FCC PART 15.247

TEST REPORT

For

High-Flying Electronics Technology Co., Ltd.

Room 1002, Building 1, No.3000, Longdong Avenue, Pudong New Area, Shanghai, China

FCC ID: 2ACSV-HF-LPT230

Report Type:	Product Type:
Original Report	Wi-Fi Module

Test Engineer:	Edison Hu
Report Number:	RSHA170822001-00A
Report Date:	2017-09-06
Reviewed By:	Oscar Ye RF Leader
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road,Kunshan,Jiangsu province,China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	High-Flying Electronics Technology Co., Ltd.
Tested Model	HF-LPT230
Product Type	Wi-Fi Module
Dimension	22.0 mm(L)×13.5 mm(W)×3.0 mm(H)
Power Supply	DC 3.3V

**All measurement and test data in this report was gathered from production sample serial number: 20170822003. (Assigned by BACL, Kunshan). The EUT was received on 2017-08-22.*

Objective

This report is prepared on behalf of High-Flying Electronics Technology Co., Ltd. in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commissions rules.

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

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 and FCC KDB558074 D01 DTS Meas Guidance v04.

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

Measurement Uncertainty

Item		Uncertainty
AC Power Lines Conducted Emissions		3.19 dB
RF conducted test with spectrum		0.9dB
RF Output Power with Power meter		0.5dB
Radiated emission	30MHz~1GHz	6.11dB
	1GHz~6GHz	4.45dB
	6GHz~18GHz	5.23dB
	18GHz~40GHz	4.88dB
Occupied Bandwidth		0.5kHz
Temperature		1.0℃
Humidity		6%

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road,Kunshan,Jiangsu province,China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01. 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.: 815570. 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

Channel List for 802.11b, 802.11g and 802.11n-HT20 mode:

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

EUT was tested with Channel 1, 6 and 11.

Channel List for 802.11n-HT40 mode:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	8	2447
4	2427	9	2452
5	2432	/	/
6	2437	/	/
7	2442	/	/

EUT was tested with Channel 3, 6 and 9.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

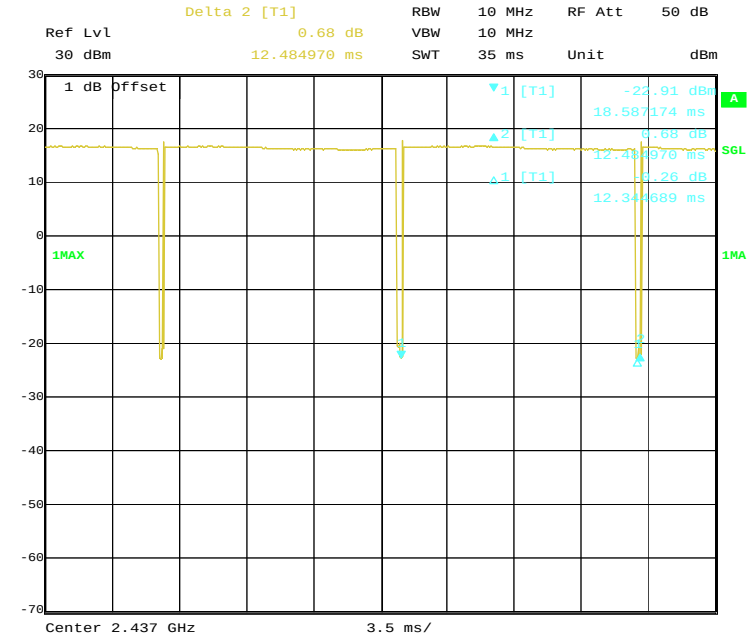
RF test tool : CRT

Pre-scan with all the data rates, and the worst case was performed as below:

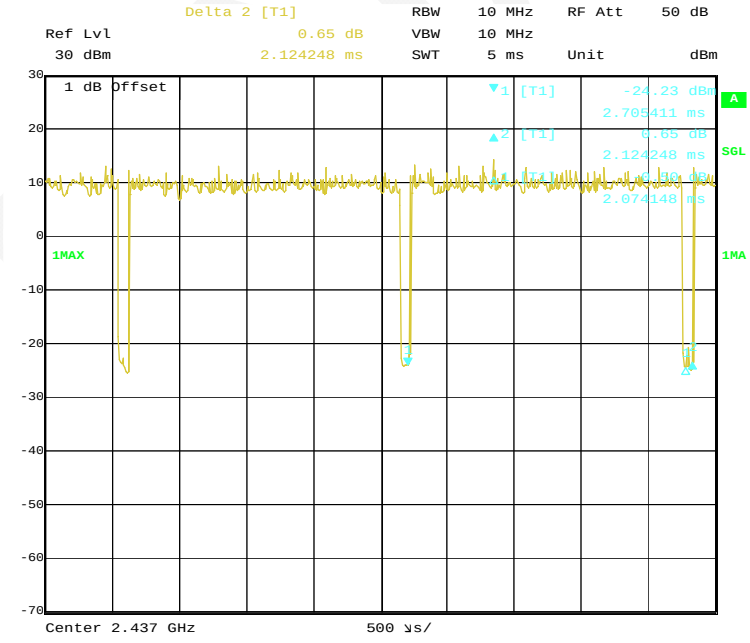
Mode	Data rate	Power level
802.11b	1 Mbps	16
802.11g	6 Mbps	14
802.11n-HT20	MCS0	13
802.11n-HT40	MCS0	12

Duty Cycle:

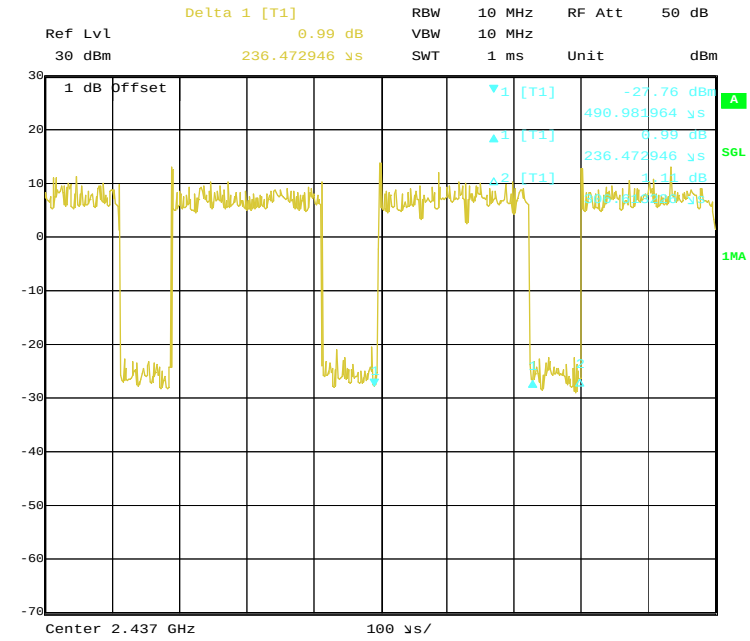
802.11b Mode Middle Channel



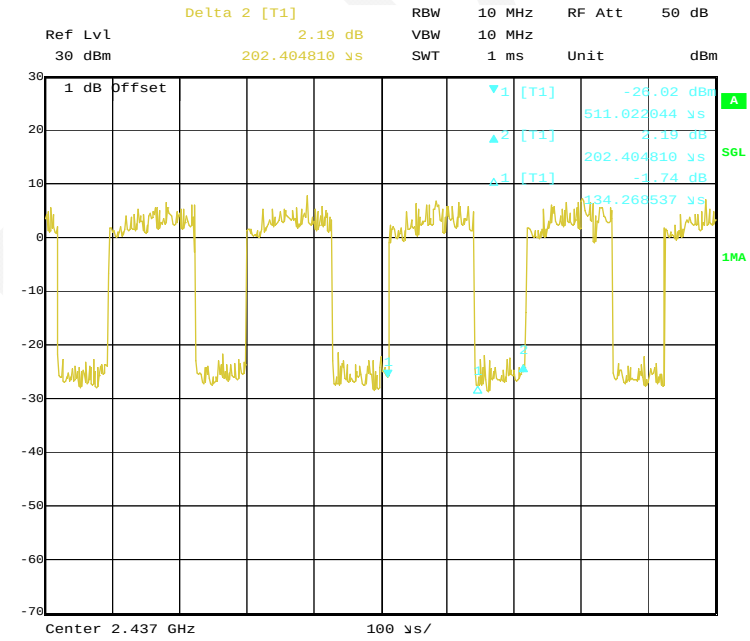
802.11g Mode Middle Channel



802.11n-HT20 Mode Middle Channel



802.11n-HT40 Mode Middle Channel



Mode	Duty Cycle	T(us)	1/T(kHz)	VBW Setting	10log(1/x)
802.11b	98.88%	/	/	10Hz	0.05
802.11g	97.64%	2.074	0.482	1kHz	0.10
802.11n-HT20	77.12%	0.236	4.237	10kHz	1.13
802.11n-HT40	66.34%	0.134	7.463	10kHz	1.78

Support Equipment List and Details

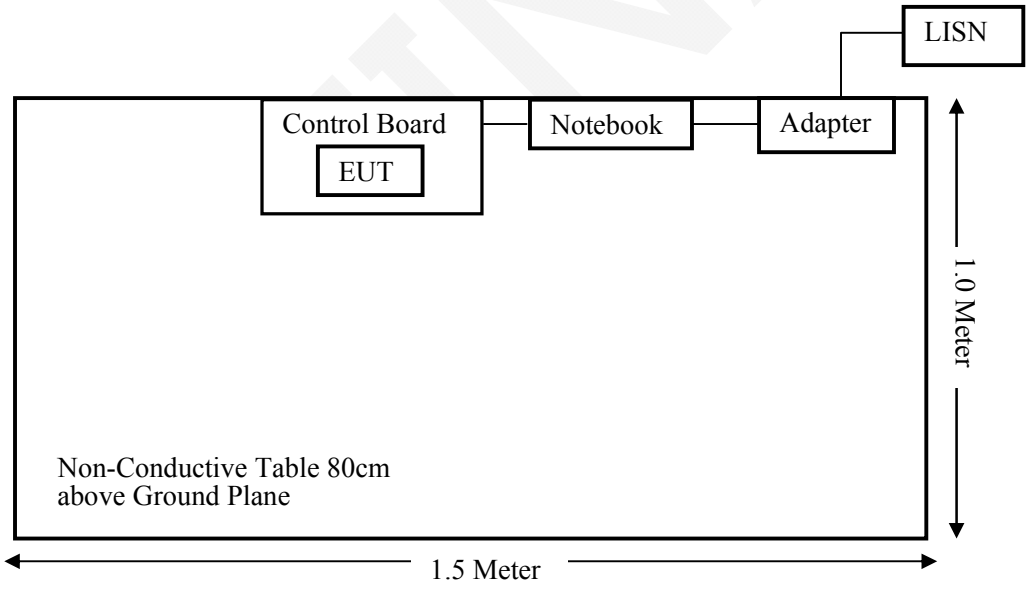
Manufacturer	Description	Model	Serial Number
DELL	Notebook	GX620	D65874152
High-Flying	Control Box	/	/

External I/O Cable

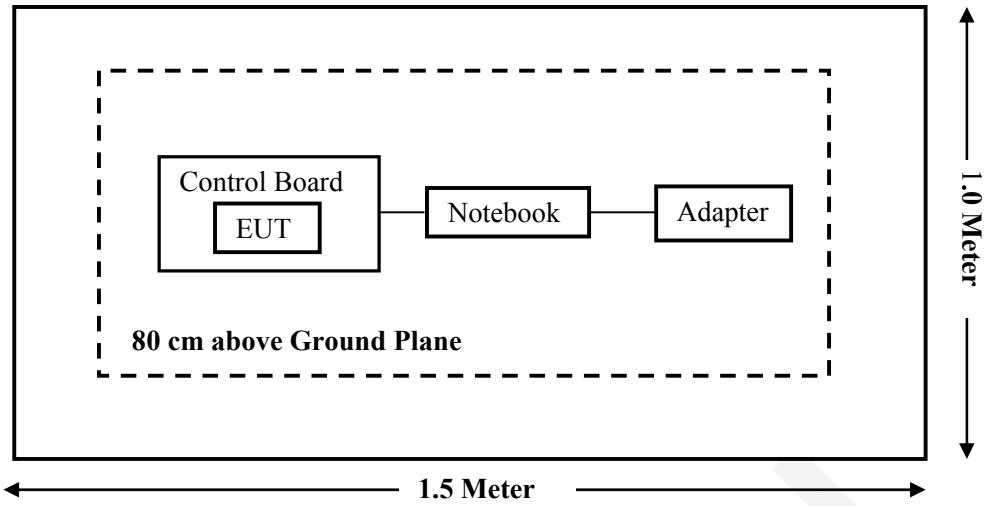
Cable Description	Shielding Type	Length (m)	From Port	To
USB Cable	Un-shielding	0.8	Notebook	Control Board

Block Diagram of Test Setup

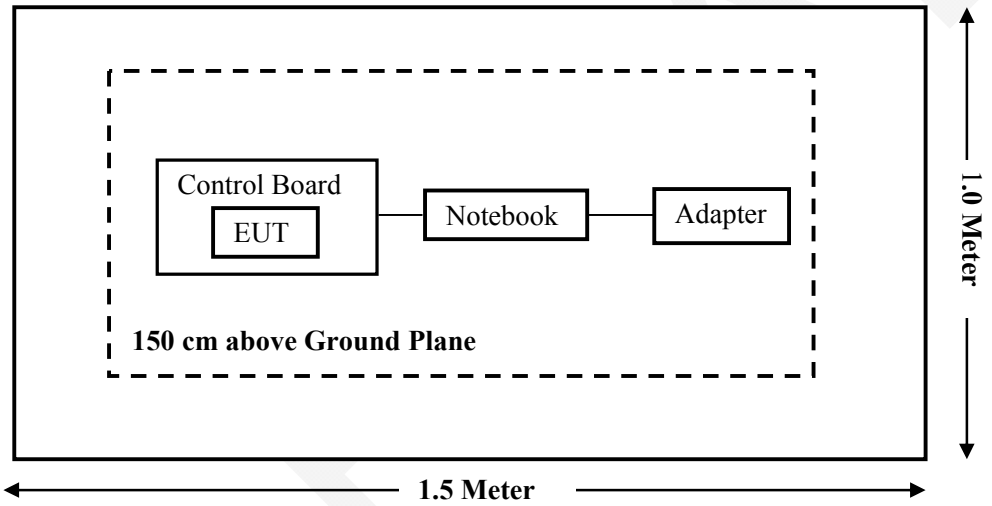
For Conducted Emissions:



