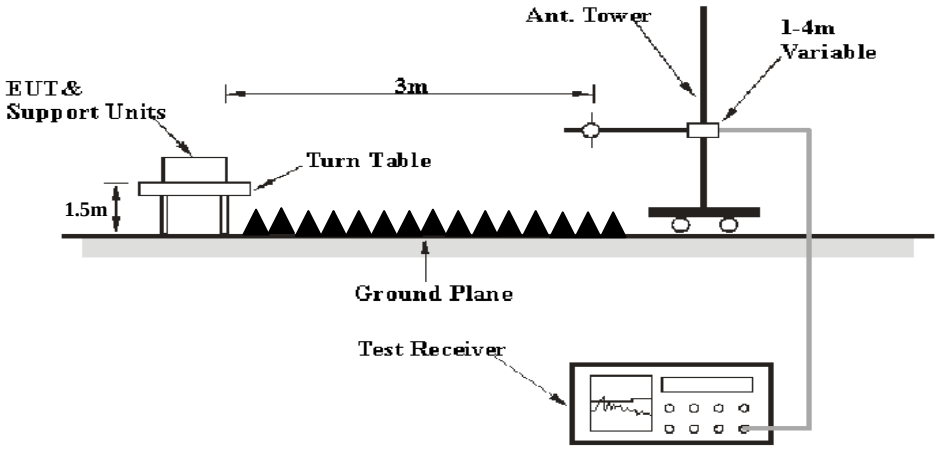
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup

Below 1 GHz:



Above 1 GHz:



The radiated emission tests were performed in the 3 meters Semi-Anechoic Chamber, using the setup in accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209 and FCC 15.247 limits.

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

The spacing between the peripherals was 10 cm.

The adapter was connected to AC 120V/60Hz power source.

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	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	3 MHz	/	PK
	1 MHz	10 Hz	/	Ave.

Test Procedure

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-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

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 = Receiver Reading + Cable loss + Antenna Factor – 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 limit. The equation for margin calculation is as follows:

Margin = Limit-Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2015-12-02	2016-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2015-12-02	2016-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
EM TEST	Horn Antenna	3115	003-6076	2015-12-02	2016-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-5-20	2017-5-19
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2015-11-10	2016-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2015-11-10	2016-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2015-11-10	2016-11-09
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2015-11-10	2016-11-09
Rohde & Schwarz	EMC32	N/A	V 8.54.0	N/A	N/A

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Section 15.205, 15.209 and 15.247.

Test Data

Environmental Conditions

Temperature:	28 °C
Relative Humidity:	62 %
ATM Pressure:	96.8 kPa

The testing was performed by Mill Chen on 2016-07-04.

Test Mode: Transmitting (Worst Case)

30 MHz to 25 GHz:

Wi-Fi Mode

802.11b Mode (ANT1)

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB	dB	dB	dBµV/m	dBµV/m	dB
2412 MHz									
2412	84.32	PK	V	23.14	2.80	0.00	110.26	N/A	N/A
2412	72.63	AV	V	23.14	2.80	0.00	98.57	N/A	N/A
2412	82.14	PK	H	23.14	2.80	0.00	108.08	N/A	N/A
2412	69.14	AV	H	23.14	2.80	0.00	95.08	N/A	N/A
2390	30.21	PK	V	23.08	2.63	0.00	55.92	74.00	18.08
2390	15.31	AV	V	23.08	2.63	0.00	41.02	54.00	12.98
4824	44.35	PK	V	30.76	4.26	26.81	52.56	74.00	21.44
4824	28.74	AV	V	30.76	4.26	26.81	36.95	54.00	17.05
7236	41.28	PK	V	34.35	4.80	26.62	53.81	74.00	20.19
7236	24.84	AV	V	34.35	4.80	26.62	37.37	54.00	16.63
9648	33.02	PK	V	37.08	6.15	26.35	49.90	74.00	24.10
9648	17.25	AV	V	37.08	6.15	26.35	34.13	54.00	19.87
183.2	45.36	QP	V	11.37	1.60	27.65	30.68	43.50	12.82
2437 MHz									
2437	81.35	PK	V	25.74	2.81	0.00	109.90	N/A	N/A
2437	70.52	AV	V	25.74	2.81	0.00	99.07	N/A	N/A
2437	81.01	PK	H	25.74	2.81	0.00	109.56	N/A	N/A
2437	68.35	AV	H	25.74	2.81	0.00	96.90	N/A	N/A
4874	46.51	PK	V	30.77	4.29	26.78	54.79	74.00	19.21
4874	29.32	AV	V	30.77	4.29	26.78	37.60	54.00	16.40
7311	38.86	PK	V	34.35	4.79	26.56	51.44	74.00	22.56
7311	23.21	AV	V	34.35	4.79	26.56	35.79	54.00	18.21
9748	33.18	PK	V	36.30	6.19	26.32	49.35	74.00	24.65
9748	24.31	AV	V	36.30	6.19	26.32	40.48	54.00	13.52
183.2	43.27	QP	V	11.37	1.60	27.65	28.59	43.50	14.91

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB	dB	dB	dBµV/m	dBµV/m	dB
2462 MHz									
2462	83.16	PK	V	25.80	2.82	0.00	111.78	N/A	N/A
2462	71.2	AV	V	25.80	2.82	0.00	99.82	N/A	N/A
2462	81.27	PK	H	25.80	2.82	0.00	109.89	N/A	N/A
2462	70.36	AV	H	25.80	2.82	0.00	98.98	N/A	N/A
2483.5	28.32	PK	V	25.86	2.83	0.00	57.01	74.00	16.99
2483.5	13.59	AV	V	25.86	2.83	0.00	42.28	54.00	11.72
4924	41.24	PK	V	30.90	4.31	26.71	49.74	74.00	24.26
4924	25.32	AV	V	30.90	4.31	26.71	33.82	54.00	20.18
7386	39.35	PK	V	34.53	4.85	26.53	52.20	74.00	21.80
7386	25.12	AV	V	34.53	4.85	26.53	37.97	54.00	16.03
9848	36.14	PK	V	36.54	6.24	26.30	52.62	74.00	21.38
9848	20.04	AV	V	36.54	6.24	26.30	36.52	54.00	17.48
183.2	43.19	QP	V	11.37	1.60	27.65	28.51	43.50	14.99

802.11g Mode

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB	dB	dB	dBµV/m	dBµV/m	dB
2412 MHz									
2412	82.14	PK	V	23.14	2.80	0.00	108.08	N/A	N/A
2412	68.74	AV	V	23.14	2.80	0.00	94.68	N/A	N/A
2412	80.54	PK	H	23.14	2.80	0.00	106.48	N/A	N/A
2412	67.25	AV	H	23.14	2.80	0.00	93.19	N/A	N/A
2390	30.24	PK	V	23.08	2.63	0.00	55.95	74.00	18.05
2390	14.58	AV	V	23.08	2.63	0.00	40.29	54.00	13.71
4824	45.35	PK	V	30.76	4.26	26.81	53.56	74.00	20.44
4824	31.78	AV	V	30.76	4.26	26.81	39.99	54.00	14.01
7236	36.74	PK	V	34.35	4.80	26.62	49.27	74.00	24.73
7236	21.36	AV	V	34.35	4.80	26.62	33.89	54.00	20.11
9648	38.75	PK	V	37.08	6.15	26.35	55.63	74.00	18.37
9648	21.36	AV	V	37.08	6.15	26.35	38.24	54.00	15.76
183.2	43.38	QP	V	11.37	1.60	27.65	28.70	43.50	14.80

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB	dB	dB	dBµV/m	dBµV/m	dB
2437 MHz									
2437	83.88	PK	V	25.74	2.81	0.00	112.43	N/A	N/A
2437	72.02	AV	V	25.74	2.81	0.00	100.57	N/A	N/A
2437	81.25	PK	H	25.74	2.81	0.00	109.80	N/A	N/A
2437	70.39	AV	H	25.74	2.81	0.00	98.94	N/A	N/A
4874	46.21	PK	V	30.77	4.29	26.78	54.49	74.00	19.51
4874	31.25	AV	V	30.77	4.29	26.78	39.53	54.00	14.47
7311	38.54	PK	V	34.35	4.79	26.56	51.12	74.00	22.88
7311	23.42	AV	V	34.35	4.79	26.56	36.00	54.00	18.00
9748	34.12	PK	V	36.30	6.19	26.32	50.29	74.00	23.71
9748	18.31	AV	V	36.30	6.19	26.32	34.48	54.00	19.52
183.2	44.35	QP	V	11.37	1.60	27.65	29.67	43.50	13.83
2462 MHz									
2462	80.79	PK	V	25.80	2.82	0.00	109.41	N/A	N/A
2462	68.54	AV	V	25.80	2.82	0.00	97.16	N/A	N/A
2462	78.25	PK	H	25.80	2.82	0.00	106.87	N/A	N/A
2462	66.84	AV	H	25.80	2.82	0.00	95.46	N/A	N/A
2483.5	28.21	PK	V	25.86	2.83	0.00	56.90	74.00	17.10
2483.5	14.03	AV	V	25.86	2.83	0.00	42.72	54.00	11.28
4924	46.16	PK	V	30.90	4.31	26.71	54.66	74.00	19.34
4924	30.02	AV	V	30.90	4.31	26.71	38.52	54.00	15.48
7386	38.35	PK	V	34.53	4.85	26.53	51.20	74.00	22.80
7386	24.38	AV	V	34.53	4.85	26.53	37.23	54.00	16.77
9848	34.67	PK	V	36.54	6.24	26.30	51.15	74.00	22.85
9848	21.37	AV	V	36.54	6.24	26.30	37.85	54.00	16.15
183.2	43.41	QP	V	11.37	1.60	27.65	28.73	43.50	14.77

802.11n ht20 Mode (ANT1+ANT2)

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB	dB	dB	dBµV/m	dBµV/m	dB
2412 MHz									
2412	82.14	PK	V	23.14	2.80	0.00	108.08	N/A	N/A
2412	70.57	AV	V	23.14	2.80	0.00	96.51	N/A	N/A
2412	80.36	PK	H	23.14	2.80	0.00	106.30	N/A	N/A
2412	65.42	AV	H	23.14	2.80	0.00	91.36	N/A	N/A
2390	30.15	PK	V	23.08	2.63	0.00	55.86	74.00	18.14
2390	19.32	AV	V	23.08	2.63	0.00	45.03	54.00	8.97
4824	46.32	PK	V	30.76	4.26	26.81	54.53	74.00	19.47
4824	32.35	AV	V	30.76	4.26	26.81	40.56	54.00	13.44
7236	33.34	PK	V	34.35	4.80	26.62	45.87	74.00	28.13
7236	19.86	AV	V	34.35	4.80	26.62	32.39	54.00	21.61
9648	35.23	PK	V	37.08	6.15	26.35	52.11	74.00	21.89
9648	18.32	AV	V	37.08	6.15	26.35	35.20	54.00	18.80
183.2	46.11	QP	V	11.37	1.60	27.65	31.43	43.50	12.07
2437 MHz									
2437	80.74	PK	V	25.74	2.81	0.00	109.29	N/A	N/A
2437	68.36	AV	V	25.74	2.81	0.00	96.91	N/A	N/A
2437	79.54	PK	H	25.74	2.81	0.00	108.09	N/A	N/A
2437	70.13	AV	H	25.74	2.81	0.00	98.68	N/A	N/A
4874	44.62	PK	V	30.77	4.29	26.78	52.90	74.00	21.10
4874	29.78	AV	V	30.77	4.29	26.78	38.06	54.00	15.94
7311	34.58	PK	V	34.35	4.79	26.56	47.16	74.00	26.84
7311	21.35	AV	V	34.35	4.79	26.56	33.93	54.00	20.07
9748	33.41	PK	V	36.30	6.19	26.32	49.58	74.00	24.42
9748	18.35	AV	V	36.30	6.19	26.32	34.52	54.00	19.48
183.2	44.52	QP	V	11.37	1.60	27.65	29.84	43.50	13.66

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB	dB	dB	dBµV/m	dBµV/m	dB
2462 MHz									
2462	81.55	PK	V	25.80	2.82	0.00	110.17	N/A	N/A
2462	73.24	AV	V	25.80	2.82	0.00	101.86	N/A	N/A
2462	79.86	PK	H	25.80	2.82	0.00	108.48	N/A	N/A
2462	70.54	AV	H	25.80	2.82	0.00	99.16	N/A	N/A
2483.5	28.41	PK	V	25.86	2.83	0.00	57.10	74.00	16.90
2483.5	14.16	AV	V	25.86	2.83	0.00	42.85	54.00	11.15
4924	43.58	PK	V	30.90	4.31	26.71	52.08	74.00	21.92
4924	23.79	AV	V	30.90	4.31	26.71	32.29	54.00	21.71
7386	34.28	PK	V	34.53	4.85	26.53	47.13	74.00	26.87
7386	17.43	AV	V	34.53	4.85	26.53	30.28	54.00	23.72
9848	33.85	PK	V	36.54	6.24	26.30	50.33	74.00	23.67
9848	17.29	AV	V	36.54	6.24	26.30	33.77	54.00	20.23
183.2	45.02	QP	V	11.37	1.60	27.65	30.34	43.50	13.16

BLE Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable Loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	FCC 15.247	
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)				Limit (dBμV/m)	Margin (dB)
Low Channel: 2402 MHz									
2402	68.54	PK	V	25.65	3.90	0.00	98.09	N/A	N/A
2402	55.41	AV	V	25.65	3.90	0.00	84.96	N/A	N/A
2402	66.25	PK	H	25.65	3.90	0.00	95.80	N/A	N/A
2402	53.12	AV	H	25.65	3.90	0.00	82.67	N/A	N/A
2390	28.32	PK	V	25.61	3.84	0.00	57.77	74.00	16.23
2390	15.82	AV	V	25.61	3.84	0.00	45.27	54.00	8.73
4804	48.65	PK	V	30.59	4.67	26.35	57.56	74.00	16.44
4804	35.45	AV	V	30.59	4.67	26.35	44.36	54.00	9.64
7206	32.15	PK	V	34.09	6.50	26.91	45.83	74.00	28.17
7206	21.31	AV	V	34.09	6.50	26.91	34.99	54.00	19.01
9608	35.49	PK	V	35.96	8.75	27.21	52.99	74.00	21.01
9608	26.54	AV	V	35.96	8.75	27.21	44.04	54.00	9.96
1715	45.21	PK	V	24.03	3.23	23.33	49.14	74.00	24.86
1715	38.74	AV	V	24.03	3.23	23.33	42.67	54.00	11.33
47.36	39.31	QP	V	9.79	0.88	28.02	21.96	40	18.04
Middle Channel: 2440 MHz									
2440	66.35	PK	V	25.74	3.99	0.00	96.08	N/A	N/A
2440	51.74	AV	V	25.74	3.99	0.00	81.47	N/A	N/A
2440	67.02	PK	H	25.74	3.99	0.00	96.75	N/A	N/A
2440	53.52	AV	H	25.74	3.99	0.00	83.25	N/A	N/A
4880	45.23	PK	V	30.79	4.75	26.58	54.19	74.00	19.81
4880	33.74	AV	V	30.79	4.75	26.58	42.70	54.00	11.30
7320	25.74	PK	V	34.37	6.72	26.95	39.88	74.00	34.12
7320	15.36	AV	V	34.37	6.72	26.95	29.50	54.00	24.50
9760	38.39	PK	V	36.32	8.58	27.32	55.97	74.00	18.03
9760	28.68	AV	V	36.32	8.58	27.32	46.26	54.00	**7.74**
1715	45.33	PK	V	24.03	3.23	23.33	49.26	74.00	24.74
1715	33.25	AV	V	24.03	3.23	23.33	37.18	54.00	16.82
1272	46.77	PK	V	23.01	2.64	23.56	48.86	74.00	25.14
1272	38.36	AV	V	23.01	2.64	23.56	40.45	54.00	13.55
47.36	38.32	QP	V	9.79	0.88	28.02	20.97	40	19.03
High Channel: 2480 MHz									
2480	63.52	PK	V	25.85	3.82	0.00	93.19	N/A	N/A
2480	50.46	AV	V	25.85	3.82	0.00	80.13	N/A	N/A
2480	67.86	PK	H	25.85	3.82	0.00	97.53	N/A	N/A
2480	52.83	AV	H	25.85	3.82	0.00	82.50	N/A	N/A
2483.5	27.25	PK	V	25.86	3.80	0.00	56.91	74.00	17.09
2483.5	12.34	AV	V	25.86	3.80	0.00	42.00	54.00	12.00
4960	40.21	PK	V	31.00	4.70	26.71	49.20	74.00	24.80
4960	25.58	AV	V	31.00	4.70	26.71	34.57	54.00	19.43
7440	40.74	PK	V	34.66	6.95	27.06	55.29	74.00	18.71
7440	30.42	AV	V	34.66	6.95	27.06	44.97	54.00	9.03
9920	39.35	PK	V	36.71	8.41	27.35	57.12	74.00	16.88
9920	27.67	AV	V	36.71	8.41	27.35	45.44	54.00	8.56
1715	42.35	PK	V	24.03	3.23	23.33	46.28	74.00	27.72
1715	35.21	AV	V	24.03	3.23	23.33	39.14	54.00	14.86
47.36	42.25	QP	V	9.79	0.88	28.02	24.9	40	15.10

For co-location evaluation data

Frequency	Result	Polarity	Detector	Corrected factor	Limit	Margin
MHz	(dBµV/m)	V/H	PK/Ave.	(dB)	(dBµV/m)	(dB)
1622.53	57.69	V	PK	0.44	74	16.31
1621.53	40.35	V	AV	0.44	54	13.65
2583.81	52.83	V	PK	-0.7	74	21.17
2583.81	43.92	V	AV	-0.7	54	10.08
1040.76	58.77	H	PK	-2.03	74	15.23
1040.76	42.13	H	AV	-2.03	54	11.87
1714.56	53.87	H	PK	0.48	74	20.13
1714.56	38.65	H	AV	0.48	54	15.35
120.24	40.4	V	QP	-11.9	43.5	3.1
590.66	42.8	V	QP	-7.7	46.0	3.2

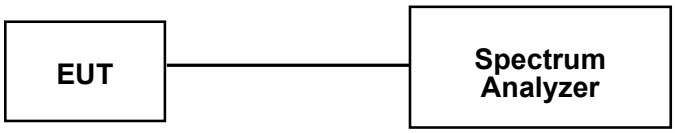
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

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.

