FCC PART 15.247
RSS-GEN, ISSUE 4, NOVEMBER 2014
RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

For

Huawei Technologies Co.,Ltd

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

Test Model: eA380-123
FCC ID: QISEA380-123
IC: 6369A-EA380123

Report Type:	**Product Name:**
Original Report	LTE CPE

Test Engineer:	Lorin Bian
Report Number:	RDG170511006B
Report Date:	2017-07-05
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 ***Huawei Technologies Co.,Ltd***'s product, model number: ***eA380-123 (FCC ID: QISEA380-123, IC: 6369A-EA380123)*** (the "EUT") in this report was a ***LTE CPE,*** which was measured approximately: 25.8 cm (L) x 22 cm (W) x 6.6 cm (H), rated input voltage: DC 54V from POE Port.

**All measurement and test data in this report was gathered from final production sample, serial number: 170511006 (assigned by the BACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-02-08, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of ***Huawei Technologies Co.,Ltd*** in accordance with Part 2, Subpart J, Part 15, Subparts A and C of the Federal Communications Commission's rules and RSS-247, ISSUE 2, February 2017, RSS-GeN ISSUE 4, November 2014 of the Innovation, Science and Economic Development Canada.

The tests were performed in order to determine the compliance of the EUT with FCC Rules Part 15-Subpart C, section 15.203, 15.205, 15.207, 15.209, 15.247 rules and RSS-247, ISSUE 2, February 2017, RSS-GeN ISSUE 4, November 2014 of the Innovation, Science and Economic Development Canada.

Related Submittal(s)/Grant(s)

FCC Part 15B JBP/Part 27 PCB submissions with FCC ID: QISEA380-123.
RSS-195/ RSS-199 submissions with IC: 6369A-EA380123.

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”, and RSS-247, ISSUE 2, February 2017, RSS-GEN ISSUE 4, November 2014 of the Innovation, Science and Economic Development Canada.

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 in the No.5040, Huilongwan Plaza, No.1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 24, 2015. 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.: 560332. 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

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

The device support 1TX and 2Tx at 802.11n modes, the 2TX mode was the worst and reported, and only 1TX at 802.11g and g mode, total 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.

EUT Exercise Software

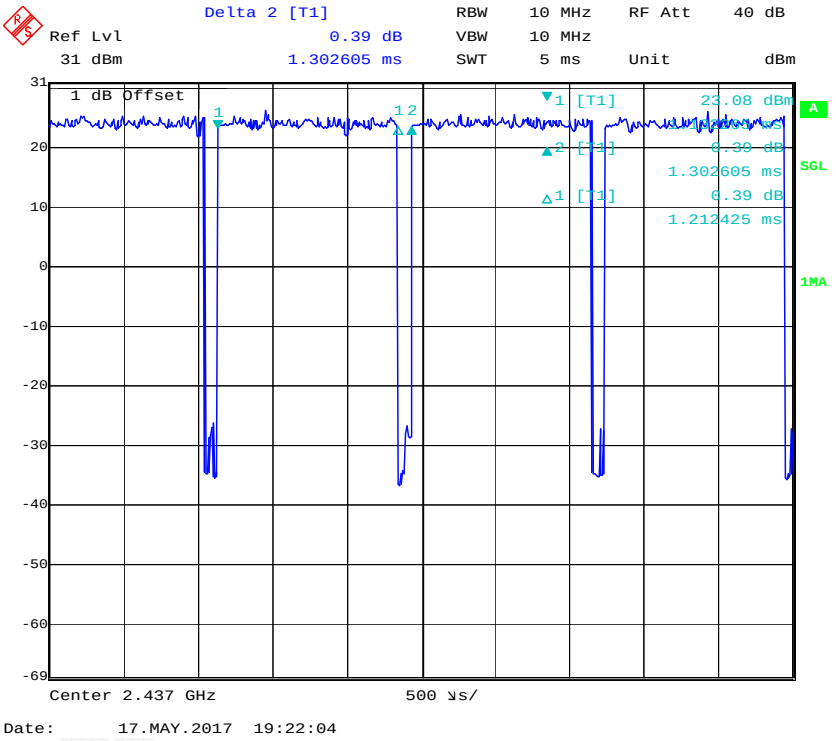
The software “IPOR” was used for testing, and the commands were provided by manufacturer. The maximum power and duty cycle was set by commands as following table:

Software and version			IPOP		
Mode	Channel	Frequency (MHz)	Data Rate	Power Level	
				Chain 0	Chain 1
802.11 b	Low	2412	1Mbps	16	16
	Middle	2437	1Mbps	16	16
	High	2462	1Mbps	16	16
802.11 g	Low	2412	6Mbps	16	16
	Middle	2437	6Mbps	16	16
	High	2462	6Mbps	16	16
802.11 n20	Low	2412	MCS8	62	62
	Middle	2437	MCS8	62	62
	High	2462	MCS8	62	62
802.11 n40	Low	2422	MCS8	62	62
	Middle	2437	MCS8	62	62
	High	2452	MCS8	56	56

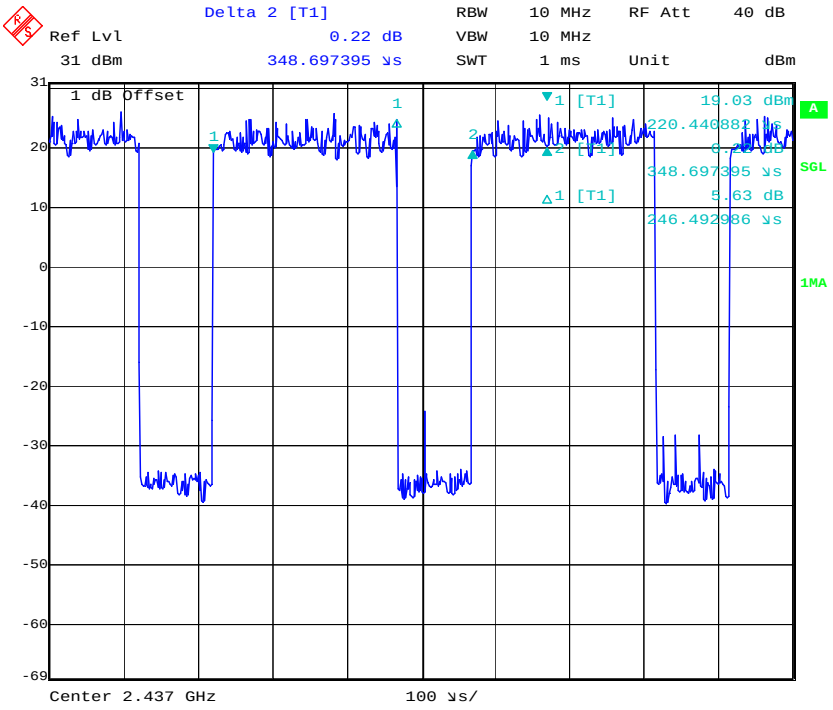
The duty cycle as below:

Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)	Minimum Transmission Duration (T) (ms)
802.11b	1.21	1.30	93	1.21
802.11g	0.246	0.349	71	0.246
802.11n ht20	0.091	0.141	65	0.091
802.11n ht40	0.058	0.107	54	0.058

802.11b



802.11g



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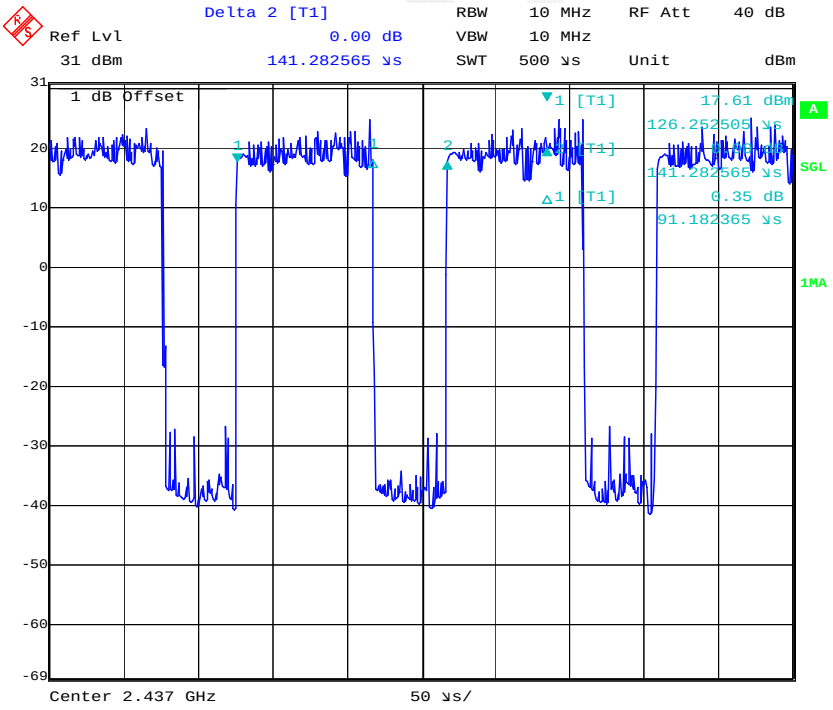
802.11n ht20



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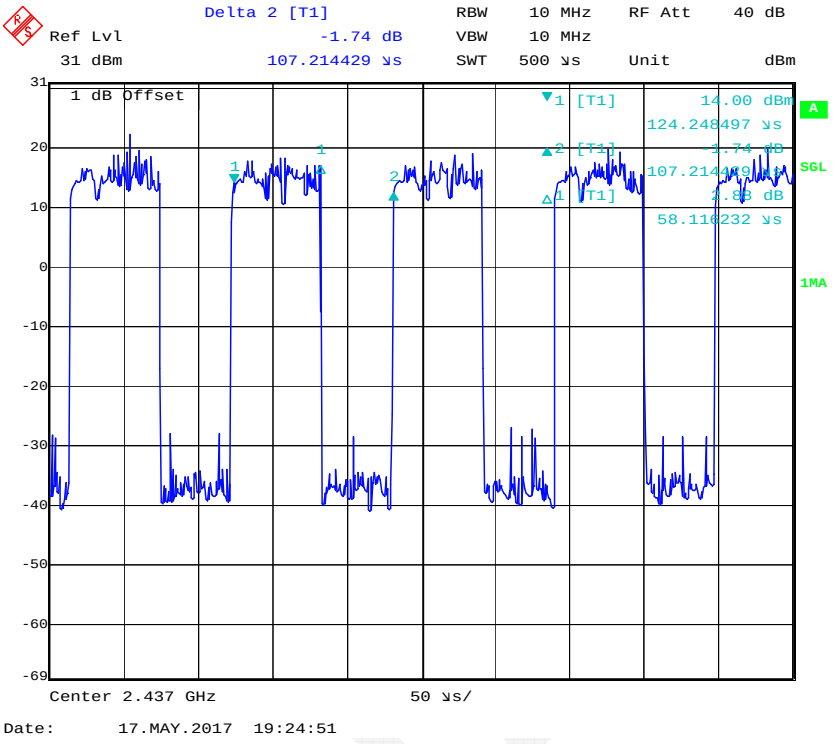
802.11n ht40



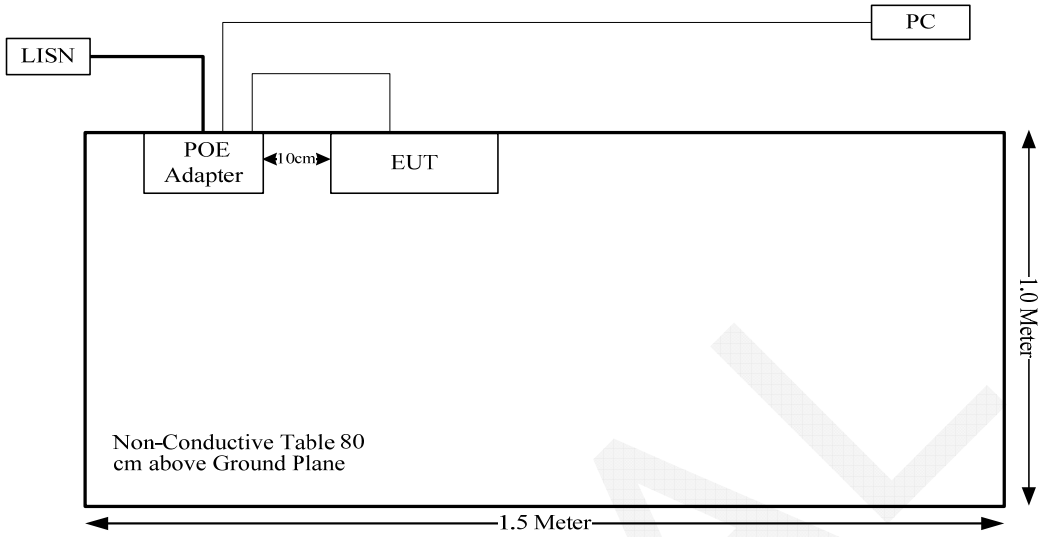
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
IBM	PC	8176	99Y7315
Huawei	POE	POE35-54V	N/A

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ45 Cable	No	No	1.0	EUT	POE Adapter
RJ45 Cable	No	No	10	POE Adapter	PC

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1091 RSS-102§4	Maximum Permissable Exposure (MPE)	Compliance
FCC§15.203 RSS-Gen§8.3	Antenna Requirement	Compliance
§15.207 (a) RSS-Gen §8.8	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d) RSS-247 §5.5 RSS-Gen §8.10	Spurious Emissions	Compliance
§15.247 (a)(2) RSS-247 §5.2 a)	6 dB Emission Bandwidth And 99% Occupied Bandwidth	Compliance
§15.247(b)(3) RSS-247 §5.4 d)	Maximum conducted output power	Compliance
§15.247(d) RSS-247 §5.5	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e) RSS-247 §5.2 b)	Power Spectral Density	Compliance

FCC §15.247 (i) , §1.1310 , §2.1091& RSS-102 § 4- 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.

According to RSS-102 § 4Table 4, RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
$0.003\text{-}10^{21}$	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142f^{0.3417}$	$0.008335f^{0.3417}$	$0.02619f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

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);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

Calculated Data:

Mode	Frequency (MHz)	Antenna Gain		Conducted Power including Tolerance		Evaluation Distance (cm)	Power Density		MPE Limit	
		(dBi)	(numeric)	(dBm)	(mW)		(mW/cm^2)	(W/m^2)	FCC (mW/cm^2)	RSS-102 (W/m^2)
WLAN 2.4GHz	2412-2462	2	1.58	28	630.96	40.00	0.0498	0.498	1.0	5.37
LTE Band 7	2500-2570	13	19.95	23	199.53	40.00	0.20	2.0	1.0	5.50
LTE Band 40	2305-2320	13	19.95	23	199.53	40.00	0.20	2.0	1.0	5.20
	2345-2360	13	19.95	23	199.53	40.00	0.20	2.0	1.0	5.26
LTE Band 41	2500-2690	13	19.95	23	199.53	40.00	0.20	2.0	1.0	5.49

The 2.4GHz WLAN and LTE can transmit simultaneously:

For FCC:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$=S_{WLAN}/S_{limit\text{-}WLAN} + S_{LTE}/S_{limit\text{-}LTE}$
=0.0498/1+0.2/1
=0.24928
< 1.0

For RSS-102:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$=S_{WLAN}/S_{limit\text{-}WLAN} + S_{LTE}/S_{limit\text{-}LTE}$
=0.498/5.37+2.0/5.49
=0.457
< 1.0

Result: Compliance, The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at distance ≥40 cm.

FCC §15.203 ,RSS-GEN§8.3- 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.

According to RSS-Gen §8.3, The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the licence-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.
Licence-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotropically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the licence-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of licence-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.9 When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

Antenna Information And Connector Construction

Ant.	Antenna Type	Frequency Range/Antenna Gain
WIFI Chain 0	Internal PCB	2.4GHz Band/2.0dBi
WIFI Chain 1	Internal PCB	2.4GHz Band/2.0dBi

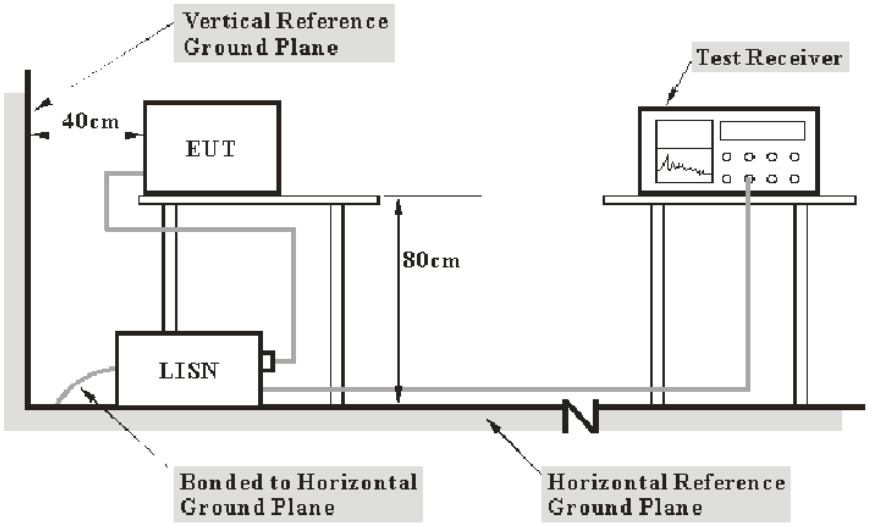
Result: Compliance. Please refer to the EUT photos

FCC §15.207 (a), RSS-Gen §8.8– AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207(a) and RSS-Gen§8.8

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 and RSS-Gen 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 Data

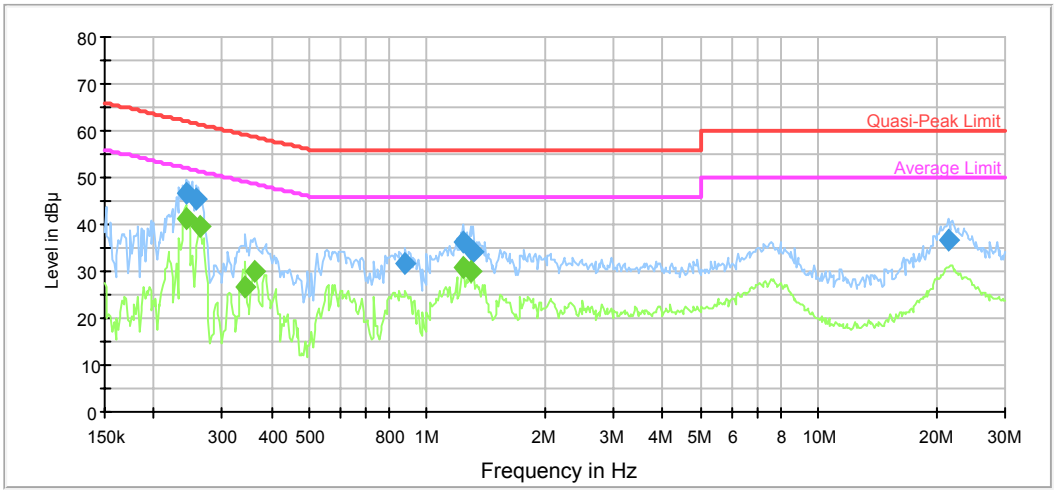
Environmental Conditions

Temperature:	27 °C
Relative Humidity:	50 %
ATM Pressure:	100 kPa

The testing was performed by Lorin Bian on 2017-05-31.