For Radiated Emissions (Below 1GHz):



For Radiated Emissions (Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1310& §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.247(d)	Spurious Emissions at Antenna Port	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission 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

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test（Chamber 1#）					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Sunol Sciences	Broadband Antenna	JB3	A040914-2	2016-01-09	2019-01-08
Sonoma Instrunent	Pre-amplifier	310N	171205	2017-08-15	2018-08-14
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-8	008	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2017-08-15	2018-08-14
Radiated Emission Test（Chamber 2#）					
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2016-11-25	2017-11-24
ETS-LINDGREN	Horn Antenna	3115	6229	2016-01-11	2019-01-10
ETS-LINDGREN	Horn Antenna	3116	00084159	2016-10-18	2019-10-17
Narda	Pre-amplifier	AFS42-00101800	2001270	2016-12-12	2017-12-11
Heatsink Required	Amplifier	QLW-18405536-J0	15964001009	2016-12-12	2017-12-11
Rohde & Schwarz	Auto test Software	EMC32	100361	/	/
MICRO-COAX	Coaxial Cable	Cable-6	006	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-11	011	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-12	012	2017-08-15	2018-08-14
MICRO-COAX	Coaxial Cable	Cable-13	013	2017-08-15	2018-08-14
RF Conducted Test					
Rohde & Schwarz	Signal Analyzer	FSIQ26	836131/009	2016-09-21	2017-09-20
Agilent	Power Meter	N1912A	MY5000492	2016-11-18	2017-11-17
Agilent	Power Sensor	N1921A	MY54210024	2016-11-18	2017-11-17
High-Flying	RF Cable	/	/	2017-08-21	2018-08-20
Conducted Emission Test					
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2016-11-25	2017-11-24
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2016-10-10	2017-10-09
Rohde & Schwarz	LISN	ENV216	3560655016	2016-11-25	2017-11-24
BACL	BACL-EMC	V1.0	CE001	/	/
Narda	Attenuator/6dB	10690812-2	26850-6	2017-01-10	2018-01-09
MICRO-COAX	Coaxial Cable	Cable-15	015	2017-08-15	2018-08-14

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

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	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/		f/1500	30
1500-100,000	/		1.0	30

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

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

Calculated Formulary:

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$ = 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:

Mode	Frequency Range	Antenna Gain		Output Power		Evaluation Distance	Power Density	MPE Limit
	(MHz)	(dBi)	(numeric)	(dBm)	(mW)	(cm)	(mW/cm^2)	(mW/cm^2)
802.11b	2412~2462	-0.35	0.92	16.00	39.81	20	0.0073	1.0
802.11g		-0.35	0.92	14.00	25.12	20	0.0046	1.0
802.11n-HT20		-0.35	0.92	13.00	19.95	20	0.0037	1.0
802.11n-HT40	2422~2452	-0.35	0.92	12.00	15.85	20	0.0029	1.0

Note: For the above target output power are all declared by the manufacturer.

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.

Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.
And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has a PCB antenna arrangement for Wi-Fi, which the antenna gain is -0.35 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

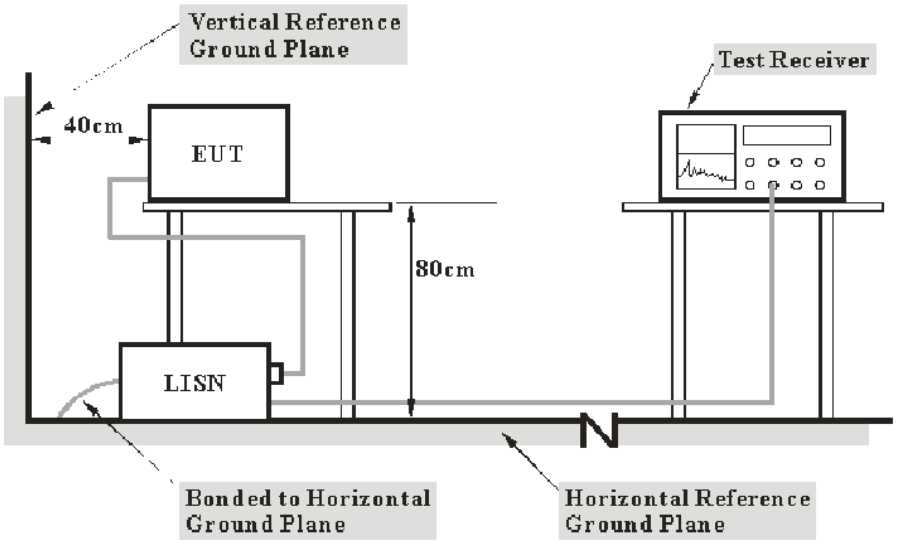
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

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 limits.

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 outlet of the 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 Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Correction Factor = LISN VDF + Cable Loss

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

Margin = Limit – Corrected Amplitude

Test Results Summary

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

Test Data

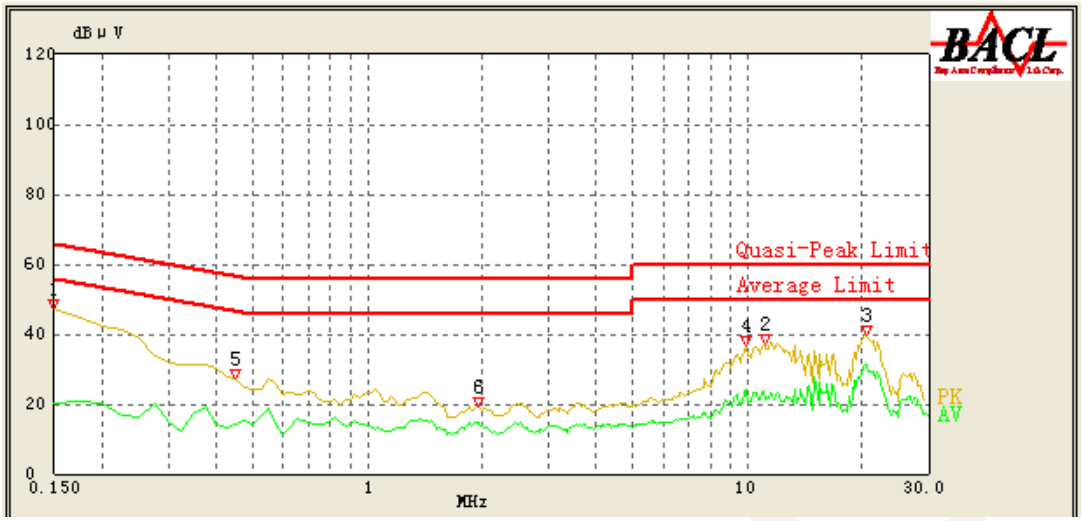
Environmental Conditions

Temperature:	24.2℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Edison Hu on 2017-08-21.

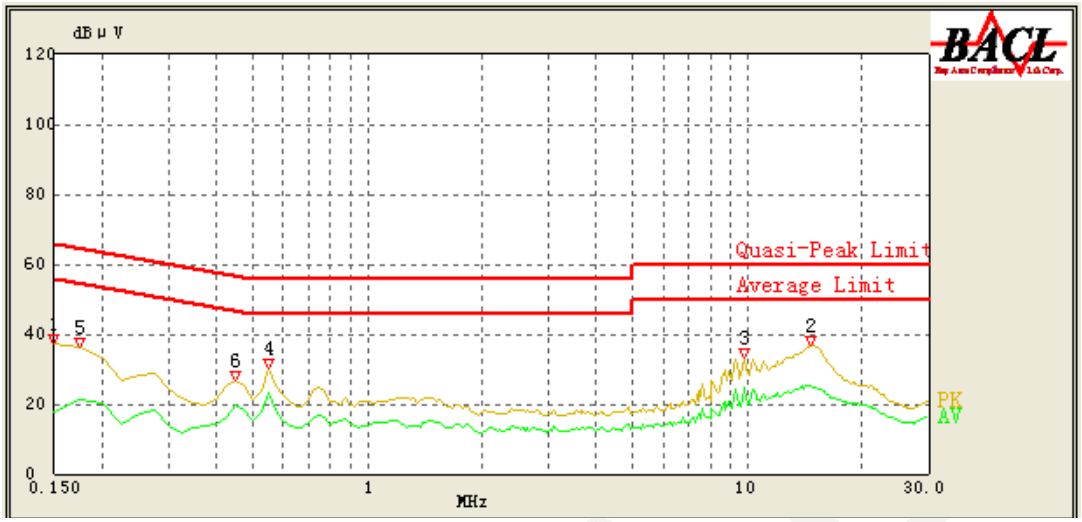
EUT operation mode: Transmitting in 802.11b mode Middle channel

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	47.38	PK	9.000	L1	16.06	66.00	18.62	Compliance
0.150	20.18	AV	9.000	L1	16.06	56.00	35.82	Compliance
11.100	37.31	PK	9.000	L1	16.09	60.00	22.69	Compliance
11.000	23.53	AV	9.000	L1	16.09	50.00	26.47	Compliance
20.675	39.89	PK	9.000	L1	16.44	60.00	20.11	Compliance
20.675	31.30	AV	9.000	L1	16.44	50.00	18.70	Compliance
9.925	36.72	PK	9.000	L1	16.06	60.00	23.28	Compliance
9.925	24.07	AV	9.000	L1	16.06	50.00	25.93	Compliance
0.450	27.49	PK	9.000	L1	16.07	57.43	29.94	Compliance
0.450	14.05	AV	9.000	L1	16.07	47.43	33.38	Compliance
1.950	19.21	PK	9.000	L1	15.85	56.00	36.79	Compliance
1.950	14.53	AV	9.000	L1	15.85	46.00	31.47	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	37.49	PK	9.000	N	16.06	66.00	28.51	Compliance
0.150	17.75	AV	9.000	N	16.06	56.00	38.25	Compliance
14.725	36.79	PK	9.000	N	16.01	60.00	23.21	Compliance
14.825	24.70	AV	9.000	N	16.01	50.00	25.30	Compliance
9.825	33.19	PK	9.000	N	15.99	60.00	26.81	Compliance
9.825	24.68	AV	9.000	N	15.99	50.00	25.32	Compliance
0.550	30.07	PK	9.000	N	16.08	56.00	25.93	Compliance
0.550	23.20	AV	9.000	N	16.08	46.00	22.80	Compliance
0.175	36.19	PK	9.000	N	16.06	65.29	29.10	Compliance
0.175	21.10	AV	9.000	N	16.06	55.29	34.19	Compliance
0.450	26.73	PK	9.000	N	16.10	57.43	30.70	Compliance
0.450	19.59	AV	9.000	N	16.10	47.43	27.84	Compliance

Note:
1) Corr.=LISN VDF (Voltage Division Factor) + Cable Loss
2) Corrected Amplitude = Reading + Corr.
3) Margin = Limit –Corrected Amplitude

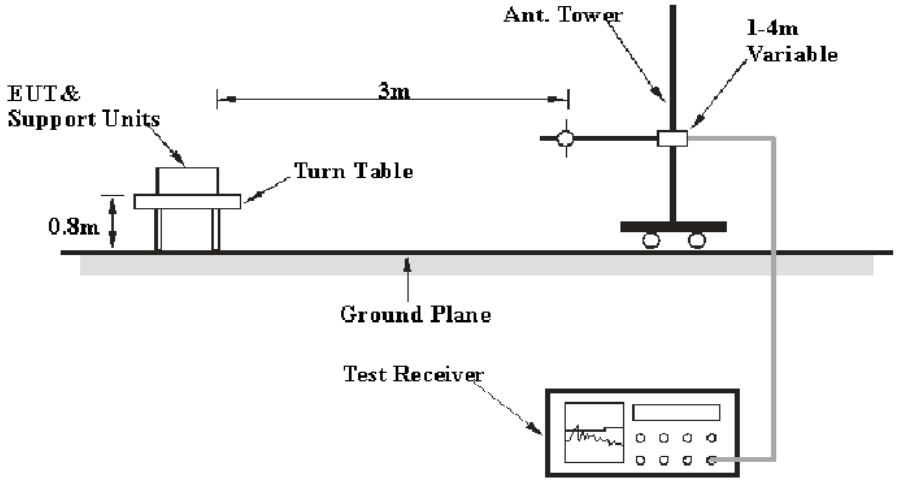
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

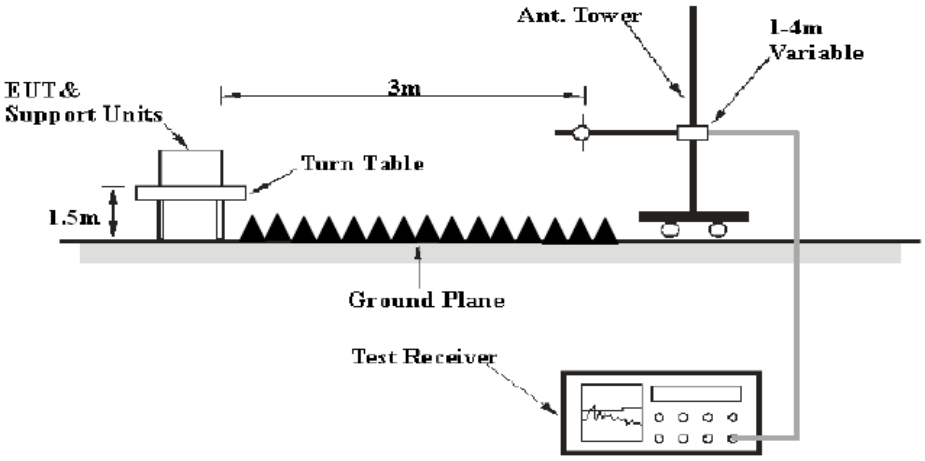
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1 GHz:



Above 1GHz:



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

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

Frequency Range	RBW	Video B/W	Duty cycle	Detector
1GHz – 25GHz	1MHz	3 MHz	Any	PK
	1MHz	10 Hz	>98%	Ave.
	1MHz	1/T	<98%	

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 Results Summary

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

Test Data

Environmental Conditions

Temperature:	24.2℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Edison Hu on 2017-08-21.