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 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
N/A	RF Cable	NO.3	N/A	2015-11-10	2016-11-09
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2015-11-10	2016-11-09

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	27~28 °C
Relative Humidity:	60~61 %
ATM Pressure:	94.9~100.2 kPa

The testing was performed by Mill Chen on 2016-07-04 and 2016-07-05.

Test Mode: Transmitting

Wi-Fi mode

Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Limit (MHz)
			Antenna 1	Antenna 2	
802.11b	Low	2412	9.08	9.14	≥0.50
	Middle	2437	9.14	9.08	≥0.50
	High	2462	9.02	9.08	≥0.50
802.11g	Low	2412	16.47	16.41	≥0.50
	Middle	2437	16.47	16.47	≥0.50
	High	2462	16.47	16.47	≥0.50
802.11n HT20	Low	2412	17.68	17.68	≥0.50
	Middle	2437	17.74	17.68	≥0.50
	High	2462	17.68	17.68	≥0.50

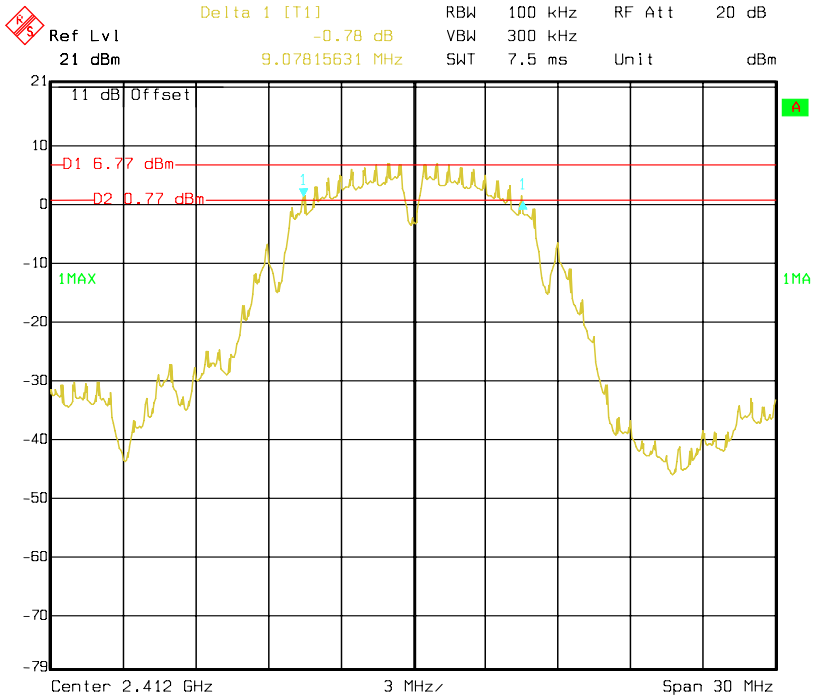
BLE mode

Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)
BLE	Low	2402	0.745	≥0.50
	Middle	2440	0.741	≥0.50
	High	2480	0.749	≥0.50

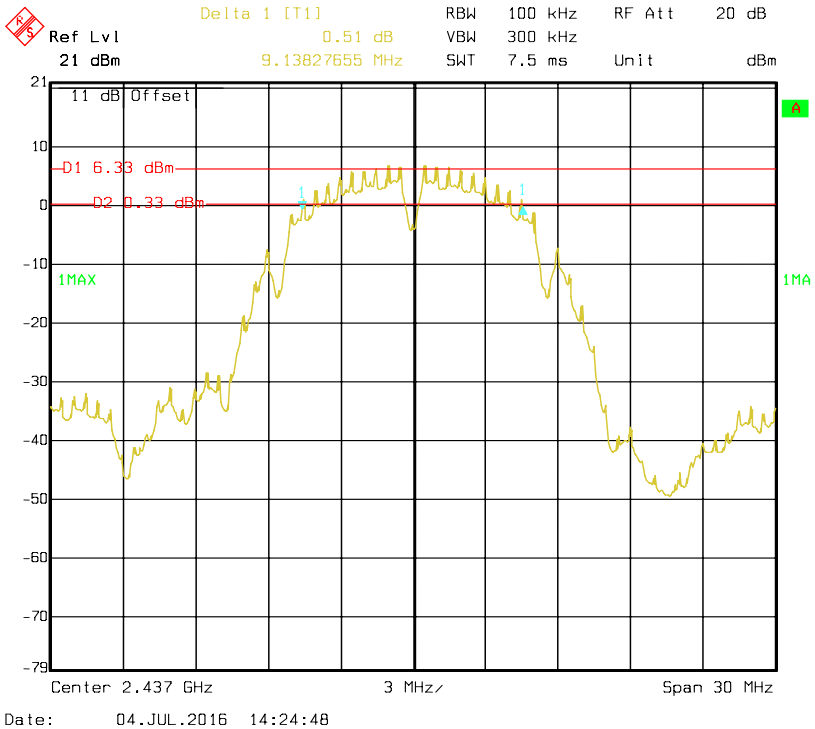
Please refer to the following plots:

