FCC PART 15.247

TEST REPORT

For

Iconnect

No.9, Aly. 58, Ln. 112, Ruiguang Rd., Neihu Dist.,Taipei City,Taiwan

FCC ID:2AB8788121
Tested Model: AWUS036ACH
Multiple Model: AWUS036NHU, AWUS036ACMH, NU-AC, NU-ACM, NU-ACMH, UBDo-ACH, UBDo-ACM, UBDo-ACMH, Tube-UACH, Tube-UACM, Tube-UACMH

Report Type:	**Product Name:**
Original Report	802.11ac ultra-Range AC1200 USB adapter

Test Engineer:	*Tom Tang*
Report Number:	RDG170525007A
Report Date:	2017-08-25
Reviewed By:	Henry Ding EMC Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: 028-65525123, Fax: 028-65525125 www.baclcorp.com

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***Iconnect***'s product, model number: ***AWUS036ACH (FCC ID: 2AB8788121)*** (the "EUT") in this report was a ***802.11ac ultra-Range AC1200 USB adapter***, which was measured approximately: 8.7 cm (L) × 6.2 cm (W) × 2.2 cm (H), rated input voltage: DC 5V from USB port.

Note: The series product, model AWUS036ACH, AWUS036NHU, AWUS036ACMH, NU-AC, NU-ACM, NU-ACMH, UBDo-ACH, UBDo-ACM, UBDo-ACMH, Tube-UACH, Tube-UACM, Tube-UACMH are electrically identical, the difference between them is the model name, we selected AWUS036ACH for fully testing, the details was explained in the eclaration letter.

**All measurement and test data in this report was gathered from final production sample, serial number: 170525007 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-05-26, and EUT conformed to test requirement.*

Objective

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

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

Related Submittal(s)/Grant(s)

FCC Part 15E NII submissions with FCC ID: 2AB8788121.

Test Methodology

All measurements detailed in this Test Report were performed in accordance with ANSI C63.10-2013 "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices".

All of the measurements detailed in this Test Report were performed by Bay Area Compliance Laboratories Corp. (Chengdu).

The Bay Area Compliance Laboratories Corp. Chengdu's measurement Uncertainties (calculated for a k=2 Coverage Factor corresponding to approximately 95% Coverage) were as follows:

-For all of the AC Line Conducted Emissions Tests reported herein: ±3.17 dB.
-For of all of the Direct Antenna Conducted Emissions Tests reported herein: ±0.56 dB.

-For of all of the direct Radiated Emissions Tests reported herein are:
30 MHz to 200 MHz: ±4.7 dB;
200 MHz to 1 GHz: ±6.0 dB;
1 GHz to 6 GHz: ±5.13dB; and,
6 GHz to 40 GHz: ±5.47dB.

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

Test Facility

The test site used by BACL to collect test data is located No. 5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, China

BACL(Chengdu) is accredited by A2LA in accordance with the recognized international standard ISO/IEC 17025, A2LA cert No.: 4324.01. The Federal communications commission has on file and is listed under FCC Test Firm Registration No.: 910975.

BACL(Chengdu) has been fully described in reports on file and registered with the Innovation, Science and Economic Development Canada under Registration Numbers: 3062C-1.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

For 2.4G band, the device support SISO, 2 x 2 MIMO at 802.11 n system, and 11 channels are provided to testing:

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

For 802.11b, 802.11g, and 802.11n20 modes were tested with Channel 1, 6 and 11.
For 802.11n40 mode were tested with Channel 3, 6 and 9.

The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all data rates bandwidths, and modulations.Preliminary tests were perfrmed in difference data rate and all the possible configurations, the worst cases as below table and shown in the report.

Configurations	Test Mode	Data Rate	Channel	Antenna Chain
SISO	802.11b	1Mbps	1,6,11	0, 1
	802.11g	6Mbps	1,6,11	0, 1
	802.11 ht20	MCS0	1,6,11	0, 1
	802.11 ht40	MCS0	3,6,9	0, 1
2*2 MIMO	802.11 ht20	MCS8	1,6,11	1+2
	802.11 ht40	MCS8	3,6,9	1+2

EUT Exercise Software

The software “MP_Kit_RTL11ac_8812AU_USB_v60.1” was used for testing, and the commands were provided by manufacturer. The maximum power level and duty cycle was set by commands as following table:

SISO:

Test Mode	Test Software Version	MP_Kit_RTL11ac_8812AU_USB_v60.1		
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	1Mbps	1Mbps	1Mbps
	Chain 0	10	12	12
	Chain 1	26	26	26
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	6Mbps	6Mbps	6Mbps
	Chain 0	27	27	21
	Chain 1	30	30	24
802.11n ht20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS0	MCS0	MCS0
	Chain 0	27	27	21
	Chain 1	31	30	24
802.11n ht40	Test Frequency	2422MHz	2437MHz	2452MHz
	Data Rate	MCS0	MCS0	MCS0
	Chain 0	27	27	20
	Chain 1	31	31	24

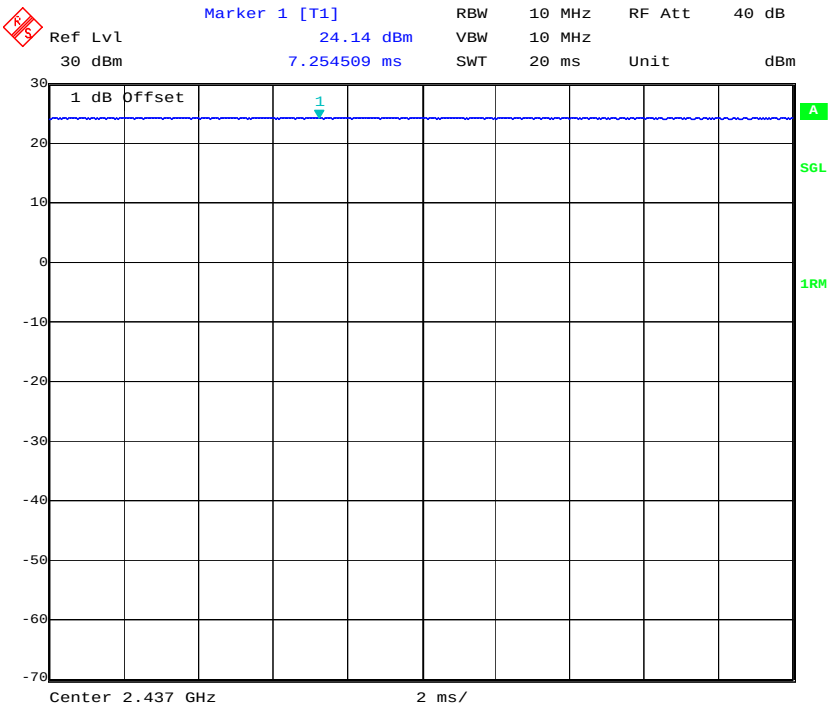
MIMO 2T2R:

Test Mode	Test Software Version	MP_Kit_RTL11ac_8812AU_USB_v60.1		
802.11n ht20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS8	MCS8	MCS8
	Chain 0&1	29	29	29
802.11n ht40	Test Frequency	2422MHz	2437MHz	2452MHz
	Data Rate	MCS8	MCS8	MCS8
	Chain 0&1	29	29	29

The duty cycle as below:

Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11 b	20	20	100
802.11 g	20	20	100
802.11n ht20_MCS0	20	20	100
802.11n ht40_MCS0	20	20	100

802.11b



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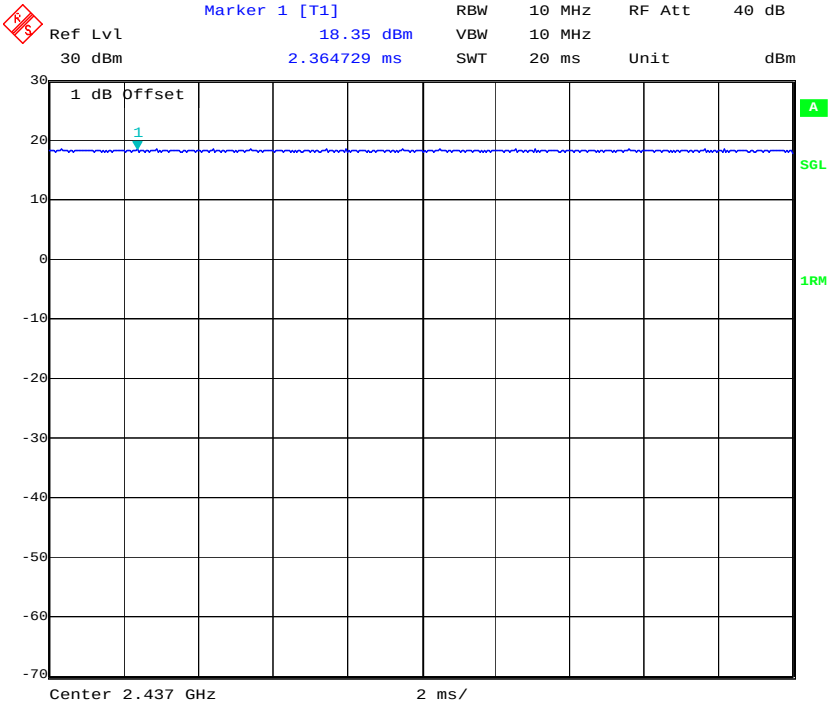
802.11g



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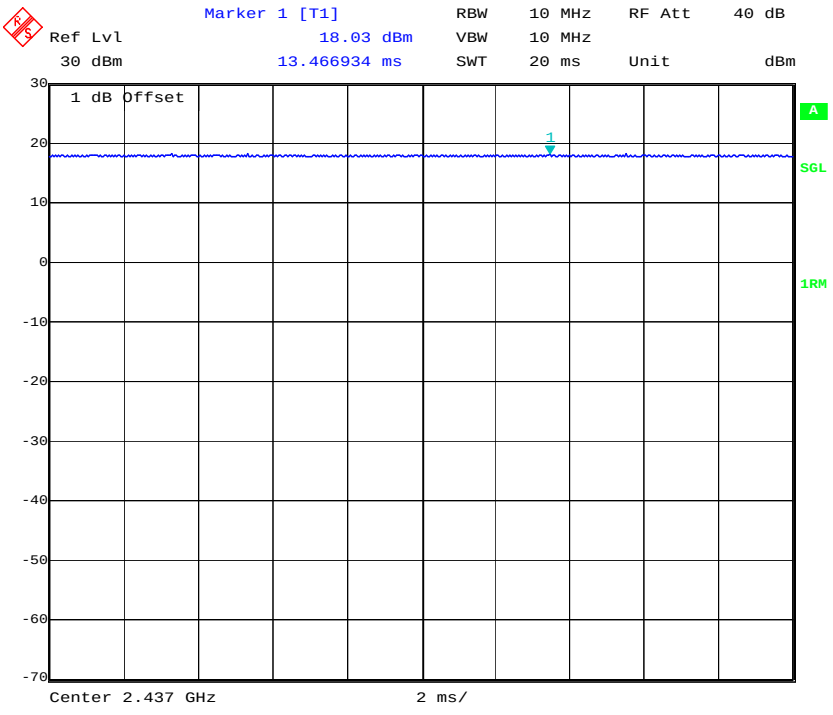
802.11n ht20



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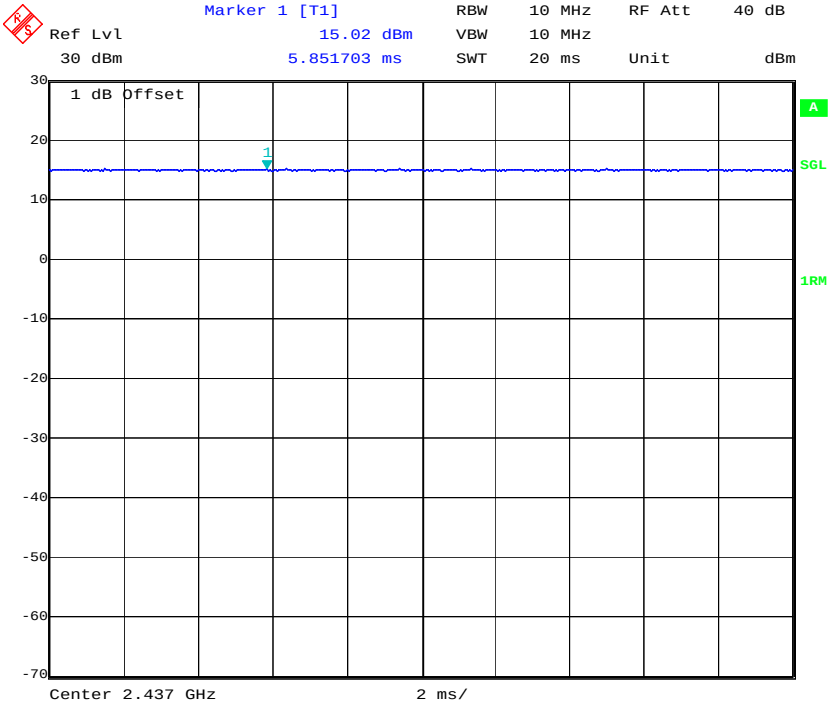
802.11n ht40



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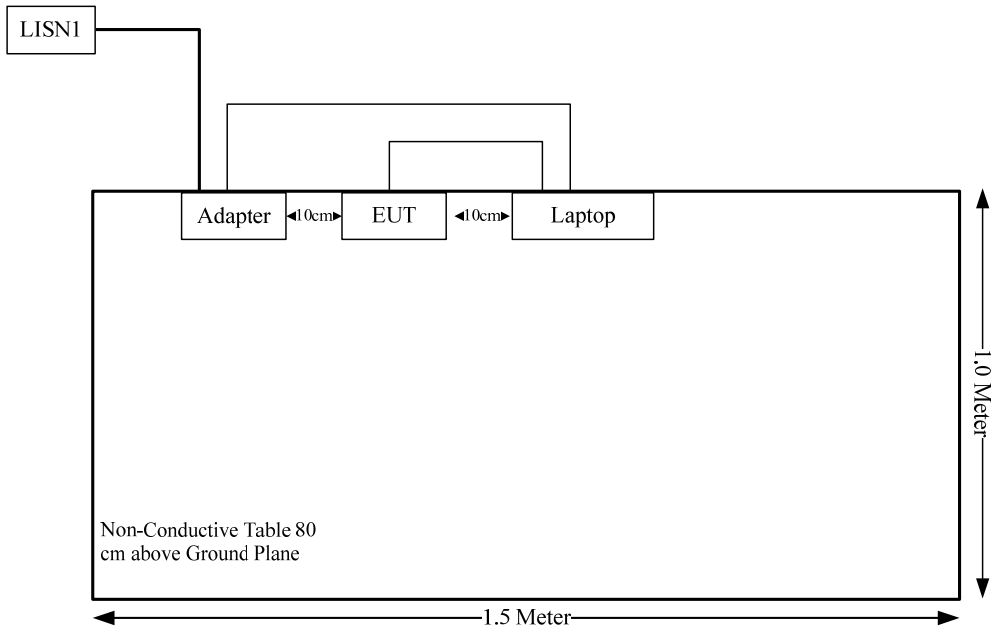
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1017

Support Cable List and Details

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
DC Cable	yes	No	1.3	Adapter	Laptop
USB Cable	yes	No	1.03	USB Port of PC	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

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

FCC §15.247 (i) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

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

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

Calculation Formula:

Prediction of power density at the distance of the applicable MPE limit:
$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);
P = power input to the antenna (in appropriate units, e.g., mW);
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

Calculated Data:

Frequency (MHz)	**Antenna Gain**		**Tune-up Power**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
	(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
2400-2483.5	3	2.00	30	1000.00	20.00	0.40	1.0
5150-5850	4	2.51	23	199.53	20.00	0.10	1.0

Note: The 2.4GHz and 5GHz band can`t transmit simultaneously

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.

Antenna Connector Construction

The EUT have 2 dipole antennas with RP-SMA connector, all the antenna gains are 3.0 dBi in 2.4G band, 4dBi in 5GHz bands, fulfill the requirement of this section. Please refer to the EUT photos.

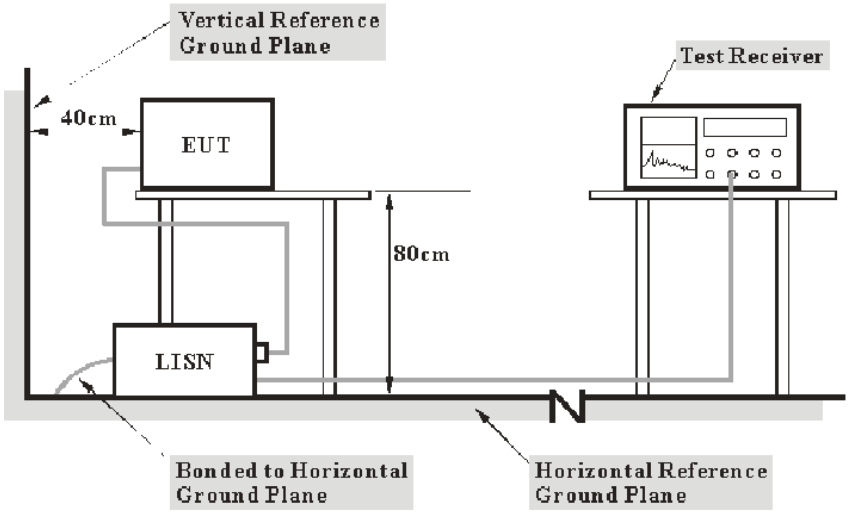
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a)

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

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

The spacing between the peripherals was 10 cm.

The adapter was connected to the main LISN with a 120 V/60 Hz AC power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	IF B/W
150 kHz – 30 MHz	9 kHz

Test Procedure

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

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

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

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

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

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2016-12-02	2017-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	100018	2016-12-02	2017-12-01
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	DE14781	2016-10-31	2017-10-30
Unknown	Conducted Cable	Unknown	NO.5	2016-11-10	2017-11-09
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B "Implementation of traceability policy in accredited laboratories".

Test Results Summary

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

Test Data

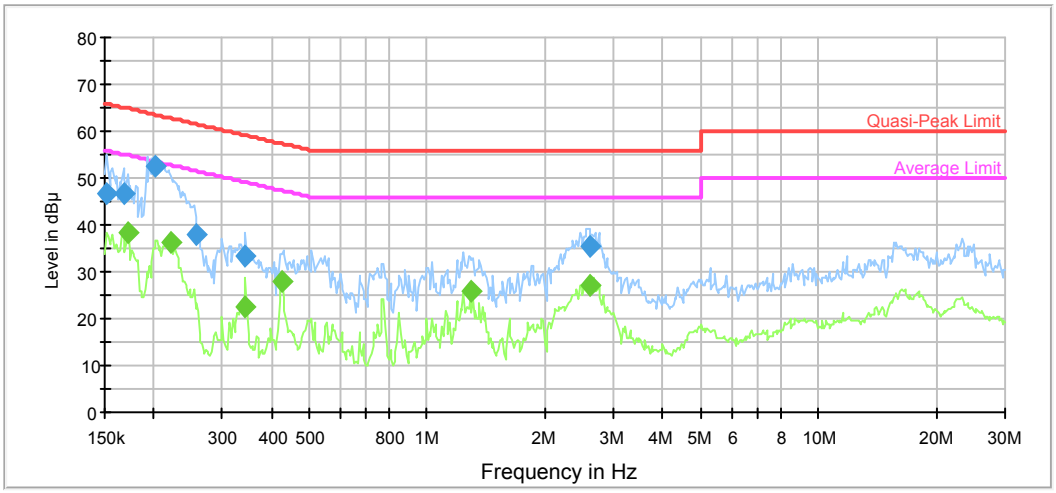
Environmental Conditions

Temperature:	27.4 °C
Relative Humidity:	46.9 %
ATM Pressure:	100.1 kPa

The testing was performed by Tom Tang on 2017-06-26.

Test Mode: Transmitting

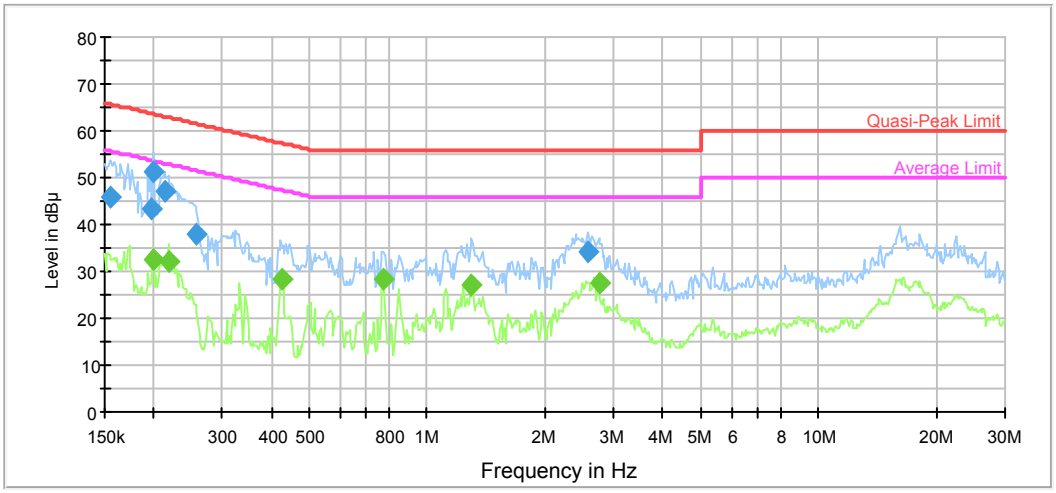
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.152410	46.7	9.000	L1	19.7	19.2	65.9	Compliance
0.167702	46.8	9.000	L1	19.7	18.3	65.1	Compliance
0.201433	52.7	9.000	L1	19.7	10.9	63.6	Compliance
0.255827	38.1	9.000	L1	19.7	23.5	61.6	Compliance
0.343548	33.3	9.000	L1	19.7	25.8	59.1	Compliance
2.599932	35.3	9.000	L1	19.7	20.7	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.171759	38.4	9.000	L1	19.7	16.5	54.9	Compliance
0.221645	36.2	9.000	L1	19.7	16.6	52.8	Compliance
0.343548	22.7	9.000	L1	19.7	26.4	49.1	Compliance
0.426011	27.8	9.000	L1	19.7	19.5	47.3	Compliance
1.289541	25.6	9.000	L1	19.7	20.4	46.0	Compliance
2.599932	26.9	9.000	L1	19.7	19.1	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.156097	45.9	9.000	N	19.7	19.8	65.7	Compliance
0.196675	43.3	9.000	N	19.6	20.4	63.7	Compliance
0.199835	51.4	9.000	N	19.6	12.2	63.6	Compliance
0.212988	47.1	9.000	N	19.6	16.0	63.1	Compliance
0.255827	37.8	9.000	N	19.6	23.8	61.6	Compliance
2.579298	34.2	9.000	N	19.7	21.8	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.199835	32.5	9.000	N	19.6	21.1	53.6	Compliance
0.218141	32.3	9.000	N	19.6	20.6	52.9	Compliance
0.426011	28.4	9.000	N	19.6	18.9	47.3	Compliance
0.774393	28.3	9.000	N	19.6	17.7	46.0	Compliance
1.289541	26.9	9.000	N	19.6	19.1	46.0	Compliance
2.749070	27.6	9.000	N	19.7	18.4	46.0	Compliance

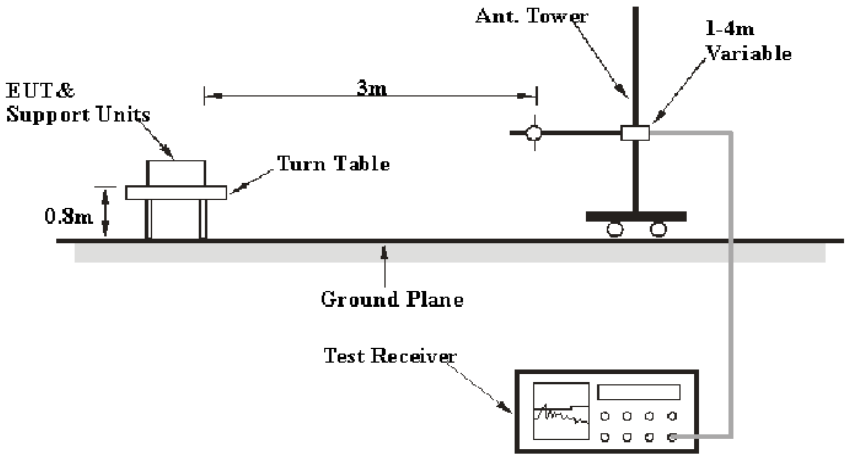
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

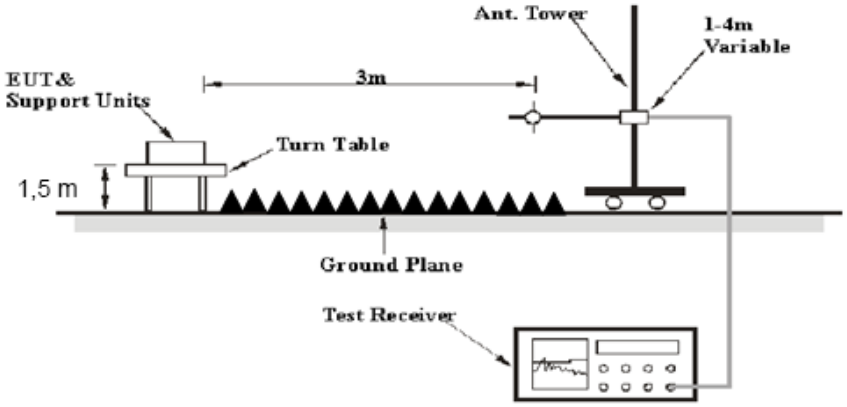
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters 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.

