FCC PART 15.247

TEST REPORT

For

Billion Electric Co., Ltd.

8F, No.192, Sec. 2, Zhongxing Road, Xindian Dist., New Taipei City 231, Taiwan

FCC ID: QI3BIL-8700AXL

Report Type: Original Report	**Product Name:** Triple-WAN Wireless 1600Mbps VPN VDSL2/ADSL2+Firewall Router

Report Number:	RSC180228001-0C
Report Date:	2018-03-16
Reviewed By:	Sula Huang Engineering Director
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China Tel: +86-28-65525123 Fax: +86-28-65525125 www.baclcorp.com

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TABLE OF CONTENTS

GENERAL INFORMATION **4**
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) 4
MECHANICAL DESCRIPTION OF EUT 4
OBJECTIVE 4
RELATED SUBMITTAL(S)/GRANT(S) 4
MEASUREMENT UNCERTAINTY 5
TEST METHODOLOGY 5
TEST FACILITY 5
SYSTEM TEST CONFIGURATION **6**
DESCRIPTION OF TEST CONFIGURATION 6
EQUIPMENT MODIFICATIONS 7
EUT EXERCISE SOFTWARE 7
SUPPORT EQUIPMENT LIST AND DETAILS 10
EXTERNAL I/O CABLE 10
BLOCK DIAGRAM OF TEST SETUP 11
TEST EQUIPMENTS LIST 12
SUMMARY OF TEST RESULTS **13**
FCC §15.247 & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE) **14**
APPLICABLE STANDARD 14
FCC §15.203 - ANTENNA REQUIREMENT **16**
APPLICABLE STANDARD 16
ANTENNA CONNECTOR CONSTRUCTION 16
FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS **17**
APPLICABLE STANDARD 17
EUT SETUP 17
EMI TEST RECEIVER SETUP 17
TEST PROCEDURE 18
CORRECTED AMPLITUDE & MARGIN CALCULATION 18
TEST DATA 18
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS **21**
APPLICABLE STANDARD 21
EUT SETUP 21
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP 22
TEST PROCEDURE 22
CORRECTED AMPLITUDE & MARGIN CALCULATION 22
TEST DATA 23
FCC §15.247(a) (2) – 6 dB EMISSION BANDWIDTH **32**
APPLICABLE STANDARD 32
TEST PROCEDURE 32
TEST DATA 33
FCC §15.247(b) (3) - MAXIMUM CONDUCTED OUTPUT POWER **46**
APPLICABLE STANDARD 46
TEST PROCEDURE 46
TEST DATA 46
FCC §15.247(d) – 100 kHz BANDWIDTH OF FREQUENCY BAND EDGE **48**
APPLICABLE STANDARD 48
TEST PROCEDURE 48
TEST DATA 48

FINAL

FCC §15.247(e) - POWER SPECTRAL DENSITY 57
APPLICABLE STANDARD 57
TEST PROCEDURE 57
TEST DATA 58

FINAL

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **Billion Electric Co., Ltd.**, model number: **BiPAC 8700AX-1600 (FCC ID: QI3BIL-8700AXL)** or the "EUT" as referred to in this report was one **Triple-WAN Wireless 1600Mbps VPN VDSL2/ADSL2+ Firewall Router**.

Mechanical Description of EUT

The EUT was measured approximately: 225mm (L) x 183 mm (W) x 72 mm (H).

Rated input voltage: DC 12V from adapter

Adapter Information
Manufacturer: SHENZHEN FRECOM ELECTRONICS CO., LTD
Model: F24W5-120200SPAU
Input: AC 100-240V; 50/60Hz
Output: DC 12V, 2A

Note: The products, test model: BiPAC 8700AX-1600, multiple models: BiPAC 8700AXL-1600, BEC 8700AXL. Their differences were presented in Product Difference Statement provided by the applicant. So we selected model BiPAC 8700AX-1600 to fully test.

**All measurement and test data in this report were gathered from final production sample, serial number: 180228001/01 (assigned by BACL). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2018-02-27, and EUT complied with test requirement.*

Objective

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

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

Related Submittal(s)/Grant(s)

FCC Part 15.407 NII submissions with FCC ID: QI3BIL-8700AXL

Measurement Uncertainty

Item			Uncertainty
AC power line conducted emission			2.71 dB
Radiated Emission(Field Strength)	30MHz-200MHz	H	4.57 dB
		V	4.81 dB
	200MHz-1GHz	H	5.69 dB
		V	6.07 dB
	1GHz-6GHz		5.49 dB
	6GHz-18GHz		5.57 dB
	18GHz-40GHz		5.48 dB
Conducted RF Power			±0.61dB
Power Spectrum Density			±0.61dB
Occupied Bandwidth			±5%
Conducted Emission			±1.5dB
Humidity			±5%
Temperature			±1℃

Test Methodology

All measurements contained in this report were conducted with:

1. ANSI C63.10-2013 American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

2. KDB558074 D01 DTS Meas Guidance v04.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Chengdu) to collect test data is located No.5040, Huilongwan Plaza, No. 1, Shawan Road, Jinniu District, Chengdu, Sichuan, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 910975, the FCC Designation No. : CN1186.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062C-1.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

For Wi-Fi mode, 802.11b, 802.11g, and 802.11n-HT20 mode, 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, 7 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	7	2442
4	2427	8	2447
5	2432	9	2452
6	2437	-	-

802.11n HT40 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, PSD across all data rates bandwidths and modulations.

The device supports SISO and MIMO mode, maximum duty cycle was configured.
Power and PSD test results were the same as MIMO and SISO mode. So only the SISO mode was tested for these items and used to evaluate MIMO mode compliance.

All modes (b/g/n20/n40) support SISO and MIMO.

Equipment Modifications

No modification was made to the EUT tested.

EUT Exercise Software

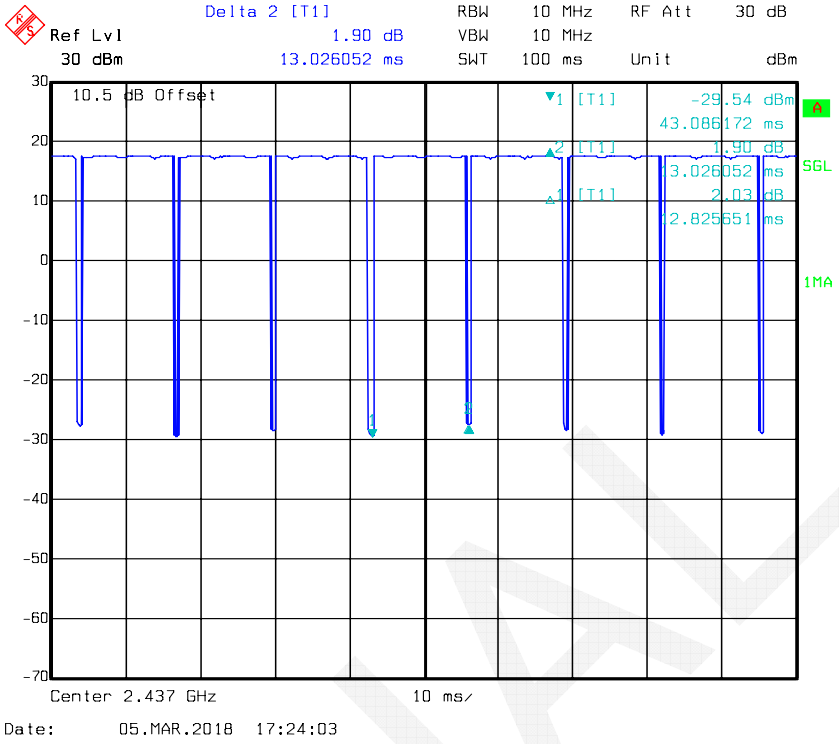
The worst condition (maximum power with maximum duty cycle) was setting by the software as following table:

Software and Version			accessMTool_3.0.0.2			
Test Mode	Channel	Frequency (MHz)	Data Rate (Mbps)		Power Level	
			Antenna 0	Antenna 1	Antenna 0	Antenna 1
802.11b	Low	2412	1	1	50	50
	Middle	2437	1	1	50	50
	High	2462	1	1	50	50
802.11g	Low	2412	6	6	40	40
	Middle	2437	6	6	40	40
	High	2462	6	6	40	40
802.11n-HT20	Low	2412	MCS0	MCS0	40	40
	Middle	2437	MCS0	MCS0	40	40
	High	2462	MCS0	MCS0	40	40
802.11n-HT40	Low	2422	MCS0	MCS0	35	35
	Middle	2437	MCS0	MCS0	35	35
	High	2452	MCS0	MCS0	35	35

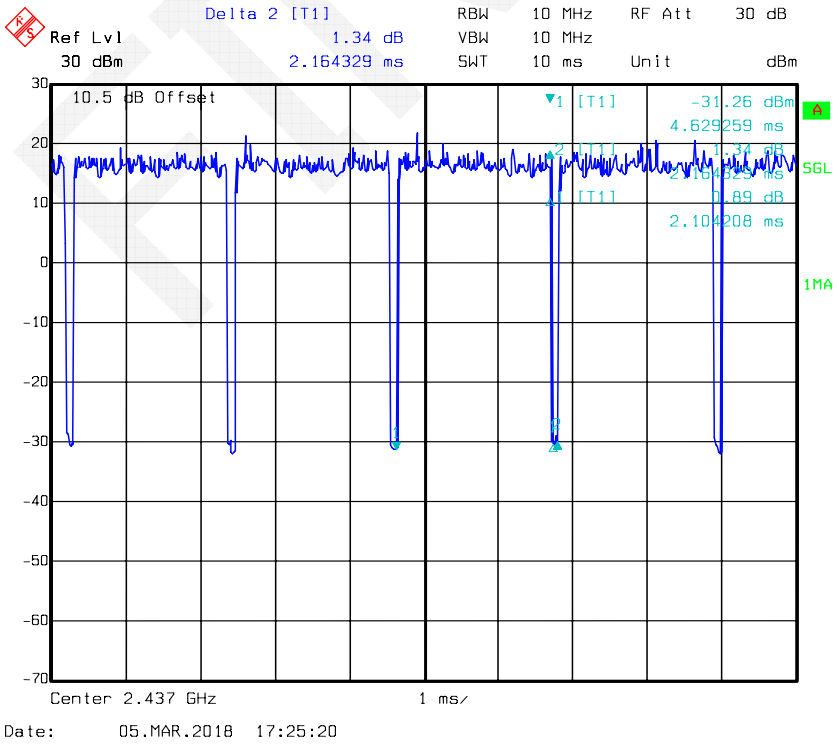
Duty Cycle information is below:

Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11b	12.83	13.03	98.47
802.11g	2.10	2.16	97.22
802.11n-HT20	1.96	2.02	97.03
802.11n-HT40	1.00	1.04	96.15

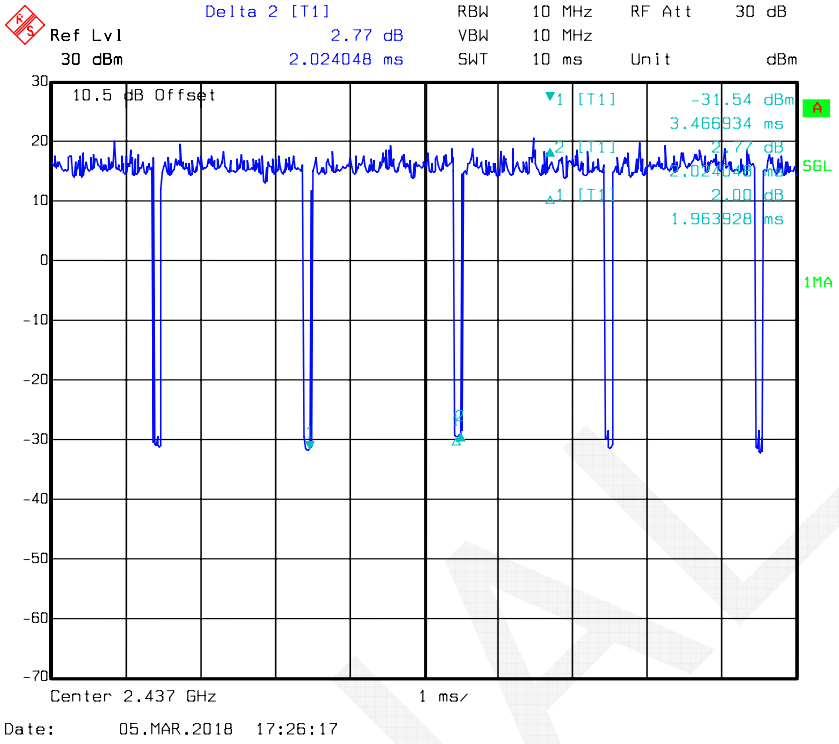
802.11b



802.11g



802.11n-HT20



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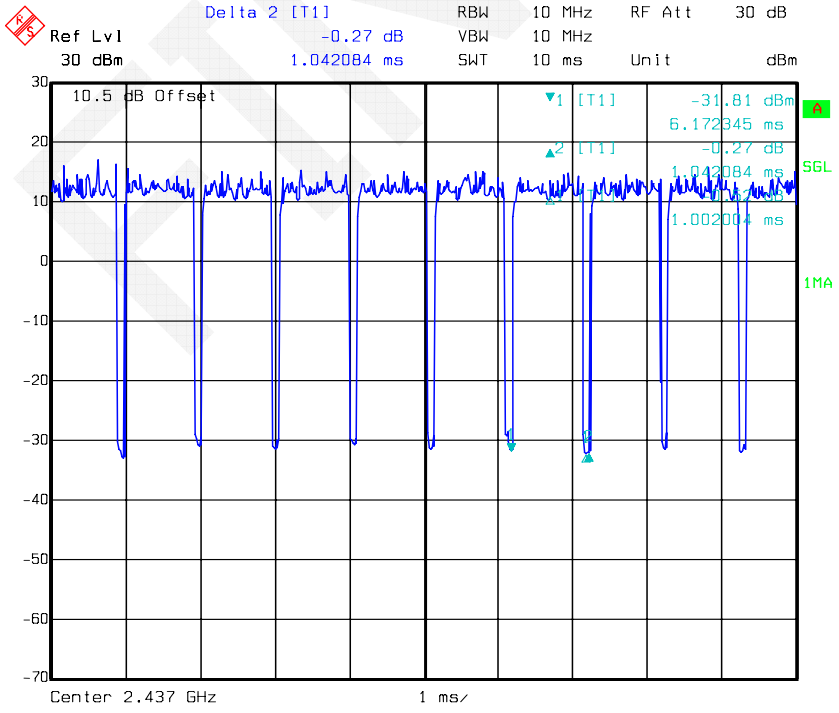
802.11n-HT40



Date: 05.MAR.2018 17:27:50

Support Equipment List and Details

Manufacturer	Description	Model Number	Serial Number
DL	Switch	DL-S1005PM	None
Kingston	USB Disk	DTSE9G2	1337254
None	PTSN	None	None
D-Link	HUB	DES-1008D	DK9Q25A008177
DELL	Laptop	E6410	7480059229

External I/O Cable

Cable Description	Length (m)	From	To
Unshielded RJ11 Cable	10	EUT	PTSN
Unshielded RJ45 Cable	10	EUT	Laptop
Unshielded RJ45 Cable x3	10	EUT	HUB
Unshielded RJ45 Cable	10	EUT	Switch

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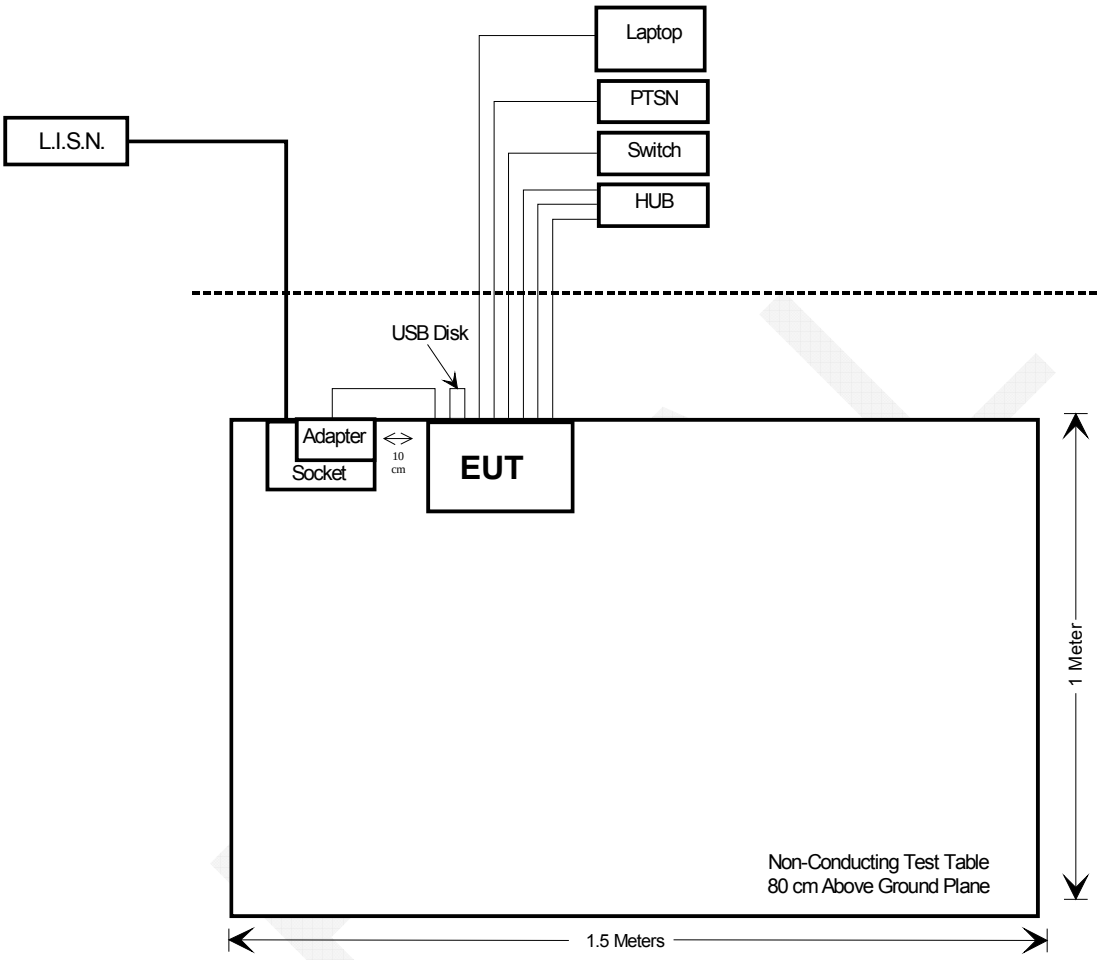
Block Diagram of Test Setup

AC Power Lines Conducted Emissions Test



Test Equipments List

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Conducted Emissions Test					
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2017-12-02	2018-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	100018	2017-05-20	2018-05-19
EMCO	L.I.S.N.	3810/2BR	9509-1102	2017-12-02	2018-12-01
Rohde & Schwarz	RF Limiter	ESH3Z2	DE14781	2017-11-10	2018-11-09
N/A	Conducted Cable	L-E003	N/A	2017-11-10	2018-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
Radiated Emissions Test					
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2017-05-20	2018-05-19
Sunol Sciences	Broadband Antenna	JB3	A121808	2017-05-18	2020-05-17
Sonoma	Pre-Amplifier	310N	186684	2017-08-18	2018-08-17
INMET	Attenuator	18N-6dB	64671	2017-11-10	2018-11-09
Rohde & Schwarz	EMI Test Receiver	ESIB 40	100215	2017-09-12	2018-09-11
ETS	Horn Antenna	3115	003-6076	2017-05-19	2020-05-18
A.H.Systems,inc	Horn Antenna	SAS-574	505	2017-12-02	2018-12-01
Mini-circuits	Pre-Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
EM Electronics Corporation	RF Pre-Amplifier	EM18G40	060725	2018-03-01	2019-02-28
N/A	RF Cable (below 1GHz)	L-E005	N/A	2017-11-10	2018-11-09
N/A	RF Cable (below 1GHz)	T-E128	N/A	2017-11-10	2018-11-09
N/A	RF Cable (below 1GHz)	T-E129	N/A	2017-11-10	2018-11-09
N/A	RF Cable (above 1GHz)	T-E069	N/A	2017-11-10	2018-11-09
ORIDA RF LABS	RF Cable (18-40GHz)	KMS-160A-72.0-KMS	1042	2017-11-10	2018-11-09
Micro-coax	RF Cable (18-40GHz)	UFA147A-1-2362-100100	MFR 64639 2310	2017-11-10	2018-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
RF Conducted Test					
Agilent	USB Wideband Power Sensor	U2021XA	MY53320008	2017-11-10	2018-11-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2017-05-18	2018-05-17
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2017-11-10	2018-11-09
N/A	RF Cable	NO.3	N/A	2017-11-09	2018-11-08
E-Microwave	DC Block	EMDCB-00036	OE01304225	Each Time	/
N/A	RF Cable	N/A	N/A	Each Time	/

*** Statement of Traceability:** BACL (Chengdu) attested that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 & §1.1310 & §2.1091	Maximum Permissible Exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum conducted output power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

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

Applicable Standard

According to subpart 15.247 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.

Per 447498 D01 General RF Exposure Guidance v06, simultaneous transmission MPE test exclusion applies when the sum of the MPE for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0.

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = PG/4\pi R^2$$

Where:
S = 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:

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

The rated tune-up output power and antenna gain in the below table:

Calculated Data:

MPE evaluation for single transmission:

Mode	Frequency Range (MHz)	Antenna Gain		Tune-up Conducted Power		Evaluation Distance (cm)	Power Density (mW/cm^2)	MPE Limit (mW/cm^2)
		(dBi)	(numeric)	(dBm)	(mW)			
WLAN	2412-2462	3.00	2.00	21.00	125.89	20	0.050	1.00
	5150-5250	5.00	3.16	17.50	56.23	20	0.035	1.00
	5725-5850	5.00	3.16	20.00	100.00	20	0.063	1.00

Note: The Wi-Fi(2.4G) and Wi-Fi(5G) can transmit simultaneously.

MPE evaluation for simultaneous transmission:

2.4 G(Wi-Fi) and 5G(Wi-Fi) can transmit at the same time, MPE evaluation is as below formula:

PD1/Limit1+PD2/Limit2+……＜1, PD (Power Density)

MPE evaluation:

2.4 G(Wi-Fi) and 5G(Wi-Fi):

Max MPE of 2.4G(Wi-Fi) + Max MPE of 5G(Wi-Fi) =0.050/1+0.063/1=0.113＜1.0

Result: MPE evaluation of single and simultaneous transmission meet the requirement of standard.

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FCC §15.203 - ANTENNA REQUIREMENT

Applicable Standard

According to § 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited. The structure and application of the EUT were analyzed to determine compliance with section §15.203 of the rules. §15.203 state that the subject device must meet the following criteria:

a. Antenna must be permanently attached to the unit.
b. Antenna must use a unique type of connector to attach to the EUT.
Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

This device used two internal PIFA antennas for 2.4G band and three external Dipole antennas for 5G band. The maximum gain for 2.4G band is 3dBi and 5G band is 5dBi, which fulfill the requirement of this section, please refer to the EUT photos.

Antenna Information

Antenna Type	Manufacturer	Model Name	Connector Type	Max. Antenna Gain
2.4G WIFI	Signal Plus Technology Co., Ltd.	6022F00015	Integrated	3dBi
5G WIFI	Signal Plus Technology Co., Ltd.	6022F00061 6022F00063 6022F00074	SMA-K	5dBi

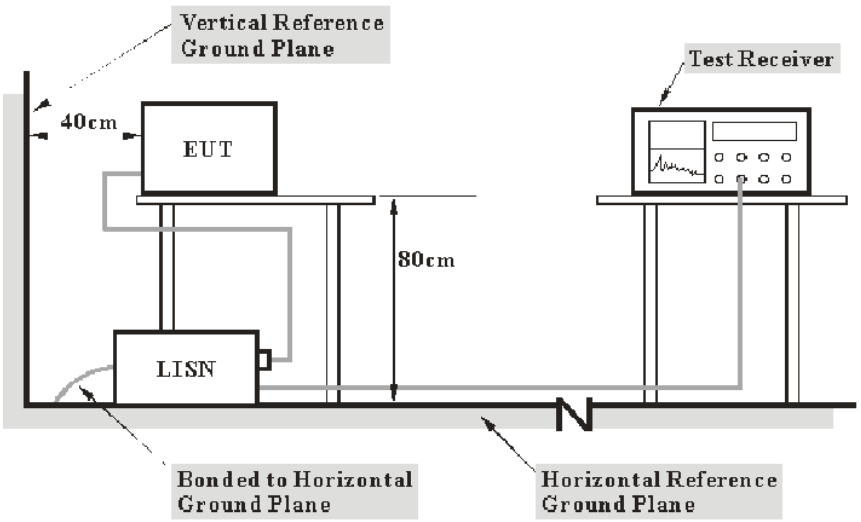
Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC§15.207

EUT Setup



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

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

The spacing between the peripherals was 10 cm.