Wi-Fi Mode_Antenna 1

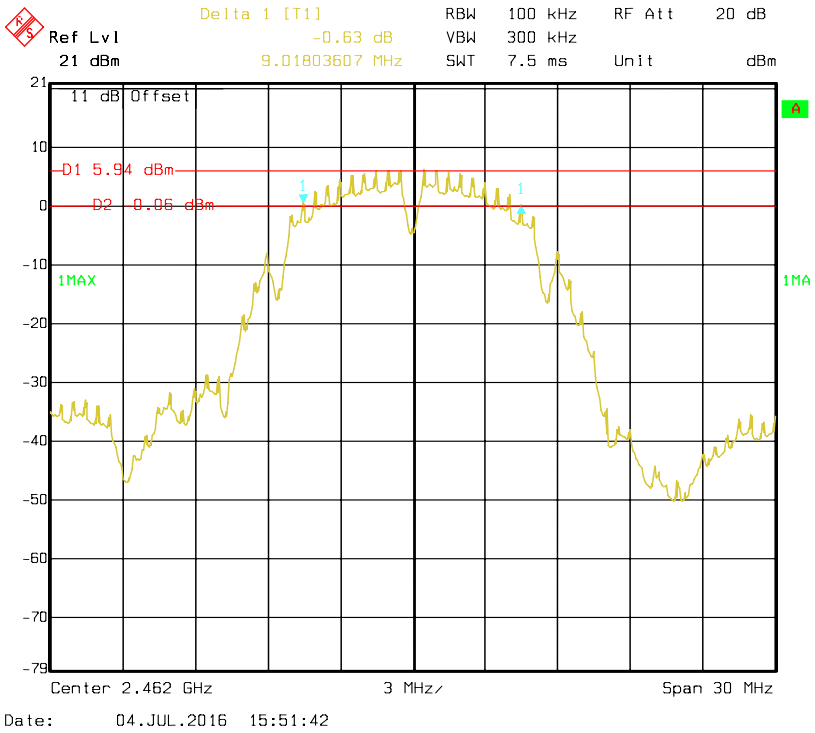
802.11b Low Channel



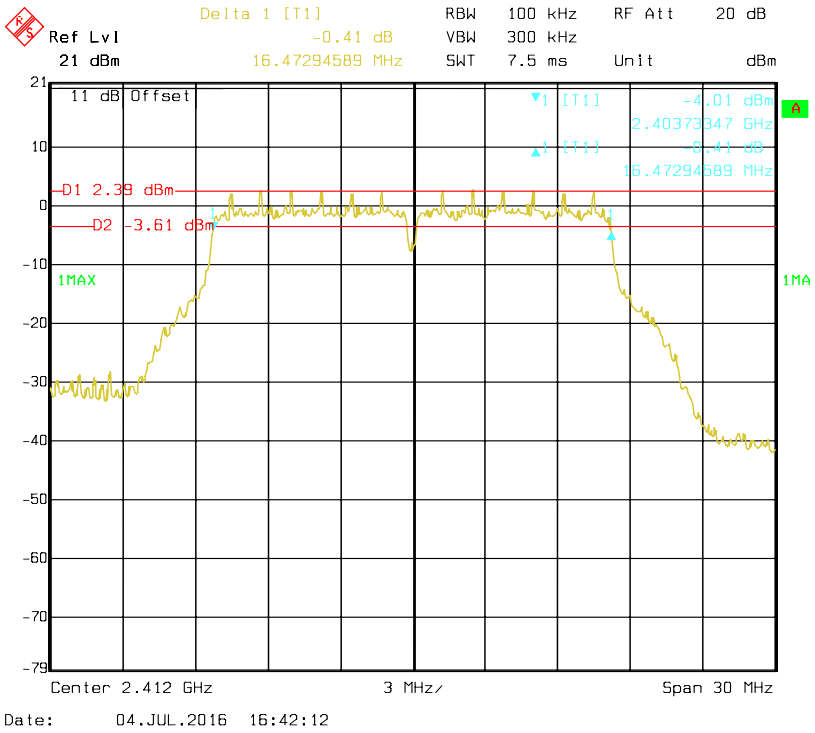
802.11b Middle Channel



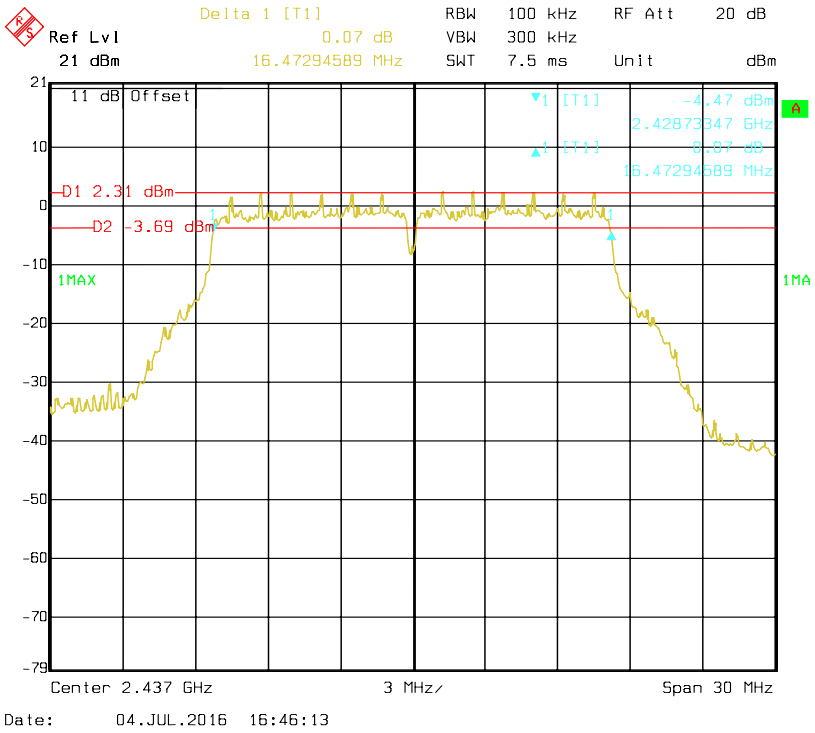
802.11b High Channel



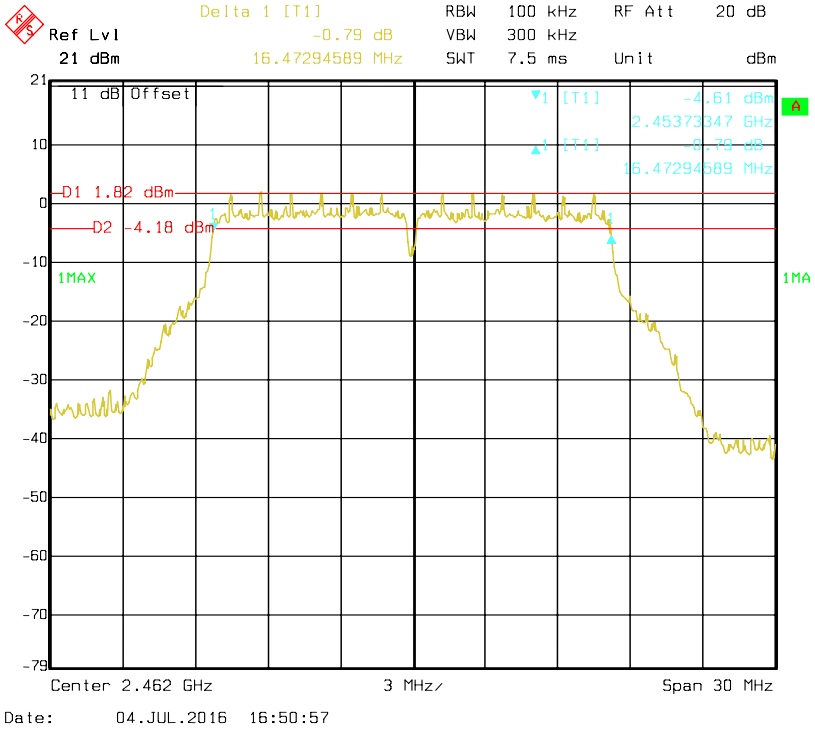
802.11g Low Channel



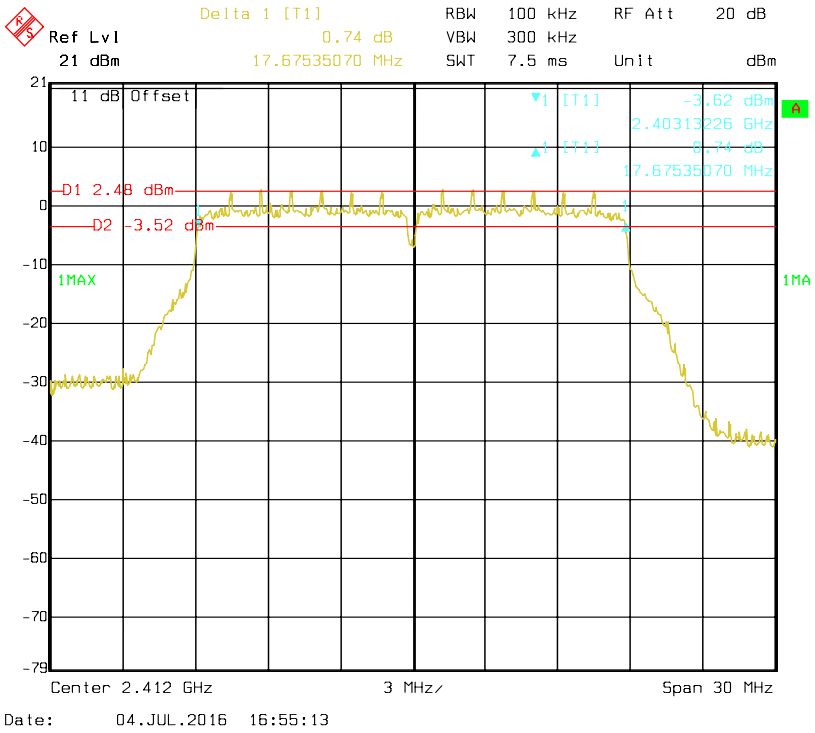
802.11g Middle Channel



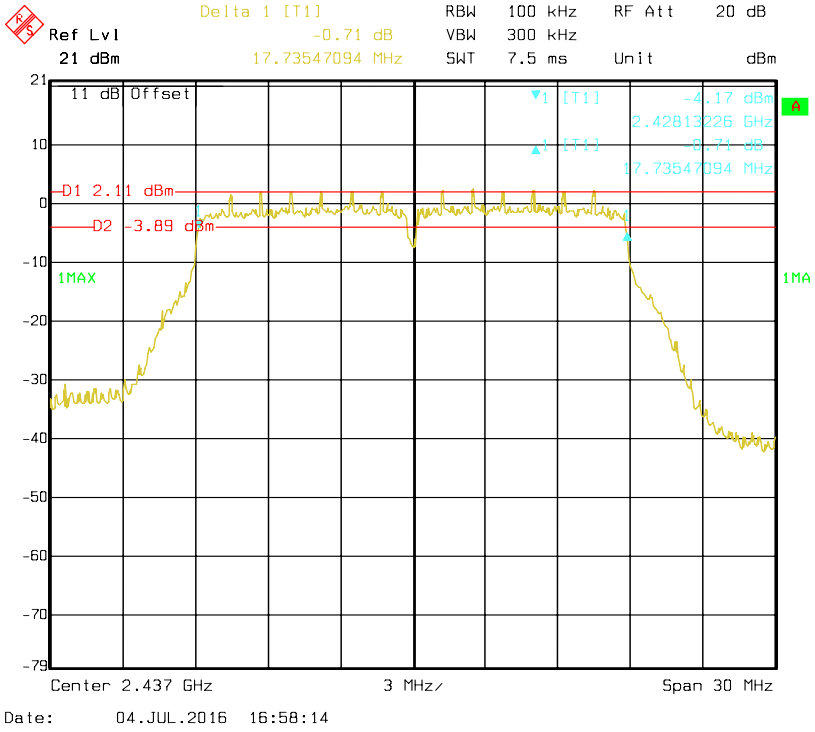
802.11g High Channel



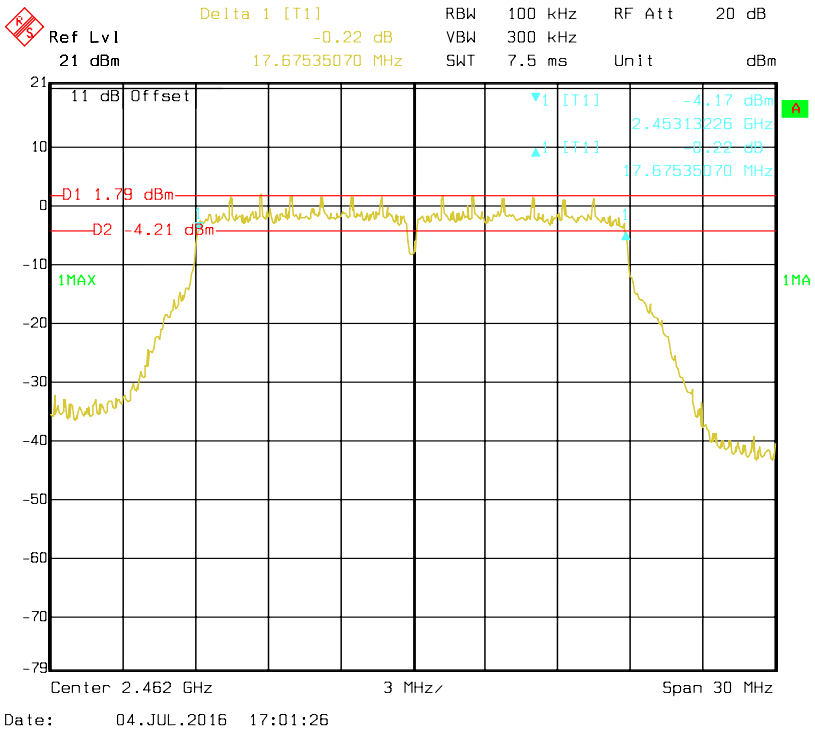
802.11n ht20 Low Channel



802.11n ht20 Middle Channel

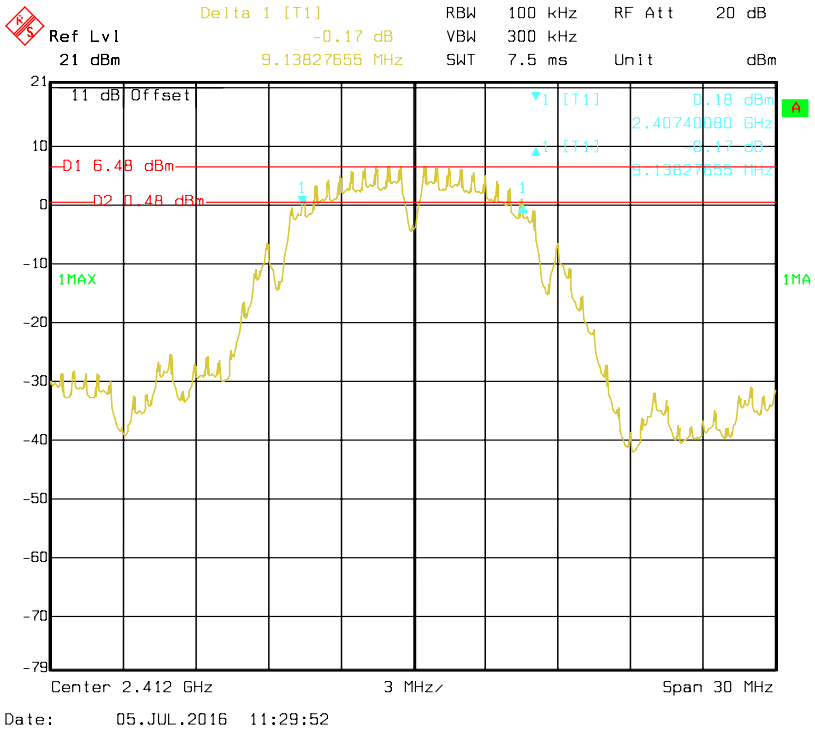


802.11n ht20 High Channel

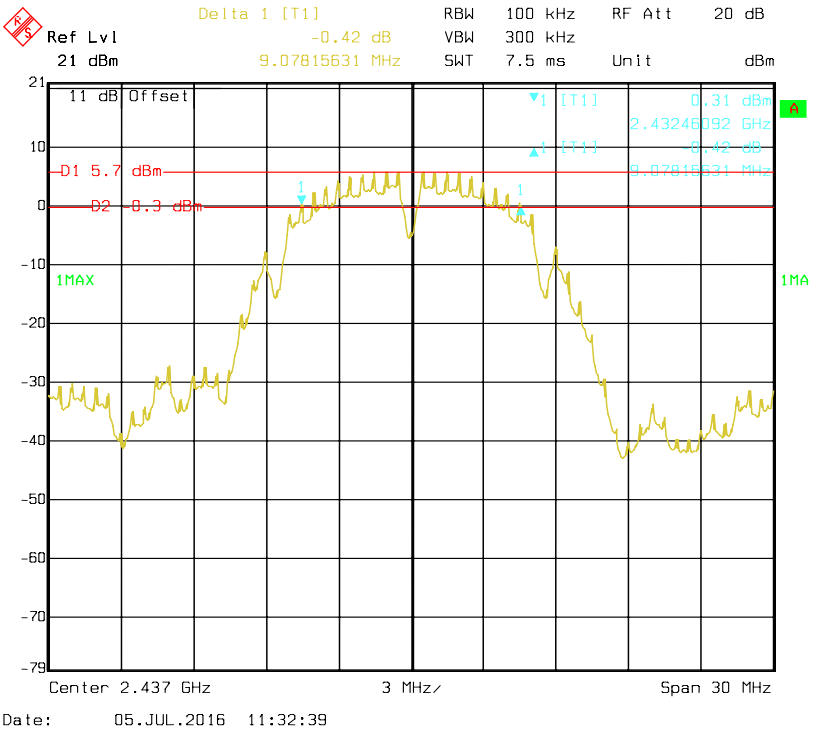


Wi-Fi Mode_Antenna 2

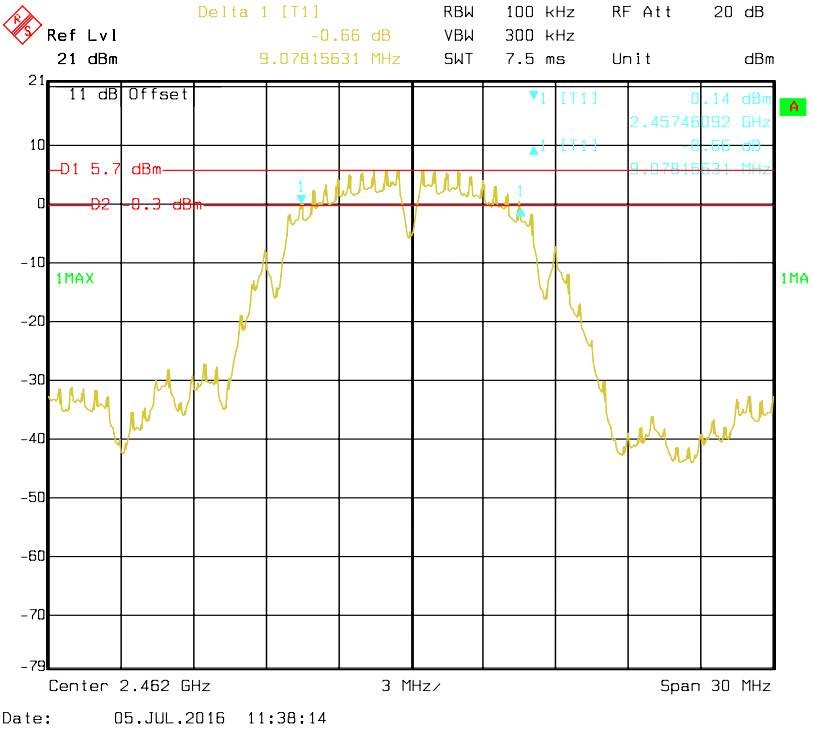
802.11b Low Channel



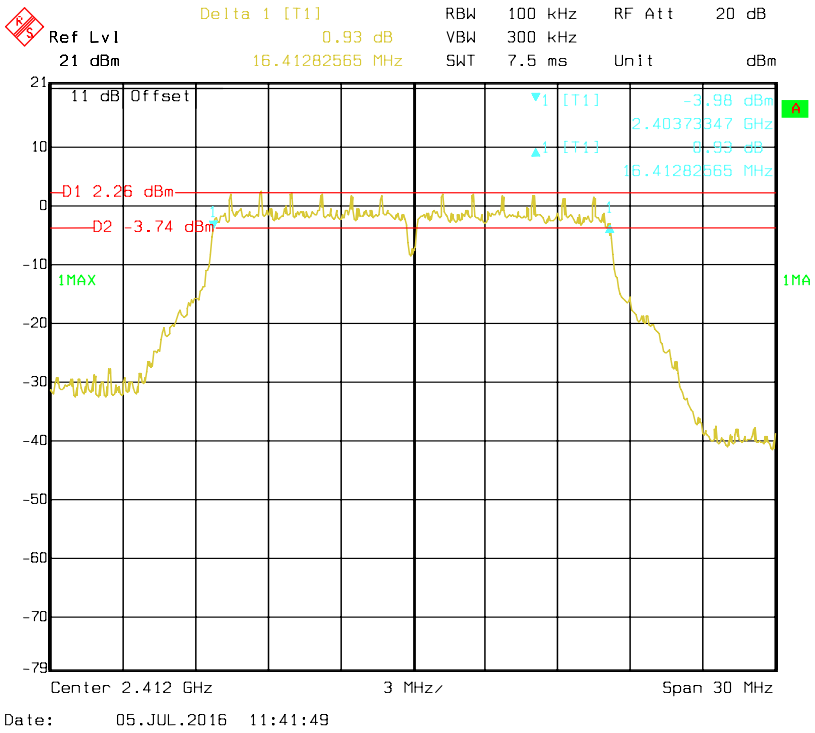
802.11b Middle Channel



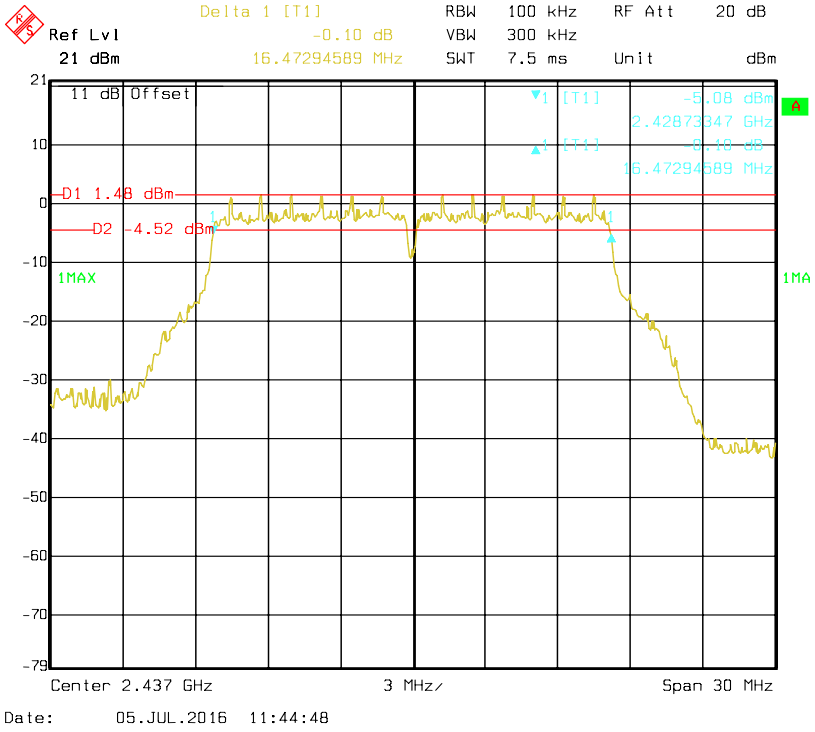
802.11b High Channel



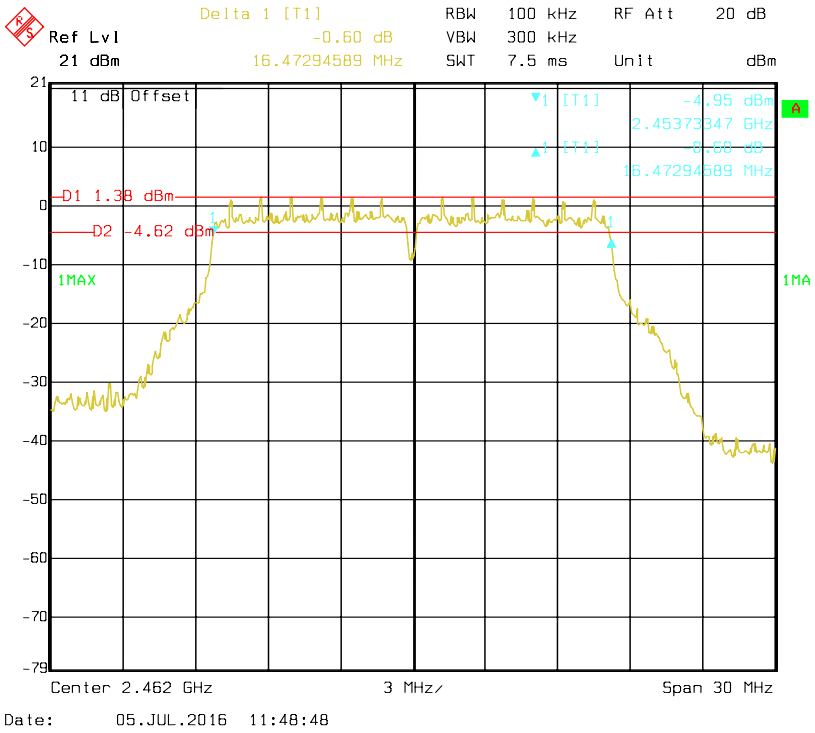
802.11g Low Channel



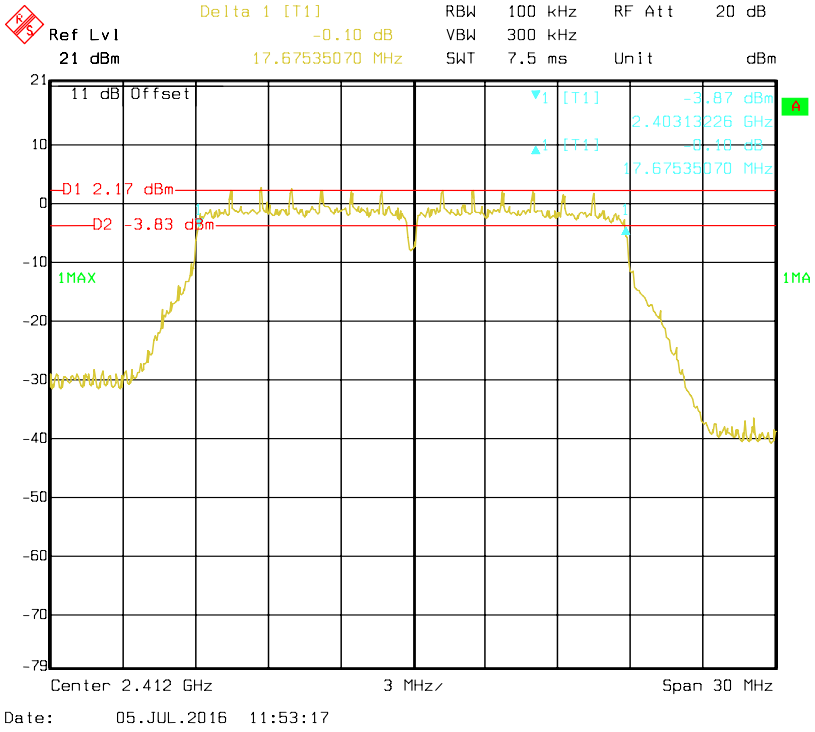
802.11g Middle Channel



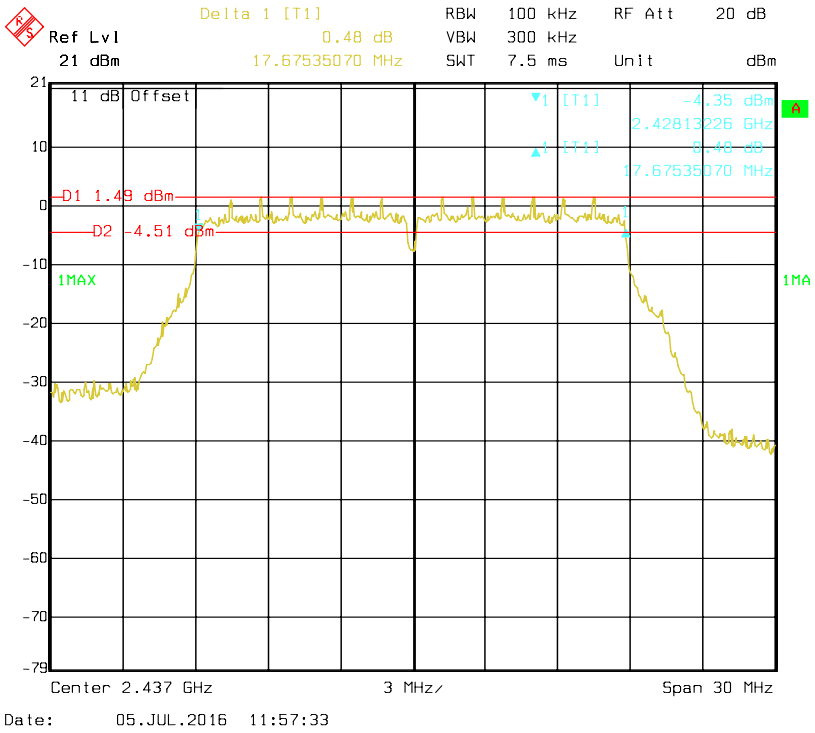
802.11g High Channel



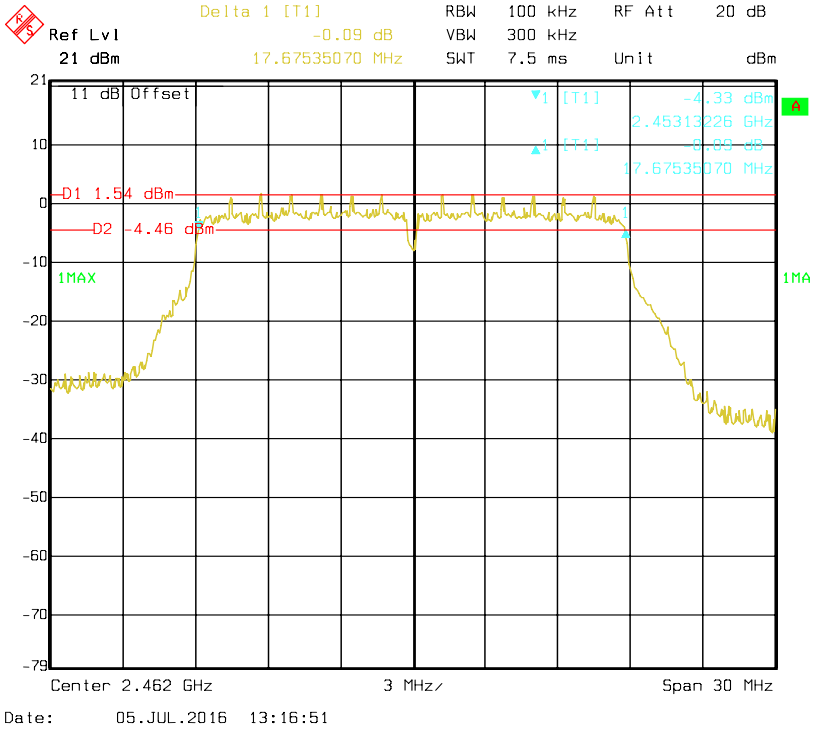
802.11n ht20 Low Channel



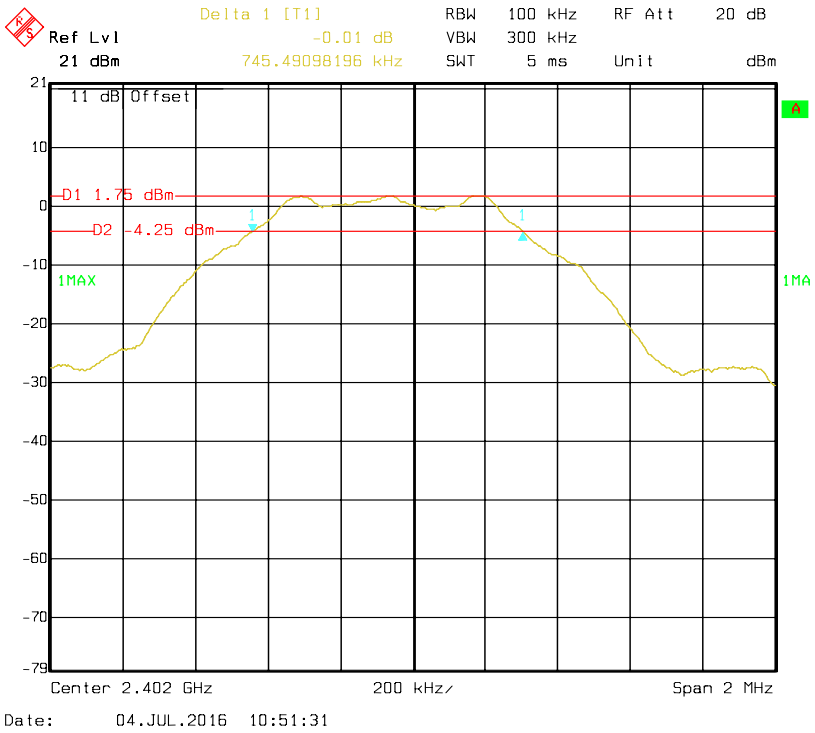
802.11n ht20 Middle Channel



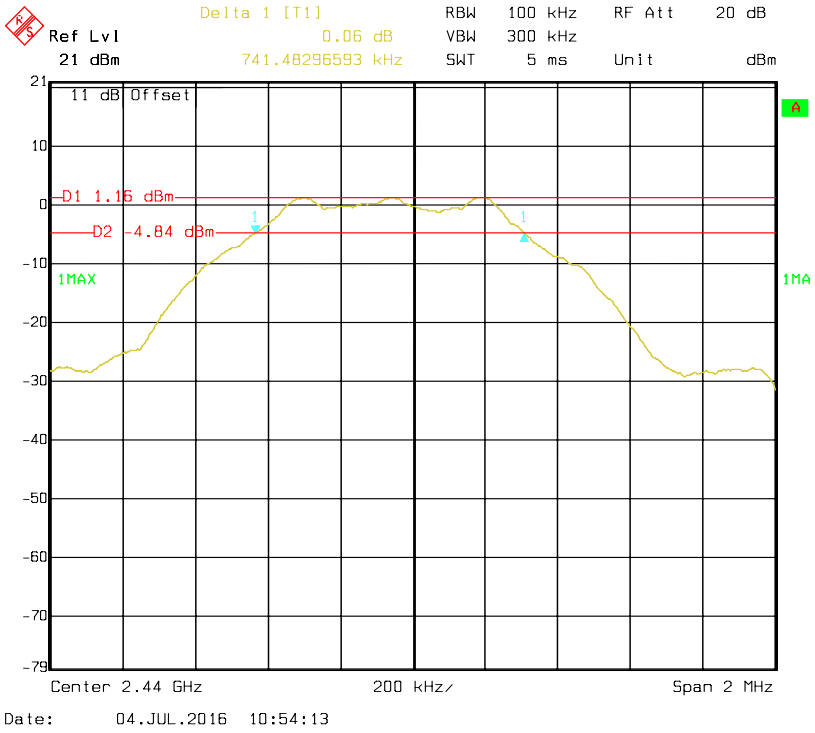
802.11n ht20 High Channel



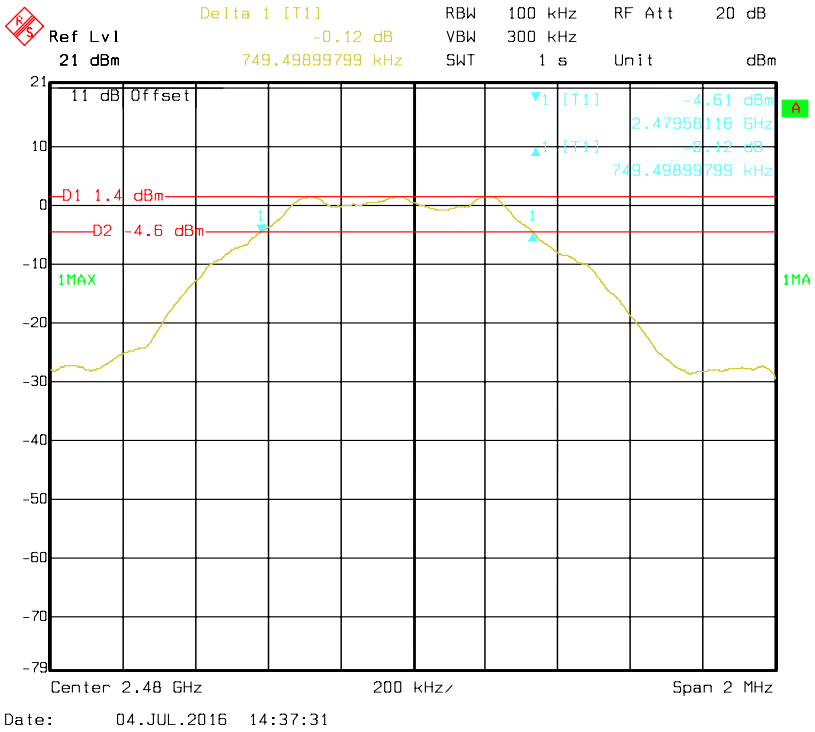
BLE Low Channel



BLE Middle Channel



BLE High Channel



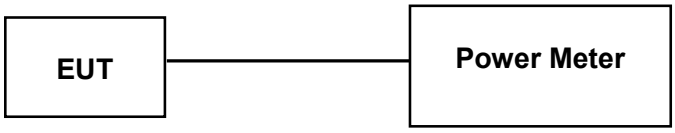
FCC §15.247(b) (3) - MAXIMUM PEAK OUTPUT POWER

Applicable Standard

According to FCC §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.

Test Procedure

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



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
N/A	RF Cable	NO.3	N/A	2015-11-10	2016-11-09
