FCC PART 15.247

TEST REPORT

For

Qingdao Hisense Intelligent Commercial System Co., Ltd.

Bldg 3, 151 Zhuzhou Lu, Laoshan, Qingdao, China

FCC ID: GQK-HM618

Report Type:	Product Type:
Original Report	Tablet POS

Test Engineer:	Kyle Xu
Report Number:	RSHA170823001-00C
Report Date:	2017-10-14
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	Qingdao Hisense Intelligent Commercial System Co., Ltd.
Tested Model	HM618
Series Model	HM616
Product Type	Tablet POS
Dimension	Tablet: 282 mm(L)×198 mm(W)×18 mm(H) Dock: 151 mm(L)×121 mm(W)×92 mm(H) Multifunctional dock: 236 mm(L)×218 mm(W)×370 mm(H)
Power Supply	Tablet: DC 3.7V from battery and DC 5.0V charging by adapter Dock: DC5.0V charging by adapter Multifunctional dock: DC24.0V charging by adapter

Adapter-1 Information:
Model: ADS-25SGP-06 05020E
Input: AC100-240V, 50/60Hz, 0.7A
Output:5.0V, 4.0A

Adapter-2 Information:
Model: FSP060-DAAN2
Input: AC100-240V, 50/60Hz, 0.7A
Output:24.0V, 2.5A

** Note: The difference between tested model and series model was explained in the declaration letter.*

**All measurement and test data in this report was gathered from production sample serial number: 20170823001 (Assigned by the BACL. The EUT supplied by the applicant was received on 2017-08-23)*

Objective

This report is prepared on behalf of Qingdao Hisense Intelligent Commercial System 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)

FCC Part 15.247 DSS, Part 15.247 DTS, Part 15.407 NII and Part 15.225 DXX submission with FCC ID: GQK-HM618.

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

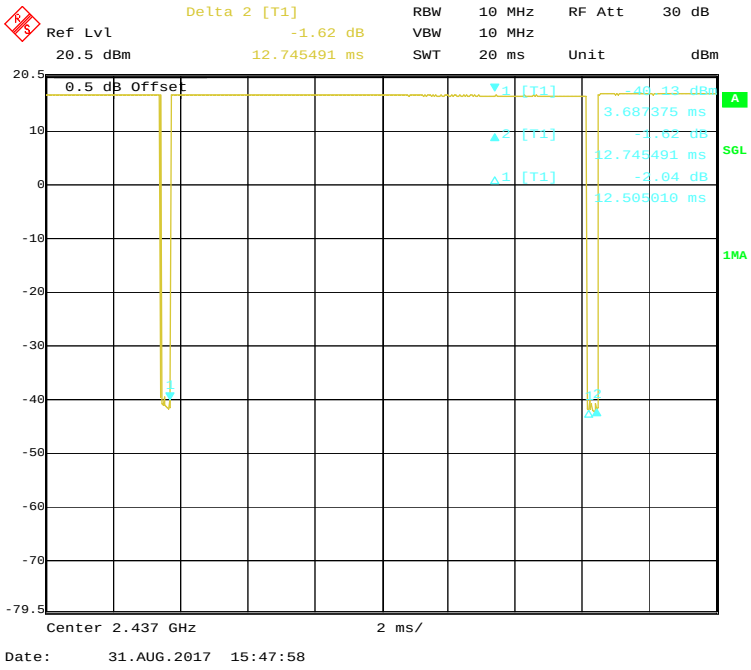
RF test tool : CMD.

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

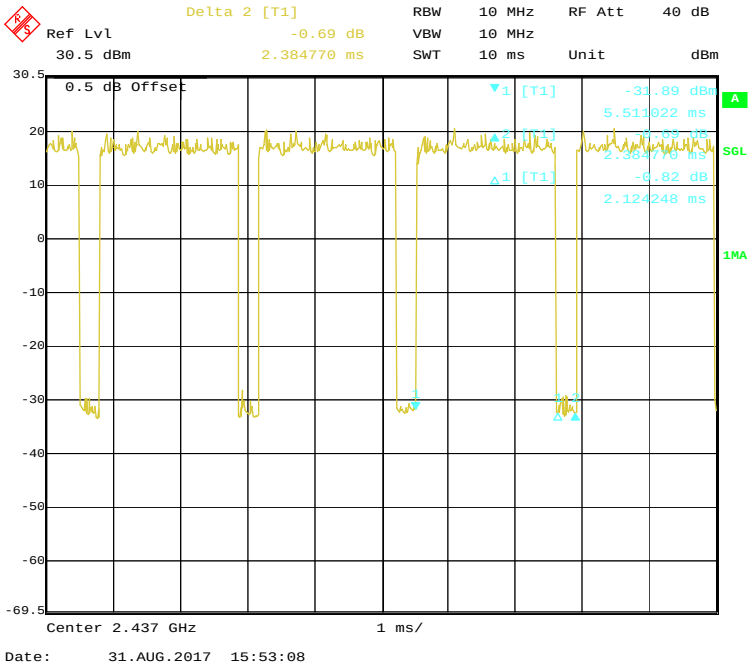
Mode	Data rate	Power level
802.11b	1 Mbps	14
802.11g	6 Mbps	13
802.11n-HT20	MCS0	13
802.11n-HT40	MCS0	13

Duty Cycle:

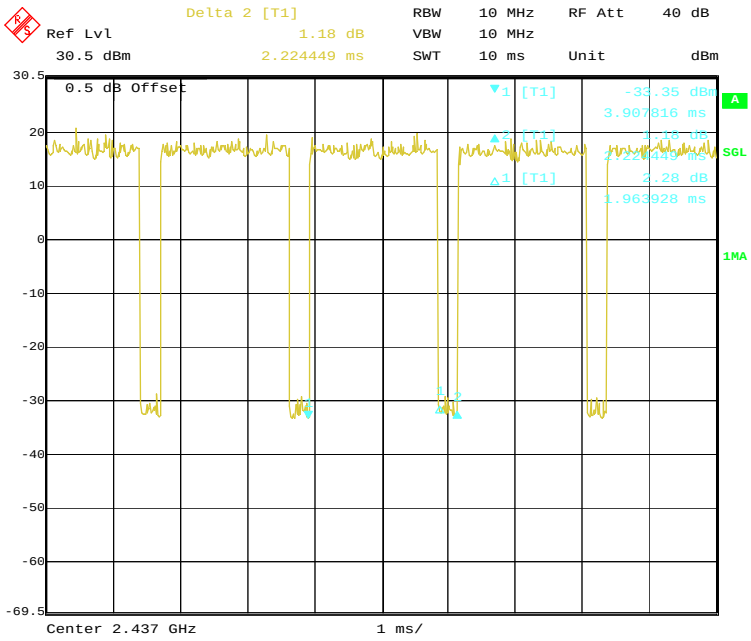
802.11b Mode Middle Channel



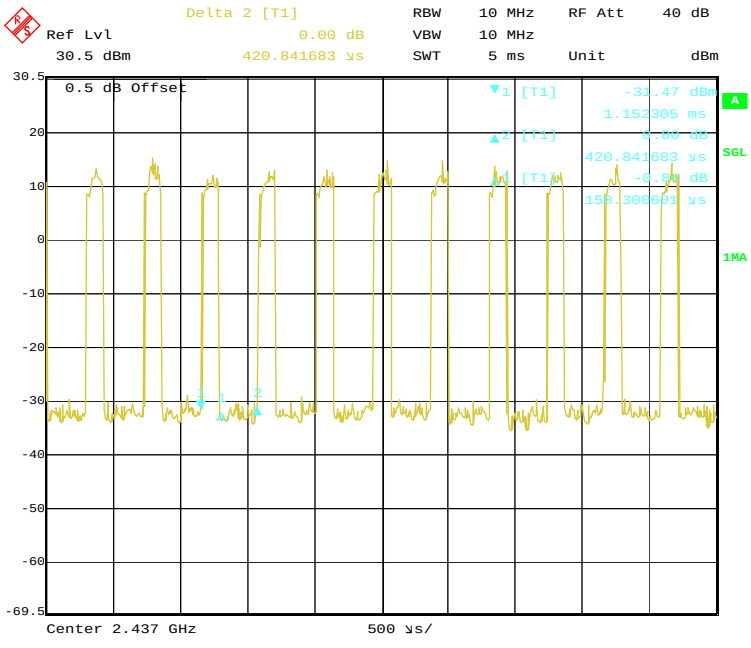
802.11g Mode Middle Channel



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	98.11%	/	/	10Hz	0.08
802.11g	89.08%	2.124	0.471	1kHz	0.50
802.11n-HT20	88.29%	1.964	0.509	1kHz	0.54
802.11n-HT40	35.71%	0.150	6.667	10kHz	4.47

Support Equipment List and Details

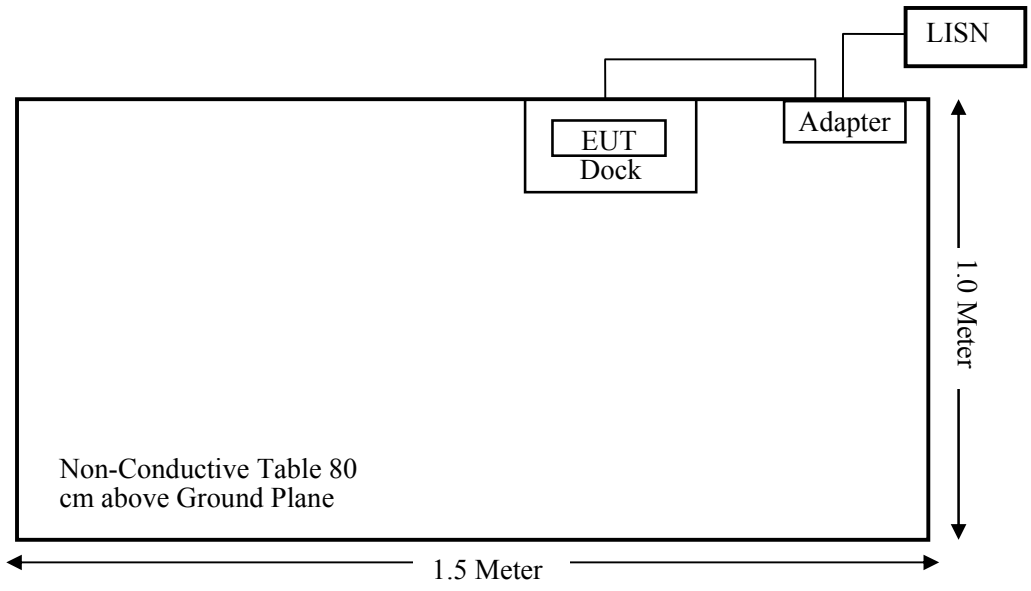
Manufacturer	Description	Model	Serial Number
/	/	/	/

External I/O Cable

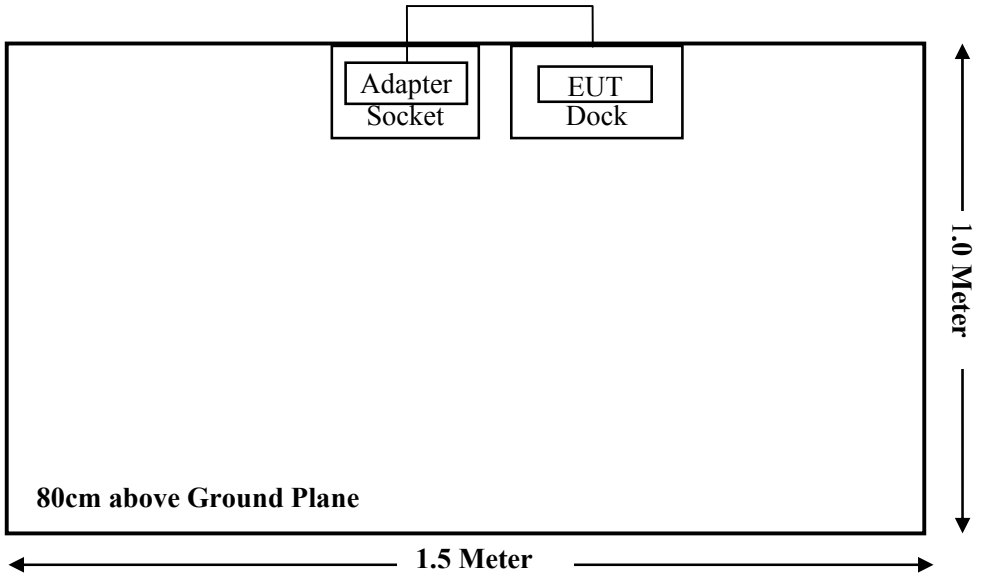
Cable Description	Shielding Type	Length (m)	From Port	To
/	/	/	/	/

Block Diagram of Test Setup

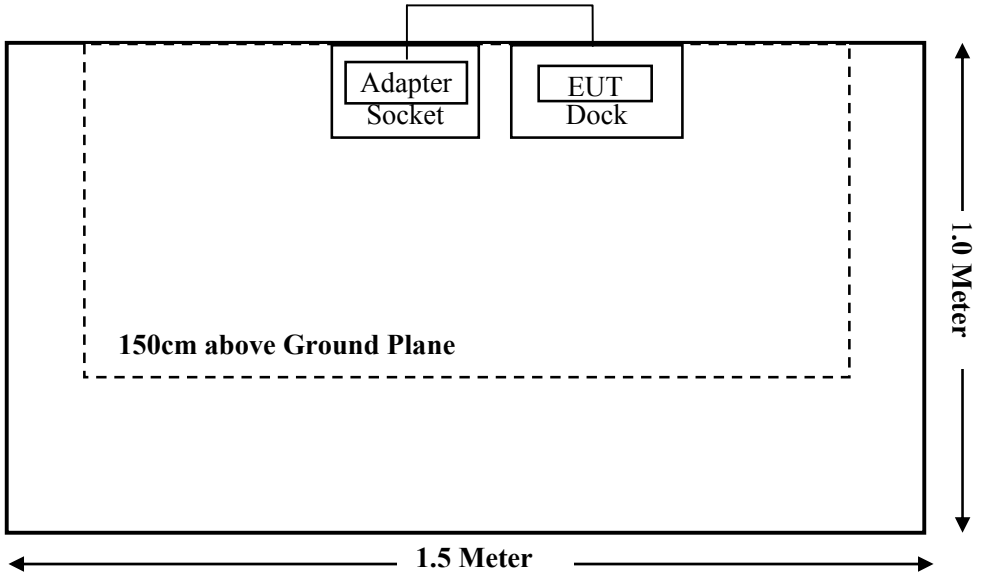
For Conducted Emissions:



For Radiated Emissions(Below 1GHz):



For Radiated Emissions(Above 1GHz):



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§1.1310 &§2.1093	RF Exposure	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
Hisense	RF Cable	N/A	N/A	2017-08-28	2018-08-27
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§1.1310 &§2.1093 –RF EXPOSURE

Applicable Standard

According to§2.1093and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB447498 D01 General RF Exposure Guidance v06:

For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:
[(max. power of channel, including tune-up tolerance, mW) / (min. test separation distance, mm)] · [√f(GHz)] ≤ 3.0 for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR

·f(GHz) is the RF channel transmit frequency in GHz
·Power and distance are rounded to the nearest mW and mm before calculation
·The result is rounded to one decimal place for comparison
·When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Standalone SAR test exclusion

Mode	Frequency Range (MHz)	Conducted Output Power			Minimum Distance (mm)	Calculated Value	Threshold (1-g)	SAR Test Exclusion
		ANT0 (dBm)	ANT1 (dBm)	ANT0+ANT1 (dBm)				
Bluetooth	2402-2480	-1.00	/	/	5.00	0.3	3.00	Yes
BLE	2402-2480	-1.00	/	/	5.00	0.3	3.00	Yes
802.11b	2412~2462	8.50	8.00	/	5.00	2.2	3.00	Yes
802.11g	2412~2462	8.00	7.50	/	5.00	2.0	3.00	Yes
802.11n20	2412~2462	6.00	5.00	8.00	5.00	2.0	3.00	Yes
802.11n40	2422~2452	5.00	4.50	8.00	5.00	2.0	3.00	Yes
802.11a	5180~5240	7.50	7.00	/	5.00	2.6	3.00	Yes
	5745~5825	7.50	7.00	/	5.00	2.7	3.00	Yes
802.11n20	5180~5240	5.00	4.00	7.50	5.00	2.6	3.00	Yes
	5745~5825	4.50	4.00	7.00	5.00	2.4	3.00	Yes
802.11n40	5190~5230	4.50	4.00	7.00	5.00	2.3	3.00	Yes
	5755~5795	5.00	4.00	7.50	5.00	2.7	3.00	Yes
802.11ac20	5180~5240	5.00	4.00	7.50	5.00	2.6	3.00	Yes
	5745~5825	5.00	4.00	7.50	5.00	2.7	3.00	Yes
802.11ac40	5180~5240	5.00	4.00	7.50	5.00	2.6	3.00	Yes
	5755~5795	5.00	4.00	7.50	5.00	2.7	3.00	Yes
802.11ac80	5210	4.50	3.50	7.00	5.00	2.3	3.00	Yes
	5775	5.00	4.00	7.50	5.00	2.7	3.00	Yes

Standalone SAR estimation:

Mode	Frequency Range (MHz)	Max tune-up power (dBm)		Max tune-up power (mW)		Distance (mm)	Estimated $_{1-g}$ (W/kg)	
		ANT 0	ANT 1	ANT 0	ANT 1		ANT 0	ANT 1
Bluetooth	2402-2480	-1.00	/	0.79	/	5	0.03	/
BLE	2402-2480	-1.00	/	0.79	/	5	0.03	/
802.11b	2412~2462	8.50	8.00	7.08	6.31	5	0.30	0.26
802.11g	2412~2462	8.00	7.50	6.31	5.62	5	0.26	0.24
802.11n20	2412~2462	6.00	5.00	3.98	3.16	5	0.17	0.13
802.11n40	2422~2452	5.00	4.50	3.16	2.82	5	0.13	0.12
802.11a	5180~5240	7.50	7.00	5.62	5.01	5	0.34	0.31
	5745~5825	7.50	7.00	5.62	5.01	5	0.36	0.32
802.11n20	5180~5240	5.00	4.00	3.16	2.51	5	0.19	0.15
	5745~5825	4.50	4.00	2.82	2.51	5	0.18	0.16
802.11n40	5190~5230	4.50	4.00	2.82	2.51	5	0.17	0.15
	5755~5795	5.00	4.00	3.16	2.51	5	0.20	0.16
802.11ac20	5180~5240	5.00	4.00	3.16	2.51	5	0.19	0.15
	5745~5825	5.00	4.00	3.16	2.51	5	0.20	0.16
802.11ac40	5180~5240	5.00	4.00	3.16	2.51	5	0.19	0.15
	5755~5795	5.00	4.00	3.16	2.51	5	0.20	0.16
802.11ac80	5210	4.50	3.50	2.82	2.24	5	0.17	0.14
	5775	5.00	4.00	3.16	2.51	5	0.20	0.16

When standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to following to determine simultaneous transmission SAR test exclusion:
[(*max. power of channel, including* ***tune-up tolerance****, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm;
where $x = 7.5$ for 1-g SAR.
When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion

Simultaneous Transmission:

Description of Simultaneous Transmit Capabilities		
Transmitter Combination		Simultaneous?
ANT 0	ANT 1	
2.4G BT/BLE	2.4GWi-Fi	×
2.4G BT/BLE	5G Wi-Fi	√
2.4G Wi-Fi	2.4G Wi-Fi	√
2.4G Wi-Fi	5G Wi-Fi	×
5G Wi-Fi	2.4G Wi-Fi	×
5G Wi-Fi	5G Wi-Fi	√

Simultaneous SAR test exclusion considerations:

Mode (ANT 0+ ANT 1)	Reported SAR (W/kg)		ΣSAR < 1.6W/kg
	ANT 0	ANT 1	
2.4G BT +5G Wi-Fi	0.03	0.32	0.35
2.4G Wi-Fi	0.30	0.26	0.56
5G Wi-Fi	0.36	0.32	0.68

Conclusion: ΣSAR < 1.6 W/kg therefore simultaneous transmission SAR is not required.

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

Chain	Manufacturer	Antenna Type	Max. Antenna Gain
0	AMPAK	FPCB	1.2 dBi
1	AMPAK	FPCB	1.2 dBi

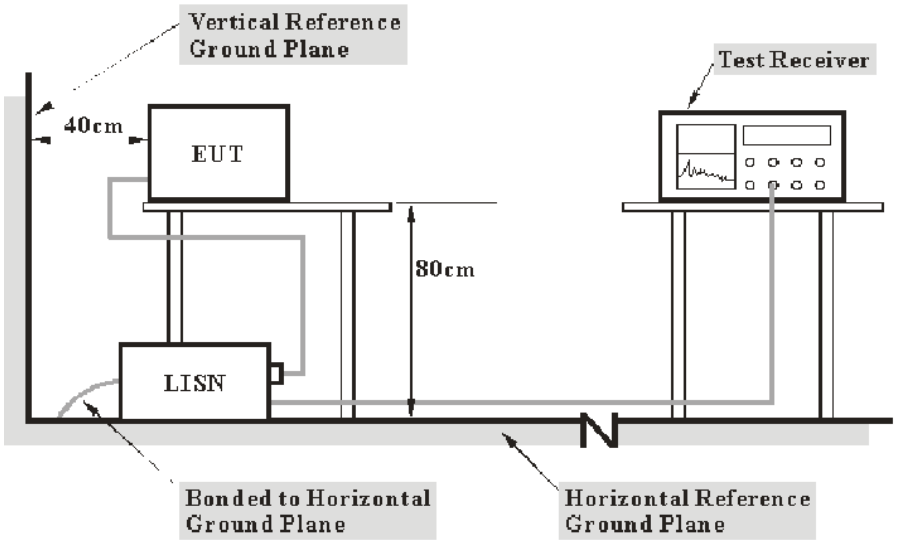
Result: Compliance.

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

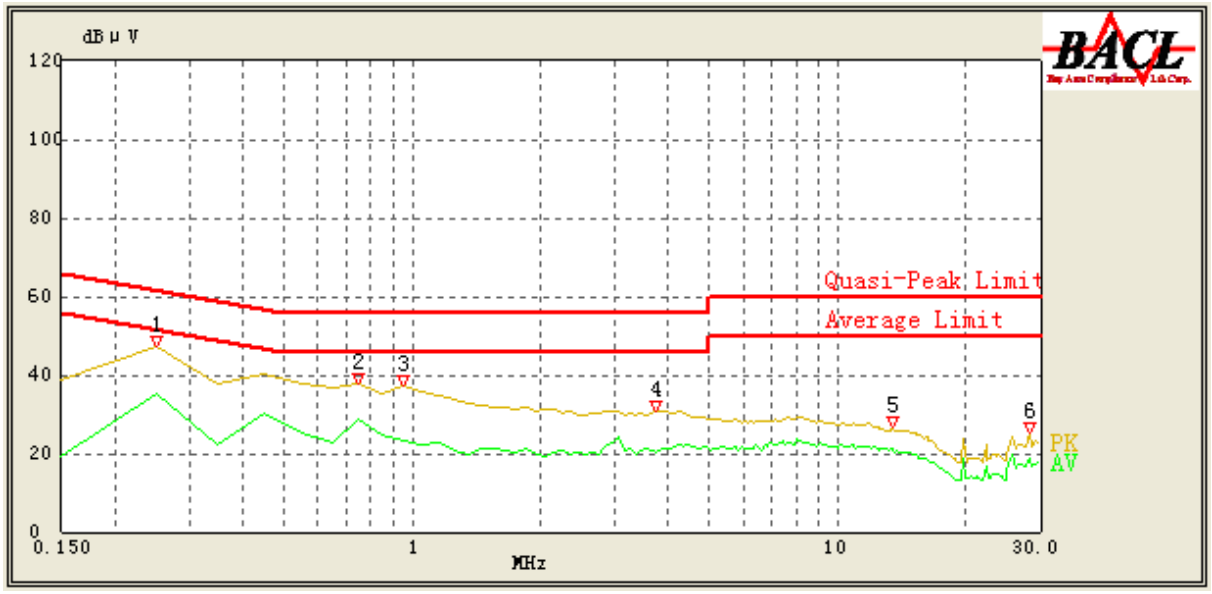
Temperature:	20.2 ℃
Relative Humidity:	51 %
ATM Pressure:	101.3 kPa

The testing was performed by Kyle Xu on 2017-08-29.

