FCC PART 15.247

TEST REPORT

For

SKSpruce Technologies Co., Ltd.

A1, Tianfu Software Park, 1129 Century City Road, Hi-tech Zone,
Chengdu, Sichuan, China

FCC ID: 2AHKT-WIA3300-20

Report Type:	**Product Name:**
Original Report	Indoor Access Point

Report Number:	RSC170718001C
Report Date:	2017-07-31
Reviewed By:	Sula Huang EMC 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

FINAL

Note: This test report was prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Chengdu). Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. This report was valid only with a valid digital signature.

TABLE OF CONTENTS

FINAL

FINAL

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The **SKSpruce Technologies Co., Ltd.**, model number: **WIA3300-20 (FCC ID: 2AHKT-WIA3300-20)** or the "EUT" as referred to in this report was one **Indoor Access Point**.

Mechanical Description of EUT

The EUT was measured approximately: 200mm (L) x 200 mm (W) x 45 mm (H).

Rated input voltage: DC 12V from Adapter or DC 48V from POE.

POE Information
Manufacturer: SKSpruce Technologies Co., Ltd.
Model: PSE802G
Input: 100-240V/AC; 50/60Hz
Output: DC48-56V

**All measurement and test data in this report were gathered from final production sample, serial number: 170718001/01 (assigned by BACL). It may have deviation from any other sample. The EUT supplied by the applicant was received on 2017-07-07, and EUT complied with test requirement.*

Objective

This report is prepared on behalf of ***SKSpruce Technologies 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 15B JBP submissions with FCC ID: 2AHKT-WIA3300-20.
FCC Part 15.407 NII submissions with FCC ID: 2AHKT-WIA3300-20.

FINAL

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

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

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

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

For 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)
1	2422	5	2442
2	2427	6	2447
3	2432	7	2452
4	2437	-	-

For 802.11n-HT40 mode was tested with Channel 1, 4 and 7.

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

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:

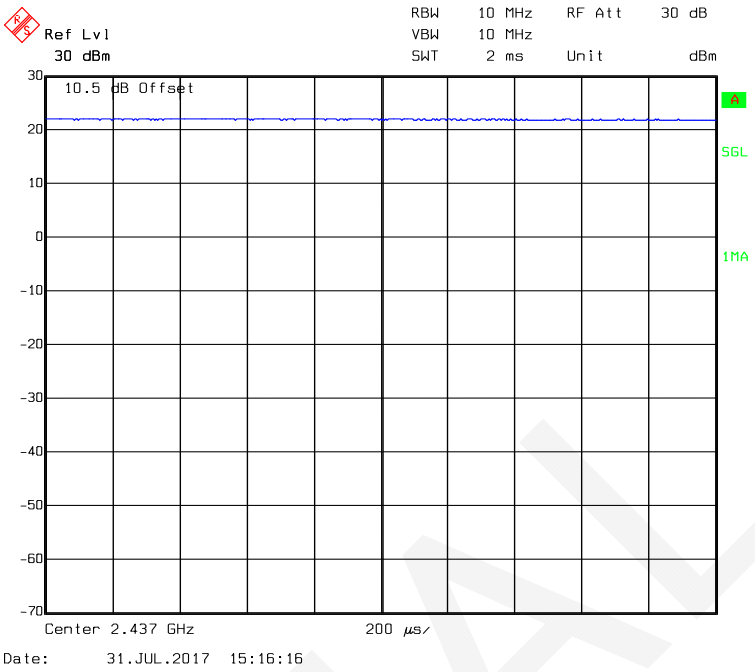
The software "QRCT V3.0-00210" was used to set during testing, which was provided by manufacturer.

Test Mode	Test Software Version	QRCT V3.0-00210		
802.11b	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	CCK 1M	CCK 1M	CCK 1M
	Power Level Setting Antenna 0	16	16	16
	Power Level Setting Antenna 1	16	16	16
802.11g	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	OFDM 6M	OFDM 6M	OFDM 6M
	Power Level Setting Antenna 0	16	16	16
	Power Level Setting Antenna 1	16	16	16
802.11n HT20	Test Frequency	2412MHz	2437MHz	2462MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting Antenna 0	16	16	16
	Power Level Setting Antenna 1	16	16	16
802.11n HT40	Test Frequency	2422MHz	2437MHz	2452MHz
	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting Antenna 0	16	16	16
	Power Level Setting Antenna 1	16	16	16

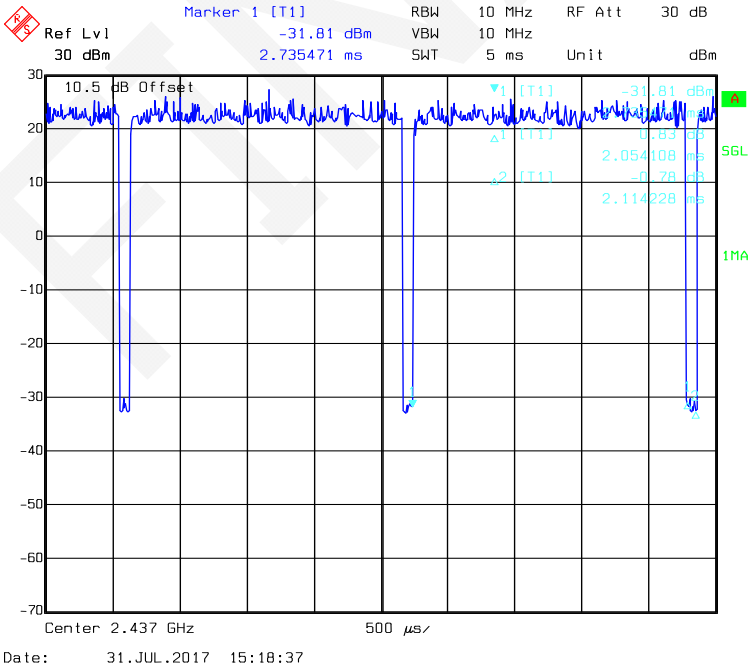
Duty Cycle information is below:

Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11b	2.0	2.0	100
802.11g	2.05	2.11	97.16
802.11n-HT20	5.01	5.05	99.21
802.11n-HT40	2.46	2.51	98.00

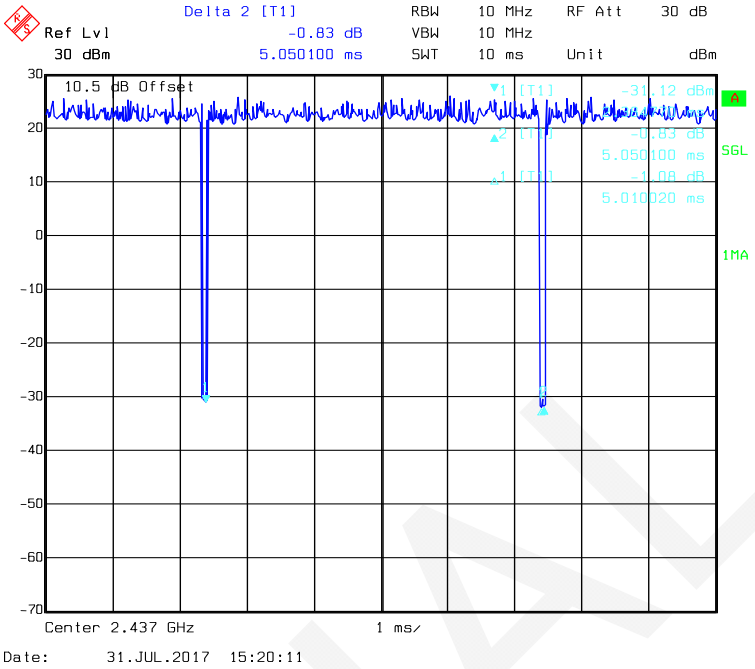
802.11b



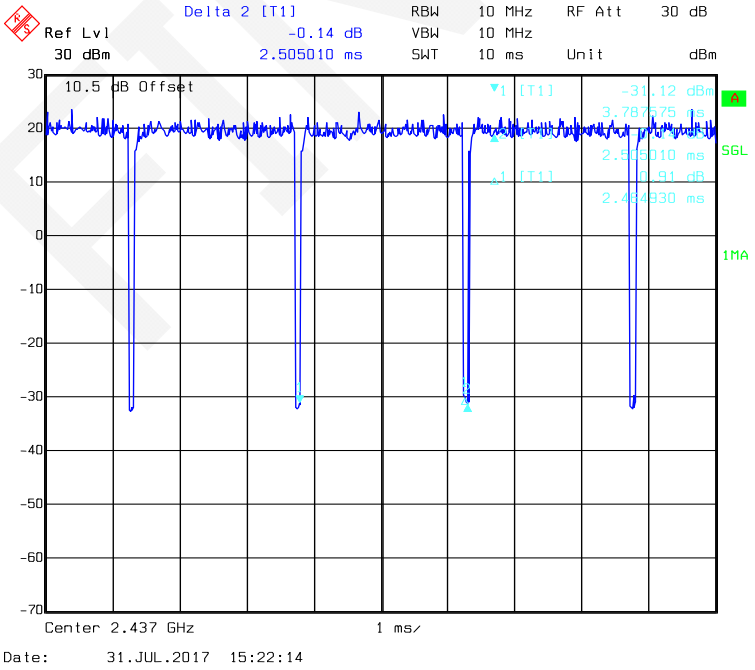
802.11g



802.11n-HT20



802.11n-HT40



Support Equipment List and Details

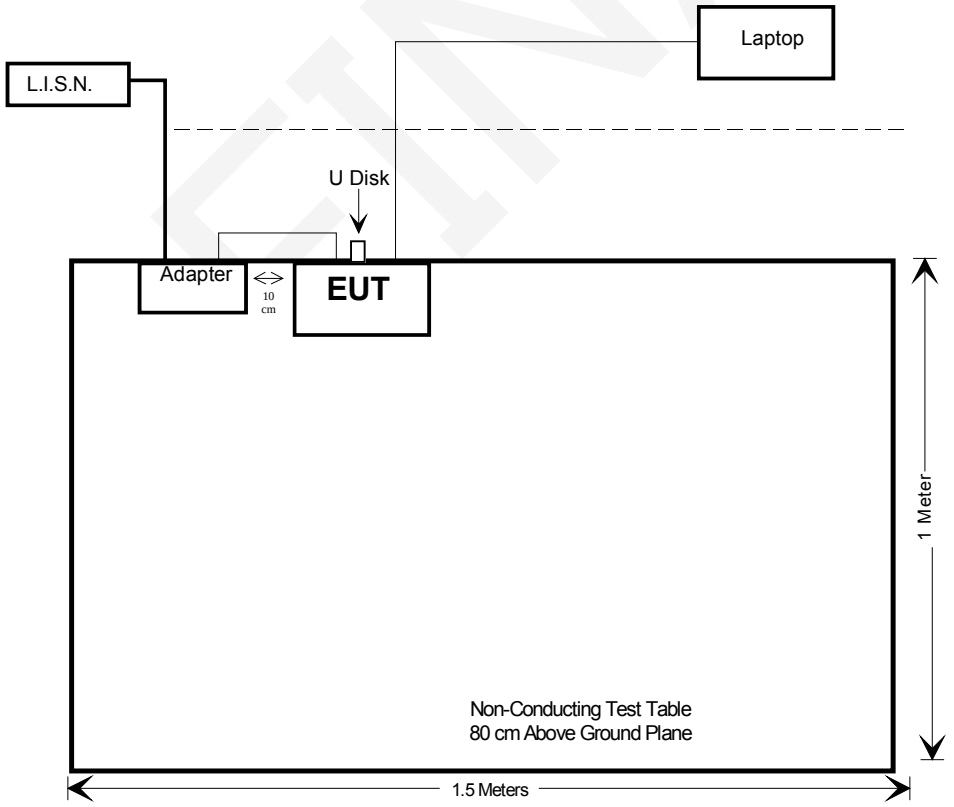
Manufacturer	Description	Model	Serial Number
DELL	Laptop	E6410	37417629385
GPE	Adapter	GPE048A-120350-D	GMA-W3322-EA-002
Kingston	U Disk	101G2	N/A

External I/O Cable

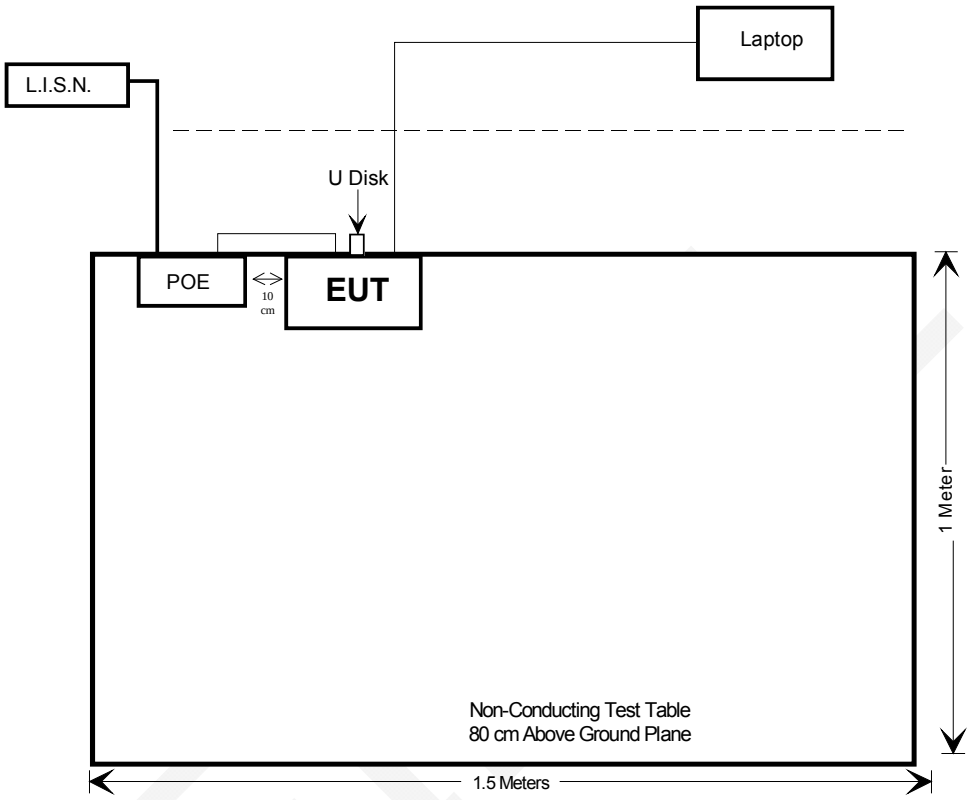
Cable Description	Length (m)	From	To
Unshielded DC Cable	1.2	EUT	Adapter
Unshielded RJ45 Cable	1.2	EUT	POE
Unshielded RJ45 Cable	5.0	EUT	Laptop

Block Diagram of Test Setup

AC Power Lines Conducted Emissions Test
Adapter Mode



POE Mode


Laptop
L.I.S.N.
U Disk
POE
10 cm
EUT
1 Meter
Non-Conducting Test Table
80 cm Above Ground Plane
1.5 Meters

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	2016-12-02	2017-12-01
Rohde & Schwarz	L.I.S.N.	ENV216	100018	2017-05-20	2018-05-19
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	DE14781	2016-11-10	2017-11-09
N/A	Conducted Cable	NO.5	N/A	N/A	N/A
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
Radiated Emissions Test					
Agilent	Pre-Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
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
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2017-05-18	2018-05-17
ETS	Horn Antenna	3115	003-6076	2017-05-19	2020-05-18
A.H.Systems,inc	Horn Antenna	SAS-574	505	2016-12-02	2017-12-01
Mini-circuits	Pre-Amplifier	ZVA-183-S+	771001215	2017-05-20	2018-05-19
Quinstar	Pre-Amplifier	QLW-18405536-JO	15964004001	2017-05-20	2018-05-19
INMET	Attenuator	N-6dB	/	2016-11-10	2017-11-09
EMCT	Semi-Anechoic Chamber	966	N/A	2015-04-24	2018-04-23
N/A	RF Cable (below 1GHz)	NO.1	N/A	2016-11-10	2017-11-09
N/A	RF Cable (below 1GHz)	NO.4	N/A	2016-11-10	2017-11-09
N/A	RF Cable (above 1GHz)	NO.2	N/A	2016-11-10	2017-11-09
Rohde & Schwarz	EMC32	N/A	V 8.52.0	N/A	N/A
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSL18	100180	2016-12-02	2017-12-01
WEINSCHEL ENGINEERING	Attenuator	1A10dB	AA4135	2016-11-10	2017-11-09
Agilent	USB Wideband Power Sensor	U2021XA	MY53320008	2016-12-02	2017-12-01
N/A	RF Cable	NO.3	N/A	2016-11-10	2017-11-09
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 §15.407(f) & §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

FINAL

FCC §15.407(f) & §1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 15.407(f)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 v05r02**,** 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 $\leqslant$ 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	3.0	2.00	28.0	630.96	20	0.251	1.0
	5150-5250	3.0	2.00	20.0	100.00	20	0.040	1.0
	5250-5350	3.0	2.00	19.0	79.43	20	0.032	1.0
	5470-5725	3.0	2.00	20.0	100.00	20	0.040	1.0
	5725-5850	3.0	2.00	21.0	125.89	20	0.050	1.0

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) = 0.251/1+0.050/1=0.301＜1.0

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

FINAL

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 PCB antennas (2.4G) and two PCB antennas (5G) which connected to the main board with IPEX socket, the maximum gain for 2.4G and 5G band is 3dBi, which fulfill the requirement of this section, please refer to the EUT photos.

Antenna Information

Band	Manufacturer	Antenna model	Antenna Peak Gain	Antenna type	Connector
Wi-Fi 2.4GHz	Walsin Technology	RFPCA451010IMAB301	3dBi	Omni-directional	IPEX
	Walsin Technology	RFPCA451021IMAB301	3dBi	Omni-directional	IPEX
Wi-Fi 5GHz	Walsin Technology	RFPCA190505IM5B302	3dBi	Omni-directional	IPEX
	Walsin Technology	RFPCA190507IM5B301	3dBi	Omni-directional	IPEX

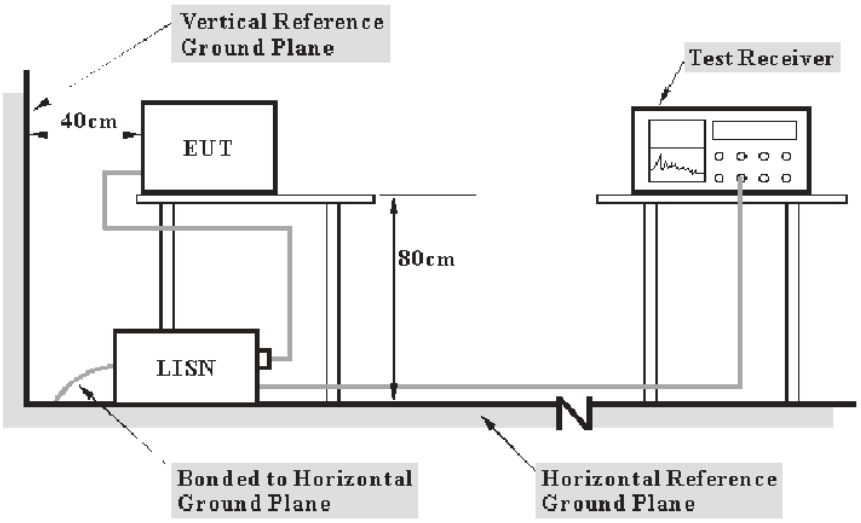
Result: Compliance.

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 POE was connected to AC 120V/60Hz.

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:	29 °C
Relative Humidity:	56 %
ATM Pressure:	94.9 kPa

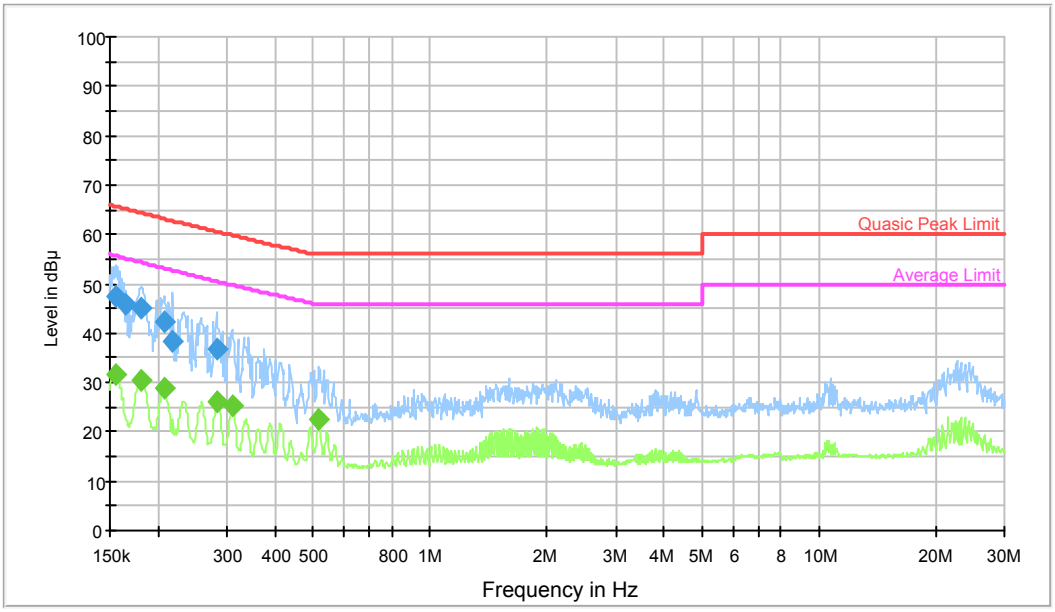
The testing was performed by Tom Tang on 2017-07-25.

