FCC PART 15.247

TEST REPORT

For

SZ DJI TECHNOLOGY CO., LTD

14th floor, West Wing, Skyworth Semiconductor Design Building NO.18 Gaoxin South 4th Ave, Nanshan, Shenzhen, Guangdong, China

FCC ID: SS3-DLG60A1701

Report Type:	Product Name:
Original Report	C1

Test Engineer:	*Kevin Hu*
Report Number:	RDG170108006B
Report Date:	2017-02-08
Reviewed By:	Henry Ding EMC Leader
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Chengdu) 5040, HuiLongWan Plaza, No. 1, ShaWan Road, JinNiu District, ChengDu, China Tel: 028-65523123, Fax: 028-65525125 www.baclcorp.com

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The ***SZ DJI TECHNOLOGY CO., LTD***'s product, model number: ***DLG60A (FCC ID: SS3-DLG60A1701)*** (the "EUT") in this report was a ***C1,*** which was measured approximately: 16.3 cm (L) x16.6 cm (W) x 15.4 cm(H), rated input voltage: DC7.4V from lithium battery or DC 17.5V from adapter.

Adapter Information:
MODEL: PH4C100
INPUT: 100-240V~1.4A 50-60Hz
OUTPUT: DC17.5V 5.7A (Total)
DC17.5V 0~2A (Output 1)
DC17.5V 0~5.7A (Output 2)

**All measurement and test data in this report was gathered from final production sample, serial number: 170108006 (assigned by the BACL, Chengdu). It may have deviation from any other sample.The EUT supplied by the applicant was received on 2017-01-13, and EUT conformed to test requirement.*

Objective

This report is prepared on behalf of ***SZ DJI TECHNOLOGY CO., LTD*** in accordance with Part 2, Subpart J, Part 15, Subparts A, B 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 15E NII submissions with FCC ID: SS3-DLG60A1701.
FCC Part 15C DSS submissions with FCC ID: SS3-DLG60A1701.
Part of system submissions with FCC ID: SS3-AG4051701.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Chengdu). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

The uncertainty of any RF tests which use conducted method measurement is ±3.17 dB, the uncertainty of any radiation on emissions measurement is:

30M~200MHz: ±4.7 dB;
200M~1GHz: ±6.0 dB;
1G~6GHz: ±5.13dB;
6G~25GHz: ±5.47dB;

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

Test Facility

The test site used by BACL to collect test data is located in the5040, HuiLongWan Plaza, No. 1, ShaWan Road,JinNiu District, ChengDu, China

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on April 24, 2015. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.:560332. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in Engineering Mode, which was provided by the manufacturer.

For 2.4GHz band, the device employed 802.11b/g/n ht20 modes.

For 802.11b, 802.11g, and 802.11n20 modes, 11 channels are provided:

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	/	/

EUT Exercise Software

The software “DJI-RF Certification” was used for testing, which was provided by manufacturer. The worst-case data rates are determined to be as follows for each mode based upon investigations by measuring the average power and PSD across all date rates bandwidths, and modulations.

For 802.11b/g/n mode, the maximum power was as below setting, the power setting was provided by the manufacturer:

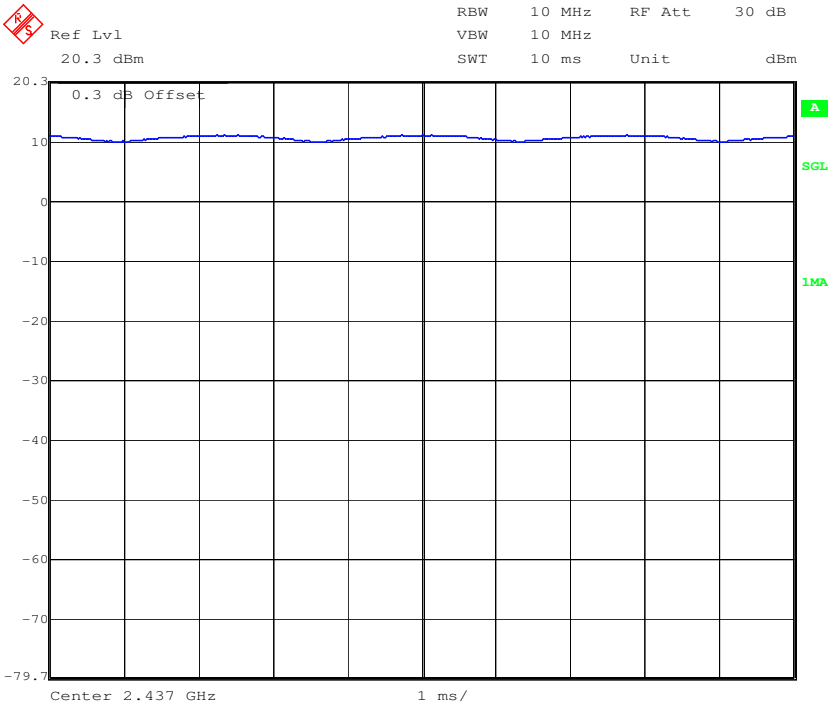
Antenna 0&1				
Test Mode	Test Software Version	DJI-RF Certification		
802.11b	Frequency (MHz)	2412	2437	2462
	Data Rate	1Mbps	1Mbps	1Mbps
	Power Level Setting	7	10	7
802.11g	Data Rate	6Mbps	6Mbps	6Mbps
	Power Level Setting	7	10	7
802.11n ht20	Data Rate	MCS0	MCS0	MCS0
	Power Level Setting	7	10	7

The software configured maximum duty cycle as below:

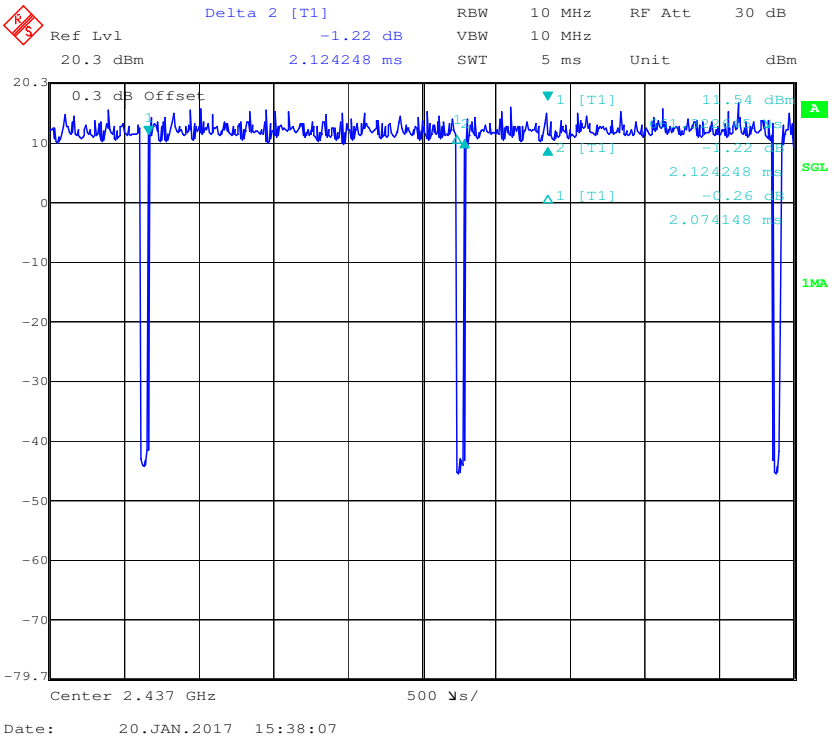
Mode	T_{on} (ms)	T_{on+off} (ms)	Duty Cycle (%)
802.11b	10	10	100
802.11g	2.074	2.124	97.64
802.11n ht20	1.924	1.984	96.98

The minimum transmission duration(T) is 2.074ms in 802.11g mode, 1.924ms in 802.11n mode.

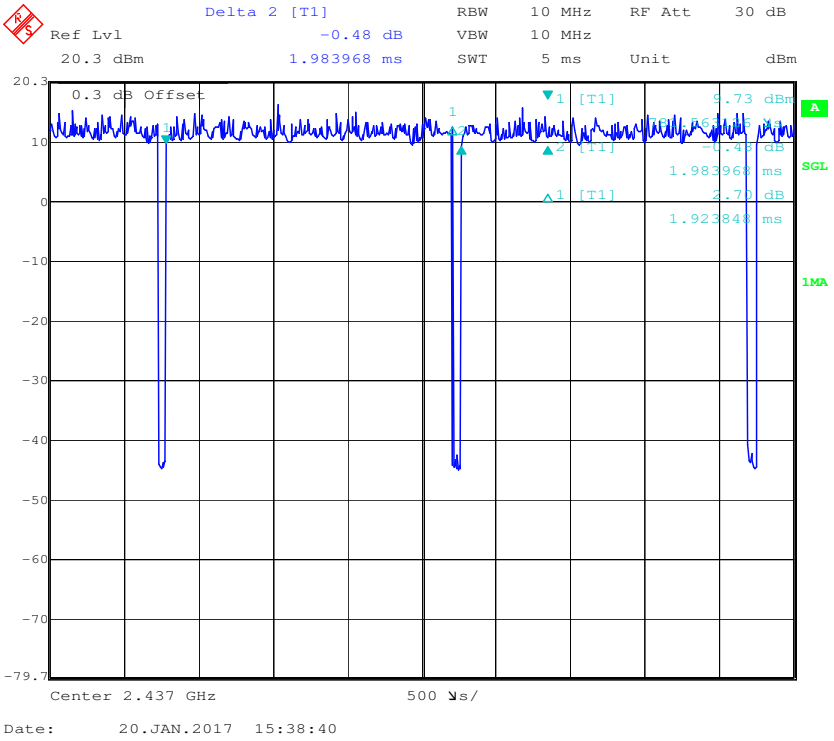
802.11b mode



802.11g mode



802.11n ht20 mode



Equipment Modifications

No modification was made to the EUT.

Support Equipment List and Details

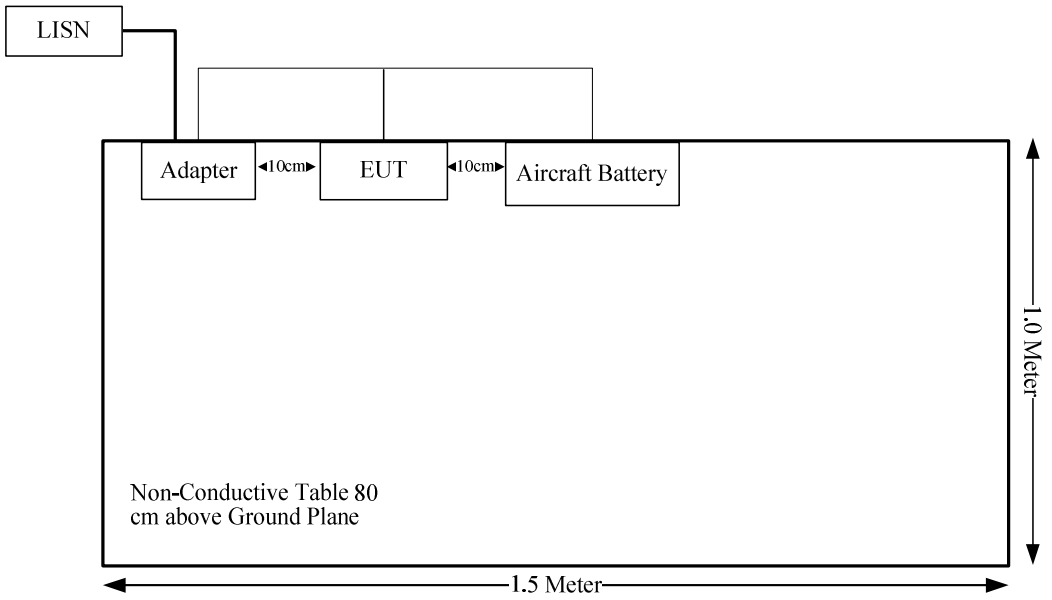
Manufacturer	Description	Model	Serial Number
DJI	Aircraft Battery	/	/

External Cable

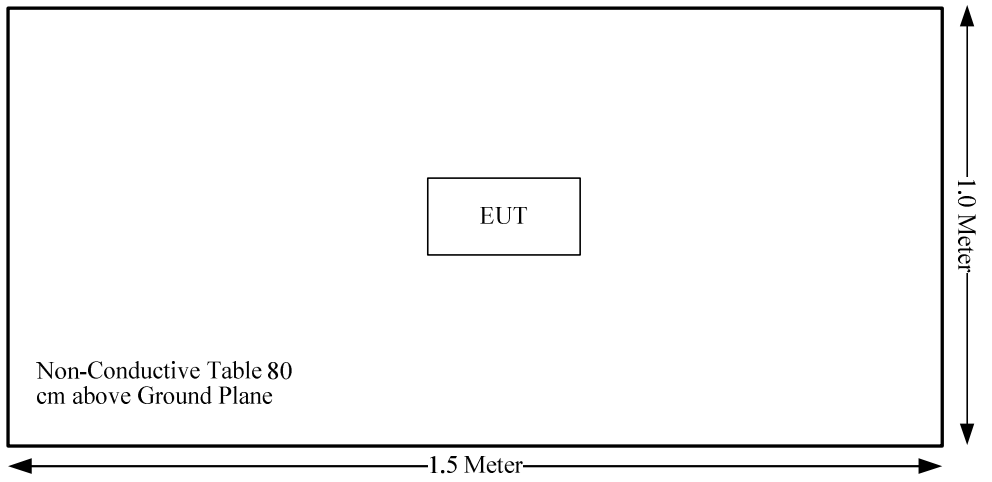
Cable Description	Shielding Type	Ferrite Core	Length (m)	From Port	To
DC cable	Yes	Yes	1	Adapter	EUT or Battery

Block Diagram of Test Setup

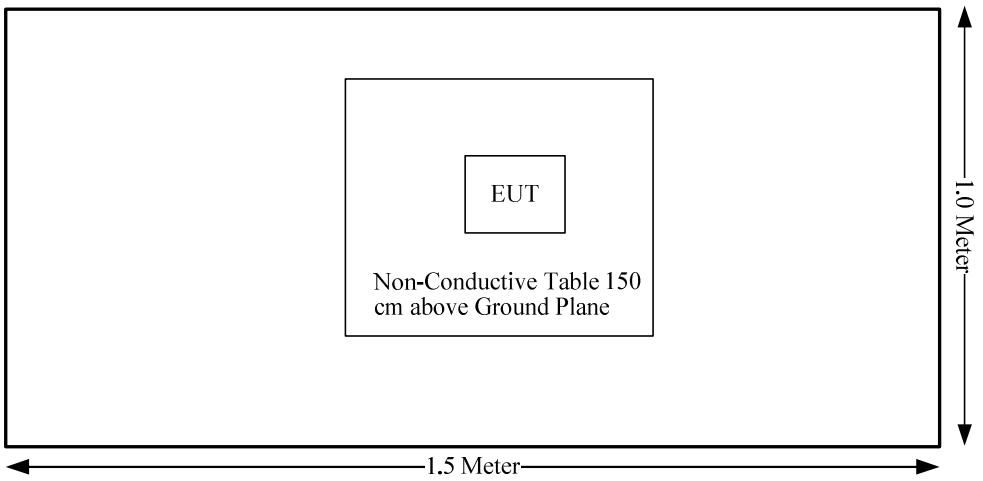
AC Line Conducted Test:



Radiation test below 1GHz:



Radiation test above 1GHz:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
FCC §15.247 (i) & §1.1310 & §2.1093	RF Exposure	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 Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

FCC §15.247 (i) & §1.1310 & §2.1093- RF EXPOSURE

Applicable Standard

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

According to KDB447498 D01 General RF Exposure Guidance v06§4.3.1:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,[25] where

- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation[26]
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

According to KDB447498 D01 General RF Exposure Guidance v05r02§4.3.2:

When the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion:[30]

- (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[$\sqrt{f_{(GHz)}}/x$] W/kg for *test separation distances* ≤ 50 mm;
  where x = 7.5 for 1-g SAR, and x = 18.75 for 10-g SAR.
- 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.[31]

This SAR estimation formula has been considered, in conjunction with the *SAR Test Exclusion Thresholds*, to result in substantially conservative SAR values of ≤ 0.4 W/kg. When SAR is estimated, the peak SAR location is assumed to be at the feed-point or geometric center of the antenna, whichever provides a smaller antenna separation distance, and must be clearly identified in test reports. The estimated SAR is only used to determine simultaneous transmission SAR test exclusion; it should not be reported as the standalone SAR. When SAR is estimated, it must be applied to determine the sum of 1-g SAR test exclusion. When SAR to peak location separation ratio test exclusion is applied, the highest reported SAR for simultaneous transmission can be an estimated standalone SAR if the estimated SAR is the highest among the simultaneously transmitting antennas (see KDB 690783). For conditions where the estimated SAR is overly conservative for certain conditions, the test lab may choose to perform standalone SAR measurements and use the measured SAR to determine simultaneous transmission SAR test exclusion. The estimated SAR values at selected frequencies, distances and power levels are illustrated in Appendix D.