EUT operation mode: Transmitting(Scan with X-Axis, Y-Axis and Z-Axis position, the worst case X-Axis was recorded)

30MHz-25GHz

802.11b Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
166.54	27.63	QP	105	249	H	-12.61	15.02	43.50	28.48
2412.00	107.59	PK	7	224	V	-4.90	102.69	/	/
2412.00	100.34	Ave	7	224	V	-4.90	95.44	/	/
2412.00	105.44	PK	54	209	H	-4.90	100.54	/	/
2412.00	99.44	Ave	54	209	H	-4.90	94.54	/	/
2390.00	54.25	PK	168	101	V	-4.96	49.29	74.00	24.71
2390.00	48.50	Ave	168	101	V	-4.96	43.54	54.00	10.46
1368.25	57.49	PK	146	219	H	-9.01	48.48	74.00	25.52
1368.25	49.51	Ave	146	219	H	-9.01	40.50	54.00	13.50
1862.32	48.55	PK	201	143	H	-7.12	41.43	74.00	32.57
1862.32	38.59	Ave	201	143	H	-7.12	31.47	54.00	22.53
4824.00	53.21	PK	9	145	V	2.52	55.73	74.00	18.27
4824.00	46.51	Ave	9	145	V	2.52	49.03	54.00	4.97
7236.00	45.58	PK	24	199	V	9.83	55.41	74.00	18.59
7236.00	32.45	Ave	24	199	V	9.83	42.28	54.00	11.72

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2437 MHz)									
166.54	26.89	QP	333	187	H	-12.61	14.28	43.50	29.22
2437.00	107.16	PK	86	218	V	-4.83	102.33	/	/
2437.00	100.21	Ave	86	218	V	-4.83	95.38	/	/
2437.00	105.17	PK	166	101	H	-4.83	100.34	/	/
2437.00	98.07	Ave	166	101	H	-4.83	93.24	/	/
1862.32	54.45	PK	68	184	H	-7.12	47.33	74.00	26.67
1862.32	48.45	Ave	68	184	H	-7.12	41.33	54.00	12.67
3130.22	57.48	PK	208	219	V	-1.90	55.58	74.00	18.42
3130.22	49.15	Ave	208	219	V	-1.90	47.25	54.00	6.75
4874.00	52.81	PK	320	130	V	2.63	55.44	74.00	18.56
4874.00	46.51	Ave	320	130	V	2.63	49.14	54.00	4.86
6432.34	45.89	PK	94	200	H	8.02	53.91	74.00	20.09
6432.34	41.19	Ave	94	200	H	8.02	49.21	54.00	4.79
7311.00	45.70	PK	115	228	V	9.95	55.65	74.00	18.35
7311.00	33.01	Ave	115	228	V	9.95	42.96	54.00	11.04
High Channel (2462 MHz)									
166.54	27.24	QP	13	188	H	-12.61	14.63	43.50	28.87
2462.00	106.88	PK	32	118	V	-4.76	102.12	/	/
2462.00	100.01	Ave	32	118	V	-4.76	95.25	/	/
2462.00	105.41	PK	279	218	H	-4.76	100.65	/	/
2462.00	99.47	Ave	279	218	H	-4.76	94.71	/	/
2483.50	54.15	PK	357	209	V	-4.71	49.44	74.00	24.56
2483.50	48.71	Ave	357	209	V	-4.71	44.00	54.00	10.00
1862.32	57.13	PK	267	137	H	-7.12	50.01	74.00	23.99
1862.32	49.47	Ave	267	137	H	-7.12	42.35	54.00	11.65
4924.00	54.11	PK	159	165	V	2.74	56.85	74.00	17.15
4924.00	47.53	Ave	159	165	V	2.74	50.27	54.00	3.73
6432.34	45.86	PK	327	169	H	8.02	53.88	74.00	20.12
6432.34	41.54	Ave	327	169	H	8.02	49.56	54.00	4.44
7386.00	45.51	PK	180	223	V	10.06	55.57	74.00	18.43
7386.00	33.26	Ave	180	223	V	10.06	43.32	54.00	10.68

802.11g Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
166.54	26.88	QP	180	248	H	-12.61	14.27	43.50	29.23
2412.00	104.96	PK	127	224	V	-4.90	100.06	/	/
2412.00	96.14	Ave	127	224	V	-4.90	91.24	/	/
2412.00	103.01	PK	276	179	H	-4.90	98.11	/	/
2412.00	95.86	Ave	276	179	H	-4.90	90.96	/	/
2390.00	52.05	PK	308	242	V	-4.96	47.09	74.00	26.91
2390.00	46.28	Ave	308	242	V	-4.96	41.32	54.00	12.68
1563.21	55.42	PK	108	177	H	-7.80	47.62	74.00	26.38
1563.21	46.89	Ave	108	177	H	-7.80	39.09	54.00	14.91
1862.32	50.78	PK	276	199	H	-7.12	43.66	74.00	30.34
1862.32	48.18	Ave	276	199	H	-7.12	41.06	54.00	12.94
4824.00	43.77	PK	241	126	V	2.52	46.29	74.00	27.71
4824.00	43.13	Ave	241	126	V	2.52	45.65	54.00	8.35
7236.00	43.39	PK	34	220	V	9.83	53.22	74.00	20.78
7236.00	30.84	Ave	34	220	V	9.83	40.67	54.00	13.33
Middle Channel (2437 MHz)									
166.54	26.78	QP	86	195	H	-12.61	14.17	43.50	29.33
2437.00	105.06	PK	173	197	V	-4.83	100.23	/	/
2437.00	99.08	Ave	173	197	V	-4.83	94.25	/	/
2437.00	102.98	PK	354	104	H	-4.83	98.15	/	/
2437.00	96.74	Ave	354	104	H	-4.83	91.91	/	/
1862.32	52.42	PK	308	180	V	-7.12	45.30	74.00	28.70
1862.32	46.22	Ave	308	180	V	-7.12	39.10	54.00	14.90
3130.22	55.48	PK	72	147	H	-1.90	53.58	74.00	20.42
3130.22	46.77	Ave	72	147	H	-1.90	44.87	54.00	9.13
4874.00	50.45	PK	253	158	V	2.63	53.08	74.00	20.92
4874.00	47.40	Ave	253	158	V	2.63	50.03	54.00	3.97
6432.34	43.51	PK	344	169	H	8.02	51.53	74.00	22.47
6432.34	41.84	Ave	344	169	H	8.02	49.86	54.00	4.14
7311.00	43.61	PK	198	118	V	9.95	53.56	74.00	20.44
7311.00	30.74	Ave	198	118	V	9.95	40.69	54.00	13.31

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2462 MHz)									
166.54	26.75	QP	127	192	H	-12.61	14.14	43.50	29.36
2462.00	104.71	PK	66	104	V	-4.76	99.95	/	/
2462.00	99.00	Ave	66	104	V	-4.76	94.24	/	/
2462.00	103.05	PK	272	239	H	-4.76	98.29	/	/
2462.00	98.25	Ave	272	239	H	-4.76	93.49	/	/
2483.50	52.03	PK	272	189	V	-6.01	46.02	74.00	27.98
2483.50	46.41	Ave	272	189	V	-6.01	40.40	54.00	13.60
1862.32	54.81	PK	38	219	H	-7.12	47.69	74.00	26.31
1862.32	47.28	Ave	38	219	H	-7.12	40.16	54.00	13.84
4924.00	51.86	PK	197	185	V	2.74	54.60	74.00	19.40
4924.00	46.30	Ave	197	185	V	2.74	49.04	54.00	4.96
6432.34	43.82	PK	52	197	H	8.02	51.84	74.00	22.16
6432.34	41.17	Ave	52	197	H	8.02	49.19	54.00	4.81
7386.00	43.21	PK	237	153	V	10.06	53.27	74.00	20.73
7386.00	30.97	Ave	237	153	V	10.06	41.03	54.00	12.97

802.11n-HT20 Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2412 MHz)									
166.54	28.12	QP	198	250	H	-12.61	15.51	43.50	27.99
2412.00	103.65	PK	137	190	V	-4.90	98.75	/	/
2412.00	98.65	Ave	137	190	V	-4.90	93.75	/	/
2412.00	101.57	PK	317	139	H	-4.90	96.67	/	/
2412.00	96.27	Ave	317	139	H	-4.90	91.37	/	/
2390.00	50.60	PK	41	159	V	-4.96	45.64	74.00	28.36
2390.00	44.59	Ave	41	159	V	-4.96	39.63	54.00	14.37
2635.68	53.87	PK	333	128	V	-7.80	46.07	74.00	27.93
2635.68	45.33	Ave	333	128	V	-7.80	37.53	54.00	16.47
1862.32	49.43	PK	112	102	V	-7.12	42.31	74.00	31.69
1862.32	46.79	Ave	112	102	V	-7.12	39.67	54.00	14.33
4824.00	42.41	PK	110	186	V	2.52	44.93	74.00	29.07
4824.00	41.48	Ave	110	186	V	2.52	44.00	54.00	10.00
7236.00	41.77	PK	305	114	V	9.83	51.60	74.00	22.40
7236.00	29.42	Ave	305	114	V	9.83	39.25	54.00	14.75

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Middle Channel (2437 MHz)									
166.54	28.46	QP	237	236	H	-12.61	15.85	43.50	27.65
2437.00	103.71	PK	230	194	V	-4.83	98.88	/	/
2437.00	98.42	Ave	230	194	V	-4.83	93.59	/	/
2437.00	101.33	PK	47	143	H	-4.83	96.50	/	/
2437.00	95.23	Ave	47	143	H	-4.83	90.40	/	/
1862.32	51.04	PK	37	104	V	-7.12	43.92	74.00	30.08
1862.32	44.56	Ave	37	104	V	-7.12	37.44	54.00	16.56
3130.22	53.93	PK	31	130	V	-1.90	52.03	74.00	21.97
3130.22	45.13	Ave	31	130	V	-1.90	43.23	54.00	10.77
4874.00	49.07	PK	262	175	V	2.63	51.70	74.00	22.30
4874.00	46.89	Ave	262	175	V	2.63	49.52	54.00	4.48
6432.34	42.13	PK	174	114	V	8.02	50.15	74.00	23.85
6432.34	41.17	Ave	174	114	V	8.02	49.19	54.00	4.81
7311.00	42.30	PK	291	136	V	9.95	52.25	74.00	21.75
7311.00	29.10	Ave	291	136	V	9.95	39.05	54.00	14.95
High Channel (2462 MHz)									
166.54	27.84	QP	248	133	H	-12.61	15.23	43.50	28.27
2462.00	103.55	PK	75	159	V	-4.76	98.79	/	/
2462.00	97.40	Ave	75	159	V	-4.76	92.64	/	/
2462.00	101.14	PK	71	114	H	-4.76	96.38	/	/
2462.00	95.41	Ave	71	114	H	-4.76	90.65	/	/
2483.50	50.42	PK	261	192	V	-6.01	44.41	74.00	29.59
2483.50	44.69	Ave	261	192	V	-6.01	38.68	54.00	15.32
1862.32	52.98	PK	331	214	V	-7.12	45.86	74.00	28.14
1862.32	45.58	Ave	331	214	V	-7.12	38.46	54.00	15.54
4924.00	50.10	PK	166	101	V	4.45	54.55	74.00	19.45
4924.00	45.33	Ave	166	101	V	4.45	49.78	54.00	4.22
6432.34	42.09	PK	302	229	V	8.02	50.11	74.00	23.89
6432.34	41.44	Ave	302	229	V	8.02	49.46	54.00	4.54
7386.00	41.48	PK	278	142	V	10.06	51.54	74.00	22.46
7386.00	29.35	Ave	278	142	V	10.06	39.41	54.00	14.59

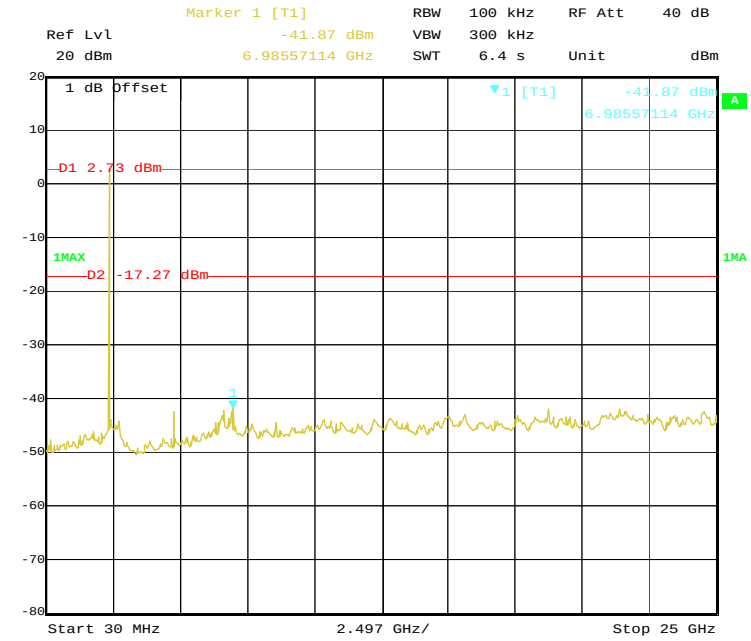
802.11n-HT40 Mode:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
Low Channel (2422 MHz)									
166.54	28.81	QP	250	111	H	-12.61	16.20	43.50	27.30
2422.00	98.31	PK	74	221	V	-4.88	93.43	/	/
2422.00	91.51	Ave	74	221	V	-4.88	86.63	/	/
2422.00	93.62	PK	282	159	H	-4.88	88.74	/	/
2422.00	87.95	Ave	282	159	H	-4.88	83.07	/	/
2390.00	53.95	PK	171	238	V	-4.96	48.99	74.00	25.01
2390.00	39.89	Ave	171	238	V	-4.96	34.93	54.00	19.07
2685.21	54.88	PK	272	119	V	-3.94	50.94	74.00	23.06
2685.21	39.21	Ave	272	119	V	-3.94	35.27	54.00	18.73
1862.32	44.81	PK	269	112	V	-7.12	37.69	74.00	36.31
1862.32	30.13	Ave	269	112	V	-7.12	23.01	54.00	30.99
4844.00	47.93	PK	343	145	V	2.56	50.49	74.00	23.51
4844.00	32.14	Ave	343	145	V	2.56	34.70	54.00	19.30
7266.00	44.80	PK	70	106	V	9.88	54.68	74.00	19.32
7266.00	29.66	Ave	70	106	V	9.88	39.54	54.00	14.46
Middle Channel (2437 MHz)									
166.54	28.91	QP	0	205	H	-12.61	16.30	43.50	27.20
2437.00	98.83	PK	145	160	V	-4.83	94.00	/	/
2437.00	91.48	Ave	145	160	V	-4.83	86.65	/	/
2437.00	93.14	PK	297	104	H	-4.83	88.31	/	/
2437.00	88.37	Ave	297	104	H	-4.83	83.54	/	/
1862.32	44.09	PK	236	197	V	-7.12	36.97	74.00	37.03
1862.32	31.17	Ave	236	197	V	-7.12	24.05	54.00	29.95
3130.22	45.00	PK	349	128	V	-1.90	43.10	74.00	30.90
3130.22	31.95	Ave	349	128	V	-1.90	30.05	54.00	23.95
4874.00	49.28	PK	138	109	V	2.63	51.91	74.00	22.09
4874.00	34.79	Ave	138	109	V	2.63	37.42	54.00	16.58
6432.34	45.49	PK	187	240	V	8.02	53.51	74.00	20.49
6432.34	30.79	Ave	187	240	V	8.02	38.81	54.00	15.19
7311.00	44.98	PK	154	102	V	9.95	54.93	74.00	19.07
7311.00	30.49	Ave	154	102	V	9.95	40.44	54.00	13.56