Test Mode: Transmitting

FINAL

Adapter Mode

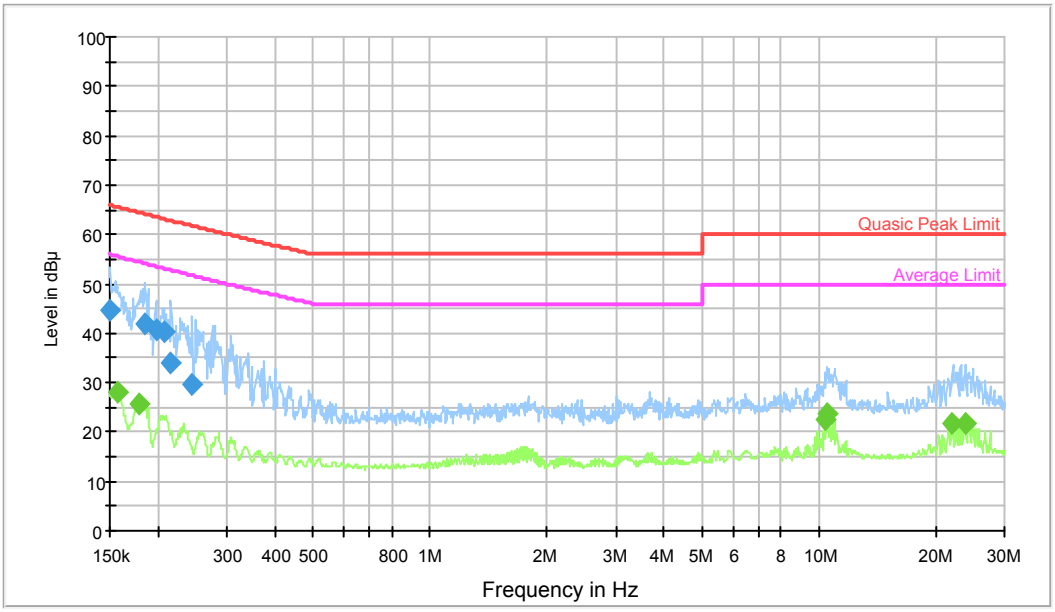
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.156109	47.3	9.000	L1	19.7	18.3	65.6
0.165082	45.8	9.000	L1	19.7	19.3	65.1
0.180957	44.9	9.000	L1	19.7	19.4	64.3
0.207263	42.3	9.000	L1	19.7	20.9	63.2
0.217434	38.4	9.000	L1	19.7	24.3	62.7
0.281850	36.9	9.000	L1	19.7	23.7	60.6

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.155487	31.6	9.000	L1	19.7	24.1	55.7
0.180236	30.4	9.000	L1	19.7	23.9	54.3
0.206437	28.7	9.000	L1	19.7	24.5	53.2
0.281850	26.0	9.000	L1	19.7	24.5	50.5
0.308954	25.2	9.000	L1	19.7	24.6	49.8
0.517062	22.4	9.000	L1	19.8	23.6	46.0

AC120 V, 60 Hz, Neutral:



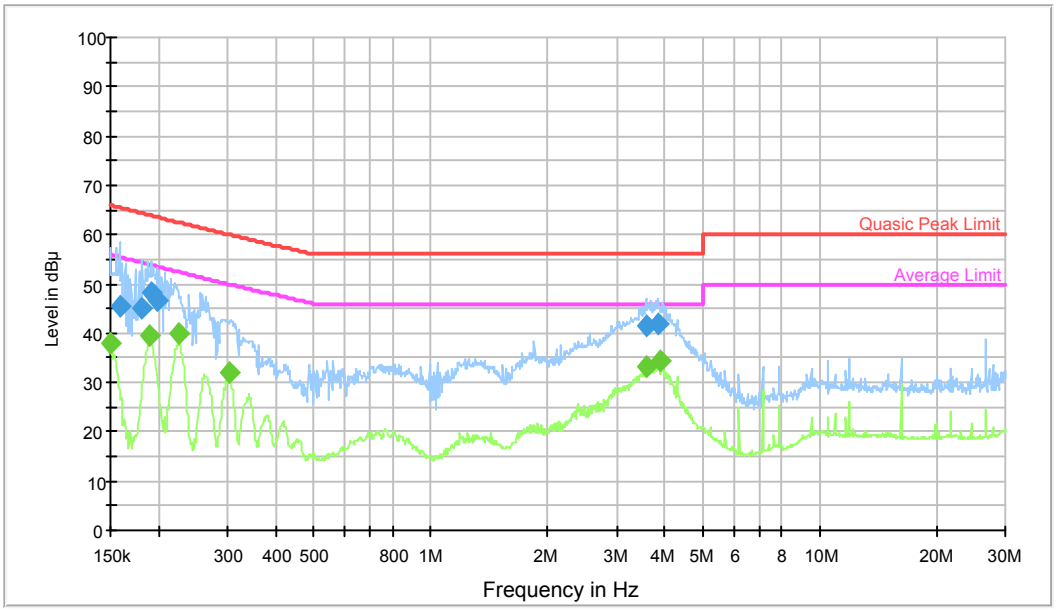
Frequency (MHz)	QuasiPeak (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.150600	44.5	9.000	N	19.6	21.5	66.0
0.184605	41.7	9.000	N	19.6	22.5	64.2
0.196781	40.6	9.000	N	19.5	23.0	63.6
0.206437	40.5	9.000	N	19.5	22.7	63.2
0.215705	34.1	9.000	N	19.5	28.7	62.8
0.244121	29.7	9.000	N	19.5	32.1	61.8

Frequency (MHz)	Average (dB µ V)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dB µ V)
0.156734	28.0	9.000	N	19.6	27.6	55.6
0.178803	25.6	9.000	N	19.6	28.8	54.4
10.364798	22.6	9.000	N	19.8	27.4	50.0
10.447882	23.6	9.000	N	19.8	26.4	50.0
21.953251	21.8	9.000	N	20.0	28.2	50.0
23.777878	21.7	9.000	N	20.0	28.3	50.0

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

POE Mode

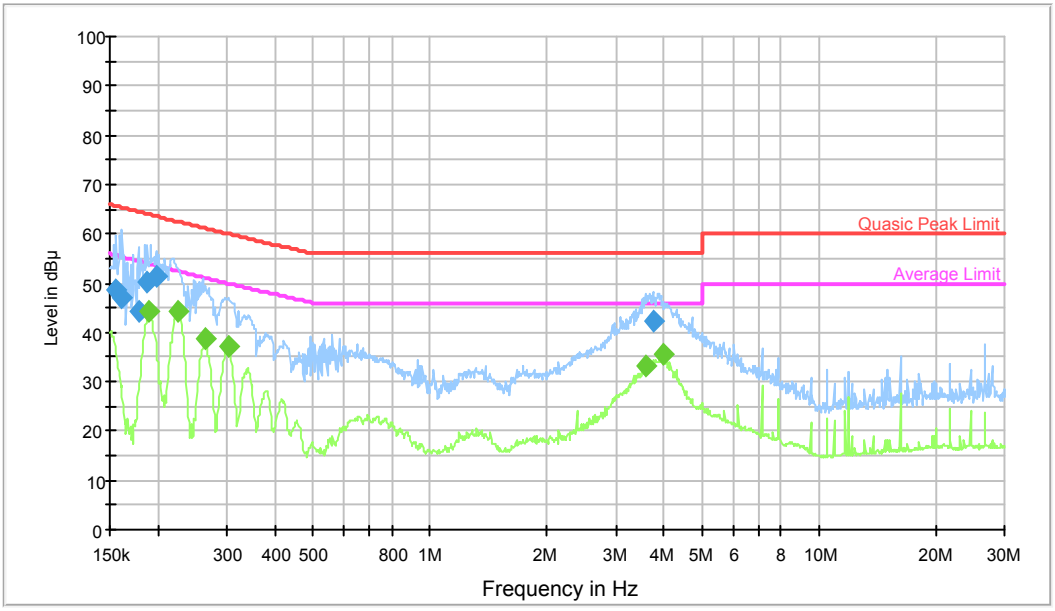
AC120 V, 60 Hz, Line:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.158622	45.6	9.000	L1	19.7	19.9	65.5
0.180957	44.9	9.000	L1	19.7	19.4	64.3
0.191359	48.3	9.000	L1	19.7	15.5	63.8
0.196781	46.8	9.000	L1	19.7	16.8	63.6
3.569929	41.4	9.000	L1	19.9	14.6	56.0
3.835892	41.9	9.000	L1	19.9	14.1	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	38.0	9.000	L1	19.7	18.0	56.0
0.189081	39.7	9.000	L1	19.7	14.2	53.9
0.225388	39.9	9.000	L1	19.7	12.5	52.4
0.304060	32.1	9.000	L1	19.7	17.8	49.9
3.584208	33.3	9.000	L1	19.9	12.7	46.0
3.882107	34.3	9.000	L1	19.9	11.7	46.0

AC120 V, 60 Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.156109	48.4	9.000	N	19.6	17.2	65.6
0.161175	47.0	9.000	N	19.6	18.4	65.4
0.177381	44.3	9.000	N	19.6	20.2	64.5
0.187577	50.3	9.000	N	19.6	13.7	64.0
0.196781	51.3	9.000	N	19.5	12.3	63.6
3.745106	42.3	9.000	N	19.6	13.7	56.0

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.189081	44.2	9.000	N	19.6	9.7	53.9
0.224490	44.2	9.000	N	19.5	8.2	52.4
0.263357	38.8	9.000	N	19.5	12.3	51.1
0.304060	37.1	9.000	N	19.5	12.8	49.9
3.569929	33.4	9.000	N	19.6	12.6	46.0
3.992119	35.5	9.000	N	19.6	10.5	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

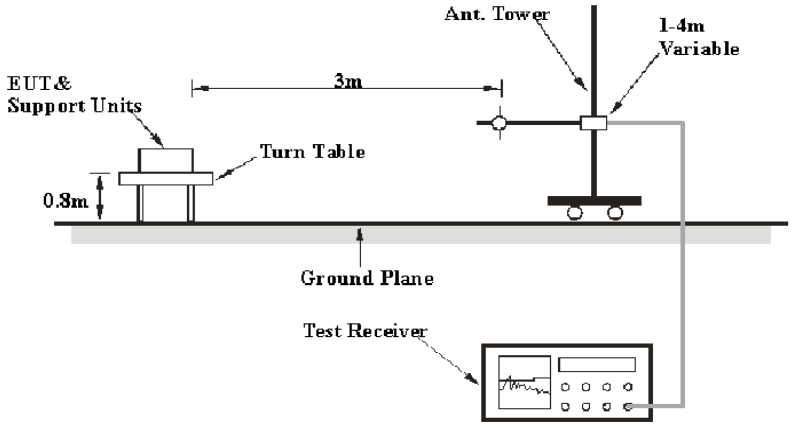
FCC §15.209, §15.205 & §15.247(d) - SPURIOUS EMISSIONS

Applicable Standard

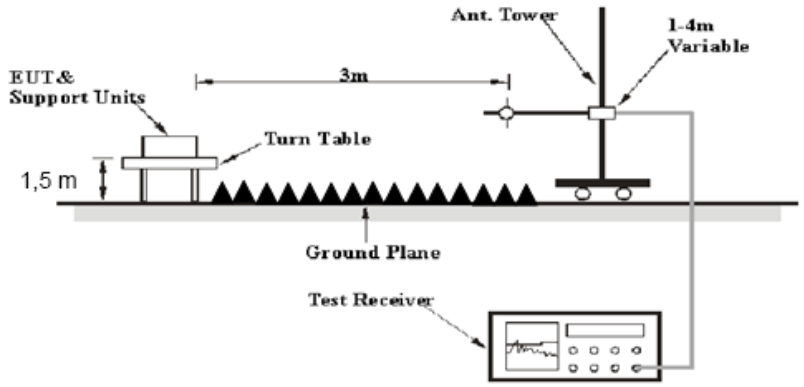
FCC §15.247 (d); §15.209; §15.205;

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 POE was connected to AC 120V/60Hz.

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 & Spectrum Analyzer Setup were set with the following configurations:

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

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

Note: T is 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

FINAL

Test Data

Environmental Conditions

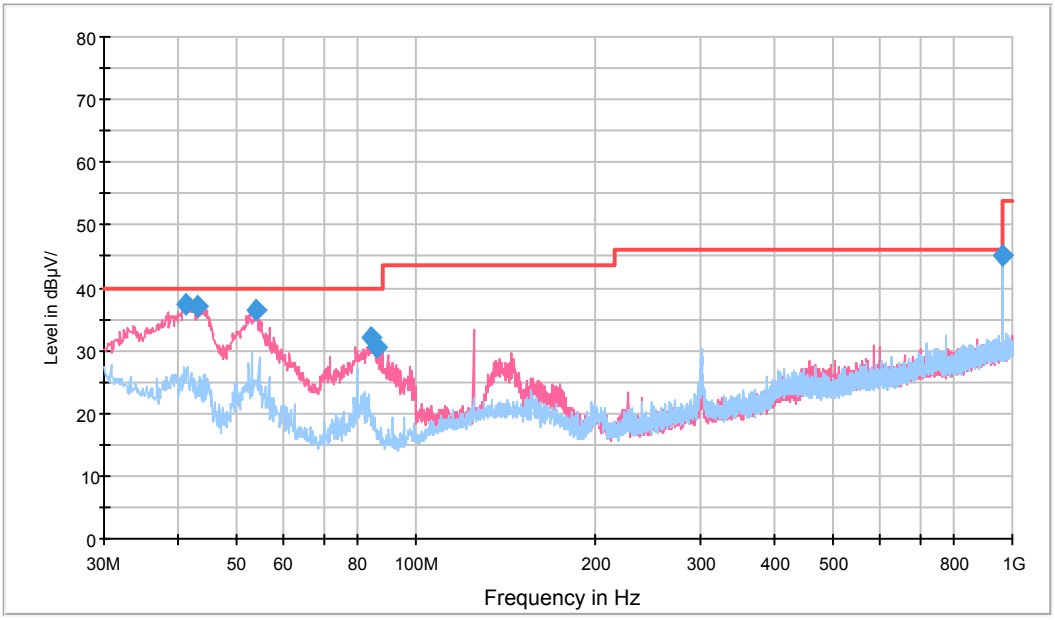
Temperature:	30 °C
Relative Humidity:	56 %
ATM Pressure:	94.9 kPa

** The testing was performed by Tom Tang on 2017-07-26.*

Test Mode: Transmitting

Adapter Mode

30 MHz to 1 GHz

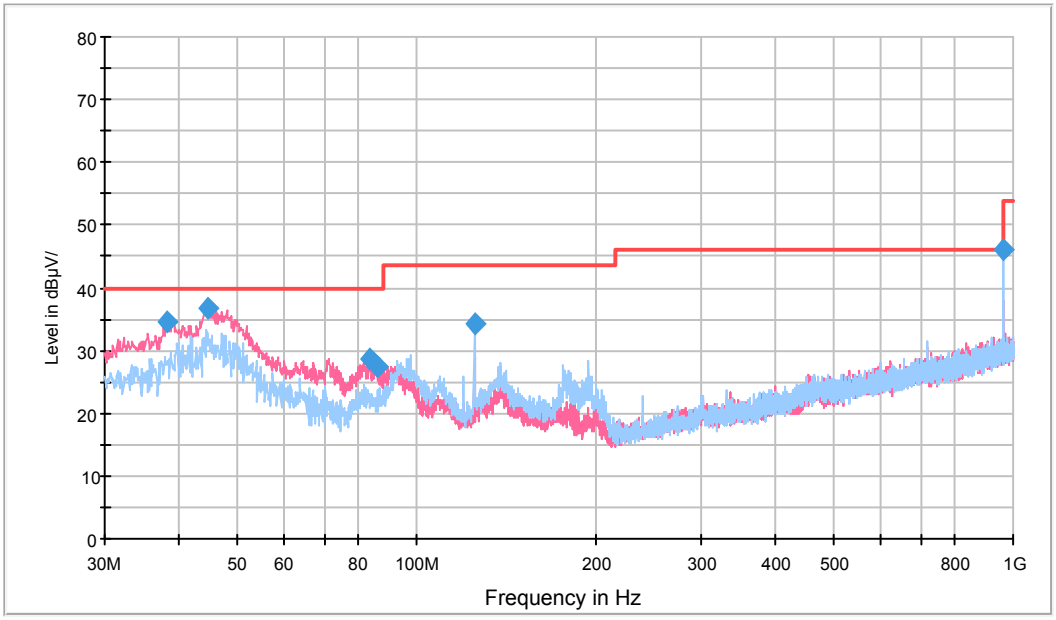


Frequency (MHz)	QuasicPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
41.276250	37.5	100.0	V	144.0	-8.0	*2.5	40.0
42.973750	36.9	100.0	V	170.0	-9.0	*3.1	40.0
54.007500	36.6	150.0	V	296.0	-13.3	*3.4	40.0
83.835000	32.1	165.0	V	287.0	-12.9	7.9	40.0
86.017500	30.6	100.0	V	296.0	-13.1	9.4	40.0
960.108750	45.2	200.0	H	338.0	4.4	8.7	53.9

**Within measurement uncertainty!*

POE Mode

30 MHz to 1 GHz



Frequency (MHz)	QuasicPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.245000	34.4	100.0	V	206.0	-6.3	5.6	40.0
44.550000	36.9	150.0	V	287.0	-9.9	*3.1	40.0
83.228750	28.6	200.0	V	216.0	-12.9	11.4	40.0
86.017500	27.3	175.0	V	180.0	-13.1	12.7	40.0
124.938750	34.3	100.0	H	279.0	-7.1	9.2	43.5
960.108750	46.0	200.0	H	288.0	4.4	7.9	53.9

**Within measurement uncertainty!*

POE Mode

Above 1 GHz

802.11b Mode (MIMO)
Worst Case

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
frequency: 2412MHz									
2412	81.98	PK	H	28.74	3.00	0.00	113.72	N/A	N/A
2412	77.55	AV	H	28.74	3.00	0.00	109.29	N/A	N/A
2412	84.27	PK	V	28.74	3.00	0.00	116.01	N/A	N/A
2412	79.79	AV	V	28.74	3.00	0.00	111.53	N/A	N/A
2390	32.77	PK	V	28.67	3.00	0.00	64.44	74.00	9.56
2390	17.45	AV	V	28.67	3.00	0.00	49.12	54.00	*4.88
4824	43.07	PK	V	33.91	5.11	26.87	55.22	74.00	18.78
4824	39.13	AV	V	33.91	5.11	26.87	51.28	54.00	*2.72
7236	32.56	PK	V	36.43	6.18	26.36	48.81	74.00	25.19
7236	17.33	AV	V	36.43	6.18	26.36	33.58	54.00	20.42
frequency:2437MHz									
2437	82.27	PK	H	28.81	3.00	0.00	114.08	N/A	N/A
2437	77.99	AV	H	28.81	3.00	0.00	109.80	N/A	N/A
2437	84.90	PK	V	28.81	3.00	0.00	116.71	N/A	N/A
2437	80.72	AV	V	28.81	3.00	0.00	112.53	N/A	N/A
4874	43.55	PK	V	34.05	5.09	26.87	55.82	74.00	18.18
4874	39.26	AV	V	34.05	5.09	26.87	51.53	54.00	*2.47
7311	32.64	PK	V	36.54	6.21	26.40	48.99	74.00	25.01
7311	17.76	AV	V	36.54	6.21	26.40	34.11	54.00	19.89
frequency: 2462MHz									
2462	82.43	PK	H	28.89	2.99	0.00	114.31	N/A	N/A
2462	78.19	AV	H	28.89	2.99	0.00	110.07	N/A	N/A
2462	85.47	PK	V	28.89	2.99	0.00	117.35	N/A	N/A
2462	81.05	AV	V	28.89	2.99	0.00	112.93	N/A	N/A
2483.5	38.05	PK	V	28.95	2.99	0.00	69.99	74.00	*4.01
2483.5	17.65	AV	V	28.95	2.99	0.00	49.59	54.00	*4.41
4924	43.48	PK	V	34.19	5.07	26.88	55.86	74.00	18.14
4924	39.27	AV	V	34.19	5.07	26.88	51.65	54.00	*2.35
7386	32.46	PK	V	36.64	6.25	26.43	48.92	74.00	25.08
7386	17.69	AV	V	36.64	6.25	26.43	34.15	54.00	19.85