EUT operation mode: Transmitting in 802.11b mode high channel of chain 0.(worst case)

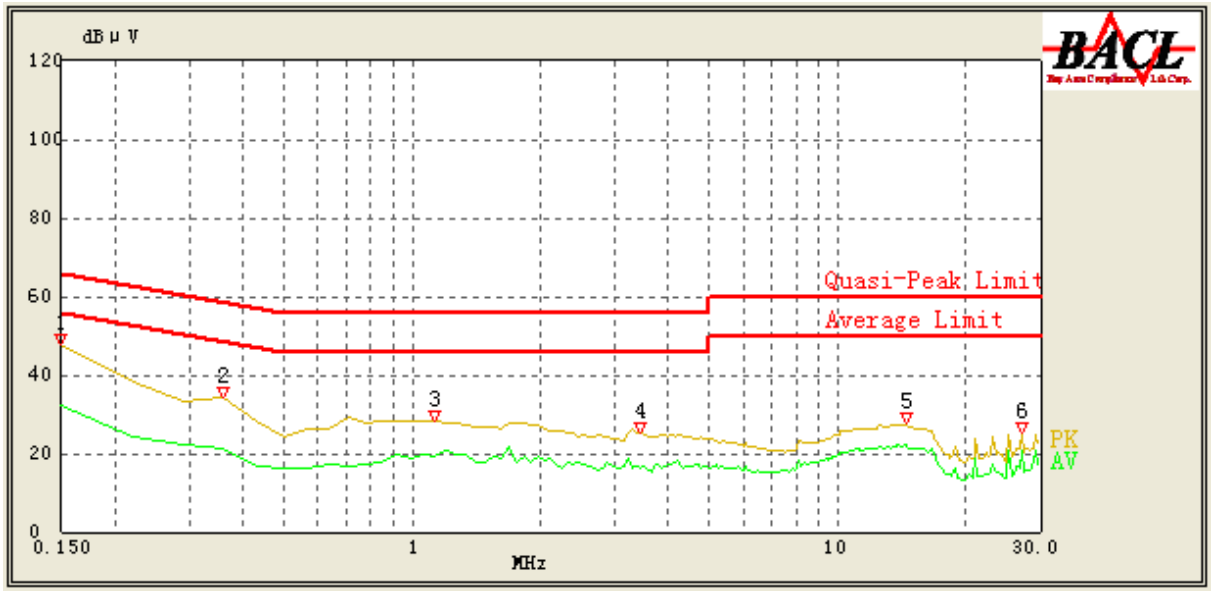
Adapter 1

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Correction (dB)	Limit (dBµV)	Margin (dB)	Comment
0.250	47.13	PK	9.000	L1	16.02	63.14	16.01	Compliance
0.250	35.08	AV	9.000	L1	16.02	53.14	18.06	Compliance
0.750	37.75	PK	9.000	L1	15.94	56.00	18.25	Compliance
0.750	28.84	AV	9.000	L1	15.94	46.00	17.16	Compliance
0.950	37.34	PK	9.000	L1	15.89	56.00	18.66	Compliance
0.950	23.16	AV	9.000	L1	15.89	46.00	22.84	Compliance
3.750	30.70	PK	9.000	L1	15.85	56.00	25.30	Compliance
3.750	20.16	AV	9.000	L1	15.85	46.00	25.84	Compliance
13.550	26.91	PK	9.000	L1	16.17	60.00	33.09	Compliance
13.550	21.06	AV	9.000	L1	16.17	50.00	28.94	Compliance
28.450	25.31	PK	9.000	L1	16.55	60.00	34.69	Compliance
28.450	18.81	AV	9.000	L1	16.55	50.00	31.19	Compliance

AC 120V/60 Hz, Neutral



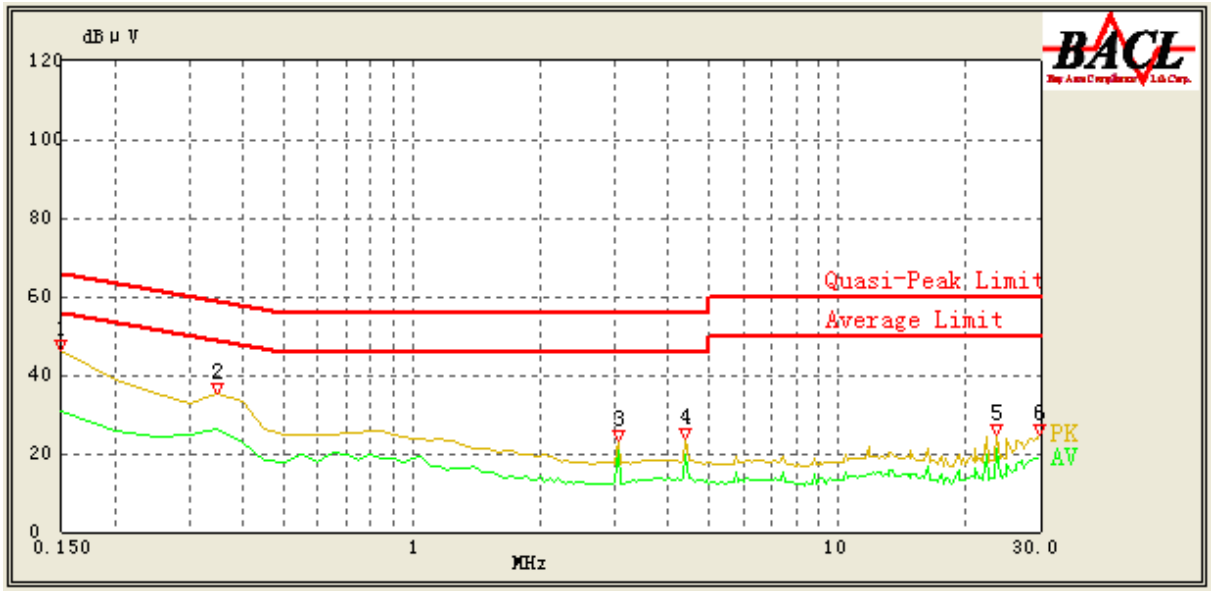
Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Correction (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	47.97	PK	9.000	N	16.06	66.00	18.03	Compliance
0.150	32.14	AV	9.000	N	16.06	56.00	23.86	Compliance
0.360	34.10	PK	9.000	N	16.08	60.00	25.90	Compliance
0.360	21.09	AV	9.000	N	16.08	50.00	28.91	Compliance
1.130	28.31	PK	9.000	N	15.94	56.00	27.69	Compliance
1.130	19.18	AV	9.000	N	15.94	46.00	26.82	Compliance
3.440	25.07	PK	9.000	N	15.89	56.00	30.93	Compliance
3.440	16.49	AV	9.000	N	15.89	46.00	29.51	Compliance
14.570	27.94	PK	9.000	N	16.01	60.00	32.06	Compliance
14.570	22.48	AV	9.000	N	16.01	50.00	27.52	Compliance
27.100	25.23	PK	9.000	N	16.28	60.00	34.77	Compliance
27.100	20.82	AV	9.000	N	16.28	50.00	29.18	Compliance

Note:

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

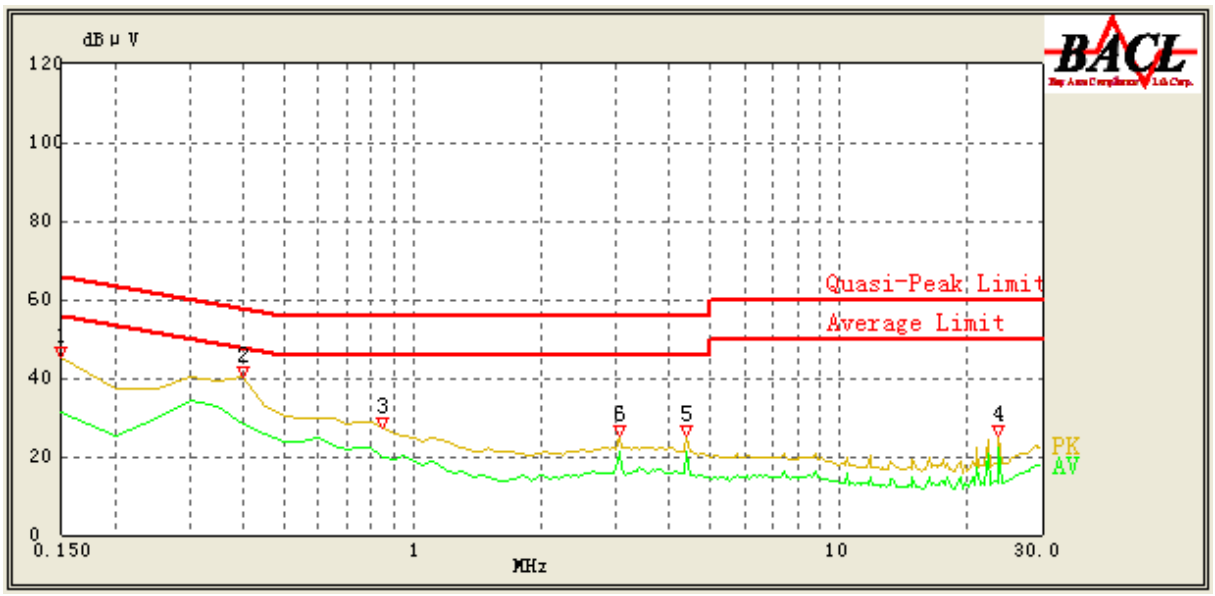
Adapter 2

AC 120V/60 Hz, Line



Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Correction (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	46.10	PK	9.000	L1	16.06	66.00	19.90	Compliance
0.150	31.00	AV	9.000	L1	16.06	56.00	25.00	Compliance
0.350	35.29	PK	9.000	L1	16.05	60.29	25.00	Compliance
0.350	26.28	AV	9.000	L1	16.05	50.29	24.01	Compliance
3.050	23.05	PK	9.000	L1	15.85	56.00	32.95	Compliance
3.050	20.69	AV	9.000	L1	15.85	46.00	25.31	Compliance
4.400	23.53	PK	9.000	L1	15.85	56.00	32.47	Compliance
4.400	19.89	AV	9.000	L1	15.85	46.00	26.11	Compliance
23.700	24.92	PK	9.000	L1	16.45	60.00	35.08	Compliance
23.700	21.04	AV	9.000	L1	16.45	50.00	28.96	Compliance
29.800	24.60	PK	9.000	L1	16.58	60.00	35.40	Compliance
29.800	18.86	AV	9.000	L1	16.58	50.00	31.14	Compliance

AC 120V/60 Hz, Neutral



Frequency (MHz)	Reading (dBµV)	Detector (PK/AV/QP)	Bandwidth (kHz)	Line	Correction (dB)	Limit (dBµV)	Margin (dB)	Comment
0.150	45.35	PK	9.000	N	16.06	66.00	20.65	Compliance
0.150	31.21	AV	9.000	N	16.06	56.00	24.79	Compliance
0.400	40.09	PK	9.000	N	16.09	58.86	18.77	Compliance
0.400	28.50	AV	9.000	N	16.09	48.86	20.36	Compliance
0.850	27.08	PK	9.000	N	15.97	56.00	28.92	Compliance
0.850	19.97	AV	9.000	N	15.97	46.00	26.03	Compliance
23.700	25.09	PK	9.000	N	16.22	60.00	34.91	Compliance
23.700	22.12	AV	9.000	N	16.22	50.00	27.88	Compliance
4.400	25.04	PK	9.000	N	15.88	56.00	30.96	Compliance
4.400	21.17	AV	9.000	N	15.88	46.00	24.83	Compliance
3.050	25.28	PK	9.000	N	15.90	56.00	30.72	Compliance
3.050	21.47	AV	9.000	N	15.90	46.00	24.53	Compliance

Note:

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

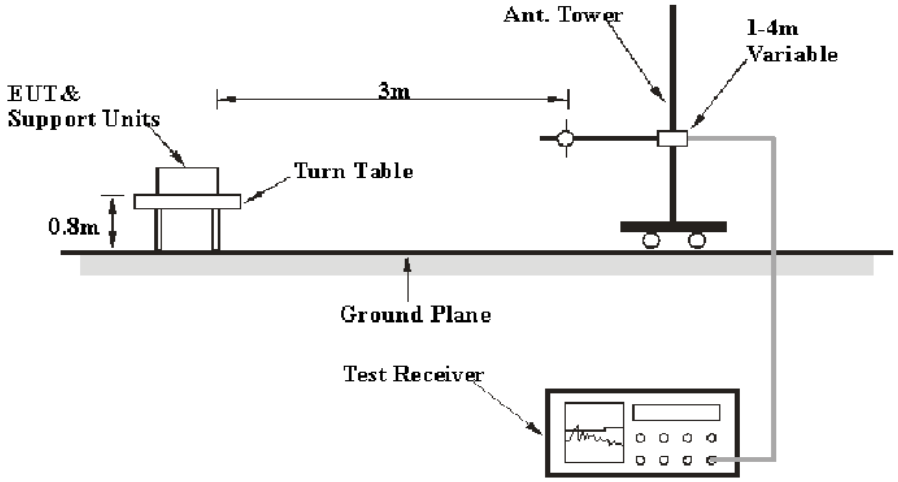
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

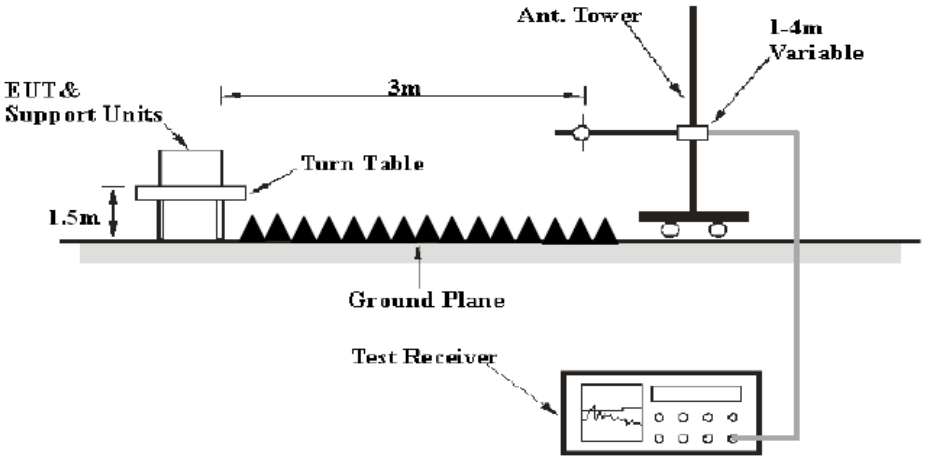
FCC §15.247 (d); §15.209; §15.205;

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:	101.2 kPa

The testing was performed by Kyle Xu on 2017-08-30.

EUT operation mode: Transmitting(Scan with X-Axis, Y-Axis and Z-Axis position, the worst case X-Axis with adapter 2 was recorded)

30MHz-25GHz

*802.11b Mode **Chain 0** (worst case):*

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)									
149.29	50.54	QP	203	152	H	-13.00	37.54	43.50	5.96
2412.00	109.11	PK	284	210	V	-4.90	104.21	/	/
2412.00	104.12	Ave	284	210	V	-4.90	99.22	/	/
2412.00	108.35	PK	161	175	H	-4.90	103.45	/	/
2412.00	103.44	Ave	161	175	H	-4.90	98.54	/	/
2390.00	60.23	PK	156	246	V	-4.96	55.27	74.00	18.73
2390.00	46.32	Ave	156	246	V	-4.96	41.36	54.00	12.64
1832.66	50.32	PK	346	228	H	-6.71	43.61	74.00	30.39
1832.66	38.07	Ave	346	228	H	-6.71	31.36	54.00	22.64
1322.51	43.32	PK	220	120	V	-9.35	33.97	74.00	40.03
1322.51	29.11	Ave	220	120	V	-9.35	19.76	54.00	34.24
4824.00	43.21	PK	100	205	V	2.52	45.73	74.00	28.27
4824.00	29.87	Ave	100	205	V	2.52	32.39	54.00	21.61
7236.00	39.13	PK	327	194	V	9.83	48.96	74.00	25.04
7236.00	26.07	Ave	327	194	V	9.83	35.90	54.00	18.10

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)									
149.29	51.04	QP	228	190	H	-13.00	38.04	43.5	5.46
2437.00	110.24	PK	125	223	V	-4.83	105.41	/	/
2437.00	105.32	Ave	125	223	V	-4.83	100.49	/	/
2437.00	108.32	PK	7	232	H	-4.83	103.49	/	/
2437.00	103.65	Ave	7	232	H	-4.83	98.82	/	/
1632.54	49.32	PK	37	162	V	-7.52	41.80	74.00	32.20
1632.54	38.55	Ave	37	162	V	-7.52	31.03	54.00	22.97
3278.33	43.35	PK	40	106	H	-1.42	41.93	74.00	32.07
3278.33	30.87	Ave	40	106	H	-1.42	29.45	54.00	24.55
4874.00	46.32	PK	290	188	V	2.63	48.95	74.00	25.05
4874.00	32.07	Ave	290	188	V	2.63	34.70	54.00	19.30
6683.54	44.93	PK	58	247	H	8.71	53.64	74.00	20.36
6683.54	30.02	Ave	58	247	H	8.71	38.73	54.00	15.27
7311.00	40.36	PK	275	169	V	9.95	50.31	74.00	23.69
7311.00	26.91	Ave	275	169	V	9.95	36.86	54.00	17.14
High Channel (2462 MHz)									
149.29	50.69	QP	137	197	H	-13.00	37.69	43.5	5.81
2462.00	109.32	PK	152	224	V	-4.76	104.56	/	/
2462.00	104.11	Ave	152	224	V	-4.76	99.35	/	/
2462.00	108.35	PK	32	168	H	-4.76	103.59	/	/
2462.00	103.27	Ave	32	168	H	-4.76	98.51	/	/
2483.50	47.11	PK	219	204	V	-4.71	42.40	74.00	31.60
2483.50	34.67	Ave	219	204	V	-4.71	29.96	54.00	24.04
1534.66	43.23	PK	46	228	V	-7.91	35.32	74.00	38.68
1534.66	30.69	Ave	46	228	V	-7.91	22.78	54.00	31.22
4924.00	45.02	PK	176	201	V	2.74	47.76	74.00	26.24
4924.00	32.14	Ave	176	201	V	2.74	34.88	54.00	19.12
6673.27	41.36	PK	299	187	V	8.69	50.05	74.00	23.95
6673.27	28.09	Ave	299	187	V	8.69	36.78	54.00	17.22
7386.00	40.54	PK	16	113	V	10.06	50.60	74.00	23.40
7386.00	28.35	Ave	16	113	V	10.06	38.41	54.00	15.59

*802.11g Mode **Chain 0** (worst case):*

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)									
149.29	49.35	QP	10	249	H	-13.00	36.35	43.5	7.15
2412.00	103.12	PK	359	206	V	-4.90	98.22	/	/
2412.00	95.32	Ave	359	206	V	-4.90	90.42	/	/
2412.00	102.36	PK	252	133	H	-4.90	97.46	/	/
2412.00	94.15	Ave	252	133	H	-4.90	89.25	/	/
2390.00	61.32	PK	191	239	V	-4.96	56.36	74.00	17.64
2390.00	49.36	Ave	191	239	V	-4.96	44.40	54.00	9.60
2400.00	66.39	PK	233	126	V	-6.71	59.68	74.00	14.32
2400.00	53.64	Ave	233	126	V	-6.71	46.93	54.00	7.07
1476.95	44.43	PK	191	198	V	-9.35	35.08	74.00	38.92
1476.95	31.60	Ave	191	198	V	-9.35	22.25	54.00	31.75
4824.00	44.04	PK	12	177	V	2.52	46.56	74.00	27.44
4824.00	31.08	Ave	12	177	V	2.52	33.60	54.00	20.40
7236.00	39.32	PK	326	163	V	9.83	49.15	74.00	24.85
7236.00	25.92	Ave	326	163	V	9.83	35.75	54.00	18.25
Middle Channel (2437 MHz)									
149.29	49.57	QP	302	153	H	-13.00	36.57	43.5	6.93
2437.00	104.32	PK	114	153	V	-4.83	99.49	/	/
2437.00	92.32	Ave	114	153	V	-4.83	87.49	/	/
2437.00	102.32	PK	21	124	H	-4.83	97.49	/	/
2437.00	94.17	Ave	21	124	H	-4.83	89.34	/	/
1435.25	42.32	PK	183	183	V	-8.52	33.80	74.00	40.20
1435.25	29.63	Ave	183	183	V	-8.52	21.11	54.00	32.89
3317.52	41.32	PK	202	163	H	-1.33	39.99	74.00	34.01
3317.52	29.03	Ave	202	163	H	-1.33	27.70	54.00	26.30
4874.00	45.68	PK	357	154	V	2.63	48.31	74.00	25.69
4874.00	32.62	Ave	357	154	V	2.63	35.25	54.00	18.75
6312.25	41.52	PK	137	180	V	7.30	48.82	74.00	25.18
6312.25	29.31	Ave	137	180	V	7.30	36.61	54.00	17.39
7311.00	40.02	PK	50	138	V	9.95	49.97	74.00	24.03
7311.00	27.37	Ave	50	138	V	9.95	37.32	54.00	16.68

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)									
149.29	49.63	QP	85	121	H	-13.00	36.63	43.5	6.87
2462.00	104.01	PK	85	176	V	-4.76	99.25	/	/
2462.00	97.41	Ave	85	176	V	-4.76	92.65	/	/
2462.00	101.25	PK	274	112	H	-4.76	96.49	/	/
2462.00	94.22	Ave	274	112	H	-4.76	89.46	/	/
2483.50	60.41	PK	337	239	V	-4.71	55.70	74.00	18.30
2483.50	46.32	Ave	337	239	V	-4.71	41.61	54.00	12.39
1374.25	44.67	PK	48	113	V	-8.97	35.70	74.00	38.30
1374.25	31.88	Ave	48	113	V	-8.97	22.91	54.00	31.09
4924.00	43.12	PK	195	228	V	2.74	45.86	74.00	28.14
4924.00	29.58	Ave	195	228	V	2.74	32.32	54.00	21.68
6354.25	40.05	PK	39	232	V	7.52	47.57	74.00	26.43
6354.25	28.41	Ave	39	232	V	7.52	35.93	54.00	18.07
7386.00	38.93	PK	301	238	V	10.06	48.99	74.00	25.01
7386.00	25.26	Ave	301	238	V	10.06	35.32	54.00	18.68

802.11n-HT20 Mode(Chain0+Chain1):

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)									
149.29	48.36	QP	28	190	H	-13.00	35.36	43.5	8.14
2412.00	104.25	PK	174	205	V	-4.90	99.35	/	/
2412.00	97.32	Ave	174	205	V	-4.90	92.42	/	/
2412.00	101.35	PK	300	108	H	-4.90	96.45	/	/
2412.00	92.91	Ave	300	108	H	-4.90	88.01	/	/
2390.00	59.35	PK	337	116	V	-4.96	54.39	74.00	19.61
2390.00	45.96	Ave	337	116	V	-4.96	41.00	54.00	13.00
1894.35	43.25	PK	234	233	V	-6.46	36.79	74.00	37.21
1894.35	30.11	Ave	234	233	V	-6.46	23.65	54.00	30.35
1123.54	40.35	PK	318	117	H	-10.80	29.55	74.00	44.45
1123.54	27.12	Ave	318	117	H	-10.80	16.32	54.00	37.68
4824.00	45.36	PK	307	132	V	2.52	47.88	74.00	26.12
4824.00	30.25	Ave	307	132	V	2.52	32.77	54.00	21.23
7236.00	39.21	PK	257	205	V	9.83	49.04	74.00	24.96
7236.00	26.87	Ave	257	205	V	9.83	36.70	54.00	17.30

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)									
149.29	49.03	QP	311	161	H	-13.00	36.03	43.5	7.47
2437.00	105.32	PK	354	139	V	-4.83	100.49	/	/
2437.00	97.35	Ave	354	139	V	-4.83	92.52	/	/
2437.00	102.65	PK	120	141	H	-4.83	97.82	/	/
2437.00	94.11	Ave	120	141	H	-4.83	89.28	/	/
1123.54	40.32	PK	293	144	H	-10.80	29.52	74.00	44.48
1123.54	28.32	Ave	293	144	H	-10.80	17.52	54.00	36.48
3274.65	40.32	PK	71	175	V	-1.42	38.90	74.00	35.10
3274.65	29.65	Ave	71	175	V	-1.42	28.23	54.00	25.77
4874.00	45.63	PK	346	188	V	2.63	48.26	74.00	25.74
4874.00	31.36	Ave	346	188	V	2.63	33.99	54.00	20.01
6321.52	41.13	PK	165	194	V	7.35	48.48	74.00	25.52
6321.52	27.35	Ave	165	194	V	7.35	34.70	54.00	19.30
7311.00	38.93	PK	8	172	V	9.95	48.88	74.00	25.12
7311.00	26.01	Ave	8	172	V	9.95	35.96	54.00	18.04
High Channel (2462 MHz)									
149.29	49.32	QP	29	102	H	-13.00	36.32	43.5	7.18
2462.00	103.25	PK	342	110	V	-4.76	98.49	/	/
2462.00	96.33	Ave	342	110	V	-4.76	91.57	/	/
2462.00	101.25	PK	179	176	H	-4.76	96.49	/	/
2462.00	93.37	Ave	179	176	H	-4.76	88.61	/	/
2483.50	53.25	PK	50	145	V	-4.71	48.54	74.00	25.46
2483.50	40.21	Ave	50	145	V	-4.71	35.50	54.00	18.50
1121.35	38.35	PK	282	112	H	-10.14	28.21	74.00	45.79
1121.35	26.32	Ave	282	112	H	-10.14	16.18	54.00	37.82
4924.00	45.42	PK	247	228	V	2.74	48.16	74.00	25.84
4924.00	31.26	Ave	247	228	V	2.74	34.00	54.00	20.00
6321.52	40.33	PK	186	155	V	7.35	47.68	74.00	26.32
6321.52	26.35	Ave	186	155	V	7.35	33.70	54.00	20.30
7386.00	37.35	PK	120	241	V	10.06	47.41	74.00	26.59
7386.00	25.35	Ave	120	241	V	10.06	35.41	54.00	18.59