Agilent	Wideband Power Sensor	N1921A	MY54170013	2015-11-12	2016-11-12
Agilent	P-Series Power Meter	N1912A	MY5000448	2015-11-12	2016-11-12

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	65 %
zATM Pressure:	94.9 kPa

The testing was performed by Mill Chen on 2016-07-06.

Test Mode: Transmitting

Wi-Fi Mode

Mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)		Total (dBm)	Limit (dBm)
			Antenna 1	Antenna 2		
802.11b	Low	2412	18.58	18.31	/	30
	Middle	2437	18.01	17.50	/	30
	High	2462	17.66	17.27	/	30
802.11g	Low	2412	14.73	14.41	/	30
	Middle	2437	14.23	13.95	/	30
	High	2462	14.73	13.56	/	30
802.11n HT20	Low	2412	14.45	14.24	17.36	30
	Middle	2437	14.15	13.54	16.87	30
	High	2462	13.72	13.44	16.59	30

Note: The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

So:

Directional gain = GANT + Array Gain = 4.10dBi < 6dBi

BLE Mode

Mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)	Limit (dBm)
BLE	Low	2402	3.46	30
	Middle	2440	2.94	30
	High	2480	1.88	30

FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

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)).

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 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. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
N/A	RF Cable	NO.3	N/A	2015-11-10	2016-11-09
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2015-11-10	2016-11-09

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Temperature:	29 °C ~ 28 °C
Relative Humidity:	64 % ~ 60 %
ATM Pressure:	96.8 kPa ~ 94.9 kPa

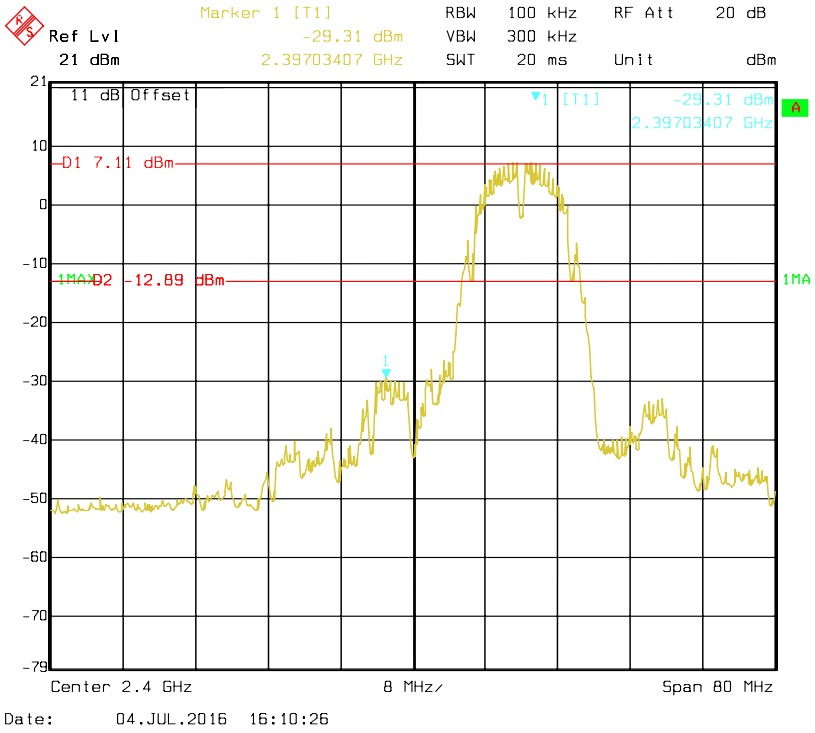
The testing was performed by Mill Chen on 2016-07-04 & 2016-07-05.

Test Mode: Transmitting

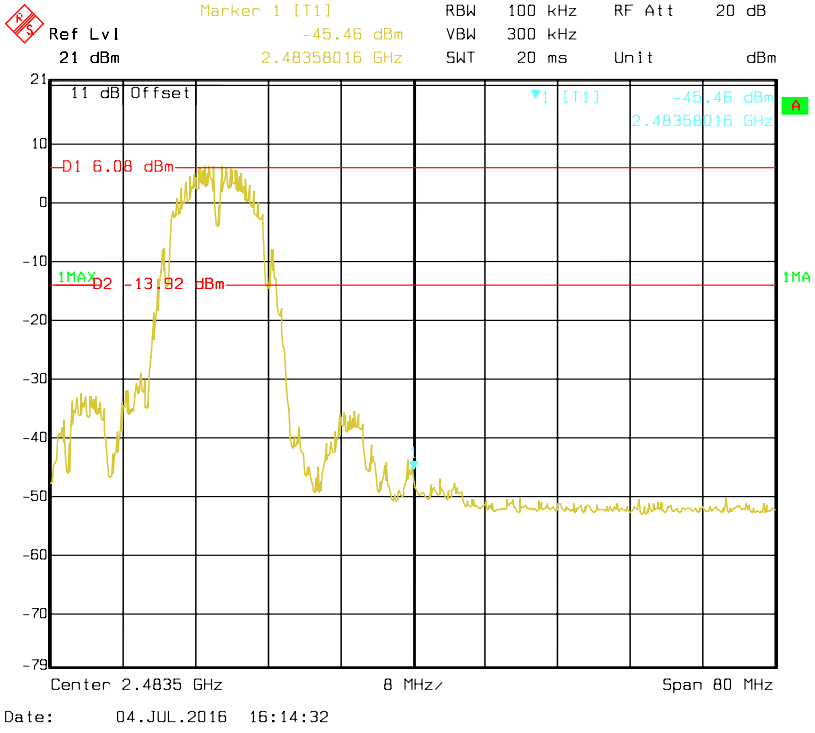
Test Result: Compliance, Please refer to following plots.