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

The spacing between the peripherals was 10 cm.

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:

30-1000MHz:

Frequency Range	RBW	Video B/W	IF B/W	Detector
30 MHz – 1000 MHz	120 kHz	300 kHz	120 kHz	QP

1GHz- 25GHz:

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

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 Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - Amplifier Gain

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

Margin = Limit –Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A121808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113024	2017-06-16	2020-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
EMCT	Semi-Anechoic Chamber	966	966-1	2015-04-24	2018-04-23
Unknown	RF Cable (below 1GHz)	Unknown	NO.1	2016-11-10	2017-11-09
Unknown	RF Cable (below 1GHz)	Unknown	NO.4	2016-11-10	2017-11-09
Unknown	RF Cable (above 1GHz)	Unknown	NO.2	2016-11-10	2017-11-09
Ducommun Technolagies	Horn Antenna	ARH-2823-02	1007726-01 1312	2016-08-18	2017-08-18
Quinstar	Amplifier	QLW-18405536-JO	15964001032	2016-08-18	2017-08-18
Agilent	Spectrum Analyzer	8564E	5943A01752	2016-08-18	2017-08-18

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Results Summary

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

Test Data

Environmental Conditions

Temperature:	28.9~29.0 °C
Relative Humidity:	50.1~53.2 %
ATM Pressure:	100.1 kPa

** The testing was performed by Tom Tang from 2017-06-30 to 2017-07-01.*

Test Mode: Transmitting

SISO:
802.11b Mode (Chain 0 was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	78.54	PK	H	23.50	3.00	0.00	105.04	N/A	N/A
2412	75.17	AV	H	23.50	3.00	0.00	101.67	N/A	N/A
2412	79.19	PK	V	23.50	3.00	0.00	105.69	N/A	N/A
2412	75.75	AV	V	23.50	3.00	0.00	102.25	N/A	N/A
2390	31.77	PK	V	23.57	3.00	0.00	58.34	74	15.66
2390	18.19	AV	V	23.57	3.00	0.00	44.76	54	9.24
4824	48.53	PK	V	30.84	5.11	26.87	57.61	74	16.39
4824	44.54	AV	V	30.84	5.11	26.87	53.62	54	0.38
7236	37.61	PK	V	34.77	6.18	26.36	52.2	74	21.8
7236	23.14	AV	V	34.77	6.18	26.36	37.73	54	16.27
5965	37.49	PK	V	32.86	5.93	26.66	49.62	74	24.38
5965	22.82	AV	V	32.86	5.93	26.66	34.95	54	19.05
210.42	54.87	QP	H	11.31	0.91	27.74	39.35	43.50	4.15
282.2	48.6	QP	H	13.92	1.20	27.51	36.21	46.00	9.79
Middle Channel: 2437 MHz									
2437	82.18	PK	H	23.41	3.00	0.00	108.59	N/A	N/A
2437	78.42	AV	H	23.41	3.00	0.00	104.83	N/A	N/A
2437	82.66	PK	V	23.41	3.00	0.00	109.07	N/A	N/A
2437	78.86	AV	V	23.41	3.00	0.00	105.27	N/A	N/A
4874	48.11	PK	V	31.00	5.09	26.87	57.33	74	16.67
4874	44.15	AV	V	31.00	5.09	26.87	53.37	54	0.63
7311	37.57	PK	V	34.92	6.21	26.40	52.3	74	21.7
7311	23.08	AV	V	34.92	6.21	26.40	37.81	54	16.19
5565	37.79	PK	V	32.38	5.58	26.62	49.13	74	24.87
5565	23.24	AV	V	32.38	5.58	26.62	34.58	54	19.42
6655	37.11	PK	V	33.68	6.11	26.45	50.45	74	23.55
6655	22.34	AV	V	33.68	6.11	26.45	35.68	54	18.32
210.42	55.14	QP	H	11.31	0.91	27.74	39.62	43.50	3.88
282.2	48.74	QP	H	13.92	1.20	27.51	36.35	46.00	9.65
High Channel: 2462 MHz									
2462	81.42	PK	H	23.33	2.99	0.00	107.74	N/A	N/A
2462	78.12	AV	H	23.33	2.99	0.00	104.44	N/A	N/A
2462	82.54	PK	V	23.33	2.99	0.00	108.86	N/A	N/A
2462	79.11	AV	V	23.33	2.99	0.00	105.43	N/A	N/A
2483.5	32.77	PK	V	23.26	2.99	0.00	59.02	74	14.98
2483.5	18.54	AV	V	23.26	2.99	0.00	44.79	54	9.21
4924	47.59	PK	V	31.16	5.07	26.88	56.94	74	17.06
4924	44.18	AV	V	31.16	5.07	26.88	53.53	54	0.47
7386	37.42	PK	V	35.07	6.25	26.43	52.31	74	21.69
7386	23.01	AV	V	35.07	6.25	26.43	37.9	54	16.1
5475	37.89	PK	V	32.26	5.50	26.62	49.03	74	24.97
5475	23.33	AV	V	32.26	5.50	26.62	34.47	54	19.53
210.42	55.98	QP	H	11.31	0.91	27.74	40.46	43.50	3.04
282.2	49.16	QP	H	13.92	1.20	27.51	36.77	46.00	9.23

802.11g Mode (Chain 0 was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	84.55	PK	H	23.50	3.00	0.00	111.05	N/A	N/A
2412	74.84	AV	H	23.50	3.00	0.00	101.34	N/A	N/A
2412	86.48	PK	V	23.50	3.00	0.00	112.98	N/A	N/A
2412	76.70	AV	V	23.50	3.00	0.00	103.2	N/A	N/A
2390	42.10	PK	V	23.57	3.00	0.00	68.67	74	5.33
2390	25.45	AV	V	23.57	3.00	0.00	52.02	54	1.98
4824	54.43	PK	V	30.84	5.11	26.87	63.51	74	10.49
4824	33.76	AV	V	30.84	5.11	26.87	42.84	54	11.16
7236	38.31	PK	V	34.77	6.18	26.36	52.9	74	21.1
7236	23.17	AV	V	34.77	6.18	26.36	37.76	54	16.24
5765	37.80	PK	V	32.62	5.75	26.64	49.53	74	24.47
5765	23.15	AV	V	32.62	5.75	26.64	34.88	54	19.12
210.42	55.51	QP	H	11.31	0.91	27.74	39.99	43.50	3.51
282.2	49.6	QP	H	13.92	1.20	27.51	37.21	46.00	8.79
Middle Channel: 2437 MHz									
2437	84.25	PK	H	23.41	3.00	0.00	110.66	N/A	N/A
2437	74.71	AV	H	23.41	3.00	0.00	101.12	N/A	N/A
2437	86.40	PK	V	23.41	3.00	0.00	112.81	N/A	N/A
2437	76.36	AV	V	23.41	3.00	0.00	102.77	N/A	N/A
4874	54.52	PK	V	31.00	5.09	26.87	63.74	74	10.26
4874	34.00	AV	V	31.00	5.09	26.87	43.22	54	10.78
7311	38.52	PK	V	34.92	6.21	26.40	53.25	74	20.75
7311	23.38	AV	V	34.92	6.21	26.40	38.11	54	15.89
5835	37.58	PK	V	32.70	5.81	26.64	49.45	74	24.55
5835	23.45	AV	V	32.70	5.81	26.64	35.32	54	18.68
6225	37.50	PK	V	33.13	6.04	26.60	50.07	74	23.93
6225	22.69	AV	V	33.13	6.04	26.60	35.26	54	18.74
210.42	55.04	QP	H	11.31	0.91	27.74	39.52	43.50	3.98
282.2	50.04	QP	H	13.92	1.20	27.51	37.65	46.00	8.35
High Channel: 2462 MHz									
2462	83.82	PK	H	23.33	2.99	0.00	110.14	N/A	N/A
2462	73.91	AV	H	23.33	2.99	0.00	100.23	N/A	N/A
2462	86.64	PK	V	23.33	2.99	0.00	112.96	N/A	N/A
2462	75.11	AV	V	23.33	2.99	0.00	101.43	N/A	N/A
2483.5	39.29	PK	V	23.26	2.99	0.00	65.54	74	8.46
2483.5	25.81	AV	V	23.26	2.99	0.00	52.06	54	1.94
4924	53.99	PK	V	31.16	5.07	26.88	63.34	74	10.66
4924	32.87	AV	V	31.16	5.07	26.88	42.22	54	11.78
7386	37.73	PK	V	35.07	6.25	26.43	52.62	74	21.38
7386	23.26	AV	V	35.07	6.25	26.43	38.15	54	15.85
5765	37.71	PK	V	32.62	5.75	26.64	49.44	74	24.56
5765	23.38	AV	V	32.62	5.75	26.64	35.11	54	18.89
210.42	54.01	QP	H	11.31	0.91	27.74	38.49	43.50	5.01
282.2	47.36	QP	H	13.92	1.20	27.51	34.97	46.00	11.03

802.11 n ht20 Mode (Chain 0 was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	84.55	PK	H	23.50	3.00	0.00	111.05	N/A	N/A
2412	74.28	AV	H	23.50	3.00	0.00	100.78	N/A	N/A
2412	86.07	PK	V	23.50	3.00	0.00	112.57	N/A	N/A
2412	75.36	AV	V	23.50	3.00	0.00	101.86	N/A	N/A
2390	41.59	PK	V	23.57	3.00	0.00	68.16	74	5.84
2390	25.48	AV	V	23.57	3.00	0.00	52.05	54	1.95
4824	58.58	PK	V	30.84	5.11	26.87	67.66	74	6.34
4824	33.29	AV	V	30.84	5.11	26.87	42.37	54	11.63
7236	43.08	PK	V	34.77	6.18	26.36	57.67	74	16.33
7236	26.10	AV	V	34.77	6.18	26.36	40.69	54	13.31
6065	37.44	PK	V	32.97	5.98	26.64	49.75	74	24.25
6065	22.68	AV	V	32.97	5.98	26.64	34.99	54	19.01
210.42	54.28	QP	H	11.31	0.91	27.74	38.76	43.50	4.74
282.2	47.5	QP	H	13.92	1.20	27.51	35.11	46.00	10.89
Middle Channel: 2437 MHz									
2437	83.52	PK	H	23.41	3.00	0.00	109.93	N/A	N/A
2437	73.80	AV	H	23.41	3.00	0.00	100.21	N/A	N/A
2437	85.71	PK	V	23.41	3.00	0.00	112.12	N/A	N/A
2437	75.29	AV	V	23.41	3.00	0.00	101.7	N/A	N/A
4874	57.58	PK	V	31.00	5.09	26.87	66.8	74	7.2
4874	32.84	AV	V	31.00	5.09	26.87	42.06	54	11.94
7311	43.02	PK	V	34.92	6.21	26.40	57.75	74	16.25
7311	26.07	AV	V	34.92	6.21	26.40	40.8	54	13.2
5695	38.15	PK	V	32.53	5.69	26.63	49.74	74	24.26
5695	23.62	AV	V	32.53	5.69	26.63	35.21	54	18.79
6315	37.15	PK	V	33.22	6.07	26.58	49.86	74	24.14
6315	22.67	AV	V	33.22	6.07	26.58	35.38	54	18.62
210.42	55.12	QP	H	11.31	0.91	27.74	39.60	43.50	3.90
282.2	47.92	QP	H	13.92	1.20	27.51	35.53	46.00	10.47
High Channel: 2462 MHz									
2462	83.27	PK	H	23.33	2.99	0.00	109.59	N/A	N/A
2462	73.14	AV	H	23.33	2.99	0.00	99.46	N/A	N/A
2462	85.67	PK	V	23.33	2.99	0.00	111.99	N/A	N/A
2462	74.75	AV	V	23.33	2.99	0.00	101.07	N/A	N/A
2483.5	41.88	PK	V	23.26	2.99	0.00	68.13	74	5.87
2483.5	25.80	AV	V	23.26	2.99	0.00	52.05	54	1.95
4924	56.42	PK	V	31.16	5.07	26.88	65.77	74	8.23
4924	32.68	AV	V	31.16	5.07	26.88	42.03	54	11.97
7386	43.03	PK	V	35.07	6.25	26.43	57.92	74	16.08
7386	26.12	AV	V	35.07	6.25	26.43	41.01	54	12.99
5625	38.12	PK	V	32.45	5.63	26.62	49.58	74	24.42
5625	23.94	AV	V	32.45	5.63	26.62	35.4	54	18.6
210.42	54.65	QP	H	11.31	0.91	27.74	39.13	43.50	4.37
282.2	48.36	QP	H	13.92	1.20	27.51	35.97	46.00	10.03

802.11 n ht40 Mode (Chain 0 was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2422 MHz									
2422	79.50	PK	H	23.47	3.00	0.00	105.97	N/A	N/A
2422	69.35	AV	H	23.47	3.00	0.00	95.82	N/A	N/A
2422	83.76	PK	V	23.47	3.00	0.00	110.23	N/A	N/A
2422	72.61	AV	V	23.47	3.00	0.00	99.08	N/A	N/A
2390	41.37	PK	V	23.57	3.00	0.00	67.94	74	6.06
2390	25.48	AV	V	23.57	3.00	0.00	52.05	54	1.95
4844	57.36	PK	V	30.90	5.10	26.87	66.49	74	7.51
4844	34.93	AV	V	30.90	5.10	26.87	44.06	54	9.94
7266	37.61	PK	V	34.83	6.19	26.38	52.25	74	21.75
7266	23.08	AV	V	34.83	6.19	26.38	37.72	54	16.28
5325	38.63	PK	V	31.99	5.35	26.70	49.27	74	24.73
5325	24.05	AV	V	31.99	5.35	26.70	34.69	54	19.31
210.42	54.18	QP	H	11.31	0.91	27.74	38.66	43.50	4.84
282.2	48.8	QP	H	13.92	1.20	27.51	36.41	46.00	9.59
Middle Channel: 2437 MHz									
2437	80.29	PK	H	23.41	3.00	0.00	106.7	N/A	N/A
2437	69.50	AV	H	23.41	3.00	0.00	95.91	N/A	N/A
2437	83.21	PK	V	23.41	3.00	0.00	109.62	N/A	N/A
2437	73.04	AV	V	23.41	3.00	0.00	99.45	N/A	N/A
4874	56.47	PK	V	31.00	5.09	26.87	65.69	74	8.31
4874	34.83	AV	V	31.00	5.09	26.87	44.05	54	9.95
7311	37.98	PK	V	34.92	6.21	26.40	52.71	74	21.29
7311	23.42	AV	V	34.92	6.21	26.40	38.15	54	15.85
5958	37.91	PK	V	32.85	5.92	26.66	50.02	74	23.98
5958	23.33	AV	V	32.85	5.92	26.66	35.44	54	18.56
5665	37.97	PK	V	32.50	5.67	26.63	49.51	74	24.49
5665	23.50	AV	V	32.50	5.67	26.63	35.04	54	18.96
210.42	53.26	QP	H	11.31	0.91	27.74	37.74	43.50	5.76
282.2	47.14	QP	H	13.92	1.20	27.51	34.75	46.00	11.25
High Channel: 2452 MHz									
2452	80.42	PK	H	23.36	3.00	0.00	106.78	N/A	N/A
2452	69.81	AV	H	23.36	3.00	0.00	96.17	N/A	N/A
2452	85.67	PK	V	23.36	3.00	0.00	112.03	N/A	N/A
2452	72.51	AV	V	23.36	3.00	0.00	98.87	N/A	N/A
2483.5	39.80	PK	V	23.26	2.99	0.00	66.05	74	7.95
2483.5	26.68	AV	V	23.26	2.99	0.00	52.93	54	1.07
4904	55.80	PK	V	31.09	5.08	26.87	65.1	74	8.9
4904	34.69	AV	V	31.09	5.08	26.87	43.99	54	10.01
7356	37.45	PK	V	35.01	6.23	26.42	52.27	74	21.73
7356	22.30	AV	V	35.01	6.23	26.42	37.12	54	16.88
5885	37.64	PK	V	32.76	5.86	26.65	49.61	74	24.39
5885	23.47	AV	V	32.76	5.86	26.65	35.44	54	18.56
210.42	53.53	QP	H	11.31	0.91	27.74	38.01	43.50	5.49
282.2	47.28	QP	H	13.92	1.20	27.51	34.89	46.00	11.11

MIMO-2TX:
802.11n ht20 Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	84.27	PK	H	23.50	3.00	0.00	110.77	N/A	N/A
2412	70.94	AV	H	23.50	3.00	0.00	97.44	N/A	N/A
2412	86.59	PK	V	23.50	3.00	0.00	113.09	N/A	N/A
2412	73.82	AV	V	23.50	3.00	0.00	100.32	N/A	N/A
2390	38.88	PK	V	23.57	3.00	0.00	65.45	74	8.55
2390	23.66	AV	V	23.57	3.00	0.00	50.23	54	3.77
4824	59.36	PK	V	30.84	5.11	26.87	68.44	74	5.56
4824	37.08	AV	V	30.84	5.11	26.87	46.16	54	7.84
7236	42.67	PK	V	34.77	6.18	26.36	57.26	74	16.74
7236	26.05	AV	V	34.77	6.18	26.36	40.64	54	13.36
6065	37.44	PK	V	32.97	5.98	26.64	49.75	74	24.25
6065	22.65	AV	V	32.97	5.98	26.64	34.96	54	19.04
210.42	54.37	QP	H	11.31	0.91	27.74	38.85	43.50	4.65
282.2	47.7	QP	H	13.92	1.20	27.51	35.31	46.00	10.69
Middle Channel: 2437 MHz									
2437	83.73	PK	H	23.41	3.00	0.00	110.14	N/A	N/A
2437	70.52	AV	H	23.41	3.00	0.00	96.93	N/A	N/A
2437	85.81	PK	V	23.41	3.00	0.00	112.22	N/A	N/A
2437	73.00	AV	V	23.41	3.00	0.00	99.41	N/A	N/A
4874	58.06	PK	V	31.00	5.09	26.87	67.28	74	6.72
4874	36.67	AV	V	31.00	5.09	26.87	45.89	54	8.11
7311	42.70	PK	V	34.92	6.21	26.40	57.43	74	16.57
7311	26.11	AV	V	34.92	6.21	26.40	40.84	54	13.16
5695	38.15	PK	V	32.53	5.69	26.63	49.74	74	24.26
5695	23.62	AV	V	32.53	5.69	26.63	35.21	54	18.79
6315	37.05	PK	V	33.22	6.07	26.58	49.76	74	24.24
6315	22.56	AV	V	33.22	6.07	26.58	35.27	54	18.73
210.42	53.9	QP	H	11.31	0.91	27.74	38.38	43.50	5.12
282.2	48.14	QP	H	13.92	1.20	27.51	35.75	46.00	10.25
High Channel: 2462 MHz									
2462	84.69	PK	H	23.33	2.99	0.00	111.01	N/A	N/A
2462	71.35	AV	H	23.33	2.99	0.00	97.67	N/A	N/A
2462	87.47	PK	V	23.33	2.99	0.00	113.79	N/A	N/A
2462	76.13	AV	V	23.33	2.99	0.00	102.45	N/A	N/A
2483.5	42.14	PK	V	23.26	2.99	0.00	68.39	74	5.61
2483.5	26.55	AV	V	23.26	2.99	0.00	52.8	54	1.2
4924	57.17	PK	V	31.16	5.07	26.88	66.52	74	7.48
4924	36.56	AV	V	31.16	5.07	26.88	45.91	54	8.09
7386	42.17	PK	V	35.07	6.25	26.43	57.06	74	16.94
7386	26.54	AV	V	35.07	6.25	26.43	41.43	54	12.57
5625	38.19	PK	V	32.45	5.63	26.62	49.65	74	24.35
5625	23.97	AV	V	32.45	5.63	26.62	35.43	54	18.57
210.42	53.43	QP	H	11.31	0.91	27.74	37.91	43.50	5.59
282.2	48.58	QP	H	13.92	1.20	27.51	36.19	46.00	9.81

802.11n ht40 Mode

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2422 MHz									
2422	80.64	PK	H	23.47	3.00	0.00	107.11	N/A	N/A
2422	68.13	AV	H	23.47	3.00	0.00	94.6	N/A	N/A
2422	82.97	PK	V	23.47	3.00	0.00	109.44	N/A	N/A
2422	71.22	AV	V	23.47	3.00	0.00	97.69	N/A	N/A
2390	38.88	PK	V	23.57	3.00	0.00	65.45	74	8.55
2390	25.29	AV	V	23.57	3.00	0.00	51.86	54	2.14
4844	52.05	PK	V	30.90	5.10	26.87	61.18	74	12.82
4844	33.62	AV	V	30.90	5.10	26.87	42.75	54	11.25
7266	37.71	PK	V	34.83	6.19	26.38	52.35	74	21.65
7266	23.13	AV	V	34.83	6.19	26.38	37.77	54	16.23
5325	38.63	PK	V	31.99	5.35	26.70	49.27	74	24.73
5325	24.05	AV	V	31.99	5.35	26.70	34.69	54	19.31
210.42	52.97	QP	H	11.31	0.91	27.74	37.45	43.50	6.05
282.2	46.88	QP	H	13.92	1.20	27.51	34.49	46.00	11.51
Middle Channel: 2437 MHz									
2437	80.34	PK	H	23.41	3.00	0.00	106.75	N/A	N/A
2437	68.33	AV	H	23.41	3.00	0.00	94.74	N/A	N/A
2437	83.21	PK	V	23.41	3.00	0.00	109.62	N/A	N/A
2437	71.33	AV	V	23.41	3.00	0.00	97.74	N/A	N/A
4874	52.83	PK	V	31.00	5.09	26.87	62.05	74	11.95
4874	33.71	AV	V	31.00	5.09	26.87	42.93	54	11.07
7311	39.48	PK	V	34.92	6.21	26.40	54.21	74	19.79
7311	23.32	AV	V	34.92	6.21	26.40	38.05	54	15.95
5958	37.91	PK	V	32.85	5.92	26.66	50.02	74	23.98
5958	23.33	AV	V	32.85	5.92	26.66	35.44	54	18.56
5665	37.97	PK	V	32.50	5.67	26.63	49.51	74	24.49
5665	23.53	AV	V	32.50	5.67	26.63	35.07	54	18.93
210.42	53.24	QP	H	11.31	0.91	27.74	37.72	43.50	5.78
282.2	47.02	QP	H	13.92	1.20	27.51	34.63	46.00	11.37
High Channel: 2452 MHz									
2452	80.32	PK	H	23.36	3.00	0.00	106.68	N/A	N/A
2452	68.18	AV	H	23.36	3.00	0.00	94.54	N/A	N/A
2452	83.26	PK	V	23.36	3.00	0.00	109.62	N/A	N/A
2452	71.37	AV	V	23.36	3.00	0.00	97.73	N/A	N/A
2483.5	41.37	PK	V	23.26	2.99	0.00	67.62	74	6.38
2483.5	26.06	AV	V	23.26	2.99	0.00	52.31	54	1.69
4904	51.90	PK	V	31.09	5.08	26.87	61.2	74	12.8
4904	33.32	AV	V	31.09	5.08	26.87	42.62	54	11.38
7356	38.75	PK	V	35.01	6.23	26.42	53.57	74	20.43
7356	23.30	AV	V	35.01	6.23	26.42	38.12	54	15.88
5885	37.64	PK	V	32.76	5.86	26.65	49.61	74	24.39
5885	23.47	AV	V	32.76	5.86	26.65	35.44	54	18.56
210.42	54.08	QP	H	11.31	0.91	27.74	38.56	43.50	4.94
282.2	47.44	QP	H	13.92	1.20	27.51	35.05	46.00	10.95

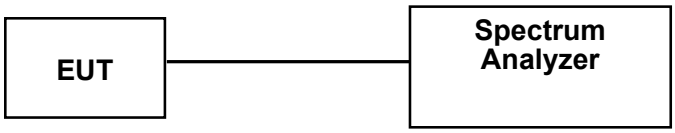
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH

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

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



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	28.7~32.8 °C
Relative Humidity:	37.1~51.4 %
ATM Pressure:	94.8~100.1 kPa