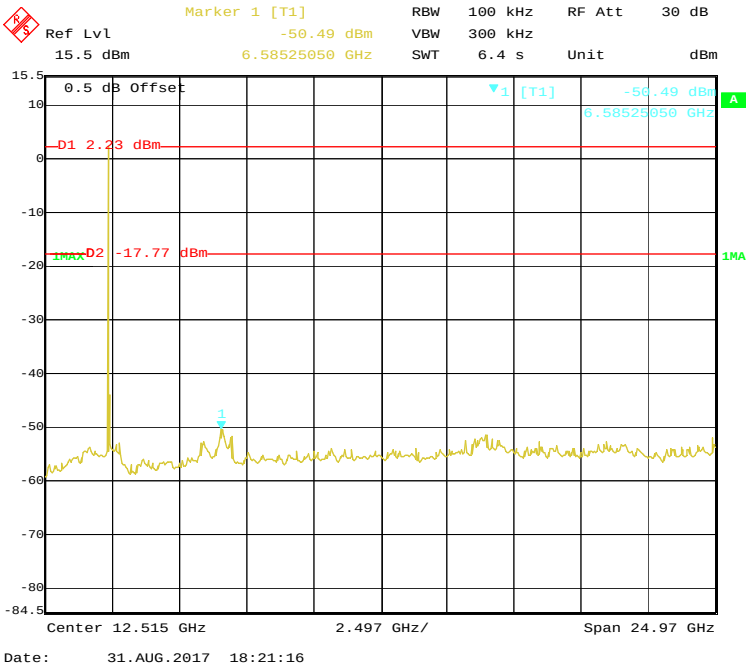
802.11n-HT40 Mode(Chain0+Chain1):

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)									
149.29	49.25	QP	171	239	H	-13.00	36.25	43.5	7.25
2422.00	102.35	PK	337	178	V	-4.88	97.47	/	/
2422.00	90.11	Ave	337	178	V	-4.88	85.23	/	/
2422.00	98.35	PK	152	236	H	-4.88	93.47	/	/
2422.00	86.03	Ave	152	236	H	-4.88	81.15	/	/
2390.00	58.93	PK	116	158	V	-4.96	53.97	74.00	20.03
2390.00	42.36	Ave	116	158	V	-4.96	37.40	54.00	16.60
1835.51	43.28	PK	2	238	V	-6.70	36.58	74.00	37.42
1835.51	30.31	Ave	2	238	V	-6.70	23.61	54.00	30.39
1152.36	40.32	PK	193	156	H	-10.59	29.73	74.00	44.27
1152.36	28.36	Ave	193	156	H	-10.59	17.77	54.00	36.23
4844.00	45.14	PK	358	115	V	2.56	47.70	74.00	26.30
4844.00	31.68	Ave	358	115	V	2.56	34.24	54.00	19.76
7266.00	38.91	PK	332	214	V	9.88	48.79	74.00	25.21
7266.00	27.52	Ave	332	214	V	9.88	37.40	54.00	16.60
Middle Channel (2437 MHz)									
149.29	49.66	QP	198	102	H	-13.00	36.66	43.5	6.84
2437.00	102.58	PK	265	156	V	-4.83	97.75	/	/
2437.00	90.63	Ave	265	156	V	-4.83	85.80	/	/
2437.00	98.32	PK	356	173	H	-4.83	93.49	/	/
2437.00	85.61	Ave	356	173	H	-4.83	80.78	/	/
1142.35	40.23	PK	203	206	V	-10.36	29.87	74.00	44.13
1142.35	27.85	Ave	203	206	V	-10.36	17.49	54.00	36.51
3354.74	42.35	PK	5	106	H	-1.42	40.93	74.00	33.07
3354.74	28.57	Ave	5	106	H	-1.42	27.15	54.00	26.85
4874.00	45.21	PK	170	181	V	2.63	47.84	74.00	26.16
4874.00	32.24	Ave	170	181	V	2.63	34.87	54.00	19.13
6612.54	40.35	PK	8	148	V	8.54	48.89	74.00	25.11
6612.54	28.02	Ave	8	148	V	8.54	36.56	54.00	17.44
7311.00	39.35	PK	349	235	V	9.95	49.30	74.00	24.70
7311.00	26.78	Ave	349	235	V	9.95	36.73	54.00	17.27

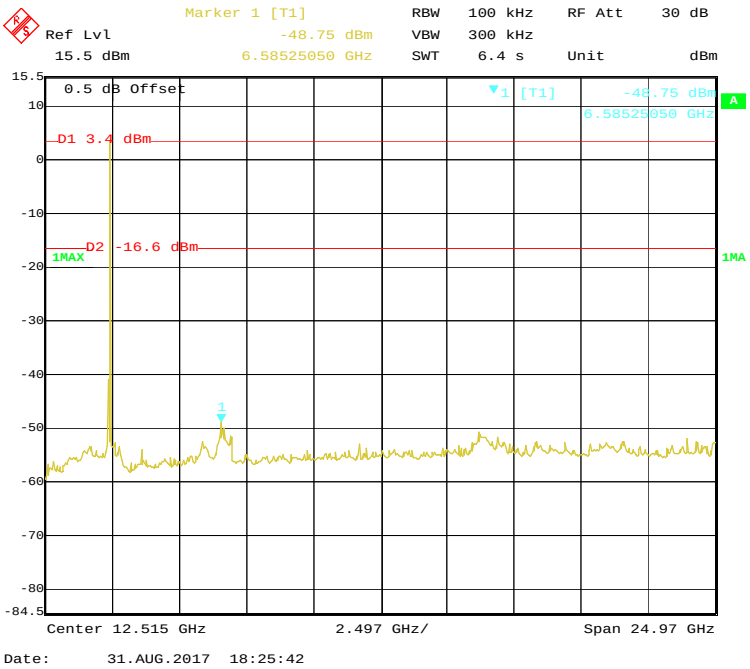
Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB)	Corrected Amplitude (dBμV/m)	FCC Part 15.247/205/209	
	Reading (dBμV)	Detector (PK/QP/Ave.)		Height (cm)	Polar (H/V)			Limit (dBμV/m)	Margin (dB)
High Channel (2452 MHz)									
149.29	49.62	QP	7	188	H	-13.00	36.62	43.5	6.88
2452.00	103.12	PK	78	126	V	-4.79	98.33	/	/
2452.00	91.28	Ave	78	126	V	-4.79	86.49	/	/
2452.00	98.32	PK	332	109	H	-4.79	93.53	/	/
2452.00	86.02	Ave	332	109	H	-4.79	81.23	/	/
2483.50	46.87	PK	220	138	V	-4.71	42.16	74.00	31.84
2483.50	33.54	Ave	220	138	V	-4.71	28.83	54.00	25.17
1294.59	40.23	PK	229	127	V	-9.55	30.68	74.00	43.32
1294.59	28.34	Ave	229	127	V	-9.55	18.79	54.00	35.21
4904.00	44.68	PK	215	242	V	2.70	47.38	74.00	26.62
4904.00	30.16	Ave	215	242	V	2.70	32.86	54.00	21.14
6679.74	40.32	PK	238	141	H	8.70	49.02	74.00	24.98
6679.74	29.67	Ave	238	141	H	8.70	38.37	54.00	15.63
7356.00	38.44	PK	320	163	V	10.01	48.45	74.00	25.55
7356.00	25.63	Ave	320	163	V	10.01	35.64	54.00	18.36