Wi-Fi Mode_Antenna 1

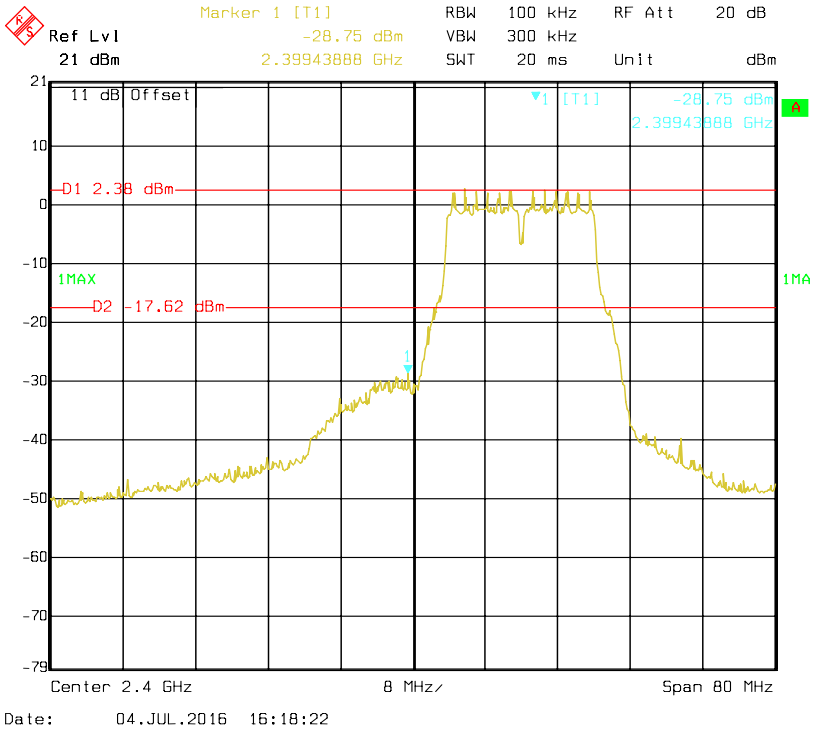
802.11b: Band Edge, Left Side



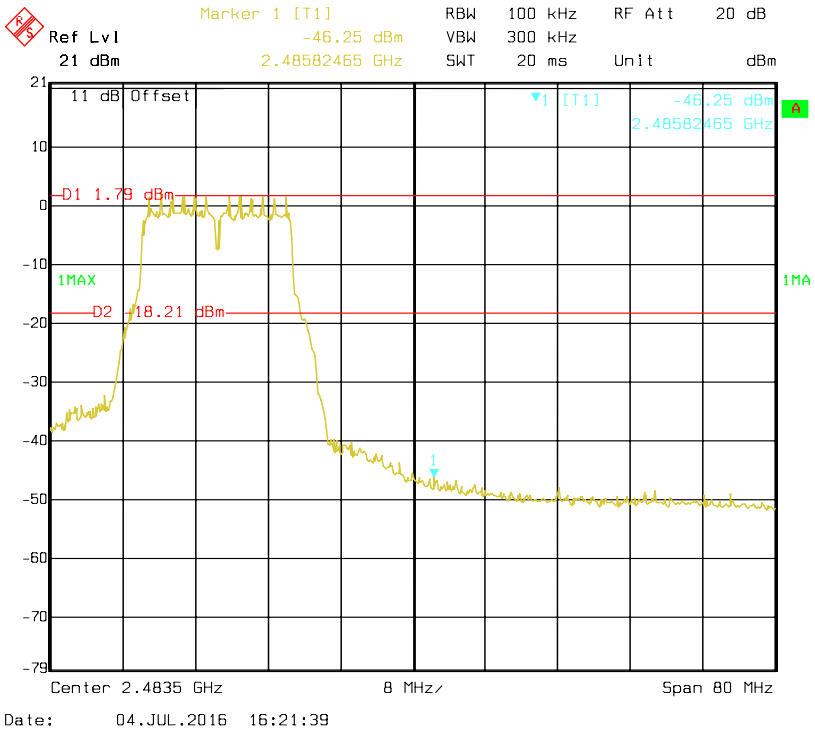
802.11b: Band Edge, Right Side



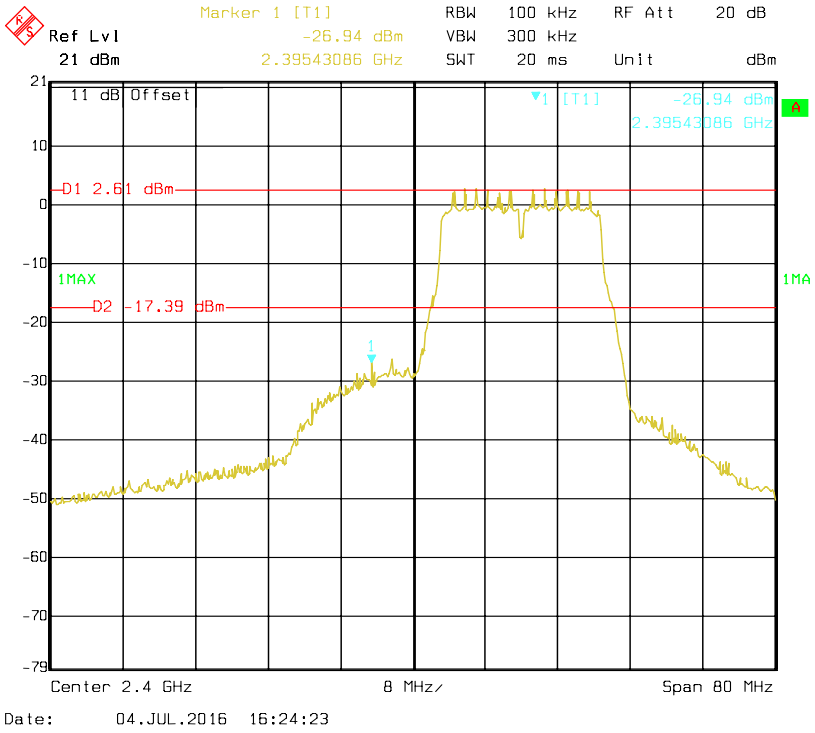
802.11g: Band Edge, Left Side



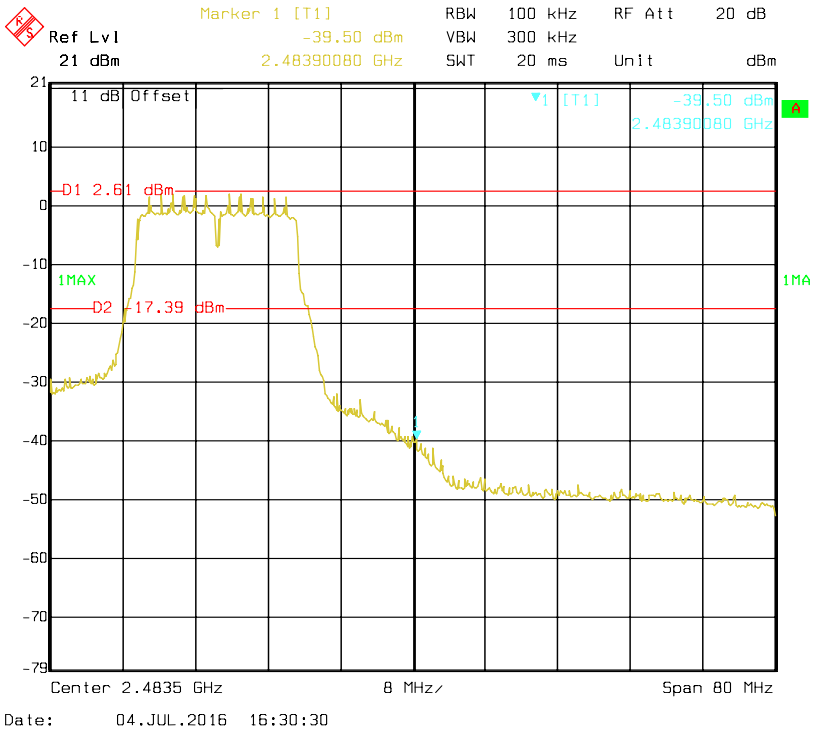
802.11g: Band Edge, Right Side



802.11n HT20 Band Edge, Left Side

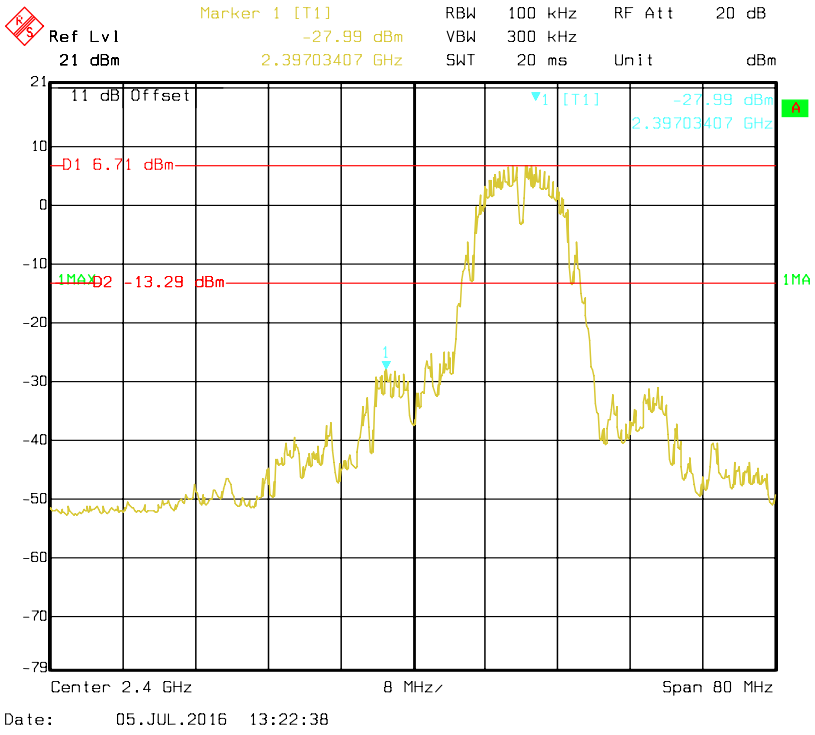


802.11n HT20 Band Edge, Right Side

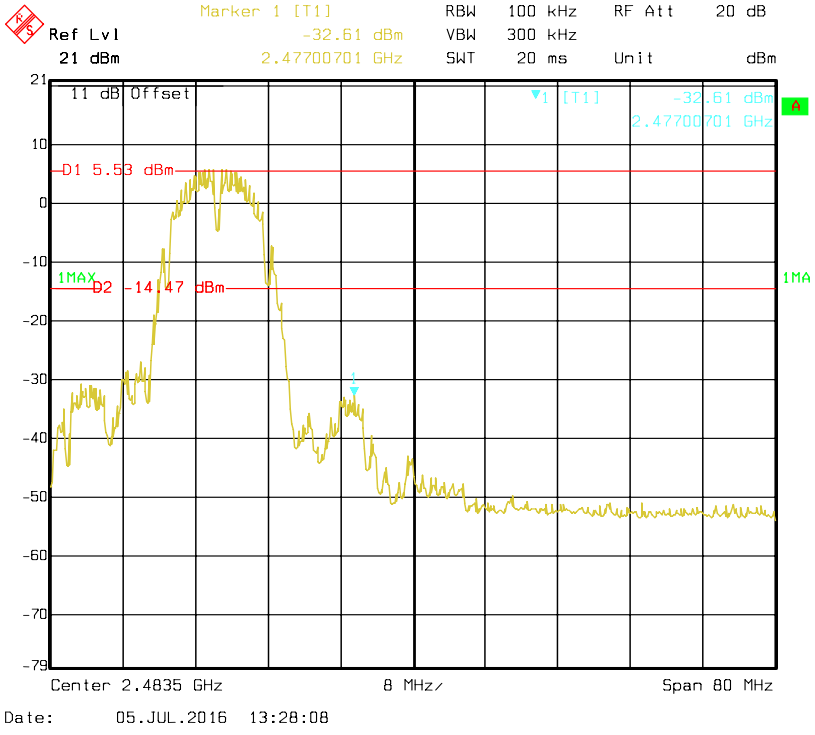


Wi-Fi Mode_Antenna 2

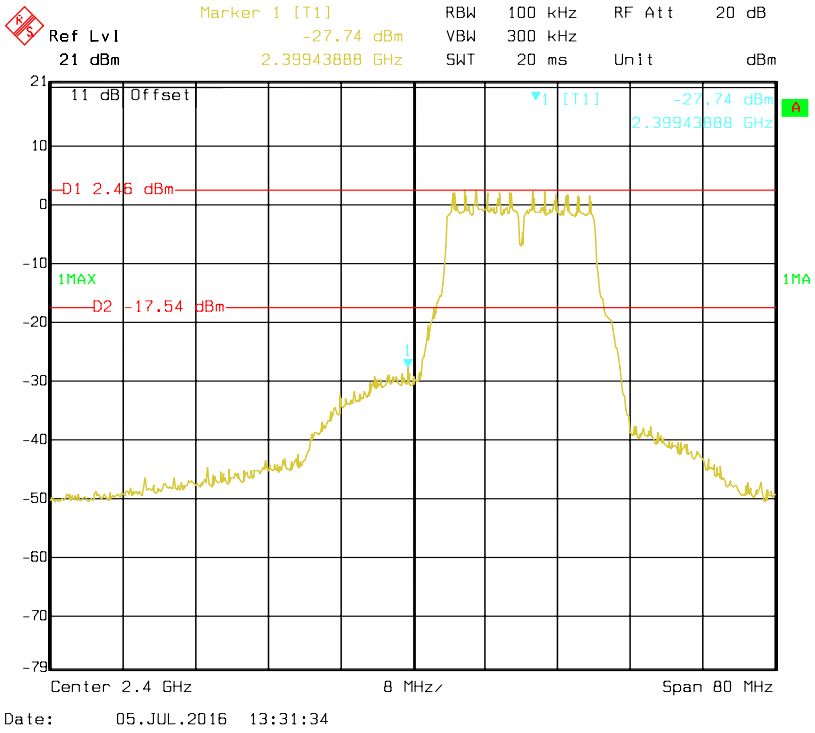
802.11b: Band Edge, Left Side



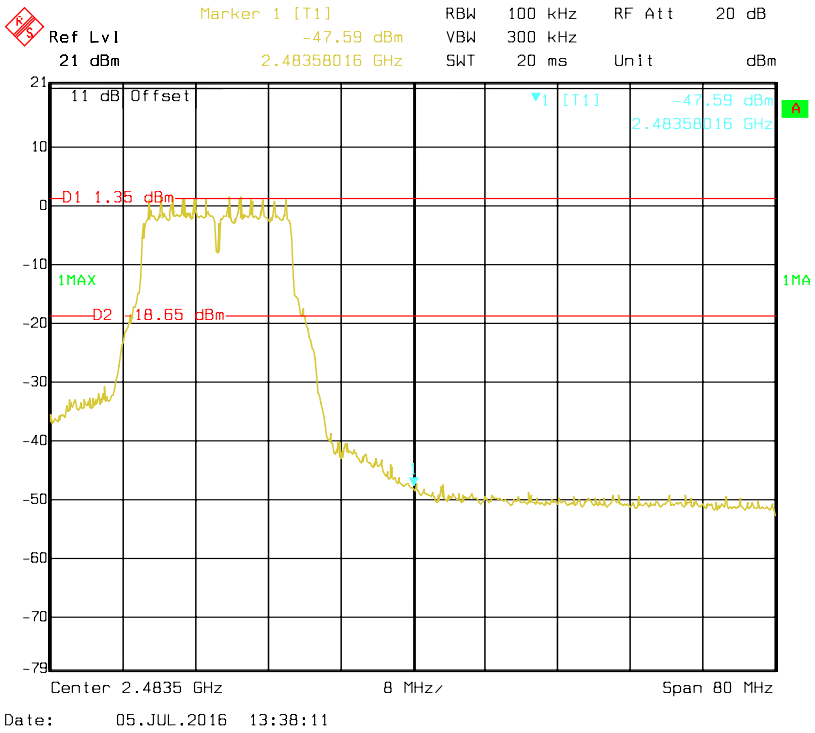
802.11b: Band Edge, Right Side



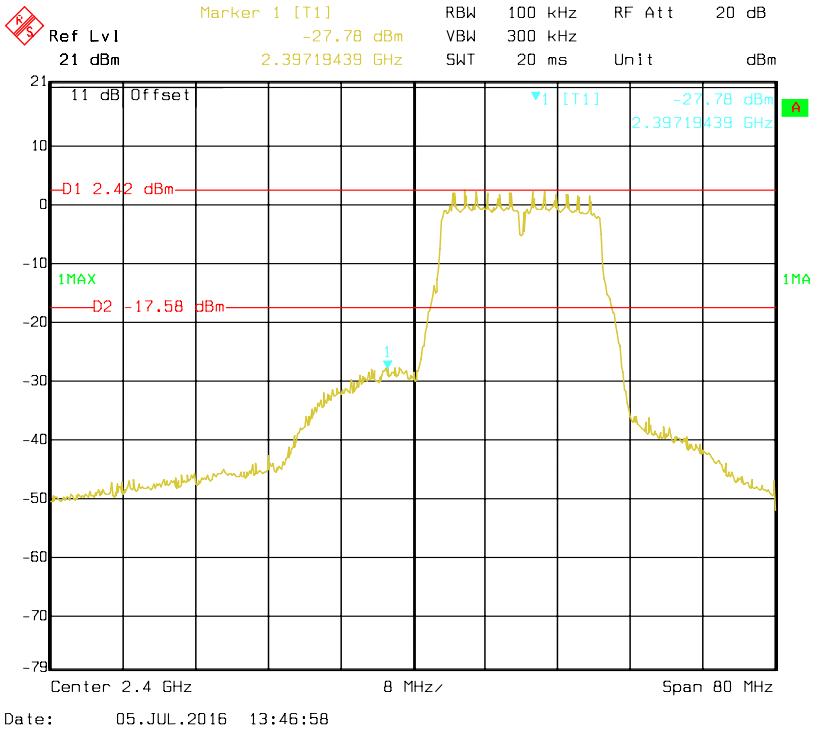
802.11g: Band Edge, Left Side



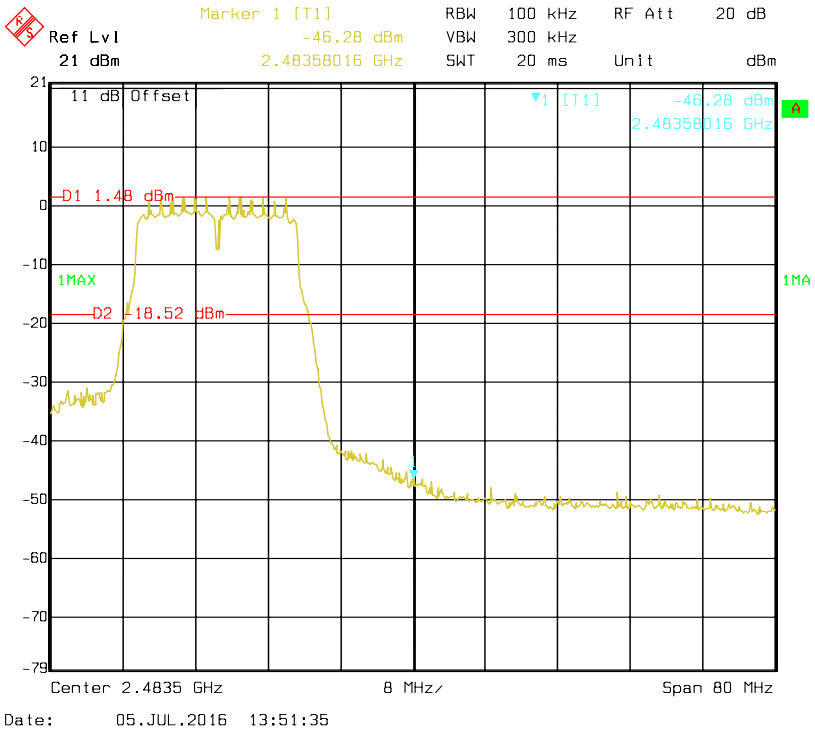
802.11g: Band Edge, Right Side



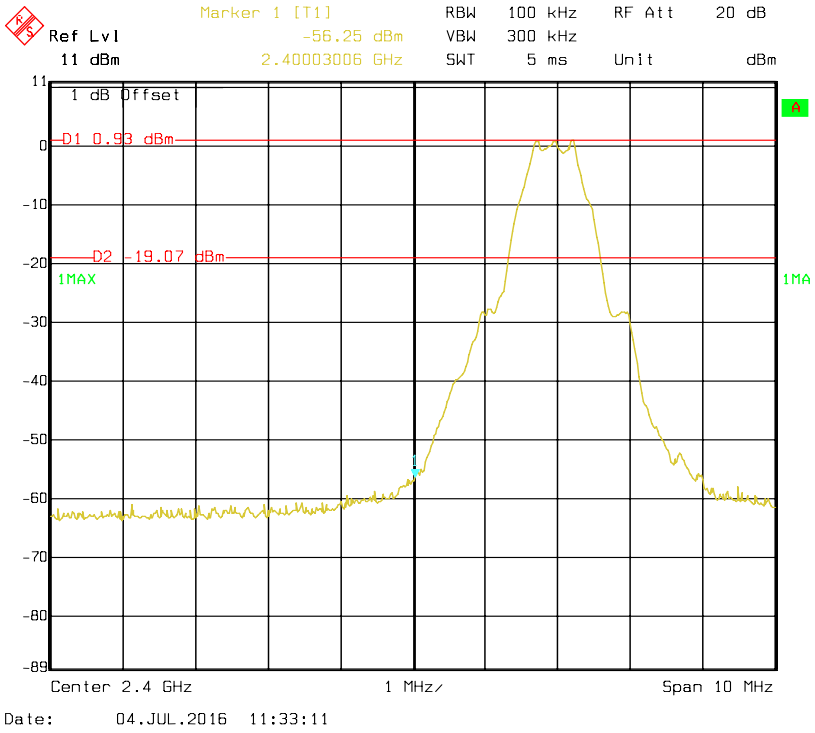
802.11n HT20 Band Edge, Left Side



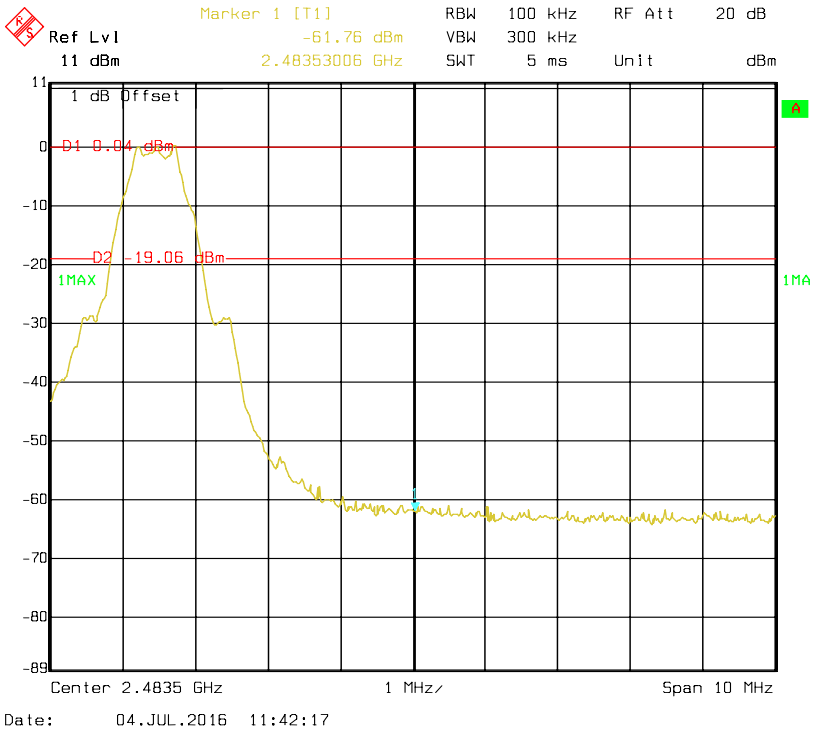
802.11n HT20 Band Edge, Right Side



BLE Band Edge, Left Side



BLE Band Edge, Right Side



FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

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. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

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 v03r05, set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS channel bandwidth.
4. Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2015-12-02	2016-12-01
N/A	RF Cable	NO.3	N/A	2015-11-10	2016-11-09