Test Mode: Transmitting

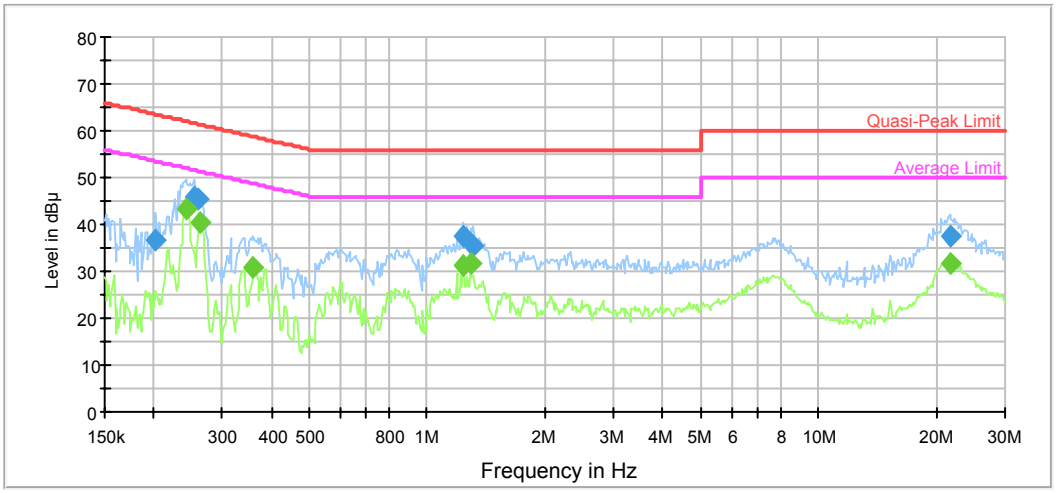
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.241949	46.7	9.000	L1	19.7	15.3	62.0	Compliance
0.255827	45.5	9.000	L1	19.7	16.1	61.6	Compliance
0.879690	31.6	9.000	L1	19.7	24.4	56.0	Compliance
1.239175	36.4	9.000	L1	19.7	19.6	56.0	Compliance
1.310256	34.4	9.000	L1	19.7	21.6	56.0	Compliance
21.478456	36.6	9.000	L1	20.1	23.4	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.241949	41.4	9.000	L1	19.7	10.6	52.0	Compliance
0.264113	39.5	9.000	L1	19.7	11.8	51.3	Compliance
0.343548	26.8	9.000	L1	19.7	22.3	49.1	Compliance
0.363254	30.0	9.000	L1	19.7	18.7	48.7	Compliance
1.239175	30.9	9.000	L1	19.7	15.1	46.0	Compliance
1.289541	30.2	9.000	L1	19.7	15.8	46.0	Compliance

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.203045	36.8	9.000	N	19.6	26.7	63.5	Compliance
0.253797	46.0	9.000	N	19.6	15.6	61.6	Compliance
0.259937	45.5	9.000	N	19.6	15.9	61.4	Compliance
1.239175	37.7	9.000	N	19.6	18.3	56.0	Compliance
1.310256	35.6	9.000	N	19.6	20.4	56.0	Compliance
21.650283	37.4	9.000	N	20.0	22.6	60.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.241949	43.5	9.000	N	19.6	8.5	52.0	Compliance
0.264113	40.3	9.000	N	19.6	11.0	51.3	Compliance
0.360371	30.7	9.000	N	19.6	18.0	48.7	Compliance
1.239175	31.0	9.000	N	19.6	15.0	46.0	Compliance
1.289541	31.7	9.000	N	19.6	14.3	46.0	Compliance
21.650283	31.5	9.000	N	20.0	18.5	50.0	Compliance

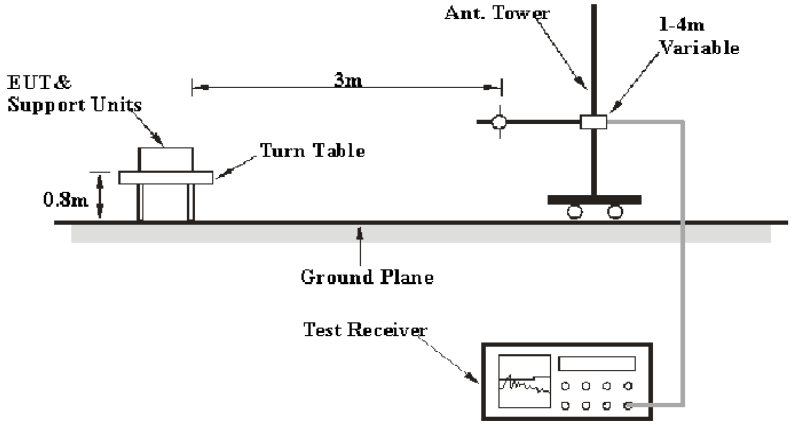
FCC §15.209, §15.205 , §15.247(d) & RSS-247 §5.5&RSS-GEN§8.10- SPURIOUS EMISSIONS

Applicable Standard

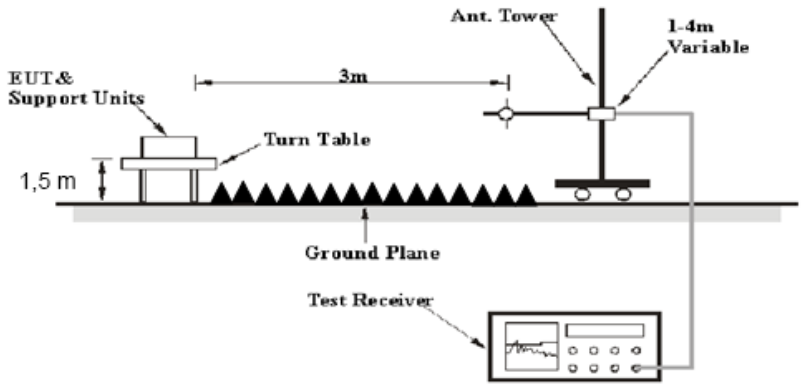
FCC §15.247 (d); §15.209; §15.205; and RSS-247 §5.5, RSS-GEN §8.10

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC 15.209, and FCC 15.247 and RSS-247 §5.5,RSS-GEN §8.10 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 Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

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

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

Margin = Limit –Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
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	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-05-20	2017-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
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

*** 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:	27.7 °C
Relative Humidity:	52 %
ATM Pressure:	97.8 kPa

** The testing was performed by Lorin Bian on 2017-05-19.*

Test Mode: Transmitting

30MHz-25GHz:
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	86.56	PK	H	23.50	3.00	0.00	113.06	N/A	N/A
2412	78.69	AV	H	23.50	3.00	0.00	105.19	N/A	N/A
2412	83.60	PK	V	23.50	3.00	0.00	110.1	N/A	N/A
2412	75.43	AV	V	23.50	3.00	0.00	101.93	N/A	N/A
2390	29.38	PK	H	23.57	3.00	0.00	55.95	74	18.05
2390	18.32	AV	H	23.57	3.00	0.00	44.89	54	9.11
4824	36.47	PK	H	30.84	5.11	26.87	45.55	74	28.45
4824	27.52	AV	H	30.84	5.11	26.87	36.6	54	17.4
7236	34.03	PK	H	34.77	6.18	26.36	48.62	74	25.38
7236	24.57	AV	H	34.77	6.18	26.36	39.16	54	14.84
1518	31.25	PK	H	24.13	2.68	26.35	31.71	74	42.29
1518	19.76	AV	H	24.13	2.68	26.35	20.22	54	33.78
637.22	41.61	QP	H	20.10	1.92	28.85	34.78	46.00	11.22
826.37	41.86	QP	H	22.06	2.30	28.38	37.84	46.00	8.16
Middle Channel: 2437 MHz									
2437	87.19	PK	H	23.41	3.00	0.00	113.6	N/A	N/A
2437	79.07	AV	H	23.41	3.00	0.00	105.48	N/A	N/A
2437	84.03	PK	V	23.41	3.00	0.00	110.44	N/A	N/A
2437	75.90	AV	V	23.41	3.00	0.00	102.31	N/A	N/A
4874	36.52	PK	H	31.00	5.09	26.87	45.74	74	28.26
4874	27.80	AV	H	31.00	5.09	26.87	37.02	54	16.98
7311	34.53	PK	H	34.92	6.21	26.40	49.26	74	24.74
7311	24.65	AV	H	34.92	6.21	26.40	39.38	54	14.62
1563	31.55	PK	H	24.20	2.72	26.39	32.08	74	41.92
1563	20.79	AV	H	24.20	2.72	26.39	21.32	54	32.68
637.22	41.88	QP	H	20.10	1.92	28.85	35.05	46.00	10.95
826.37	42	QP	H	22.06	2.30	28.38	37.98	46.00	8.02
High Channel: 2462 MHz									
2462	86.54	PK	H	23.33	2.99	0.00	112.86	N/A	N/A
2462	78.25	AV	H	23.33	2.99	0.00	104.57	N/A	N/A
2462	85.35	PK	V	23.33	2.99	0.00	111.67	N/A	N/A
2462	77.22	AV	V	23.33	2.99	0.00	103.54	N/A	N/A
2483.5	35.23	PK	H	23.26	2.99	0.00	61.48	74	12.52
2483.5	21.93	AV	H	23.26	2.99	0.00	48.18	54	5.82
4924	36.90	PK	H	31.16	5.07	26.88	46.25	74	27.75
4924	28.06	AV	H	31.16	5.07	26.88	37.41	54	16.59
7386	35.07	PK	H	35.07	6.25	26.43	49.96	74	24.04
7386	25.58	AV	H	35.07	6.25	26.43	40.47	54	13.53
1584	31.14	PK	H	24.23	2.73	26.41	31.69	74	42.31
1584	21.09	AV	H	24.23	2.73	26.41	21.64	54	32.36
637.22	42.72	QP	H	20.10	1.92	28.85	35.89	46.00	10.11
826.37	42.42	QP	H	22.06	2.30	28.38	38.40	46.00	7.60

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	85.50	PK	H	23.50	3.00	0.00	112	N/A	N/A
2412	74.71	AV	H	23.50	3.00	0.00	101.21	N/A	N/A
2412	82.84	PK	V	23.50	3.00	0.00	109.34	N/A	N/A
2412	72.00	AV	V	23.50	3.00	0.00	98.5	N/A	N/A
2390	36.75	PK	H	23.57	3.00	0.00	63.32	74	10.68
2390	18.89	AV	H	23.57	3.00	0.00	45.46	54	8.54
4824	36.25	PK	H	30.84	5.11	26.87	45.33	74	28.67
4824	25.82	AV	H	30.84	5.11	26.87	34.9	54	19.1
7236	34.76	PK	H	34.77	6.18	26.36	49.35	74	24.65
7236	23.22	AV	H	34.77	6.18	26.36	37.81	54	16.19
1325	29.63	PK	H	23.65	2.43	26.50	29.21	74	44.79
1325	18.95	AV	H	23.65	2.43	26.50	18.53	54	35.47
637.22	42.25	QP	H	20.10	1.92	28.85	35.42	46.00	10.58
826.37	42.86	QP	H	22.06	2.30	28.38	38.84	46.00	7.16
Middle Channel: 2437 MHz									
2437	85.56	PK	H	23.41	3.00	0.00	111.97	N/A	N/A
2437	74.47	AV	H	23.41	3.00	0.00	100.88	N/A	N/A
2437	83.89	PK	V	23.41	3.00	0.00	110.3	N/A	N/A
2437	72.23	AV	V	23.41	3.00	0.00	98.64	N/A	N/A
4874	36.78	PK	H	31.00	5.09	26.87	46	74	28
4874	24.92	AV	H	31.00	5.09	26.87	34.14	54	19.86
7311	34.54	PK	H	34.92	6.21	26.40	49.27	74	24.73
7311	23.38	AV	H	34.92	6.21	26.40	38.11	54	15.89
1362	30.32	PK	H	23.74	2.48	26.46	30.08	74	43.92
1362	19.44	AV	H	23.74	2.48	26.46	19.2	54	34.8
2218	32.20	PK	H	24.16	3.02	26.85	32.53	74	41.47
2218	21.47	AV	H	24.16	3.02	26.85	21.8	54	32.2
637.22	41.78	QP	H	20.10	1.92	28.85	34.95	46.00	11.05
826.37	43.3	QP	H	22.06	2.30	28.38	39.28	46.00	6.72
High Channel: 2462 MHz									
2462	85.66	PK	H	23.33	2.99	0.00	111.98	N/A	N/A
2462	75.21	AV	H	23.33	2.99	0.00	101.53	N/A	N/A
2462	83.61	PK	V	23.33	2.99	0.00	109.93	N/A	N/A
2462	72.72	AV	V	23.33	2.99	0.00	99.04	N/A	N/A
2483.5	41.30	PK	H	23.26	2.99	0.00	67.55	74	6.45
2483.5	25.05	AV	H	23.26	2.99	0.00	51.3	54	2.7
4924	36.46	PK	H	31.16	5.07	26.88	45.81	74	28.19
4924	25.65	AV	H	31.16	5.07	26.88	35	54	19
7386	35.08	PK	H	35.07	6.25	26.43	49.97	74	24.03
7386	23.56	AV	H	35.07	6.25	26.43	38.45	54	15.55
1403	30.69	PK	H	23.85	2.54	26.42	30.66	74	43.34
1403	20.24	AV	H	23.85	2.54	26.42	20.21	54	33.79
637.22	42.01	QP	H	20.10	1.92	28.85	35.18	46.00	10.82
826.37	41.64	QP	H	22.06	2.30	28.38	37.62	46.00	8.38

802.11 n ht20 Mode(2TX 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	85.40	PK	H	23.50	3.00	0.00	111.9	N/A	N/A
2412	74.69	AV	H	23.50	3.00	0.00	101.19	N/A	N/A
2412	85.13	PK	V	23.50	3.00	0.00	111.63	N/A	N/A
2412	73.06	AV	V	23.50	3.00	0.00	99.56	N/A	N/A
2390	34.36	PK	H	23.57	3.00	0.00	60.93	74	13.07
2390	20.59	AV	H	23.57	3.00	0.00	47.16	54	6.84
4824	35.93	PK	H	30.84	5.11	26.87	45.01	74	28.99
4824	25.57	AV	H	30.84	5.11	26.87	34.65	54	19.35
7236	34.37	PK	H	34.77	6.18	26.36	48.96	74	25.04
7236	23.72	AV	H	34.77	6.18	26.36	38.31	54	15.69
1325	29.93	PK	H	23.65	2.43	26.50	29.51	74	44.49
1325	19.21	AV	H	23.65	2.43	26.50	18.79	54	35.21
637.22	42.28	QP	H	20.10	1.92	28.85	35.45	46.00	10.55
826.37	41.78	QP	H	22.06	2.30	28.38	37.76	46.00	8.24
Middle Channel: 2437 MHz									
2437	85.98	PK	H	23.41	3.00	0.00	112.39	N/A	N/A
2437	74.75	AV	H	23.41	3.00	0.00	101.16	N/A	N/A
2437	85.26	PK	V	23.41	3.00	0.00	111.67	N/A	N/A
2437	73.00	AV	V	23.41	3.00	0.00	99.41	N/A	N/A
4874	36.30	PK	H	31.00	5.09	26.87	45.52	74	28.48
4874	25.93	AV	H	31.00	5.09	26.87	35.15	54	18.85
7311	34.61	PK	H	34.92	6.21	26.40	49.34	74	24.66
7311	23.73	AV	H	34.92	6.21	26.40	38.46	54	15.54
1362	30.73	PK	H	23.74	2.48	26.46	30.49	74	43.51
1362	19.65	AV	H	23.74	2.48	26.46	19.41	54	34.59
2218	32.13	PK	H	24.16	3.02	26.85	32.46	74	41.54
2218	21.00	AV	H	24.16	3.02	26.85	21.33	54	32.67
637.22	43.12	QP	H	20.10	1.92	28.85	36.29	46.00	9.71
826.37	42.2	QP	H	22.06	2.30	28.38	38.18	46.00	7.82
High Channel: 2462 MHz									
2462	86.57	PK	H	23.33	2.99	0.00	112.89	N/A	N/A
2462	76.03	AV	H	23.33	2.99	0.00	102.35	N/A	N/A
2462	86.06	PK	V	23.33	2.99	0.00	112.38	N/A	N/A
2462	74.95	AV	V	23.33	2.99	0.00	101.27	N/A	N/A
2483.5	39.50	PK	H	23.26	2.99	0.00	65.75	74	8.25
2483.5	25.97	AV	H	23.26	2.99	0.00	52.22	54	1.78
4924	37.15	PK	H	31.16	5.07	26.88	46.5	74	27.5
4924	25.90	AV	H	31.16	5.07	26.88	35.25	54	18.75
7386	34.77	PK	H	35.07	6.25	26.43	49.66	74	24.34
7386	23.96	AV	H	35.07	6.25	26.43	38.85	54	15.15
1403	31.20	PK	H	23.85	2.54	26.42	31.17	74	42.83
1403	19.52	AV	H	23.85	2.54	26.42	19.49	54	34.51
637.22	42.65	QP	H	20.10	1.92	28.85	35.82	46.00	10.18
826.37	42.64	QP	H	22.06	2.30	28.38	38.62	46.00	7.38

802.11 n ht40 Mode(2TX 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	83.77	PK	H	23.47	3.00	0.00	110.24	N/A	N/A
2422	73.87	AV	H	23.47	3.00	0.00	100.34	N/A	N/A
2422	83.40	PK	V	23.47	3.00	0.00	109.87	N/A	N/A
2422	73.68	AV	V	23.47	3.00	0.00	100.15	N/A	N/A
2390	36.18	PK	H	23.57	3.00	0.00	62.75	74	11.25
2390	26.33	AV	H	23.57	3.00	0.00	52.9	54	1.1
4844	36.27	PK	H	30.90	5.10	26.87	45.4	74	28.6
4844	25.56	AV	H	30.90	5.10	26.87	34.69	54	19.31
7266	34.07	PK	H	34.83	6.19	26.38	48.71	74	25.29
7266	23.42	AV	H	34.83	6.19	26.38	38.06	54	15.94
1325	29.44	PK	H	23.65	2.43	26.50	29.02	74	44.98
1325	18.75	AV	H	23.65	2.43	26.50	18.33	54	35.67
637.22	42.18	QP	H	20.10	1.92	28.85	35.35	46.00	10.65
826.37	43.08	QP	H	22.06	2.30	28.38	39.06	46.00	6.94
Middle Channel: 2437 MHz									
2437	84.16	PK	H	23.41	3.00	0.00	110.57	N/A	N/A
2437	73.92	AV	H	23.41	3.00	0.00	100.33	N/A	N/A
2437	83.51	PK	V	23.41	3.00	0.00	109.92	N/A	N/A
2437	73.27	AV	V	23.41	3.00	0.00	99.68	N/A	N/A
4874	36.14	PK	H	31.00	5.09	26.87	45.36	74	28.64
4874	26.20	AV	H	31.00	5.09	26.87	35.42	54	18.58
7311	34.74	PK	H	34.92	6.21	26.40	49.47	74	24.53
7311	23.87	AV	H	34.92	6.21	26.40	38.6	54	15.4
1362	30.64	PK	H	23.74	2.48	26.46	30.4	74	43.6
1362	19.32	AV	H	23.74	2.48	26.46	19.08	54	34.92
2218	32.73	PK	H	24.16	3.02	26.85	33.06	74	40.94
2218	21.05	AV	H	24.16	3.02	26.85	21.38	54	32.62
637.22	41.67	QP	H	20.10	1.92	28.85	34.84	46.00	11.16
826.37	40.68	QP	H	22.06	2.30	28.38	36.66	46.00	9.34
High Channel: 2452 MHz									
2452	81.03	PK	H	23.36	3.00	0.00	107.39	N/A	N/A
2452	71.14	AV	H	23.36	3.00	0.00	97.5	N/A	N/A
2452	80.65	PK	V	23.36	3.00	0.00	107.01	N/A	N/A
2452	70.95	AV	V	23.36	3.00	0.00	97.31	N/A	N/A
2483.5	35.55	PK	H	23.26	2.99	0.00	61.8	74	12.2
2483.5	26.42	AV	H	23.26	2.99	0.00	52.67	54	1.33
4904	36.69	PK	H	31.09	5.08	26.87	45.99	74	28.01
4904	25.88	AV	H	31.09	5.08	26.87	35.18	54	18.82
7356	34.39	PK	H	35.01	6.23	26.42	49.21	74	24.79
7356	23.49	AV	H	35.01	6.23	26.42	38.31	54	15.69
1403	30.79	PK	H	23.85	2.54	26.42	30.76	74	43.24
1403	19.95	AV	H	23.85	2.54	26.42	19.92	54	34.08
637.22	41.94	QP	H	20.10	1.92	28.85	35.11	46.00	10.89
826.37	40.82	QP	H	22.06	2.30	28.38	36.80	46.00	9.20

FCC §15.247(a) (2)& RSS-247 §5.2 a) &RSS-GEN§6.6 –6 dB EMISSION BANDWIDTH AND 99% OCCUPIED BANDWIDTH

Applicable Standard

According to FCC §15.247(a) (2)

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

According to RSS-247 §5.2 a)

The minimum 6 dB bandwidth shall be 500 kHz.

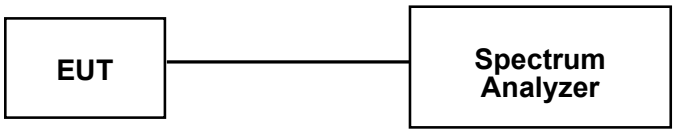
According to RSS-Gen §6.6

The emission bandwidth (x dB) is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated x dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth in the range of 1% to 5% of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth.

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

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.
h) Measure the 99% bandwidth use OBW test function.