Conducted Spurious Emissions at Antenna Port

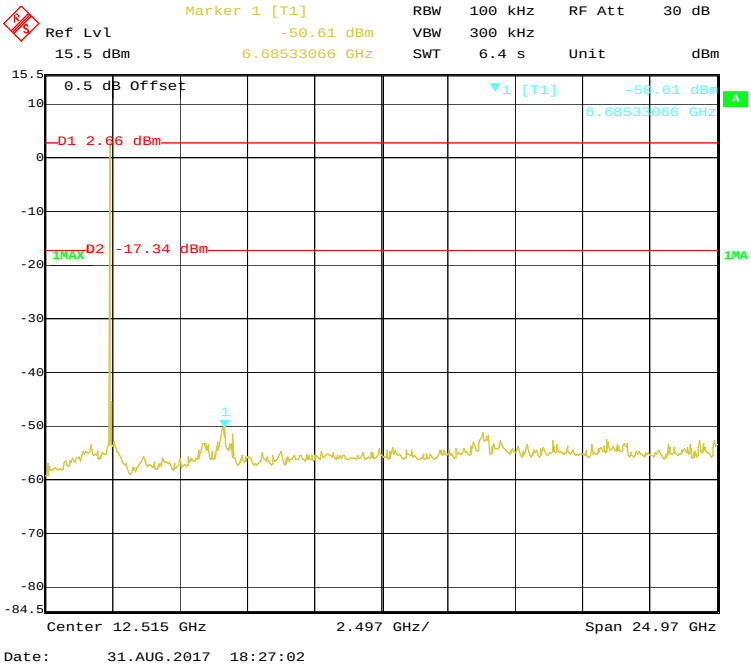
Chain0: 802.11b Low Channel



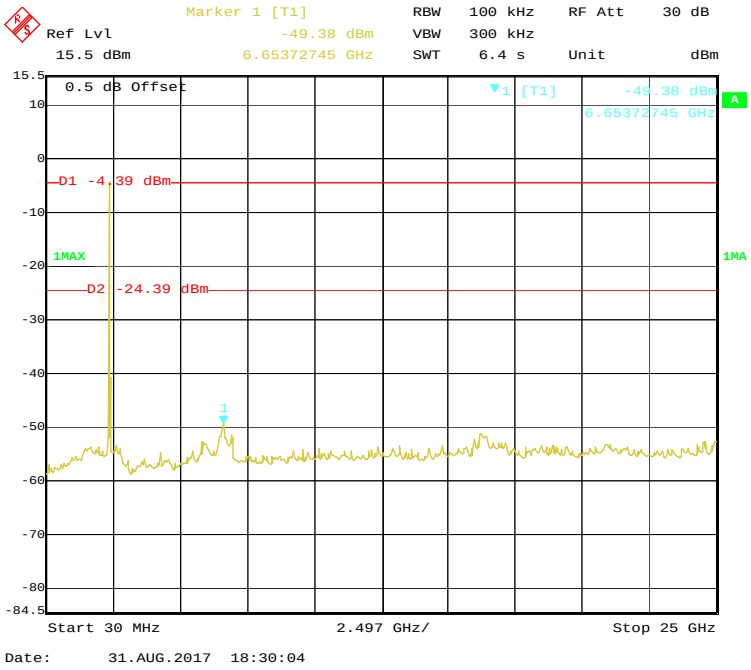
Chain0: 802.11b Middle Channel



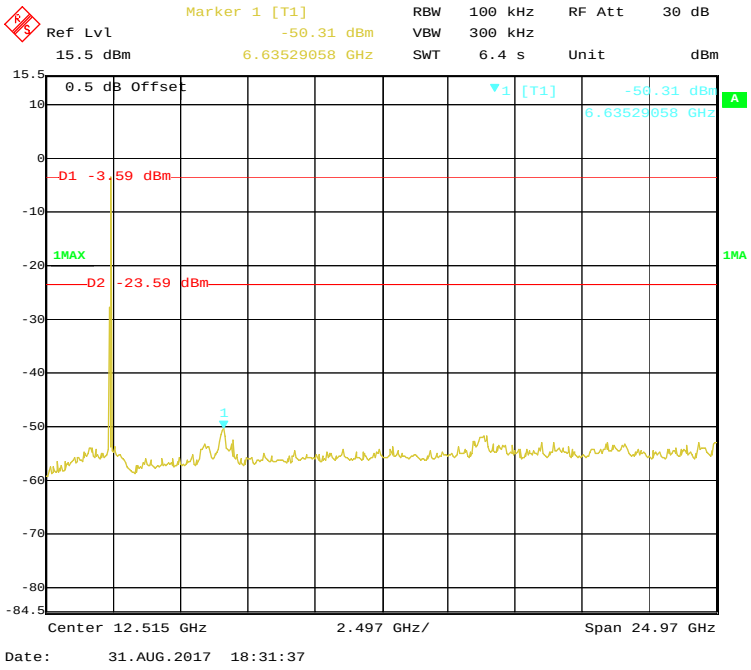
Chain0: 802.11b High Channel



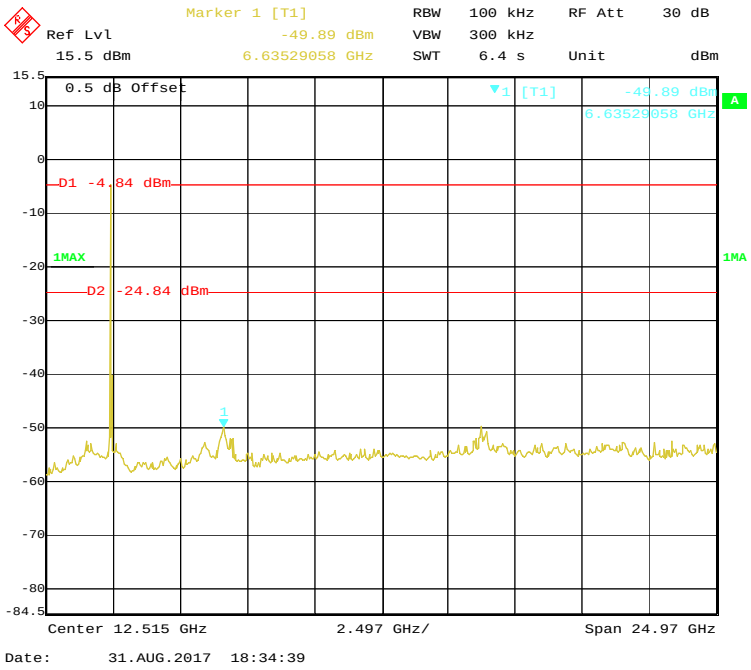
Chain0: 802.11g Low Channel



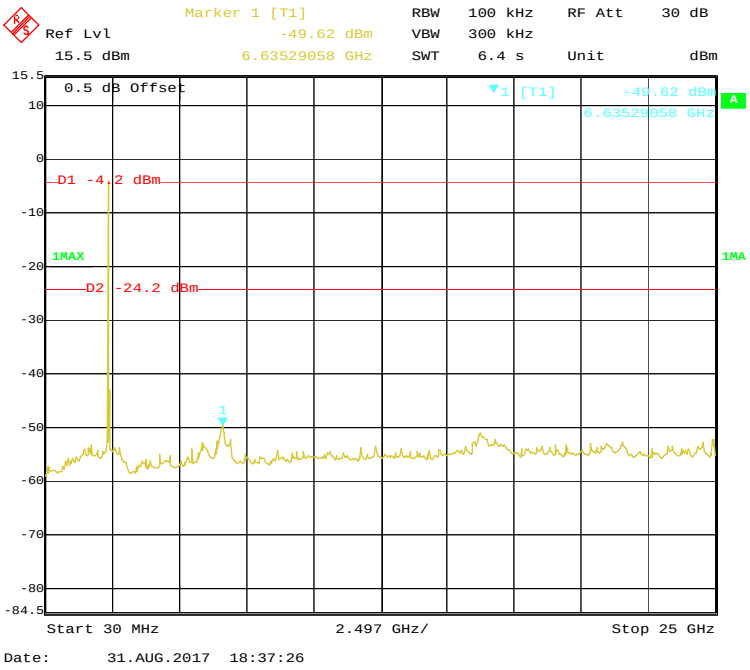
Chain0: 802.11g Middle Channel



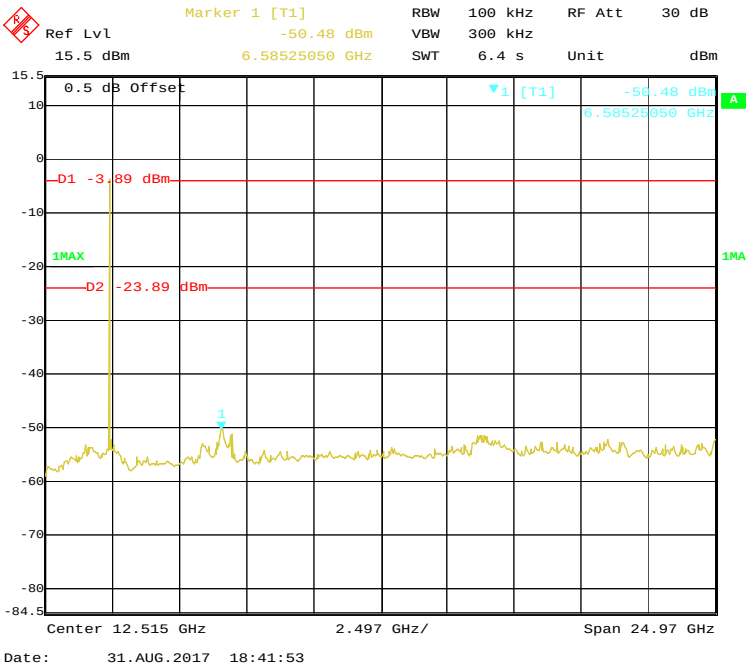
Chain0: 802.11g High Channel



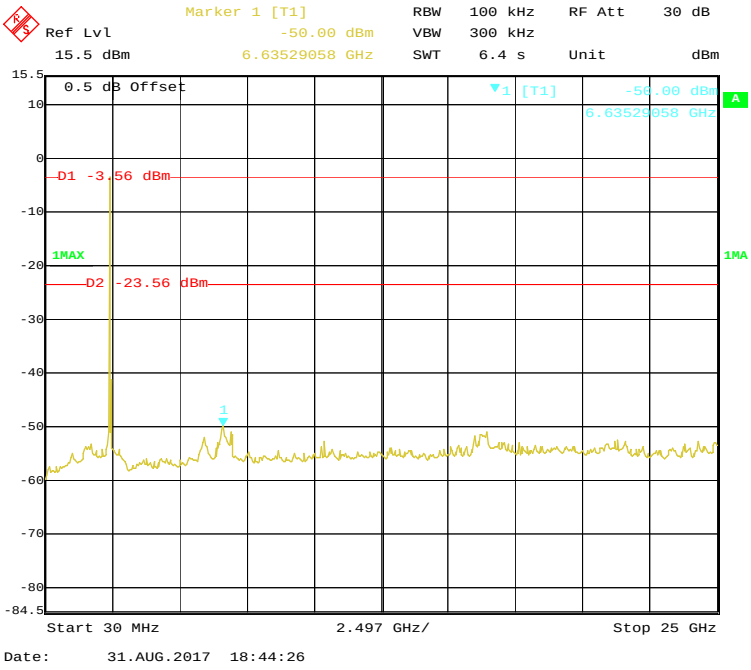
Chain0: 802.11n-HT20 Low Channel



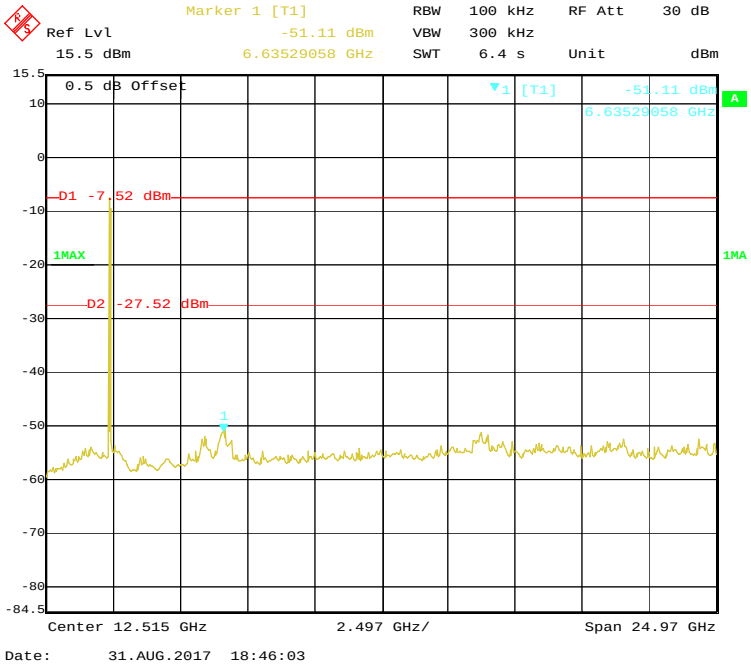
Chain0: 802.11n-HT20 Middle Channel



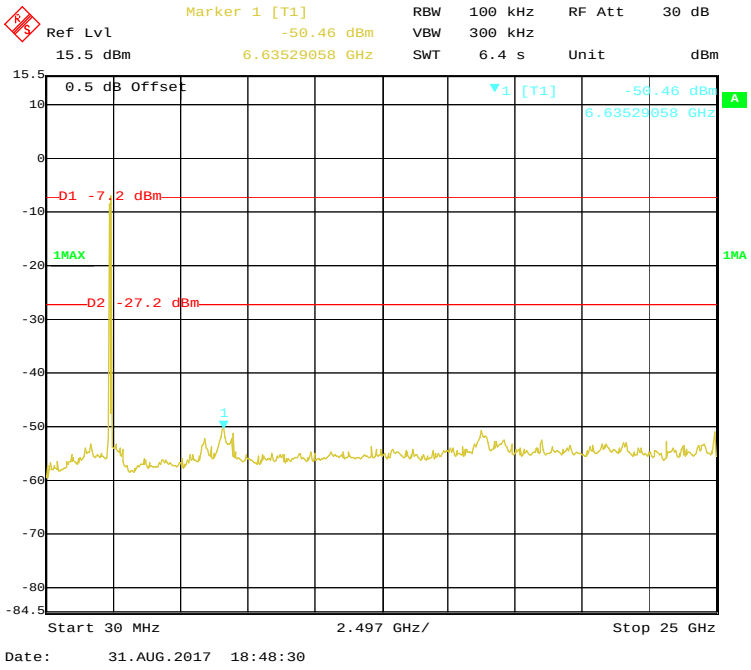
Chain0: 802.11n-HT20 High Channel



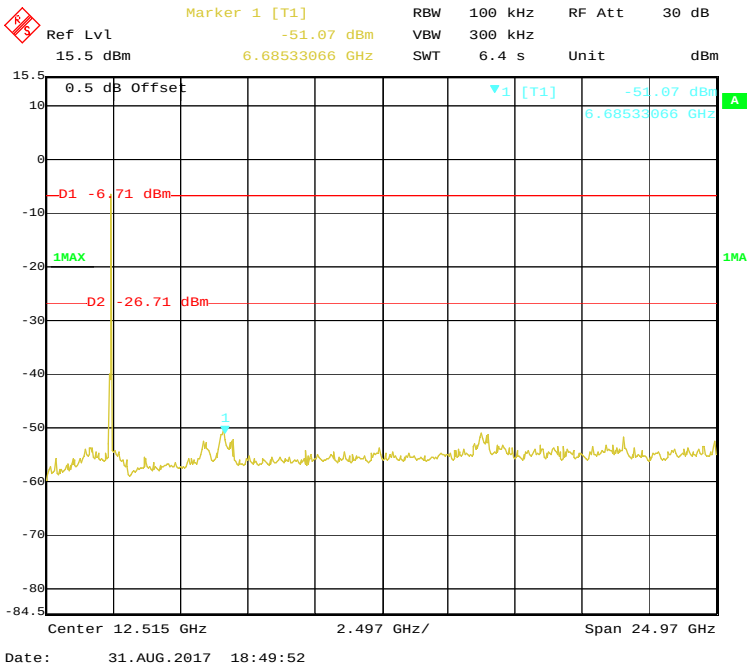
Chain0: 802.11n-HT40 Low Channel



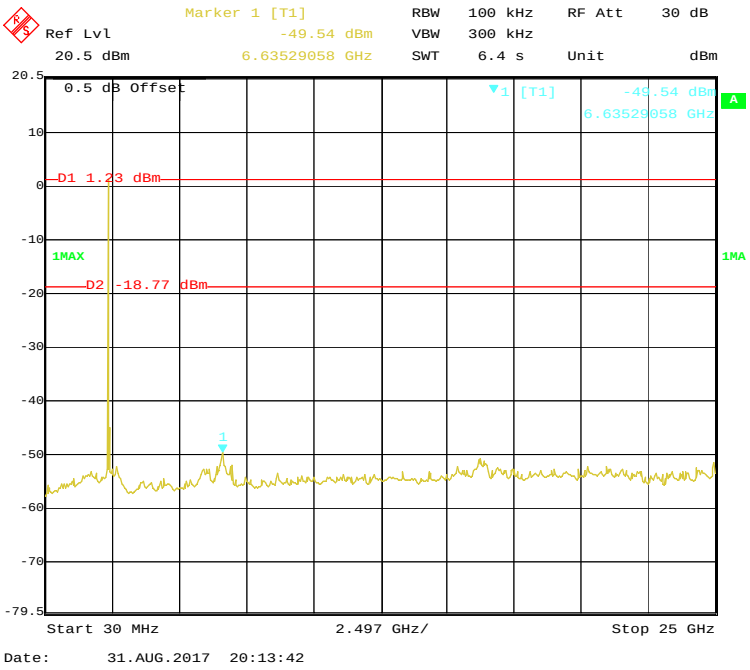
Chain0: 802.11n-HT40 Middle Channel



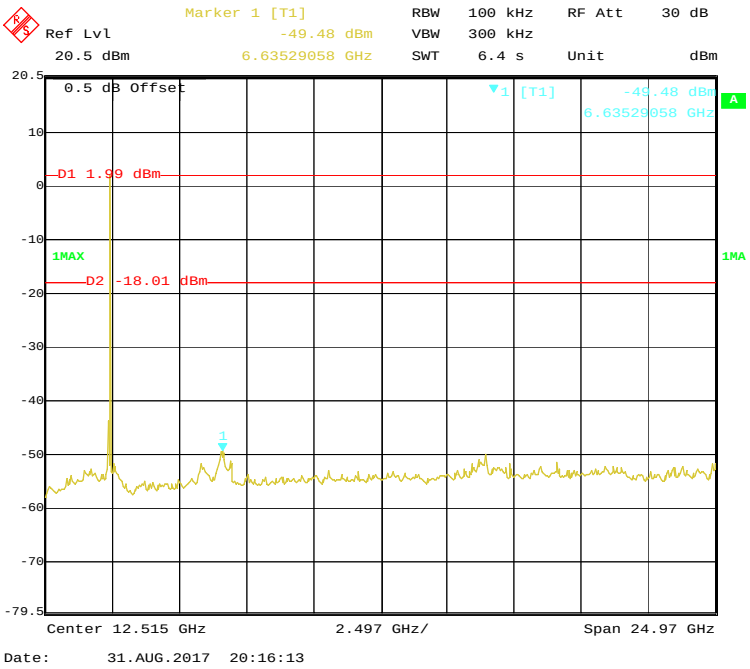
Chain0: 802.11n-HT40 High Channel



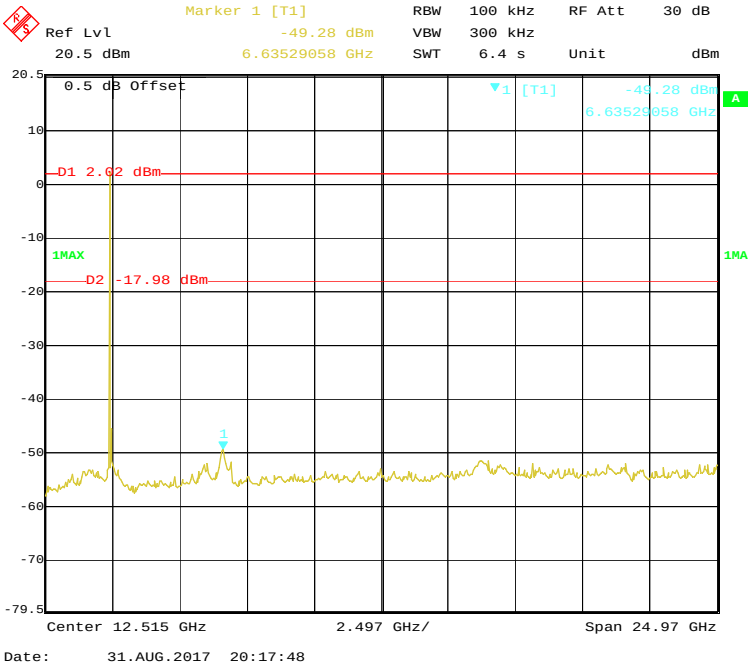
Chain1: 802.11b Low Channel



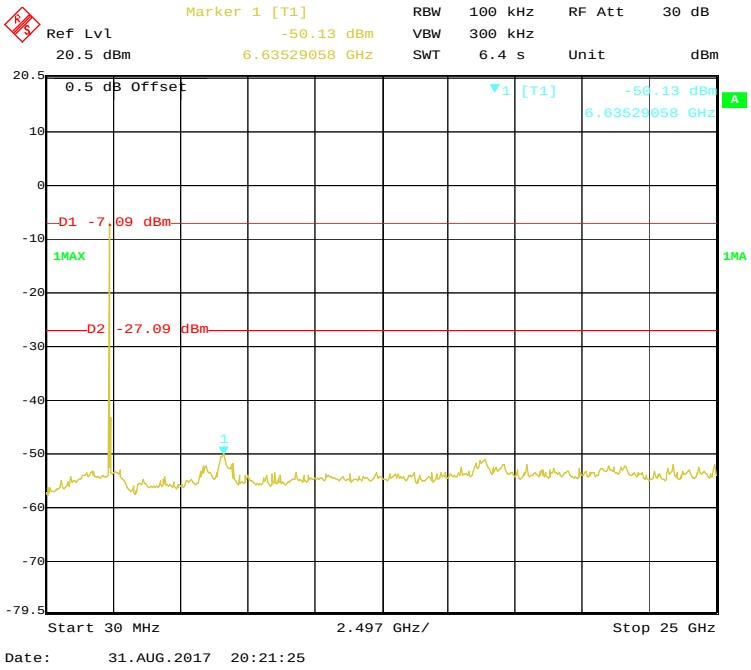
Chain1: 802.11b Middle Channel



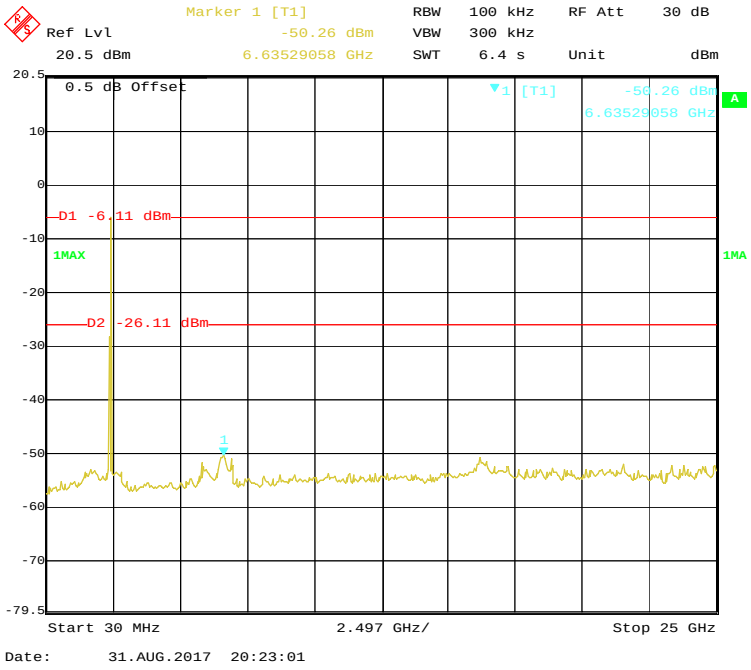
Chain1: 802.11b High Channel



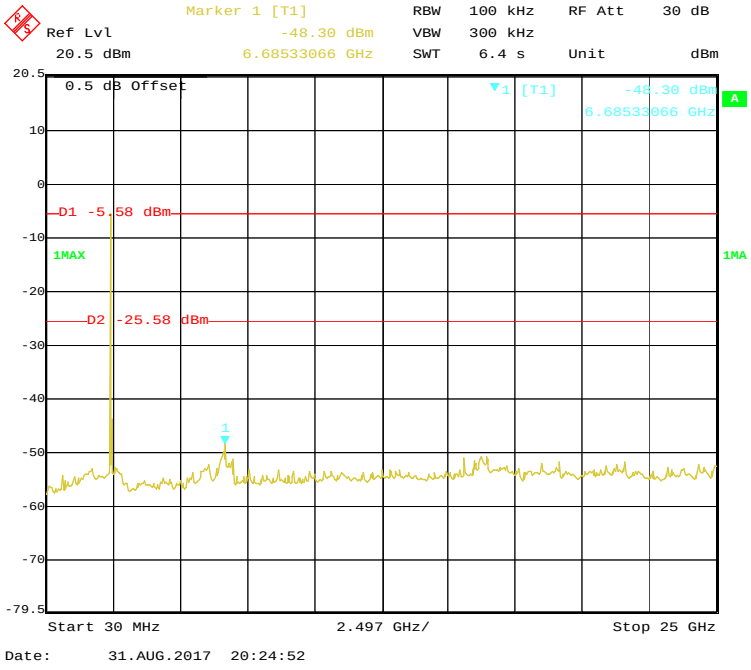
Chain1: 802.11g Low Channel



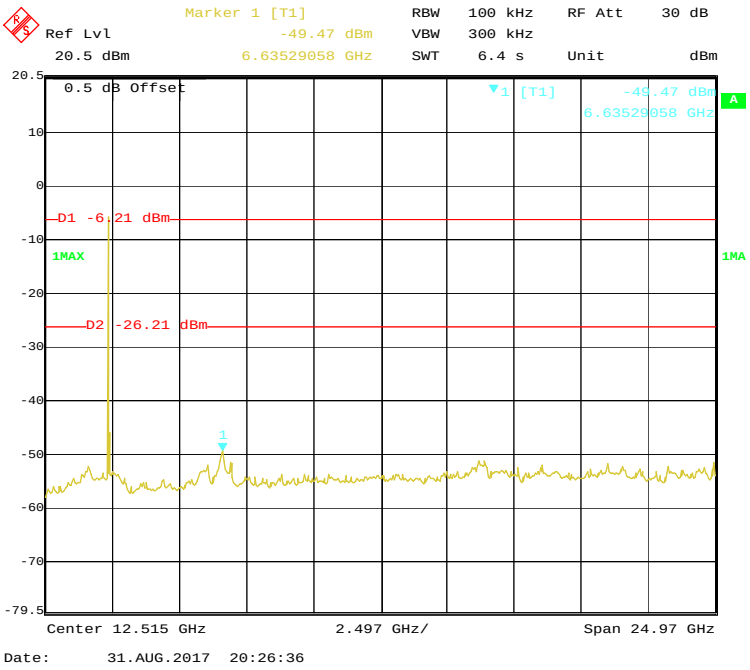
