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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: eA280-135
FCC ID: QISEA280-135
IC: 6369A-EA280135

Report Type: Original Report	Product Name: LTE CPE
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Report Number: RDG161201012B	
Report Date: 2017-05-28	
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F I N A L

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Huawei Technologies Co.,Ltd**'s product, model number: **eA280-135** (**FCC ID: QISEA280-135, IC: 6369A-EA280135**) (the "EUT") in this report was a **LTE CPE**, which was measured approximately: 9.5 cm (D) x 21 cm (H), rated input voltage: DC12.0V from adapter.

Switching power adapter information:

MODEL: HW-120200U6W

INPUT: 100-240V~50/60Hz, 0.8A

OUTPUT: DC12.0V 2.0A

**All measurement and test data in this report was gathered from final production sample, serial number: 161201012 (assigned by the BAACL, Chengdu). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2016-12-01, 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/15E NII/Part 27 TNB /Part 90 TNB submissions with FCC ID: QISEA280-135. RSS-195/ RSS-197/ RSS-199/RSS-247 LE-LAN submissions with IC: 6369A-EA280135.

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", KDB 558074 D01 DTS Meas Guidance v04 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: ± 5.13 dB; and,
6 GHz to 40 GHz: ± 5.47 dB.

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 2.4GHz, 5GHz double band WLAN.

For 2.4G band WLAN, 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 802.11n ht20 modes were tested with Channel 1, 6 and 11. For 802.11n ht40 mode was 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

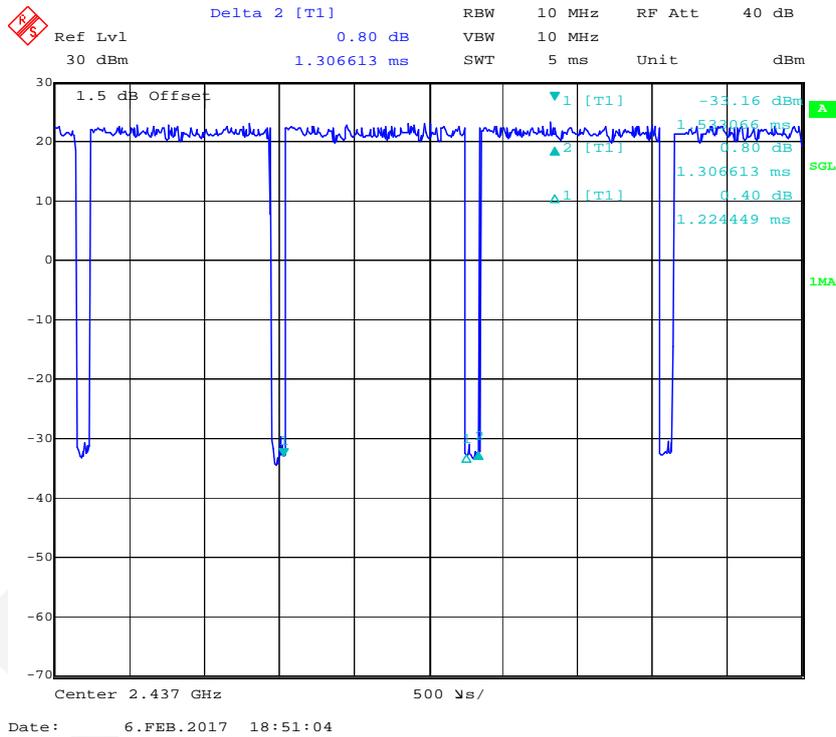
The software "IPOR" was used for testing, and the commands were provided by manufacturer. The maximum power and duty cycle was set by commands as following table:

Software and version			IPOR		
Mode	Channel	Frequency (MHz)	Data Rate	Power Level	
			(Mbps)	Chain 0	Chain 1
802.11 b	Low	2412	1	16	16
	Middle	2437	1	16	16
	High	2462	1	16	16
802.11 g	Low	2412	6	16	16
	Middle	2437	6	16	16
	High	2462	6	16	16
802.11n ht20	Low	2412	MCS8	62	62
	Middle	2437	MCS8	62	62
	High	2462	MCS8	62	62
802.11n ht40	Low	2422	MCS8	62	62
	Middle	2437	MCS8	62	62
	High	2452	MCS8	62	62

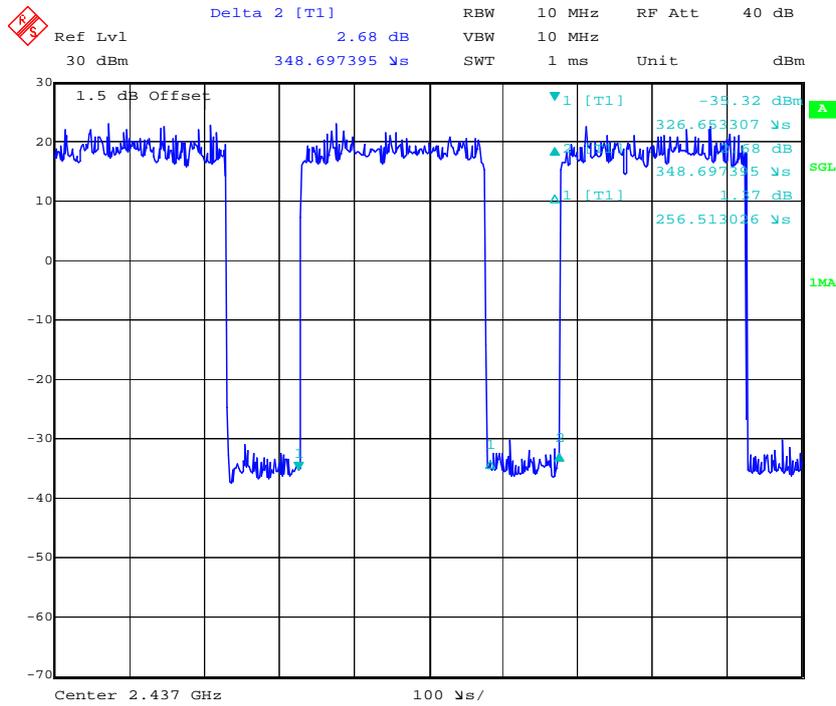
The duty cycle as below:

Mode	T _{on} (ms)	T _{on+off} (ms)	Duty Cycle (%)	Minimum Transmission Duration (T) (ms)
802.11b	1.22	1.31	93	1.22
802.11g	0.257	0.349	74	0.257
802.11n ht20	0.098	0.140	70	0.098
802.11n ht40	0.068	0.110	62	0.068

802.11b

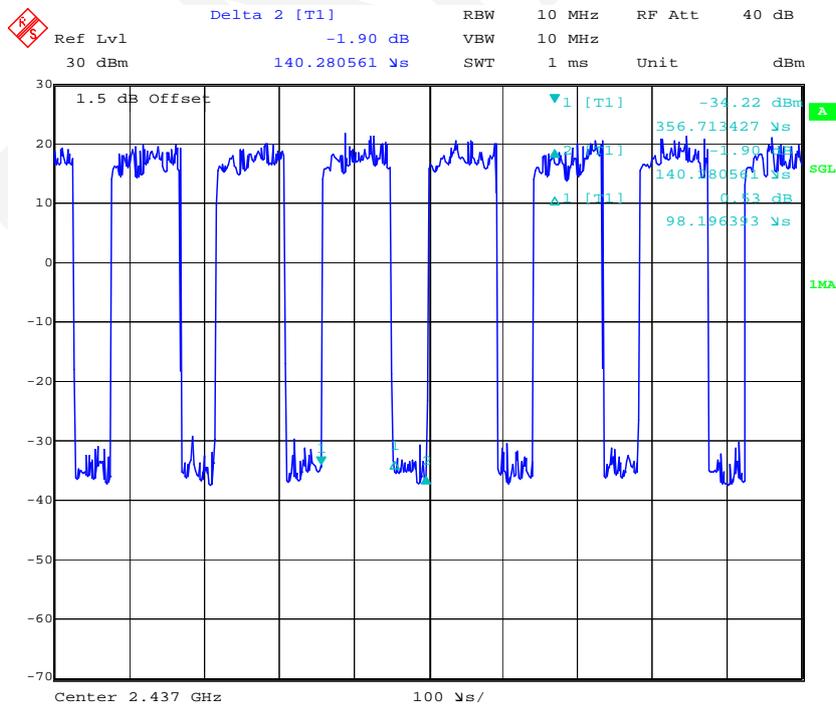


802.11g



Date: 6.FEB.2017 18:49:38

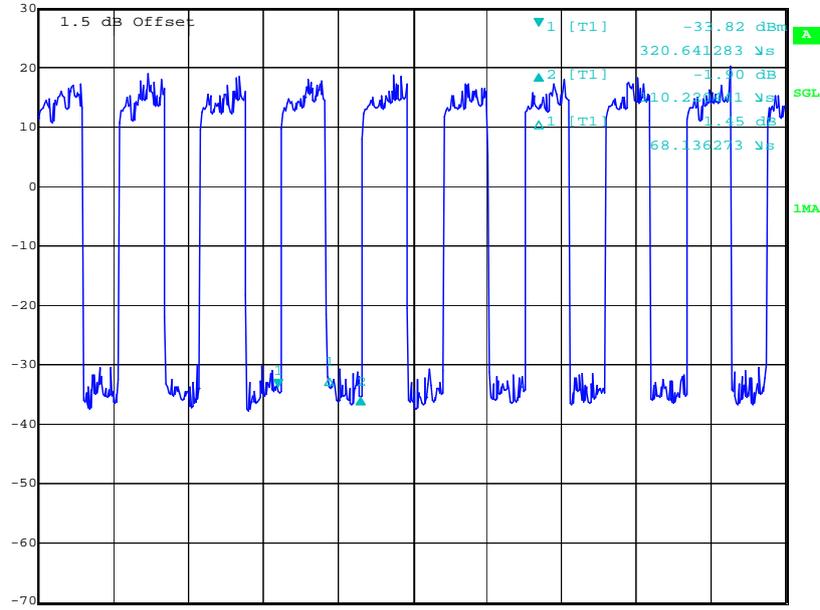
802.11n ht20



Date: 6.FEB.2017 18:53:22

802.11n ht40

 Delta 2 [T1] RBW 10 MHz RF Att 40 dB
Ref Lvl -1.90 dB VBW 10 MHz
30 dBm 110.220441 μ s SWT 1 ms Unit dBm



Date: 6.FEB.2017 18:54:13

FEM

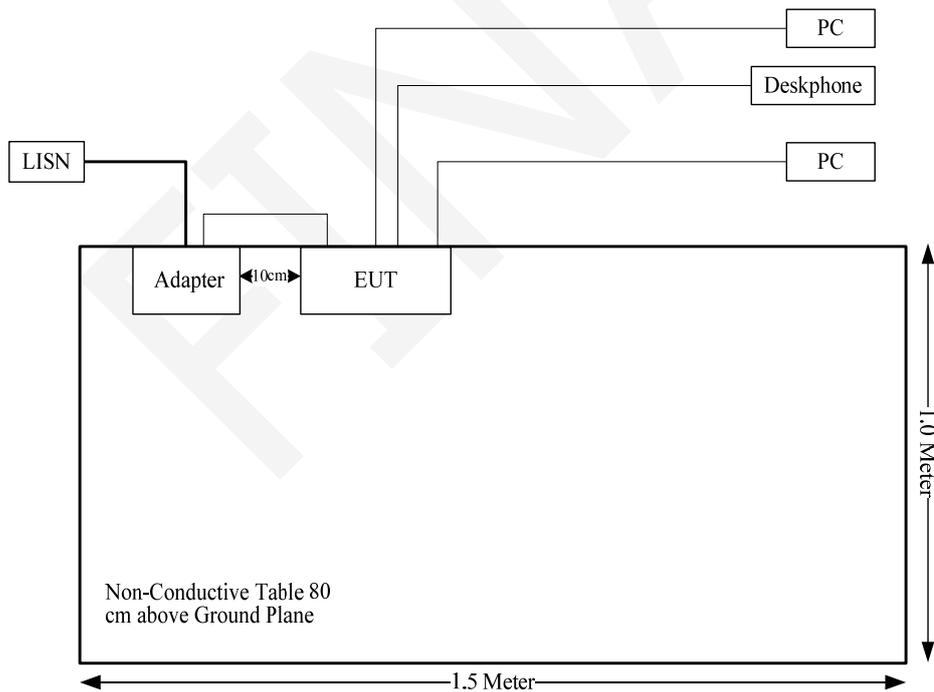
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
IBM	PC	8176	99Y7315
AVAYA	Deskphone	6408D+	041654712819
IBM	PC	8176	99Y7872

External Cable

Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
RJ11 Cable	No	No	10	EUT	Deskphone
RJ45 Cable*2	No	No	10	EUT	PC
DC Cable	No	No	1.5	Adapter	EUT

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 Permissible 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/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500	/	/	f/1500	30
1500–100,000	/	/	1.0	30

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

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

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)
0.003-10 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	3.142 f ^{0.3417}	0.008335 f ^{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	0.158 f ^{0.5}	4.21 x 10 ⁻⁴ f ^{0.5}	6.67 x 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/cm²);

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		Tune-up Power		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	20.00	0.1990	1.99	1.0	5.37
WLAN 5GHz	5150-5850	2	1.58	18	63.10	20.00	0.02	0.2	1.0	9.05
LTE Band 7	2500-2570	3	2.00	24	251.19	20.00	0.10	1.0	1.0	5.50
LTE Band 40	2305-2315	3	2.00	19	79.43	20.00	0.032	0.32	1.0	5.20
	2350-2360	3	2.00	19	79.43	20.00	0.032	0.32	1.0	5.27
LTE Band 41	2500-2690	3	2.00	25	316.23	20.00	0.1256	1.256	1.0	5.49
LTE Band 43	3650-3700	3	2.00	23	199.53	20.00	0.0792	0.792	1.0	7.12

The WLAN 2.4GHz, 5GHz and LTE can transmit simultaneously:

For FCC:

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

$$= S_{2.4}/S_{limit-2.4} + S_5/S_{limit-5} + S_{LTE}/S_{limit-LTE}$$

$$= 0.199/1 + 0.02/1 + 0.1256/1$$

$$= 0.3446$$

$$< 1.0$$

For RSS-102:

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

$$\begin{aligned} &= S_{2.4}/S_{limit-2.4} + S_5/S_{limit-5} + S_{LTE}/S_{limit-LTE} \\ &= 1.99/5.37 + 0.2/9.05 + 1.256/5.49 \\ &= 0.621 \\ &< 1.0 \end{aligned}$$

Result: Compliance, The device meets MPE requirement for Devices Used by the General Public (Uncontrolled Environment) at distance ≥ 20 cm.

FINAL

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.	Manufacturer	Model	Antenna Type	Connector	Frequency Range/Antenna Gain
Chain 0	HI-tronics	N/A	Internal PCB	IPEX	2.4GHz Band/2.0dBi 5GHz Band/2.0dBi
Chain 1	HI-tronics	N/A	Internal PCB	IPEX	2.4GHz Band/2.0dBi 5GHz Band/2.0dBi

Result: Compliance. Please refer to the EUT photos

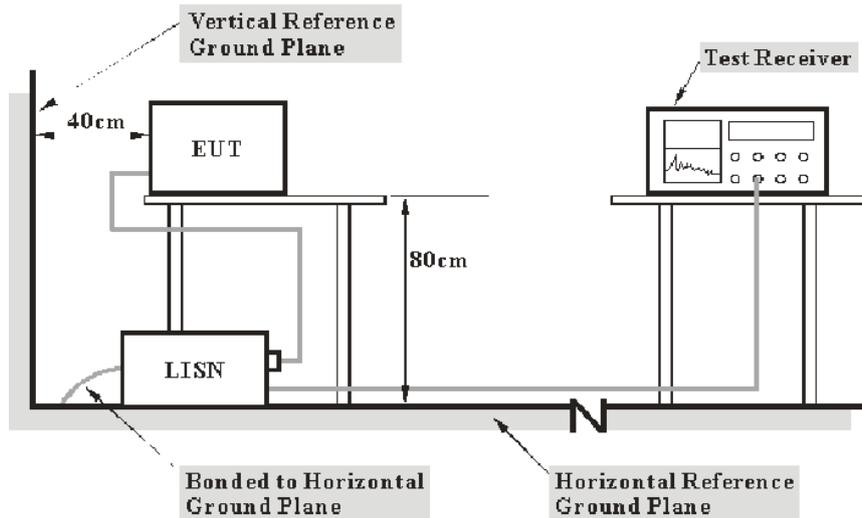
FEMVAL

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 limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

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:** BA CL(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

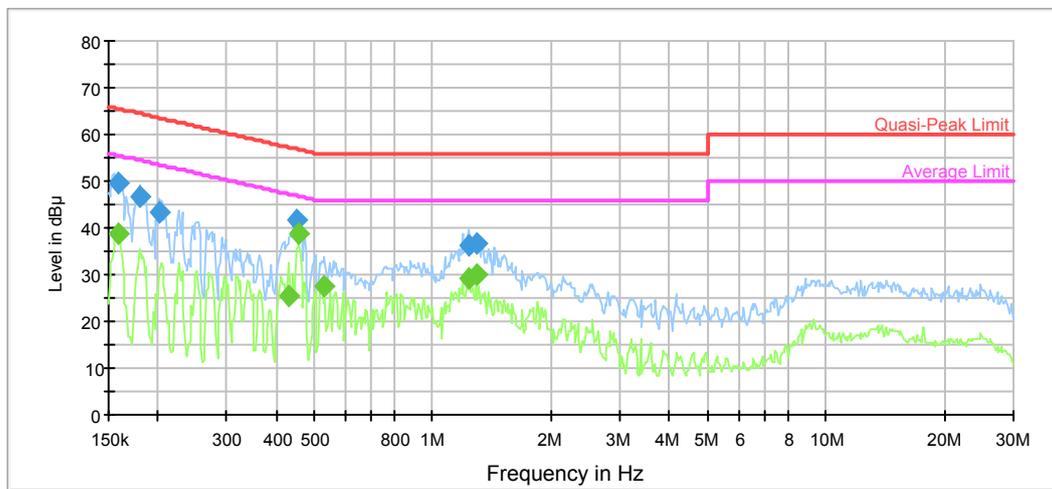
Environmental Conditions

Temperature:	17 °C
Relative Humidity:	52 %
ATM Pressure:	96.8 kPa

The testing was performed by Lorin Bian on 2017-02-08.

