FCC PART 15.247

TEST REPORT

For

Huawei Technologies Co.,Ltd

Administration Building,Headquarters of Huawei Technologies Co.,Ltd., Bantian,Longgang District, Shenzhen, 518129, P.R.C

Test Model: EchoLife EG8245H
Multiple Model: EchoLife HG8245H
FCC ID: QISEG8245HE

Report Type:	**Product Name:**
Original Report	GPON Terminal

Report Number:	RDG170621001-00
Report Date:	2017-08-25
Reviewed By:	Jerry Zhang EMC Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Huawei Technologies Co.,Ltd***'s product, model number: ***EchoLife EG8245H (FCC ID: QISEG8245HE)*** (the "EUT") in this report was a ***GPON Terminal,*** rated input voltage: DC 12V from adapter.

Adapter 1 Information:
MODEL: HW-120200U7W
INPUT: AC100-240V, 50/60Hz, 0.8A
OUTPUT: DC 12.0V, 2.0A
Manufacturer: DONDGUAN SHILONG FUHUA ELECTRONIC CO.LTD

Adapter 2 Information:
MODEL: HW-120200U7W
INPUT: AC100-240V, 50/60Hz, 0.8A
OUTPUT: DC 12.0V, 2.0A
Manufacturer: SHENZHEN HUNTKEY ELECTRIC CO.LTD

Note: The series product, model EchoLife EG8245H, EchoLife HG8245H are electrically identical, the difference them is the model name, we selected EchoLife EG8245H for fully testing, the details was explained in the attached declaration letter.

**All measurement and test data in this report was gathered from final production sample, serial number: 170621001 (assigned by the BACL, Dongguan). The EUT was received on 2017-07-18.*

Objective

This report is prepared on behalf of *Huawei Technologies Co.,Ltd* in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules.

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

Related Submittal(s)/Grant(s)

No related submittal(s)/grant(s).

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. (Dongguan).

Measurement Uncertainty

Parameter	Measurement Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.61dB
Power Spectral Density, conducted	±0.61 dB
Unwanted Emissions, radiated	30M~200MHz: 4.58 dB for Horizontal, 4.59 dB for Vertical 200M~1GHz: 4.83 dB for Horizontal, 5.85 dB for Vertical 1G~6GHz: 4.45 dB, 6G~26.5GHz: 5.23 dB
Unwanted Emissions, conducted	±1.5 dB
Temperature	±1℃
Humidity	±5%
DC and low frequency voltages	±0.4%
Duty Cycle	1%
AC Power Lines Conducted Emission	3.12 dB (150 kHz to 30 MHz)

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China

Bay Area Compliance Laboratories Corp. (Dongguan) has been accredited to ISO 17025 by CNAS(Lab code: L5662). And accredited to ISO 17025 by NVLAP(Test Laboratory Accreditation Certificate Number 500069-0), the FCC Designation No. CN5002 under the KDB 974614 D01.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Bay Area Compliance Laboratories Corp. (Dongguan) was registered with ISED Canada under ISED Canada Registration Number 3062D.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

The device has 2 external antennas, 802.11n support MIMO mode. Total 11 channels are provided:

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 802.11 n20 modes were test with channel 1,6,11.
For 802.11 n40 mode was test with channel 3,6, 9. And additional test items: conducted output power and radiation bandedge with channel 4,5,7,8, since the output power is more difference for each channel.

EUT Exercise Software

The software "IPOP" was used for testing, which was provided by manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all date rates bandwidths, and modulations. The maximum power was configured as below table, that provided by the manufacturer:

SISO:

Software and version			IPOR		
Mode	Channel	Frequency (MHz)	Data Rate	Power Level	
				Chain 0	Chain 1
802.11 b	Low	2412	1Mbps	64	64
	Middle	2437	1Mbps	72	72
	High	2462	1Mbps	64	64
802.11 g	Low	2412	6Mbps	51	51
	Middle	2437	6Mbps	72	72
	High	2462	6Mbps	51	51
802.11 n20	Low	2412	MCS0	54	54
	Middle	2437	MCS0	72	72
	High	2462	MCS0	55	55
802.11 n40	Low	2422	MCS0	39	39
	additional	2427	MCS0	52	52
	additional	2432	MCS0	64	64
	Middle	2437	MCS0	72	72
	additional	2442	MCS0	64	64
	additional	2447	MCS0	52	52
	High	2452	MCS0	41	41

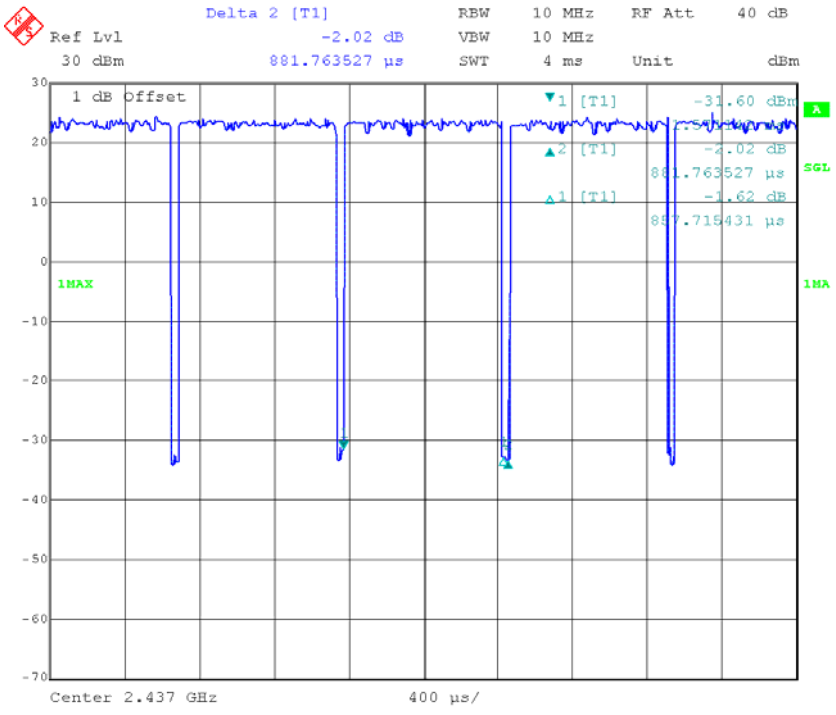
MIMO

Software and version			IPOR&QSPR	
Mode	Channel	Frequency (MHz)	Data Rate	Power Level
				Chain 0&Chain 1
802.11 n20	Low	2412	MCS8	36
	Middle	2437	MCS8	68
	High	2462	MCS8	36
802.11 n40	Low	2422	MCS8	29
	additional	2427	MCS8	43
	additional	2432	MCS8	54
	Middle	2437	MCS8	67
	additional	2442	MCS8	54
	additional	2447	MCS8	43
	High	2452	MCS8	29

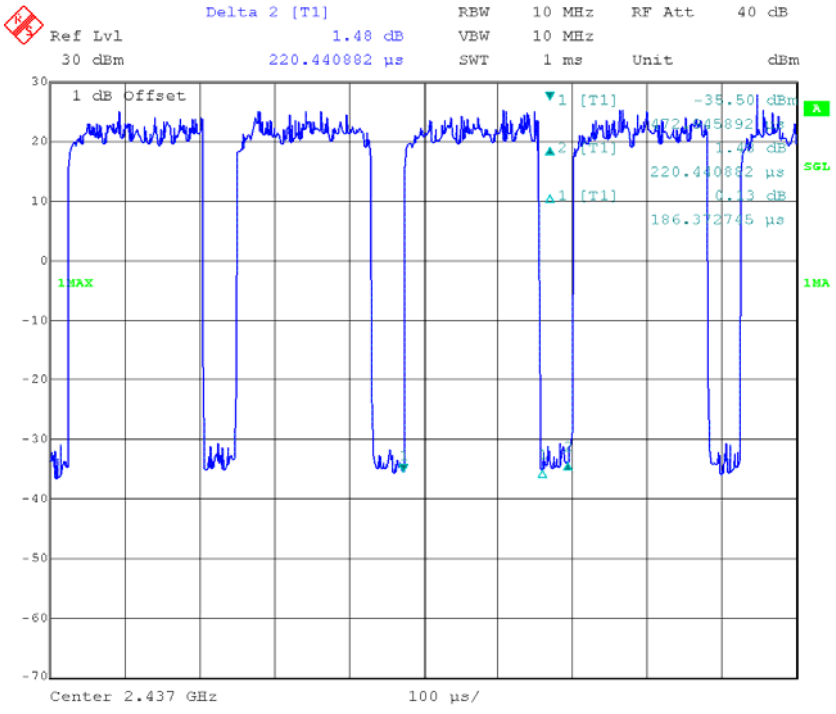
The duty cycle as below:

Mode	**T_{on} (ms)**	**T_{on+off} (ms)**	**Duty Cycle (%)**	**Minimum Transmission Duration (T) (ms)**
802.11b	0.857	0.881	97.3	0.857
802.11g	0.186	0.220	84.5	0.186
802.11 n20	0.160	0.202	79.2	0.160
802.11 n40	0.092	0.136	67.6	0.092

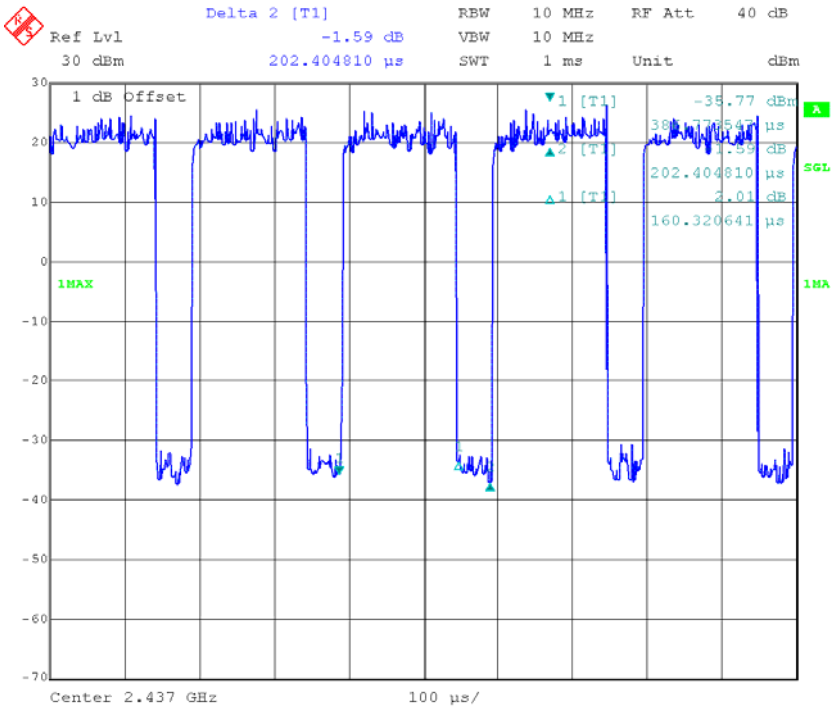
802.11b



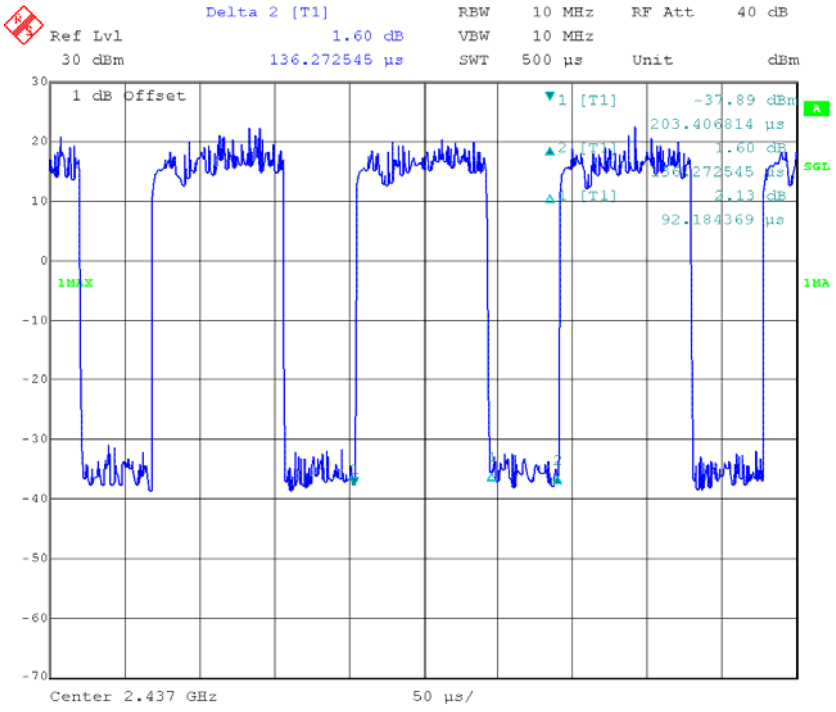
802.11g



802.11 n20



802.11 n40



Equipment Modifications

No modification was made to the EUT.

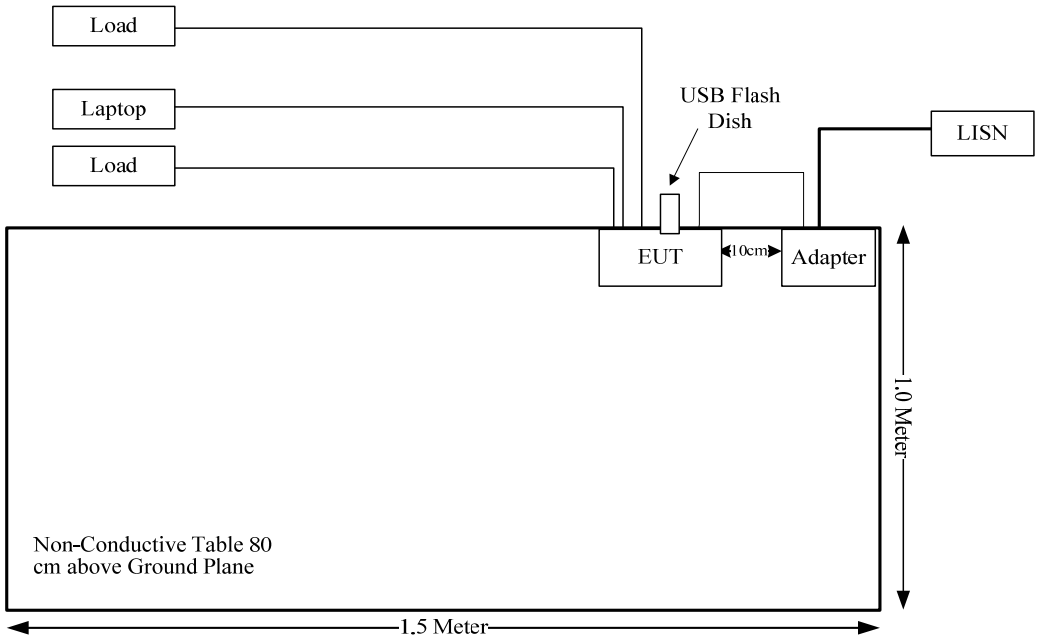
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1017
Kinston	USB flash Disk	4G	N/A

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 cable	No	No	10	EUT	PC
RJ45 cable*3	No	No	10	EUT	Load
RJ11 cable*2	No	No	10	EUT	Load
Adapter Cable	No	No	1.6	Adapter	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091	Maximum Permissable Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC §15.247 (i) & §1.1310 & §2.1091- 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.

Calculation formula:

Prediction of power density at the distance of the applicable MPE limit
$S = PG/4\pi R^2$ = 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);

Calculated Data:

Frequency (MHz)	**Antenna Gain**		**Conducted output power including Tune-up Tolerance**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
2412-2462	5	3.16	30	1000.00	20.00	0.6294	1.0

Result: The device meet FCC MPE at 20 cm distance

FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

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.
c. 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 has 2 external antennas permanently attached to the EUT, both antenna gains are 5.0 dBi. Please refer to the EUT photos.

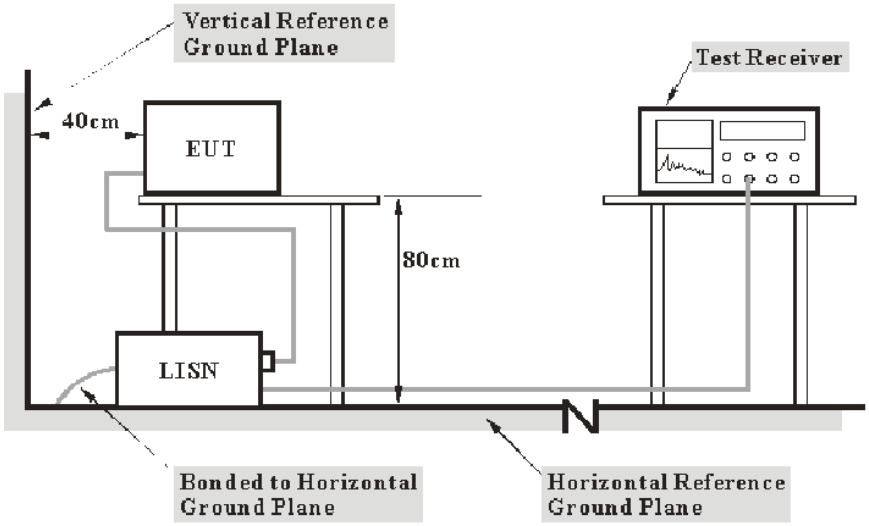
Result: Compliance.

FCC §15.207 (a)– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

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 is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207.

The spacing between the peripherals was 10 cm.

The adapter was connected to the main lisn with a 120 V/60 Hz AC 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

During the conducted emission test, the adapter was connected to the first LISN.

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:

$V_C = V_R + A_C + VDF$
$C_f = A_C + VDF$

Herein,
V_C (cord. Reading): corrected voltage amplitude
V_R: reading voltage amplitude
A_c: attenuation caused by cable loss
VDF: voltage division factor of AMN
C_f: Correction Factor

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 limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCS 30	830245/006	2016-12-08	2017-12-08
R&S	L.I.S.N	ESH2-Z5	892107/021	2016-09-01	2017-09-01
R&S	Two-line V-network	ENV 216	3560.6550.12	2016-12-08	2017-12-08
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A
Unknown	Coaxial Cable	2m	Con-1	2016-09-01	2017-09-01

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

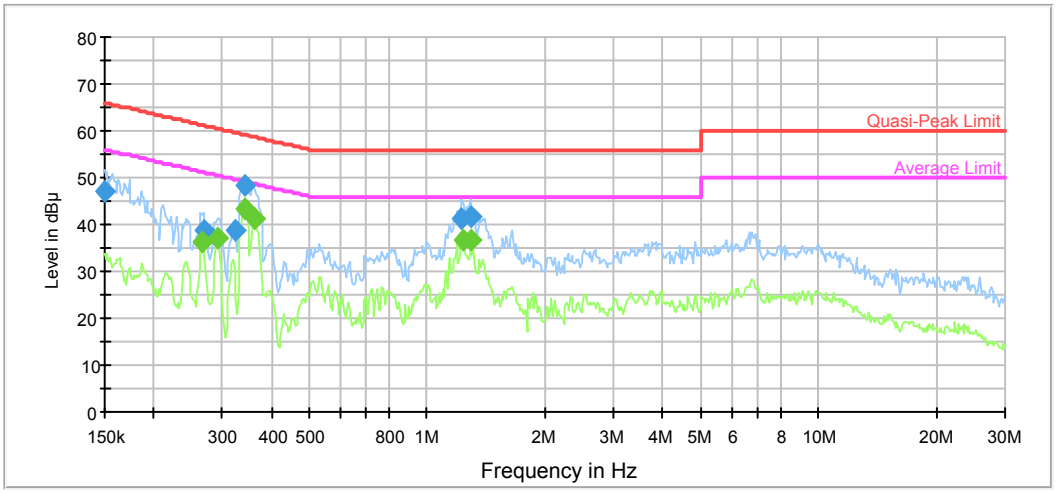
Environmental Conditions

Temperature:	26.2 °C
Relative Humidity:	51 %
ATM Pressure:	100.4 kPa

The testing was performed by Gaochao Gong on 2017-07-29.