**Within measurement uncertainty!*

802.11g Mode (MIMO)
Worst Case

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
frequency:2412MHz									
2412	84.11	PK	H	28.74	3.00	0.00	115.85	N/A	N/A
2412	73.22	AV	H	28.74	3.00	0.00	104.96	N/A	N/A
2412	85.24	PK	V	28.74	3.00	0.00	116.98	N/A	N/A
2412	75.15	AV	V	28.74	3.00	0.00	106.89	N/A	N/A
2390	34.72	PK	V	28.67	3.00	0.00	66.39	74.00	7.61
2390	18.57	AV	V	28.67	3.00	0.00	50.24	54.00	*3.76
4824	42.88	PK	V	33.91	5.11	26.87	55.03	74.00	18.97
4824	39.51	AV	V	33.91	5.11	26.87	51.66	54.00	*2.34
7236	32.46	PK	V	36.43	6.18	26.36	48.71	74.00	25.29
7236	17.27	AV	V	36.43	6.18	26.36	33.52	54.00	20.48
frequency:2437MHz									
2437	84.77	PK	H	28.81	3.00	0.00	116.58	N/A	N/A
2437	74.40	AV	H	28.81	3.00	0.00	106.21	N/A	N/A
2437	86.22	PK	V	28.81	3.00	0.00	118.03	N/A	N/A
2437	76.11	AV	V	28.81	3.00	0.00	107.92	N/A	N/A
4874	43.12	PK	V	34.05	5.09	26.87	55.39	74.00	18.61
4874	39.54	AV	V	34.05	5.09	26.87	51.81	54.00	*2.19
7311	32.66	PK	V	36.54	6.21	26.40	49.01	74.00	24.99
7311	17.38	AV	V	36.54	6.21	26.40	33.73	54.00	20.27
frequency:2462MHz									
2462	84.97	PK	H	28.89	2.99	0.00	116.85	N/A	N/A
2462	75.01	AV	H	28.89	2.99	0.00	106.89	N/A	N/A
2462	86.87	PK	V	28.89	2.99	0.00	118.75	N/A	N/A
2462	76.49	AV	V	28.89	2.99	0.00	108.37	N/A	N/A
2483.5	36.44	PK	V	28.95	2.99	0.00	68.38	74.00	5.62
2483.5	18.27	AV	V	28.95	2.99	0.00	50.21	54.00	*3.79
4924	43.05	PK	V	34.19	5.07	26.88	55.43	74.00	18.57
4924	39.36	AV	V	34.19	5.07	26.88	51.74	54.00	*2.26
7386	32.69	PK	V	36.64	6.25	26.43	49.15	74.00	24.85
7386	17.41	AV	V	36.64	6.25	26.43	33.87	54.00	20.13

**Within measurement uncertainty!*

802.11n-HT20 Mode (MIMO)
Worst Case

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
frequency: 2412MHz									
2412	83.87	PK	H	28.74	3.00	0.00	115.61	N/A	N/A
2412	73.06	AV	H	28.74	3.00	0.00	104.80	N/A	N/A
2412	85.68	PK	V	28.74	3.00	0.00	117.42	N/A	N/A
2412	74.45	AV	V	28.74	3.00	0.00	106.19	N/A	N/A
2390	33.45	PK	V	28.67	3.00	0.00	65.12	74.00	8.88
2390	18.34	AV	V	28.67	3.00	0.00	50.01	54.00	*3.99
4824	43.41	PK	V	33.91	5.11	26.87	55.56	74.00	18.44
4824	39.64	AV	V	33.91	5.11	26.87	51.79	54.00	*2.21
7236	32.55	PK	V	36.43	6.18	26.36	48.80	74.00	25.20
7236	17.33	AV	V	36.43	6.18	26.36	33.58	54.00	20.42
frequency:2437MHz									
2437	84.31	PK	H	28.81	3.00	0.00	116.12	N/A	N/A
2437	73.33	AV	H	28.81	3.00	0.00	105.14	N/A	N/A
2437	86.44	PK	V	28.81	3.00	0.00	118.25	N/A	N/A
2437	75.18	AV	V	28.81	3.00	0.00	106.99	N/A	N/A
4874	43.34	PK	V	34.05	5.09	26.87	55.61	74.00	18.39
4874	39.89	AV	V	34.05	5.09	26.87	52.16	54.00	*1.84
7311	32.62	PK	V	36.54	6.21	26.40	48.97	74.00	25.03
7311	17.45	AV	V	36.54	6.21	26.40	33.80	54.00	20.20
frequency:2462MHz									
2462	84.21	PK	H	28.89	2.99	0.00	116.09	N/A	N/A
2462	73.55	AV	H	28.89	2.99	0.00	105.43	N/A	N/A
2462	86.69	PK	V	28.89	2.99	0.00	118.57	N/A	N/A
2462	75.74	AV	V	28.89	2.99	0.00	107.62	N/A	N/A
2483.5	37.75	PK	V	28.95	2.99	0.00	69.69	74.00	*4.31
2483.5	19.79	AV	V	28.95	2.99	0.00	51.73	54.00	*2.27
4924	43.21	PK	V	34.19	5.07	26.88	55.59	74.00	18.41
4924	39.52	AV	V	34.19	5.07	26.88	51.90	54.00	*2.10
7386	32.32	PK	V	36.64	6.25	26.43	48.78	74.00	25.22
7386	17.49	AV	V	36.64	6.25	26.43	33.95	54.00	20.05

**Within measurement uncertainty!*

802.11n-HT40 Mode (MIMO)
Worst Case

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBμV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBμV/m	dBμV/m	dB
frequency:2422MHz									
2422	81.61	PK	H	28.77	3.00	0.00	113.38	N/A	N/A
2422	70.75	AV	H	28.77	3.00	0.00	102.52	N/A	N/A
2422	83.47	PK	V	28.77	3.00	0.00	115.24	N/A	N/A
2422	72.18	AV	V	28.77	3.00	0.00	103.95	N/A	N/A
2390	36.31	PK	V	28.67	3.00	0.00	67.98	74.00	6.02
2390	20.07	AV	V	28.67	3.00	0.00	51.74	54.00	*2.26
4844	43.34	PK	V	33.96	5.10	26.87	55.53	74.00	18.47
4844	39.79	AV	V	33.96	5.10	26.87	51.98	54.00	*2.02
7266	32.39	PK	V	36.47	6.19	26.38	48.67	74.00	25.33
7266	17.25	AV	V	36.47	6.19	26.38	33.53	54.00	20.47
frequency:2437MHz									
2437	82.31	PK	H	28.81	3.00	0.00	114.12	N/A	N/A
2437	70.93	AV	H	28.81	3.00	0.00	102.74	N/A	N/A
2437	84.28	PK	V	28.81	3.00	0.00	116.09	N/A	N/A
2437	72.78	AV	V	28.81	3.00	0.00	104.59	N/A	N/A
4874	43.76	PK	V	34.05	5.09	26.87	56.03	74.00	17.97
4874	40.09	AV	V	34.05	5.09	26.87	52.36	54.00	*1.64
7311	32.59	PK	V	36.54	6.21	26.40	48.94	74.00	25.06
7311	17.45	AV	V	36.54	6.21	26.40	33.80	54.00	20.20
frequency:2452MHz									
2452	82.97	PK	H	28.86	3.00	0.00	114.83	N/A	N/A
2452	70.58	AV	H	28.86	3.00	0.00	102.44	N/A	N/A
2452	85.06	PK	V	28.86	3.00	0.00	116.92	N/A	N/A
2452	73.17	AV	V	28.86	3.00	0.00	105.03	N/A	N/A
2483.5	38.41	PK	V	28.95	2.99	0.00	70.35	74.00	*3.65
2483.5	20.51	AV	V	28.95	2.99	0.00	52.45	54.00	*1.55
4904	43.89	PK	V	34.13	5.08	26.87	56.23	74.00	17.77
4904	40.17	AV	V	34.13	5.08	26.87	52.51	54.00	*1.49
7356	32.67	PK	V	36.60	6.23	26.42	49.08	74.00	24.92
7356	17.58	AV	V	36.60	6.23	26.42	33.99	54.00	20.01

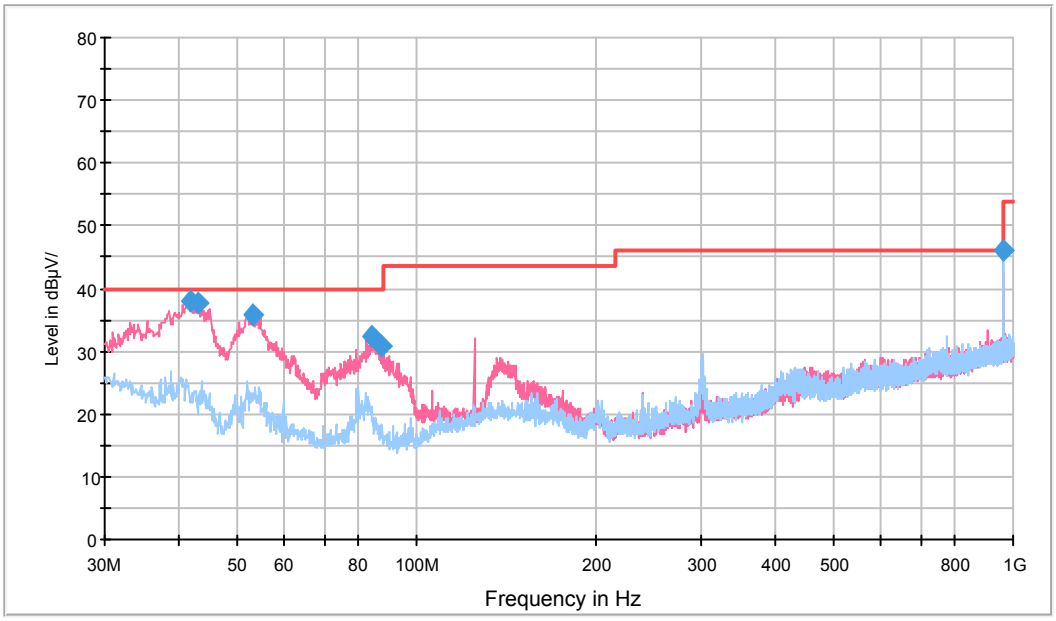
**Within measurement uncertainty!*
Note:
Corrected Amplitude = Corrected Factor + Reading
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor
Margin = Limit- Corr. Amplitude

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

Adapter Mode

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

30 MHz to 1 GHz



Frequency (MHz)	QuasicPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
41.882500	38.1	100.0	V	135.0	-8.3	*1.9	40.0
42.973750	37.8	100.0	V	126.0	-9.0	*2.2	40.0
53.037500	35.9	150.0	V	307.0	-13.2	*4.1	40.0
84.077500	32.5	100.0	V	254.0	-13.0	7.5	40.0
87.230000	30.7	170.0	V	272.0	-13.2	9.3	40.0
960.108750	46.1	100.0	H	349.0	4.4	7.8	53.9

**Within measurement uncertainty!*

Above 1 GHz

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

Worst Case

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
1368	58.85	PK	V	24.68	2.49	26.46	59.56	74.00	14.44
1368	35.22	AV	V	24.68	2.49	26.46	35.93	54.00	18.07
1775	51.70	PK	V	26.38	2.88	26.60	54.36	74.00	19.64
1775	32.57	AV	V	26.38	2.88	26.60	35.23	54.00	18.77
2135	46.78	PK	V	27.91	3.03	26.84	50.88	74.00	23.12
2135	33.62	AV	V	27.91	3.03	26.84	37.72	54.00	16.28
1368	57.92	PK	H	24.68	2.49	26.46	58.63	74.00	15.37
1368	36.94	AV	H	24.68	2.49	26.46	37.65	54.00	16.35
1845	47.34	PK	H	26.73	2.93	26.67	50.33	74.00	23.67
1845	26.77	AV	H	26.73	2.93	26.67	29.76	54.00	24.24
2231	45.22	PK	H	28.19	3.02	26.85	49.58	74.00	24.42
2231	30.42	AV	H	28.19	3.02	26.85	34.78	54.00	19.22

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

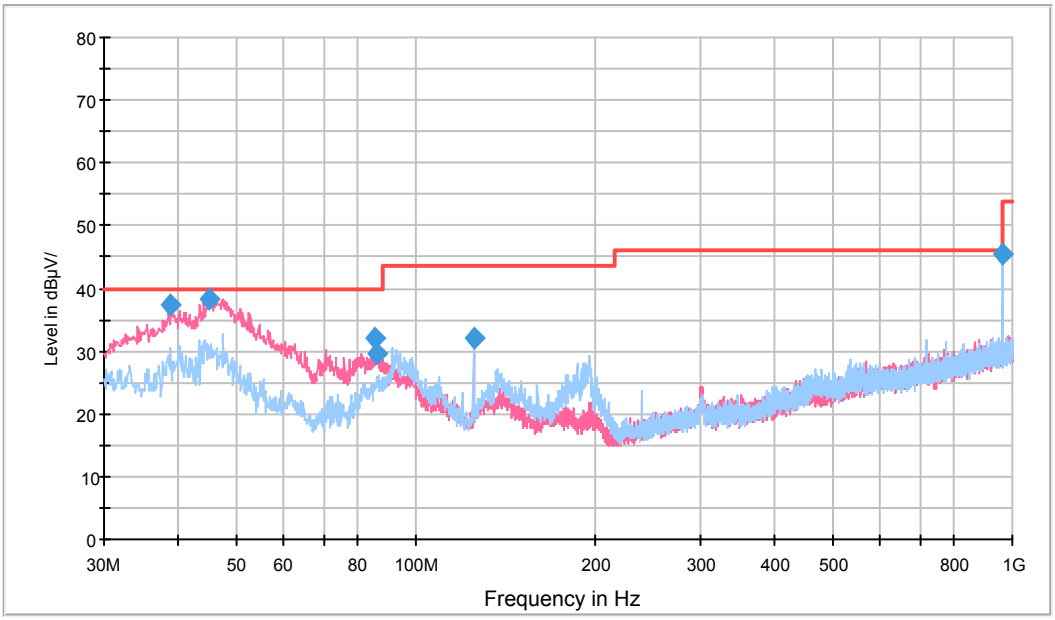
Spurious emissions more than 20 dB below the limit were not reported.

FINAL

POE Mode

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

30 MHz to 1 GHz



Frequency (MHz)	QuasicPeak (dBµV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
38.851250	37.4	100.0	V	343.0	-6.6	*2.6	40.0
45.035000	38.2	110.0	V	343.0	-10.2	*1.8	40.0
85.168750	32.0	200.0	V	200.0	-13.1	8.0	40.0
86.017500	29.5	150.0	V	226.0	-13.1	10.5	40.0
124.938750	32.1	200.0	H	270.0	-7.1	11.4	43.5
960.108750	45.3	100.0	H	234.0	4.4	8.6	53.9

**Within measurement uncertainty!*

Above 1 GHz

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

Worst Case

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dBµV	PK/QP/AV	H/V	dB(1/m)	dB	dB	dBµV/m	dBµV/m	dB
1368	61.29	PK	V	24.68	2.49	26.46	62.00	74.00	12.00
1368	38.09	AV	V	24.68	2.49	26.46	38.80	54.00	15.20
1697	51.72	PK	V	25.99	2.82	26.52	54.01	74.00	19.99
1697	34.66	AV	V	25.99	2.82	26.52	36.95	54.00	17.05
2135	49.20	PK	V	27.91	3.03	26.84	53.30	74.00	20.70
2135	34.78	AV	V	27.91	3.03	26.84	38.88	54.00	15.12
1368	60.45	PK	H	24.68	2.49	26.46	61.16	74.00	12.84
1368	39.06	AV	H	24.68	2.49	26.46	39.77	54.00	14.23
1845	49.13	PK	H	26.73	2.93	26.67	52.12	74.00	21.88
1845	28.56	AV	H	26.73	2.93	26.67	31.55	54.00	22.45
2079	47.68	PK	H	27.74	3.04	26.83	51.63	74.00	22.37
2079	30.47	AV	H	27.74	3.04	26.83	34.42	54.00	19.58

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:	31 °C
Relative Humidity:	54 %
ATM Pressure:	94.9 kPa

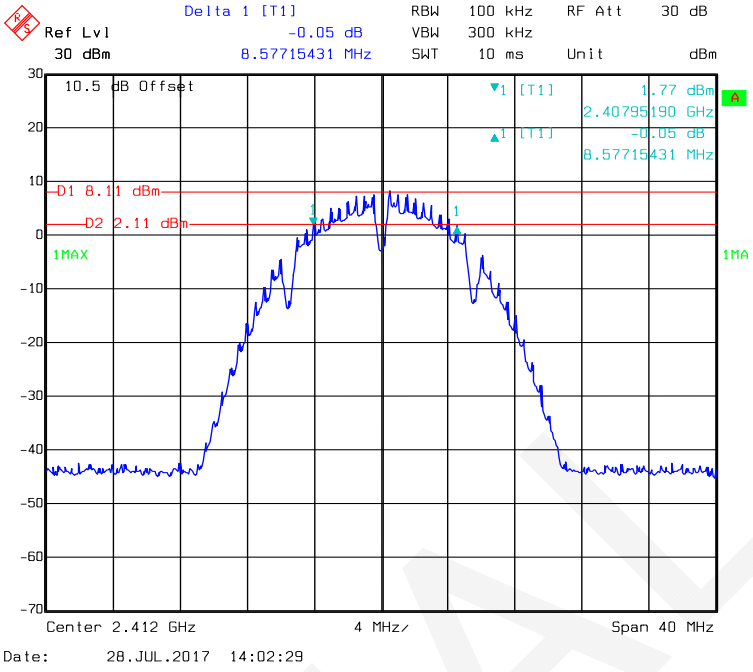
** The testing was performed by Tom Tang on 2017-07-28.*

Test Mode: Transmitting

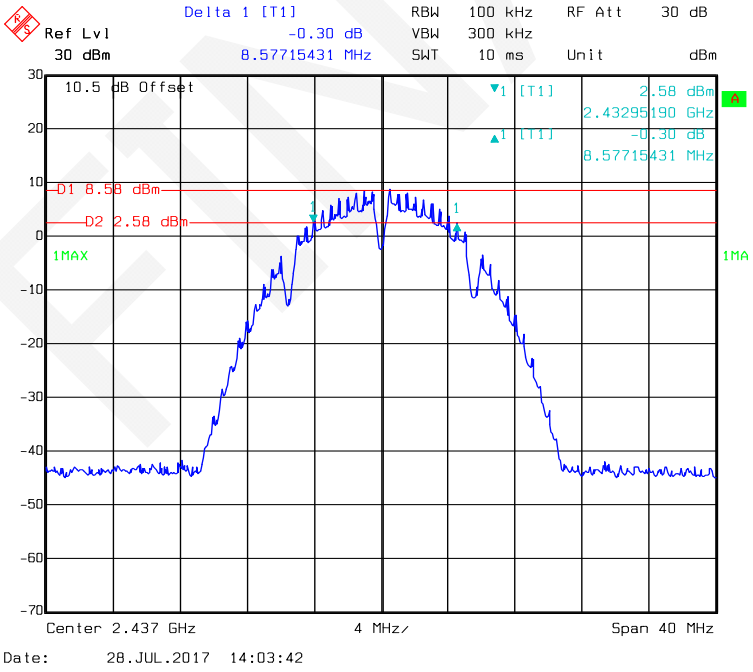
Test Result: Compliance. Please refer to the following table and plots.

