FCC PART 15.247

TEST REPORT

For

Shanghai Xiaoyi Technology Co., Ltd.

6F, Building E, No.2889, Jinke Road, Shanghai, China

FCC ID:2AFIB-YHS3017

Report Type:	Product Type:
Original Report	YI Outdoor Camera 1080p

Test Engineer:	Chris Wang
Report Number:	RSHA170814011-00A
Report Date:	2017-09-04
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	Shanghai Xiaoyi Technology Co., Ltd.
Tested Model	YHS.3017
Product Type	YI Outdoor Camera 1080p
Dimension	132.42mm(H)×70 mm(D)
Power Supply	DC 5.0V from adapter

Adapter Information:
Model: A8-501000
Input: AC100-240 V 50/60Hz 0.2A
Output:5.0V, 1.0A

**All measurement and test data in this report was gathered from production sample serial number: 20170814012. (Assigned by the BACL. The EUT supplied by the applicant was received on 2017-08-14)*

Objective

This report is prepared on behalf of Shanghai Xiaoyi 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)

N/A

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

Test channel list is as below,

for 802.11b, 802.11g and 802.11n-HT20 mode, EUT was tested with Channel 1, 6 and 11;

for 802.11n-HT40 mode, EUT was tested with Channel 3, 6 and 9.

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	/	/

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

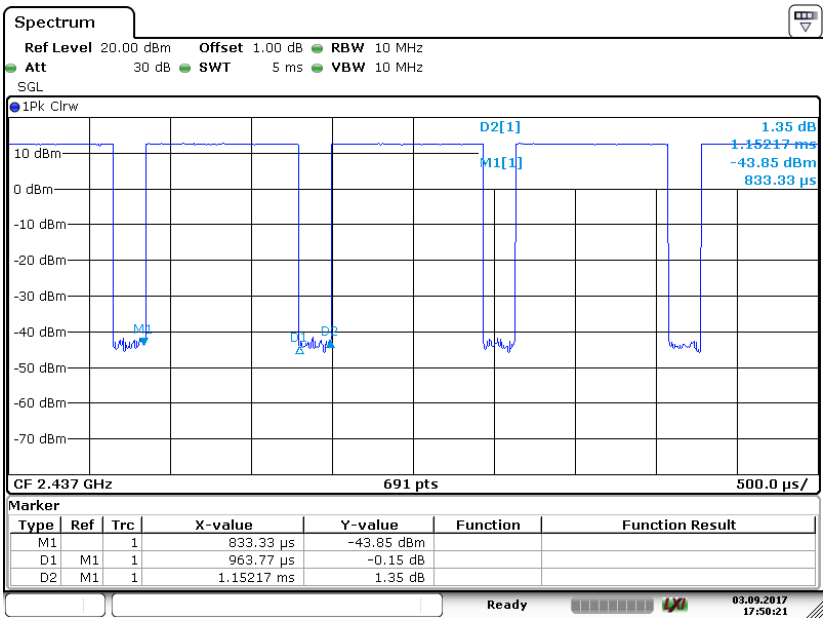
RF test tool: Secure CRT

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

Mode	Data rate	Power level
802.11b	1 Mbps	2
802.11g	6 Mbps	2
802.11n-HT20	MCS0	2
802.11n-HT40	MCS0	2

Duty Cycle:

802.11b Mode Middle Channel



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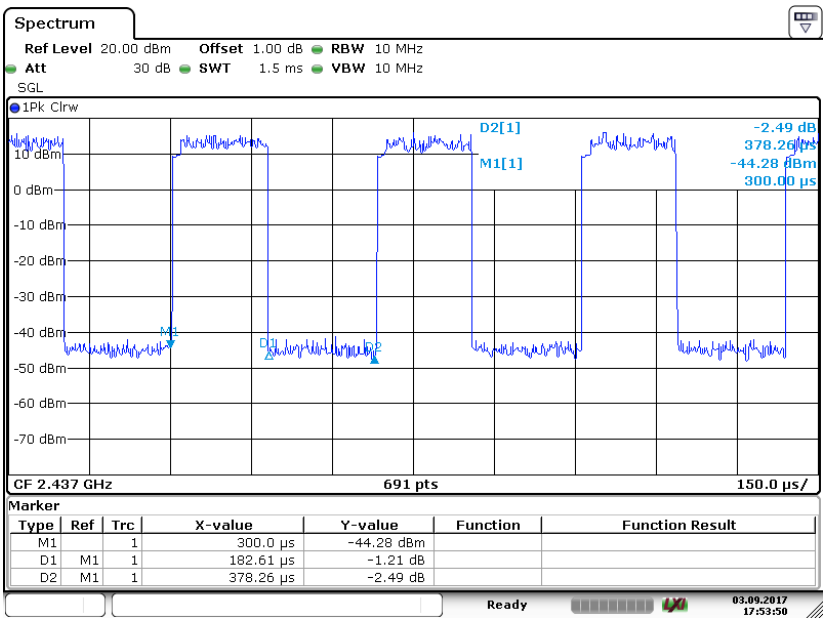
802.11g Mode Middle Channel



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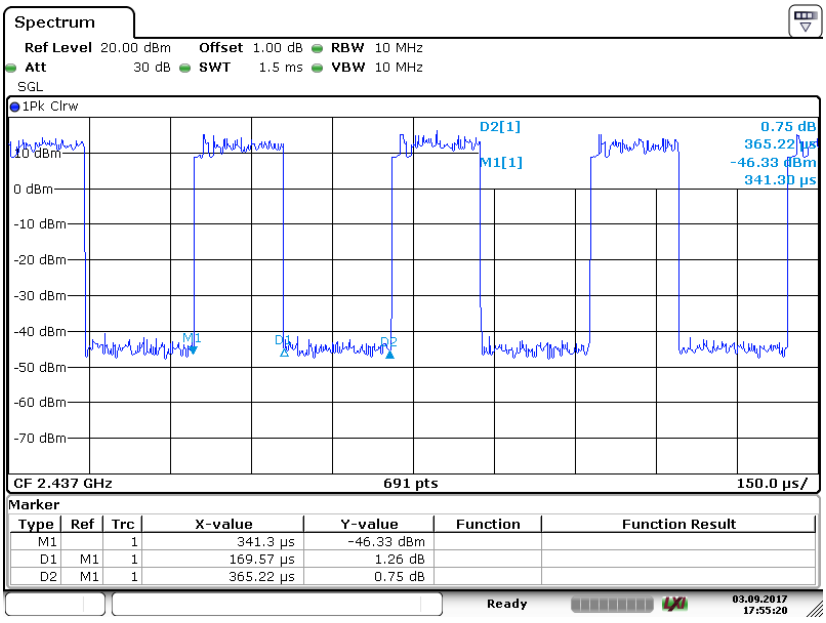
802.11n-HT20 Mode Middle Channel



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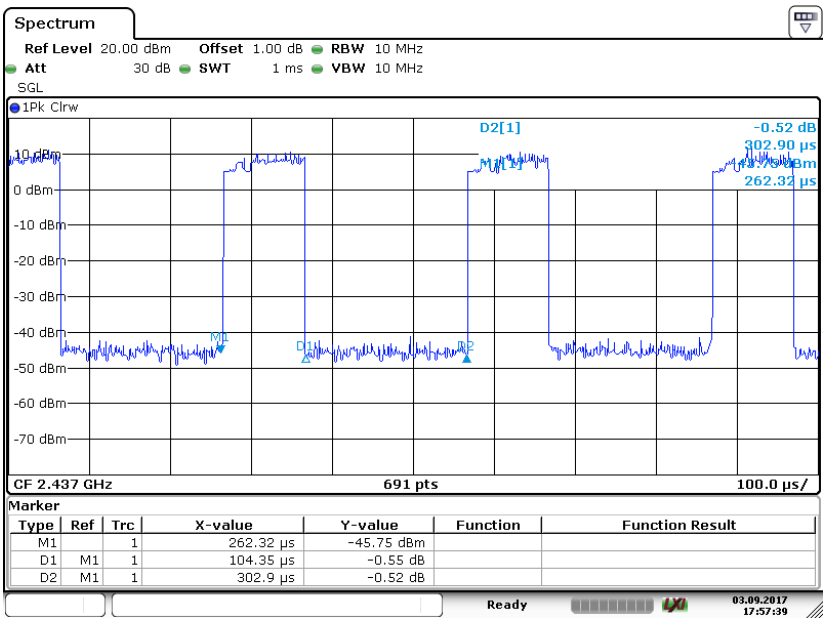
802.11n-HT40 Mode Middle Channel



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Mode	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	10log(1/x)
802.11b	83.68	964	1.04	3kHz	0.77
802.11g	48.41	183	5.46	10kHz	3.15
802.11n-HT20	46.58	170	5.88	10kHz	3.32
802.11n-HT40	34.32	104	9.62	10kHz	4.64

Support Equipment List and Details

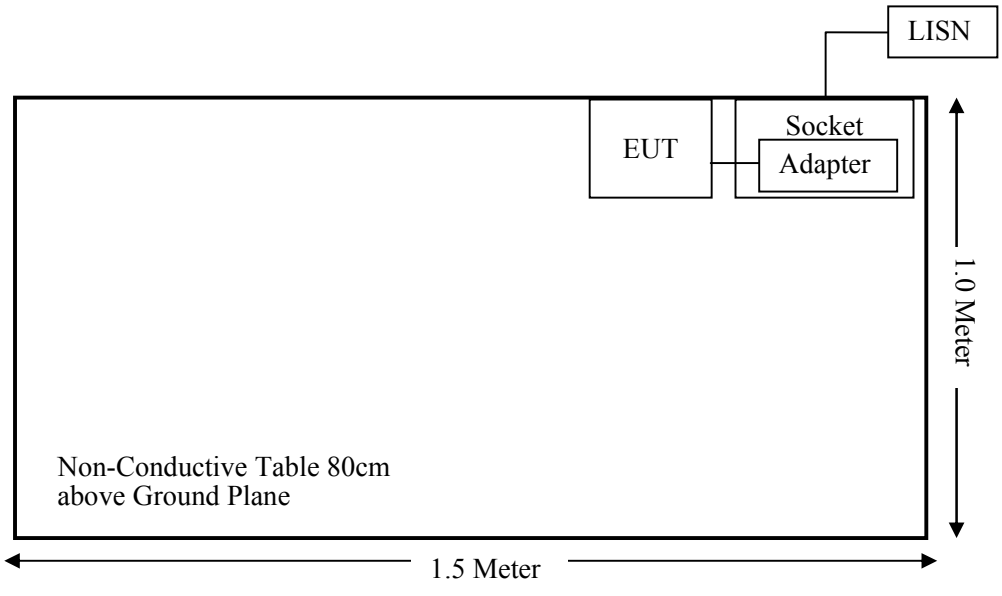
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

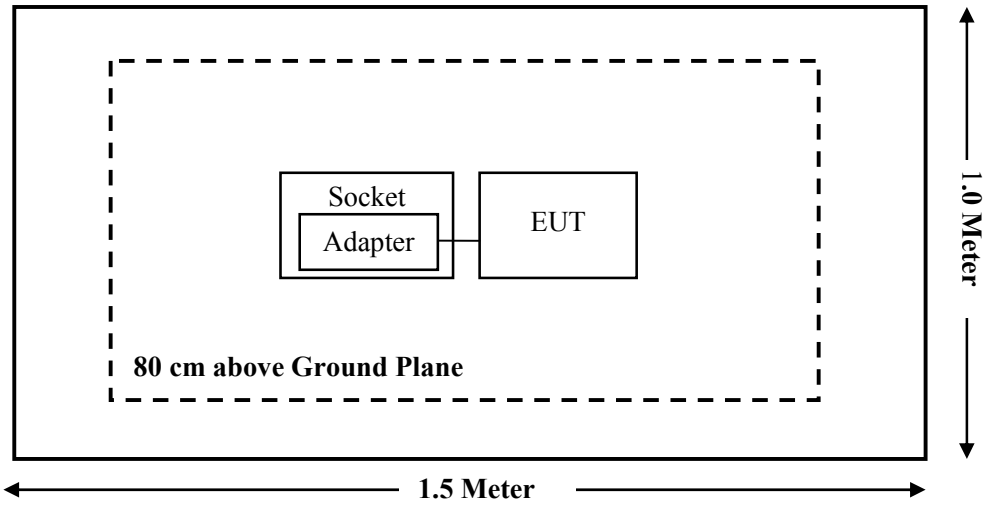
Cable Description	Shielding Type	Length (m)	From Port	To
/	/	/	/	/

Block Diagram of Test Setup

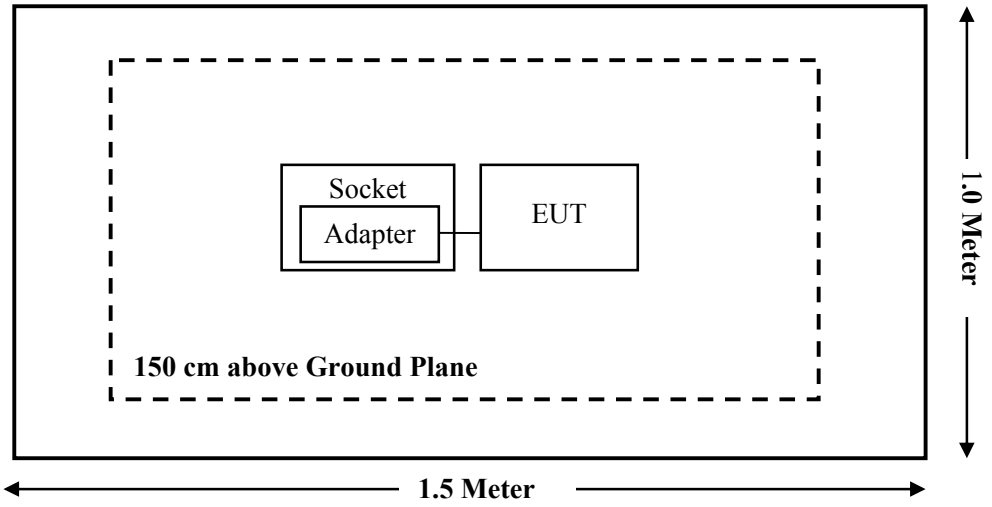
For Conducted Emissions:



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
Xiaoyi	RF Cable	N/A	N/A	2017-09-03	2018-09-02
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		Target Output Power		Evaluation Distance	Power Density	MPE Limit
	(MHz)	(dBi)	(numeric)	(dBm)	(mW)	(cm)	(mW/cm^2)	(mW/cm^2)
802.11b	2412~2462	3.00	2.00	17.00	50.12	20	0.0199	1
802.11g		3.00	2.00	18.50	70.79	20	0.0281	1
802.11 n-HT20		3.00	2.00	18.00	63.10	20	0.0250	1
802.11 n-HT40	2422-2452	3.00	2.00	17.50	56.23	20	0.0223	1

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 an internal integrated antenna arrangement for Wi-Fi, which the antenna gain is 3.0dBi; fulfill the requirement of this section. Please refer to the EUT photos.