Test Mode: Transmitting(adapter 1)

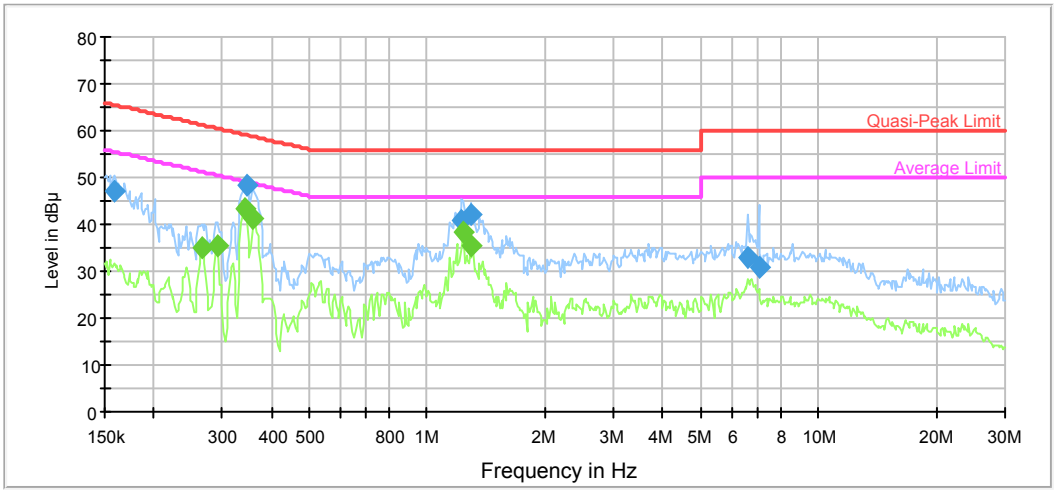
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	47.1	9.000	L1	11.2	18.9	66.0	Compliance
0.268355	38.9	9.000	L1	10.2	22.3	61.2	Compliance
0.322331	38.6	9.000	L1	10.1	21.0	59.6	Compliance
0.343548	48.4	9.000	L1	10.0	10.7	59.1	Compliance
1.229340	41.4	9.000	L1	9.7	14.6	56.0	Compliance
1.289541	41.9	9.000	L1	9.7	14.1	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.266226	36.4	9.000	L1	10.3	14.8	51.2	Compliance
0.290613	37.0	9.000	L1	10.2	13.5	50.5	Compliance
0.340821	43.3	9.000	L1	10.1	5.9	49.2	Compliance
0.363254	41.1	9.000	L1	10.0	7.6	48.7	Compliance
1.239175	36.5	9.000	L1	9.7	9.5	46.0	Compliance
1.289541	36.5	9.000	L1	9.7	9.5	46.0	Compliance

AC120 V, 60 Hz, Neutral:

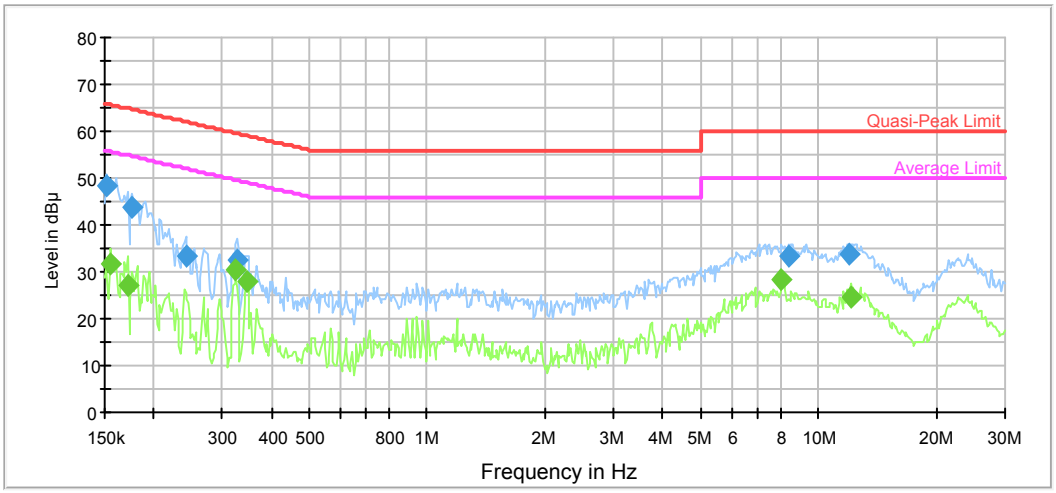


Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.158604	47.1	9.000	N	11.0	18.4	65.5	Compliance
0.346296	48.2	9.000	N	10.0	10.9	59.1	Compliance
1.229340	40.7	9.000	N	9.7	15.3	56.0	Compliance
1.289541	42.1	9.000	N	9.7	13.9	56.0	Compliance
6.604566	32.8	9.000	N	9.8	27.2	60.0	Compliance
7.039285	30.7	9.000	N	9.8	29.3	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.266226	34.8	9.000	N	10.3	16.4	51.2	Compliance
0.290613	35.4	9.000	N	10.2	15.1	50.5	Compliance
0.340821	43.2	9.000	N	10.1	6.0	49.2	Compliance
0.360371	41.3	9.000	N	10.0	7.4	48.7	Compliance
1.239175	38.3	9.000	N	9.7	7.7	46.0	Compliance
1.289541	35.2	9.000	N	9.7	10.8	46.0	Compliance

Test Mode: Transmitting(adapter 2)

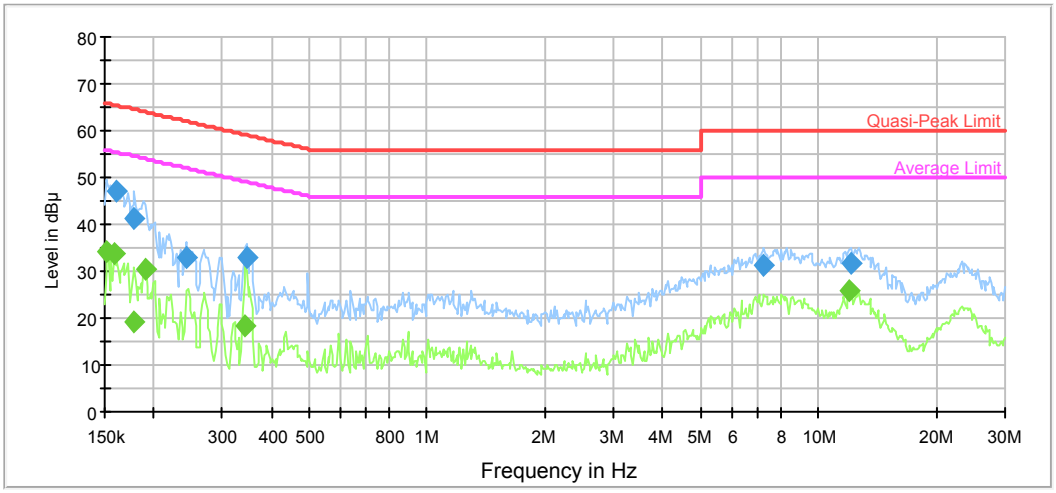
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.151200	48.4	9.000	L1	11.2	17.5	65.9	Compliance
0.175915	43.6	9.000	L1	10.8	21.1	64.7	Compliance
0.241949	33.4	9.000	L1	10.4	28.6	62.0	Compliance
0.327509	32.5	9.000	L1	10.1	27.0	59.5	Compliance
8.388036	33.1	9.000	L1	9.8	26.9	60.0	Compliance
12.005609	33.8	9.000	L1	9.9	26.2	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.156097	31.6	9.000	L1	11.1	24.1	55.7	Compliance
0.171759	27.2	9.000	L1	10.9	27.7	54.9	Compliance
0.324910	30.3	9.000	L1	10.1	19.3	49.6	Compliance
0.346296	28.0	9.000	L1	10.0	21.1	49.1	Compliance
8.060419	28.3	9.000	L1	9.8	21.7	50.0	Compliance
12.101654	24.4	9.000	L1	9.9	25.6	50.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.159873	46.9	9.000	N	11.0	18.6	65.5	Compliance
0.178741	41.1	9.000	N	10.8	23.4	64.5	Compliance
0.241949	33.0	9.000	N	10.4	29.0	62.0	Compliance
0.346296	32.9	9.000	N	10.0	26.2	59.1	Compliance
7.267260	31.5	9.000	N	9.8	28.5	60.0	Compliance
12.101654	31.8	9.000	N	9.9	28.2	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.152410	34.1	9.000	N	11.1	21.8	55.9	Compliance
0.158604	33.6	9.000	N	11.0	21.9	55.5	Compliance
0.178741	19.2	9.000	N	10.8	35.3	54.5	Compliance
0.190505	30.4	9.000	N	10.7	23.6	54.0	Compliance
0.343548	18.2	9.000	N	10.0	30.9	49.1	Compliance
12.005609	26.0	9.000	N	9.9	24.0	50.0	Compliance

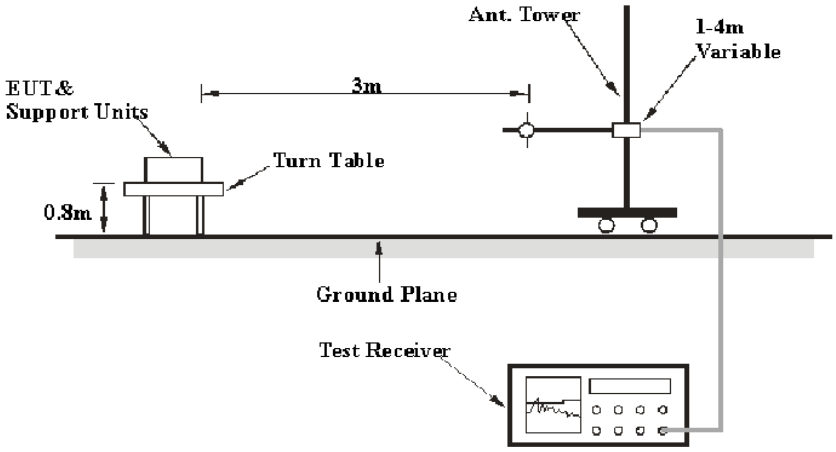
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

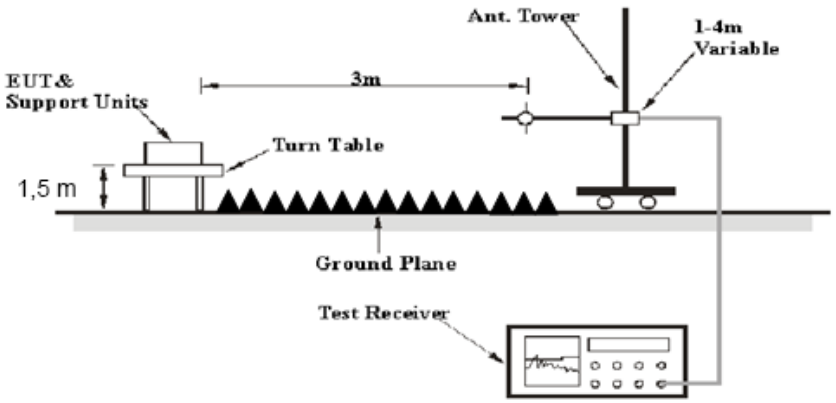
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



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

The spacing between the peripherals was 10 cm.

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:

30MHz-1000MHz:

Detector	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

Detector	Duty cycle	RBW	Video B/W
PK	Any	1MHz	3 MHz
Ave.	>98%	1MHz	10 Hz
	<98%	1MHz	1/T

Note: T is minimum transmission duration

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 = 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 limit. The equation for margin calculation is as follows:

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI Test Receiver	ESCI	100224	2016-09-01	2017-08-31
Sunol Sciences	Antenna	JB3	A060611-1	2014-11-06	2017-11-05
HP	Amplifier	8447E	2434A02181	2016-09-01	2017-09-01
R&S	Spectrum Analyzer	FSU 26	200256	2016-12-08	2017-12-08
ETS-Lindgren	Horn Antenna	3115	000 527 35	2016-01-05	2019-01-04
Ducommun Technolagies	Horn Antenna	ARH-4223-02	1007726-02 1304	2017-06-16	2020-06-15
Mini-Circuit	Amplifier	ZVA-213-S+	SN054201245	2017-02-19	2018-02-19
Quinstar	Amplifier	QLW-18405536-JO	15964001001	2016-09-06	2017-09-06
Unknown	Coaxial Cable	Chamber A-1	4m	2016-09-01	2017-09-01
Unknown	Coaxial Cable	Chamber B-1	0.75m	2016-09-01	2017-09-01
Unknown	Coaxial Cable	Chamber A-2	10m	2016-09-01	2017-09-01
Unknown	Coaxial Cable	Chamber B-2	8m	2016-09-01	2017-09-01
Farad	Test Software	EZ-EMC	V1.1.4.2	N/A	N/A

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26.3 °C
Relative Humidity:	36 %
ATM Pressure:	100.2 kPa

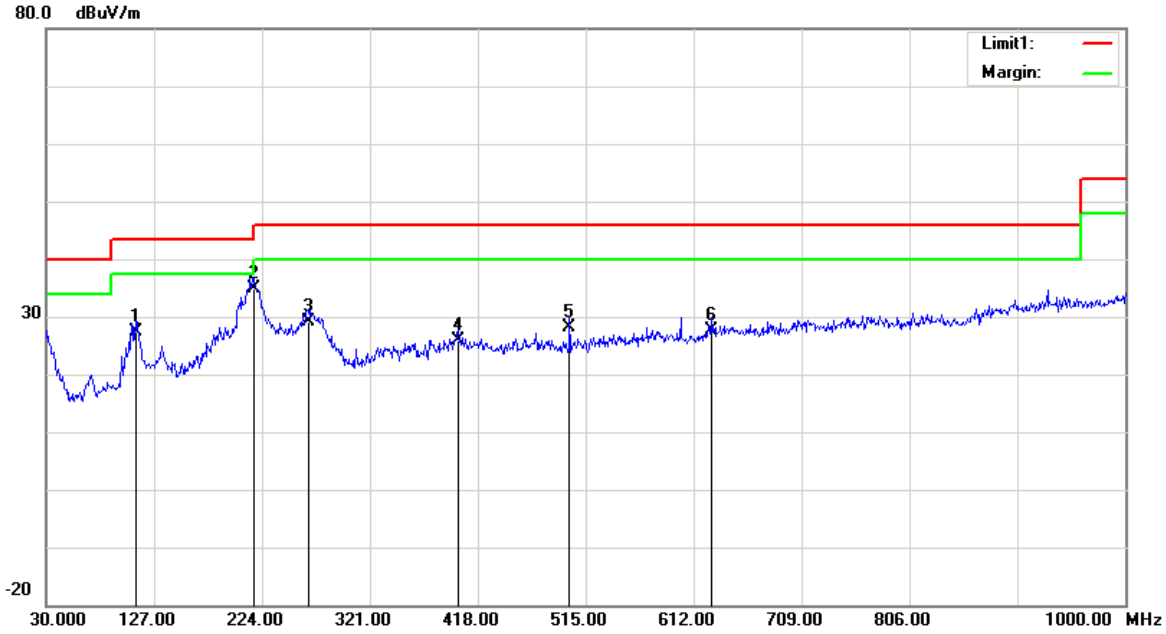
The testing was performed by Tony Zeng on 2017-08-04.

Test Result: Compliance, please Refer to the following data

Test Mode: Transmitting (adapter 1 was the worst)

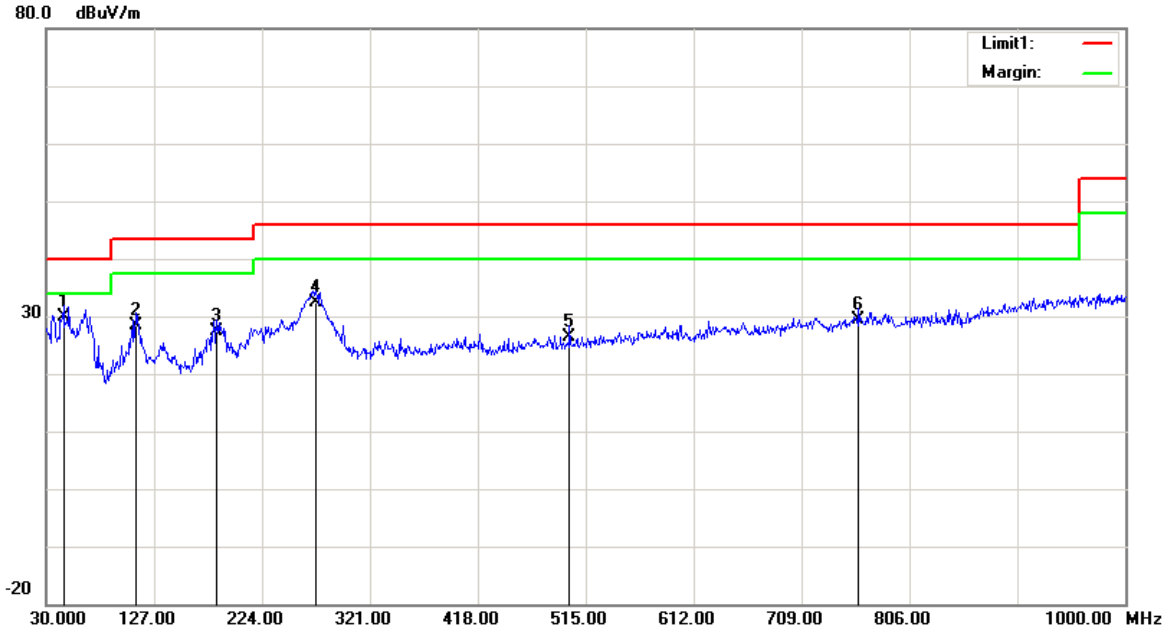
1) 30MHz-1GHz(802.11b mode Middle channel was the worst)**:**

Horizontal:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
110.5100	33.48	QP	-6.18	27.30	43.50	16.20
216.2400	42.31	QP	-7.41	34.90	46.00	11.10
265.7100	33.60	QP	-4.40	29.20	46.00	16.80
400.5400	28.33	QP	-2.43	25.90	46.00	20.10
500.4500	29.21	QP	-1.11	28.10	46.00	17.90
628.4900	26.49	QP	1.21	27.70	46.00	18.30

Vertical:



Frequency (MHz)	Receiver Reading (dBuV)	Detector	Correction Factor (dB/m)	Cord. Amp. (dBuV/m)	Limit (dBuV/m)	Margin (dB)
45.5200	39.80	QP	-10.00	29.80	40.00	10.20
110.5100	34.68	QP	-6.18	28.50	43.50	15.00
183.2600	35.30	QP	-7.90	27.40	43.50	16.10
272.5000	36.20	QP	-3.90	32.30	46.00	13.70
500.4500	27.41	QP	-1.11	26.30	46.00	19.70
760.4100	26.06	QP	3.34	29.40	46.00	16.60

2) 1-25GHz:

802.11b(Chain 0 mode was the worst):

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	71.73	PK	H	28.12	3.11	0.00	102.96	N/A	N/A
2412	64.65	AV	H	28.12	3.11	0.00	95.88	N/A	N/A
2412	85.31	PK	V	28.12	3.11	0.00	116.54	N/A	N/A
2412	78.21	AV	V	28.12	3.11	0.00	109.44	N/A	N/A
2390	33.14	PK	V	28.08	3.10	0.00	64.32	74.00	9.68
2390	21.45	AV	V	28.08	3.10	0.00	52.63	54.00	1.37
4824	55.16	PK	V	32.95	4.33	35.49	56.95	74.00	17.05
4824	38.27	AV	V	32.95	4.33	35.49	40.06	54.00	13.94
7236	48.52	PK	V	35.81	5.47	35.97	53.83	74.00	20.17
7236	33.49	AV	V	35.81	5.47	35.97	38.80	54.00	15.20
5885	47.53	PK	V	34.25	4.63	35.85	50.56	74.00	23.44
5885	32.66	AV	V	34.25	4.63	35.85	35.69	54.00	18.31
Middle Channel: 2437 MHz									
2437	70.23	PK	H	28.17	3.11	0.00	101.51	N/A	N/A
2437	62.85	AV	H	28.17	3.11	0.00	94.13	N/A	N/A
2437	86.16	PK	V	28.17	3.11	0.00	117.44	N/A	N/A
2437	77.82	AV	V	28.17	3.11	0.00	109.10	N/A	N/A
4874	55.57	PK	V	33.05	4.39	35.53	57.48	74.00	16.52
4874	49.68	AV	V	33.05	4.39	35.53	51.59	54.00	2.41
7311	46.63	PK	V	36.01	5.52	35.97	52.19	74.00	21.81
7311	32.51	AV	V	36.01	5.52	35.97	38.07	54.00	15.93
5985	46.33	PK	V	34.29	4.66	35.85	49.43	74.00	24.57
5985	32.88	AV	V	34.29	4.66	35.85	35.98	54.00	18.02
6335	46.69	PK	V	34.23	5.07	35.78	50.21	74.00	23.79
6335	32.57	AV	V	34.23	5.07	35.78	36.09	54.00	17.91
High Channel: 2462 MHz									
2462	70.28	PK	H	28.22	3.10	0.00	101.60	N/A	N/A
2462	62.49	AV	H	28.22	3.10	0.00	93.81	N/A	N/A
2462	82.59	PK	V	28.22	3.10	0.00	113.91	N/A	N/A
2462	77.48	AV	V	28.22	3.10	0.00	108.80	N/A	N/A
2483.5	33.28	PK	V	28.27	3.10	0.00	64.65	74.00	9.35
2483.5	20.94	AV	V	28.27	3.10	0.00	52.31	54.00	1.69
4924	52.79	PK	V	33.15	4.42	35.57	54.79	74.00	19.21
4924	36.73	AV	V	33.15	4.42	35.57	38.73	54.00	15.27
7386	48.29	PK	V	36.20	5.57	35.98	54.08	74.00	19.92
7386	33.56	AV	V	36.20	5.57	35.98	39.35	54.00	14.65
6125	46.85	PK	V	34.28	4.82	35.82	50.13	74.00	23.87
6125	32.42	AV	V	34.28	4.82	35.82	35.70	54.00	18.30

802.11g(Chain 0 mode was the worst):

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	65.87	PK	H	28.12	3.11	0.00	97.10	N/A	N/A
2412	56.49	AV	H	28.12	3.11	0.00	87.72	N/A	N/A
2412	82.65	PK	V	28.12	3.11	0.00	113.88	N/A	N/A
2412	73.66	AV	V	28.12	3.11	0.00	104.89	N/A	N/A
2390	30.94	PK	V	28.08	3.10	0.00	62.12	74.00	11.88
2390	21.71	AV	V	28.08	3.10	0.00	52.89	54.00	1.11
4824	49.26	PK	V	32.95	4.33	35.49	51.05	74.00	22.95
4824	35.12	AV	V	32.95	4.33	35.49	36.91	54.00	17.09
7236	48.54	PK	V	35.81	5.47	35.97	53.85	74.00	20.15
7236	33.52	AV	V	35.81	5.47	35.97	38.83	54.00	15.17
5945	47.26	PK	V	34.28	4.64	35.85	50.33	74.00	23.67
5945	32.58	AV	V	34.28	4.64	35.85	35.65	54.00	18.35
Middle Channel: 2437 MHz									
2437	71.63	PK	H	28.17	3.11	0.00	102.91	N/A	N/A
2437	62.98	AV	H	28.17	3.11	0.00	94.26	N/A	N/A
2437	85.32	PK	V	28.17	3.11	0.00	116.60	N/A	N/A
2437	74.69	AV	V	28.17	3.11	0.00	105.97	N/A	N/A
4874	56.25	PK	V	33.05	4.39	35.53	58.16	74.00	15.84
4874	38.94	AV	V	33.05	4.39	35.53	40.85	54.00	13.15
7311	46.59	PK	V	36.01	5.52	35.97	52.15	74.00	21.85
7311	32.33	AV	V	36.01	5.52	35.97	37.89	54.00	16.11
5775	46.96	PK	V	34.21	4.70	35.85	50.02	74.00	23.98
5775	32.86	AV	V	34.21	4.70	35.85	35.92	54.00	18.08
6235	46.79	PK	V	34.25	4.95	35.80	50.19	74.00	23.81
6235	32.24	AV	V	34.25	4.95	35.80	35.64	54.00	18.36
High Channel: 2462 MHz									
2462	65.37	PK	H	28.22	3.10	0.00	96.69	N/A	N/A
2462	56.31	AV	H	28.22	3.10	0.00	87.63	N/A	N/A
2462	82.04	PK	V	28.22	3.10	0.00	113.36	N/A	N/A
2462	72.97	AV	V	28.22	3.10	0.00	104.29	N/A	N/A
2483.5	32.31	PK	V	28.27	3.10	0.00	63.68	74.00	10.32
2483.5	21.61	AV	V	28.27	3.10	0.00	52.98	54.00	1.02
4924	49.69	PK	V	33.15	4.42	35.57	51.69	74.00	22.31
4924	34.86	AV	V	33.15	4.42	35.57	36.86	54.00	17.14
7386	48.59	PK	V	36.20	5.57	35.98	54.38	74.00	19.62
7386	33.46	AV	V	36.20	5.57	35.98	39.25	54.00	14.75
5485	46.87	PK	V	34.08	4.49	35.84	49.60	74.00	24.40
5485	32.27	AV	V	34.08	4.49	35.84	35.00	54.00	19.00

