



# FCC PART 15.247 TEST REPORT

For

## **Advanced Mobile Payment Inc.**

Units 401-403, 15 Wertheim Court. Richmond Hill, Ontario L4B 3H7 Canada

FCC ID: 2AKJB-AMP6700

Report Type:
Original Report

Report Number: RSZ180809001-00C

Report Date: 2018-10-16
Simon Wang
Reviewed By: RF Engineer

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**Note**: This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA\* or any agency of the Federal Government. \* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "\*".

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#### **GENERAL INFORMATION**

#### **Product Description for Equipment under Test (EUT)**

The Advanced Mobile Payment Inc.'s product, model number: AMP 6700 (FCC ID: 2AKJB-AMP6700) or the "EUT" in this report was a AMP 6700, which was measured approximately: 19.7 cm (L) \* 19.2 cm (W) \*4.4 cm (H), rated with input voltage: DC 9.5V from adapter.

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Adapter Information:

Model: ADS-25SG-12-2 09524E

Input: AC 100-240V, 50/60Hz, Max. 0.7 A

Output: DC 9.5V, 2.5A

\*All measurement and test data in this report was gathered from production sample serial number: 180809001. (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-08-09.

#### **Objective**

This report is prepared on behalf of *Advanced Mobile Payment Inc.* in accordance with Part 2-Subpart J, Part 15-Subparts A and C of the Federal Communication Commission's rules.

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

#### Related Submittal(s)/Grant(s)

FCC Part 15B JAB, Part 15.247 DSS and Part 15.225 DXX submissions with FCC ID: 2AKJB-AMP6700.

#### **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.

And KDB 558074 D01 DTS Meas Guidance v04.

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

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#### **Measurement Uncertainty**

Para	meter	Uncertainty
Occupied Char	nnel Bandwidth	±5%
RF Output Power	with Power meter	±0.5dB
RF conducted to	est with spectrum	±1.5dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions,	Below 1GHz	±4.75dB
Radiated	Above 1GHz	±4.88dB
Temp	erature	±3℃
Humidity		±6%
Supply	voltages	±0.4%

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#### **Test Facility**

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

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## **SYSTEM TEST CONFIGURATION**

## **Description of Test Configuration**

For 802.11b, 802.11g and 802.11n-HT20 mode, 11 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	11	2462
5	2432	/	/
6	2437	/	/
7	2442	/	/

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For 802.11b, 802.11g, 802.11n-HT20 mode, EUT was tested with Channel 1, 6 and 11

For BLE mode, 40 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2437
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2462
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	39	2480

EUT was tested with Channel 0, 19 and 39.

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#### **Equipment Modifications**

No modification was made to the EUT tested.

#### **EUT Exercise Software**

BLE & Wi-Fi test in the engineer mode.

The device was tested with the worst case was performed as below:

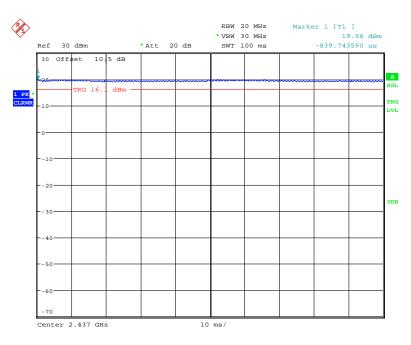
Mode	Data rate	Power level			
Mode	Data rate	Low channel	Middle channel	High channel	
802.11b	1 Mbps	17	17	17	
802.11g	6 Mbps	13	13	13	
802.11n-HT20	MCS0	13	13	13	
BLE	/	Default	Default	Default	

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Pre-scan with all the data rates, the above data rate is the worst case for Wi-Fi test.