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2015-11-10	2016-11-09

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	29 °C ~ 28 °C
Relative Humidity:	64 % ~ 60 %
ATM Pressure:	96.8 kPa ~ 94.9 kPa

The testing was performed by Mill Chen on 2016-07-04 & 2016-07-05.

Test Mode: Transmitting

Wi-Fi Mode

Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)		Total (dBm/3kHz)	Limit
			ANT1	ANT2	ANT1+ANT2	dBm/3kHz
802.11b	Low	2412	-7.19	-7.32	/	≤8
	Middle	2437	-7.02	-7.63	/	≤8
	High	2462	-8.01	-7.38	/	≤8
802.11g	Low	2412	-11.27	-11.10	/	≤8
	Middle	2437	-11.71	-12.04	/	≤8
	High	2462	-11.84	-11.97	/	≤8
802.11n HT20	Low	2412	-11.46	-11.92	-8.67	≤6.9
	Middle	2437	-11.95	-12.26	-9.09	≤6.9
	High	2462	-11.92	-12.66	-9.26	≤6.9

Note: The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:
Array Gain = 10 log(NANT/NSS) dB.
So:
Directional gain = GANT + Array Gain = 4.10+10*log(2) = 7.10dBi>6dBi
The Power density Limits was reduced 1.1dB in MIMO mode

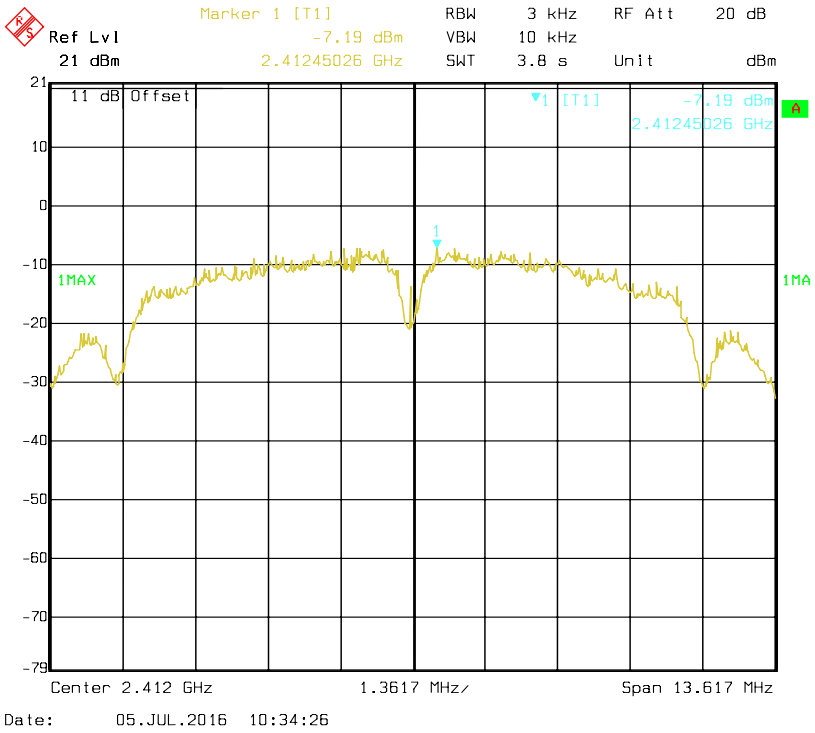
BLE Mode

Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
BLE	Low	2402	-11.62	≤8
	Middle	2440	-11.71	≤8
	High	2480	-12.51	≤8

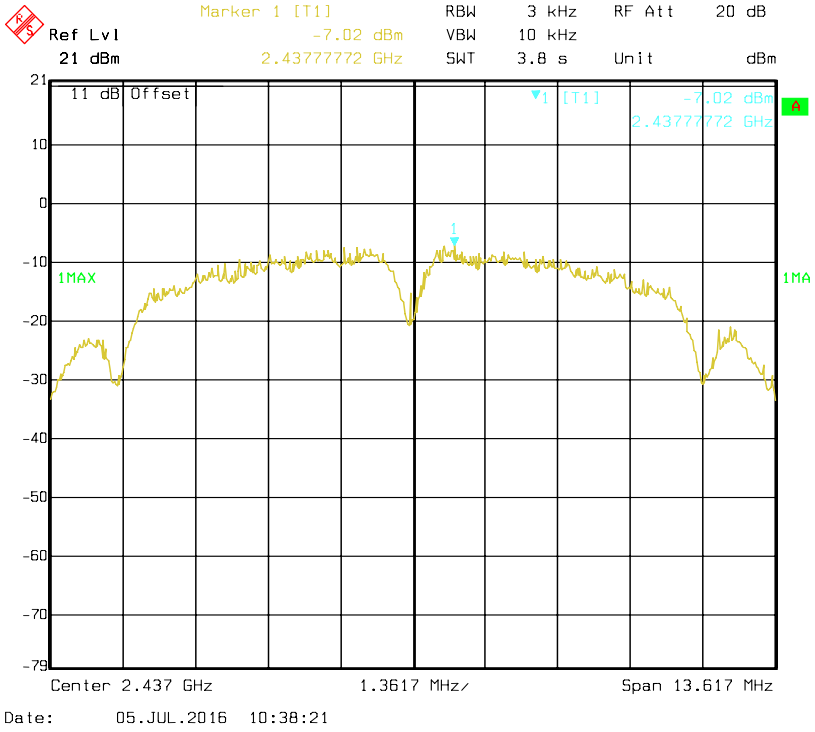
Please refer to the following plots.

Wi-Fi Mode_Antenna 1

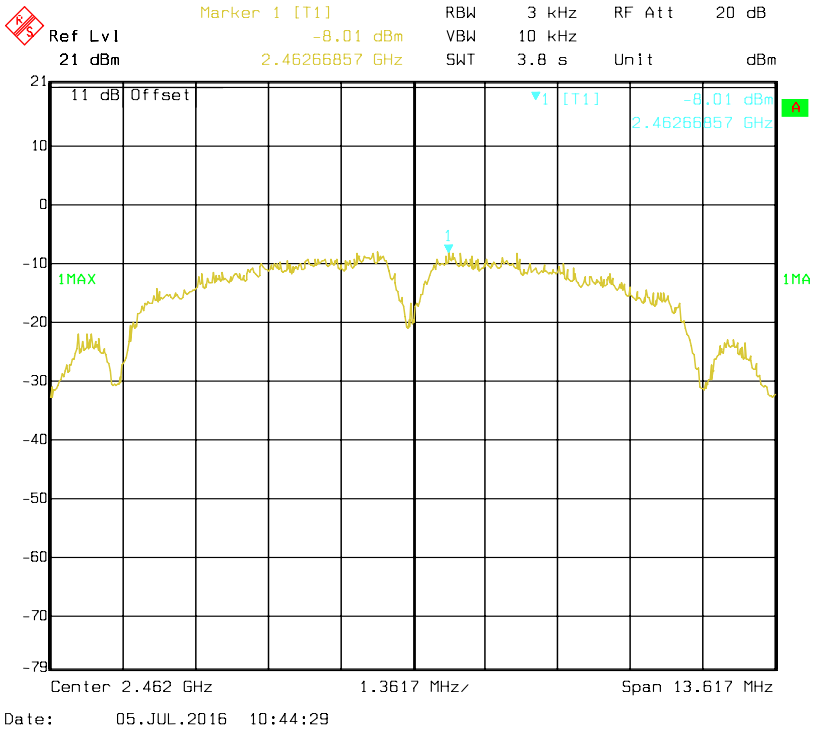
Power Spectral Density, 802.11b Low Channel



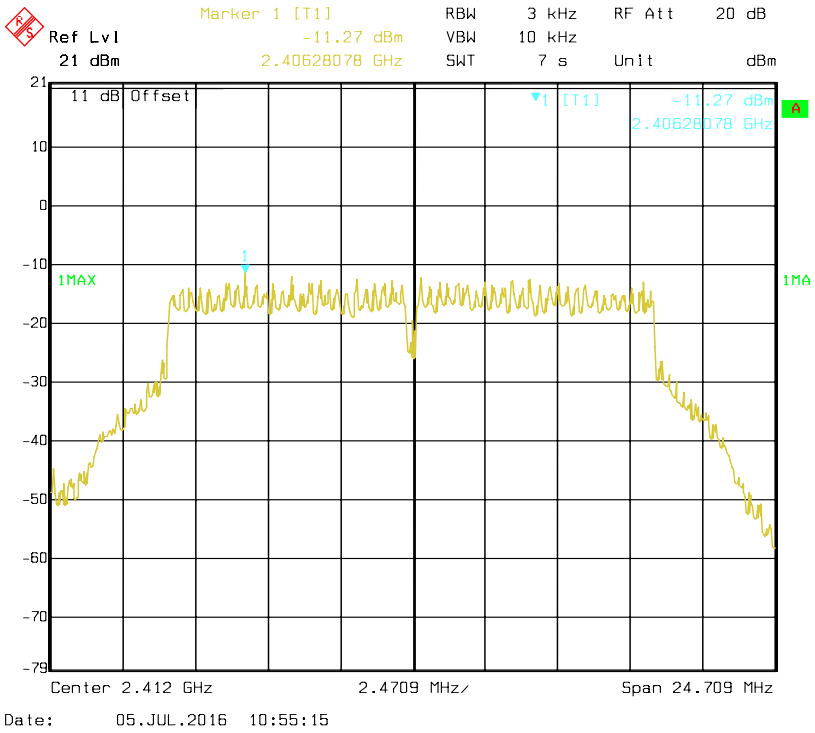
Power Spectral Density, 802.11b Middle Channel