802.11n20(2TX mode was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	63.75	PK	H	28.12	3.11	0.00	94.98	N/A	N/A
2412	54.98	AV	H	28.12	3.11	0.00	86.21	N/A	N/A
2412	78.24	PK	V	28.12	3.11	0.00	109.47	N/A	N/A
2412	70.01	AV	V	28.12	3.11	0.00	101.24	N/A	N/A
2390	32.41	PK	V	28.08	3.10	0.00	63.59	74.00	10.41
2390	21.57	AV	V	28.08	3.10	0.00	52.75	54.00	1.25
4824	47.96	PK	V	32.95	4.33	35.49	49.75	74.00	24.25
4824	34.35	AV	V	32.95	4.33	35.49	36.14	54.00	17.86
7236	48.27	PK	V	35.81	5.47	35.97	53.58	74.00	20.42
7236	33.15	AV	V	35.81	5.47	35.97	38.46	54.00	15.54
5675	47.23	PK	V	34.17	4.62	35.85	50.17	74.00	23.83
5675	32.24	AV	V	34.17	4.62	35.85	35.18	54.00	18.82
Middle Channel: 2437 MHz									
2437	68.56	PK	H	28.17	3.11	0.00	99.84	N/A	N/A
2437	59.91	AV	H	28.17	3.11	0.00	91.19	N/A	N/A
2437	84.21	PK	V	28.17	3.11	0.00	115.49	N/A	N/A
2437	75.81	AV	V	28.17	3.11	0.00	107.09	N/A	N/A
4874	55.86	PK	V	33.05	4.39	35.53	57.77	74.00	16.23
4874	43.65	AV	V	33.05	4.39	35.53	45.56	54.00	8.44
7311	46.15	PK	V	36.01	5.52	35.97	51.71	74.00	22.29
7311	32.55	AV	V	36.01	5.52	35.97	38.11	54.00	15.89
5635	46.21	PK	V	34.15	4.58	35.85	49.09	74.00	24.91
5635	32.48	AV	V	34.15	4.58	35.85	35.36	54.00	18.64
6448	46.35	PK	V	34.21	5.21	35.75	50.02	74.00	23.98
6448	32.77	AV	V	34.21	5.21	35.75	36.44	54.00	17.56
High Channel: 2462 MHz									
2462	64.31	PK	H	28.22	3.10	0.00	95.63	N/A	N/A
2462	54.72	AV	H	28.22	3.10	0.00	86.04	N/A	N/A
2462	80.85	PK	V	28.22	3.10	0.00	112.17	N/A	N/A
2462	72.84	AV	V	28.22	3.10	0.00	104.16	N/A	N/A
2483.5	35.12	PK	V	28.27	3.10	0.00	66.49	74.00	7.51
2483.5	21.57	AV	V	28.27	3.10	0.00	52.94	54.00	1.06
4924	48.97	PK	V	33.15	4.42	35.57	50.97	74.00	23.03
4924	34.96	AV	V	33.15	4.42	35.57	36.96	54.00	17.04
7386	48.94	PK	V	36.20	5.57	35.98	54.73	74.00	19.27
7386	34.07	AV	V	36.20	5.57	35.98	39.86	54.00	14.14
6558	48.15	PK	V	34.32	5.28	35.76	51.99	74.00	22.01
6558	32.98	AV	V	34.32	5.28	35.76	36.82	54.00	17.18

802.11n40(2TX mode was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2422 MHz									
2422	56.23	PK	H	28.14	3.11	0.00	87.48	N/A	N/A
2422	45.46	AV	H	28.14	3.11	0.00	76.71	N/A	N/A
2422	70.12	PK	V	28.14	3.11	0.00	101.37	N/A	N/A
2422	62.26	AV	V	28.14	3.11	0.00	93.51	N/A	N/A
2390	32.53	PK	V	28.08	3.10	0.00	63.71	74.00	10.29
2390	21.25	AV	V	28.08	3.10	0.00	52.43	54.00	1.57
4844	48.32	PK	V	32.99	4.35	35.51	50.15	74.00	23.85
4844	35.62	AV	V	32.99	4.35	35.51	37.45	54.00	16.55
7266	46.85	PK	V	35.89	5.49	35.97	52.26	74.00	21.74
7266	32.24	AV	V	35.89	5.49	35.97	37.65	54.00	16.35
5675	47.86	PK	V	34.17	4.62	35.85	50.80	74.00	23.20
5675	33.45	AV	V	34.17	4.62	35.85	36.39	54.00	17.61
Middle Channel: 2437 MHz									
2437	67.36	PK	H	28.17	3.11	0.00	98.64	N/A	N/A
2437	52.53	AV	H	28.17	3.11	0.00	83.81	N/A	N/A
2437	81.71	PK	V	28.17	3.11	0.00	112.99	N/A	N/A
2437	71.27	AV	V	28.17	3.11	0.00	102.55	N/A	N/A
4874	54.76	PK	V	33.05	4.39	35.53	56.67	74.00	17.33
4874	42.61	AV	V	33.05	4.39	35.53	44.52	54.00	9.48
7311	47.13	PK	V	36.01	5.52	35.97	52.69	74.00	21.31
7311	33.18	AV	V	36.01	5.52	35.97	38.74	54.00	15.26
5687	46.33	PK	V	34.17	4.64	35.85	49.29	74.00	24.71
5687	32.16	AV	V	34.17	4.64	35.85	35.12	54.00	18.88
6315	45.29	PK	V	34.24	5.05	35.78	48.80	74.00	25.20
6315	32.56	AV	V	34.24	5.05	35.78	36.07	54.00	17.93
High Channel: 2452 MHz									
2452	56.72	PK	H	28.20	3.10	0.00	88.02	N/A	N/A
2452	45.85	AV	H	28.20	3.10	0.00	77.15	N/A	N/A
2452	71.21	PK	V	28.20	3.10	0.00	102.51	N/A	N/A
2452	62.75	AV	V	28.20	3.10	0.00	94.05	N/A	N/A
2483.5	31.16	PK	V	28.27	3.10	0.00	62.53	74.00	11.47
2483.5	20.79	AV	V	28.27	3.10	0.00	52.16	54.00	1.84
4904	47.62	PK	V	33.11	4.42	35.56	49.59	74.00	24.41
4904	35.14	AV	V	33.11	4.42	35.56	37.11	54.00	16.89
7356	46.38	PK	V	36.13	5.55	35.98	52.08	74.00	21.92
7356	33.19	AV	V	36.13	5.55	35.98	38.89	54.00	15.11
6354	48.31	PK	V	34.23	5.09	35.77	51.86	74.00	22.14
6354	32.74	AV	V	34.23	5.09	35.77	36.29	54.00	17.71

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)
	Reading (dBµV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Additional Channel: 2427 MHz									
2427	56.79	PK	H	28.15	3.11	0.00	88.05	N/A	N/A
2427	48.37	AV	H	28.15	3.11	0.00	79.63	N/A	N/A
2427	72.52	PK	V	28.15	3.11	0.00	103.78	N/A	N/A
2427	64.11	AV	V	28.15	3.11	0.00	95.37	N/A	N/A
2390	29.89	PK	V	28.08	3.10	0.00	61.07	74.00	12.93
2390	21.27	AV	V	28.08	3.10	0.00	52.45	54.00	1.55
Additional Channel: 2432 MHz									
2432	59.76	PK	H	28.16	3.11	0.00	91.03	N/A	N/A
2432	50.66	AV	H	28.16	3.11	0.00	81.93	N/A	N/A
2432	76.15	PK	V	28.16	3.11	0.00	107.42	N/A	N/A
2432	67.44	AV	V	28.16	3.11	0.00	98.71	N/A	N/A
2390	28.26	PK	V	28.08	3.10	0.00	59.44	74.00	14.56
2390	20.89	AV	V	28.08	3.10	0.00	52.07	54.00	1.93
Additional Channel: 2442 MHz									
2442	58.41	PK	H	28.18	3.11	0.00	89.70	N/A	N/A
2442	48.34	AV	H	28.18	3.11	0.00	79.63	N/A	N/A
2442	73.16	PK	V	28.18	3.11	0.00	104.45	N/A	N/A
2442	67.18	AV	V	28.18	3.11	0.00	98.47	N/A	N/A
2483.5	30.57	PK	V	28.27	3.10	0.00	61.94	74.00	12.06
2483.5	21.56	AV	V	28.27	3.10	0.00	52.93	54.00	1.07
Additional Channel: 2447 MHz									
2447	60.21	PK	H	28.19	3.11	0.00	91.51	N/A	N/A
2447	50.84	AV	H	28.19	3.11	0.00	82.14	N/A	N/A
2447	75.37	PK	V	28.19	3.11	0.00	106.67	N/A	N/A
2447	66.74	AV	V	28.19	3.11	0.00	98.04	N/A	N/A
2483.5	30.28	PK	V	28.27	3.10	0.00	61.65	74.00	12.35
2483.5	20.45	AV	V	28.27	3.10	0.00	51.82	54.00	2.18

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

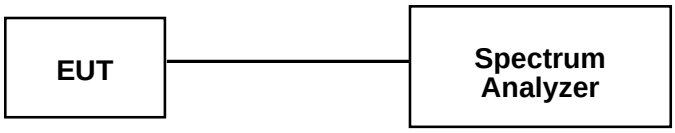
Applicable Standard

According to FCC §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.

Test Procedure

a) Set RBW = 100 kHz.
b) Set the video bandwidth (VBW) ≥ 3×RBW.
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE23437	2016-11-22	2017-11-22
Unknown	RF Cable	Unknown	C-2	Each Time	/

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26. 5 °C
Relative Humidity:	63 %
ATM Pressure:	100.1 kPa

** The testing was performed by David Huang on 2017-07-28.*

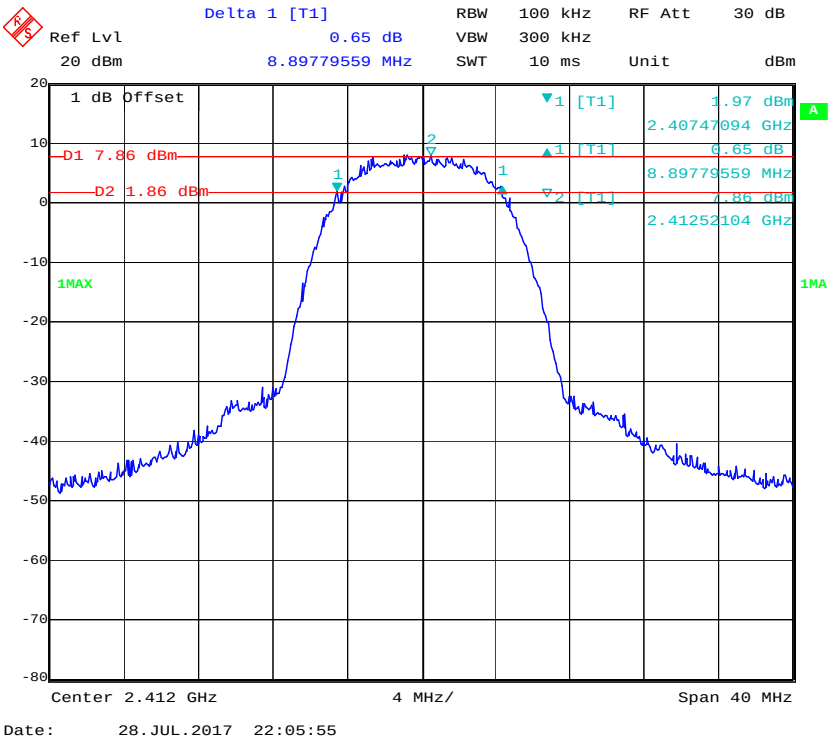
Test Mode: Transmitting(Test performed at chain 0)

Test Result: Compliant. Please refer to the following table and plots.

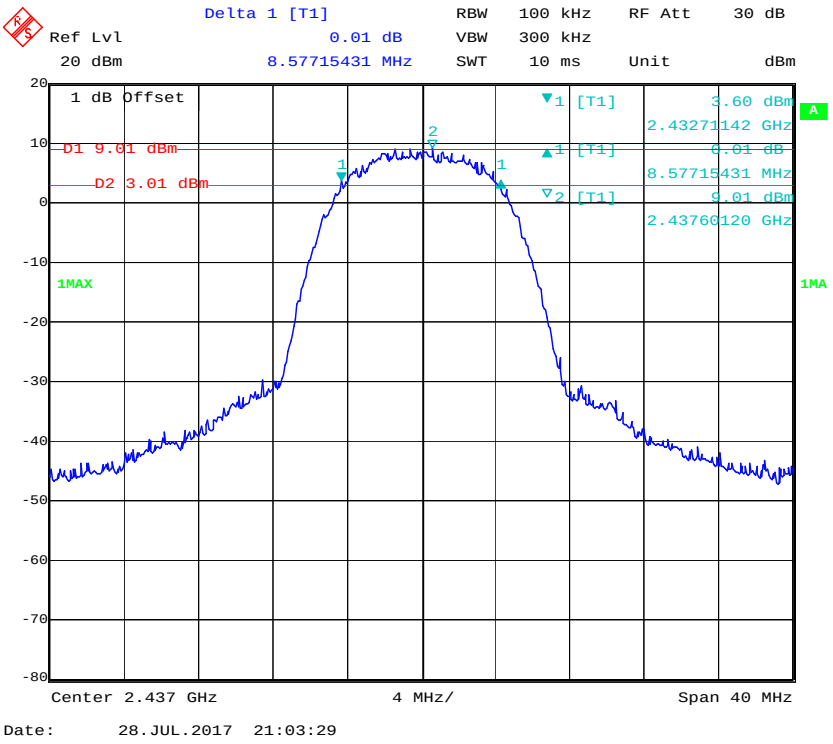
Test mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	8.90	≥0.5
	Middle	2437	8.58	≥0.5
	High	2462	8.10	≥0.5
802.11g	Low	2412	16.59	≥0.5
	Middle	2437	16.59	≥0.5
	High	2462	16.59	≥0.5
802.11 n20	Low	2412	16.59	≥0.5
	Middle	2437	16.59	≥0.5
	High	2462	16.59	≥0.5
802.11 n40	Low	2422	36.39	≥0.5
	Middle	2437	36.39	≥0.5
	High	2452	36.39	≥0.5

6dB Bandwidth:

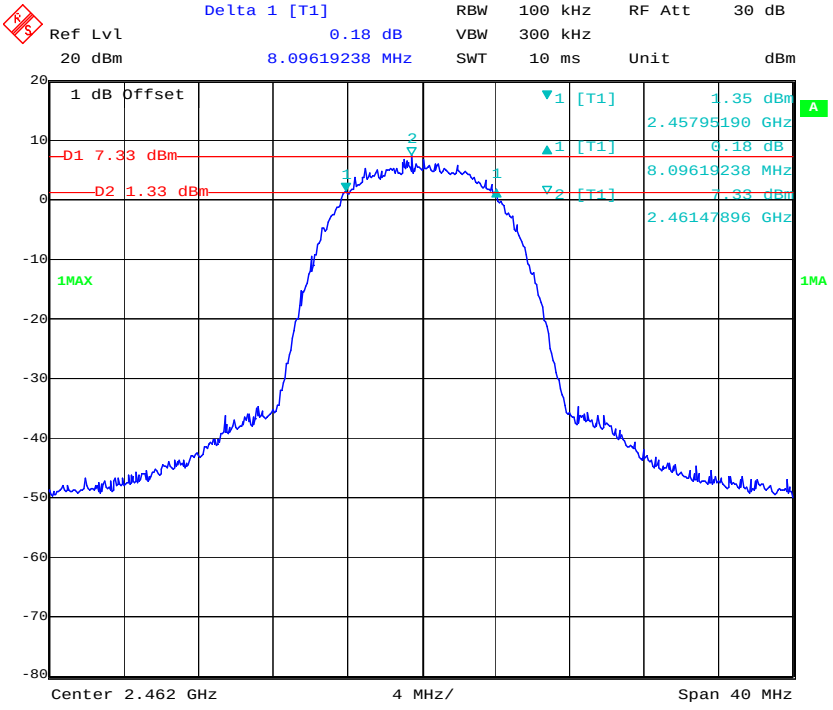
802.11b Low Channel



802.11b Middle Channel

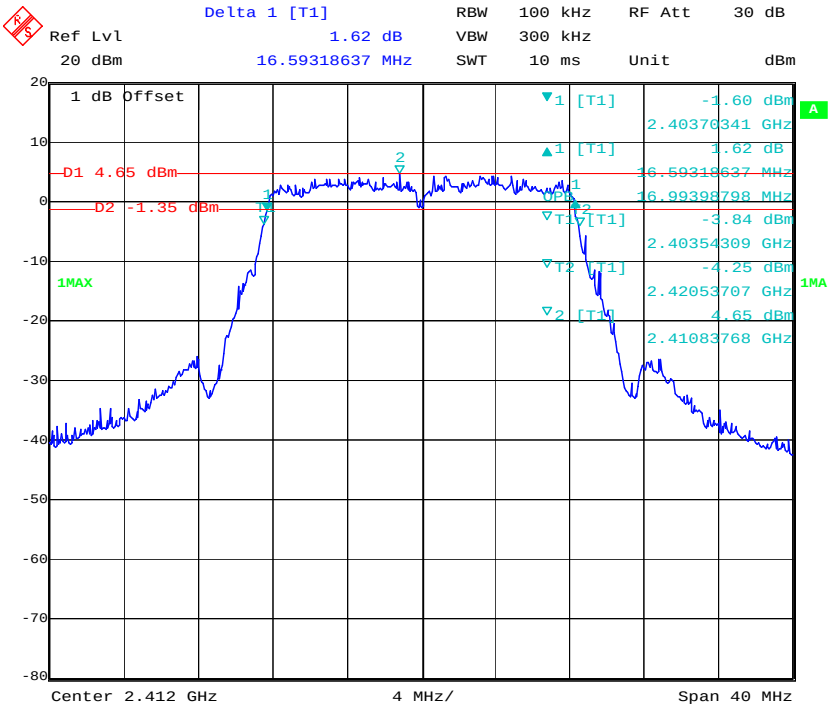


802.11b High Channel



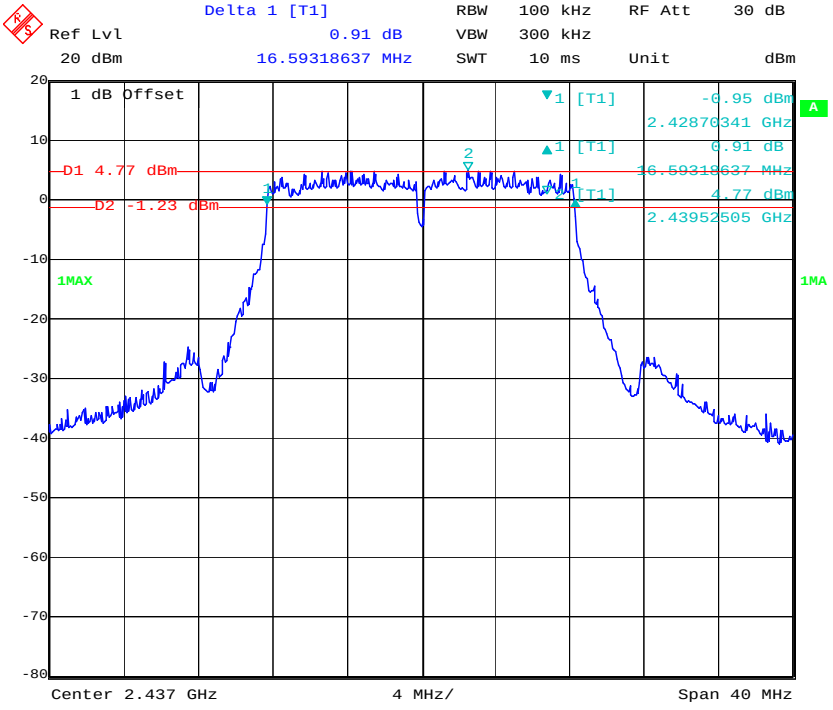
Date: 28.JUL.2017 21:06:14

802.11g Low Channel

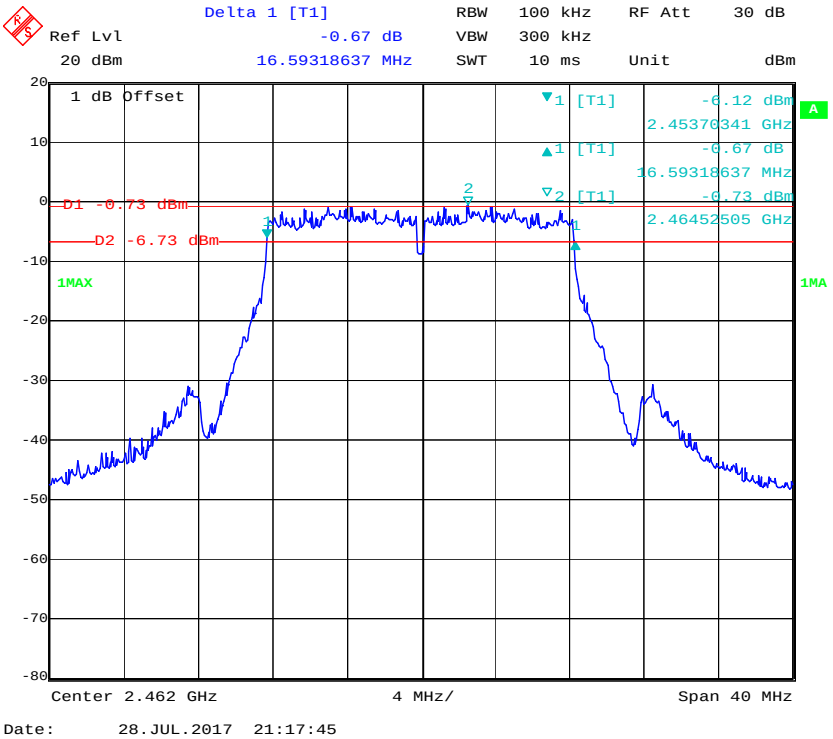


Date: 28.JUL.2017 21:12:43

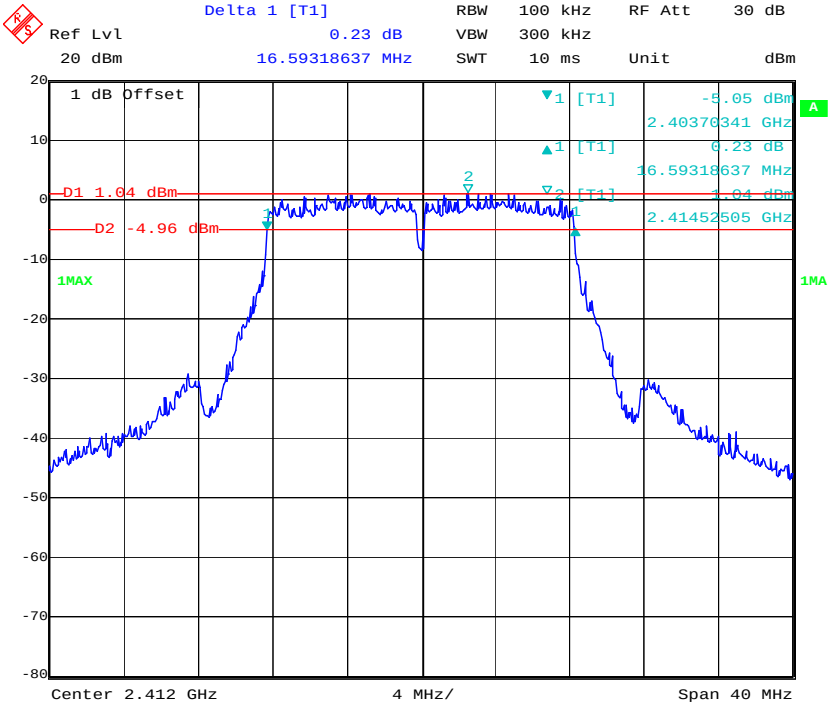
802.11g Middle Channel



802.11g High Channel

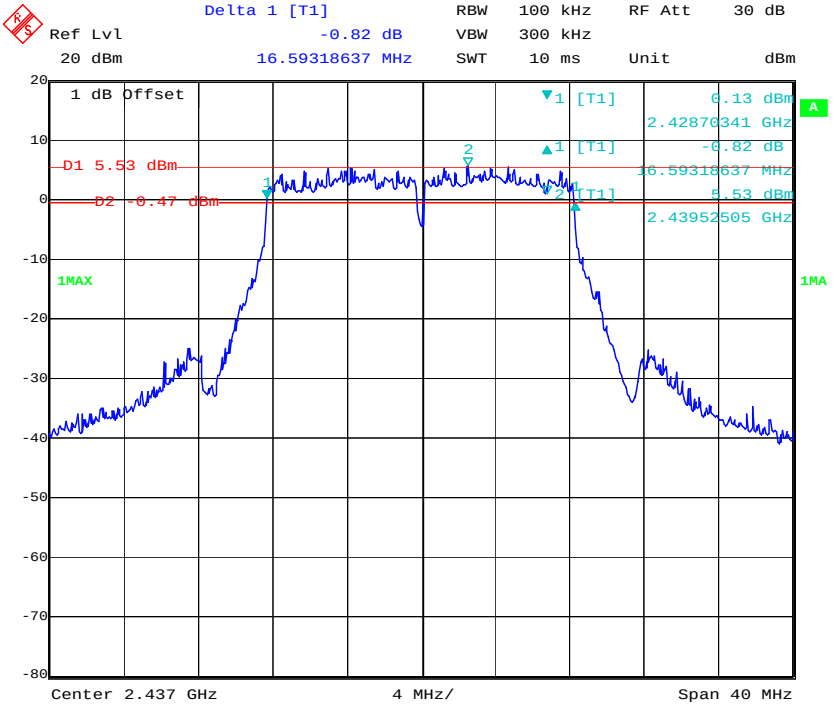


802.11 n20 Low Channel



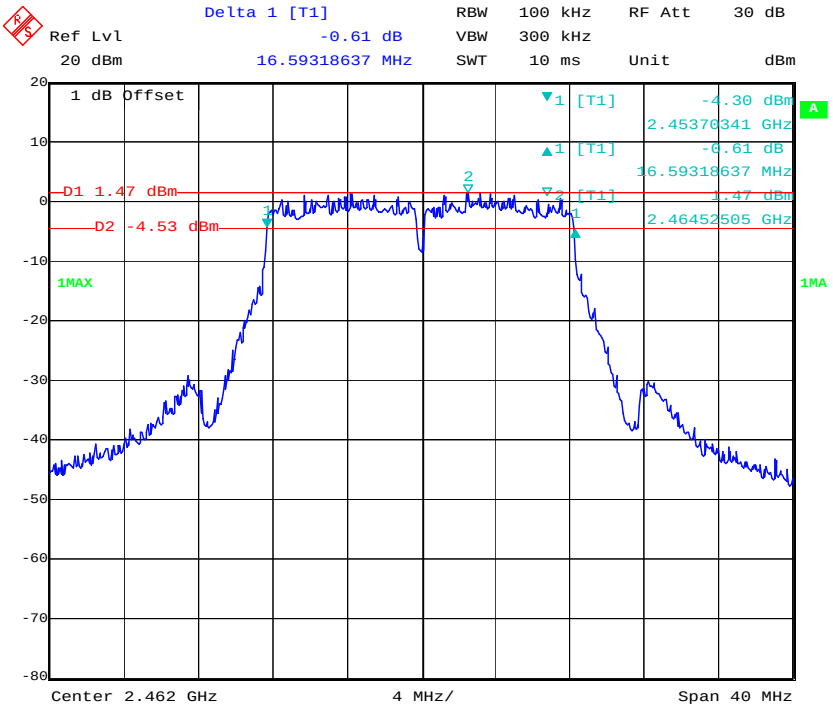
Date: 28.JUL.2017 21:23:22

802.11 n20 Middle Channel



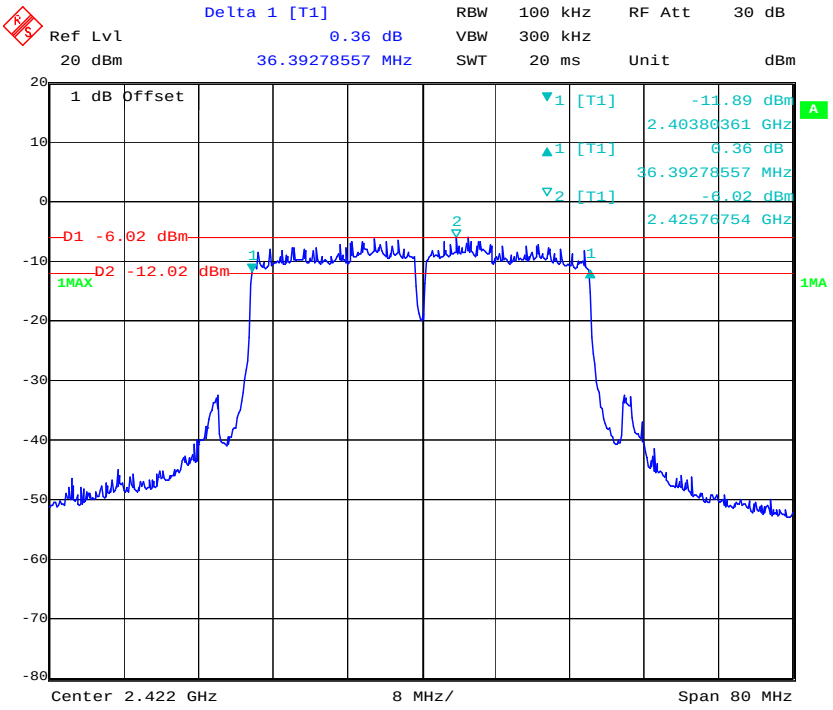
Date: 28.JUL.2017 21:29:12

802.11 n20 High Channel



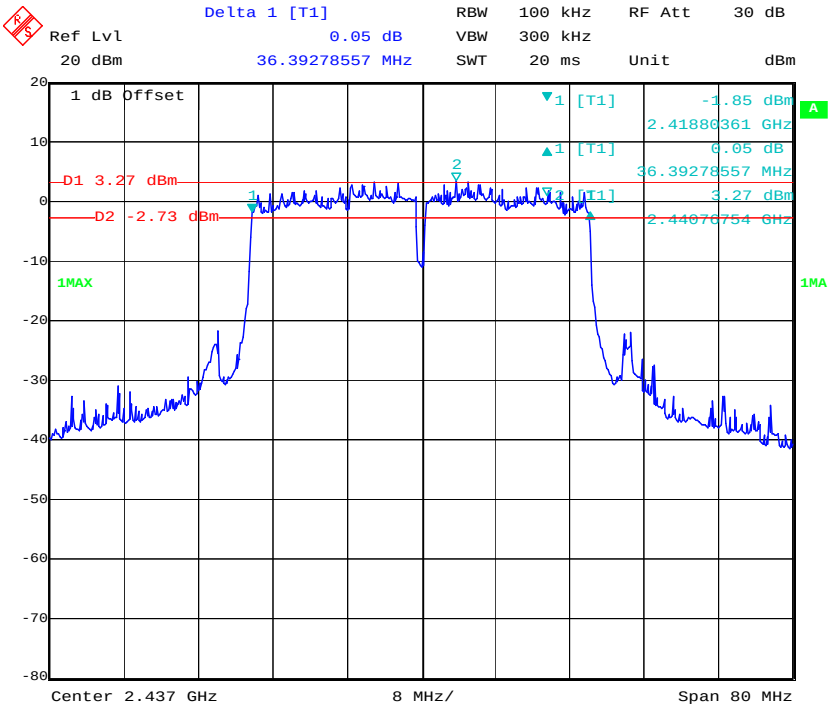
Date: 28.JUL.2017 21:31:08

802.11 n40 Low Channel

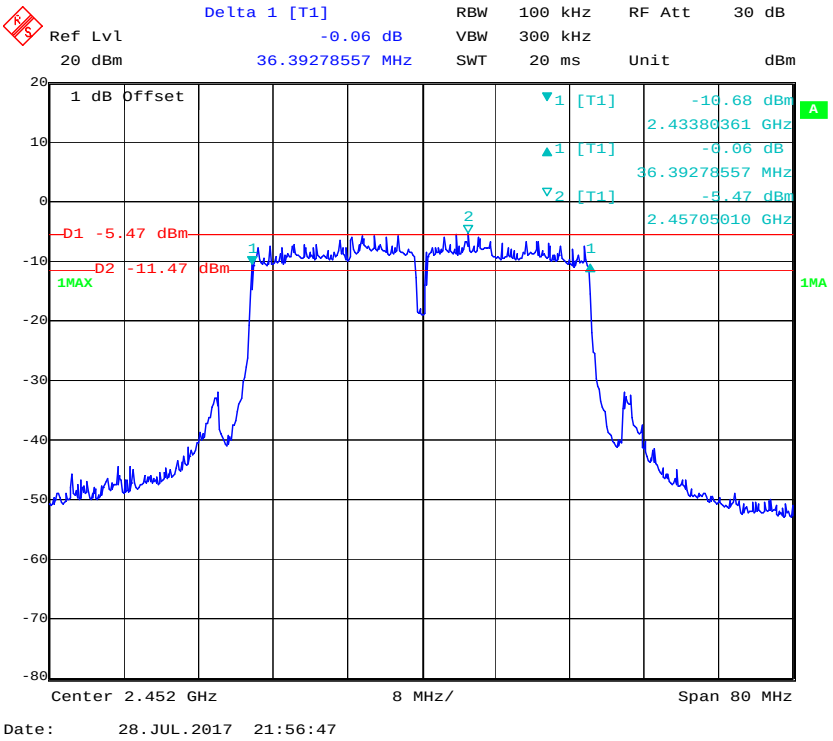


Date: 28.JUL.2017 21:45:15

802.11 n40 Middle Channel



802.11 n40 High Channel



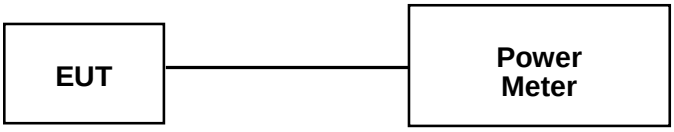
FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER

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 test equipment.
3. Add a correction factor to the display.
4. Set the power Meter to test Peak output power, record the result as peak power.
5. Set the power meter to test average output power, record the result as average power.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54210016	2016-11-03	2017-11-03
Agilent	Wideband Power Sensor	N1921A	MY54170013	2016-11-03	2017-11-03
Agilent	P-Series Power Meter	N1912A	MY5000448	2016-11-03	2017-11-03
Unknown	Coaxial Cable	0.1m	C-1	Each Time	/

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26.5 °C
Relative Humidity:	63 %
ATM Pressure:	100.1 kPa

The testing was performed by David Huang on 2017-07-19.

Test Mode: Transmitting

1Tx

Test mode	Frequency (MHz)	Max Peak Conducted Output Power (dBm)		Limit (dBm)
		Chain 0	Chain 1	
802.11b	2412	22.17	22.5	30
	2437	24.64	24.86	30
	2462	22.29	21.73	30
802.11g	2412	23.46	23.69	30
	2437	26.79	26.74	30
	2462	23.25	24.22	30
802.11 n20	2412	23.78	23.86	30
	2437	26.69	27.01	30
	2462	23.66	22.5	30
802.11 n40	2422	16.38	15.3	30
	2427	21.01	20.62	30
	2432	24.52	24.99	30
	2437	26.69	27.14	30
	2442	21.36	22.01	30
	2447	23.66	24.36	30
	2452	18.05	18.4	30

2Tx

Test mode	Frequency (MHz)	Max Peak Conducted Output Power (dBm)		Total (dBm)	Limit (dBm)
		Chain 0	Chain 1		
802.11 n20	2412	23.34	23.76	26.57	30
	2437	26.27	26.23	29.26	30
	2462	23.45	22.4	25.97	30
802.11 n40	2422	15.66	15.3	18.49	30
	2427	20.21	20.05	23.14	30
	2432	24.24	24.29	27.28	30
	2437	25.75	26.87	29.36	30
	2442	21.16	21.51	24.35	30
	2447	23.33	23.97	26.67	30
	2452	15.09	15.99	18.57	30

Note: the antenna gains are 5.0 dBi in 2.4GHz band, the device employed Cyclic Delay Diversity (CDD) for 2TX 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 $N_{ANT} \leq 4$;

So:

Directional gain = G_{ANT} + Array Gain = 5.0 dBi < 6dBi

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

Applicable Standard

According to FCC§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)).

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
R&S	Spectrum Analyzer	FSEM	DE23437	2016-11-22	2017-11-22
Unknown	RF Cable	Unknown	C-2	Each Time	/

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

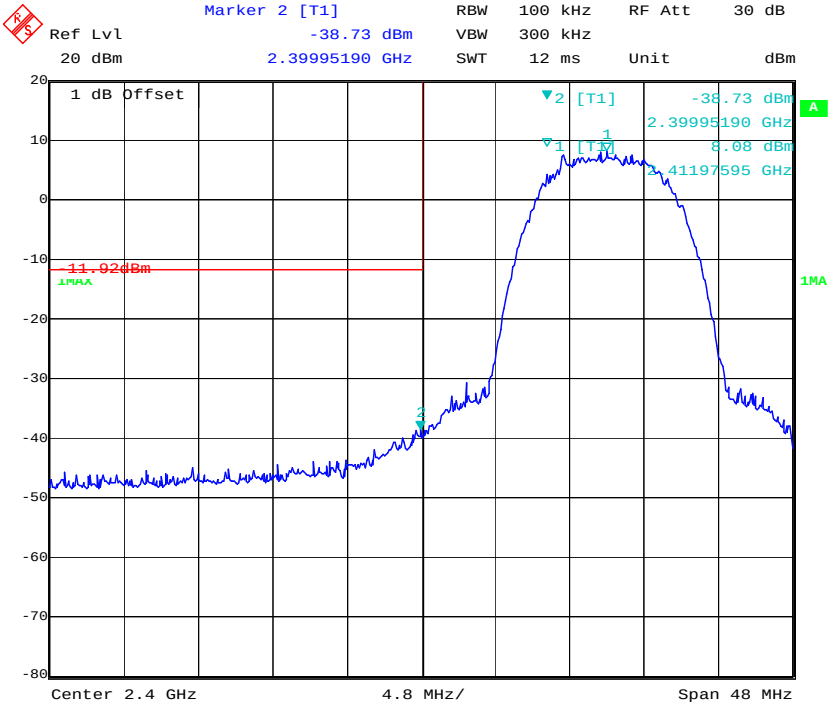
Temperature:	26.5 °C
Relative Humidity:	63 %
ATM Pressure:	100.1 kPa

** The testing was performed by David Huang on 2017-07-28.*

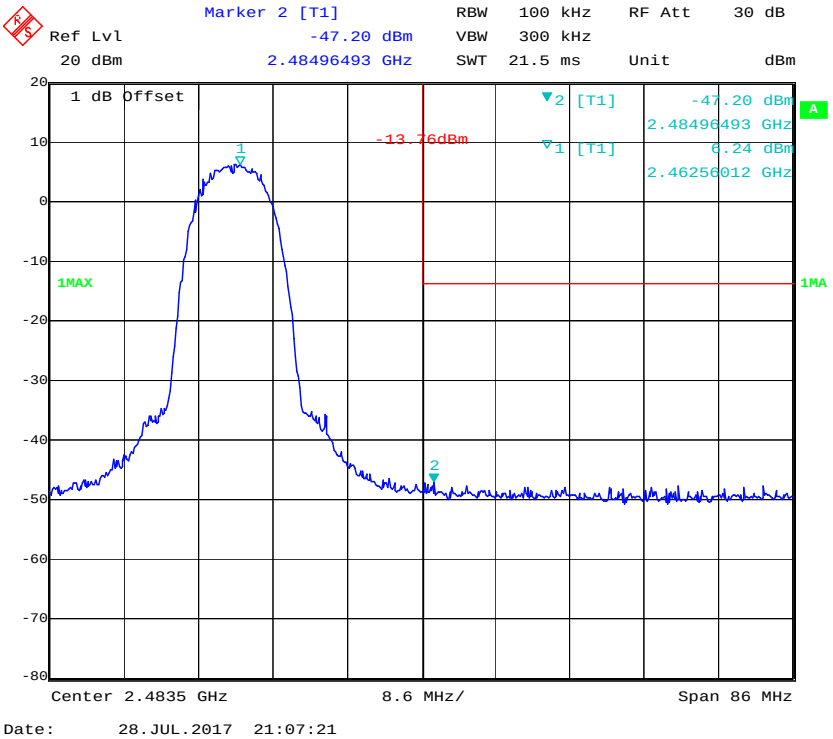
Test mode: Transmitting (test only performed at 1Tx mode, since 1TX power is the maximum power at each chain)

Test Result: Compliant. Please refer to following plots.

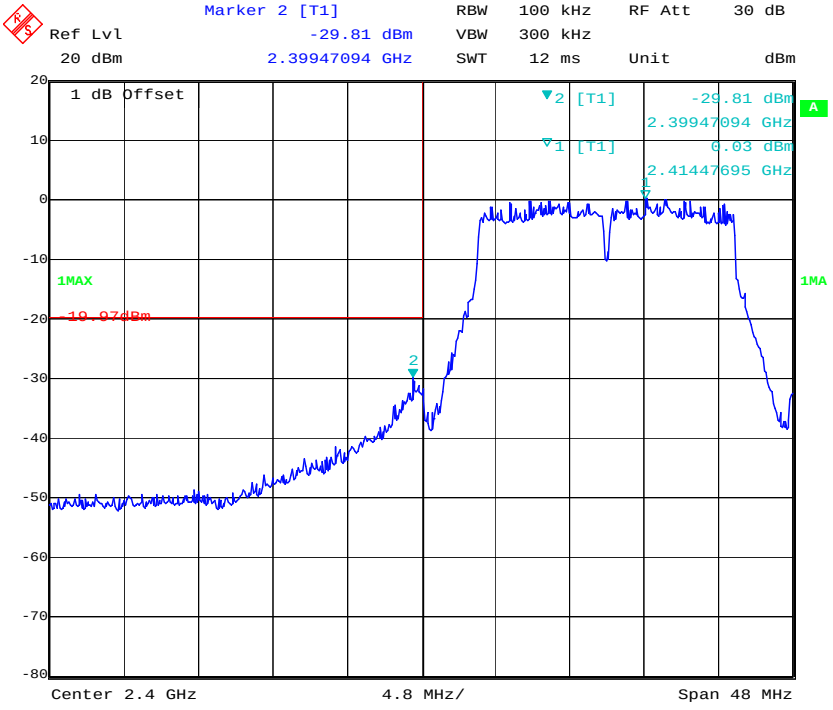
Chain 0, 802.11b: Band Edge, Left Side



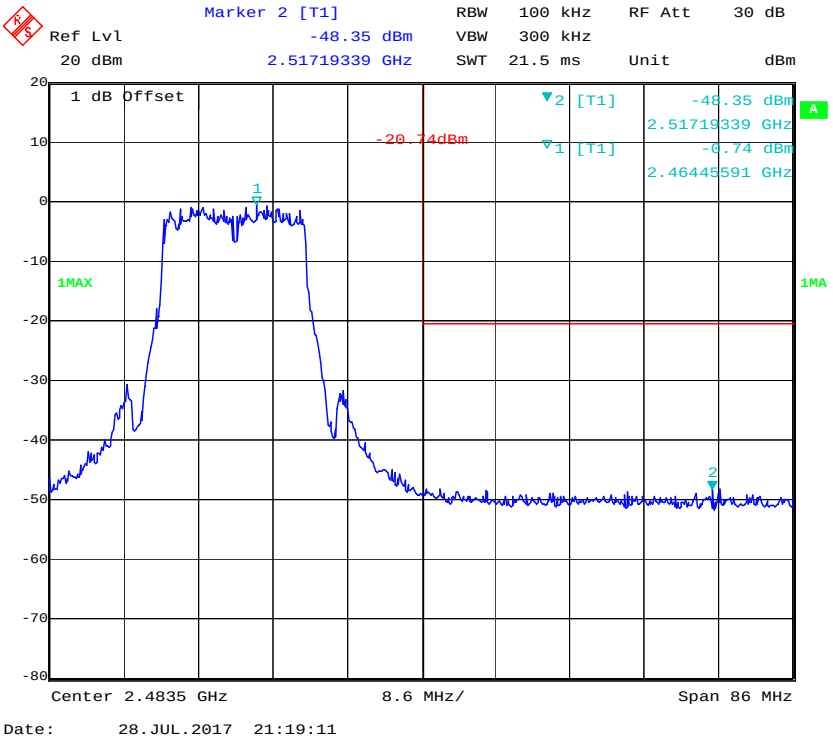
Chain 0, 802.11b: Band Edge, Right Side



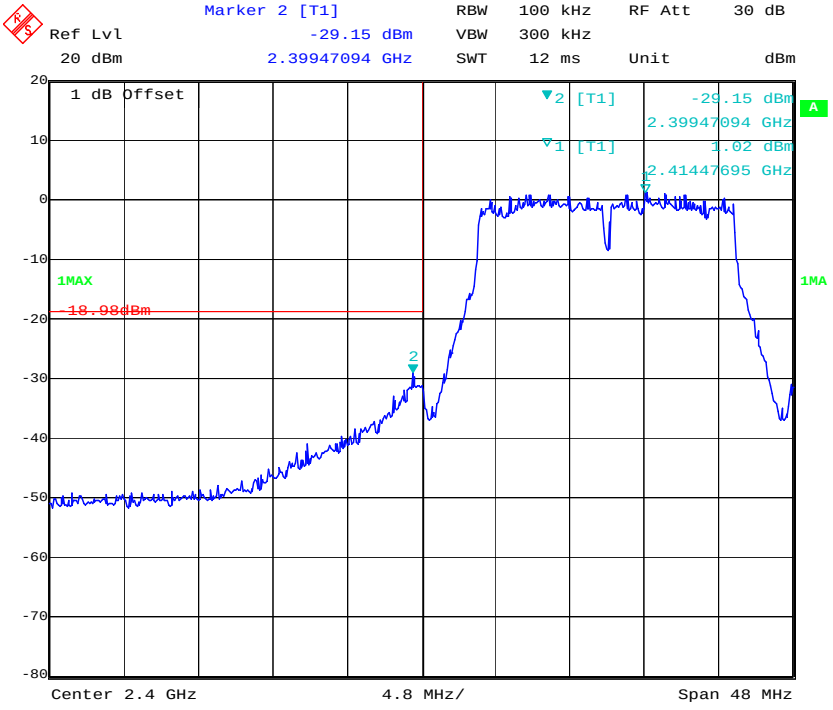
Chain 0, 802.11g: Band Edge, Left Side



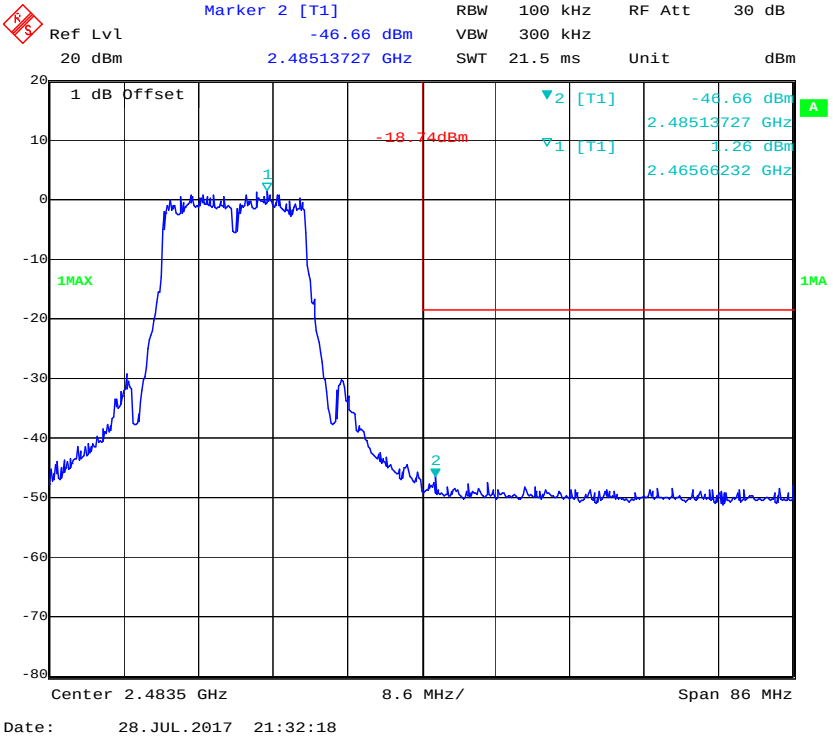
Chain 0, 802.11g: Band Edge, Right Side



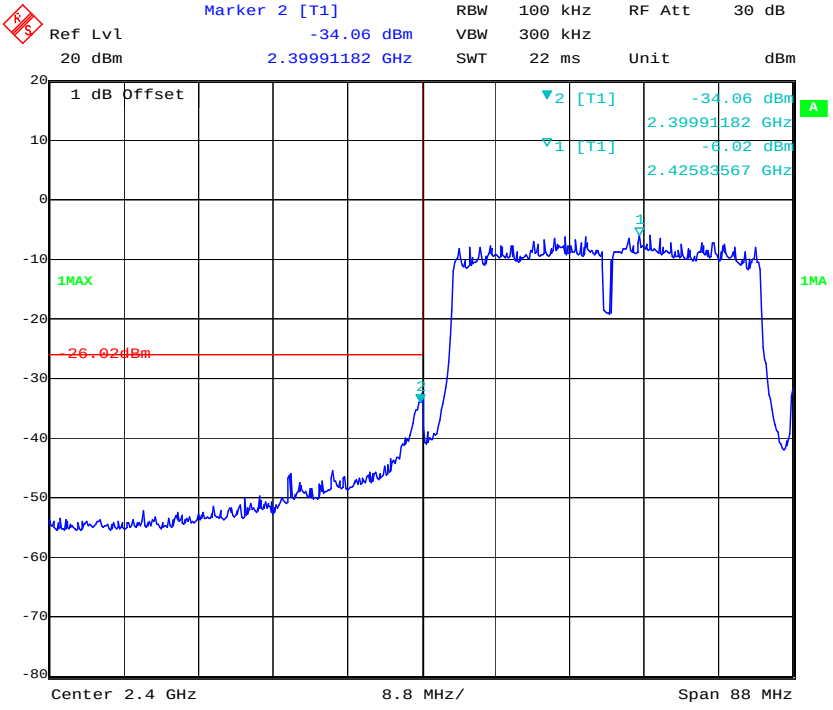
Chain 0, 802.11 n20 Band Edge, Left Side