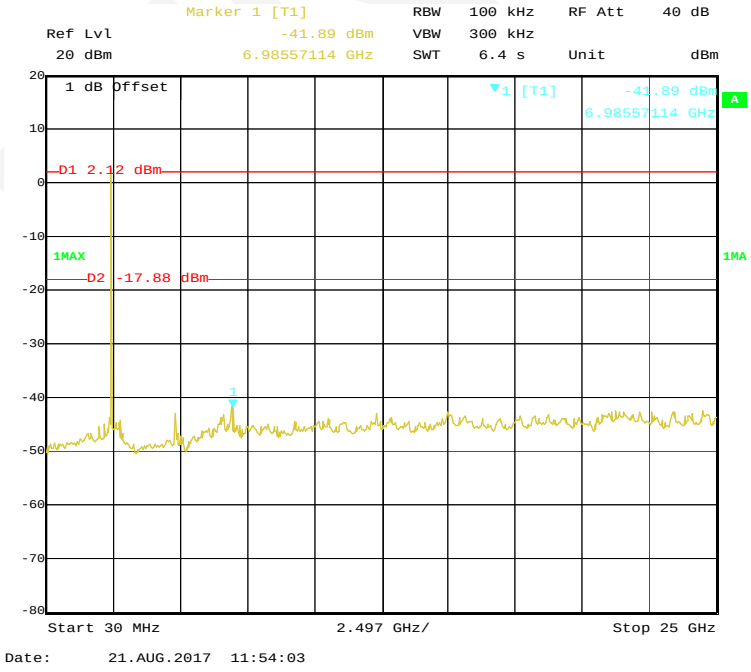
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2452 MHz)									
166.54	28.72	QP	109	136	H	-12.61	16.11	43.50	27.39
2452.00	98.88	PK	121	236	V	-4.79	94.09	/	/
2452.00	94.54	Ave	121	236	V	-4.79	89.75	/	/
2452.00	93.51	PK	176	204	H	-4.79	88.72	/	/
2452.00	87.74	Ave	176	204	H	-4.79	82.95	/	/
2483.50	54.26	PK	168	241	V	-6.01	48.25	74.00	25.75
2483.50	43.13	Ave	168	241	V	-6.01	37.12	54.00	16.88
1862.32	46.05	PK	217	162	V	-7.12	38.93	74.00	35.07
1862.32	33.90	Ave	217	162	V	-7.12	26.78	54.00	27.22
4904.00	48.50	PK	281	212	V	2.70	51.20	74.00	22.80
4904.00	35.39	Ave	281	212	V	2.70	38.09	54.00	15.91
6432.34	45.01	PK	191	241	V	8.02	53.03	74.00	20.97
6432.34	32.55	Ave	191	241	V	8.02	40.57	54.00	13.43
7356.00	45.08	PK	251	151	V	10.01	55.09	74.00	18.91
7356.00	30.77	Ave	251	151	V	10.01	40.78	54.00	13.22

Conducted Spurious Emissions at Antenna Port

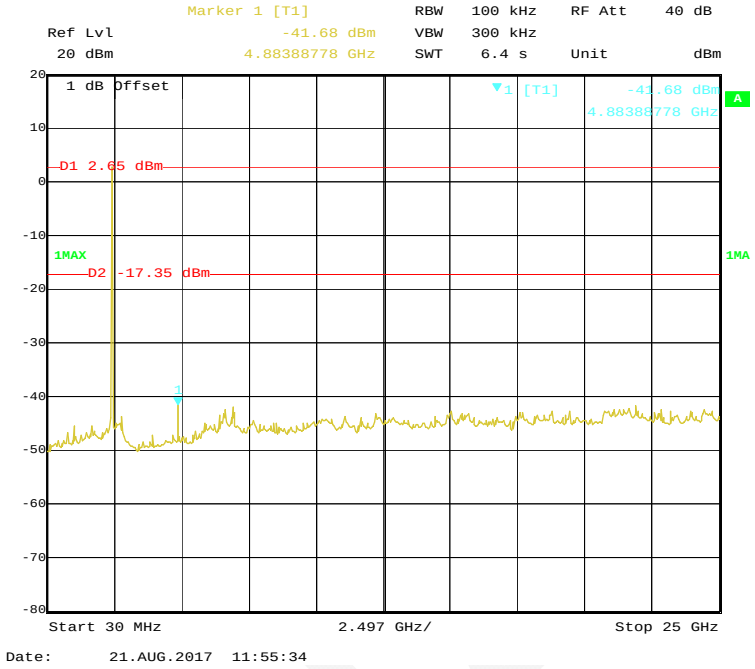
802.11b Low Channel



802.11b Middle Channel



802.11b High Channel



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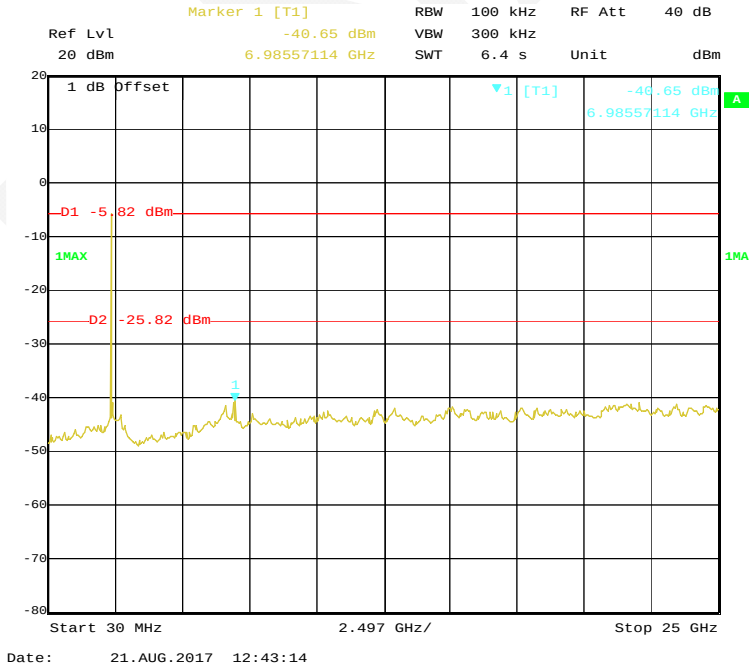
802.11g Low Channel



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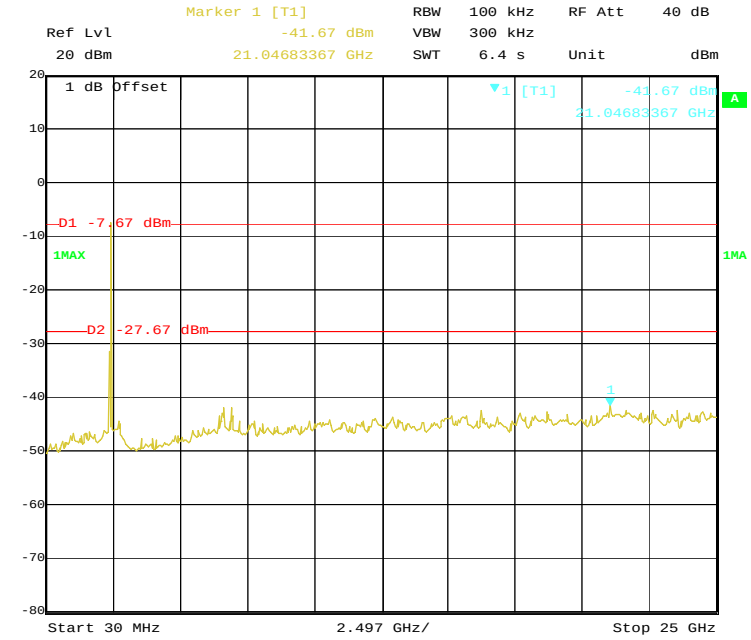
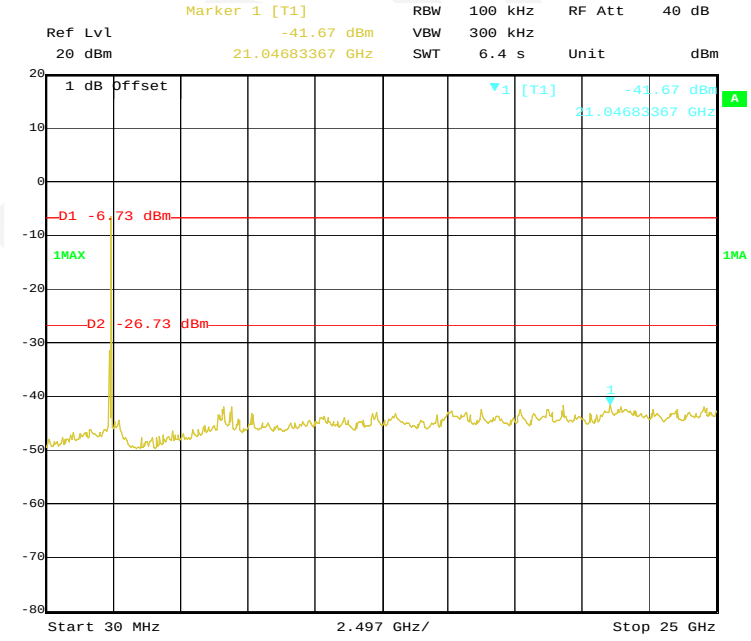
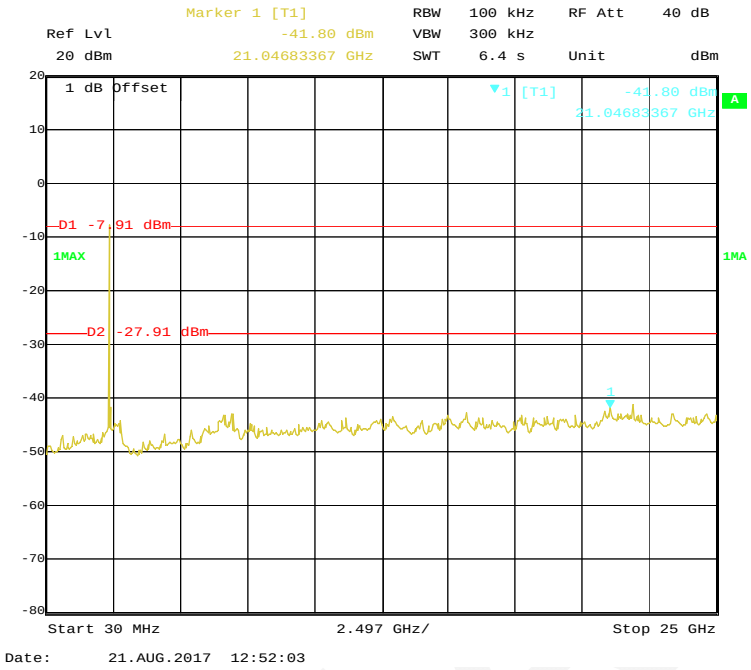
802.11g Middle Channel