Measurement Result

This device is designed for hand-held use.

For 2.4 GHz Wi-Fi

The max tune-up conducted power is 12.5 dBm (17.78 mW) per chain.
[(max. power of channel, mW)/(min. test separation distance, mm)][√f(GHz)]
= 17.78/5*(√2.462) = 5.58 ≤ 7.5

So the SAR evaluation for each chain is not necessary.

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.
c. Unit must be professionally installed, and installer shall be responsible for verifying that the correct antenna is employed with the unit.

Antenna Connector Construction

The EUT has 2 un-detachable external antennas arrangement for LB mode, the antenna gain are 3.3dBi@ 2.4GHz band, and 2 internal antennas for Wi-Fi, the antenna gain are 4.9dBi @ 2.4GHz band and 6.07 dBi @5GHz band, that fulfill the requirement of the item. Please refer to the internal photos.

Result: Compliance.

FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207(a)

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

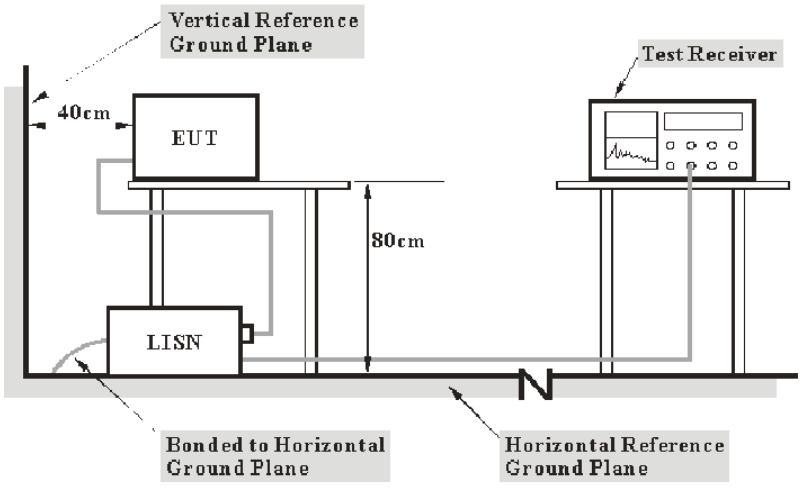
If U_{lab} is less than or equal to U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 1, then:
–compliance is deemed to occur if no measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level, increased by (U_{lab} − U_{cispr}), exceeds the disturbance limit.

Based on CISPR 16-4-2:2011, measurement uncertainty of conducted disturbance at mains port using AMN at Bay Area Compliance Laboratories Corp. (Chengdu) is ±3.17 dB (150 kHz to 30 MHz).

Table 1 – Values of U_{cispr}

Measurement	U_{cispr}
Conducted disturbance at mains port using AMN (150 kHz to 30 MHz)	3.4 dB

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 a 120V/60Hz AC power source

EMI Test Receiver Setup

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

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

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

Corrected Amplitude & Margin Calculation

The basic equation is as follows:

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

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

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

Margin = Limit – Corrected Amplitude

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS 30	836858/0016	2016-12-02	2017-12-01
Rohde & Schwarz	PULSE LIMITER	ESH3Z2	357.8810.52	2016-10-31	2017-10-30
Rohde & Schwarz	L.I.S.N.	ENV216	3560.6550.06	2016-12-02	2017-12-01
N/A	Conducted Cable	NO.5	N/A	2016-11-10	2017-11-09
R&S	Test Software	EMC32	Version8.53.0	N/A	N/A

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

Test Procedure

During the conducted emission test, the adapter was connected to thefirst LISN and the other support equipments were connected to the outlet of the second LISN.

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

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

Test Data

Environmental Conditions

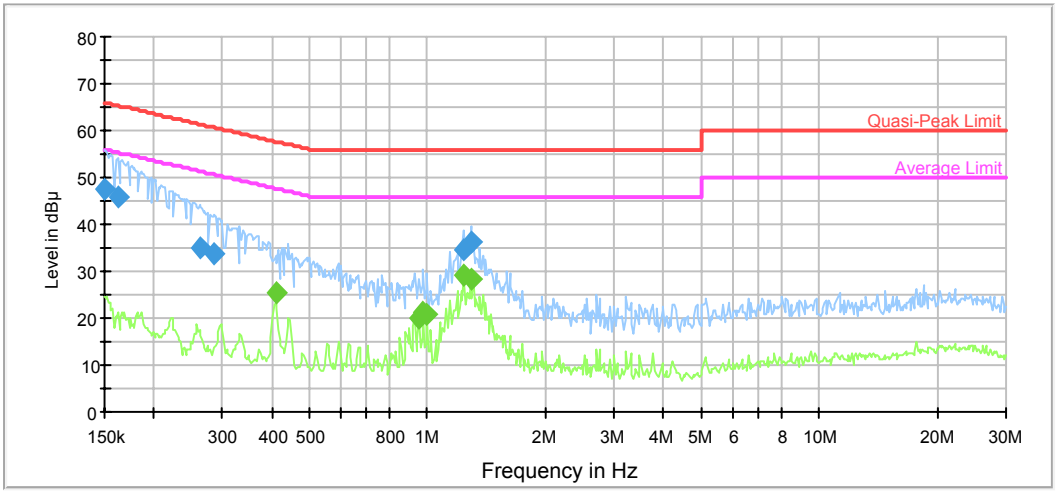
Temperature:	21.9 °C
Relative Humidity:	46 %
ATM Pressure:	97.6 kPa

The testing was performed by Kevin Hu on 2017-01-17.

Test Result: Compliance, please refer to the below data and plots.

Test Mode: Charging and transmitting

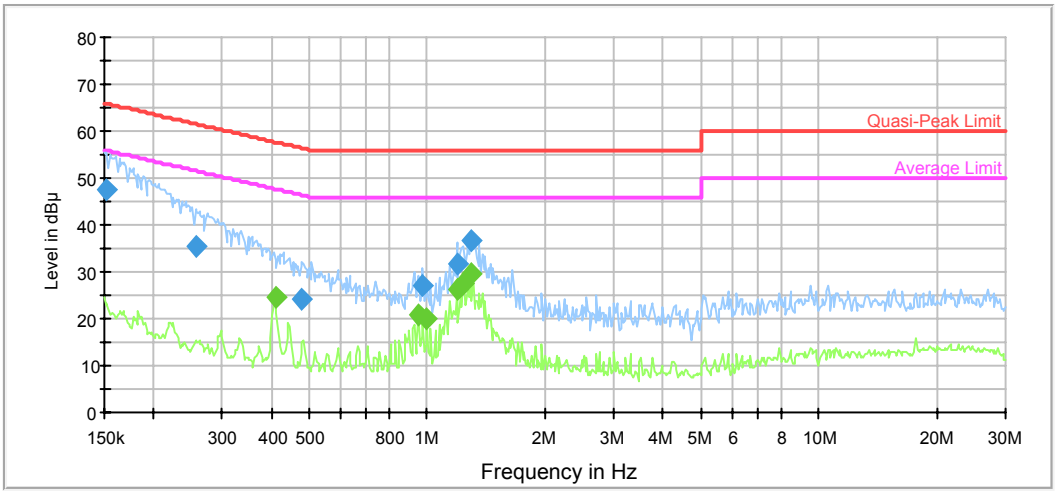
AC120V, 60Hz, Line



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.150000	47.5	9.000	L1	19.7	18.5	66.0	Compliance
0.162441	45.9	9.000	L1	19.7	19.4	65.3	Compliance
0.262017	35.0	9.000	L1	19.7	26.4	61.4	Compliance
0.286019	33.7	9.000	L1	19.7	26.9	60.6	Compliance
1.239175	34.5	9.000	L1	19.7	21.5	56.0	Compliance
1.289541	36.1	9.000	L1	19.7	19.9	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.409372	25.3	9.000	L1	19.8	22.4	47.7	Compliance
0.952654	20.1	9.000	L1	19.7	25.9	46.0	Compliance
0.975701	21.4	9.000	L1	19.7	24.6	46.0	Compliance
0.999305	20.9	9.000	L1	19.7	25.1	46.0	Compliance
1.239175	29.0	9.000	L1	19.7	17.0	46.0	Compliance
1.289541	28.2	9.000	L1	19.7	17.8	46.0	Compliance

AC120V, 60Hz, Neutral:



Frequency (MHz)	QuasiPeak (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.152410	47.6	9.000	N	19.7	18.3	65.9	Compliance
0.255827	35.6	9.000	N	19.6	26.0	61.6	Compliance
0.480097	24.2	9.000	N	19.6	32.1	56.3	Compliance
0.975701	27.1	9.000	N	19.7	28.9	56.0	Compliance
1.190776	31.8	9.000	N	19.6	24.2	56.0	Compliance
1.289541	36.5	9.000	N	19.6	19.5	56.0	Compliance

Frequency (MHz)	Average (dBµV)	Bandwidth (kHz)	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.409372	24.7	9.000	N	19.6	23.0	47.7	Compliance
0.952654	20.8	9.000	N	19.7	25.2	46.0	Compliance
0.999305	20.0	9.000	N	19.7	26.0	46.0	Compliance
1.190776	26.2	9.000	N	19.6	19.8	46.0	Compliance
1.239175	27.6	9.000	N	19.6	18.4	46.0	Compliance
1.289541	29.5	9.000	N	19.6	16.5	46.0	Compliance

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

Applicable Standard

FCC §15.247 (d); §15.209; §15.205;

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cispr} of Table 2, then:
–compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.
If U_{lab} is greater than U_{cispr} of Table 2, then:
–compliance is deemed to occur if no measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit;
–non - compliance is deemed to occur if any measured disturbance level, increased by ($U_{lab} - U_{cispr}$), exceeds the disturbance limit.

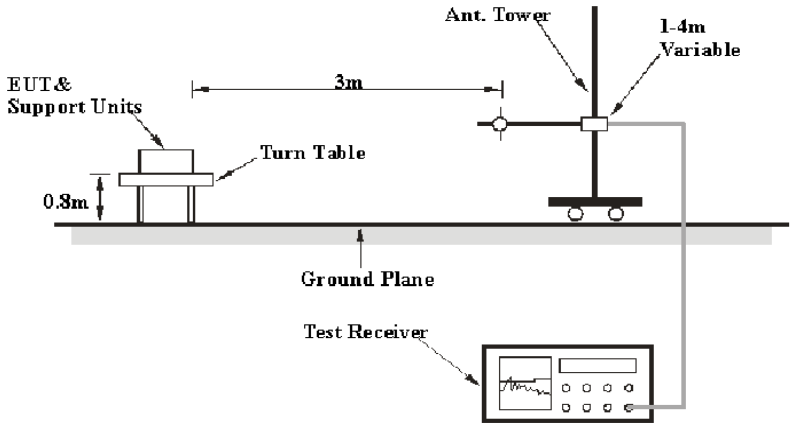
Based on CISPR 16-4-2-2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Chengdu) is:
30M~200MHz: ±4.7 dB;
200M~1GHz: ±6.0 dB;
1G~6GHz: ±5.13dB;
6G~25GHz: ±5.47 dB;

Table 2 – Values of U_{cispr}

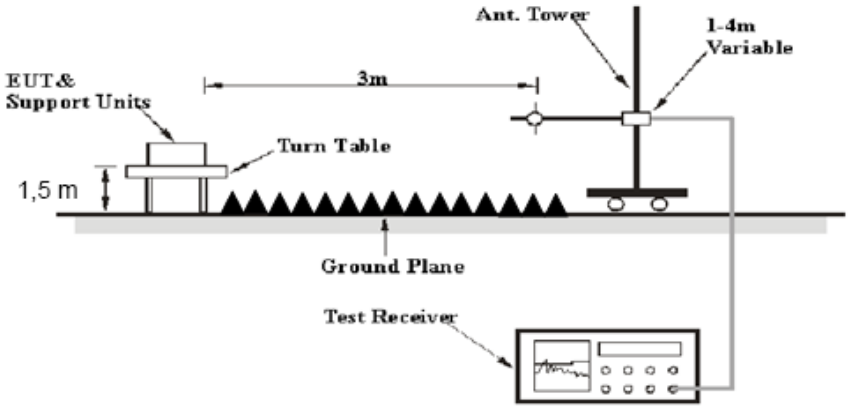
Measurement	U_{cispr}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

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 spacing between the peripherals was 10 cm.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

30MHz-1000MHz:

Detector	RBW	Video B/W	IF B/W
QP	120 kHz	300 kHz	120kHz

1GHz- 25GHz:

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

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Amplifier	8447D	2944A10442	2016-12-02	2017-12-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100028	2016-12-02	2017-12-01
Sunol Sciences	Broadband Antenna	JB3	A101808	2016-04-10	2019-04-09
Rohde & Schwarz	Spectrum Analyzer	FSEM30	100018	2016-12-02	2017-12-01
ETS	Horn Antenna	3115	003-6076	2016-12-02	2017-12-01
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-0113028	2014-06-16	2017-06-15
Mini-circuits	Amplifier	ZVA-183-S+	771001215	2016-05-20	2017-05-19
HP	Amplifier	8449B	3008A00277	2016-12-02	2017-12-01
EMCT	Semi-Anechoic Chamber	966	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

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

Test Data

Environmental Conditions

Temperature:	22.3~23.1 °C
Relative Humidity:	51~56 %
ATM Pressure:	95.8~96.7 kPa

The testing was performed by Kevin Hu from 2017-01-18 to 2017-01-20.