Chain 0, 802.11 n20 Band Edge, Right Side

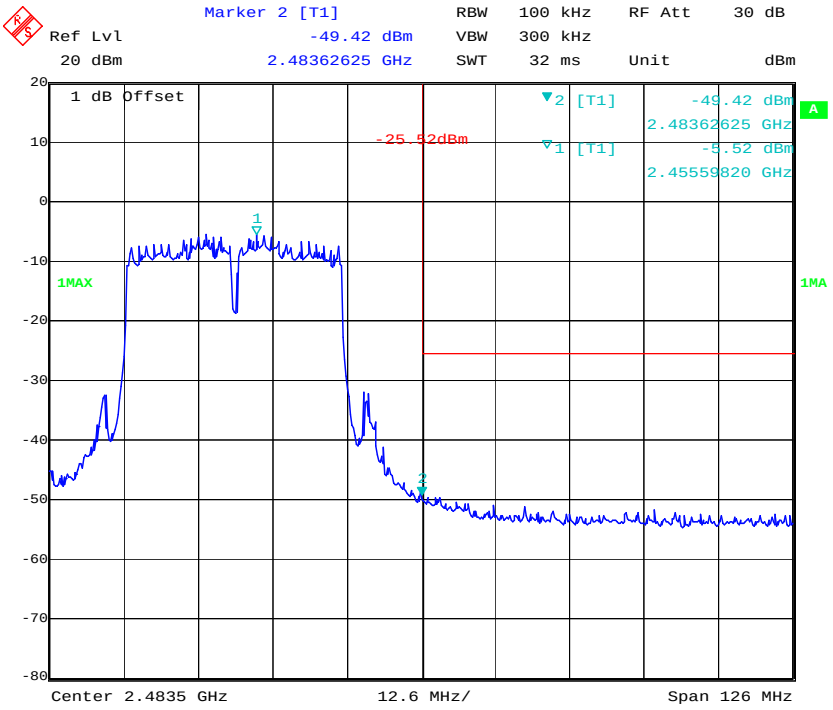


Chain 0, 802.11 n40 Band Edge, Left Side



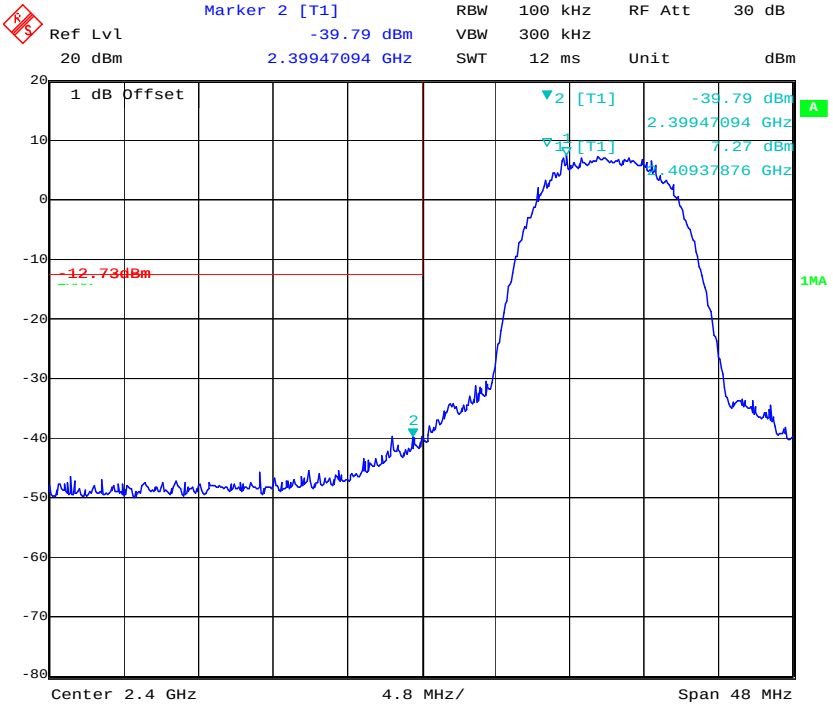
Date: 28.JUL.2017 21:46:57

Chain 0, 802.11 n40 Band Edge, Right Side

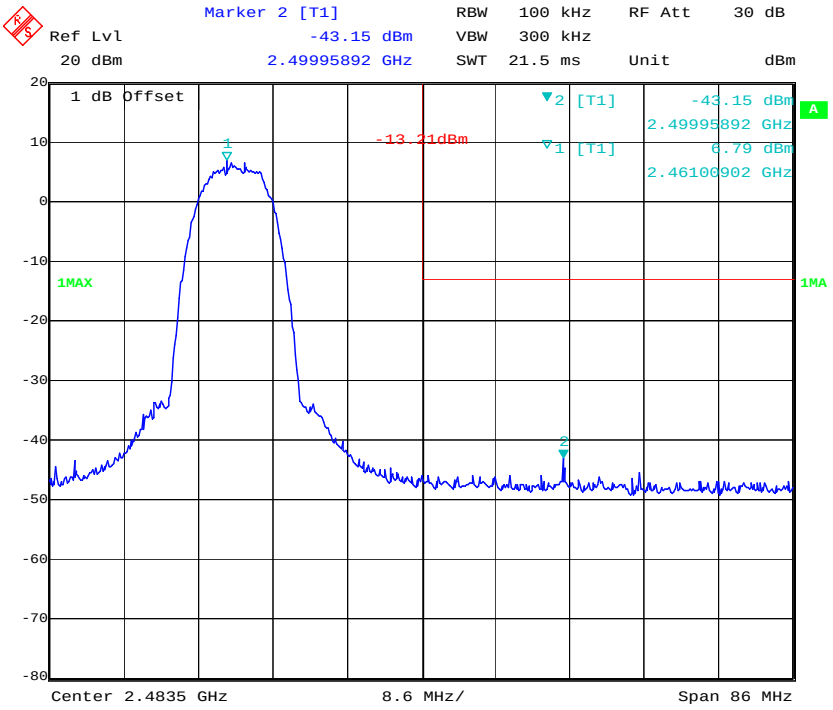


Date: 28.JUL.2017 21:59:06

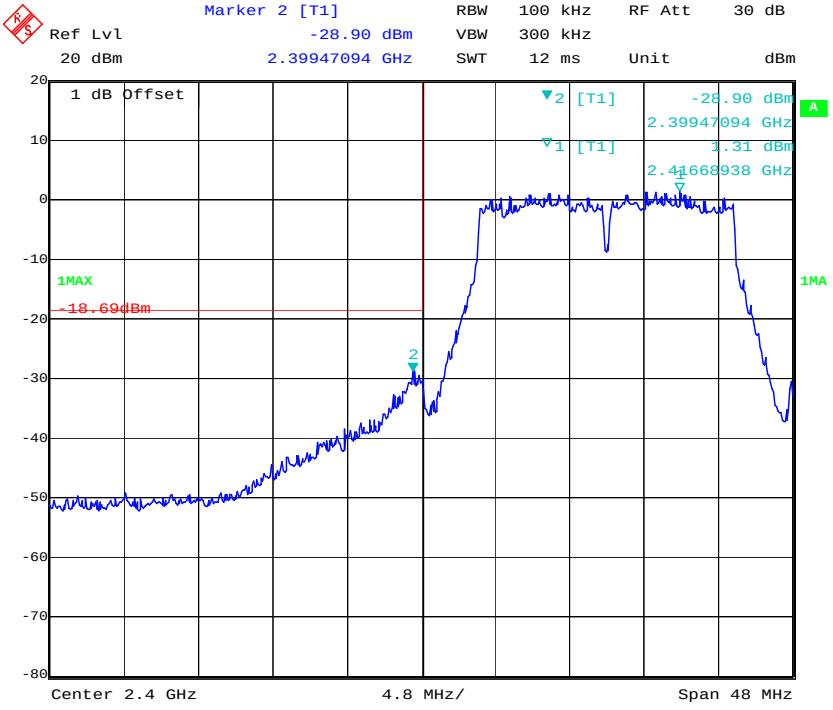
Chain 1, 802.11b: Band Edge, Left Side



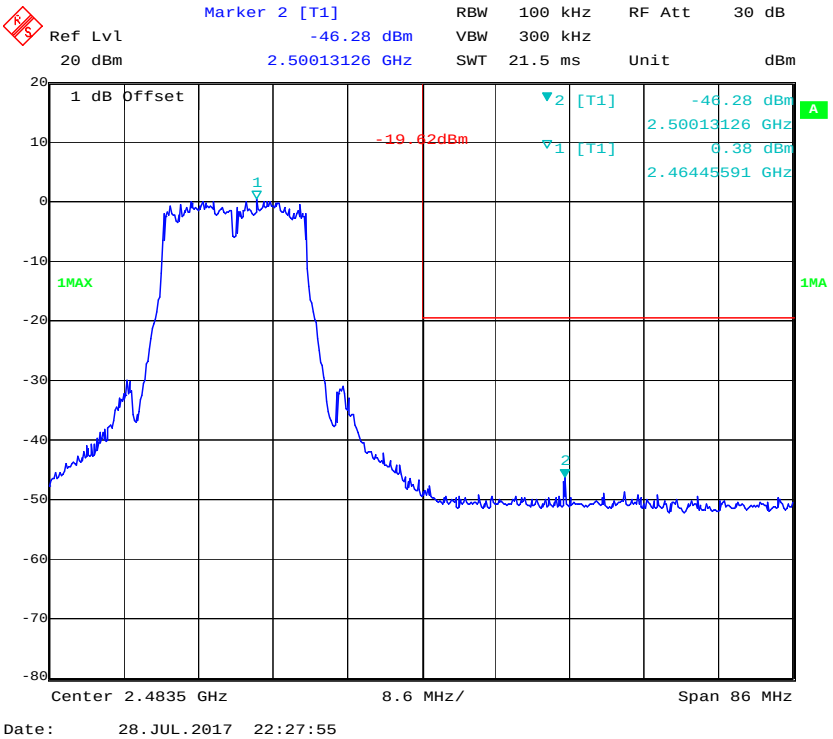
Chain 1, 802.11b: Band Edge, Right Side



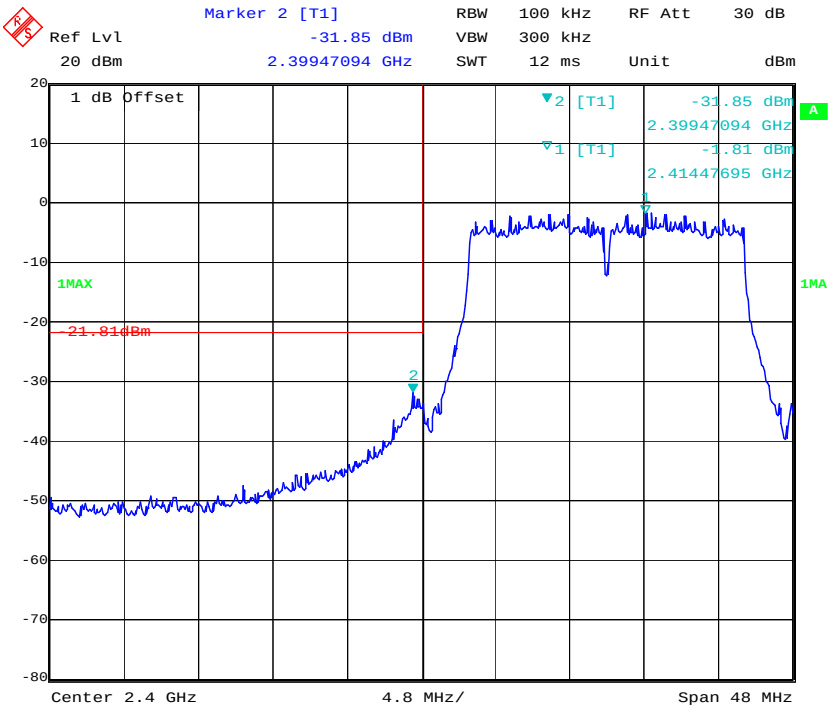
Chain 1, 802.11g: Band Edge, Left Side



Chain 1, 802.11g: Band Edge, Right Side

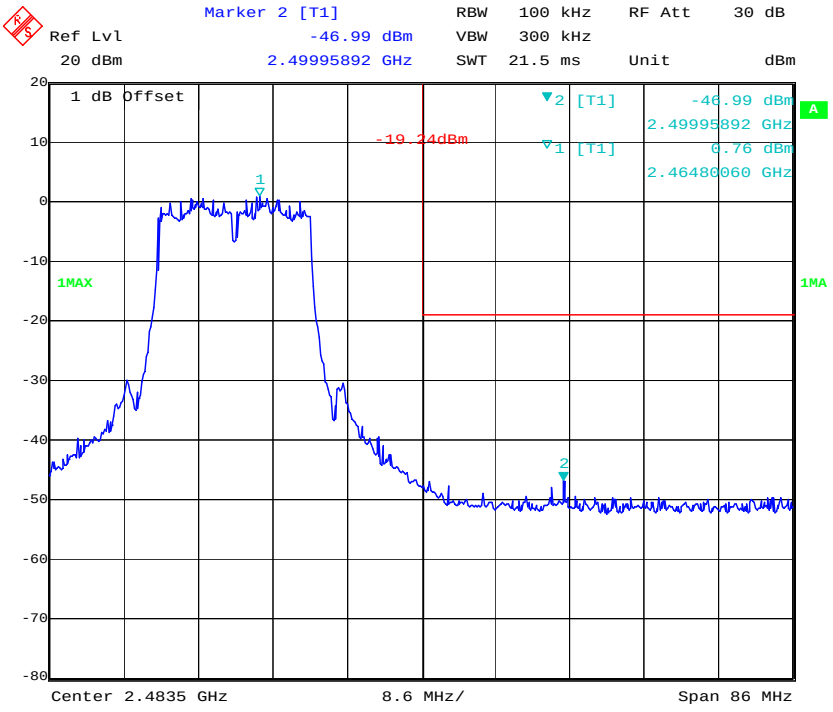


Chain 1, 802.11 n20 Band Edge, Left Side



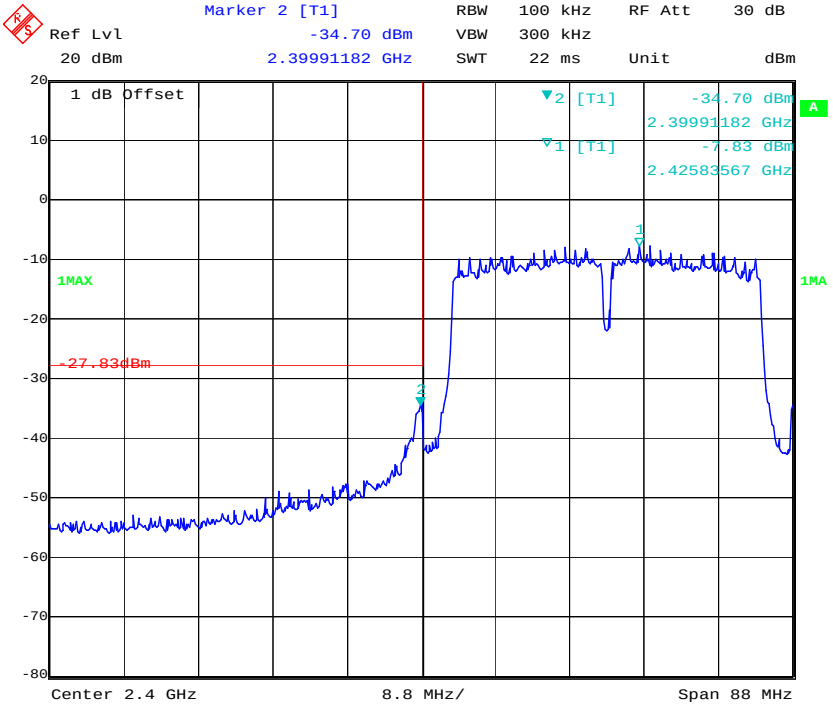
Date: 28.JUL.2017 22:32:39

Chain 1, 802.11 n20 Band Edge, Right Side



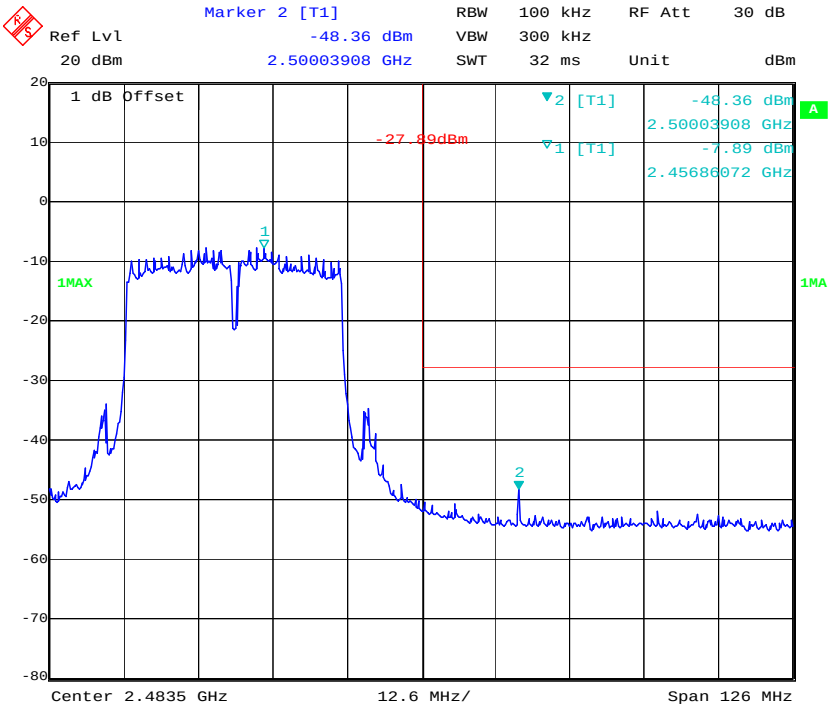
Date: 28.JUL.2017 22:38:45

Chain 1, 802.11 n40 Band Edge, Left Side



Date: 28.JUL.2017 22:42:25

Chain 1, 802.11 n40 Band Edge, Right Side



Date: 28.JUL.2017 22:48:14

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. Set the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum Analyzer	FSEM	DE23437	2016-11-22	2017-11-22
Unknown	Coaxial Cable	0.1m	C-1	Each Time	/

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	26.5 °C
Relative Humidity:	63 %
ATM Pressure:	100.1 kPa

The testing was performed by David Huang on 2017-07-28.

Test Result: Compliance

Test Mode: Transmitting

1Tx:

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)		Limit (dBm/3kHz)
			Chain 0	Chain 1	
802.11b	Low	2412	-6.26	-7.21	≤8
	Middle	2437	-4.89	-4.60	≤8
	High	2462	-7.85	-8.17	≤8
802.11g	Low	2412	-13.72	-12.29	≤8
	Middle	2437	-8.72	-8.25	≤8
	High	2462	-14.27	-14.07	≤8
802.11 n20	Low	2412	-12.09	-15.9	≤8
	Middle	2437	-8.70	-8.71	≤8
	High	2462	-13.69	-13.17	≤8
802.11 n40	Low	2422	-19.96	-22.17	≤8
	Middle	2437	-9.76	-10.20	≤8
	High	2452	-19.64	-22.20	≤8

2Tx:

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)		Total (dBm/3kHz)	Limit (dBm/3kHz)
			Chain 0	Chain 1		
802.11 n20	Low	2412	-16.28	-16.06	-13.16	≤6
	Middle	2437	-8.62	-9.08	-5.83	≤6
	High	2462	-17.71	-17.44	-14.56	≤6
802.11 n40	Low	2422	-23.64	-22.38	-19.95	≤6
	Middle	2437	-11.02	-10.60	-7.79	≤6
	High	2452	-26.00	-22.99	-21.23	≤6

Note: the antenna maximum gain are 5.0dBi in 2.4GHz band, and 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(N_{ANT}/N_{SS}) dB.