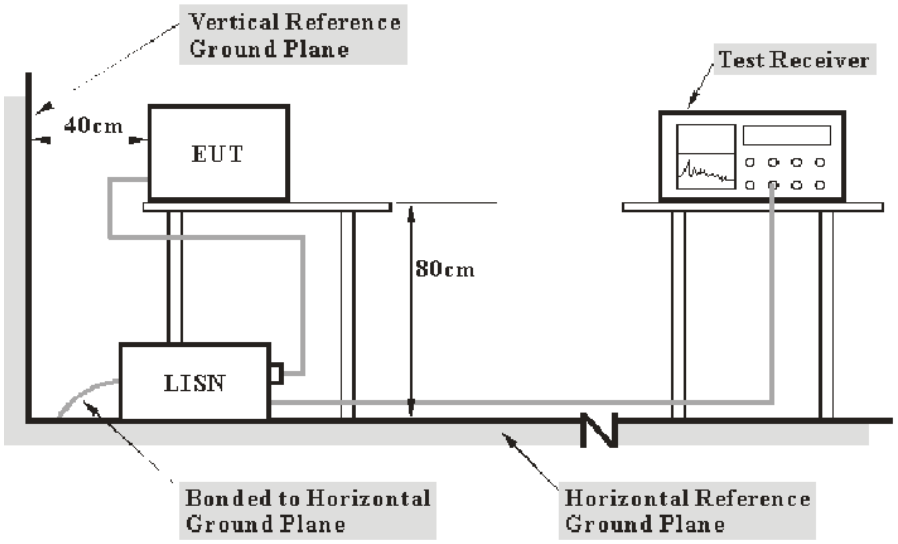
Result: Compliance.

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

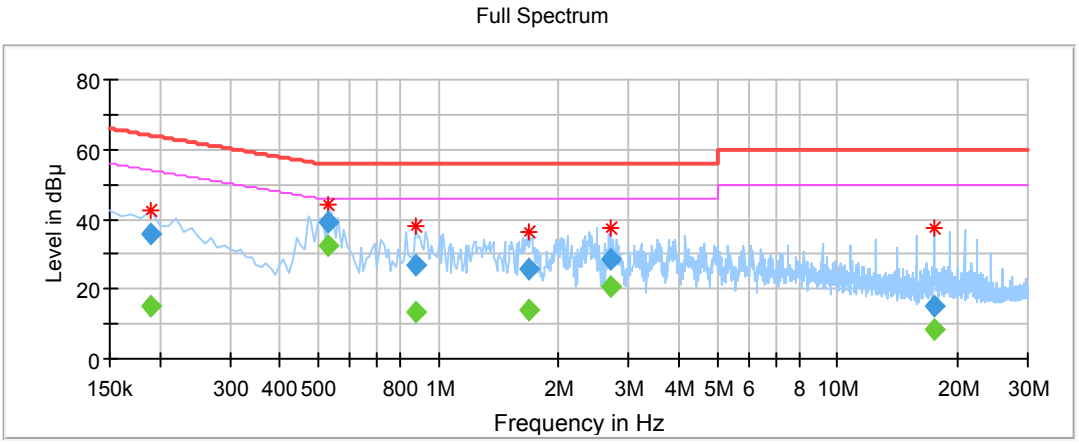
Environmental Conditions

Temperature:	24.5 ℃
Relative Humidity:	51 %
ATM Pressure:	101.2 kPa

The testing was performed by Chris Wang on 2017-09-03.

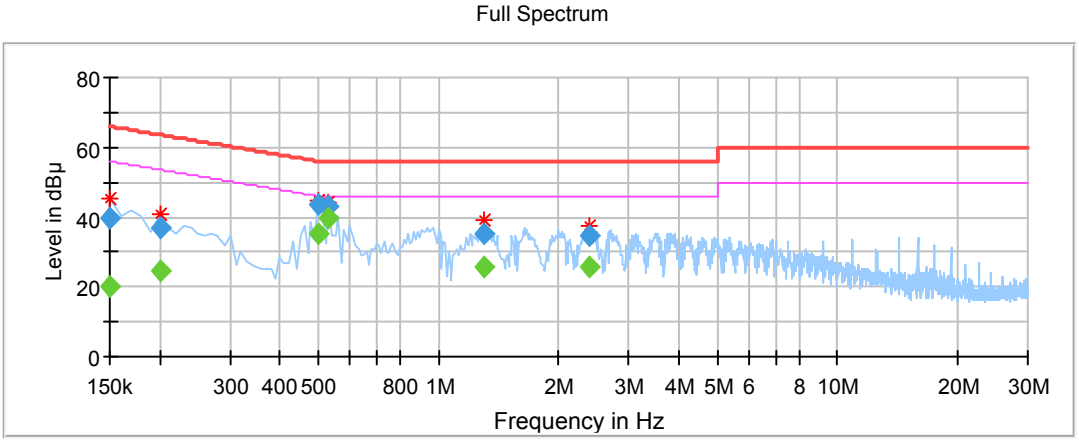
EUT operation mode: Transmitting in 802.11g mode high channel. (Worst case)

AC 120V/60 Hz, Line



Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dB µ V)	Margin (dB)	Comment
0.190000	---	15.11	9.000	L1	16.1	54.04	38.93	Compliance
0.190000	35.55	---	9.000	L1	16.1	64.04	28.49	Compliance
0.530000	---	32.26	9.000	L1	16.1	46.00	13.74	Compliance
0.530000	39.24	---	9.000	L1	16.1	56.00	16.76	Compliance
0.880000	---	13.37	9.000	L1	15.9	46.00	32.63	Compliance
0.880000	26.80	---	9.000	L1	15.9	56.00	29.20	Compliance
1.680000	---	13.91	9.000	L1	15.9	46.00	32.09	Compliance
1.680000	25.68	---	9.000	L1	15.9	56.00	30.32	Compliance
2.700000	---	20.57	9.000	L1	15.9	46.00	25.43	Compliance
2.700000	28.54	---	9.000	L1	15.9	56.00	27.46	Compliance
17.490000	---	8.52	9.000	L1	16.3	50.00	41.48	Compliance
17.490000	15.35	---	9.000	L1	16.3	60.00	44.65	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	QuasiPeak (dB µ V)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Limit (dB µ V)	Margin (dB)	Comment
0.150000	---	20.16	9.000	N	16.1	56.00	35.84	Compliance
0.150000	39.97	---	9.000	N	16.1	66.00	26.03	Compliance
0.200000	---	24.59	9.000	N	16.1	53.61	29.02	Compliance
0.200000	36.82	---	9.000	N	16.1	63.61	26.79	Compliance
0.500000	---	35.36	9.000	N	16.1	46.00	10.64	Compliance
0.500000	43.78	---	9.000	N	16.1	56.00	12.22	Compliance
0.530000	---	39.70	9.000	N	16.1	46.00	6.30	Compliance
0.530000	43.28	---	9.000	N	16.1	56.00	12.72	Compliance
1.300000	---	25.49	9.000	N	15.9	46.00	20.51	Compliance
1.300000	35.34	---	9.000	N	15.9	56.00	20.66	Compliance
2.400000	---	25.66	9.000	N	15.9	46.00	20.34	Compliance
2.400000	34.78	---	9.000	N	15.9	56.00	21.22	Compliance

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

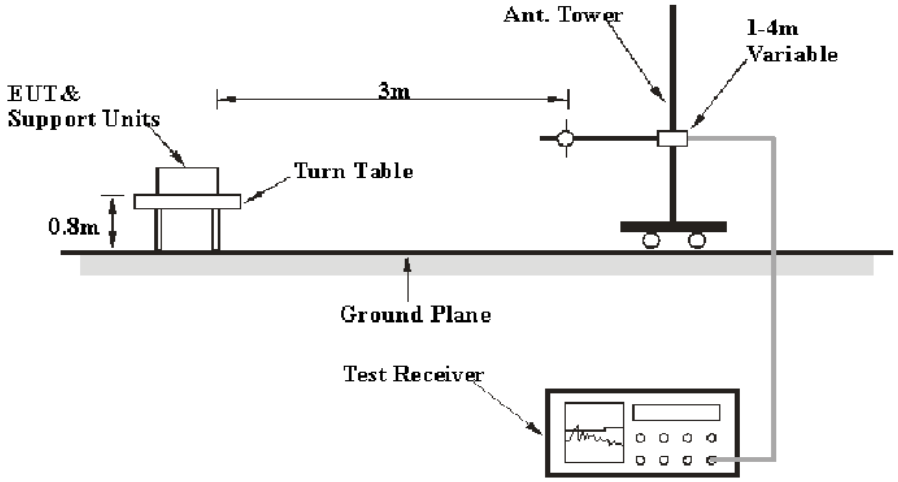
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

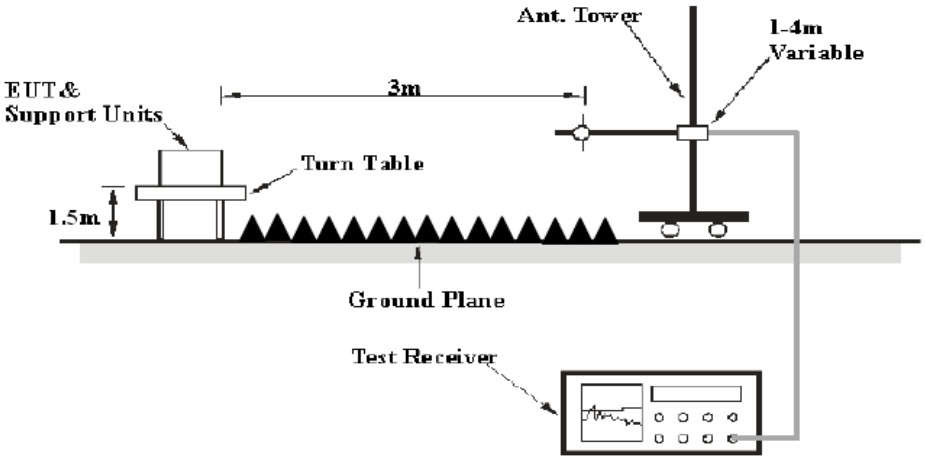
FCC §15.247 (d); §15.209; §15.205;

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:	24.8 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2017-09-03.

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)									
31.21	26.87	QP	90	139	V	-5.20	21.67	40	18.33
2412.00	108.63	PK	4	199	V	-4.90	103.73	/	/
2412.00	103.86	Ave	4	199	V	-4.90	98.96	/	/
2412.00	107.77	PK	165	164	H	-4.90	102.87	/	/
2412.00	102.01	Ave	165	164	H	-4.90	97.11	/	/
2390.00	51.26	PK	95	189	V	-4.96	46.30	74	27.70
2390.00	34.59	Ave	95	189	V	-4.96	29.63	54	24.37
2311.00	48.73	PK	316	207	H	-5.18	43.55	74	30.45
2311.00	34.41	Ave	316	207	H	-5.18	29.23	54	24.77
3249.30	56.05	PK	33	187	V	-1.48	54.57	74	19.43
3249.30	52.09	Ave	33	187	V	-1.48	50.61	54	3.39
4824.00	49.72	PK	41	145	V	2.52	52.24	74	21.76
4824.00	37.74	Ave	41	145	V	2.52	40.26	54	13.74
7236.00	38.01	PK	170	132	V	9.83	47.84	74	26.16
7236.00	24.85	Ave	170	132	V	9.83	34.68	54	19.32

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)									
31.21	26.94	QP	255	122	V	-5.20	21.74	40	18.26
2437.00	108.50	PK	321	103	V	-4.83	103.67	/	/
2437.00	103.75	Ave	321	103	V	-4.83	98.92	/	/
2437.00	107.70	PK	236	156	H	-4.83	102.87	/	/
2437.00	102.57	Ave	236	156	H	-4.83	97.74	/	/
1597.00	48.53	PK	161	131	V	-7.66	40.87	74	33.13
1597.00	32.07	Ave	161	131	V	-7.66	24.41	54	29.59
3249.30	56.17	PK	135	151	V	-1.48	54.69	74	19.31
3249.30	52.24	Ave	135	151	V	-1.48	50.76	54	3.24
4874.00	49.89	PK	99	157	V	2.63	52.52	74	21.48
4874.00	37.89	Ave	99	157	V	2.63	40.52	54	13.48
6563.06	38.72	PK	247	123	H	8.42	47.14	74	26.86
6563.06	26.78	Ave	247	123	H	8.42	35.20	54	18.80
7311.00	37.92	PK	359	219	V	9.95	47.87	74	26.13
7311.00	24.70	Ave	359	219	V	9.95	34.65	54	19.35
High Channel (2462 MHz)									
31.21	26.97	QP	233	210	V	-5.20	21.77	40	18.23
2462.00	109.48	PK	184	179	V	-4.76	104.72	/	/
2462.00	104.57	Ave	184	179	V	-4.76	99.81	/	/
2462.00	108.58	PK	157	144	H	-4.76	103.82	/	/
2462.00	103.65	Ave	157	144	H	-4.76	98.89	/	/
2483.50	48.04	PK	322	246	V	-4.71	43.33	74	30.67
2483.50	32.57	Ave	322	246	V	-4.71	27.86	54	26.14
3249.30	56.13	PK	347	249	V	-1.48	54.65	74	19.35
3249.30	52.20	Ave	347	249	V	-1.48	50.72	54	3.28
4924.00	49.84	PK	80	112	V	2.74	52.58	74	21.42
4924.00	37.85	Ave	80	112	V	2.74	40.59	54	13.41
6563.06	38.75	PK	354	114	H	8.42	47.17	74	26.83
6563.06	26.80	Ave	354	114	H	8.42	35.22	54	18.78
7386.00	37.82	PK	202	234	V	10.06	47.88	74	26.12
7386.00	24.59	Ave	202	234	V	10.06	34.65	54	19.35