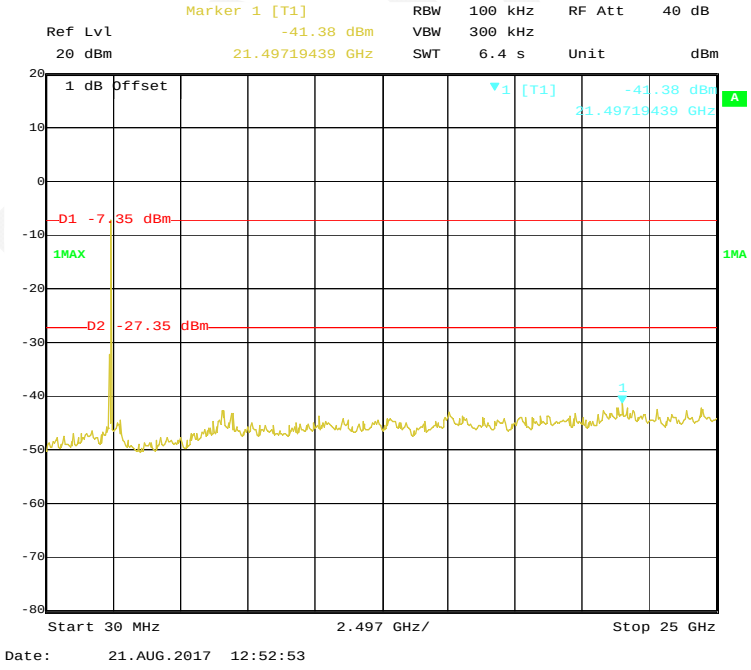
802.11g High Channel



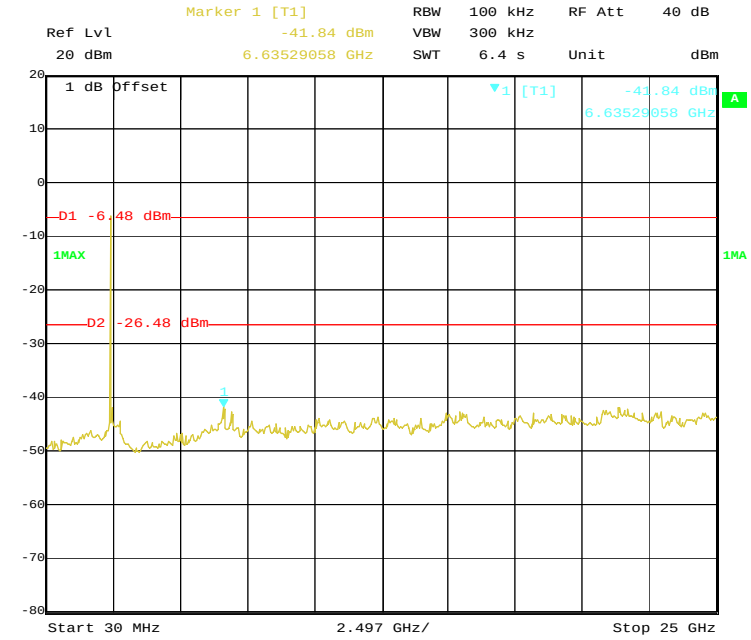
802.11n-HT20 Low Channel



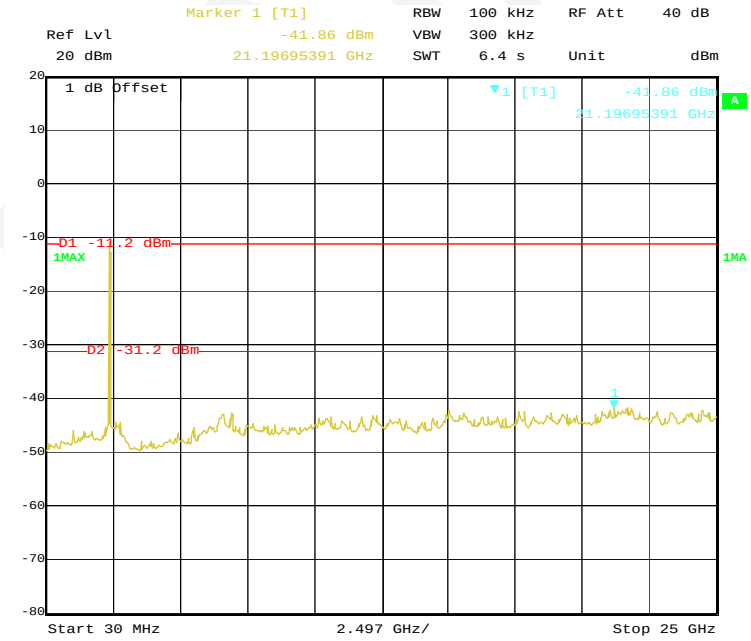
802.11n-HT20 Middle Channel



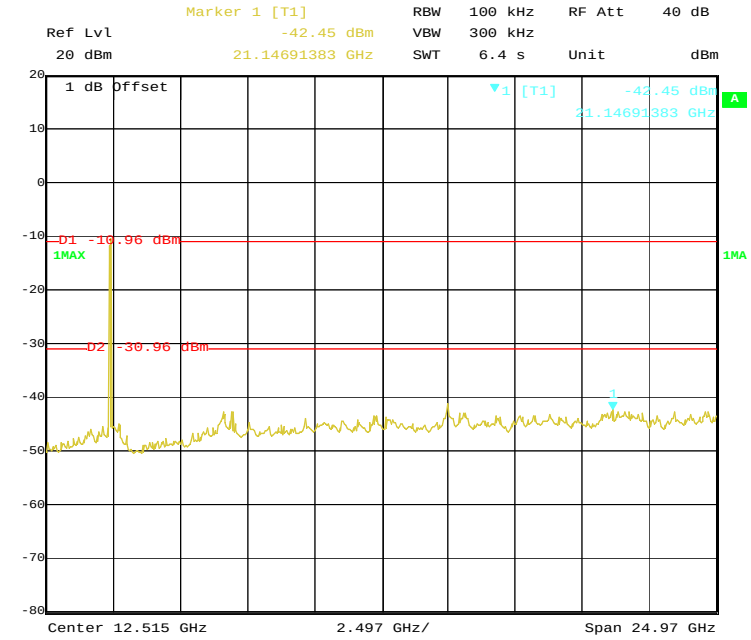
802.11n-HT20 High Channel



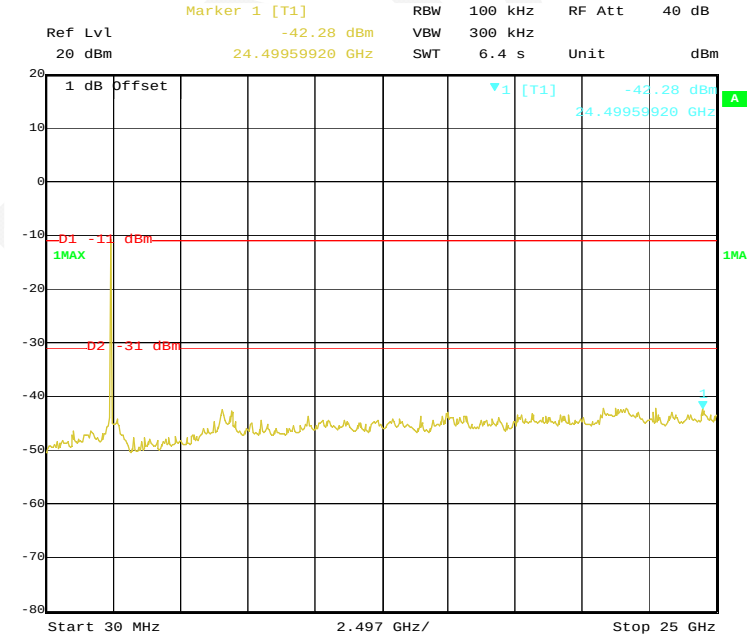
802.11n-HT40 Low Channel



802.11n-HT40 Middle Channel



802.11n-HT40 High Channel



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. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3xRBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. 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 Data

Environmental Conditions

Temperature:	24.2℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

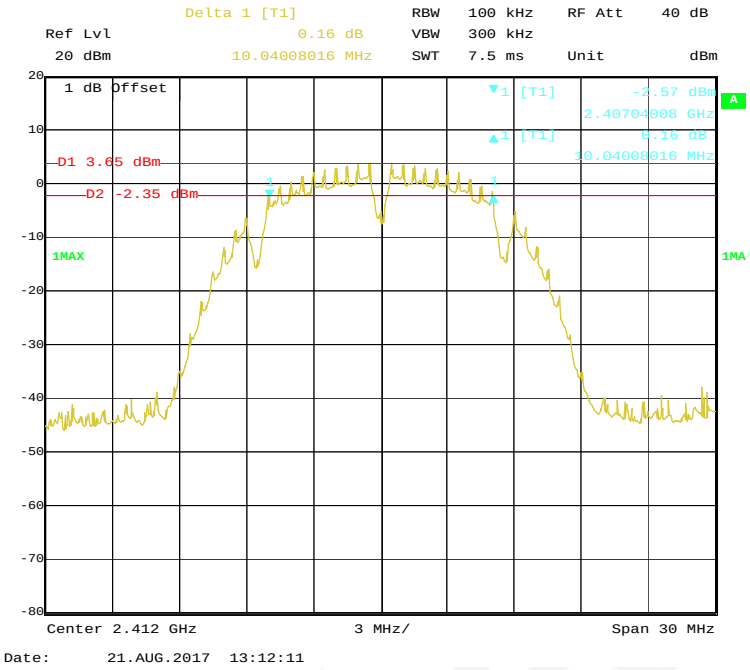
The testing was performed by Edison Hu on 2017-08-21.

Test Result: Pass.

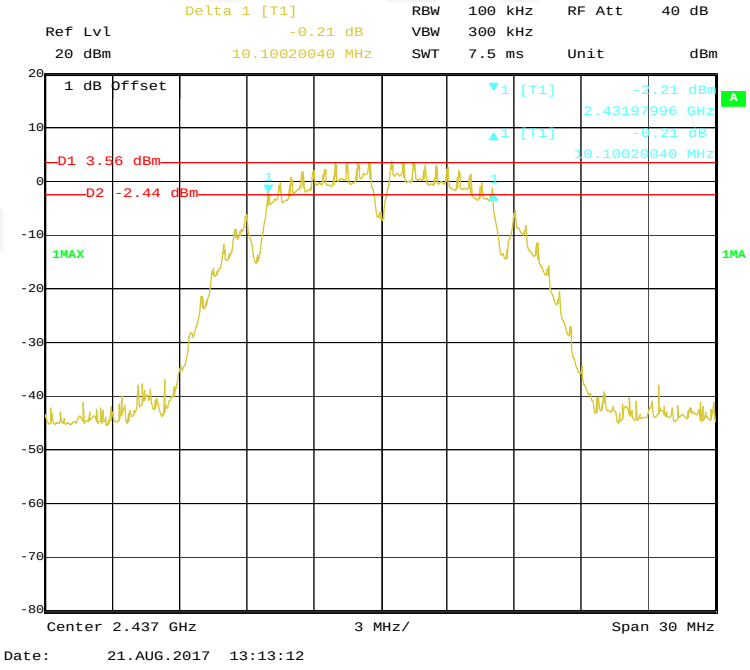
EUT operation mode: Transmitting

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b mode			
Low	2412	10.04	≥0.5
Middle	2437	10.10	≥0.5
High	2462	10.10	≥0.5
802.11g mode			
Low	2412	16.47	≥0.5
Middle	2437	16.35	≥0.5
High	2462	16.35	≥0.5
802.11n-HT20 mode			
Low	2412	17.74	≥0.5
Middle	2437	17.80	≥0.5
High	2462	17.74	≥0.5
802.11n-HT40 mode			
Low	2422	35.95	≥0.5
Middle	2437	36.43	≥0.5
High	2452	36.43	≥0.5