So:

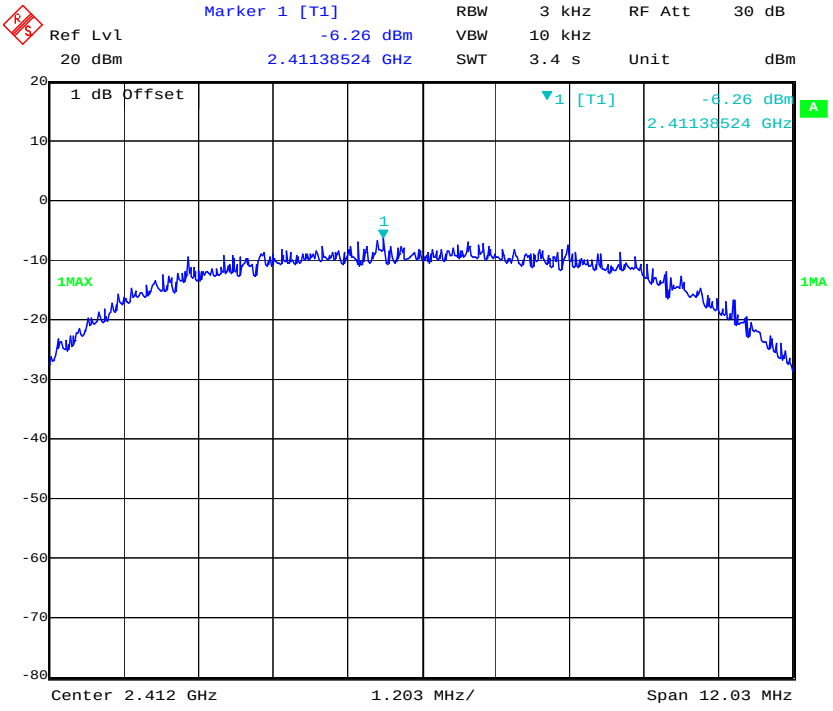
Directional gain = G_{ANT} + Array Gain = 5+10*log(2) =8 dBi

Please refer to the following plots

1Tx:

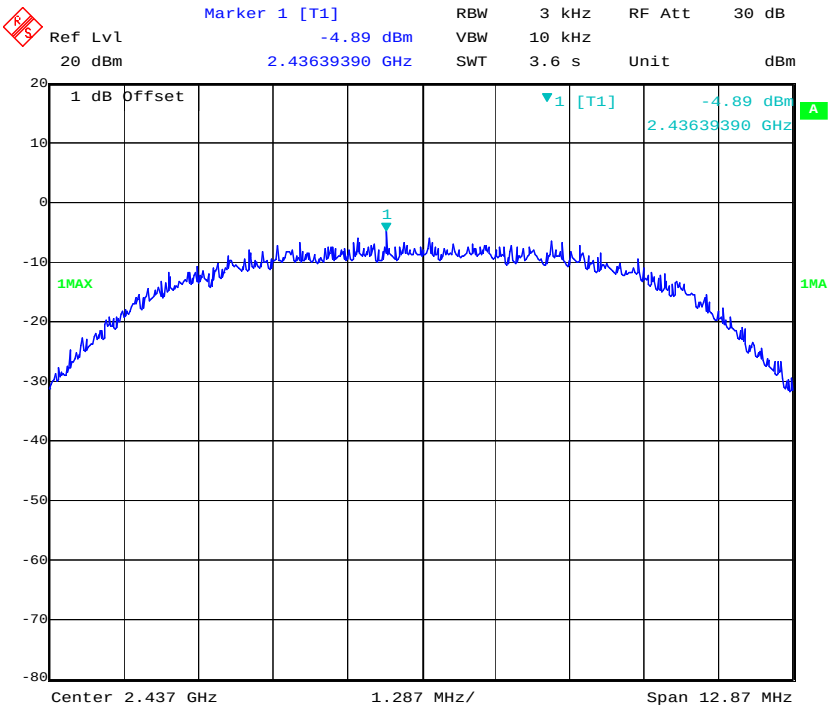
Chain 0:

Power Spectral Density, 802.11b Low Channel



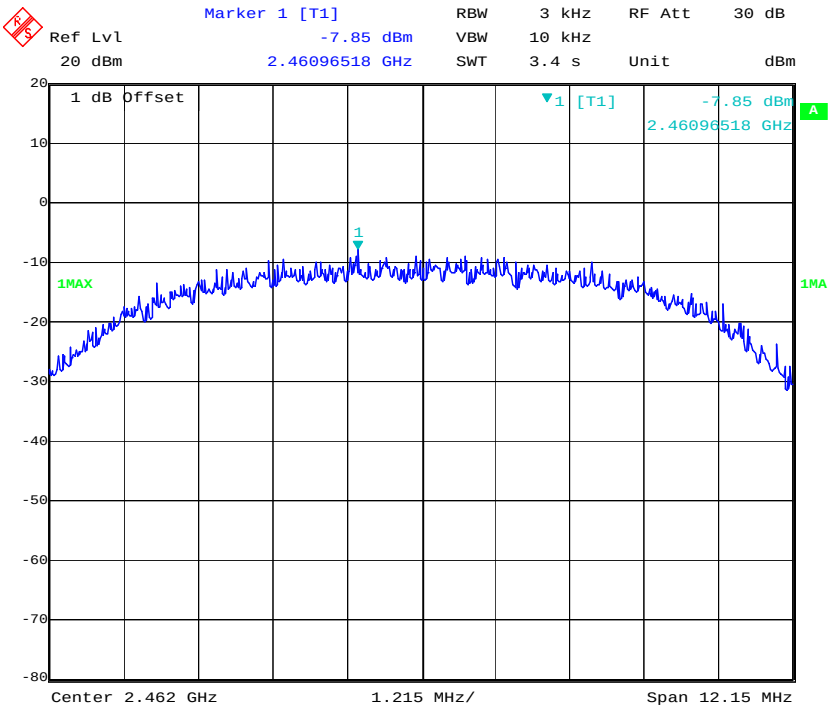
Date: 28.JUL.2017 20:55:01

Power Spectral Density, 802.11b Middle Channel



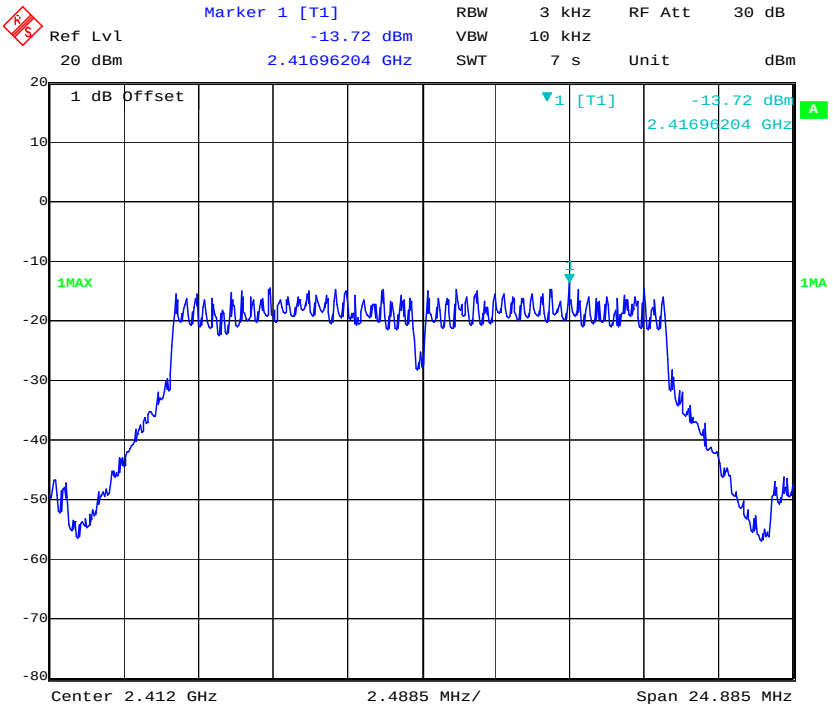
Date: 28.JUL.2017 21:04:10

Power Spectral Density, 802.11b High Channel



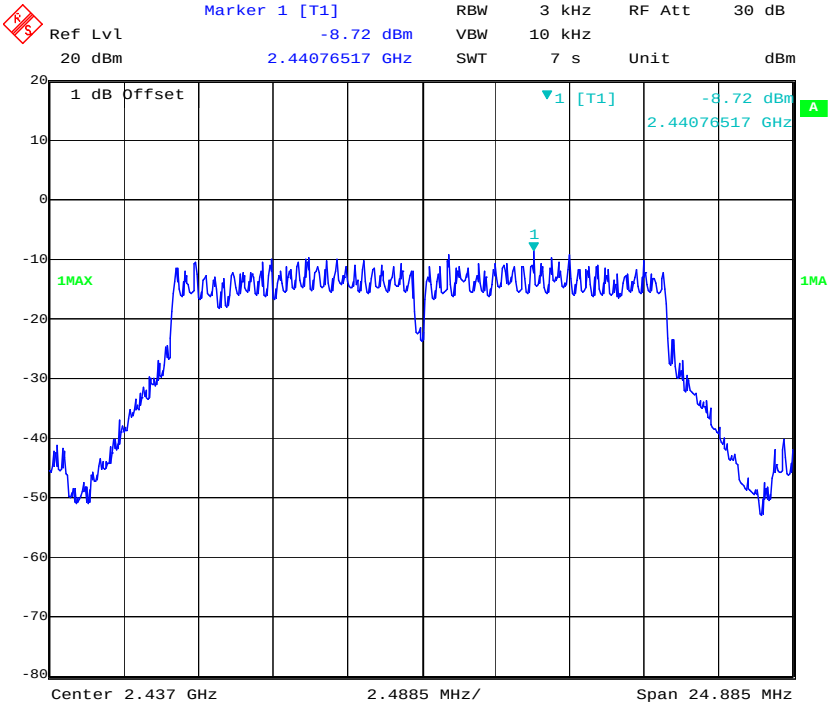
Date: 28.JUL.2017 21:06:47

Power Spectral Density, 802.11g Low Channel



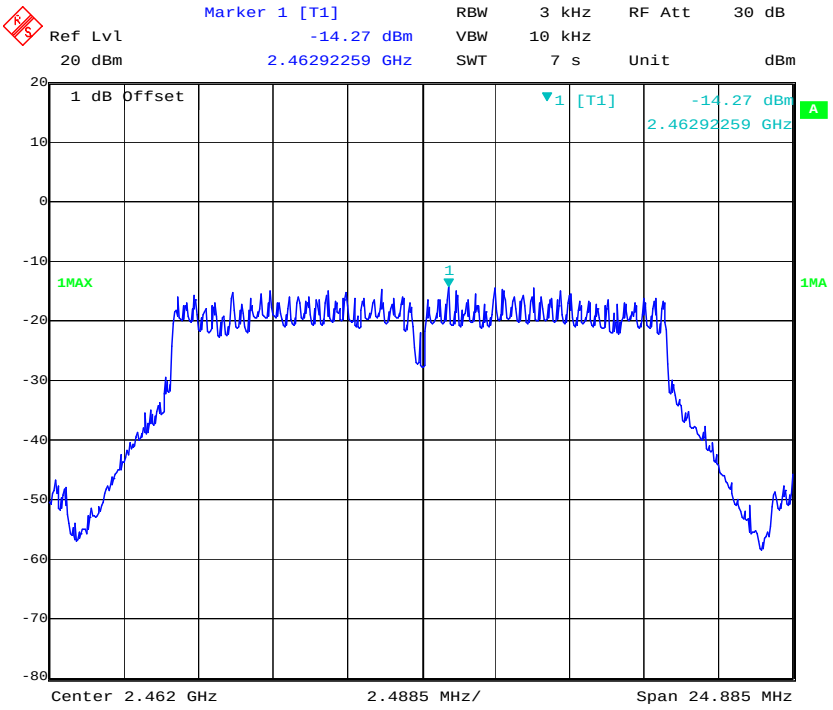
Date: 28.JUL.2017 21:13:41

Power Spectral Density, 802.11g Middle Channel



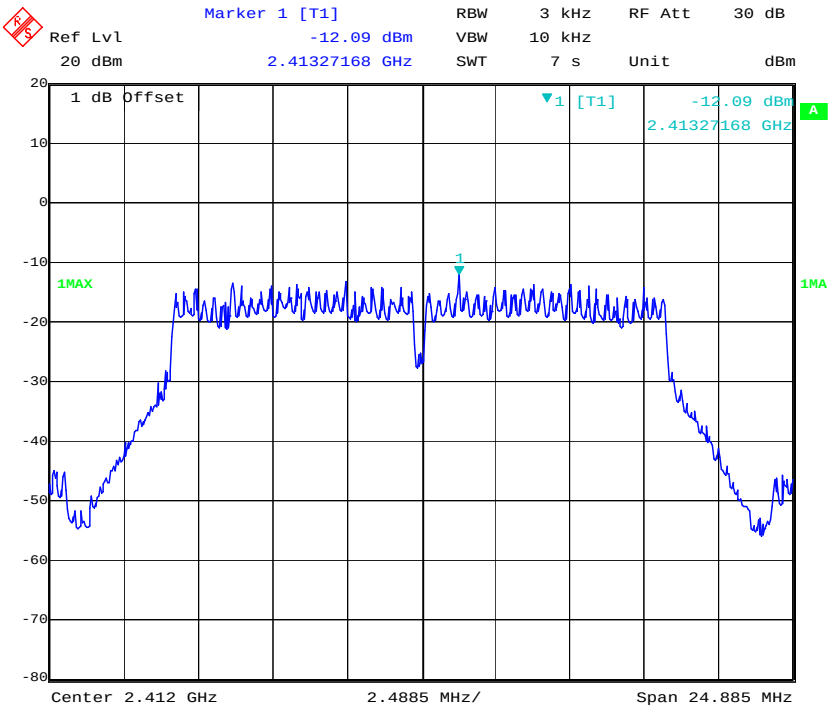
Date: 28.JUL.2017 21:16:22

Power Spectral Density, 802.11g High Channel

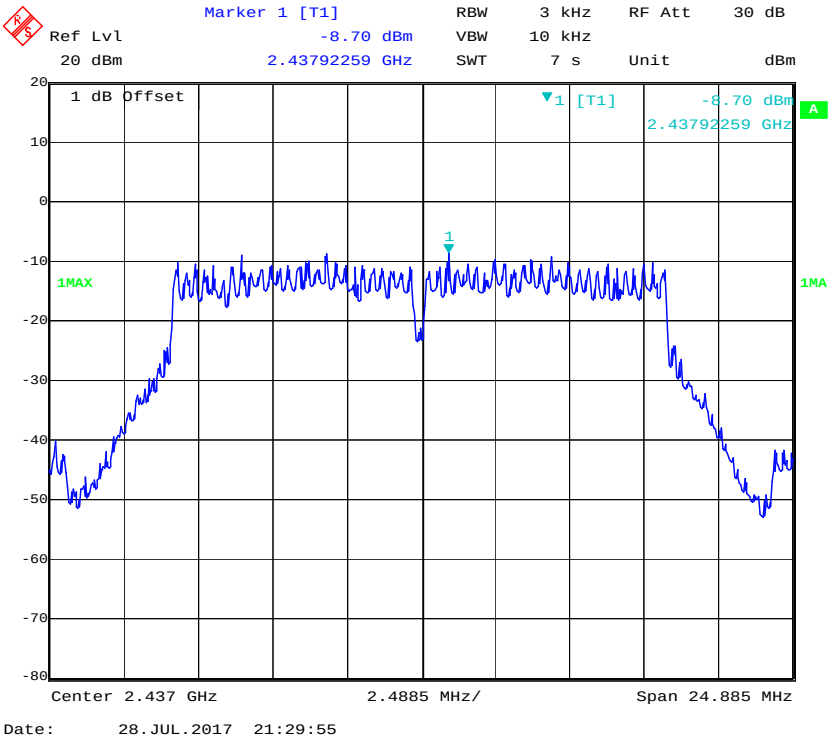


Date: 28.JUL.2017 21:18:51

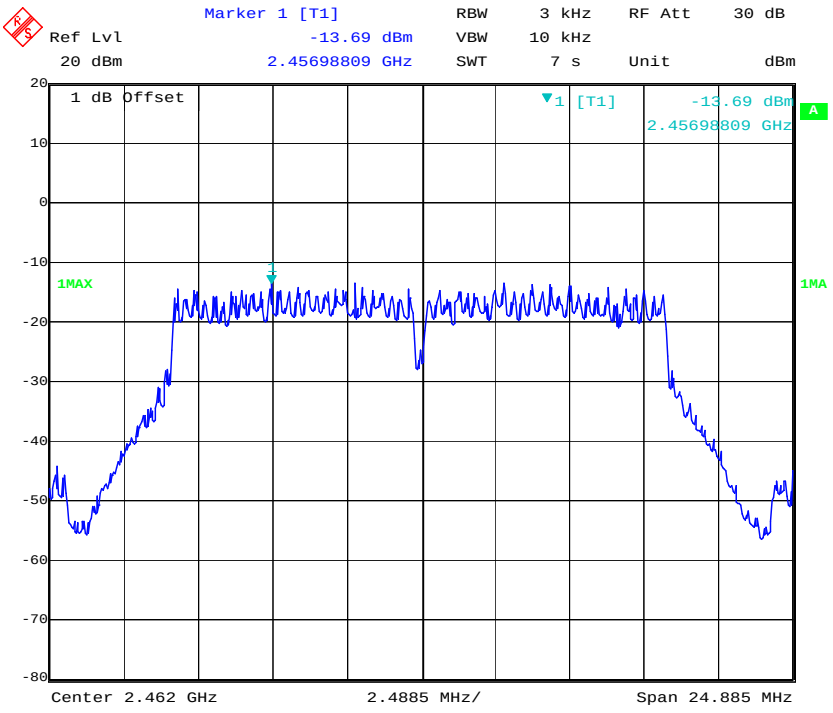
Power Spectral Density, 802.11 n20 Low Channel



Power Spectral Density, 802.11 n20 Middle Channel

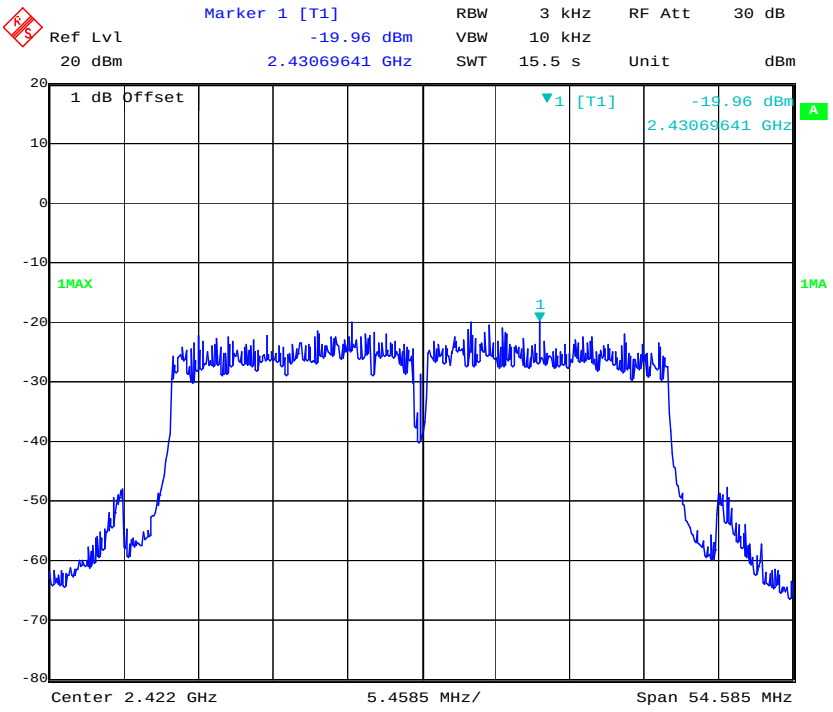


Power Spectral Density, 802.11 n20 High Channel



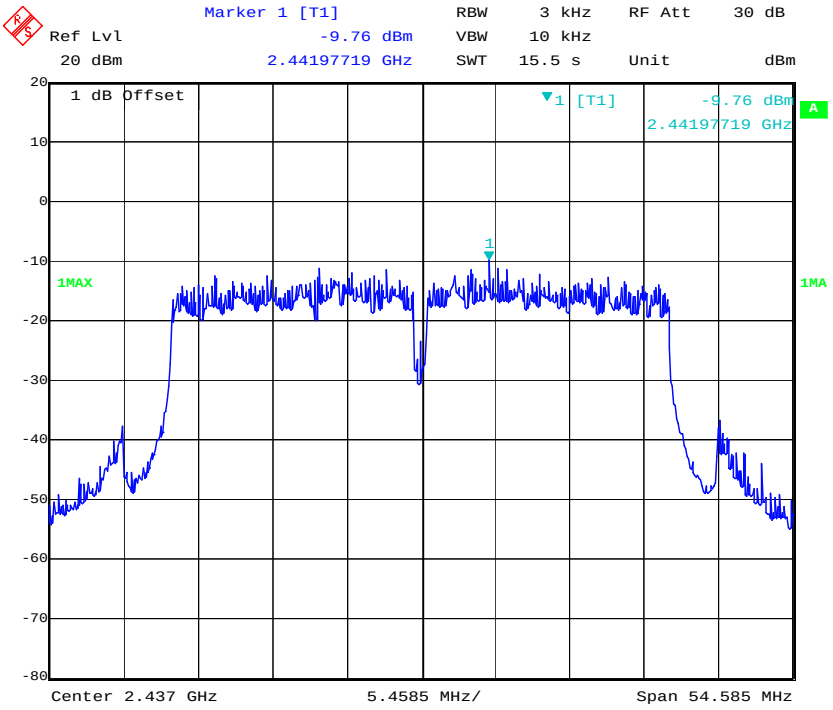
Date: 28.JUL.2017 21:31:58

Power Spectral Density, 802.11 n40 Low Channel



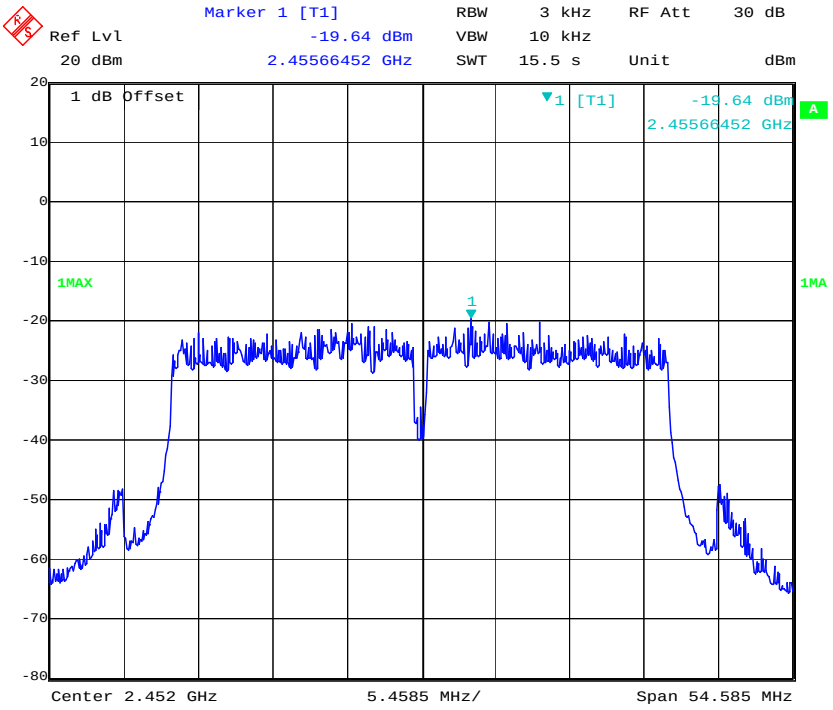
Date: 28.JUL.2017 21:46:36

Power Spectral Density, 802.11 n40 Middle Channel



Date: 28.JUL.2017 21:54:44

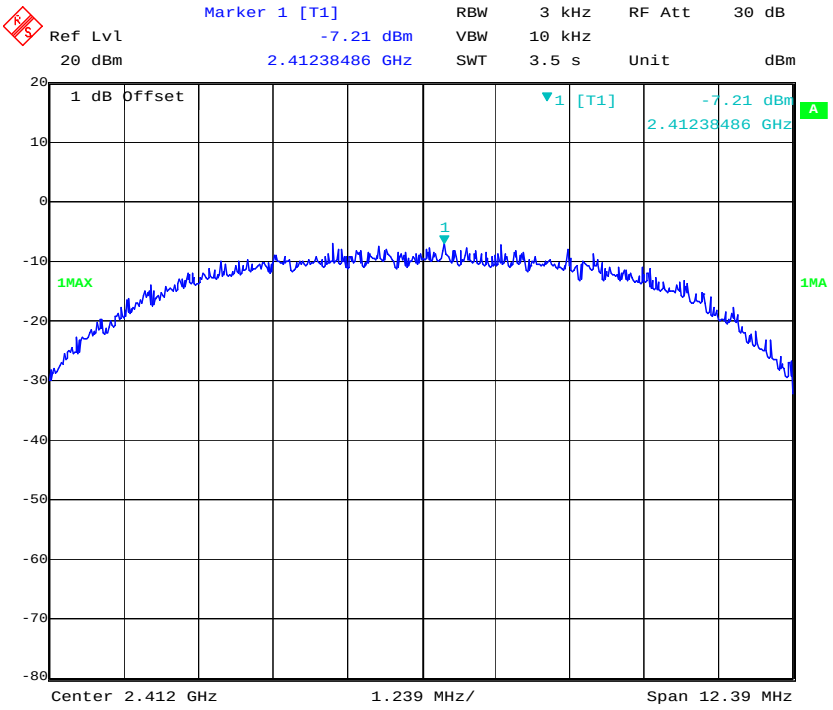
Power Spectral Density, 802.11 n40 High Channel