Test Mode: Transmitting

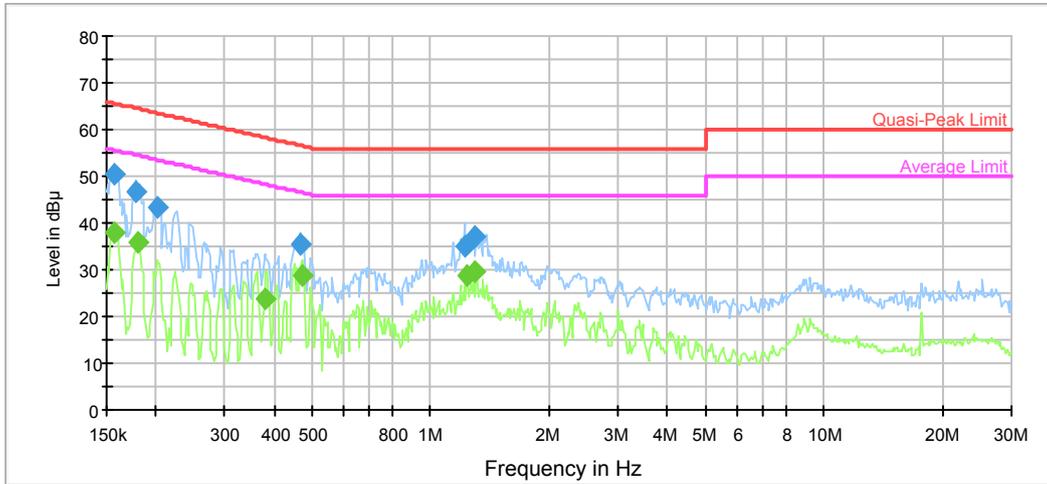
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.158604	49.7	9.000	L1	19.7	15.8	65.5	Compliance
0.180171	46.6	9.000	L1	19.7	17.9	64.5	Compliance
0.201433	43.3	9.000	L1	19.7	20.3	63.6	Compliance
0.450448	41.6	9.000	L1	19.7	15.3	56.9	Compliance
1.239175	36.4	9.000	L1	19.7	19.6	56.0	Compliance
1.289541	36.6	9.000	L1	19.7	19.4	56.0	Compliance

Frequency (MHz)	Average (dBμV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)	Comment
0.158604	38.6	9.000	L1	19.7	17.0	55.6	Compliance
0.429420	25.2	9.000	L1	19.7	22.1	47.3	Compliance
0.457684	38.9	9.000	L1	19.7	7.8	46.7	Compliance
0.532496	27.6	9.000	L1	19.7	18.4	46.0	Compliance
1.239175	29.2	9.000	L1	19.7	16.8	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 (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.157346	50.3	9.000	N	19.7	15.3	65.6	Compliance
0.178741	46.6	9.000	N	19.7	17.9	64.5	Compliance
0.201433	43.2	9.000	N	19.6	20.4	63.6	Compliance
0.465037	35.6	9.000	N	19.6	21.0	56.6	Compliance
1.219583	34.9	9.000	N	19.6	21.1	56.0	Compliance
1.289541	37.3	9.000	N	19.6	18.7	56.0	Compliance

Frequency (MHz)	Average (dB μ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)	Comment
0.157346	37.7	9.000	N	19.7	17.9	55.6	Compliance
0.180171	36.0	9.000	N	19.7	18.5	54.5	Compliance
0.381043	23.9	9.000	N	19.6	24.4	48.3	Compliance
0.472507	28.8	9.000	N	19.6	17.7	46.5	Compliance
1.239175	28.8	9.000	N	19.6	17.2	46.0	Compliance
1.289541	29.6	9.000	N	19.6	16.4	46.0	Compliance

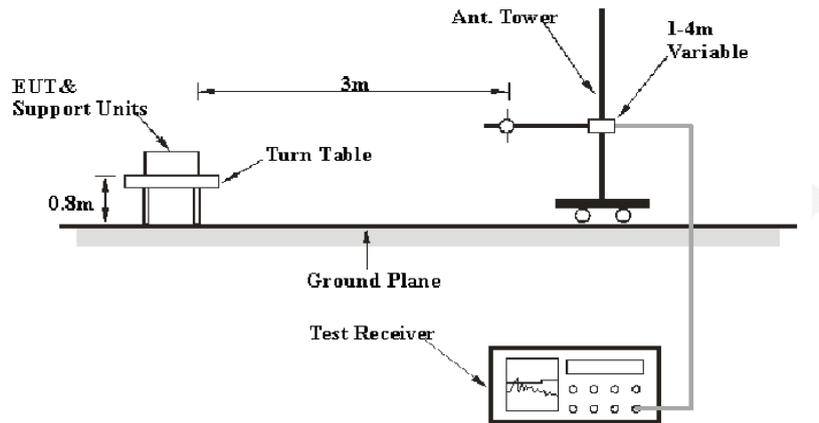
FCC §15.209, §15.205 , §15.247(d) & RSS-247 §5.5&RSS-GEN§8.10-SPURIOUS EMISSIONS

Applicable Standard

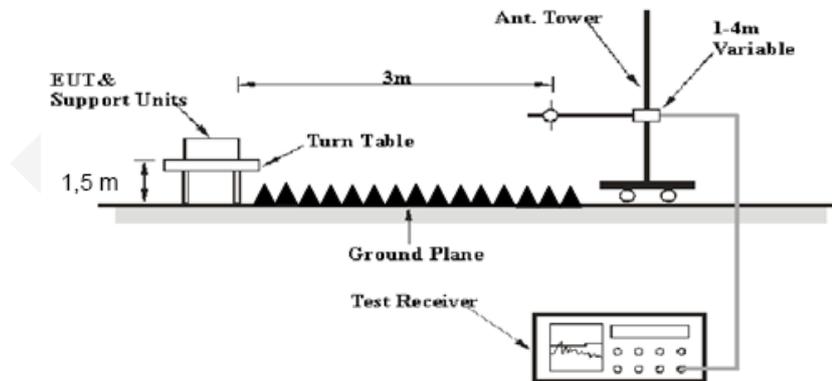
FCC §15.247 (d); §15.209; §15.205; and RSS-247 §5.5, RSS-GEN §8.10

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:

Measurement	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 measurement for frequencies above 1 GHz according to 558074 D01 DTS Meas Guidance v04 clause 12.2.5.3.

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

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
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
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:	17~23.7 °C
Relative Humidity:	50~52 %
ATM Pressure:	96.8~97.8 kPa

* The testing was performed by Lorin Bian on 2017-02-08&2017-05-23.

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	66.67	PK	H	23.50	3.00	0.00	93.17	N/A	N/A
2412	62.08	AV	H	23.50	3.00	0.00	88.58	N/A	N/A
2412	75.68	PK	V	23.50	3.00	0.00	102.18	N/A	N/A
2412	71.19	AV	V	23.50	3.00	0.00	97.69	N/A	N/A
2390	28.26	PK	V	23.57	3.00	0.00	54.83	74	19.17
2390	16.39	AV	V	23.57	3.00	0.00	42.96	54	11.04
4824	33.25	PK	V	30.84	5.11	26.87	42.33	74	31.67
4824	19.69	AV	V	30.84	5.11	26.87	28.77	54	25.23
7236	33.60	PK	V	34.77	6.18	26.36	48.19	74	25.81
7236	19.62	AV	V	34.77	6.18	26.36	34.21	54	19.79
9648	33.00	PK	V	37.09	7.79	26.20	51.68	74	22.32
9648	19.19	AV	V	37.09	7.79	26.20	37.87	54	16.13
3131	40.93	PK	V	24.93	3.63	26.46	43.03	74	30.97
3131	28.46	AV	V	24.93	3.63	26.46	30.56	54	23.44
273.47	44.67	QP	H	13.77	1.28	27.49	32.23	46.00	13.77
291.9	45.57	QP	H	14.02	1.09	27.53	33.15	46.00	12.85
Middle Channel: 2437 MHz									
2437	65.72	PK	H	23.41	3.00	0.00	92.13	N/A	N/A
2437	60.81	AV	H	23.41	3.00	0.00	87.22	N/A	N/A
2437	80.63	PK	V	23.41	3.00	0.00	107.04	N/A	N/A
2437	76.46	AV	V	23.41	3.00	0.00	102.87	N/A	N/A
4874	34.58	PK	V	31.00	5.09	26.87	43.8	74	30.2
4874	21.53	AV	V	31.00	5.09	26.87	30.75	54	23.25
7311	36.34	PK	V	34.92	6.21	26.40	51.07	74	22.93
7311	23.04	AV	V	34.92	6.21	26.40	37.77	54	16.23
9748	32.73	PK	V	37.15	7.72	26.26	51.34	74	22.66
9748	19.12	AV	V	37.15	7.72	26.26	37.73	54	16.27
3221	38.97	PK	V	25.44	3.76	26.49	41.68	74	32.32
3221	26.45	AV	V	25.44	3.76	26.49	29.16	54	24.84
273.47	44.94	QP	H	13.77	1.28	27.49	32.50	46.00	13.50
291.9	45.71	QP	H	14.02	1.09	27.53	33.29	46.00	12.71
High Channel: 2462 MHz									
2462	65.61	PK	H	23.33	2.99	0.00	91.93	N/A	N/A
2462	59.79	AV	H	23.33	2.99	0.00	86.11	N/A	N/A
2462	80.74	PK	V	23.33	2.99	0.00	107.06	N/A	N/A
2462	76.63	AV	V	23.33	2.99	0.00	102.95	N/A	N/A
2483.5	27.99	PK	V	23.26	2.99	0.00	54.24	74	19.76
2483.5	17.51	AV	V	23.26	2.99	0.00	43.76	54	10.24
4924	34.34	PK	V	31.16	5.07	26.88	43.69	74	30.31
4924	21.04	AV	V	31.16	5.07	26.88	30.39	54	23.61
7386	35.32	PK	V	35.07	6.25	26.43	50.21	74	23.79
7386	21.86	AV	V	35.07	6.25	26.43	36.75	54	17.25
9848	33.70	PK	V	37.21	7.65	26.33	52.23	74	21.77
9848	20.26	AV	V	37.21	7.65	26.33	38.79	54	15.21
3150	39.13	PK	V	25.04	3.66	26.46	41.37	74	32.63
3150	26.38	AV	V	25.04	3.66	26.46	28.62	54	25.38
273.47	45.78	QP	H	13.77	1.28	27.49	33.34	46.00	12.66
291.9	46.13	QP	H	14.02	1.09	27.53	33.71	46.00	12.29

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	65.71	PK	H	23.50	3.00	0.00	92.21	N/A	N/A
2412	58.87	AV	H	23.50	3.00	0.00	85.37	N/A	N/A
2412	80.43	PK	V	23.50	3.00	0.00	106.93	N/A	N/A
2412	72.19	AV	V	23.50	3.00	0.00	98.69	N/A	N/A
2390	28.09	PK	V	23.57	3.00	0.00	54.66	74	19.34
2390	16.26	AV	V	23.57	3.00	0.00	42.83	54	11.17
4824	34.00	PK	V	30.84	5.11	26.87	43.08	74	30.92
4824	20.40	AV	V	30.84	5.11	26.87	29.48	54	24.52
7236	34.75	PK	V	34.77	6.18	26.36	49.34	74	24.66
7236	21.68	AV	V	34.77	6.18	26.36	36.27	54	17.73
9648	31.41	PK	V	37.09	7.79	26.20	50.09	74	23.91
9648	18.18	AV	V	37.09	7.79	26.20	36.86	54	17.14
3142	40.36	PK	V	25.00	3.64	26.46	42.54	74	31.46
3142	27.60	AV	V	25.00	3.64	26.46	29.78	54	24.22
273.47	45.31	QP	H	13.77	1.28	27.49	32.87	46.00	13.13
291.9	46.57	QP	H	14.02	1.09	27.53	34.15	46.00	11.85
Middle Channel: 2437 MHz									
2437	67.70	PK	H	23.41	3.00	0.00	94.11	N/A	N/A
2437	60.41	AV	H	23.41	3.00	0.00	86.82	N/A	N/A
2437	78.81	PK	V	23.41	3.00	0.00	105.22	N/A	N/A
2437	71.57	AV	V	23.41	3.00	0.00	97.98	N/A	N/A
4874	33.40	PK	V	31.00	5.09	26.87	42.62	74	31.38
4874	19.78	AV	V	31.00	5.09	26.87	29	54	25
7311	36.07	PK	V	34.92	6.21	26.40	50.8	74	23.2
7311	23.36	AV	V	34.92	6.21	26.40	38.09	54	15.91
9748	33.49	PK	V	37.15	7.72	26.26	52.1	74	21.9
9748	20.05	AV	V	37.15	7.72	26.26	38.66	54	15.34
3022	40.38	PK	V	24.32	3.46	26.42	41.74	74	32.26
3022	28.32	AV	V	24.32	3.46	26.42	29.68	54	24.32
273.47	44.84	QP	H	13.77	1.28	27.49	32.40	46.00	13.60
291.9	47.01	QP	H	14.02	1.09	27.53	34.59	46.00	11.41
High Channel: 2462 MHz									
2462	64.86	PK	H	23.33	2.99	0.00	91.18	N/A	N/A
2462	57.02	AV	H	23.33	2.99	0.00	83.34	N/A	N/A
2462	77.58	PK	V	23.33	2.99	0.00	103.90	N/A	N/A
2462	69.96	AV	V	23.33	2.99	0.00	96.28	N/A	N/A
2483.5	27.31	PK	V	25.86	3.67	0.00	56.84	74.00	17.16
2483.5	14.22	AV	V	25.86	3.67	0.00	43.75	54.00	10.25
4924	34.29	PK	V	30.90	5.34	27.43	43.10	74.00	30.90
4924	20.68	AV	V	30.90	5.34	27.43	29.49	54.00	24.51
7386	32.89	PK	V	34.53	6.83	25.86	48.39	74.00	25.61
7386	19.48	AV	V	34.53	6.83	25.86	34.98	54.00	19.02
9848	33.35	PK	V	36.84	8.66	26.94	51.91	74.00	22.09
9848	19.44	AV	V	36.84	8.66	26.94	38.00	54.00	16.00
3105	35.29	PK	V	27.54	6.85	27.45	42.23	74.00	31.77
3105	22.69	AV	V	27.54	6.85	27.45	29.63	54.00	24.37
273.47	44.55	QP	H	13.77	1.28	27.49	32.11	46.00	13.89
291.9	45.62	QP	H	14.02	1.09	27.53	33.20	46.00	12.80

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	70.37	PK	H	23.50	3.00	0.00	96.87	N/A	N/A
2412	62.36	AV	H	23.50	3.00	0.00	88.86	N/A	N/A
2412	80.80	PK	V	23.50	3.00	0.00	107.3	N/A	N/A
2412	72.88	AV	V	23.50	3.00	0.00	99.38	N/A	N/A
2390	28.91	PK	V	23.57	3.00	0.00	55.48	74	18.52
2390	16.40	AV	V	23.57	3.00	0.00	42.97	54	11.03
4824	34.65	PK	V	30.84	5.11	26.87	43.73	74	30.27
4824	21.14	AV	V	30.84	5.11	26.87	30.22	54	23.78
7236	36.24	PK	V	34.77	6.18	26.36	50.83	74	23.17
7236	22.59	AV	V	34.77	6.18	26.36	37.18	54	16.82
9648	32.86	PK	V	37.09	7.79	26.20	51.54	74	22.46
9648	19.59	AV	V	37.09	7.79	26.20	38.27	54	15.73
2973	40.80	PK	V	24.15	3.41	26.44	41.92	74	32.08
2973	27.85	AV	V	24.15	3.41	26.44	28.97	54	25.03
273.47	44.82	QP	H	13.77	1.28	27.49	32.38	46.00	13.62
291.9	45.76	QP	H	14.02	1.09	27.53	33.34	46.00	12.66
Middle Channel: 2437 MHz									
2437	70.22	PK	H	23.41	3.00	0.00	96.63	N/A	N/A
2437	62.39	AV	H	23.41	3.00	0.00	88.8	N/A	N/A
2437	79.87	PK	V	23.41	3.00	0.00	106.28	N/A	N/A
2437	72.33	AV	V	23.41	3.00	0.00	98.74	N/A	N/A
4874	34.42	PK	V	31.00	5.09	26.87	43.64	74	30.36
4874	21.03	AV	V	31.00	5.09	26.87	30.25	54	23.75
7311	35.78	PK	V	34.92	6.21	26.40	50.51	74	23.49
7311	22.03	AV	V	34.92	6.21	26.40	36.76	54	17.24
9748	33.43	PK	V	37.15	7.72	26.26	52.04	74	21.96
9748	20.34	AV	V	37.15	7.72	26.26	38.95	54	15.05
3514	35.82	PK	V	27.06	4.20	26.59	40.49	74	33.51
3514	23.28	AV	V	27.06	4.20	26.59	27.95	54	26.05
273.47	45.66	QP	H	13.77	1.28	27.49	33.22	46.00	12.78
291.9	46.18	QP	H	14.02	1.09	27.53	33.76	46.00	12.24
High Channel: 2462 MHz									
2462	70.05	PK	H	23.33	2.99	0.00	96.37	N/A	N/A
2462	61.82	AV	H	23.33	2.99	0.00	88.14	N/A	N/A
2462	80.83	PK	V	23.33	2.99	0.00	107.15	N/A	N/A
2462	72.79	AV	V	23.33	2.99	0.00	99.11	N/A	N/A
2483.5	30.01	PK	V	23.26	2.99	0.00	56.26	74	17.74
2483.5	17.22	AV	V	23.26	2.99	0.00	43.47	54	10.53
4924	34.17	PK	V	31.16	5.07	26.88	43.52	74	30.48
4924	20.32	AV	V	31.16	5.07	26.88	29.67	54	24.33
7386	35.87	PK	V	35.07	6.25	26.43	50.76	74	23.24
7386	22.30	AV	V	35.07	6.25	26.43	37.19	54	16.81
9848	33.55	PK	V	37.21	7.65	26.33	52.08	74	21.92
9848	19.81	AV	V	37.21	7.65	26.33	38.34	54	15.66
2964	38.89	PK	V	24.13	3.40	26.44	39.98	74	34.02
2964	26.48	AV	V	24.13	3.40	26.44	27.57	54	26.43
273.47	45.19	QP	H	13.77	1.28	27.49	32.75	46.00	13.25
291.9	46.62	QP	H	14.02	1.09	27.53	34.20	46.00	11.80

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	69.69	PK	H	23.47	3.00	0.00	96.16	N/A	N/A
2422	59.59	AV	H	23.47	3.00	0.00	86.06	N/A	N/A
2422	79.77	PK	V	23.47	3.00	0.00	106.24	N/A	N/A
2422	70.05	AV	V	23.47	3.00	0.00	96.52	N/A	N/A
2390	28.60	PK	V	23.57	3.00	0.00	55.17	74	18.83
2390	16.94	AV	V	23.57	3.00	0.00	43.51	54	10.49
4844	33.92	PK	V	30.90	5.10	26.87	43.05	74	30.95
4844	20.86	AV	V	30.90	5.10	26.87	29.99	54	24.01
7266	34.21	PK	V	34.83	6.19	26.38	48.85	74	25.15
7266	20.94	AV	V	34.83	6.19	26.38	35.58	54	18.42
9688	32.81	PK	V	37.11	7.76	26.23	51.45	74	22.55
9688	19.43	AV	V	37.11	7.76	26.23	38.07	54	15.93
3103	38.96	PK	V	24.78	3.58	26.45	40.87	74	33.13
3103	26.25	AV	V	24.78	3.58	26.45	28.16	54	25.84
273.47	44.72	QP	H	13.77	1.28	27.49	32.28	46.00	13.72
291.9	47.06	QP	H	14.02	1.09	27.53	34.64	46.00	11.36
Middle Channel: 2437 MHz									
2437	68.37	PK	H	23.41	3.00	0.00	94.78	N/A	N/A
2437	58.21	AV	H	23.41	3.00	0.00	84.62	N/A	N/A
2437	79.54	PK	V	23.41	3.00	0.00	105.95	N/A	N/A
2437	69.15	AV	V	23.41	3.00	0.00	95.56	N/A	N/A
4874	33.85	PK	V	31.00	5.09	26.87	43.07	74	30.93
4874	20.76	AV	V	31.00	5.09	26.87	29.98	54	24.02
7311	35.33	PK	V	34.92	6.21	26.40	50.06	74	23.94
7311	21.50	AV	V	34.92	6.21	26.40	36.23	54	17.77
9748	33.42	PK	V	37.15	7.72	26.26	52.03	74	21.97
9748	19.49	AV	V	37.15	7.72	26.26	38.1	54	15.9
3320	36.23	PK	V	25.99	3.91	26.53	39.6	74	34.4
3320	23.94	AV	V	25.99	3.91	26.53	27.31	54	26.69
273.47	44.32	QP	H	13.77	1.28	27.49	31.88	46.00	14.12
291.9	46.76	QP	H	14.02	1.09	27.53	34.34	46.00	11.66
High Channel: 2452 MHz									
2452	67.41	PK	H	23.36	3.00	0.00	93.77	N/A	N/A
2452	62.50	AV	H	23.36	3.00	0.00	88.86	N/A	N/A
2452	80.02	PK	V	23.36	3.00	0.00	106.38	N/A	N/A
2452	70.61	AV	V	23.36	3.00	0.00	96.97	N/A	N/A
2483.5	29.69	PK	V	23.26	2.99	0.00	55.94	74	18.06
2483.5	17.87	AV	V	23.26	2.99	0.00	44.12	54	9.88
4904	33.80	PK	V	31.09	5.08	26.87	43.1	74	30.9
4904	19.84	AV	V	31.09	5.08	26.87	29.14	54	24.86
7356	33.88	PK	V	35.01	6.23	26.42	48.7	74	25.3
7356	20.69	AV	V	35.01	6.23	26.42	35.51	54	18.49
9808	32.88	PK	V	37.18	7.68	26.30	51.44	74	22.56
9808	19.18	AV	V	37.18	7.68	26.30	37.74	54	16.26
3302	37.09	PK	V	25.89	3.88	26.52	40.34	74	33.66
3302	24.12	AV	V	25.89	3.88	26.52	27.37	54	26.63
273.47	44.59	QP	H	13.77	1.28	27.49	32.15	46.00	13.85
291.9	46.9	QP	H	14.02	1.09	27.53	34.48	46.00	11.52

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.

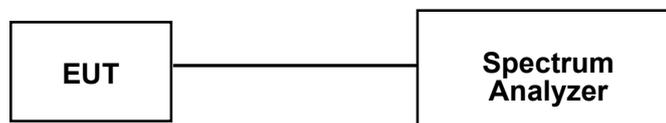
According to RSS-Gen §6.6

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) $\geq 3 \times$ 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:	18.5 °C
Relative Humidity:	56 %
ATM Pressure:	95.8 kPa

* The testing was performed by Lorin Bian on 2017-02-06.