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)									
31.21	27.07	QP	247	218	V	-5.20	21.87	40	18.13
2412.00	106.57	PK	54	245	V	-4.90	101.67	/	/
2412.00	99.81	Ave	54	245	V	-4.90	94.91	/	/
2412.00	106.79	PK	255	168	H	-4.90	101.89	/	/
2412.00	99.03	Ave	255	168	H	-4.90	94.13	/	/
2390.00	59.94	PK	319	216	H	-4.96	54.98	74	19.02
2390.00	38.63	Ave	319	216	H	-4.96	33.67	54	20.33
2317.00	51.26	PK	28	222	V	-5.17	46.09	74	27.91
2317.00	35.17	Ave	28	222	V	-5.17	30.00	54	24.00
3249.30	57.77	PK	102	191	H	-1.48	56.29	74	17.71
3249.30	51.59	Ave	102	191	H	-1.48	50.11	54	3.89
4824.00	50.23	PK	1	239	H	2.52	52.75	74	21.25
4824.00	33.36	Ave	1	239	H	2.52	35.88	54	18.12
7236.00	36.48	PK	346	147	H	9.83	46.31	74	27.69
7236.00	24.53	Ave	346	147	H	9.83	34.36	54	19.64
Middle Channel (2437 MHz)									
31.21	26.95	QP	73	151	V	-5.20	21.75	40	18.25
2437.00	106.43	PK	109	147	V	-4.83	101.60	/	/
2437.00	99.17	Ave	109	147	V	-4.83	94.34	/	/
2437.00	106.70	PK	354	183	H	-4.83	101.87	/	/
2437.00	99.63	Ave	354	183	H	-4.83	94.80	/	/
1594.40	48.76	PK	30	119	V	-7.67	41.09	74	32.91
1594.40	33.96	Ave	30	119	V	-7.67	26.29	54	27.71
3249.30	57.81	PK	23	228	H	-1.48	56.33	74	17.67
3249.30	51.61	Ave	23	228	H	-1.48	50.13	54	3.87
4874.00	50.14	PK	10	110	H	2.63	52.77	74	21.23
4874.00	33.26	Ave	10	110	H	2.63	35.89	54	18.11
6660.97	39.45	PK	256	200	V	8.66	48.11	74	25.89
6660.97	27.24	Ave	256	200	V	8.66	35.90	54	18.10
7311.00	36.34	PK	14	187	H	9.95	46.29	74	27.71
7311.00	24.40	Ave	14	187	H	9.95	34.35	54	19.65

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)									
31.21	26.92	QP	224	179	V	-5.20	21.72	40	18.28
2462.00	107.40	PK	137	222	V	-4.76	102.64	/	/
2462.00	100.25	Ave	137	222	V	-4.76	95.49	/	/
2462.00	107.98	PK	261	109	H	-4.76	103.22	/	/
2462.00	100.92	Ave	261	109	H	-4.76	96.16	/	/
2483.50	62.78	PK	249	118	H	-4.71	58.07	74	15.93
2483.50	37.87	Ave	249	118	H	-4.71	33.16	54	20.84
3249.30	57.74	PK	283	157	H	-1.48	56.26	74	17.74
3249.30	51.56	Ave	283	157	H	-1.48	50.08	54	3.92
4924.00	50.07	PK	187	165	H	2.74	52.81	74	21.19
4924.00	33.19	Ave	187	165	H	2.74	35.93	54	18.07
6660.97	39.46	PK	287	191	V	8.66	48.12	74	25.88
6660.97	27.25	Ave	287	191	V	8.66	35.91	54	18.09
7386.00	36.28	PK	30	164	H	10.06	46.34	74	27.66
7386.00	24.33	Ave	30	164	H	10.06	34.39	54	19.61

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)									
31.21	26.88	QP	12	133	V	-5.20	21.68	40	18.32
2412.00	105.62	PK	81	189	V	-4.90	100.72	/	/
2412.00	97.56	Ave	81	189	V	-4.90	92.66	/	/
2412.00	105.73	PK	48	142	H	-4.90	100.83	/	/
2412.00	97.67	Ave	48	142	H	-4.90	92.77	/	/
2390.00	59.63	PK	18	243	H	-4.96	54.67	74	19.33
2390.00	37.60	Ave	18	243	H	-4.96	32.64	54	21.36
2317.30	51.08	PK	240	185	H	-5.17	45.91	74	28.09
2317.30	34.93	Ave	240	185	H	-5.17	29.76	54	24.24
3249.30	58.56	PK	232	159	V	-1.48	57.08	74	16.92
3249.30	51.94	Ave	232	159	V	-1.48	50.46	54	3.54
4824.00	48.19	PK	68	241	H	2.52	50.71	74	23.29
4824.00	32.36	Ave	68	241	H	2.52	34.88	54	19.12
7236.00	36.95	PK	74	167	H	9.83	46.78	74	27.22
7236.00	24.52	Ave	74	167	H	9.83	34.35	54	19.65

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)									
31.21	26.93	QP	201	191	V	-5.20	21.73	40	18.27
2437.00	107.04	PK	228	142	V	-4.83	102.21	/	/
2437.00	99.99	Ave	228	142	V	-4.83	95.16	/	/
2437.00	107.17	PK	235	115	H	-4.83	102.34	/	/
2437.00	100.10	Ave	235	115	H	-4.83	95.27	/	/
1599.07	50.31	PK	336	156	H	-7.65	42.66	74	31.34
1599.07	31.07	Ave	336	156	H	-7.65	23.42	54	30.58
3249.30	58.61	PK	53	104	V	-1.48	57.13	74	16.87
3249.30	52.00	Ave	53	104	V	-1.48	50.52	54	3.48
4874.00	48.11	PK	210	241	H	2.63	50.74	74	23.26
4874.00	32.26	Ave	210	241	H	2.63	34.89	54	19.11
6655.83	39.73	PK	304	155	H	8.65	48.38	74	25.62
6655.83	27.27	Ave	304	155	H	8.65	35.92	54	18.08
7311.00	36.85	PK	108	225	H	9.95	46.80	74	27.20
7311.00	24.41	Ave	108	225	H	9.95	34.36	54	19.64
High Channel (2462 MHz)									
31.21	26.99	QP	145	156	V	-5.20	21.79	40	18.21
2462.00	107.43	PK	140	200	V	-4.76	102.67	/	/
2462.00	99.47	Ave	140	200	V	-4.76	94.71	/	/
2462.00	107.56	PK	145	195	H	-4.76	102.80	/	/
2462.00	99.57	Ave	145	195	H	-4.76	94.81	/	/
2483.50	53.91	PK	344	128	H	-4.71	49.20	74	24.80
2483.50	34.15	Ave	344	128	H	-4.71	29.44	54	24.56
3249.30	58.53	PK	194	145	H	-1.48	57.05	74	16.95
3249.30	51.91	Ave	194	145	H	-1.48	50.43	54	3.57
4924.00	48.03	PK	46	172	H	2.74	50.77	74	23.23
4924.00	32.18	Ave	46	172	H	2.74	34.92	54	19.08
6655.83	39.71	PK	46	210	V	8.65	48.36	74	25.64
6655.83	27.26	Ave	46	210	V	8.65	35.91	54	18.09
7386.00	36.78	PK	199	170	H	10.06	46.84	74	27.16
7386.00	24.35	Ave	199	170	H	10.06	34.41	54	19.59

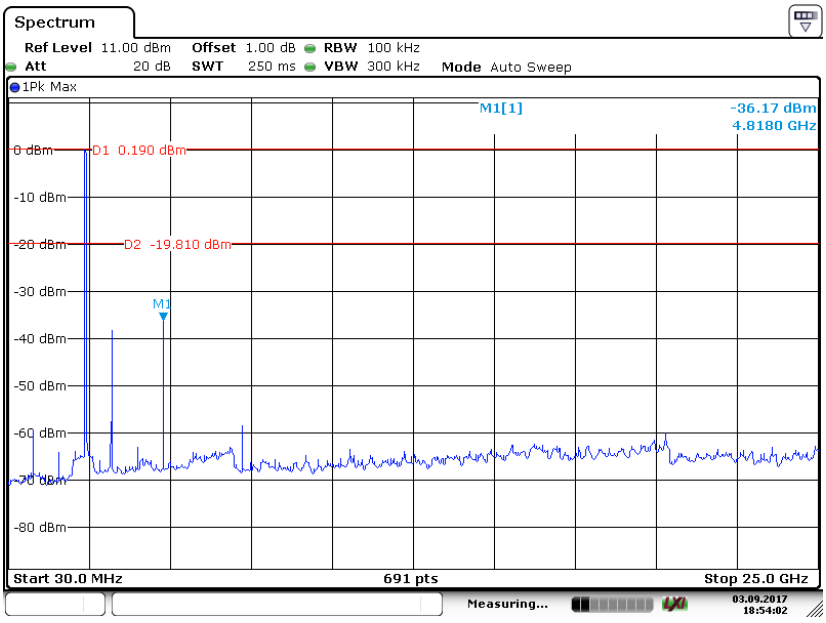
802.11n-HT40 Mode:

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)									
31.21	26.92	QP	66	244	V	-5.20	21.72	40	18.28
2422.00	102.56	PK	134	185	V	-4.88	97.68	/	/
2422.00	94.19	Ave	134	185	V	-4.88	89.31	/	/
2422.00	102.67	PK	136	133	H	-4.88	97.79	/	/
2422.00	94.25	Ave	136	133	H	-4.88	89.37	/	/
2390.00	64.41	PK	243	212	H	-4.96	59.45	74	14.55
2390.00	43.70	Ave	243	212	H	-4.96	38.74	54	15.26
2384.97	66.36	PK	159	102	V	-4.98	61.38	74	12.62
2384.97	44.17	Ave	159	102	V	-4.98	39.19	54	14.81
3249.30	57.76	PK	156	135	H	-1.48	56.28	74	17.72
3249.30	50.04	Ave	156	135	H	-1.48	48.56	54	5.44
4844.00	47.61	PK	91	133	H	2.56	50.17	74	23.83
4844.00	31.26	Ave	91	133	H	2.56	33.82	54	20.18
7266.00	37.25	PK	196	108	H	9.88	47.13	74	26.87
7266.00	24.50	Ave	196	108	H	9.88	34.38	54	19.62
Middle Channel (2437 MHz)									
31.21	26.97	QP	280	238	V	-5.20	21.77	40	18.23
2437.00	102.62	PK	128	121	V	-4.83	97.79	/	/
2437.00	94.20	Ave	128	121	V	-4.83	89.37	/	/
2437.00	102.69	PK	330	103	H	-4.83	97.86	/	/
2437.00	93.28	Ave	330	103	H	-4.83	88.45	/	/
1593.93	49.34	PK	289	216	H	-7.67	41.67	74	32.33
1593.93	31.81	Ave	289	216	H	-7.67	24.14	54	29.86
3249.30	57.72	PK	69	169	H	-1.48	56.24	74	17.76
3249.30	50.00	Ave	69	169	H	-1.48	48.52	54	5.48
4874.00	47.56	PK	109	203	H	2.63	50.19	74	23.81
4874.00	31.15	Ave	109	203	H	2.63	33.78	54	20.22
6637.67	39.27	PK	307	220	V	8.60	47.87	74	26.13
6637.67	27.50	Ave	307	220	V	8.60	36.10	54	17.90
7311.00	37.19	PK	318	126	H	9.95	47.14	74	26.86
7311.00	24.44	Ave	318	126	H	9.95	34.39	54	19.61

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)									
31.21	26.91	QP	250	194	V	-5.20	21.71	40	18.29
2452.00	102.28	PK	340	226	V	-4.79	97.49	/	/
2452.00	94.84	Ave	340	226	V	-4.79	90.05	/	/
2452.00	102.36	PK	282	153	H	-4.79	97.57	/	/
2452.00	94.90	Ave	282	153	H	-4.79	90.11	/	/
2483.50	56.05	PK	54	133	H	-4.71	51.34	74	22.66
2483.50	36.74	Ave	54	133	H	-4.71	32.03	54	21.97
3249.30	57.72	PK	57	181	H	-1.48	56.24	74	17.76
3249.30	49.99	Ave	57	181	H	-1.48	48.51	54	5.49
4904.00	47.46	PK	315	160	H	2.70	50.16	74	23.84
4904.00	31.04	Ave	315	160	H	2.70	33.74	54	20.26
6637.67	39.28	PK	257	111	V	8.60	47.88	74	26.12
6637.67	27.53	Ave	257	111	V	8.60	36.13	54	17.87
7356.00	37.11	PK	109	110	H	10.01	47.12	74	26.88
7356.00	24.36	Ave	109	110	H	10.01	34.37	54	19.63

Conducted Spurious Emissions at Antenna Port

802.11b Low Channel



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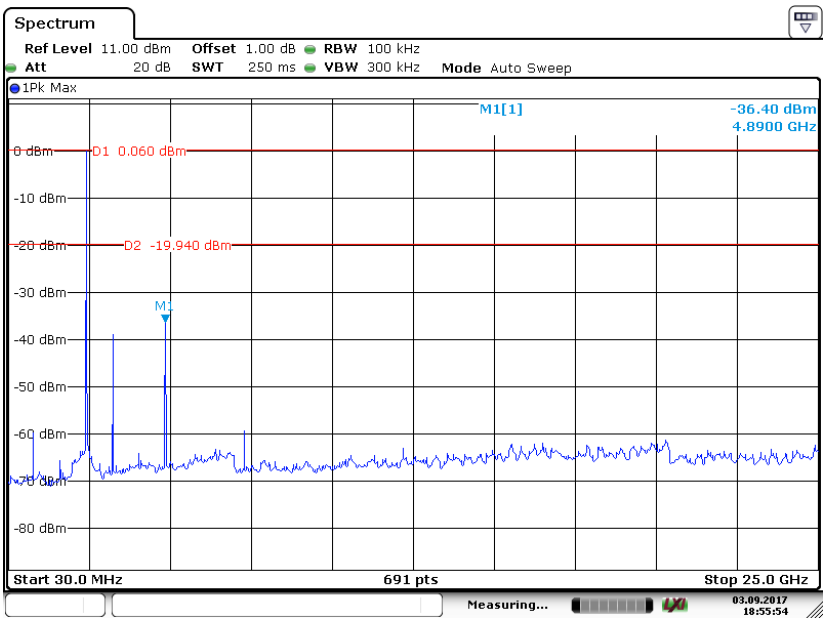
802.11b Middle Channel



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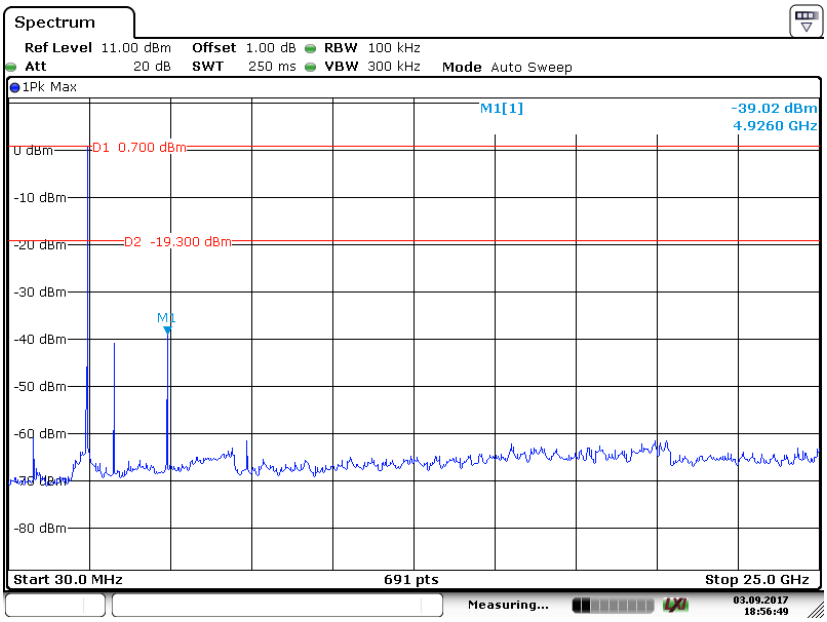
802.11b High Channel