Chain1: 802.11g Middle Channel



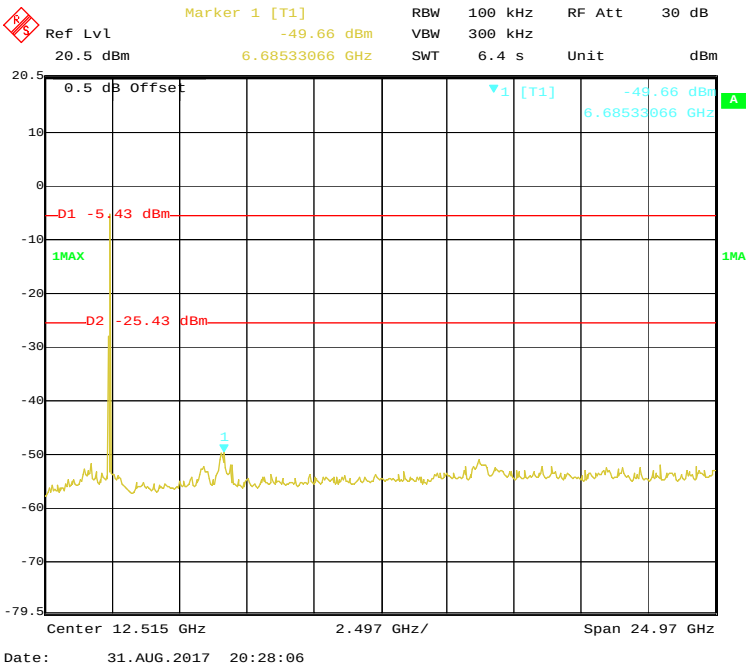
Chain1: 802.11g High Channel



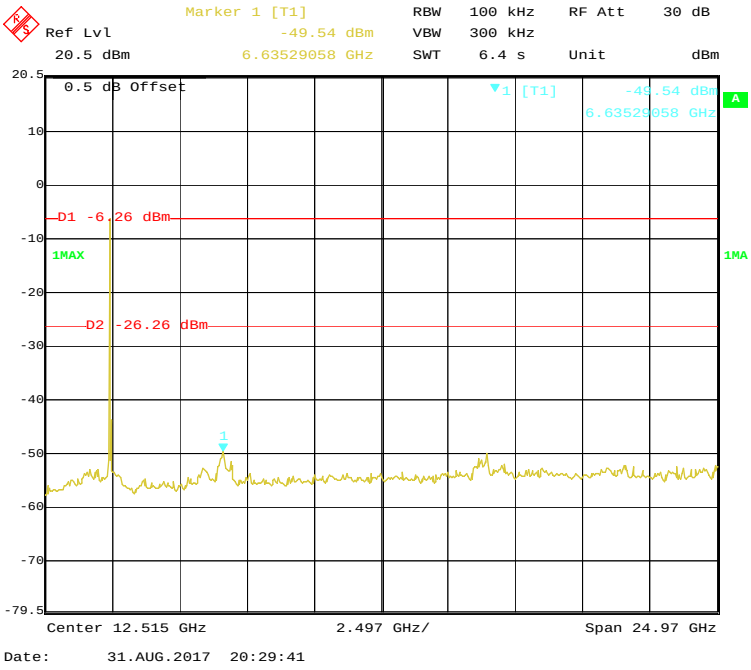
Chain1: 802.11n-HT20 Low Channel



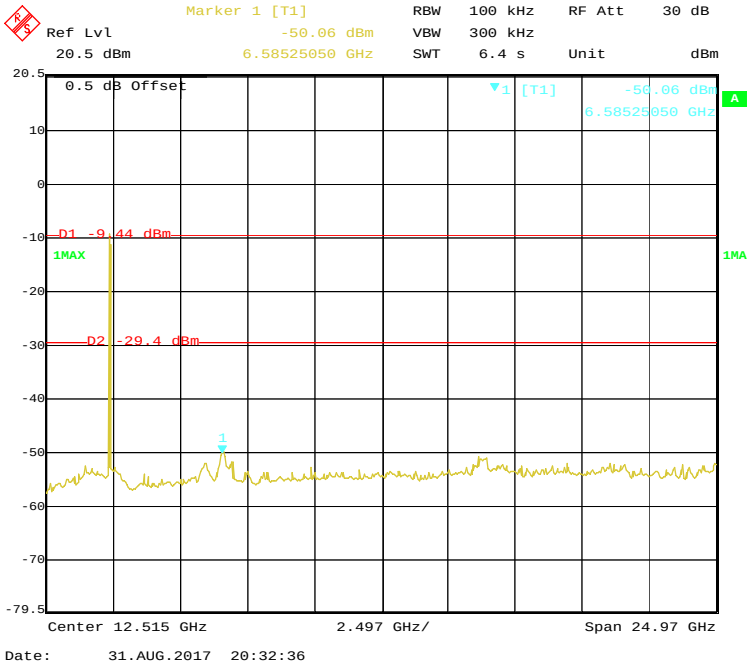
Chain1: 802.11n-HT20 Middle Channel



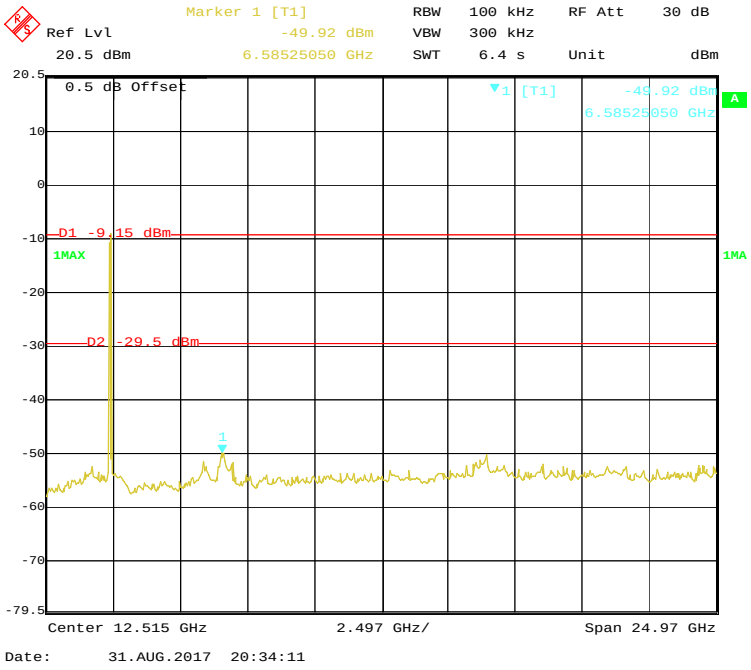
Chain1: 802.11n-HT20 High Channel



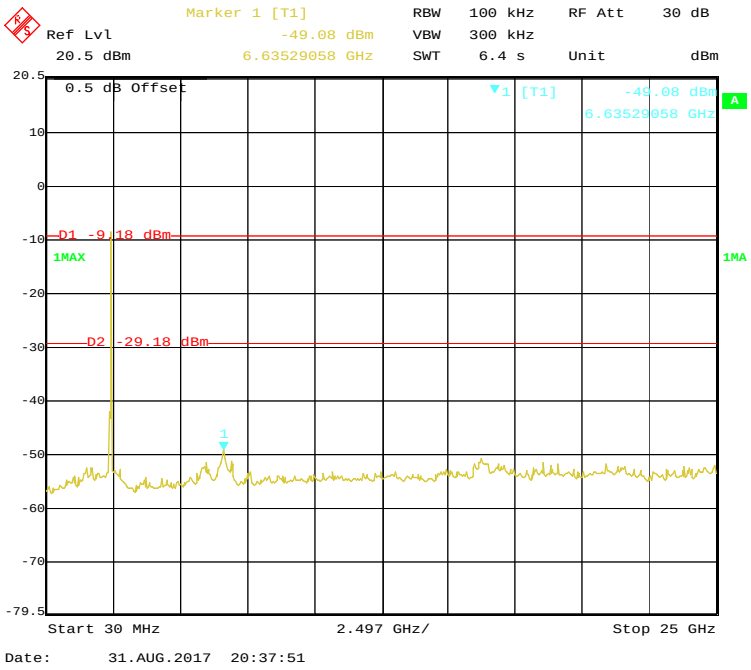
Chain1: 802.11n-HT40 Low Channel



Chain1: 802.11n-HT40 Middle Channel



Chain1: 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) ≥ 3 x RBW.
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:	24.8 ℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

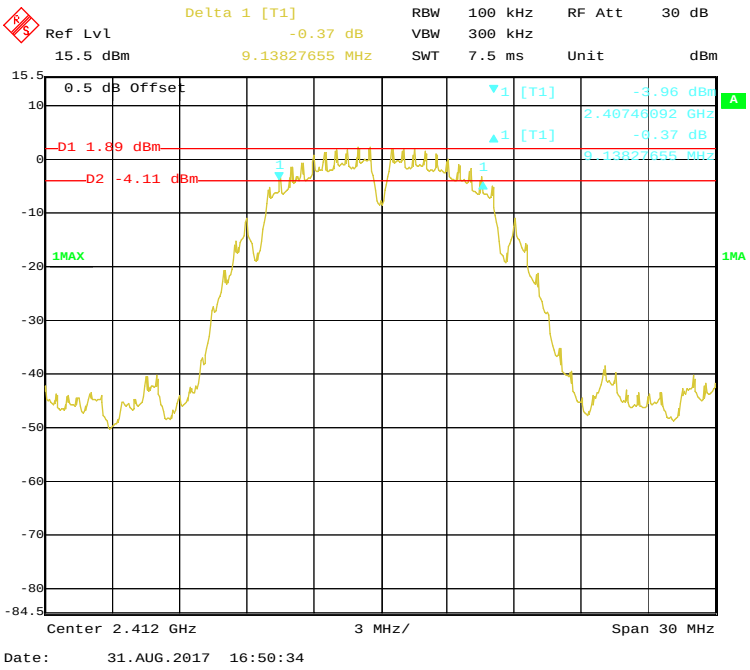
The testing was performed by Kyle Xu on 2017-08-31.

Test Result: Pass.

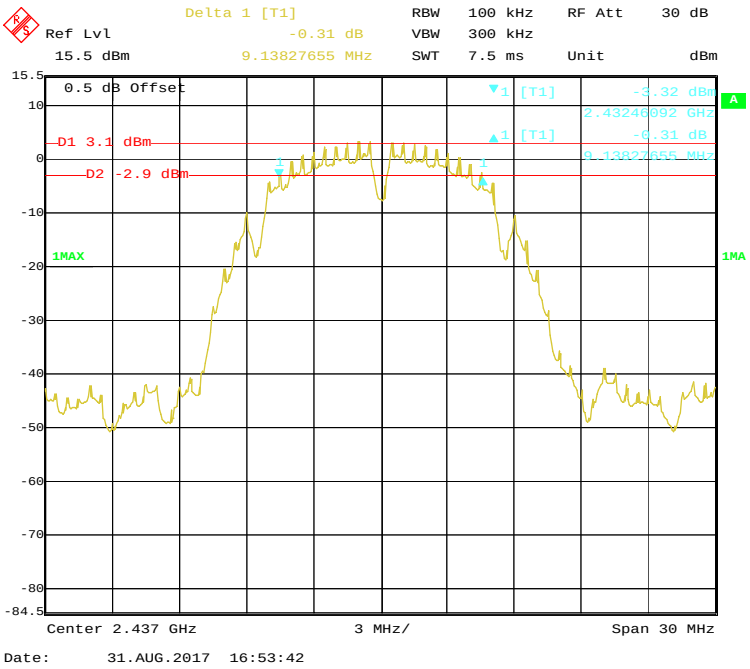
EUT operation mode: Transmitting

Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)		Limit (kHz)
		Chain0	Chain1	
802.11b mode				
Low	2412	9.14	9.14	≥500
Middle	2437	9.14	9.14	≥500
High	2462	9.08	9.14	≥500
802.11g mode				
Low	2412	16.41	16.41	≥500
Middle	2437	16.41	16.41	≥500
High	2462	16.41	16.41	≥500
802.11n-HT20 mode				
Low	2412	17.62	17.68	≥500
Middle	2437	17.62	17.68	≥500
High	2462	17.68	17.68	≥500
802.11n-HT40 mode				
Low	2422	36.37	36.47	≥500
Middle	2437	36.27	36.47	≥500
High	2452	36.47	36.47	≥500