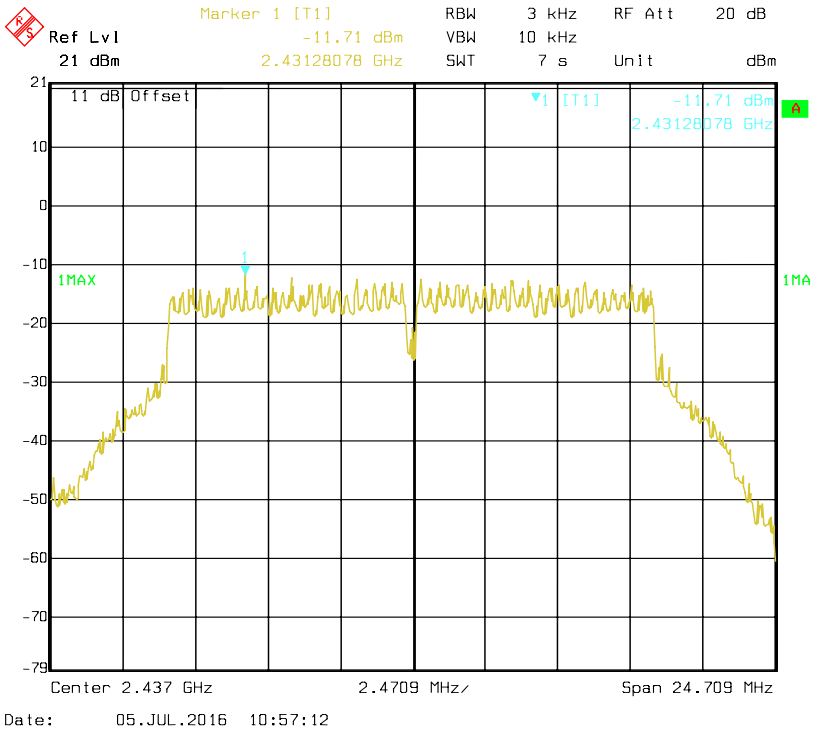
Power Spectral Density, 802.11b High Channel



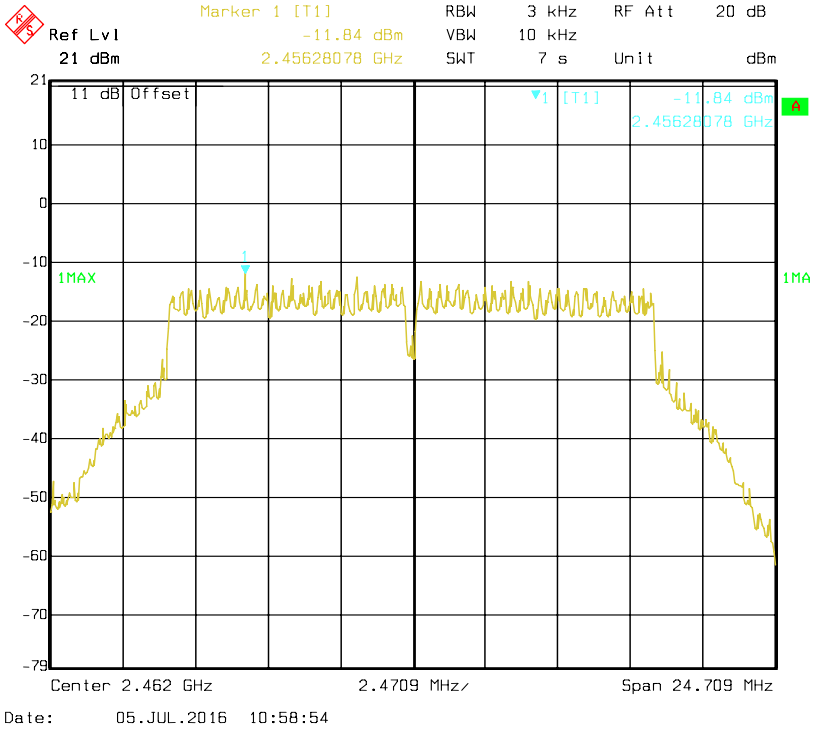
Power Spectral Density, 802.11g Low Channel



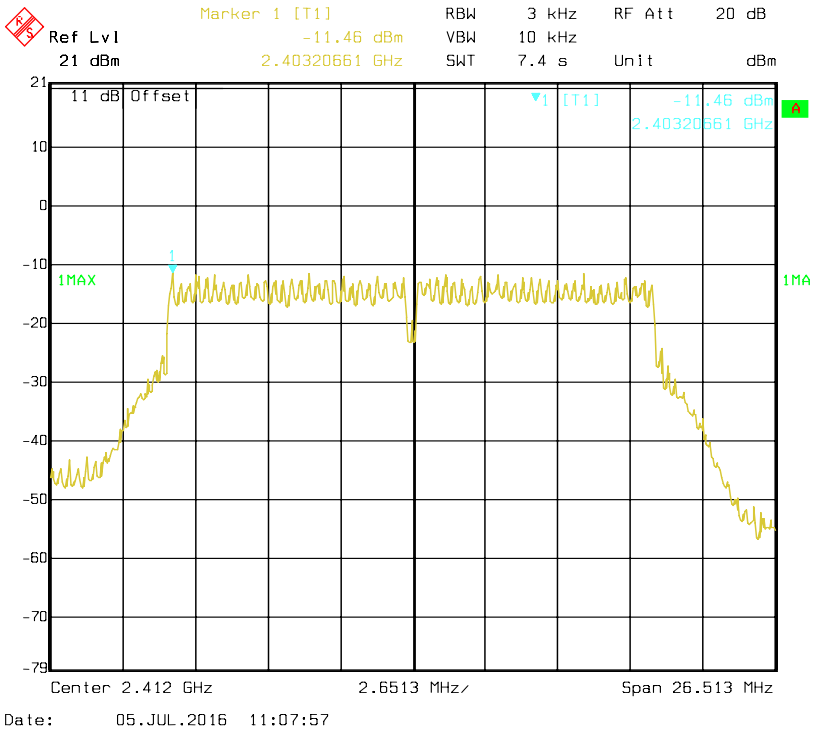
Power Spectral Density, 802.11g Middle Channel



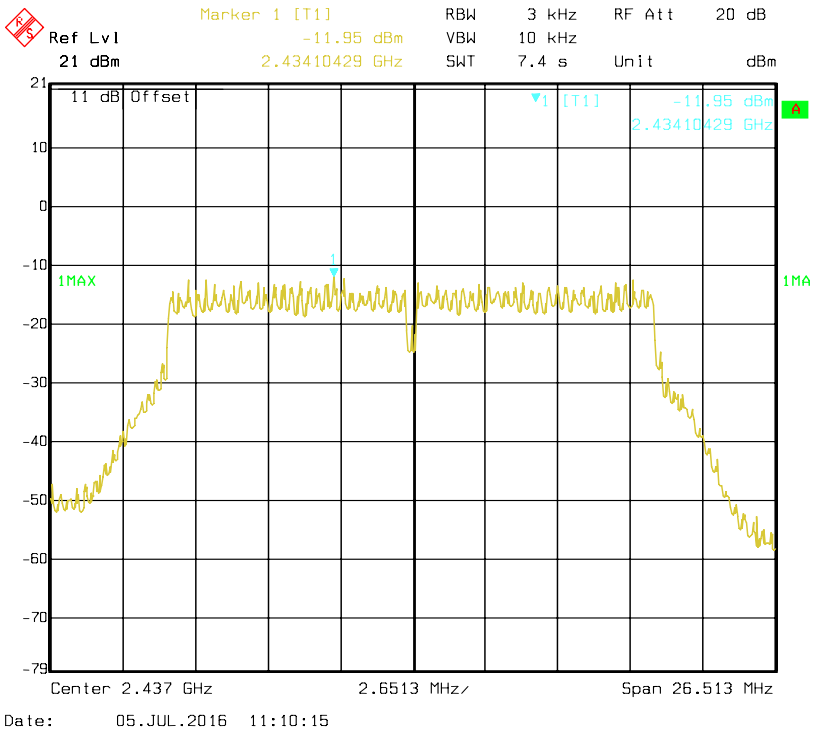
Power Spectral Density, 802.11g High Channel



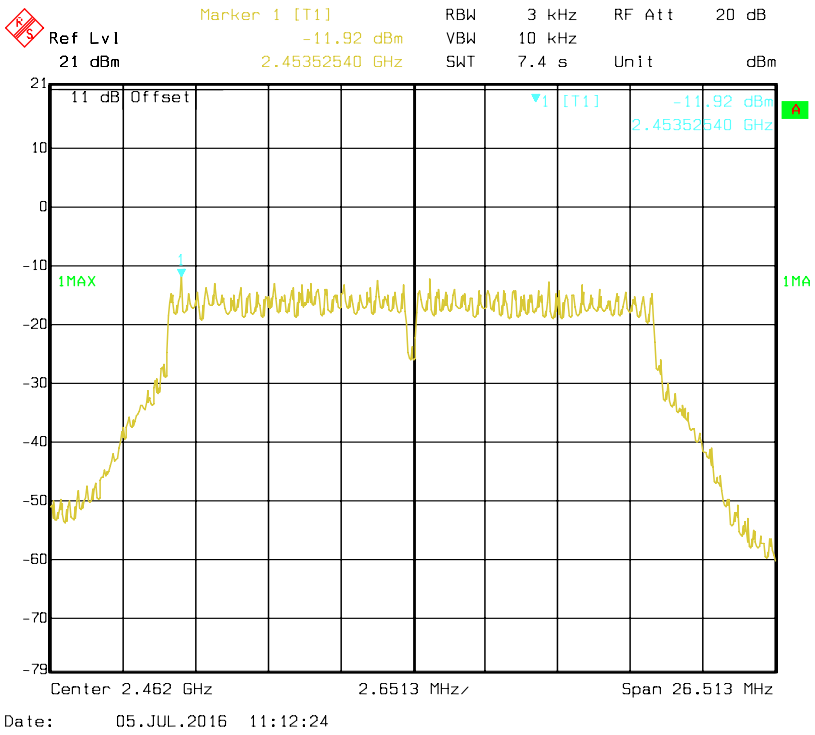
Power Spectral Density, 802.11n HT20 Low Channel



Power Spectral Density, 802.11n HT20 Middle Channel

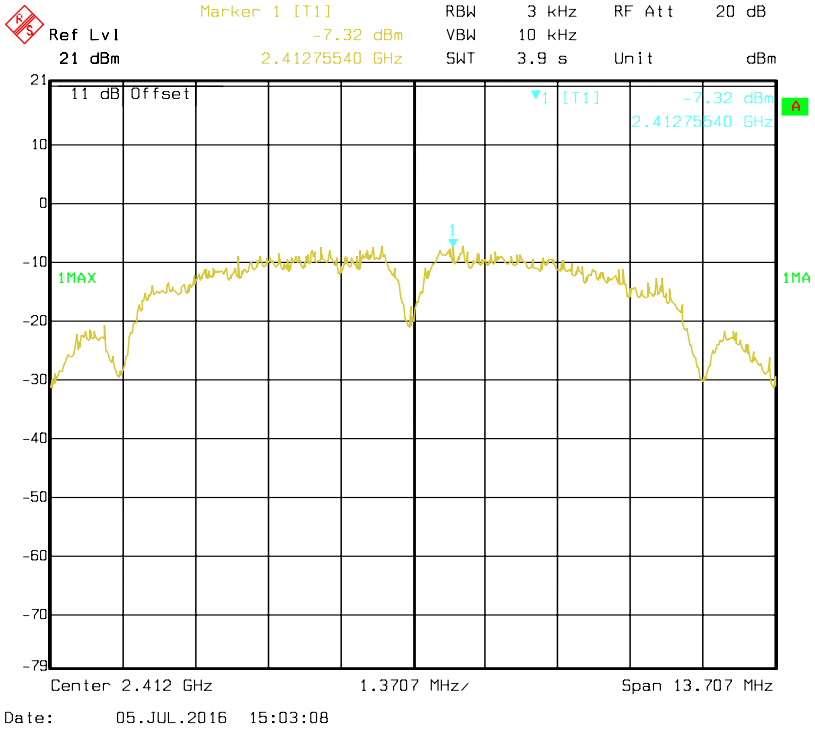


Power Spectral Density, 802.11n HT20 High Channel

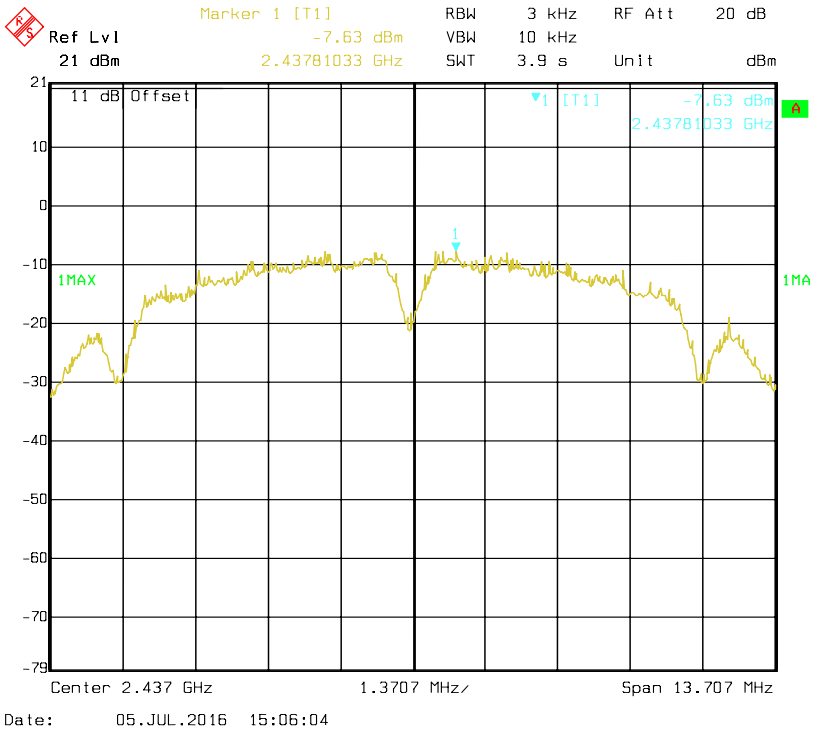


Wi-Fi Mode_Antenna 2

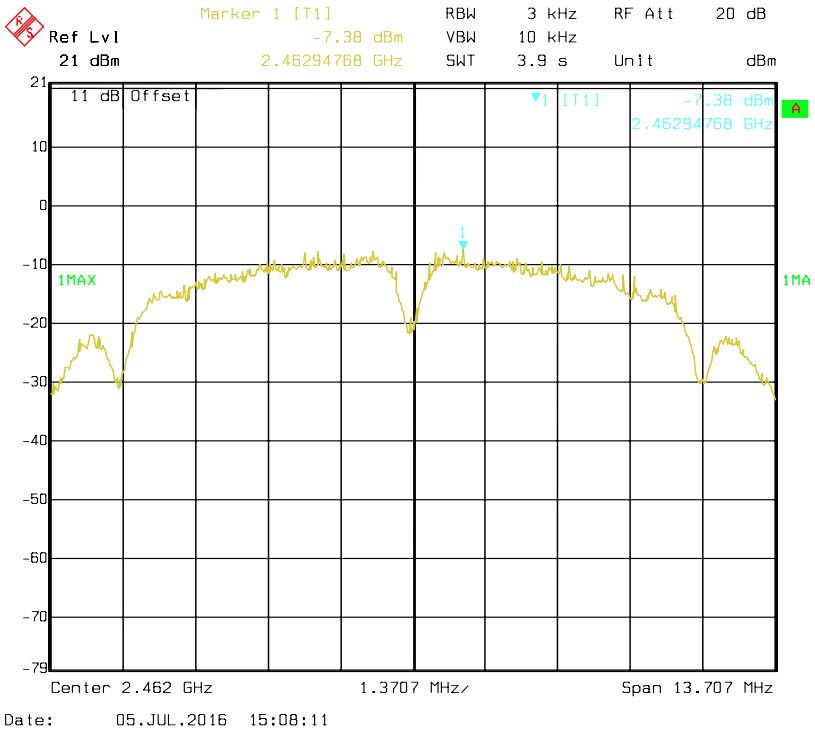
Power Spectral Density, 802.11b Low Channel



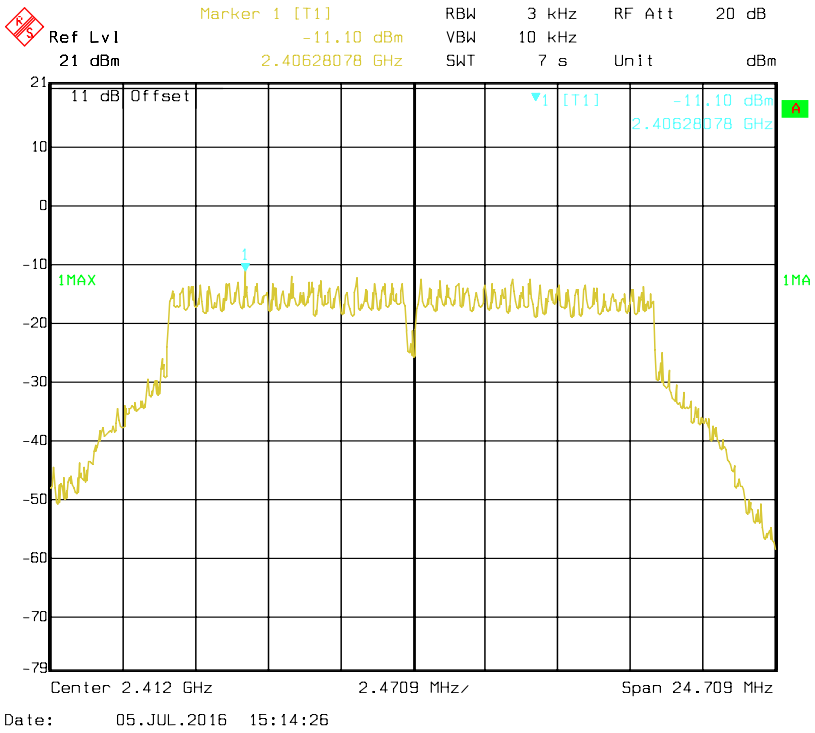
Power Spectral Density, 802.11b Middle Channel