The adapter was connected to AC 120V/60Hz.

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 L.I.S.N.

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:

Margin = Limit – Corrected Amplitude

Test Data

Environmental Conditions

Temperature:	22 °C
Relative Humidity:	40 %
ATM Pressure:	96.4 kPa

The testing was performed by Tom Tang on 2018-03-08.

Test Mode: Transmitting (802.11n-HT40_High channel)-worst case

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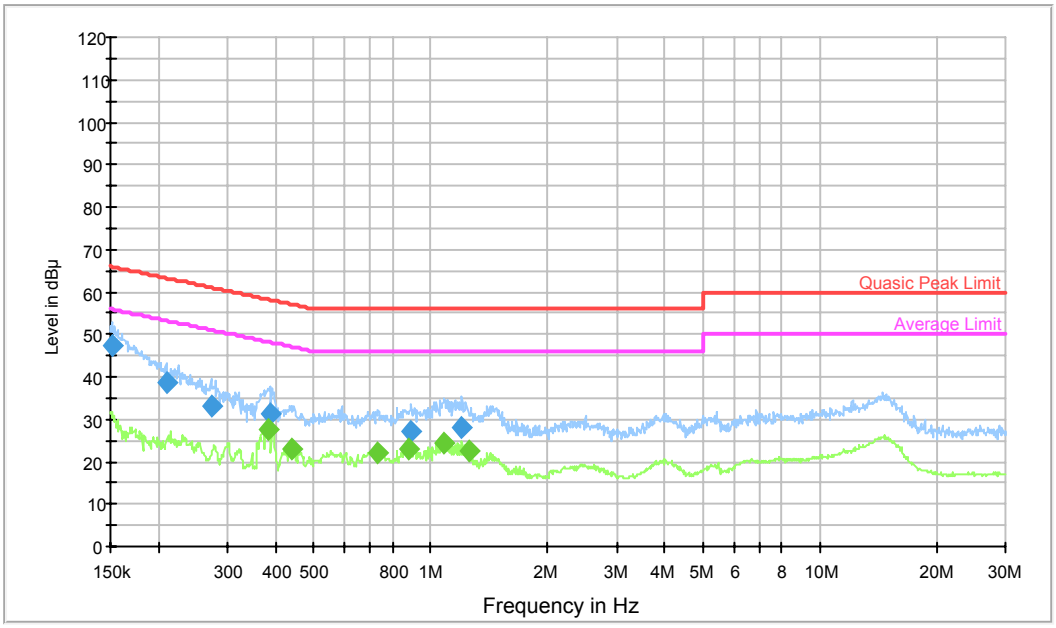
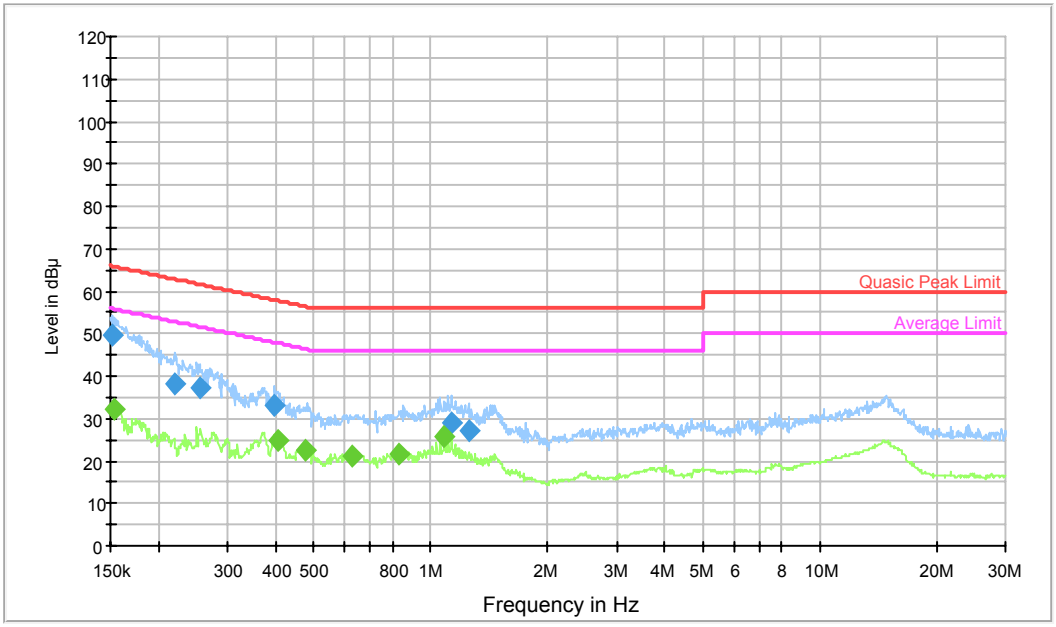
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.151203	47.5	9.000	L1	19.6	18.4	65.9
0.208925	38.8	9.000	L1	19.7	24.4	63.2
0.271903	33.0	9.000	L1	19.7	28.1	61.1
0.386351	31.1	9.000	L1	19.8	27.0	58.1
0.889872	27.2	9.000	L1	19.8	28.8	56.0
1.200483	28.3	9.000	L1	19.7	27.7	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.380230	27.4	9.000	L1	19.8	20.9	48.3
0.440752	22.8	9.000	L1	19.8	24.2	47.0
0.731772	22.0	9.000	L1	19.8	24.0	46.0
0.879278	23.0	9.000	L1	19.8	23.0	46.0
1.082130	24.2	9.000	L1	19.7	21.8	46.0
1.249376	22.3	9.000	L1	19.7	23.7	46.0

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dB µ V)
0.151807	49.4	9.000	N	19.5	16.5	65.9
0.220053	38.1	9.000	N	19.5	24.7	62.8
0.255079	37.5	9.000	N	19.5	24.1	61.6
0.397299	33.0	9.000	N	19.5	24.9	57.9
1.130707	29.2	9.000	N	19.5	26.8	56.0
1.249376	26.9	9.000	N	19.5	29.1	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corrected Factor (dB)	Margin (dB)	Limit (dBµV)
0.154251	32.4	9.000	N	19.5	23.4	55.8
0.403694	25.0	9.000	N	19.5	22.8	47.8
0.477384	22.6	9.000	N	19.5	23.8	46.4
0.626269	21.1	9.000	N	19.5	24.9	46.0
0.831485	21.8	9.000	N	19.5	24.2	46.0
1.082130	25.8	9.000	N	19.5	20.2	46.0

Note:
1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
The corrected factor has been input into the transducer of the test software.
2) Corrected Amplitude = Reading + Correction Factor
3) Margin = Limit – Corrected Amplitude

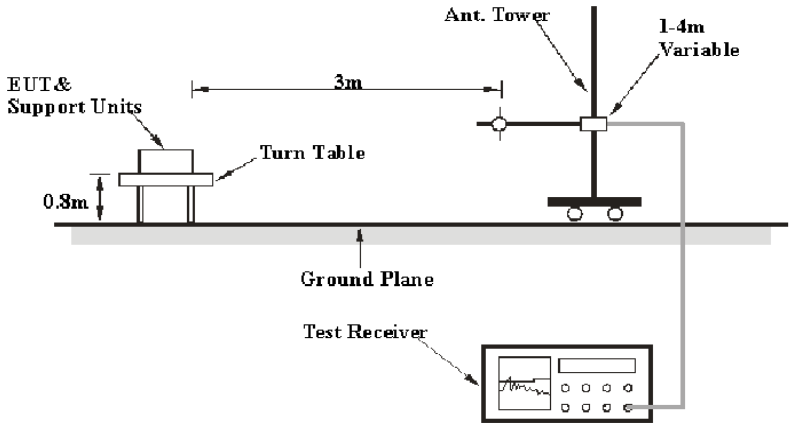
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

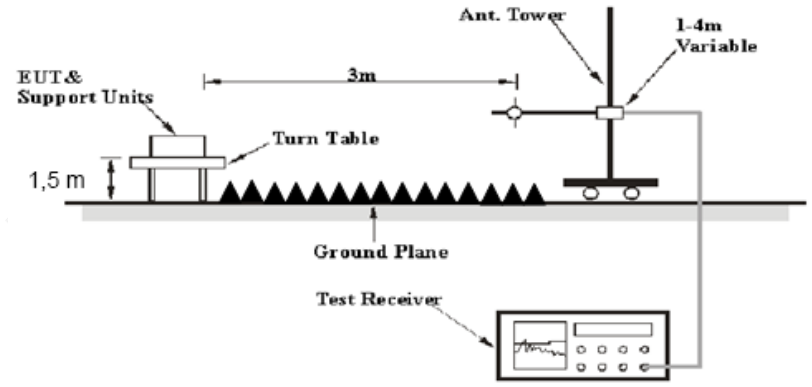
FCC §15.247 (d); §15.209; §15.205;

EUT Setup

Below 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 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.

The adapter was connected to AC 120V/60Hz.

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 Setup was set with the following configurations:

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

Frequency Range	RBW	Video B/W	Duty Cycle	Measurement
Above 1 GHz	1MHz	3 MHz	Any	PK
	1MHz	10Hz	>98%	AV
	1MHz	1/T	<98%	AV

Note: T is minimum transmission duration

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1 GHz, peak and Average detection modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

Corrected Amplitude = Meter Reading + Antenna Loss + 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 Data

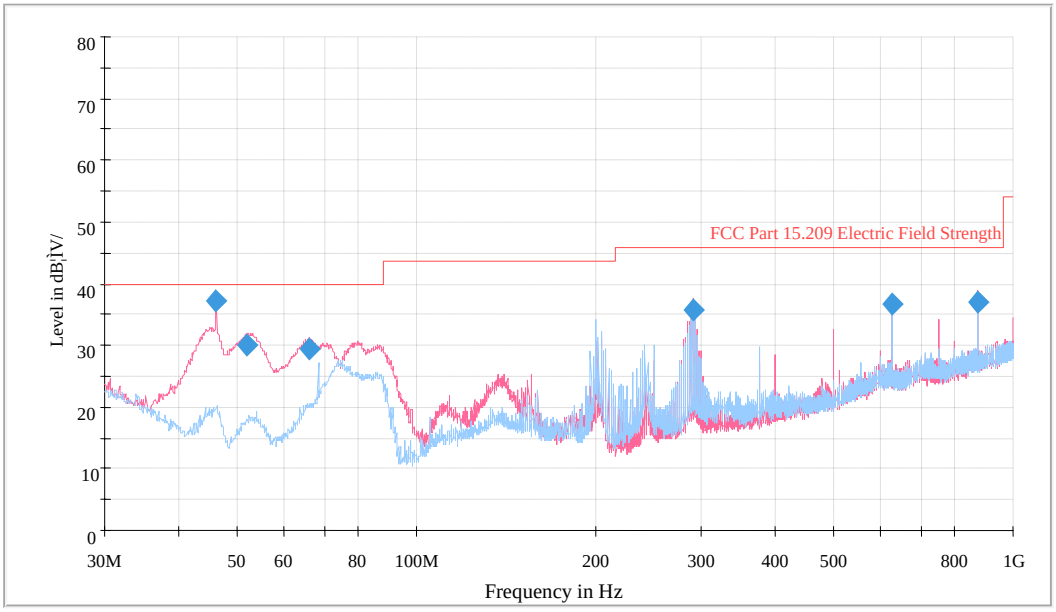
Environmental Conditions

Temperature:	22 °C
Relative Humidity:	56 %
ATM Pressure:	95.6 kPa

** The testing was performed by Tom Tang on 2018-03-15.*

Test Mode: Transmitting

1) 30 MHz to 1 GHz *(802.11n-HT40_High channel)-worst case*



Frequency (MHz)	QuasiPeak (dB µ V/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dB µ V/m)
46.126250	35.8	100.0	V	31.0	-14.9	4.2	40.0
52.067500	29.9	100.0	V	164.0	-17.2	10.1	40.0
66.011250	29.4	100.0	V	215.0	-16.9	10.6	40.0
292.021250	35.7	150.0	V	337.0	-10.8	10.3	46.0
625.095000	36.5	100.0	V	223.0	-4.3	9.5	46.0
875.112500	36.9	100.0	V	201.0	-0.6	9.1	46.0

**Within measurement uncertainty!*

1) Above 1 GHz *(MIMO) - worst case*

802.11b Mode

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	(dB/m)	dB	dB	dBµV/m	dBµV/m	dB
Frequency: 2412MHz									
2412	74.18	PK	H	28.74	3.00	0.00	105.92	N/A	N/A
2412	69.52	AV	H	28.74	3.00	0.00	101.26	N/A	N/A
2412	71.97	PK	V	28.74	3.00	0.00	103.71	N/A	N/A
2412	66.64	AV	V	28.74	3.00	0.00	98.38	N/A	N/A
2390	29.58	PK	H	28.67	3.00	0.00	61.25	74.00	12.75
2390	16.55	AV	H	28.67	3.00	0.00	48.22	54.00	5.78
4824	38.79	PK	H	33.91	5.11	26.87	50.94	74.00	23.06
4824	31.52	AV	H	33.91	5.11	26.87	43.67	54.00	10.33
7236	32.55	PK	H	36.43	6.18	26.36	48.80	74.00	25.20
7236	19.39	AV	H	36.43	6.18	26.36	35.64	54.00	18.36
Frequency: 2437MHz									
2437	73.94	PK	H	28.81	3.00	0.00	105.75	N/A	N/A
2437	68.85	AV	H	28.81	3.00	0.00	100.66	N/A	N/A
2437	71.29	PK	V	28.81	3.00	0.00	103.10	N/A	N/A
2437	66.24	AV	V	28.81	3.00	0.00	98.05	N/A	N/A
4874	38.81	PK	H	34.05	5.09	26.87	51.08	74.00	22.92
4874	31.39	AV	H	34.05	5.09	26.87	43.66	54.00	10.34
7311	33.03	PK	H	36.54	6.21	26.40	49.38	74.00	24.62
7311	20.11	AV	H	36.54	6.21	26.40	36.46	54.00	17.54
Frequency: 2462MHz									
2462	73.14	PK	H	28.89	2.99	0.00	105.02	N/A	N/A
2462	67.83	AV	H	28.89	2.99	0.00	99.71	N/A	N/A
2462	70.28	PK	V	28.89	2.99	0.00	102.16	N/A	N/A
2462	65.49	AV	V	28.89	2.99	0.00	97.37	N/A	N/A
2483.5	30.02	PK	H	28.95	2.99	0.00	61.96	74.00	12.04
2483.5	16.04	AV	H	28.95	2.99	0.00	47.98	54.00	6.02
4924	38.21	PK	H	34.19	5.07	26.88	50.59	74.00	23.41
4924	30.99	AV	H	34.19	5.07	26.88	43.37	54.00	10.63
7386	32.84	PK	H	36.64	6.25	26.43	49.30	74.00	24.70
7386	20.39	AV	H	36.64	6.25	26.43	36.85	54.00	17.15

802.11g Mode

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	(dB/m)	dB	dB	dBµV/m	dBµV/m	dB
Frequency: 2412MHz									
2412	75.18	PK	H	28.74	3.00	0.00	106.92	N/A	N/A
2412	64.56	AV	H	28.74	3.00	0.00	96.30	N/A	N/A
2412	73.24	PK	V	28.74	3.00	0.00	104.98	N/A	N/A
2412	63.74	AV	V	28.74	3.00	0.00	95.48	N/A	N/A
2390	34.26	PK	H	28.67	3.00	0.00	65.93	74.00	8.07
2390	19.39	AV	H	28.67	3.00	0.00	51.06	54.00	*2.94
4824	36.37	PK	H	33.91	5.11	26.87	48.52	74.00	25.48
4824	22.56	AV	H	33.91	5.11	26.87	34.71	54.00	19.29
7236	32.91	PK	H	36.43	6.18	26.36	49.16	74.00	24.84
7236	19.52	AV	H	36.43	6.18	26.36	35.77	54.00	18.23
Frequency: 2437MHz									
2437	74.71	PK	H	28.81	3.00	0.00	106.52	N/A	N/A
2437	63.53	AV	H	28.81	3.00	0.00	95.34	N/A	N/A
2437	73.06	PK	V	28.81	3.00	0.00	104.87	N/A	N/A
2437	63.06	AV	V	28.81	3.00	0.00	94.87	N/A	N/A
4874	36.41	PK	H	34.05	5.09	26.87	48.68	74.00	25.32
4874	22.28	AV	H	34.05	5.09	26.87	34.55	54.00	19.45
7311	33.01	PK	H	36.54	6.21	26.40	49.36	74.00	24.64
7311	19.70	AV	H	36.54	6.21	26.40	36.05	54.00	17.95
Frequency: 2462MHz									
2462	73.88	PK	H	28.89	2.99	0.00	105.76	N/A	N/A
2462	62.37	AV	H	28.89	2.99	0.00	94.25	N/A	N/A
2462	72.48	PK	V	28.89	2.99	0.00	104.36	N/A	N/A
2462	62.31	AV	V	28.89	2.99	0.00	94.19	N/A	N/A
2483.5	33.61	PK	H	28.95	2.99	0.00	65.55	74.00	8.45
2483.5	18.67	AV	H	28.95	2.99	0.00	50.61	54.00	*3.39
4924	35.99	PK	H	34.19	5.07	26.88	48.37	74.00	25.63
4924	21.87	AV	H	34.19	5.07	26.88	34.25	54.00	19.75
7386	32.67	PK	H	36.64	6.25	26.43	49.13	74.00	24.87
7386	19.33	AV	H	36.64	6.25	26.43	35.79	54.00	18.21

**Within measurement uncertainty!*

802.11n-HT20 Mode

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	(dB/m)	dB	dB	dBµV/m	dBµV/m	dB
Frequency: 2412MHz									
2412	74.94	PK	H	28.74	3.00	0.00	106.68	N/A	N/A
2412	64.74	AV	H	28.74	3.00	0.00	96.48	N/A	N/A
2412	72.71	PK	V	28.74	3.00	0.00	104.45	N/A	N/A
2412	62.91	AV	V	28.74	3.00	0.00	94.65	N/A	N/A
2390	33.85	PK	H	28.67	3.00	0.00	65.52	74.00	8.48
2390	19.18	AV	H	28.67	3.00	0.00	50.85	54.00	*3.15
4824	35.89	PK	H	33.91	5.11	26.87	48.04	74.00	25.96
4824	22.01	AV	H	33.91	5.11	26.87	34.16	54.00	19.84
7236	32.49	PK	H	36.43	6.18	26.36	48.74	74.00	25.26
7236	19.08	AV	H	36.43	6.18	26.36	35.33	54.00	18.67
Frequency: 2437MHz									
2437	74.22	PK	H	28.81	3.00	0.00	106.03	N/A	N/A
2437	63.39	AV	H	28.81	3.00	0.00	95.20	N/A	N/A
2437	72.17	PK	V	28.81	3.00	0.00	103.98	N/A	N/A
2437	62.36	AV	V	28.81	3.00	0.00	94.17	N/A	N/A
4874	35.43	PK	H	34.05	5.09	26.87	47.70	74.00	26.30
4874	21.87	AV	H	34.05	5.09	26.87	34.14	54.00	19.86
7311	32.49	PK	H	36.54	6.21	26.40	48.84	74.00	25.16
7311	19.08	AV	H	36.54	6.21	26.40	35.43	54.00	18.57
Frequency: 2462MHz									
2462	73.55	PK	H	28.89	2.99	0.00	105.43	N/A	N/A
2462	62.31	AV	H	28.89	2.99	0.00	94.19	N/A	N/A
2462	71.71	PK	V	28.89	2.99	0.00	103.59	N/A	N/A
2462	61.96	AV	V	28.89	2.99	0.00	93.84	N/A	N/A
2483.5	31.48	PK	H	28.95	2.99	0.00	63.42	74.00	10.58
2483.5	18.46	AV	H	28.95	2.99	0.00	50.40	54.00	*3.60
4924	35.21	PK	H	34.19	5.07	26.88	47.59	74.00	26.41
4924	21.94	AV	H	34.19	5.07	26.88	34.32	54.00	19.68
7386	32.65	PK	H	36.64	6.25	26.43	49.11	74.00	24.89
7386	19.17	AV	H	36.64	6.25	26.43	35.63	54.00	18.37

**Within measurement uncertainty!*

802.11n-HT40 Mode

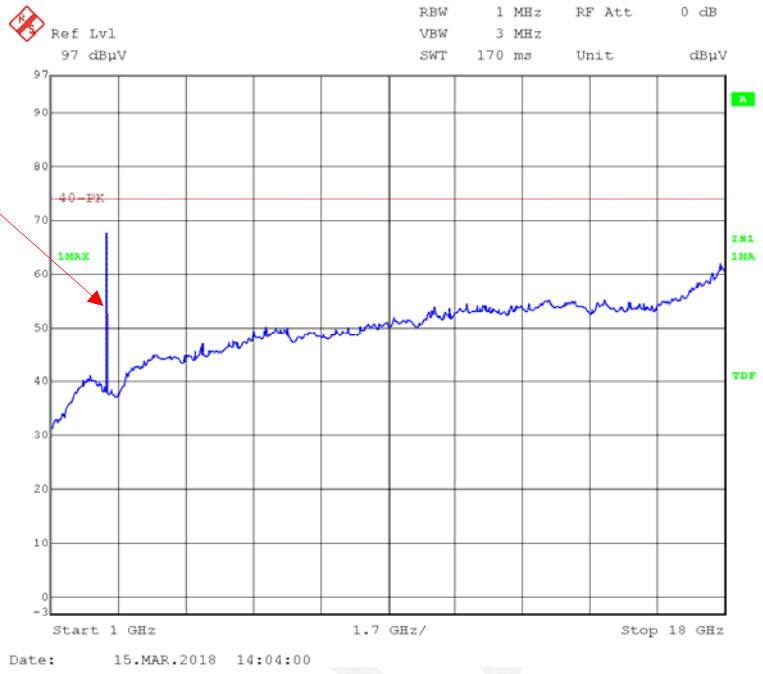
Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	(dB/m)	dB	dB	dBµV/m	dBµV/m	dB
Frequency: 2422MHz									
2422	69.81	PK	H	28.77	3.00	0.00	101.58	N/A	N/A
2422	59.56	AV	H	28.77	3.00	0.00	91.33	N/A	N/A
2422	68.59	PK	V	28.77	3.00	0.00	100.36	N/A	N/A
2422	58.08	AV	V	28.77	3.00	0.00	89.85	N/A	N/A
2390	33.43	PK	H	28.67	3.00	0.00	65.10	74.00	8.90
2390	18.67	AV	H	28.67	3.00	0.00	50.34	54.00	*3.66
4844	34.59	PK	H	33.96	5.10	26.87	46.78	74.00	27.22
4844	21.18	AV	H	33.96	5.10	26.87	33.37	54.00	20.63
7266	32.46	PK	H	36.47	6.19	26.38	48.74	74.00	25.26
7266	19.57	AV	H	36.47	6.19	26.38	35.85	54.00	18.15
Frequency: 2437MHz									
2437	69.12	PK	H	28.81	3.00	0.00	100.93	N/A	N/A
2437	58.93	AV	H	28.81	3.00	0.00	90.74	N/A	N/A
2437	67.80	PK	V	28.81	3.00	0.00	99.61	N/A	N/A
2437	57.59	AV	V	28.81	3.00	0.00	89.40	N/A	N/A
4874	34.40	PK	H	34.05	5.09	26.87	46.67	74.00	27.33
4874	21.07	AV	H	34.05	5.09	26.87	33.34	54.00	20.66
7311	32.41	PK	H	36.54	6.21	26.40	48.76	74.00	25.24
7311	19.60	AV	H	36.54	6.21	26.40	35.95	54.00	18.05
Frequency: 2452MHz									
2452	68.45	PK	H	28.86	3.00	0.00	100.31	N/A	N/A
2452	58.34	AV	H	28.86	3.00	0.00	90.20	N/A	N/A
2452	67.05	PK	V	28.86	3.00	0.00	98.91	N/A	N/A
2452	57.15	AV	V	28.86	3.00	0.00	89.01	N/A	N/A
2483.5	31.17	PK	H	28.95	2.99	0.00	63.11	74.00	10.89
2483.5	18.74	AV	H	28.95	2.99	0.00	50.68	54.00	*3.32
4904	34.23	PK	H	34.13	5.08	26.87	46.57	74.00	27.43
4904	20.99	AV	H	34.13	5.08	26.87	33.33	54.00	20.67
7356	32.37	PK	H	36.60	6.23	26.42	48.78	74.00	25.22
7356	19.66	AV	H	36.60	6.23	26.42	36.07	54.00	17.93