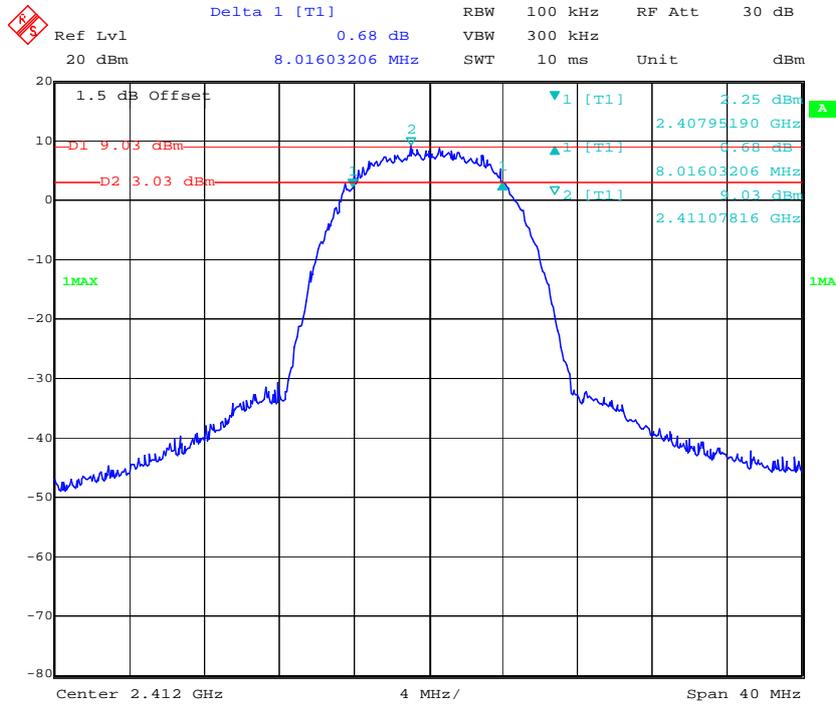
Test Mode: Transmitting (Test performed at Chain 0)

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

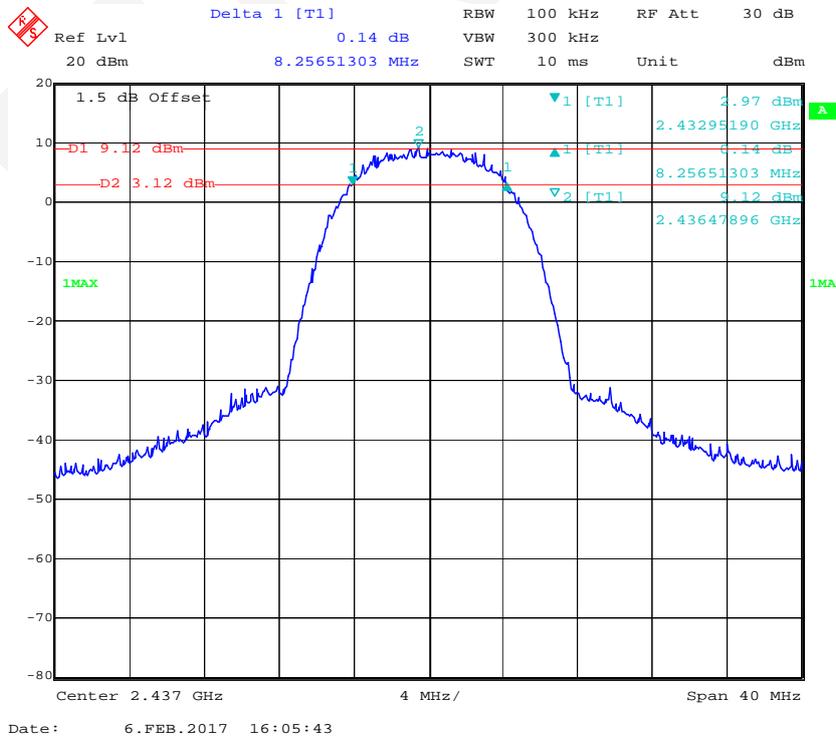
Test mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	99% Occupied bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	8.02	10.58	≥0.5
	Middle	2437	8.26	10.66	≥0.5
	High	2462	7.78	10.66	≥0.5
802.11g	Low	2412	16.59	16.99	≥0.5
	Middle	2437	16.59	16.91	≥0.5
	High	2462	16.59	16.91	≥0.5
802.11n ht20	Low	2412	17.8	17.96	≥0.5
	Middle	2437	17.8	17.88	≥0.5
	High	2462	17.72	17.88	≥0.5
802.11n ht40	Low	2422	36.23	36.55	≥0.5
	Middle	2437	36.39	36.55	≥0.5
	High	2452	35.91	36.55	≥0.5

6dB Bandwidth:

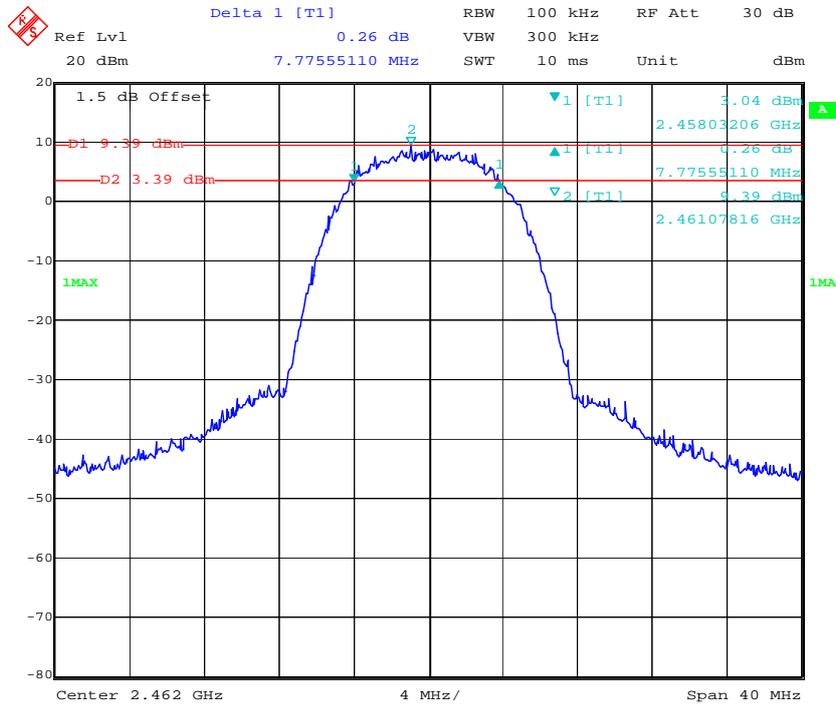
802.11b Low Channel



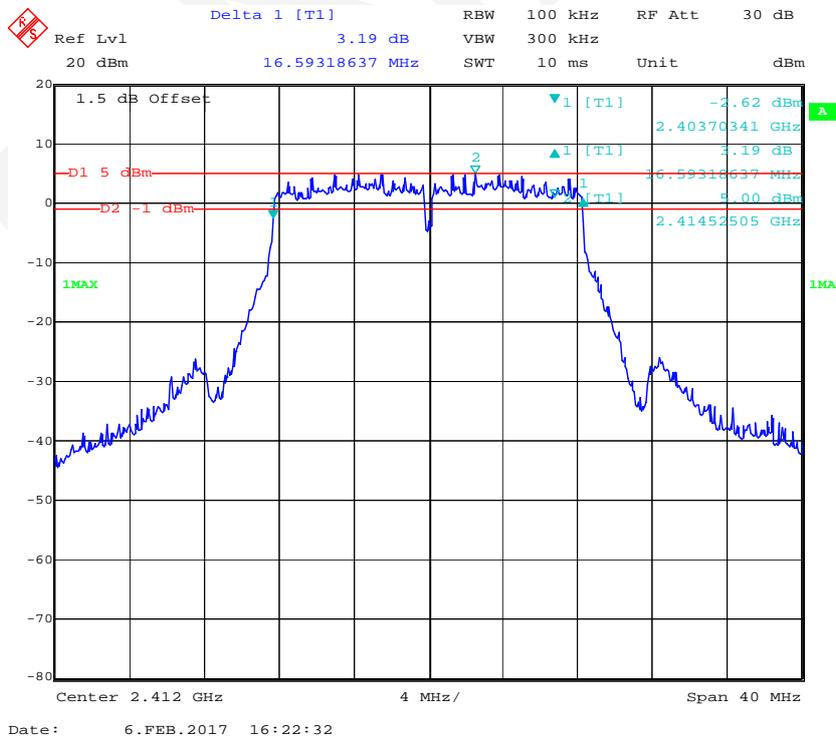
802.11b Middle Channel



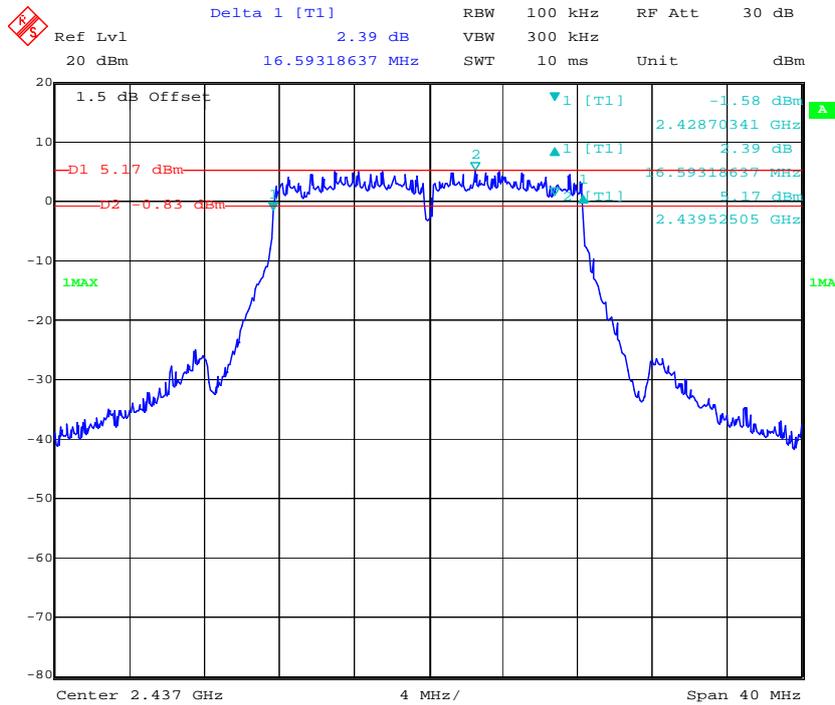
802.11b High Channel



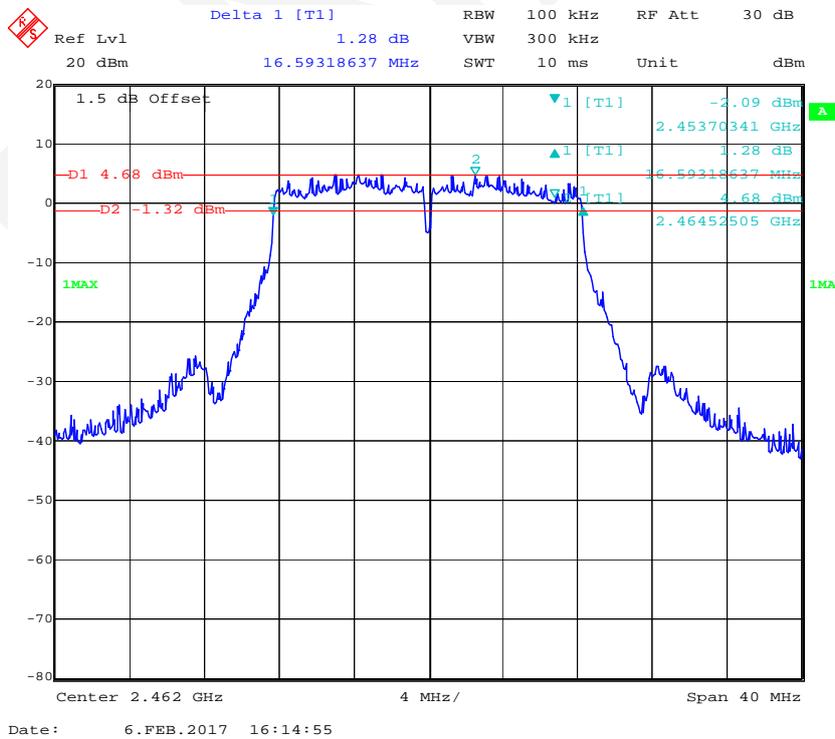
802.11g Low Channel



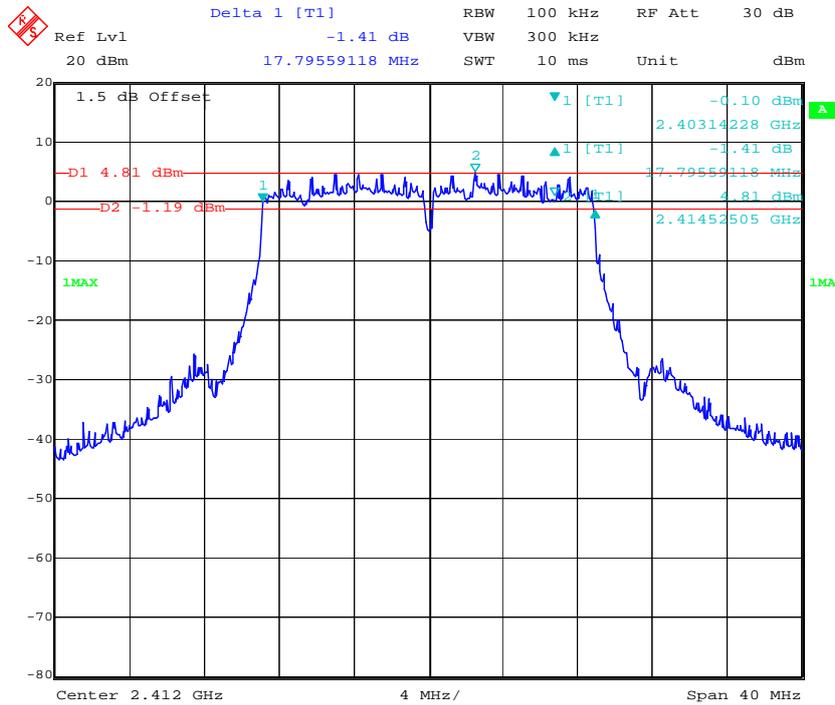
802.11g Middle Channel



802.11g High Channel

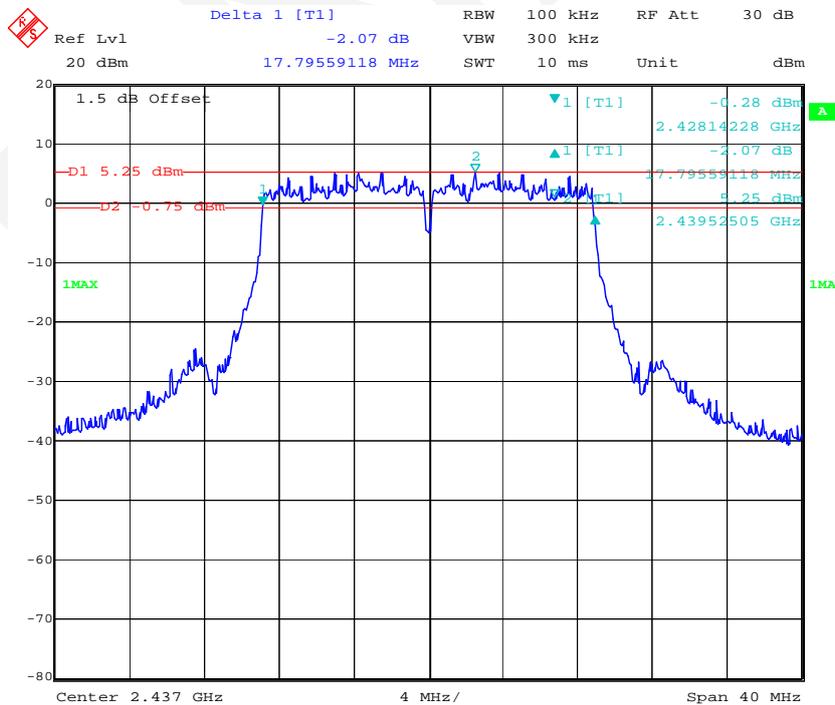


802.11n ht20 Low Channel



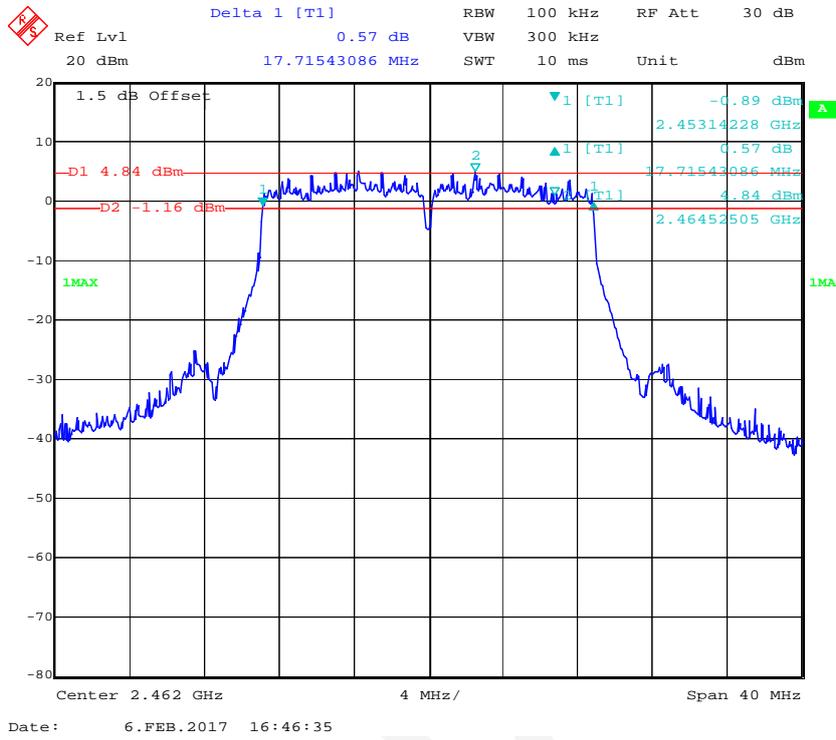
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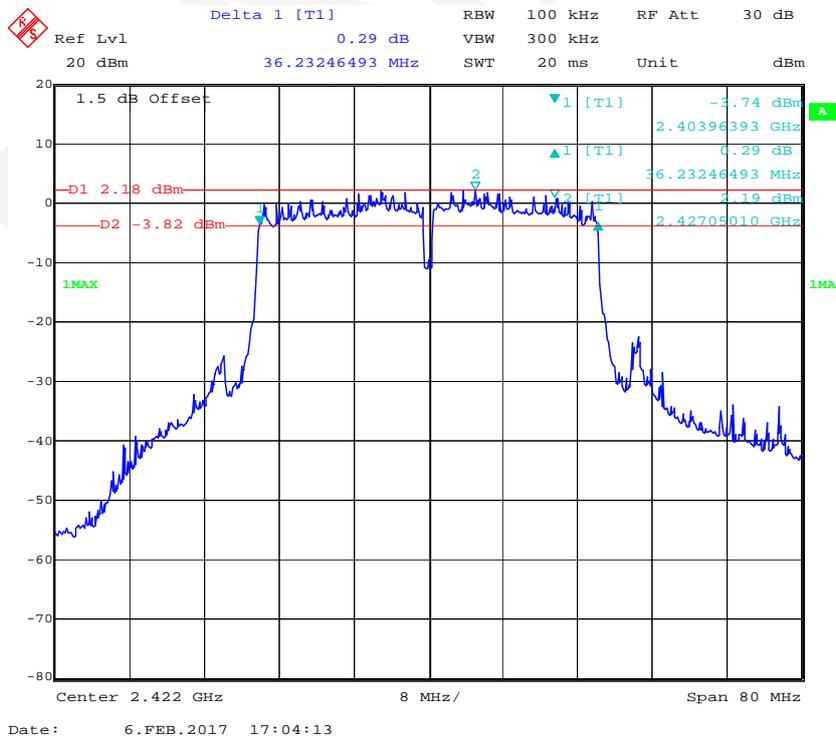


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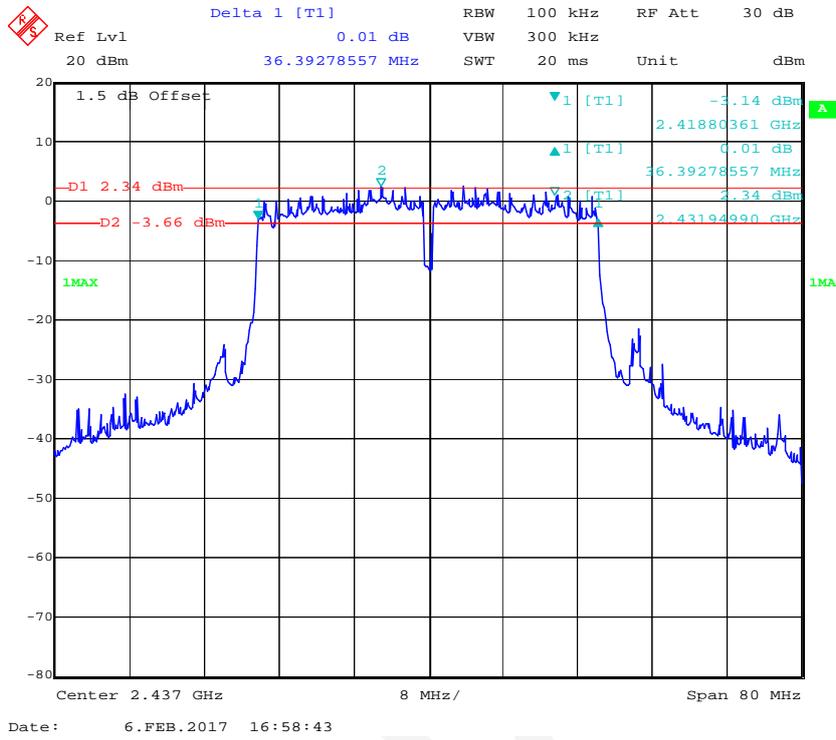
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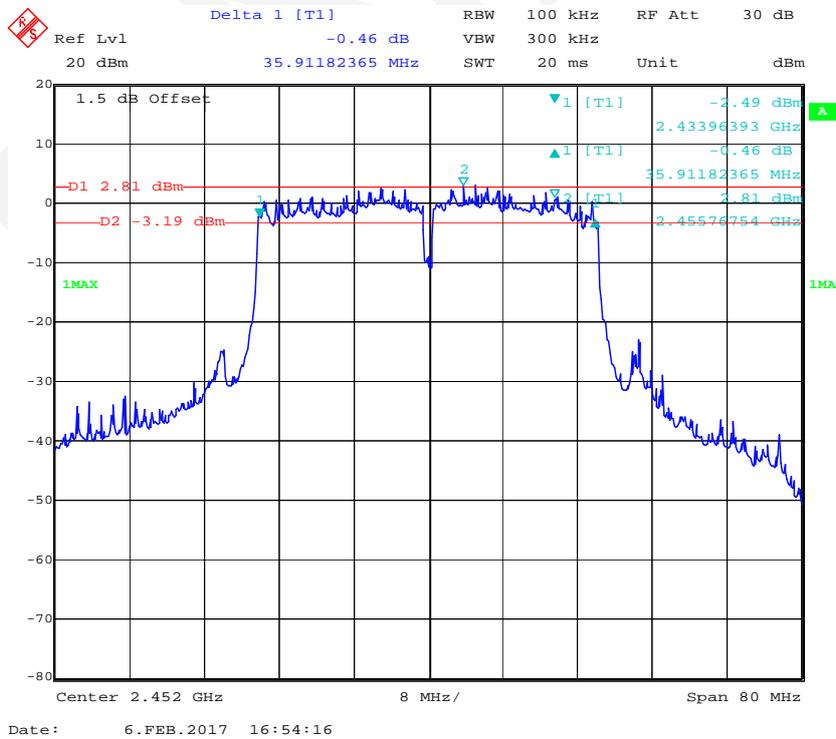
802.11n ht40 Low Channel