Mode	Channel	Frequency (MHz)	6dB OBW (MHz)		Limit (MHz)
			Antenna 0	Antenna 1	
802.11b	Low	2412	8.58	8.58	≥0.50
	Middle	2437	8.58	9.06	≥0.50
	High	2462	8.58	9.06	≥0.50
802.11g	Low	2412	16.35	16.35	≥0.50
	Middle	2437	16.35	16.35	≥0.50
	High	2462	16.35	16.35	≥0.50
802.11n HT20	Low	2412	17.56	17.64	≥0.50
	Middle	2437	17.56	17.64	≥0.50
	High	2462	17.64	17.64	≥0.50
802.11n HT40	Low	2422	35.27	35.59	≥0.50
	Middle	2437	35.59	35.59	≥0.50
	High	2452	35.59	35.59	≥0.50

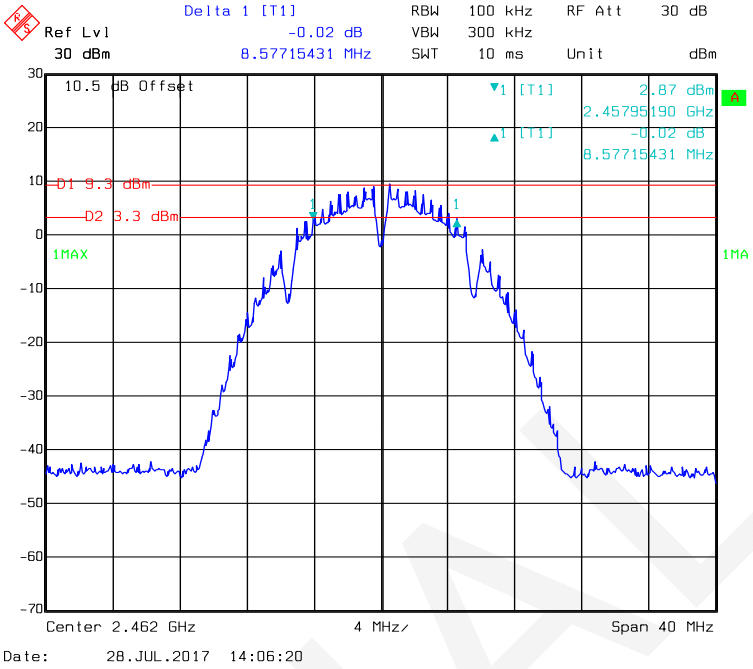
802.11b Low Channel (Antenna 0)



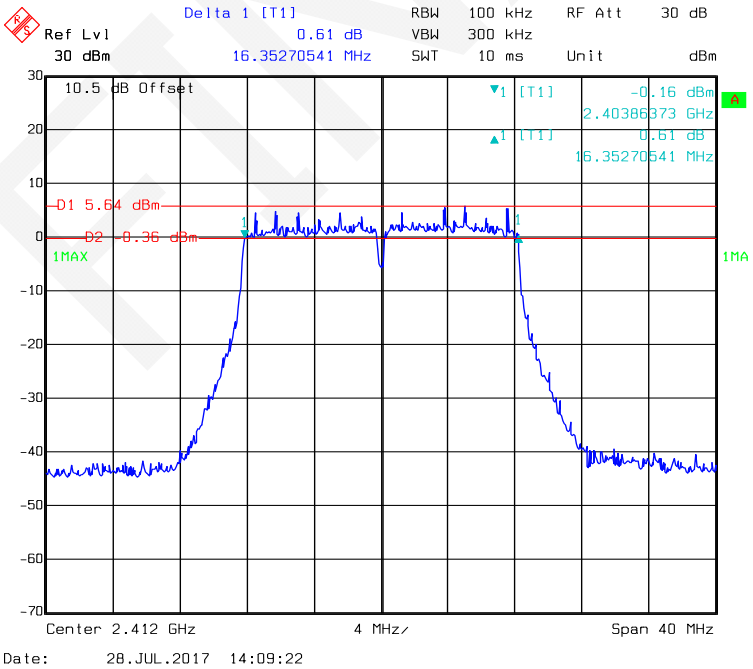
802.11b Middle Channel (Antenna 0)



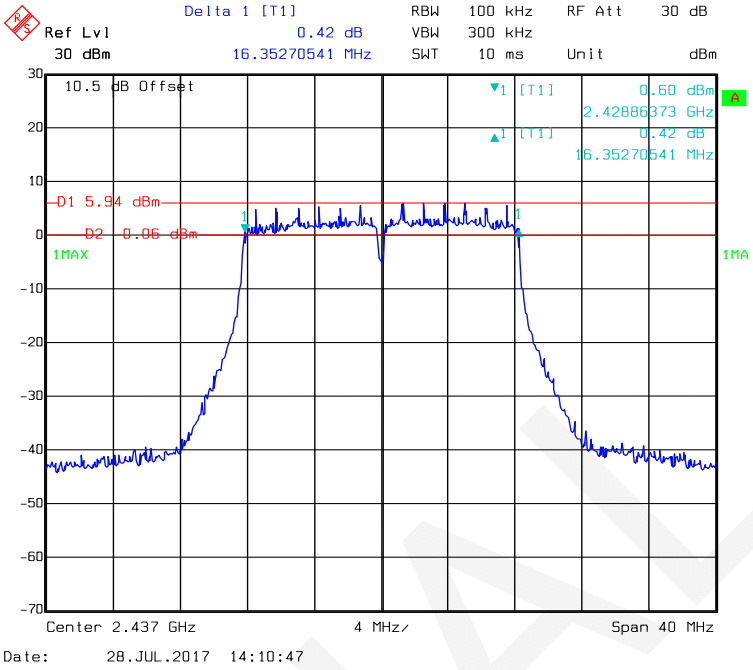
802.11b High Channel (Antenna 0)



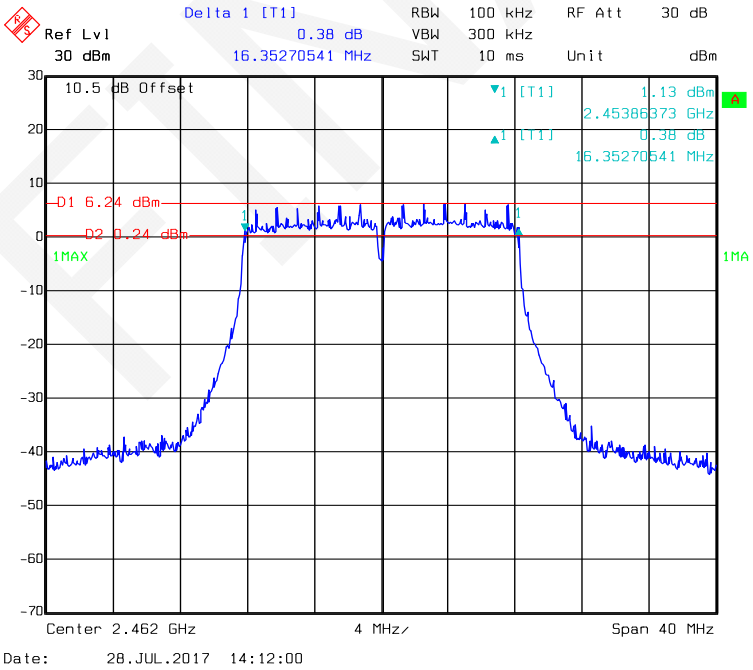
802.11g Low Channel (Antenna 0)



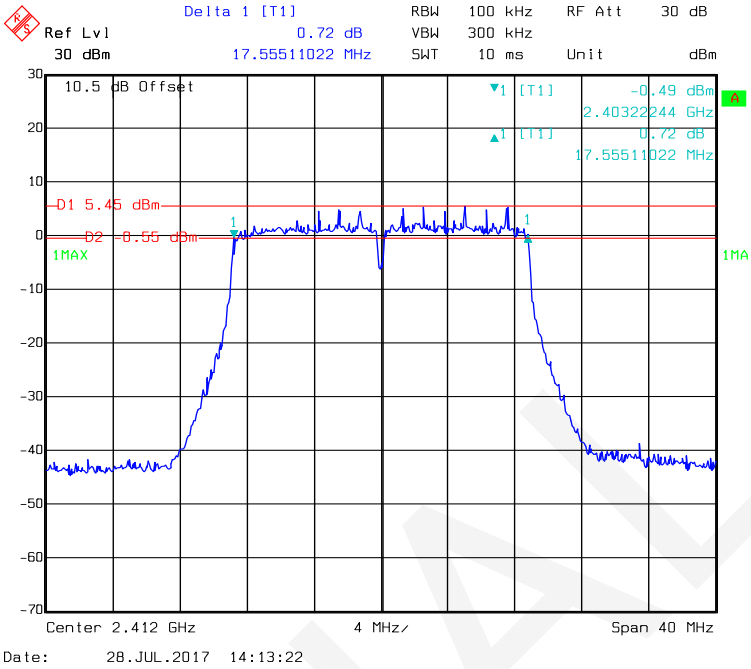
802.11g Middle Channel (Antenna 0)



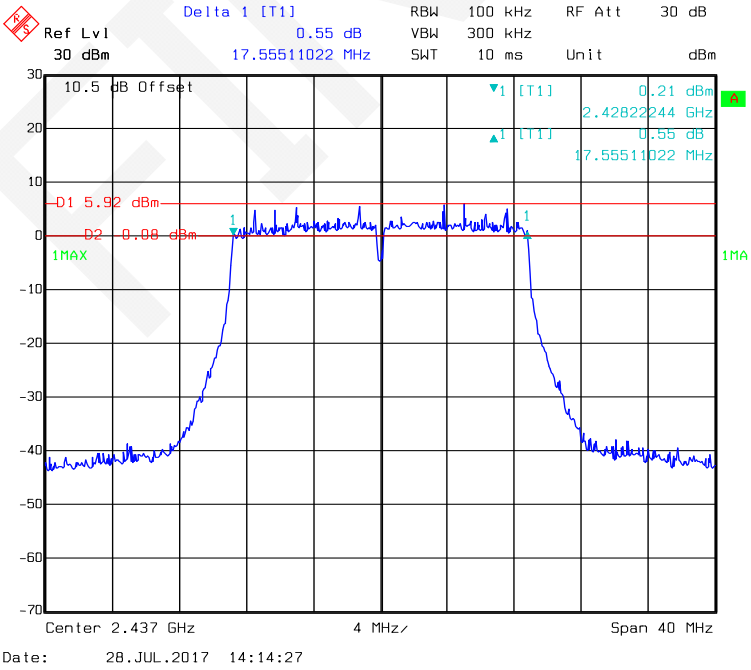
802.11g High Channel (Antenna 0)



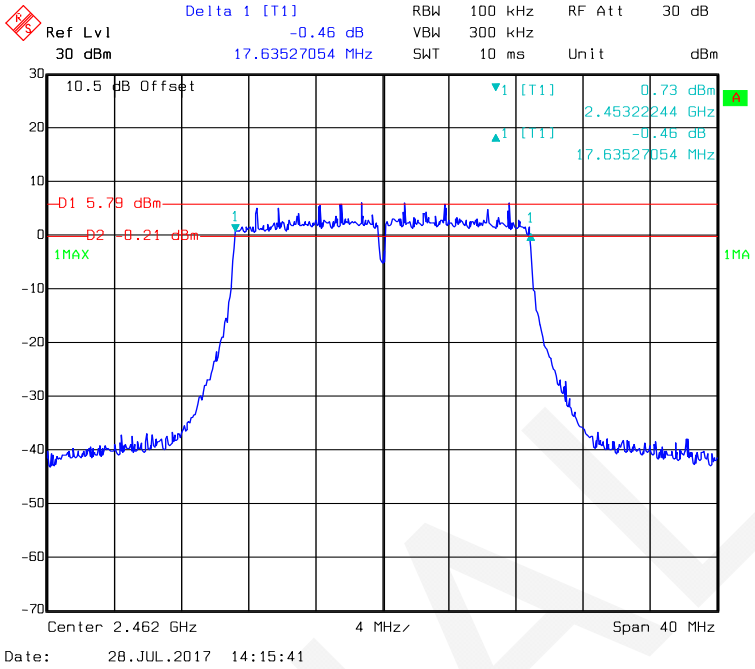
802.11n-HT20 Low Channel (Antenna 0)



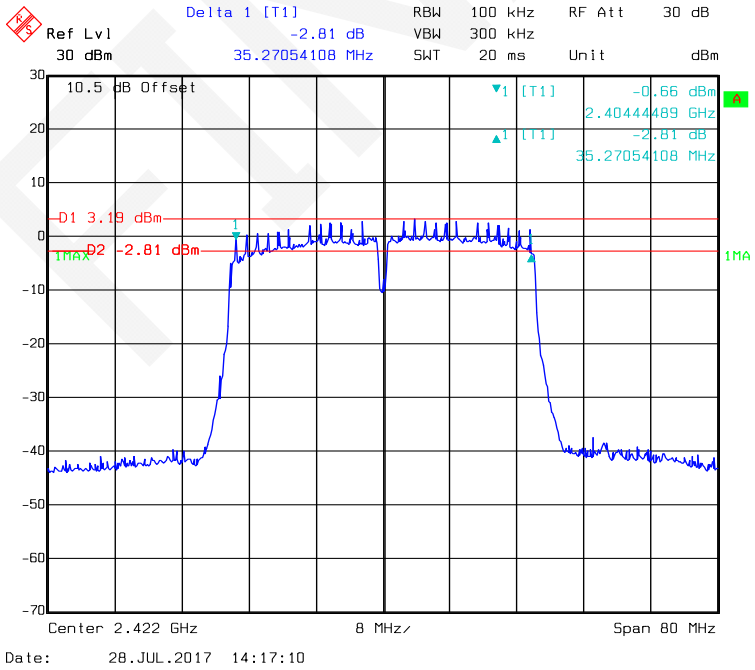
802.11n-HT20 Middle Channel (Antenna 0)



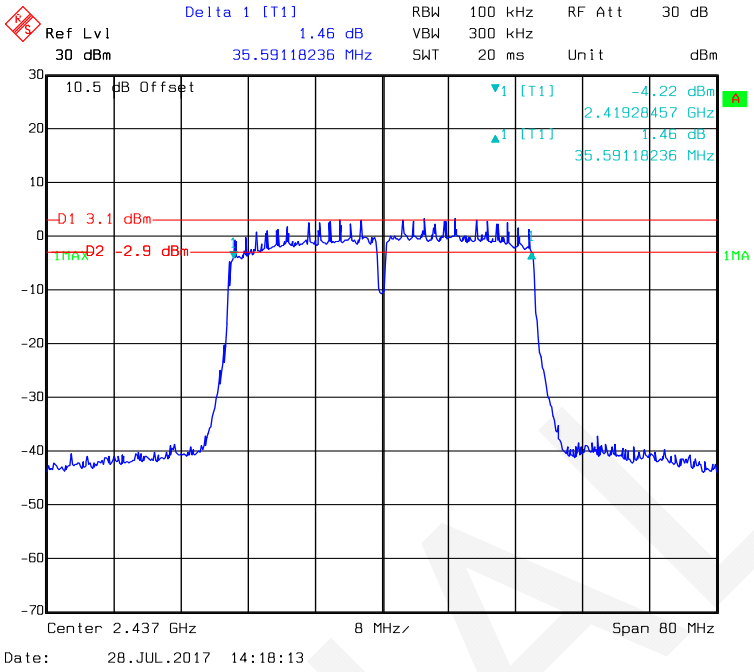
802.11n-HT20 High Channel (Antenna 0)



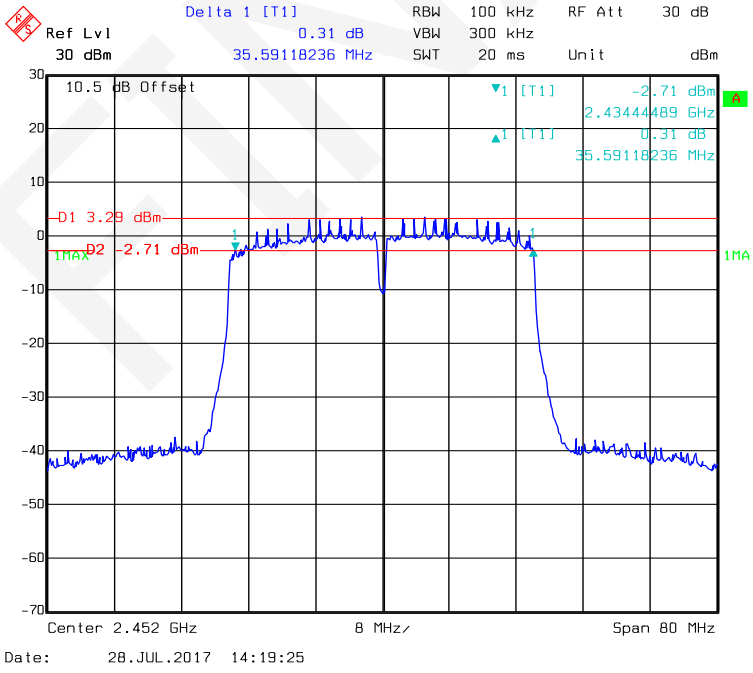
802.11n-HT40 Low Channel (Antenna 0)



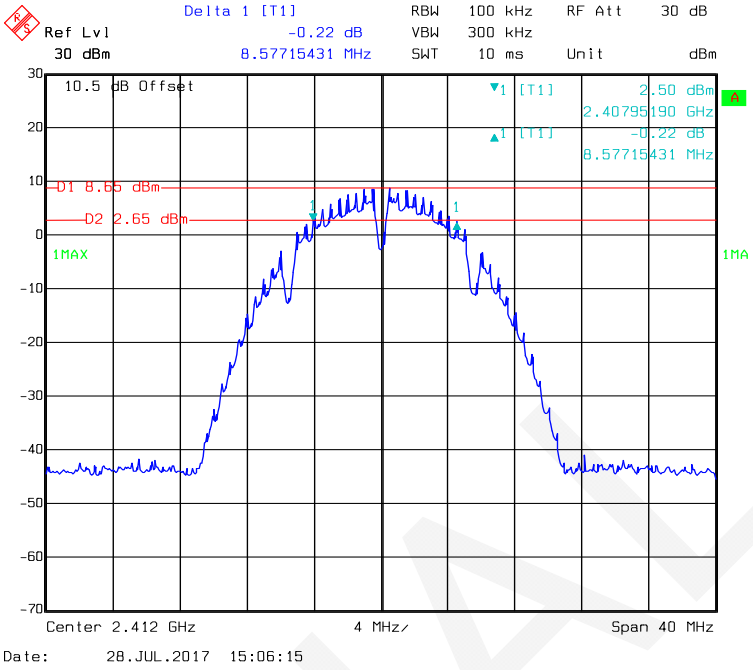
802.11n-HT40 Middle Channel (Antenna 0)



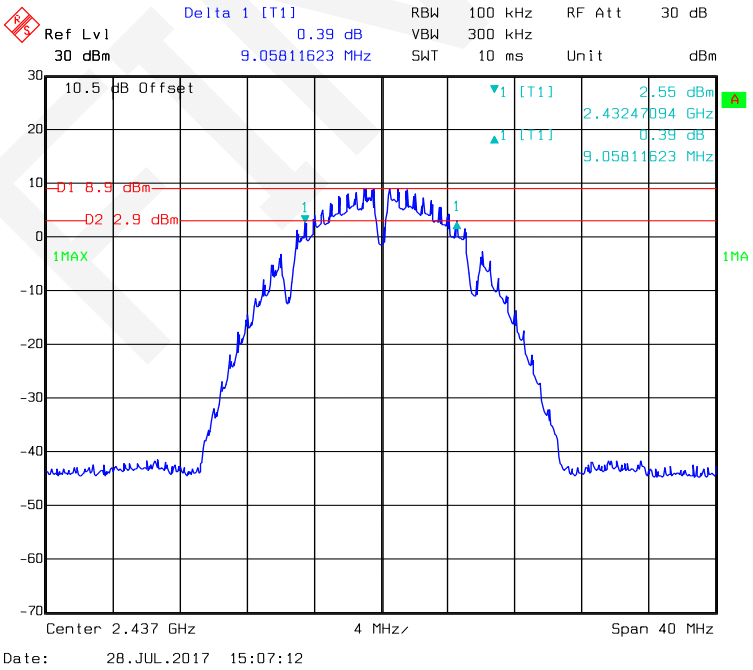
802.11n-HT40 High Channel (Antenna 0)



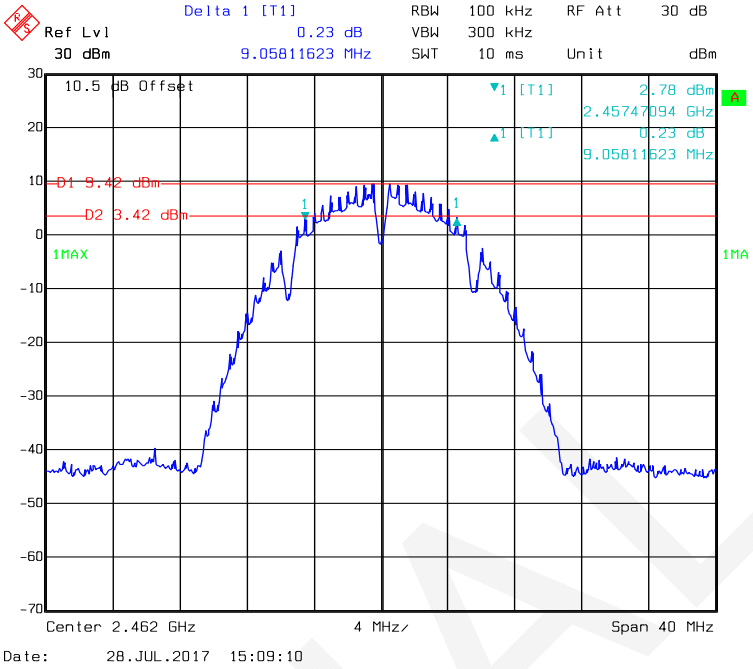
802.11b Low Channel (Antenna 1)