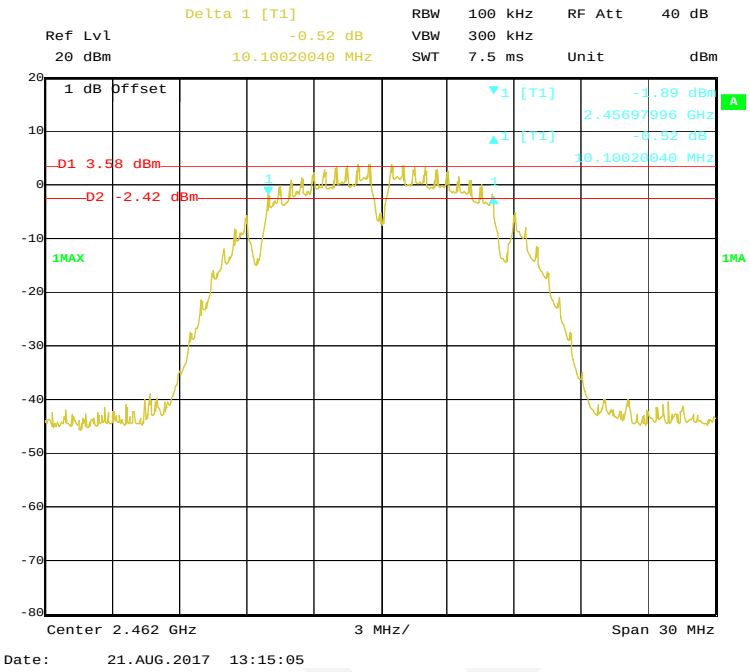
802.11b Low Channel



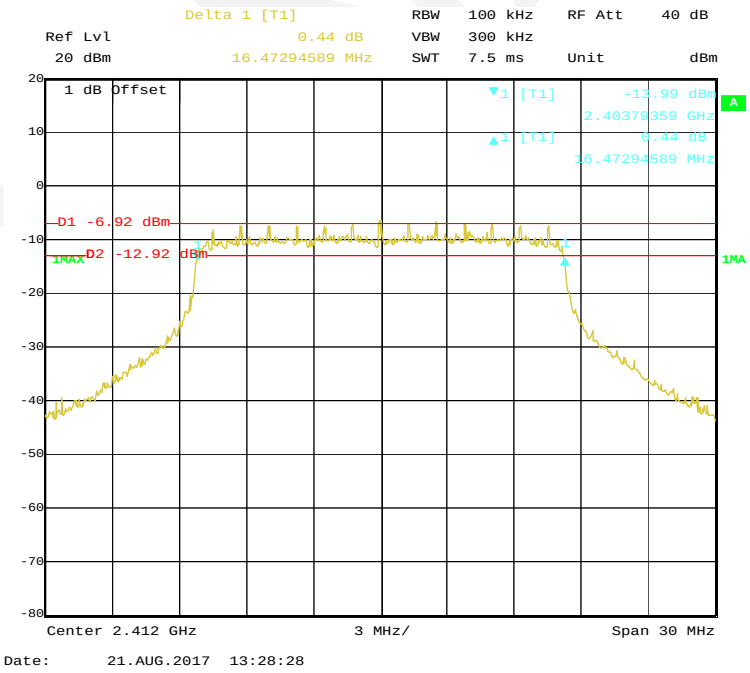
802.11b Middle Channel



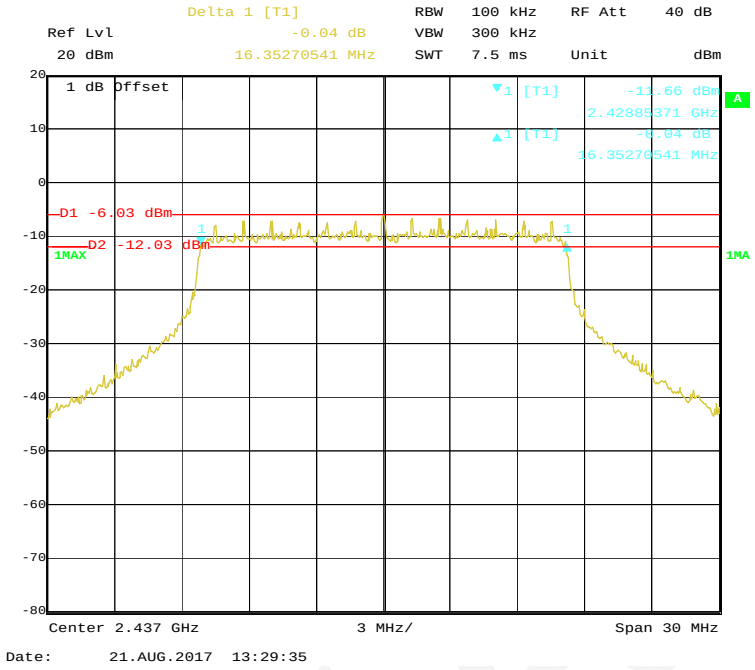
802.11b High Channel



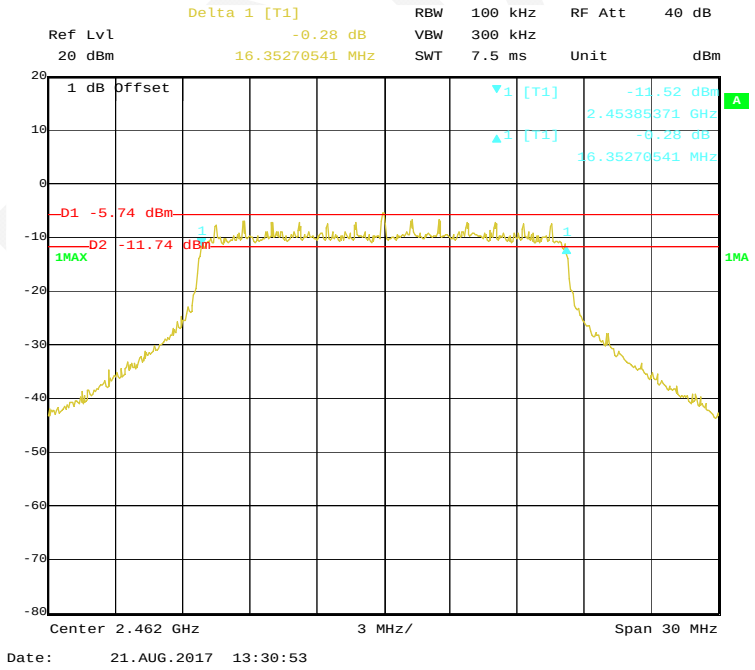
802.11g Low Channel



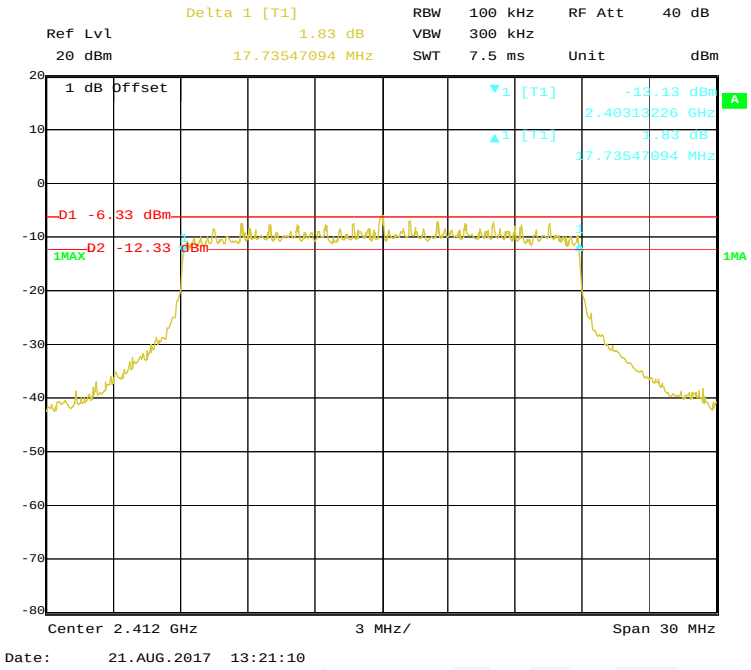
802.11g Middle Channel



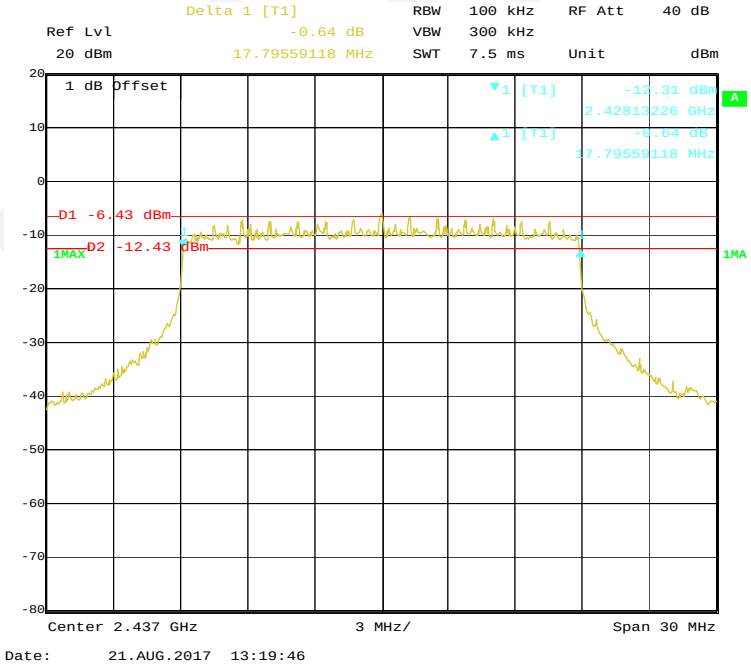
802.11g High Channel



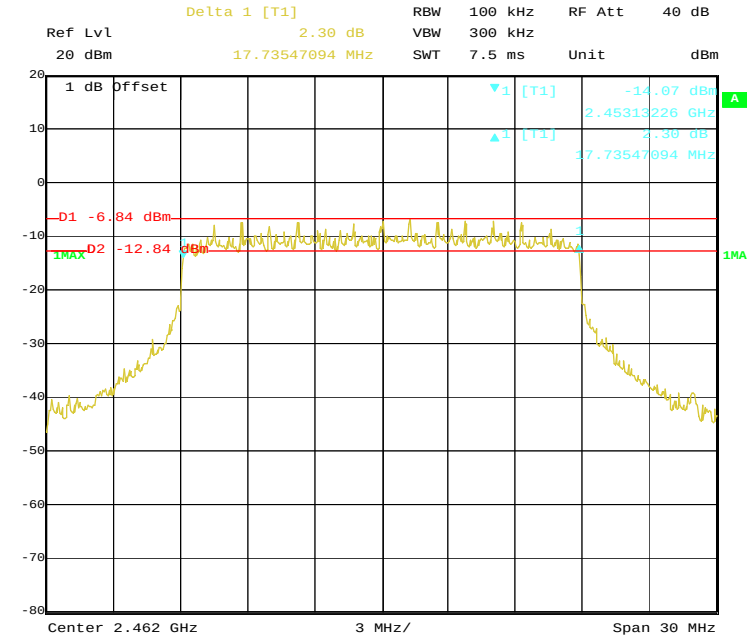
802.11n-HT20 Low Channel



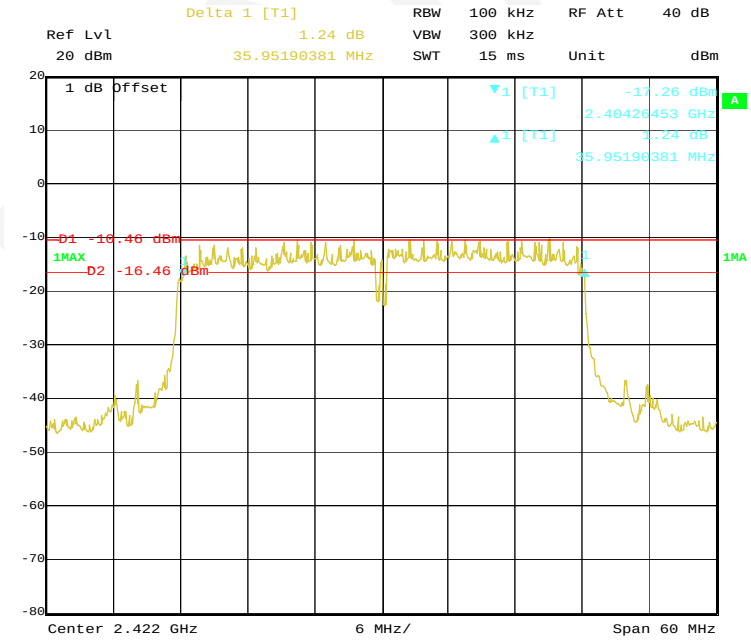
802.11n-HT20 Middle Channel



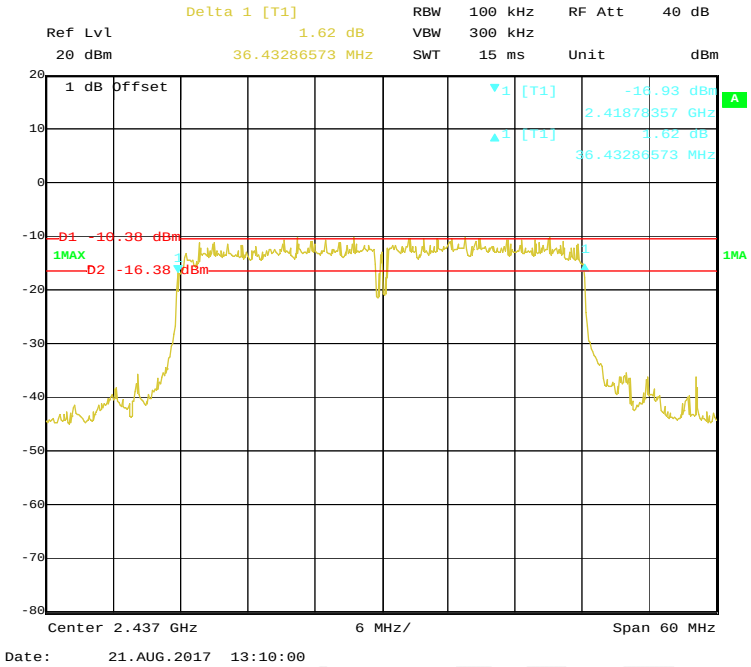
802.11n-HT20 High Channel



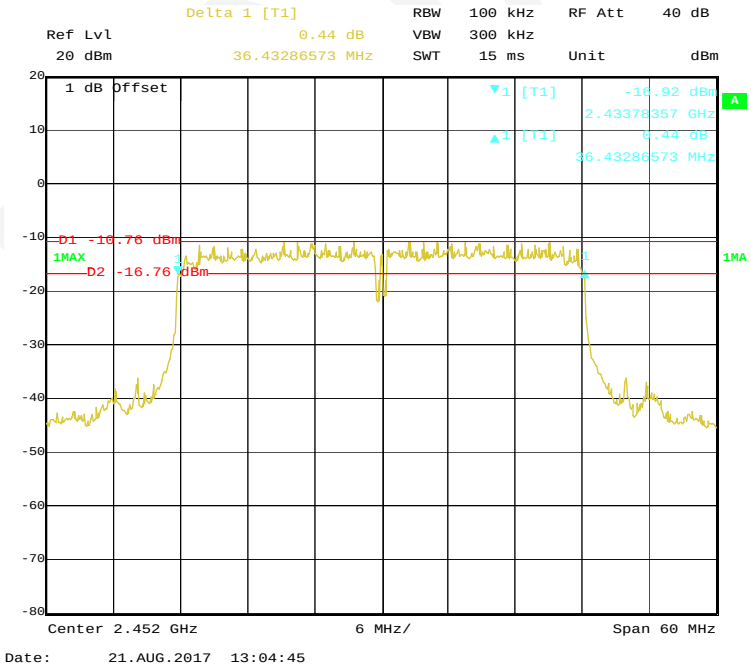
802.11n-HT40 Low Channel



802.11n-HT40 Middle Channel



802.11n-HT40 High Channel



FCC §15.247(b) (3) - MAXIMUM 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 one test equipment.
3. Add a correction factor to the display.

Note: We use signal Analyzer for peak power test and power meter for average power test.

Test Data

Environmental Conditions

Temperature:	24.2℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Edison Hu on 2017-08-21.

EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
802.11b				
Low	2412	15.70	30	Pass
Middle	2437	15.89	30	Pass
High	2462	15.85	30	Pass
802.11g				
Low	2412	13.08	30	Pass
Middle	2437	13.22	30	Pass
High	2462	13.29	30	Pass
802.11n-HT20				
Low	2412	12.75	30	Pass
Middle	2437	12.90	30	Pass
High	2462	12.29	30	Pass
802.11n-HT40				
Low	2422	11.92	30	Pass
Middle	2437	11.75	30	Pass
High	2452	11.33	30	Pass

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 Data

Environmental Conditions

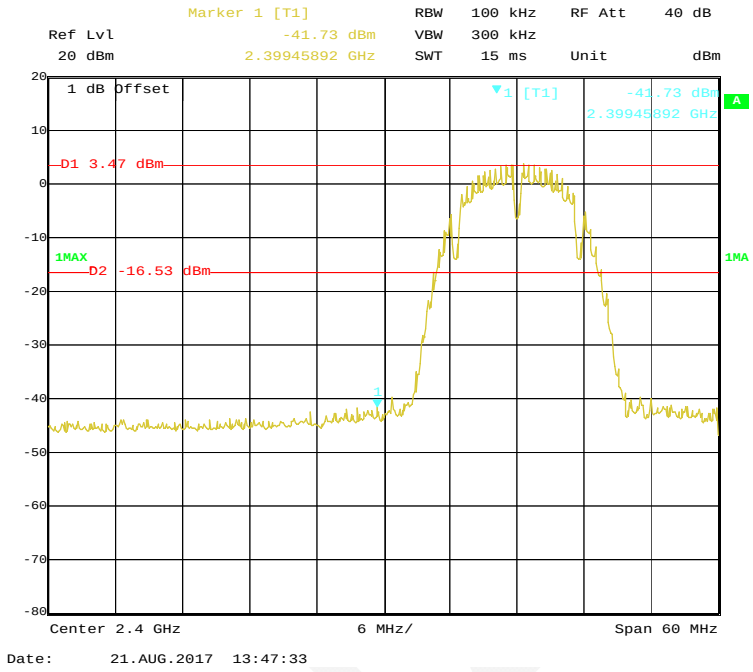
Temperature:	24.2℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Edison Hu on 2017-08-21.