802.11n ht40 Middle Channel

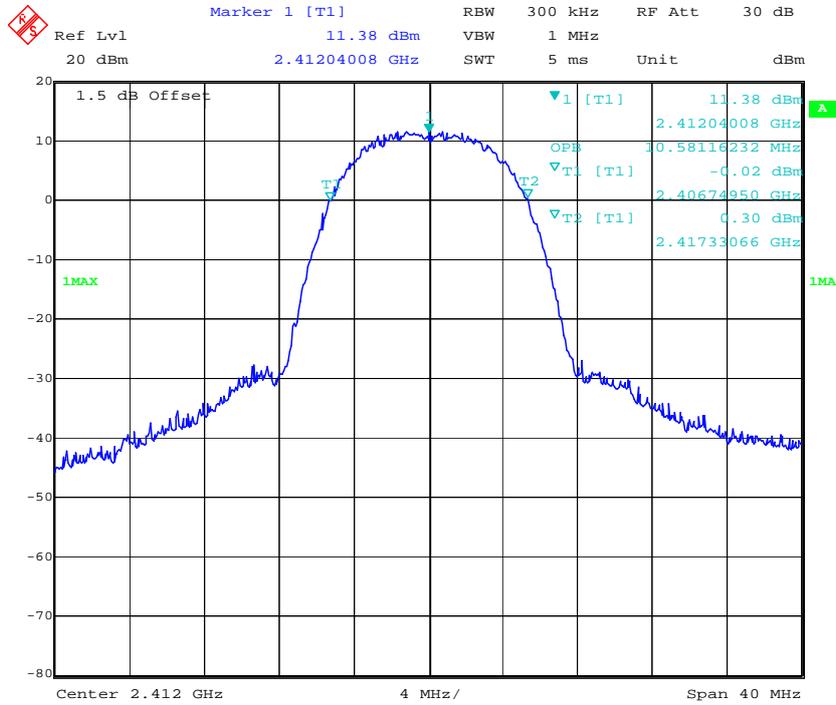


802.11n ht40 High Channel



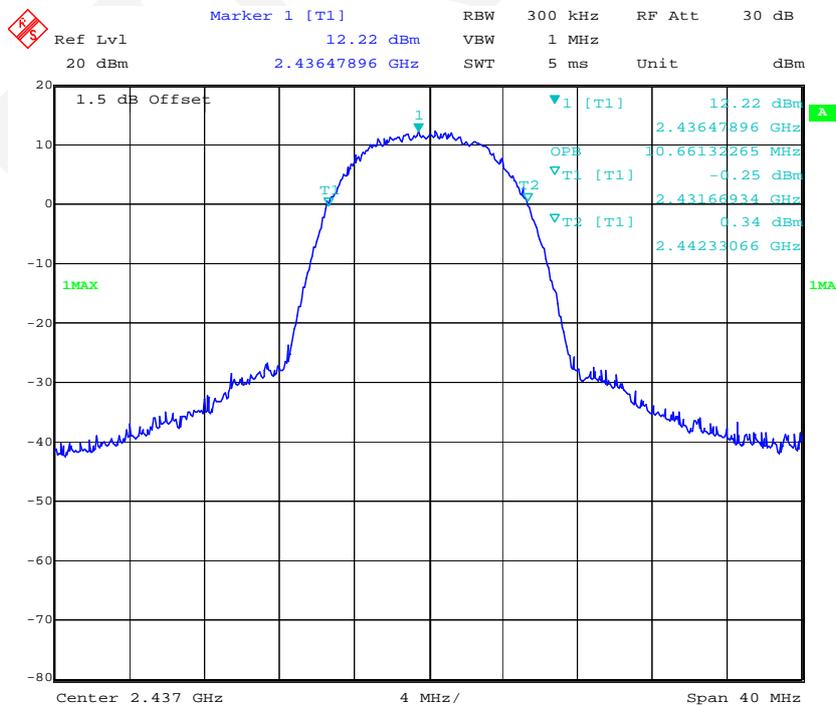
99% Occupied Bandwidth:

802.11b Low Channel



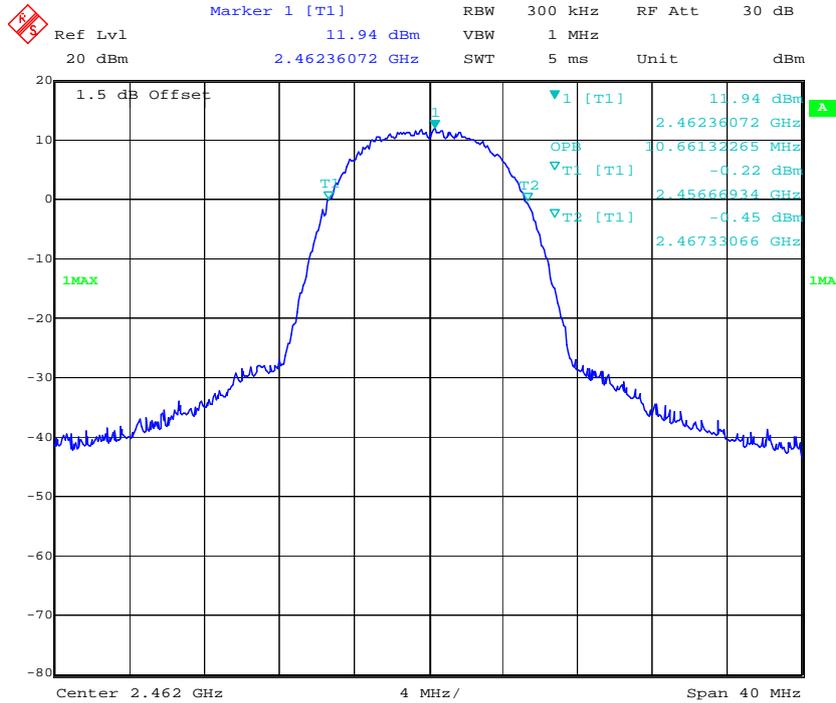
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802.11b Middle Channel

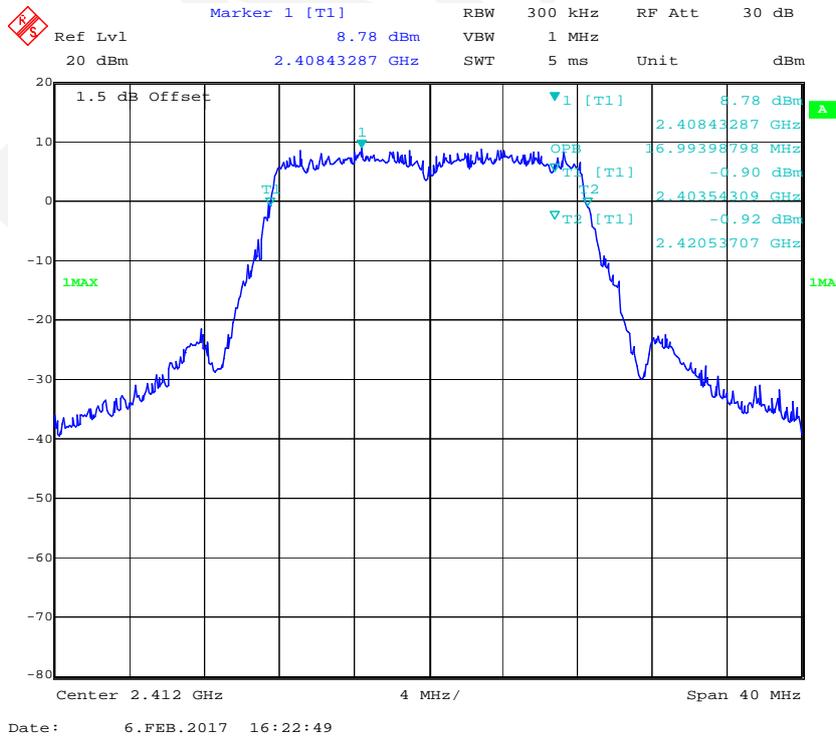


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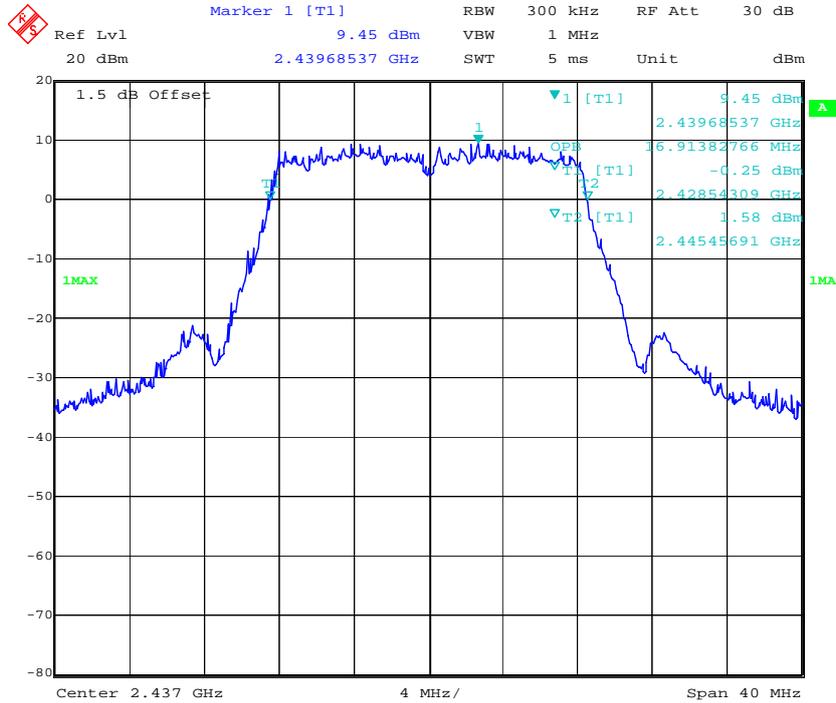
802.11b High Channel