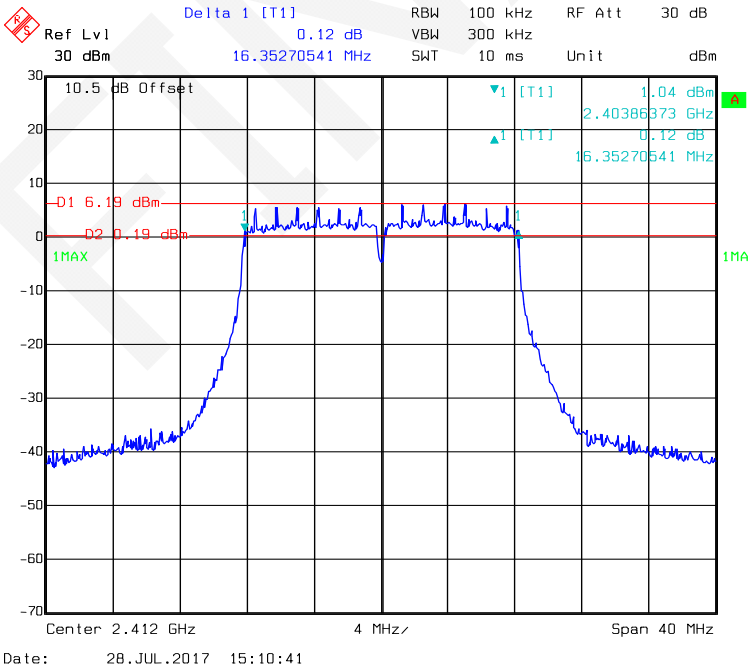
802.11b Middle Channel (Antenna 1)



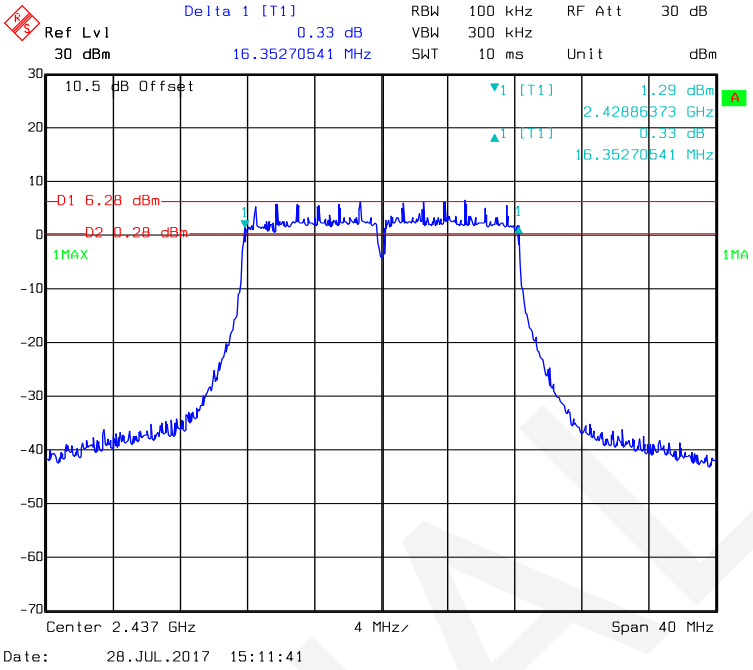
802.11b High Channel (Antenna 1)



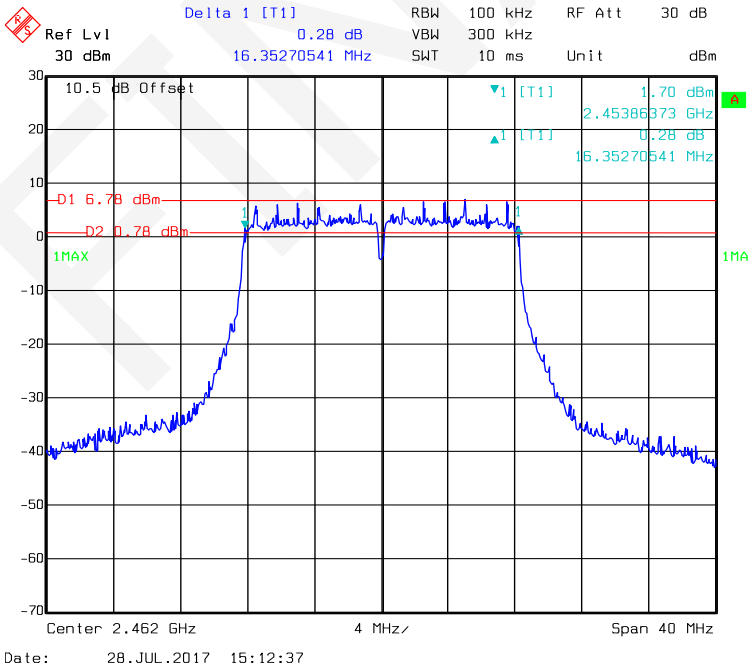
802.11g Low Channel (Antenna 1)



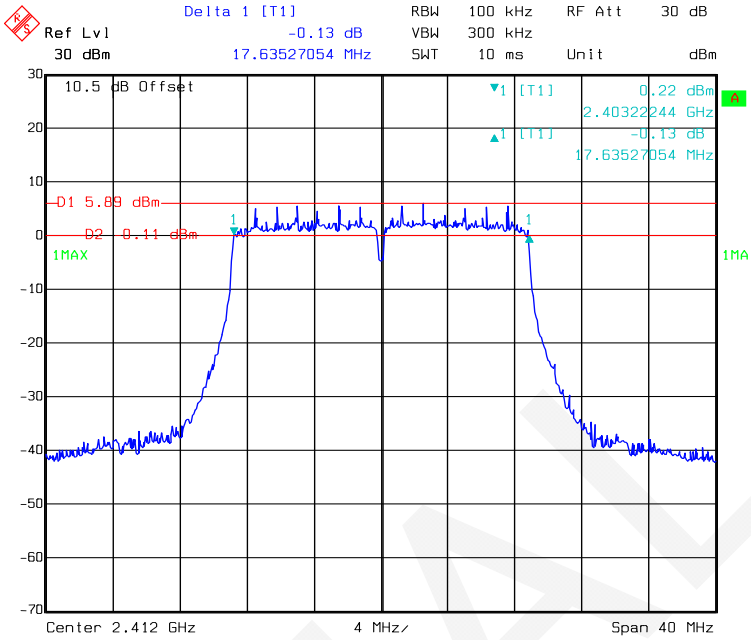
802.11g Middle Channel (Antenna 1)



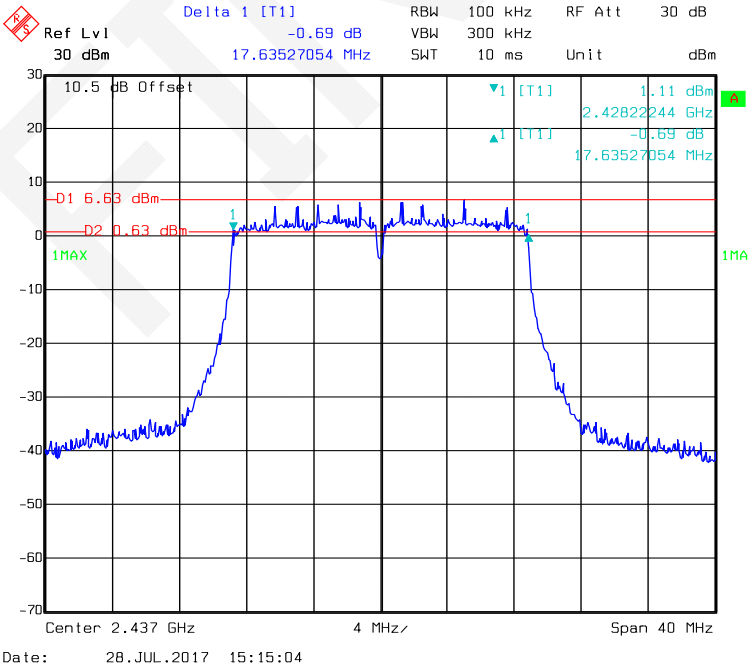
802.11g High Channel (Antenna 1)



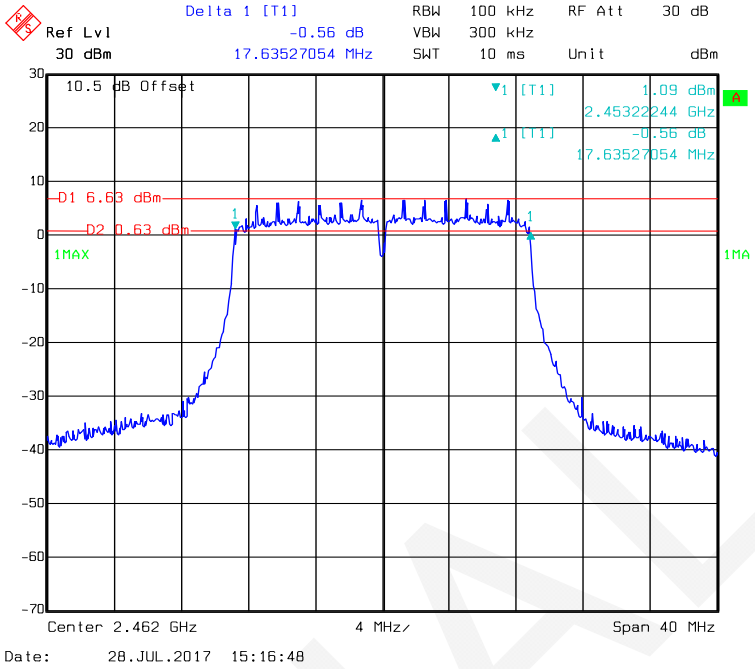
802.11n-HT20 Low Channel (Antenna 1)



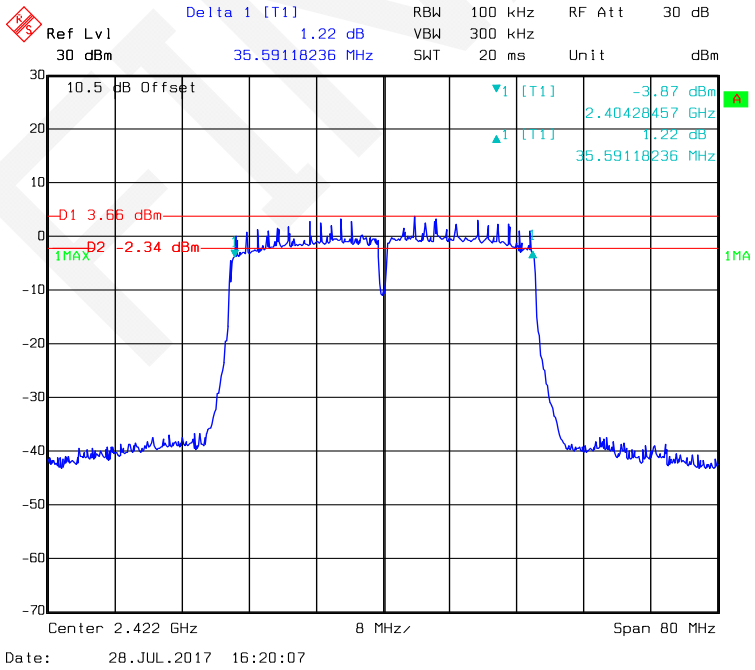
802.11n-HT20 Middle Channel (Antenna 1)



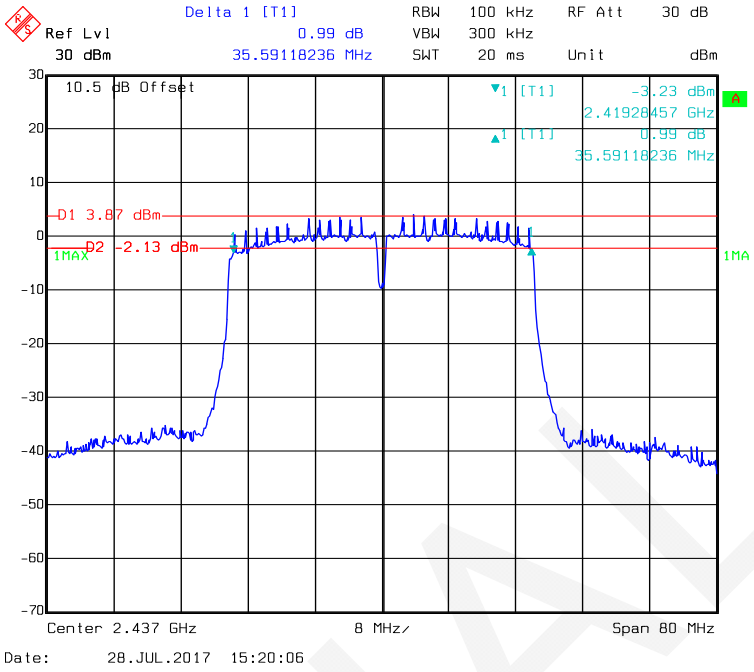
802.11n-HT20 High Channel (Antenna 1)



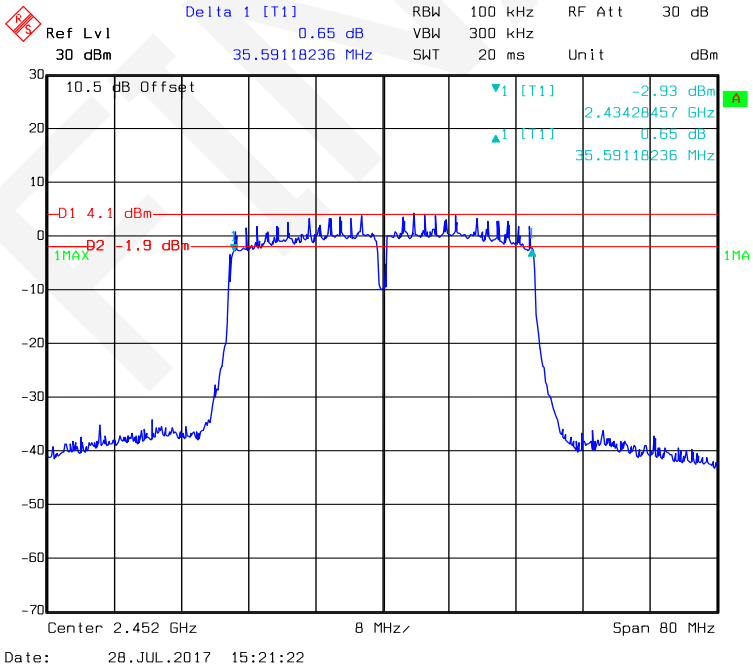
802.11n-HT40 Low Channel (Antenna 1)



802.11n-HT40 Middle Channel (Antenna 1)



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:	31 °C
Relative Humidity:	54 %
ATM Pressure:	94.9 kPa

** The testing was performed by Tom Tang on 2017-07-28.*

Test Mode: Transmitting

FINAL

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

Mode	Channel	Frequency (MHz)	Max Peak Conducted Output Power (dBm)		Total (dBm)	Limit (dBm)
			Antenna 0	Antenna 1		
802.11b	Low	2412	19.32	20.17	22.78	30
	Middle	2437	19.72	20.41	23.09	30
	High	2462	20.04	20.56	23.32	30
802.11g	Low	2412	23.85	24.35	27.12	30
	Middle	2437	24.25	24.79	27.54	30
	High	2462	24.71	24.85	27.98	30
802.11n-HT20	Low	2412	23.75	24.29	27.04	30
	Middle	2437	24.31	24.69	27.51	30
	High	2462	24.62	25.12	27.89	30
802.11n-HT40	Low	2422	24.21	24.57	27.41	30
	Middle	2437	24.45	24.88	27.68	30
	High	2452	24.75	25.13	27.95	30

Mode	Channel	Frequency (MHz)	Max Conducted Average Output Power (dBm)		Total (dBm)	Limit (dBm)
			Antenna 0	Antenna 1		
802.11b	Low	2412	16.26	16.44	19.36	30
	Middle	2437	16.74	16.95	19.86	30
	High	2462	17.06	17.43	20.26	30
802.11g	Low	2412	15.79	16.27	19.05	30
	Middle	2437	16.35	16.92	19.65	30
	High	2462	16.84	17.33	20.11	30
802.11n-HT20	Low	2412	15.74	16.32	19.05	30
	Middle	2437	16.39	16.85	19.64	30
	High	2462	16.93	17.21	20.08	30
802.11n-HT40	Low	2422	15.88	16.23	19.07	30
	Middle	2437	16.31	16.76	19.55	30
	High	2452	16.68	17.39	20.06	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 < 6dBi

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

Applicable Standard

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

Test Procedure

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

Test Data

Environmental Conditions

Temperature:	31 °C
Relative Humidity:	54 %
ATM Pressure:	94.9 kPa

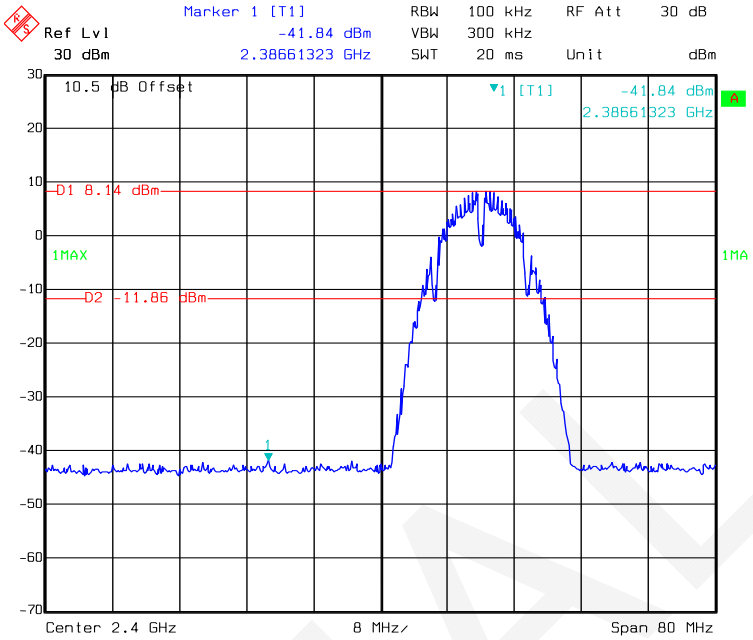
** The testing was performed by Tom Tang on 2017-07-28.*

Test mode: Transmitting

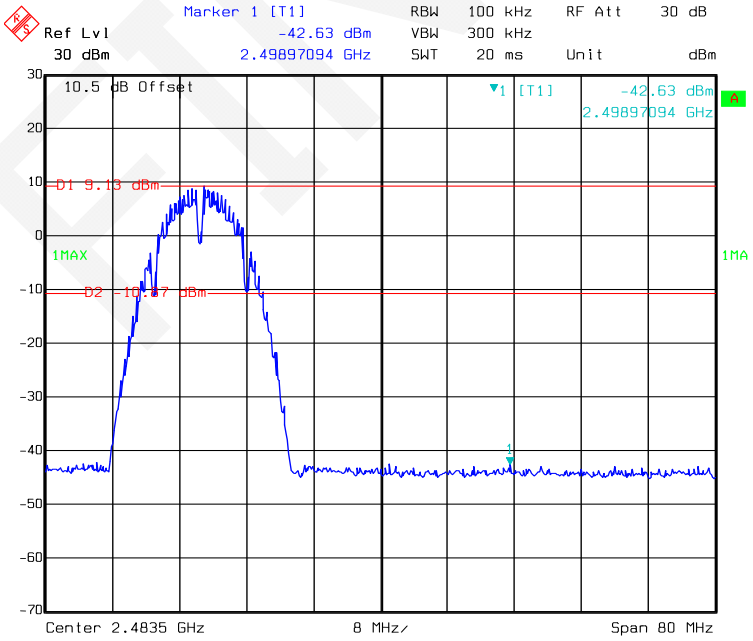
Test Result: Compliance. Please refer to following plots.