**Within measurement uncertainty!*

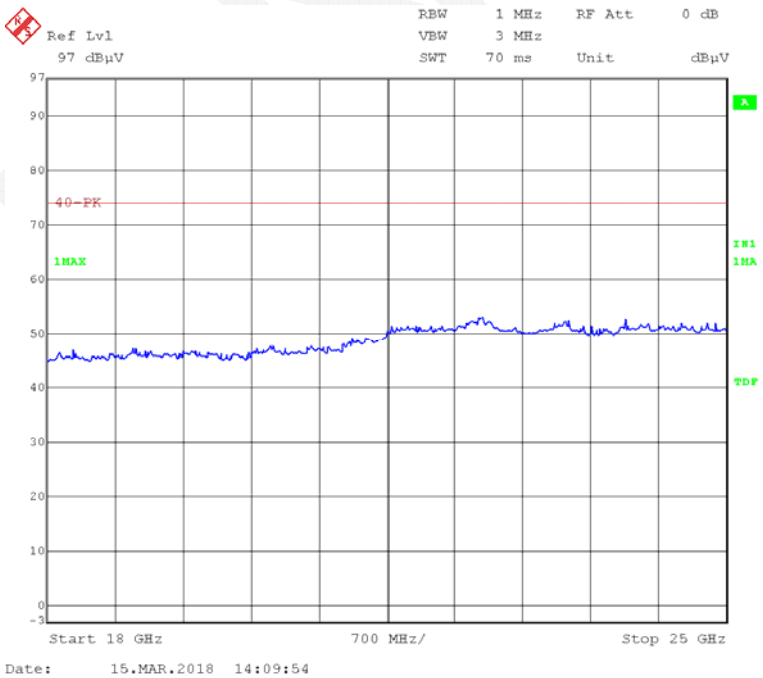
Please refer to the below pre-scan plot of worst case:

802.11g Mode: Low Channel_Horizontal_1GHz-18GHz

Fundamental with Reject Band Filter

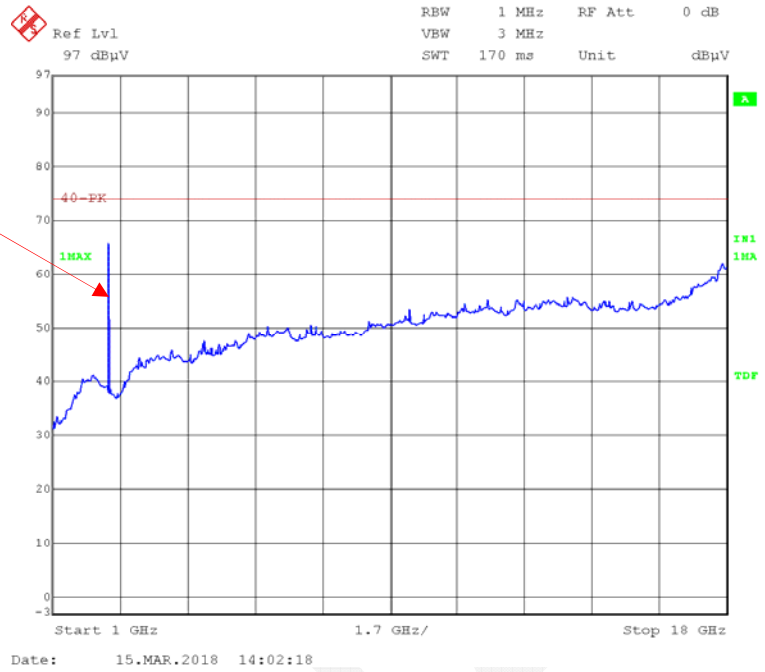


802.11g Mode: Low Channel_Horizontal_18GHz-25GHz

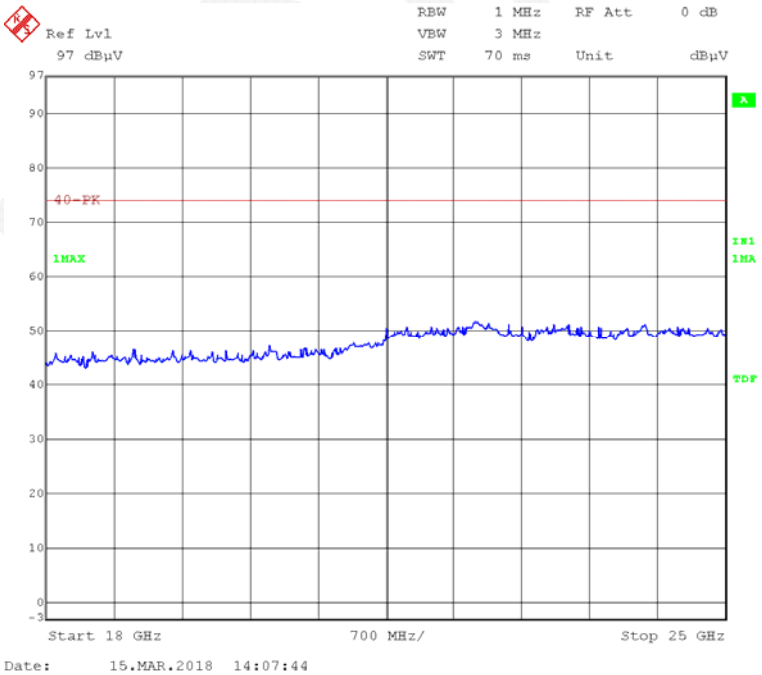


802.11g Mode: Low Channel_Vertical_1GHz-18GHz

Fundamental with Reject Band Filter



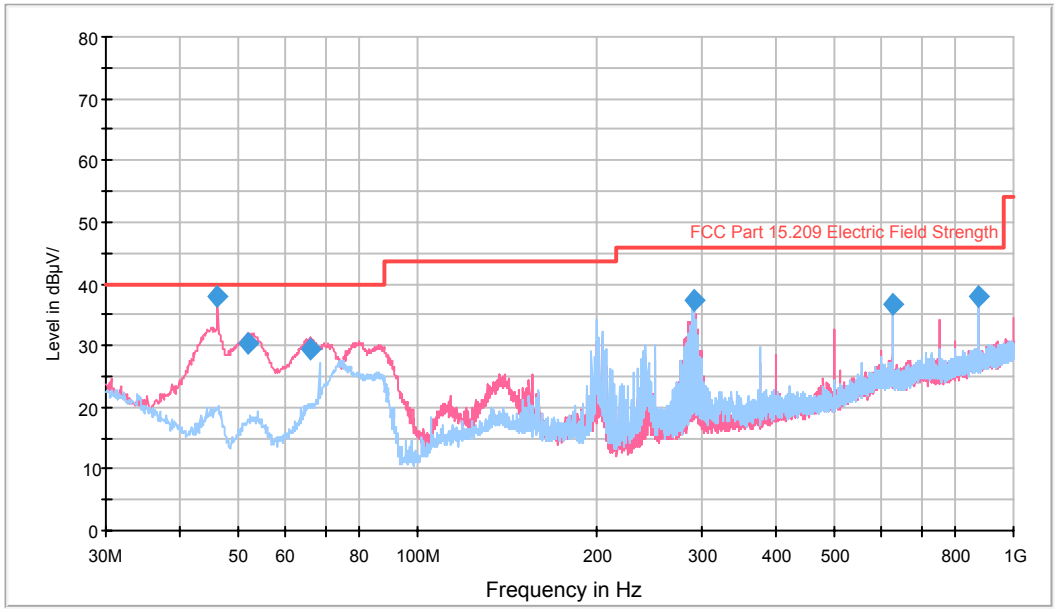
802.11g Mode: Low Channel_Vertical_18GHz-25GHz



Co-Location Evaluation Data

For co-location evaluation data (2.4 GHz, 802.11b 2412 MHz & 5 GHz, 802.11a 5180 MHz work simultaneously) (worst case)

30 MHz to 1 GHz



Frequency (MHz)	QuasicPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corrected Factor (dB/m)	Margin (dB)	Limit (dBµV/m)
46.126250	37.8	100.0	V	31.0	-14.9	*2.2	40.0
52.067500	30.4	100.0	V	164.0	-17.2	9.6	40.0
66.011250	29.4	100.0	V	215.0	-16.9	10.6	40.0
292.021250	37.3	150.0	H	337.0	-10.8	8.7	46.0
625.095000	36.5	100.0	V	223.0	-4.3	9.5	46.0
875.112500	38.1	100.0	V	201.0	-0.6	7.9	46.0

**Within measurement uncertainty!*

Above 1 GHz

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Measurement	Polar	Factor					
MHz	dBµV	PK/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
1315	38.63	PK	V	24.56	2.41	26.51	39.09	74.00	34.91
1315	27.42	AV	V	24.56	2.41	26.51	27.88	54.00	26.12
3184	34.69	PK	V	31.04	3.71	26.48	42.96	74.00	31.04
3184	20.63	AV	V	31.04	3.71	26.48	28.90	54.00	25.10
4986	39.33	PK	V	34.36	5.04	26.88	51.85	74.00	22.15
4986	20.63	AV	V	34.36	5.04	26.88	33.15	54.00	20.85
2399	43.25	PK	H	28.70	3.00	26.88	48.07	74.00	25.93
2399	23.73	AV	H	28.70	3.00	26.88	28.55	54.00	25.45
3590	37.56	PK	H	31.96	4.31	26.58	47.25	74.00	26.75
3590	22.11	AV	H	31.96	4.31	26.58	31.80	54.00	22.20
4985	38.19	PK	H	34.36	5.04	26.88	50.71	74.00	23.29
4985	20.50	AV	H	34.36	5.04	26.88	33.02	54.00	20.98

Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude

Spurious emissions more than 20 dB below the limit were not reported.

FINAL

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

Applicable Standard

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

Test Procedure

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

FINAL

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	42 %
ATM Pressure:	95.7 kPa

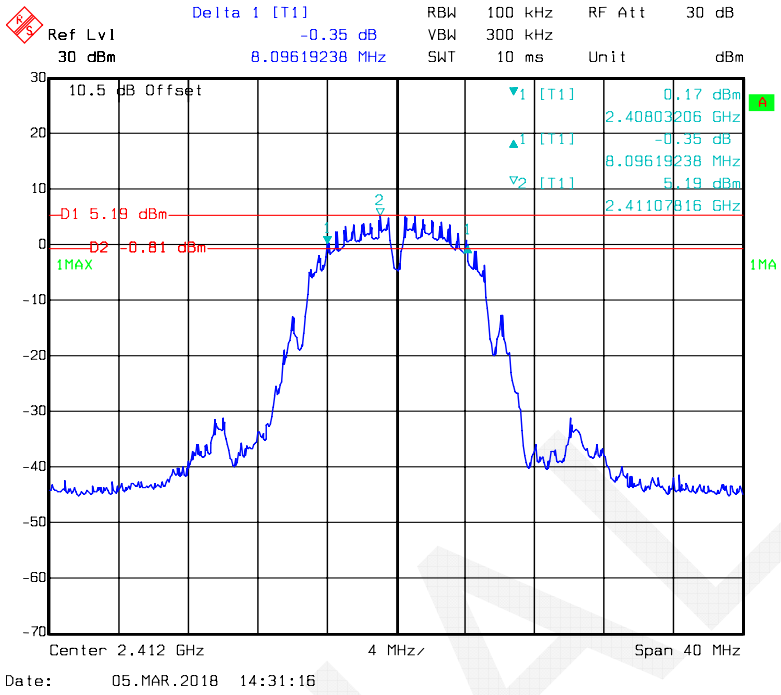
** The testing was performed by Tom Tang on 2018-03-05.*

Test Mode: Transmitting

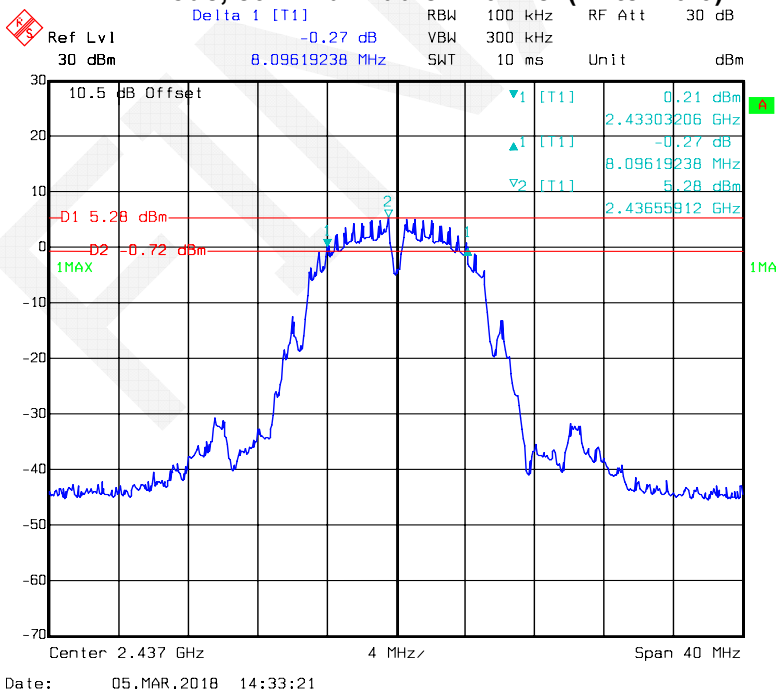
Test Result: Compliance. Please refer to the following table and plots.

Mode	Channel	Frequency (MHz)	6dB Emission Bandwidth (MHz)		Limit (MHz)
			Antenna 0	Antenna 1	
802.11b	Low	2412	8.10	8.18	≥0.50
	Middle	2437	8.10	8.10	≥0.50
	High	2462	8.58	8.18	≥0.50
802.11g	Low	2412	15.15	15.23	≥0.50
	Middle	2437	15.15	15.15	≥0.50
	High	2462	15.15	15.15	≥0.50
802.11n-HT20	Low	2412	15.15	14.83	≥0.50
	Middle	2437	15.15	15.23	≥0.50
	High	2462	15.15	16.11	≥0.50
802.11n-HT40	Low	2422	36.23	36.23	≥0.50
	Middle	2437	36.23	36.23	≥0.50
	High	2452	36.23	36.39	≥0.50

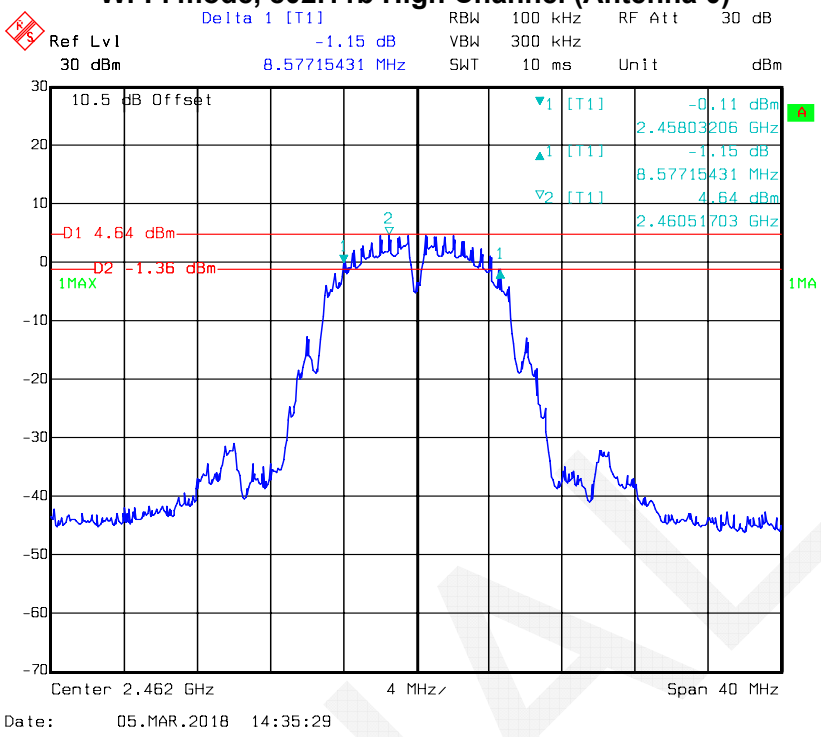
Wi-Fi mode, 802.11b Low Channel (Antenna 0)



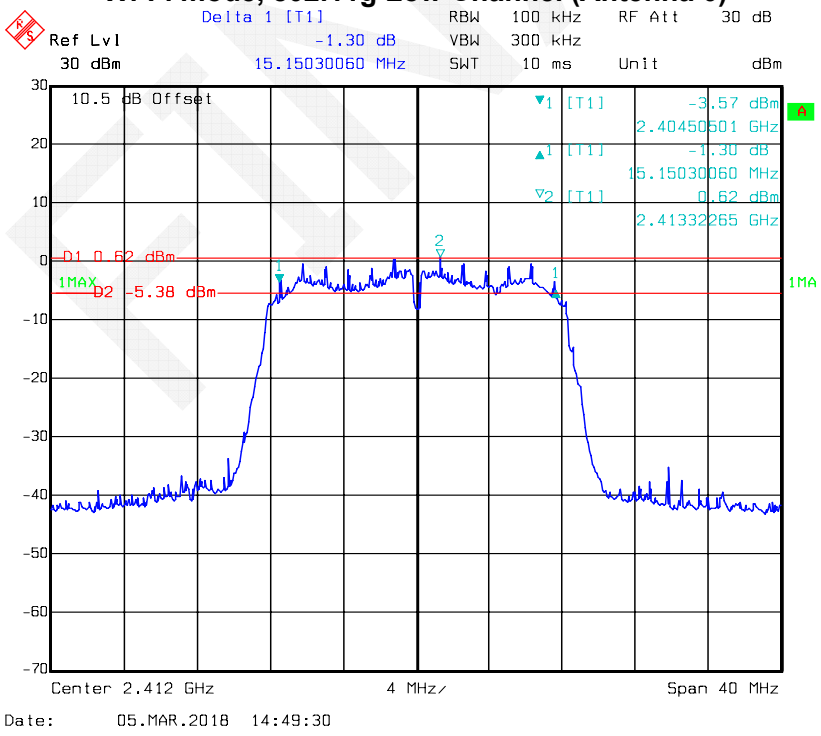
Wi-Fi mode, 802.11b Middle Channel (Antenna 0)



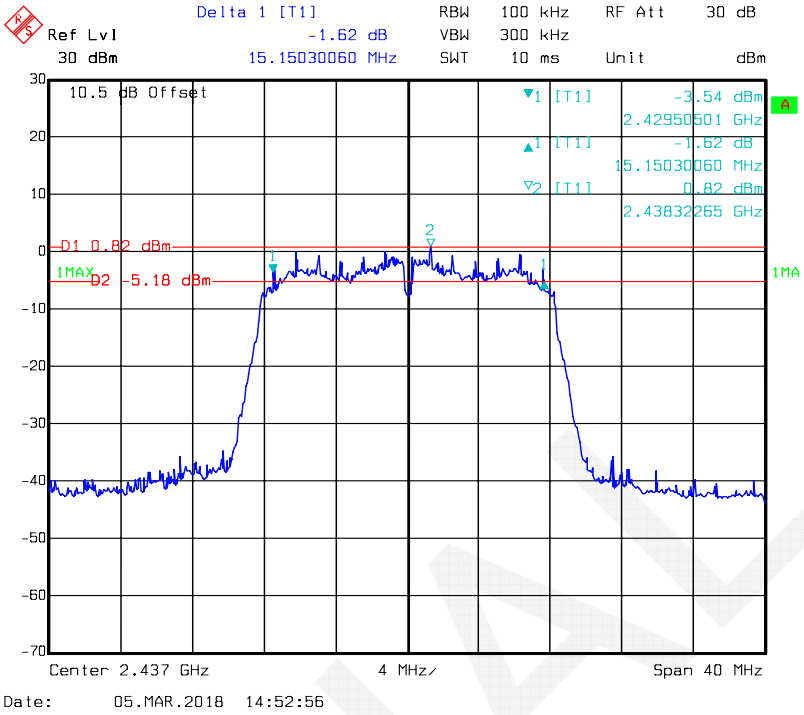
Wi-Fi mode, 802.11b High Channel (Antenna 0)



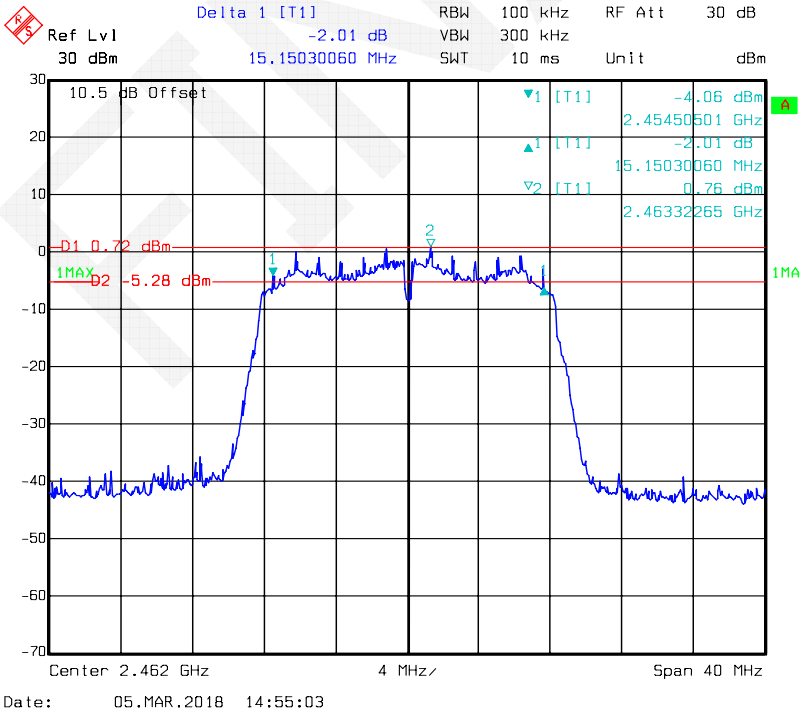
Wi-Fi mode, 802.11g Low Channel (Antenna 0)



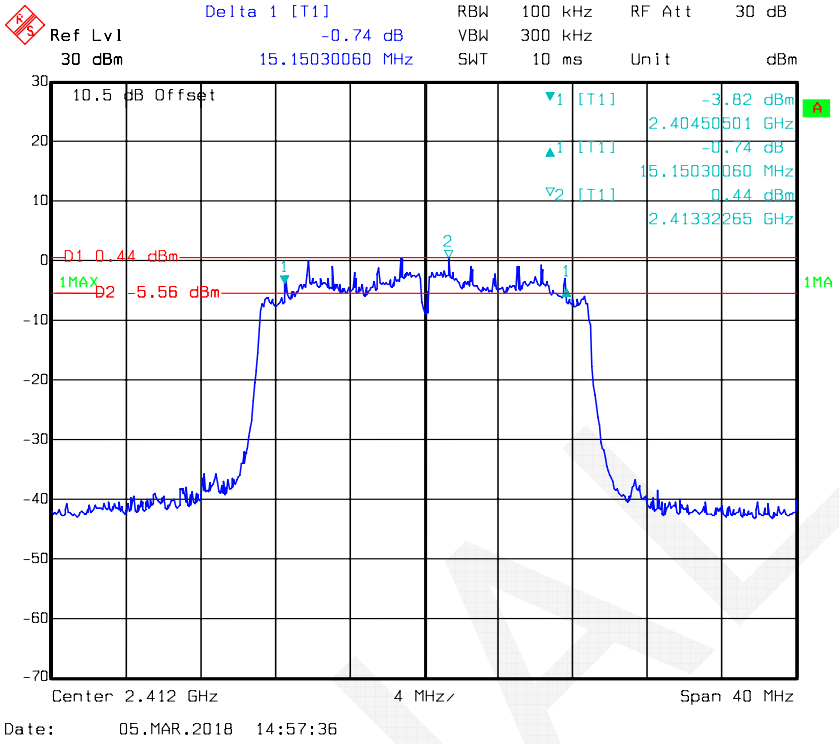
Wi-Fi mode, 802.11g Middle Channel (Antenna 0)