Test Result: Compliance, please Refer to the following data

Test Mode: Transmitting

30MHz-25GHz:

802.11b Mode(2TX mode was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	74.07	PK	H	23.50	3.00	0.00	100.57	N/A	N/A
2412	69.43	AV	H	23.50	3.00	0.00	95.93	N/A	N/A
2412	70.87	PK	V	23.50	3.00	0.00	97.37	N/A	N/A
2412	66.79	AV	V	23.50	3.00	0.00	93.29	N/A	N/A
2390	27.95	PK	H	23.57	3.00	0.00	54.52	74	19.48
2390	16.23	AV	H	23.57	3.00	0.00	42.8	54	11.2
4824	33.84	PK	H	30.84	5.11	26.87	42.92	74	31.08
4824	22.97	AV	H	30.84	5.11	26.87	32.05	54	21.95
7236	34.50	PK	H	34.77	6.18	26.36	49.09	74	24.91
7236	23.16	AV	H	34.77	6.18	26.36	37.75	54	16.25
3214	44.45	PK	H	25.40	3.75	26.49	47.11	74	26.89
3214	34.24	AV	H	25.40	3.75	26.49	36.9	54	17.1
44.55	49.39	QP	H	11.82	0.34	28.51	33.04	40.00	6.96
60.07	53.18	QP	H	7.50	0.49	28.43	32.74	40.00	7.26
Middle Channel: 2437 MHz									
2437	79.27	PK	H	23.41	3.00	0.00	105.68	N/A	N/A
2437	74.51	AV	H	23.41	3.00	0.00	100.92	N/A	N/A
2437	71.84	PK	V	23.41	3.00	0.00	98.25	N/A	N/A
2437	66.25	AV	V	23.41	3.00	0.00	92.66	N/A	N/A
4874	35.12	PK	H	31.00	5.09	26.87	44.34	74	29.66
4874	23.24	AV	H	31.00	5.09	26.87	32.46	54	21.54
7311	33.64	PK	H	34.92	6.21	26.40	48.37	74	25.63
7311	22.97	AV	H	34.92	6.21	26.40	37.7	54	16.3
1612	38.94	PK	H	24.28	2.76	26.44	39.54	74	34.46
1612	28.46	AV	H	24.28	2.76	26.44	29.06	54	24.94
3250	42.65	PK	H	25.60	3.81	26.50	45.56	74	28.44
3250	31.69	AV	H	25.60	3.81	26.50	34.6	54	19.4
44.55	49.66	QP	H	11.82	0.34	28.51	33.31	40.00	6.69
60.07	53.32	QP	H	7.50	0.49	28.43	32.88	40.00	7.12
High Channel: 2462 MHz									
2462	77.43	PK	H	23.33	2.99	0.00	103.75	N/A	N/A
2462	72.91	AV	H	23.33	2.99	0.00	99.23	N/A	N/A
2462	69.72	PK	V	23.33	2.99	0.00	96.04	N/A	N/A
2462	65.01	AV	V	23.33	2.99	0.00	91.33	N/A	N/A
2483.5	28.46	PK	H	23.26	2.99	0.00	54.71	74	19.29
2483.5	16.11	AV	H	23.26	2.99	0.00	42.36	54	11.64
4924	35.11	PK	H	31.16	5.07	26.88	44.46	74	29.54
4924	24.16	AV	H	31.16	5.07	26.88	33.51	54	20.49
7386	34.20	PK	H	35.07	6.25	26.43	49.09	74	24.91
7386	23.08	AV	H	35.07	6.25	26.43	37.97	54	16.03
3284	44.01	PK	H	25.79	3.86	26.51	47.15	74	26.85
3284	32.72	AV	H	25.79	3.86	26.51	35.86	54	18.14
44.55	50.5	QP	H	11.82	0.34	28.51	34.15	40.00	5.85
60.07	53.74	QP	H	7.50	0.49	28.43	33.30	40.00	6.70

802.11g Mode(2TX mode was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	75.70	PK	H	23.50	3.00	0.00	102.2	N/A	N/A
2412	64.41	AV	H	23.50	3.00	0.00	90.91	N/A	N/A
2412	73.20	PK	V	23.50	3.00	0.00	99.7	N/A	N/A
2412	62.19	AV	V	23.50	3.00	0.00	88.69	N/A	N/A
2390	29.87	PK	H	23.57	3.00	0.00	56.44	74	17.56
2390	16.28	AV	H	23.57	3.00	0.00	42.85	54	11.15
4824	35.33	PK	H	30.84	5.11	26.87	44.41	74	29.59
4824	24.61	AV	H	30.84	5.11	26.87	33.69	54	20.31
7236	35.11	PK	H	34.77	6.18	26.36	49.7	74	24.3
7236	23.65	AV	H	34.77	6.18	26.36	38.24	54	15.76
3214	47.07	PK	H	25.40	3.75	26.49	49.73	74	24.27
3214	35.85	AV	H	25.40	3.75	26.49	38.51	54	15.49
44.55	50.03	QP	H	11.82	0.34	28.51	33.68	40.00	6.32
60.07	54.18	QP	H	7.50	0.49	28.43	33.74	40.00	6.26
Middle Channel: 2437 MHz									
2437	81.03	PK	H	23.41	3.00	0.00	107.44	N/A	N/A
2437	69.27	AV	H	23.41	3.00	0.00	95.68	N/A	N/A
2437	76.15	PK	V	23.41	3.00	0.00	102.56	N/A	N/A
2437	65.51	AV	V	23.41	3.00	0.00	91.92	N/A	N/A
4874	34.29	PK	H	31.00	5.09	26.87	43.51	74	30.49
4874	23.43	AV	H	31.00	5.09	26.87	32.65	54	21.35
7311	33.96	PK	H	34.92	6.21	26.40	48.69	74	25.31
7311	22.37	AV	H	34.92	6.21	26.40	37.1	54	16.9
1612	41.83	PK	H	24.28	2.76	26.44	42.43	74	31.57
1612	29.71	AV	H	24.28	2.76	26.44	30.31	54	23.69
3250	42.67	PK	H	25.60	3.81	26.50	45.58	74	28.42
3250	31.31	AV	H	25.60	3.81	26.50	34.22	54	19.78
44.55	49.56	QP	H	11.82	0.34	28.51	33.21	40.00	6.79
60.07	54.62	QP	H	7.50	0.49	28.43	34.18	40.00	5.82
High Channel: 2462 MHz									
2462	79.26	PK	H	23.33	2.99	0.00	105.58	N/A	N/A
2462	68.42	AV	H	23.33	2.99	0.00	94.74	N/A	N/A
2462	74.30	PK	V	23.33	2.99	0.00	100.62	N/A	N/A
2462	63.82	AV	V	23.33	2.99	0.00	90.14	N/A	N/A
2483.5	43.73	PK	H	23.26	2.99	0.00	69.98	74	4.02
2483.5	24.68	AV	H	23.26	2.99	0.00	50.93	54	3.07
4924	35.73	PK	H	31.16	5.07	26.88	45.08	74	28.92
4924	25.18	AV	H	31.16	5.07	26.88	34.53	54	19.47
7386	35.54	PK	H	35.07	6.25	26.43	50.43	74	23.57
7386	24.17	AV	H	35.07	6.25	26.43	39.06	54	14.94
3284	46.31	PK	H	25.79	3.86	26.51	49.45	74	24.55
3284	35.40	AV	H	25.79	3.86	26.51	38.54	54	15.46
44.55	48.95	QP	H	11.82	0.34	28.51	32.60	40.00	7.40
60.07	52.17	QP	H	7.50	0.49	28.43	31.73	40.00	8.27

802.11 n ht20 Mode(2TX mode was the worst)

Frequency (MHz)	Receiver		Rx Antenna		Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude (dBμV/m)	Limit (dBμV/m)	Margin (dB)
	Reading (dBμV)	Detector (PK/QP/AV)	Polar (H/V)	Factor (dB)					
Low Channel: 2412 MHz									
2412	76.32	PK	H	23.50	3.00	0.00	102.82	N/A	N/A
2412	64.88	AV	H	23.50	3.00	0.00	91.38	N/A	N/A
2412	74.06	PK	V	23.50	3.00	0.00	100.56	N/A	N/A
2412	63.03	AV	V	23.50	3.00	0.00	89.53	N/A	N/A
2390	33.61	PK	H	23.57	3.00	0.00	60.18	74	13.82
2390	18.25	AV	H	23.57	3.00	0.00	44.82	54	9.18
4824	34.36	PK	H	30.84	5.11	26.87	43.44	74	30.56
4824	23.55	AV	H	30.84	5.11	26.87	32.63	54	21.37
7236	33.97	PK	H	34.77	6.18	26.36	48.56	74	25.44
7236	23.04	AV	H	34.77	6.18	26.36	37.63	54	16.37
3214	45.04	PK	H	25.40	3.75	26.49	47.7	74	26.3
3214	34.25	AV	H	25.40	3.75	26.49	36.91	54	17.09
44.55	49.22	QP	H	11.82	0.34	28.51	32.87	40.00	7.13
60.07	52.31	QP	H	7.50	0.49	28.43	31.87	40.00	8.13
Middle Channel: 2437 MHz									
2437	80.97	PK	H	23.41	3.00	0.00	107.38	N/A	N/A
2437	69.64	AV	H	23.41	3.00	0.00	96.05	N/A	N/A
2437	77.50	PK	V	23.41	3.00	0.00	103.91	N/A	N/A
2437	66.83	AV	V	23.41	3.00	0.00	93.24	N/A	N/A
4874	34.16	PK	H	31.00	5.09	26.87	43.38	74	30.62
4874	24.04	AV	H	31.00	5.09	26.87	33.26	54	20.74
7311	34.51	PK	H	34.92	6.21	26.40	49.24	74	24.76
7311	23.02	AV	H	34.92	6.21	26.40	37.75	54	16.25
1612	38.64	PK	H	24.28	2.76	26.44	39.24	74	34.76
1612	28.27	AV	H	24.28	2.76	26.44	28.87	54	25.13
3250	41.75	PK	H	25.60	3.81	26.50	44.66	74	29.34
3250	30.39	AV	H	25.60	3.81	26.50	33.3	54	20.7
44.55	50.06	QP	H	11.82	0.34	28.51	33.71	40.00	6.29
60.07	52.73	QP	H	7.50	0.49	28.43	32.29	40.00	7.71
High Channel: 2462 MHz									
2462	78.66	PK	H	23.33	2.99	0.00	104.98	N/A	N/A
2462	67.93	AV	H	23.33	2.99	0.00	94.25	N/A	N/A
2462	75.28	PK	V	23.33	2.99	0.00	101.6	N/A	N/A
2462	64.61	AV	V	23.33	2.99	0.00	90.93	N/A	N/A
2483.5	47.20	PK	H	23.26	2.99	0.00	73.45	74	0.55
2483.5	27.57	AV	H	23.26	2.99	0.00	53.82	54	0.18
4924	34.51	PK	H	31.16	5.07	26.88	43.86	74	30.14
4924	24.29	AV	H	31.16	5.07	26.88	33.64	54	20.36
7386	34.17	PK	H	35.07	6.25	26.43	49.06	74	24.94
7386	23.38	AV	H	35.07	6.25	26.43	38.27	54	15.73
3284	44.39	PK	H	25.79	3.86	26.51	47.53	74	26.47
3284	33.50	AV	H	25.79	3.86	26.51	36.64	54	17.36
44.55	49.59	QP	H	11.82	0.34	28.51	33.24	40.00	6.76
60.07	53.17	QP	H	7.50	0.49	28.43	32.73	40.00	7.27

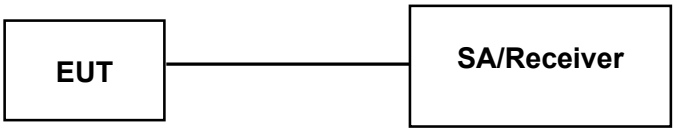
FCC §15.247(a) (2) – 6dB BANDWIDTH

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

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 it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
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).

Test Data

Environmental Conditions

Temperature:	26.3 °C
Relative Humidity:	39 %
ATM Pressure:	95.4 kPa

The testing was performed by Kevin Hu on 2017-01-16.

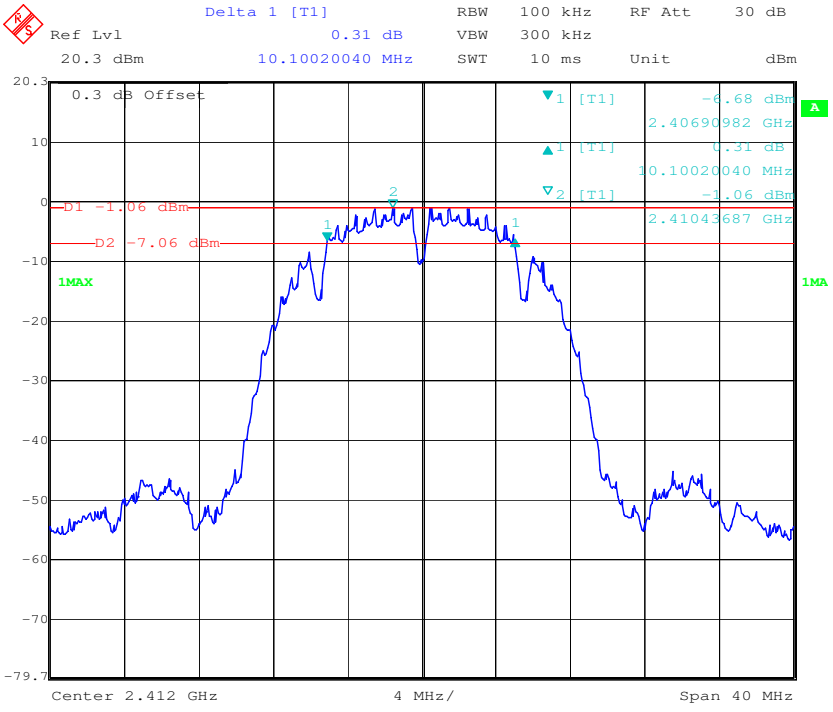
Test Result: Compliance.

Please refer to the following tables and plots.

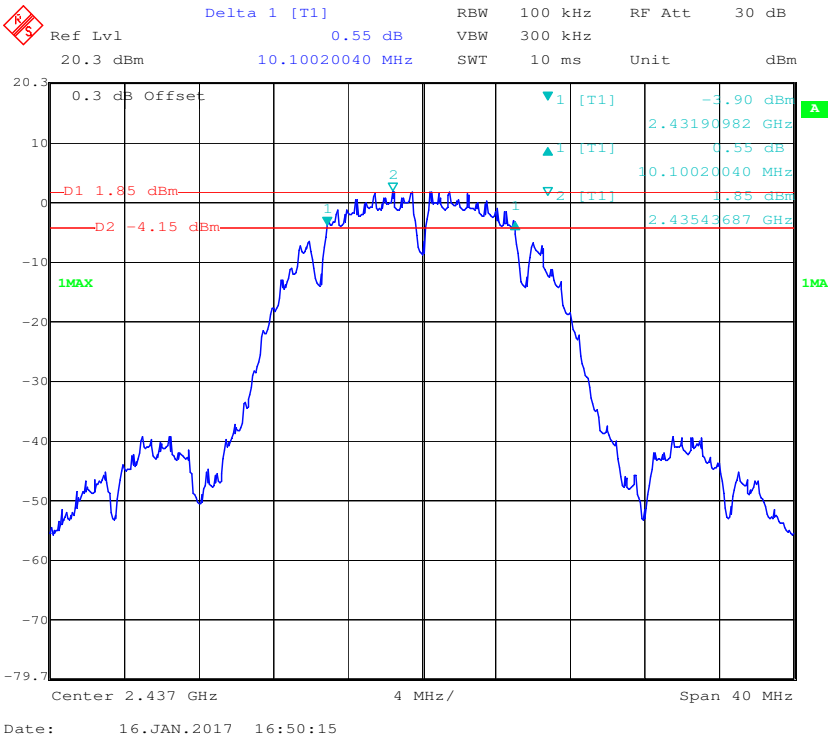
Test Mode: Transmitting (Test performed at Chain 0)

Test mode	Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (MHz)
802.11b	Low	2412	10.1	≥0.5
	Middle	2437	10.1	≥0.5
	High	2462	10.18	≥0.5
802.11g	Low	2412	16.43	≥0.5
	Middle	2437	16.35	≥0.5
	High	2462	16.51	≥0.5
802.11n20	Low	2412	17.56	≥0.5
	Middle	2437	17.64	≥0.5
	High	2462	17.47	≥0.5