FINAL

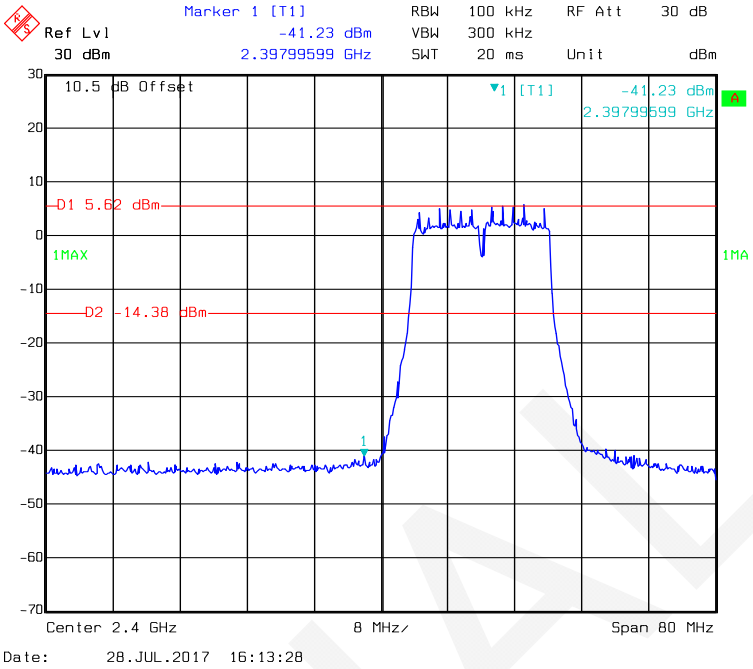
802.11b: Band Edge, Left Side (Antenna 0)



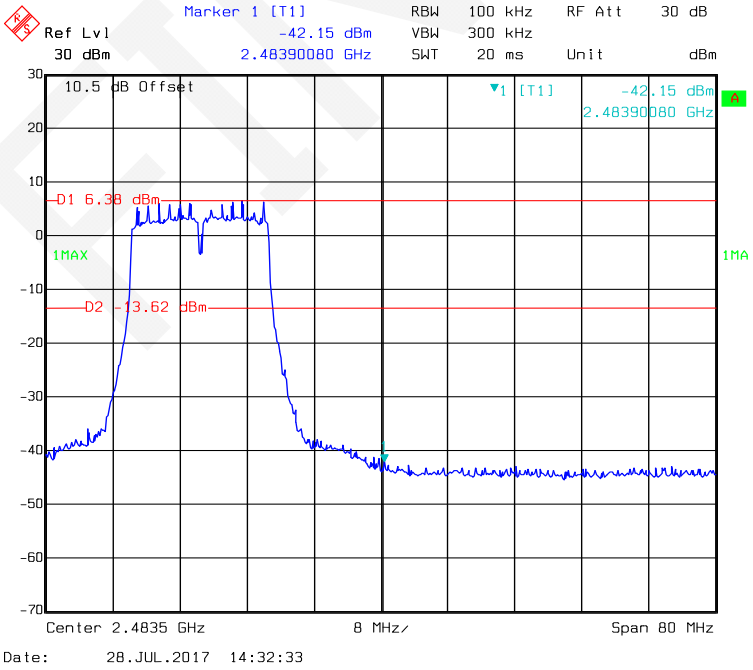
802.11b: Band Edge, Right Side (Antenna 0)



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

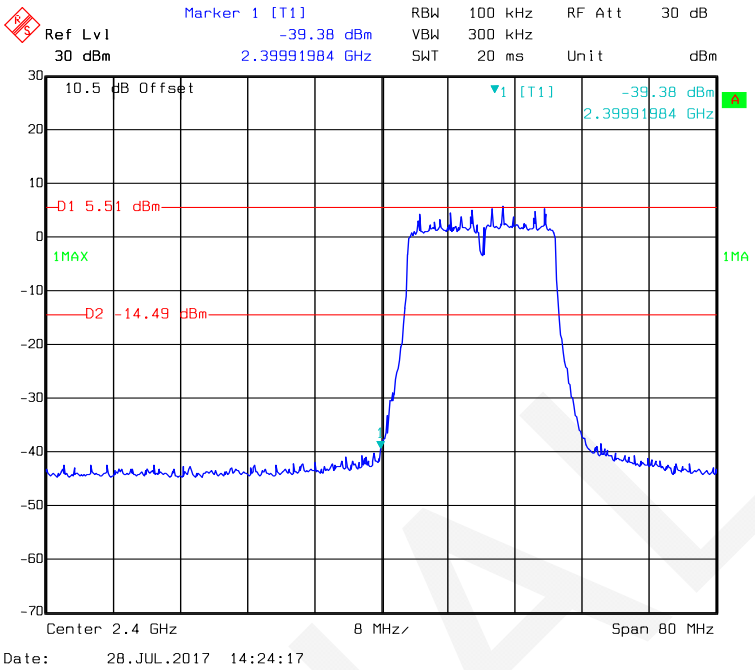


802.11g: Band Edge, Right Side (Antenna 0)

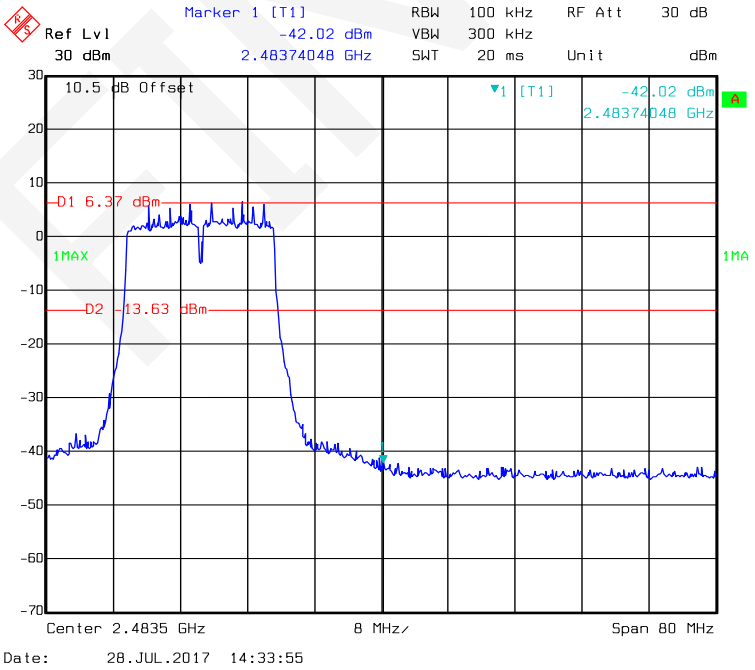


FINAL

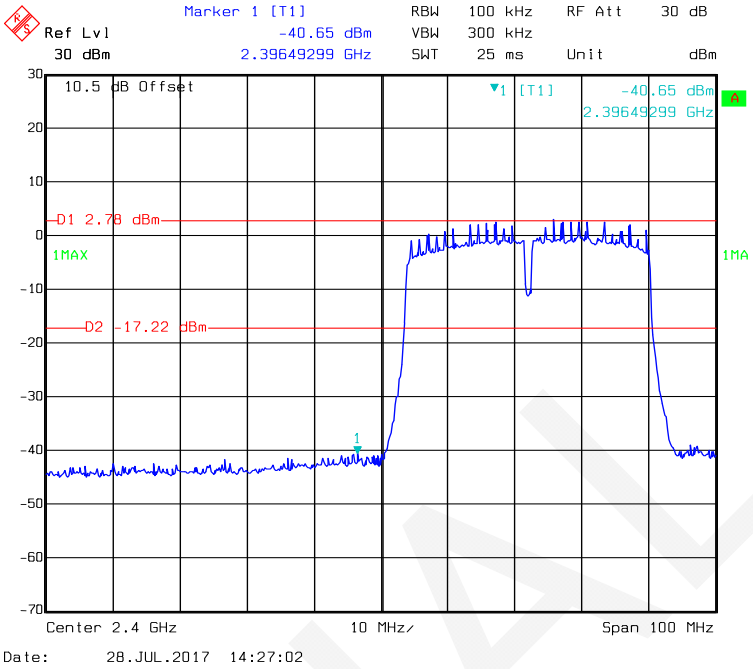
802.11n-HT20 Band Edge, Left Side (Antenna 0)



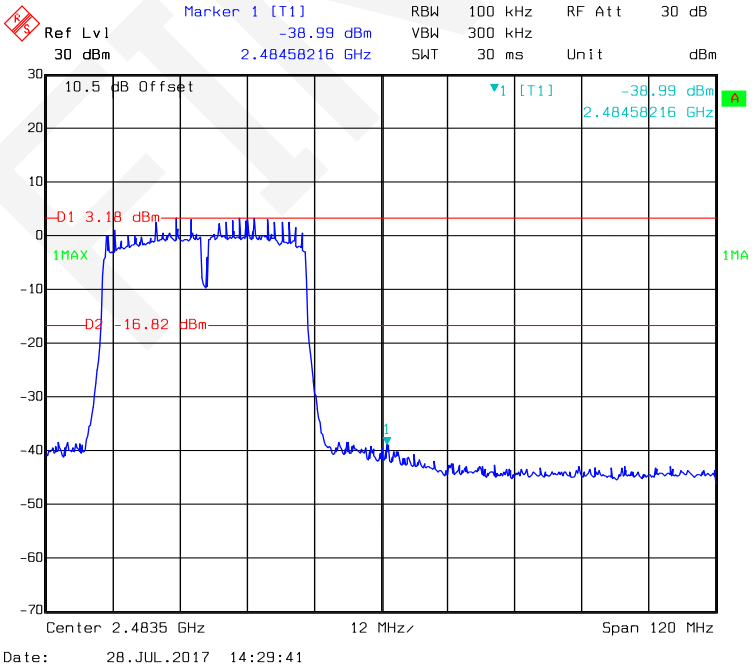
802.11n-HT20 Band Edge, Right Side (Antenna 0)



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

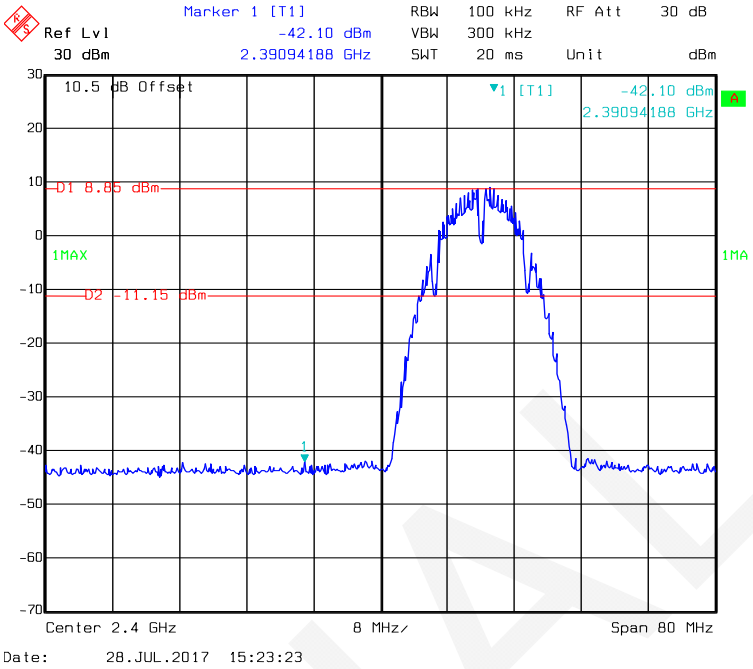


802.11n-HT40 Band Edge, Left Side (Antenna 0)

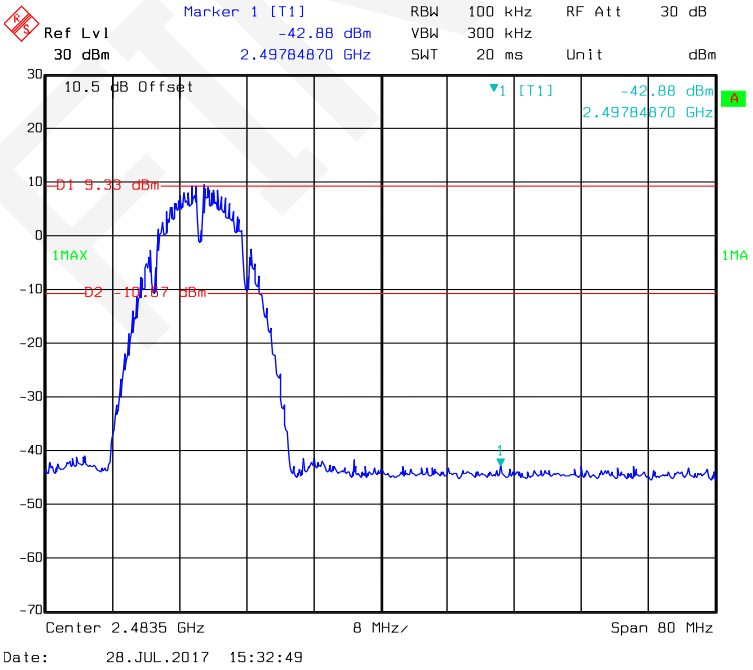


FINAL

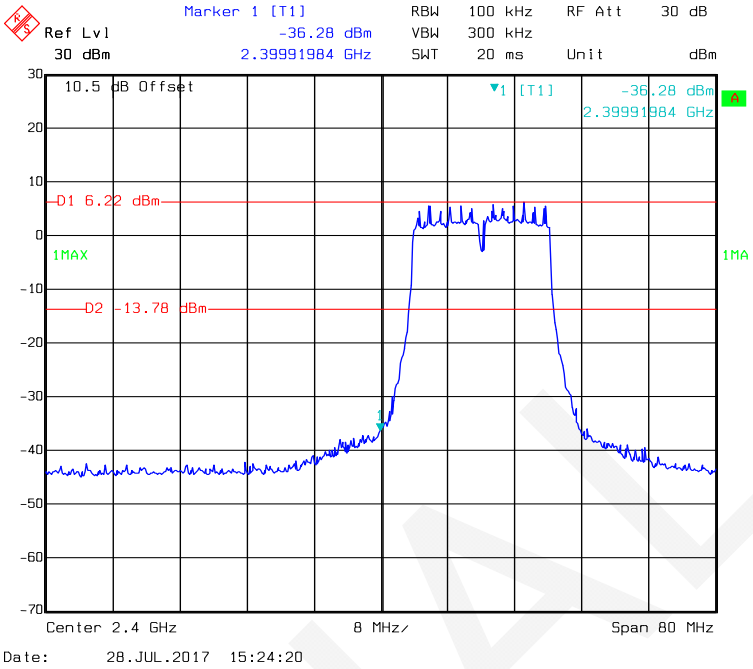
802.11b: Band Edge, Left Side (Antenna 1)



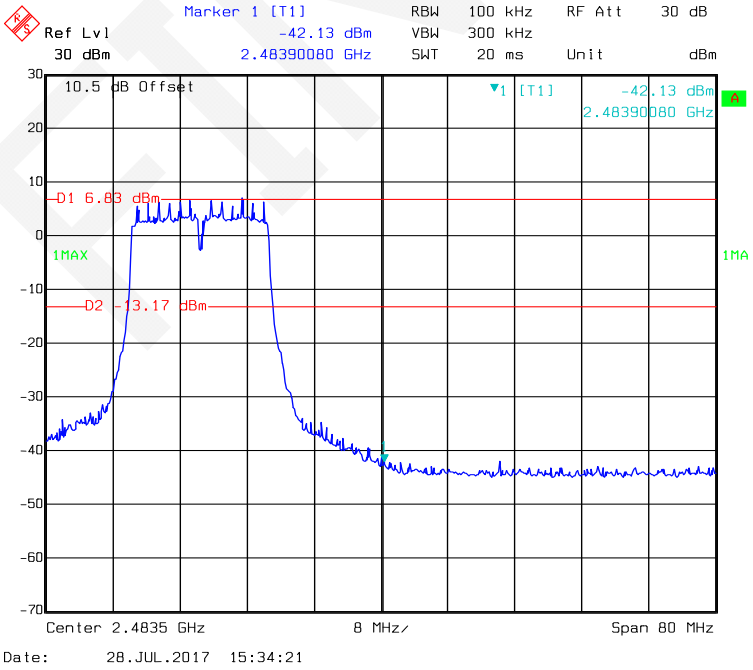
802.11b: Band Edge, Right Side (Antenna 1)



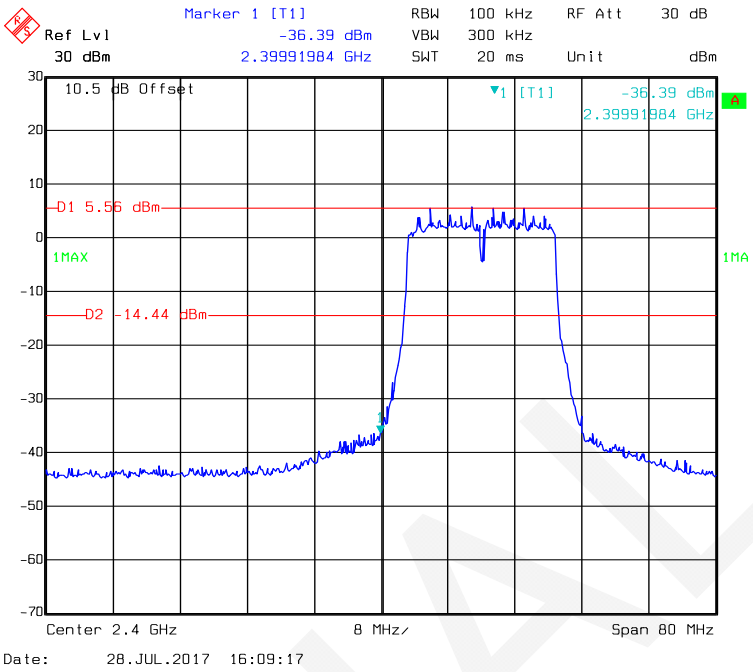
802.11g: Band Edge, Left Side (Antenna 1)



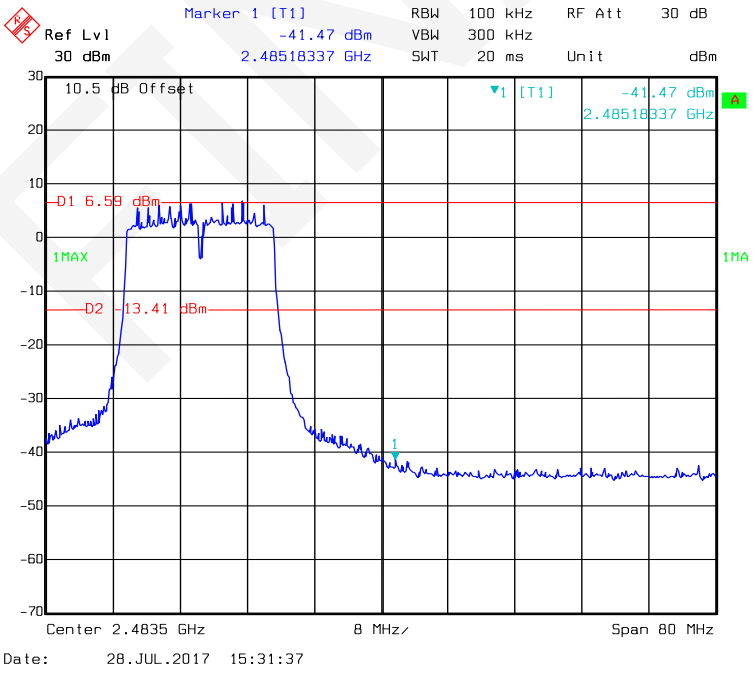
802.11g: Band Edge, Right Side (Antenna 1)



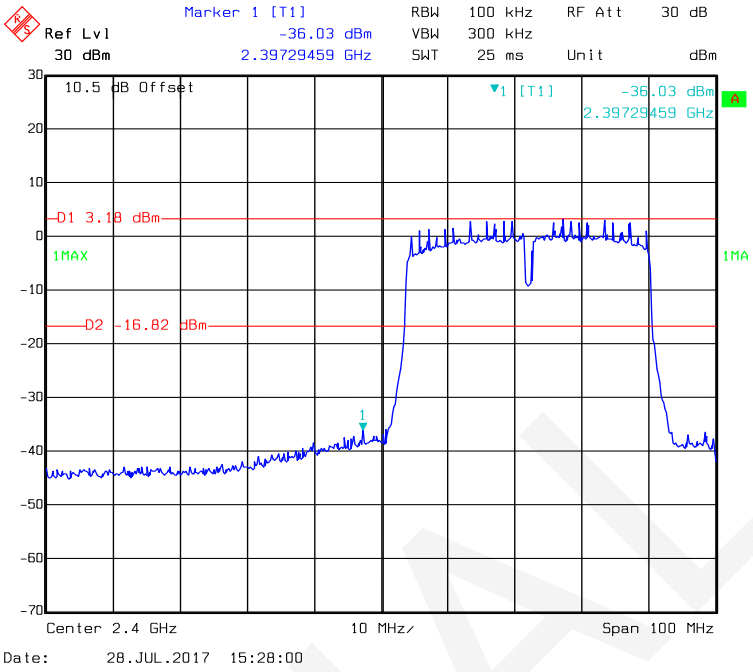
802.11n-HT20 Band Edge, Left Side (Antenna 1)



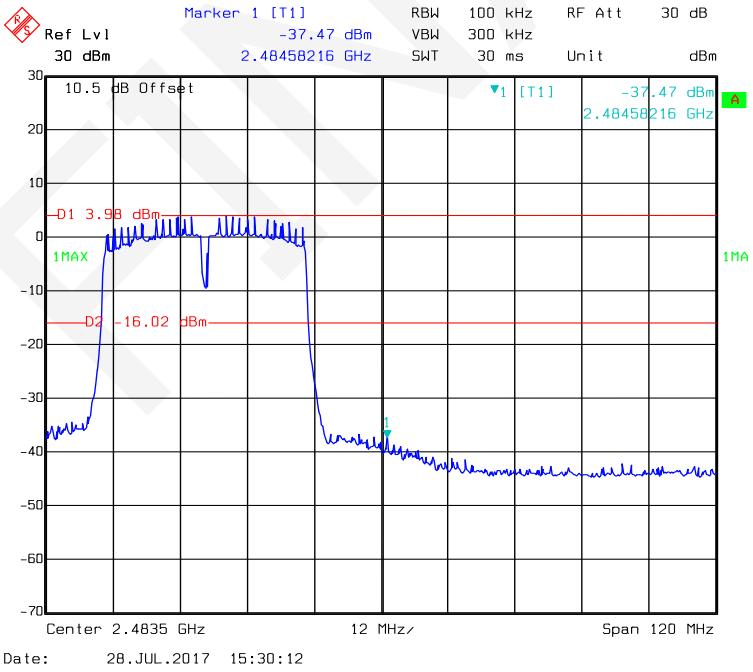
802.11n-HT20 Band Edge, Right Side (Antenna 1)



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.