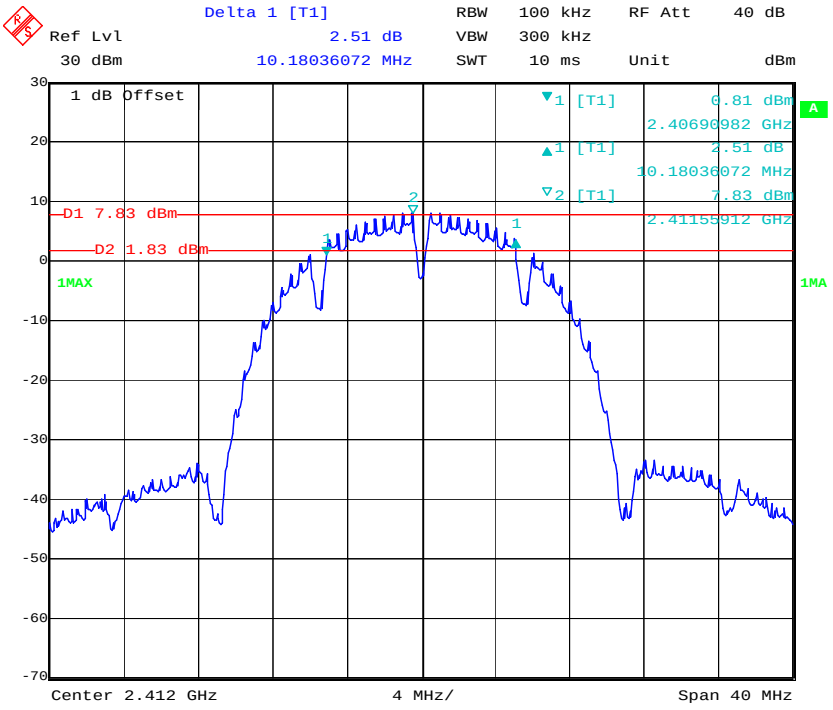
** The testing was performed by Tom Tang from 2017-07-01 to 2017-08-23.*

Test Mode: Transmitting(Test performed at SISO mode chain 0)

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

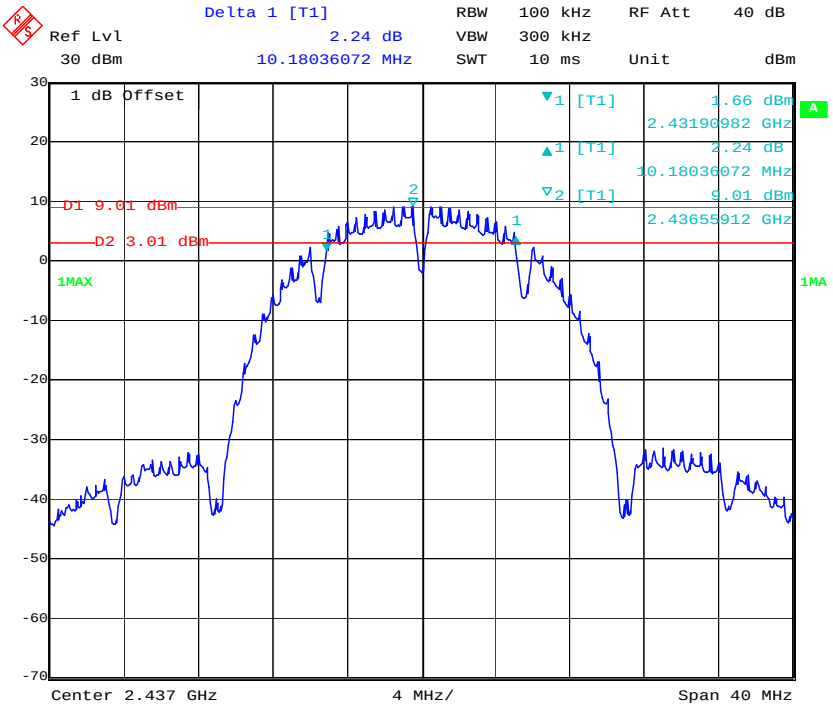
Test mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	10.18	≥0.5
	Middle	2437	10.18	≥0.5
	High	2462	10.18	≥0.5
802.11g	Low	2412	16.59	≥0.5
	Middle	2437	16.59	≥0.5
	High	2462	16.59	≥0.5
802.11n ht20	Low	2412	17.80	≥0.5
	Middle	2437	17.80	≥0.5
	High	2462	17.80	≥0.5
802.11n ht40	Low	2422	36.71	≥0.5
	Middle	2437	36.71	≥0.5
	High	2452	36.71	≥0.5

Chain 0 - 802.11b Low Channel



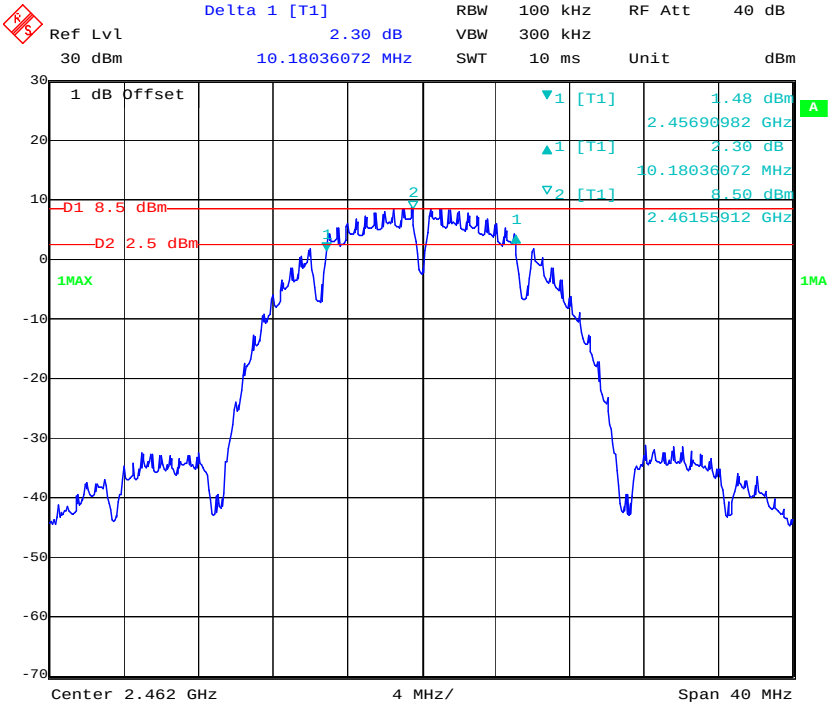
Date: 23.AUG.2017 19:46:57

Chain 0 - 802.11b Middle Channel

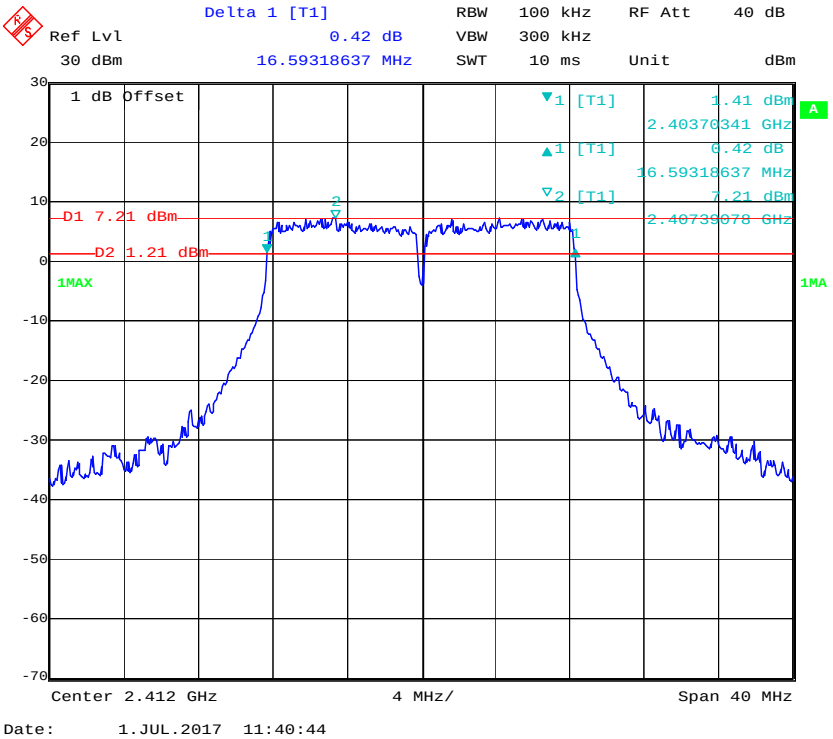


Date: 23.AUG.2017 19:50:41

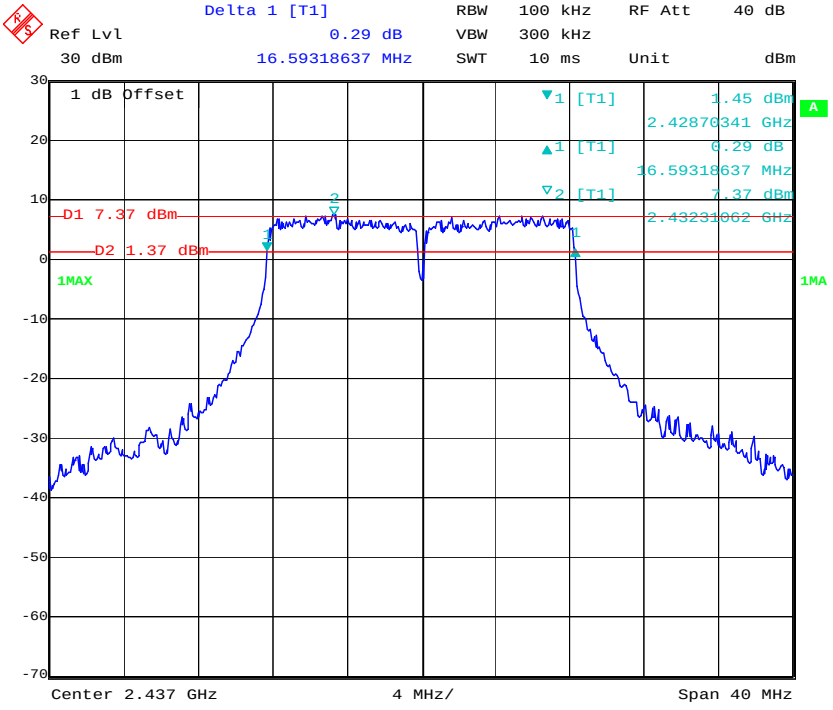
Chain 0 - 802.11b High Channel



Chain 0 - 802.11g Low Channel

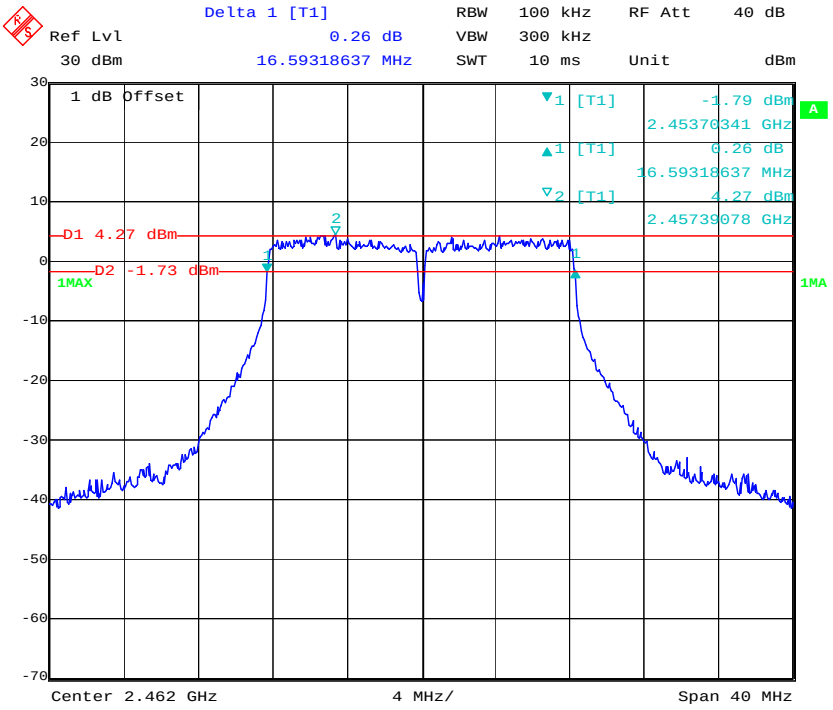


Chain 0 - 802.11g Middle Channel



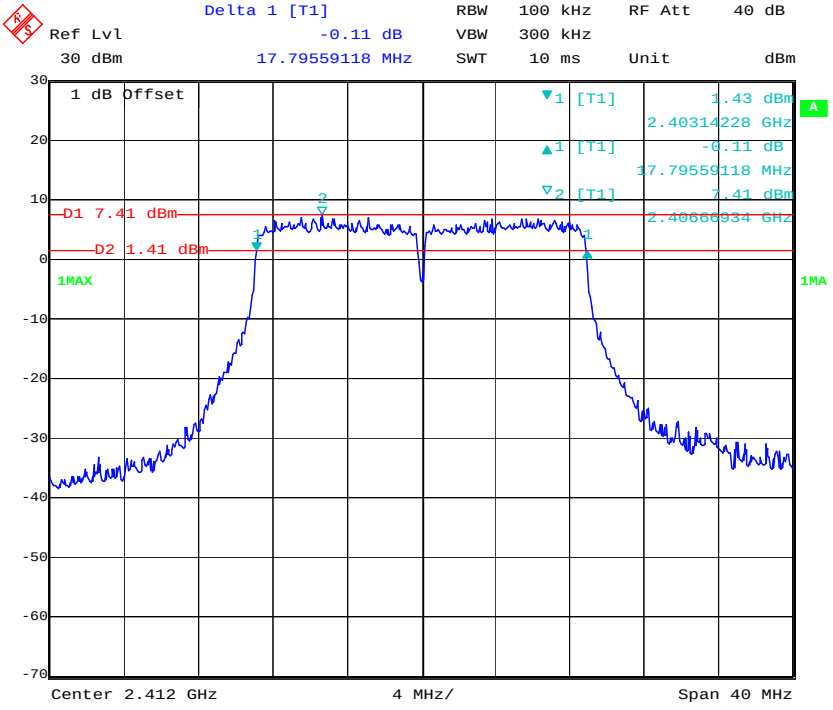
Date: 1.JUL.2017 11:36:20

Chain 0 - 802.11g High Channel



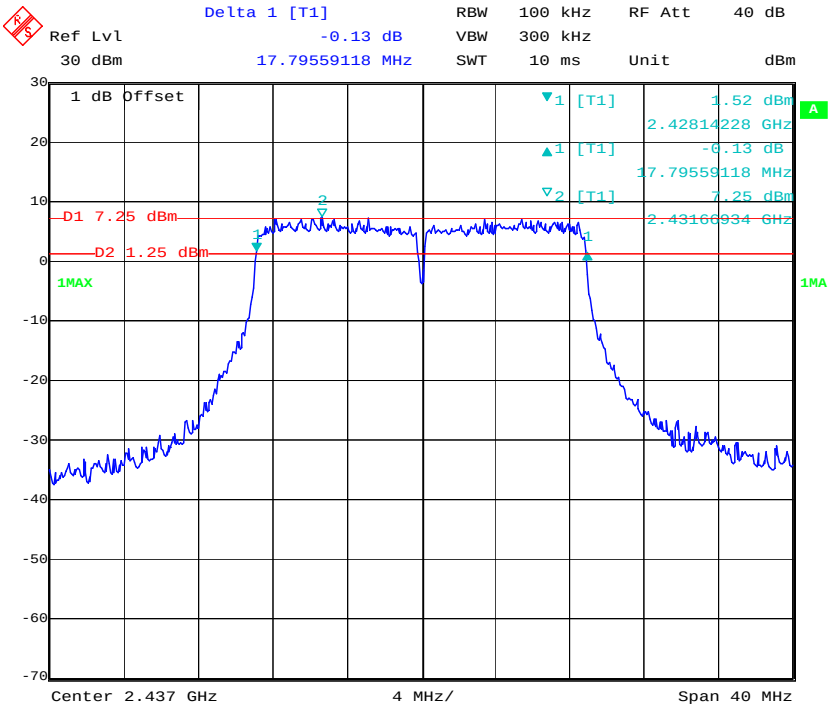
Date: 1.JUL.2017 11:31:56

Chain 0 - 802.11n ht20 Low Channel



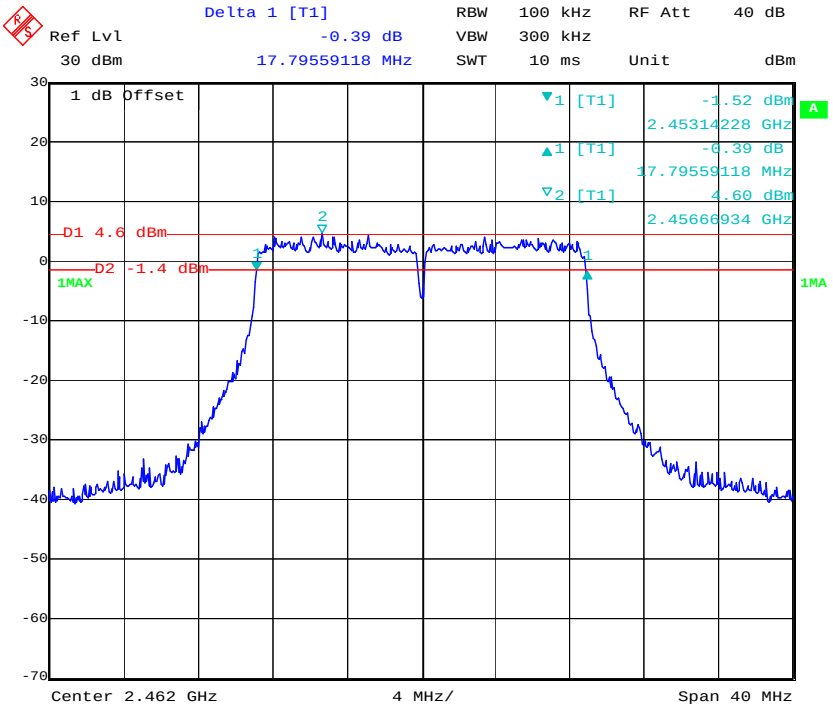
Date: 1.JUL.2017 11:43:49

Chain 0 - 802.11n ht20 Middle Channel



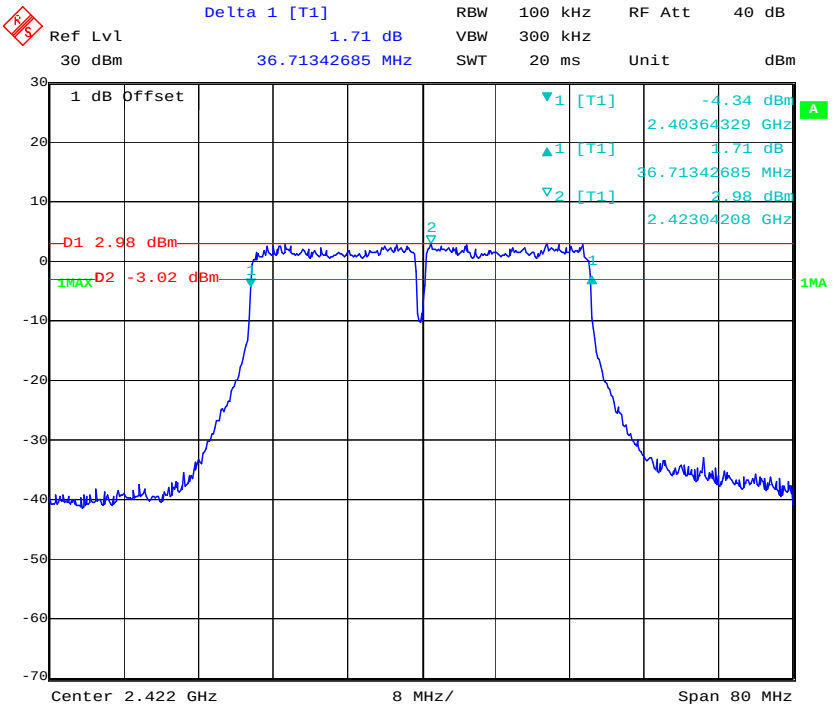
Date: 1.JUL.2017 11:48:31

Chain 0 - 802.11n ht20 High Channel



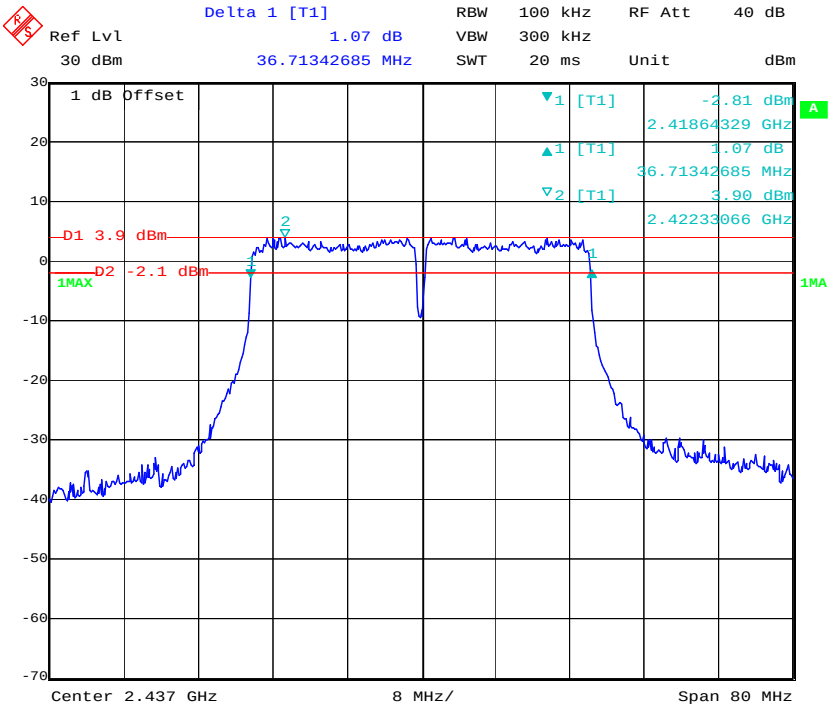
Date: 1.JUL.2017 11:51:57

Chain 0 - 802.11n ht40 Low Channel



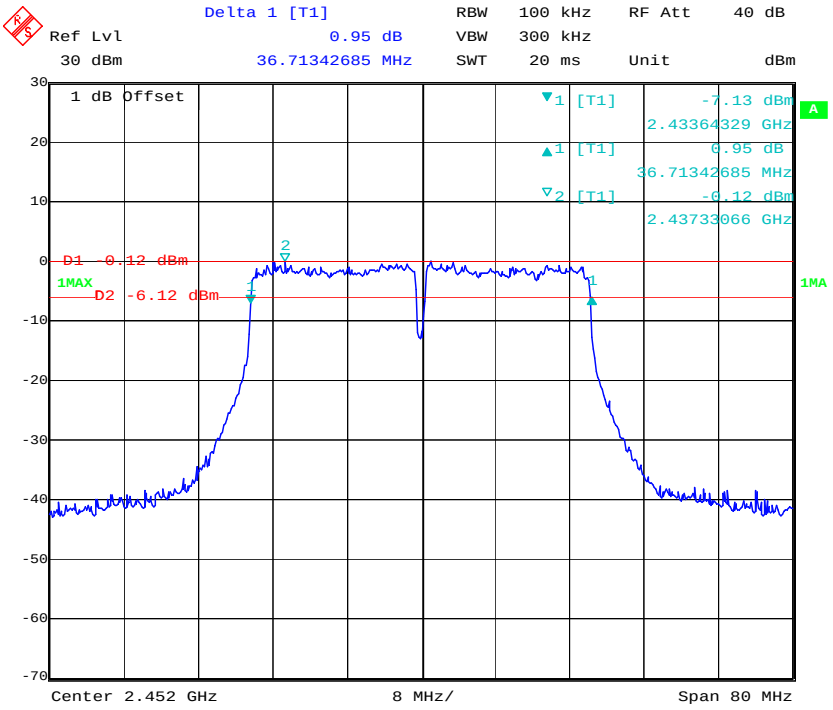
Date: 1.JUL.2017 11:56:05

Chain 0 - 802.11n ht40 Middle Channel



Date: 1.JUL.2017 12:00:34

Chain 0 - 802.11n ht40 High Channel



Date: 1.JUL.2017 12:03:26

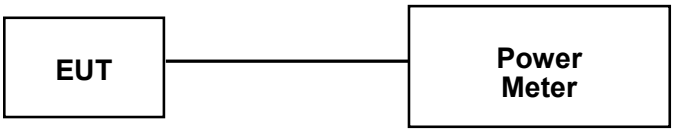
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER

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 test equipment.
3. Add a correction factor to the display.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54170074	2017-01-03	2018-01-03
Agilent	P-Series Power Meter	N1912A	MY5000798	2017-01-03	2018-01-03
Unknown	RF Cable	Unknown	C-2	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	29.3 °C
Relative Humidity:	47 %
ATM Pressure:	95.6 kPa

** The testing was performed by Tom Tang on 2017-07-01.*

Test Mode: Transmitting

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

SISO:

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)		Limit (dBm)
			Chain 0	Chain 1	
802.11b	Low	2412	20.78	27.54	30
	Middle	2437	21.84	27.74	30
	High	2462	21.56	27.62	30
802.11g	Low	2412	28.03	28.02	30
	Middle	2437	28.2	28.28	30
	High	2462	25.25	26.4	30
802.11n ht20	Low	2412	28.31	28.86	30
	Middle	2437	28.33	28.59	30
	High	2462	25.41	26.74	30
802.11n ht40	Low	2422	27.3	28.1	30
	Middle	2437	28.29	28.16	30
	High	2452	24.32	25.85	30

MIMO 2TX:

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)		Total (dBm)	Limit (dBm)
			Chain 1	Chain 2		
802.11n ht20	Low	2412	25.9	25.63	28.78	30
	Middle	2437	26.32	25.79	29.07	30
	High	2462	26.19	26.31	29.26	30
802.11n ht40	Low	2422	24.87	23.18	27.12	30
	Middle	2437	24.88	23.34	27.19	30
	High	2452	25.19	25.09	28.15	30

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

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

So:

Directional gain = G_{ANT} + Array Gain = 3dBi < 6dBi

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

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	28.7~32.8 °C
Relative Humidity:	37.1~51.4 %
ATM Pressure:	94.8~100.1 kPa

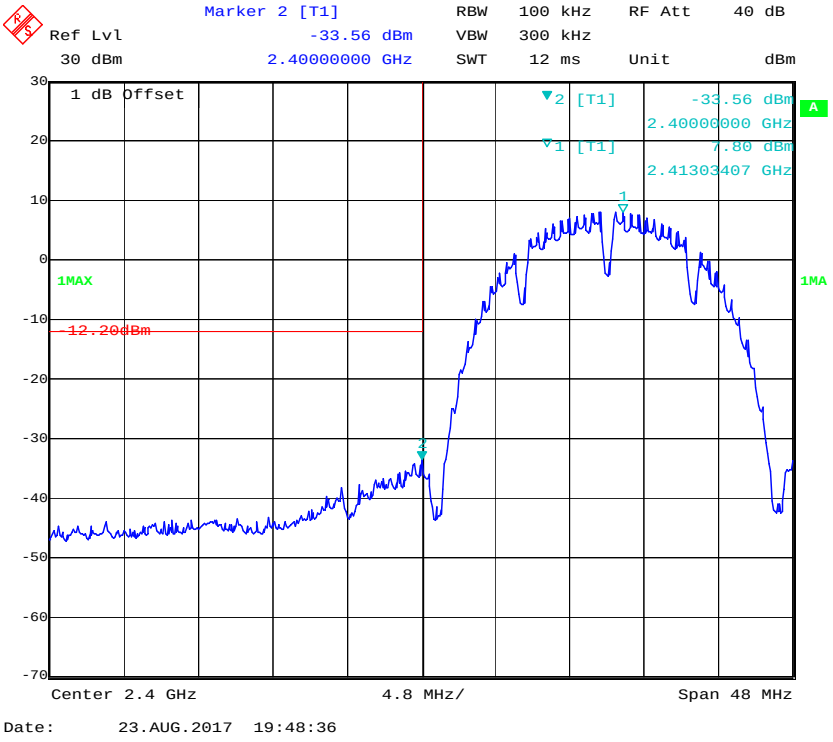
** The testing was performed by Tom Tang from 2017-07-01 to 2017-08-23.*

Test mode: Transmitting

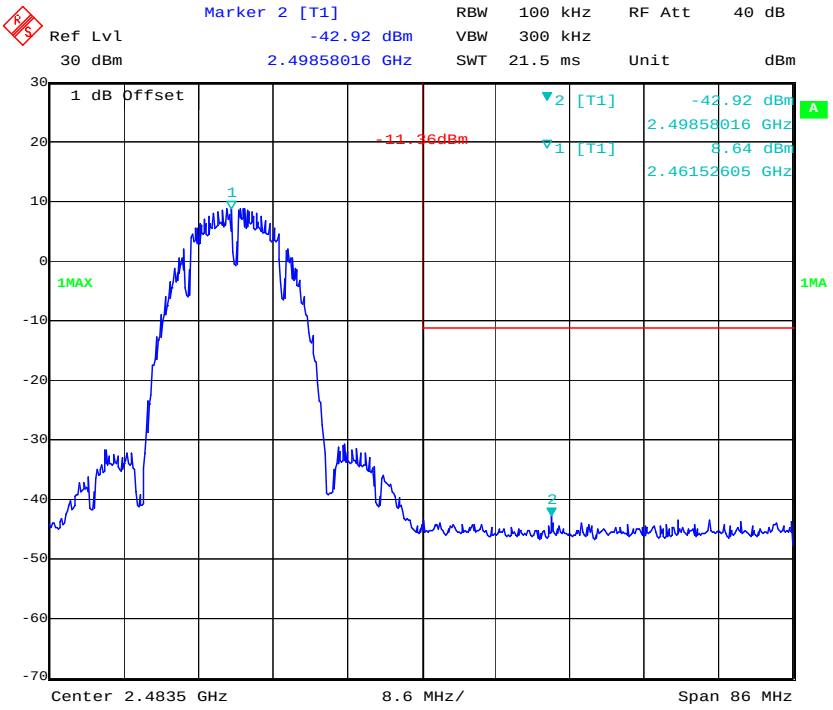
Test Result: Compliant. Please refer to following plots.

SISO:

Chain 0, 802.11b: Band Edge, Left Side

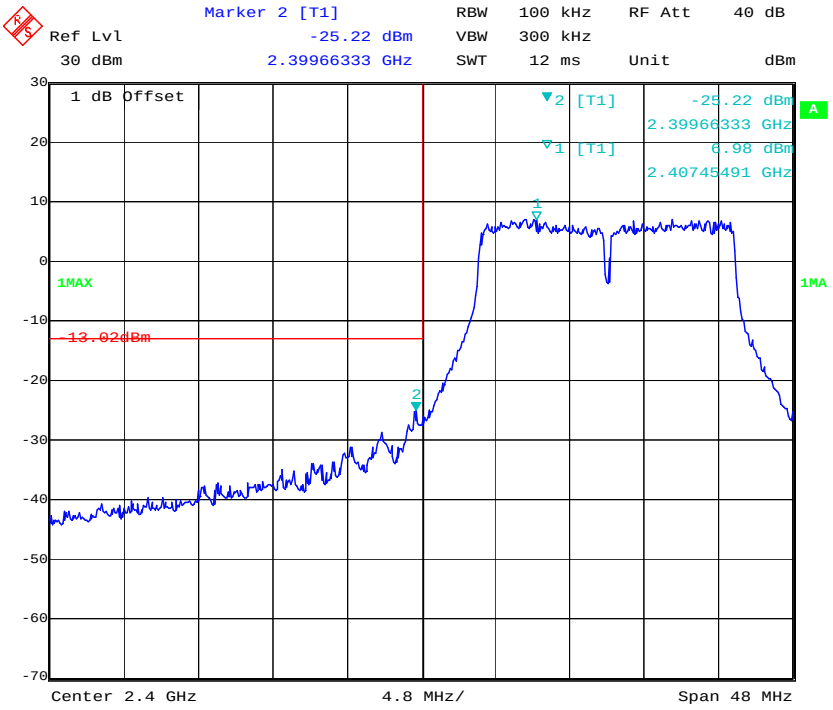


Chain 0, 802.11b: Band Edge, Right Side



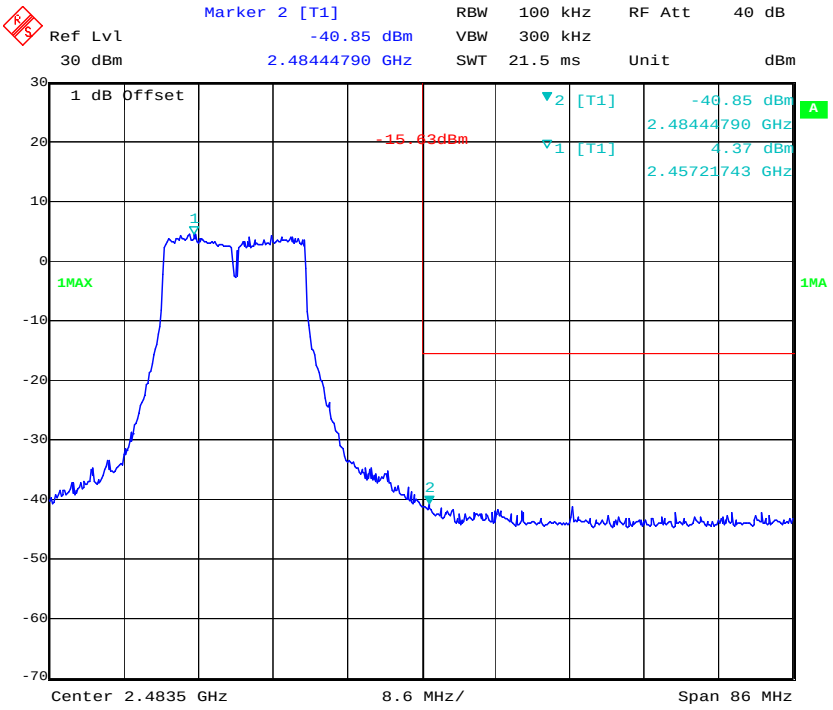
Date: 23.AUG.2017 19:56:42

Chain 0, 802.11g: Band Edge, Left Side



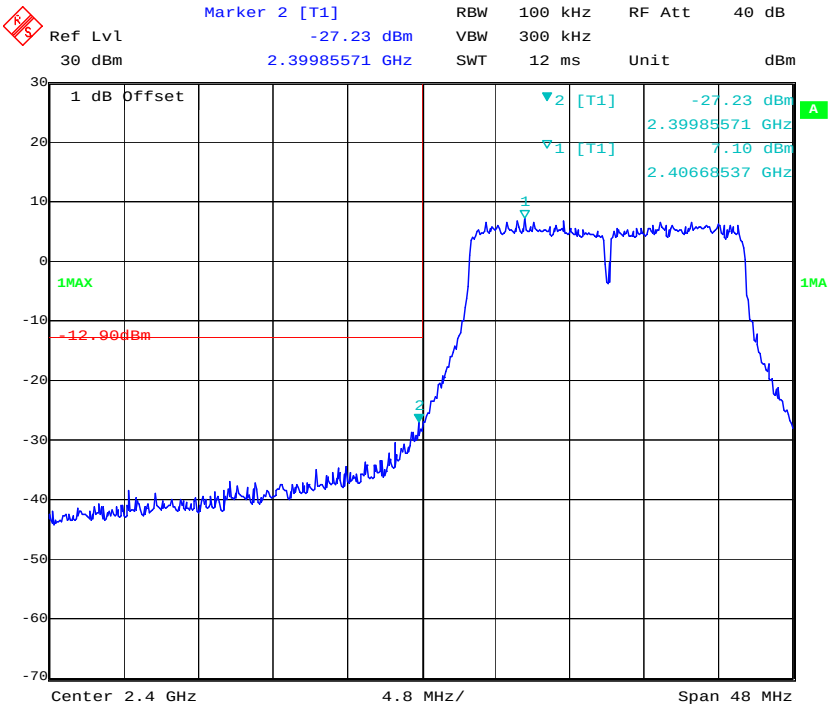
Date: 1.JUL.2017 11:42:55

Chain 0, 802.11g: Band Edge, Right Side



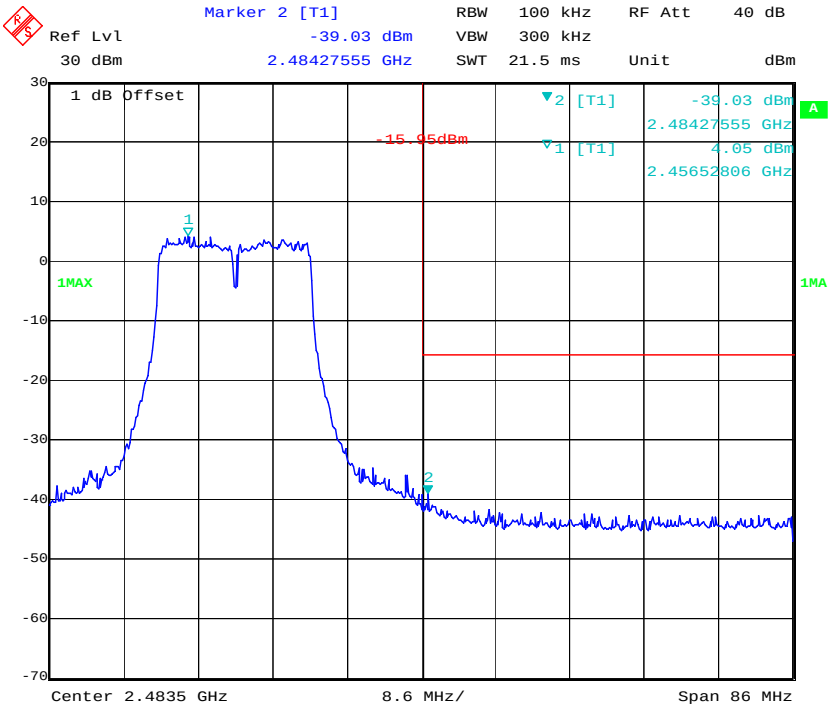
Date: 1.JUL.2017 11:34:22

Chain 0, 802.11n ht20 Band Edge, Left Side



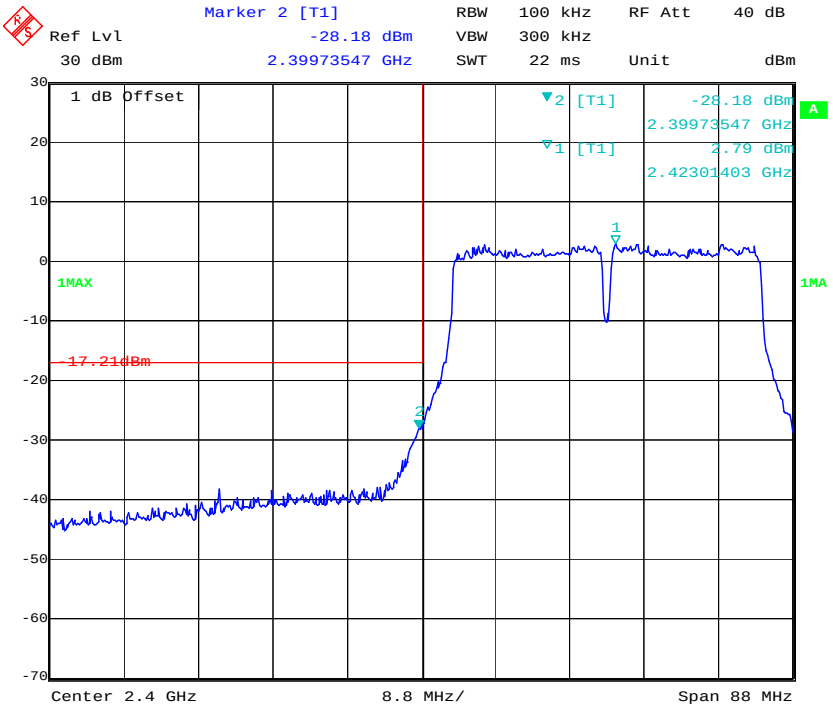
Date: 1.JUL.2017 11:47:31

Chain 0, 802.11n ht20 Band Edge, Right Side



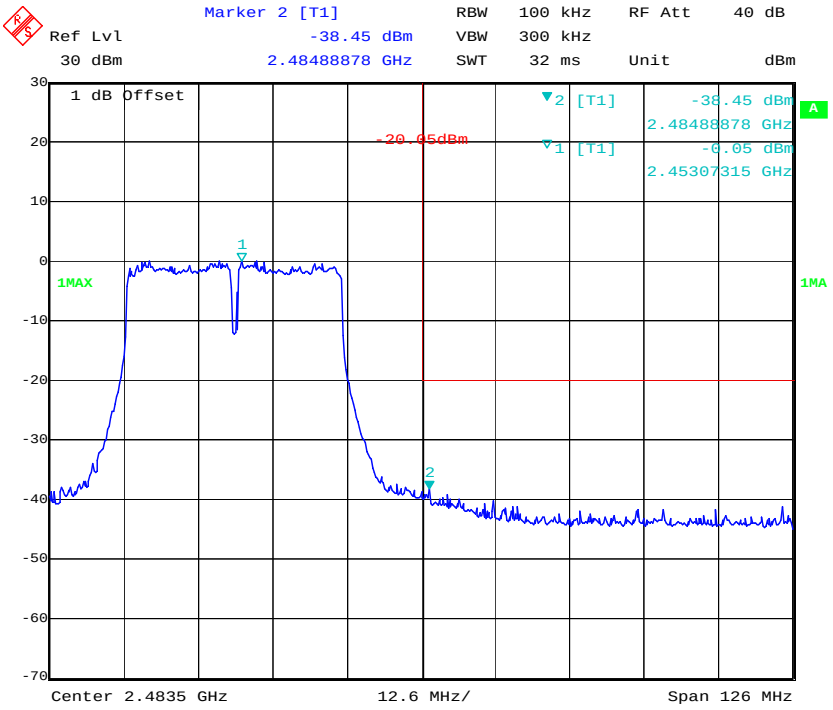
Date: 1.JUL.2017 11:55:17

Chain 0, 802.11n ht40 Band Edge, Left Side



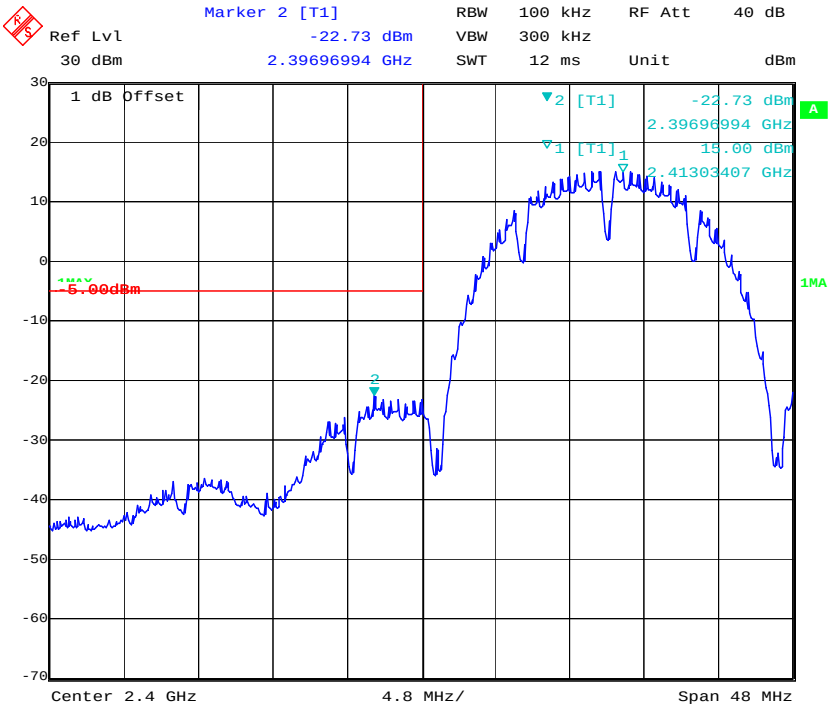
Date: 1.JUL.2017 11:58:25

Chain 0, 802.11n ht40 Band Edge, Right Side



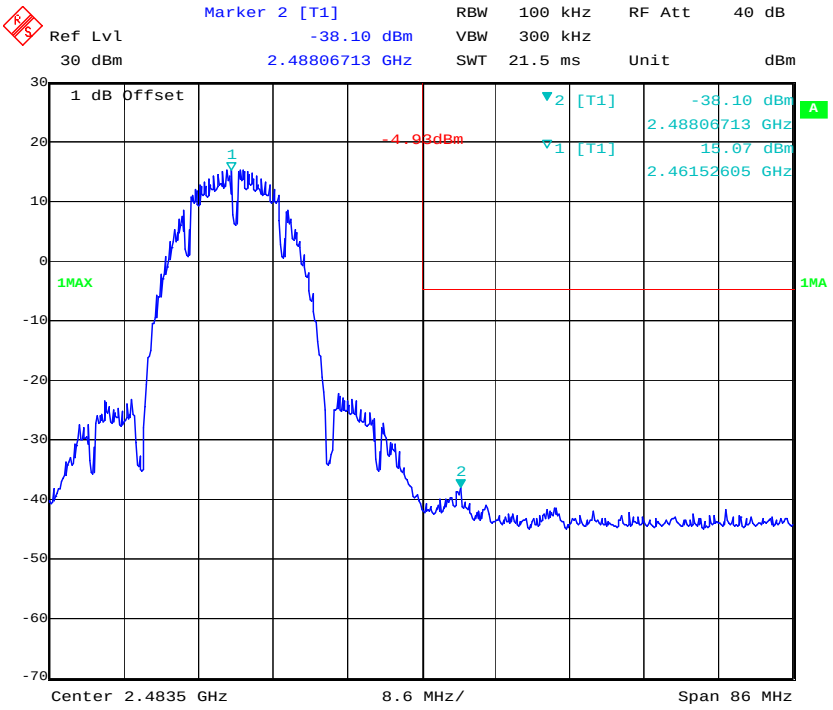
Date: 1.JUL.2017 12:05:40

Chain 1, 802.11b: Band Edge, Left Side



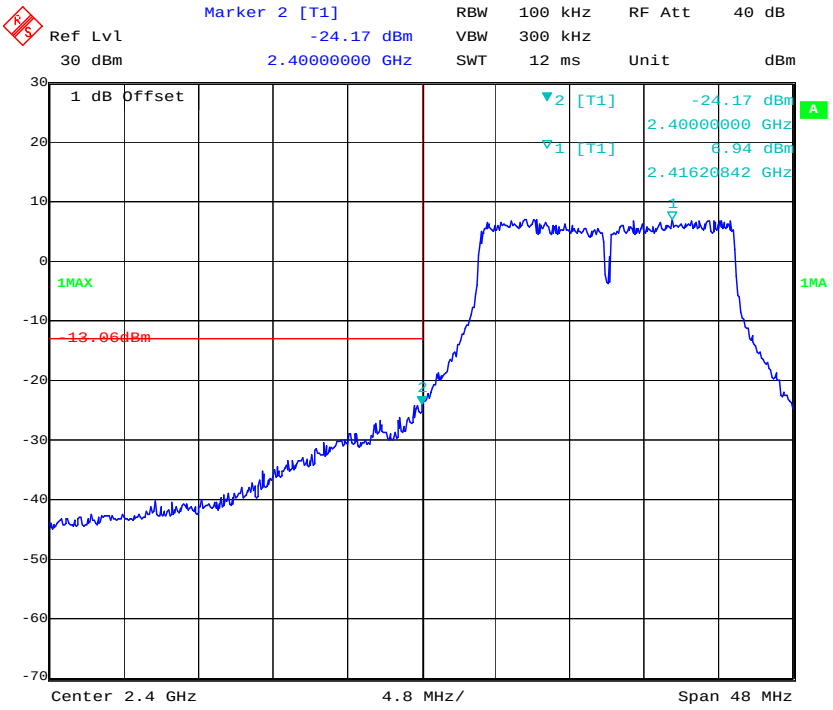
Date: 1.JUL.2017 12:54:37

Chain 1, 802.11b: Band Edge, Right Side



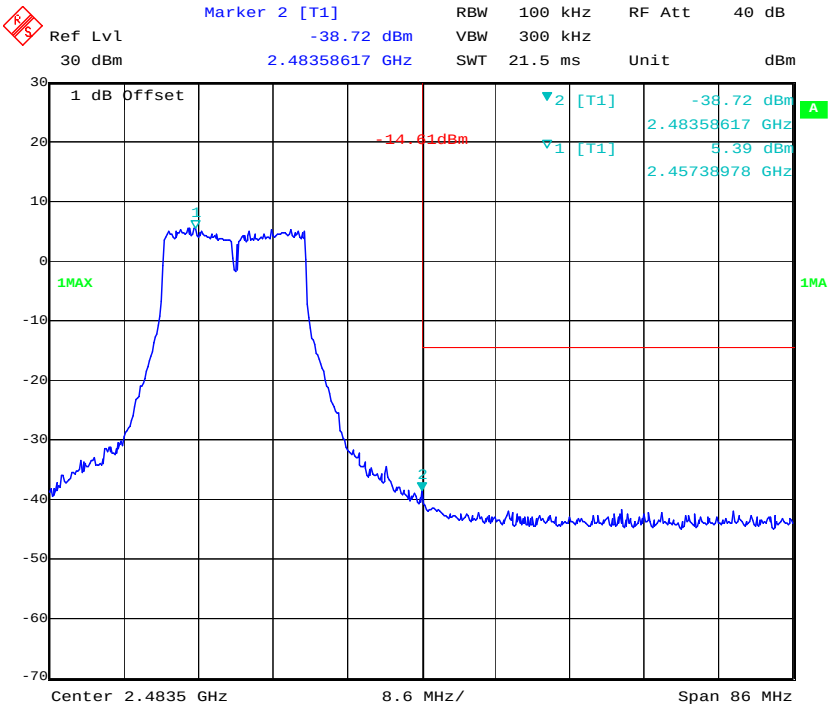
Date: 1.JUL.2017 12:59:03

Chain 1, 802.11g: Band Edge, Left Side



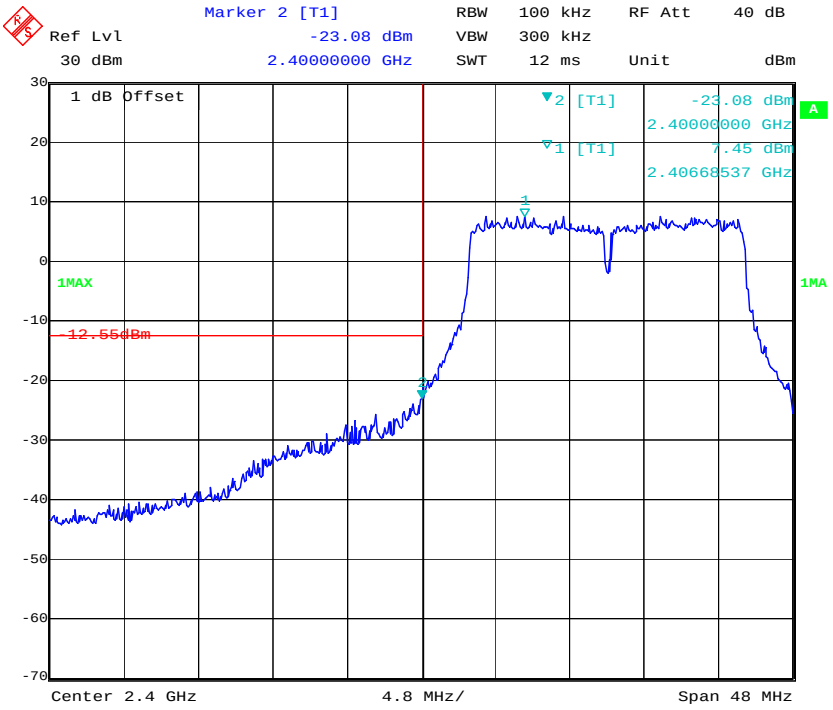
Date: 1.JUL.2017 12:49:38

Chain 1, 802.11g: Band Edge, Right Side



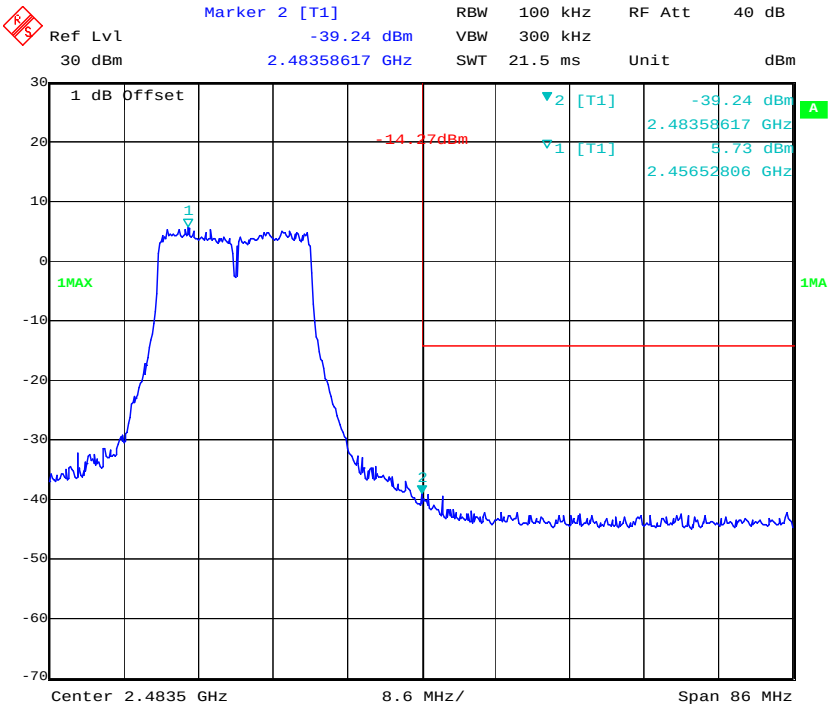
Date: 1.JUL.2017 12:44:25

Chain 1, 802.11n ht20 Band Edge, Left Side



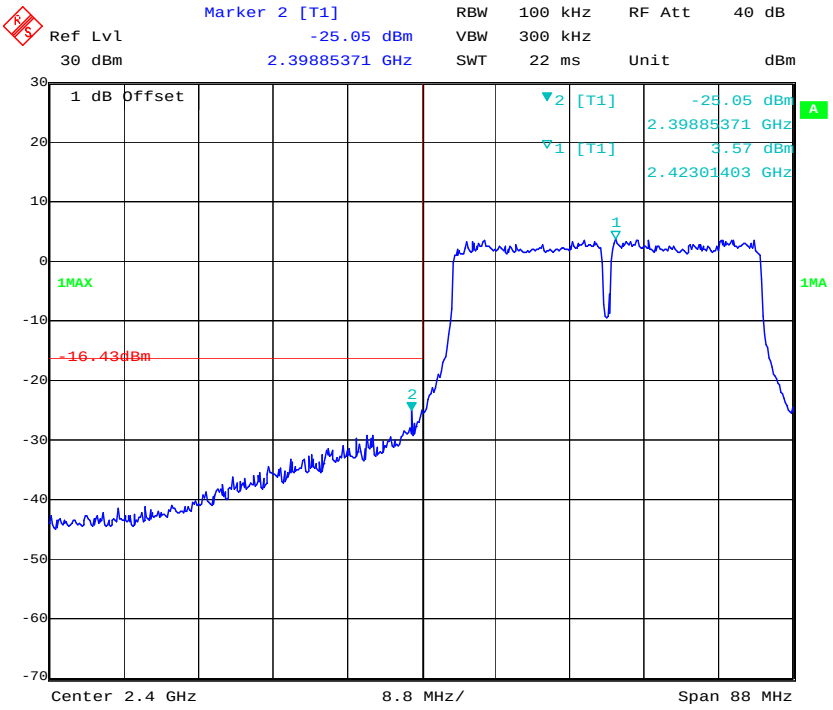
Date: 1.JUL.2017 12:26:32

Chain 1, 802.11n ht20 Band Edge, Right Side



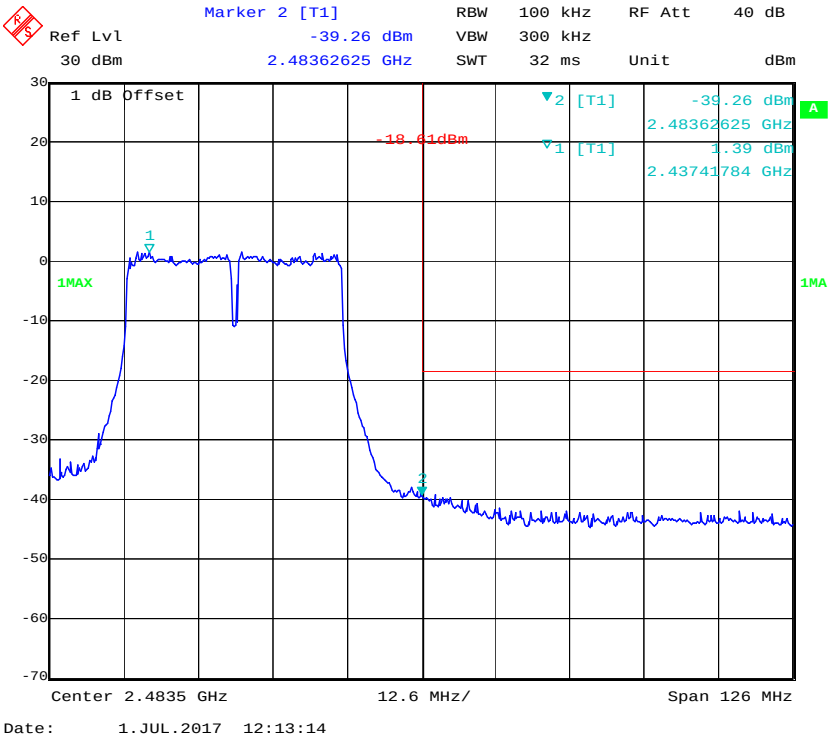
Date: 1.JUL.2017 12:35:33

Chain 1, 802.11n ht40 Band Edge, Left Side



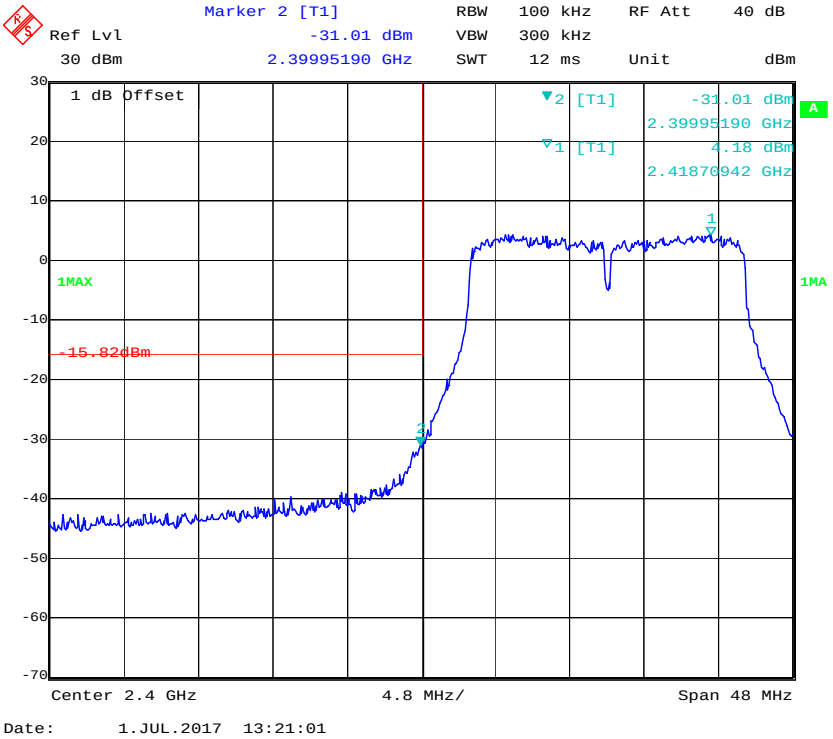
Date: 1.JUL.2017 12:20:20

Chain 1, 802.11n ht40 Band Edge, Right Side

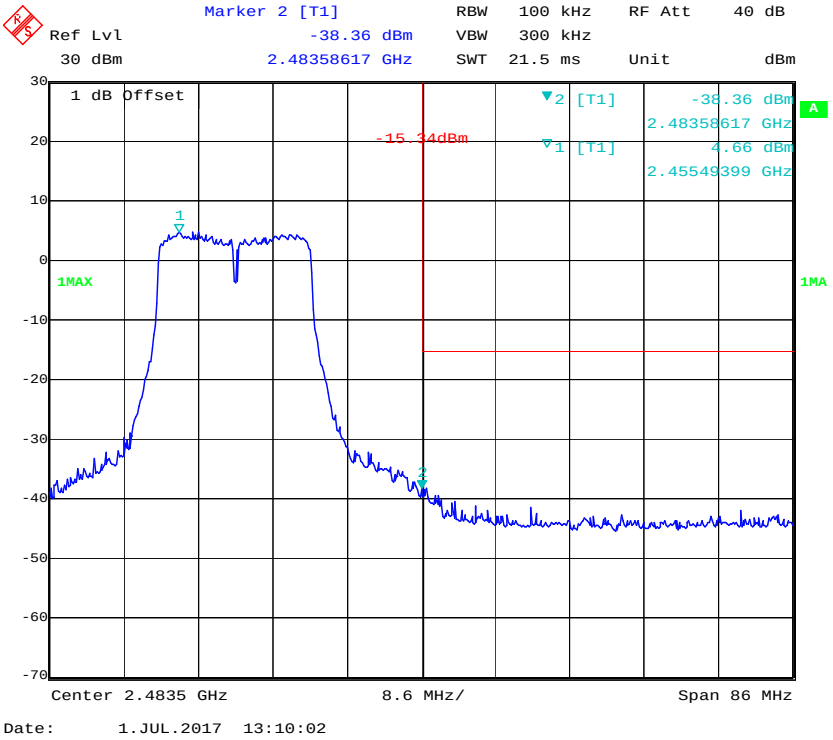


MIMO:

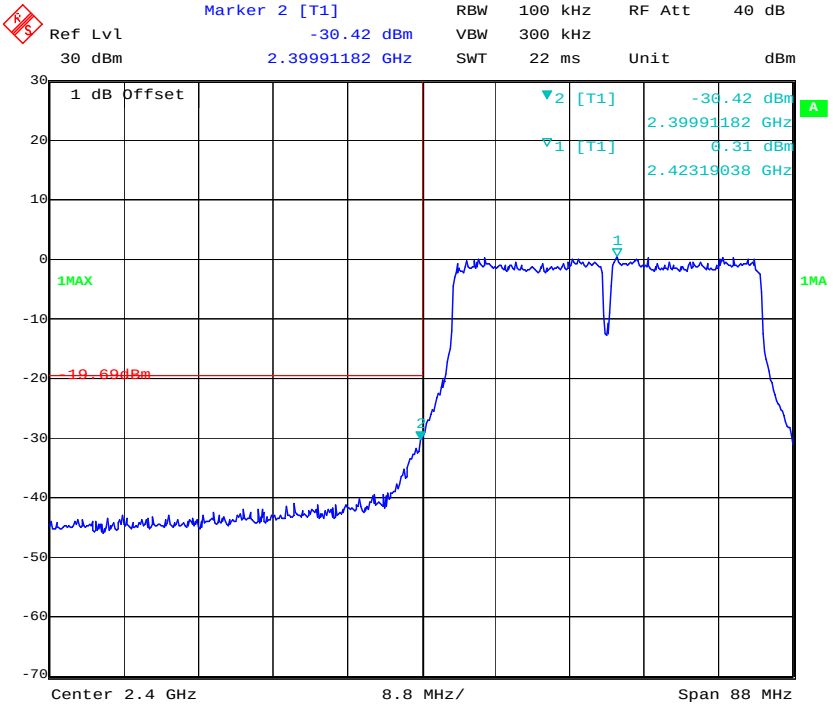
Chain 0, 802.11n ht20 Band Edge, Left Side



Chain 0, 802.11n ht20 Band Edge, Right Side

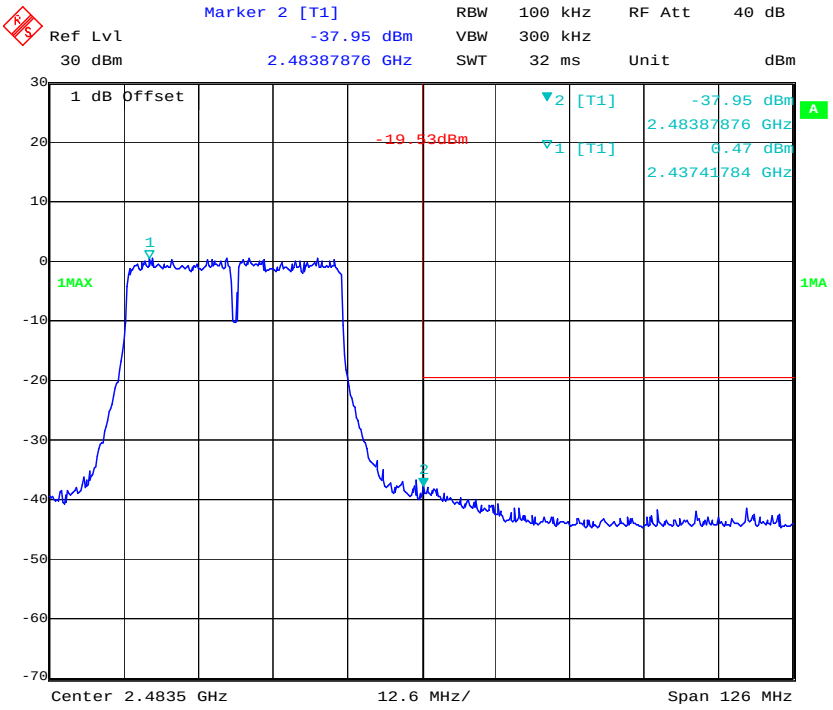


Chain 0, 802.11n ht40 Band Edge, Left Side



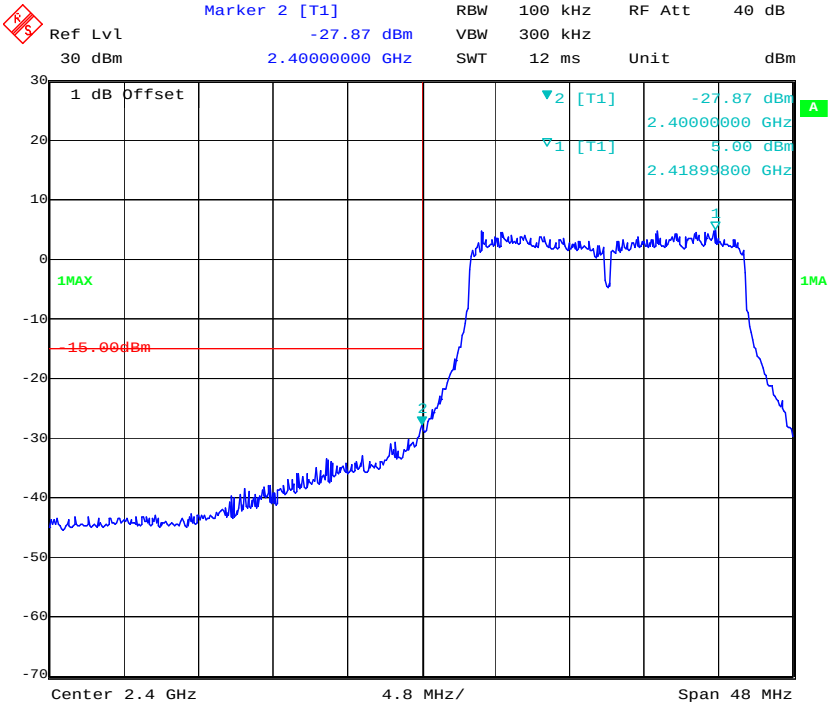
Date: 1.JUL.2017 13:24:29

Chain 0, 802.11n ht40 Band Edge, Right Side



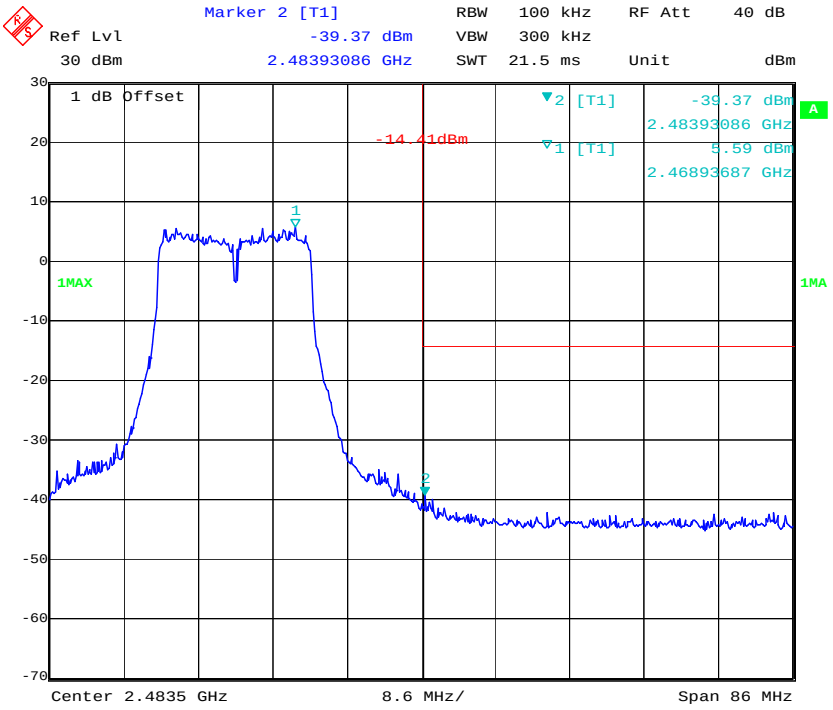
Date: 1.JUL.2017 13:38:10

Chain 1, 802.11n ht20 Band Edge, Left Side



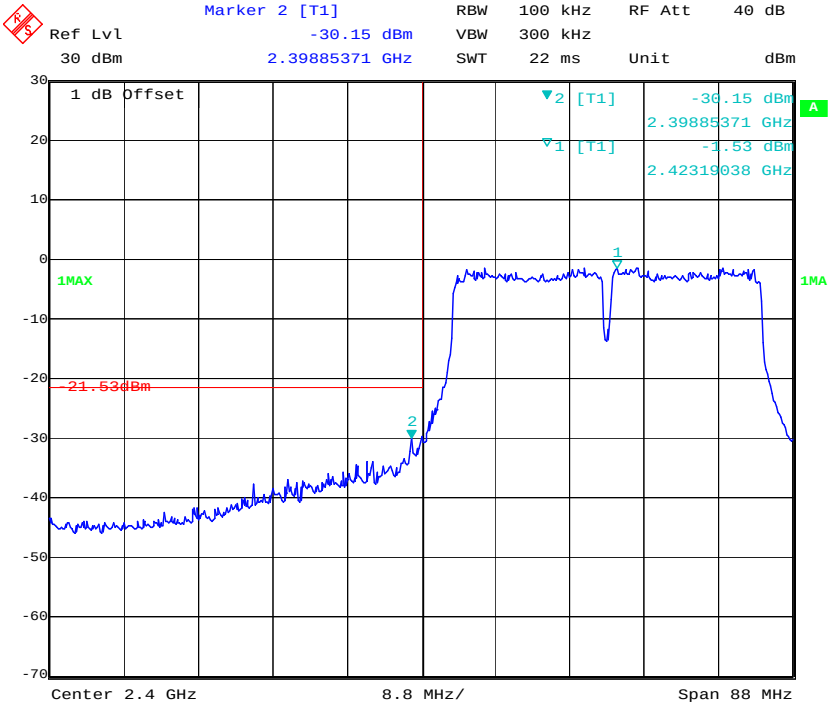
Date: 1.JUL.2017 13:18:20

Chain 1, 802.11n ht20 Band Edge, Right Side



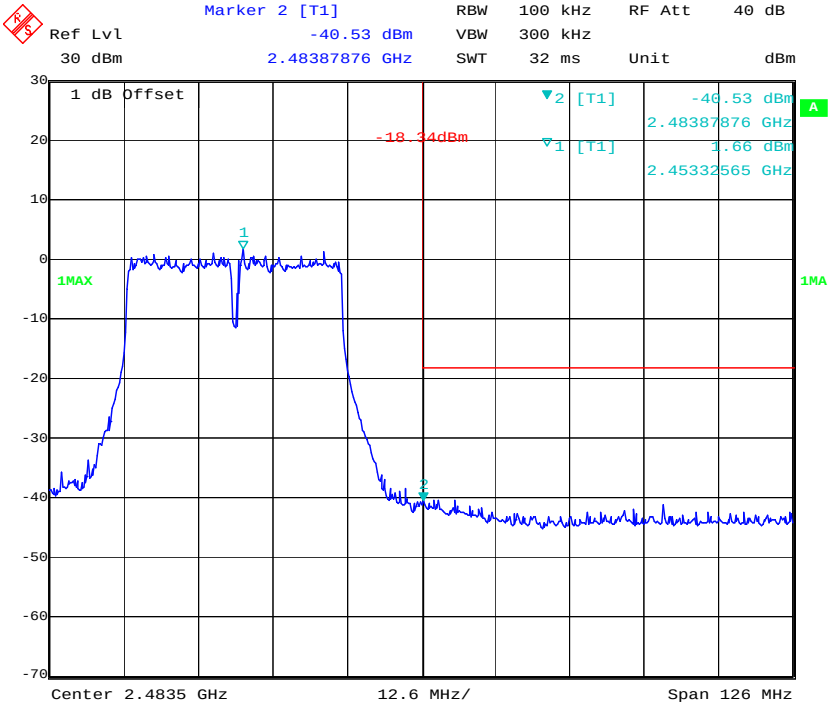
Date: 1.JUL.2017 13:07:10

Chain 1, 802.11n ht40 Band Edge, Left Side



Date: 1.JUL.2017 13:28:08

Chain 1, 802.11n ht40 Band Edge, Right Side



Date: 1.JUL.2017 13:41:30

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

a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set the VBW ≥ 3×RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
Unknown	RF Cable	Unknown	C-2	Each Time	/

*** Statement of Traceability:** BACL(Chengdu) attests that all of the calibrations on the equipment items listed above were traceable to NIM or to another internationally recognized National Metrology Institute (NMI), and were compliant with the NIST HB 150-2016 Normative Annex B “Implementation of traceability policy in accredited laboratories”.