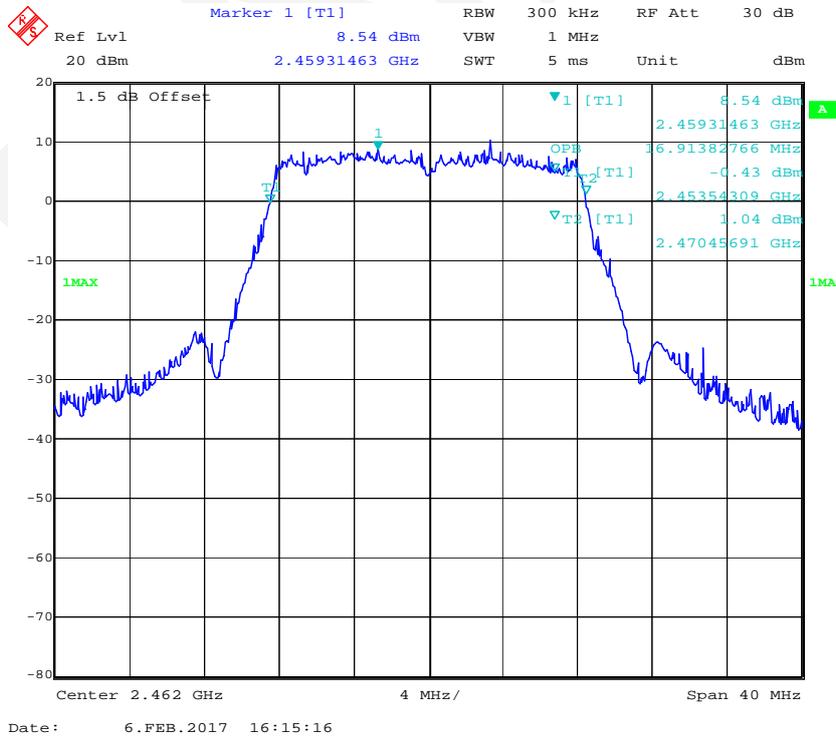
802.11g Low Channel



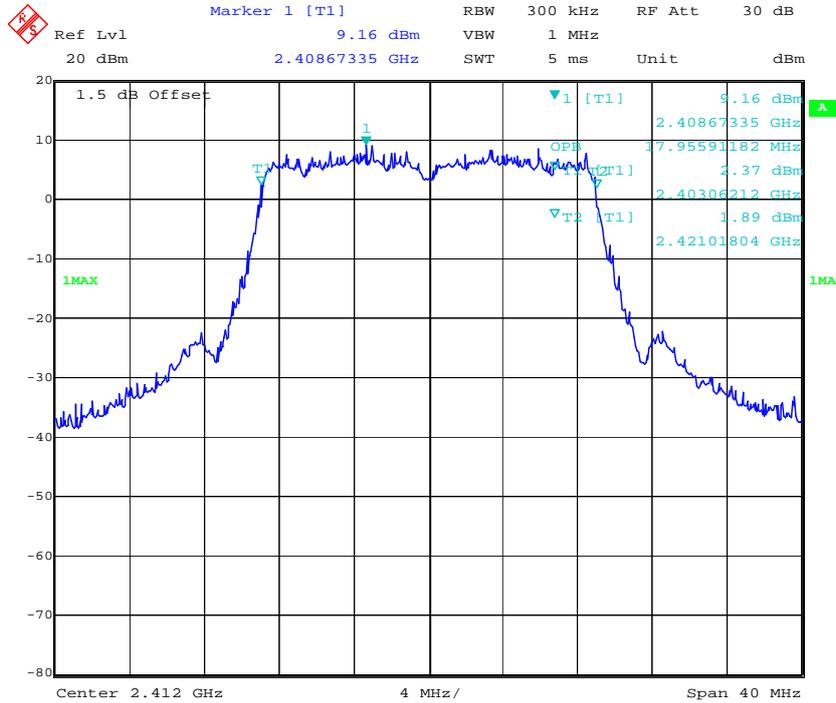
802.11g Middle Channel



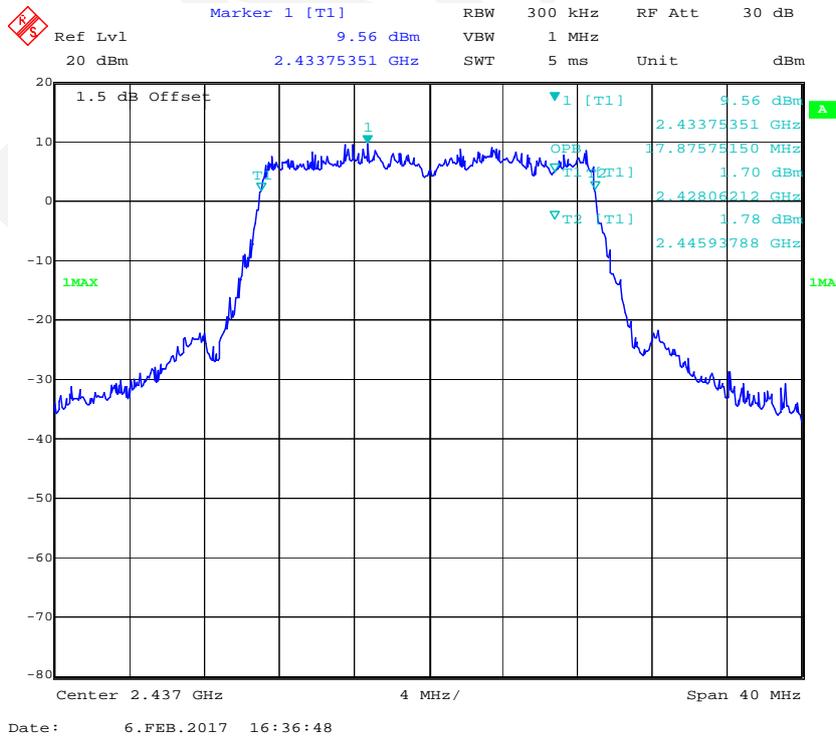
802.11g High Channel



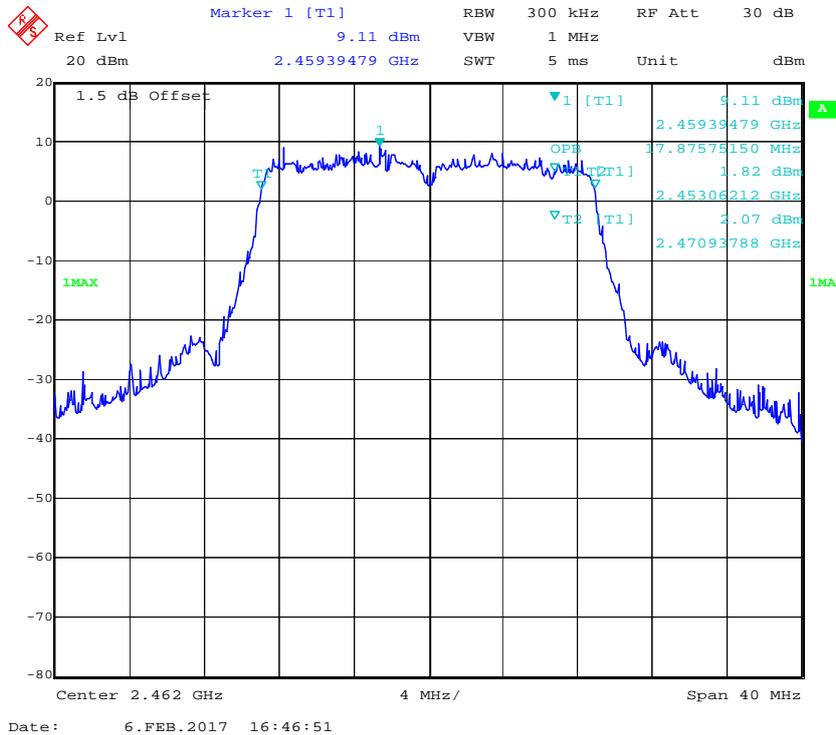
802.11n ht20 Low Channel



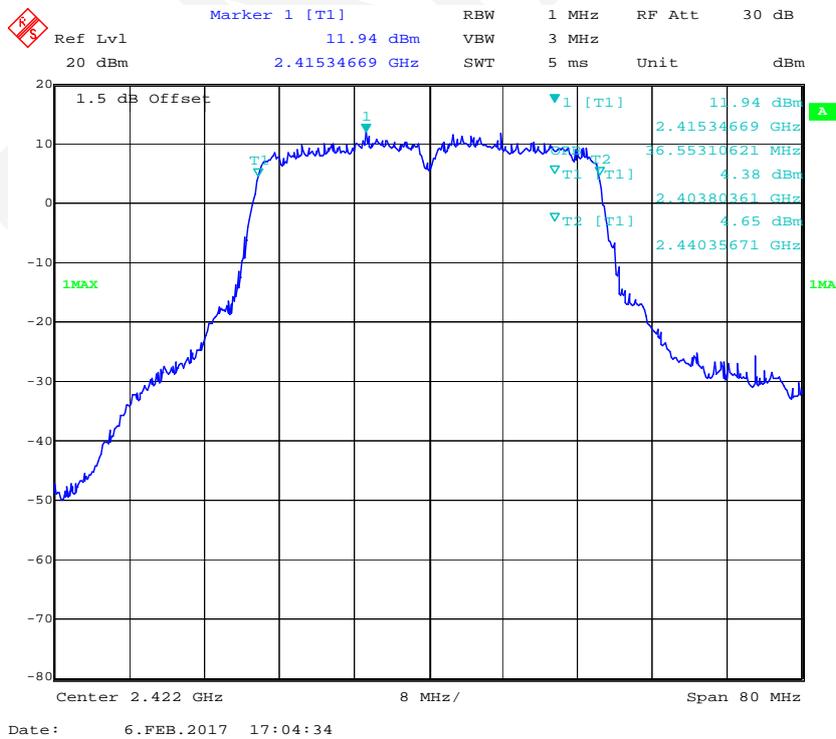
802.11n ht20 Middle Channel



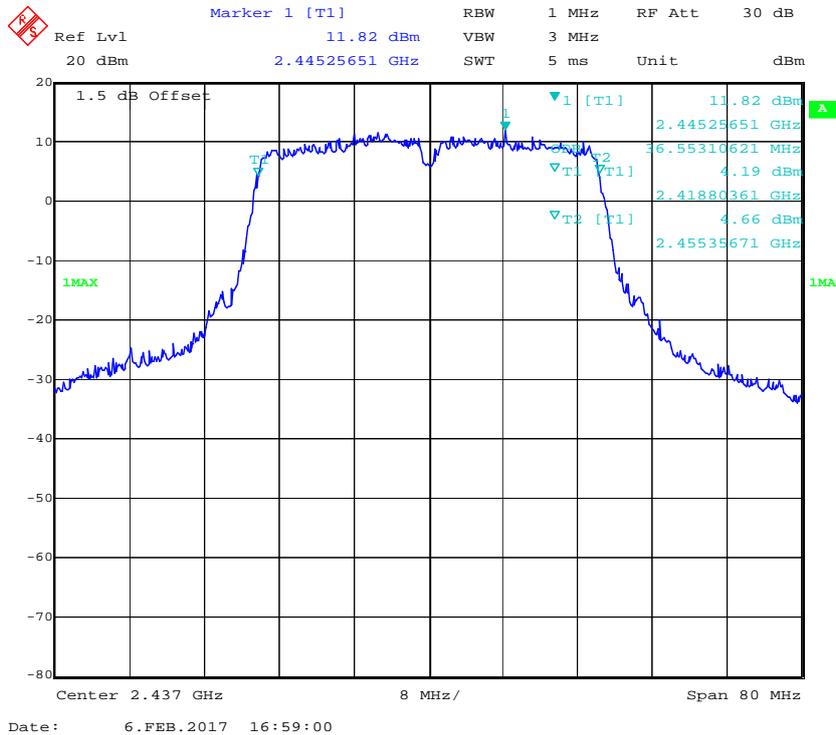
802.11n ht20 High Channel



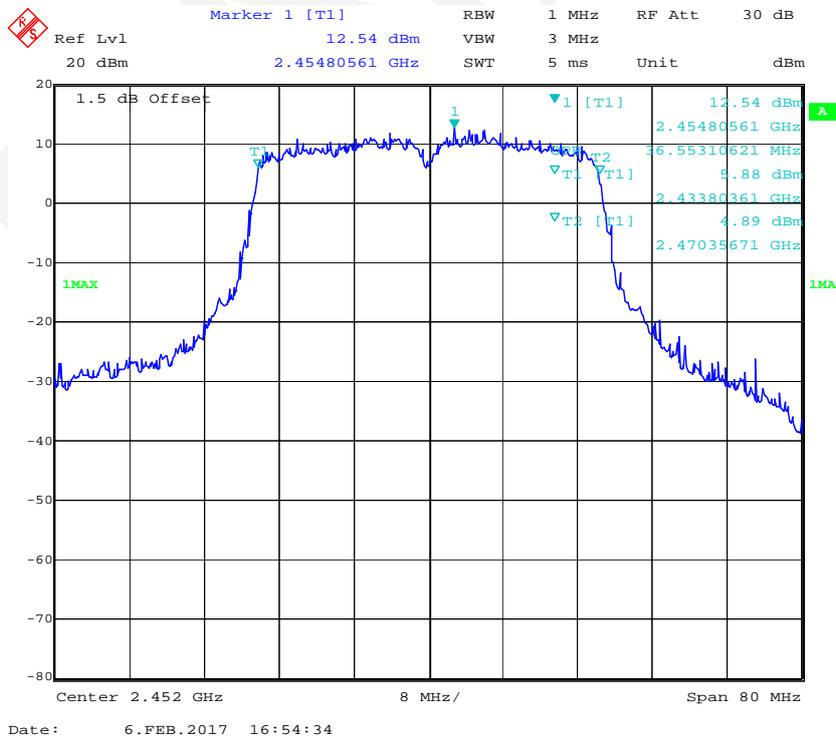
802.11n ht40 Low Channel



802.11n ht40 Middle Channel



802.11n ht40 High Channel



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

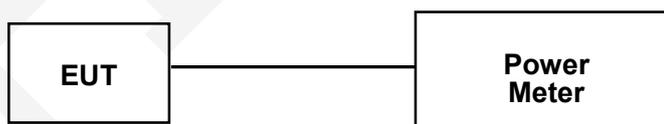
Applicable Standard

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:	18.5 °C
Relative Humidity:	56 %
ATM Pressure:	95.8 kPa

* The testing was performed by Lorin Bian on 2017-02-06.

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	24.45	24.56	/	30
	Middle	2437	25.16	23.81	/	30
	High	2462	24.6	22.5	/	30
802.11g	Low	2412	24.4	23.61	/	30
	Middle	2437	24.66	23.02	/	30
	High	2462	24.3	22.04	/	30
802.11n ht20	Low	2412	23.79	23.21	26.52	30
	Middle	2437	24.45	22.89	26.75	30
	High	2462	23.97	22.2	26.18	30
802.11n ht40	Low	2422	24.74	24.8	27.78	30
	Middle	2437	25.08	24.72	27.91	30
	High	2452	25.17	24.14	27.70	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

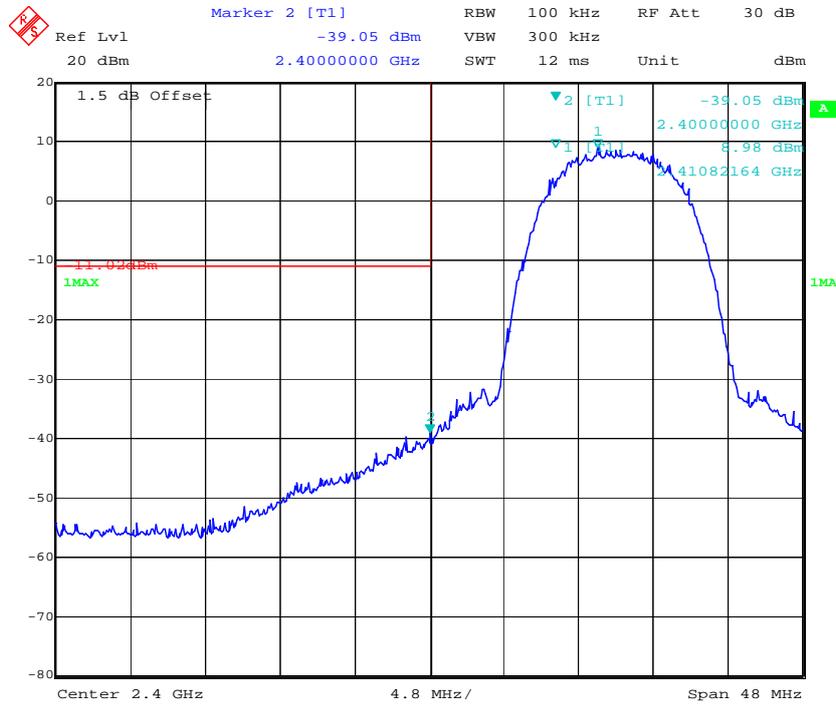
Temperature:	18.5 °C
Relative Humidity:	56 %
ATM Pressure:	95.8 kPa

* *The testing was performed by Lorin Bian on 2017-02-06.*

Test mode: Transmitting

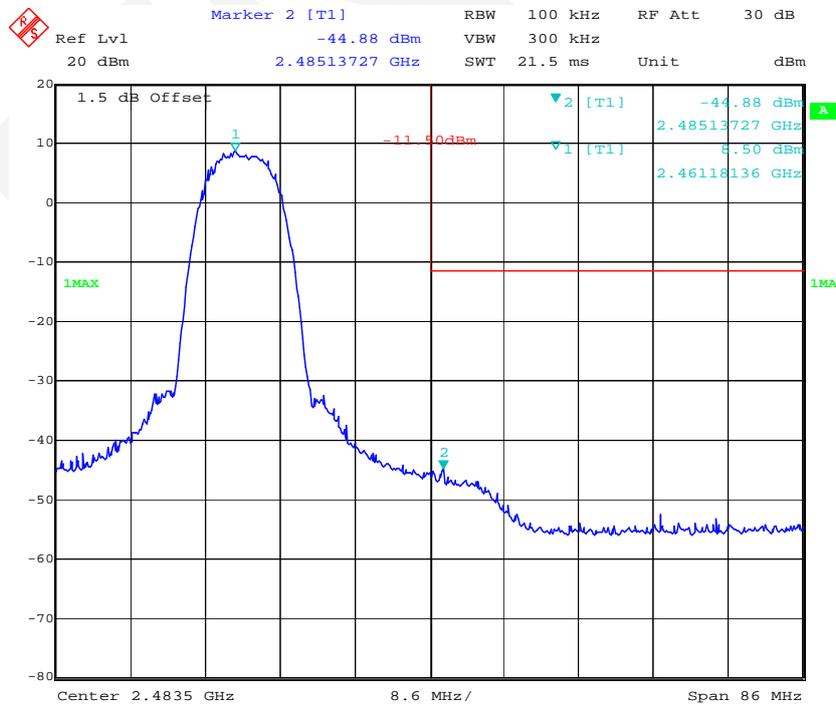
Test Result: Compliant. Please refer to following plots.

Chain 0, 802.11b: Band Edge, Left Side



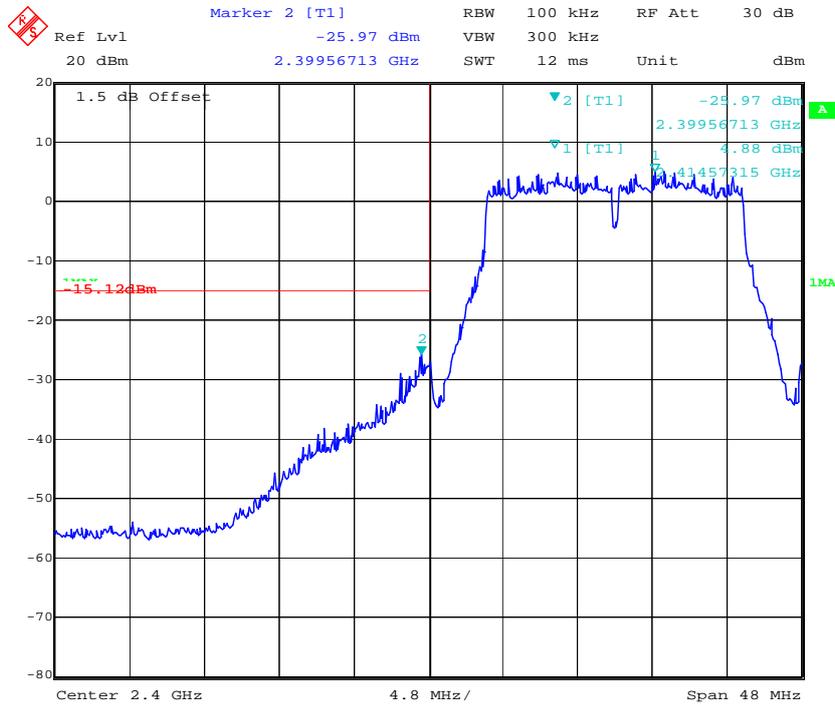
Date: 6.FEB.2017 16:03:33

Chain 0, 802.11b: Band Edge, Right Side

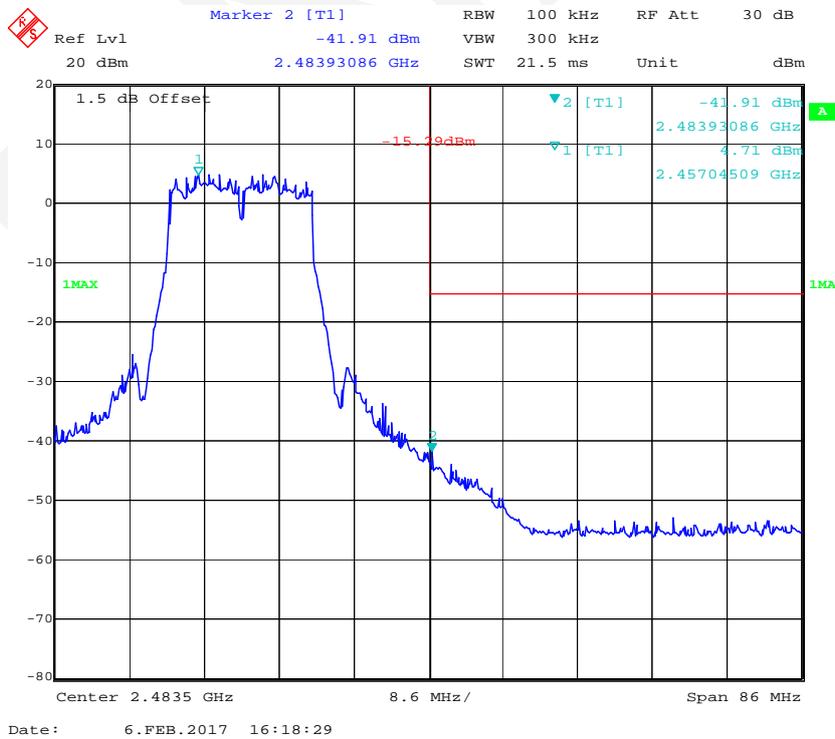


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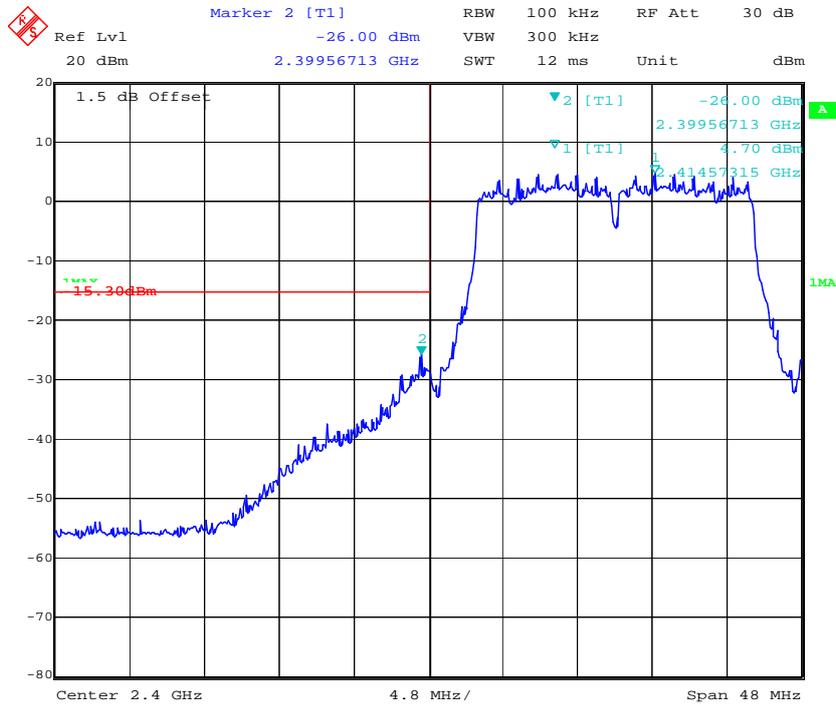
Chain 0, 802.11g: Band Edge, Left Side



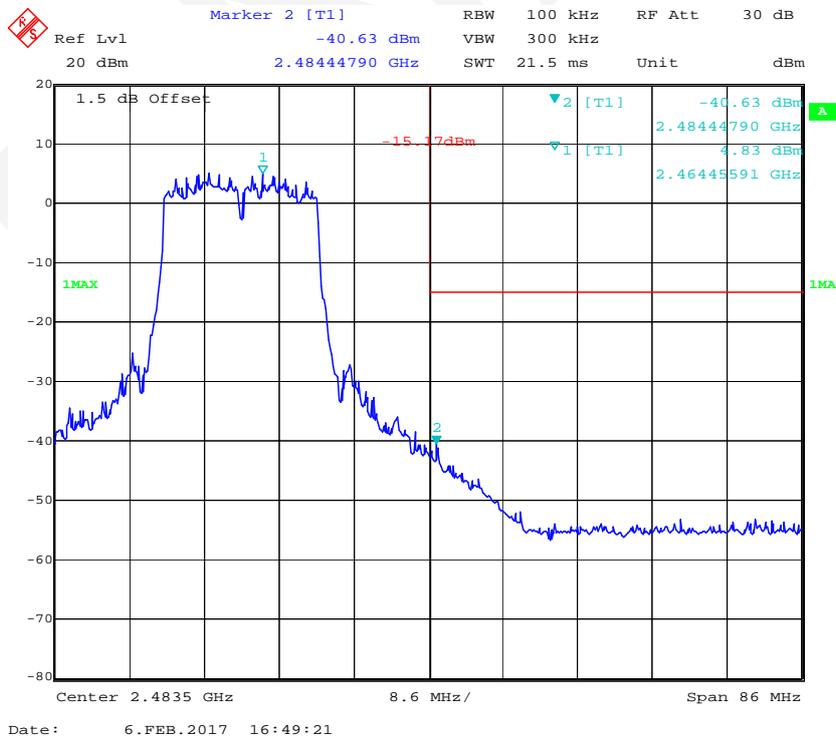
Chain 0, 802.11g: Band Edge, Right Side



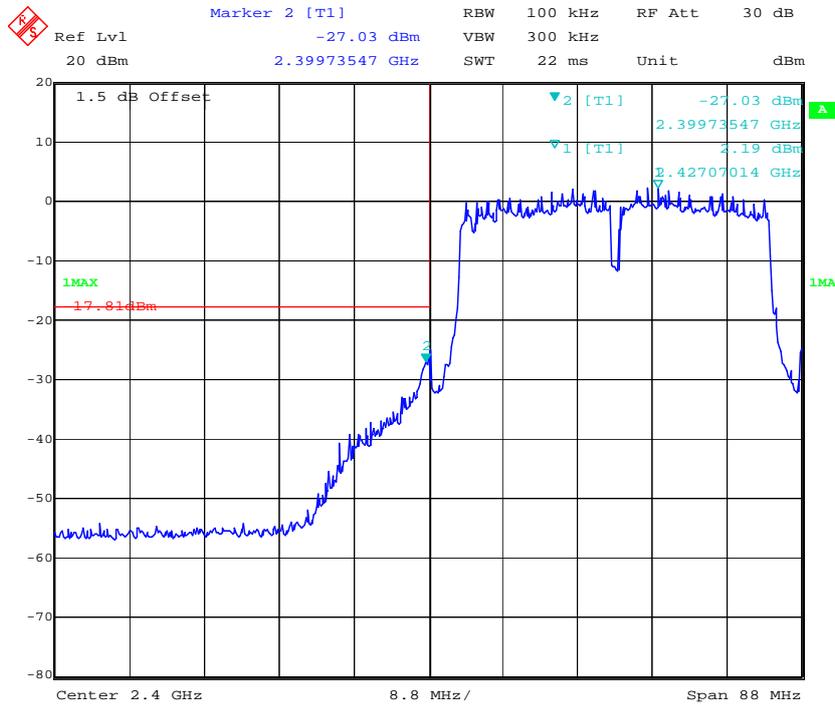
Chain 0, 802.11n ht20 Band Edge, Left Side



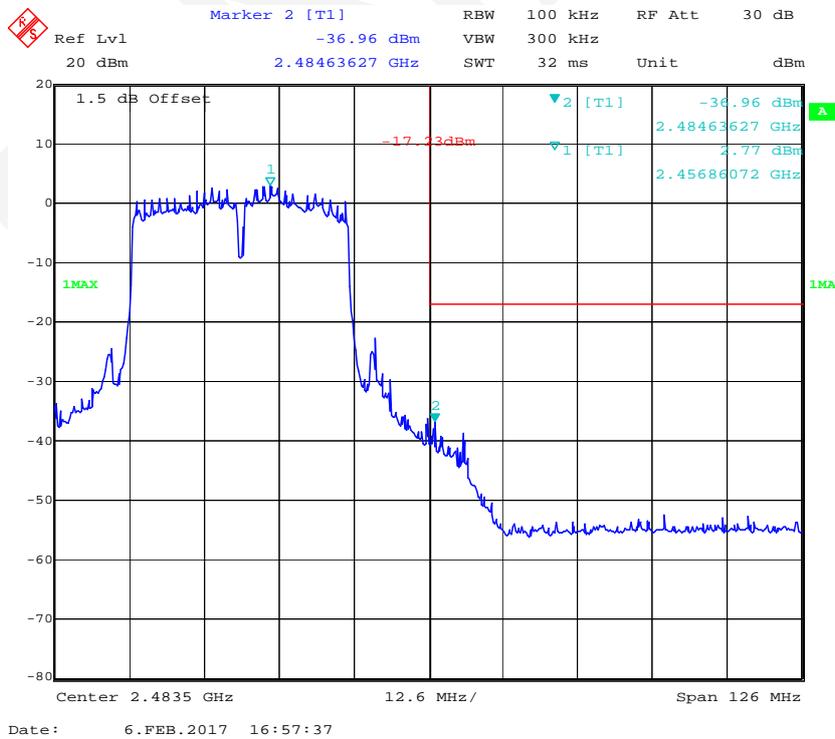
Chain 0, 802.11n ht20 Band Edge, Right Side