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:	26.7~28.5 °C
Relative Humidity:	50~54 %
ATM Pressure:	95.8~100.1 kPa

** The testing was performed by Lorin Bian from 2017-05-17 to 2017-05-19.*

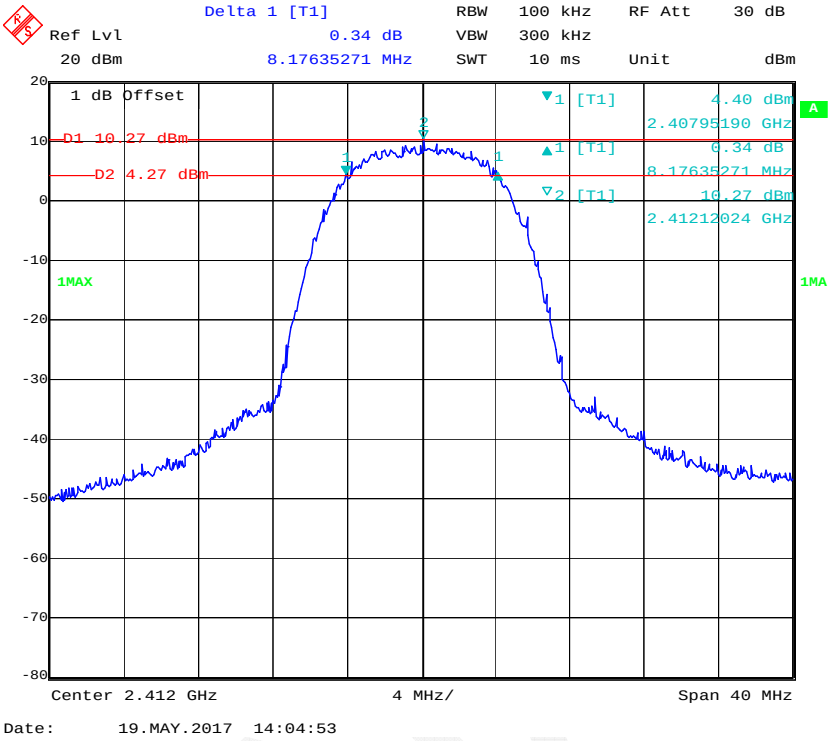
Test Mode: Transmitting (Test performed at Chain 0)

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

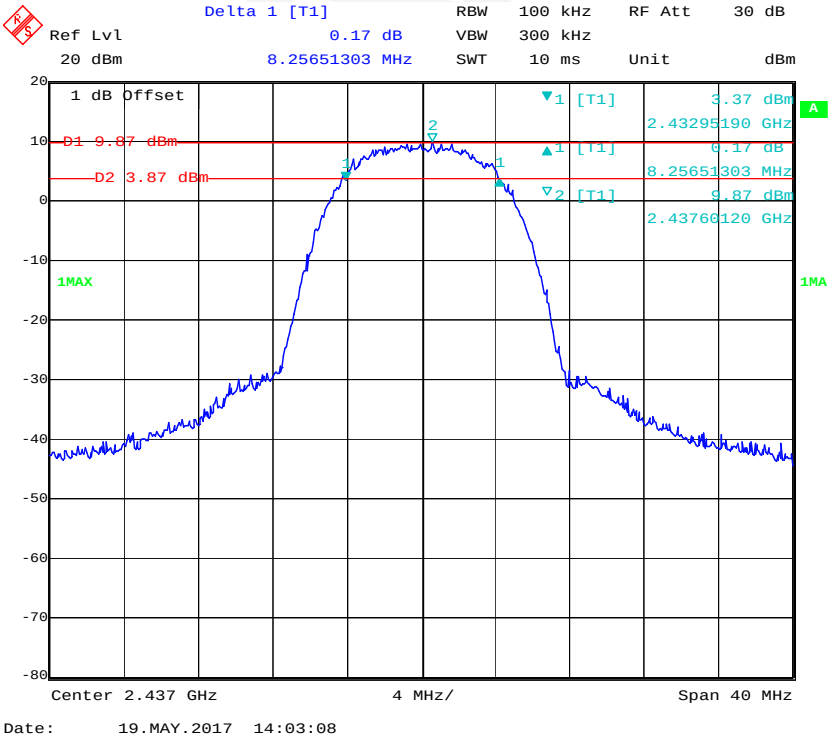
Test mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Occupied bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	8.18	10.66	≥0.5
	Middle	2437	8.26	10.74	≥0.5
	High	2462	8.5	10.82	≥0.5
802.11g	Low	2412	16.51	16.83	≥0.5
	Middle	2437	16.59	17.07	≥0.5
	High	2462	16.67	16.99	≥0.5
802.11n ht20	Low	2412	17.8	17.96	≥0.5
	Middle	2437	17.8	17.96	≥0.5
	High	2462	17.8	18.04	≥0.5
802.11n ht40	Low	2422	35.75	36.39	≥0.5
	Middle	2437	36.23	36.71	≥0.5
	High	2452	35.75	36.55	≥0.5

6dB Bandwidth:

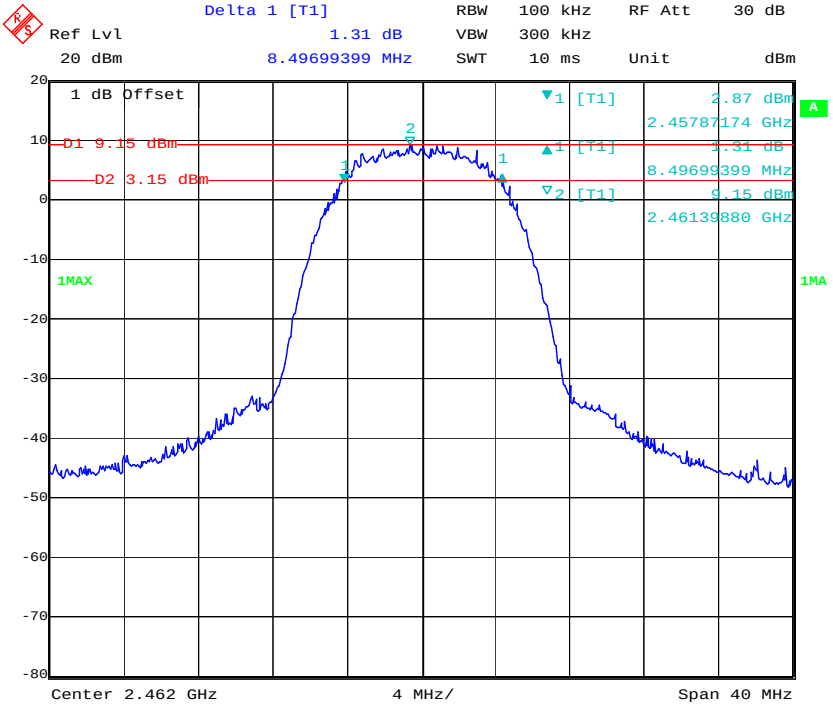
802.11b Low Channel



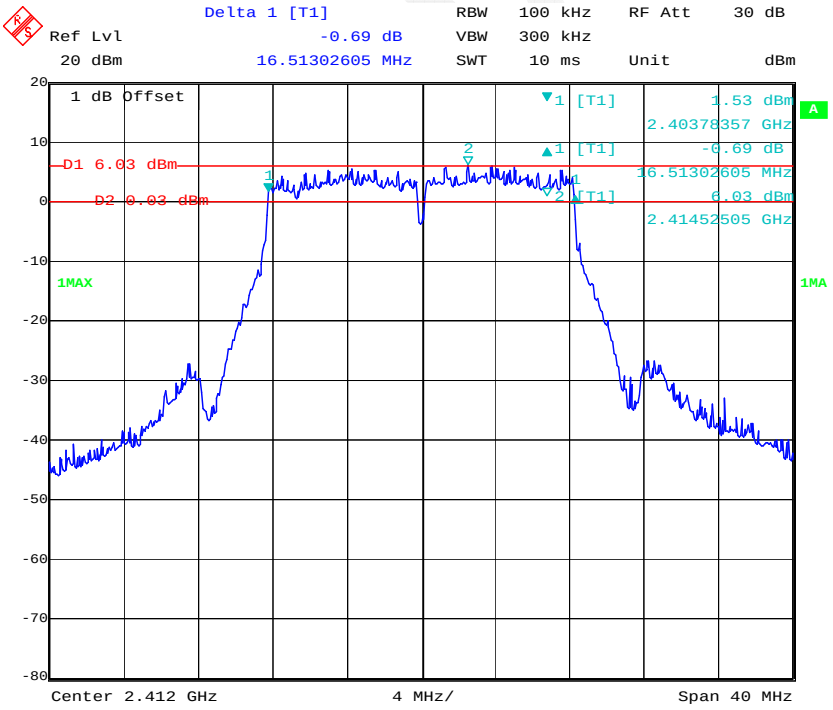
802.11b Middle Channel



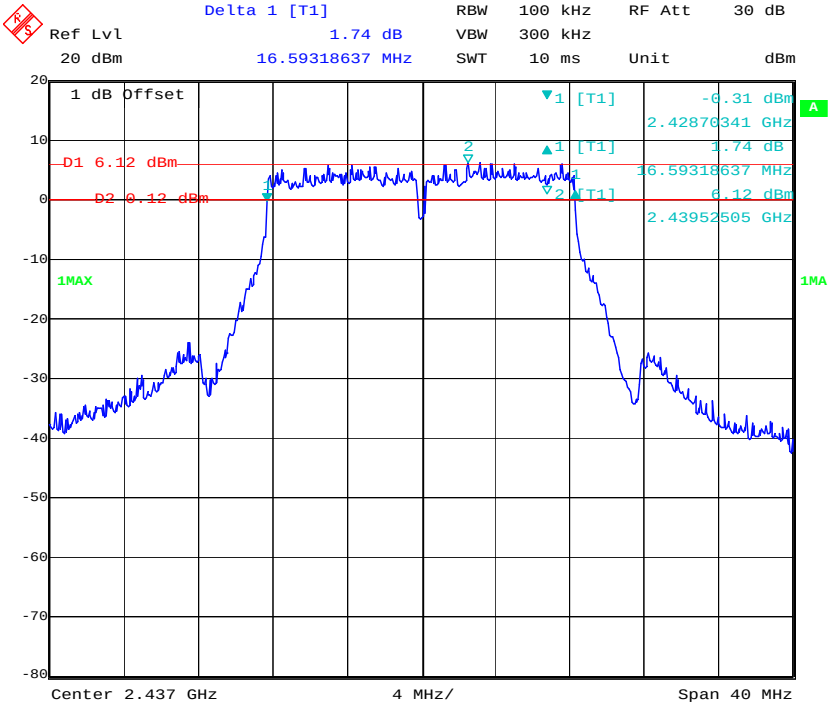
802.11b High Channel



802.11g Low Channel

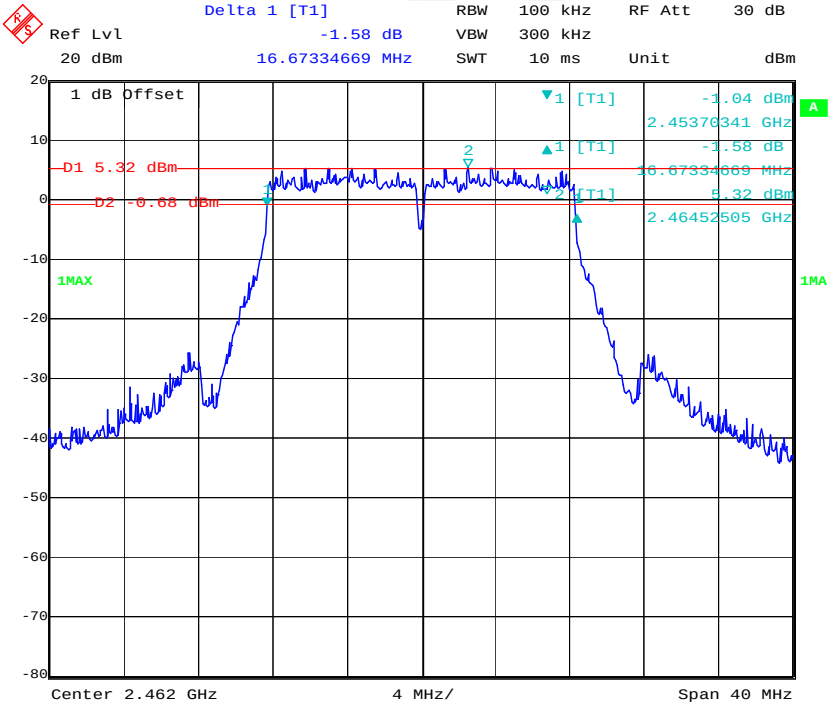


802.11g Middle Channel



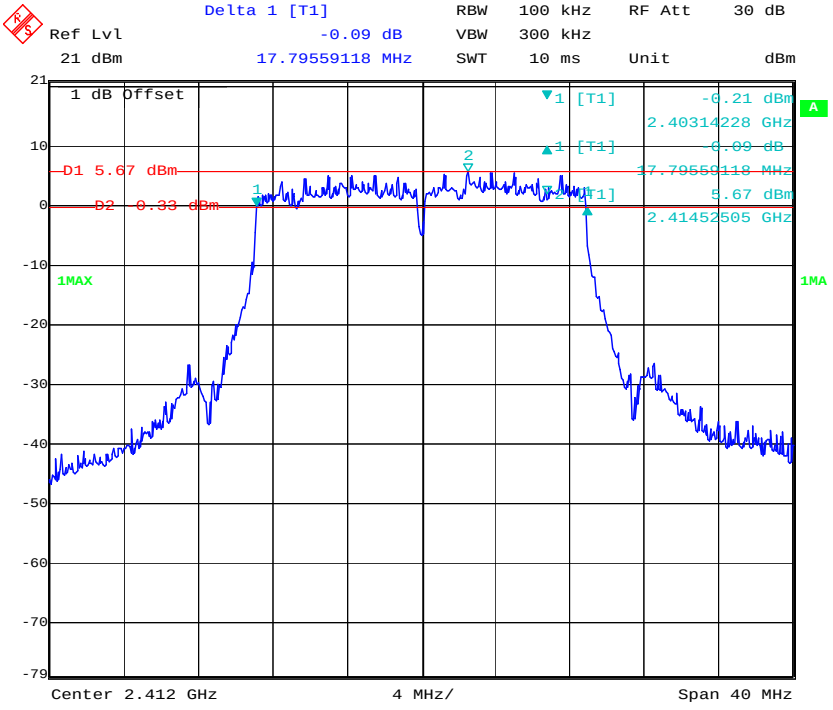
Date: 19.MAY.2017 13:56:58

802.11g High Channel



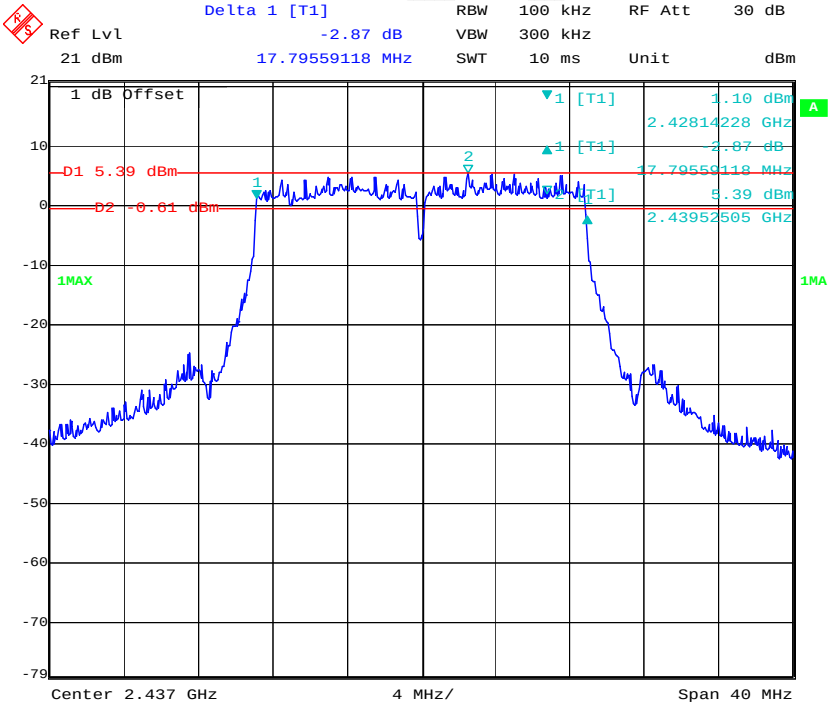
Date: 19.MAY.2017 13:59:00

802.11n ht20 Low Channel



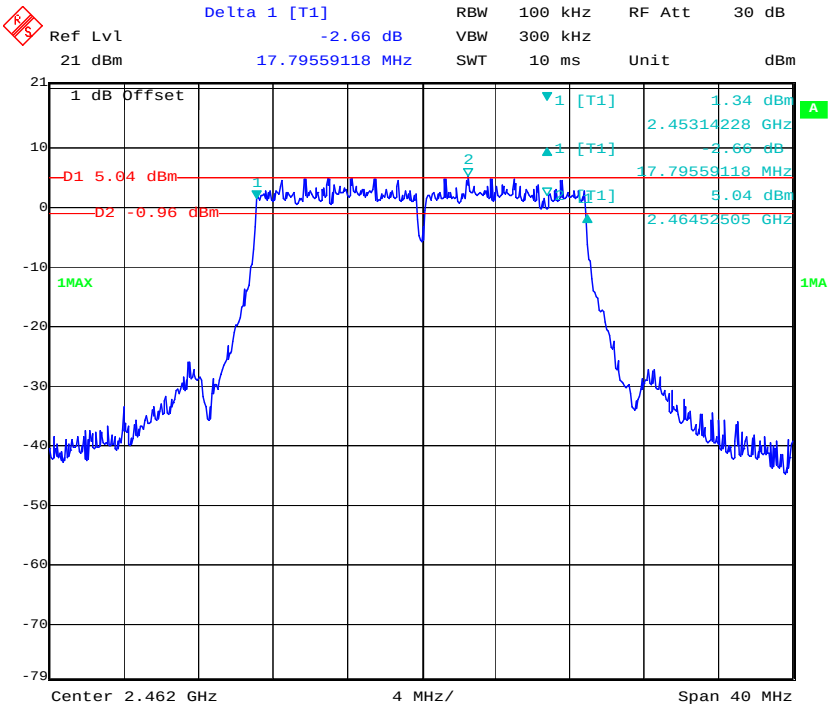
Date: 17.MAY.2017 21:09:22

802.11n ht20 Middle Channel

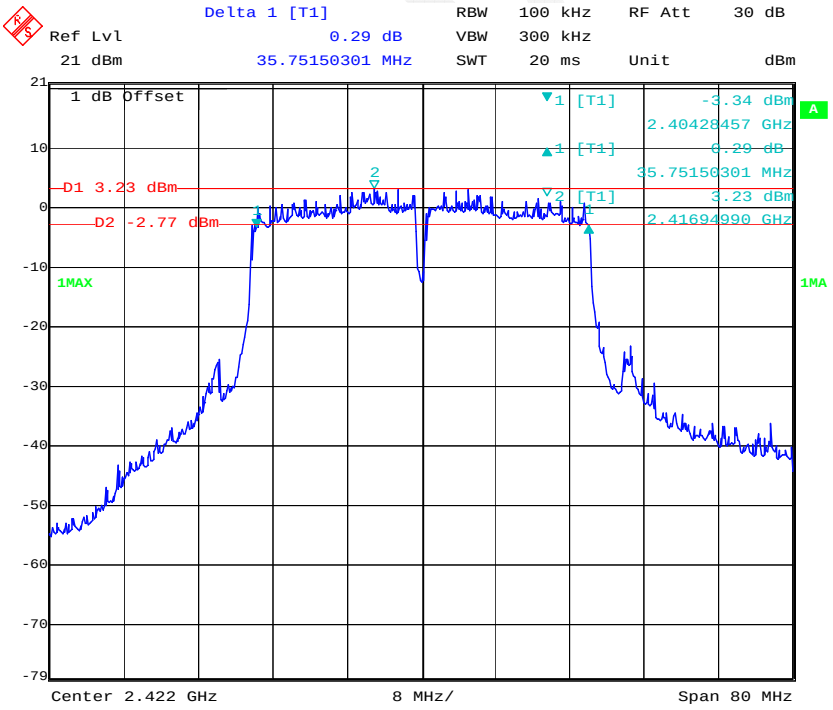


Date: 17.MAY.2017 21:11:34

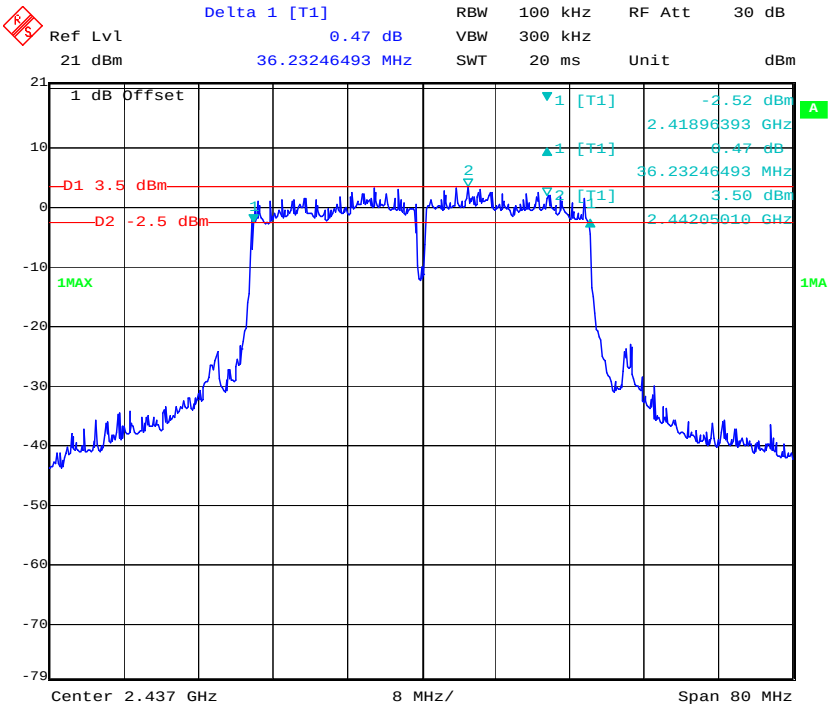
802.11n ht20 High Channel



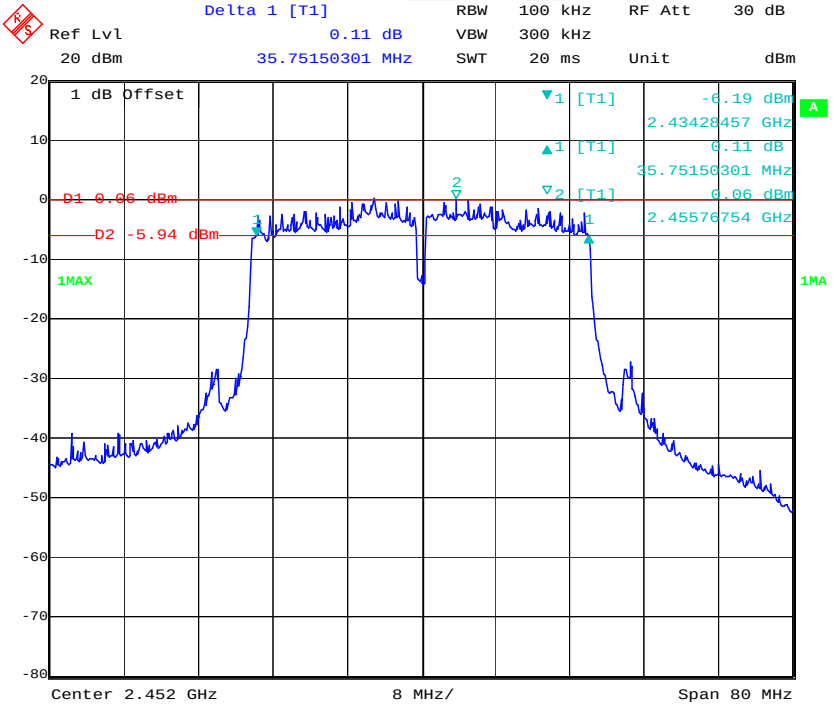
802.11n ht40 Low Channel



802.11n ht40 Middle Channel

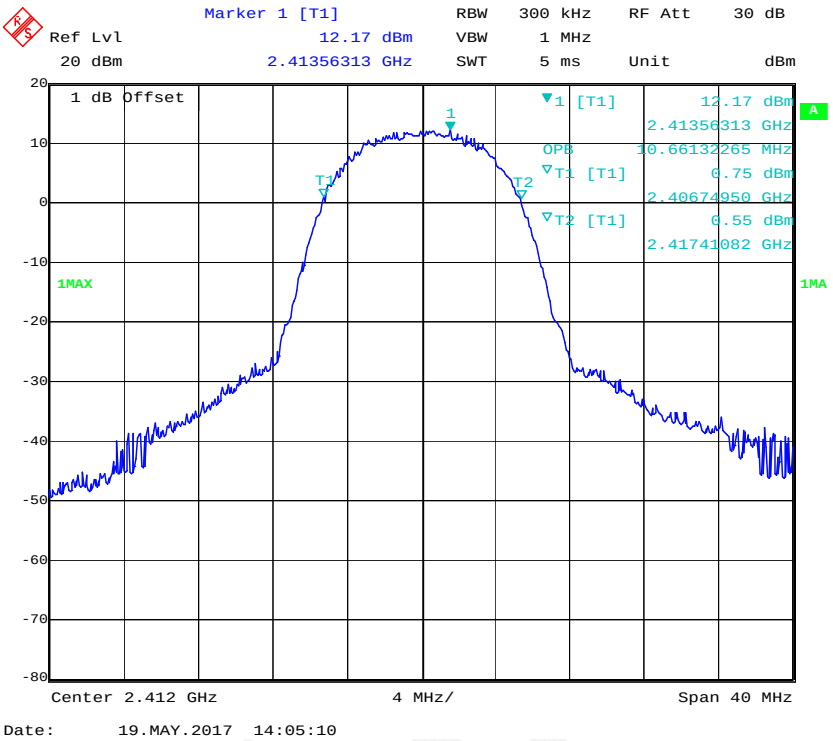


802.11n ht40 High Channel

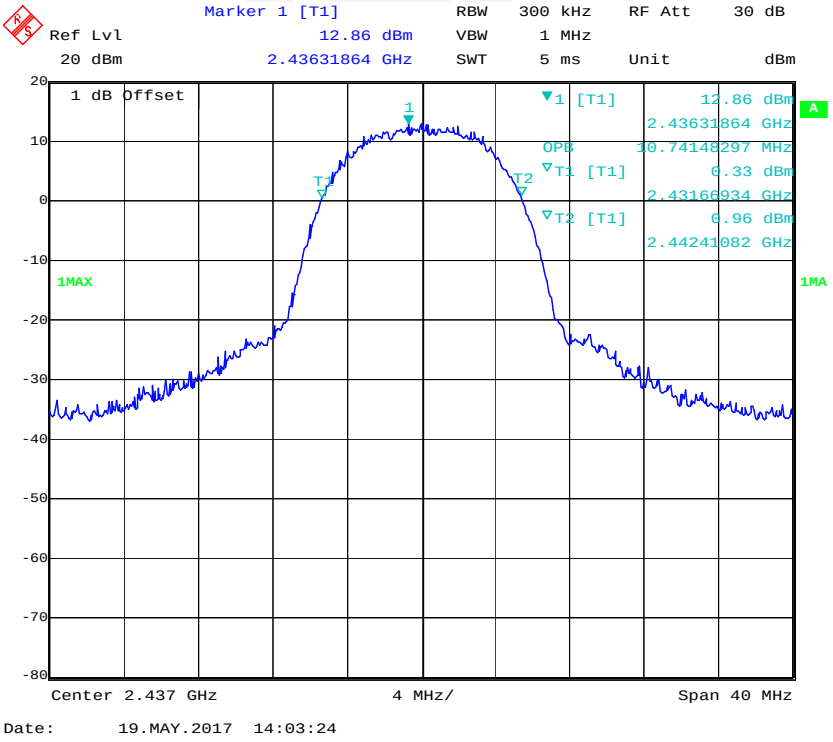


99% Occupied Bandwidth:

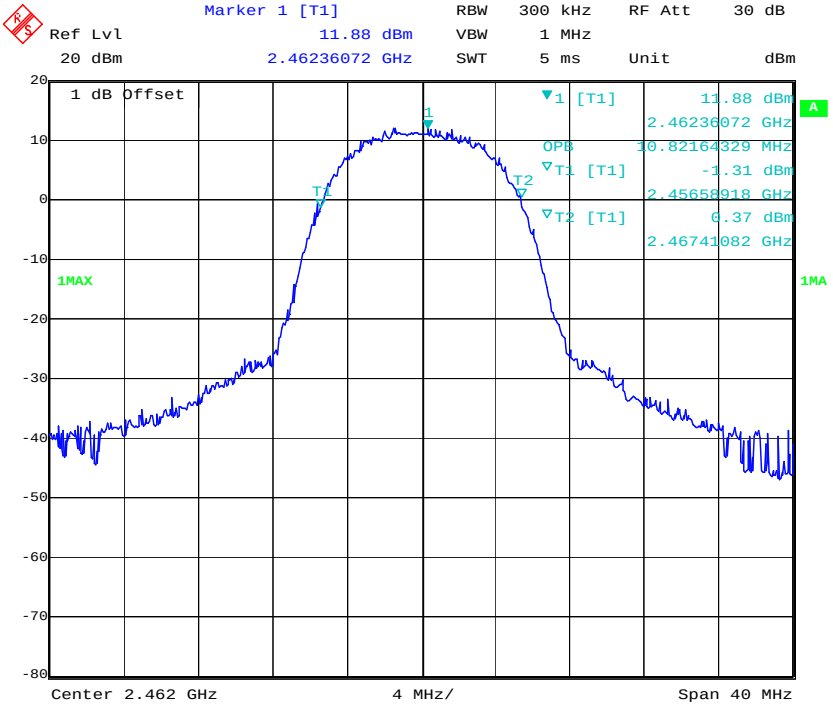
802.11b Low Channel



802.11b Middle Channel

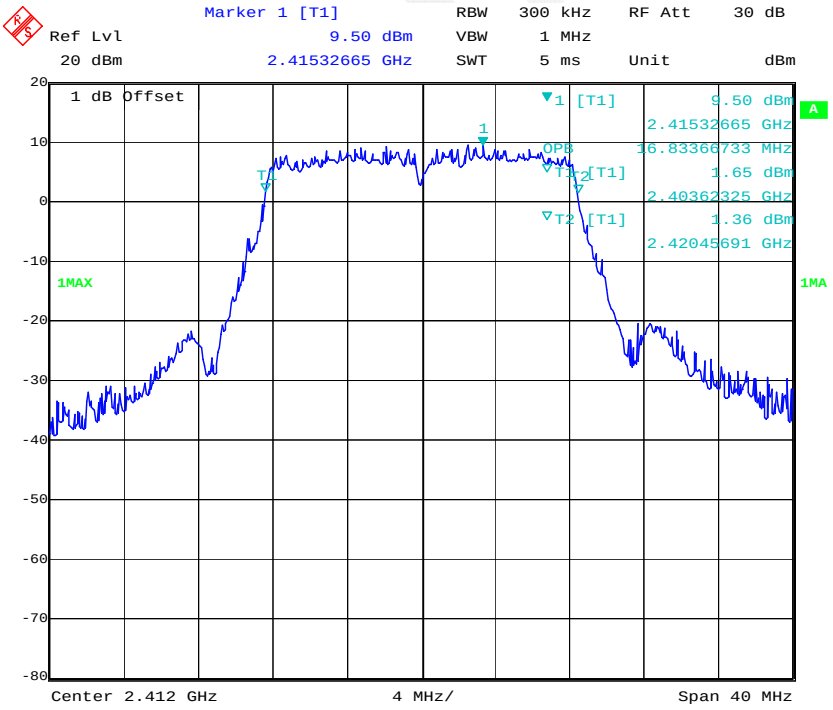


802.11b High Channel



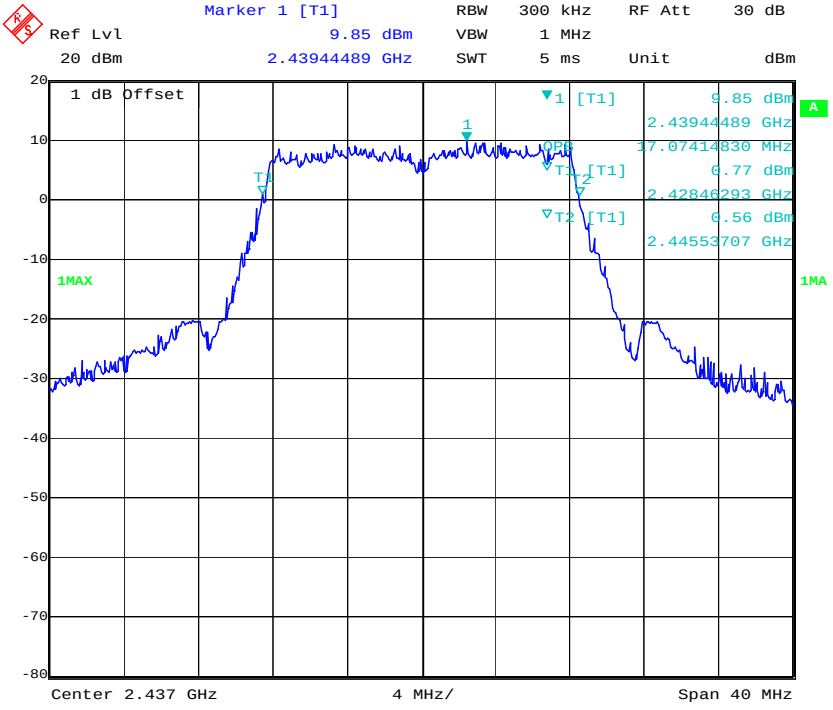
Date: 19.MAY.2017 14:01:23

802.11g Low Channel

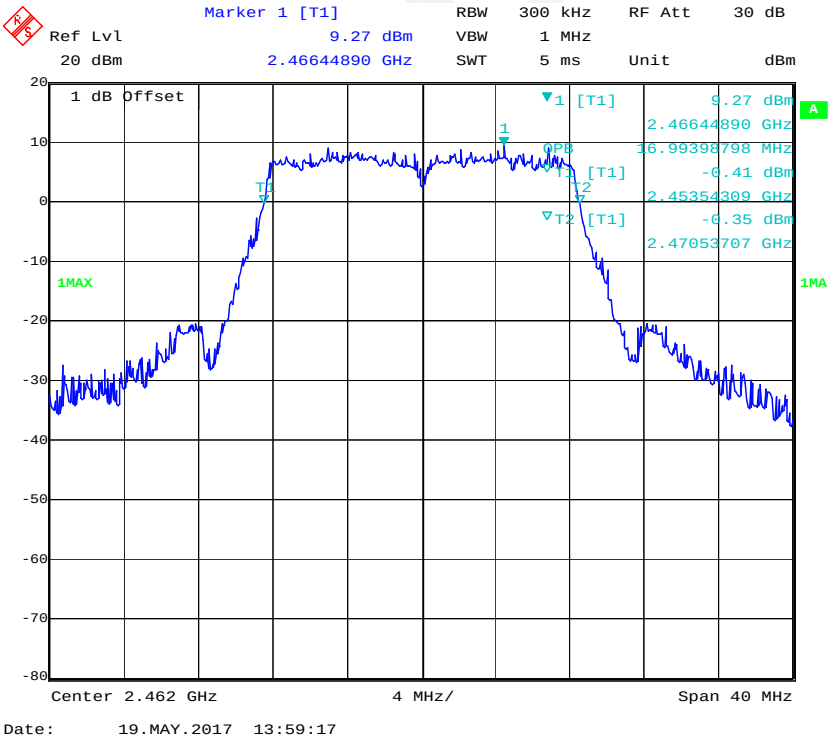


Date: 19.MAY.2017 13:53:09

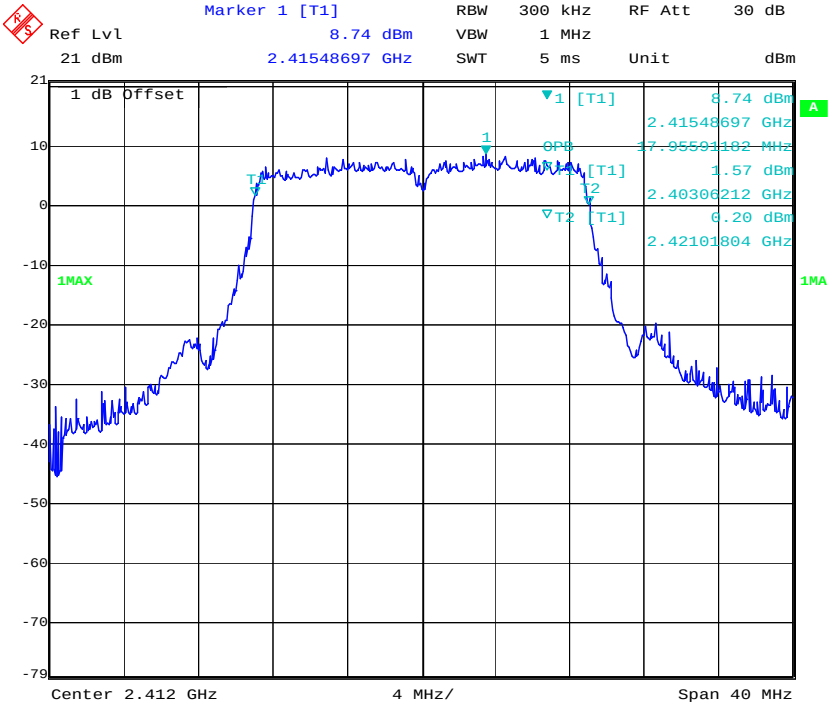
802.11g Middle Channel



802.11g High Channel

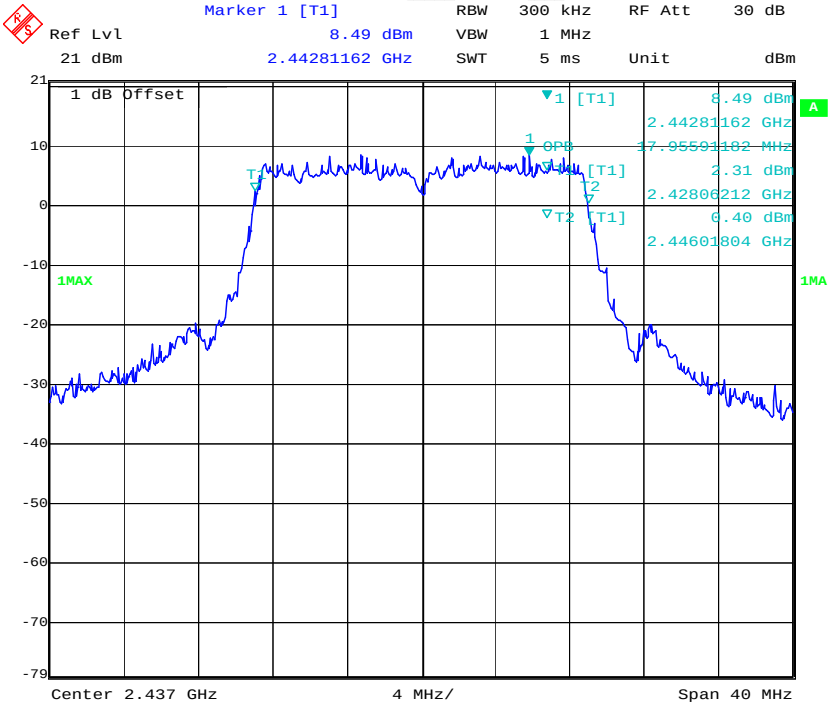


802.11n ht20 Low Channel



Date: 17.MAY.2017 21:09:38

802.11n ht20 Middle Channel



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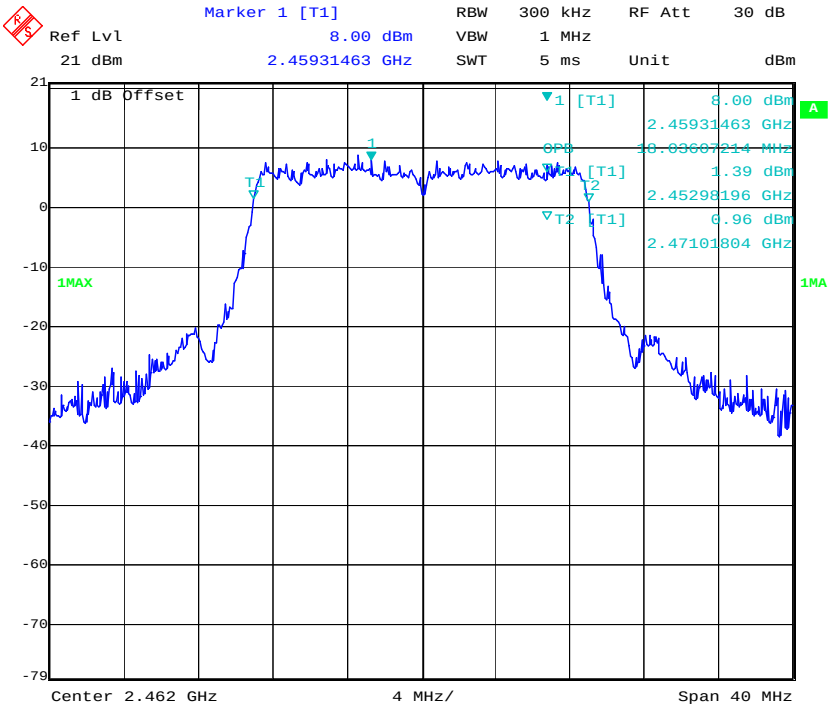
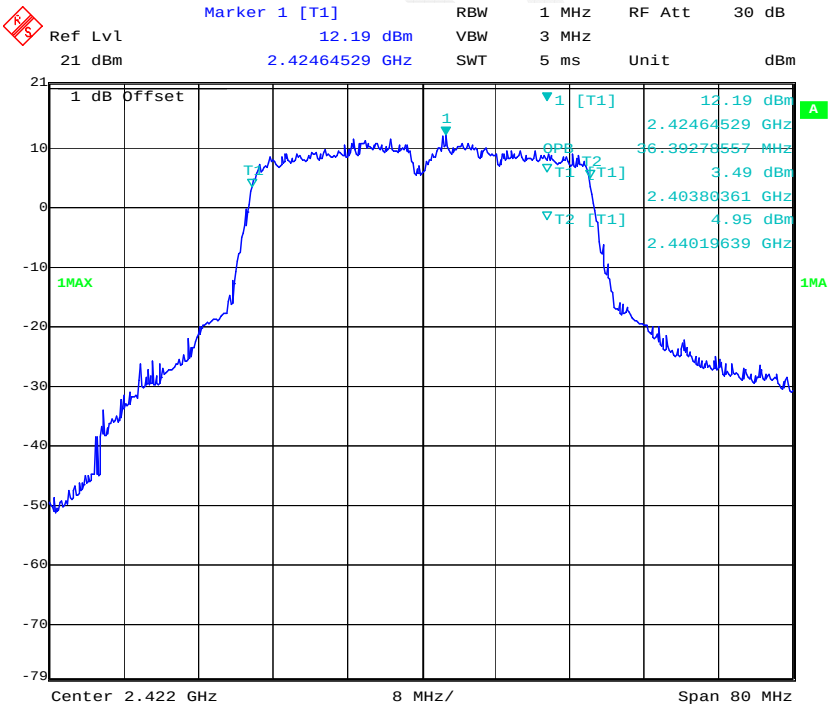
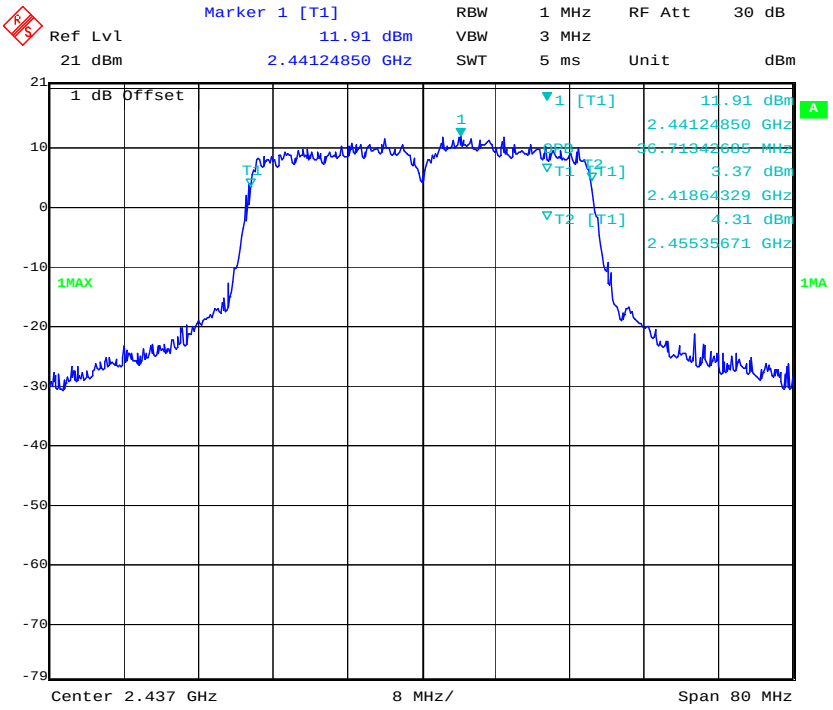
802.11n ht20 High Channel