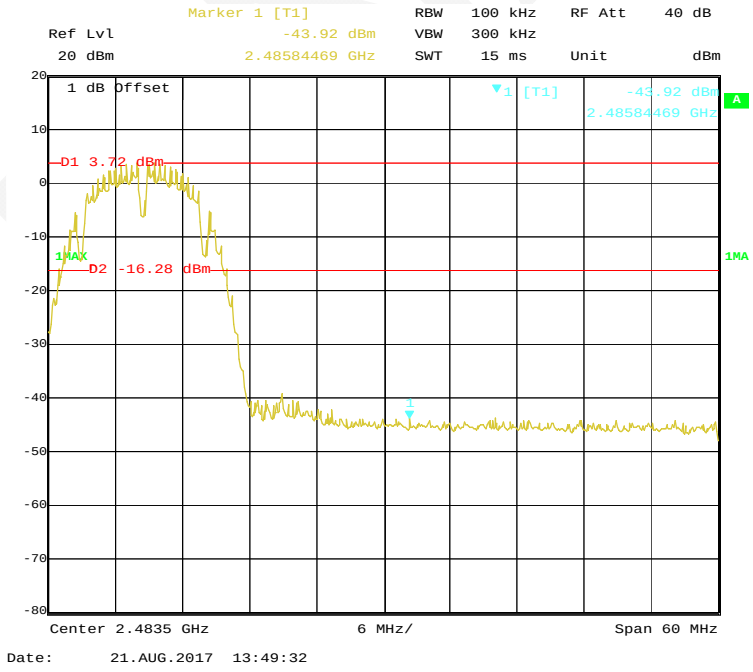
Test Result: *Compliance*

Band Edge

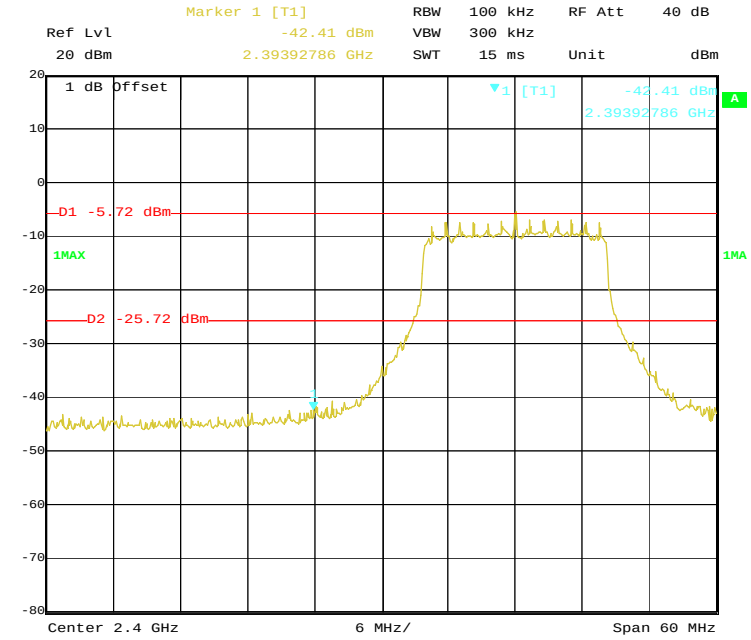
802.11b Mode Left Side



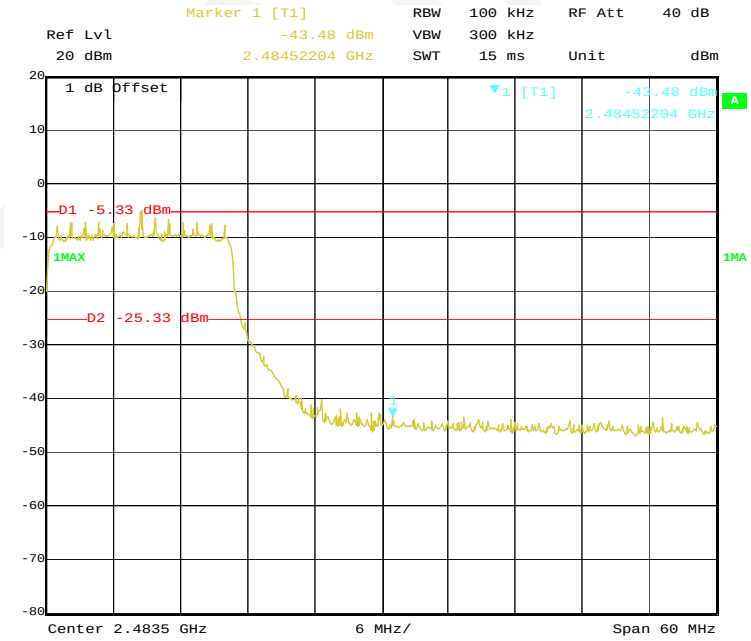
802.11b Mode Right Side



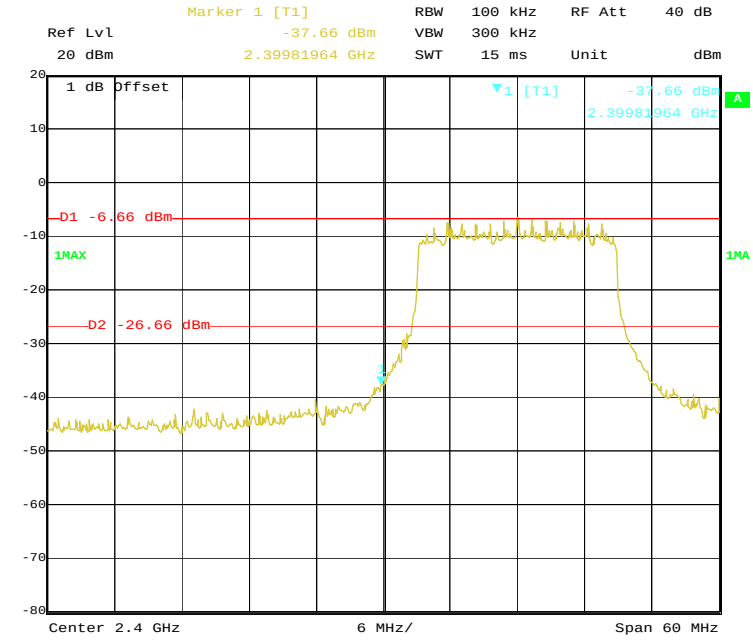
802.11g Mode Left Side



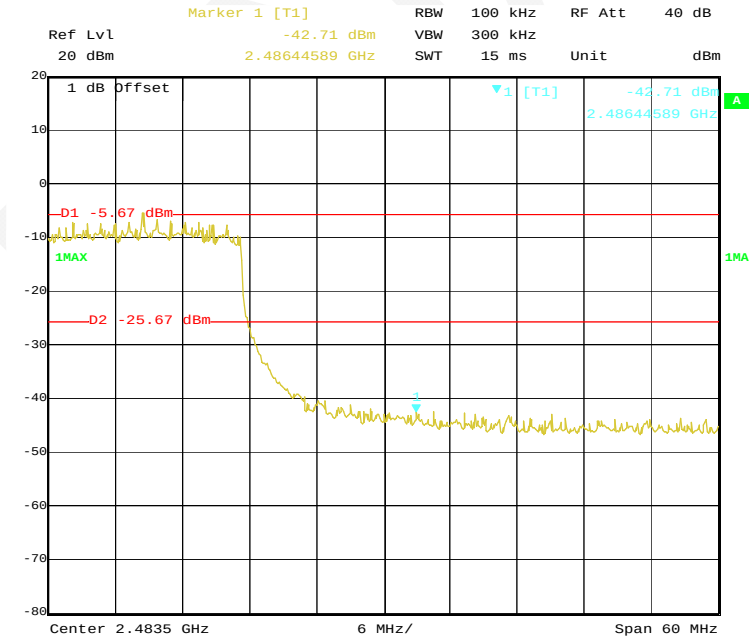
802.11g Mode Right Side



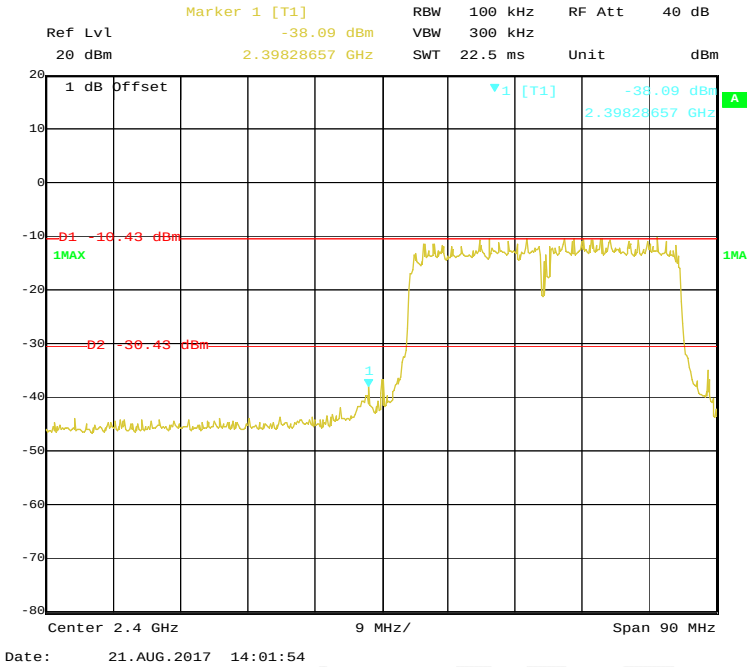
802.11n-HT20 Mode Left Side



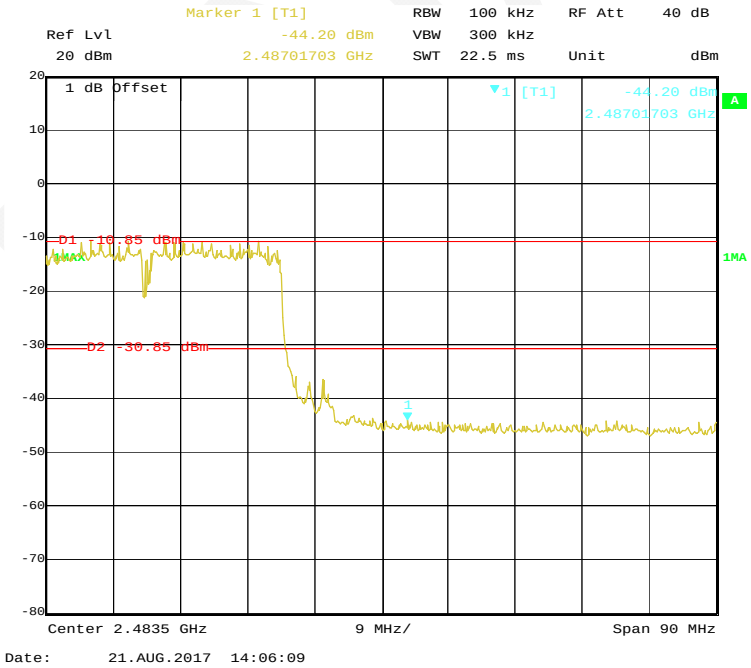
802.11n-HT20 Mode Right Side



802.11n-HT40 Mode Left Side



802.11n-HT40 Mode 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

According to KDB558074 D01 DTS Meas Guidance v04 sub-clause 10.2

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
3. Set the VBW ≥ 3×RBW.
4. Set the span to 1.5 times the DTS bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Data

Environmental Conditions

Temperature:	24.2℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

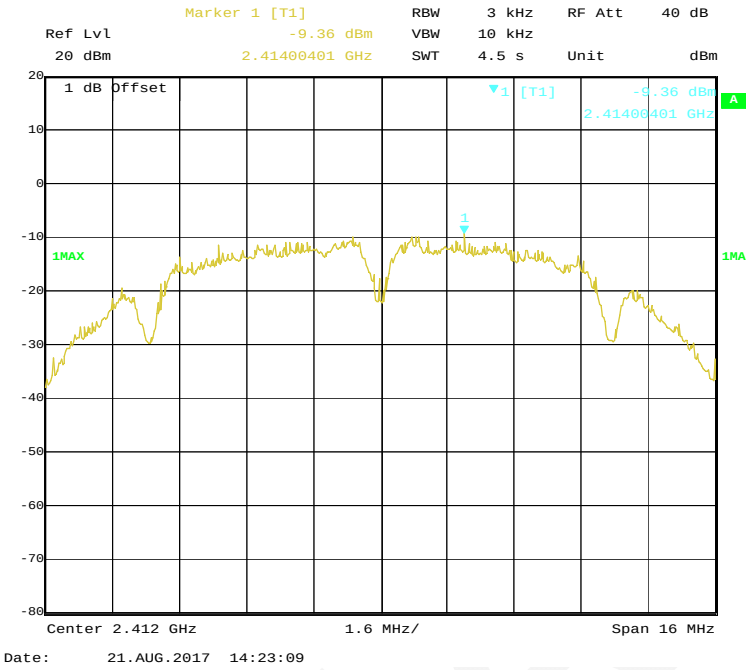
The testing was performed by Edison Hu on 2017-08-21.

EUT operation mode: Transmitting

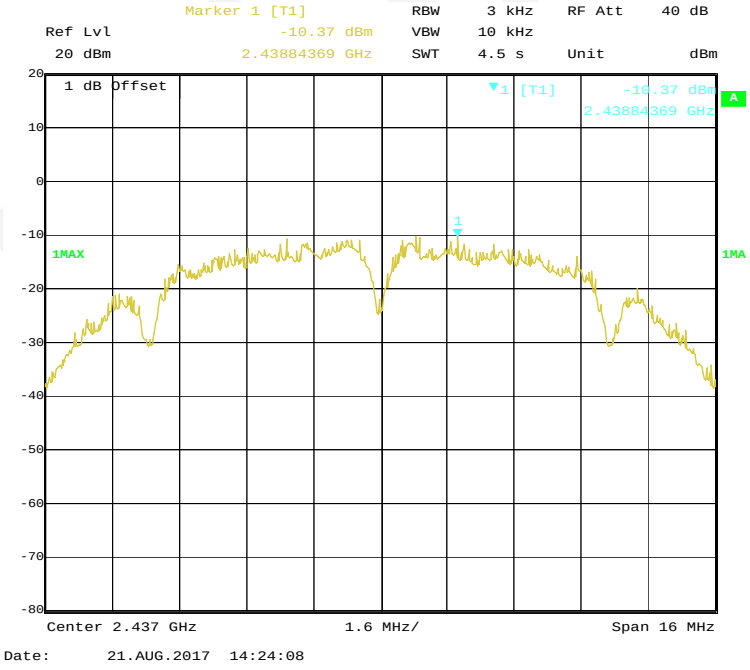
Test Result: Pass

Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-9.36	≤8
Middle	2437	-10.37	≤8
High	2462	-10.65	≤8
802.11g mode			
Low	2412	-21.01	≤8
Middle	2437	-20.21	≤8
High	2462	-20.52	≤8
802.11n-HT20 mode			
Low	2412	-22.02	≤8
Middle	2437	-21.94	≤8
High	2462	-21.58	≤8
802.11n-HT40 mode			
Low	2422	-26.24	≤8
Middle	2437	-25.27	≤8
High	2452	-25.91	≤8