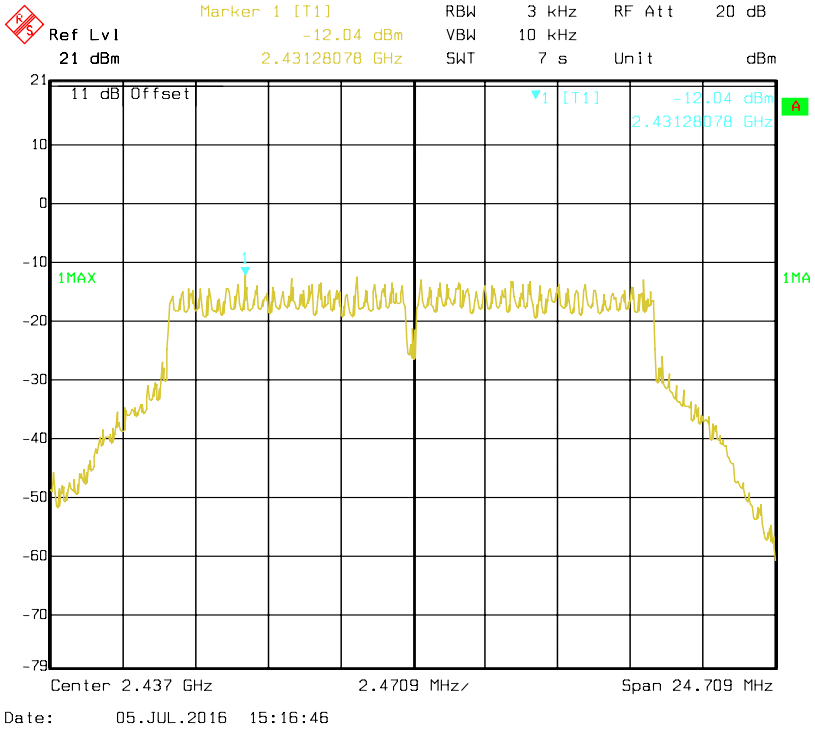
Power Spectral Density, 802.11b High Channel



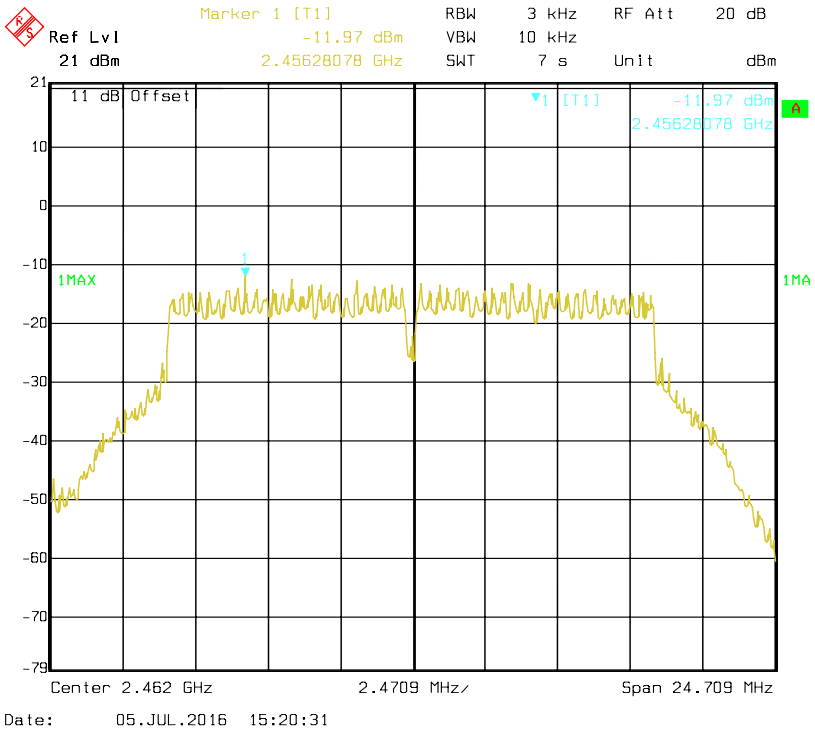
Power Spectral Density, 802.11g Low Channel



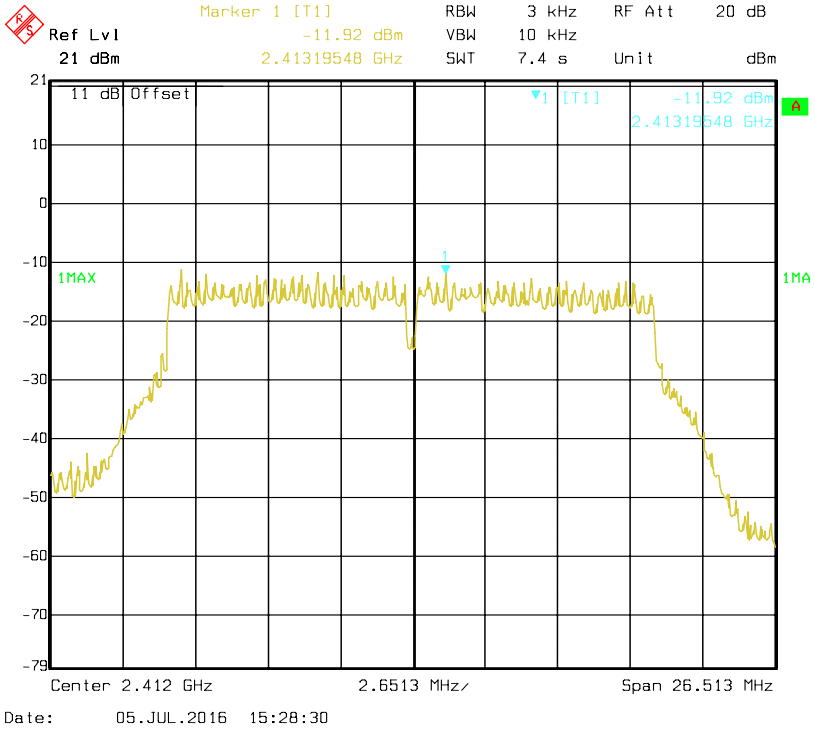
Power Spectral Density, 802.11g Middle Channel



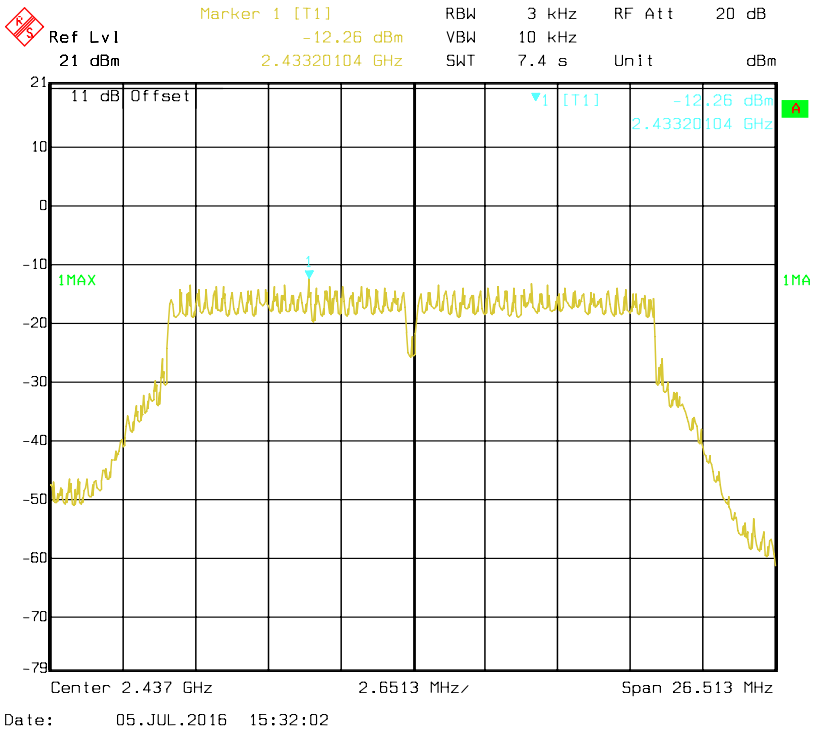
Power Spectral Density, 802.11g High Channel



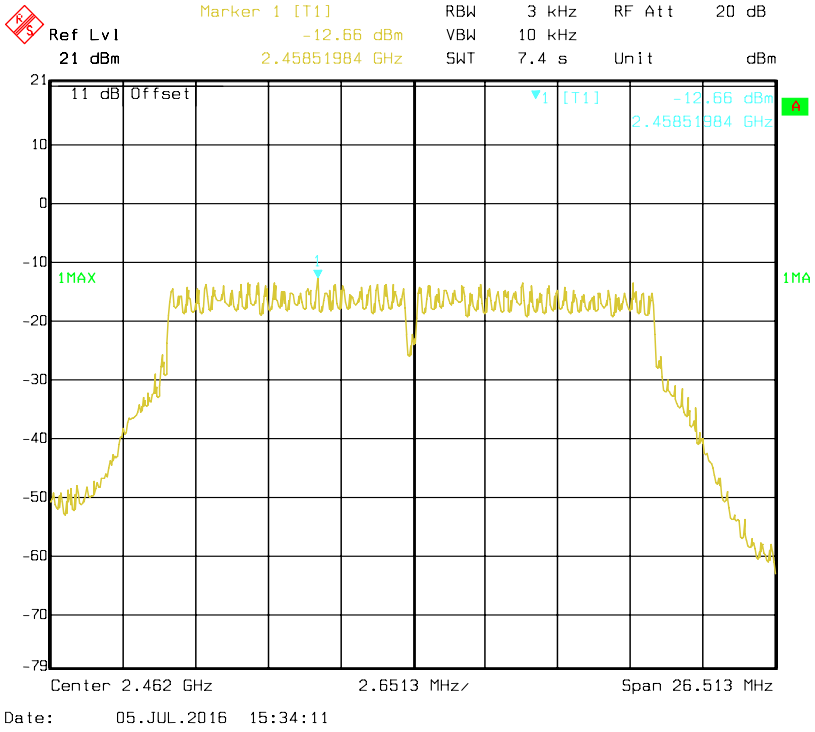
Power Spectral Density, 802.11n HT20 Low Channel



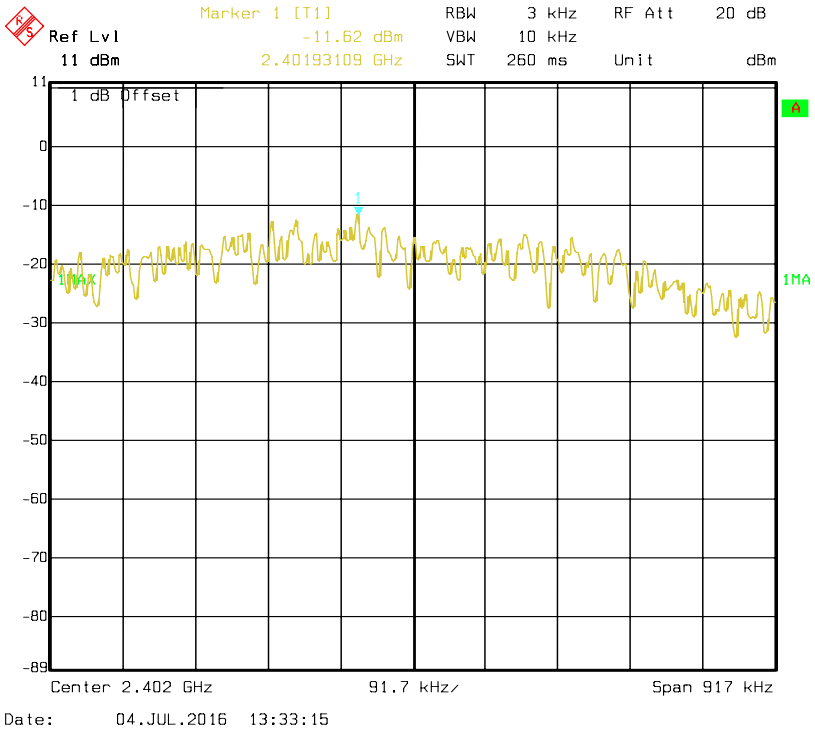
Power Spectral Density, 802.11n HT20 Middle Channel



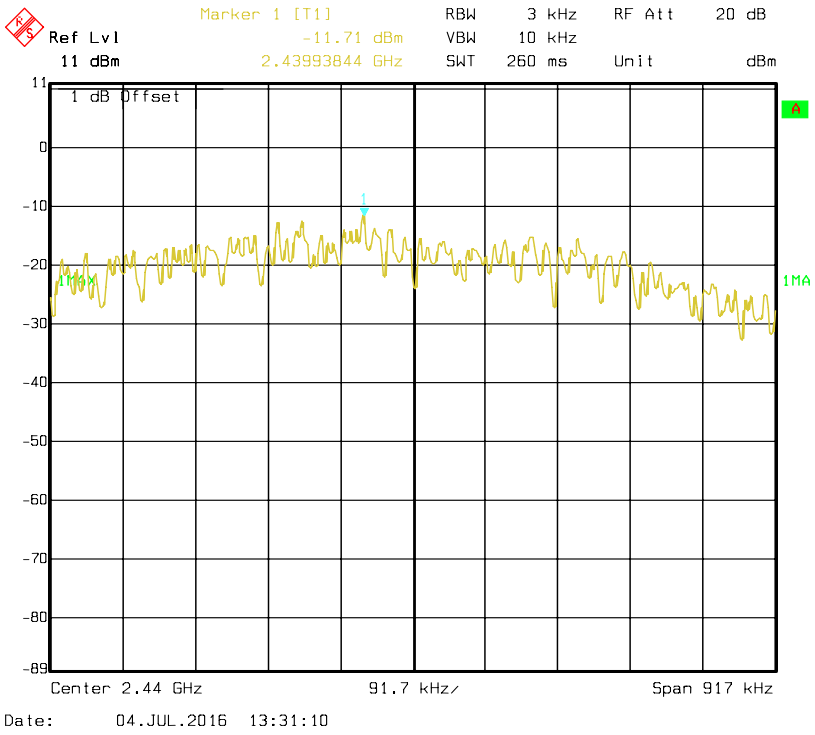
Power Spectral Density, 802.11n HT20 High Channel



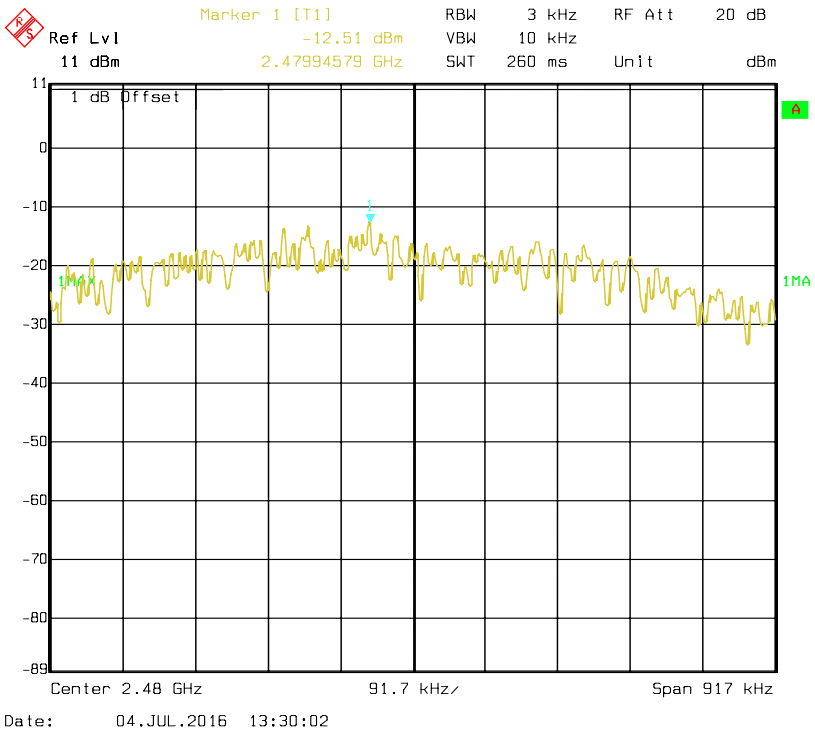
Power Spectral Density, BLE Low Channel



Power Spectral Density, BLE Middle Channel



Power Spectral Density, BLE High Channel



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