Test Data

Environmental Conditions

Temperature:	28.7~32.8 °C
Relative Humidity:	37.1~51.4 %
ATM Pressure:	94.8~100.1 kPa

** The testing was performed by Tom Tang from 2017-07-01 to 2017-08-23.*

Test Mode: Transmitting

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

SISO:

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)		Limit (dBm/3kHz)
			Chain 0	Chain 1	
802.11b	Low	2412	-11.87	-4.5	≤8
	Middle	2437	-10.67	-4.25	≤8
	High	2462	-11.03	-4.37	≤8
802.11g	Low	2412	-7.46	-7.44	≤8
	Middle	2437	-7.26	-7.23	≤8
	High	2462	-10.11	-9	≤8
802.11n ht20	Low	2412	-6.44	-5.91	≤8
	Middle	2437	-6.64	-6.26	≤8
	High	2462	-9.12	-8.41	≤8
802.11n ht40	Low	2422	-10.02	-8.3	≤8
	Middle	2437	-8.37	-8.15	≤8
	High	2452	-13.1	-10.75	≤8

MIMO:

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)		Total (dBm/3kHz)	Limit (dBm/3kHz)
			Chain 0	Chain 1		
802.11n ht20	Low	2412	-9.34	-9.48	-6.4	≤8
	Middle	2437	-8.59	-9.13	-5.84	≤8
	High	2462	-8.85	-8.7	-5.76	≤8
802.11n ht40	Low	2422	-12.18	-13.29	-9.69	≤8
	Middle	2437	-11.9	-13.18	-9.48	≤8
	High	2452	-11.76	-13.54	-9.55	≤8

Note: the device is a master device. the 2 antenna maximum atenna gain are 3.0dBi, and employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

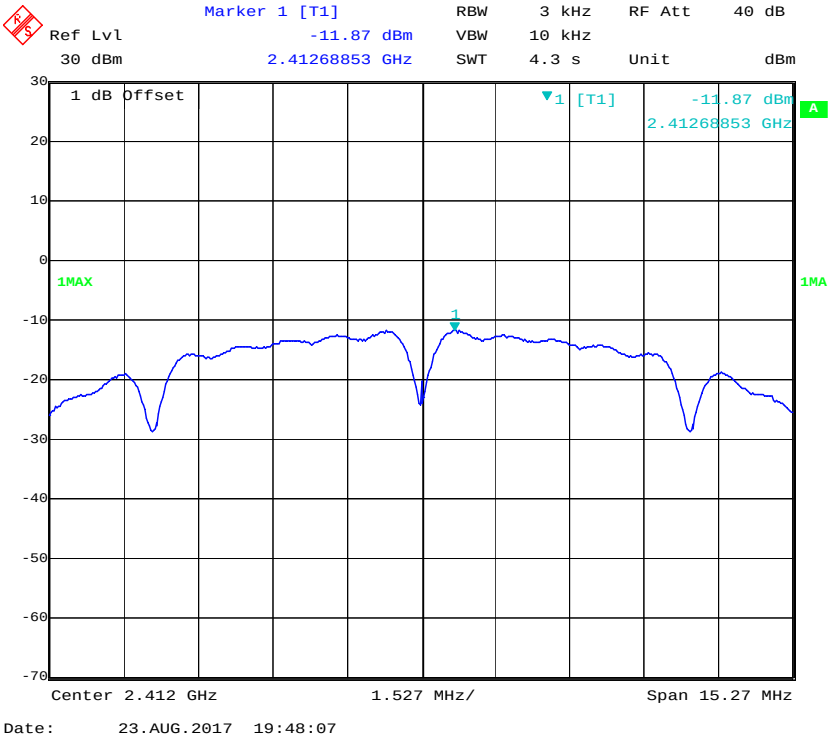
Array Gain = 10 log(NANT/NSS) dB.

So:

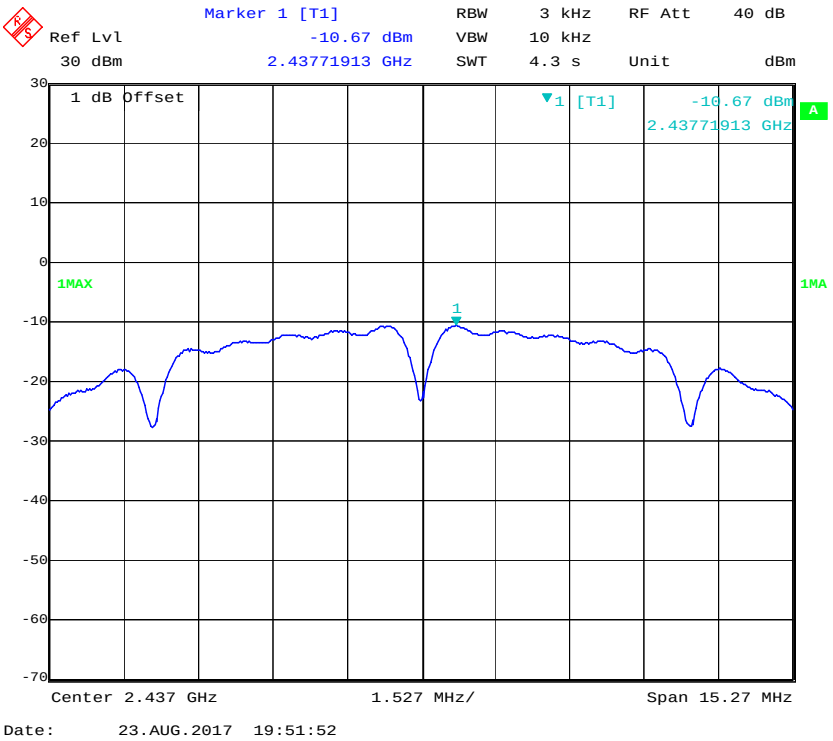
Directional gain = GANT + Array Gain = 3+10*log(2) =6 dBi

SISO:

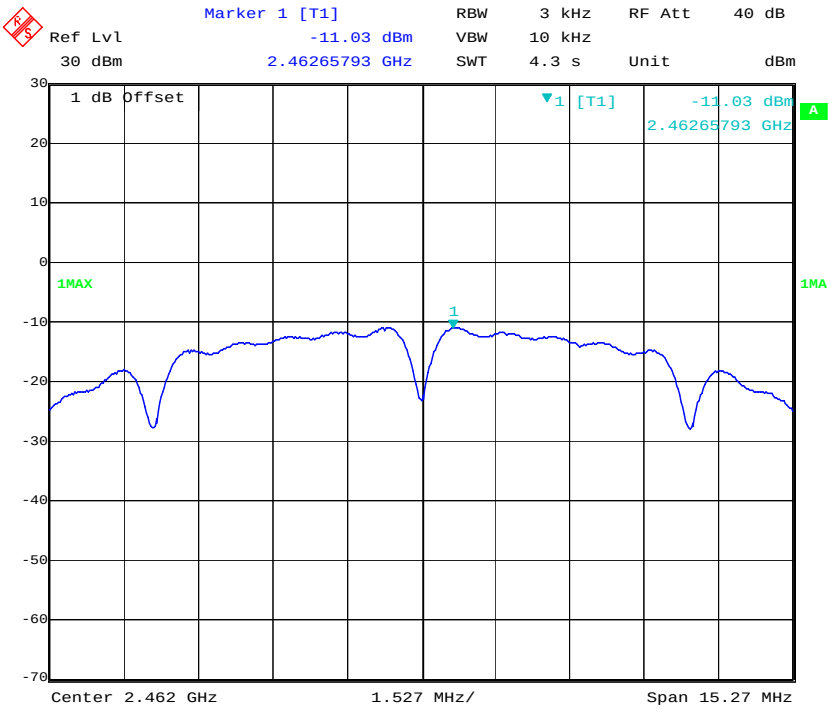
Chain0, Power Spectral Density, 802.11b Low Channel



Chain0, Power Spectral Density, 802.11b Middle Channel

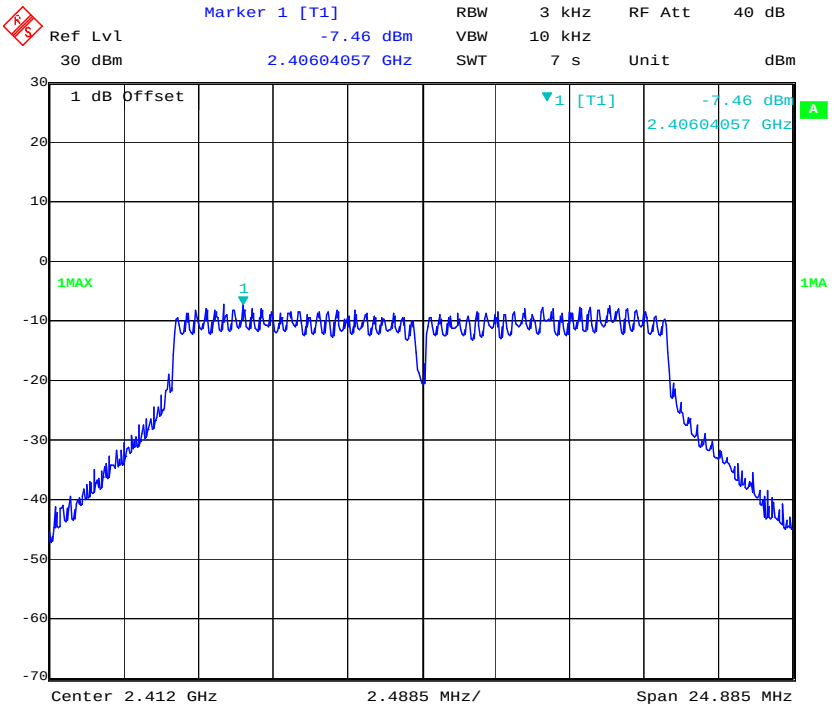


Chain0, Power Spectral Density, 802.11b High Channel



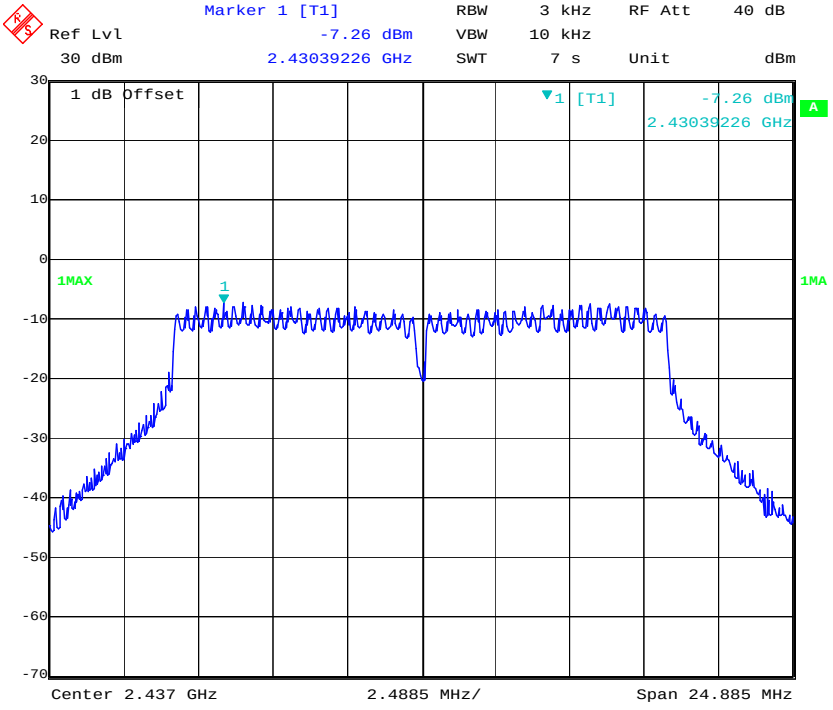
Date: 23.AUG.2017 19:56:15

Chain0, Power Spectral Density, 802.11g Low Channel



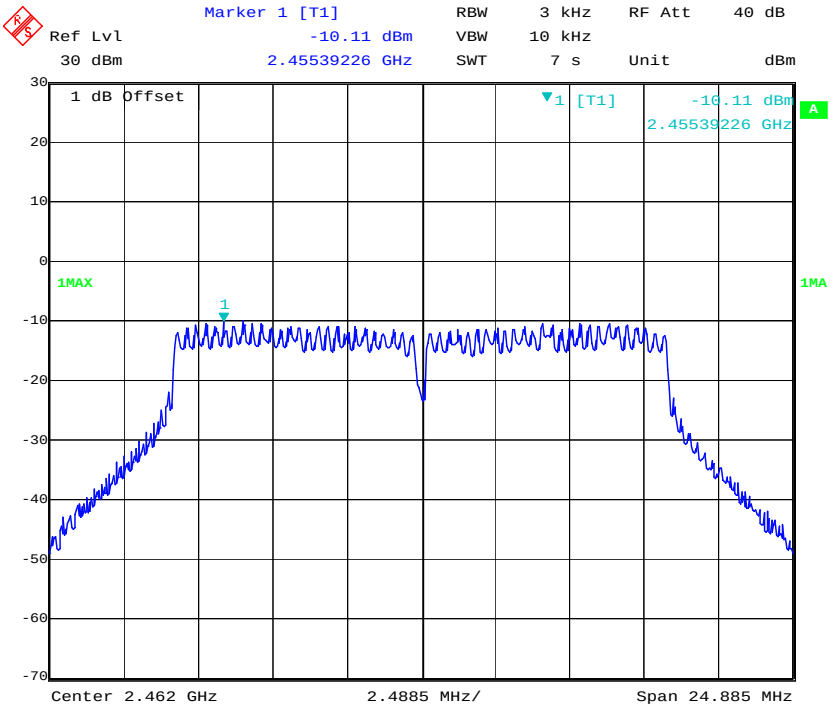
Date: 1.JUL.2017 11:42:27

Chain0, Power Spectral Density, 802.11g Middle Channel



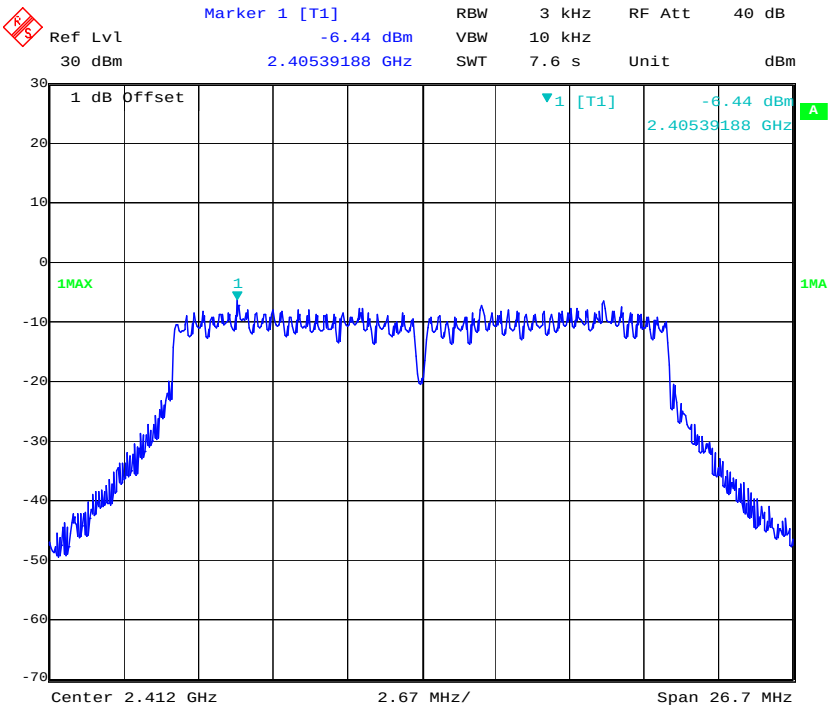
Date: 1.JUL.2017 11:37:52

Chain0, Power Spectral Density, 802.11g High Channel

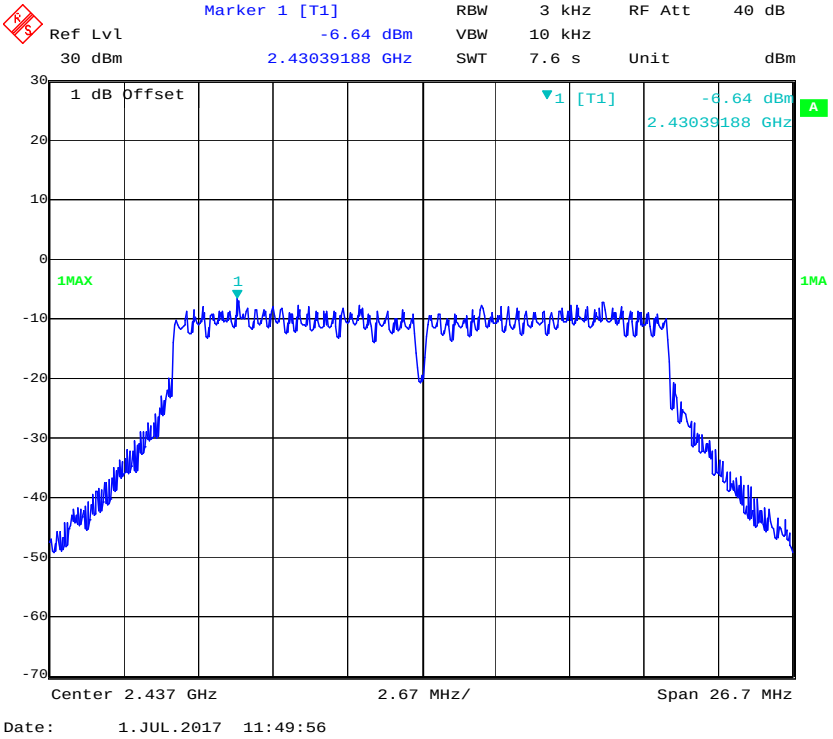


Date: 1.JUL.2017 11:33:47

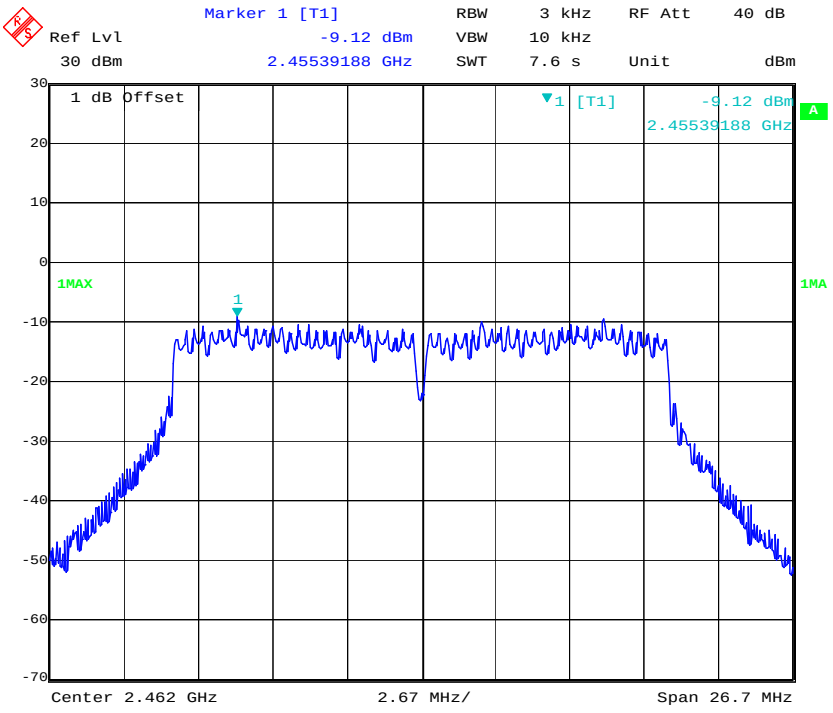
Chain0, Power Spectral Density, 802.11n ht20 Low Channel