Test Data

Environmental Conditions

Temperature:	30 °C
Relative Humidity:	56 %
ATM Pressure:	94.9 kPa

** The testing was performed by Tom Tang on 2017-07-28.*

FINAL

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	-5.57	-5.83	-2.69	≤8
	Middle	2437	-5.43	-5.19	-2.31	≤8
	High	2462	-5.33	-5.56	-2.43	≤8
802.11g	Low	2412	-9.22	-8.51	-5.84	≤8
	Middle	2437	-8.56	-8.39	-5.46	≤8
	High	2462	-8.64	-8.45	-5.53	≤8
802.11n-HT20	Low	2412	-9.54	-9.34	-6.43	≤8
	Middle	2437	-9.09	-9.26	-6.16	≤8
	High	2462	-9.20	-9.37	-6.27	≤8
802.11n-HT40	Low	2422	-11.77	-11.73	-8.74	≤8
	Middle	2437	-11.33	-11.21	-8.26	≤8
	High	2452	-12.07	-11.00	-8.49	≤8

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:

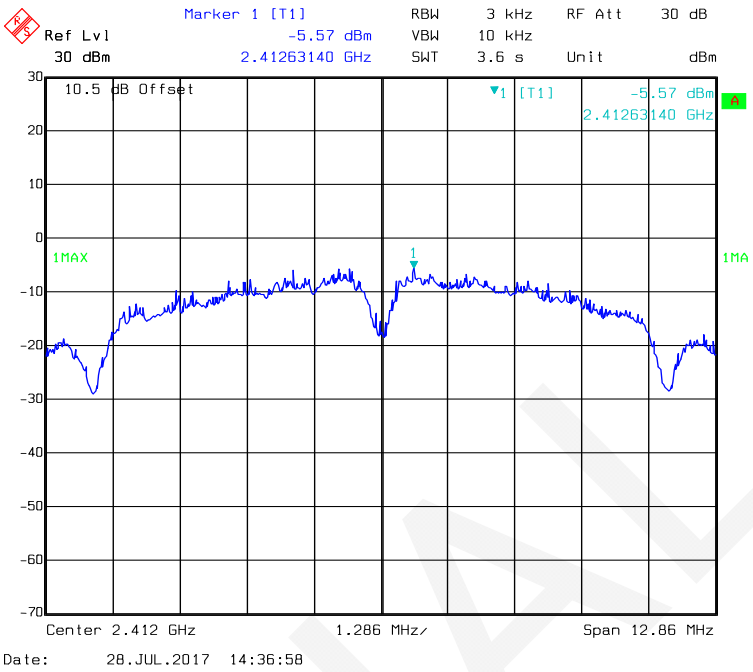
Array Gain = 10 log(NANT/NSS) dB.

So:

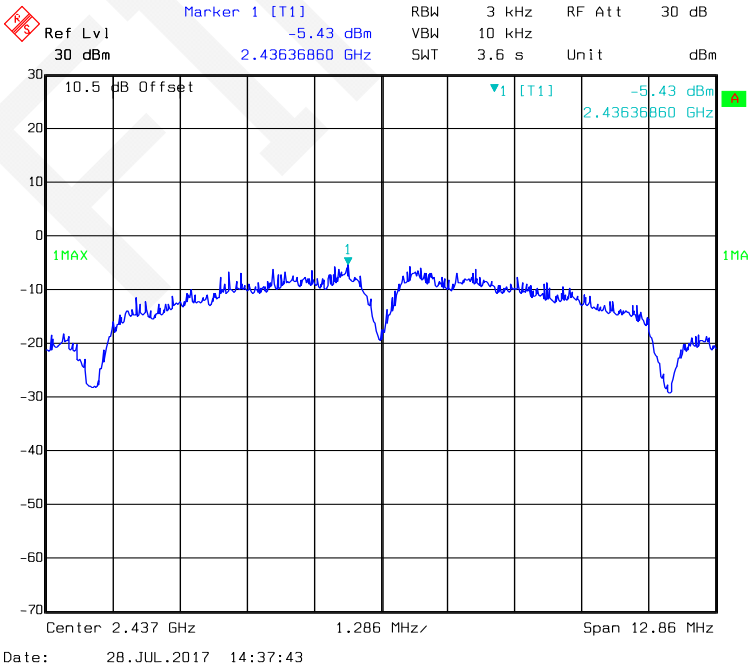
Directional gain = GANT + Array Gain = 3.0+10*log(2) =6dBi

No power density Limits was reduced in MIMO mode

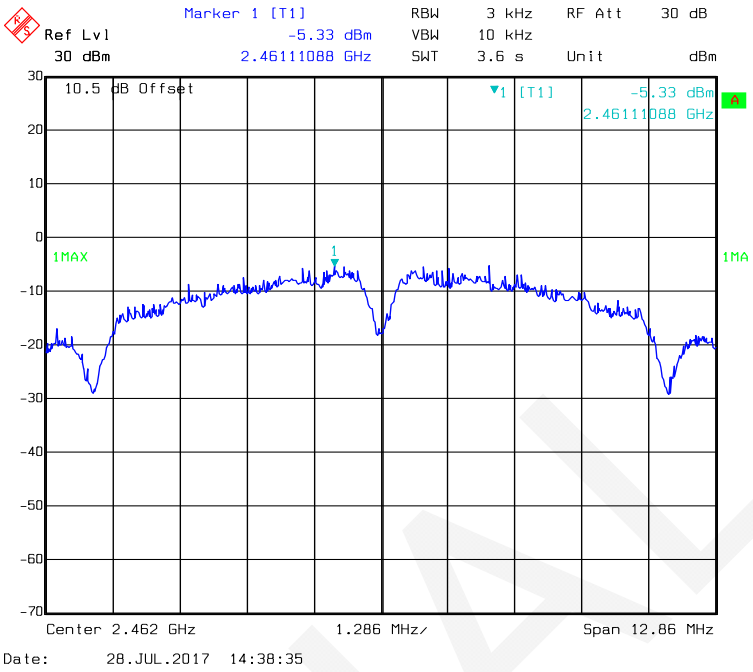
Power Spectral Density, 802.11b Low Channel (Antenna 0)



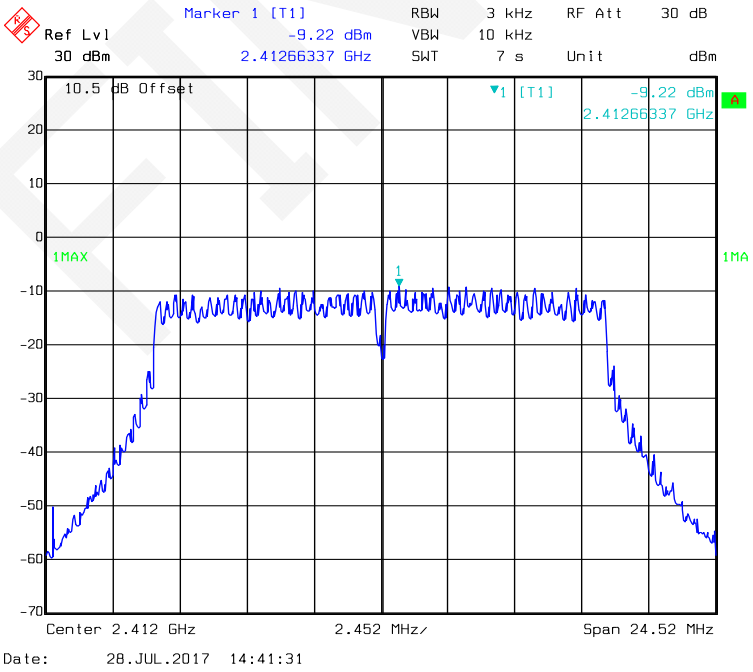
Power Spectral Density, 802.11b Middle Channel (Antenna 0)



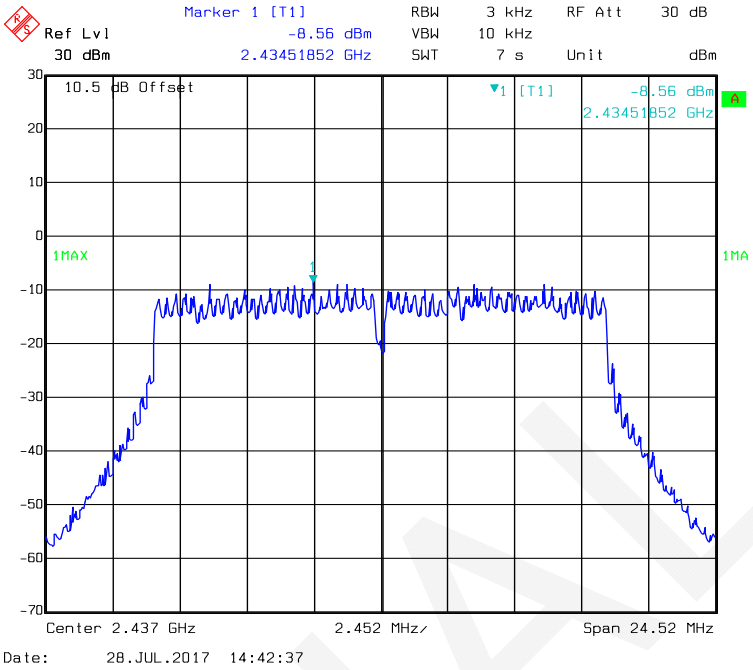
Power Spectral Density, 802.11b High Channel (Antenna 0)



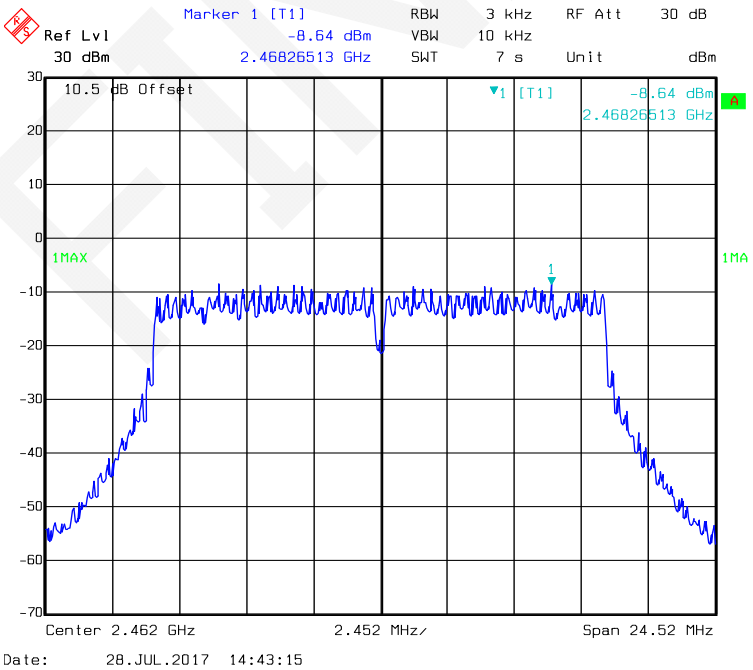
Power Spectral Density, 802.11g Low Channel (Antenna 0)



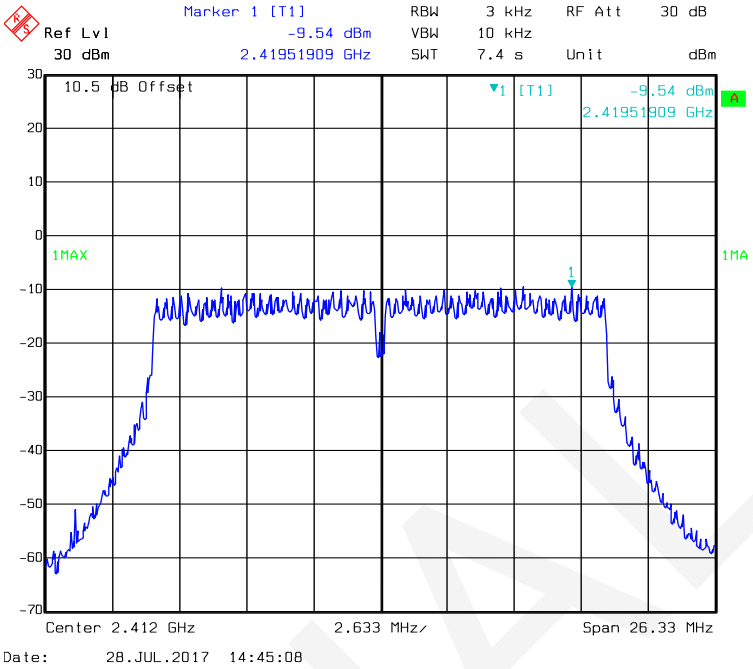
Power Spectral Density, 802.11g Middle Channel (Antenna 0)



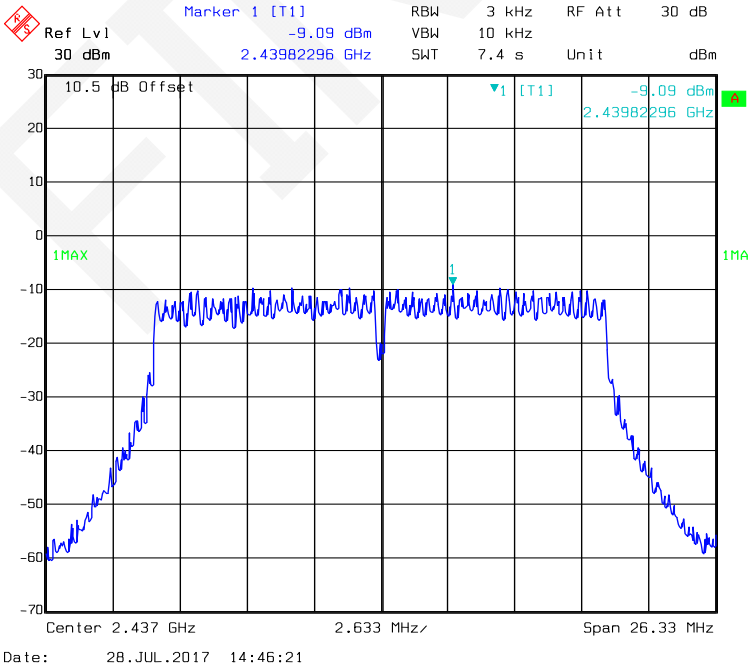
Power Spectral Density, 802.11g High Channel (Antenna 0)



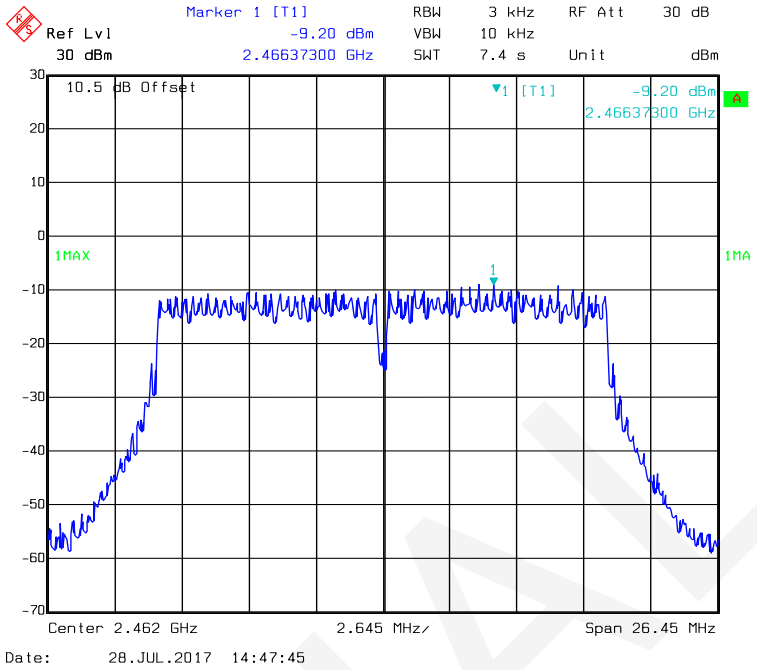
Power Spectral Density, 802.11n-HT20 Low Channel (Antenna 0)



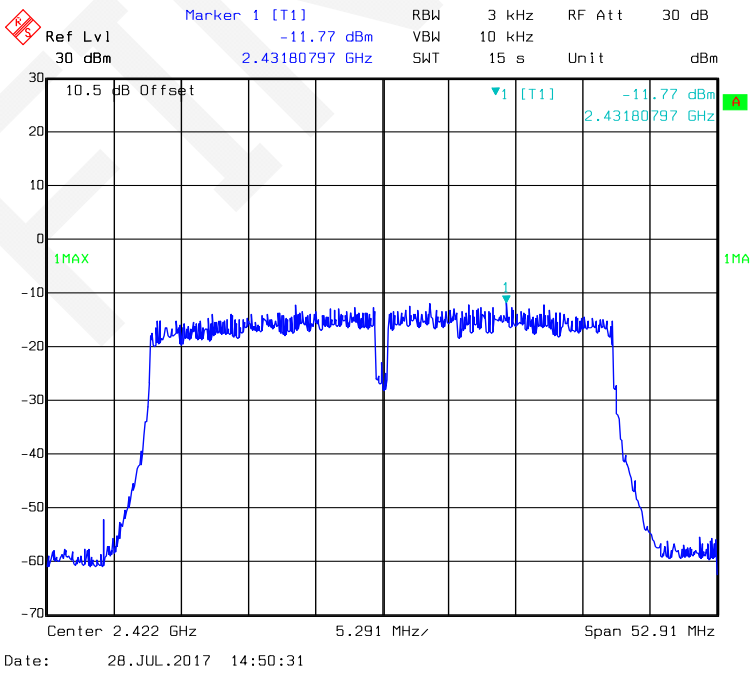
Power Spectral Density, 802.11n-HT20 Middle Channel (Antenna 0)



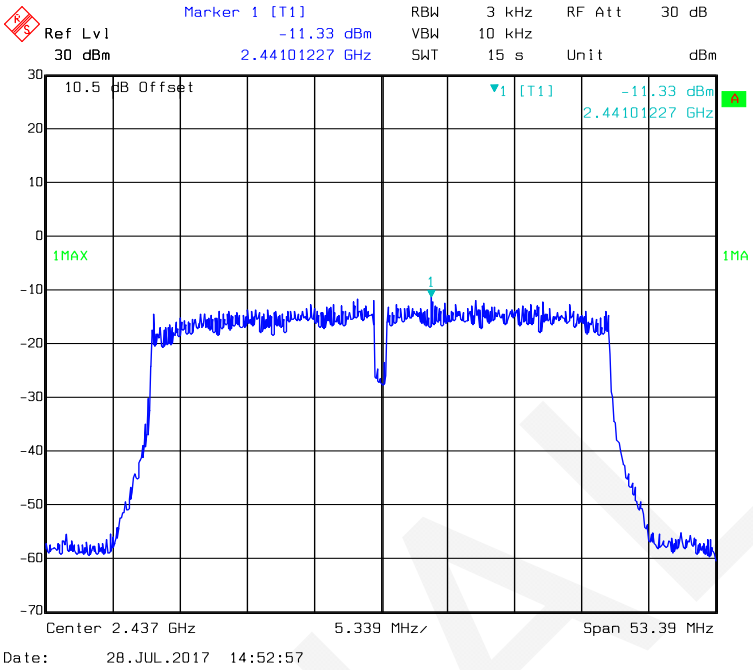
Power Spectral Density, 802.11n-HT20 High Channel (Antenna 0)



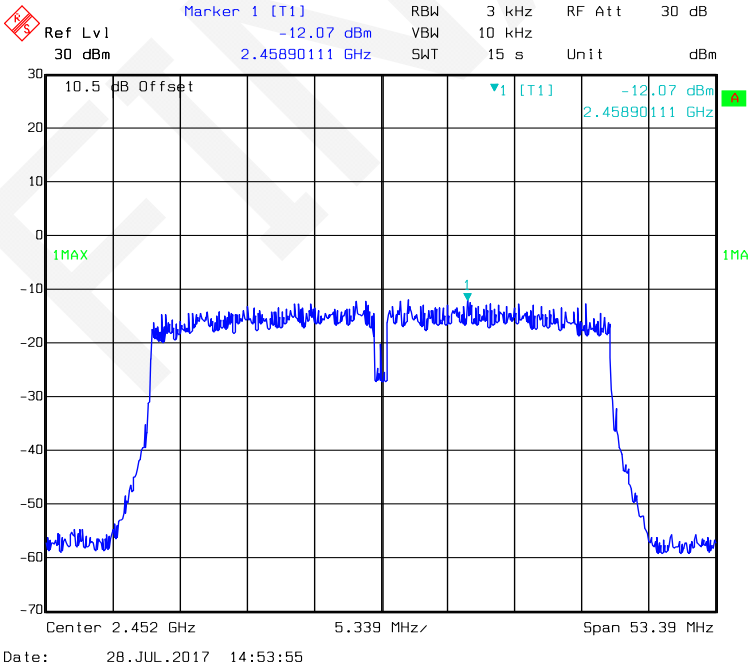
Power Spectral Density, 802.11n-HT40 Low Channel (Antenna 0)