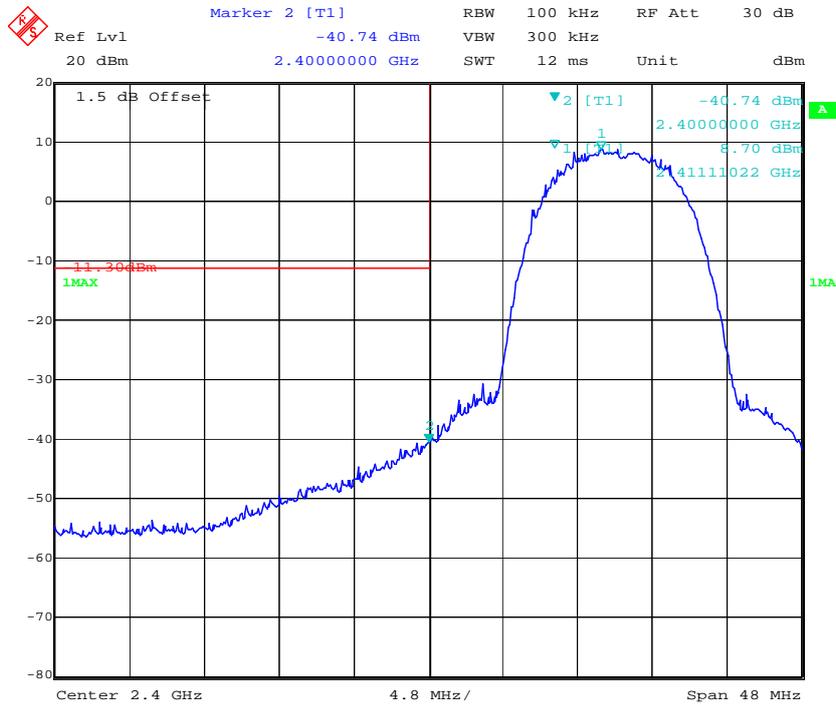
Chain 0, 802.11n ht40 Band Edge, Left Side



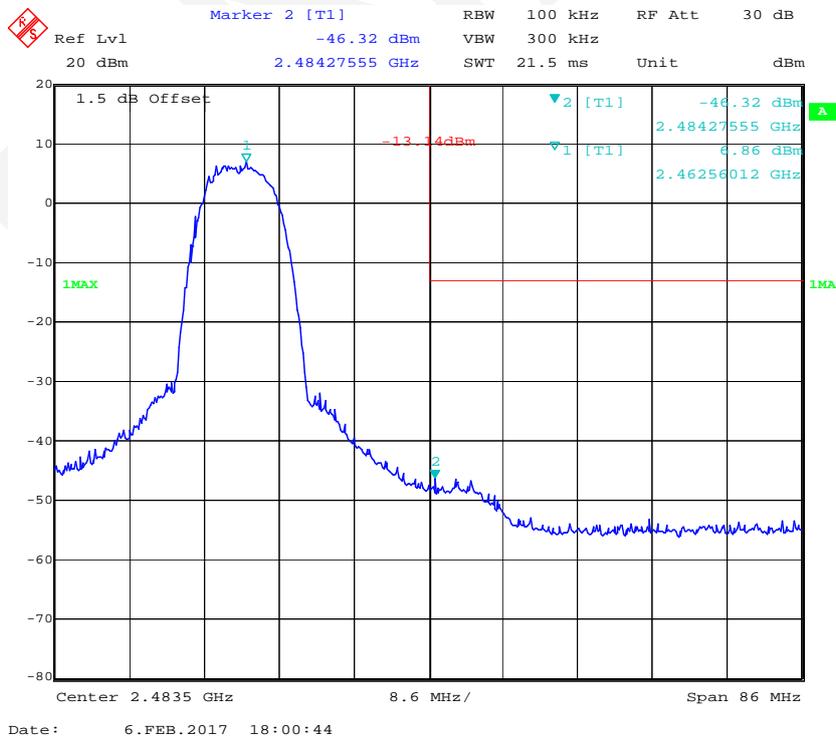
Chain 0, 802.11n ht40 Band Edge, Right Side



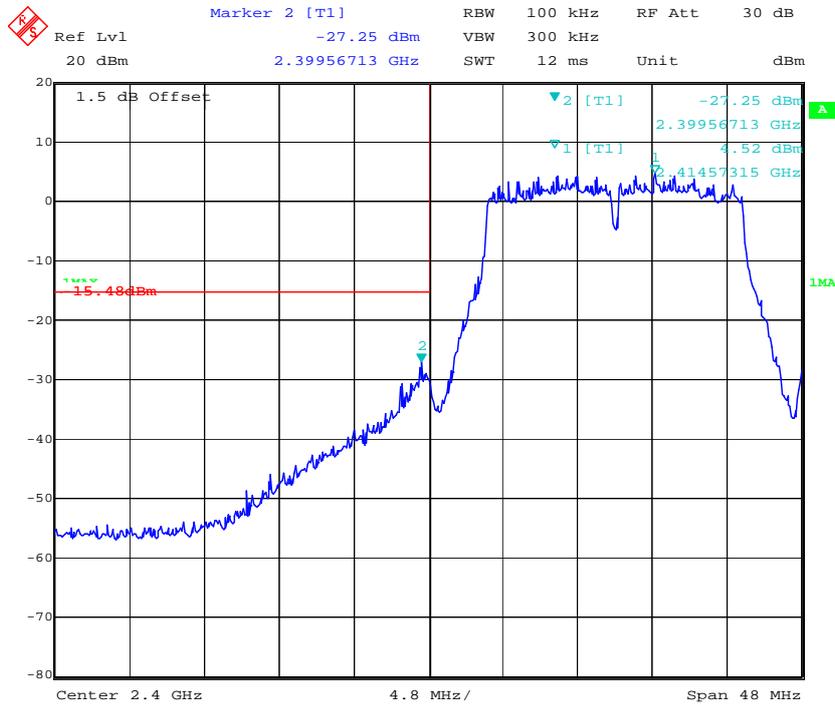
Chain 1, 802.11b: Band Edge, Left Side



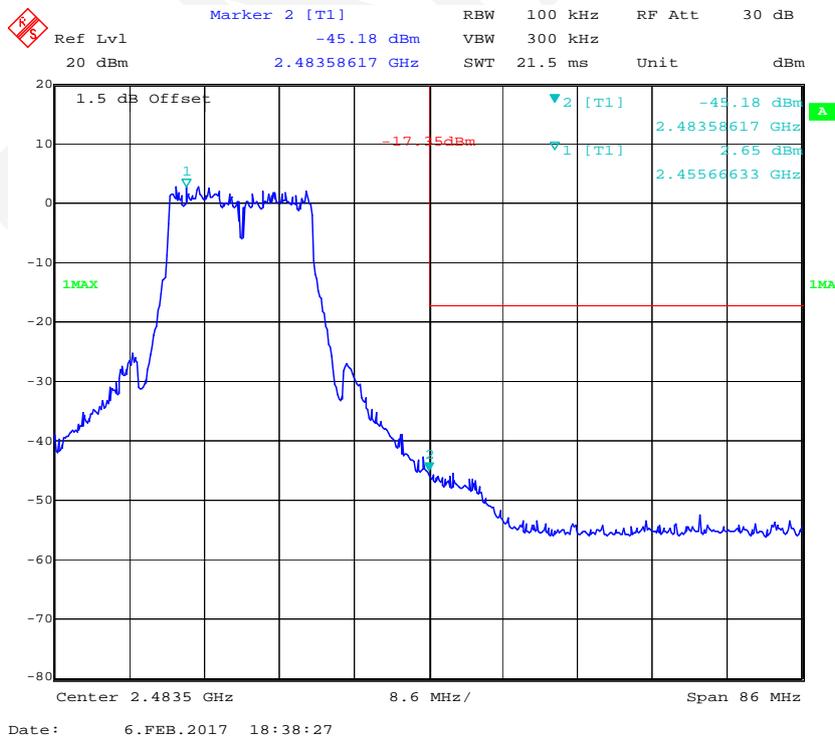
Chain 1, 802.11b: Band Edge, Right Side



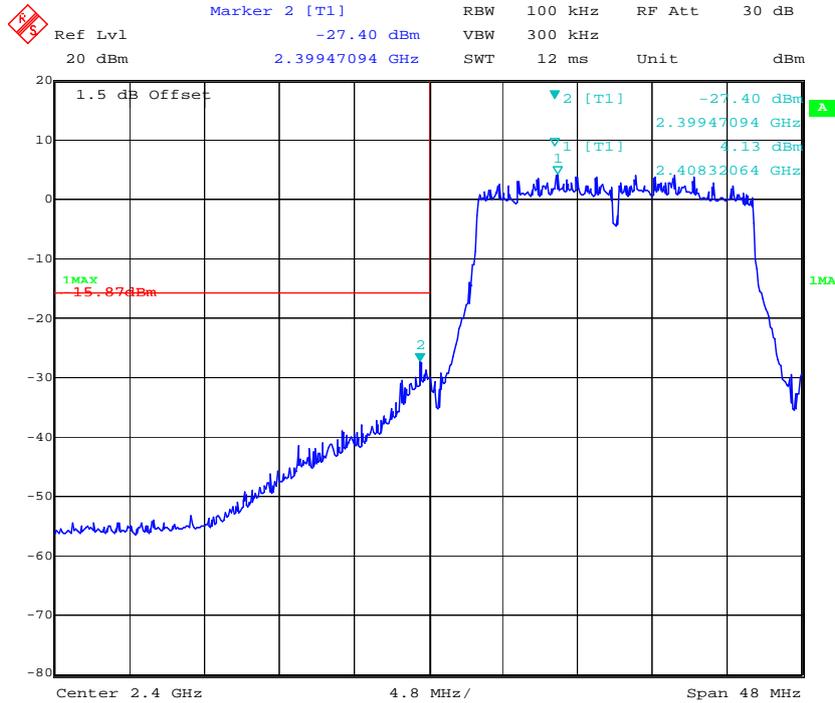
Chain 1, 802.11g: Band Edge, Left Side



Chain 1, 802.11g: Band Edge, Right Side

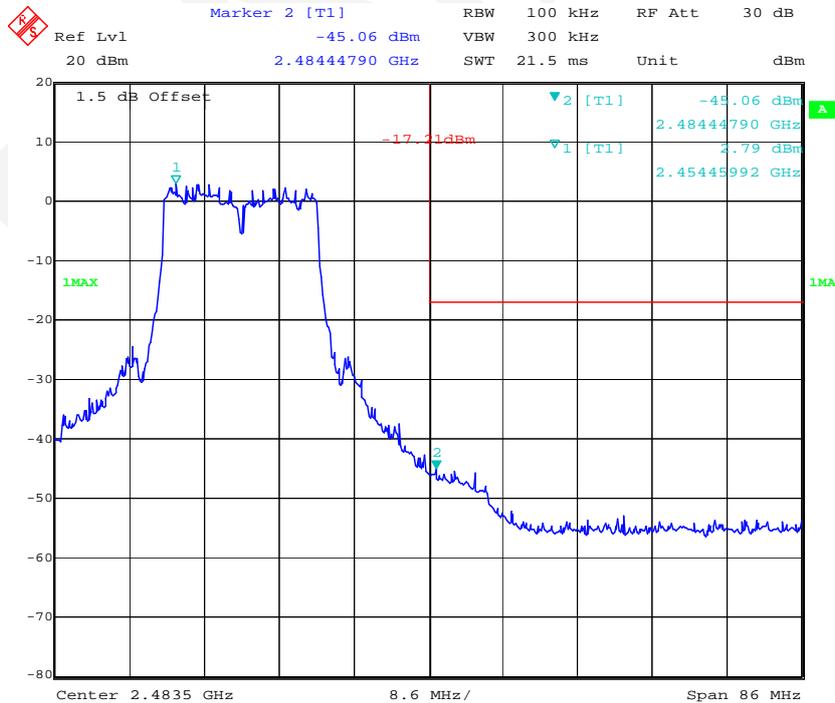


Chain 1, 802.11n ht20 Band Edge, Left Side



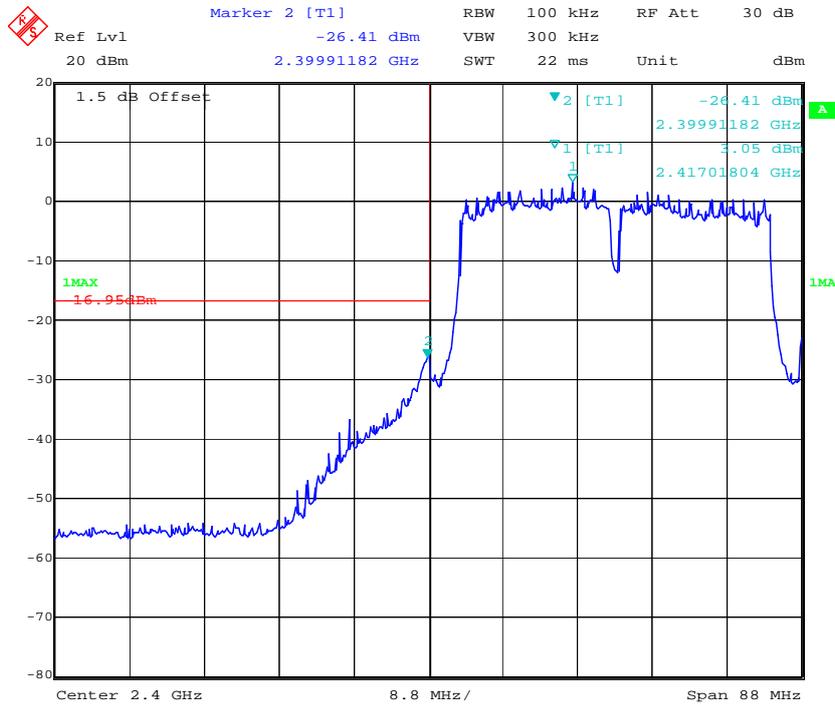
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Chain 1, 802.11n ht20 Band Edge, Right Side



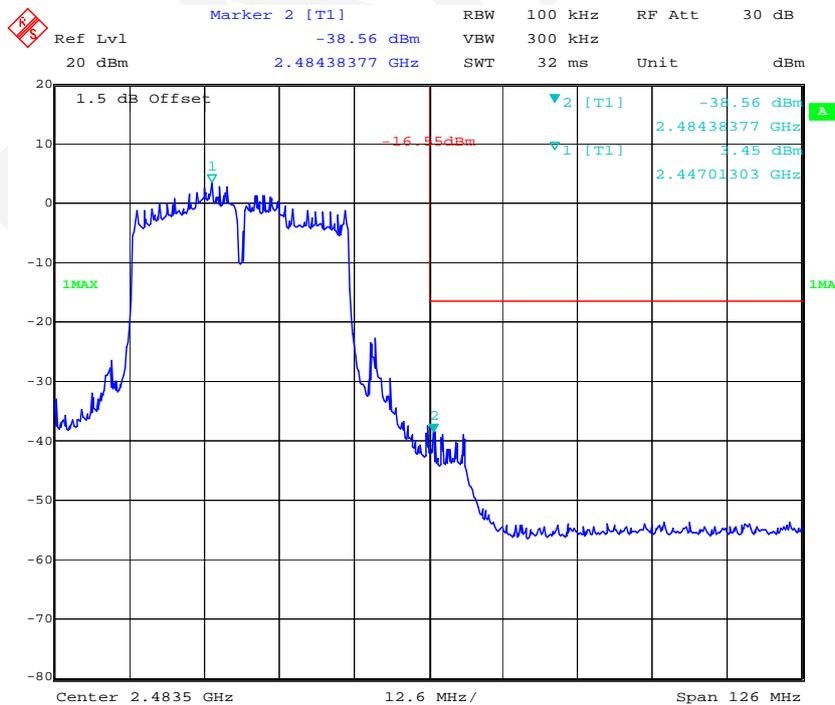
Date: 6.FEB.2017 17:44:53

Chain 1, 802.11n ht40 Band Edge, Left Side



Date: 6.FEB.2017 17:21:07

Chain 1, 802.11n ht40 Band Edge, Right Side



Date: 6.FEB.2017 17:32:00

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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d) Set the VBW $\geq 3 \times \text{RBW}$.
- 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:	18.5 °C
Relative Humidity:	56 %
ATM Pressure:	95.8 kPa

* The testing was performed by Lorin Bian on 2017-02-06.

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	-6.03	-6.08	/	≤8
	Middle	2437	-6.28	-7.29	/	≤8
	High	2462	-5.94	-8.03	/	≤8
802.11g	Low	2412	-8.62	-9.31	/	≤8
	Middle	2437	-9.37	-10.68	/	≤8
	High	2462	-8.7	-11.03	/	≤8
802.11n ht20	Low	2412	-8.95	-9.66	-6.28	≤8
	Middle	2437	-8.25	-10.72	-6.30	≤8
	High	2462	-9.62	-11.7	-7.53	≤8
802.11n ht40	Low	2422	-11.74	-12.11	-8.91	≤8
	Middle	2437	-11.66	-11.8	-8.72	≤8
	High	2452	-10.88	-12.19	-8.48	≤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:

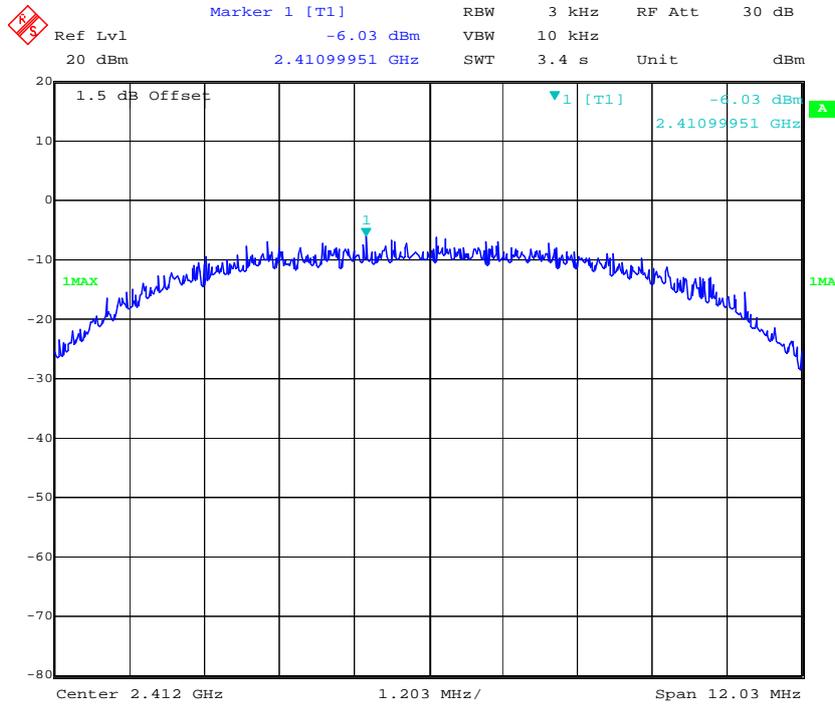
$$\text{Array Gain} = 10 \log(\text{NANT}/\text{NSS}) \text{ dB.}$$

So:

$$\text{Directional gain} = \text{GANT} + \text{Array Gain} = 2 + 10 \cdot \log(2) = 5 \text{ dBi}$$

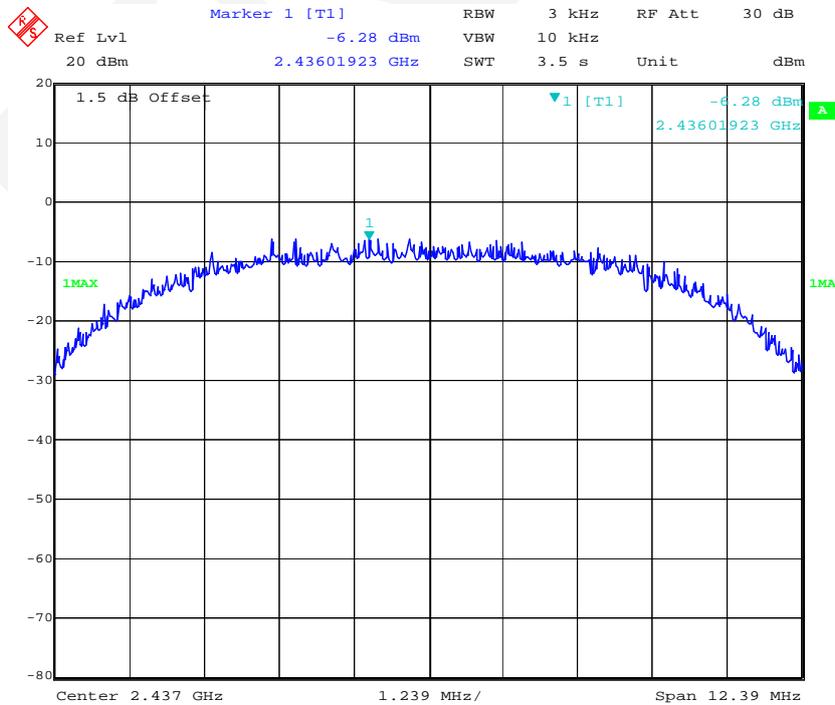
Chain 0:

Power Spectral Density, 802.11b Low Channel



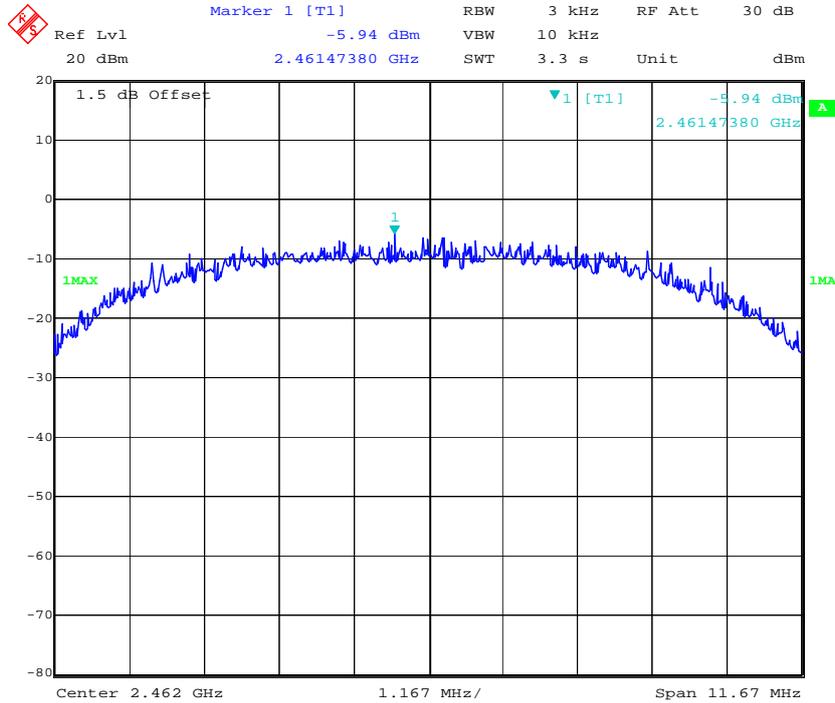
Date: 6.FEB.2017 16:03:08

Power Spectral Density, 802.11b Middle Channel

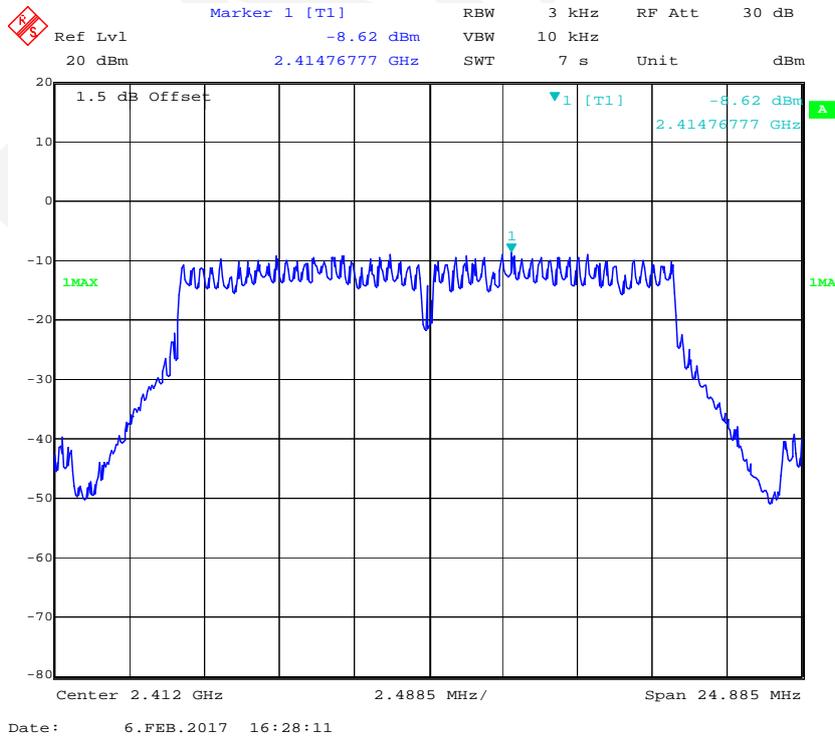


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Power Spectral Density, 802.11b High Channel

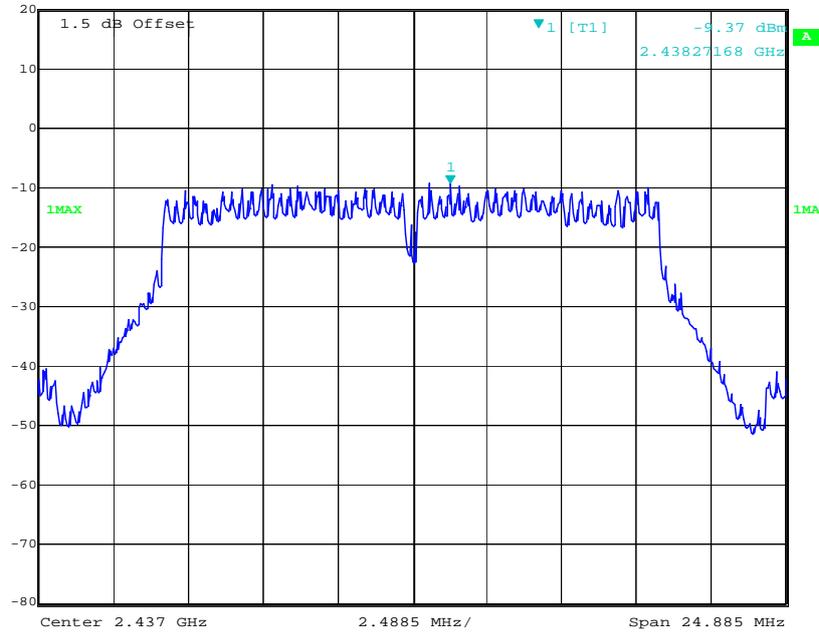


Power Spectral Density, 802.11g Low Channel



Power Spectral Density, 802.11g Middle Channel

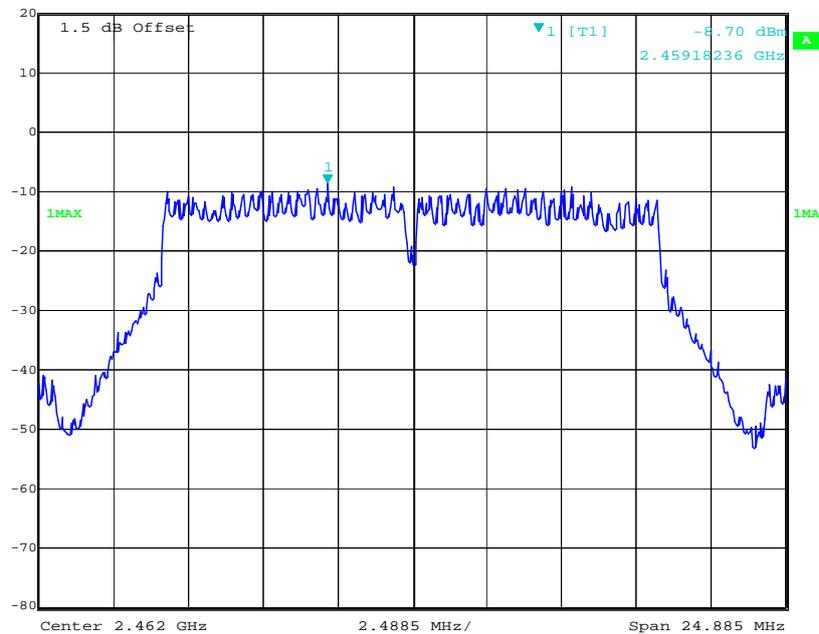
Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -9.37 dBm VBW 10 kHz
20 dBm 2.43827168 GHz SWT 7 s Unit dBm



Date: 6.FEB.2017 16:21:33

Power Spectral Density, 802.11g High Channel

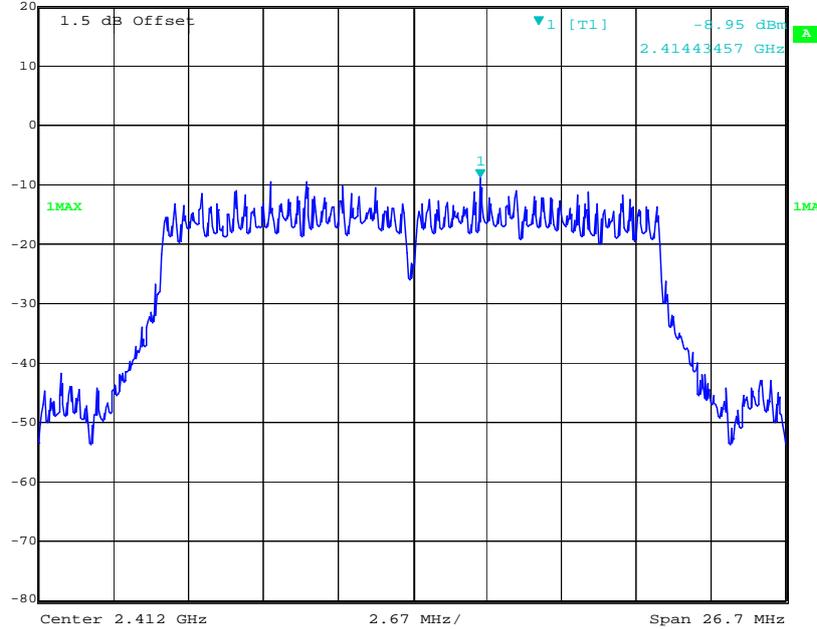
Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -8.70 dBm VBW 10 kHz
20 dBm 2.45918236 GHz SWT 7 s Unit dBm



Date: 6.FEB.2017 16:18:06

Power Spectral Density, 802.11n ht20 Low Channel

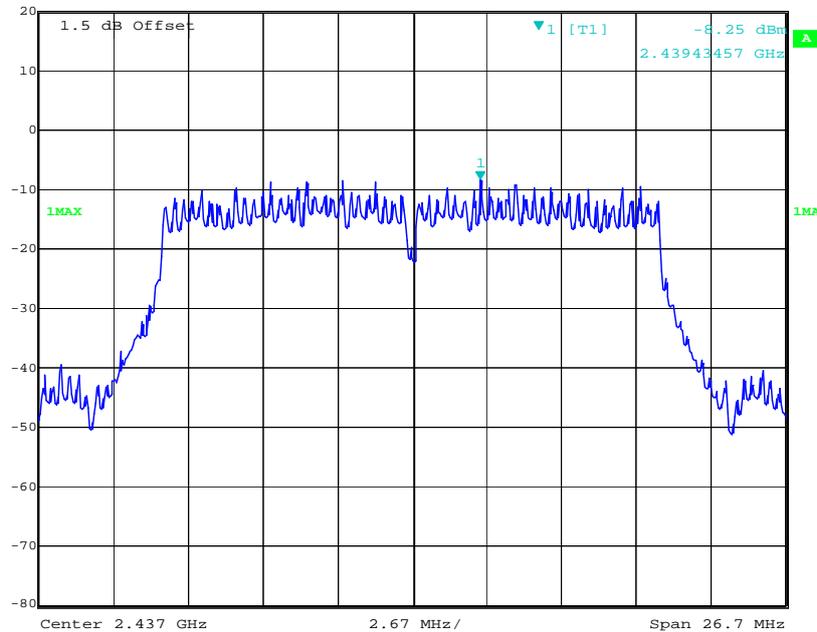
Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -8.95 dBm VBW 10 kHz
20 dBm 2.41443457 GHz SWT 7.6 s Unit dBm



Date: 6.FEB.2017 16:35:13

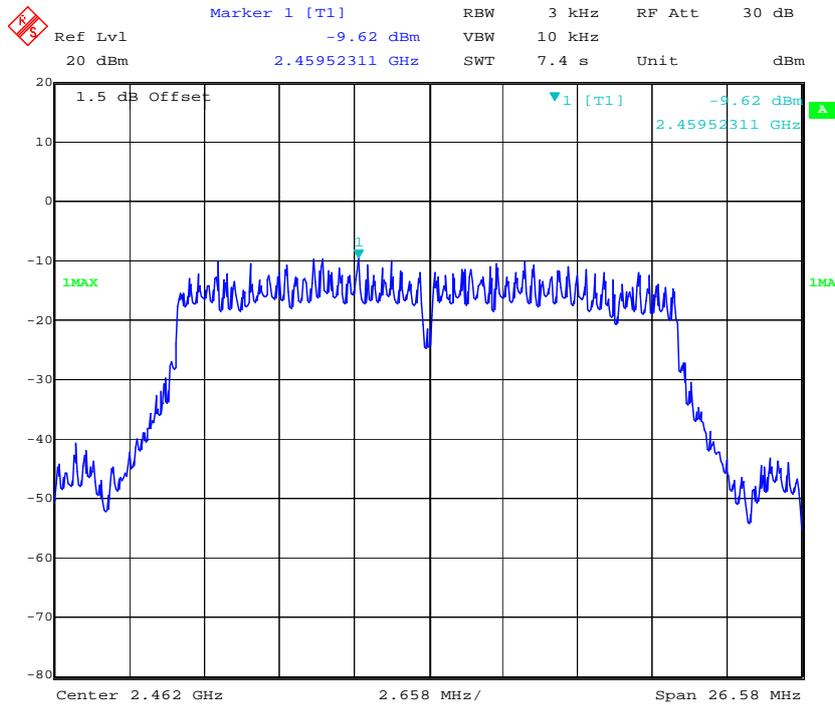
Power Spectral Density, 802.11n ht20 Middle Channel

Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -8.25 dBm VBW 10 kHz
20 dBm 2.43943457 GHz SWT 7.6 s Unit dBm

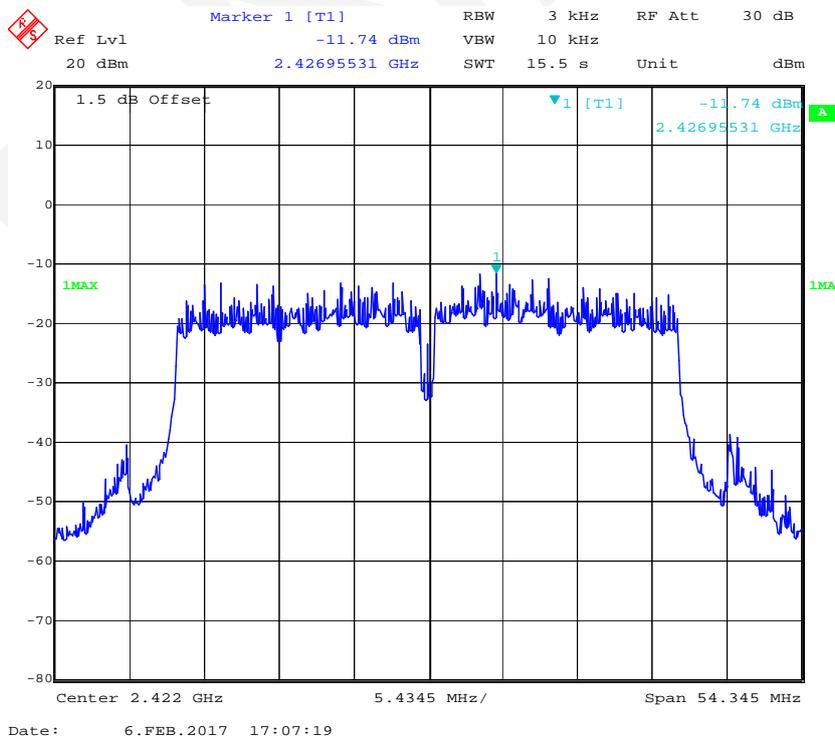


Date: 6.FEB.2017 16:44:17

Power Spectral Density, 802.11n ht20 High Channel

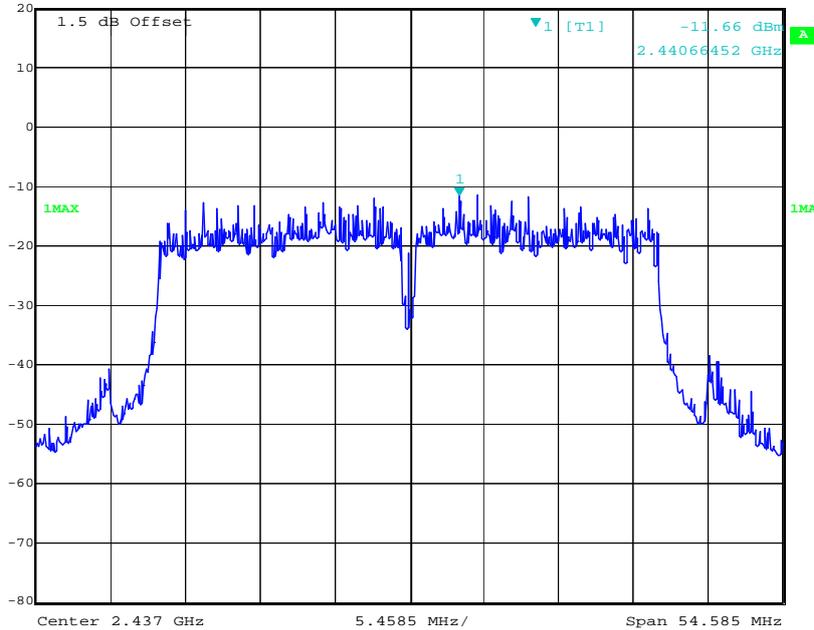


Power Spectral Density, 802.11n ht40 Low Channel



Power Spectral Density, 802.11n ht40 Middle Channel

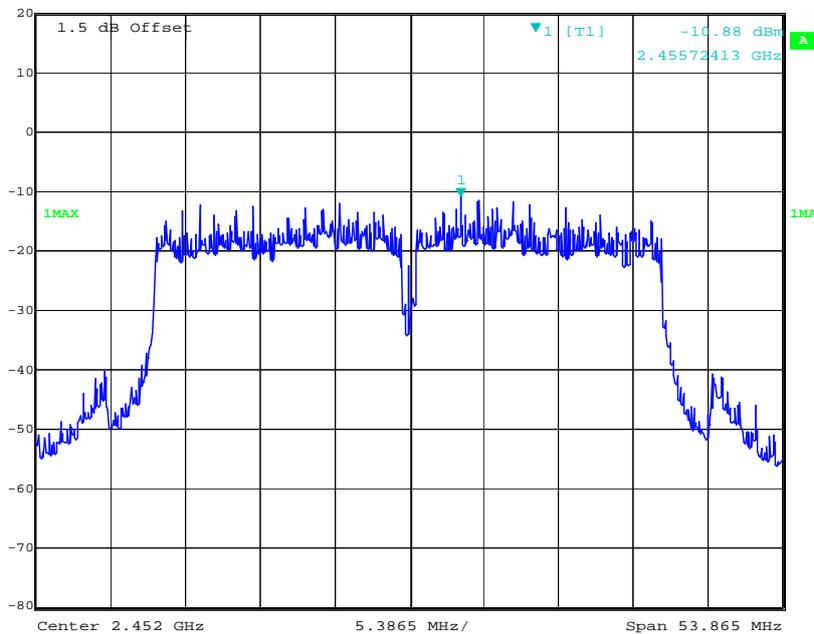
Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -11.66 dBm VBW 10 kHz
20 dBm 2.44066452 GHz SWT 15.5 s Unit dBm



Date: 6.FEB.2017 17:01:44

Power Spectral Density, 802.11n ht40 High Channel

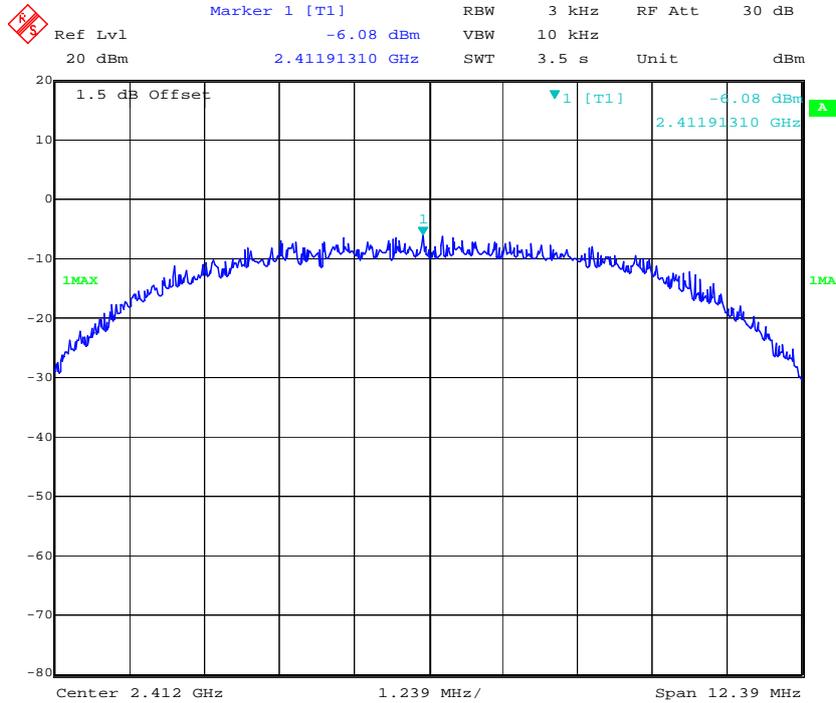
Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -10.88 dBm VBW 10 kHz
20 dBm 2.45572413 GHz SWT 15 s Unit dBm