Chain0, Power Spectral Density, 802.11n ht20 Middle Channel

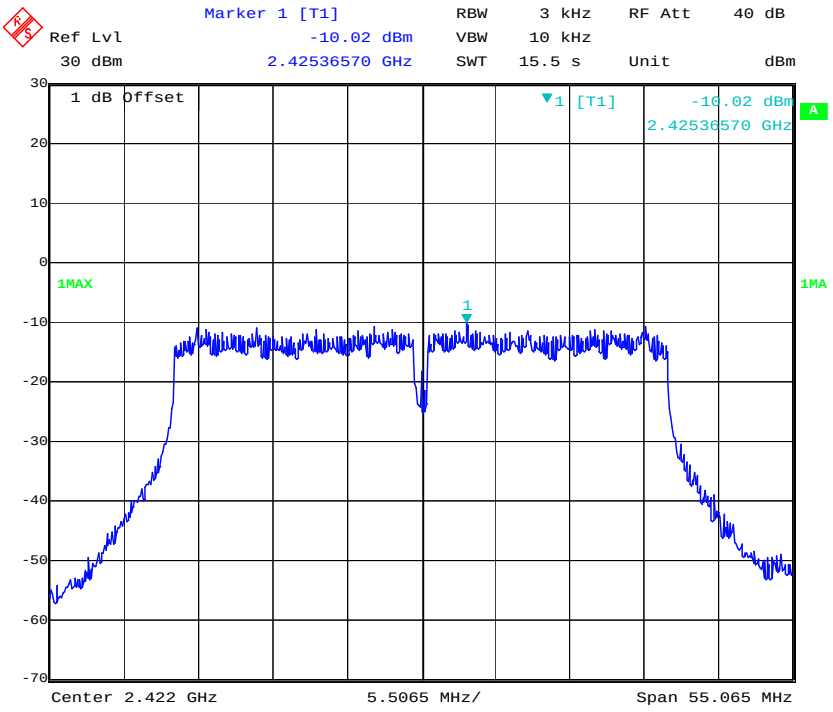


Chain0, Power Spectral Density, 802.11n ht20 High Channel



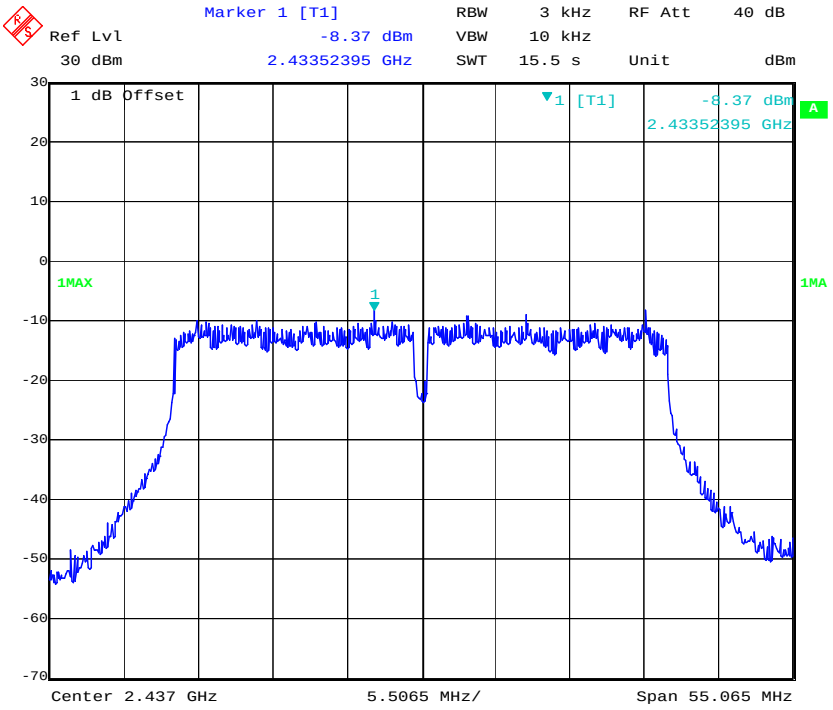
Date: 1.JUL.2017 11:54:54

Chain0, Power Spectral Density, 802.11n ht40 Low Channel



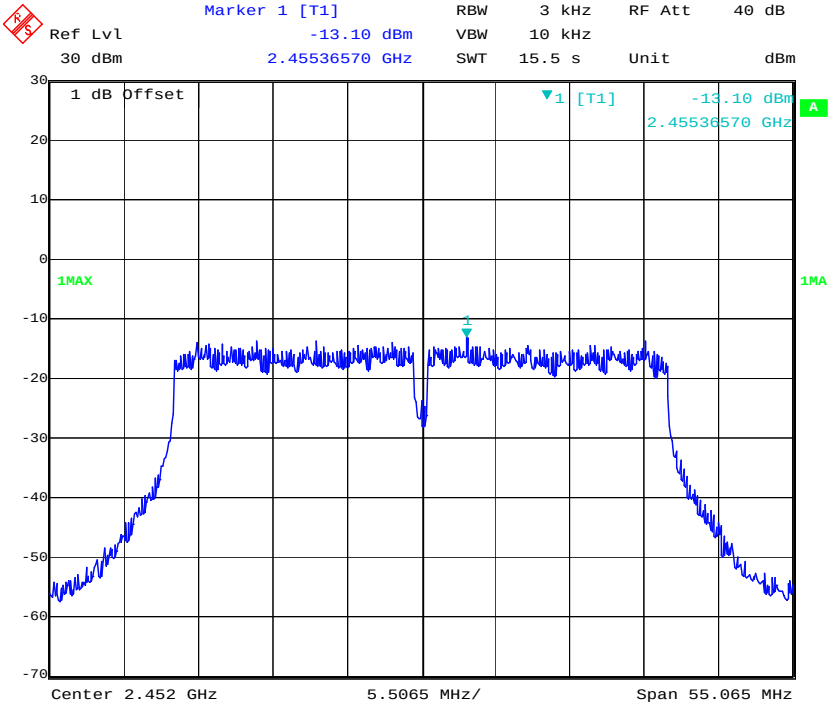
Date: 1.JUL.2017 11:57:58

Chain0, Power Spectral Density, 802.11n ht40 Middle Channel



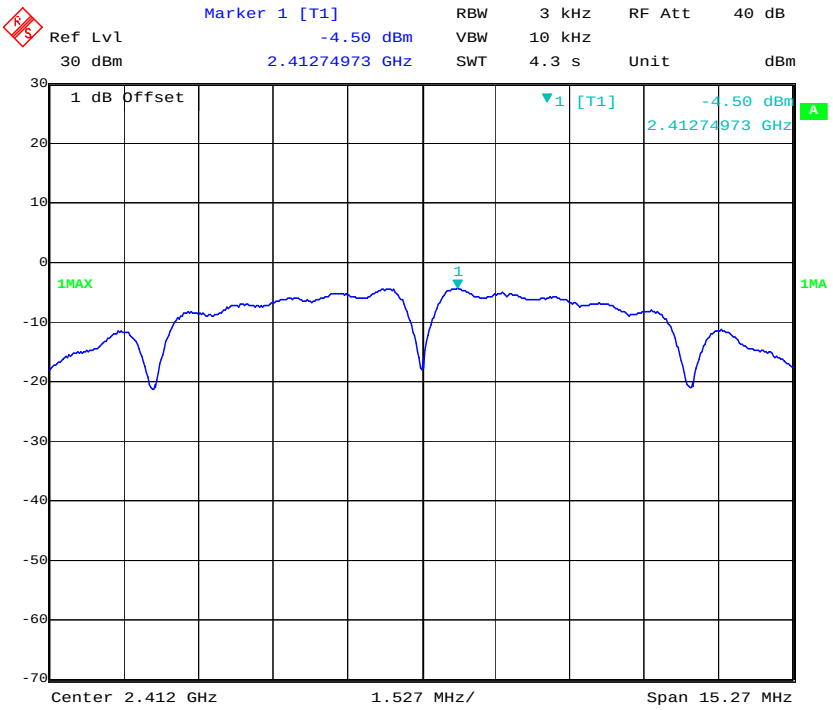
Date: 1.JUL.2017 12:02:39

Chain0, Power Spectral Density, 802.11n ht40 High Channel



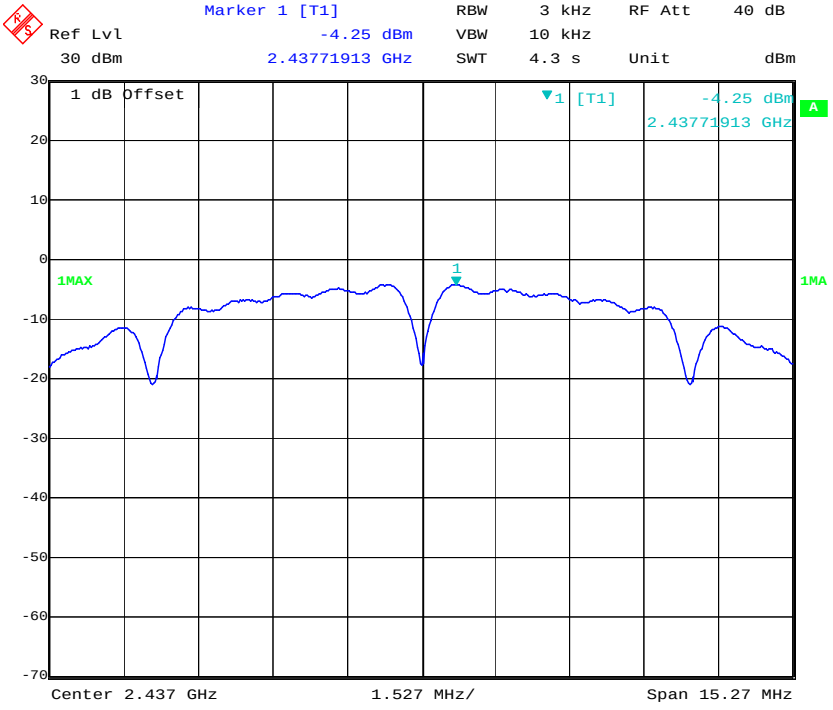
Date: 1.JUL.2017 12:05:05

Chain1, Power Spectral Density, 802.11b Low Channel



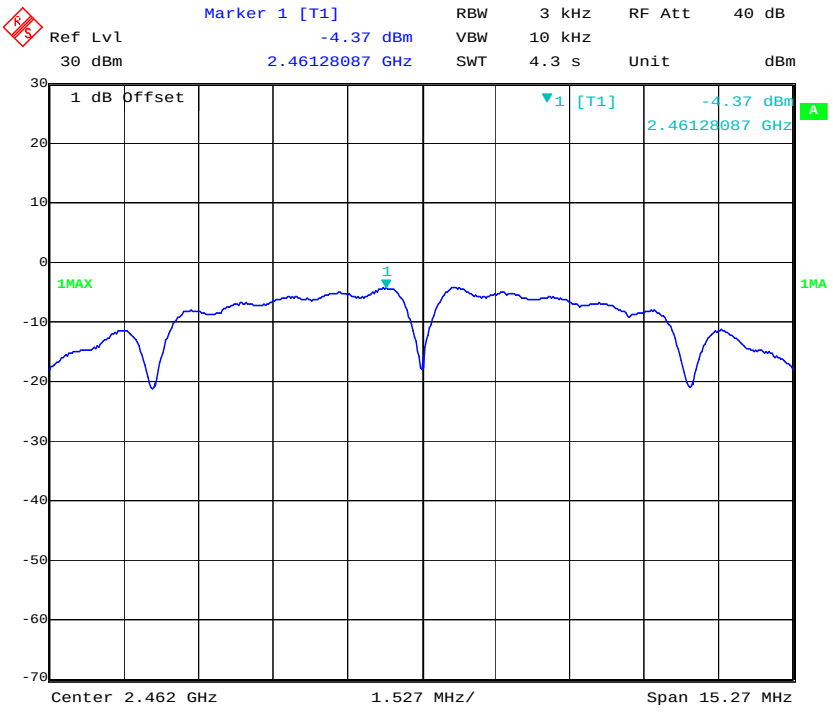
Date: 1.JUL.2017 12:54:17

Chain1, Power Spectral Density, 802.11b Middle Channel



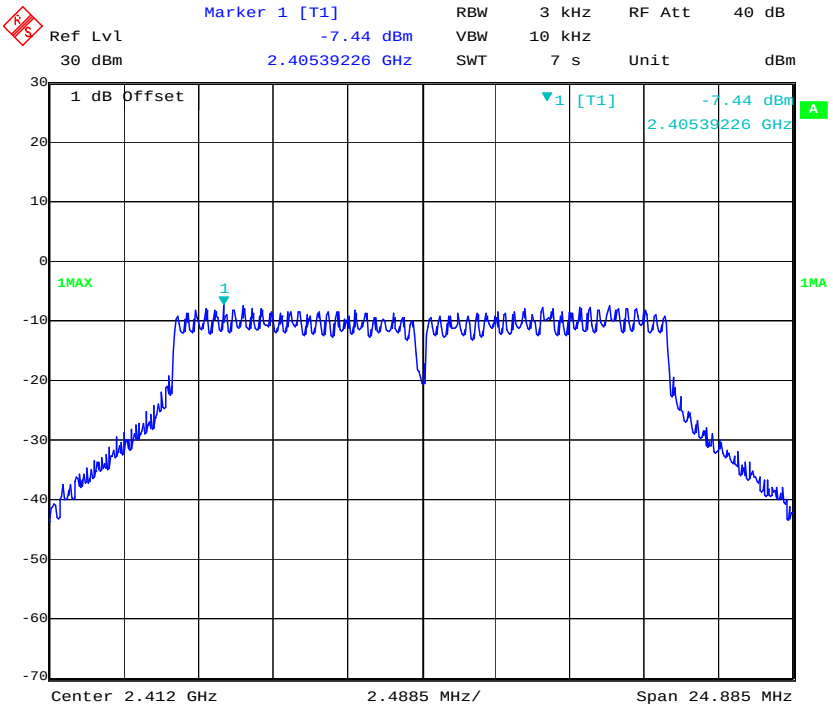
Date: 1.JUL.2017 12:56:41

Chain1, Power Spectral Density, 802.11b High Channel



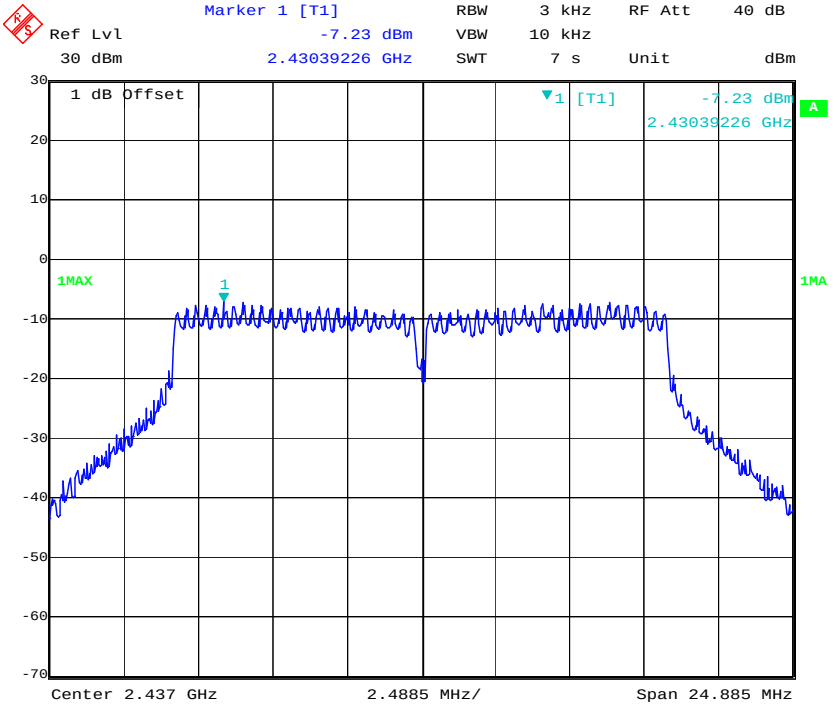
Date: 1.JUL.2017 12:58:42

Chain1, Power Spectral Density, 802.11g Low Channel



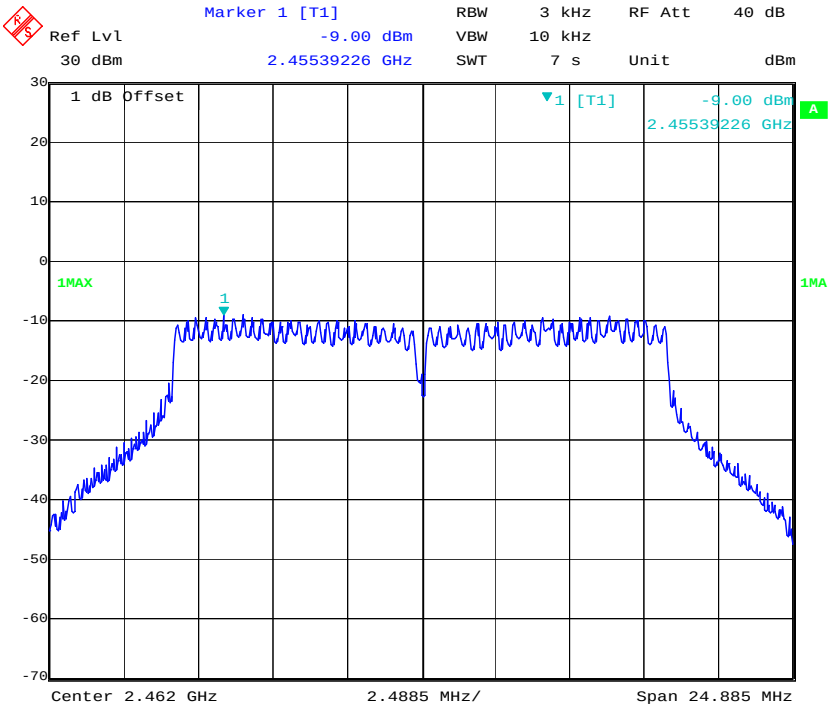
Date: 1.JUL.2017 12:49:11

Chain1, Power Spectral Density, 802.11g Middle Channel



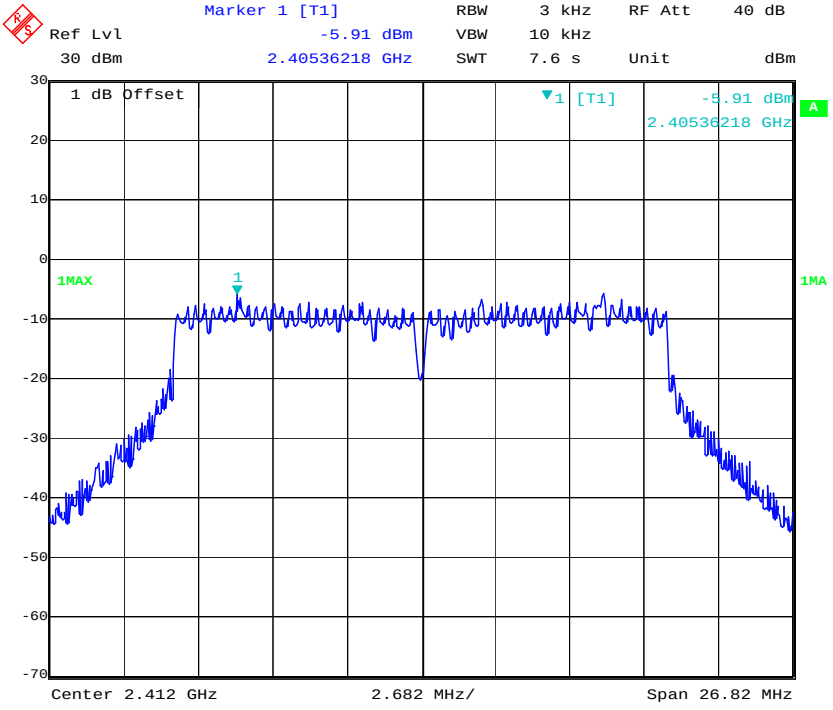
Date: 1.JUL.2017 12:46:48

Chain1, Power Spectral Density, 802.11g High Channel



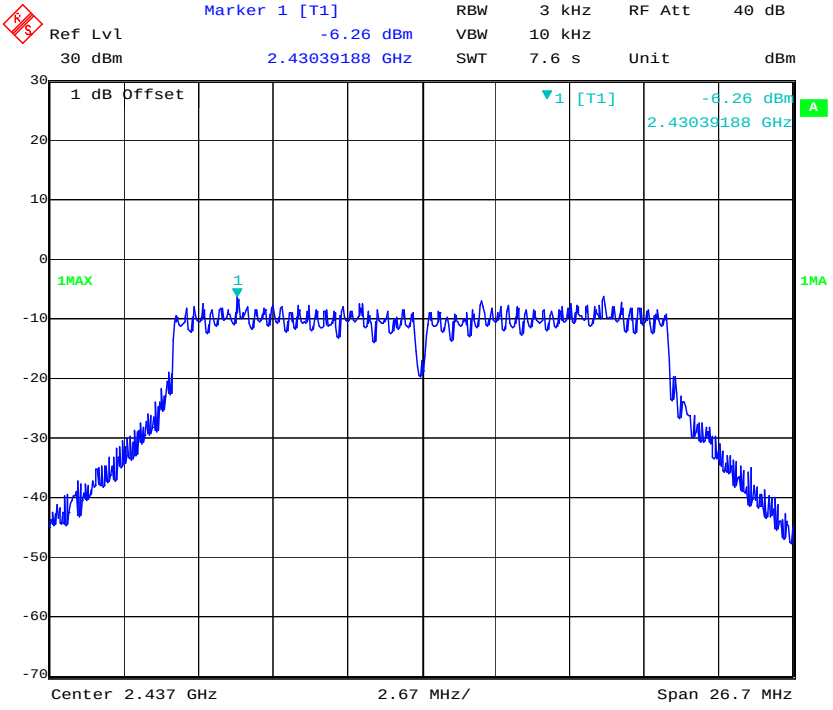
Date: 1.JUL.2017 12:43:50

Chain1, Power Spectral Density, 802.11n ht20 Low Channel



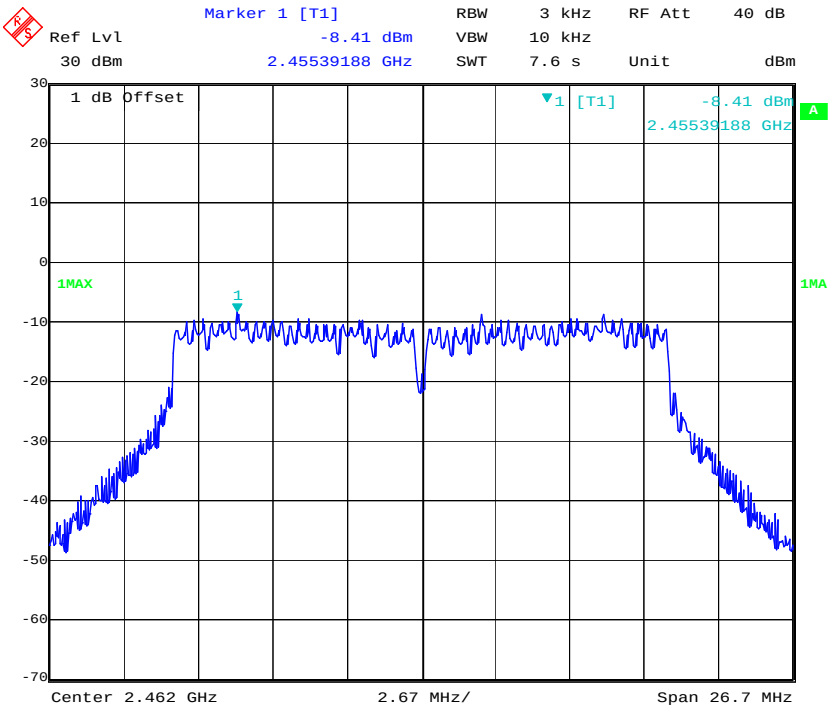
Date: 1.JUL.2017 12:26:11

Chain1, Power Spectral Density, 802.11n ht20 Middle Channel



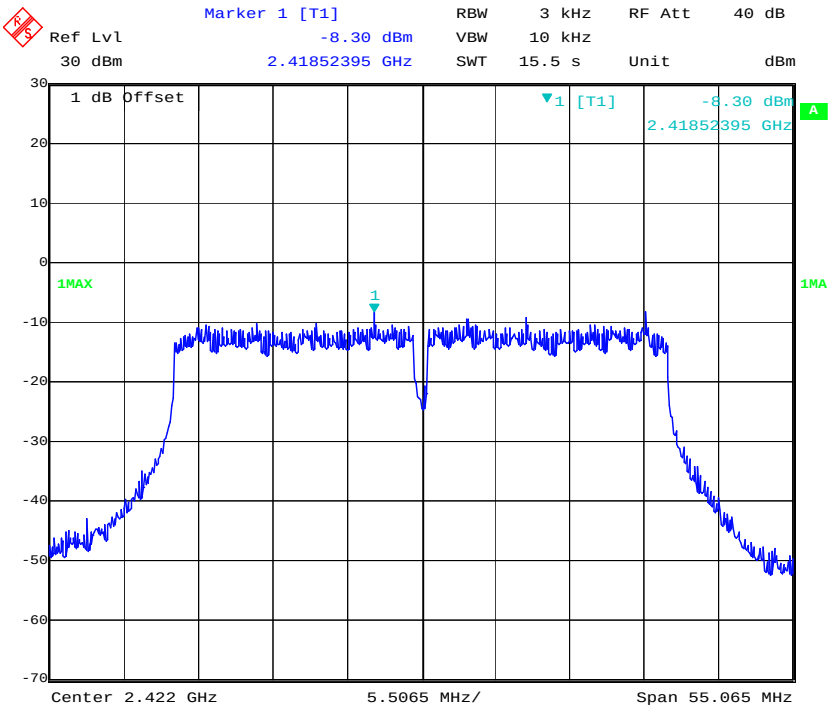
Date: 1.JUL.2017 12:31:57

Chain1, Power Spectral Density, 802.11n ht20 High Channel



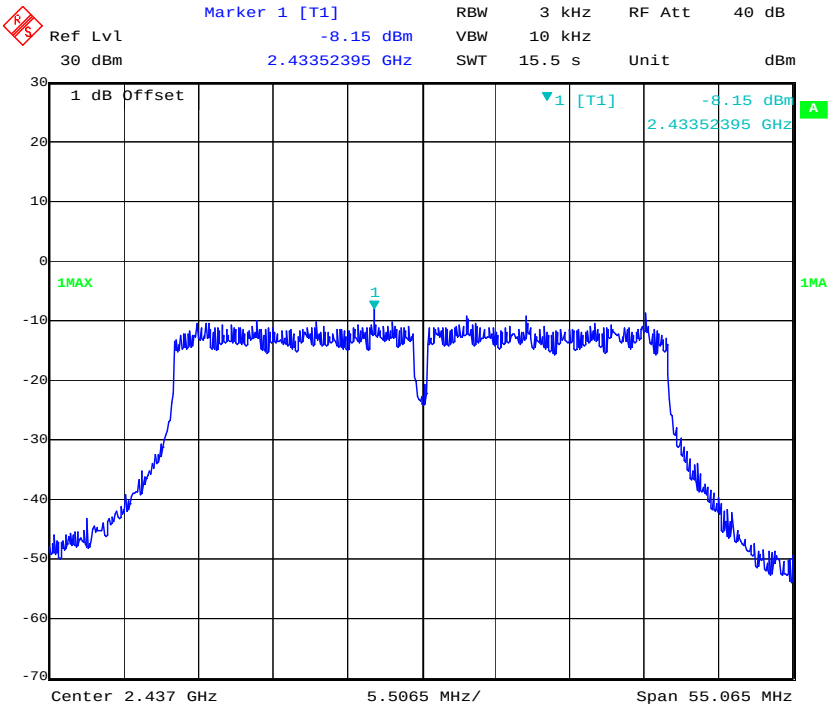
Date: 1.JUL.2017 12:35:05

Chain1, Power Spectral Density, 802.11n ht40 Low Channel



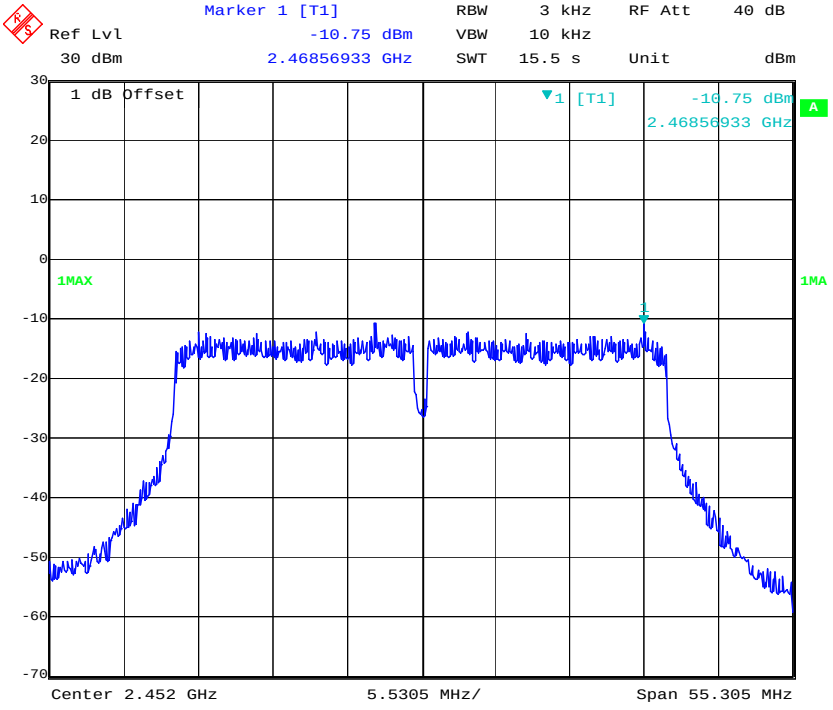
Date: 1.JUL.2017 12:19:52

Chain1, Power Spectral Density, 802.11n ht40 Middle Channel



Date: 1.JUL.2017 12:23:30

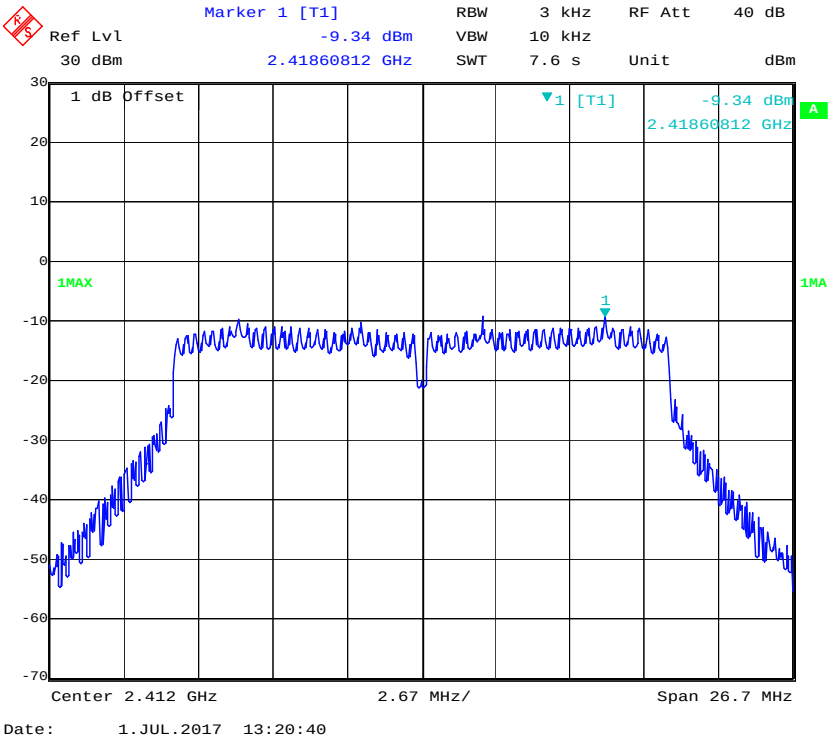
Chain1, Power Spectral Density, 802.11n ht40 High Channel