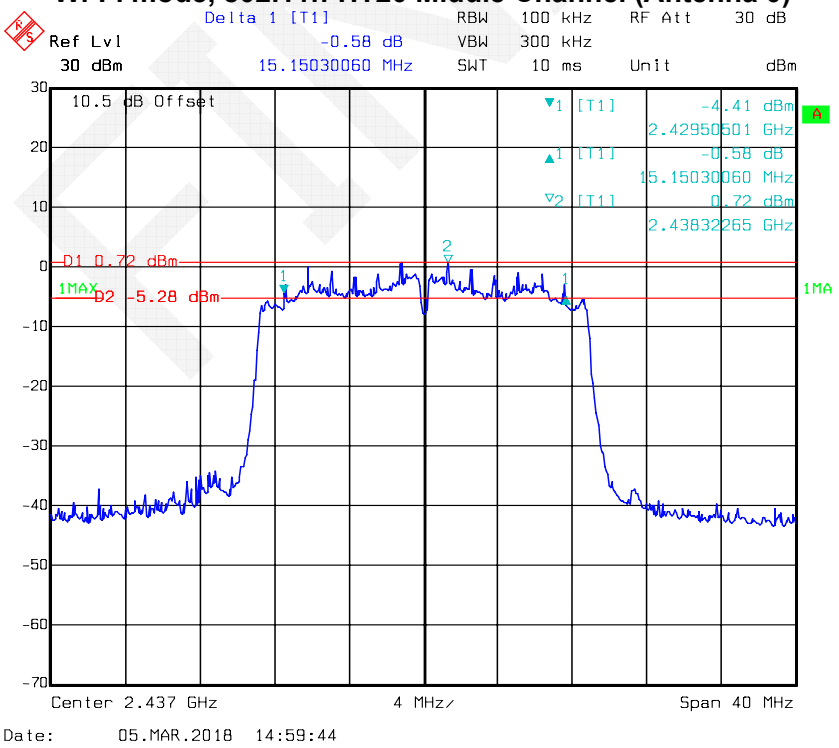
Wi-Fi mode, 802.11g High Channel (Antenna 0)



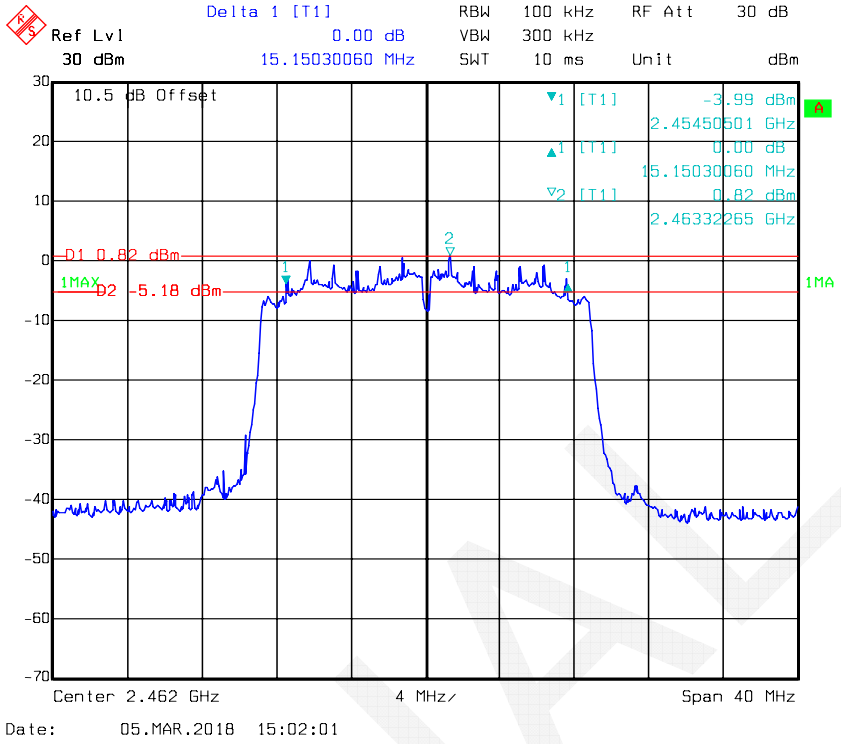
Wi-Fi mode, 802.11n-HT20 Low Channel (Antenna 0)



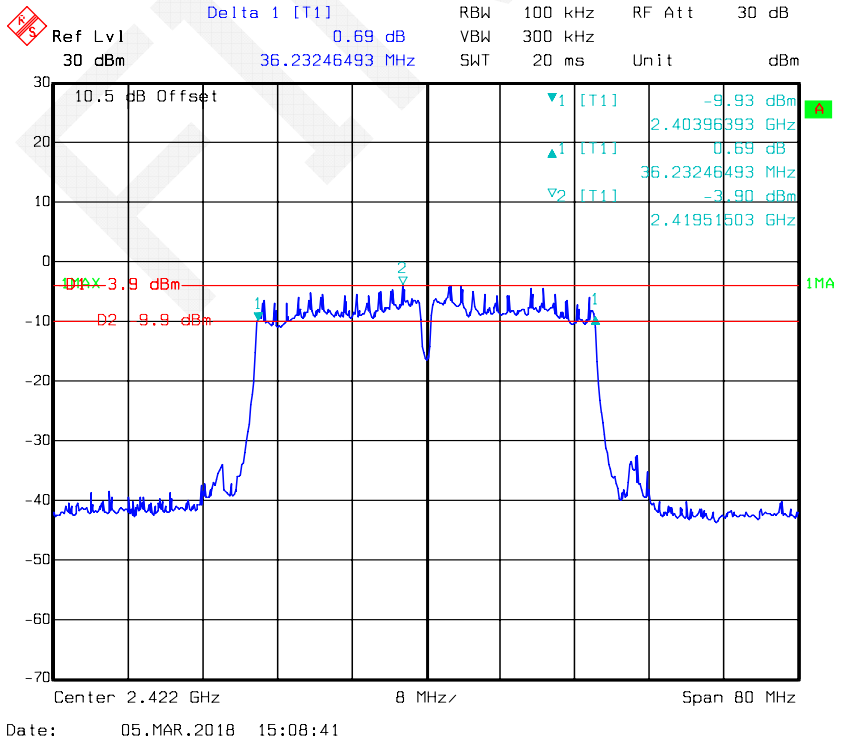
Wi-Fi mode, 802.11n-HT20 Middle Channel (Antenna 0)



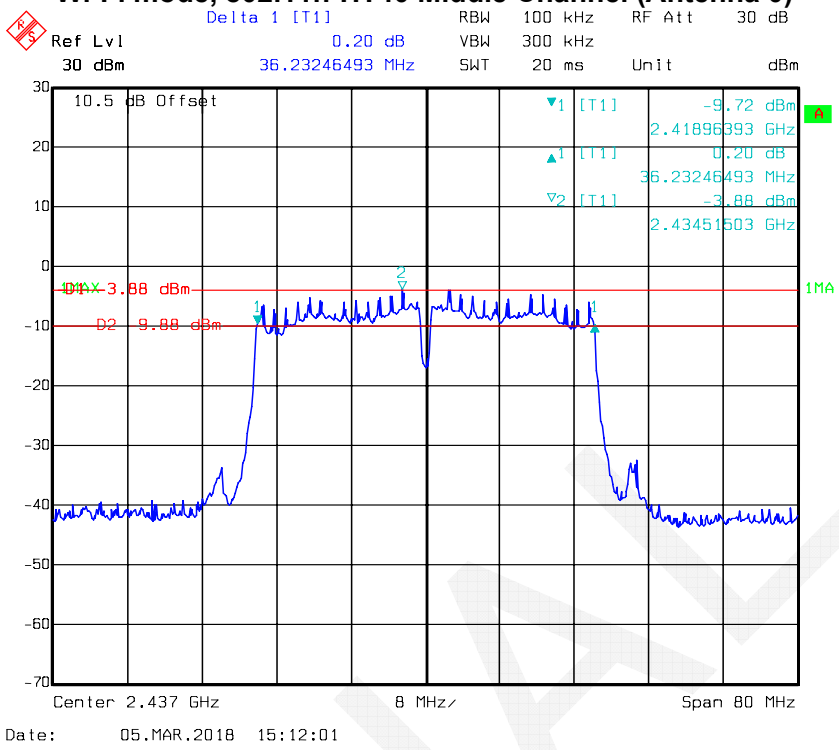
Wi-Fi mode, 802.11n-HT20 High Channel (Antenna 0)



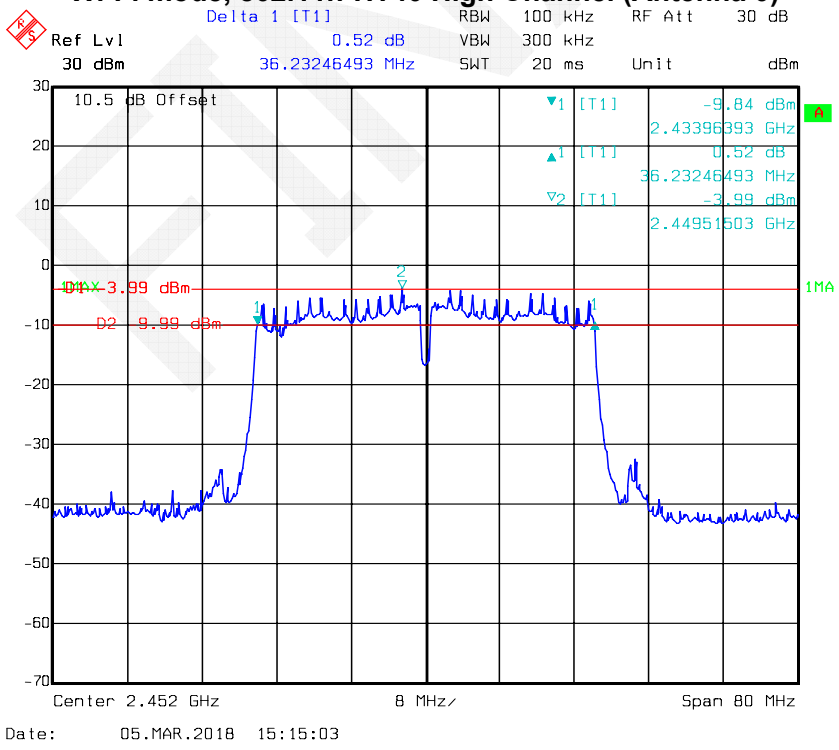
Wi-Fi mode, 802.11n-HT40 Low Channel (Antenna 0)



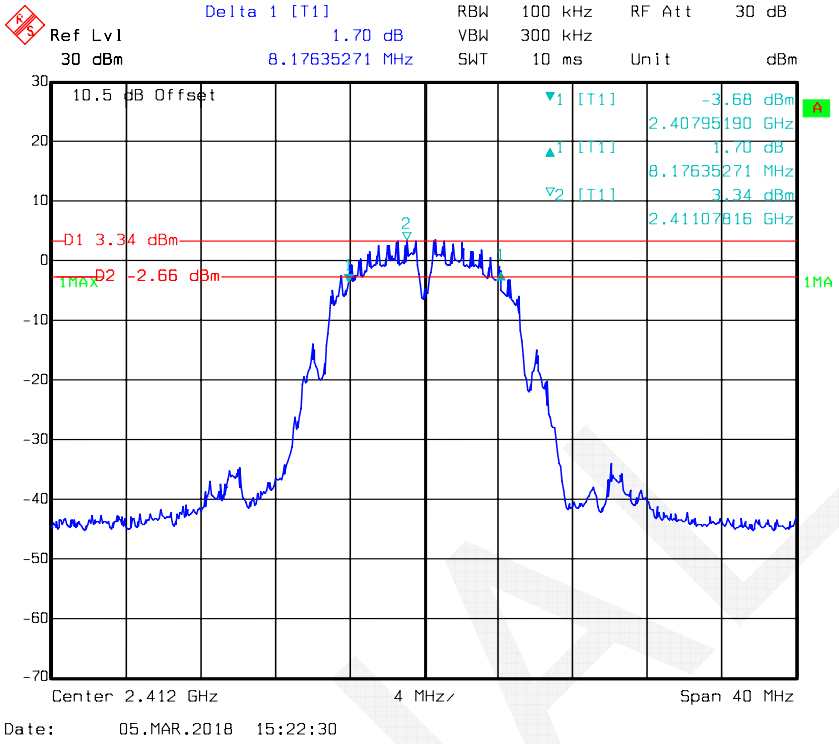
Wi-Fi mode, 802.11n-HT40 Middle Channel (Antenna 0)



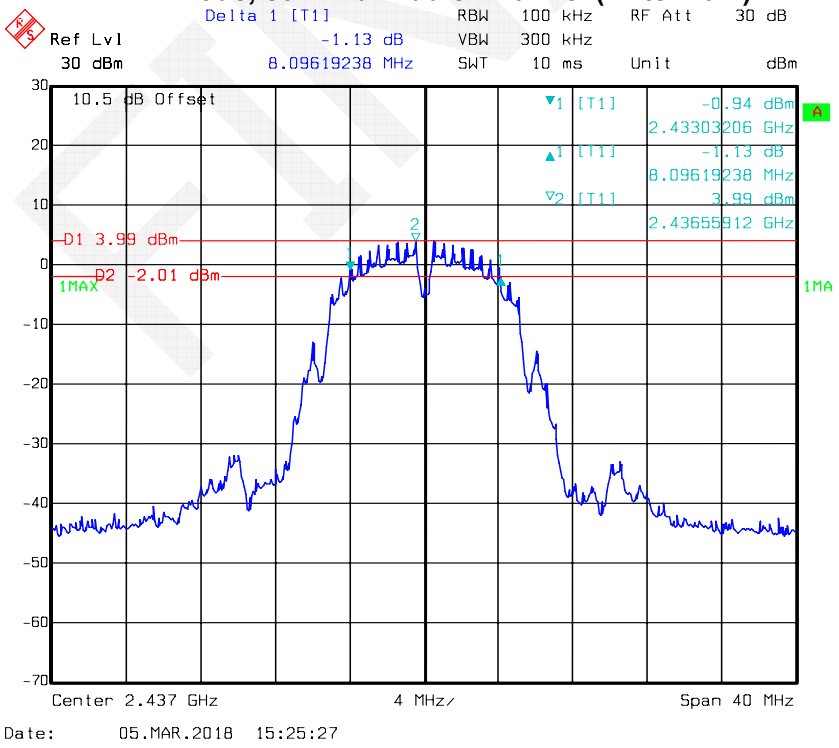
Wi-Fi mode, 802.11n-HT40 High Channel (Antenna 0)



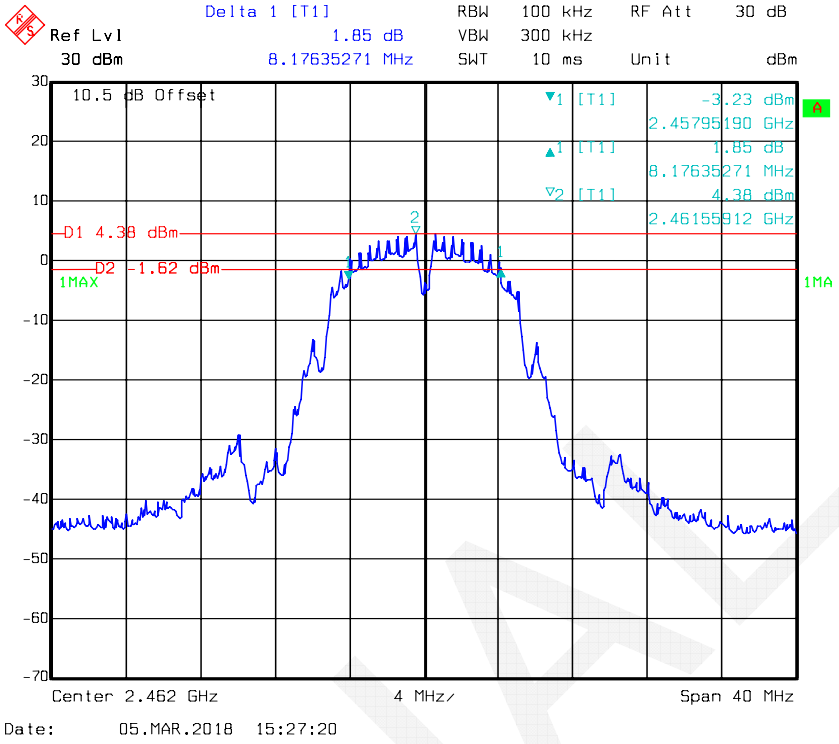
Wi-Fi mode, 802.11b Low Channel (Antenna 1)



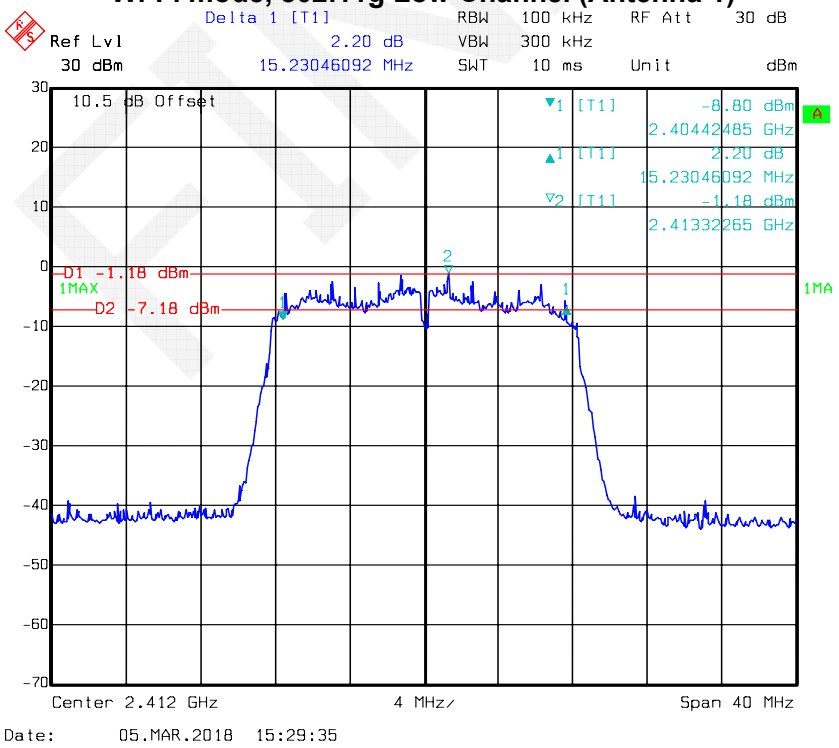
Wi-Fi mode, 802.11b Middle Channel (Antenna 1)



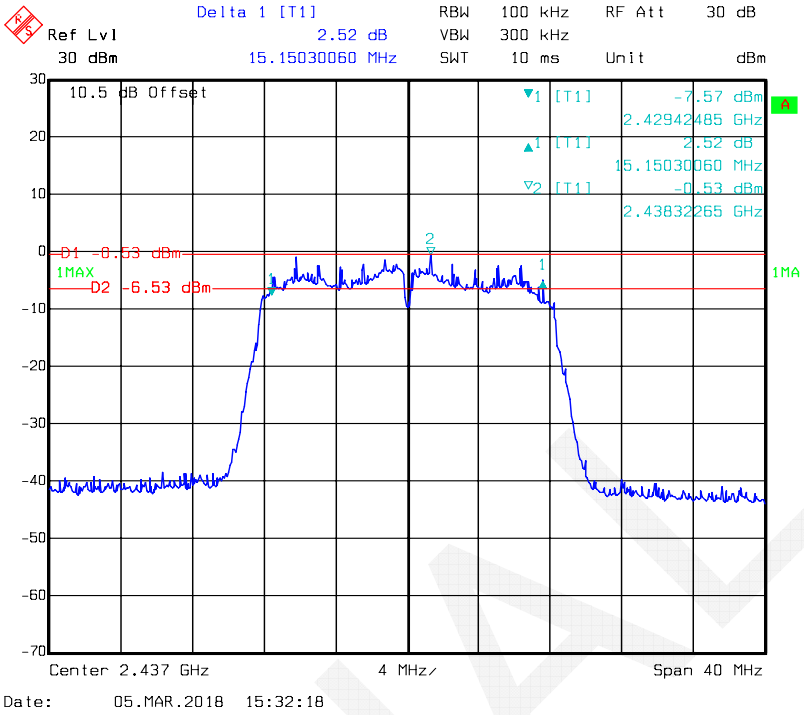
Wi-Fi mode, 802.11b High Channel (Antenna 1)



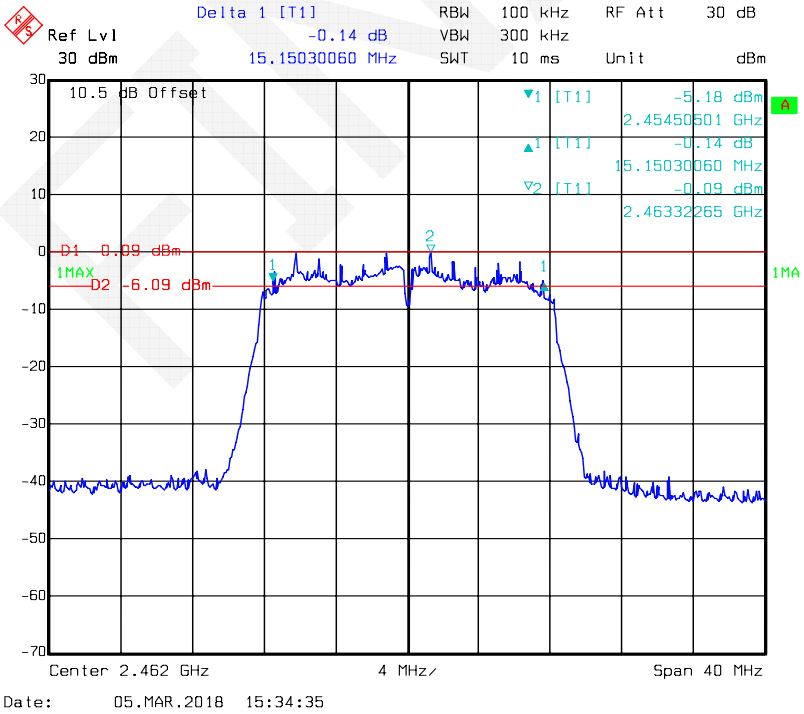
Wi-Fi mode, 802.11g Low Channel (Antenna 1)



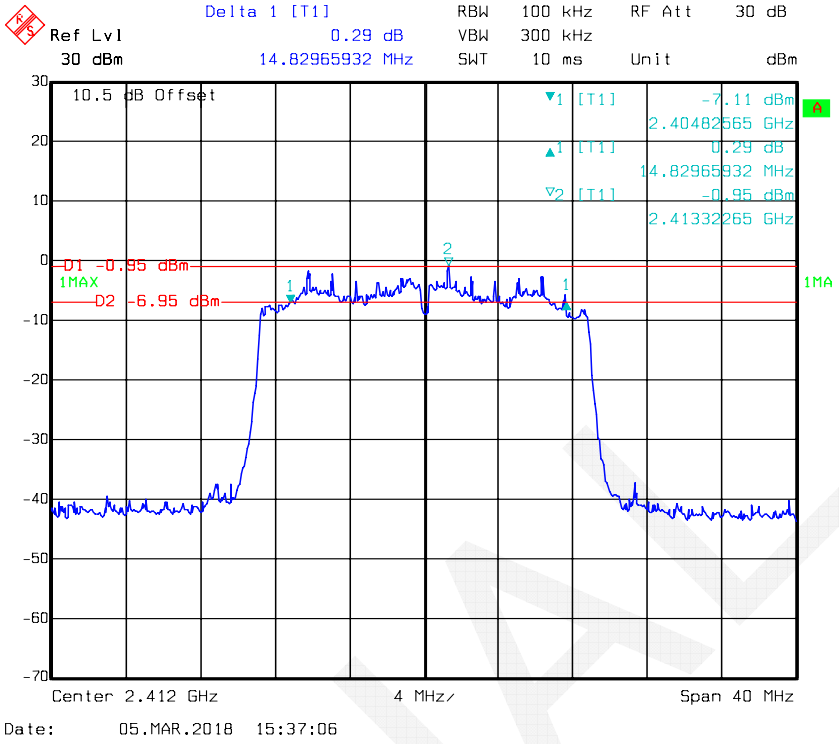
Wi-Fi mode, 802.11g Middle Channel (Antenna 1)