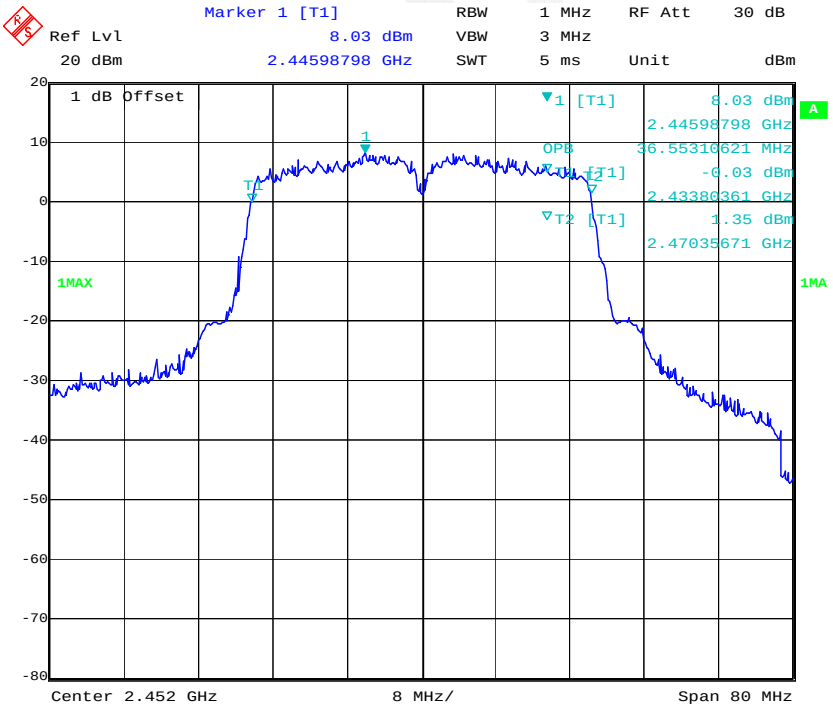
802.11n ht40 Low Channel



802.11n ht40 Middle Channel



802.11n ht40 High Channel



FCC §15.247(b) (3)& RSS-247 §5.4 d) - MAXIMUM CONDUCTED OUTPUT POWER

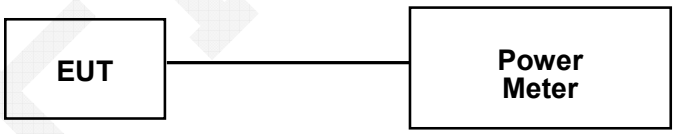
Applicable Standard

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.

According to RSS-247§5.4 d) For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. Except as provided in Section 5.4(e), the e.i.r.p. shall not exceed 4 W.
As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power. The maximum conducted output power is the total transmit power delivered to all antennas and antenna elements, averaged across all symbols in the signalling 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 transmitting at a reduced power level. If multiple modes of operation are implemented, 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	2018-01-02
Agilent	P-Series Power Meter	N1912A	MY5000798	2017-01-03	2018-01-02
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:	28.5 °C
Relative Humidity:	54 %
ATM Pressure:	100.1 kPa

** The testing was performed by Lorin Bian on 2017-05-19.*

Test Mode: Transmitting

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

Test mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)		Total (dBm)	Limit (dBm)
			Chain 0	Chain 1		
802.11b	Low	2412	23.26	23.51	/	30
	Middle	2437	23.63	22.21	/	30
	High	2462	22.98	23.57	/	30
802.11g	Low	2412	25.33	25.39	/	30
	Middle	2437	25.76	24.21	/	30
	High	2462	25.08	25.45	/	30
802.11n ht20	Low	2412	24.85	24.34	27.61	30
	Middle	2437	24.73	23.06	26.99	30
	High	2462	24.59	24.52	27.57	30
802.11n ht40	Low	2422	24.75	24.89	27.83	30
	Middle	2437	24.98	24.53	27.77	30
	High	2452	21.64	22.46	25.08	30

Note: the antenna gains are 2.0 dBi in 2.4GHz band, the device employed Cyclic Delay Diversity (CDD) for 2TX transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power measurements on IEEE 802.11 devices:

Array Gain = 0 dB (i.e., no array gain) for NANT ≤ 4;

So:

Directional gain = GANT + Array Gain = 2.0 dBi < 6dBi

FCC §15.247(d)& RSS-247 §5.5 – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE

Applicable Standard

According to FCC§15.247(d):In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to RSS-247 §5.5:

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

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

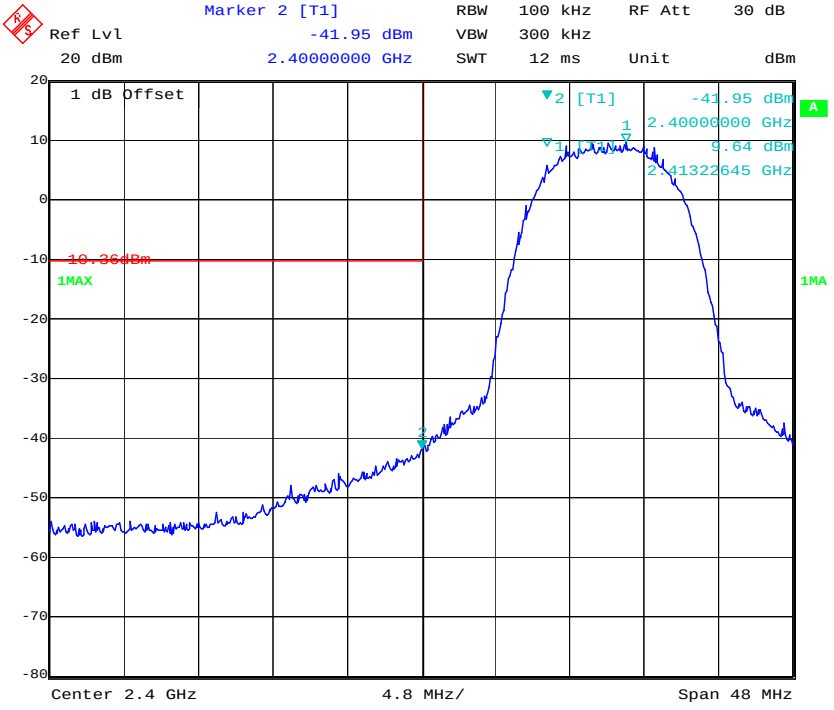
Temperature:	26.7~28.5 °C
Relative Humidity:	50~54 %
ATM Pressure:	95.8~100.1 kPa

** The testing was performed by Lorin Bian from 2017-05-17 to 2017-05-19.*

Test mode: Transmitting

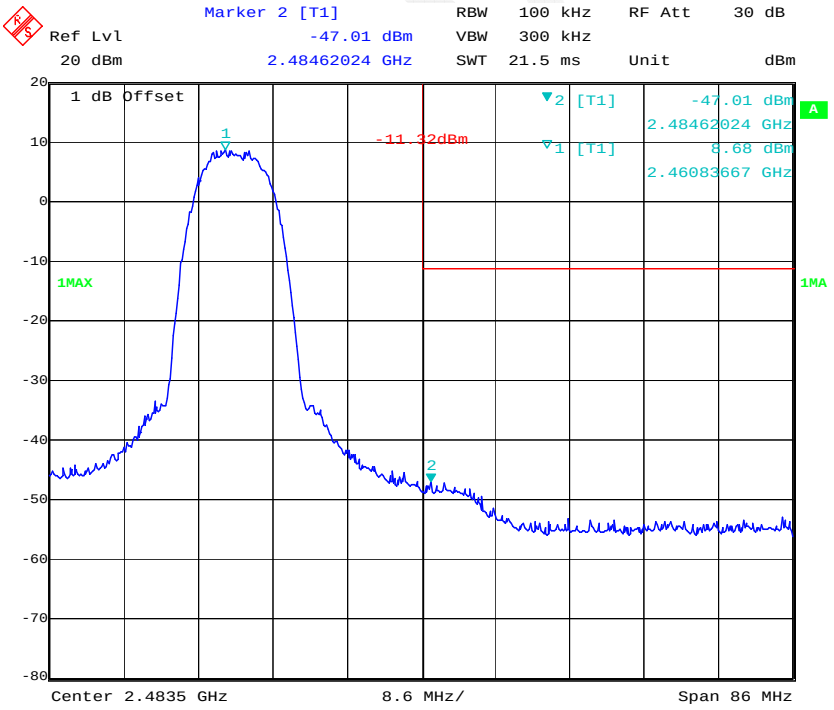
Test Result: Compliant. Please refer to following plots.