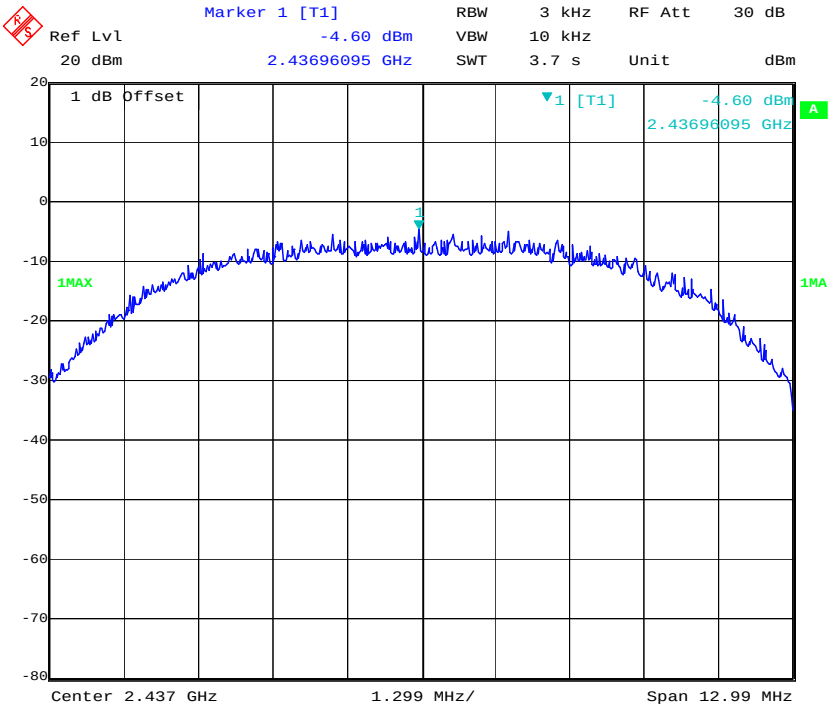
Date: 28.JUL.2017 21:58:39

Chain 1

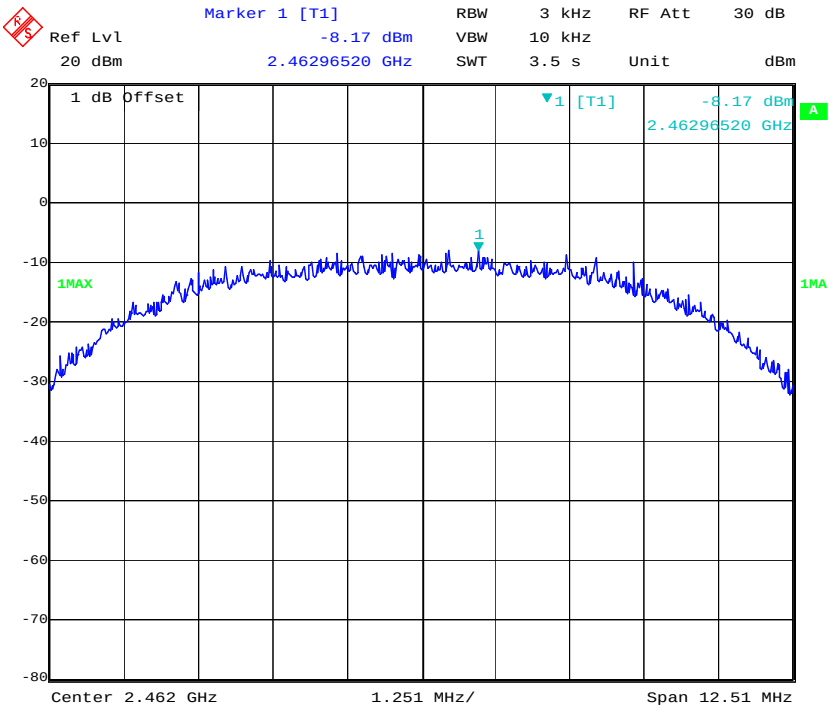
Power Spectral Density, 802.11b Low Channel



Power Spectral Density, 802.11b Middle Channel

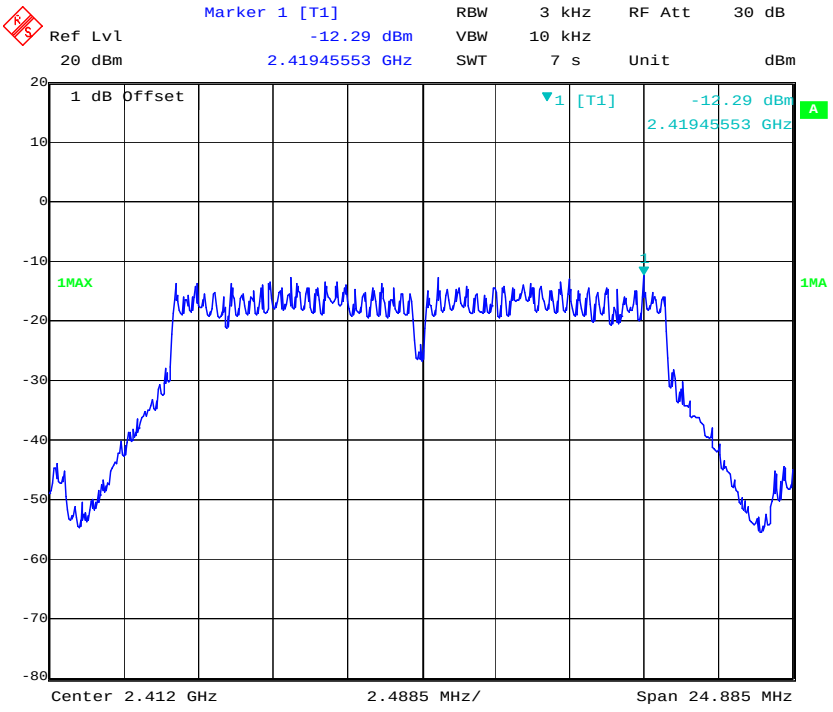


Power Spectral Density, 802.11b High Channel



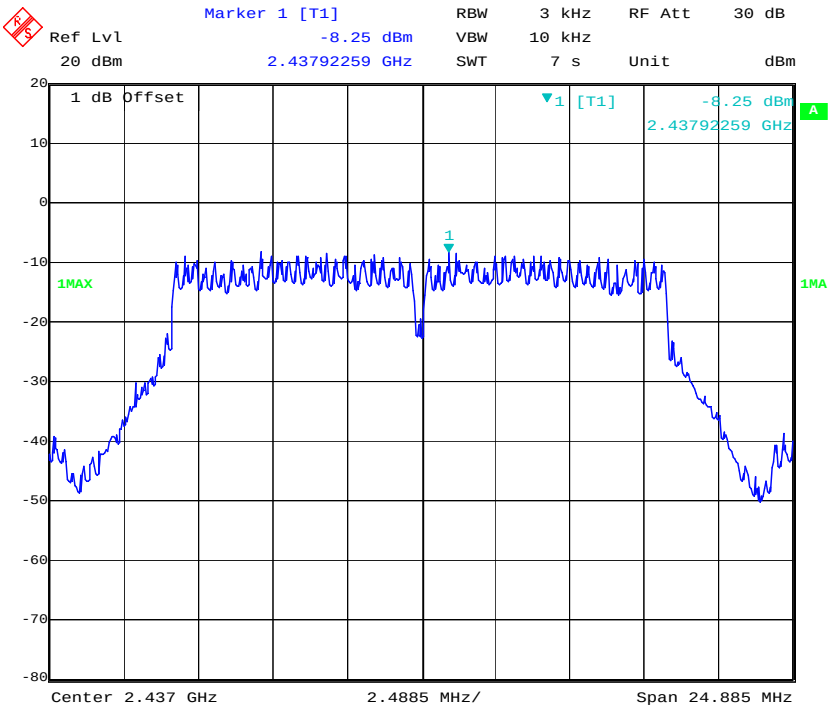
Date: 28.JUL.2017 22:18:00

Power Spectral Density, 802.11g Low Channel

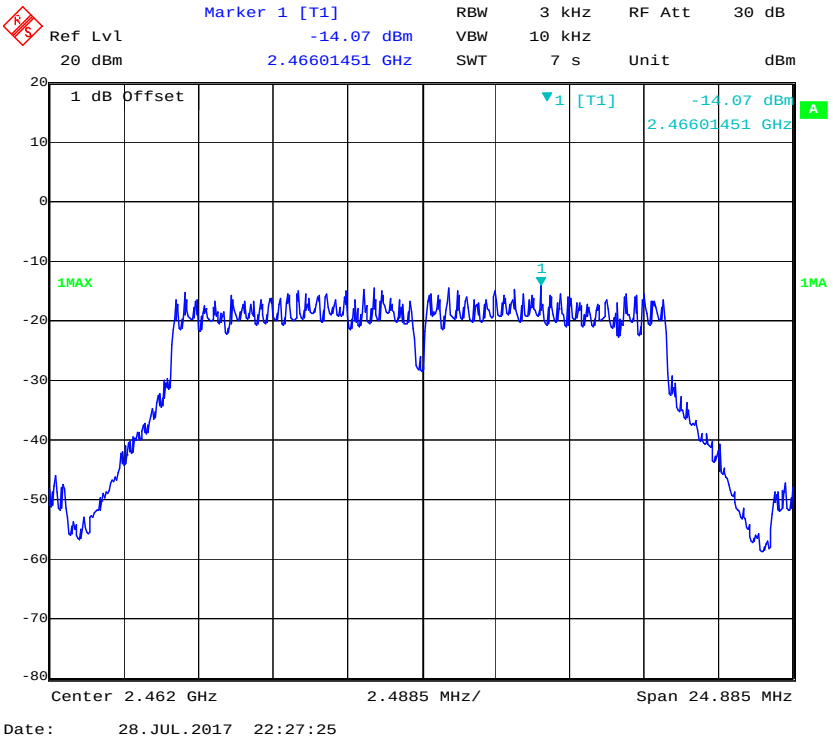


Date: 28.JUL.2017 22:22:34

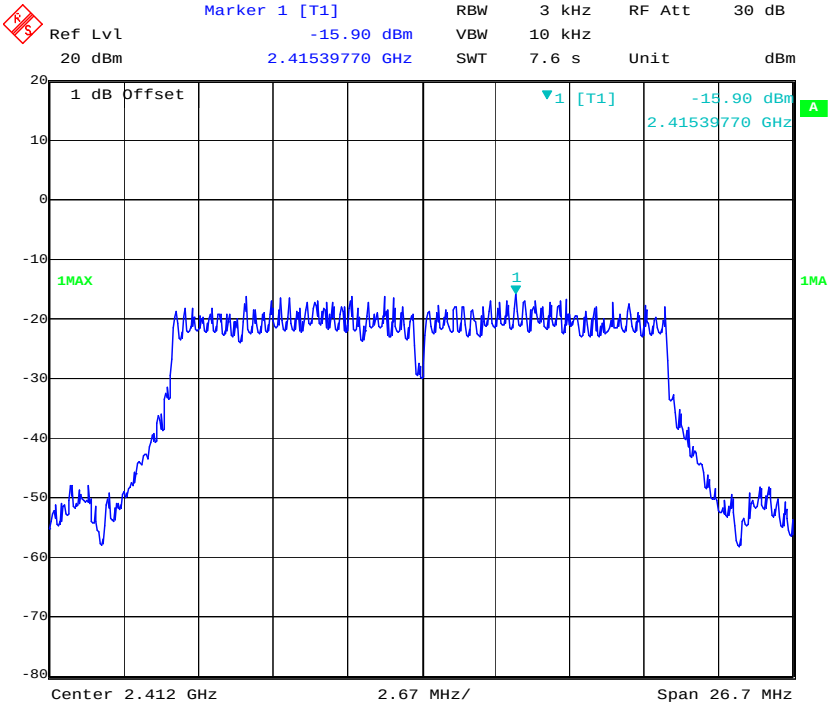
Power Spectral Density, 802.11g Middle Channel



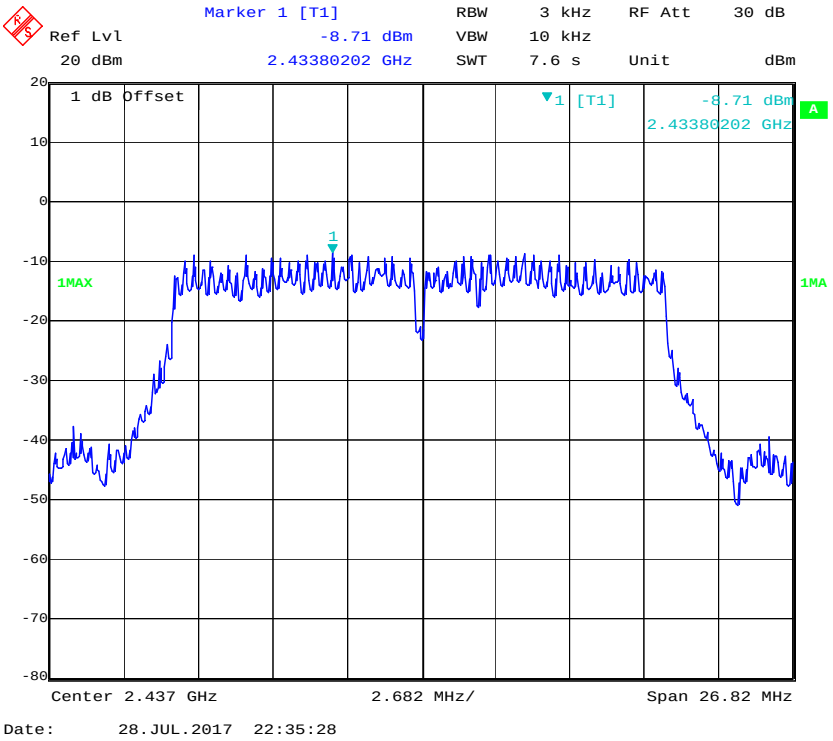
Power Spectral Density, 802.11g High Channel



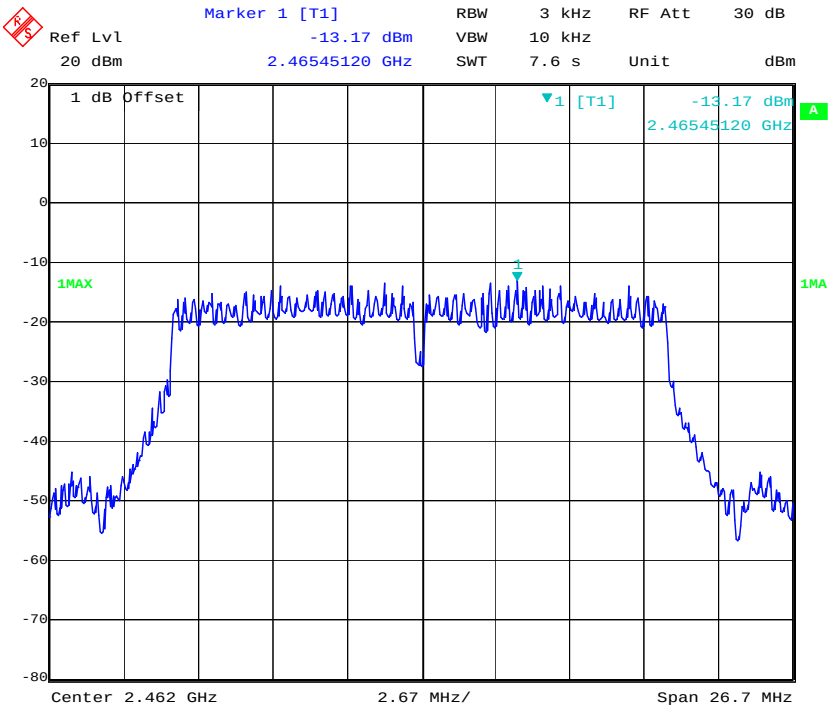
Power Spectral Density, 802.11 n20 Low Channel



Power Spectral Density, 802.11 n20 Middle Channel

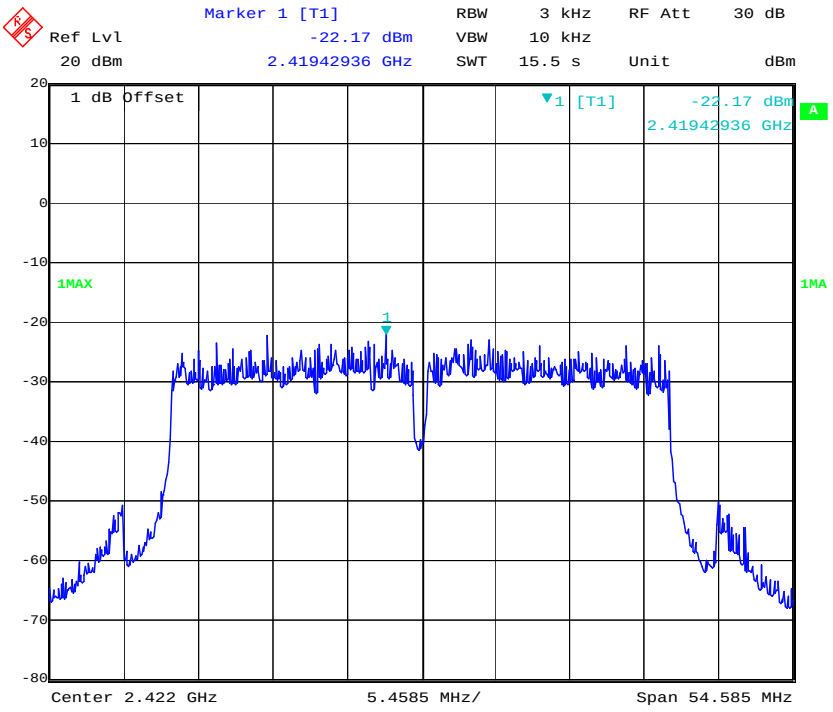


Power Spectral Density, 802.11 n20 High Channel



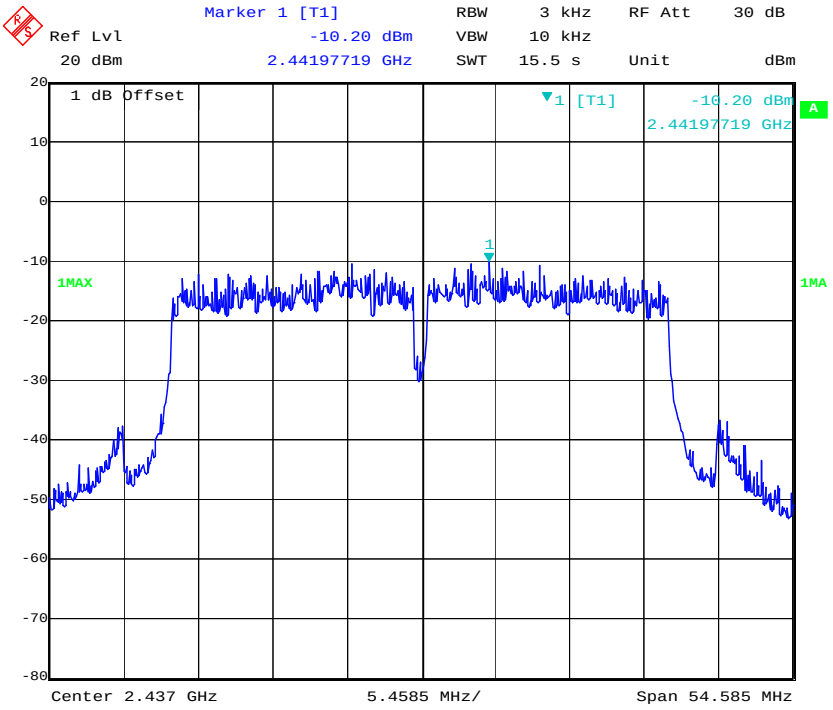
Date: 28.JUL.2017 22:38:23

Power Spectral Density, 802.11 n40 Low Channel



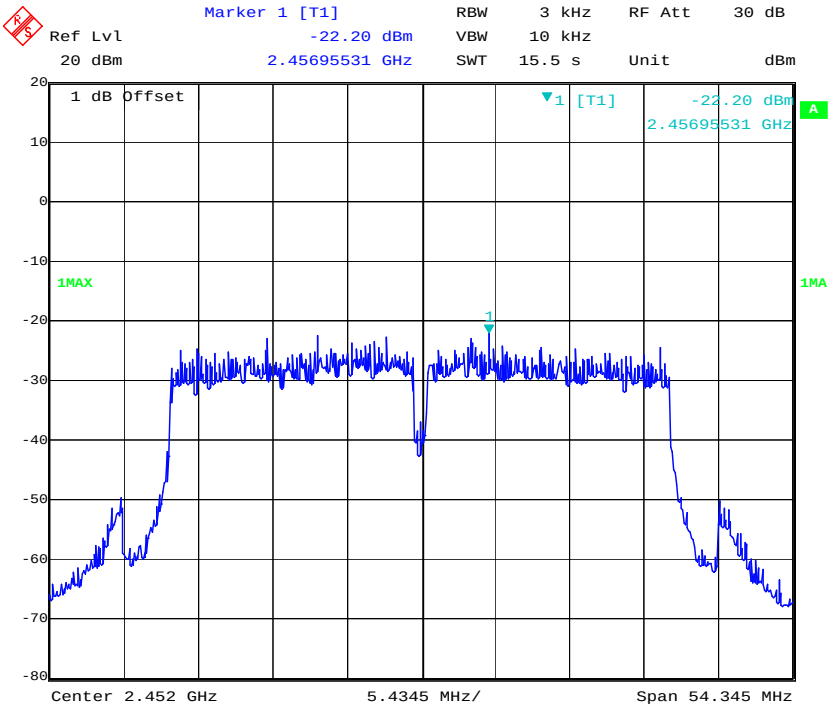
Date: 28.JUL.2017 22:42:01

Power Spectral Density, 802.11 n40 Middle Channel



Date: 28.JUL.2017 22:45:34

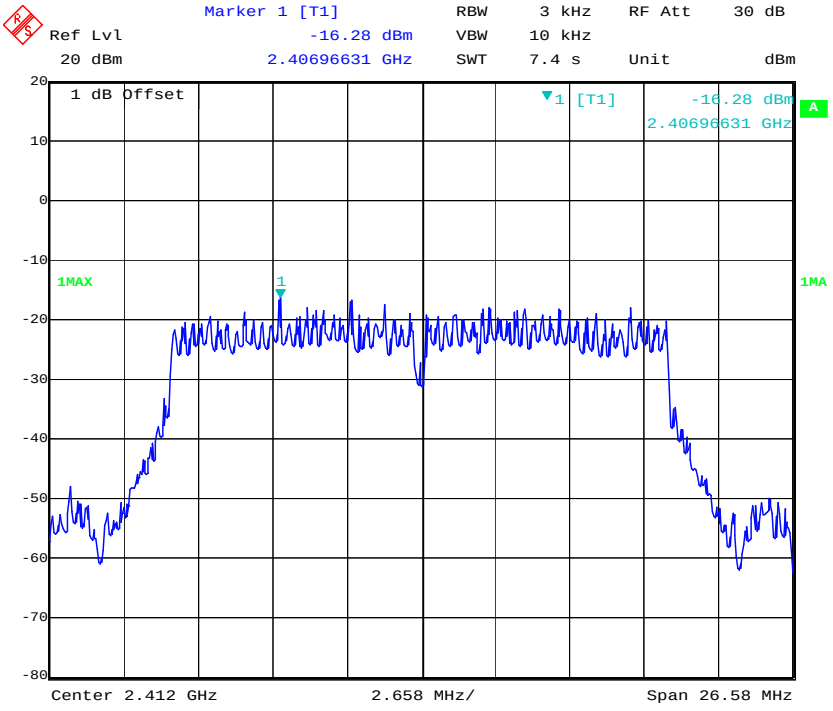
Power Spectral Density, 802.11 n40 High Channel