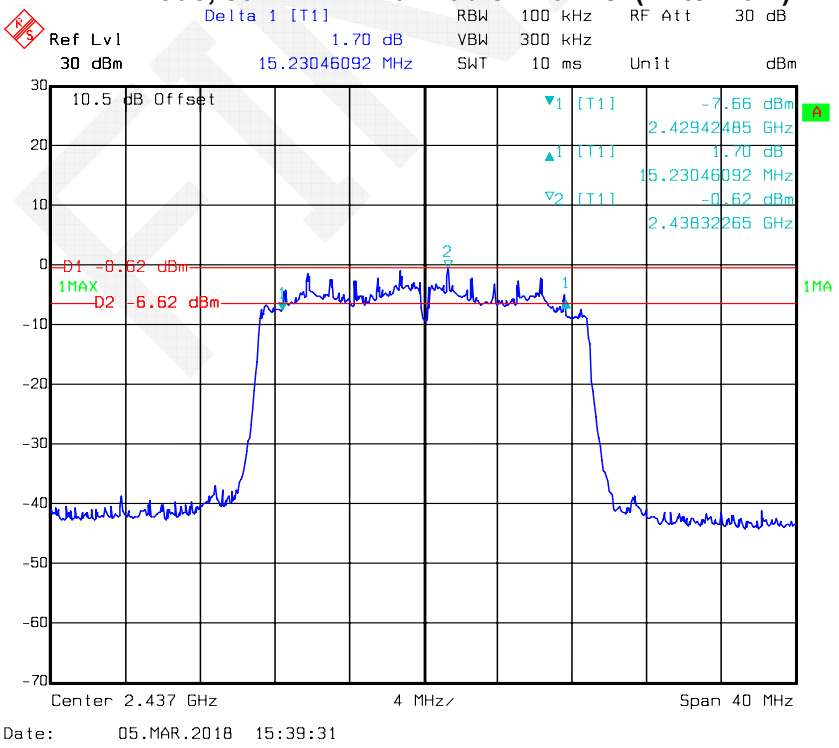
Wi-Fi mode, 802.11g High Channel (Antenna 1)



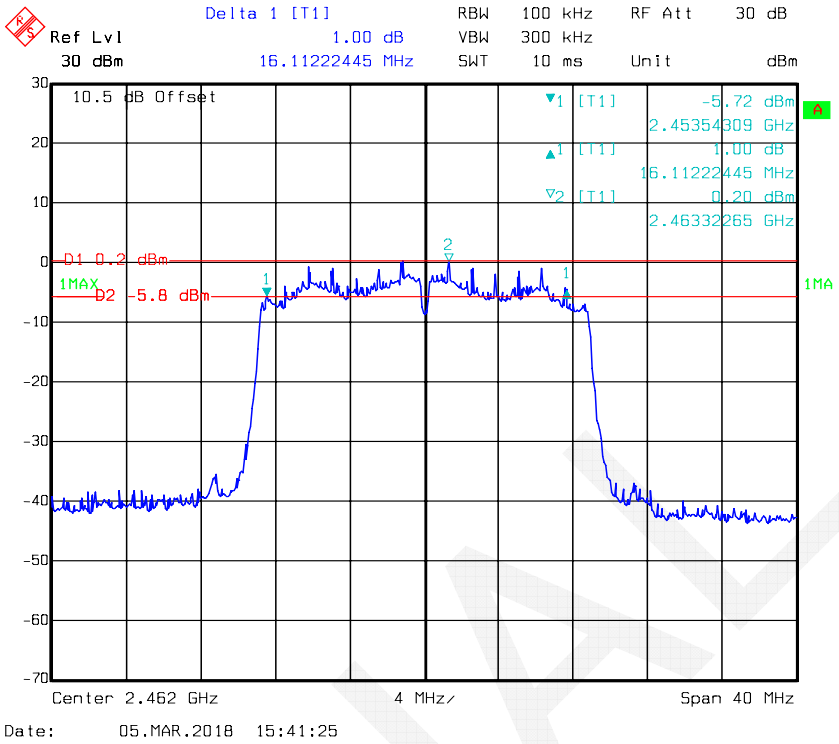
Wi-Fi mode, 802.11n-HT20 Low Channel (Antenna 1)



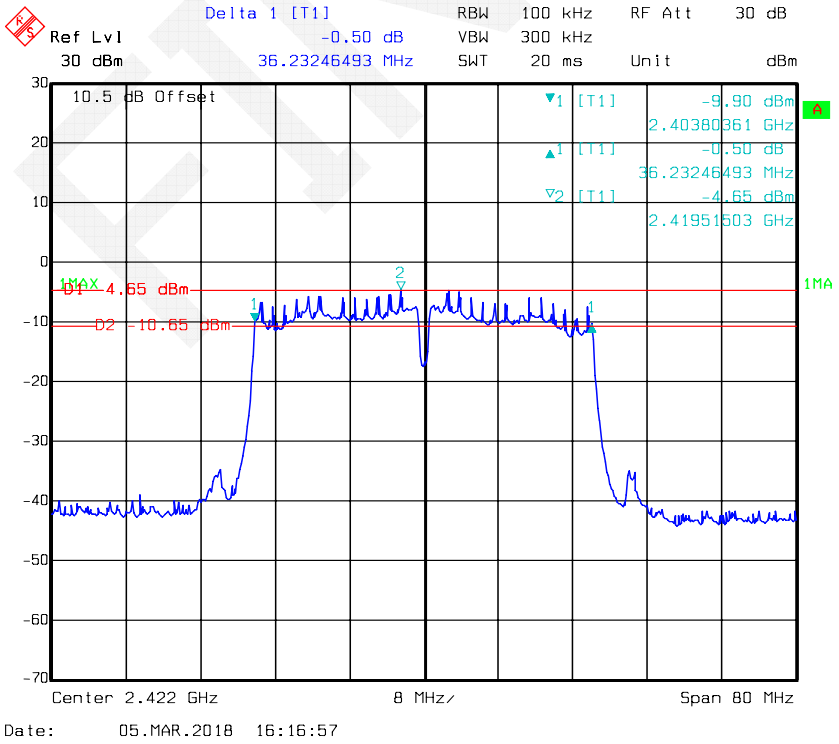
Wi-Fi mode, 802.11n-HT20 Middle Channel (Antenna 1)



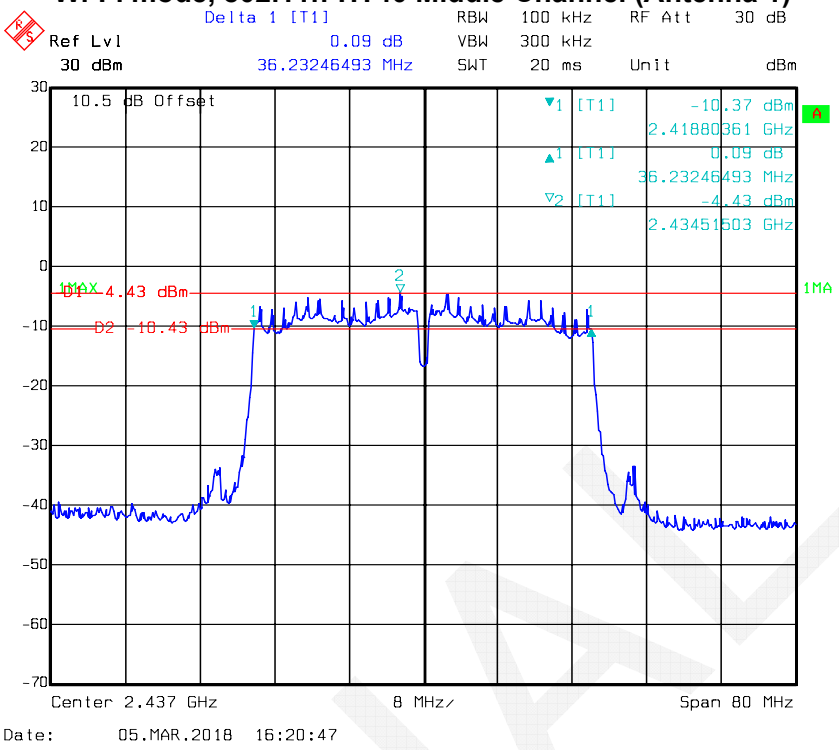
Wi-Fi mode, 802.11n-HT20 High Channel (Antenna 1)



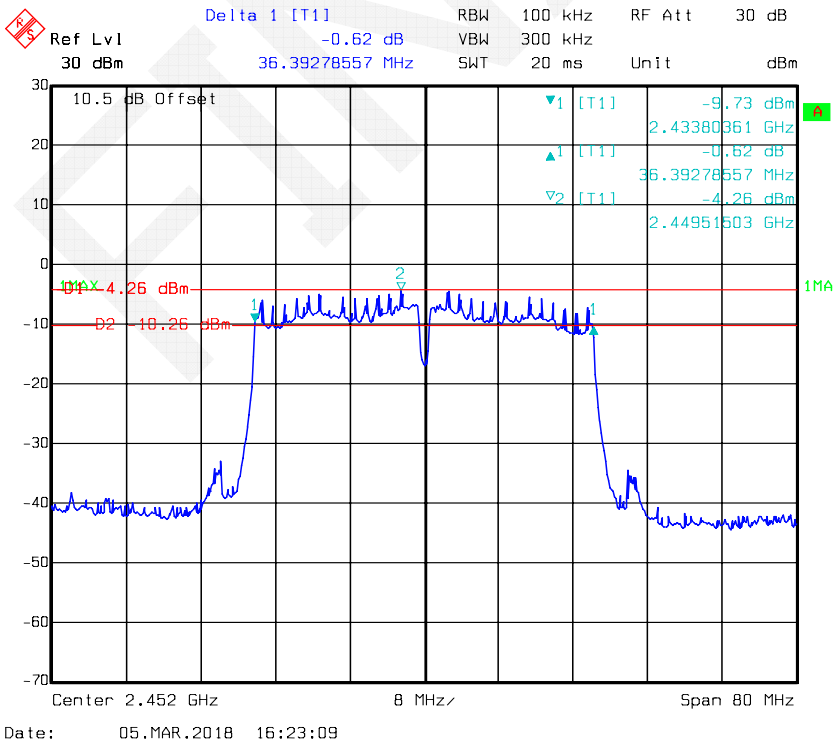
Wi-Fi mode, 802.11n-HT40 Low Channel (Antenna 1)



Wi-Fi mode, 802.11n-HT40 Middle Channel (Antenna 1)



Wi-Fi mode, 802.11n-HT40 High Channel (Antenna 1)



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

Applicable Standard

According to FCC §15.247(b) (3), for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to test equipment.
3. Add a correction factor to the display.

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	42 %
ATM Pressure:	95.7 kPa

** The testing was performed by Tom Tang on 2018-03-05.*

Test Mode: Transmitting

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

FINAL

Wi-Fi mode

Mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)		Total (dBm)	Limit (dBm)
			Antenna 0	Antenna 1		
802.11b	Low	2412	17.40	15.63	19.61	30
	Middle	2437	17.42	16.22	19.87	30
	High	2462	17.31	16.54	19.95	30
802.11g	Low	2412	17.83	16.16	20.09	30
	Middle	2437	17.92	16.74	20.38	30
	High	2462	17.83	17.10	20.49	30
802.11n-HT20	Low	2412	17.76	16.09	20.02	30
	Middle	2437	17.91	16.38	20.22	30
	High	2462	17.83	17.34	20.60	30
802.11n-HT40	Low	2422	17.64	16.64	20.18	30
	Middle	2437	17.55	17.71	20.64	30
	High	2452	17.58	17.24	20.42	30

Mode	Channel	Frequency (MHz)	Max Conducted Average Output Power (dBm)		Total (dBm)	Limit (dBm)
			Antenna 0	Antenna 1		
802.11b	Low	2412	15.85	14.15	18.09	30
	Middle	2437	15.96	14.87	18.46	30
	High	2462	15.87	15.08	18.50	30
802.11g	Low	2412	13.07	11.49	15.36	30
	Middle	2437	13.22	12.07	15.69	30
	High	2462	13.06	12.37	15.74	30
802.11n-HT20	Low	2412	13.12	11.41	15.36	30
	Middle	2437	13.24	11.67	15.54	30
	High	2462	13.15	12.64	15.91	30
802.11n-HT40	Low	2422	10.39	9.35	12.91	30
	Middle	2437	10.26	9.78	13.04	30
	High	2452	10.25	9.96	13.12	30

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

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

So:

Directional gain = GANT + Array Gain = 3 dBi < 6.0dBi.

No power limit was reduced in MIMO mode.

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

Applicable Standard

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

Test Procedure

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

Test Data

Environmental Conditions

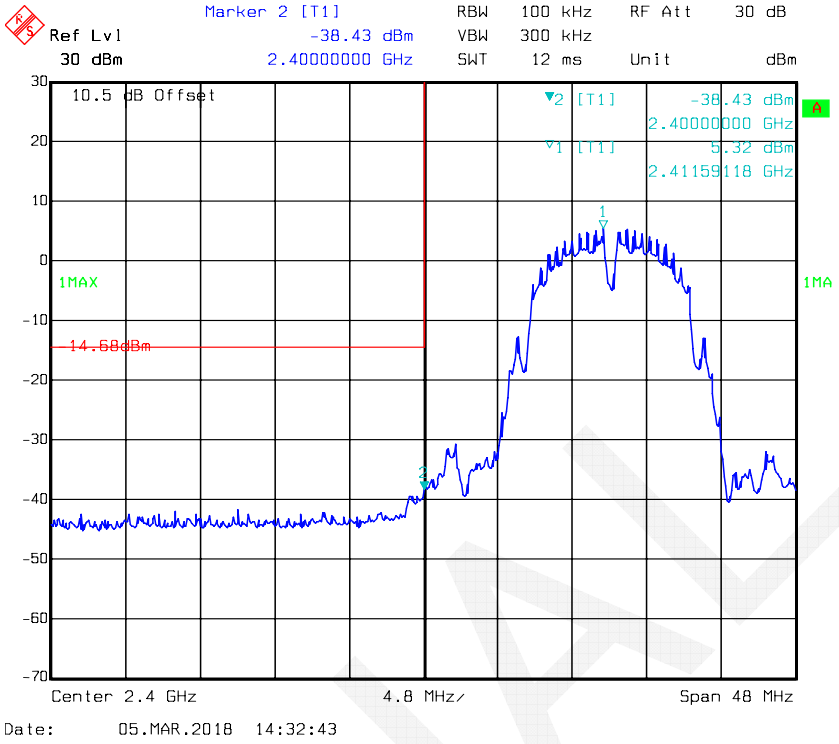
Temperature:	20 °C
Relative Humidity:	42 %
ATM Pressure:	95.7 kPa

** The testing was performed by Tom Tang on 2018-03-05.*

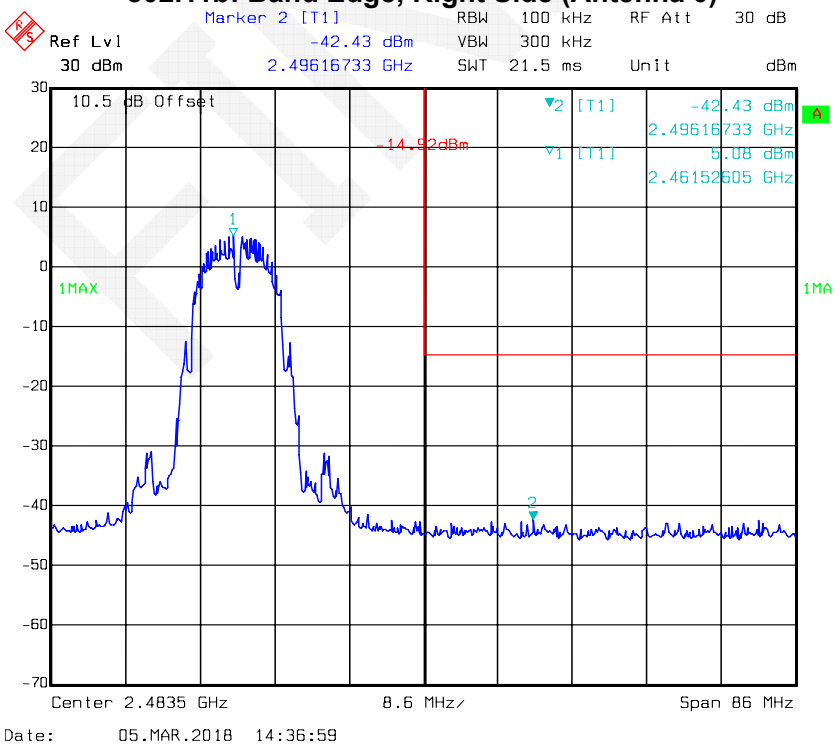
Test mode: Transmitting

Test Result: Compliance. Please refer to following plots.

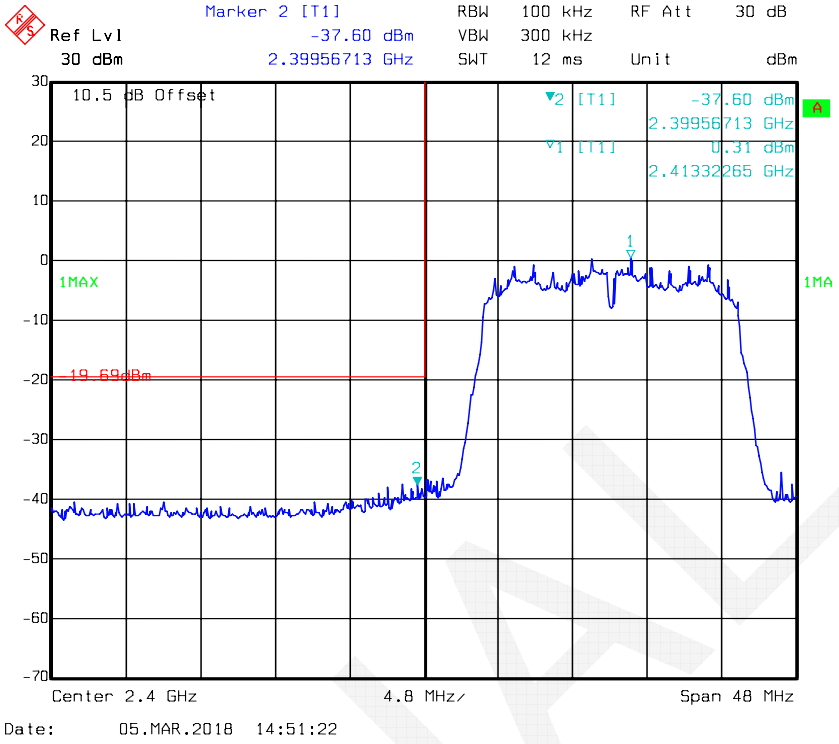
802.11b: Band Edge, Left Side (Antenna 0)



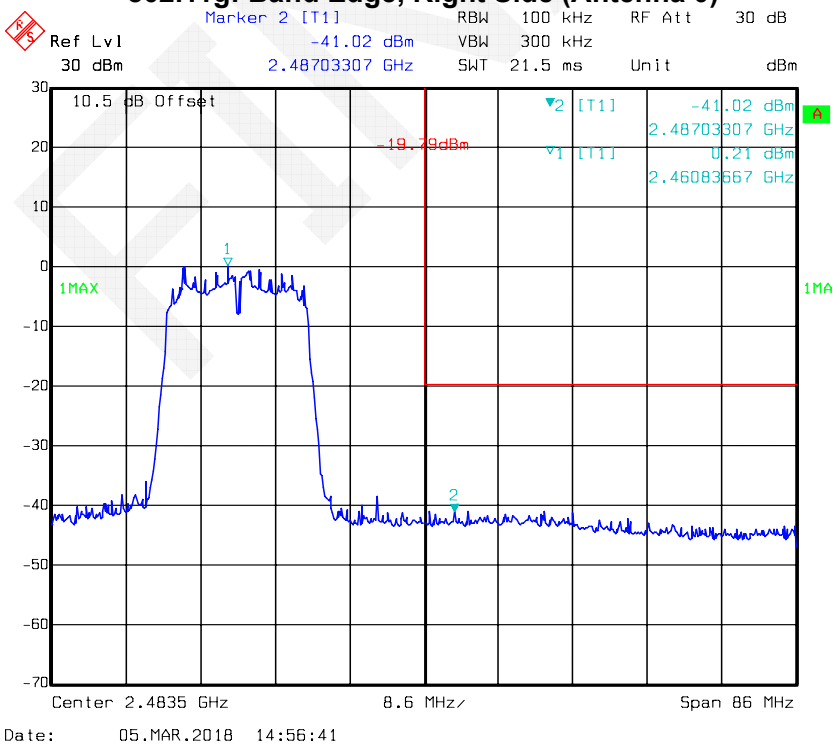
802.11b: Band Edge, Right Side (Antenna 0)



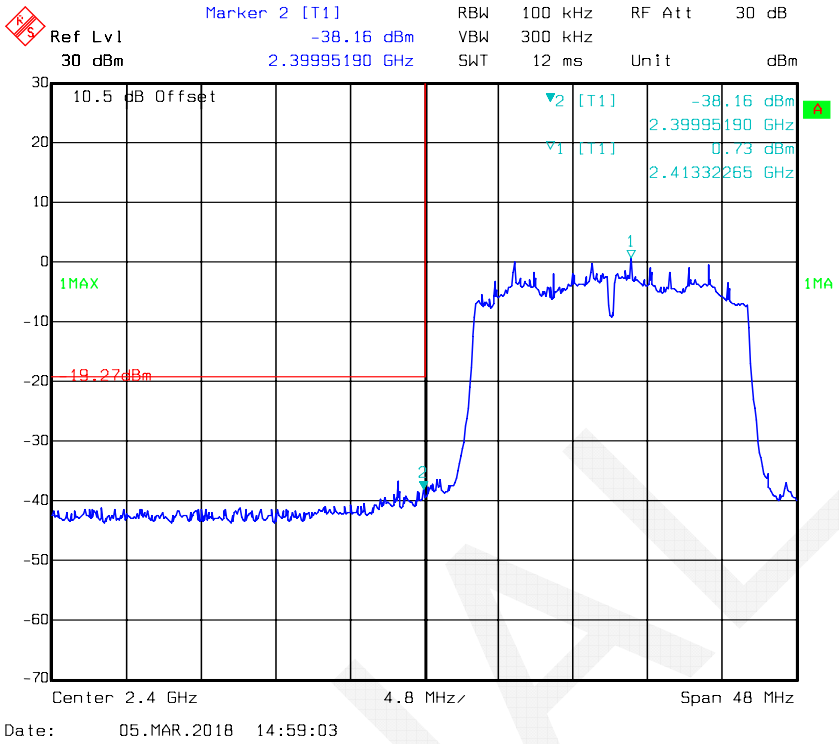
802.11g: Band Edge, Left Side (Antenna 0)