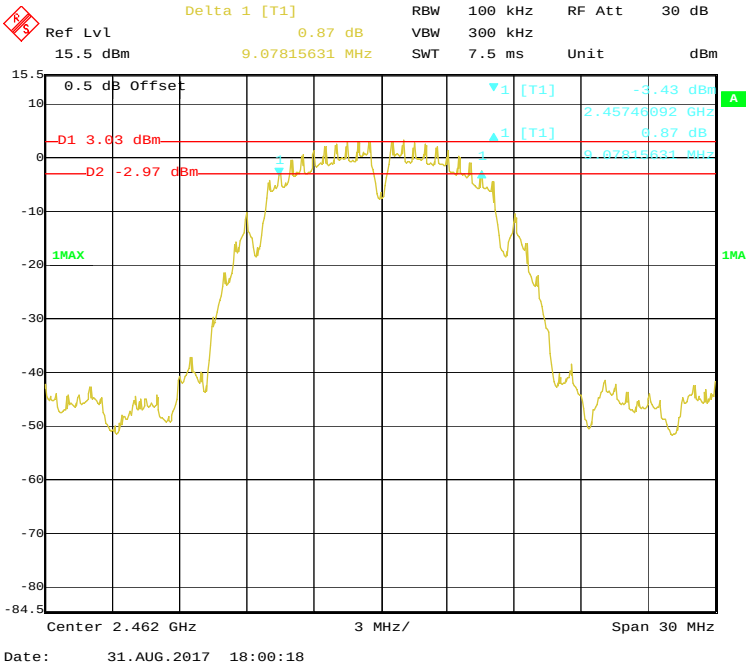
Chain0: 802.11b Low Channel



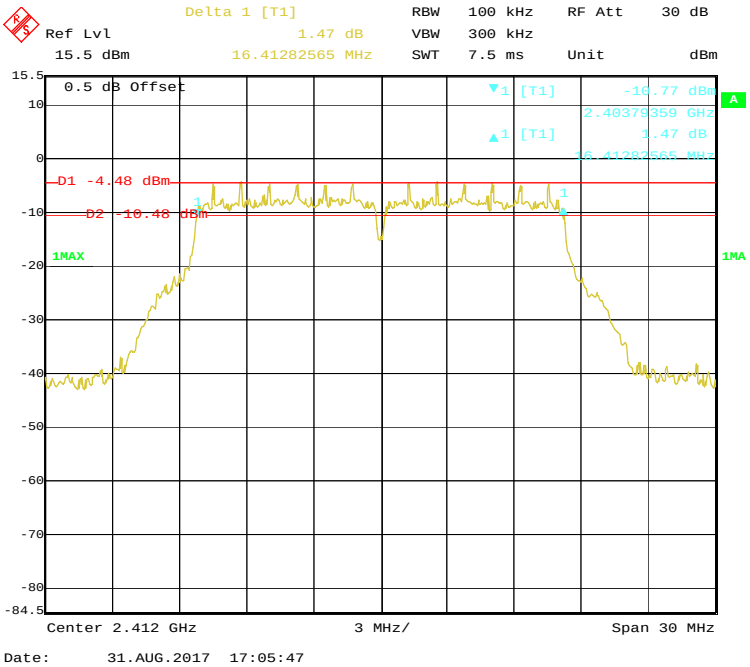
Chain0: 802.11b Middle Channel



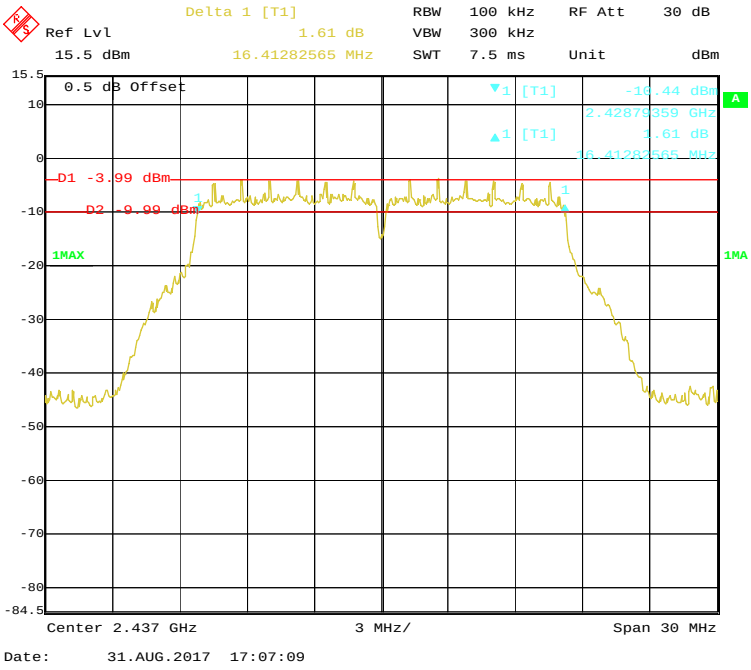
Chain0: 802.11b High Channel



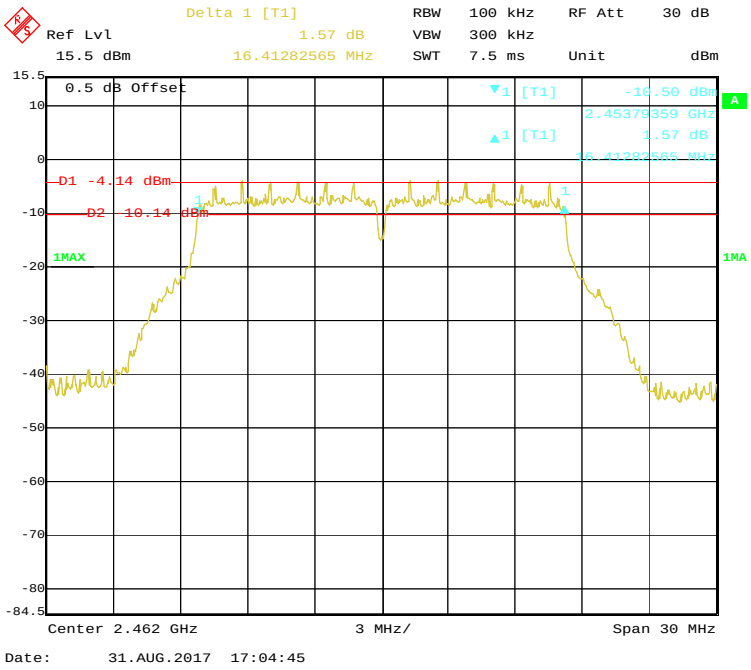
Chain0: 802.11g Low Channel



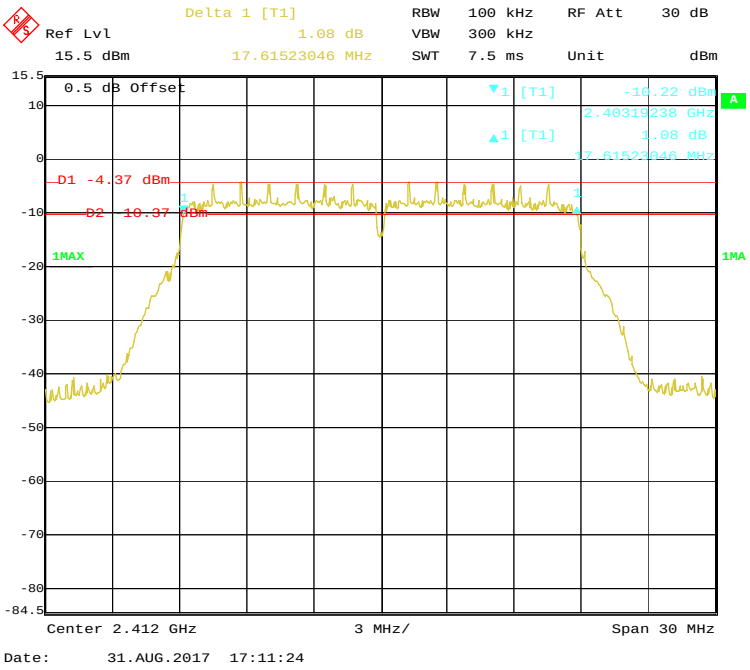
Chain0: 802.11g Middle Channel



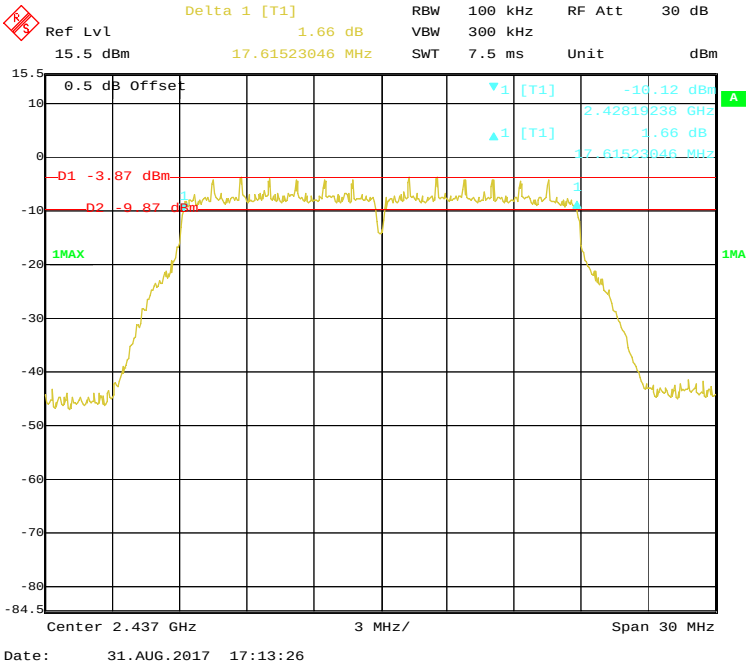
Chain0: 802.11g High Channel



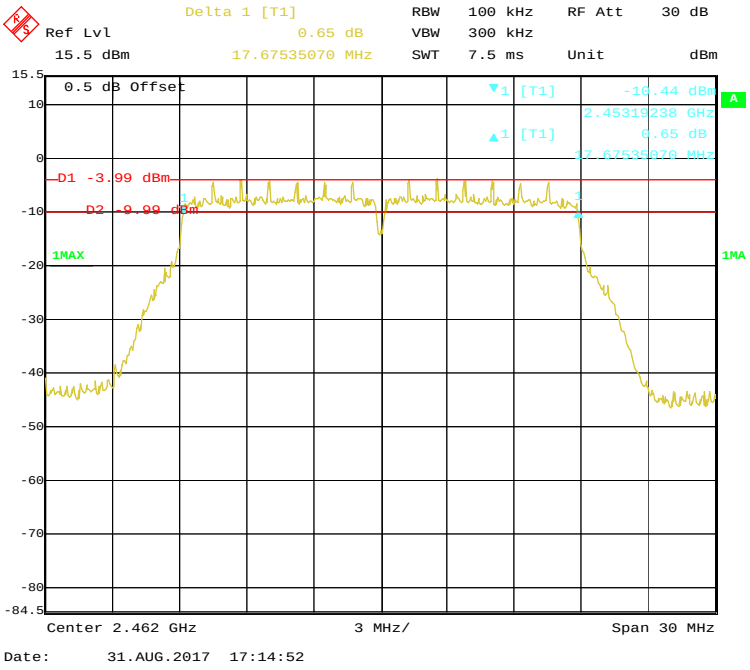
Chain0: 802.11n-HT20 Low Channel



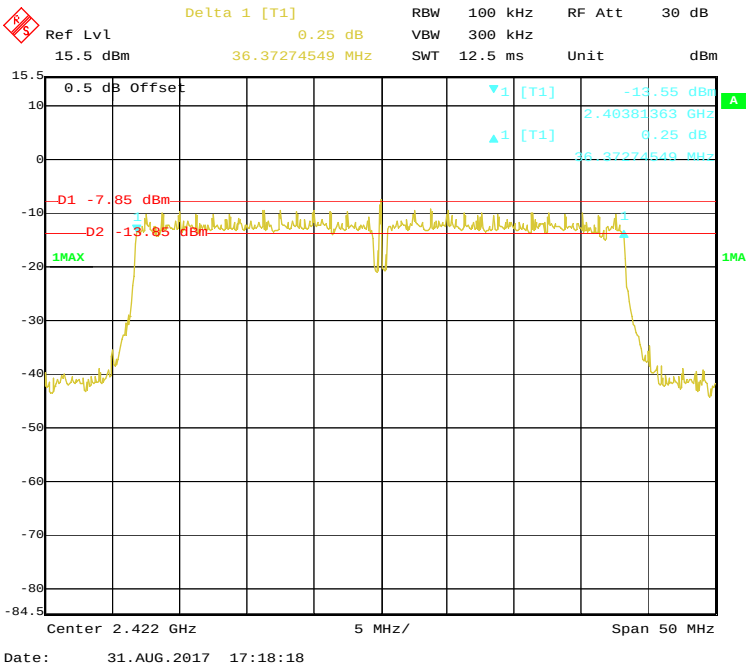
Chain0: 802.11n-HT20 Middle Channel



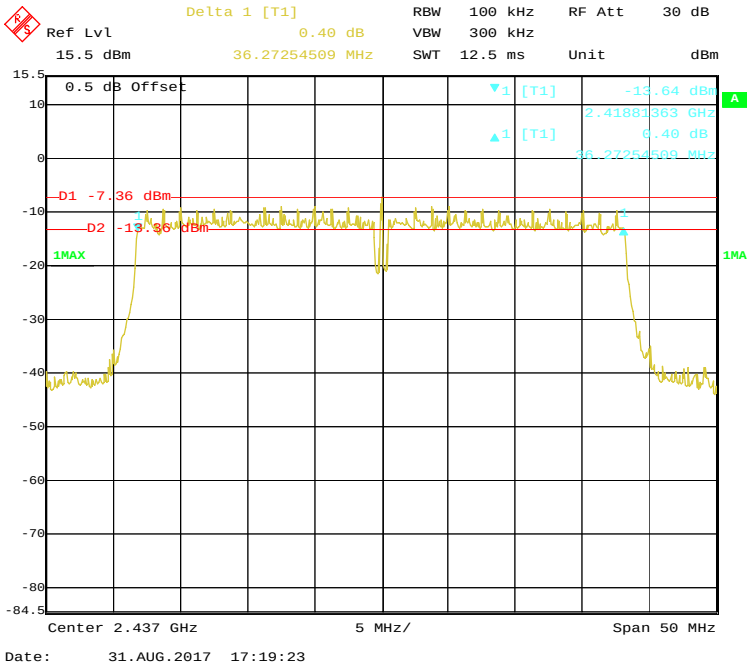
Chain0: 802.11n-HT20 High Channel



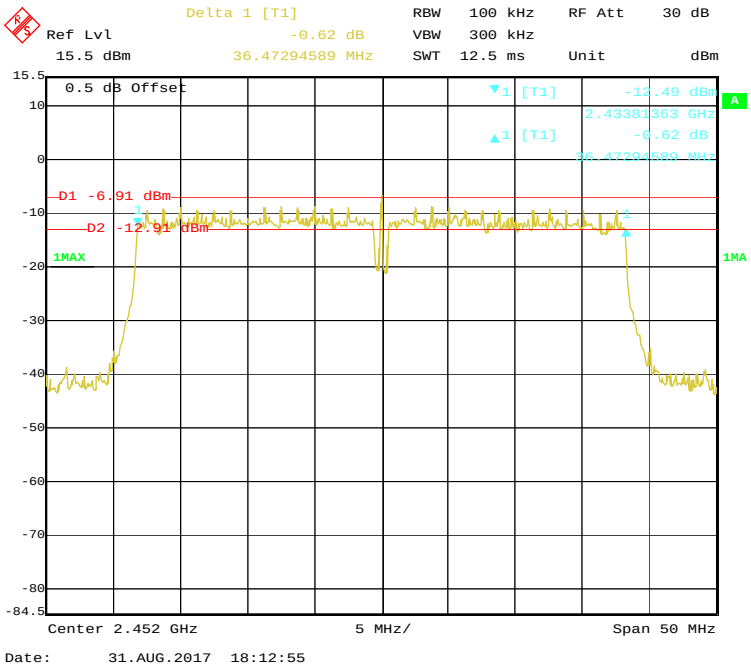
Chain0: 802.11n-HT40 Low Channel



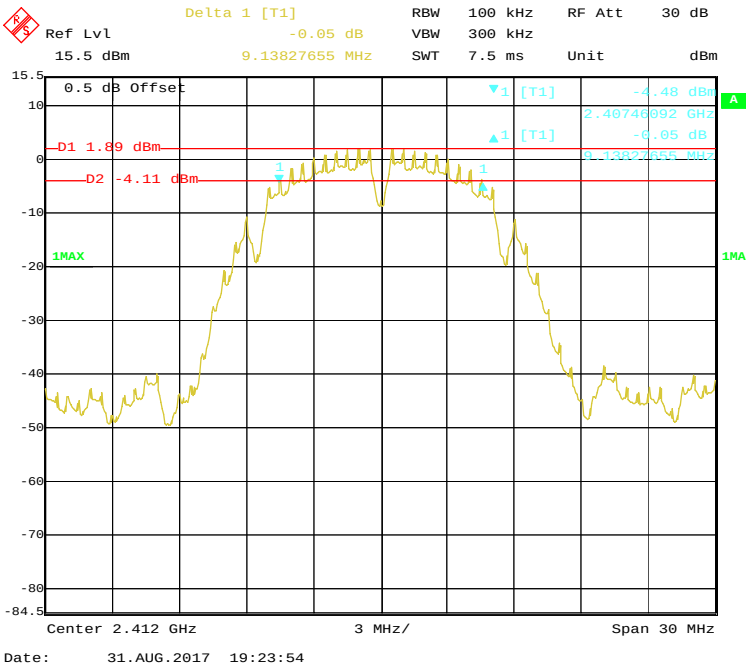
Chain0: 802.11n-HT40 Middle Channel



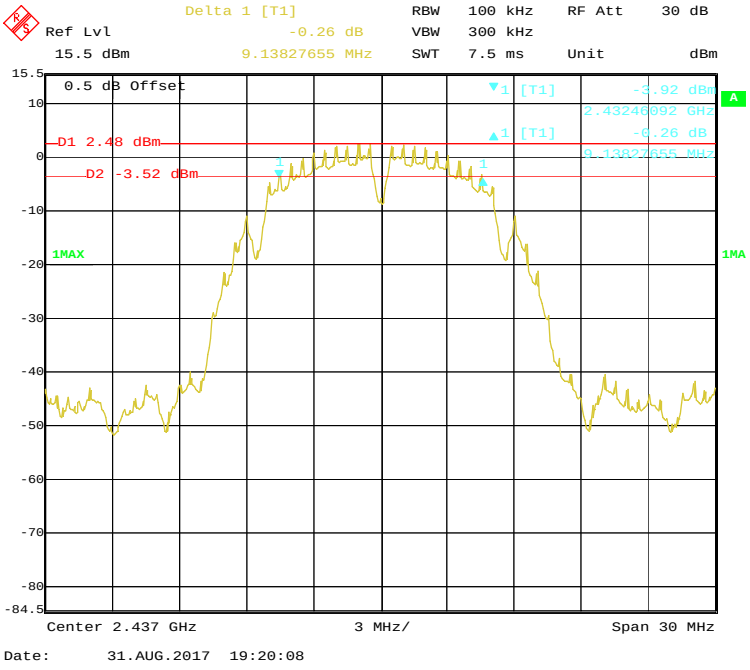
Chain0: 802.11n-HT40 High Channel



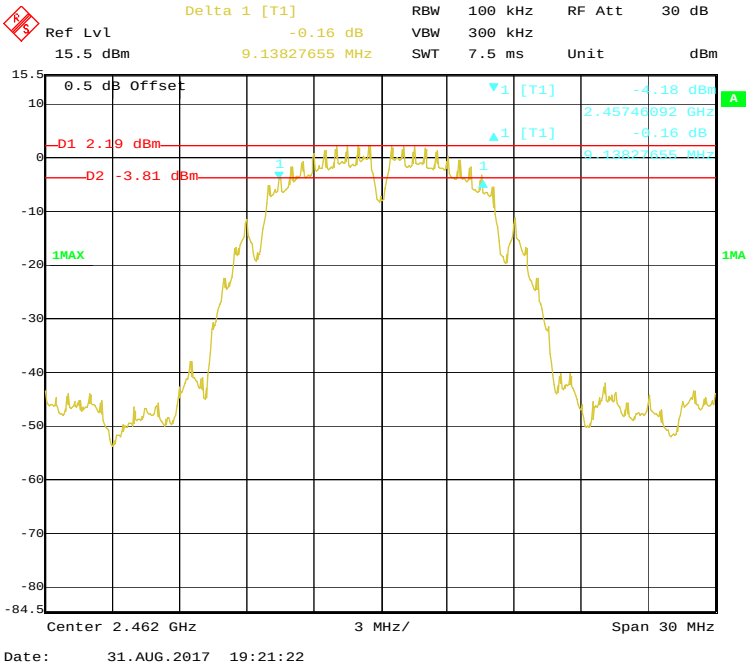
Chain1: 802.11b Low Channel



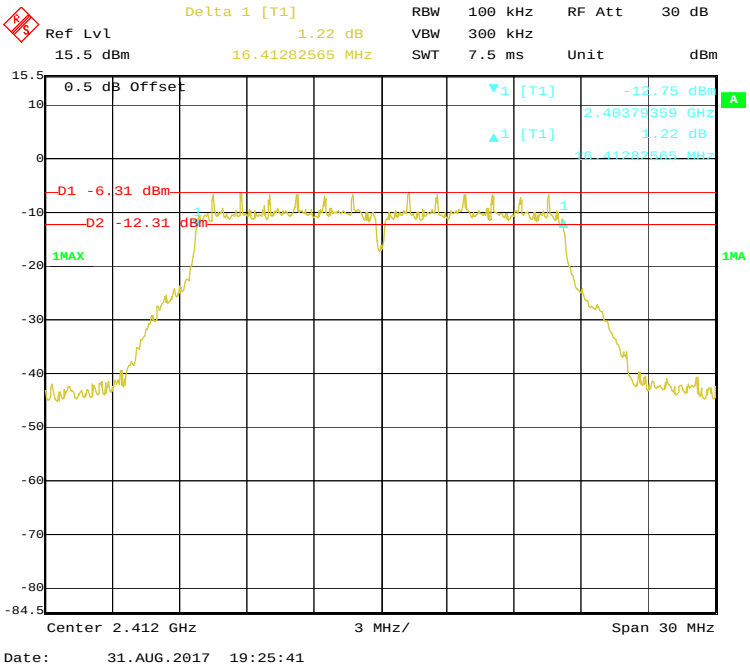
Chain1: 802.11b Middle Channel



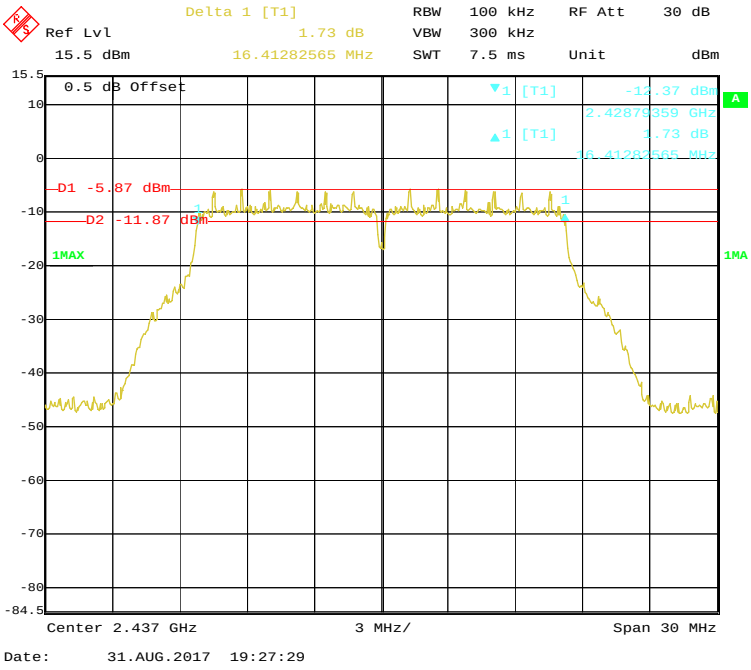
Chain1: 802.11b High Channel



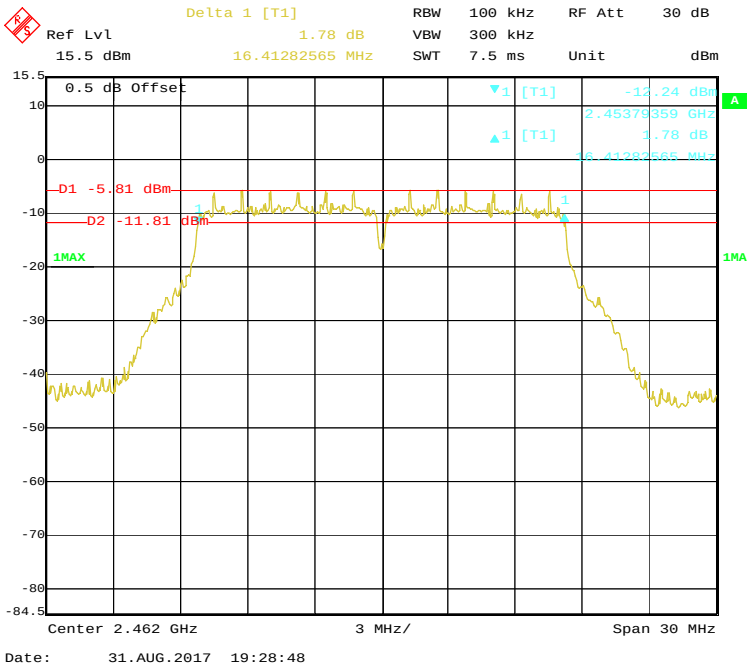
Chain1: 802.11g Low Channel



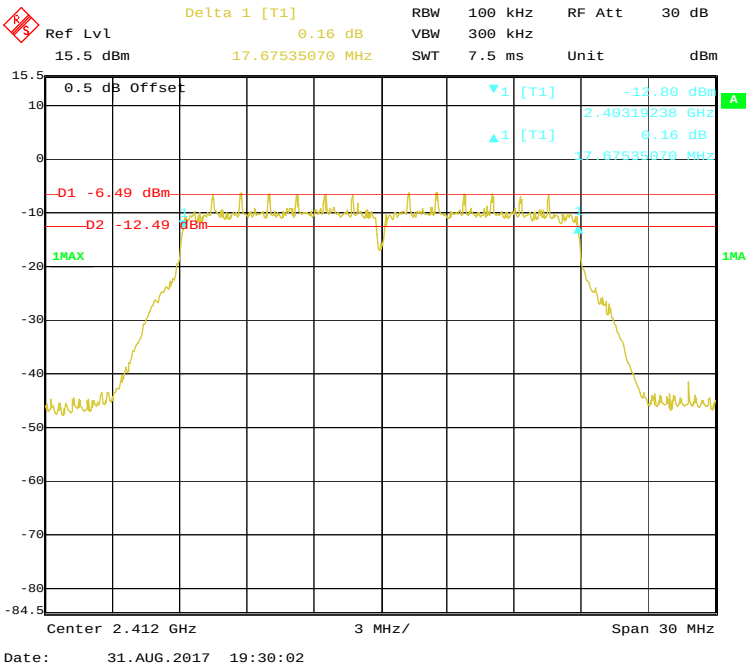
Chain1: 802.11g Middle Channel



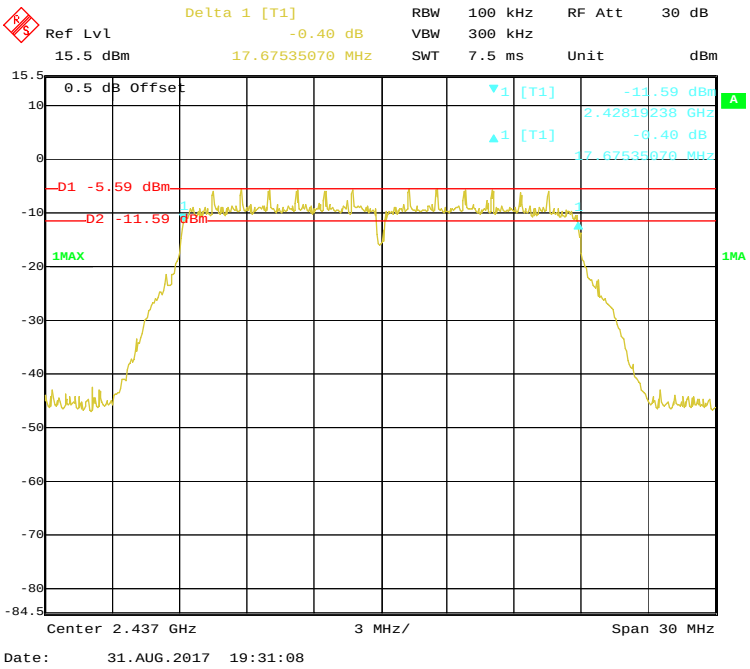
Chain1: 802.11g High Channel



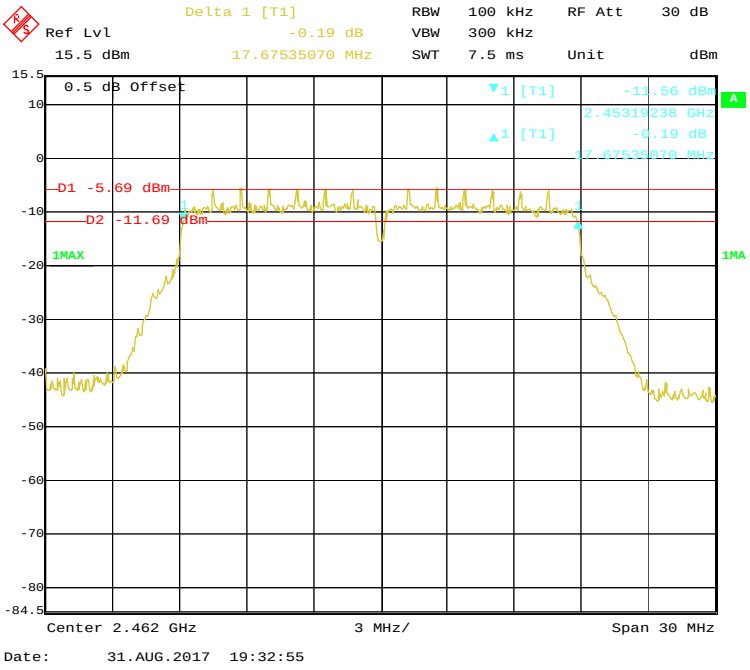
Chain1: 802.11n-HT20 Low Channel



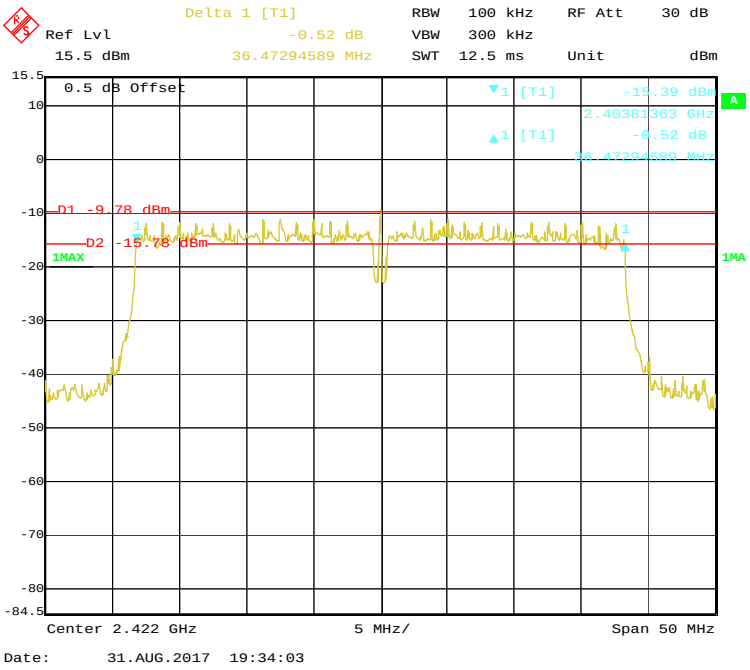
Chain1: 802.11n-HT20 Middle Channel



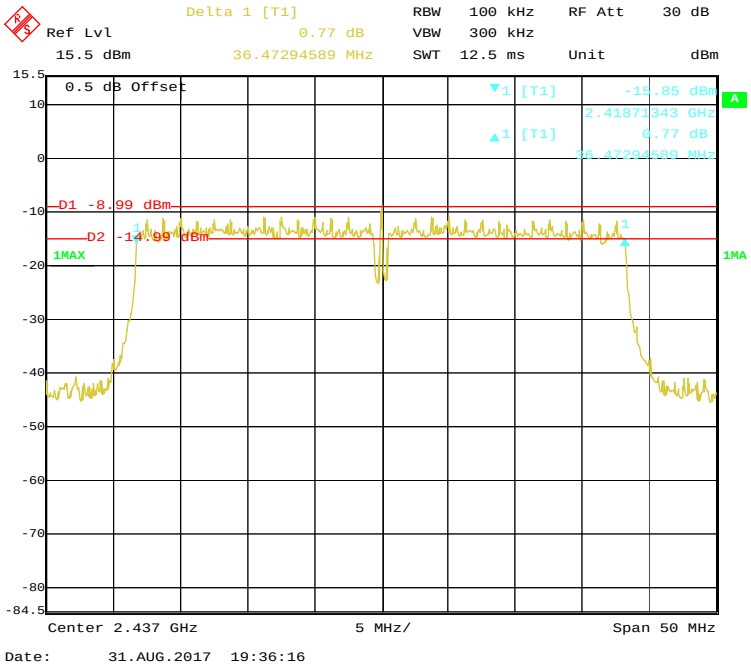
Chain1: 802.11n-HT20 High Channel



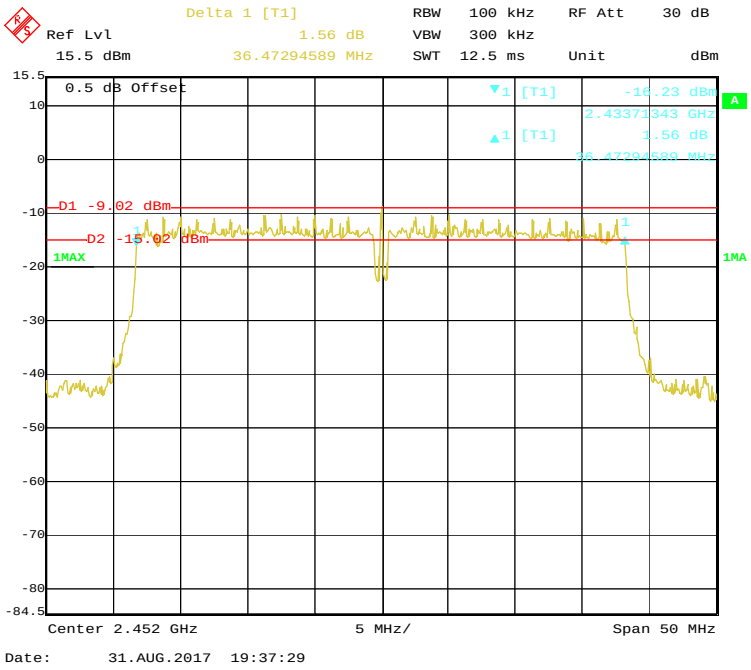
Chain1: 802.11n-HT40 Low Channel



Chain1: 802.11n-HT40 Middle Channel



Chain1: 802.11n-HT40 High Channel



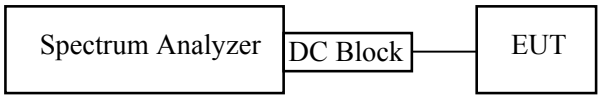
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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

The testing was performed by Kyle Xu on 2017-08-31.

EUT operation mode: Transmitting

Test mode	Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)			Limit (dBm)	Result
			Chain0	Chain1	Total		
802.11b	Low	2412	14.58	13.78	/	30	Pass
	Middle	2437	15.09	14.19	/	30	Pass
	High	2462	15.80	14.06	/	30	Pass
802.11g	Low	2412	13.78	12.75	/	30	Pass
	Middle	2437	13.94	13.18	/	30	Pass
	High	2462	14.55	13.35	/	30	Pass
802.11n-HT20	Low	2412	13.18	12.60	15.91	30	Pass
	Middle	2437	13.34	13.19	16.28	30	Pass
	High	2462	14.04	13.41	16.75	30	Pass
802.11n-HT40	Low	2422	11.85	10.68	14.31	30	Pass
	Middle	2437	13.37	11.79	15.66	30	Pass
	High	2452	13.17	11.59	15.46	30	Pass

Test mode	Channel	Frequency (MHz)	Conducted Average Output Power Reading (dBm)			Limit (dBm)	Result
			Chain0	Chain1	Total		
802.11b	Low	2412	8.24	7.38	/	30	Pass
	Middle	2437	8.31	7.92	/	30	Pass
	High	2462	8.49	7.48	/	30	Pass
802.11g	Low	2412	7.28	6.57	/	30	Pass
	Middle	2437	7.64	6.73	/	30	Pass
	High	2462	7.74	7.22	/	30	Pass
802.11n-HT20	Low	2412	5.20	4.39	7.82	30	Pass
	Middle	2437	5.31	4.36	7.87	30	Pass
	High	2462	5.55	4.09	7.89	30	Pass
802.11n-HT40	Low	2422	4.28	4.02	7.16	30	Pass
	Middle	2437	4.79	3.91	7.38	30	Pass
	High	2452	4.57	3.77	7.20	30	Pass

Note: The total output power=10Log10(10^(Chain 0/10)+10^(Chain 1/10))

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

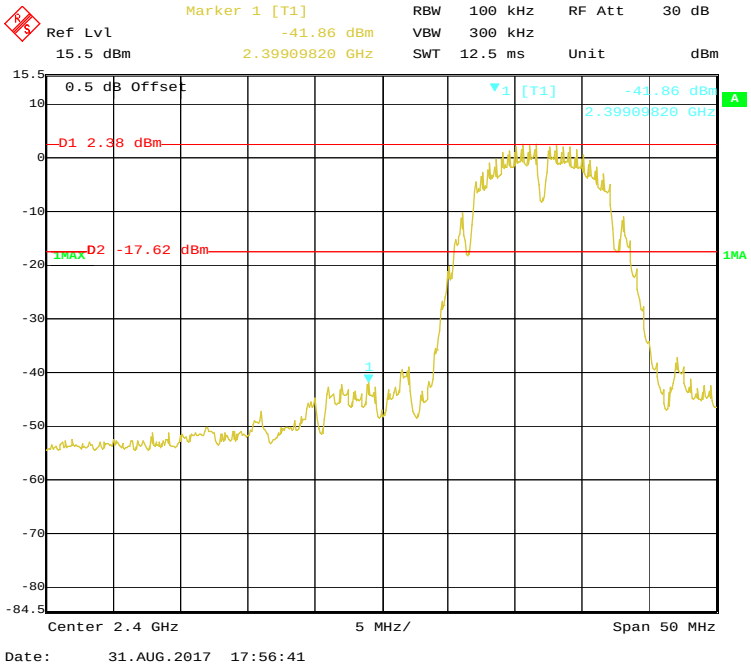
Temperature:	24.5 ℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Kyle Xu on 2017-08-31.