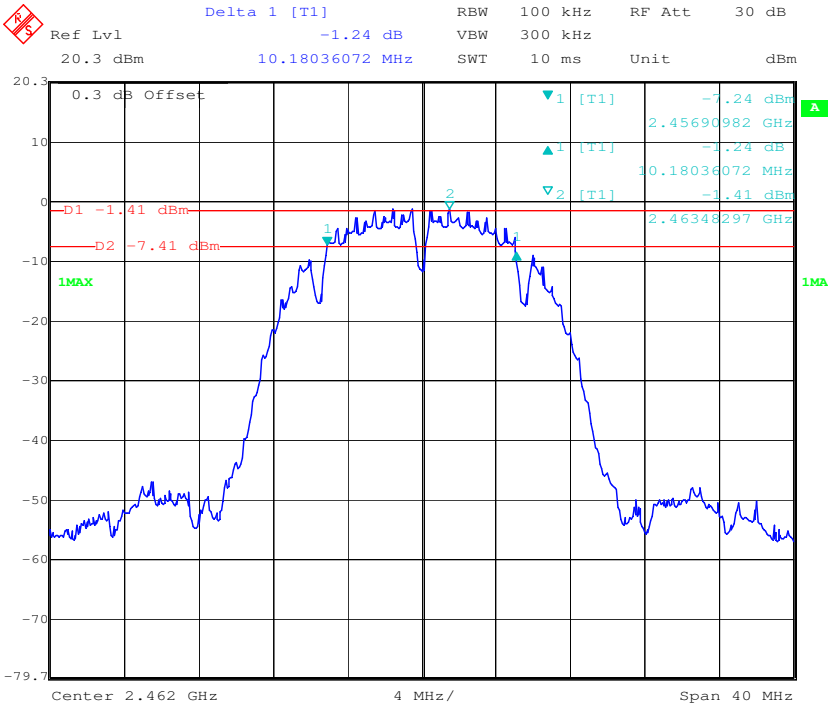
802.11b Low Channel



802.11b Middle Channel

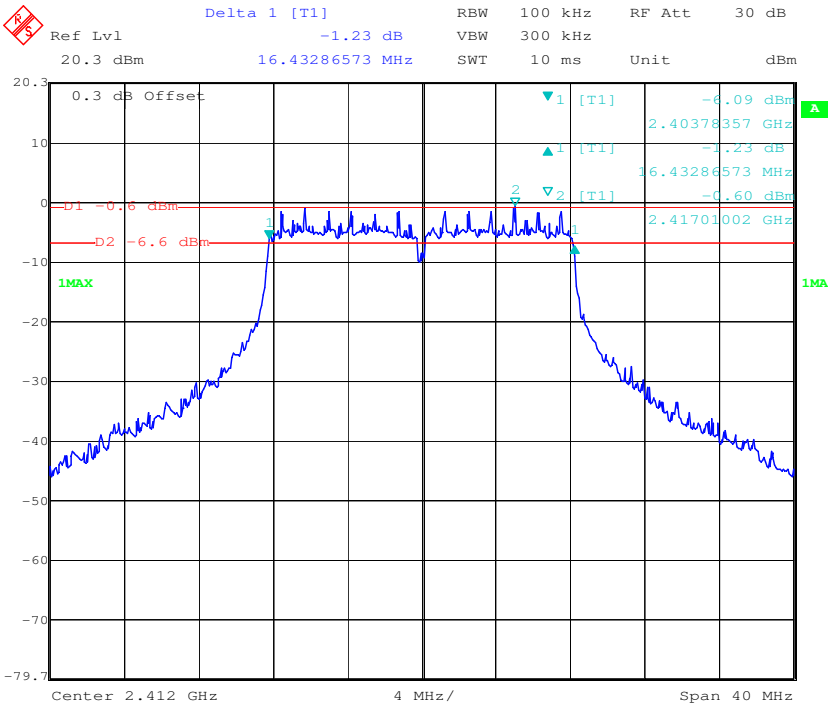


802.11b High Channel



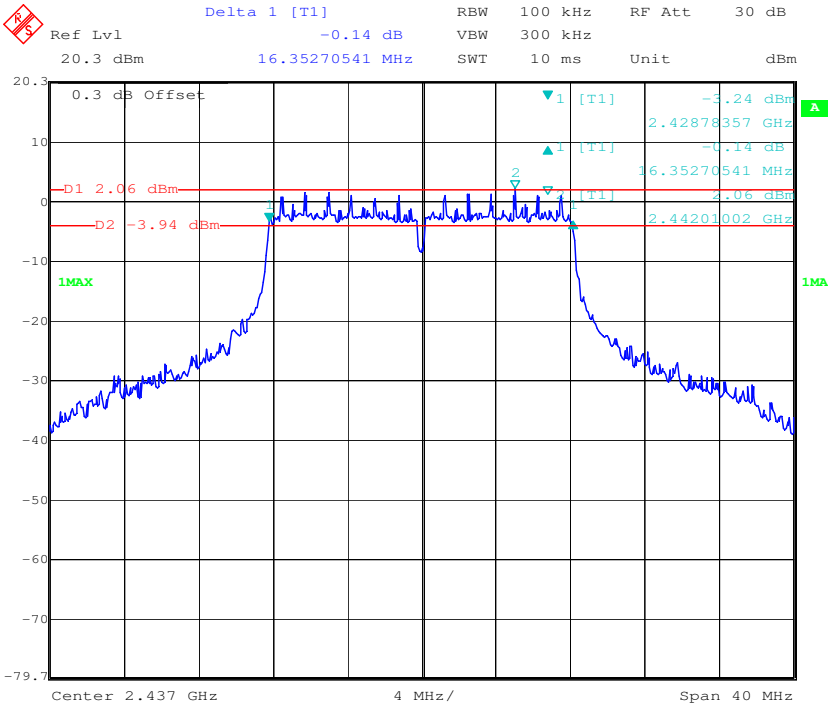
Date: 16.JAN.2017 16:51:44

802.11g Low Channel

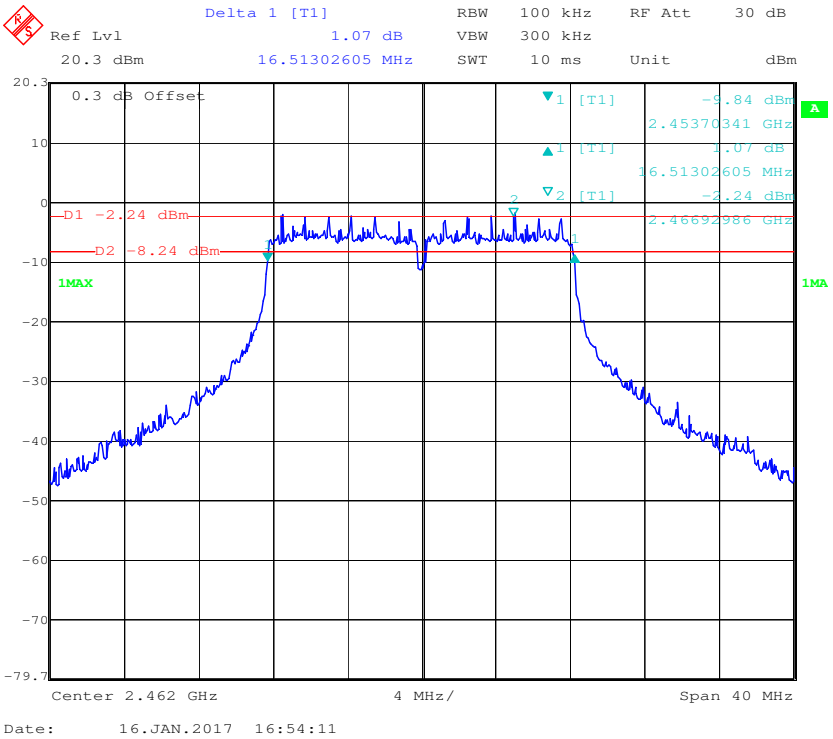


Date: 16.JAN.2017 16:59:45

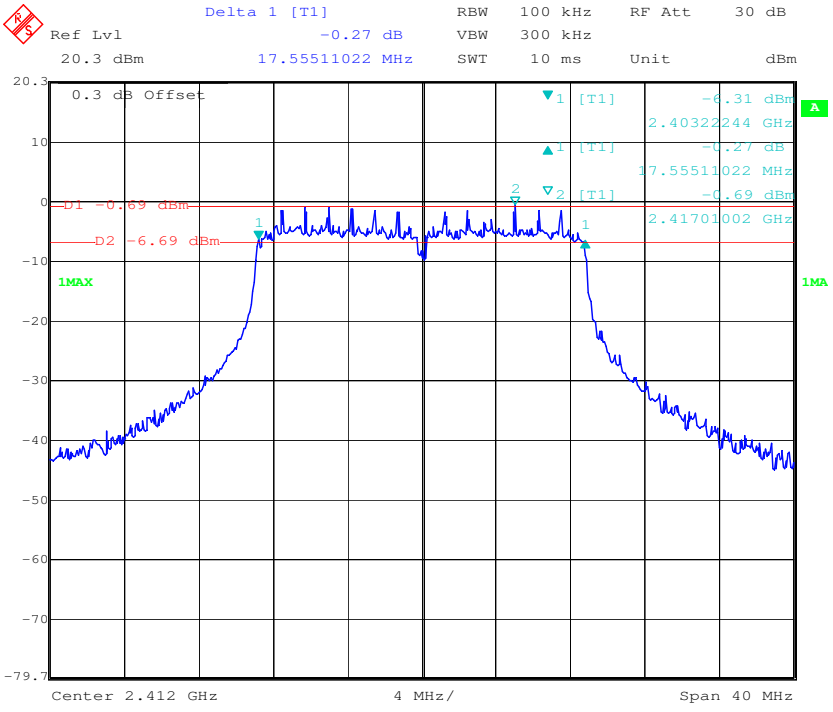
802.11g Middle Channel



802.11g High Channel

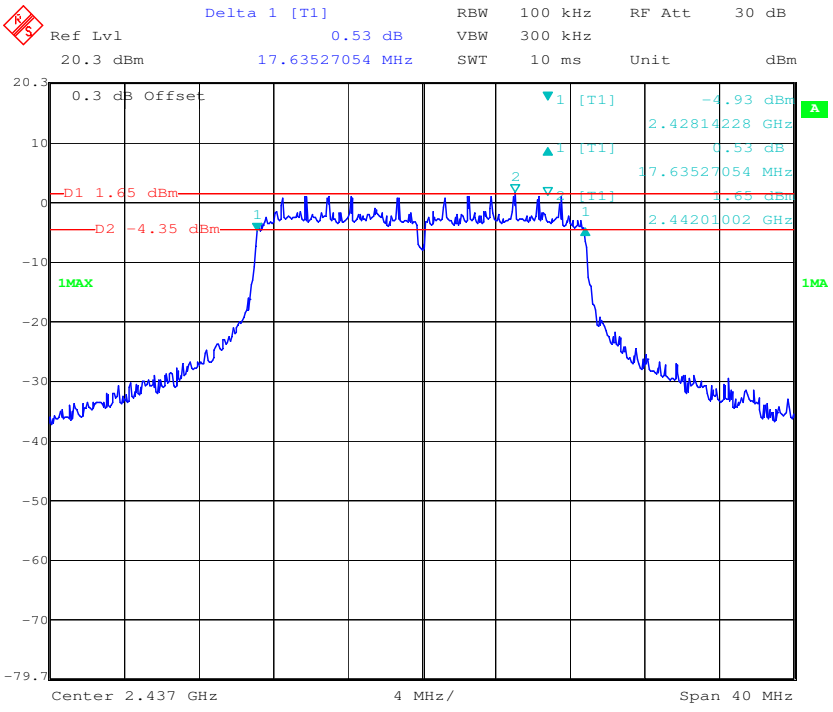


802.11n ht20 Low Channel



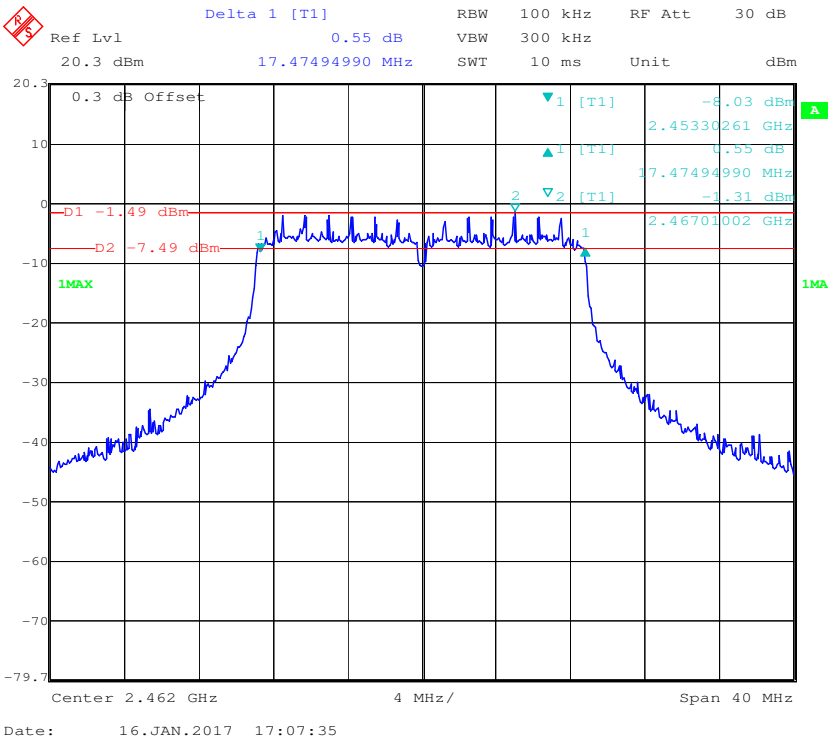
Date: 16.JAN.2017 17:03:09

802.11n ht20 Middle Channel



Date: 16.JAN.2017 17:05:56

802.11n ht20 High Channel



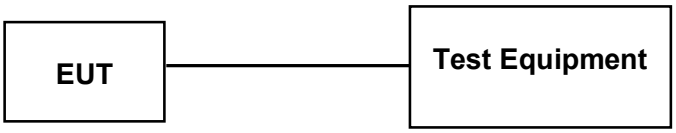
FCC §15.247(b) (3) - MAXIMUM PEAK CONDUCTED OUTPUT POWER

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 a Test Equipment.



Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Agilent	Wideband Power Sensor	N1921A	MY54170074	2017-01-03	2018-01-03
Agilent	P-Series Power Meter	N1912A	MY5000798	2017-01-03	2018-01-03
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).

Test Data

Environmental Conditions

Temperature:	26.3 °C
Relative Humidity:	39 %
ATM Pressure:	95.4 kPa

The testing was performed by Kevin Hu on 2017-01-16

Test Mode: Transmitting

Test Mode	Frequency (MHz)	Conducted Peak Output Power (dBm)		Total (dBm)	Limits (dBm)
		Chain 0	Chain 1		
802.11b	2412	13.07	13.59	16.35	30
	2437	15.6	15.06	18.35	30
	2462	12.13	12.91	15.55	30
802.11g	2412	17.05	17.19	20.13	30
	2437	20.14	19.97	23.07	30
	2462	17.08	16.55	19.83	30
802.11n 20	2412	17.03	17.14	20.1	30
	2437	20.09	19.91	23.01	30
	2462	17.04	16.38	19.73	30

Test Mode	Frequency (MHz)	Conducted Average Output Power (dBm)		Total (dBm)	Limits (dBm)
		Chain 0	Chain 1		
802.11b	2412	8.6	9.1	11.87	30
	2437	11.98	11.5	14.76	30
	2462	8.87	8.55	11.72	30
802.11g	2412	9.09	9.1	12.11	30
	2437	12.27	12.07	15.18	30
	2462	9.29	8.97	12.14	30
802.11n 20	2412	9.03	9.26	12.16	30
	2437	12.27	11.83	15.07	30
	2462	9.35	8.86	12.12	30

Note: For 802.11b/g/n the device employed Cyclic Delay Diversity (CDD) for 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 = 4.9dBi < 6dBi

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

Applicable Standard

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

Test Procedure

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
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).