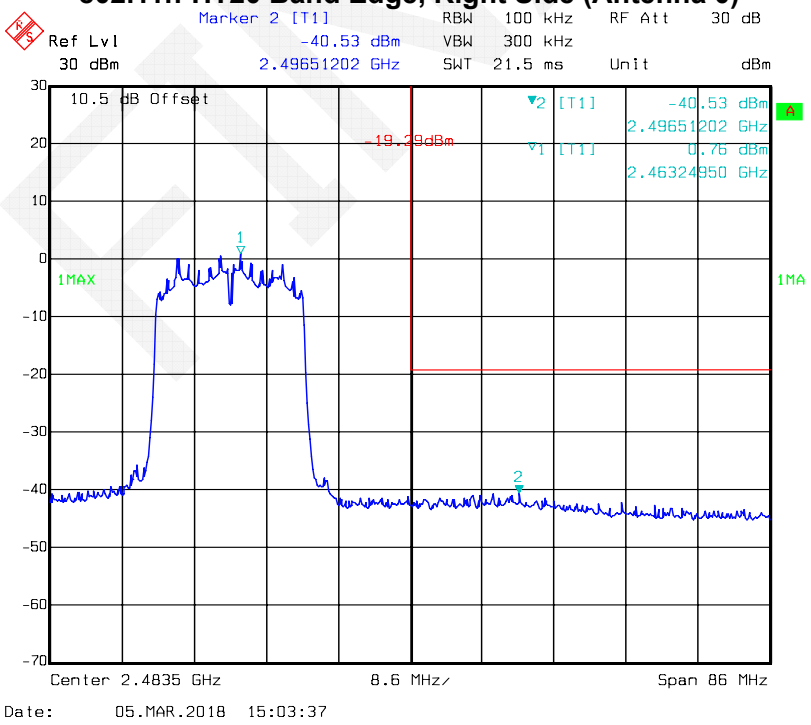
802.11g: Band Edge, Right Side (Antenna 0)



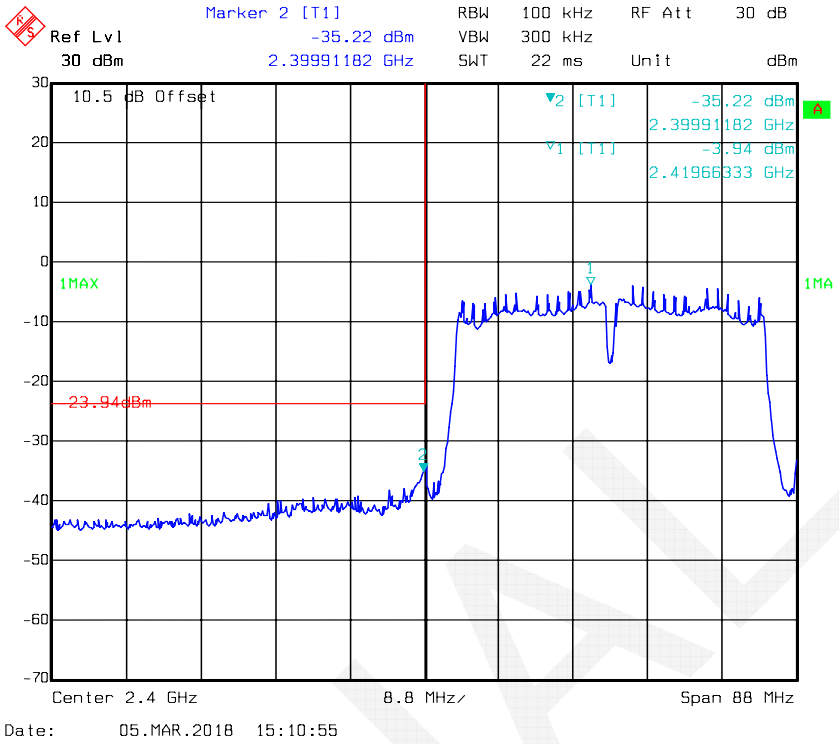
802.11n-HT20 Band Edge, Left Side (Antenna 0)



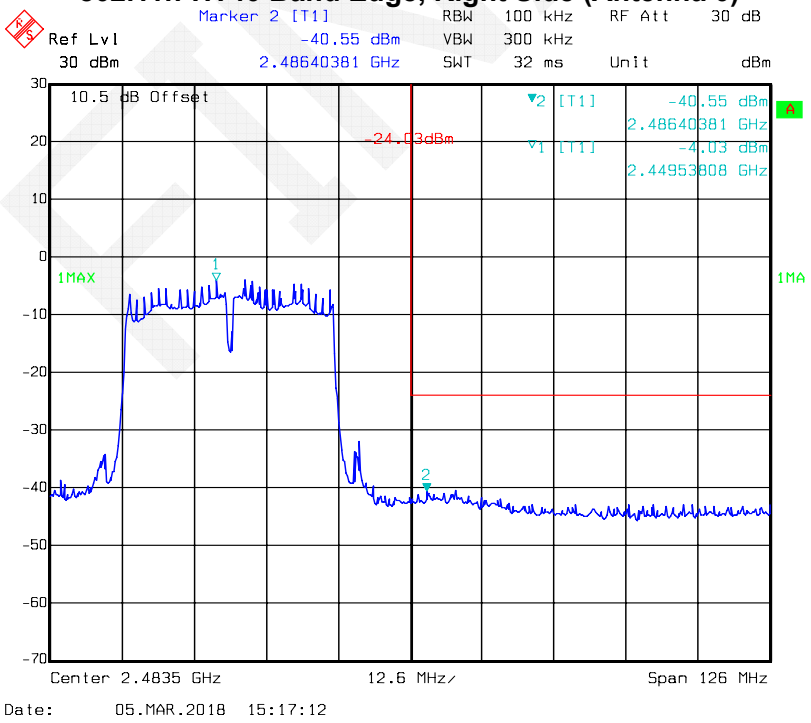
802.11n-HT20 Band Edge, Right Side (Antenna 0)



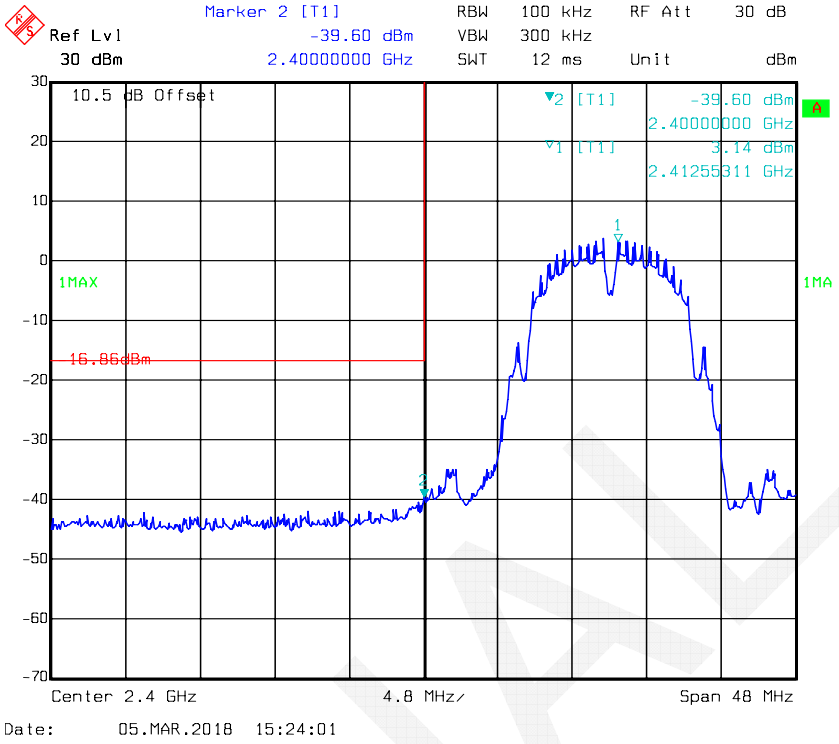
802.11n-HT40 Band Edge, Left Side (Antenna 0)



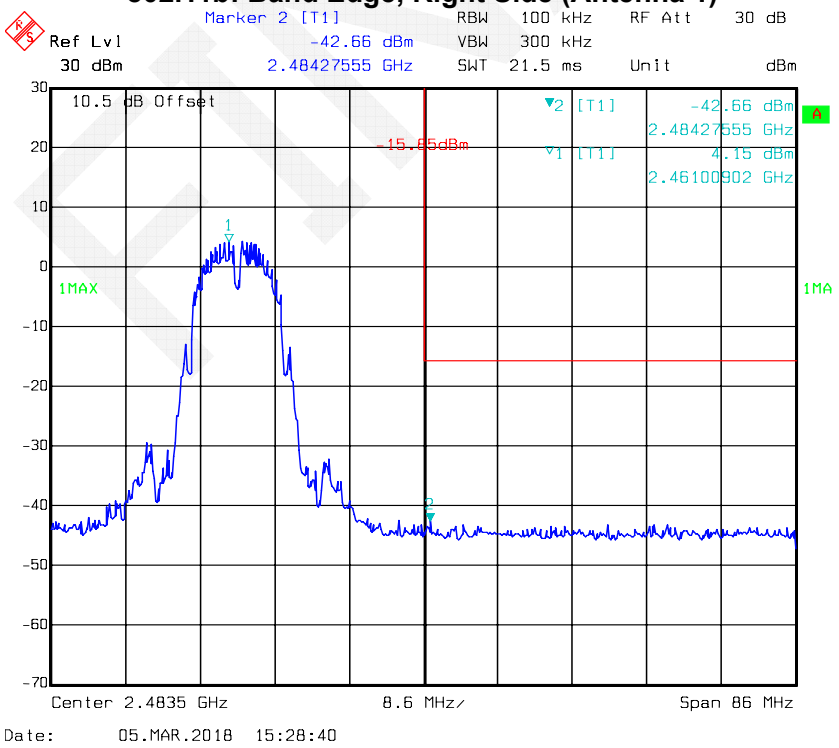
802.11n-HT40 Band Edge, Right Side (Antenna 0)



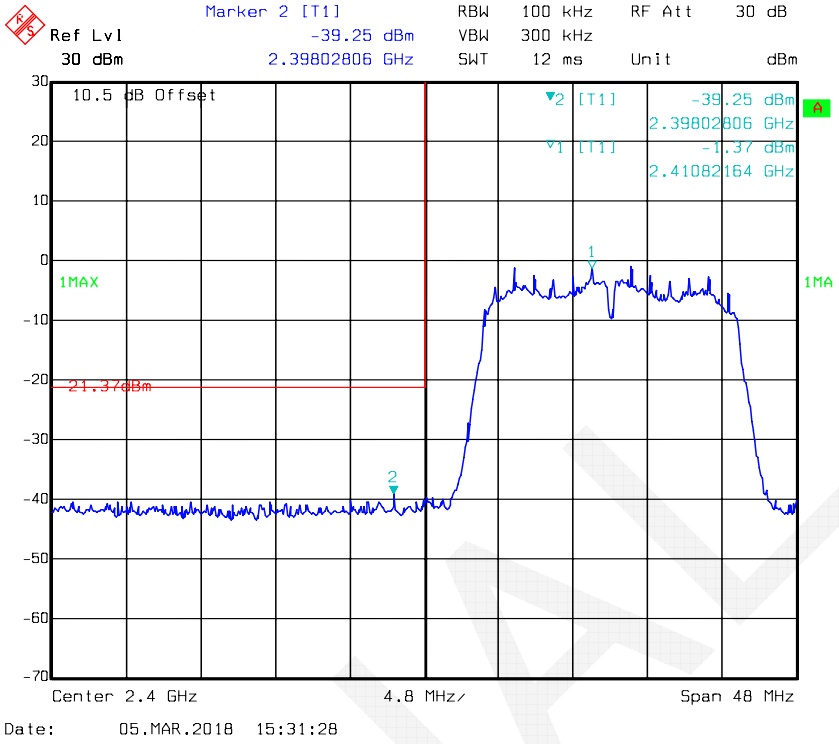
802.11b: Band Edge, Left Side (Antenna 1)



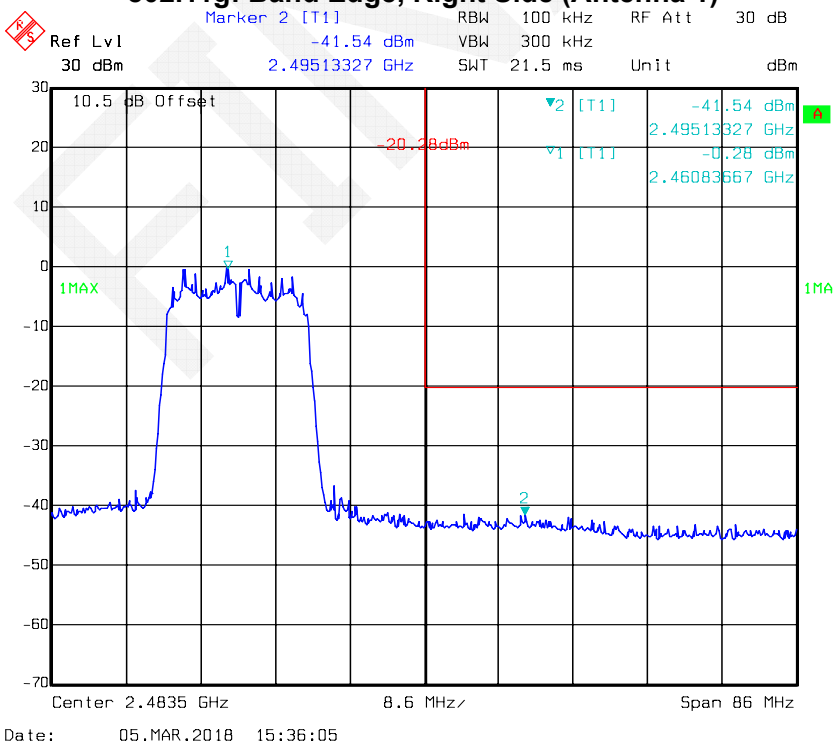
802.11b: Band Edge, Right Side (Antenna 1)



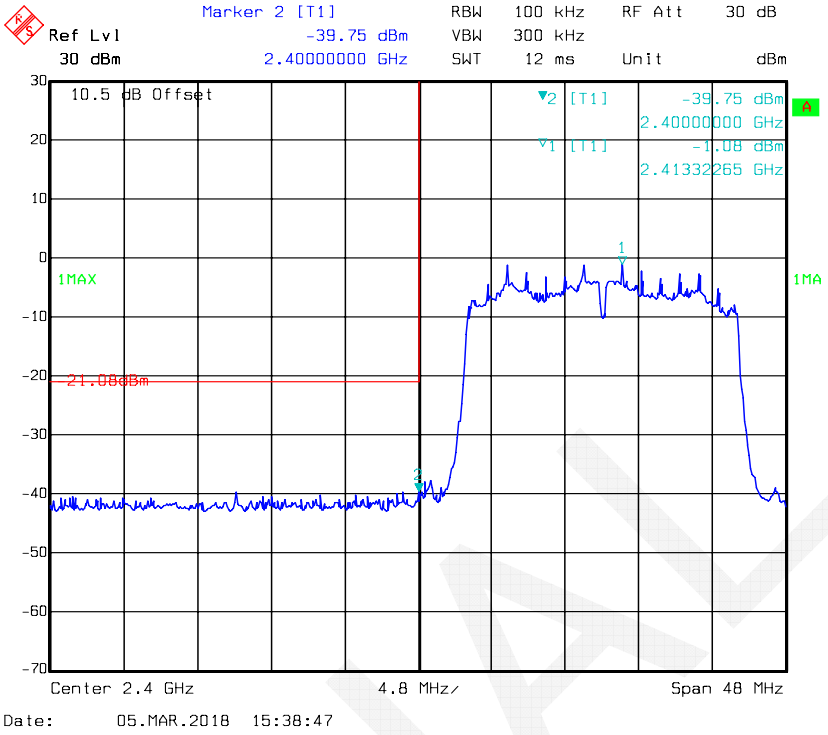
802.11g: Band Edge, Left Side (Antenna 1)



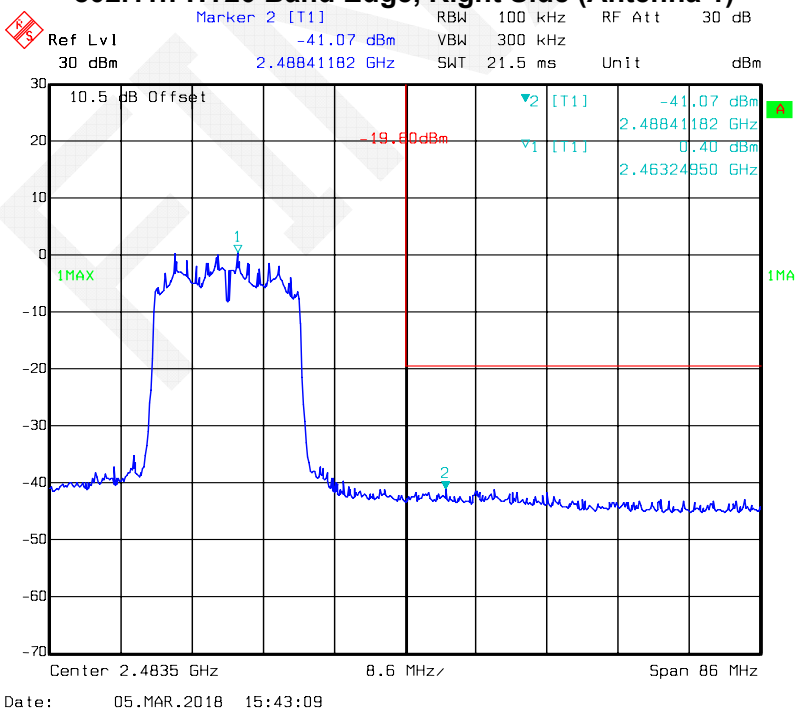
802.11g: Band Edge, Right Side (Antenna 1)



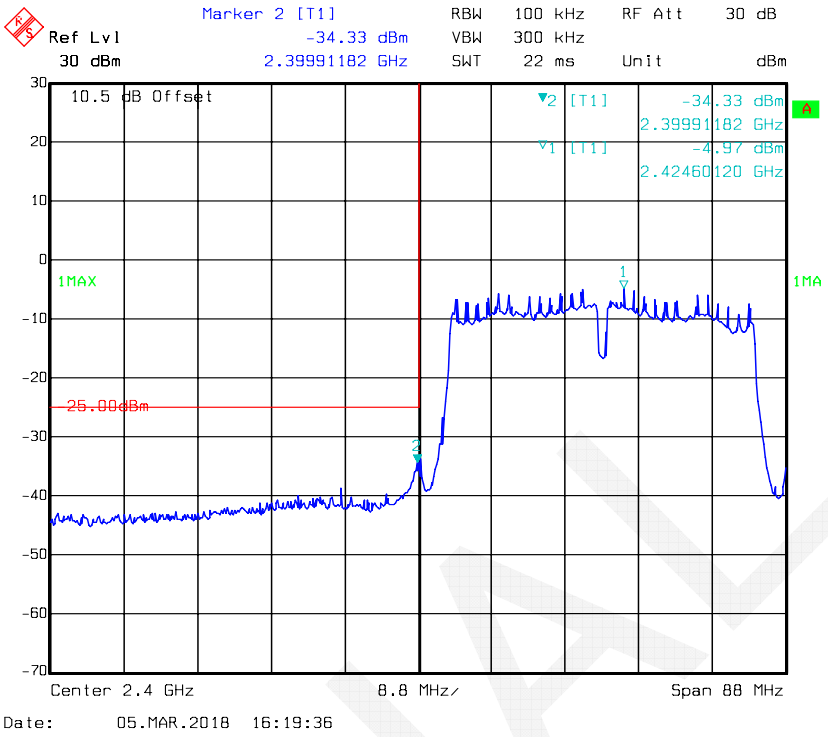
802.11n-HT20 Band Edge, Left Side (Antenna 1)



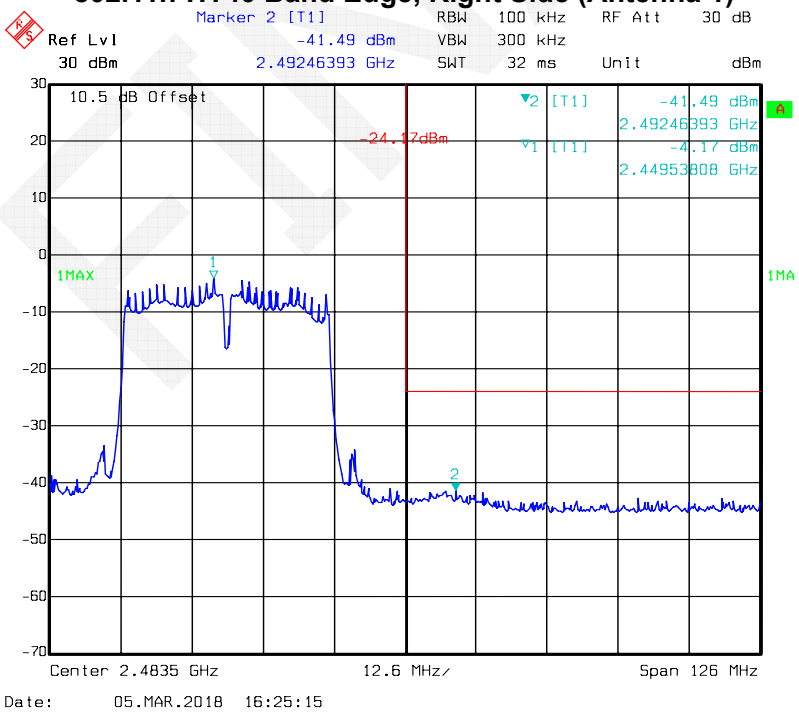
802.11n-HT20 Band Edge, Right Side (Antenna 1)



802.11n-HT40 Band Edge, Left Side (Antenna 1)



802.11n-HT40 Band Edge, Right Side (Antenna 1)



FCC §15.247(e) - POWER SPECTRAL DENSITY

Applicable Standard

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test Procedure

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

FINAL

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	42 %
ATM Pressure:	95.7 kPa

** The testing was performed by Tom Tang on 2018-03-05.*

Test Mode: Transmitting

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

Mode	Channel	Frequency (MHz)	Power Spectral Density (dBm/3kHz)		Total (dBm/3kHz)	Limit (dBm/3kHz)
			Antenna 0	Antenna 1		
802.11b	Low	2412	-8.40	-9.13	-5.74	7.99
	Middle	2437	-8.40	-9.34	-5.83	7.99
	High	2462	-8.53	-9.62	-6.03	7.99
802.11g	Low	2412	-13.51	-15.24	-11.28	7.99
	Middle	2437	-12.47	-14.51	-10.36	7.99
	High	2462	-13.59	-13.12	-10.34	7.99
802.11n-HT20	Low	2412	-13.97	-14.77	-11.34	7.99
	Middle	2437	-13.13	-14.73	-10.85	7.99
	High	2462	-13.29	-14.28	-10.75	7.99
802.11n-HT40	Low	2422	-17.87	-18.14	-14.99	7.99
	Middle	2437	-17.91	-18.09	-14.99	7.99
	High	2452	-18.57	-18.50	-15.52	7.99

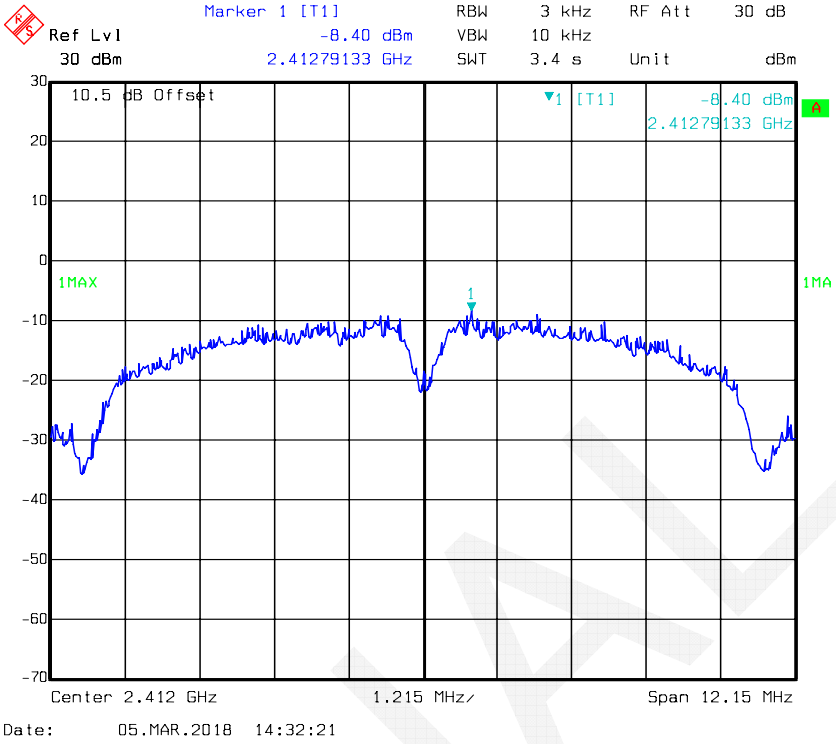
Note: The device employed Cyclic Delay Diversity (CDD) for 802.11 MIMO transmitting, per KDB 662911 D01 Multiple Transmitter Output v02r01, for power spectral density (PSD) measurements on the devices:

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

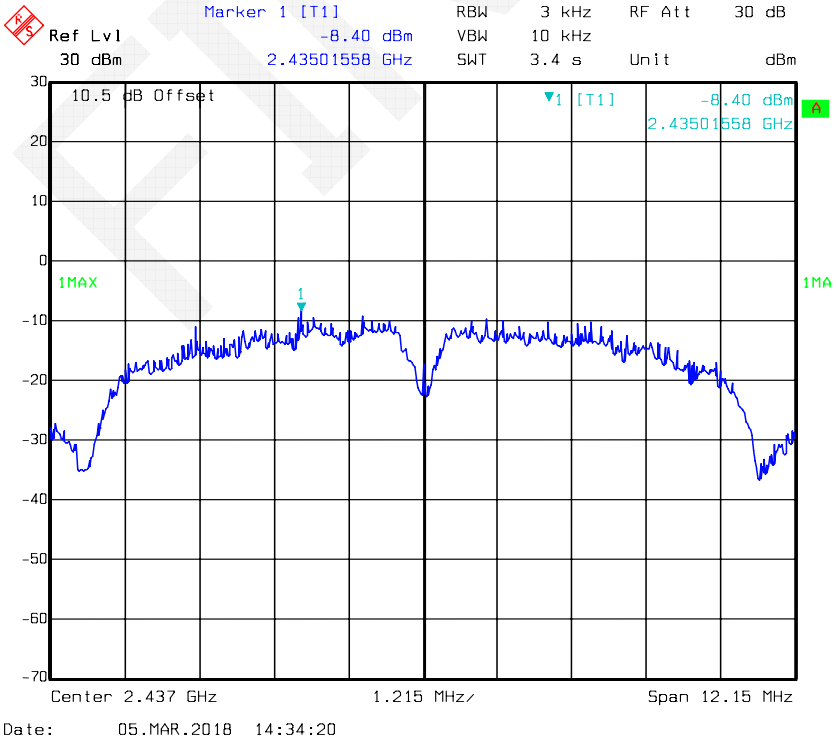
So:

Directional gain = GANT + Array Gain = 3+10*log(2) =6.01dBi＞6dBi
Power density Limit was reduced 0.01dB in MIMO mode.