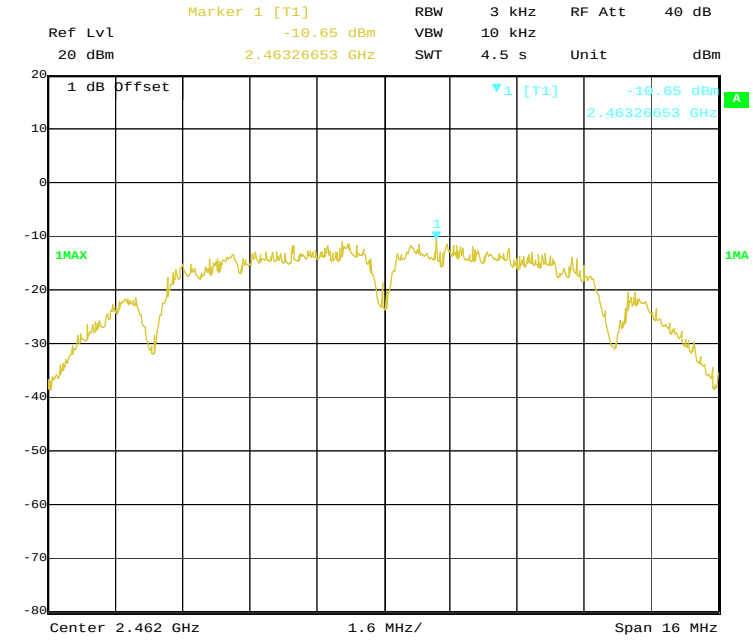
802.11b Low Channel



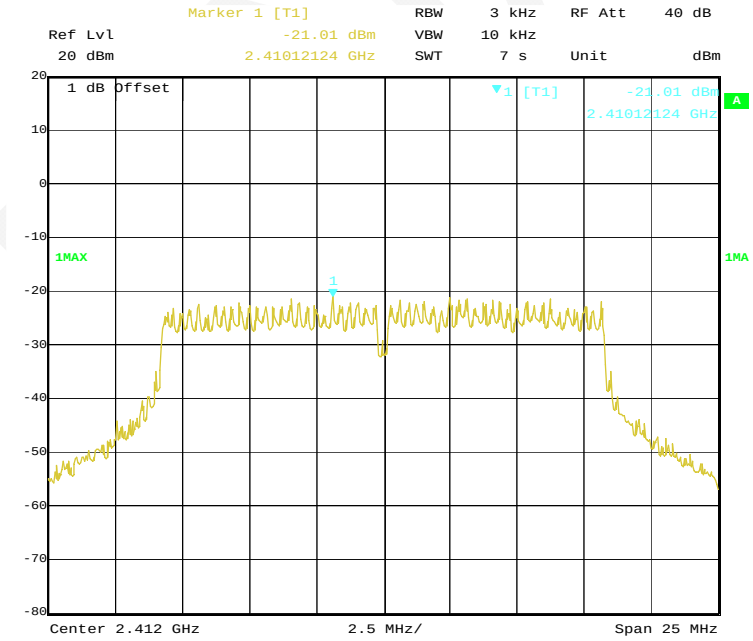
802.11b Middle Channel



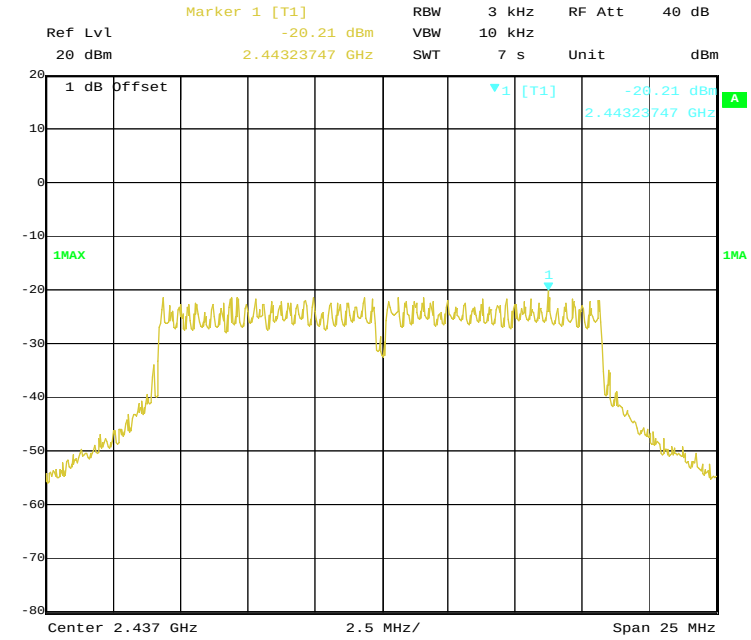
802.11b High Channel



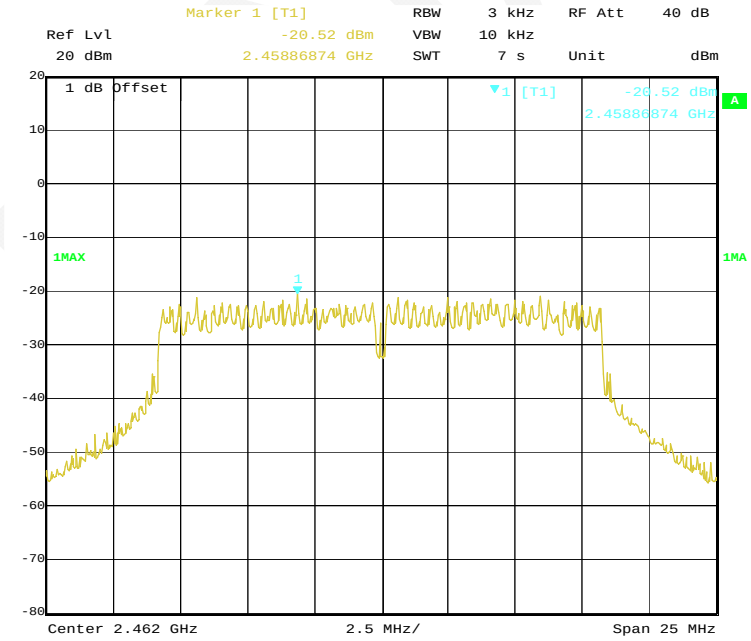
802.11g Low Channel



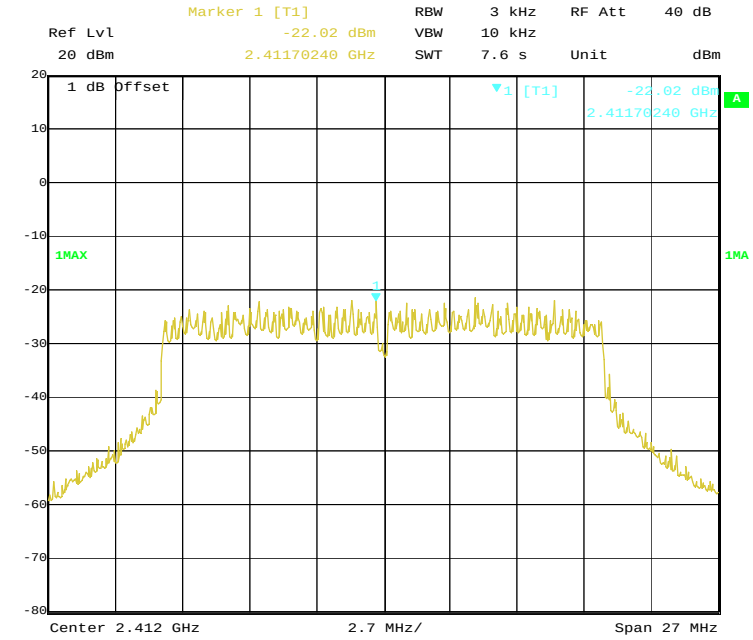
802.11g Middle Channel



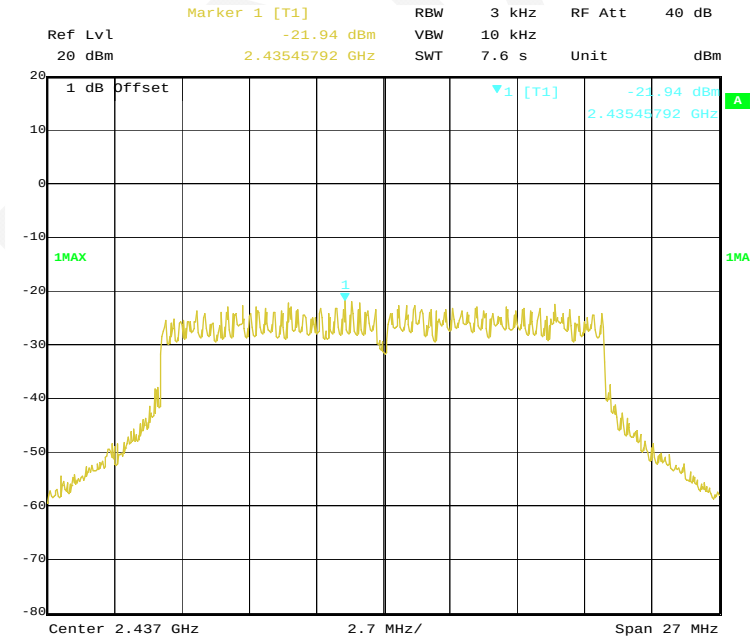
802.11g High Channel



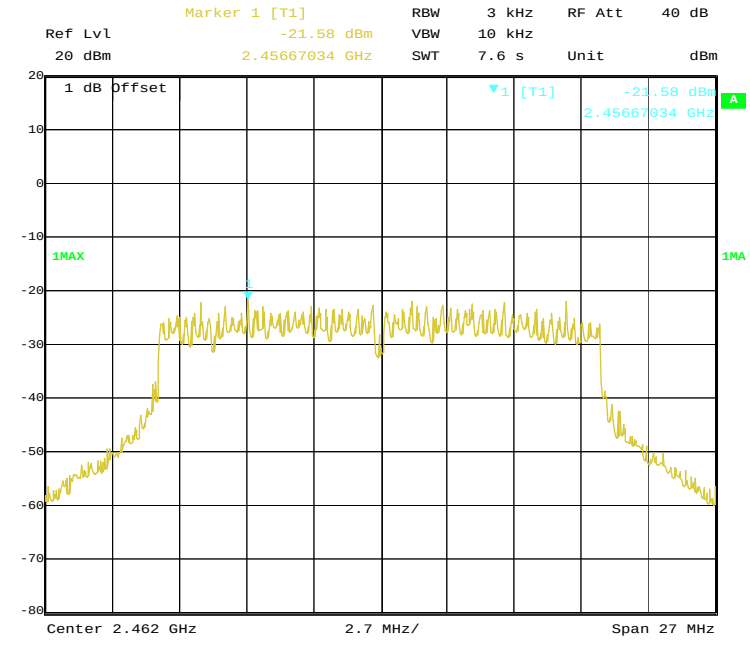
802.11n-HT20 Low Channel



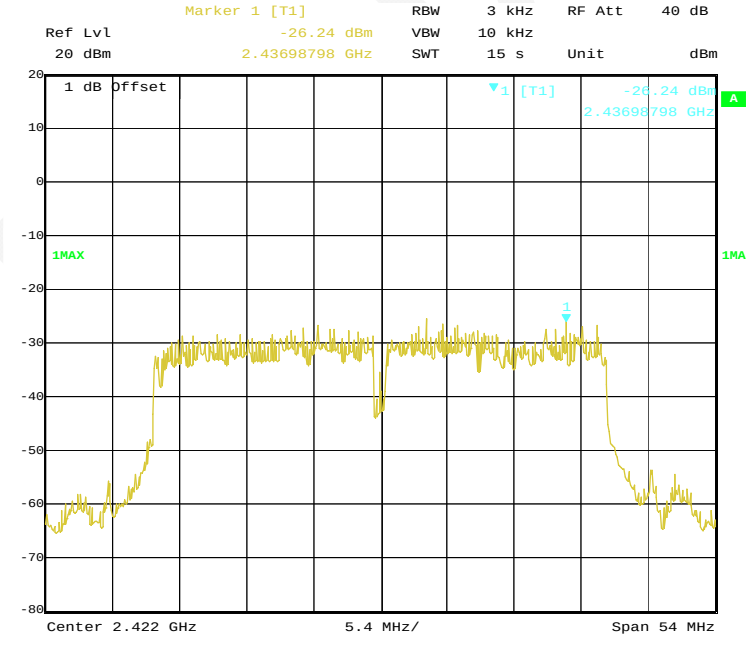
802.11n-HT20 Middle Channel



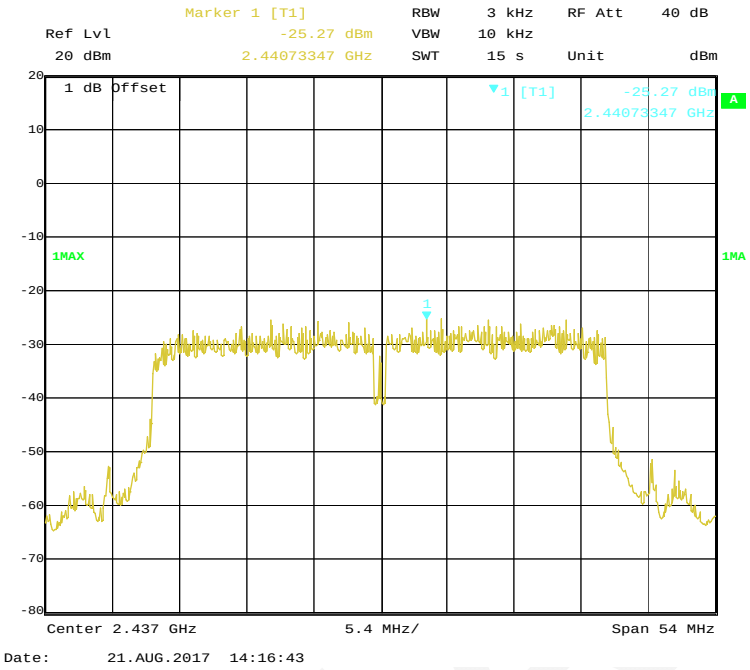
802.11n-HT20 High Channel



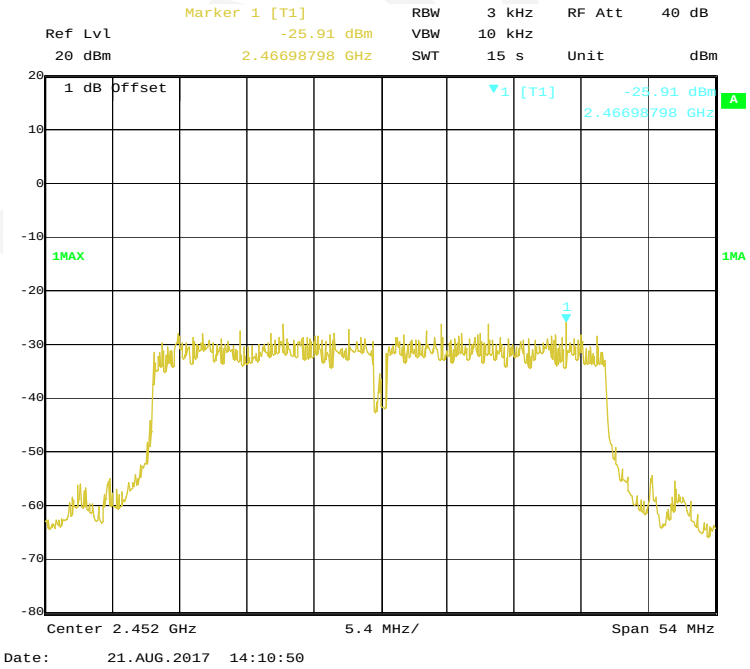
802.11n-HT40 Low Channel



802.11n-HT40 Middle Channel



802.11n-HT40 High Channel



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