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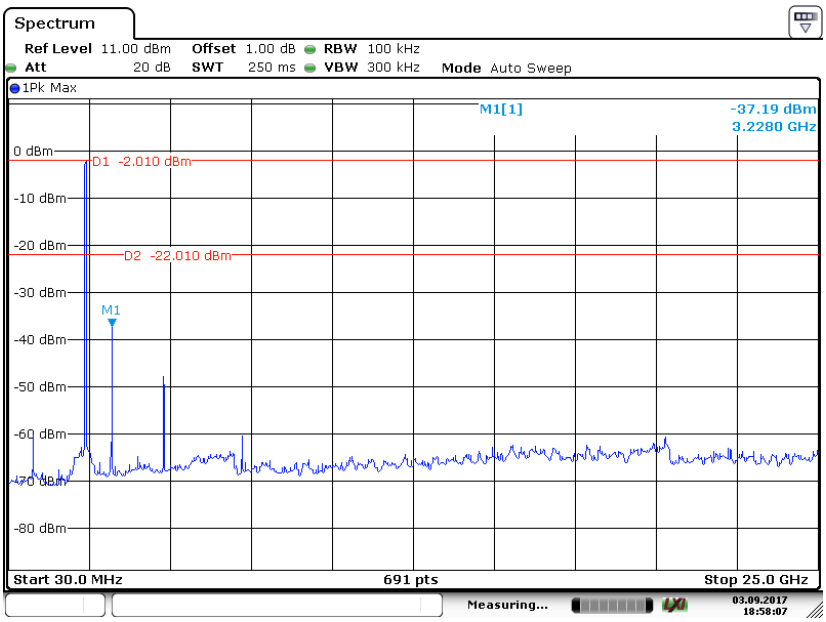
802.11g Low Channel



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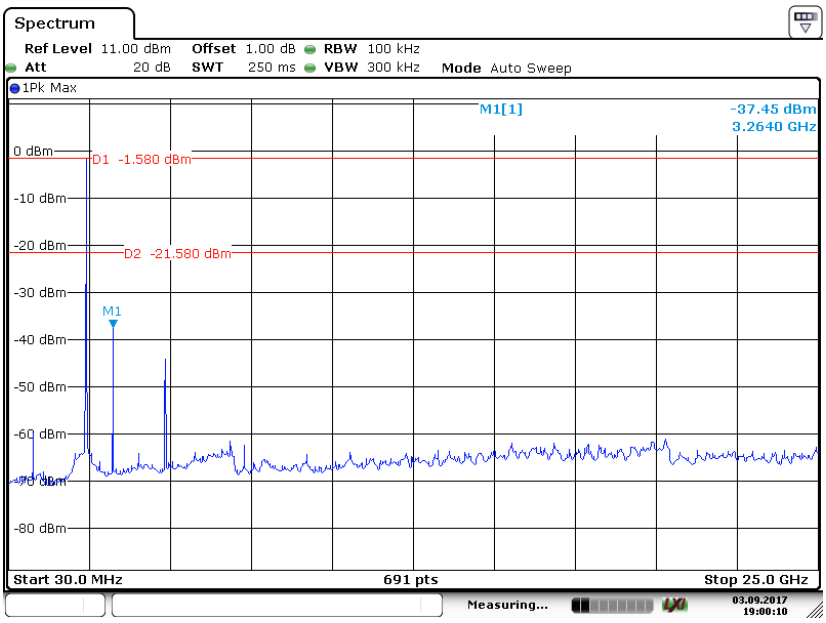
802.11g Middle Channel



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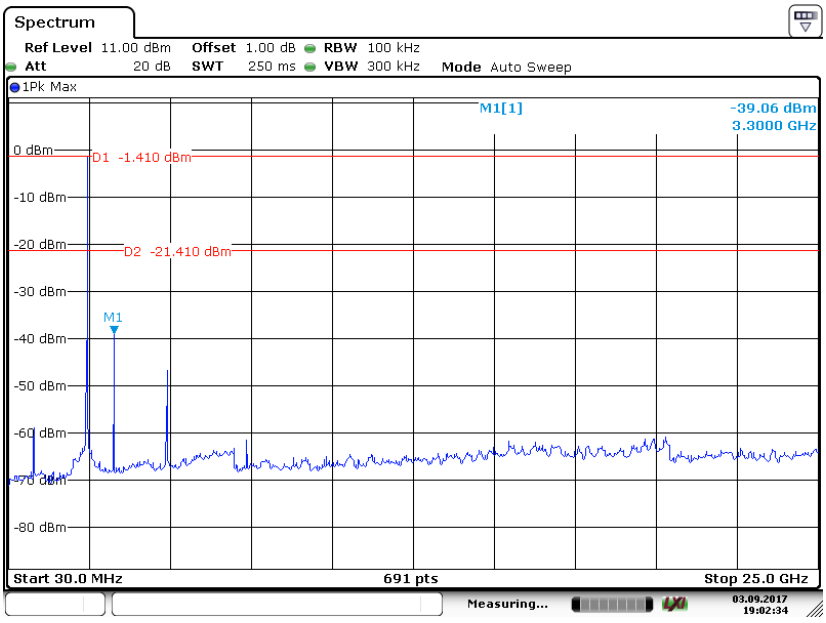

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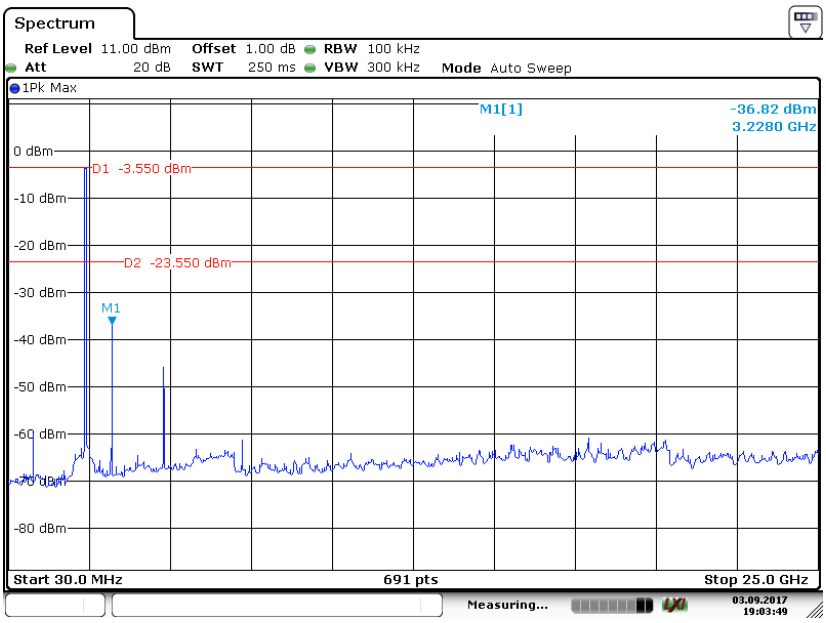
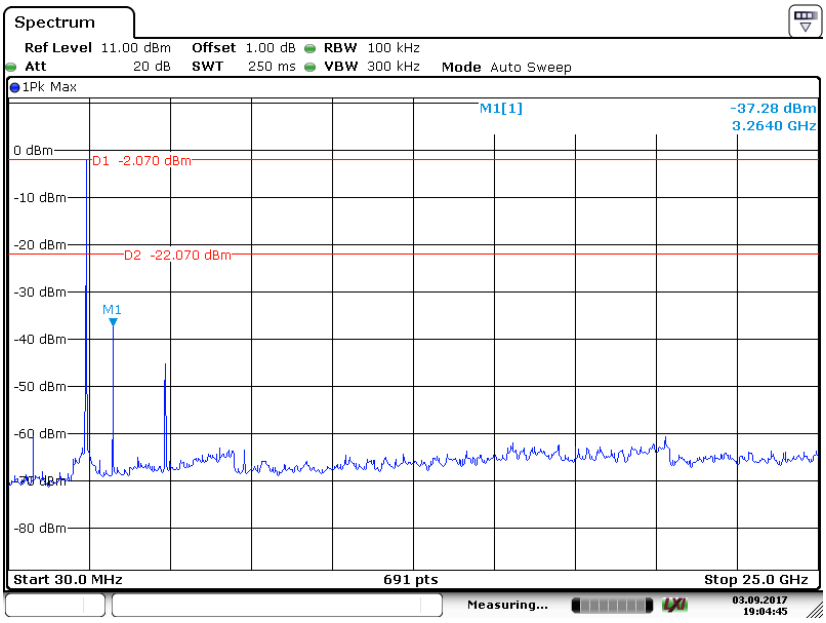
802.11n-HT20 Low Channel



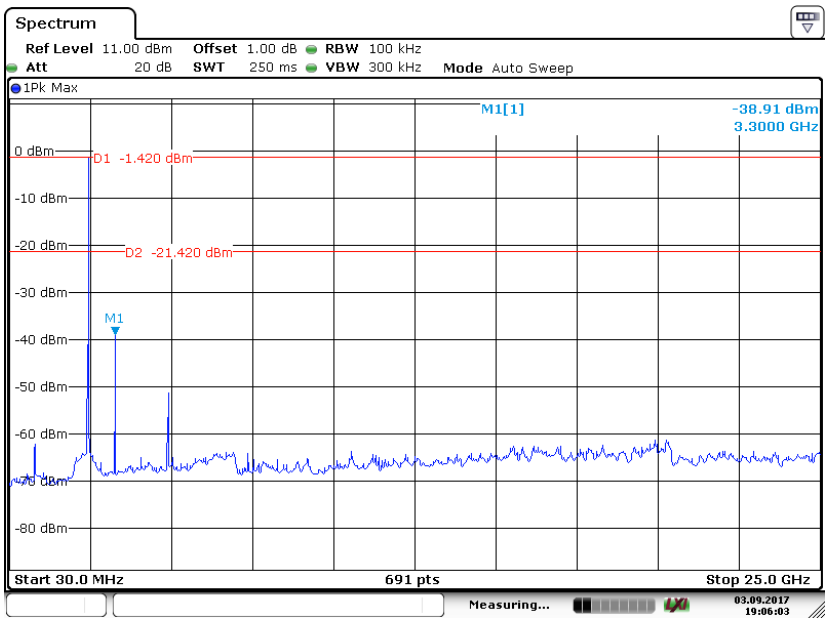
Date: 3.SEP.2017 19:03:49

802.11n-HT20 Middle Channel



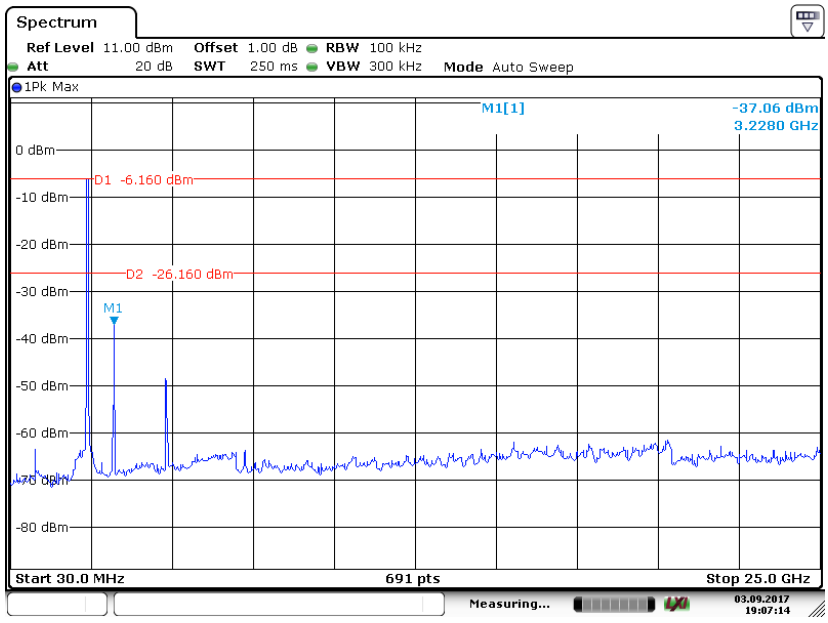
Date: 3.SEP.2017 19:04:46

802.11n-HT20 High Channel



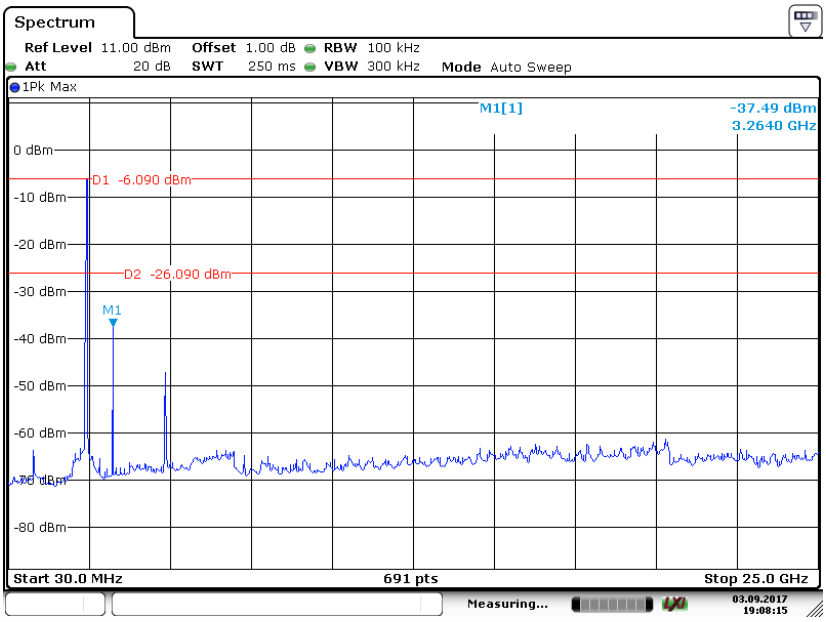
Date: 3.SEP.2017 19:06:02

802.11n-HT40 Low Channel



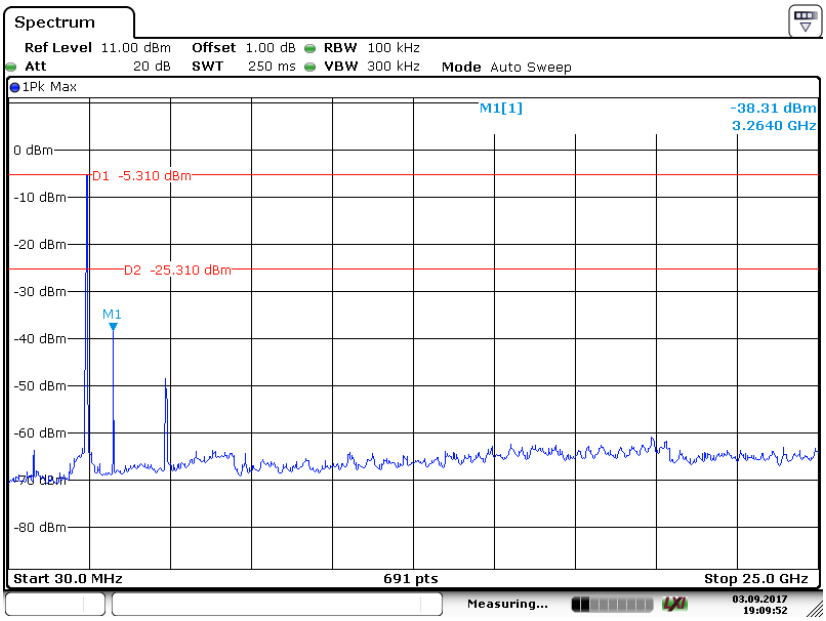
Date: 3.SEP.2017 19:07:14

802.11n-HT40 Middle Channel



Date: 3.SEP.2017 19:08:16

802.11n-HT40 High Channel



Date: 3.SEP.2017 19:09:52

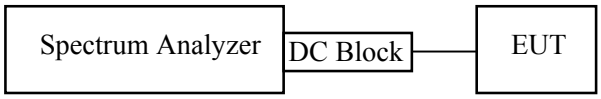
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