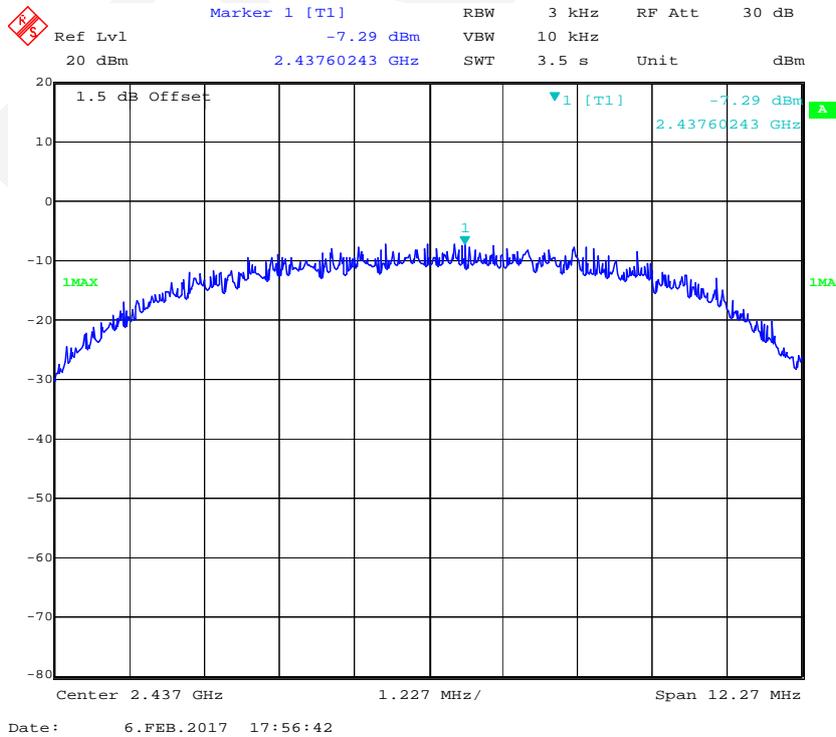
Date: 6.FEB.2017 16:57:08

Chain 1

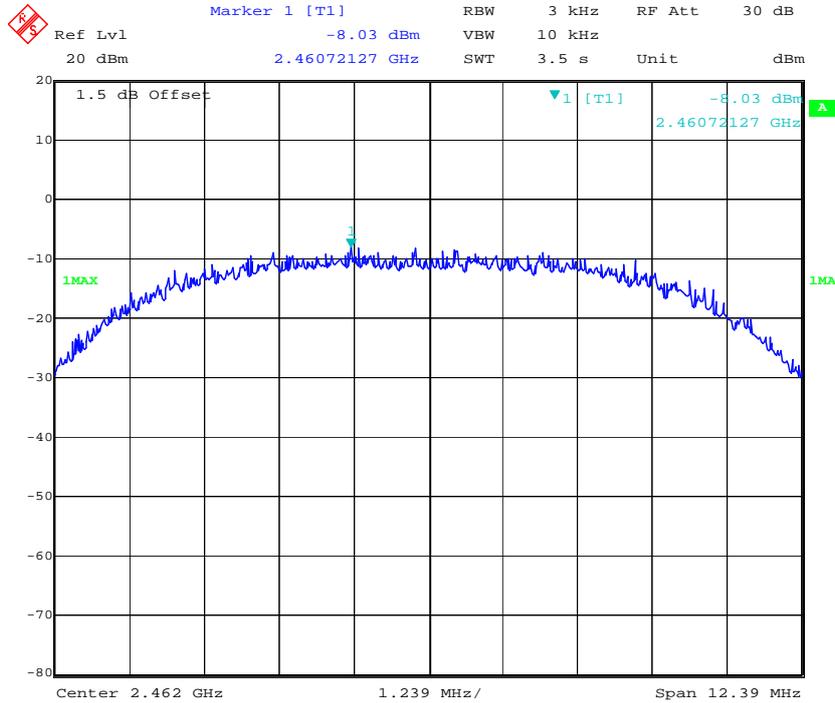
Power Spectral Density, 802.11b Low Channel



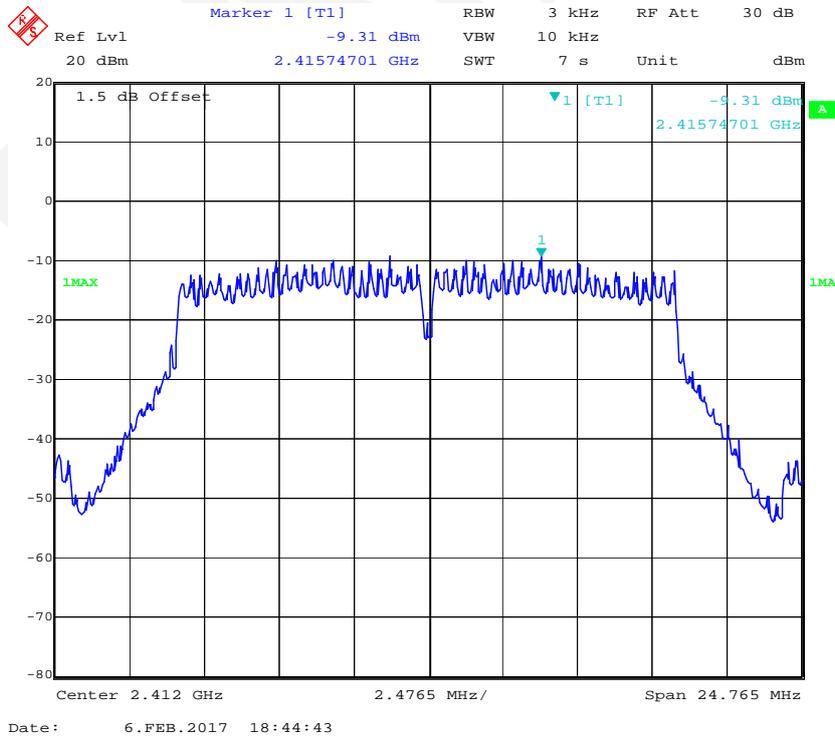
Power Spectral Density, 802.11b Middle Channel



Power Spectral Density, 802.11b High Channel

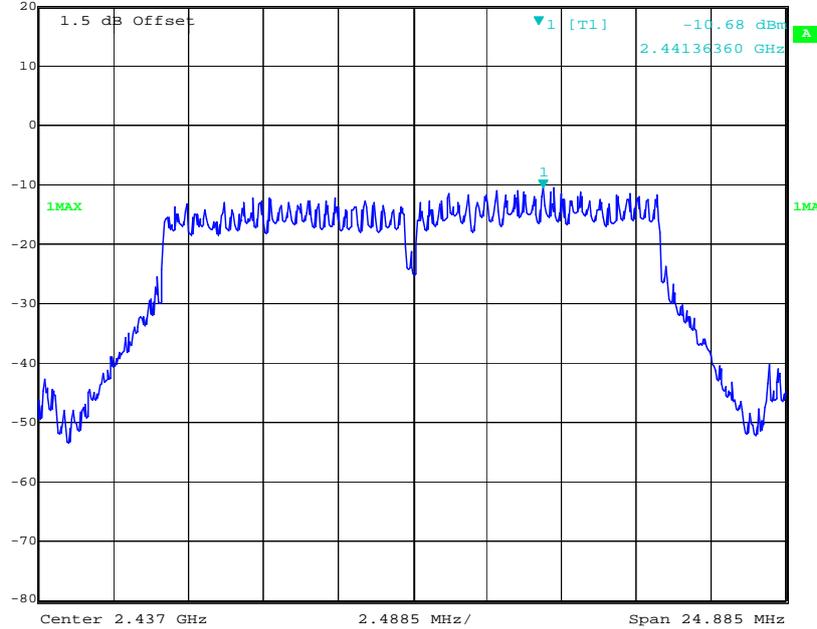


Power Spectral Density, 802.11g Low Channel



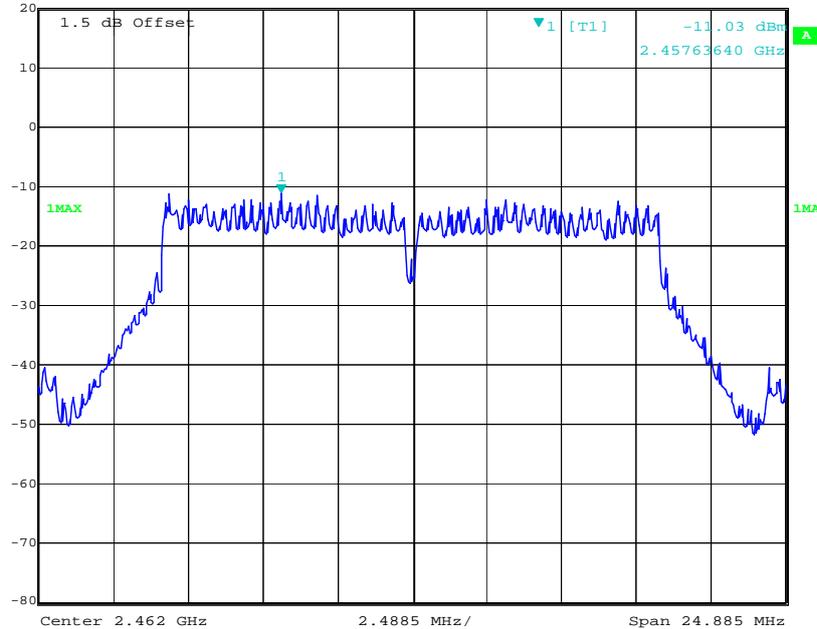
Power Spectral Density, 802.11g Middle Channel

Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -10.68 dBm VBW 10 kHz
20 dBm 2.44136360 GHz SWT 7 s Unit dBm

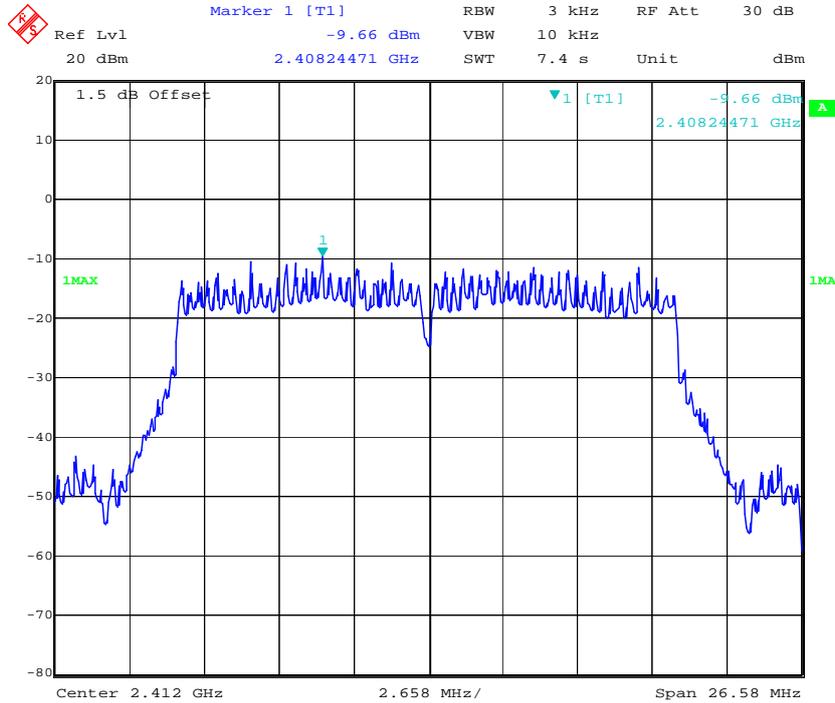


Power Spectral Density, 802.11g High Channel

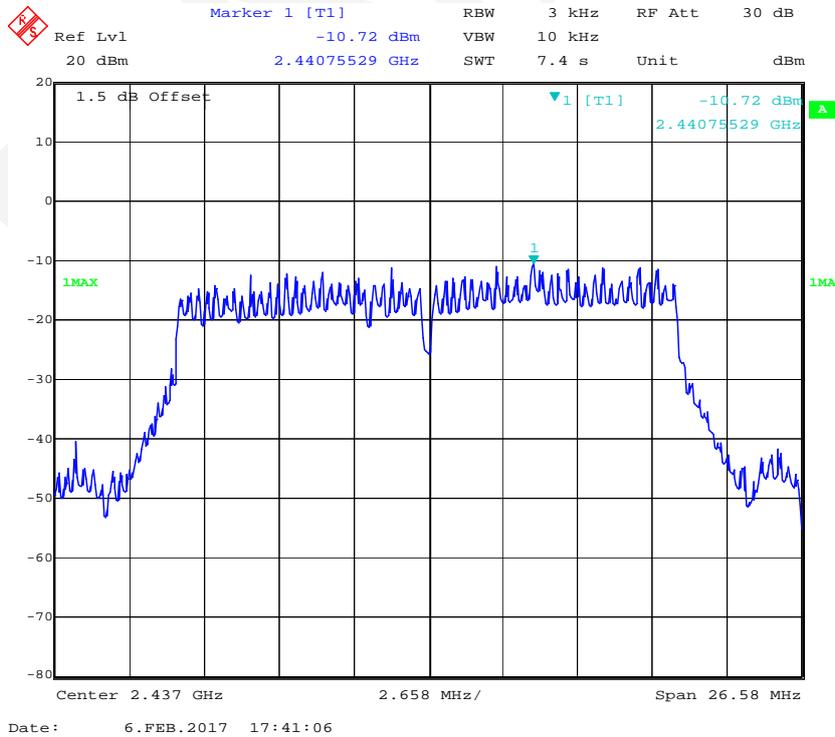
Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -11.03 dBm VBW 10 kHz
20 dBm 2.45763640 GHz SWT 7 s Unit dBm



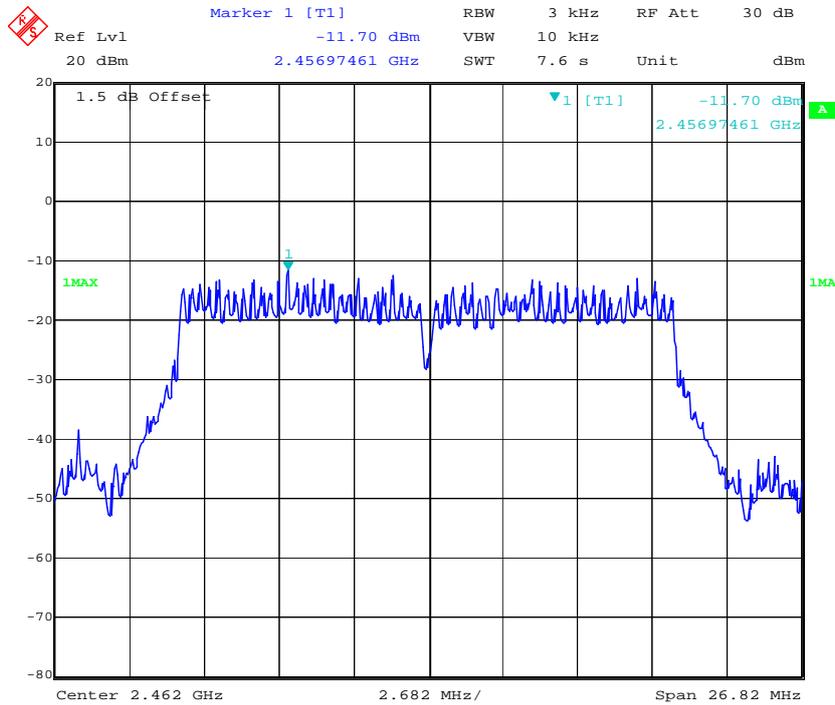
Power Spectral Density, 802.11n ht20 Low Channel



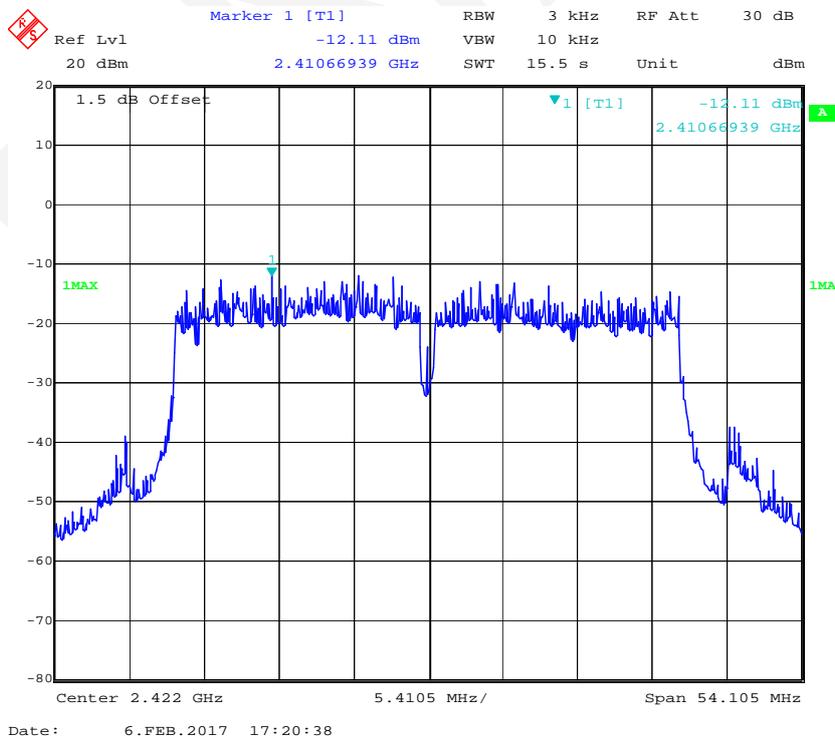
Power Spectral Density, 802.11n ht20 Middle Channel



Power Spectral Density, 802.11n ht20 High Channel

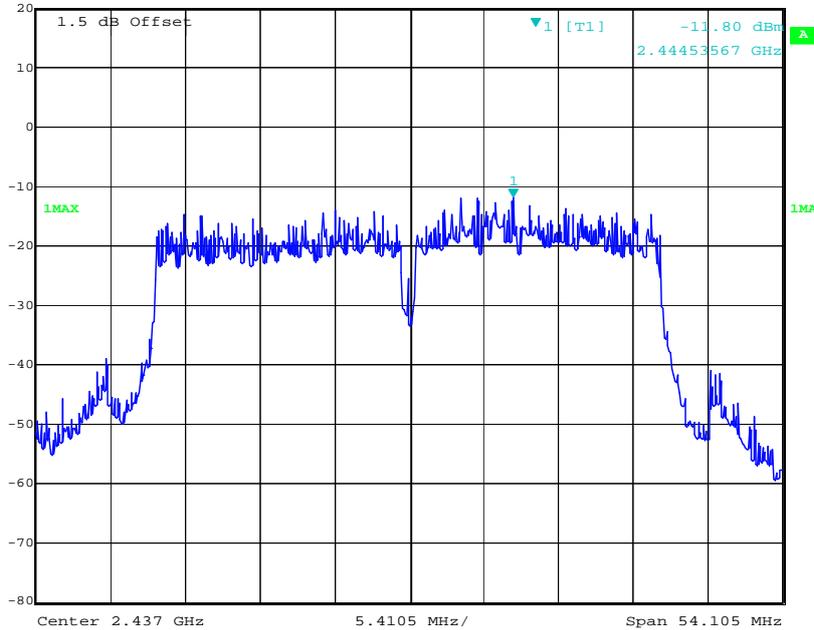


Power Spectral Density, 802.11n ht40 Low Channel



Power Spectral Density, 802.11n ht40 Middle Channel

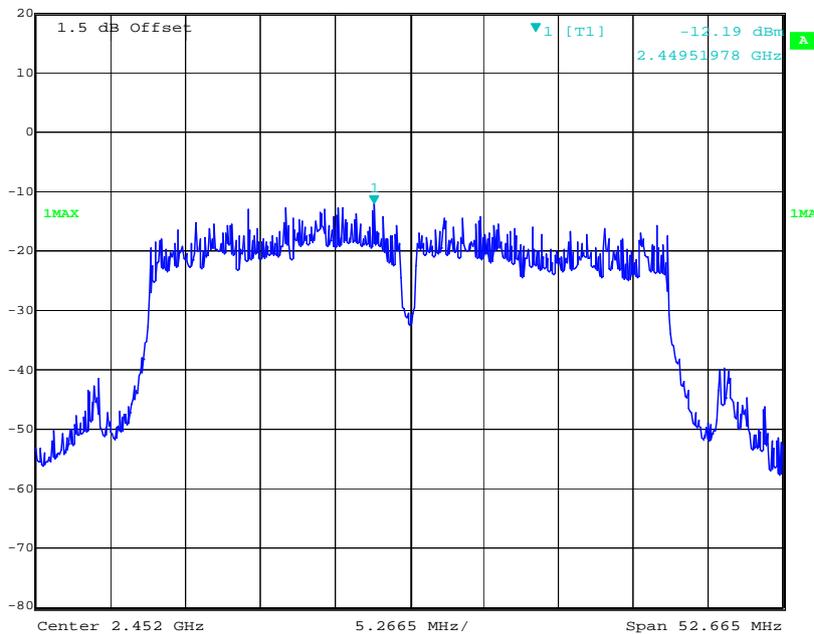
Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -11.80 dBm VBW 10 kHz
20 dBm 2.44453567 GHz SWT 15.5 s Unit dBm



Date: 6.FEB.2017 17:25:17

Power Spectral Density, 802.11n ht40 High Channel

Marker 1 [T1] RBW 3 kHz RF Att 30 dB
Ref Lvl -12.19 dBm VBW 10 kHz
20 dBm 2.44951978 GHz SWT 15 s Unit dBm



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