Test Data

Environmental Conditions

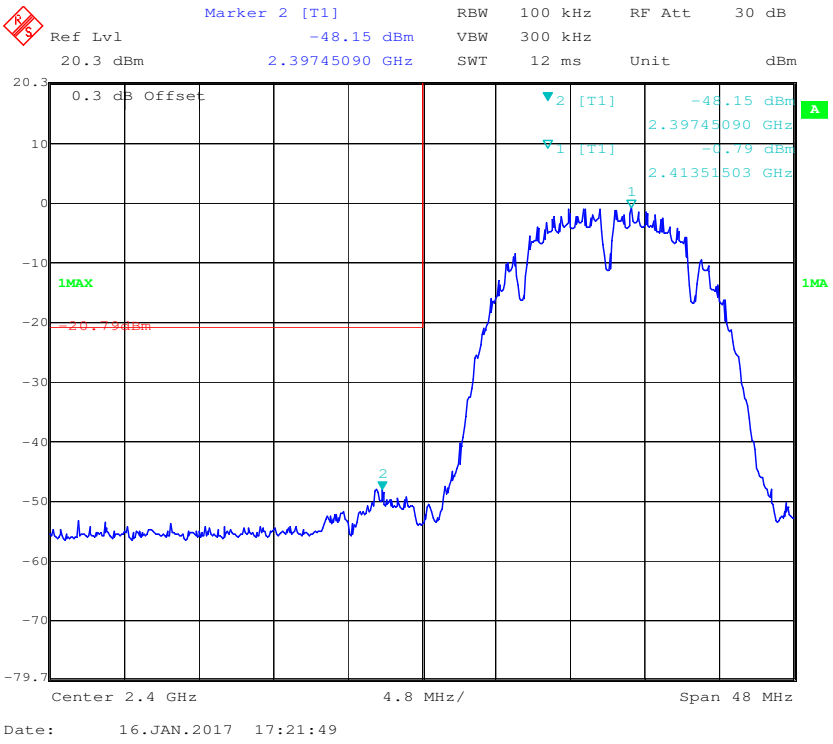
Temperature:	26.3 °C
Relative Humidity:	39 %
ATM Pressure:	95.4 kPa

The testing was performed by Kevin Hu on 2017-01-16.

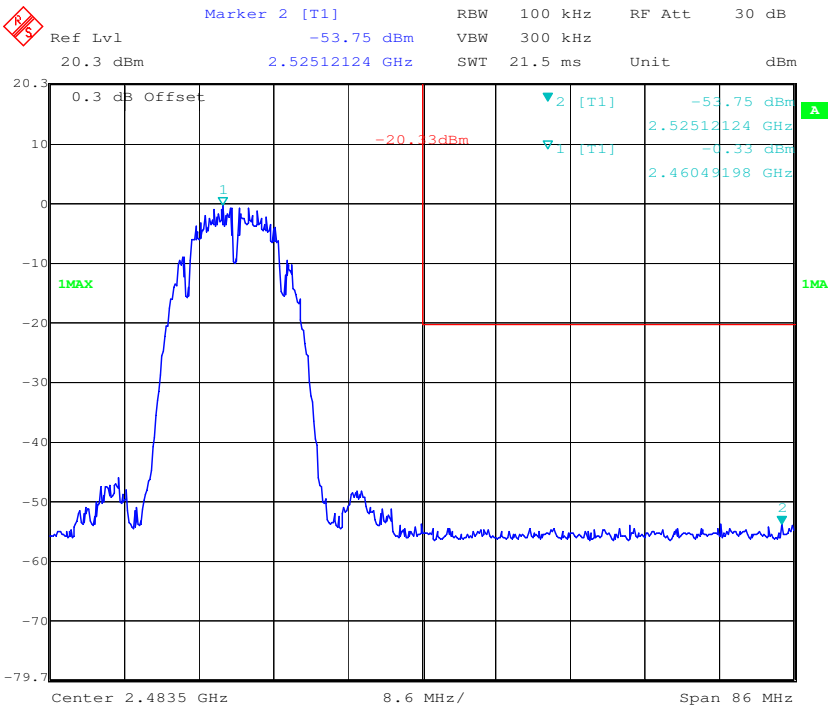
Test mode: Transmitting

Test Result: Compliant. Please refer to following plots.

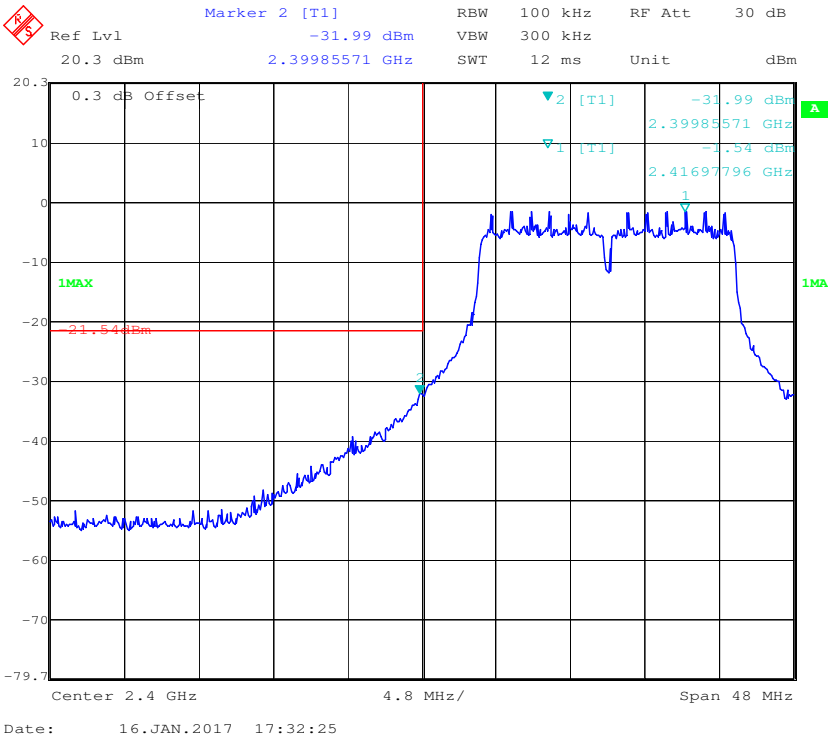
Chain 0-802.11b Band Edge, Left Side



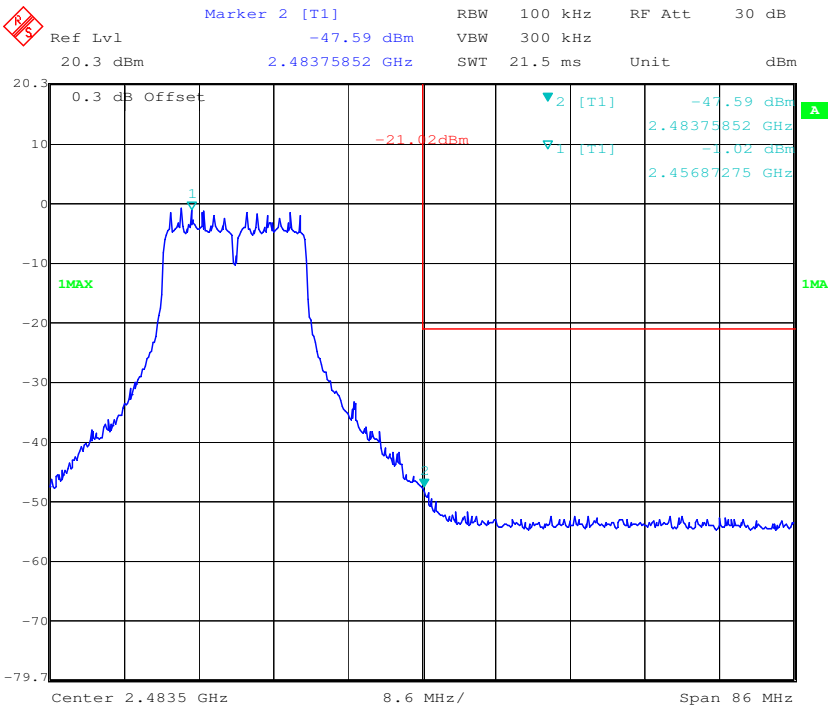
Chain 0-802.11b Band Edge, Right Side



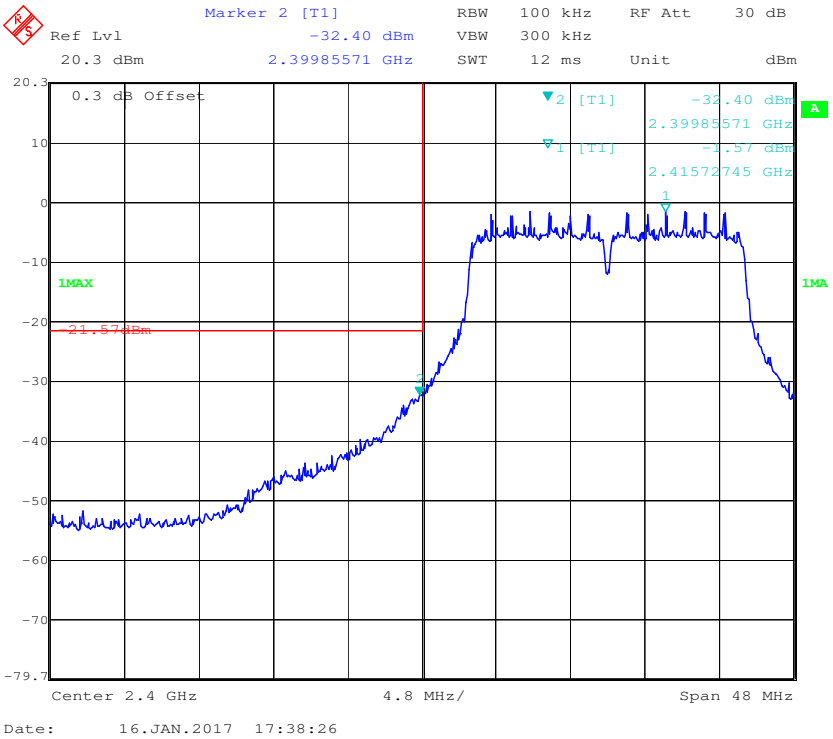
Chain 0-802.11g Band Edge, Left Side



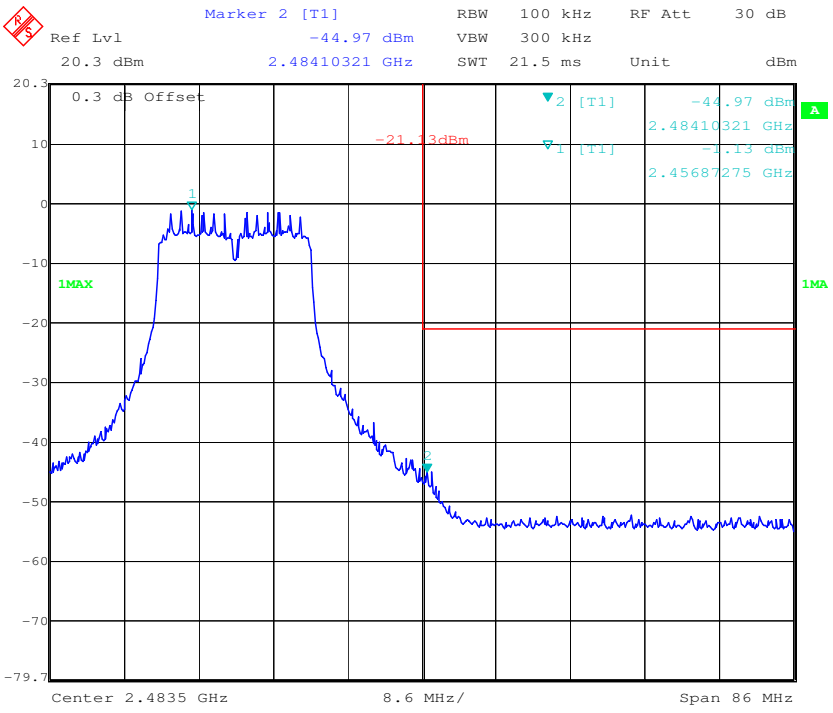
Chain 0-802.11g Band Edge, Right Side



Chain 0-802.11n ht20 Band Edge, Left Side



Chain 0-802.11n ht20 Band Edge, Right Side



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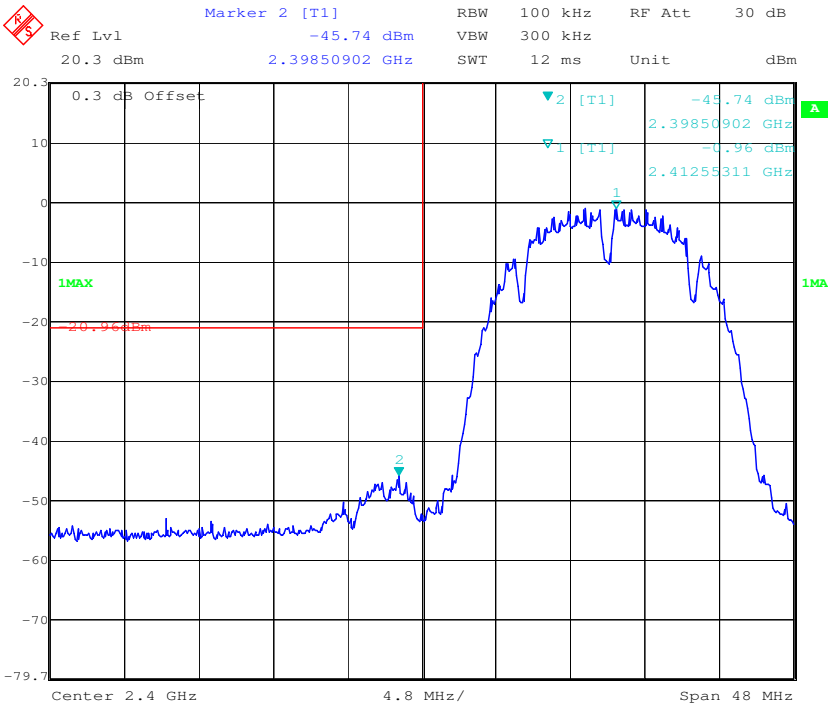
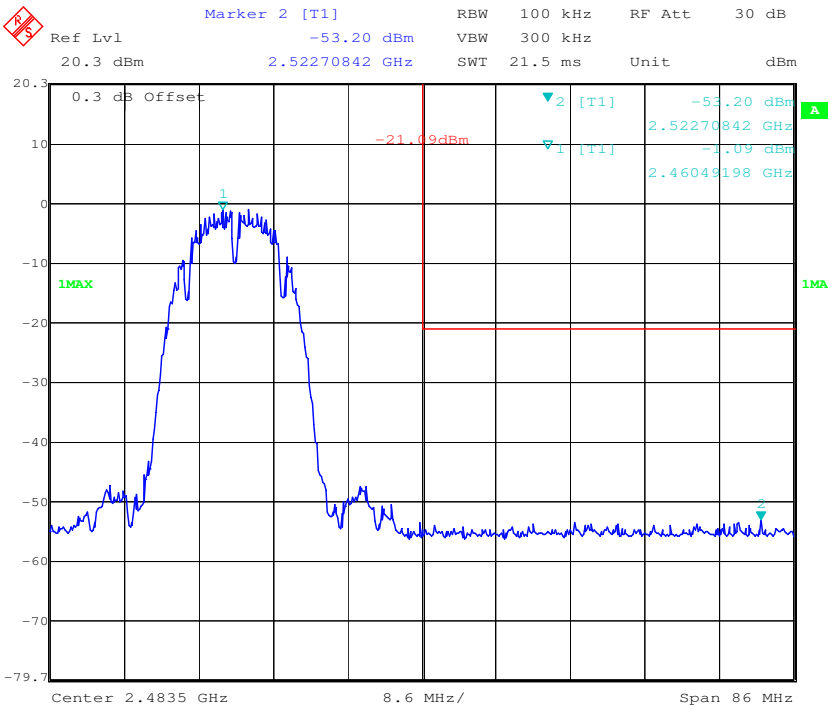
Chain 1-802.11b Band Edge, Left Side