Applicable Standard

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Data

Environmental Conditions

Temperature:	24.8 ℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

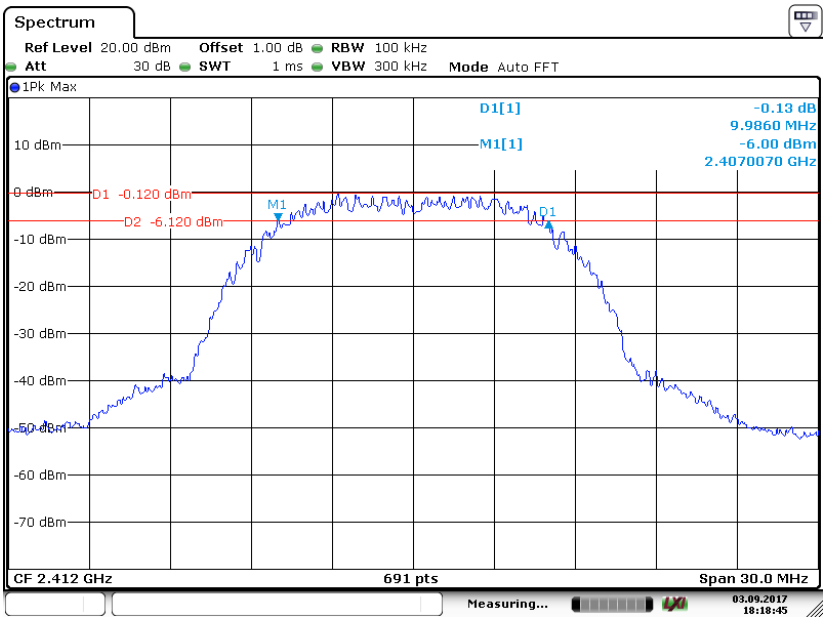
The testing was performed by Chris Wang on 2017-09-03.

EUT operation mode: Transmitting

Test Result: Pass.

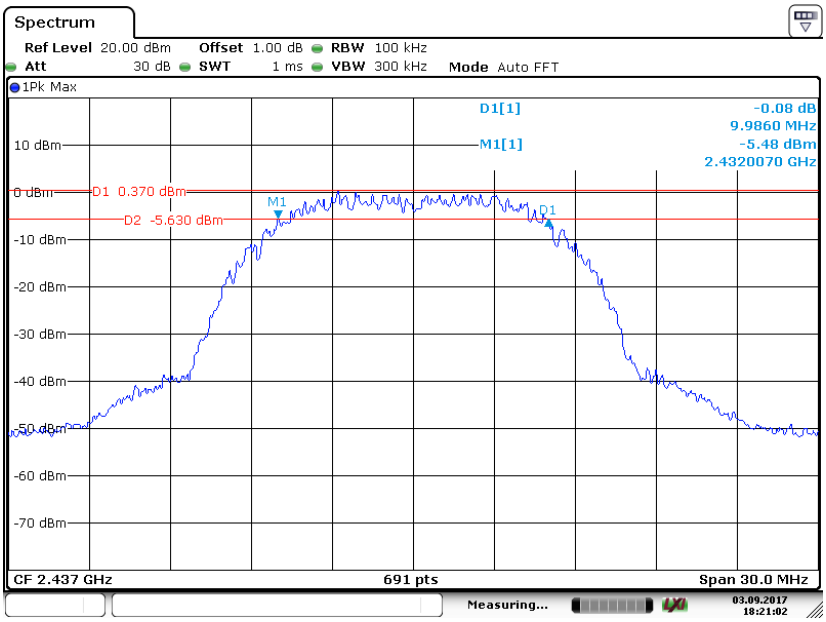
Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b mode			
Low	2412	9.986	≥0.5
Middle	2437	9.986	≥0.5
High	2462	9.986	≥0.5
802.11g mode			
Low	2412	16.541	≥0.5
Middle	2437	16.541	≥0.5
High	2462	16.541	≥0.5
802.11n-HT20 mode			
Low	2412	17.670	≥0.5
Middle	2437	17.670	≥0.5
High	2462	17.670	≥0.5
802.11n-HT40 mode			
Low	2422	36.469	≥0.5
Middle	2437	36.469	≥0.5
High	2452	36.469	≥0.5

802.11b Low Channel



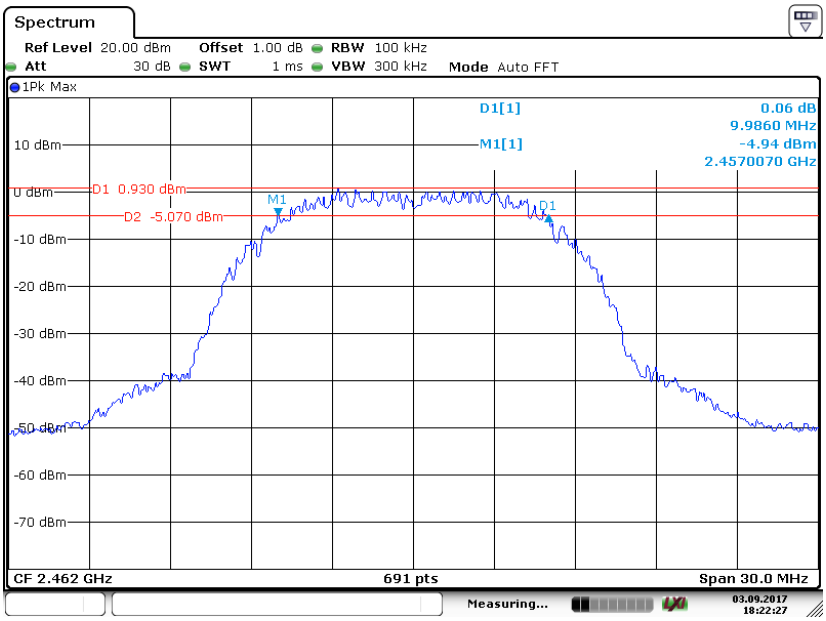
Date: 3.SEP.2017 18:18:46

802.11b Middle Channel



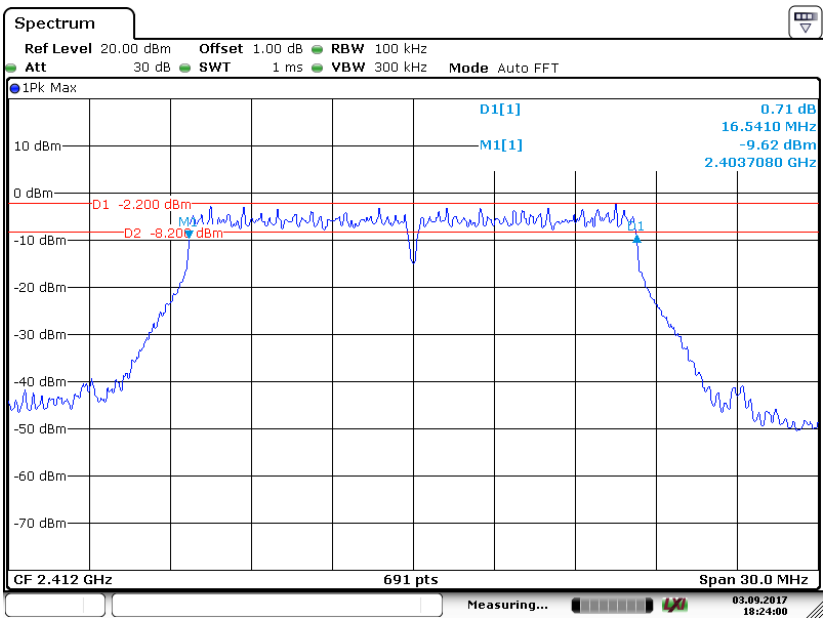
Date: 3.SEP.2017 18:21:03

802.11b High Channel



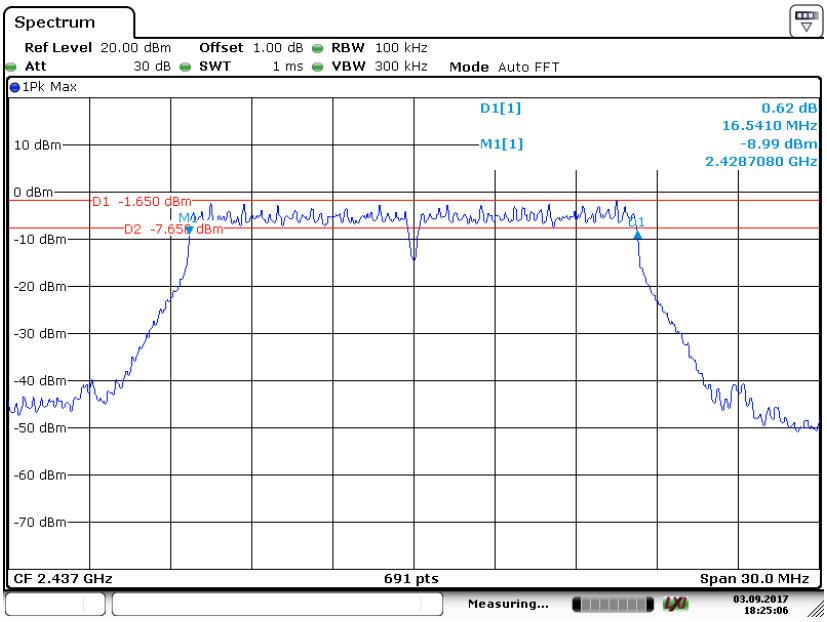
Date: 3.SEP.2017 18:22:27

802.11g Low Channel



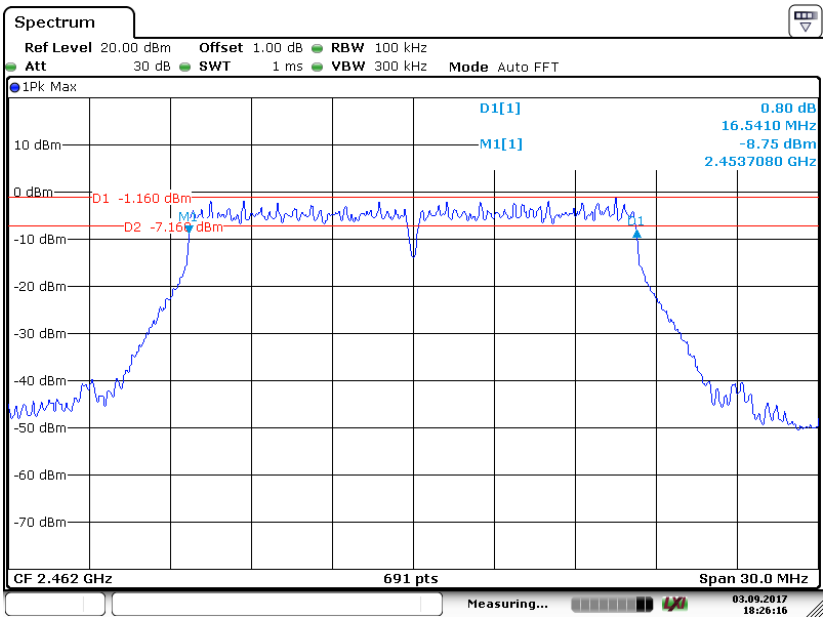
Date: 3.SEP.2017 18:24:00

802.11g Middle Channel



Date: 3.SEP.2017 18:25:06

802.11g High Channel



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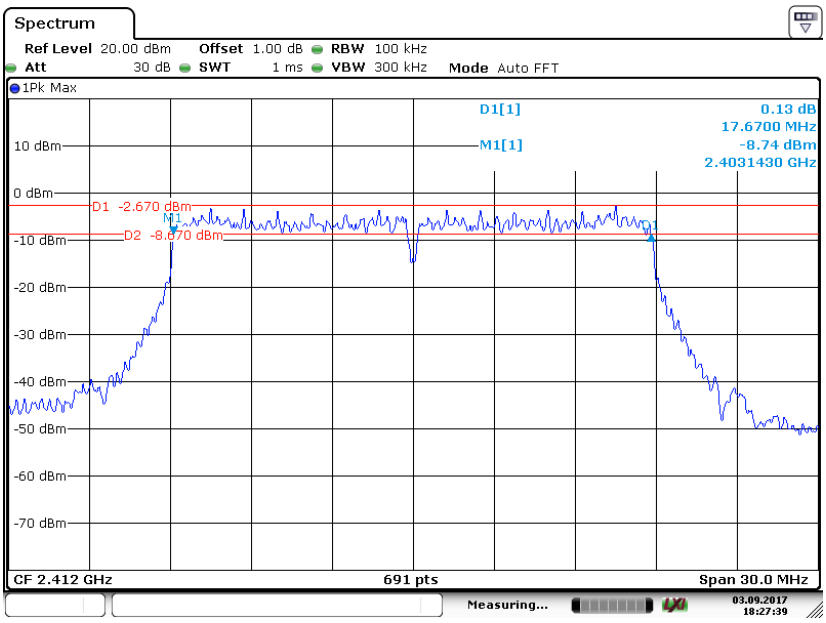
802.11n-HT20 Low Channel