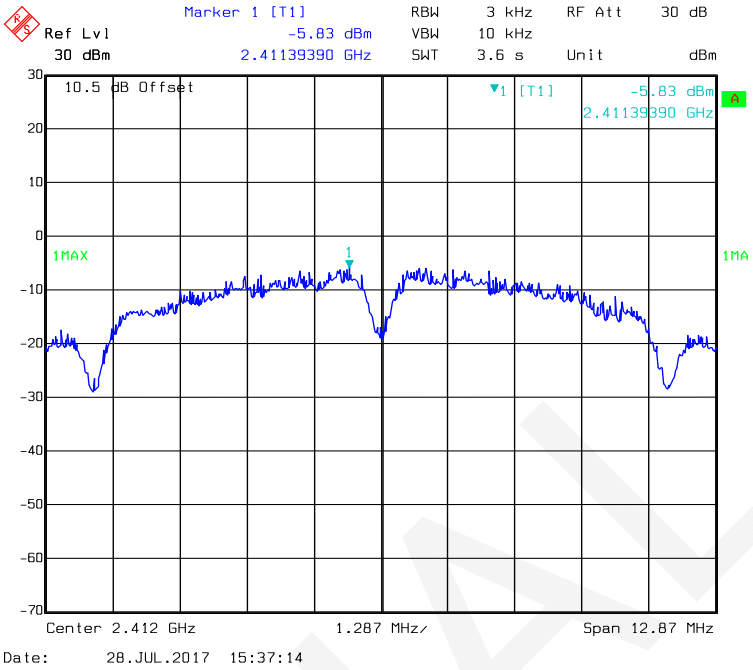
Power Spectral Density, 802.11n-HT40 Middle Channel (Antenna 0)



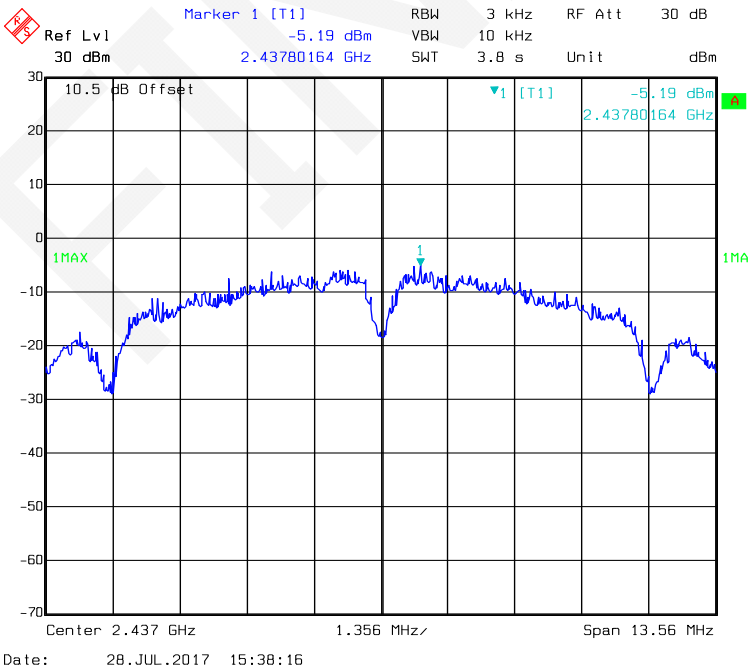
Power Spectral Density, 802.11n-HT40 High Channel (Antenna 0)



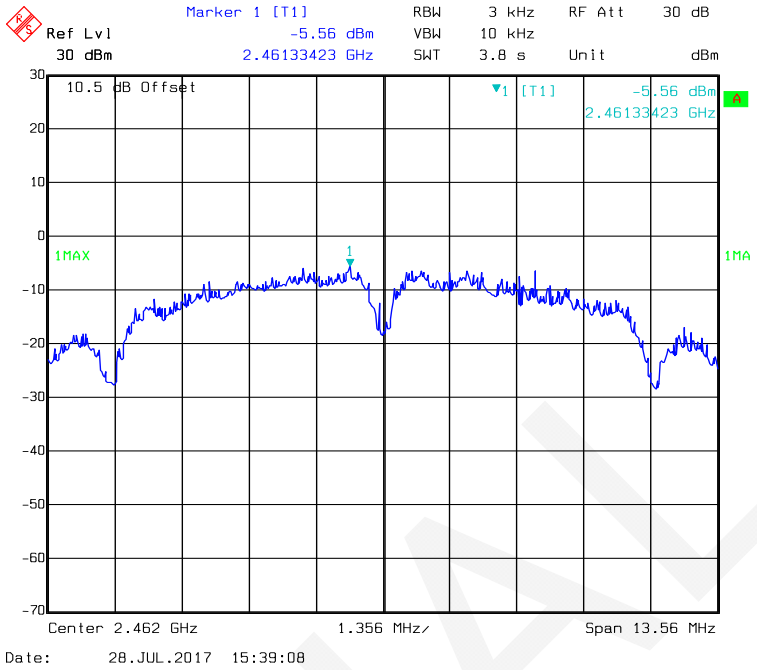
Power Spectral Density, 802.11b Low Channel (Antenna 1)



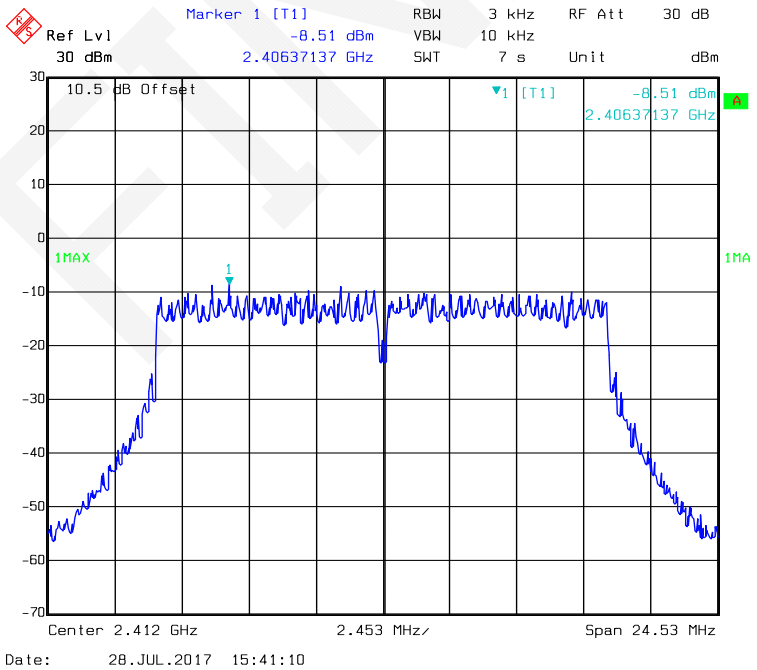
Power Spectral Density, 802.11b Middle Channel (Antenna 1)



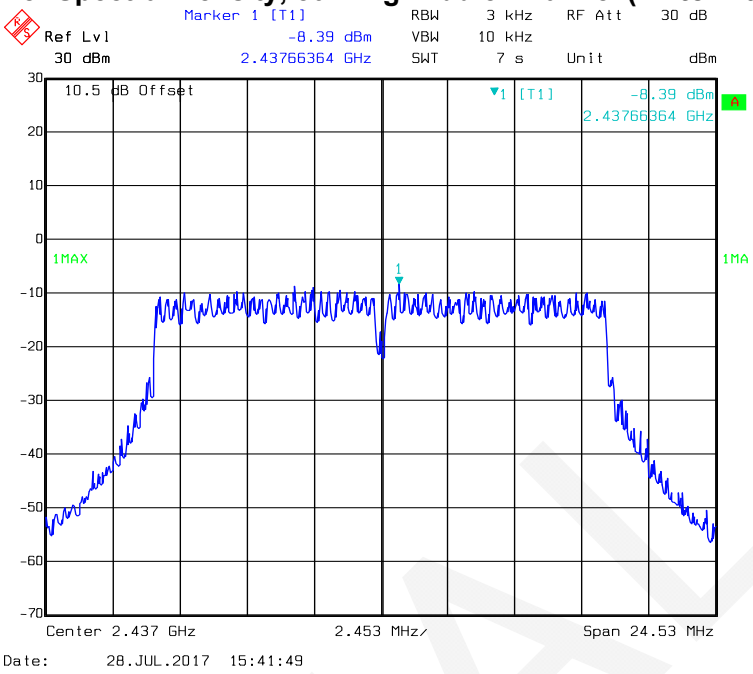
Power Spectral Density, 802.11b High Channel (Antenna 1)



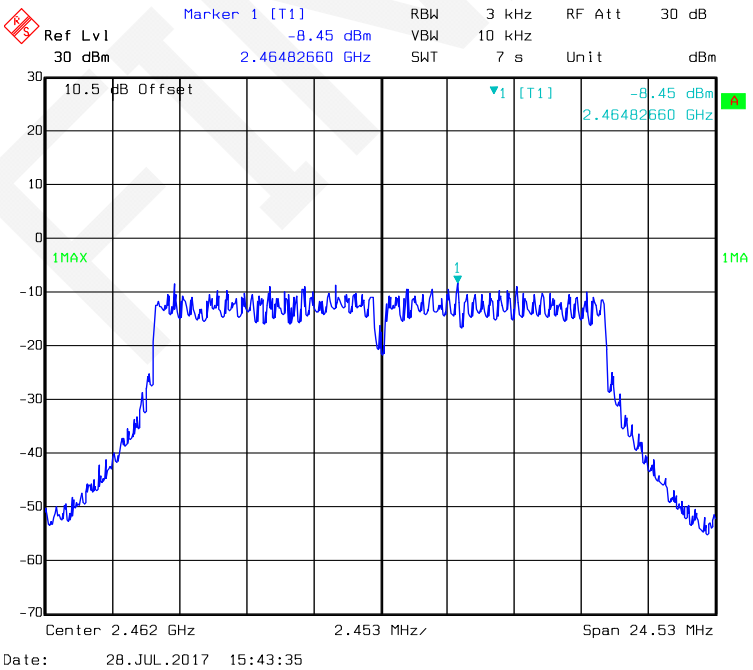
Power Spectral Density, 802.11g Low Channel (Antenna 1)



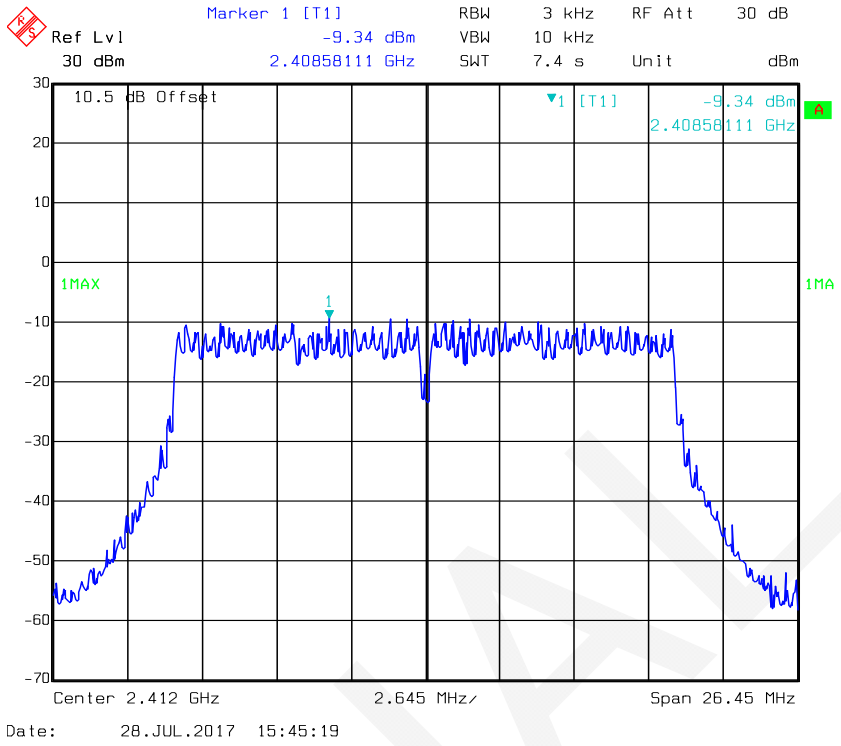
Power Spectral Density, 802.11g Middle Channel (Antenna 1)



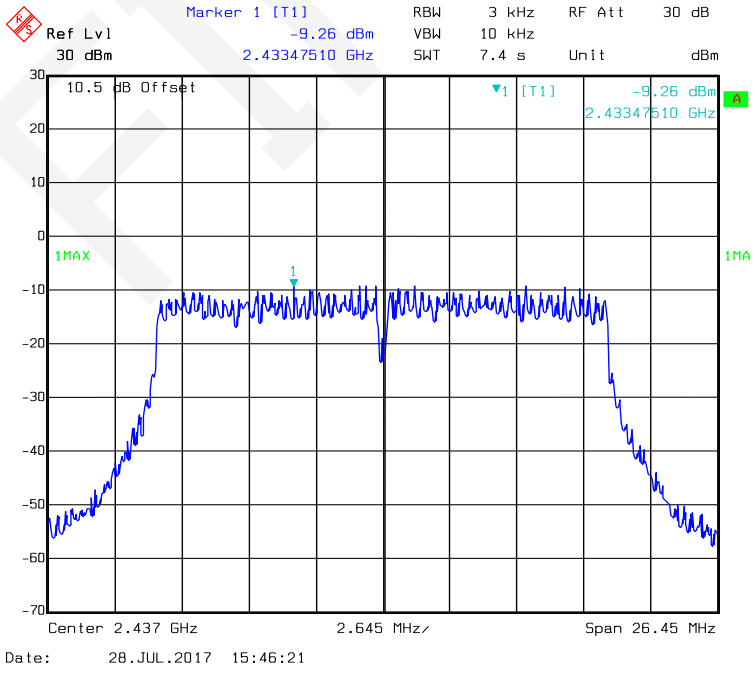
Power Spectral Density, 802.11g High Channel (Antenna 1)



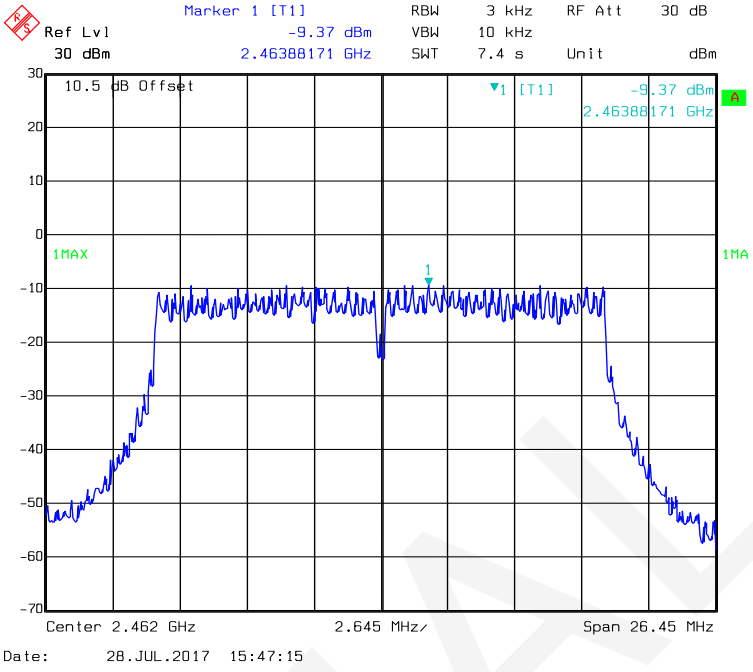
Power Spectral Density, 802.11n-HT20 Low Channel (Antenna 1)



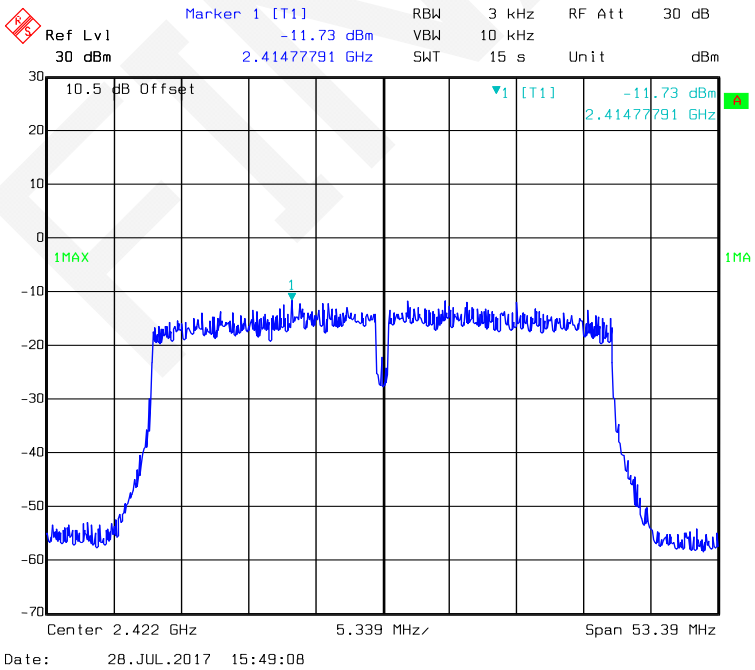
Power Spectral Density, 802.11n-HT20 Middle Channel (Antenna 1)



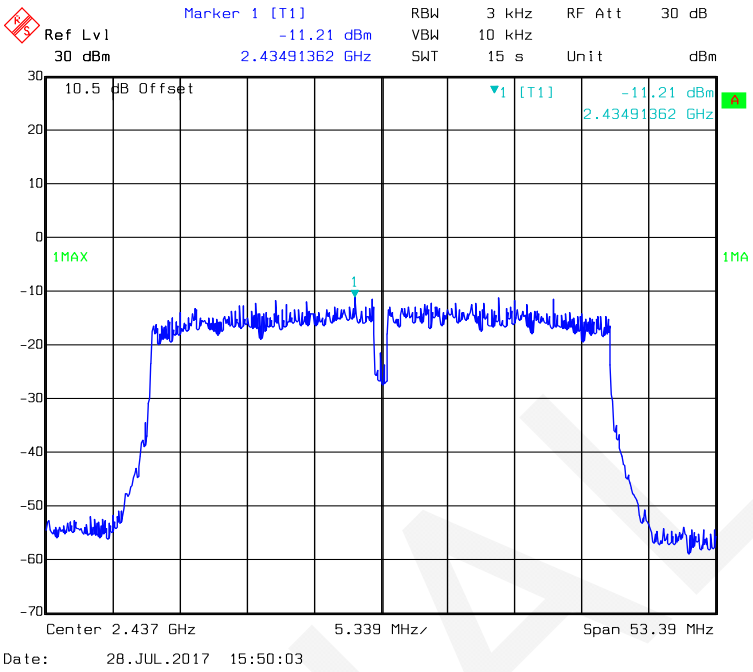
Power Spectral Density, 802.11n-HT20 High Channel (Antenna 1)



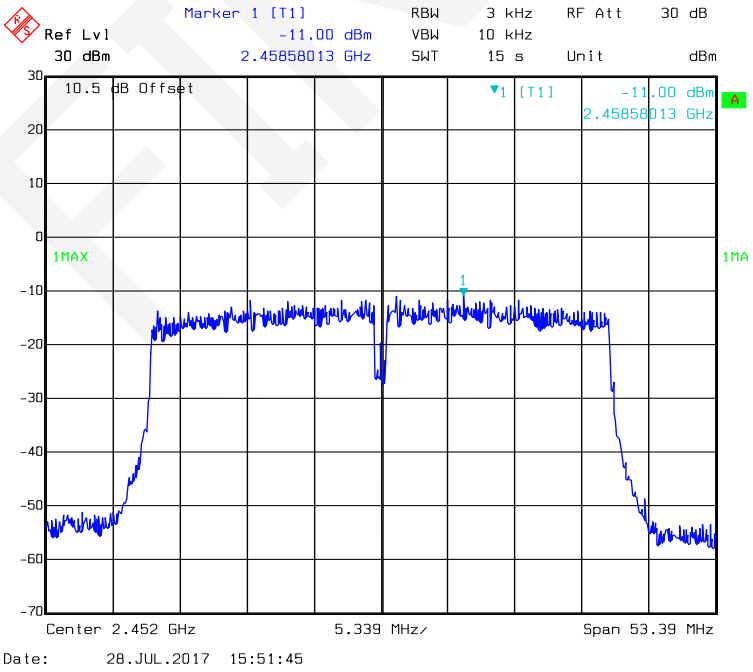
Power Spectral Density, 802.11n-HT40 Low Channel (Antenna 1)



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



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



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