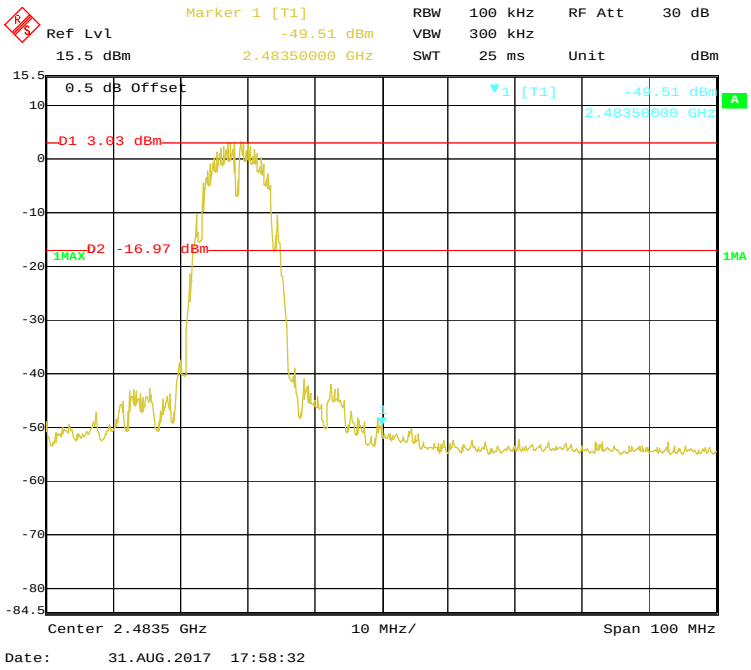
Test Result: *Compliance*

Band Edge

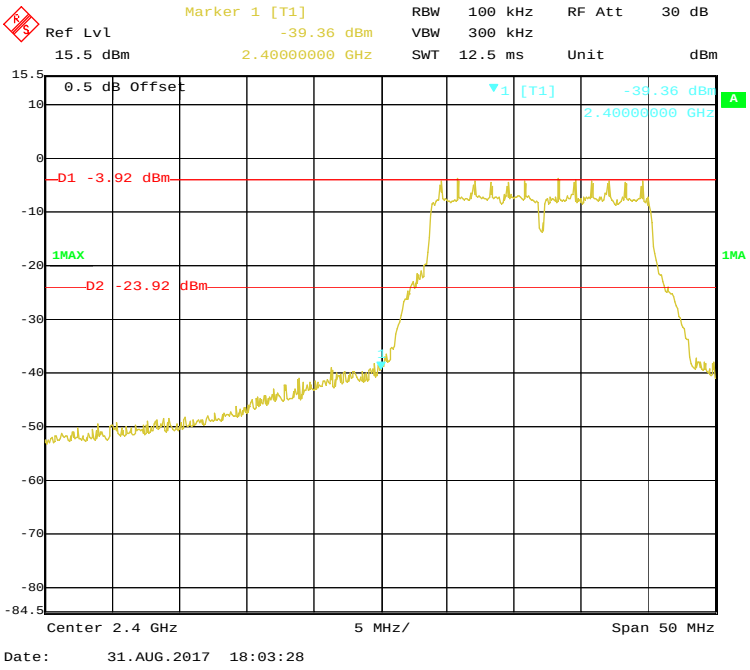
Chain0: 802.11b Mode Left Side



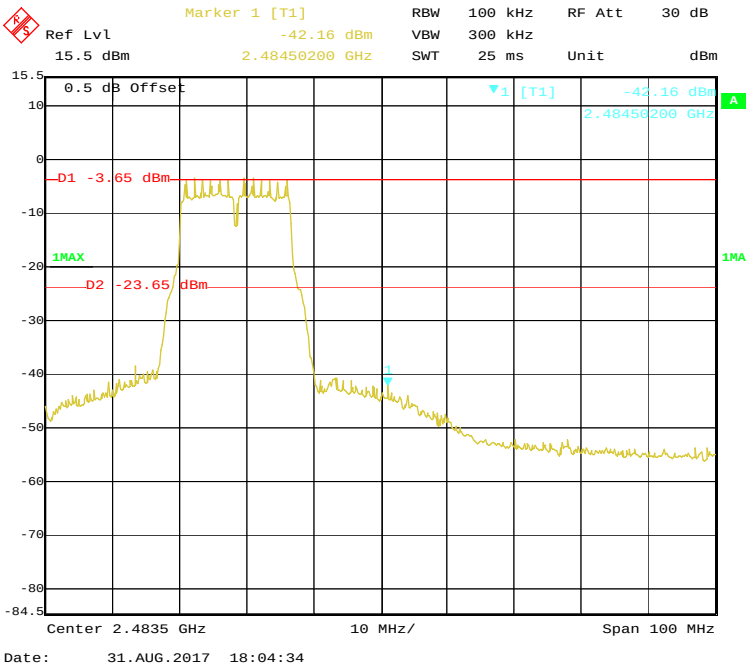
Chain0: 802.11b Mode Right Side



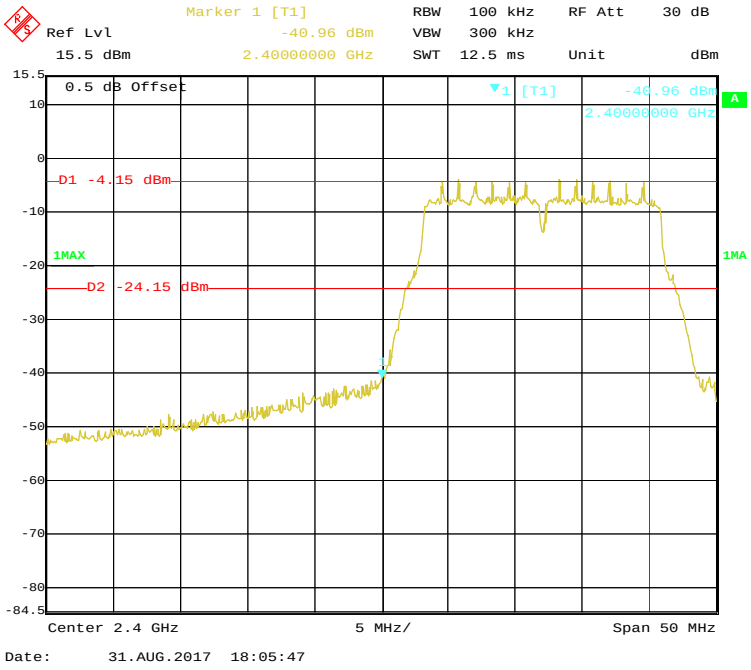
Chain0: 802.11g Mode Left Side



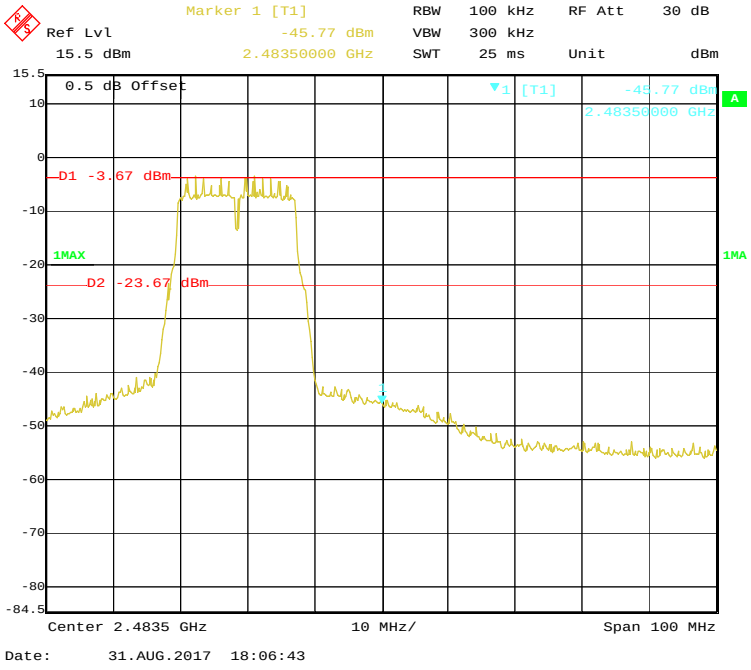
Chain0: 802.11g Mode Right Side



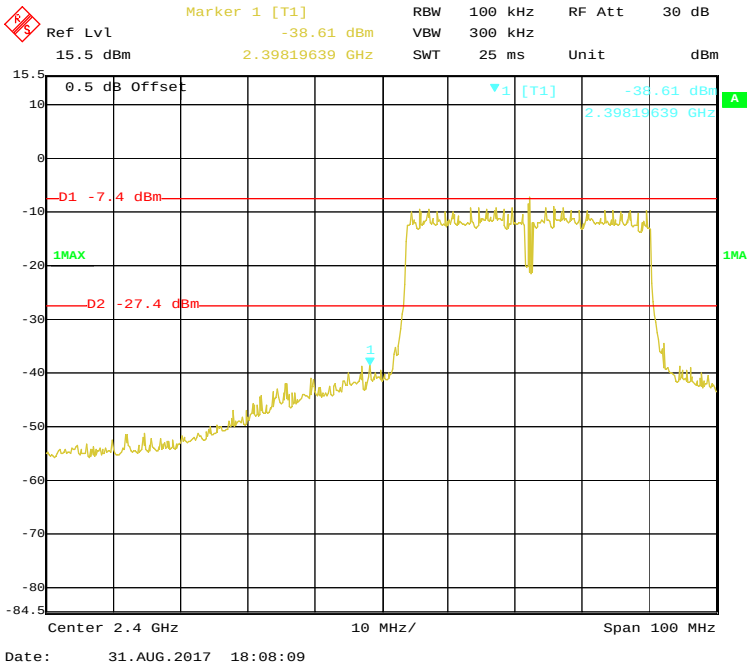
Chain0: 802.11n-HT20 Mode Left Side



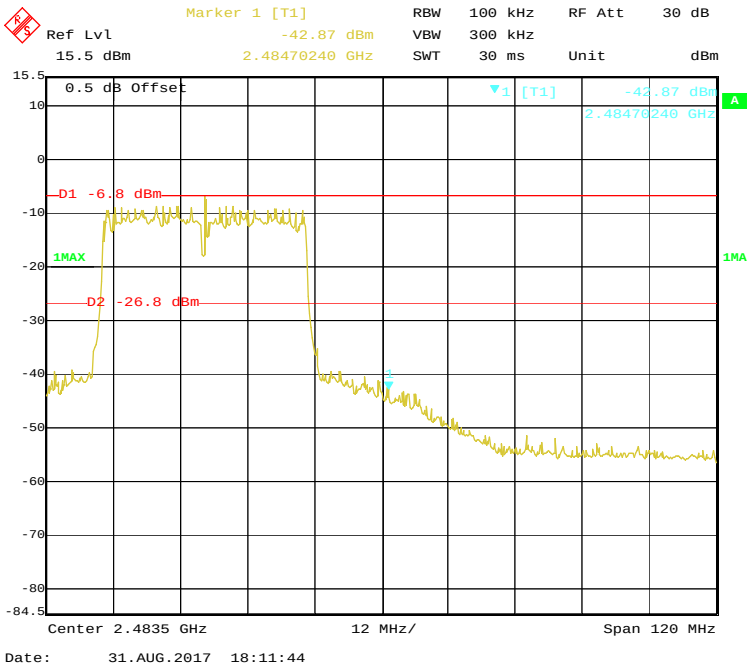
Chain0: 802.11n-HT20 Mode Right Side



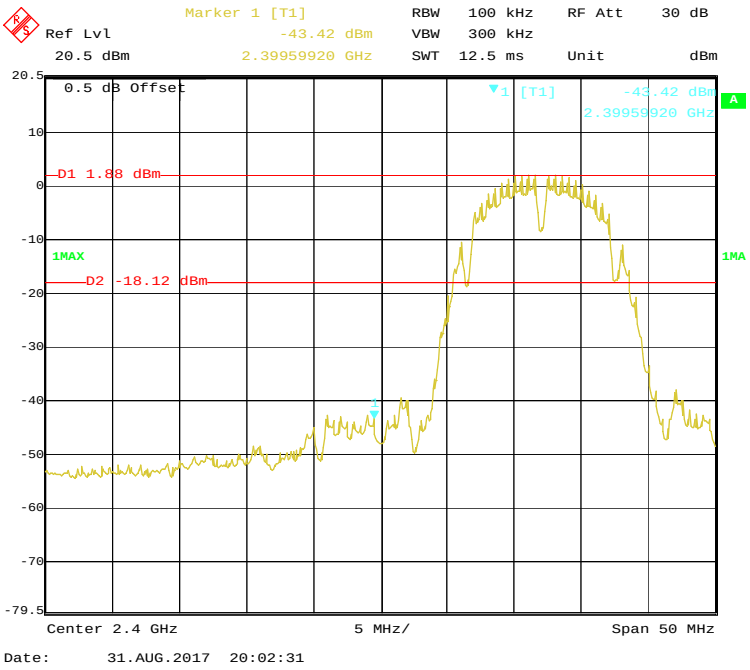
Chain0: 802.11n-HT40 Mode Left Side



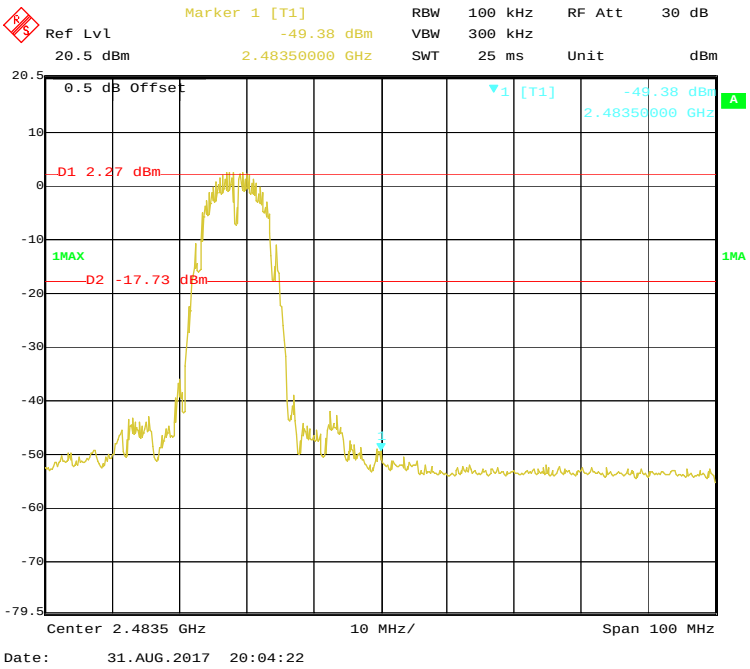
Chain0: 802.11n-HT40 Mode Right Side



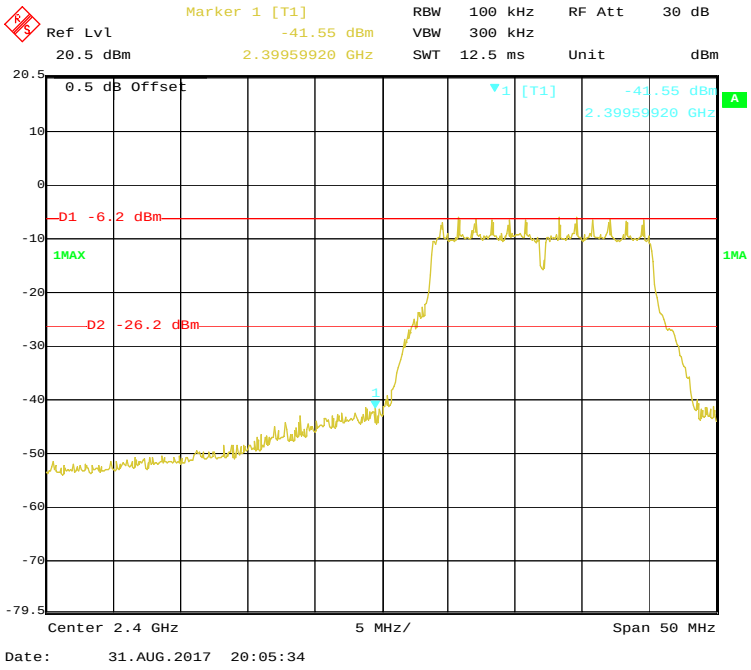
Chain1: 802.11b Mode Left Side



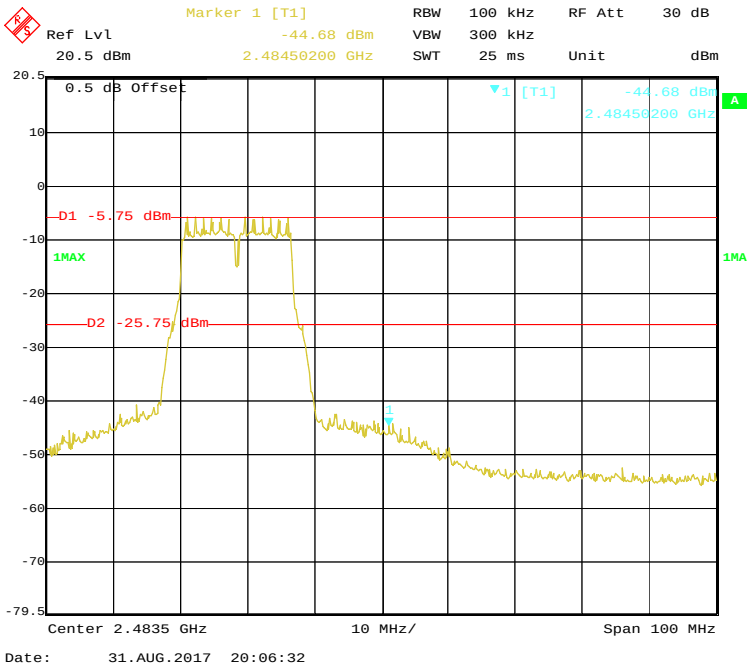
Chain1: 802.11b Mode Right Side



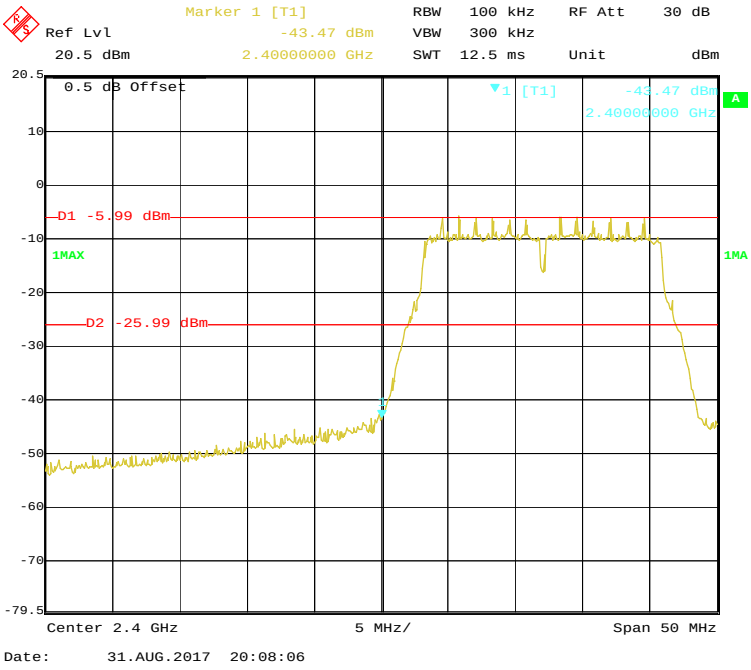
Chain1: 802.11g Mode Left Side



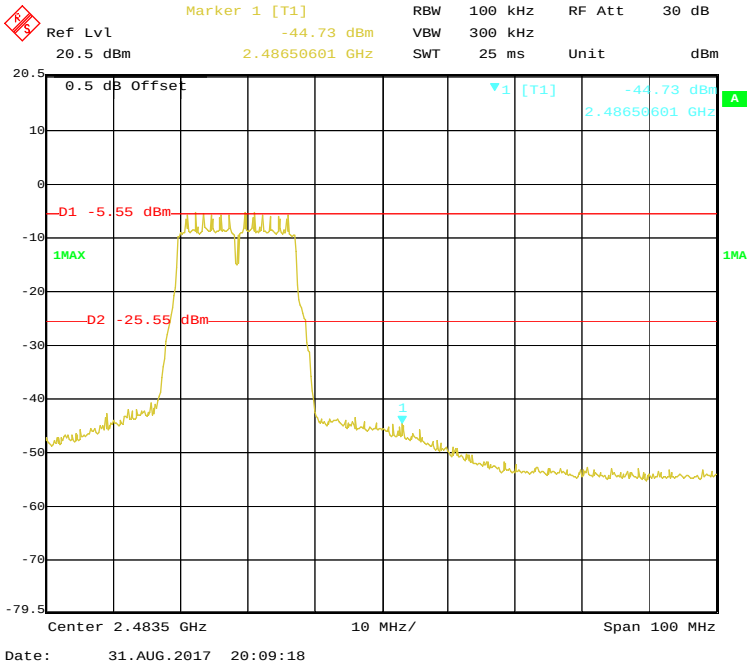
Chain1: 802.11g Mode Right Side



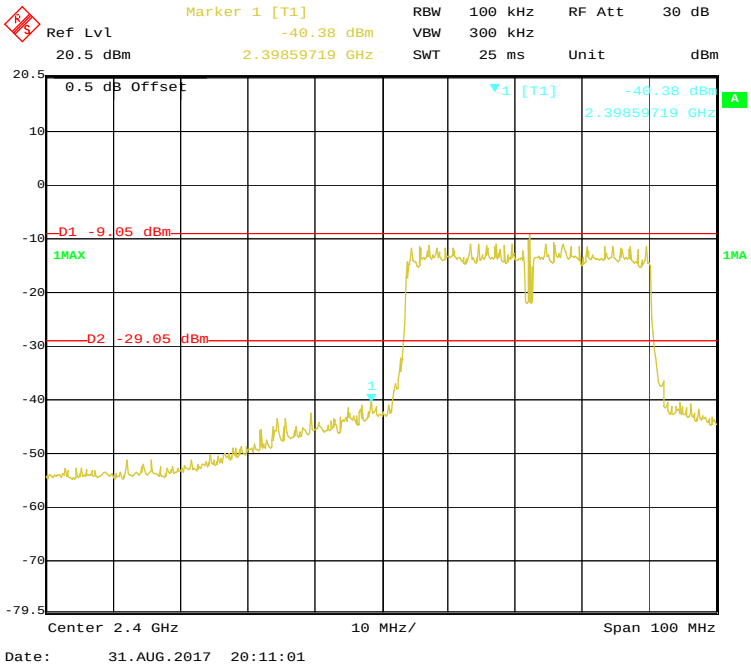
Chain1: 802.11n-HT20 Mode Left Side



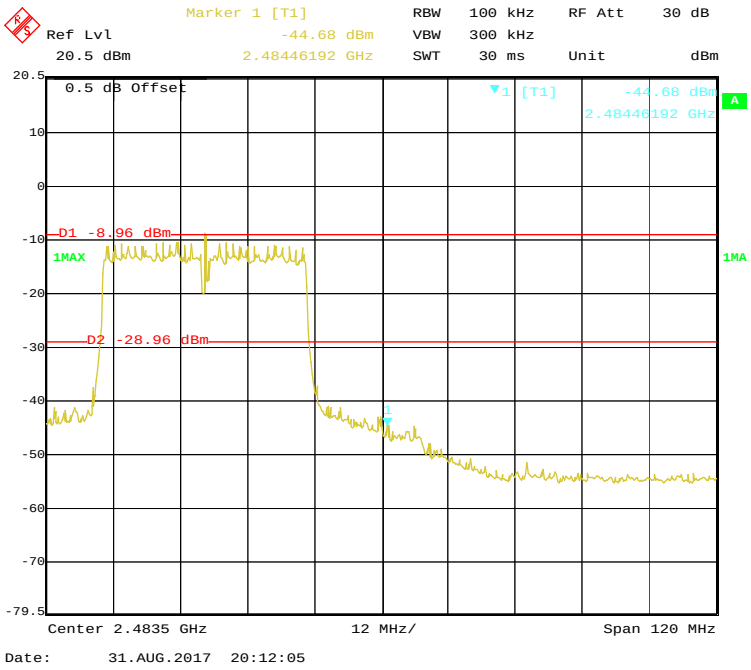
Chain1: 802.11n-HT20 Mode Right Side



Chain1: 802.11n-HT40 Mode Left Side



Chain1: 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:	24.6℃
Relative Humidity:	51 %
ATM Pressure:	101.1 kPa

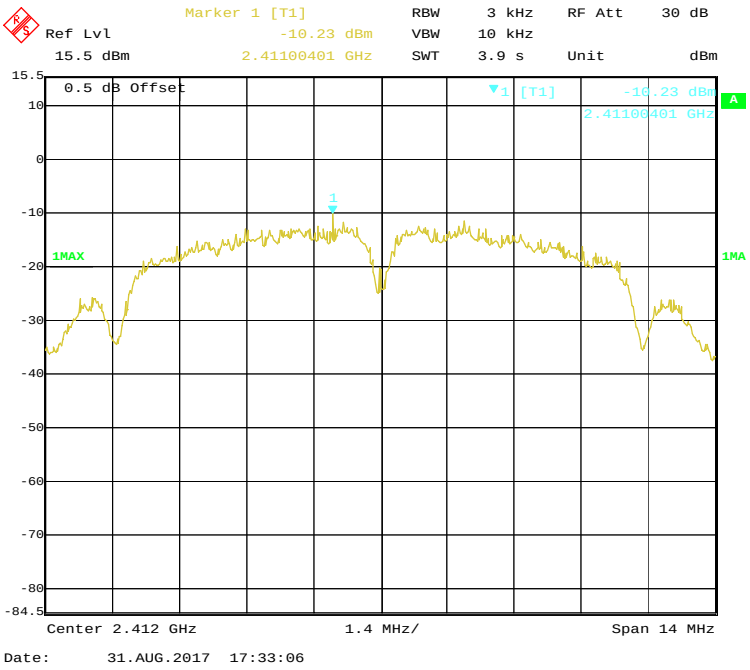
The testing was performed by Kyle Xu on 2017-08-31.

EUT operation mode: Transmitting

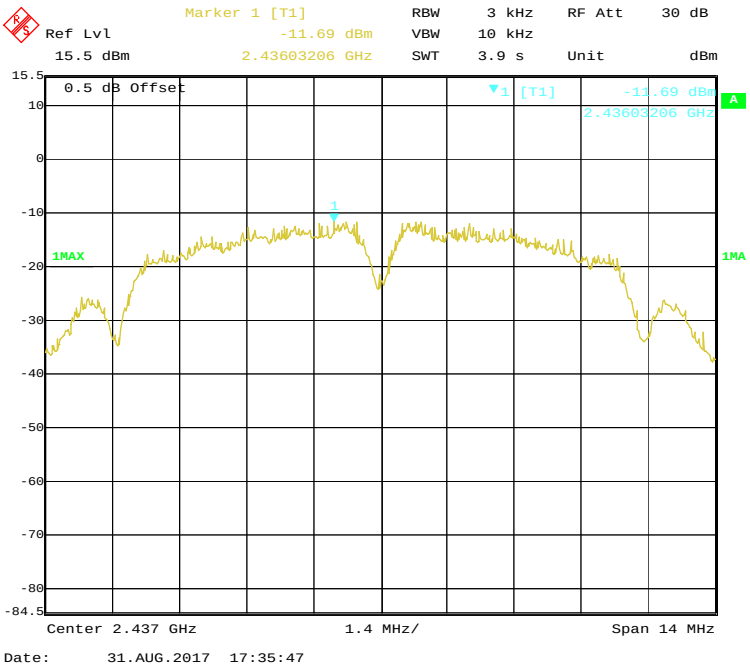
Test Result: Pass

Channel	Frequency (MHz)	PSD (dBm/3kHz)			Limit (dBm/3kHz)
		Chain0	Chain1	Total	
802.11b mode					
Low	2412	-10.23	-10.74	/	≤8
Middle	2437	-11.69	-12.09	/	≤8
High	2462	-10.73	-11.74	/	≤8
802.11g mode					
Low	2412	-18.41	-20.30	/	≤8
Middle	2437	-17.74	-19.97	/	≤8
High	2462	-17.43	-19.92	/	≤8
802.11n-HT20 mode					
Low	2412	-18.80	-21.07	-16.78	≤8
Middle	2437	-17.75	-20.38	-15.86	≤8
High	2462	-17.71	-19.46	-15.49	≤8
802.11n-HT40 mode					
Low	2422	-13.54	-15.44	-11.38	≤8
Middle	2437	-13.02	-15.31	-11.01	≤8
High	2452	-13.1	-15.3	-11.05	≤8