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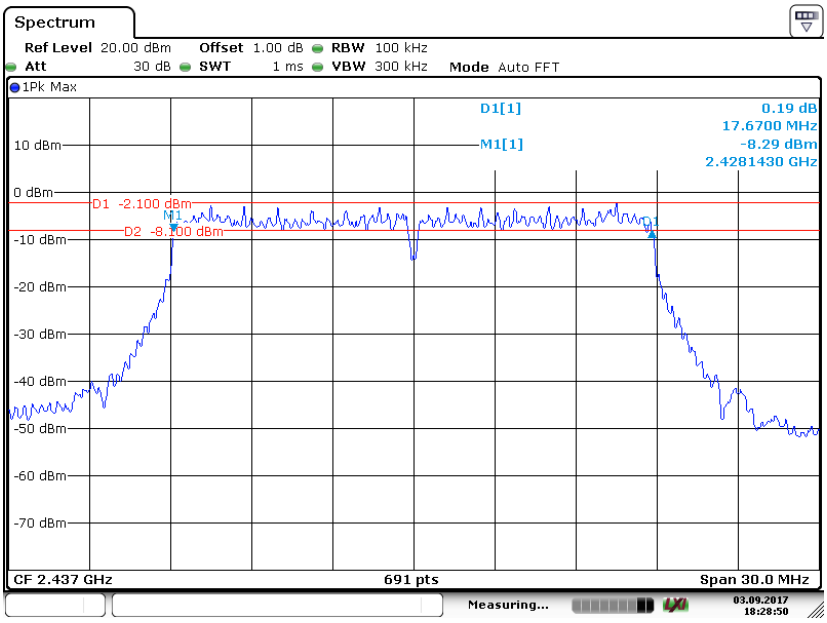
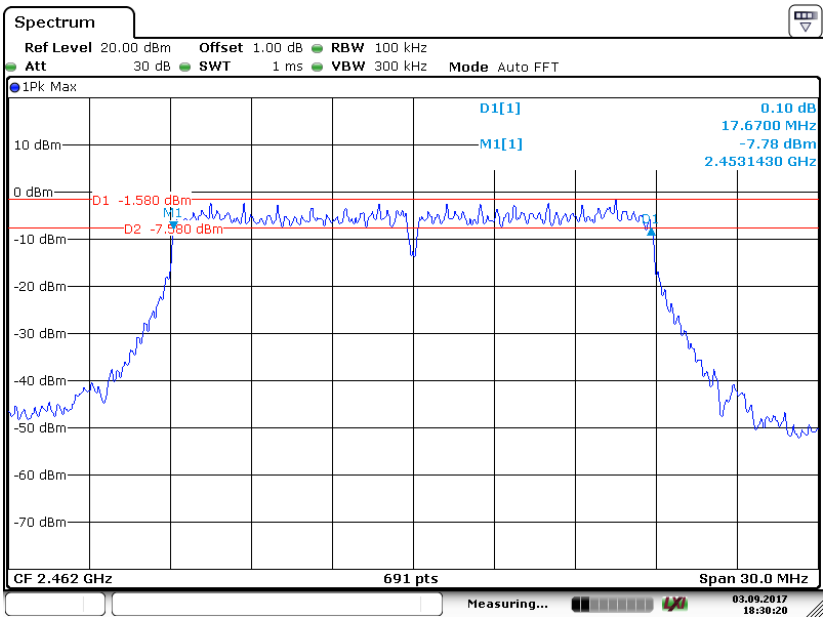
802.11n-HT20 Middle Channel



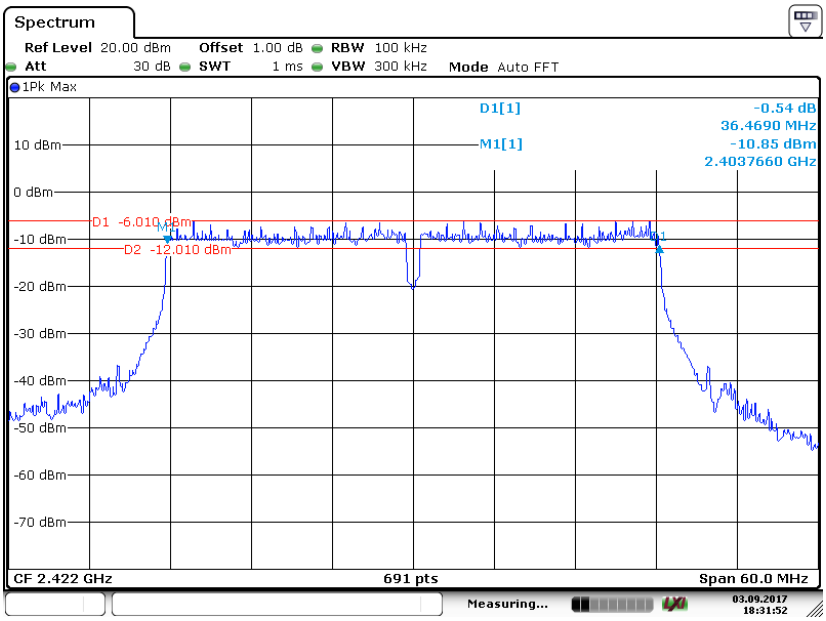
Date: 3.SEP.2017 18:28:50

802.11n-HT20 High Channel



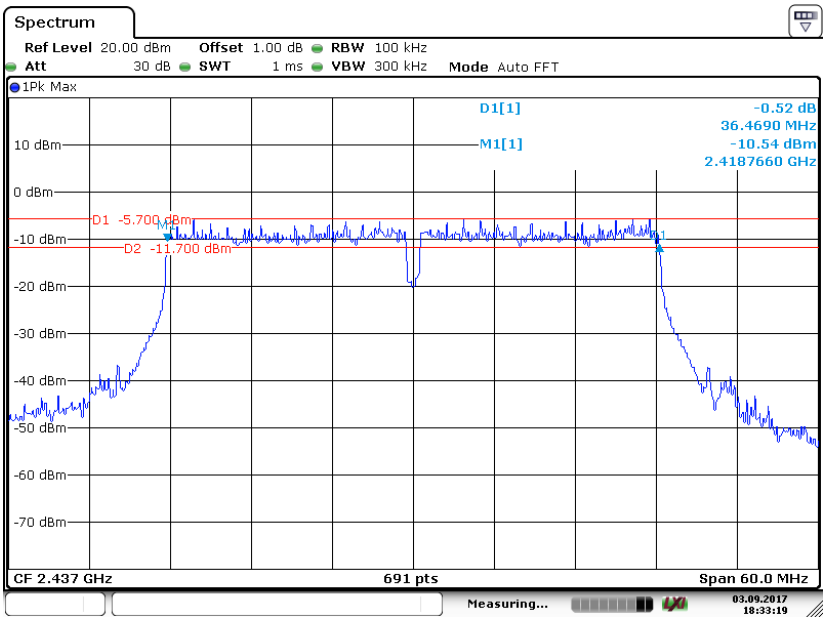
Date:3.SEP.2017 18:30:20

802.11n-HT40 Low Channel



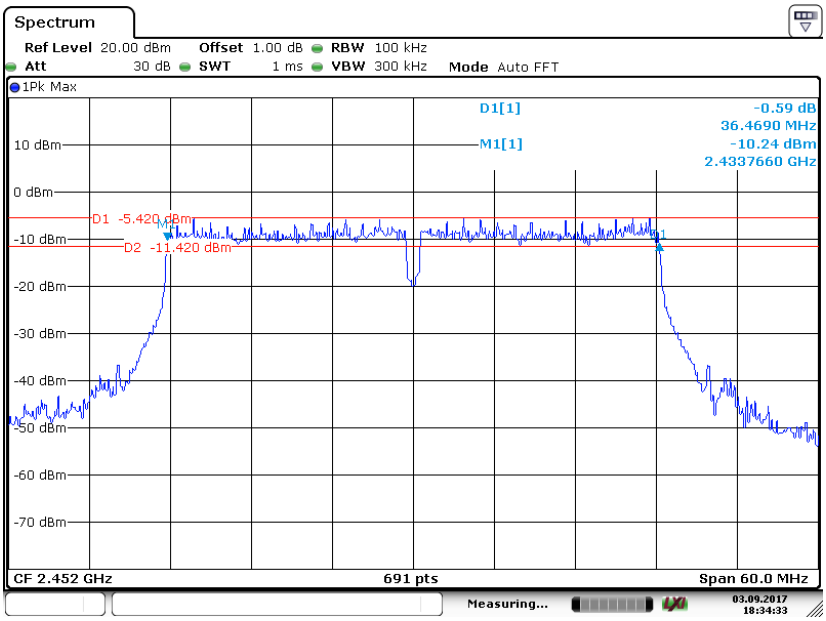
Date:3.SEP.2017 18:31:52

802.11n-HT40 Middle Channel



Date: 3.SEP.2017 18:33:19

802.11n-HT40 High Channel



Date: 3.SEP.2017 18:34:34

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.

Test Data

Environmental Conditions

Temperature:	24.5 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2017-09-03.

EUT operation mode: Transmitting

Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Limit (dBm)	Result
802.11b				
Low	2412	15.72	30	Pass
Middle	2437	16.20	30	Pass
High	2462	16.73	30	Pass
802.11g				
Low	2412	17.36	30	Pass
Middle	2437	17.88	30	Pass
High	2462	18.33	30	Pass
802.11n-HT20				
Low	2412	16.53	30	Pass
Middle	2437	17.44	30	Pass
High	2462	17.96	30	Pass
802.11n-HT40				
Low	2422	16.58	30	Pass
Middle	2437	16.78	30	Pass
High	2452	17.32	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

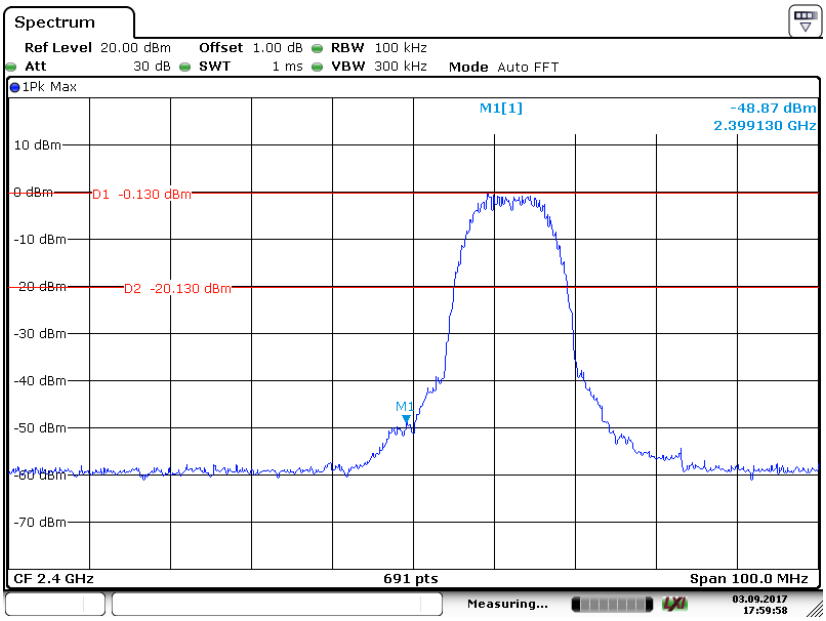
Temperature:	24.5 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Chris Wang on 2017-09-03.

Test Result: *Compliance*

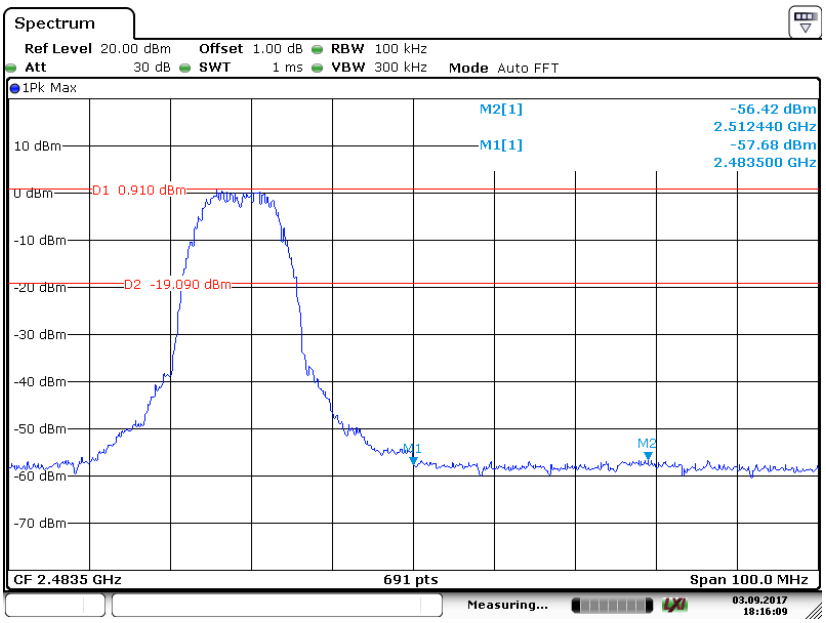
Band Edge

802.11b Mode Left Side



Date: 3.SEP.2017 17:59:58

802.11b Mode Right Side



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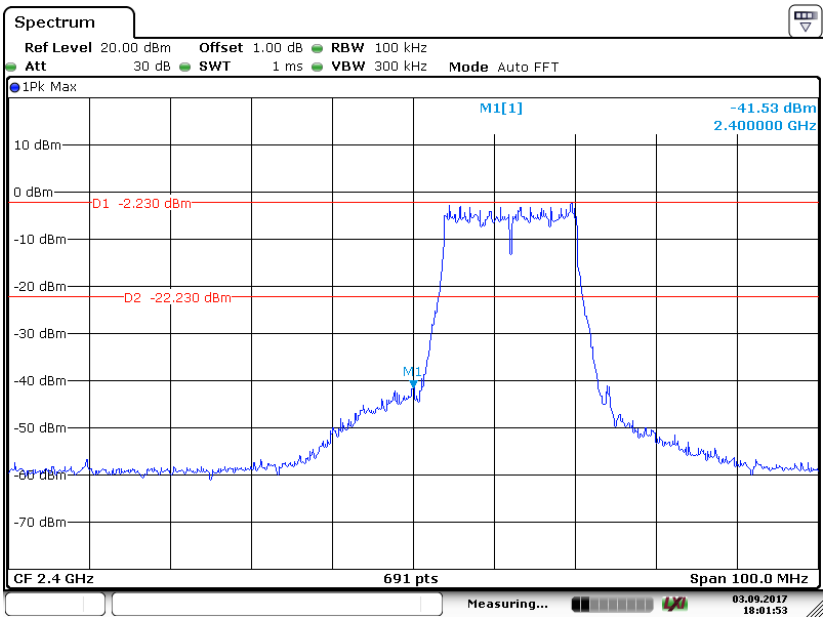
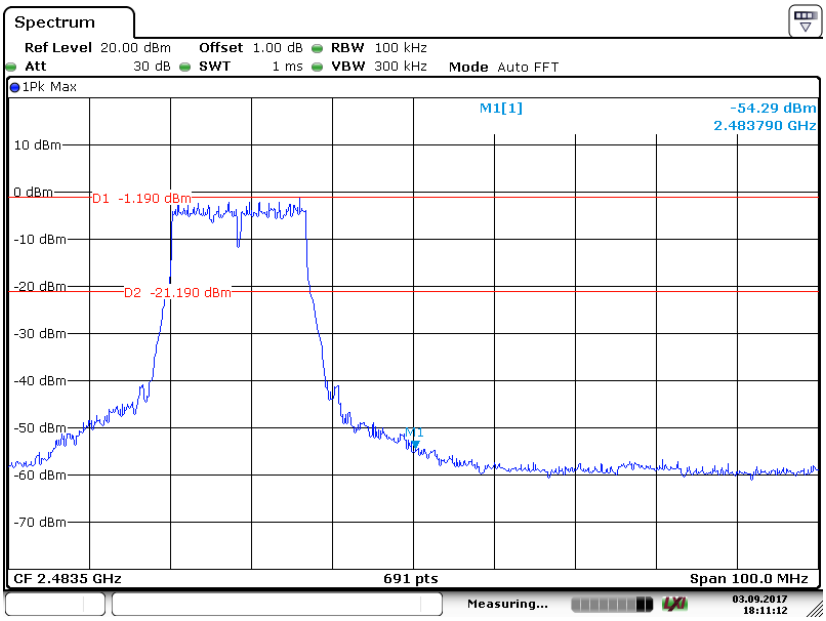
802.11g Mode Left Side