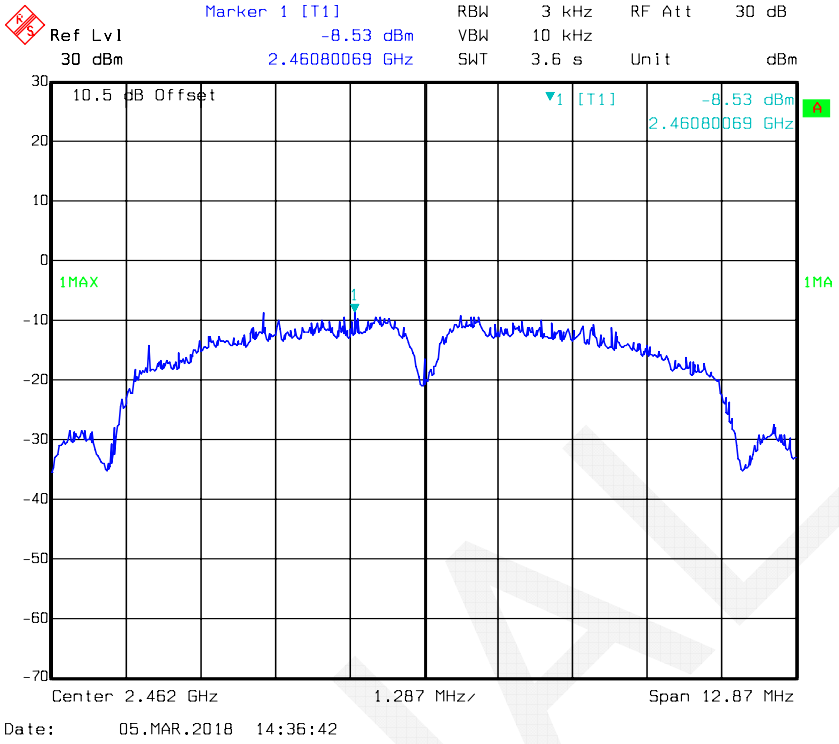
Power Spectral Density, 802.11b Low Channel (Antenna 0)



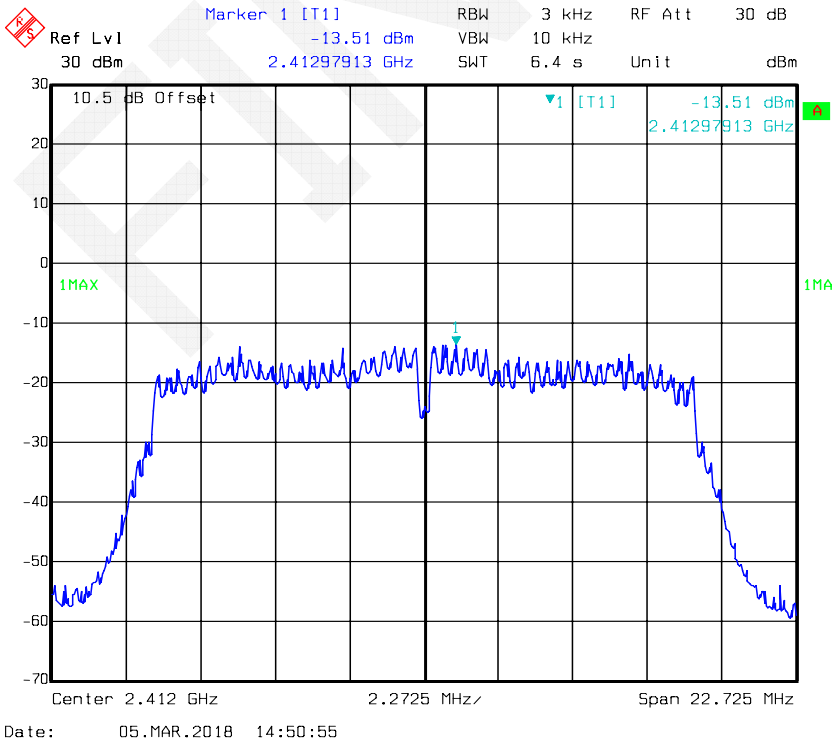
Power Spectral Density, 802.11b Middle Channel (Antenna 0)



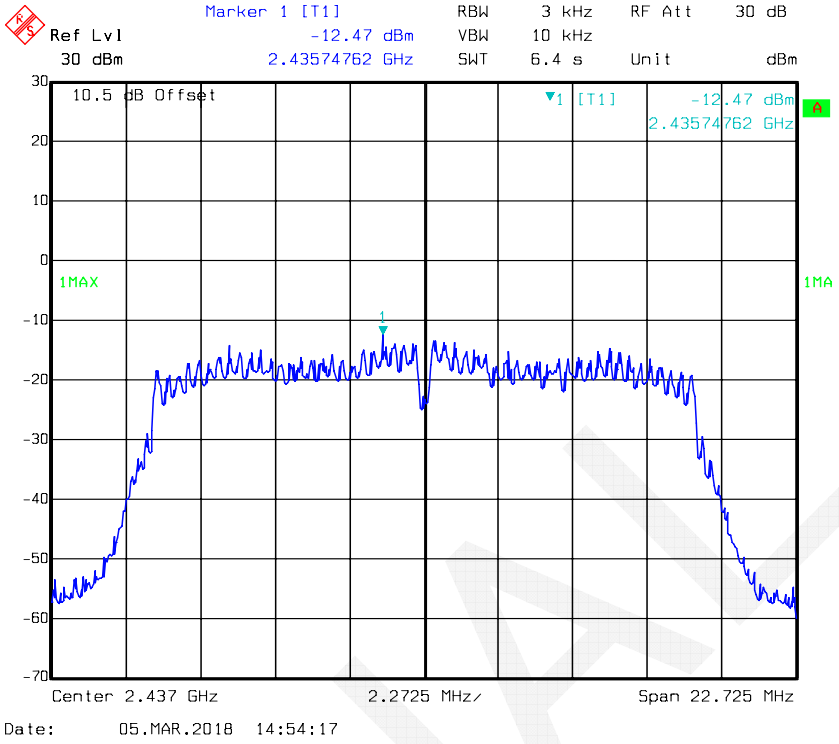
Power Spectral Density, 802.11b High Channel (Antenna 0)



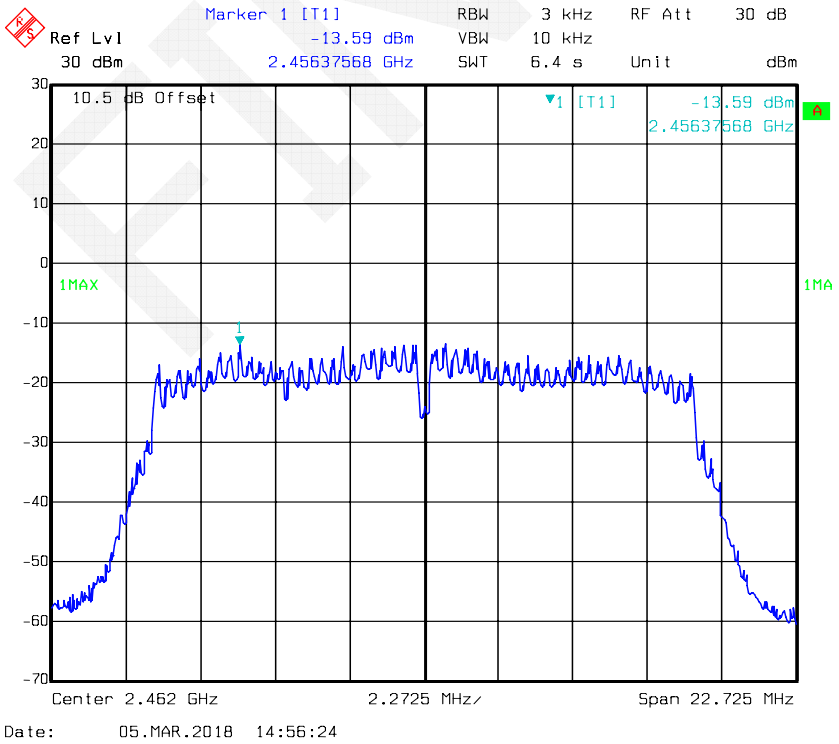
Power Spectral Density, 802.11g Low Channel (Antenna 0)



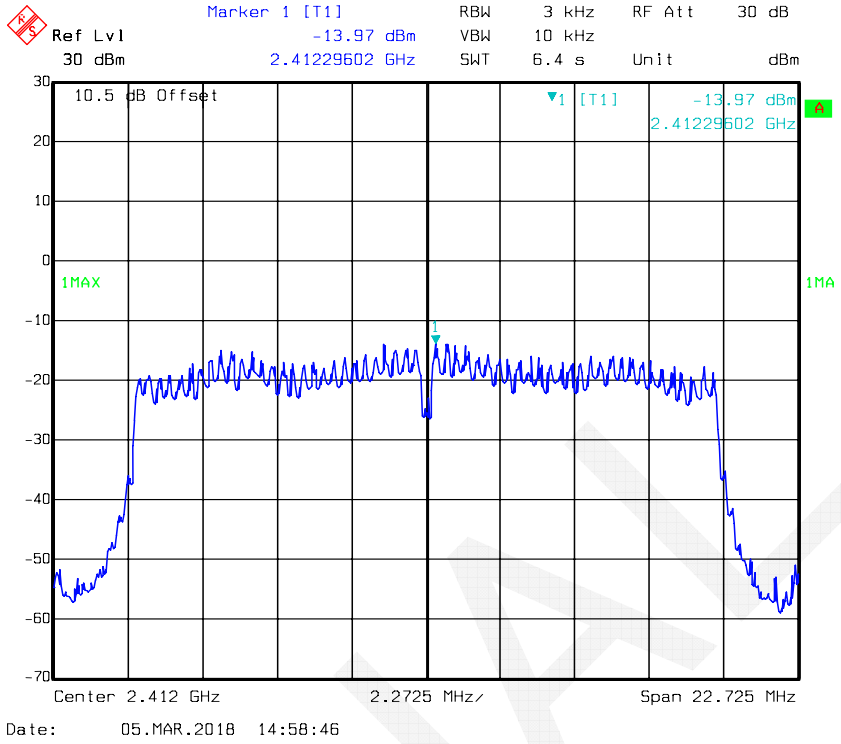
Power Spectral Density, 802.11g Middle Channel (Antenna 0)



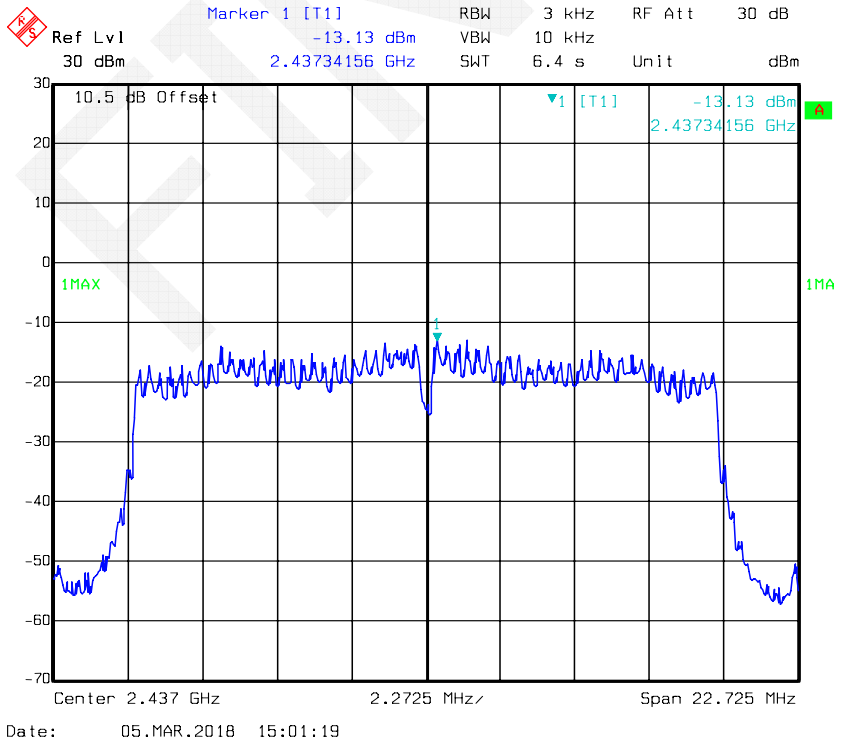
Power Spectral Density, 802.11g High Channel (Antenna 0)



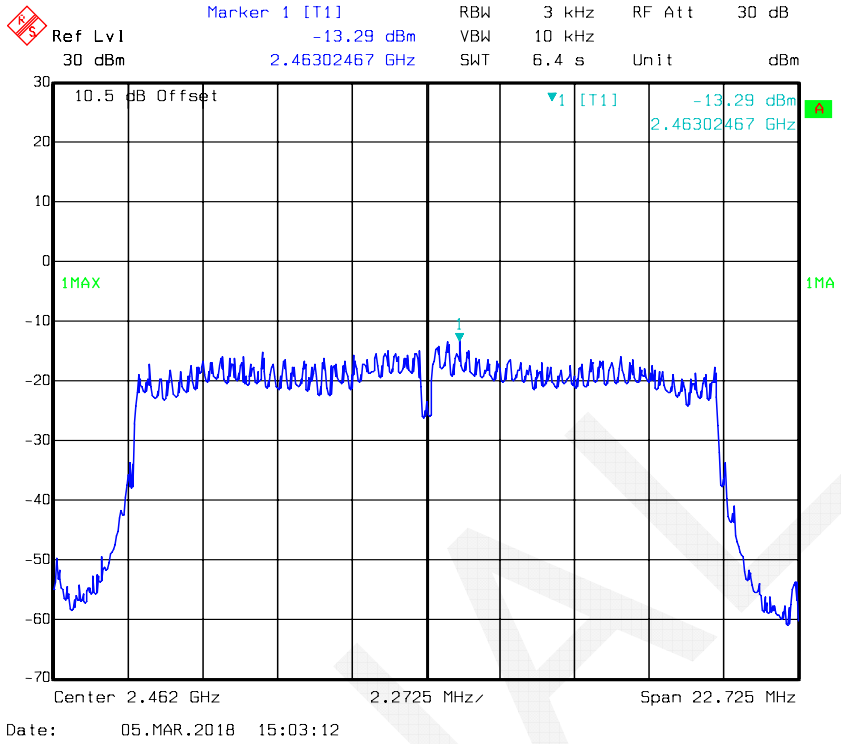
Power Spectral Density, 802.11n-HT20 Low Channel (Antenna 0)



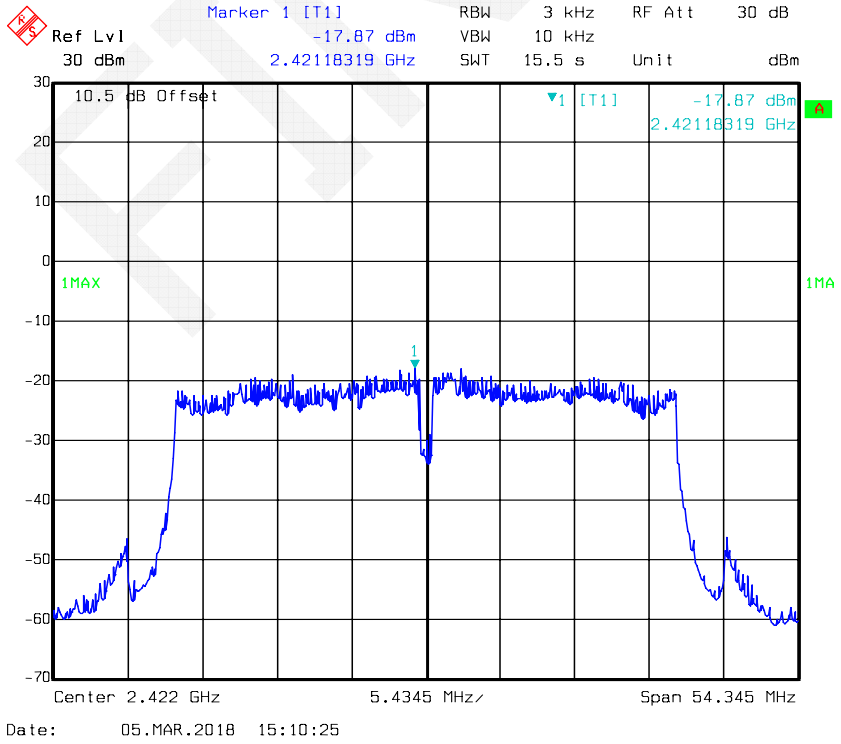
Power Spectral Density, 802.11n-HT20 Middle Channel (Antenna 0)



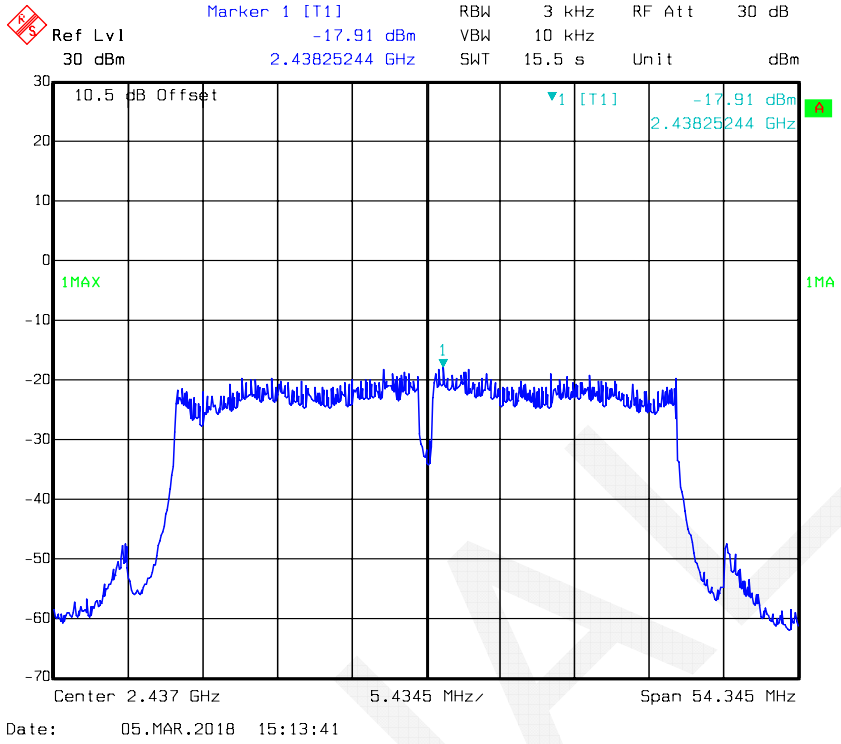
Power Spectral Density, 802.11n-HT20 High Channel (Antenna 0)



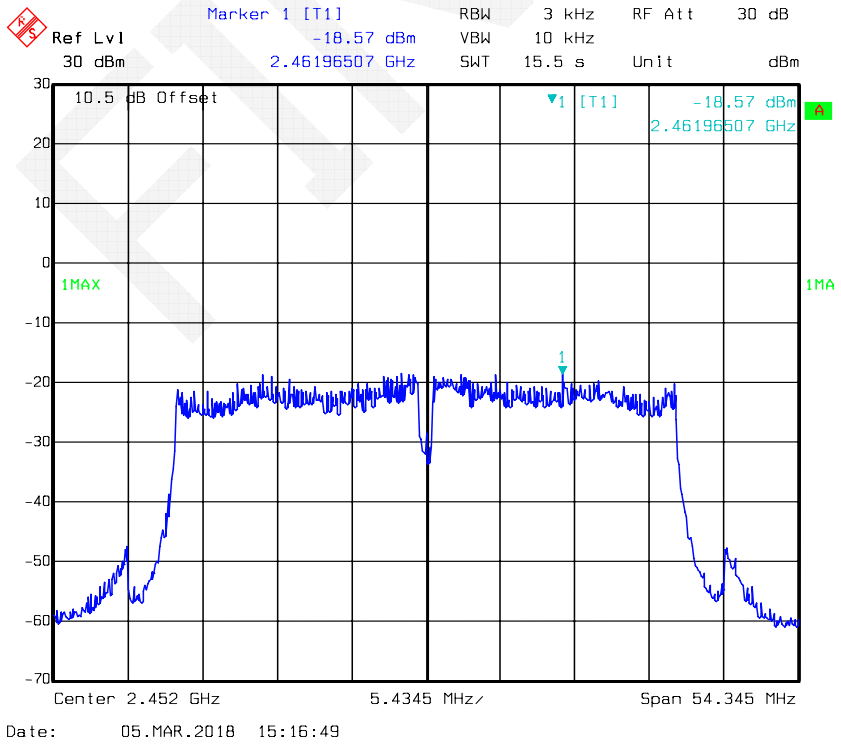
Power Spectral Density, 802.11n-HT40 Low Channel (Antenna 0)