Date: 28.JUL.2017 22:47:50

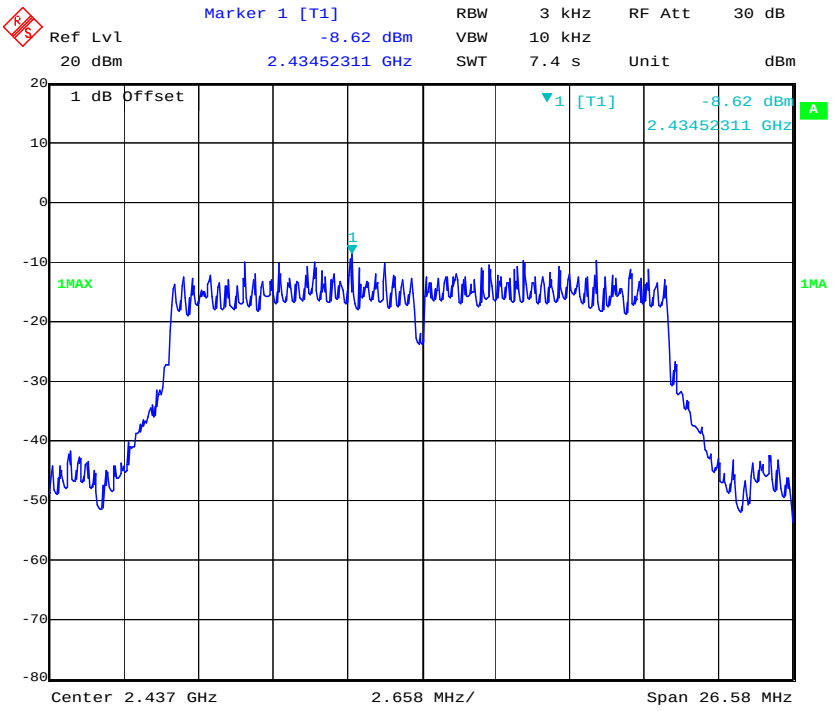
MIMO
Chain 0

Power Spectral Density, 802.11 n20 Low Channel



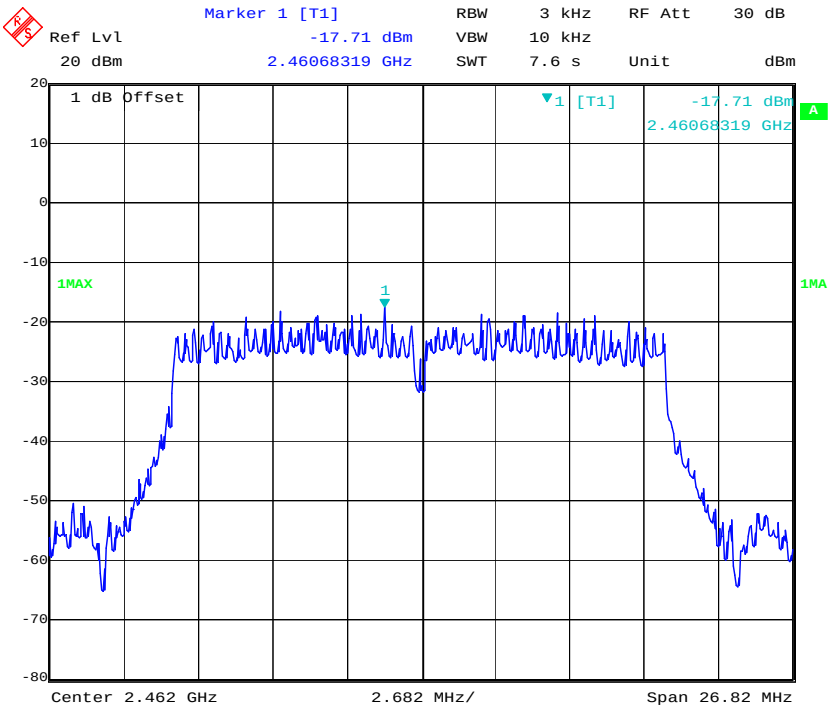
Date: 28.JUL.2017 23:37:53

Power Spectral Density, 802.11 n20 Middle Channel



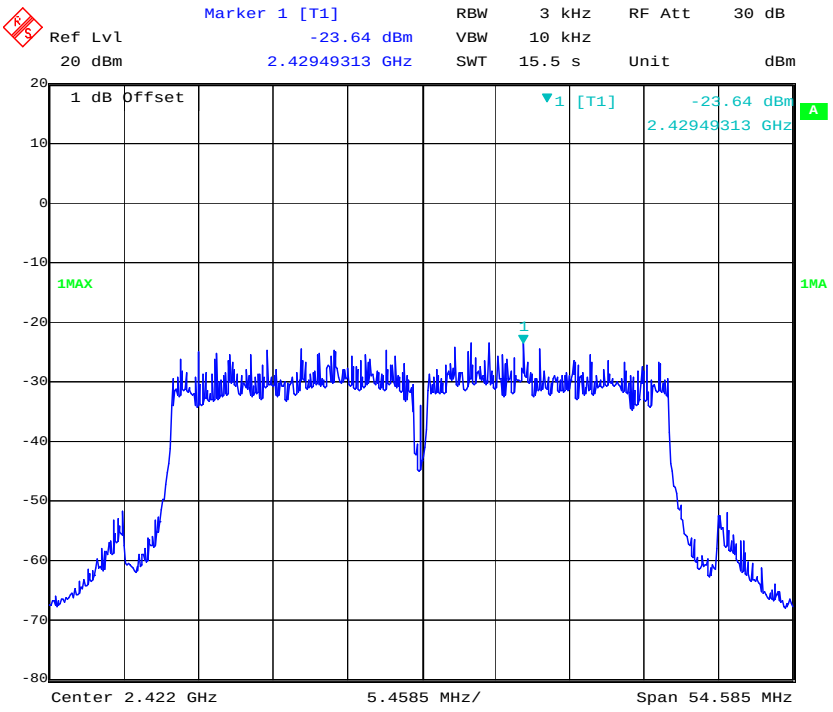
Date: 28.JUL.2017 23:40:45

Power Spectral Density, 802.11 n20 High Channel



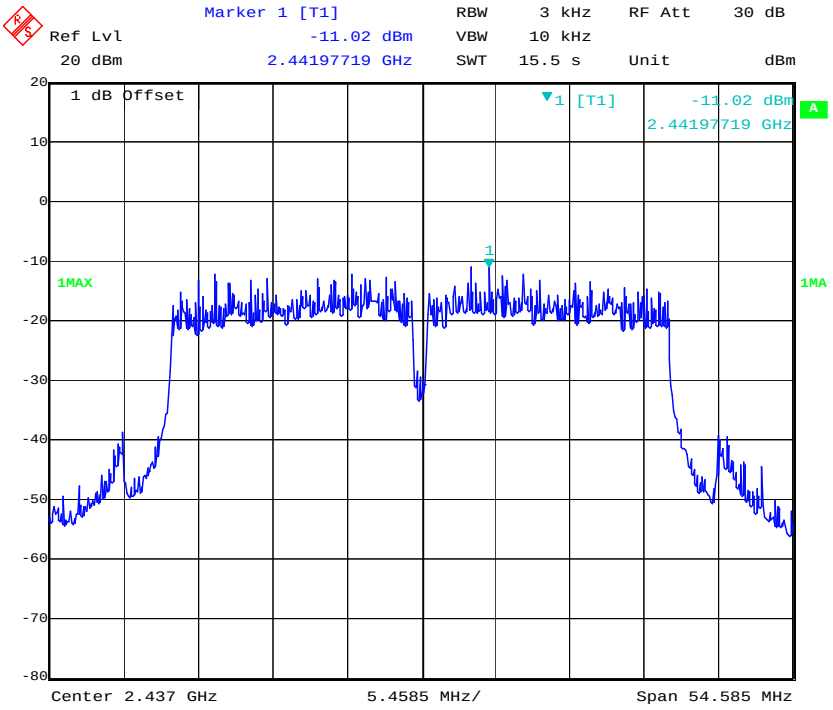
Date: 28.JUL.2017 23:43:01

Power Spectral Density, 802.11 n40 Low Channel



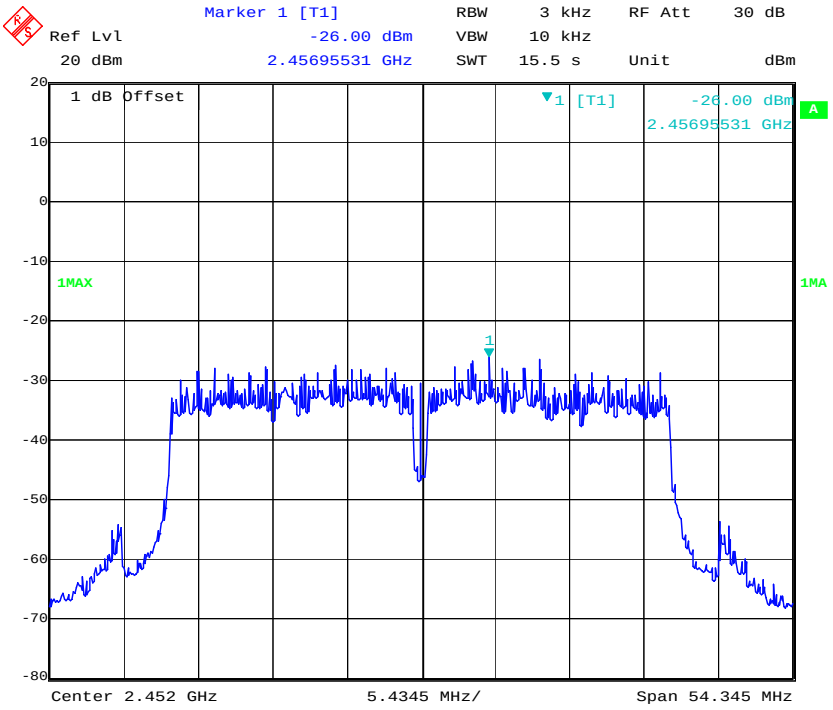
Date: 28.JUL.2017 23:28:58

Power Spectral Density, 802.11 n40 Middle Channel



Date: 28.JUL.2017 23:32:26

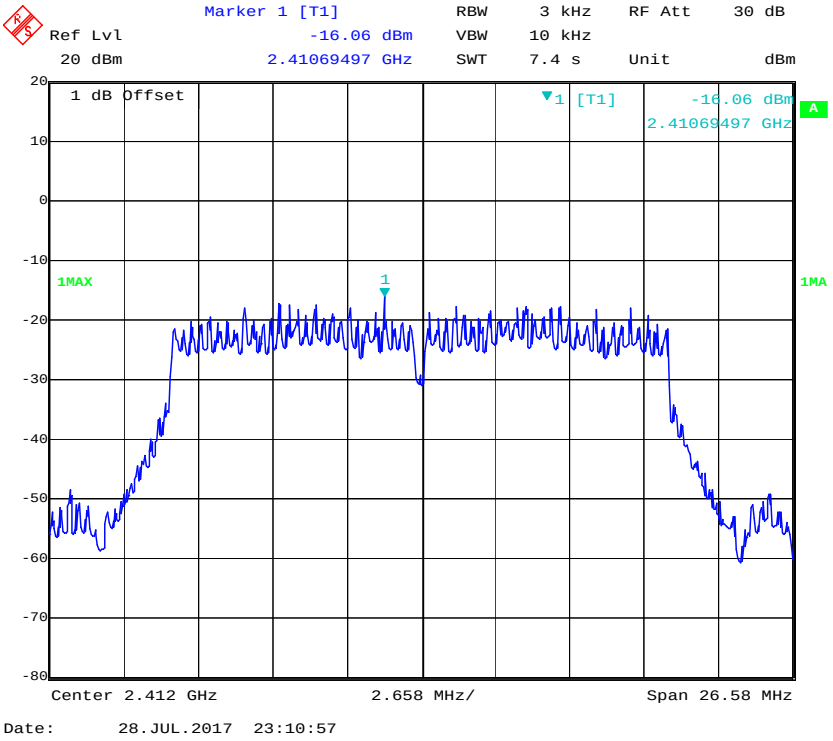
Power Spectral Density, 802.11 n40 High Channel



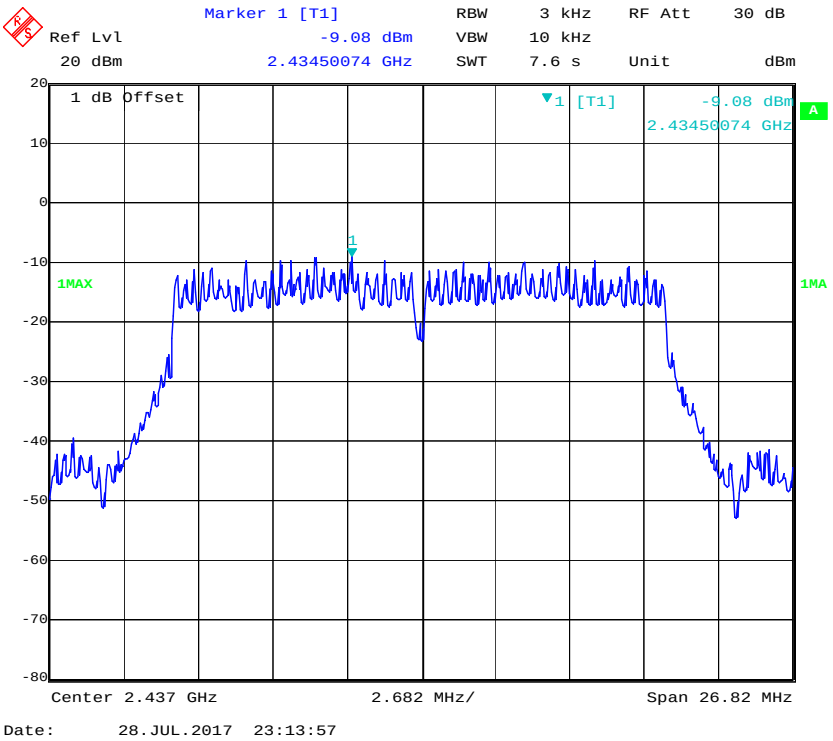
Date: 28.JUL.2017 23:34:33

Chain 1

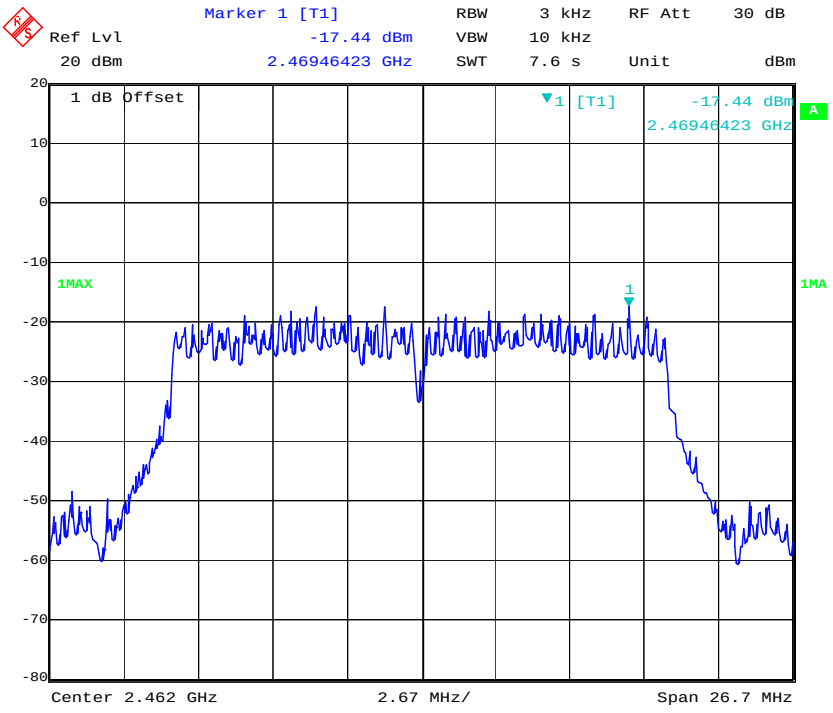
Power Spectral Density, 802.11 n20 Low Channel



Power Spectral Density, 802.11 n20 Middle Channel

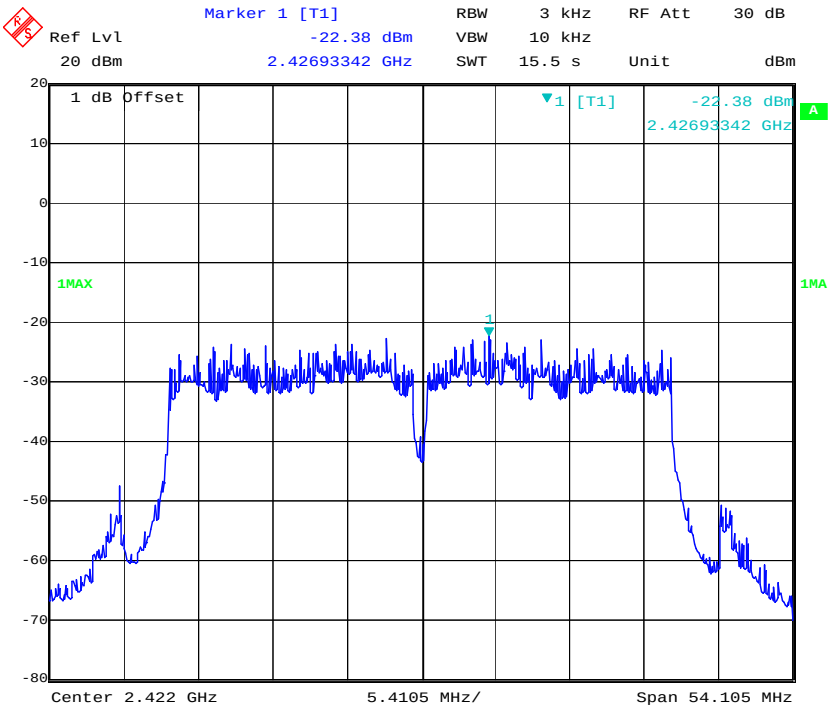


Power Spectral Density, 802.11 n20 High Channel



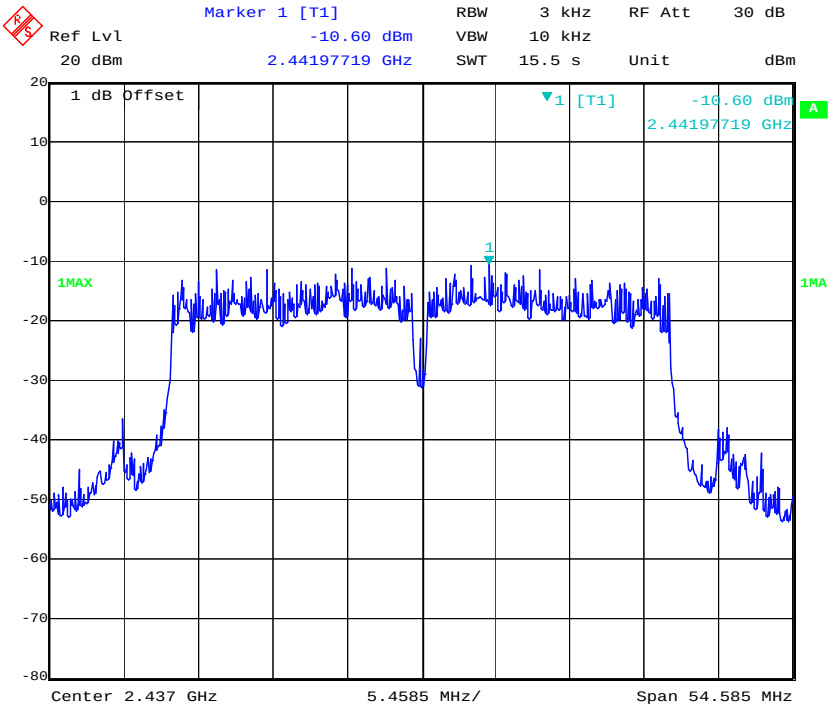
Date: 28.JUL.2017 23:15:55

Power Spectral Density, 802.11 n40 Low Channel



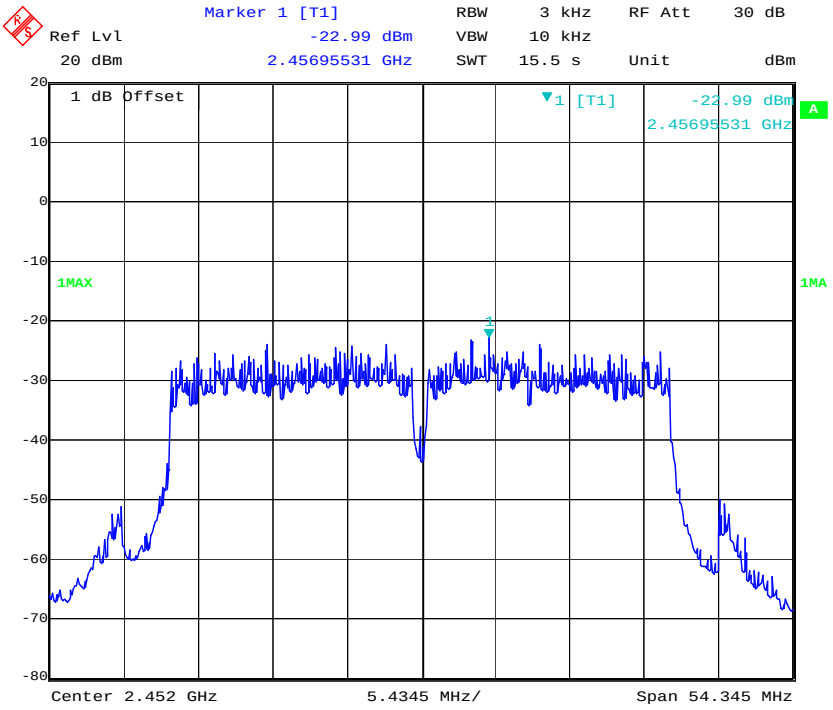
Date: 28.JUL.2017 23:20:25

Power Spectral Density, 802.11 n40 Middle Channel



Date: 28.JUL.2017 23:23:05

Power Spectral Density, 802.11 n40 High Channel



Date: 28.JUL.2017 23:24:49

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