Date: 3.SEP.2017 18:01:54

802.11g Mode Right Side



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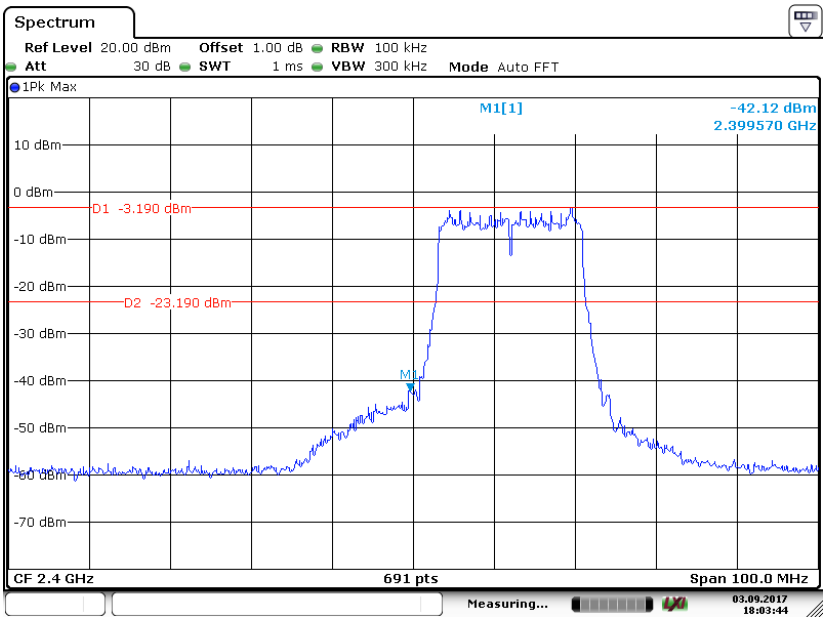
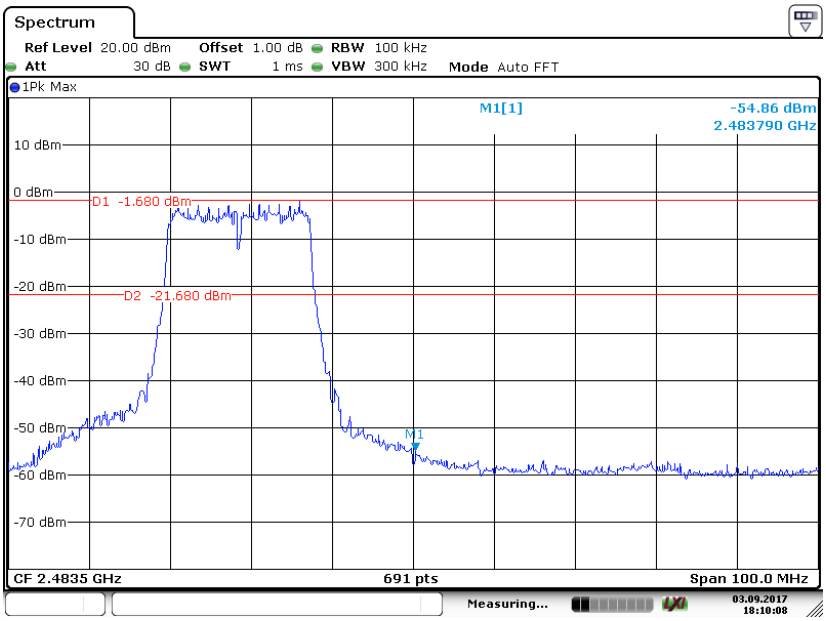
802.11n-HT20 Mode Left Side



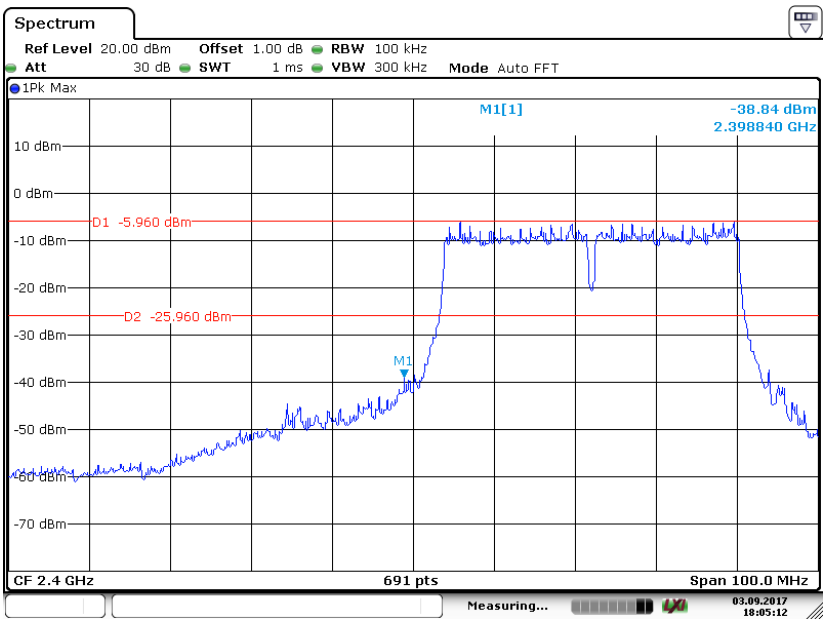
Date: 3.SEP.2017 18:03:45

802.11n-HT20 Mode Right Side



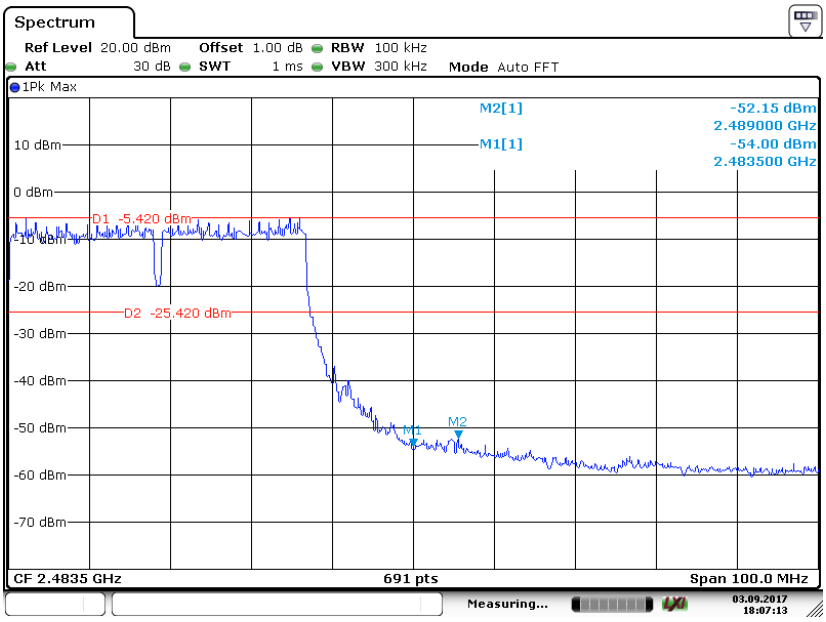
Date: 3.SEP.2017 18:10:08

802.11n-HT40 Mode Left Side



Date: 3.SEP.2017 18:05:12

802.11n-HT40 Mode Right Side



Date: 3.SEP.2017 18:07:13

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:	24.6℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

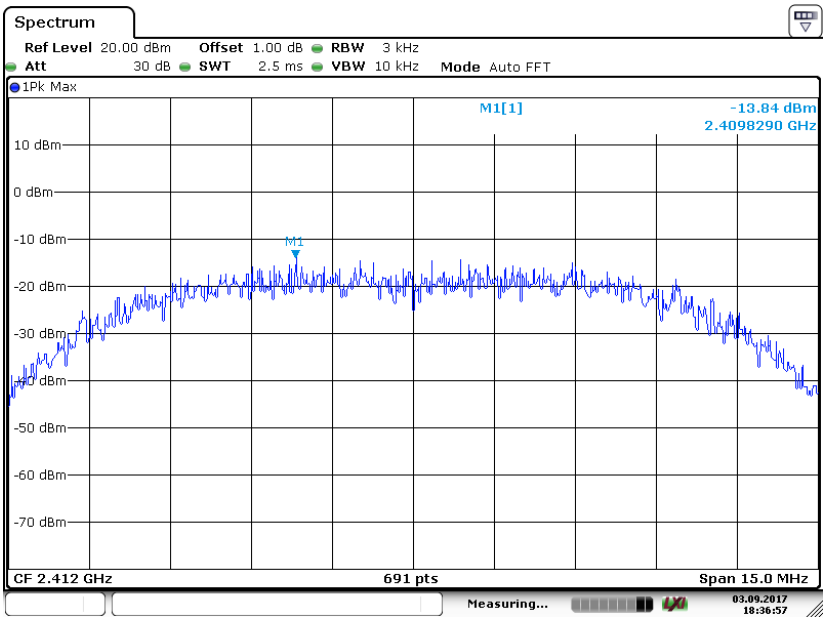
The testing was performed by Chris Wang on 2017-09-03.

EUT operation mode: Transmitting

Test Result: Pass

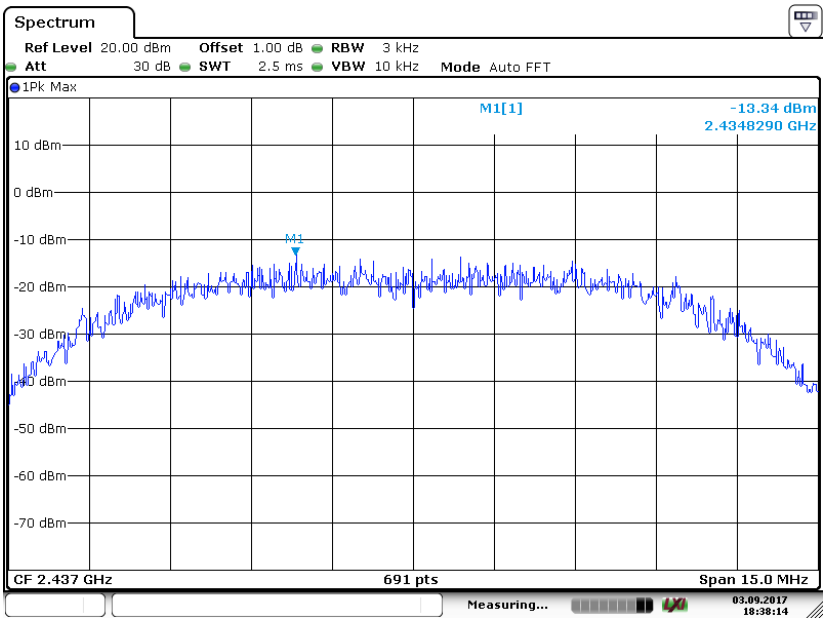
Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)
802.11b mode			
Low	2412	-13.84	≤8
Middle	2437	-13.34	≤8
High	2462	-12.77	≤8
802.11g mode			
Low	2412	-17.10	≤8
Middle	2437	-16.68	≤8
High	2462	-16.19	≤8
802.11n-HT20 mode			
Low	2412	-18.37	≤8
Middle	2437	-17.76	≤8
High	2462	-17.78	≤8
802.11n-HT40 mode			
Low	2422	-21.88	≤8
Middle	2437	-21.75	≤8
High	2452	-21.19	≤8