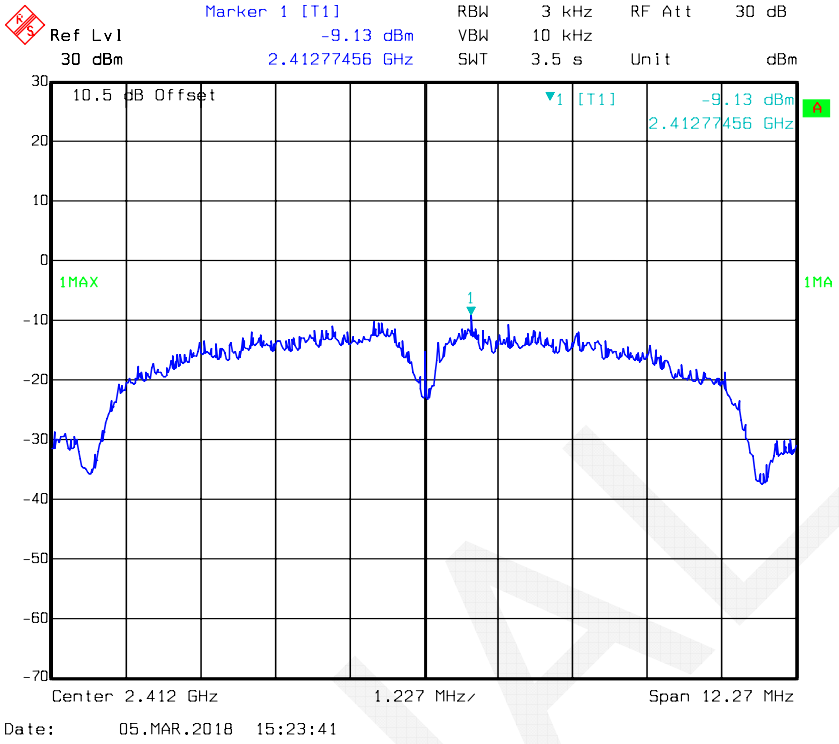
Power Spectral Density, 802.11n-HT40 Middle Channel (Antenna 0)



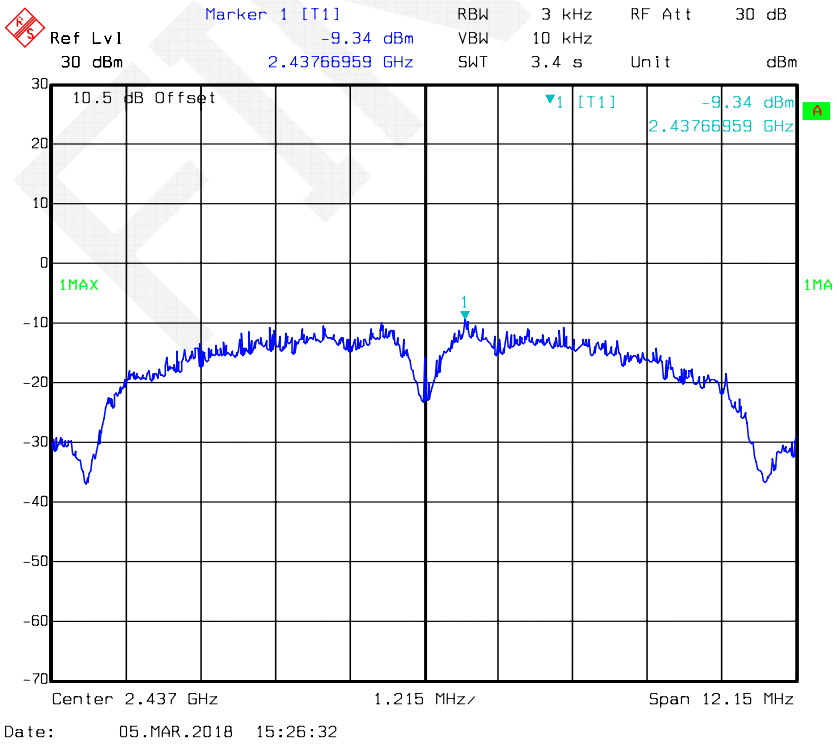
Power Spectral Density, 802.11n-HT40 High Channel (Antenna 0)



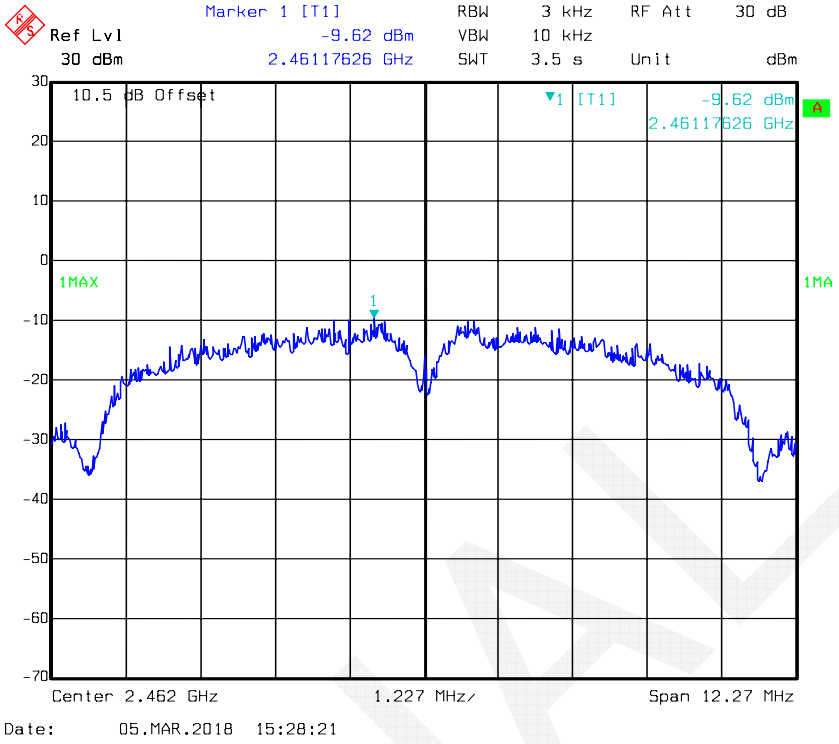
Power Spectral Density, 802.11b Low Channel (Antenna 1)



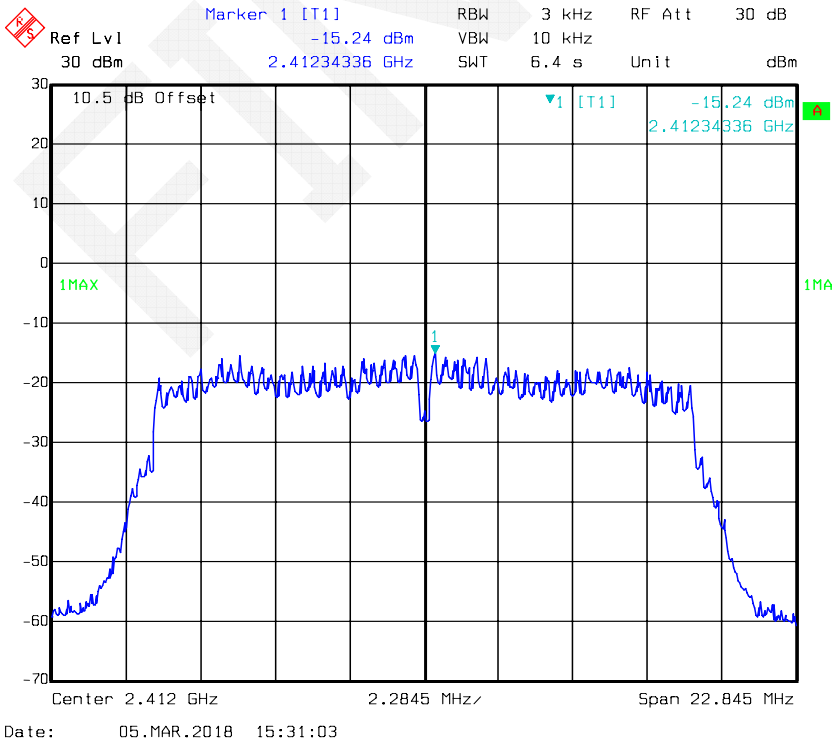
Power Spectral Density, 802.11b Middle Channel (Antenna 1)



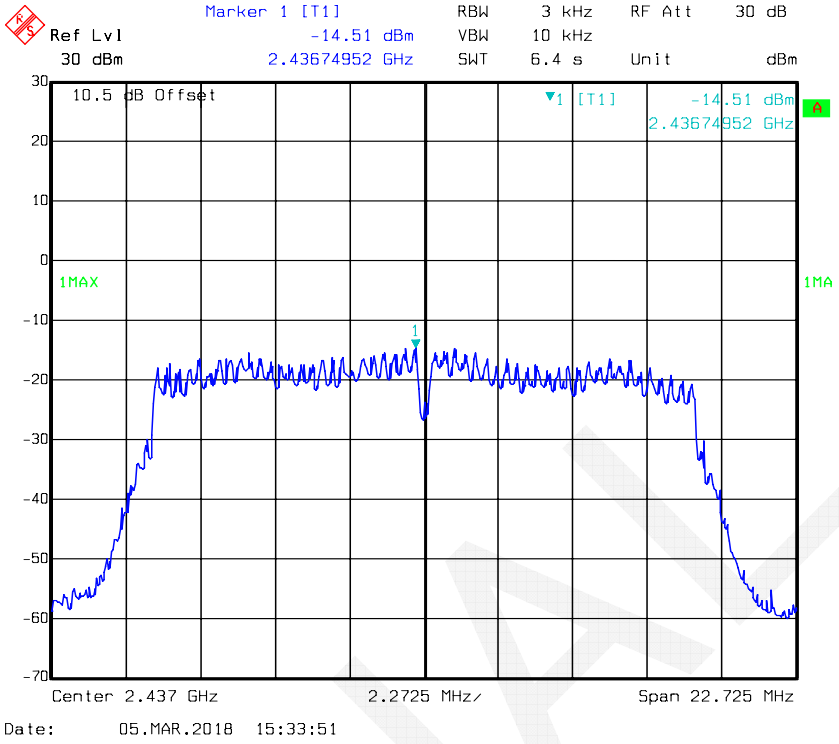
Power Spectral Density, 802.11b High Channel (Antenna 1)



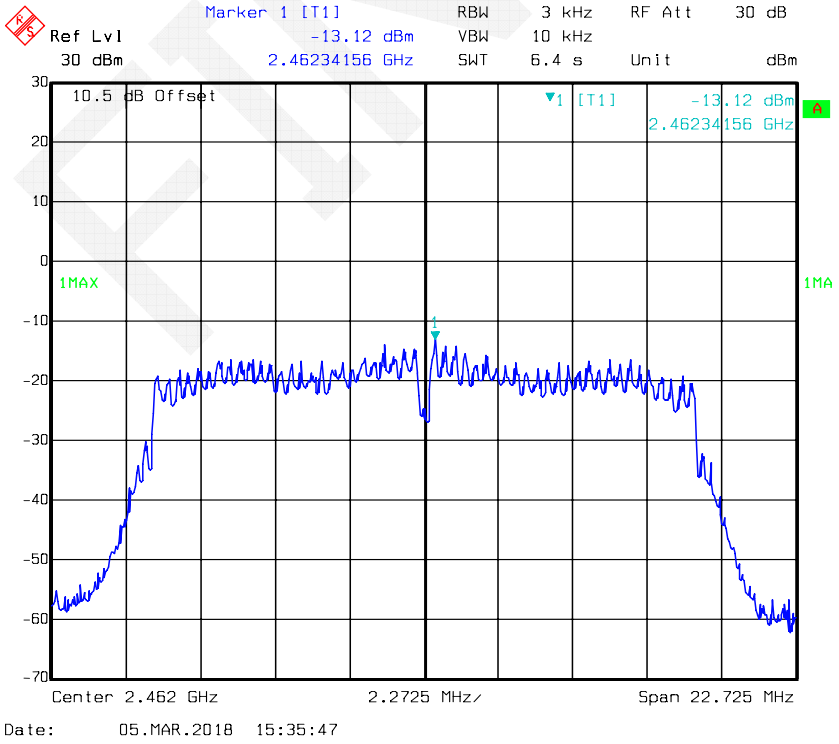
Power Spectral Density, 802.11g Low Channel (Antenna 1)



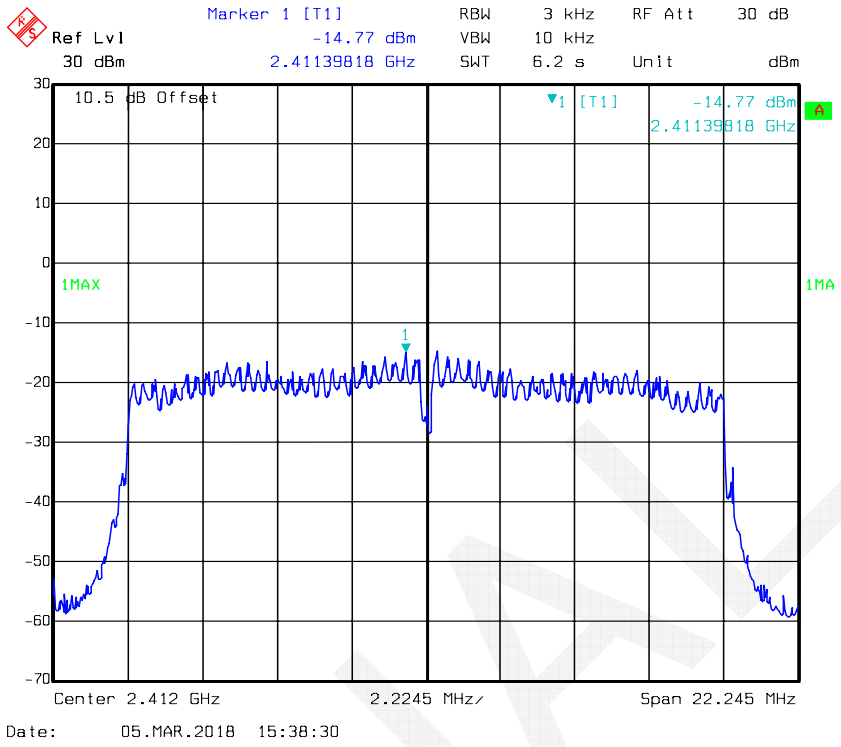
Power Spectral Density, 802.11g Middle Channel (Antenna 1)



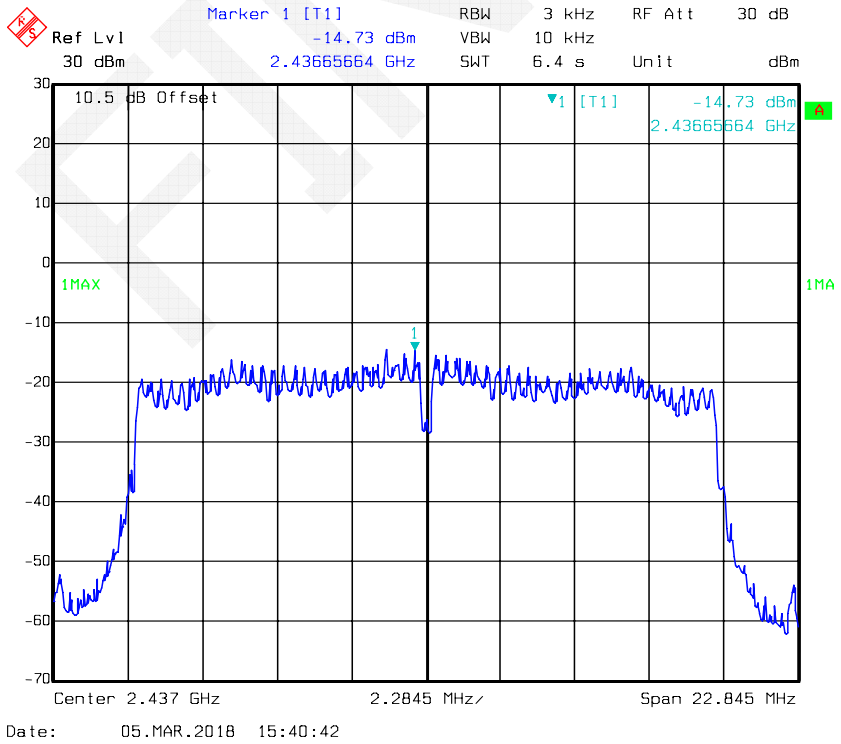
Power Spectral Density, 802.11g High Channel (Antenna 1)



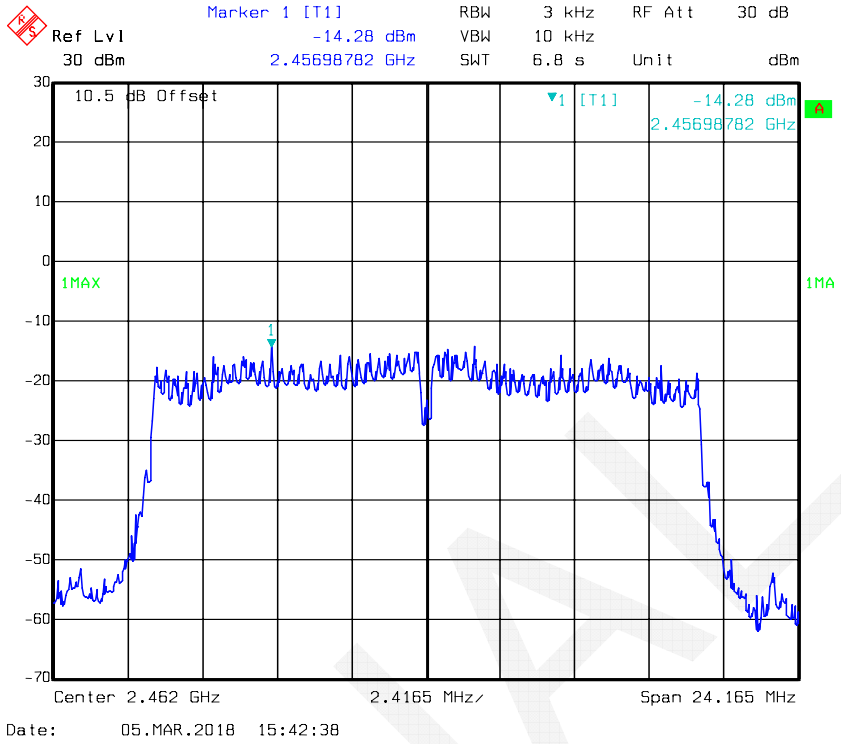
Power Spectral Density, 802.11n-HT20 Low Channel (Antenna 1)



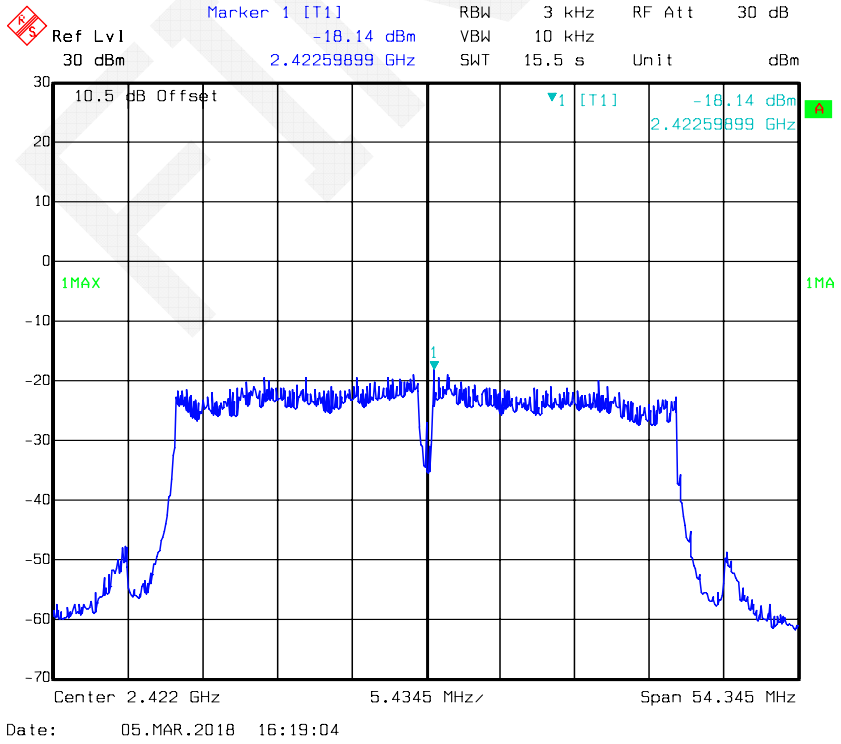
Power Spectral Density, 802.11n-HT20 Middle Channel (Antenna 1)



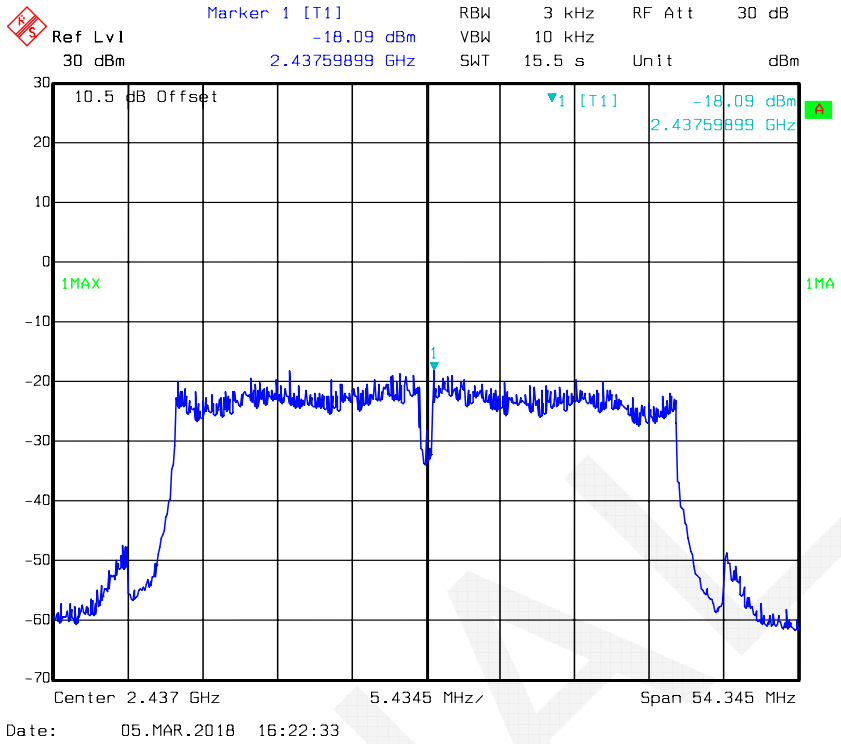
Power Spectral Density, 802.11n-HT20 High Channel (Antenna 1)



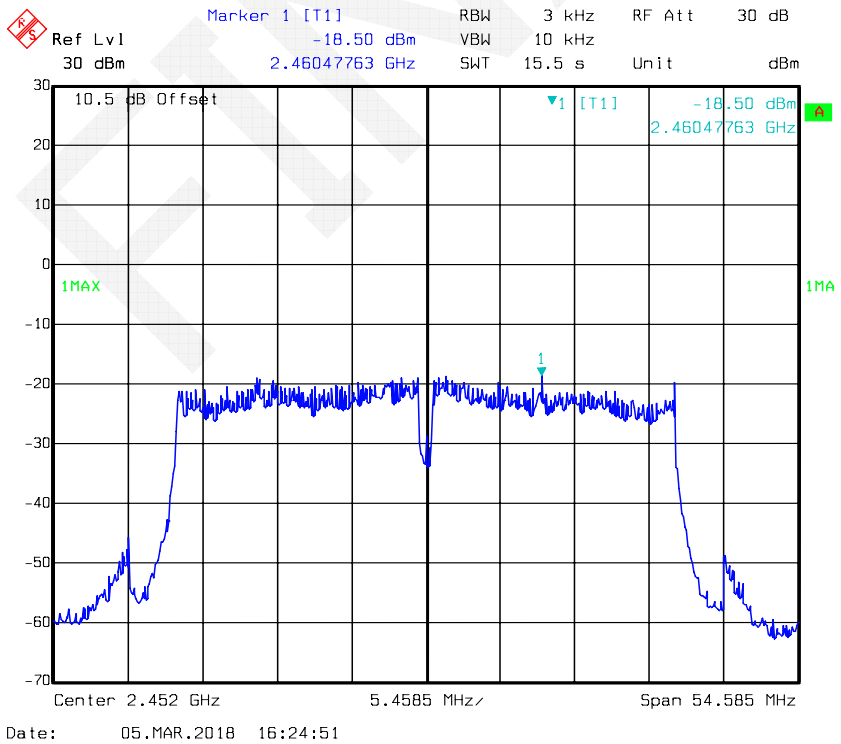
Power Spectral Density, 802.11n-HT40 Low Channel (Antenna 1)



Power Spectral Density, 802.11n-HT40 Middle Channel (Antenna 1)



Power Spectral Density, 802.11n-HT40 High Channel (Antenna 1)



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