Chain 0, 802.11b: Band Edge, Left Side



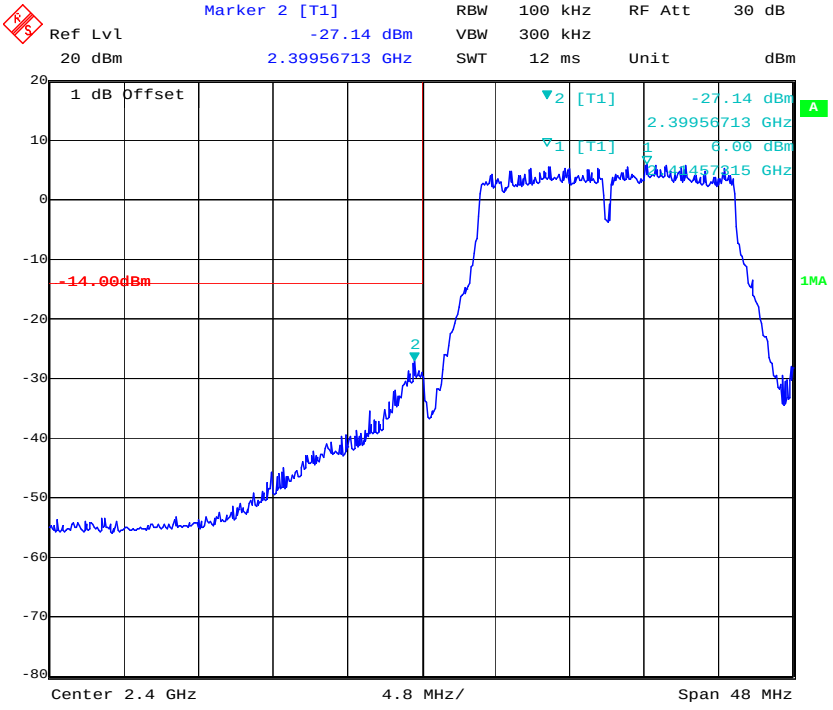
Date: 19.MAY.2017 14:06:15

Chain 0, 802.11b: Band Edge, Right Side



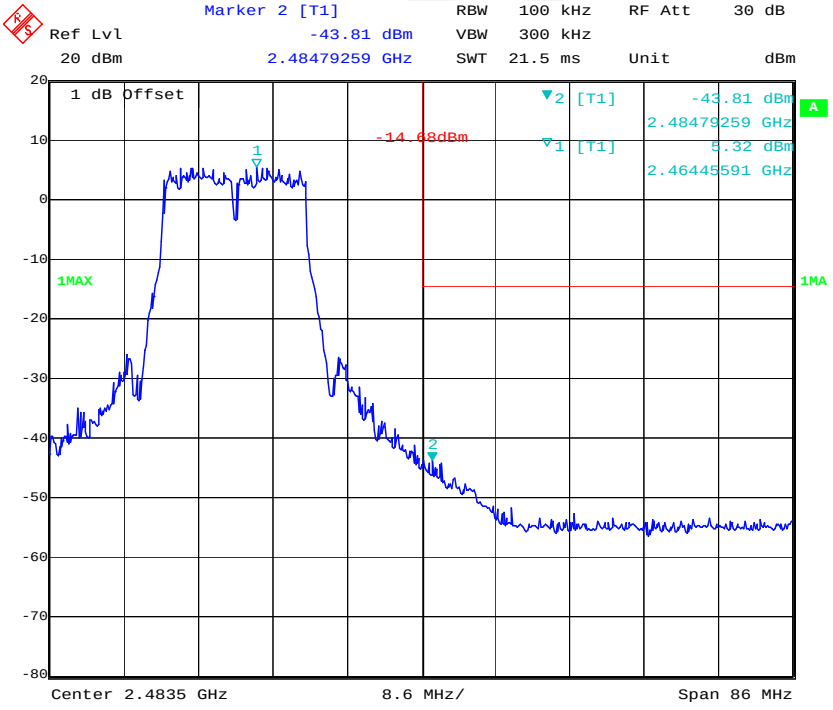
Date: 19.MAY.2017 14:02:24

Chain 0, 802.11g: Band Edge, Left Side



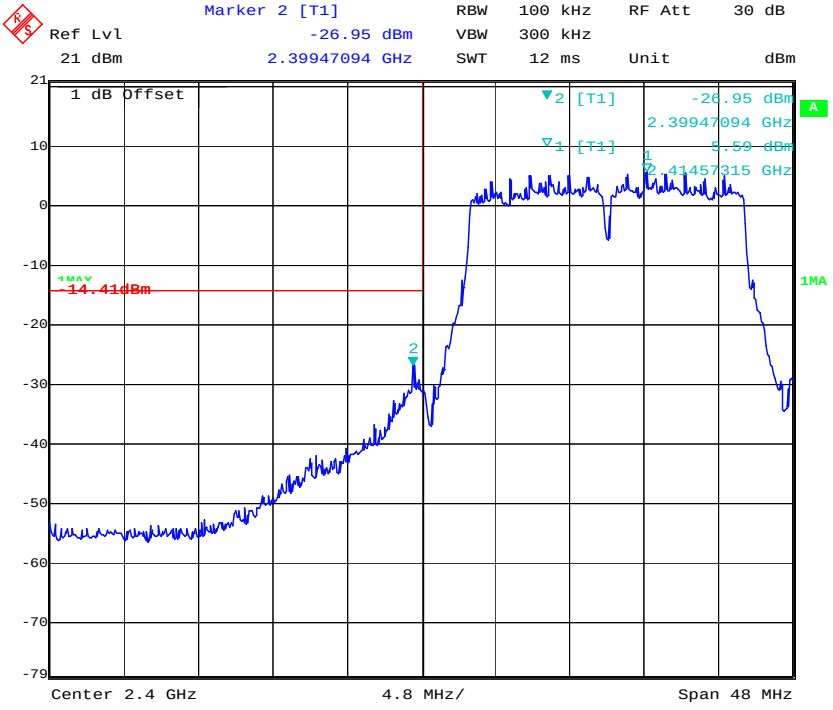
Date: 19.MAY.2017 13:54:29

Chain 0, 802.11g: Band Edge, Right Side



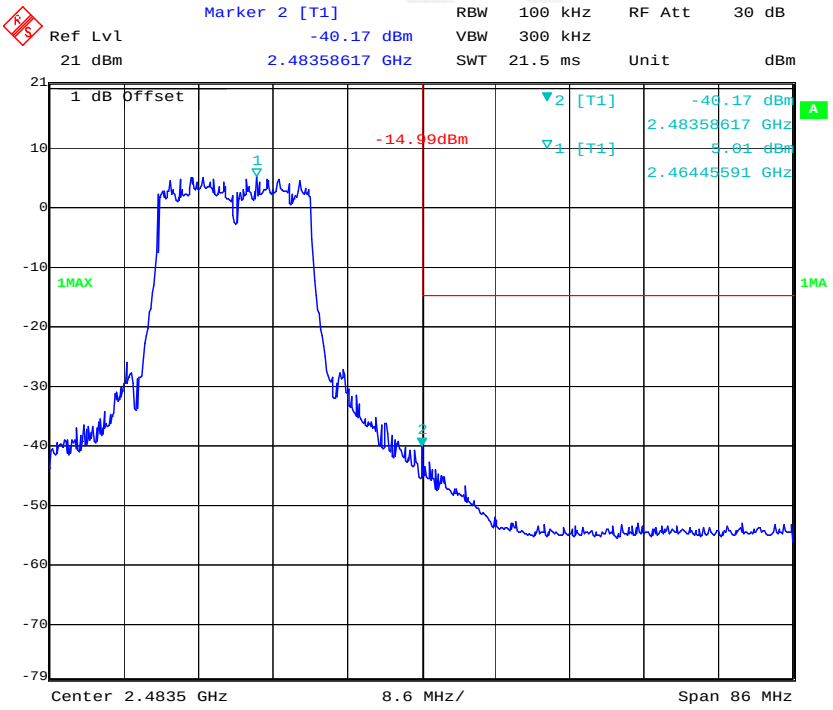
Date: 19.MAY.2017 14:00:26

Chain 0, 802.11n ht20 Band Edge, Left Side



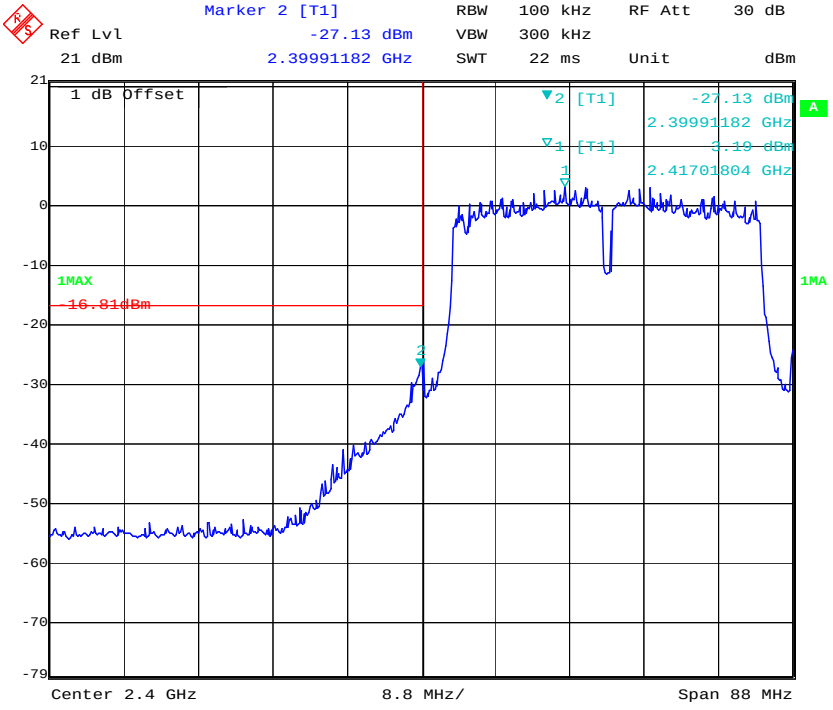
Date: 17.MAY.2017 21:10:49

Chain 0, 802.11n ht20 Band Edge, Right Side



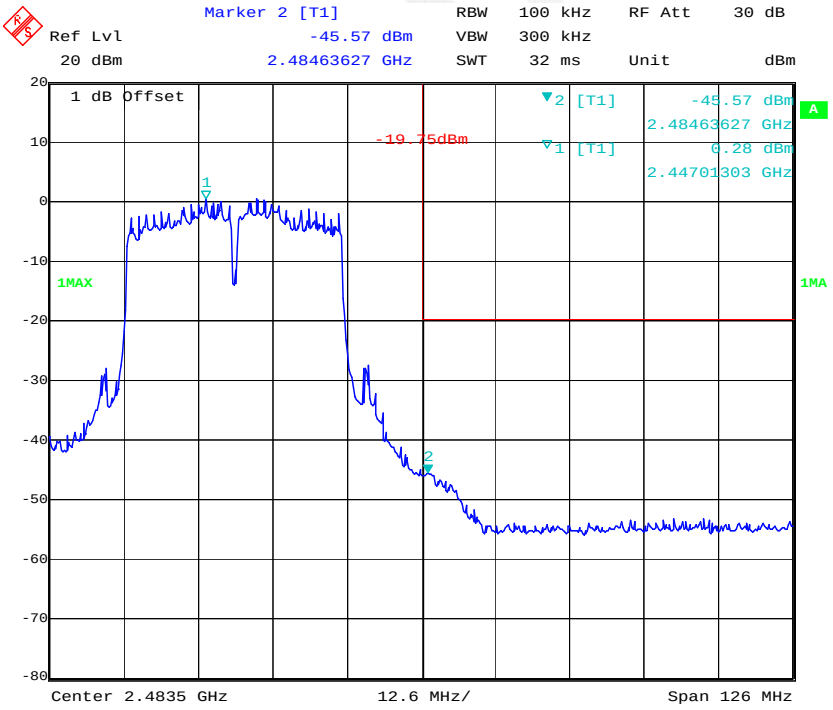
Date: 17.MAY.2017 21:14:55

Chain 0, 802.11n ht40 Band Edge, Left Side



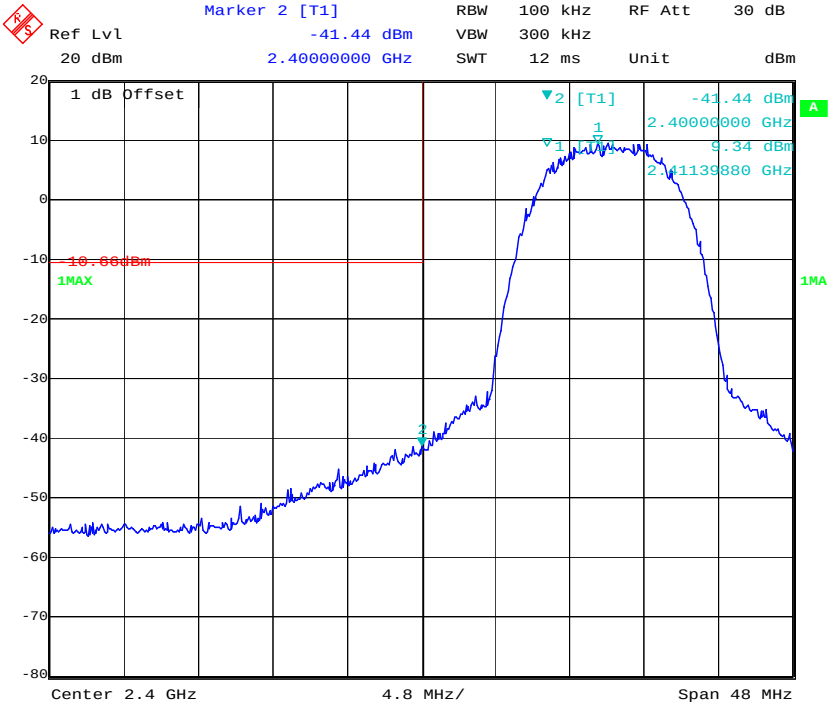
Date: 17.MAY.2017 21:08:41

Chain 0, 802.11n ht40 Band Edge, Right Side



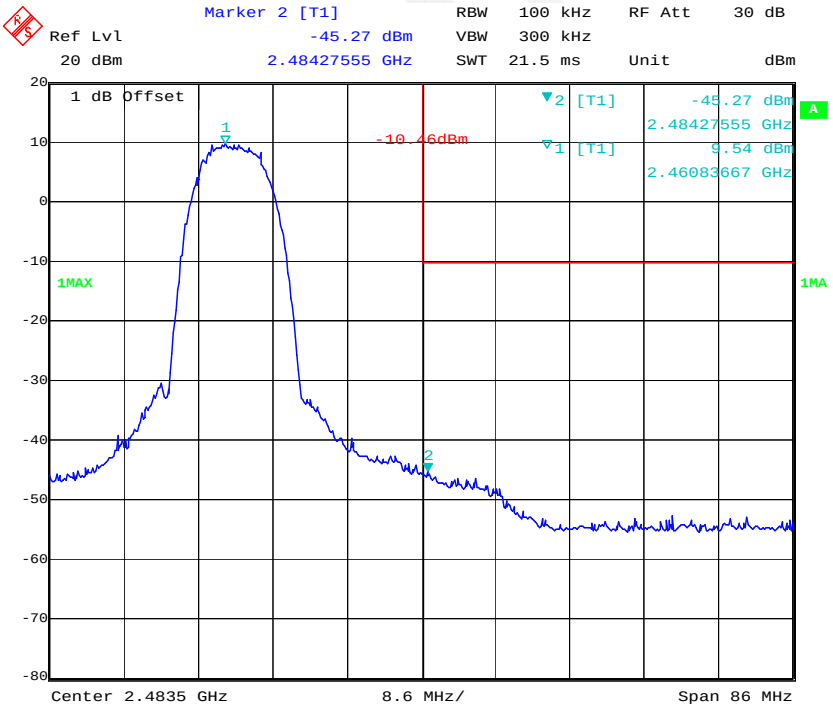
Date: 19.MAY.2017 14:09:18

Chain 1, 802.11b: Band Edge, Left Side



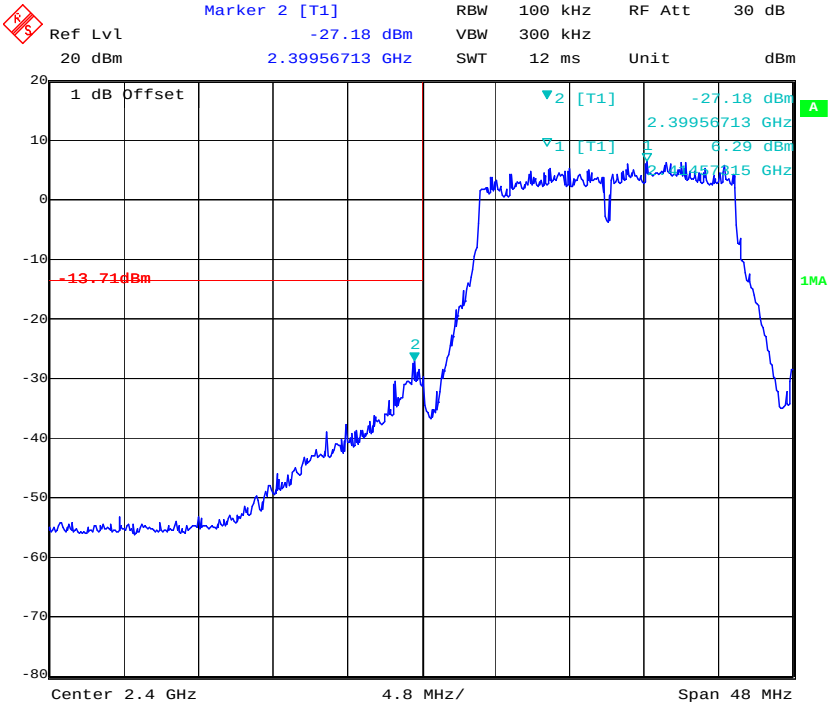
Date: 19.MAY.2017 13:37:21

Chain 1, 802.11b: Band Edge, Right Side



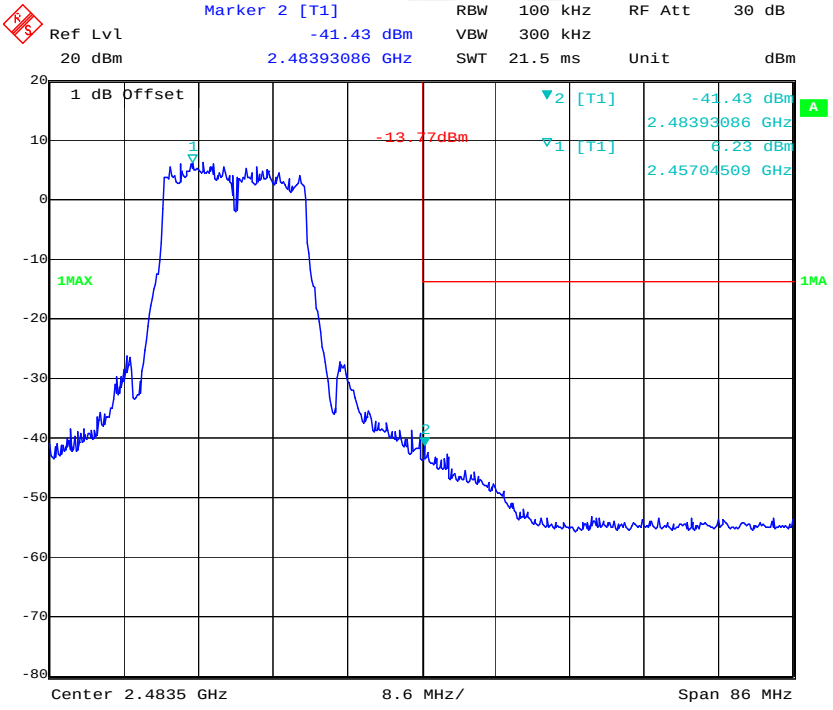
Date: 19.MAY.2017 13:41:30

Chain 1, 802.11g: Band Edge, Left Side



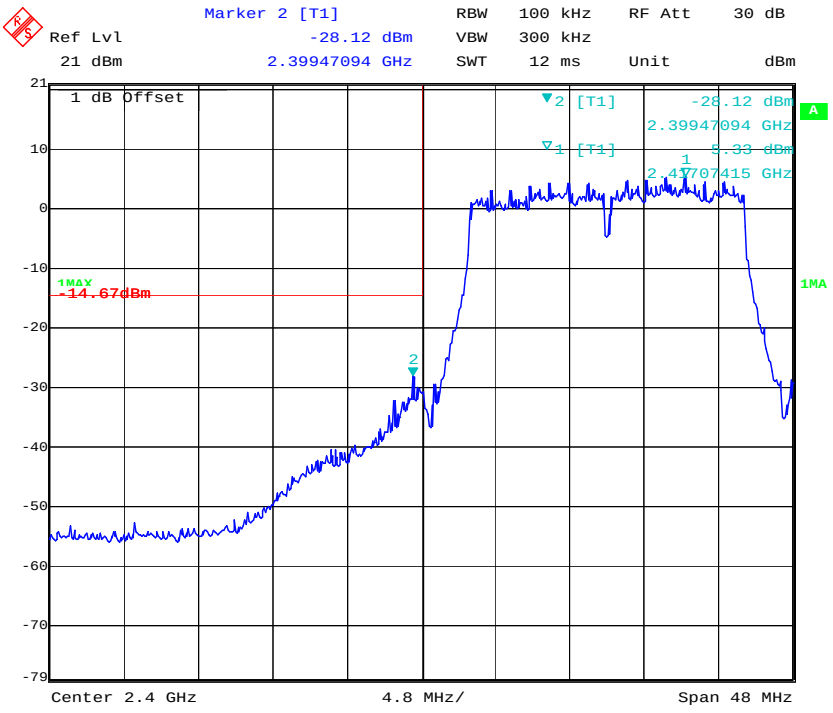
Date: 19.MAY.2017 13:47:50

Chain 1, 802.11g: Band Edge, Right Side

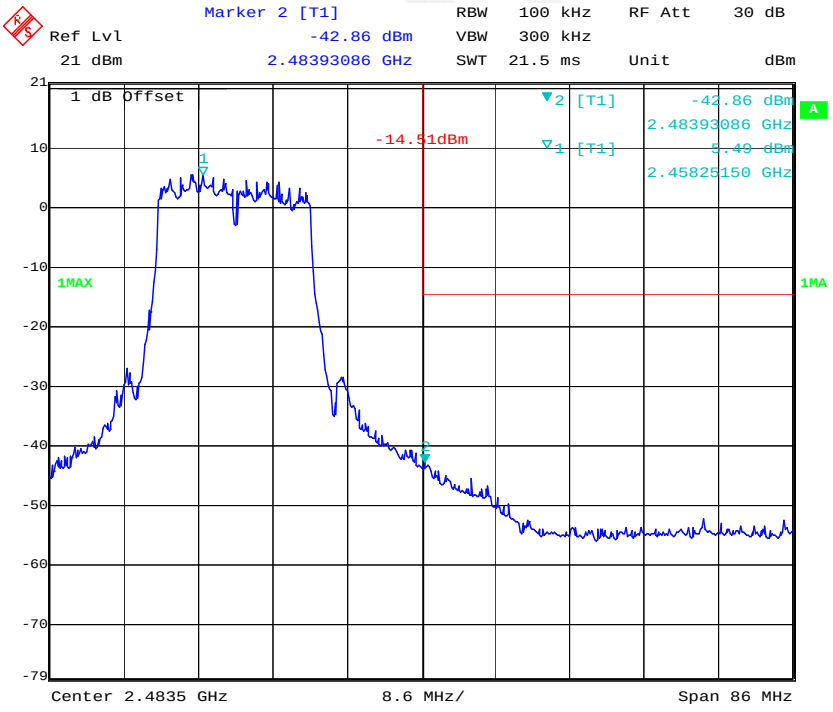


Date: 19.MAY.2017 13:43:38

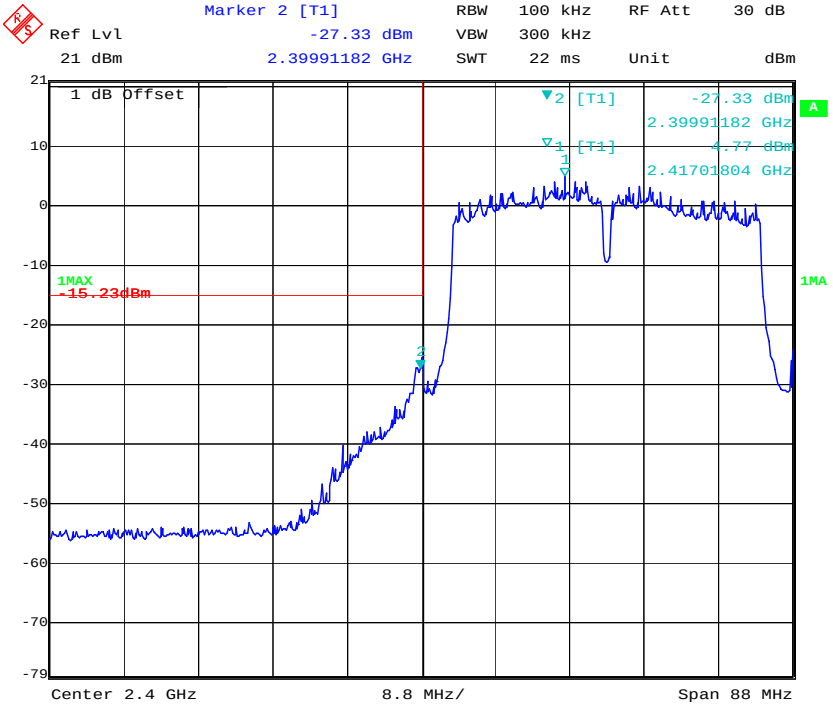
Chain 1, 802.11n ht20 Band Edge, Left Side



Chain 1, 802.11n ht20 Band Edge, Right Side

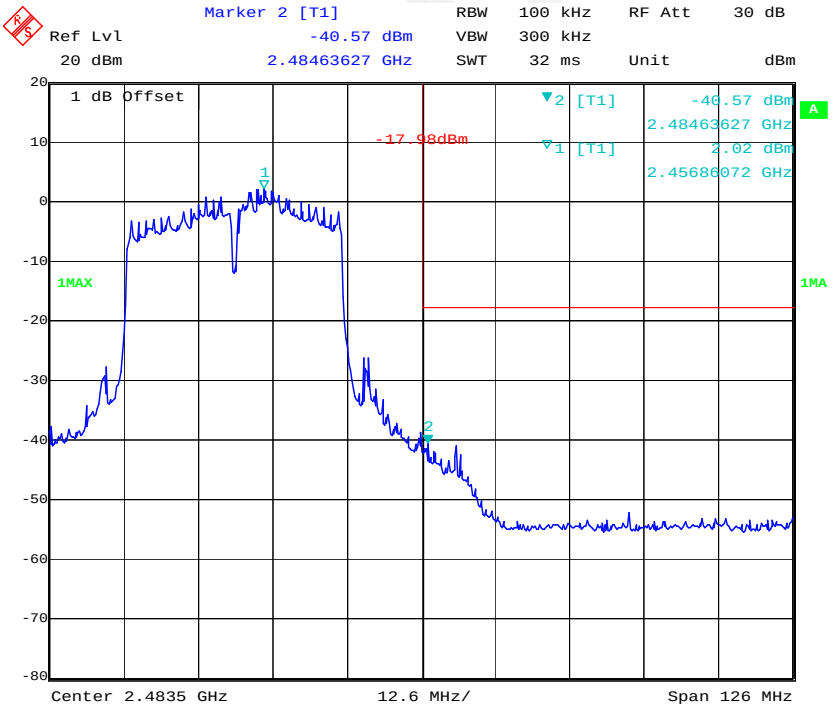


Chain 1, 802.11n ht40 Band Edge, Left Side



Date: 17.MAY.2017 21:25:51

Chain 1, 802.11n ht40 Band Edge, Right Side



Date: 19.MAY.2017 14:29:00

FCC §15.247(e) & RSS-247 §5.2 b)- POWER SPECTRAL DENSITY

Applicable Standard

According to FCC§15.247(e):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.

According to RSS-247 §5.2 b):

b) The transmitter power spectral density conducted from the transmitter 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 section 5.4(d), (i.e. the power spectral density shall be determined using the same method as is used to determine the conducted output power).

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:	26.7~28.5 °C
Relative Humidity:	50~54 %
ATM Pressure:	95.8~100.1 kPa

** The testing was performed by Lorin Bian from 2017-05-17 to 2017-05-19.*

Test Mode: Transmitting

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

Test mode	Channel	Frequency (MHz)	PSD (dBm/3kHz)		Total (dBm/3kHz)	Limit (dBm/3kHz)
			Chain 0	Chain 1		
802.11b	Low	2412	-5.81	-5.17	/	≤8
	Middle	2437	-4.79	-5.37	/	≤8
	High	2462	-5.23	-4.83	/	≤8
802.11g	Low	2412	-8.63	-8.19	/	≤8
	Middle	2437	-8.39	-10	/	≤8
	High	2462	-8.91	-8.31	/	≤8
802.11n ht20	Low	2412	-8.98	-9.76	-6.34	≤8
	Middle	2437	-9.44	-10.14	-6.77	≤8
	High	2462	-9.43	-9.23	-6.32	≤8
802.11n ht40	Low	2422	-10.91	-11.29	-8.09	≤8
	Middle	2437	-10.26	-11.75	-7.93	≤8
	High	2452	-13.32	-12.92	-10.11	≤8

Note: the antenna maximum gain are 2.0dBi in 2.4GHz band, and employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

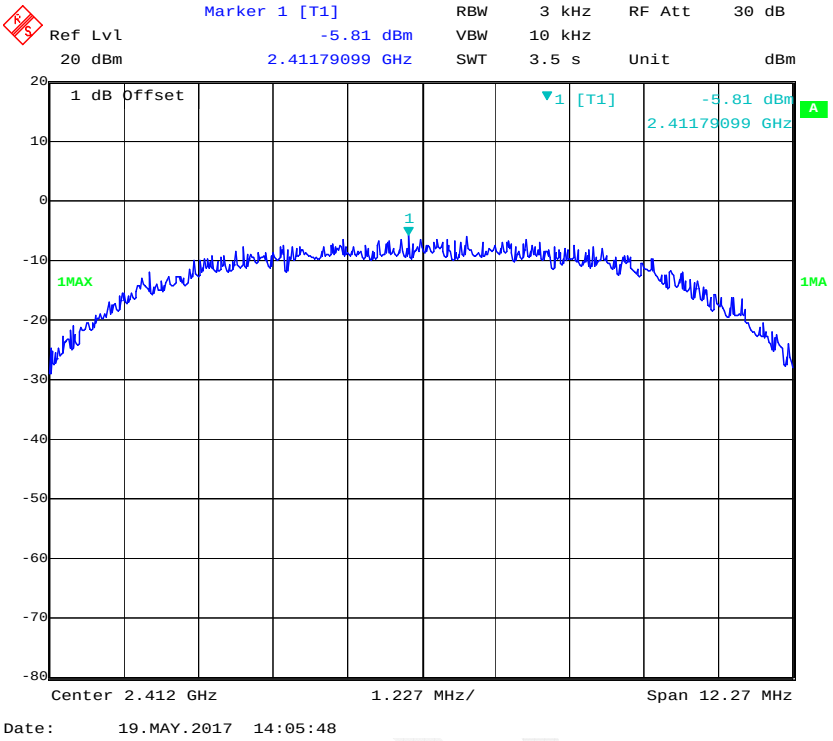
Array Gain = 10 log(NANT/NSS) dB.