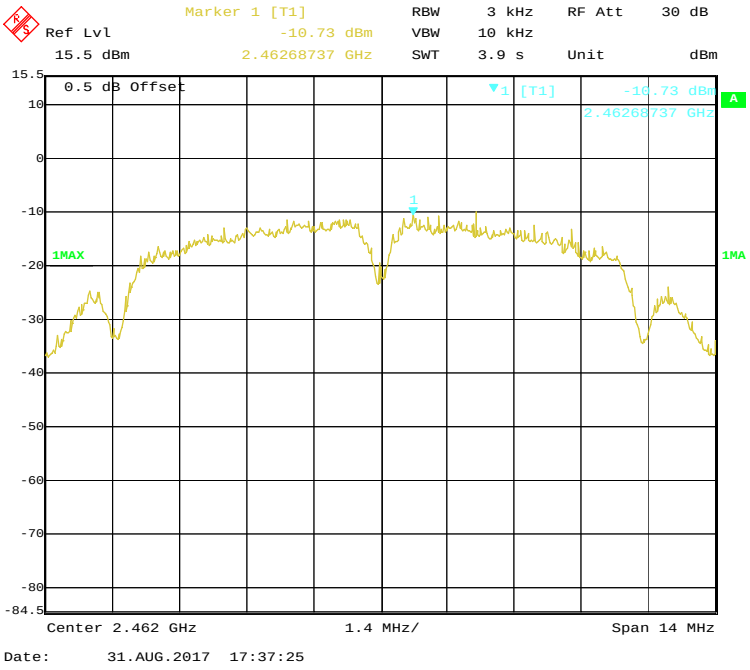
Chain0: 802.11b Low Channel



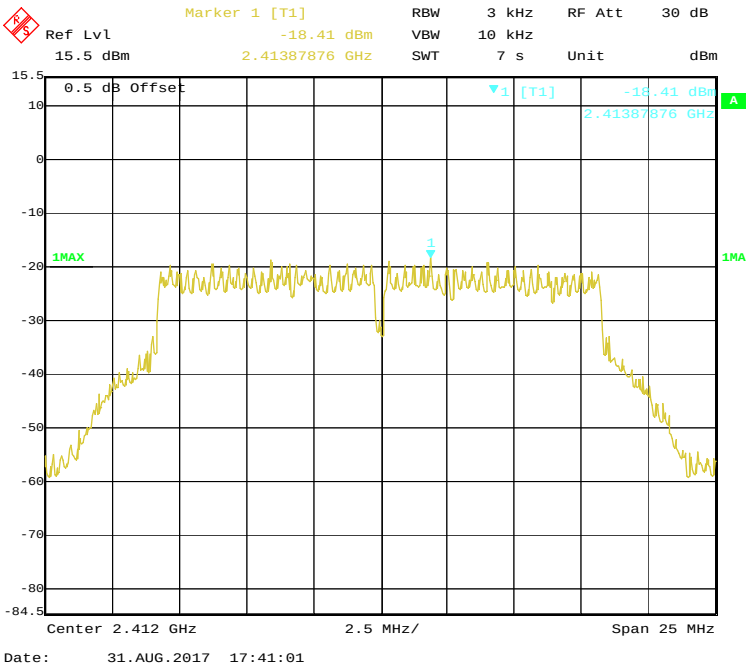
Chain0: 802.11b Middle Channel



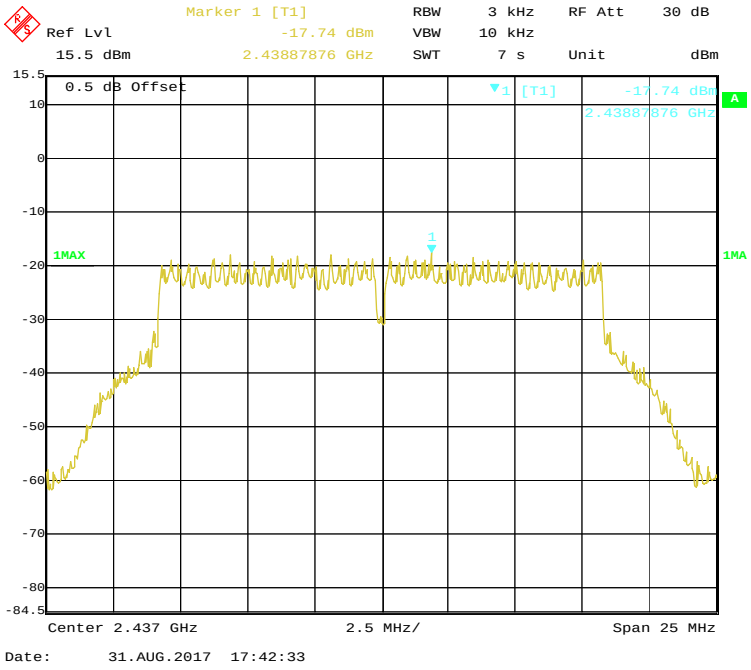
Chain0: 802.11b High Channel



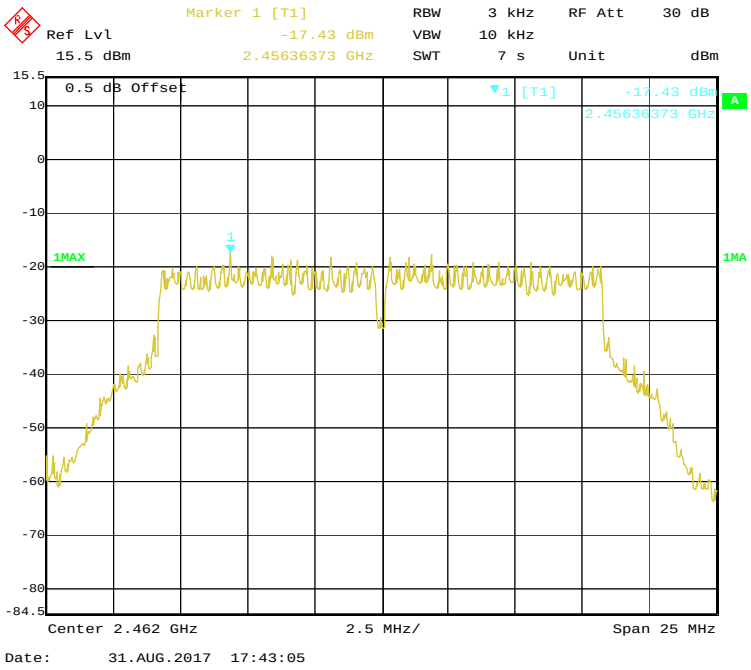
Chain0: 802.11g Low Channel



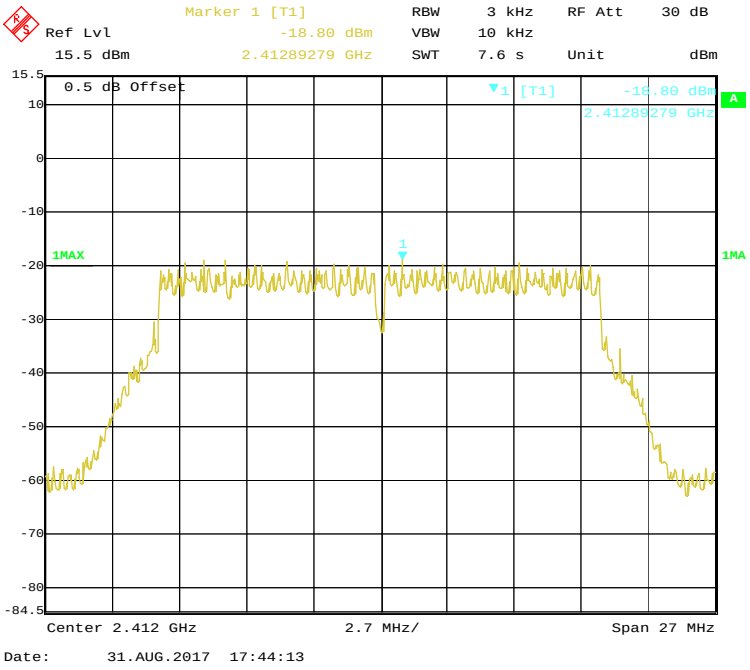
Chain0: 802.11g Middle Channel



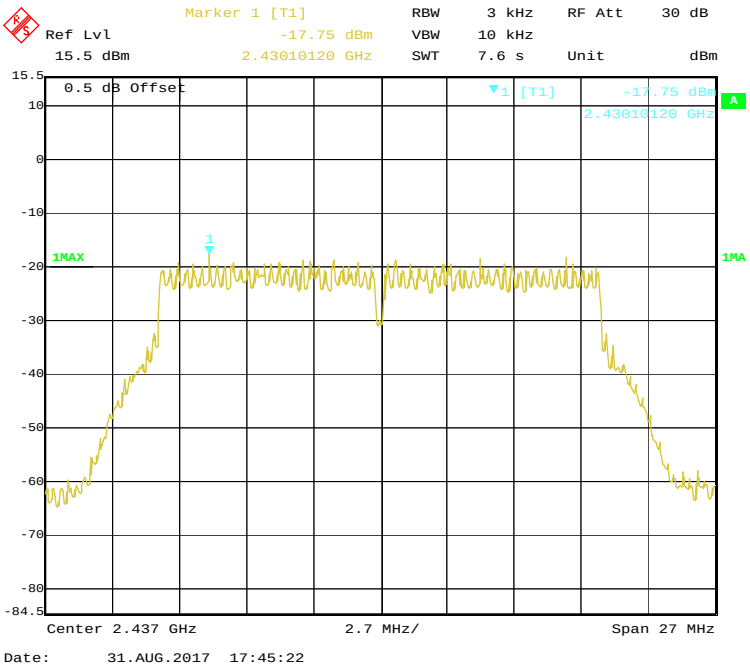
Chain0: 802.11g High Channel



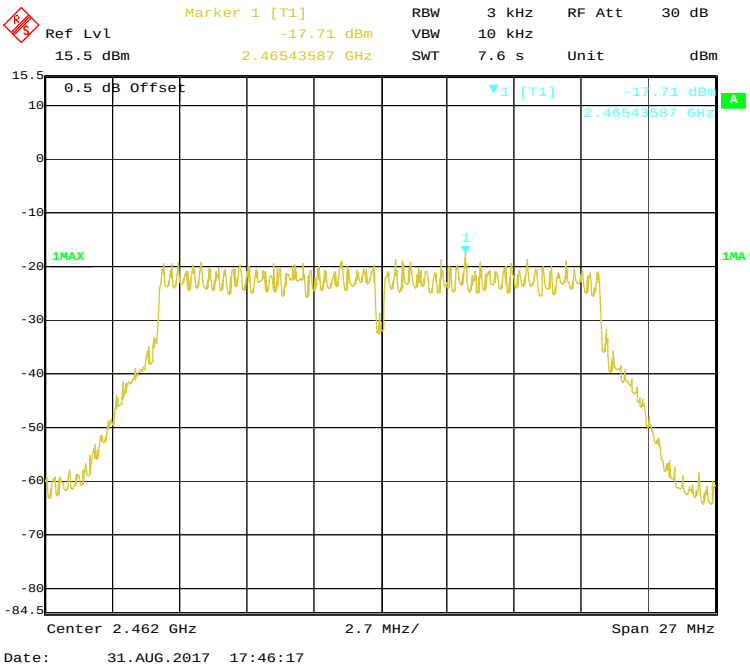
Chain0: 802.11n-HT20 Low Channel



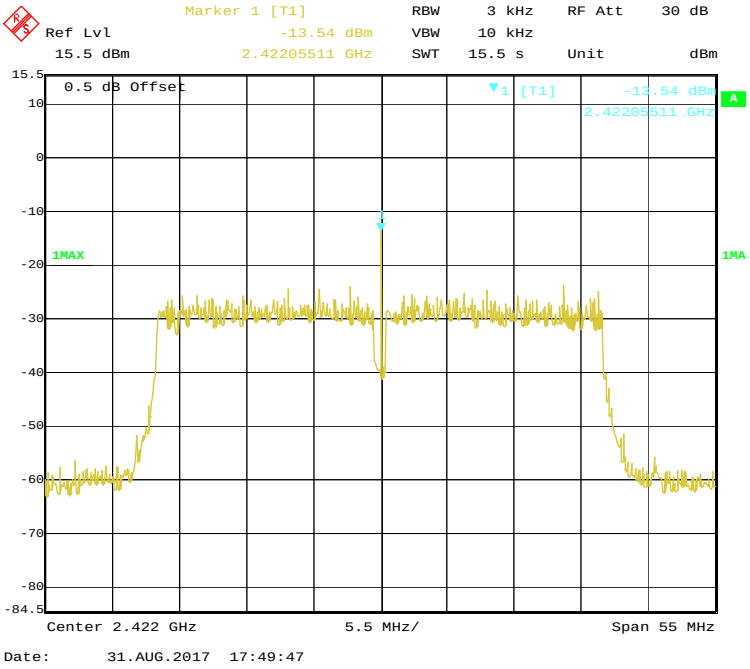
Chain0: 802.11n-HT20 Middle Channel



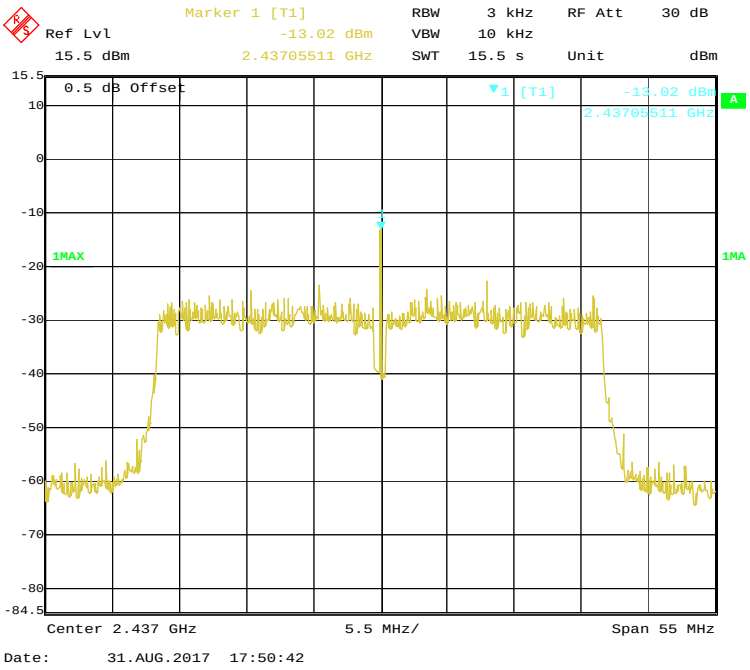
Chain0: 802.11n-HT20 High Channel



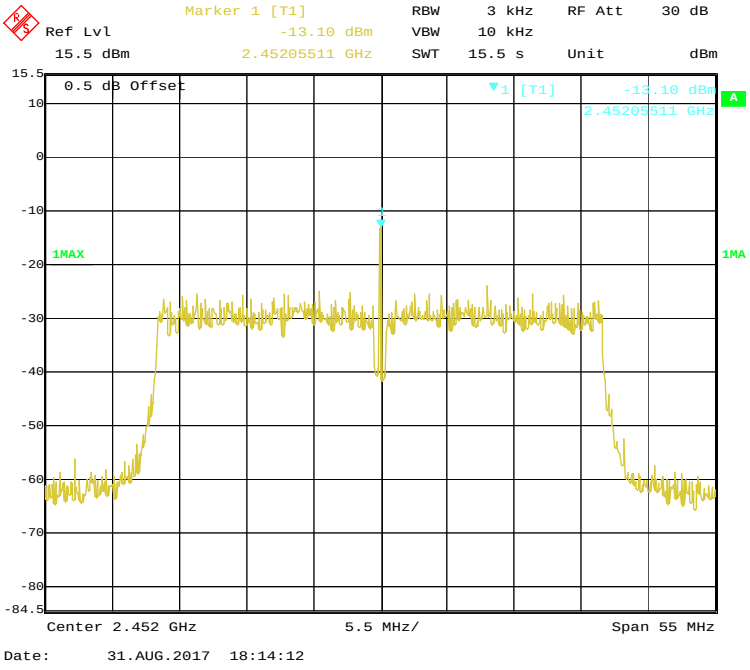
Chain0: 802.11n-HT40 Low Channel



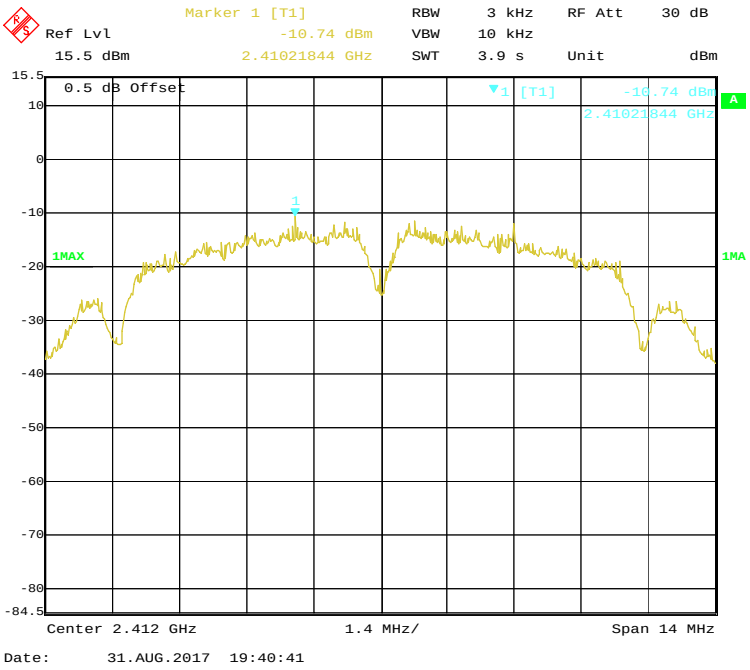
Chain0: 802.11n-HT40 Middle Channel



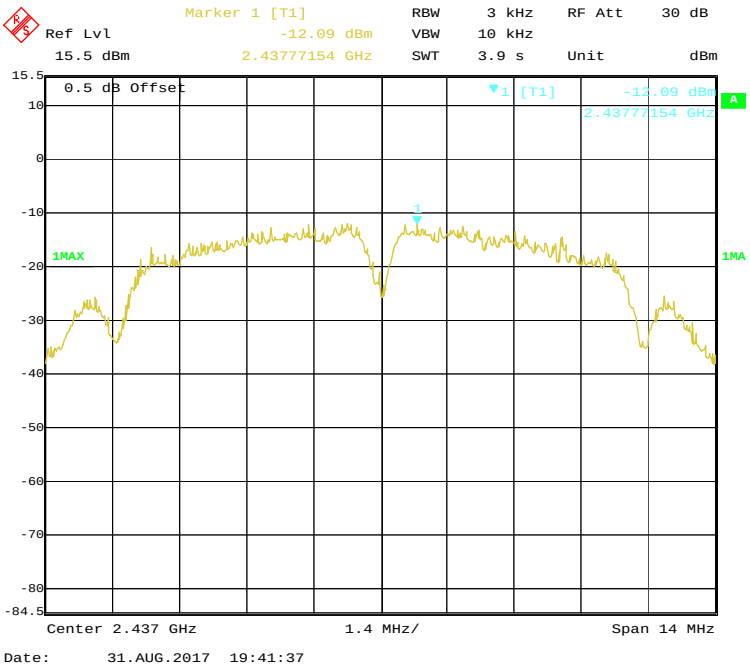
Chain0: 802.11n-HT40 High Channel



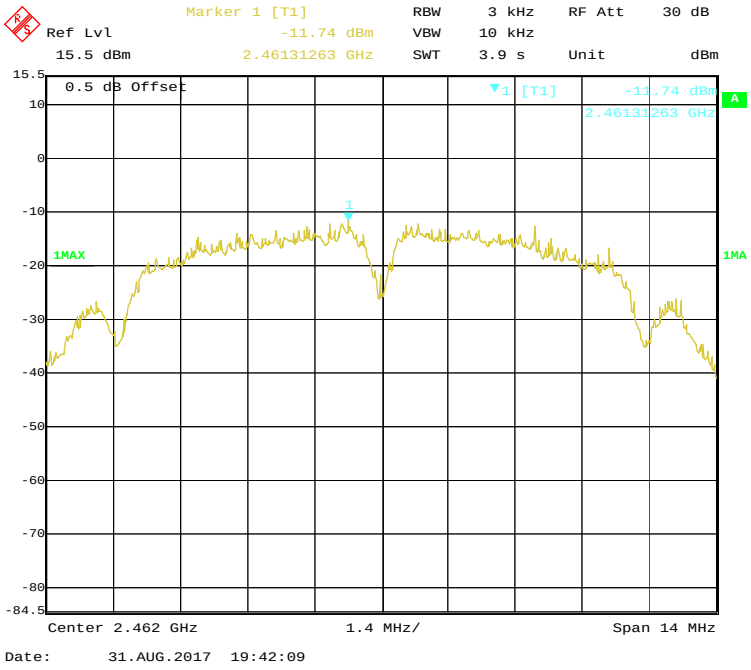
Chain1: 802.11b Low Channel



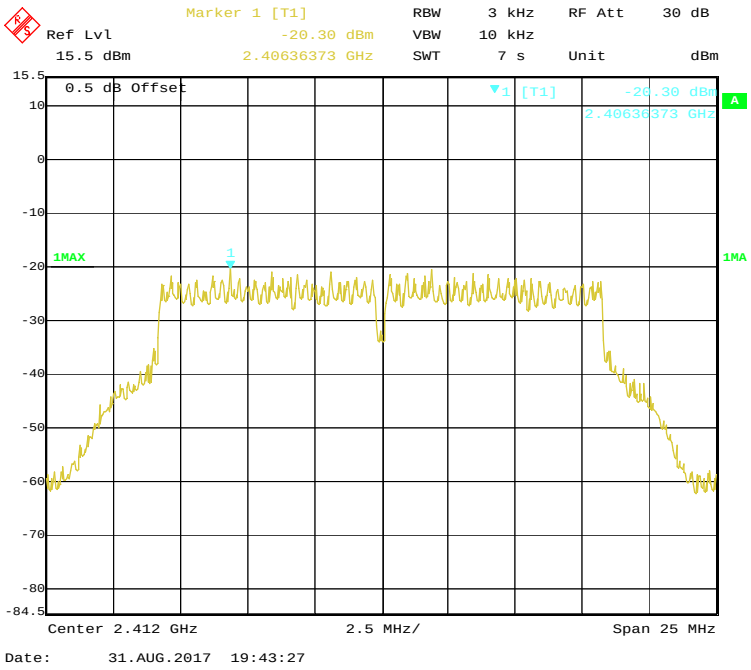
Chain1: 802.11b Middle Channel



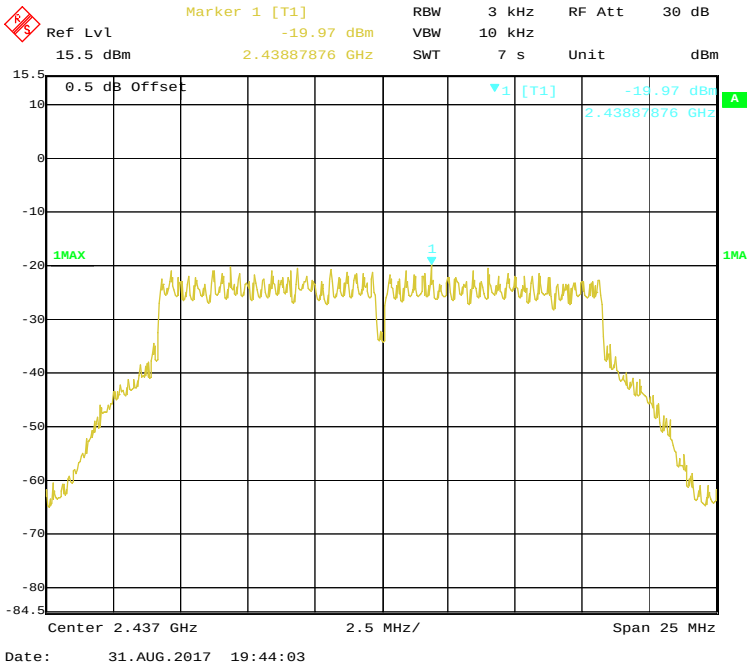
Chain1: 802.11b High Channel



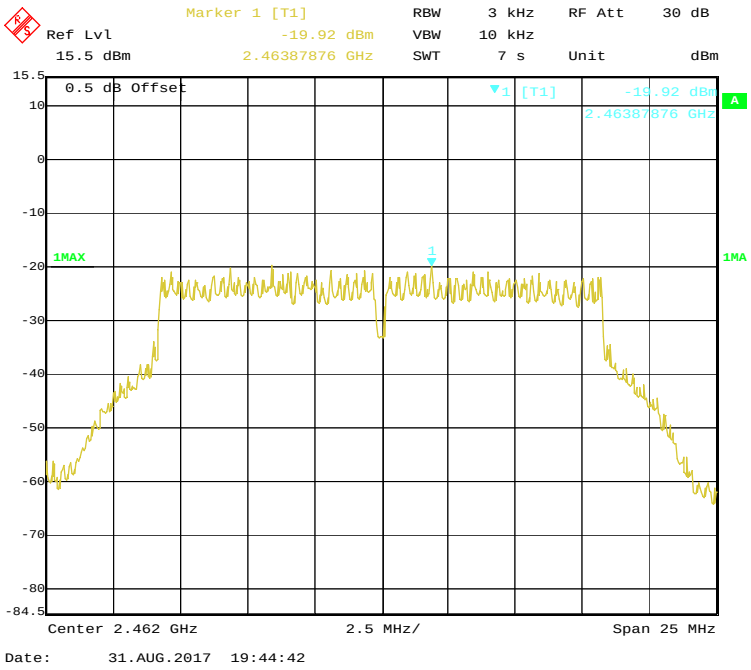
Chain1: 802.11g Low Channel



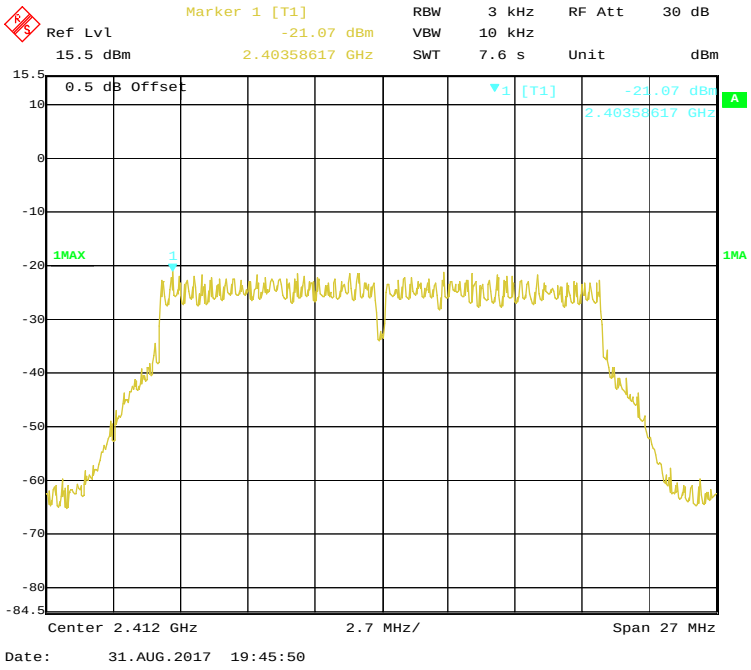
Chain1: 802.11g Middle Channel



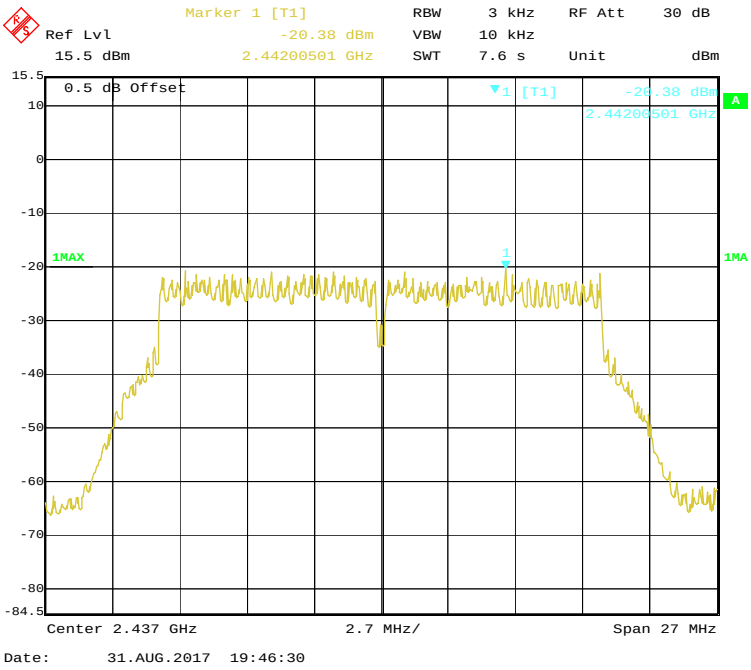
Chain1: 802.11g High Channel



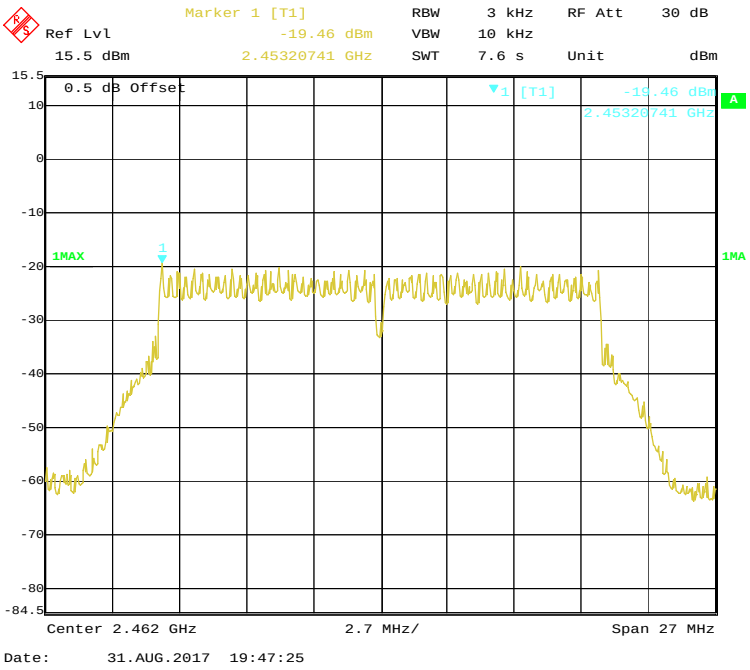
Chain1: 802.11n-HT20 Low Channel



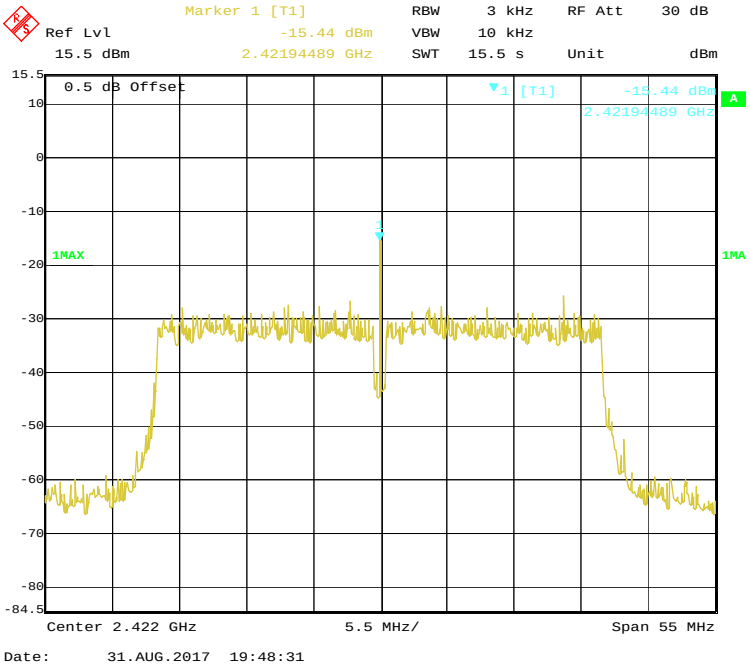
Chain1: 802.11n-HT20 Middle Channel



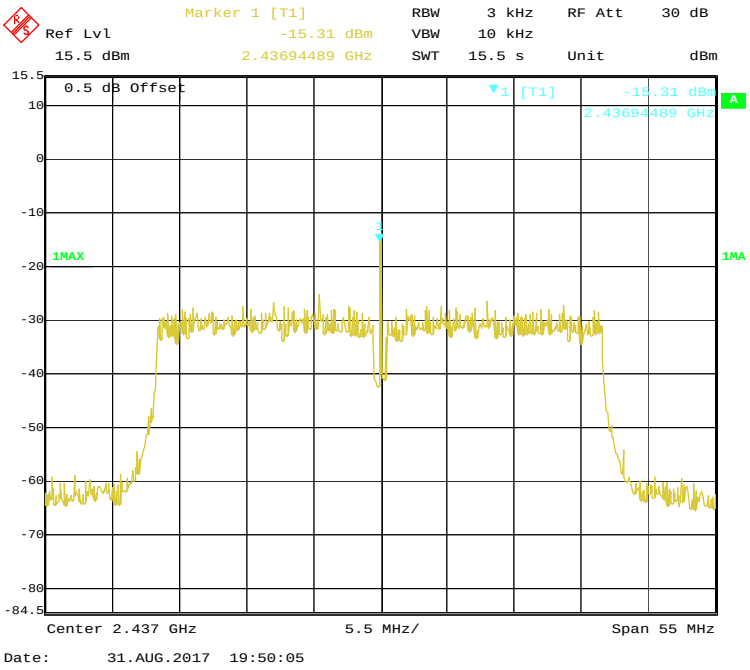
Chain1: 802.11n-HT20 High Channel



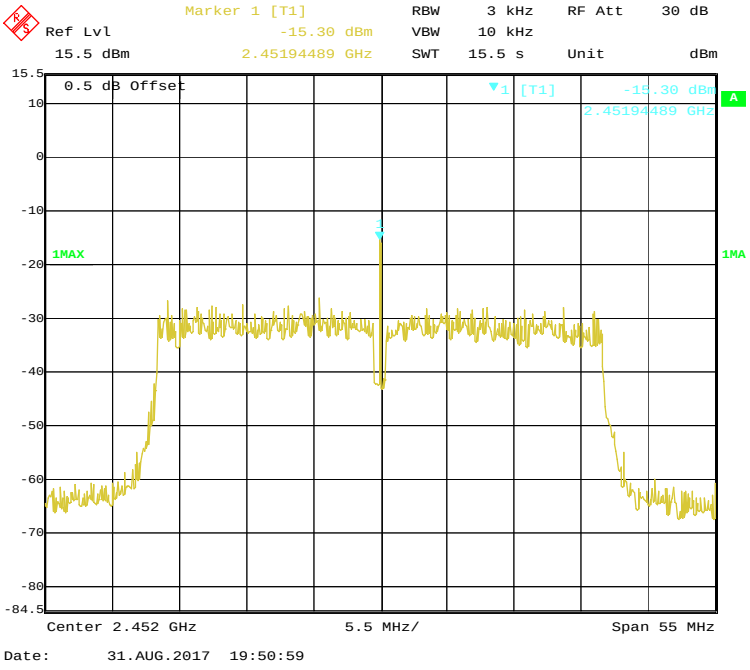
Chain1: 802.11n-HT40 Low Channel



Chain1: 802.11n-HT40 Middle Channel



Chain1: 802.11n-HT40 High Channel



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