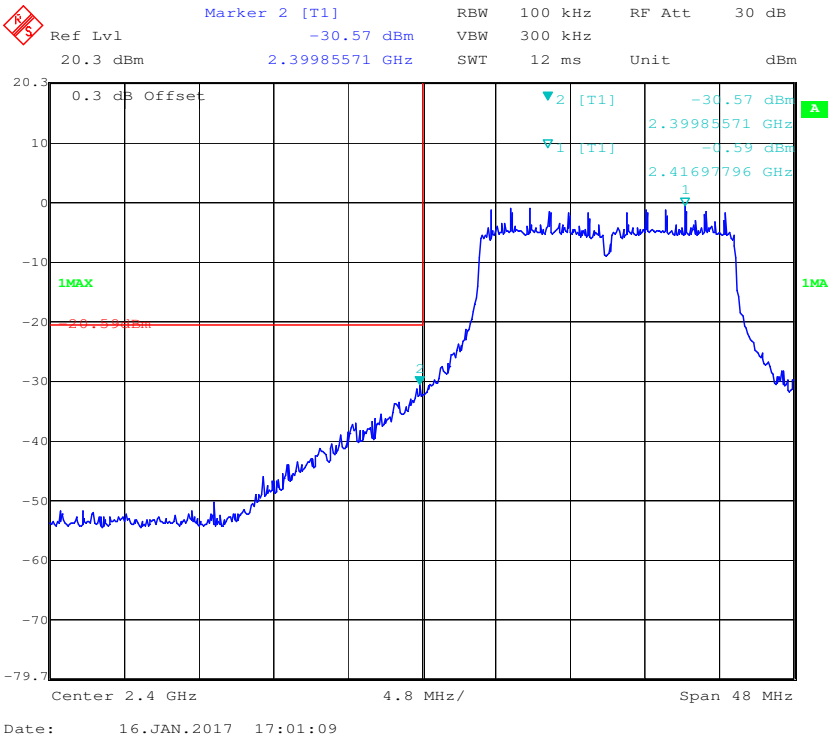


Date: 16.JAN.2017 16:49:34

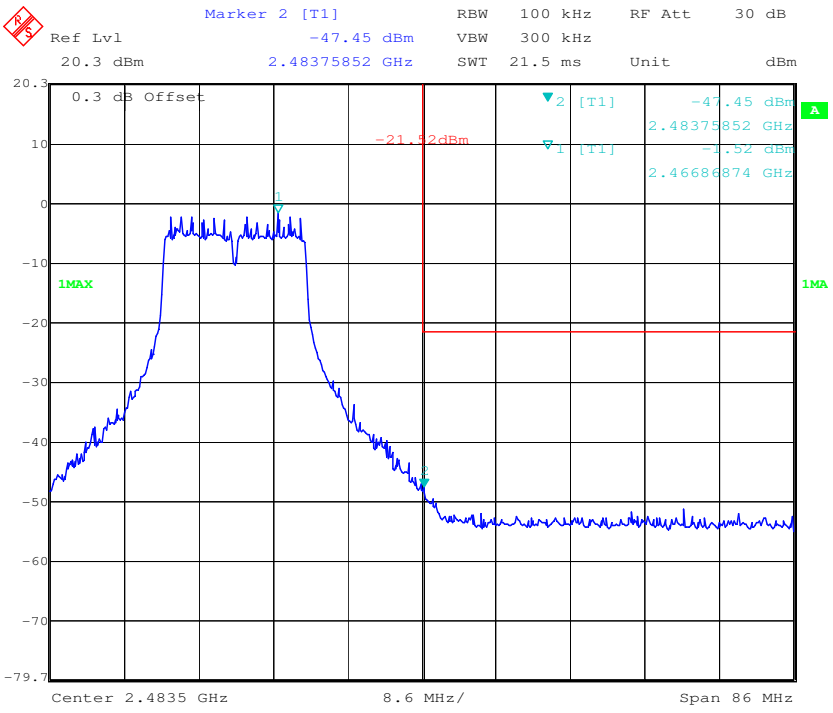
Chain 1-802.11b Band Edge, Right Side



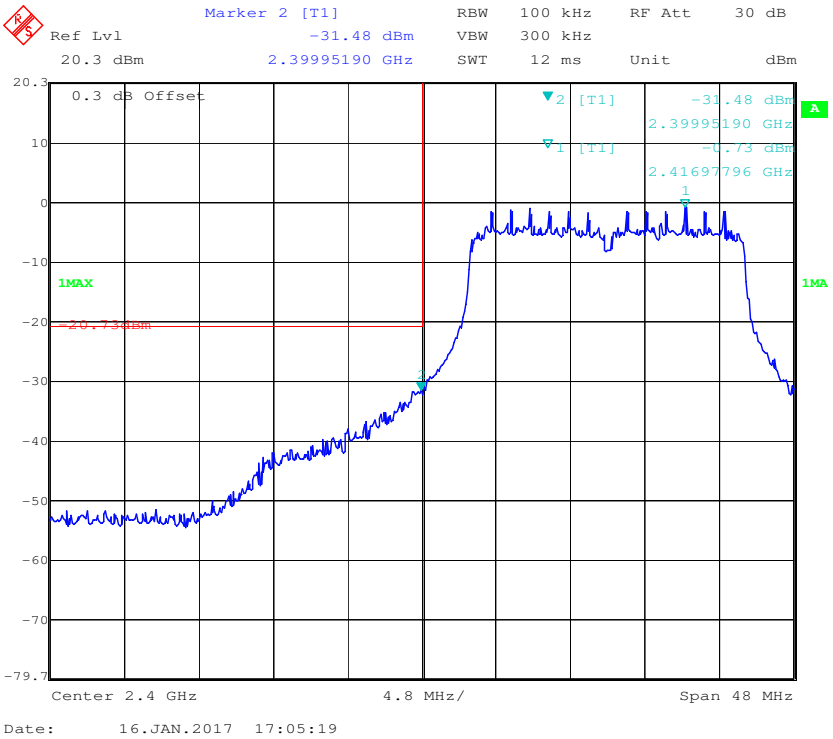
Chain 1-802.11g Band Edge, Left Side



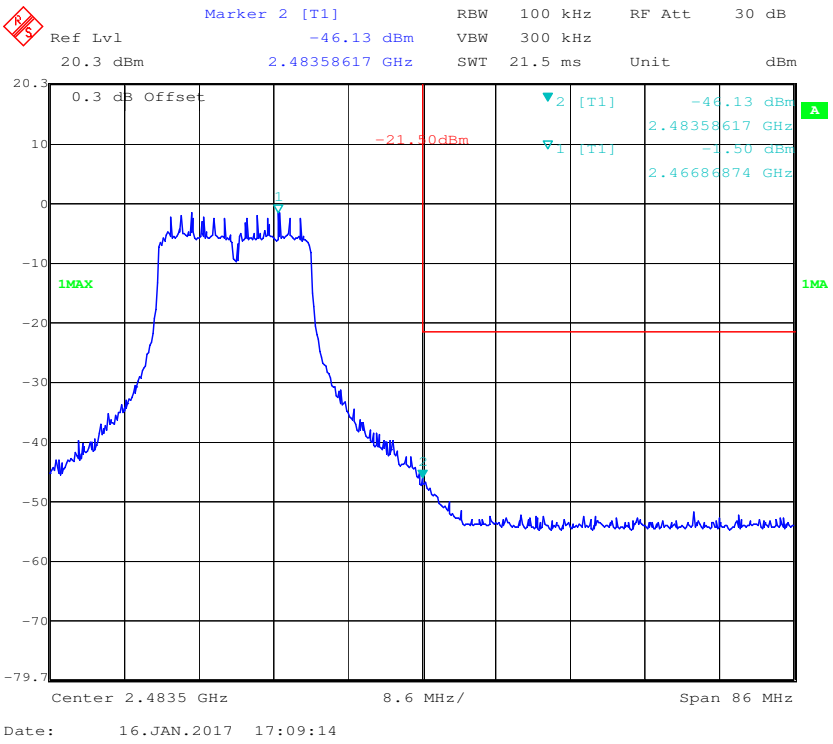
Chain 1-802.11g Band Edge, Right Side



Chain 1-802.11n ht20 Band Edge, Left Side



Chain 1-802.11n ht20 Band Edge, Right Side



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

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 was set 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 the RBW = 3 kHz, VBW = 10 kHz, Set the span to 1.5 times the DTS bandwidth.
4. Use the peak marker function to determine the maximum amplitude level.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	Signal Analyzer	FSIQ26	831929/005	2016-09-21	2017-09-20
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).

Test Data

Environmental Conditions

Temperature:	26.3 °C
Relative Humidity:	39 %
ATM Pressure:	95.4 kPa

The testing was performed by Kevin Hu on 2017-01-16.

Test Result: Compliance

Test Mode: Transmitting

Test mode	Channel	Frequency MHz	Power Spectral Density (dBm/3kHz)		Total (dBm/3kHz)	Limits (dBm/3kHz)	Result
			Chain 0	Chain 1			
802.11b	Low	2412	-16.8	-17.26	-14.01	6.1	Compliance
	Middle	2437	-13.66	-14.91	-11.23	6.1	Compliance
	High	2462	-17.42	-16.7	-14.03	6.1	Compliance
802.11g	Low	2412	-16.94	-17.05	-13.98	6.1	Compliance
	Middle	2437	-14.74	-15.23	-11.97	6.1	Compliance
	High	2462	-17.29	-18.33	-14.77	6.1	Compliance
802.11n20	Low	2412	-17.39	-17.58	-14.47	6.1	Compliance
	Middle	2437	-14.79	-14.19	-11.47	6.1	Compliance
	High	2462	-17.42	-17.06	-14.23	6.1	Compliance

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.

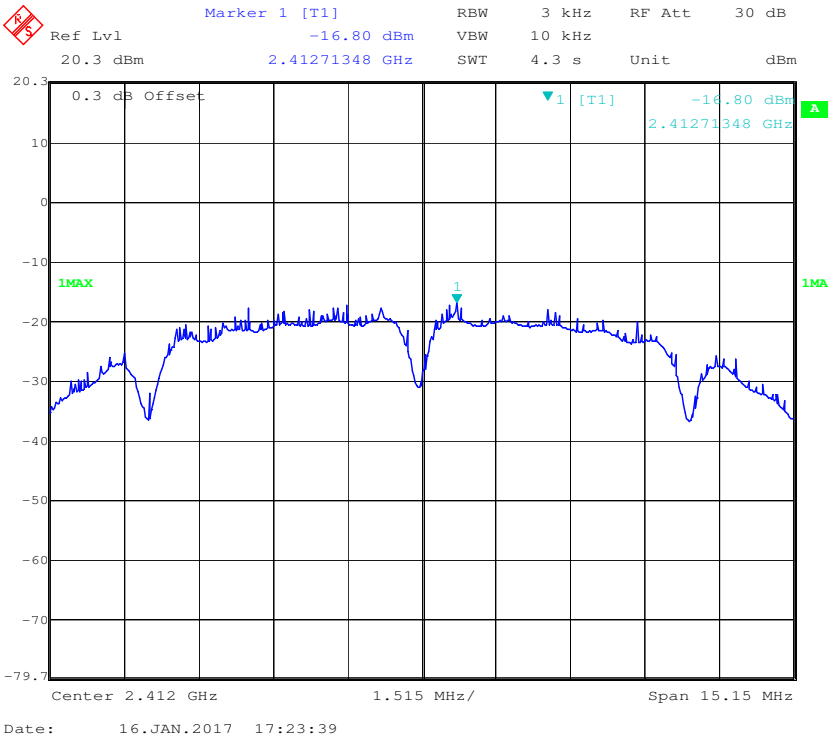
So:

Directional gain = GANT + Array Gain = 4.9+10*log(2) =7.9 dBi

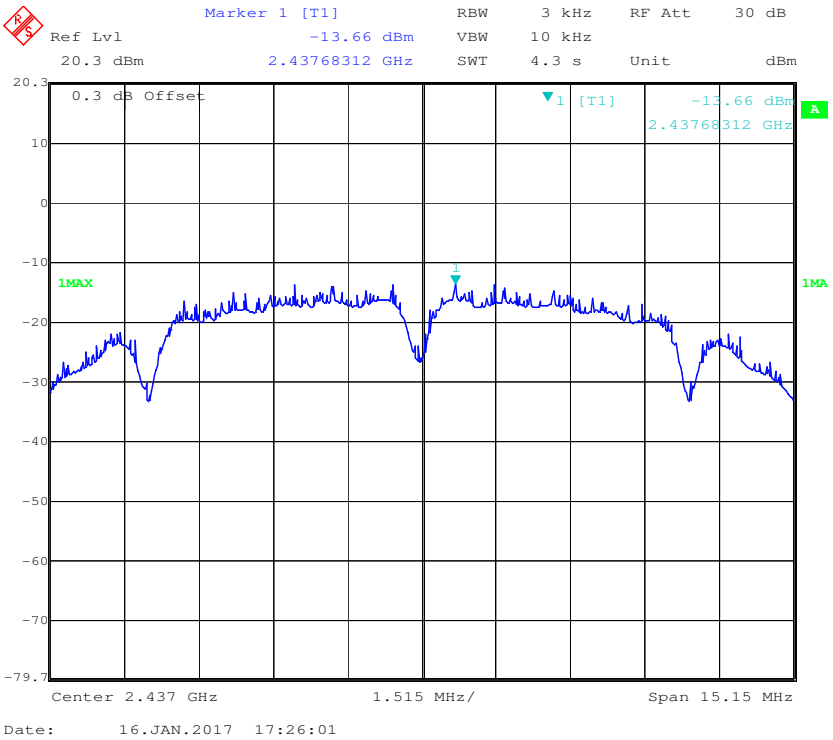
The Power density Limits was reduce 1.9dB