So:

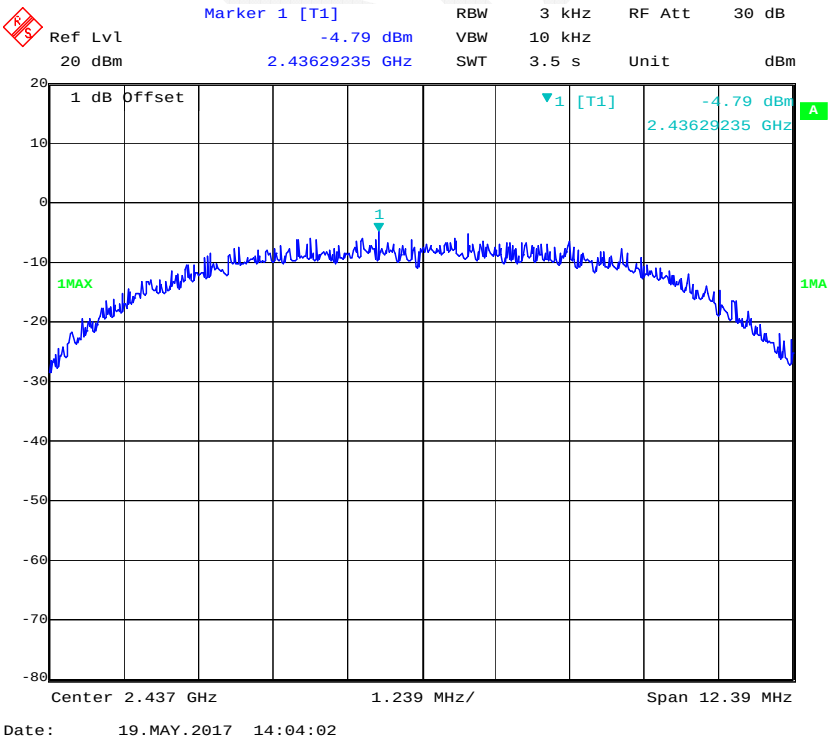
Directional gain = GANT + Array Gain = 2+10*log(2) =5 dBi

Chain 0:

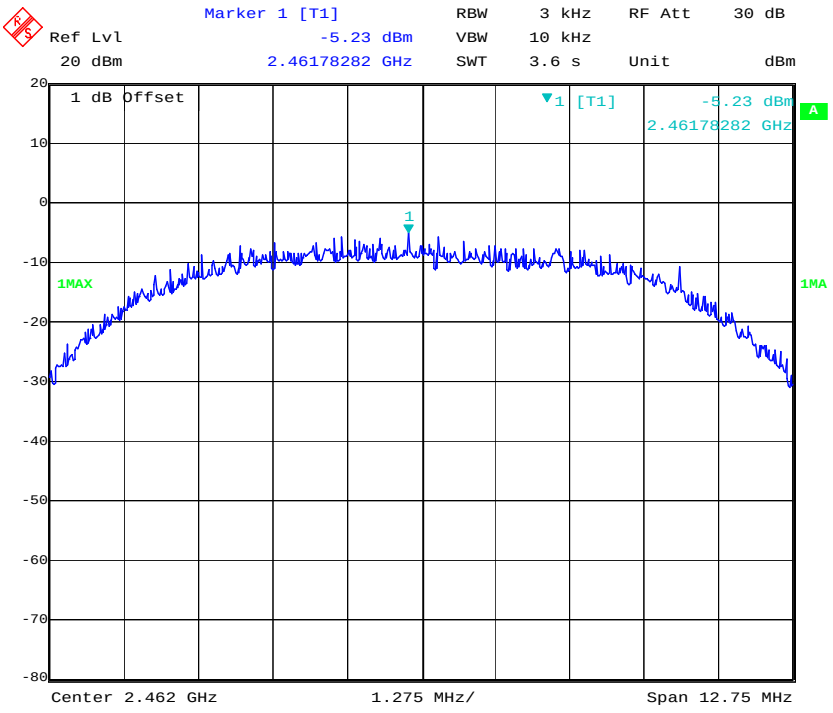
Power Spectral Density, 802.11b Low Channel



Power Spectral Density, 802.11b Middle Channel



Power Spectral Density, 802.11b High Channel



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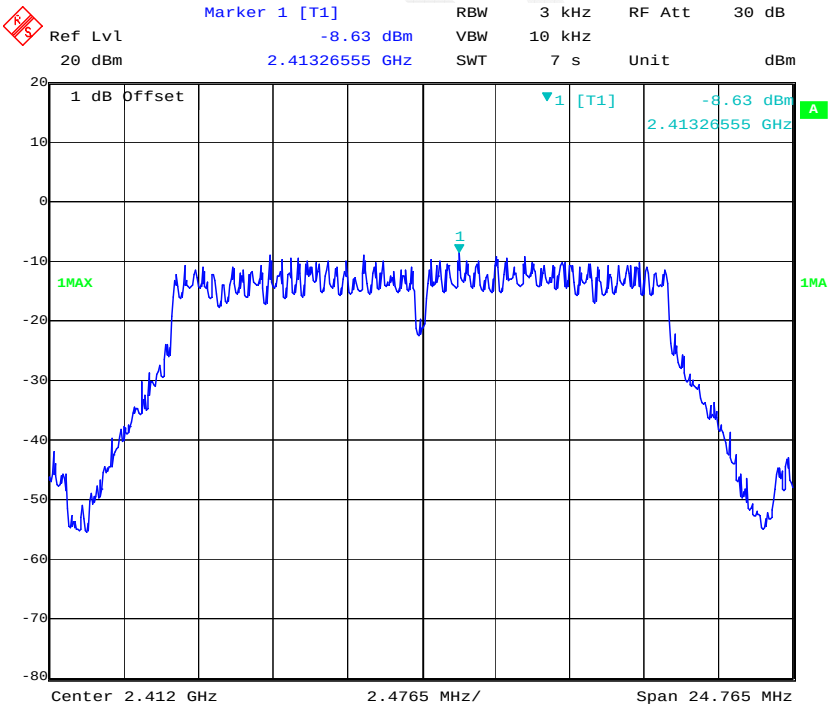
Power Spectral Density, 802.11g Low Channel



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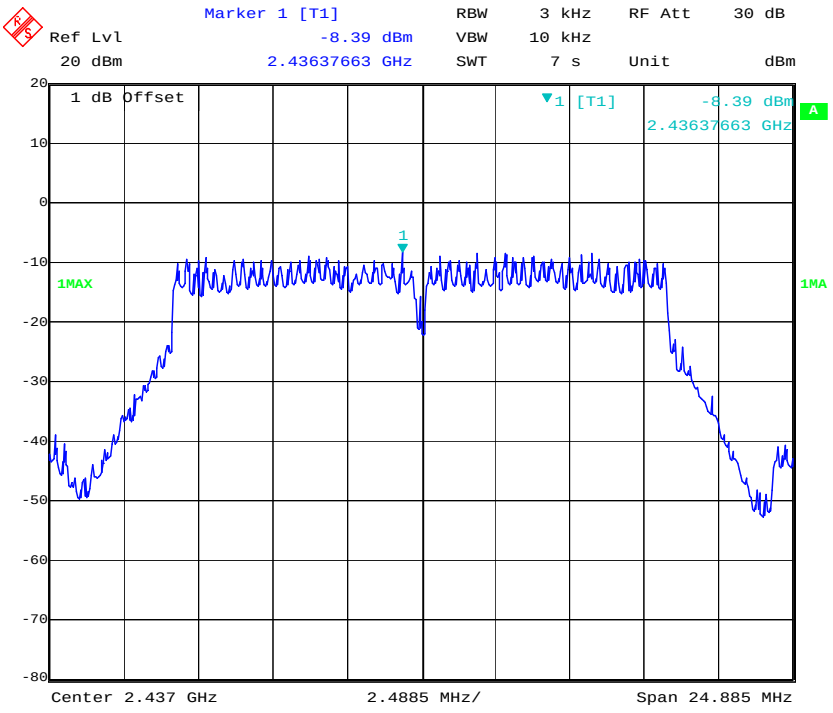
Power Spectral Density, 802.11g Middle Channel



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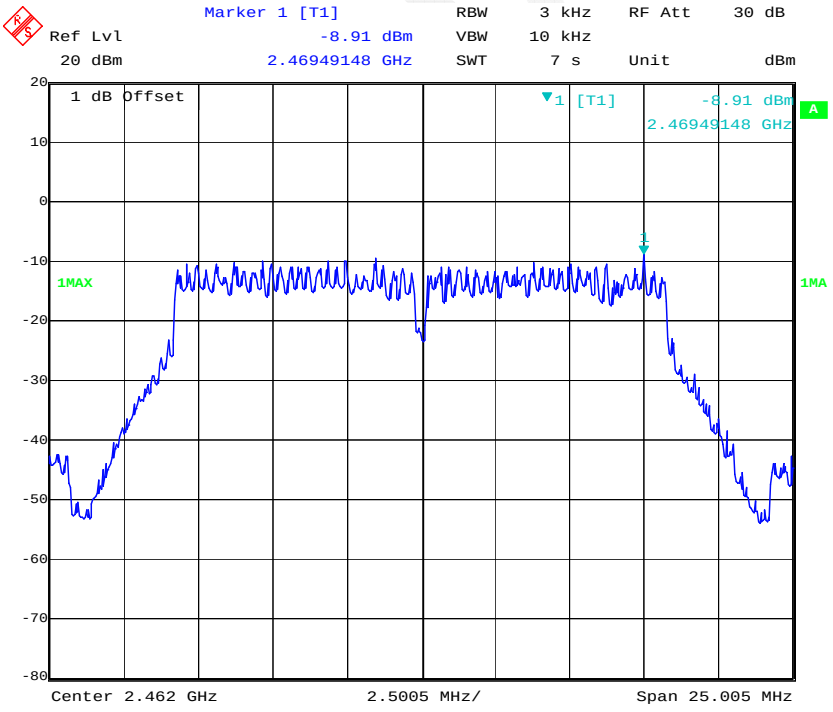
Power Spectral Density, 802.11g High Channel



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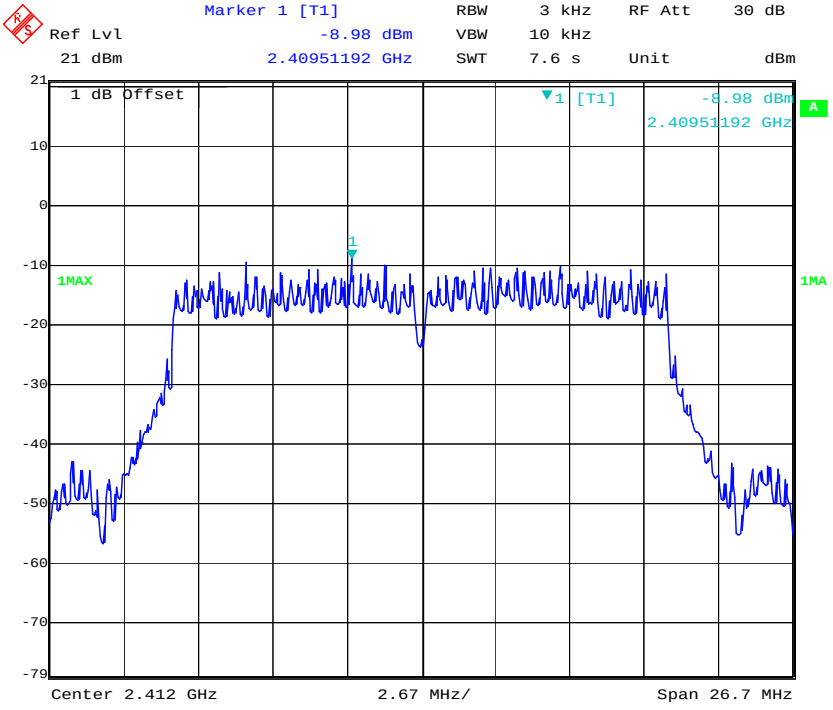
Power Spectral Density, 802.11n ht20 Low Channel



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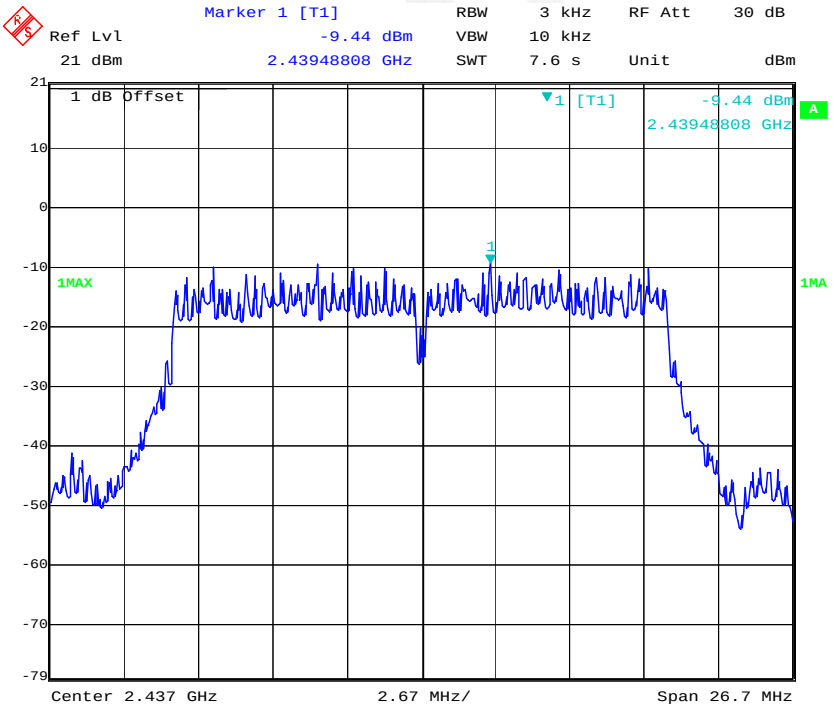
Power Spectral Density, 802.11n ht20 Middle Channel



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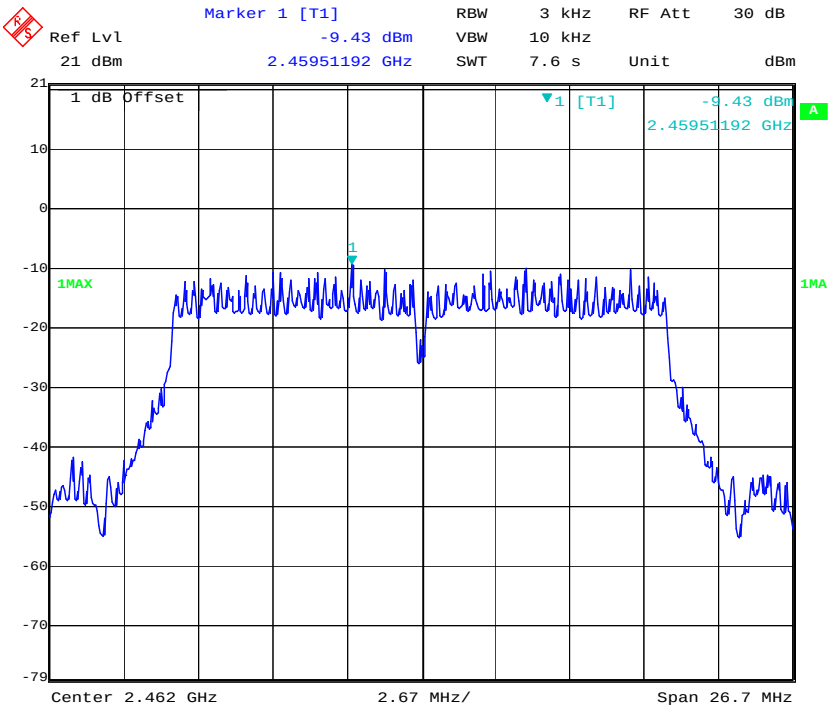
Power Spectral Density, 802.11n ht20 High Channel



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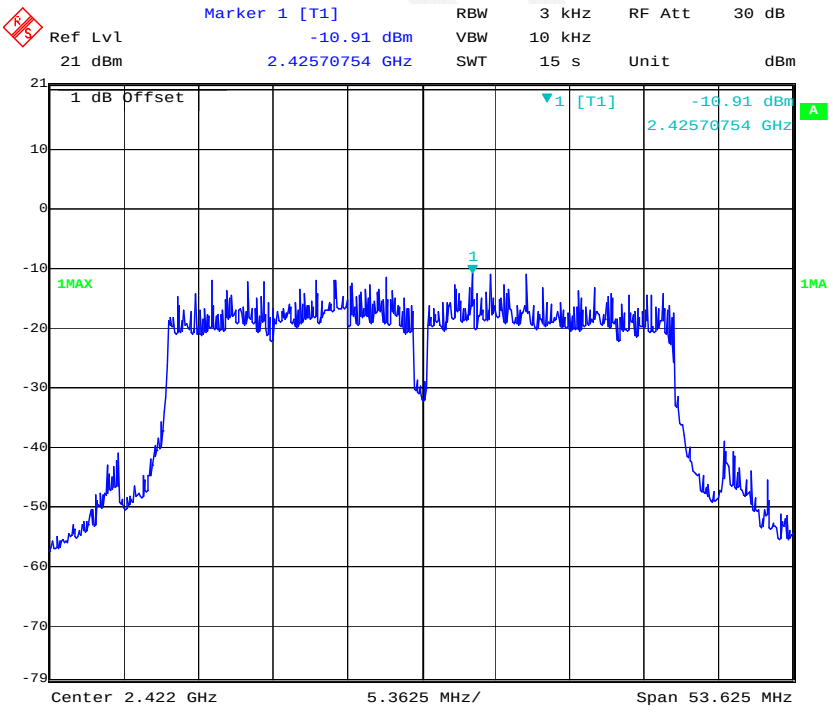
Power Spectral Density, 802.11n ht40 Low Channel



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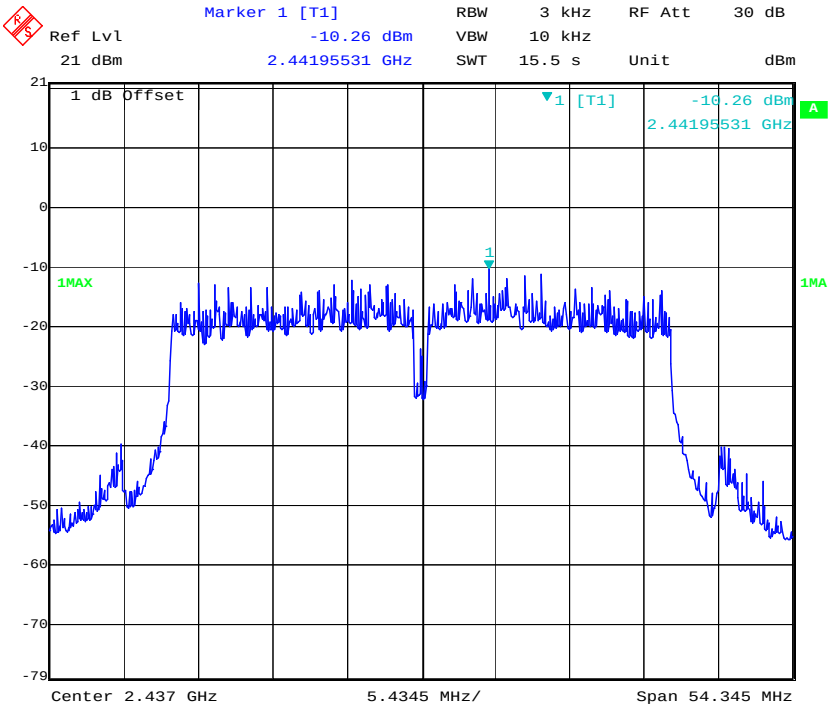
Power Spectral Density, 802.11n ht40 Middle Channel



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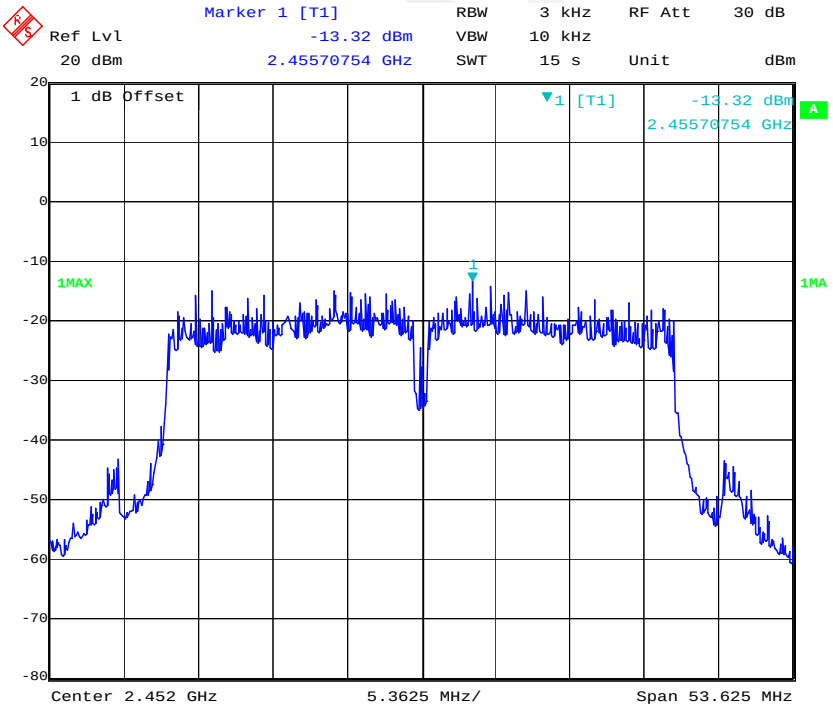
Power Spectral Density, 802.11n ht40 High Channel



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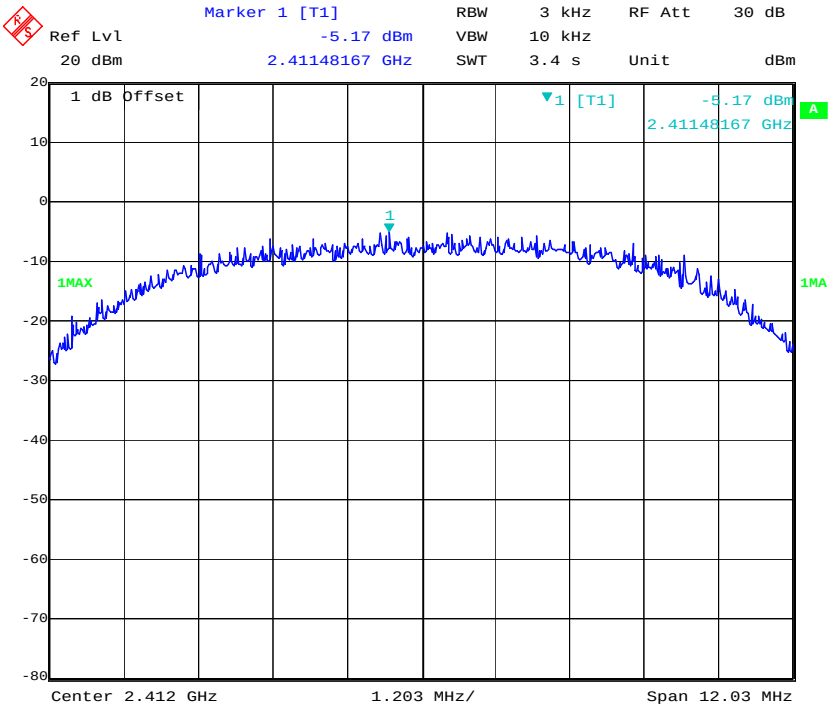
Chain 1