802.11b Low Channel



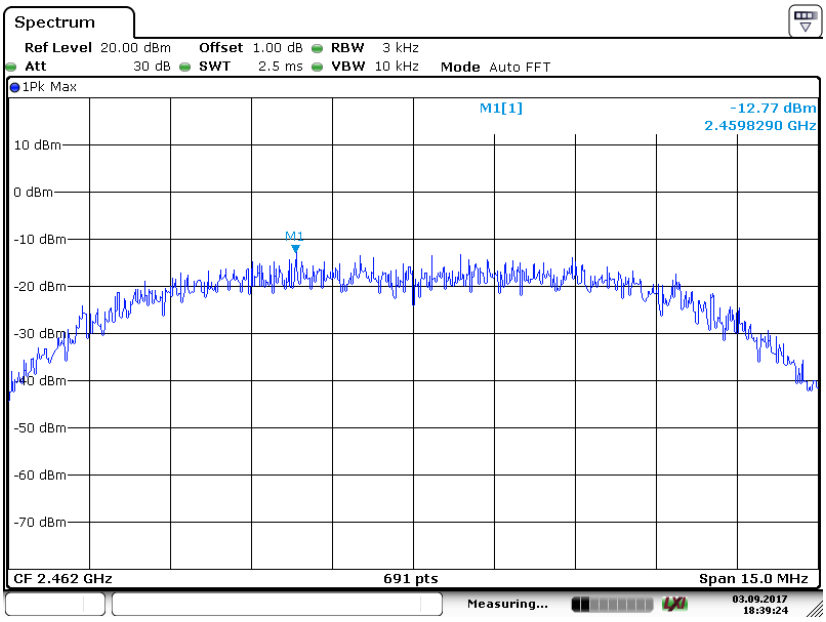
Date: 3.SEP.2017 18:36:58

802.11b Middle Channel



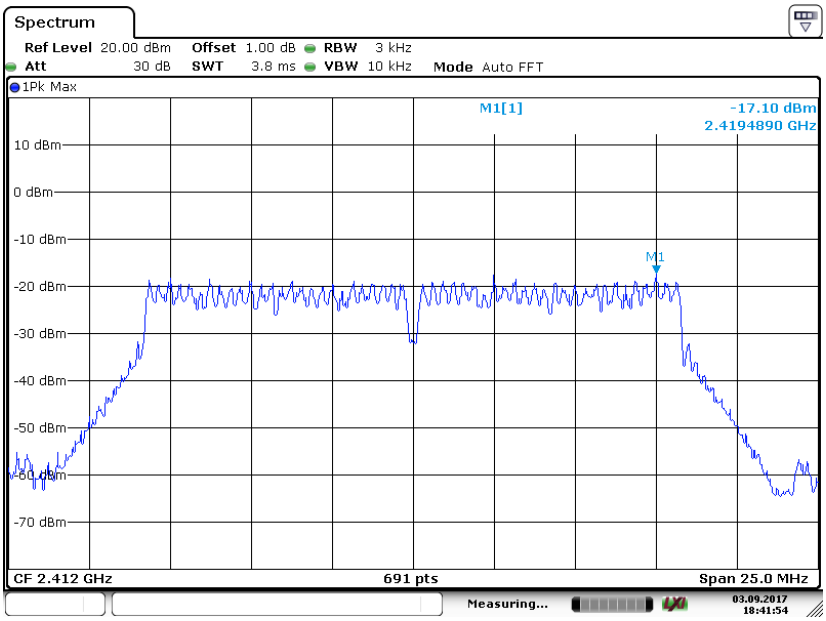
Date: 3.SEP.2017 18:38:14

802.11b High Channel



Date: 3.SEP.2017 18:39:25

802.11g Low Channel



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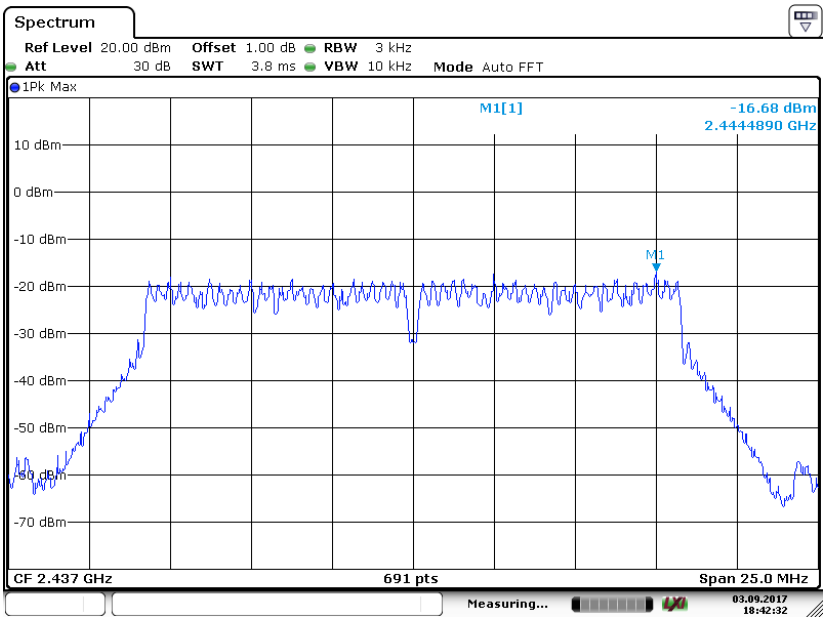
802.11g Middle Channel



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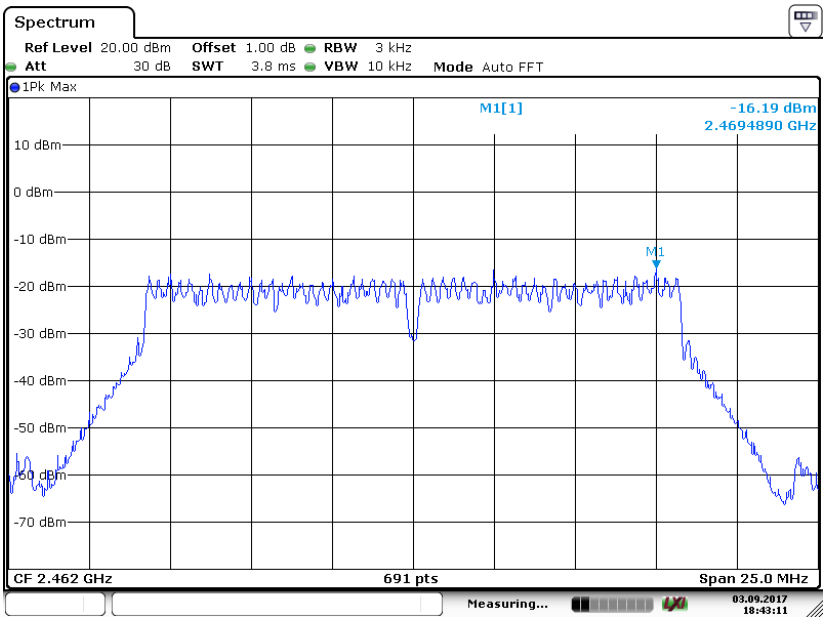
802.11g High Channel



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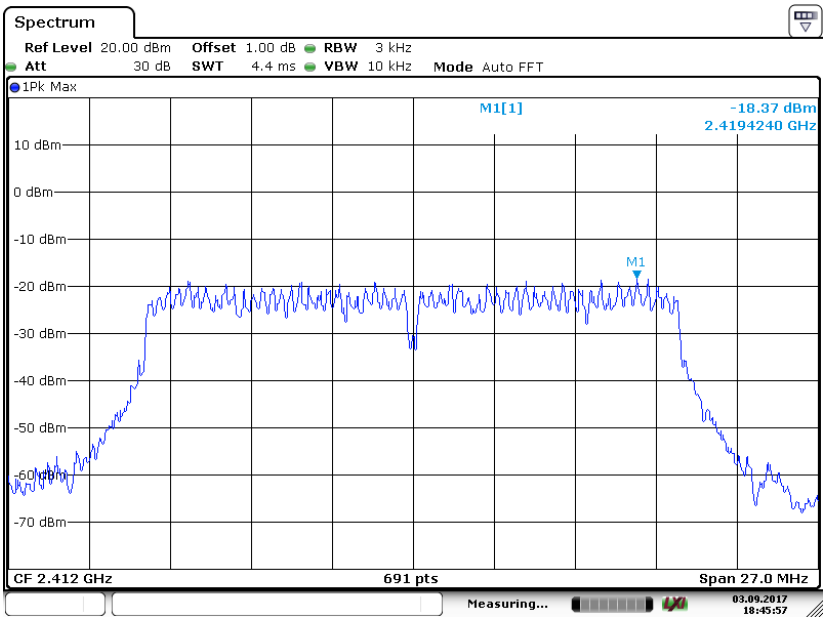
802.11n-HT20 Low Channel



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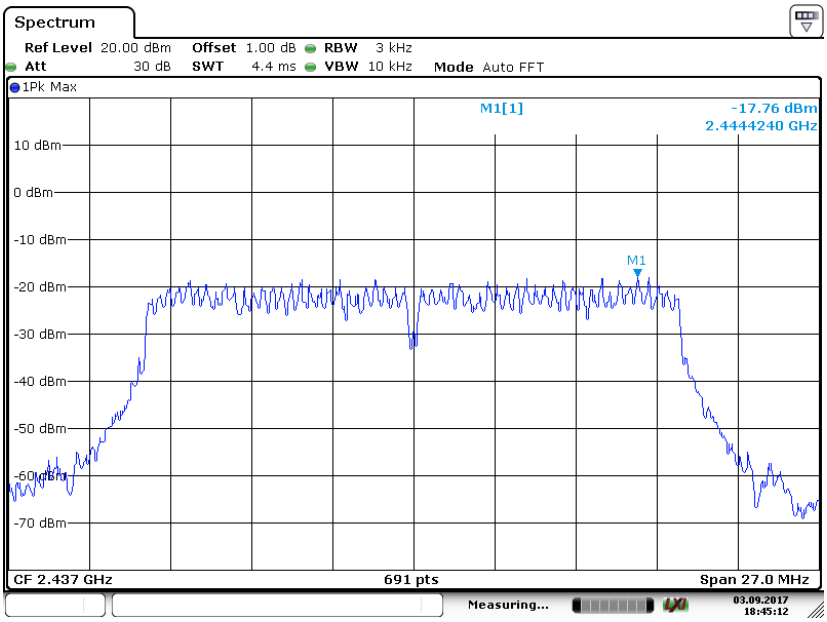
802.11n-HT20 Middle Channel



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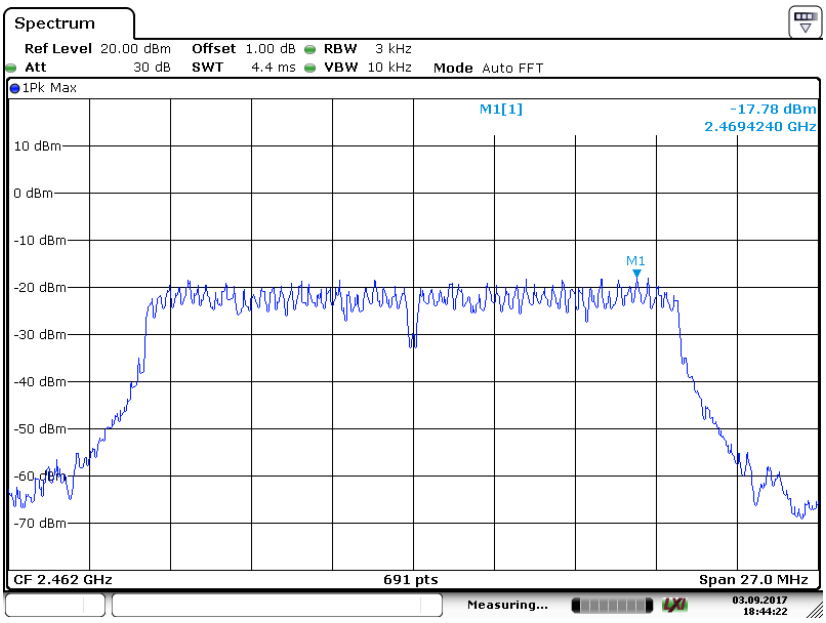
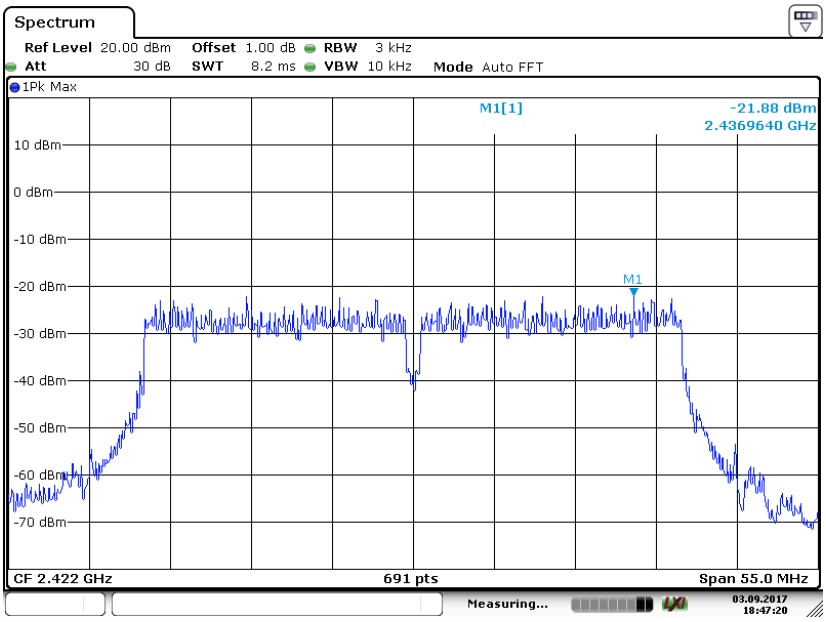
802.11n-HT20 High Channel



Date: 3.SEP.2017 18:44:21

802.11n-HT40 Low Channel



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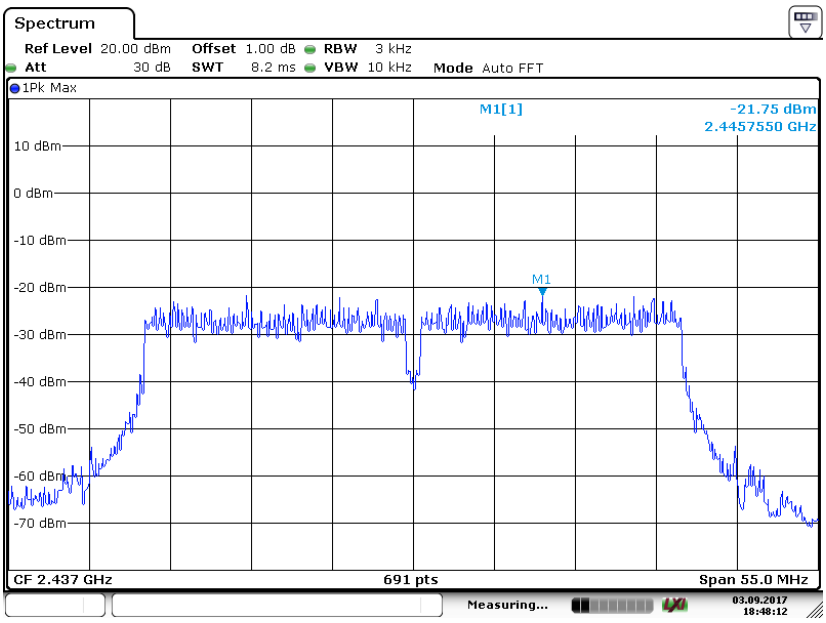
802.11n-HT40 Middle Channel



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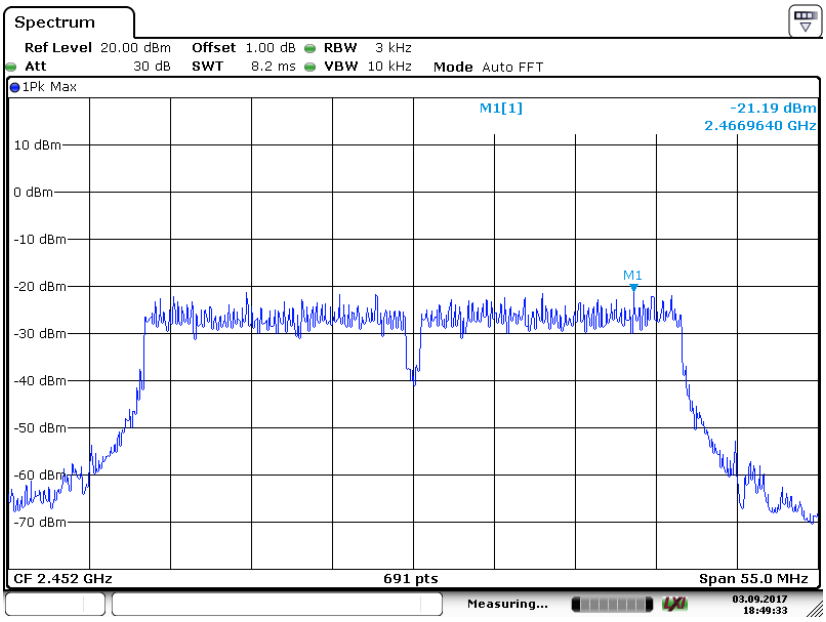
802.11n-HT40 High Channel



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