Please refer to the following plots

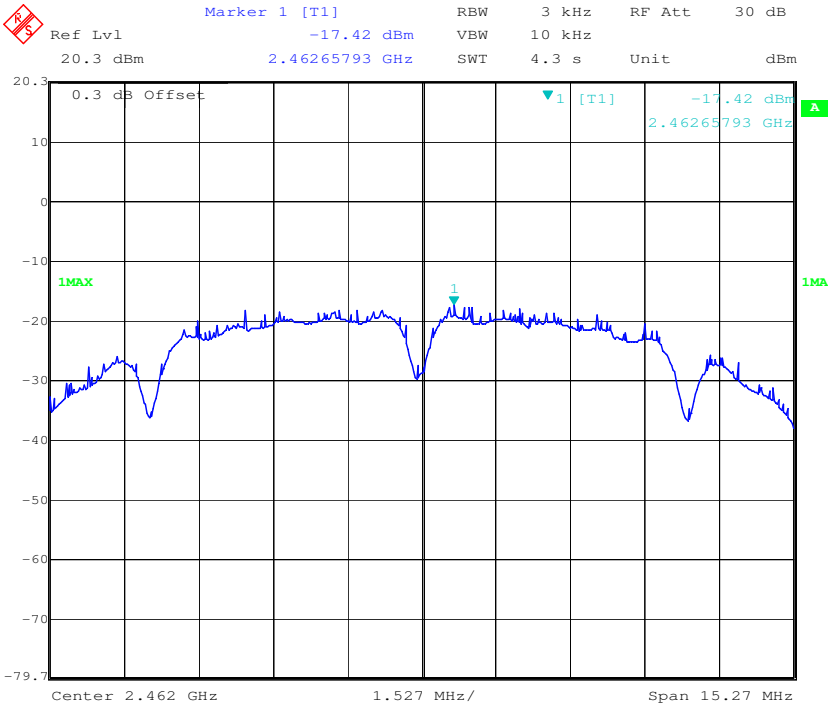
Chain 0-Power Spectral Density, 802.11b Low Channel



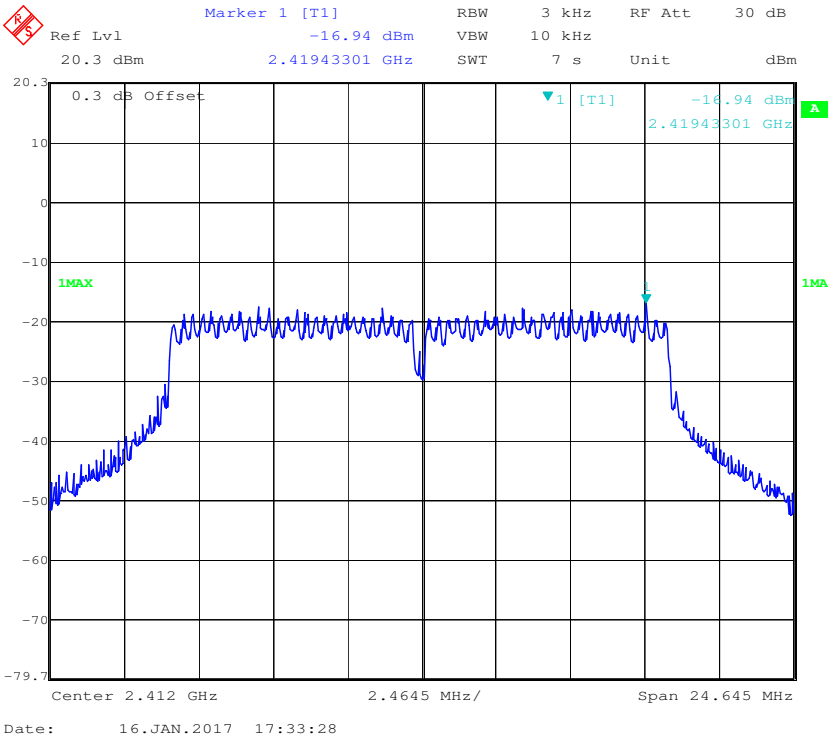
Chain 0-Power Spectral Density, 802.11b Middle Channel



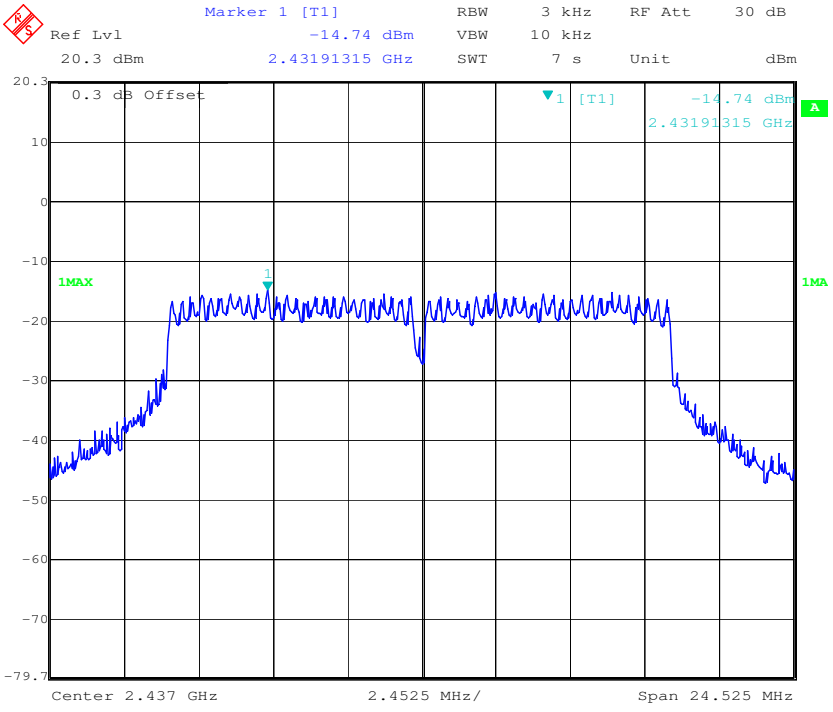
Chain 0-Power Spectral Density, 802.11b High Channel



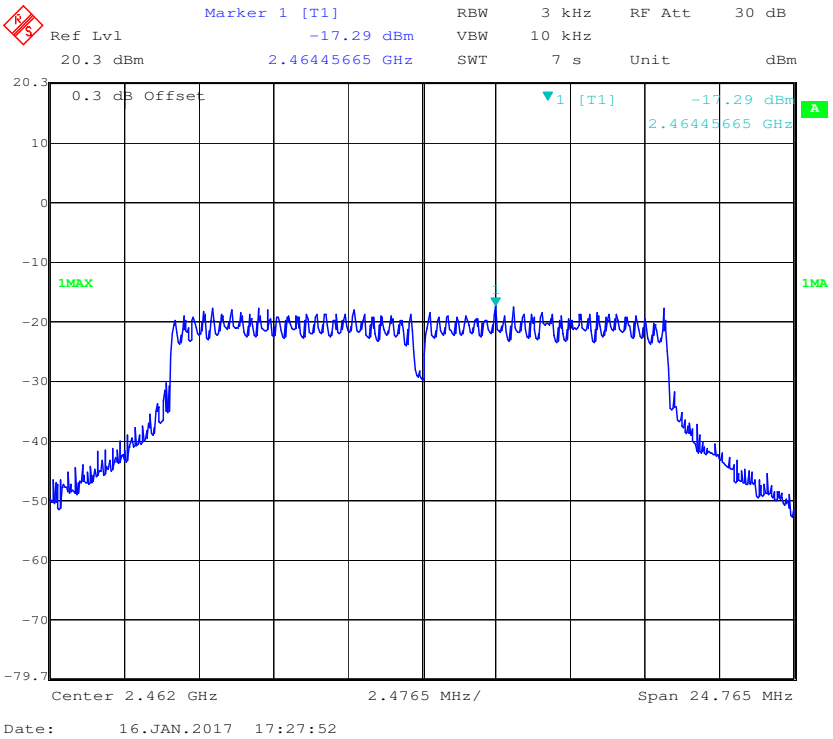
Chain 0-Power Spectral Density, 802.11g Low Channel



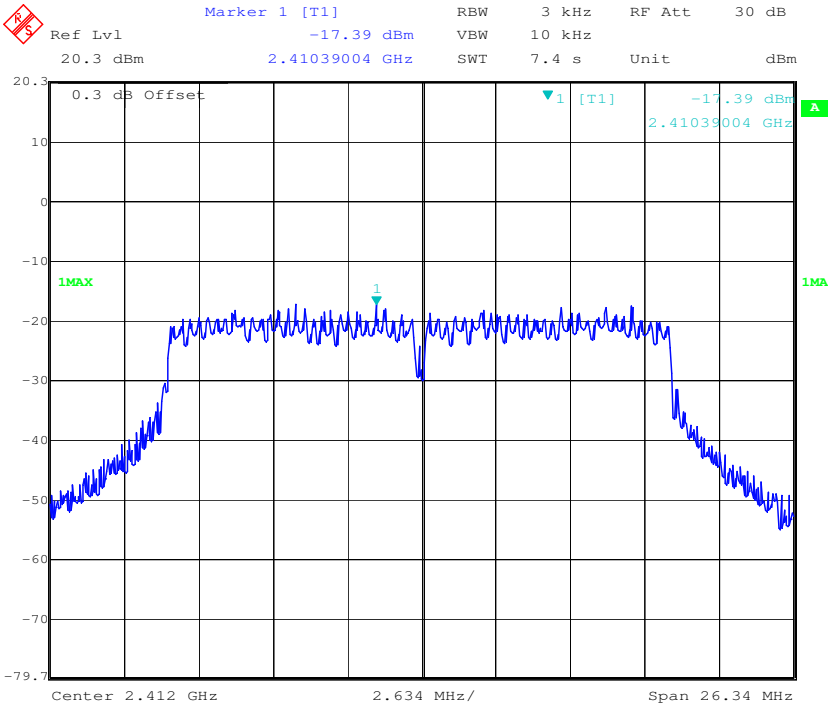
Chain 0-Power Spectral Density, 802.11g Middle Channel



Chain 0-Power Spectral Density, 802.11g High Channel



Chain 0-Power Spectral Density, 802.11n ht20 Low Channel



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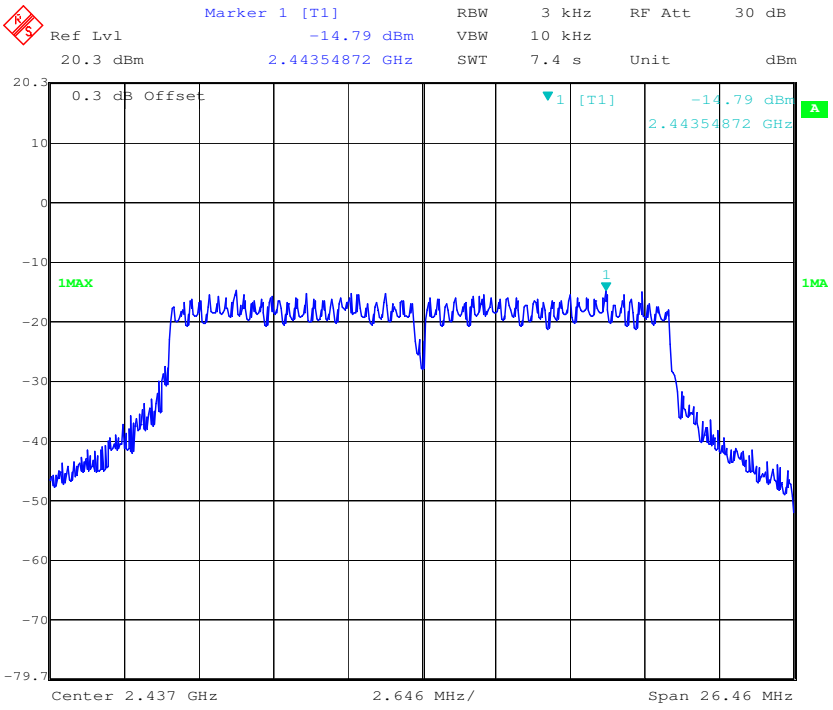
Chain 0-Power Spectral Density, 802.11n ht20 Middle Channel



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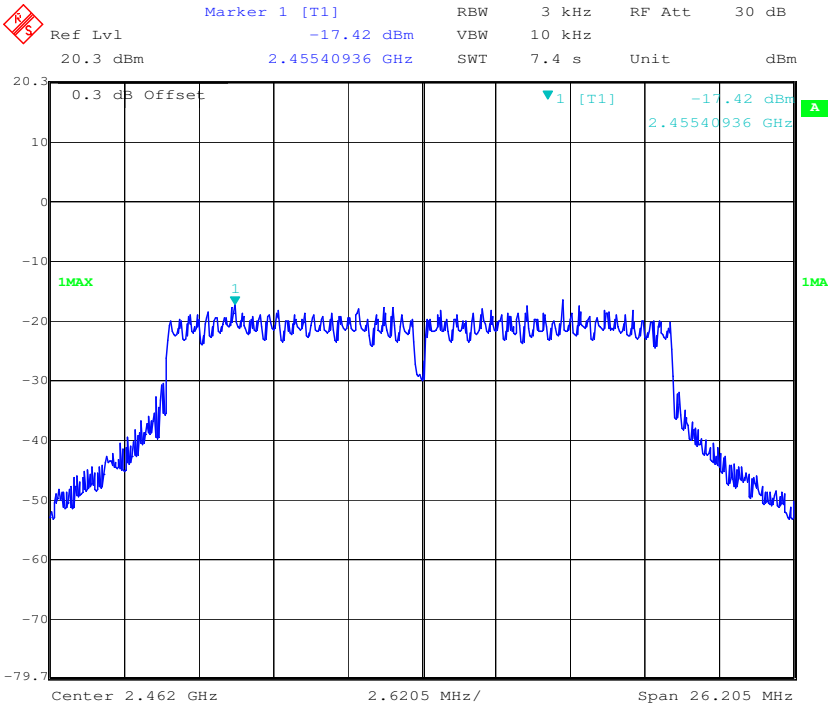
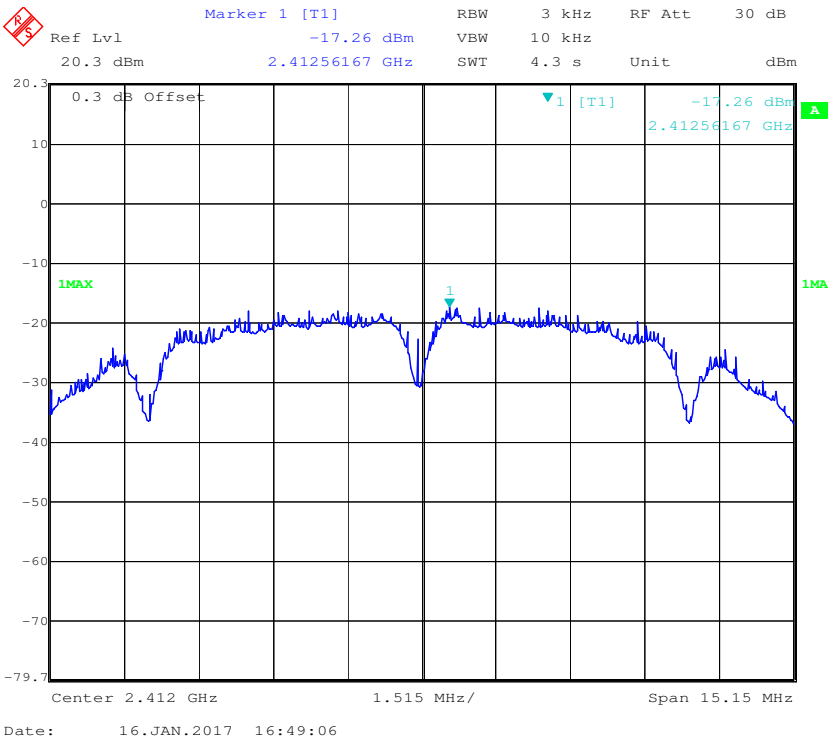
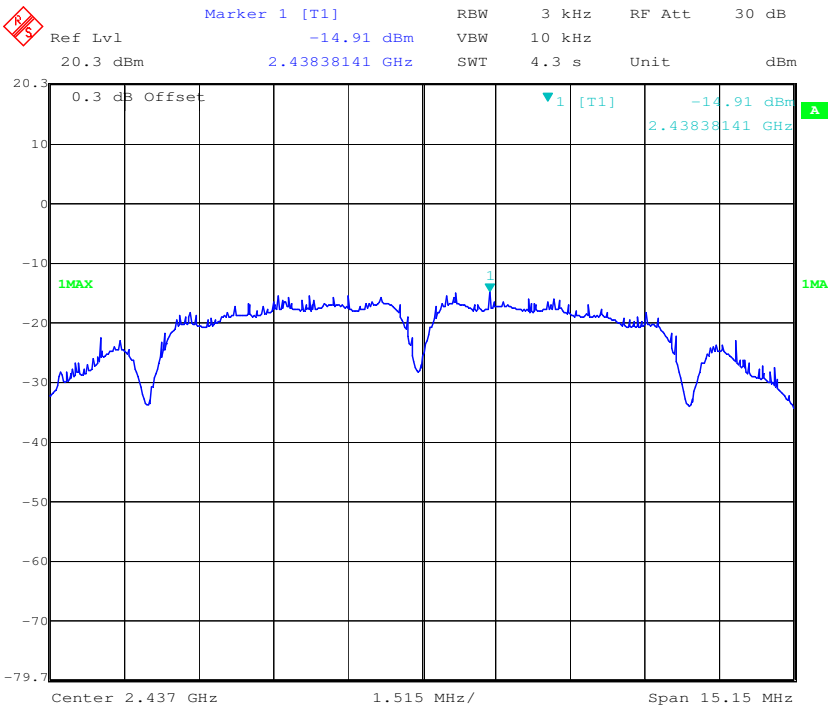
Chain 0-Power Spectral Density, 802.11n ht20 High Channel