Power Spectral Density, 802.11b Low Channel



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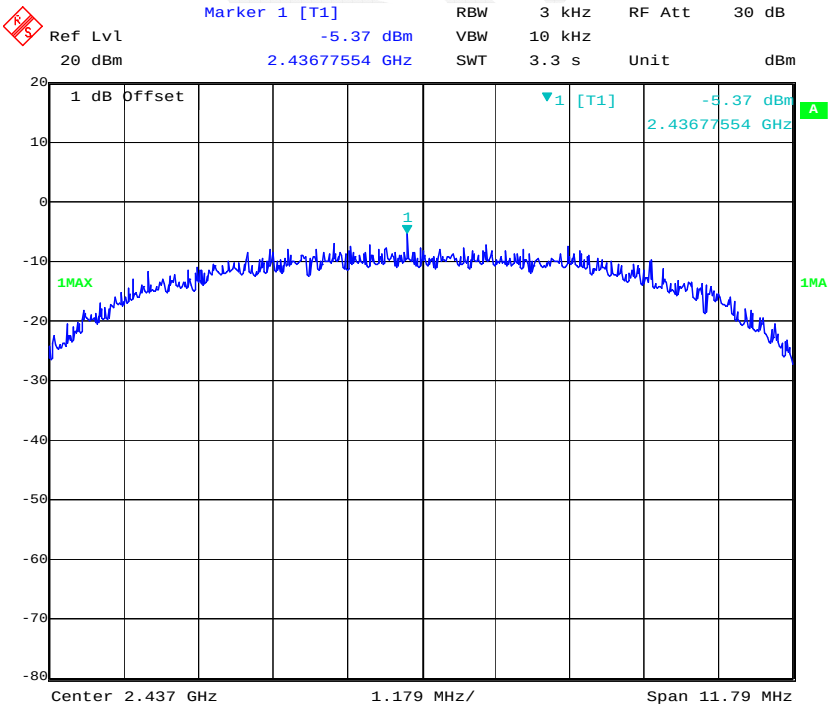
Power Spectral Density, 802.11b Middle Channel



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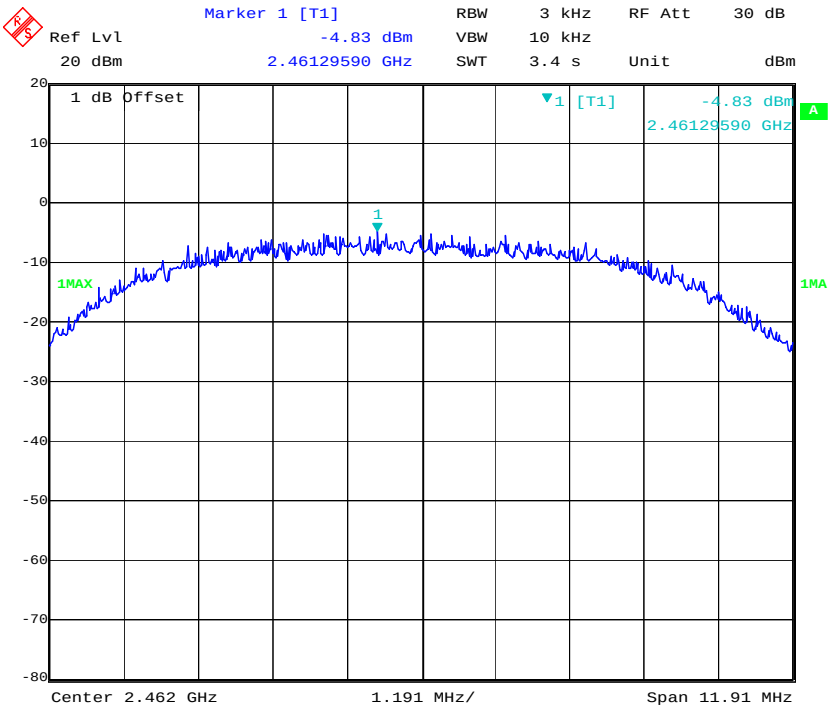
Power Spectral Density, 802.11b High Channel



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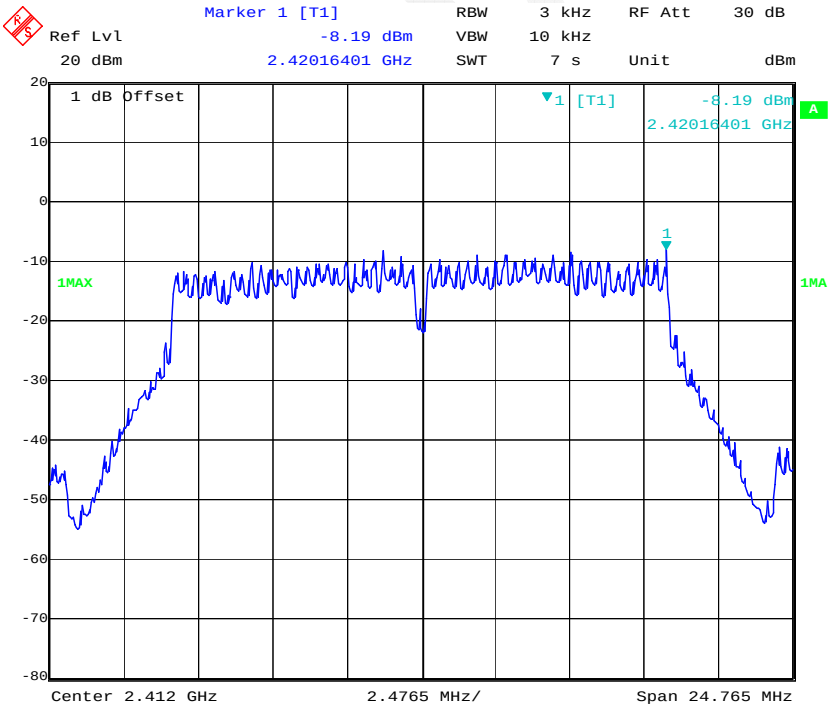
Power Spectral Density, 802.11g Low Channel



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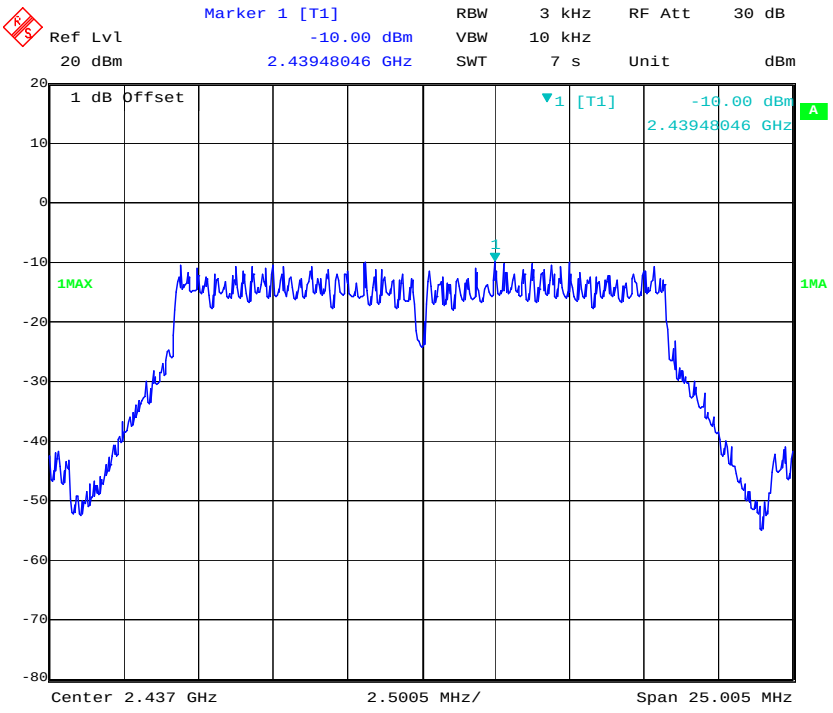
Power Spectral Density, 802.11g Middle Channel



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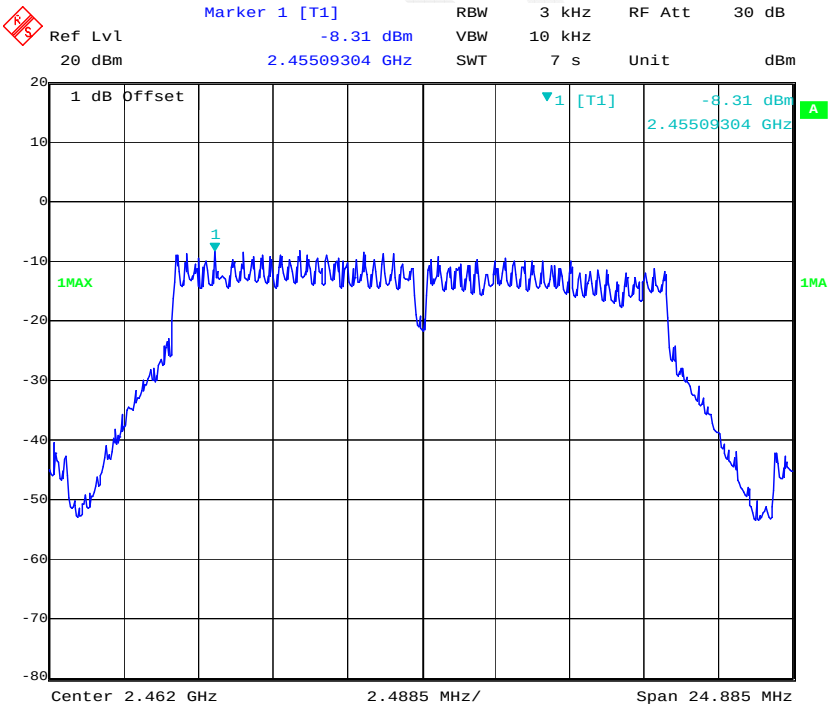
Power Spectral Density, 802.11g High Channel



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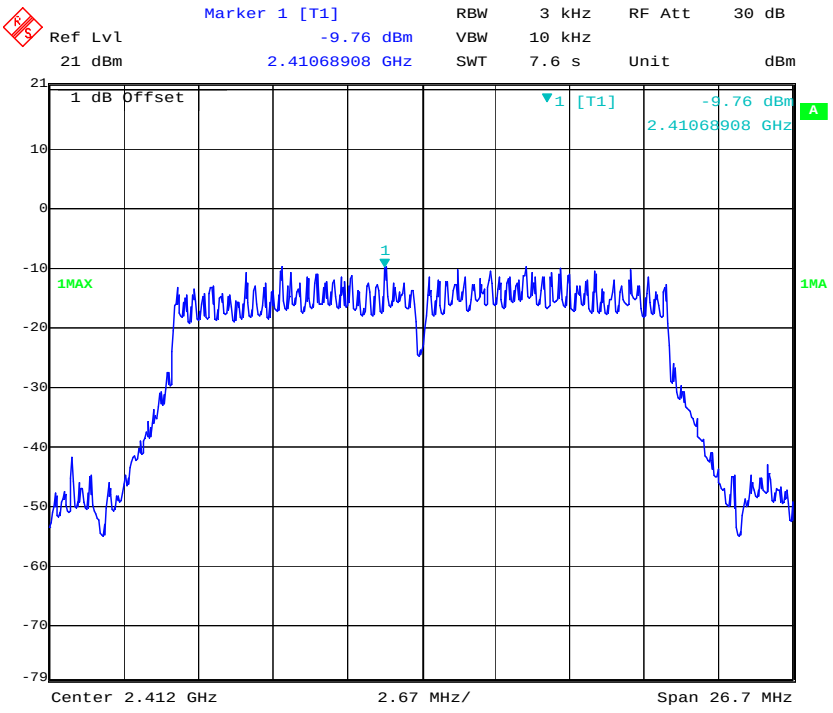
Power Spectral Density, 802.11n ht20 Low Channel



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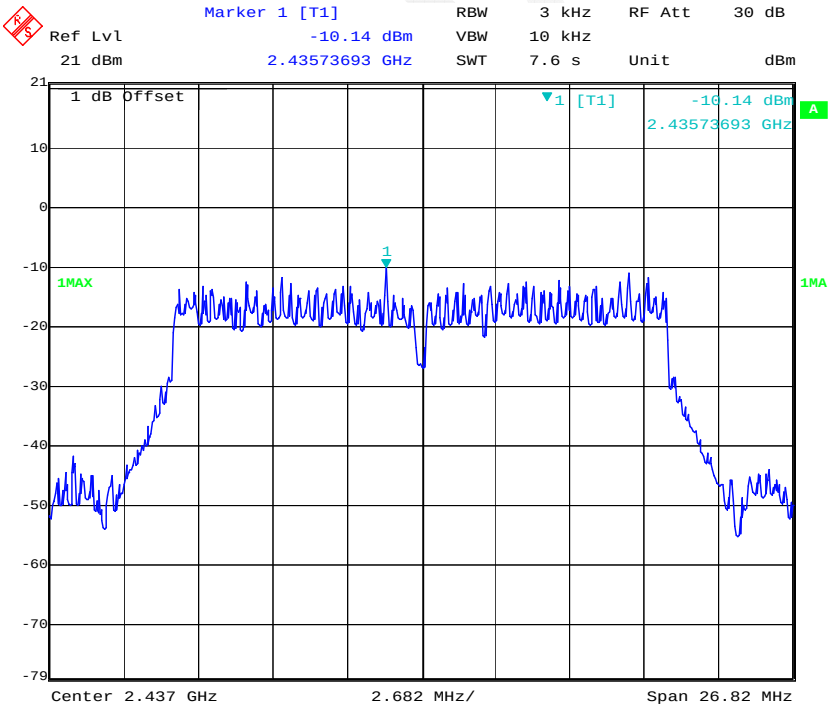
Power Spectral Density, 802.11n ht20 Middle Channel



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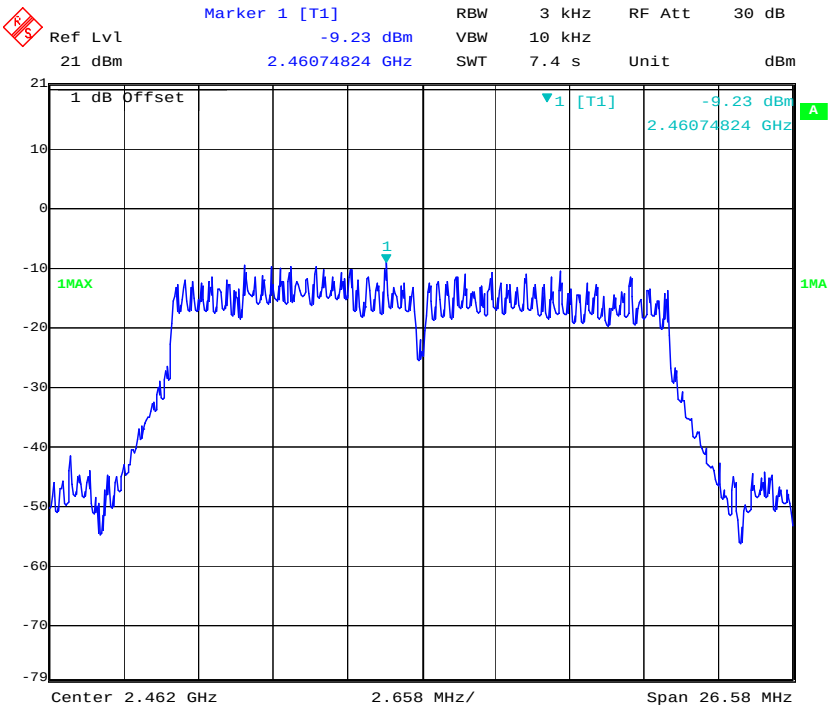
Power Spectral Density, 802.11n ht20 High Channel



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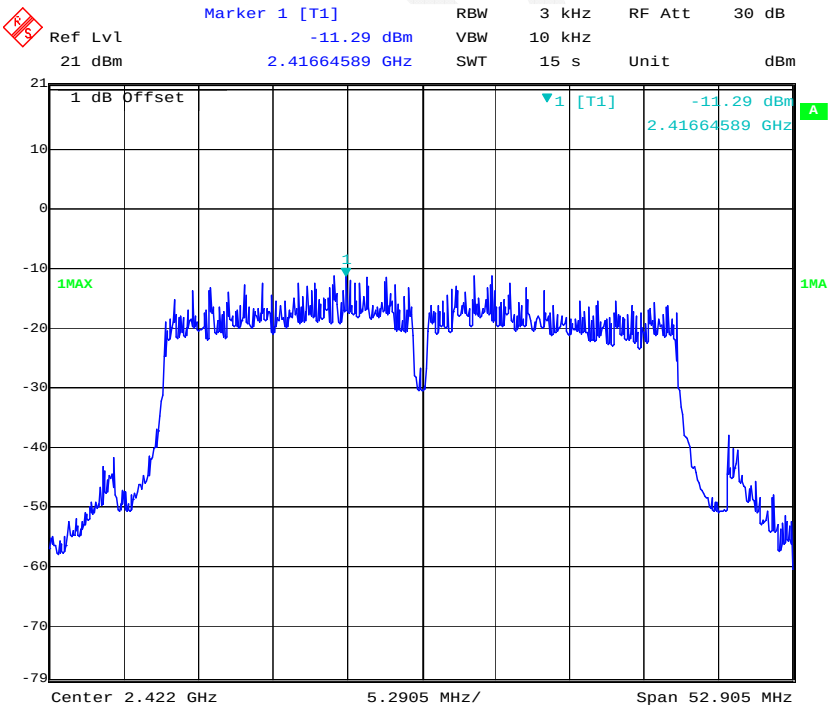
Power Spectral Density, 802.11n ht40 Low Channel



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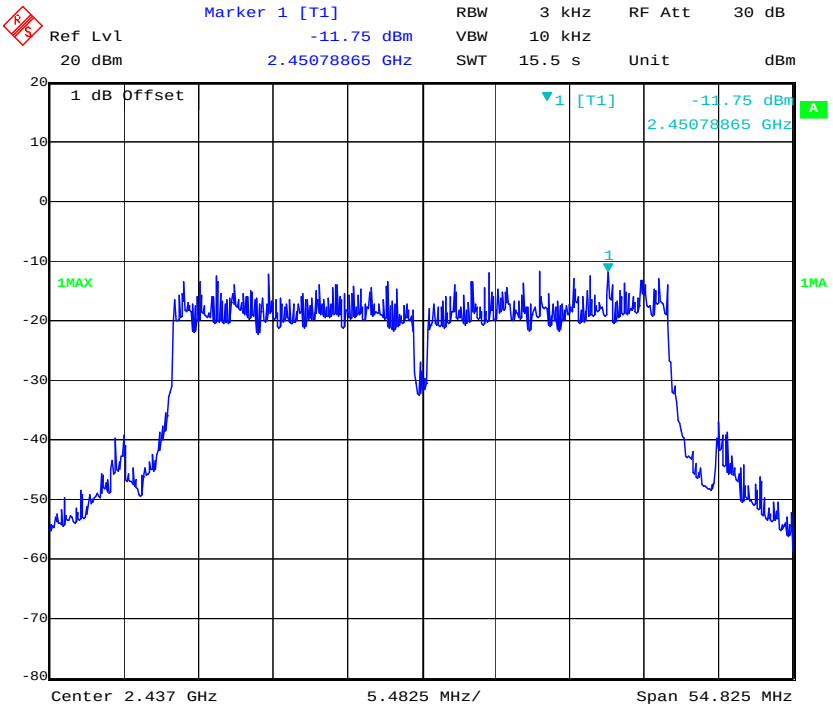
Power Spectral Density, 802.11n ht40 Middle Channel



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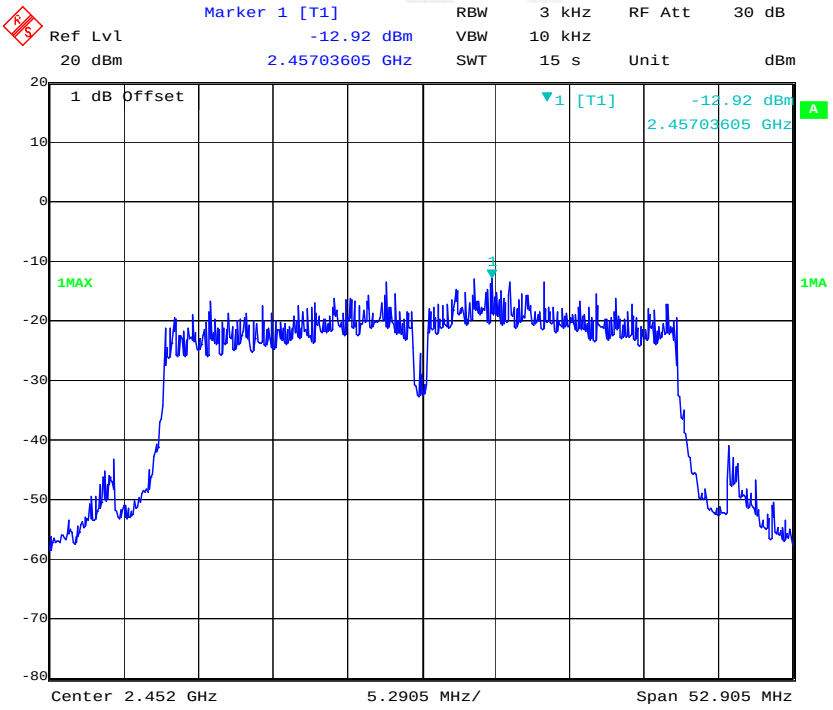
Power Spectral Density, 802.11n ht40 High Channel



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