Date: 1.JUL.2017 12:12:37

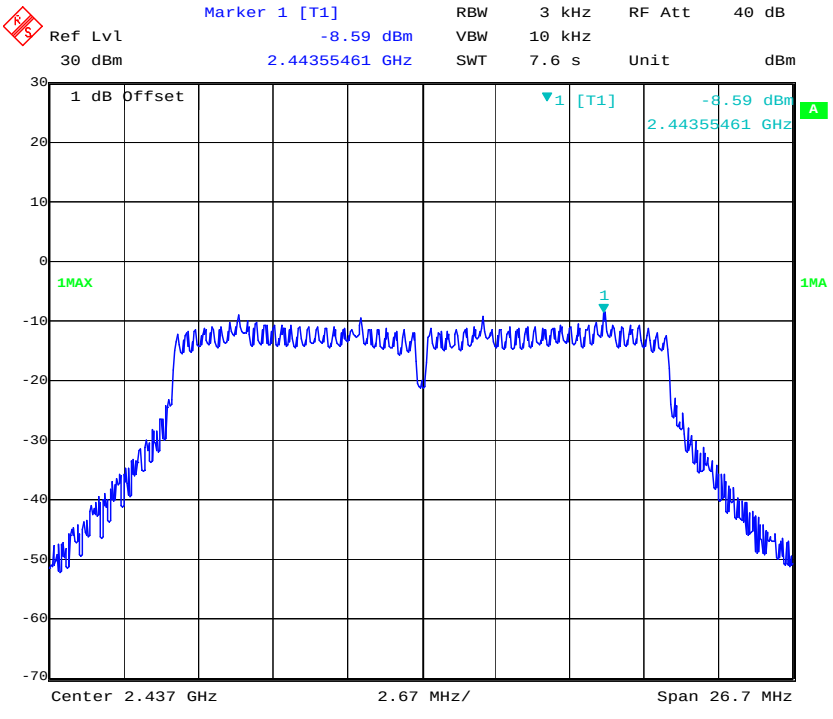
MIMO:

Chain0, Power Spectral Density, 802.11n ht20 Low Channel



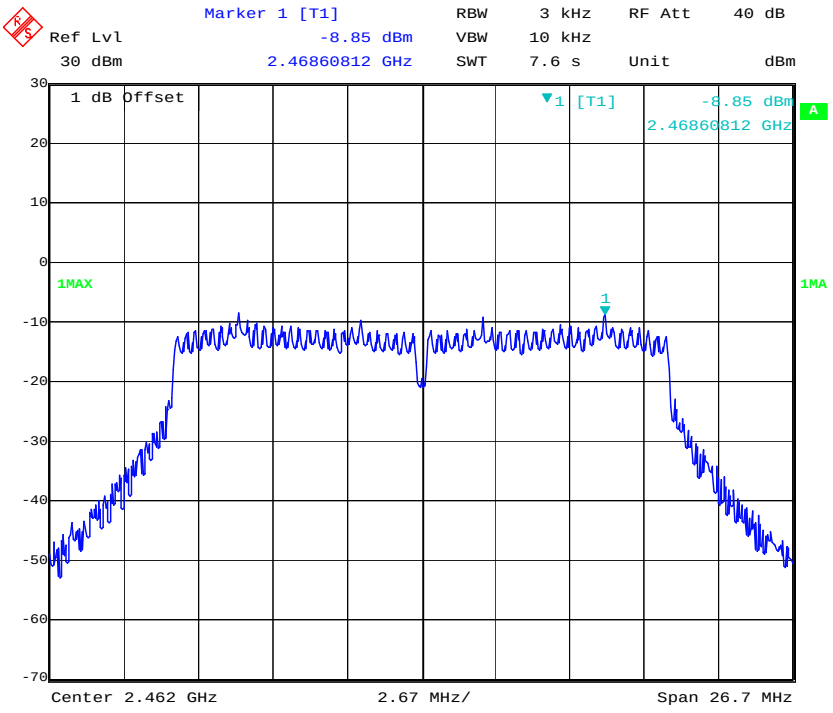
Date: 1.JUL.2017 13:20:40

Chain0, Power Spectral Density, 802.11n ht20 Middle Channel



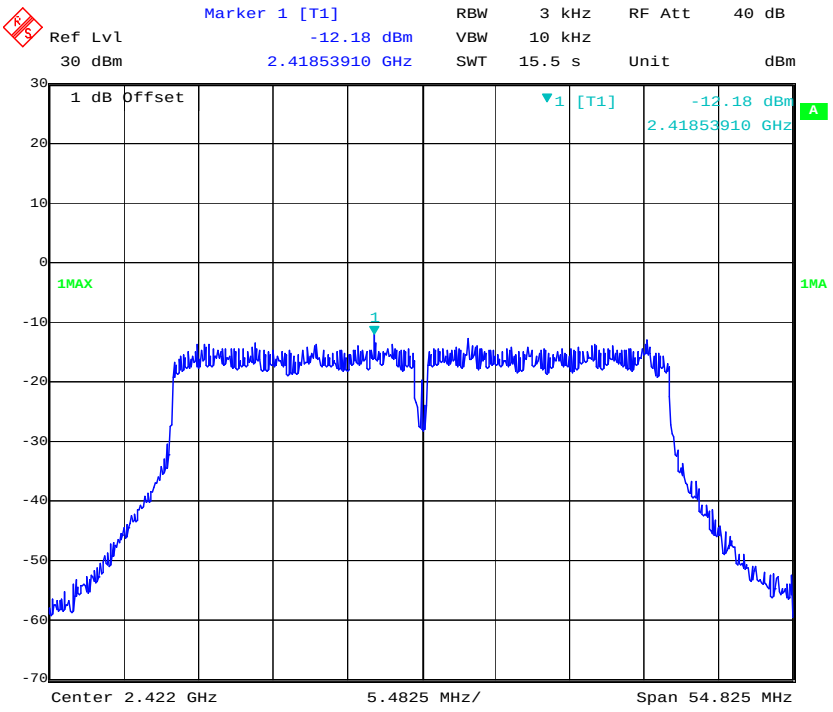
Date: 1.JUL.2017 13:12:16

Chain0, Power Spectral Density, 802.11n ht20 High Channel



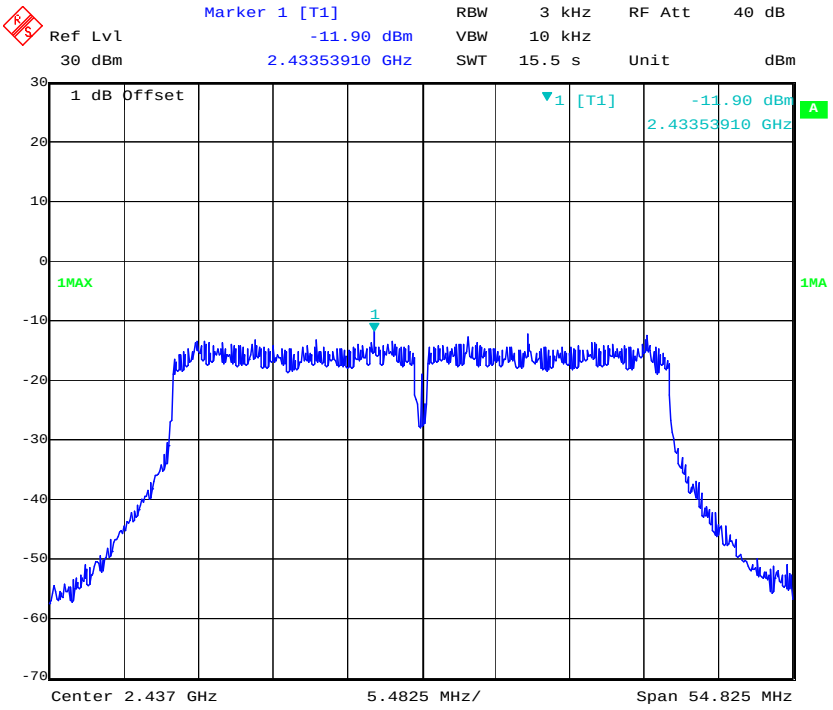
Date: 1.JUL.2017 13:09:40

Chain0, Power Spectral Density, 802.11n ht40 Low Channel



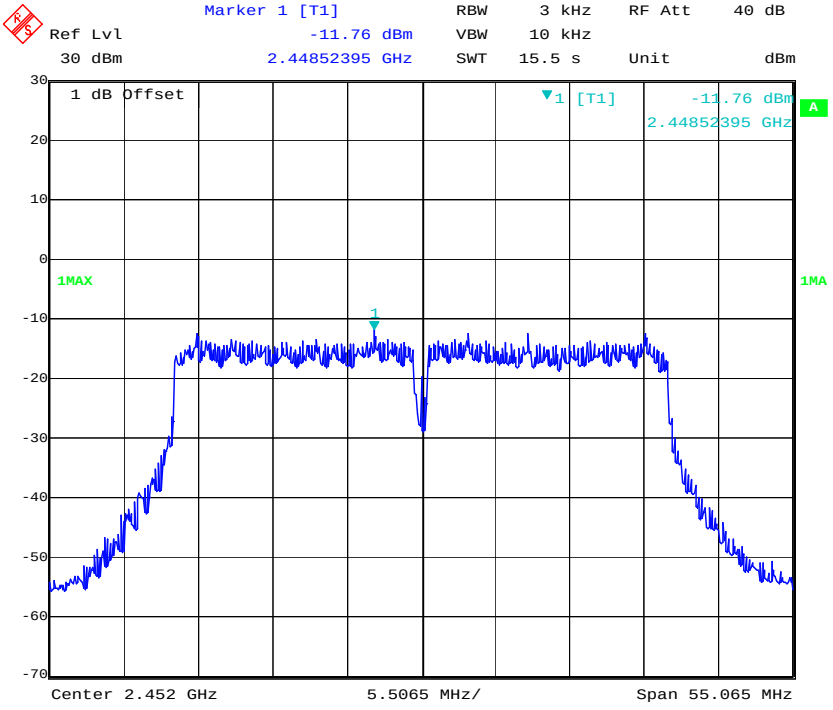
Date: 1.JUL.2017 13:24:08

Chain0, Power Spectral Density, 802.11n ht40 Middle Channel



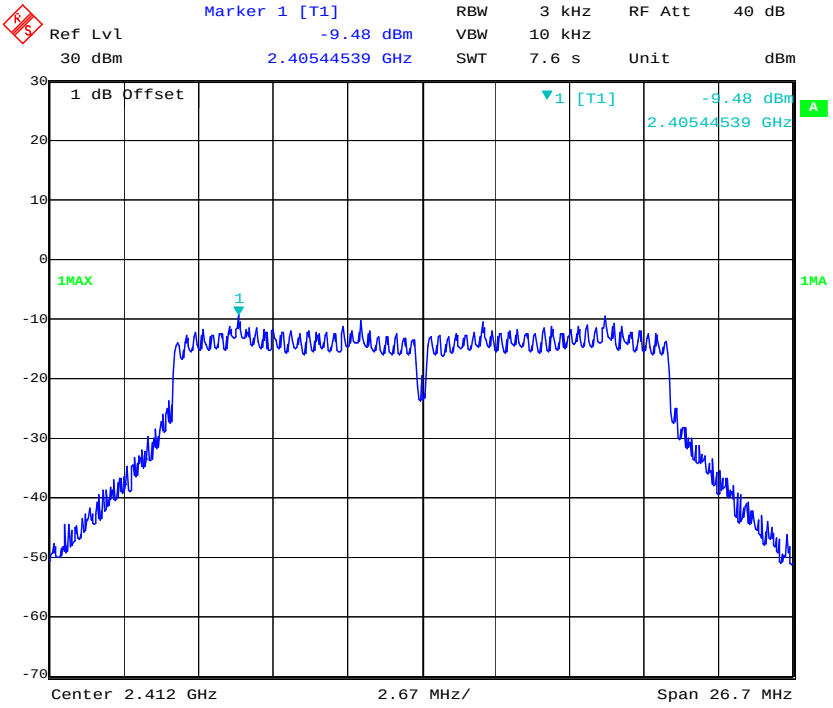
Date: 1.JUL.2017 13:34:15

Chain0, Power Spectral Density, 802.11n ht40 High Channel



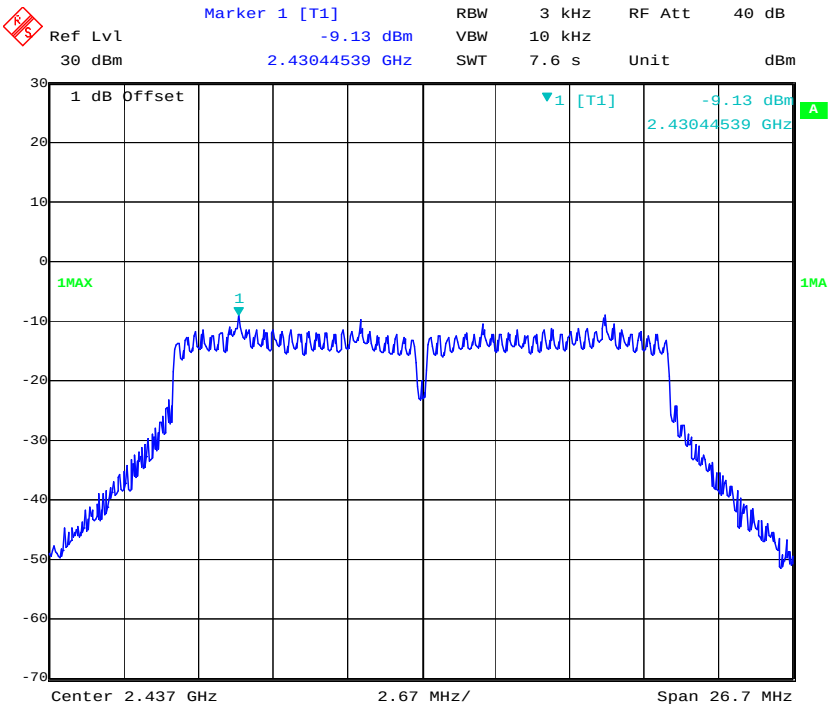
Date: 1.JUL.2017 13:37:43

Chain1, Power Spectral Density, 802.11n ht20 Low Channel



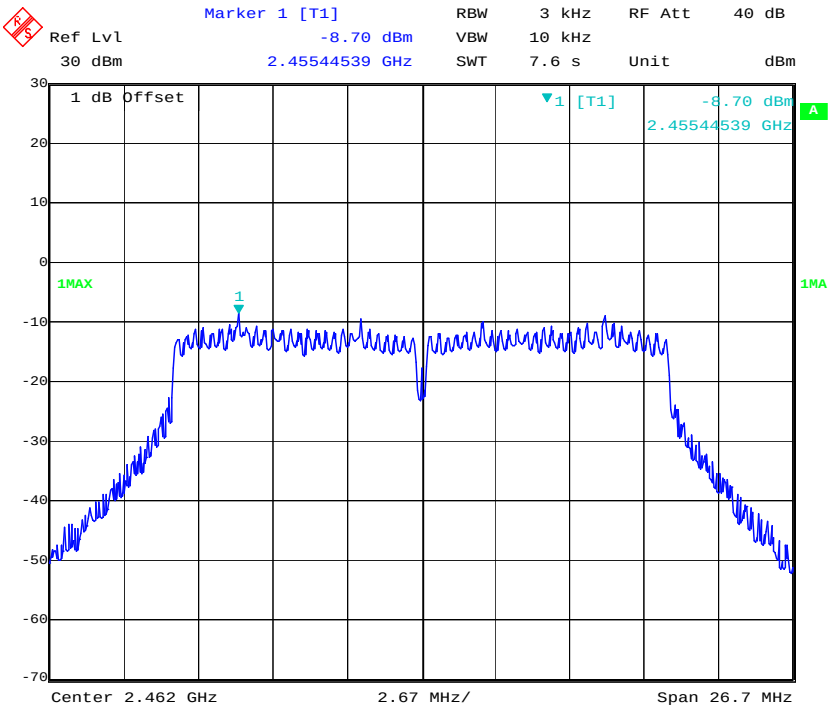
Date: 1.JUL.2017 13:17:46

Chain1, Power Spectral Density, 802.11n ht20 Middle Channel



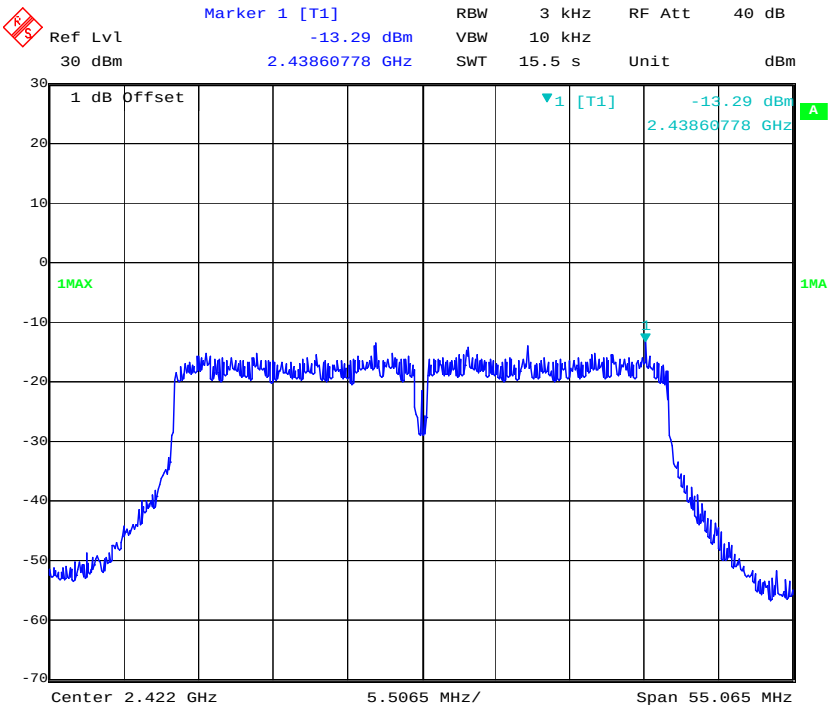
Date: 1.JUL.2017 13:15:16

Chain1, Power Spectral Density, 802.11n ht20 High Channel



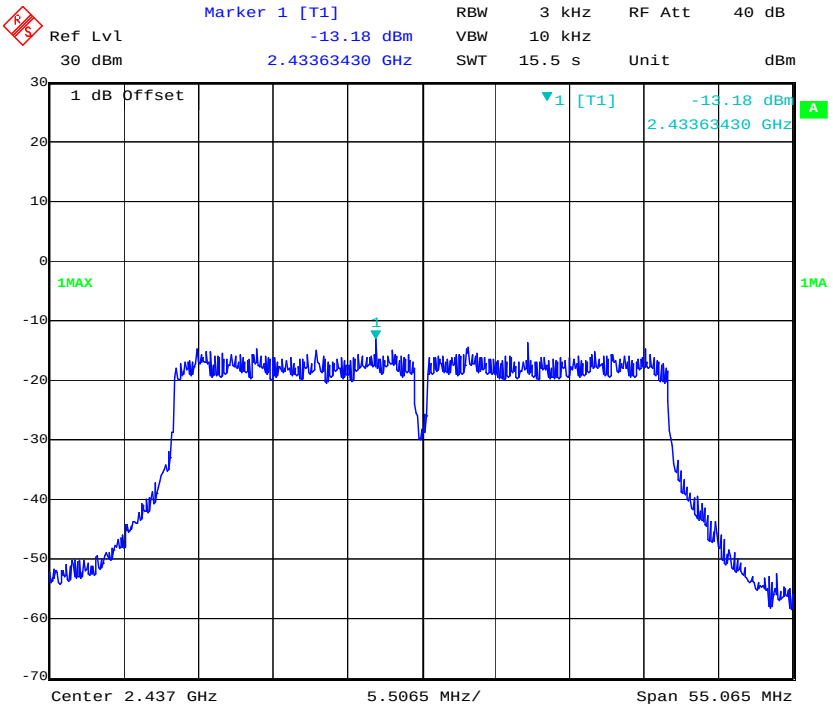
Date: 1.JUL.2017 13:06:43

Chain1, Power Spectral Density, 802.11n ht40 Low Channel



Date: 1.JUL.2017 13:27:40

Chain1, Power Spectral Density, 802.11n ht40 Middle Channel



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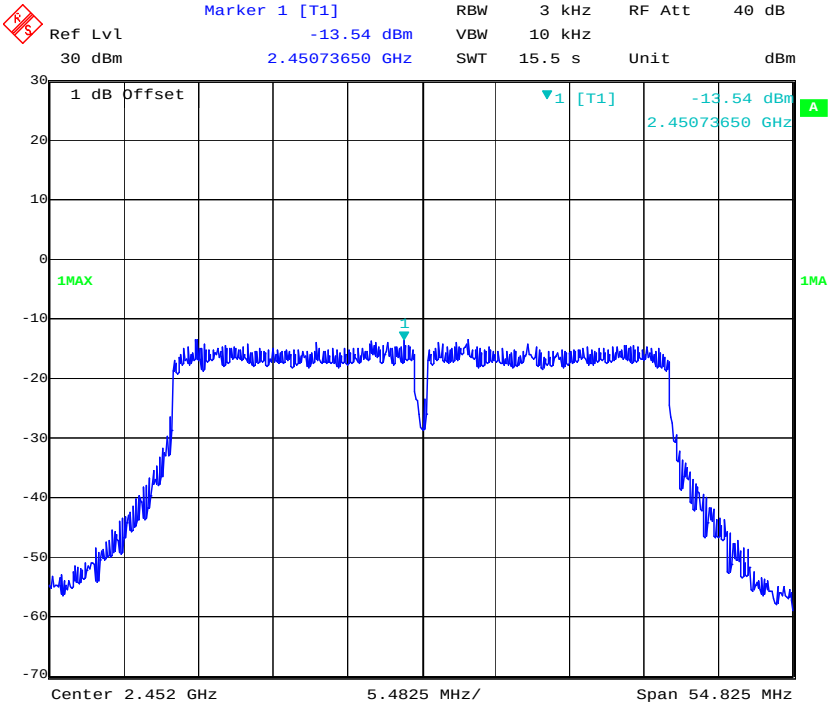
Chain1, Power Spectral Density, 802.11n ht40 High Channel



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