Chain 1-Power Spectral Density, 802.11b Low Channel

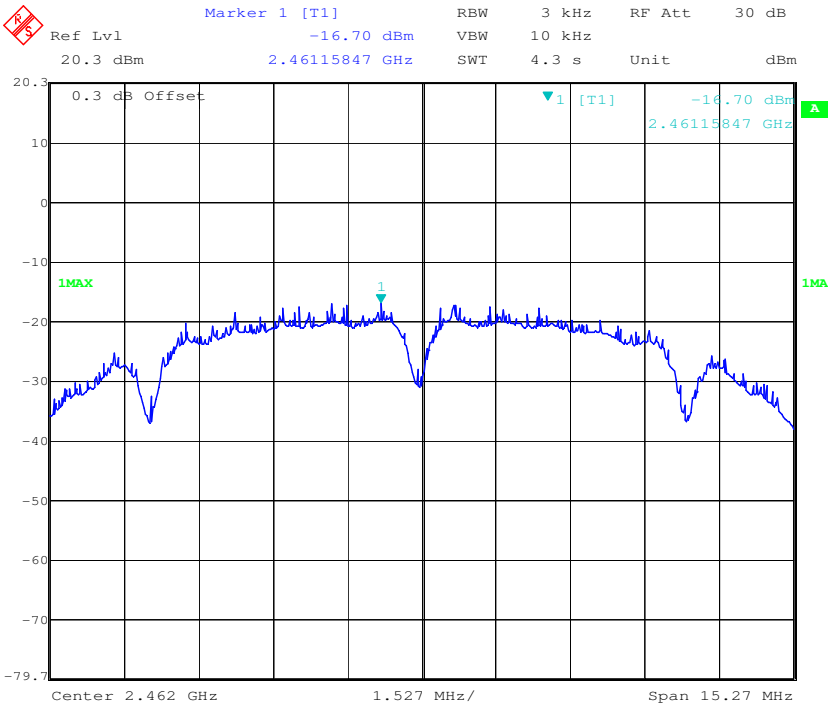


Chain 1-Power Spectral Density, 802.11b Middle Channel



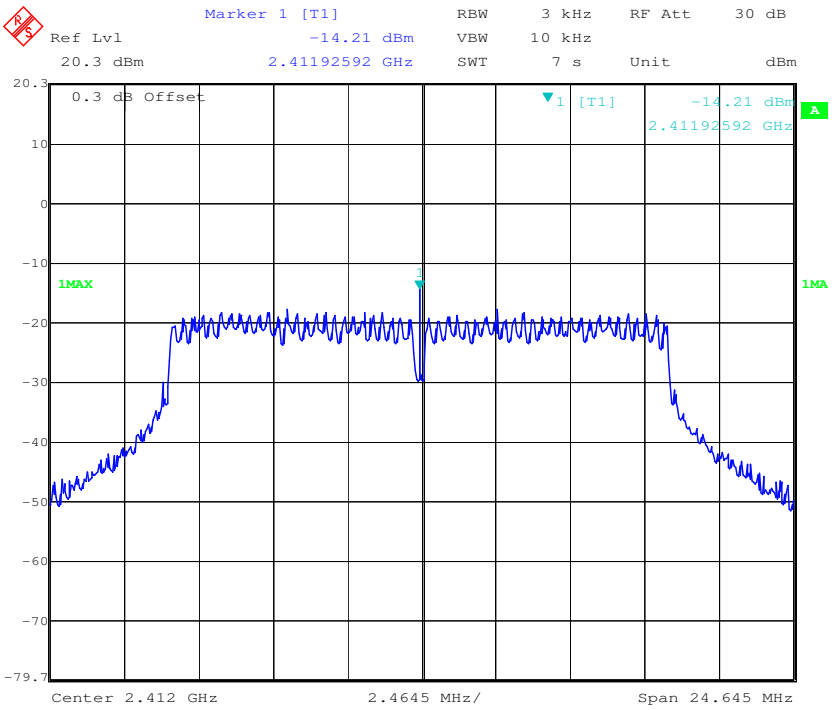
Date: 16.JAN.2017 16:51:01

Chain 1-Power Spectral Density, 802.11b High Channel



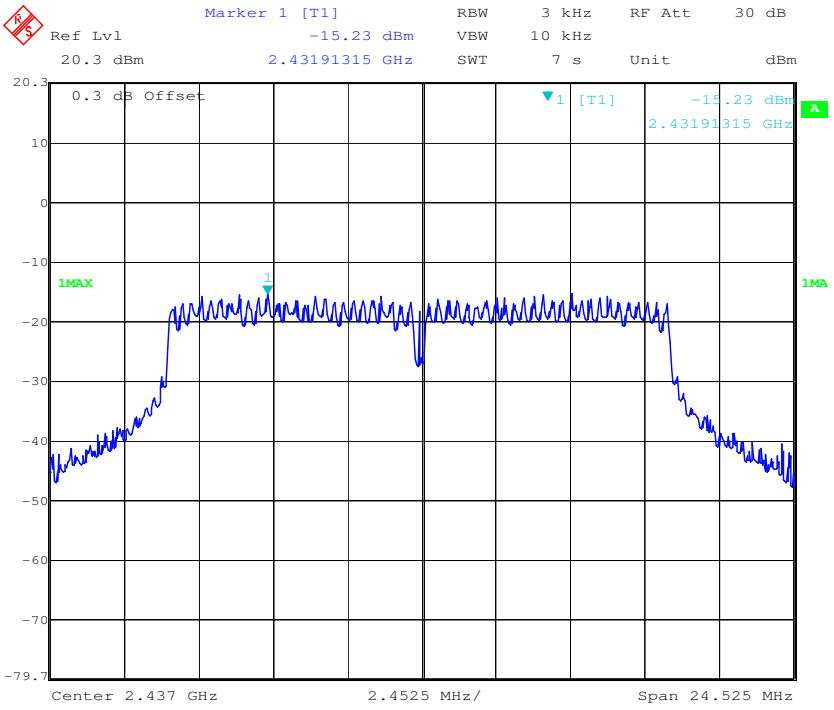
Date: 16.JAN.2017 16:52:43

Chain 1-Power Spectral Density, 802.11g Low Channel



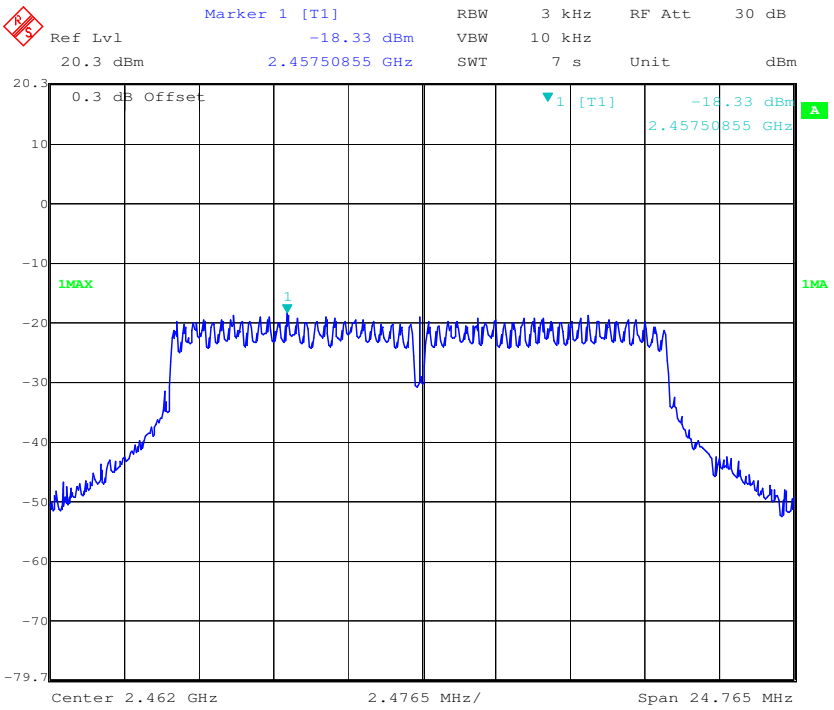
Date: 16.JAN.2017 17:00:41

Chain 1-Power Spectral Density, 802.11g Middle Channel



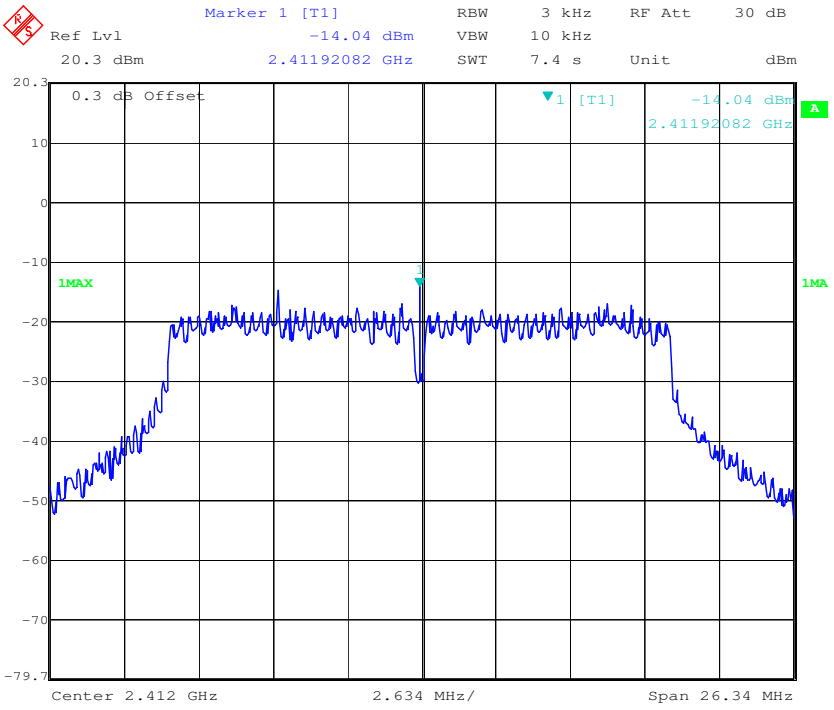
Date: 16.JAN.2017 16:58:57

Chain 1-Power Spectral Density, 802.11g High Channel



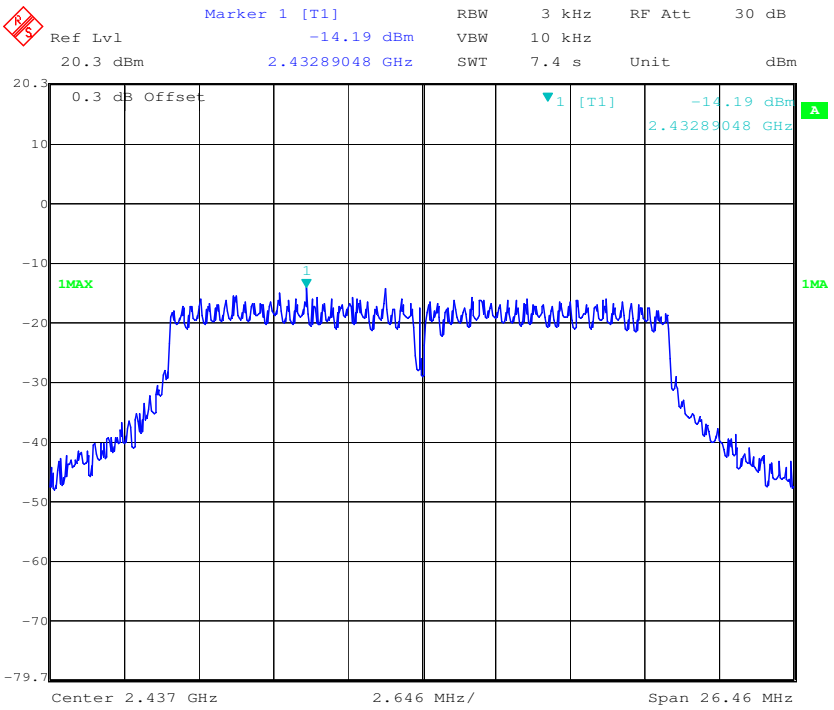
Date: 16.JAN.2017 16:57:08

Chain 1-Power Spectral Density, 802.11n ht20 Low Channel



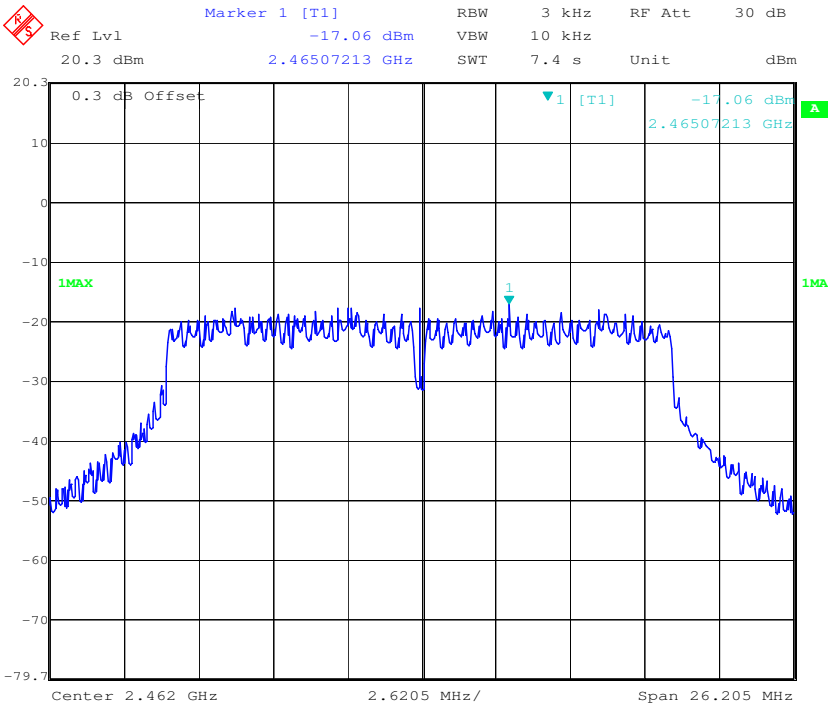
Date: 16.JAN.2017 17:04:32

Chain 1-Power Spectral Density, 802.11n ht20 Middle Channel



Date: 16.JAN.2017 17:06:54

Chain 1-Power Spectral Density, 802.11n ht20 High Channel



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