## **Duty cycle**

#### 802.11b mode

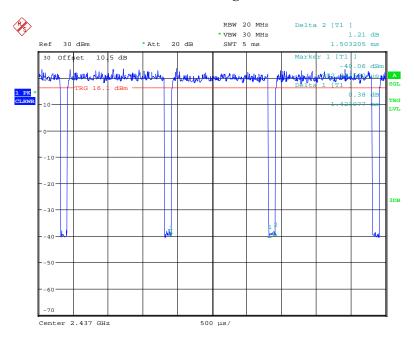


Date: 30.SEP.2018 21:01:28

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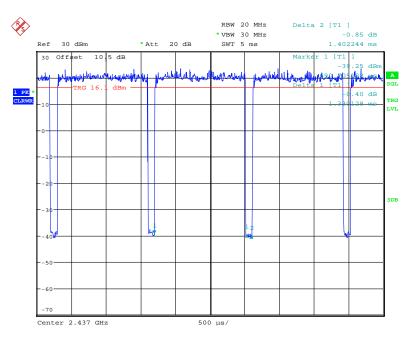
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#### 802.11g mode



Date: 30.SEP.2018 21:00:39

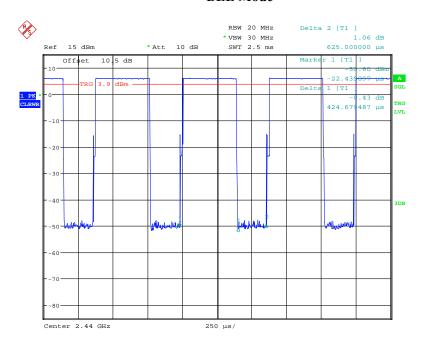
#### 802.11n-HT20 Mode



Date: 30.SEP.2018 20:59:12

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**BLE Mode** 



Date: 30.SEP.2018 21:48:52

Mode	Duty Cycle (%)	T(us)	1/T(kHz)	VBW Setting	10log(1/ Duty Cycle)
802.11b	100	-	-	10Hz	0
802.11g	94.67	1423	0.70	1kHz	0.238
802.11n-HT20	94.86	1330	0.75	1kHz	0.229
BLE	67.95	424.68	2.35	3kHz	1.678

## **Support Equipment List and Details**

Manufacturer	Description	Model	Serial Number
Lenovo	Notebook	SR860	100000633225
Lenovo	Notebook	Air 15	100897564
Lenovo	Mouse	M300	11093844046
Philip	Earphone	SHE3705BK	28232617325
N/A	POE	PSE801FM	N/A

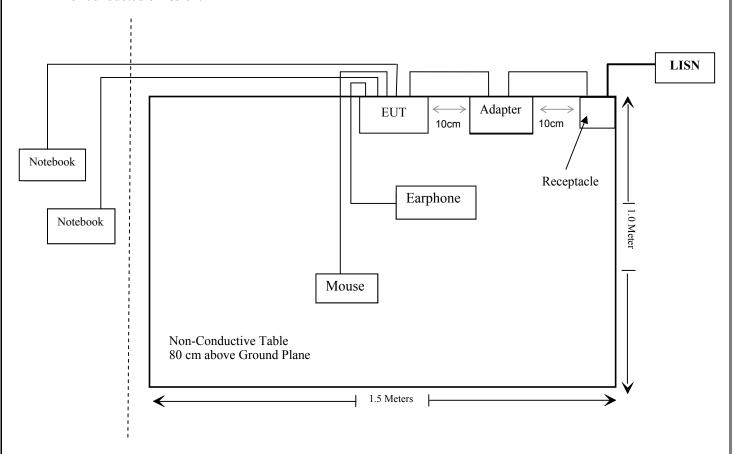
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Cable Description	Length (m)	From/Port	То
Un-Shielding Detachable DC Cable	1.2	EUT	Adapter
Un-shielding Detachable AC Cable	0.8	Adapter	Receptacle
Un-shielding Detachable Earphone Cable	0.8	EUT	Earphone
Un-shielding Undetachable AC Cable	1.0	Receptacle	LISN
Un-shielding Detachable RJ45 Cable	0.8	EUT	POE
Un-shielding Detachable AC Cable	1.0	POE	LISN

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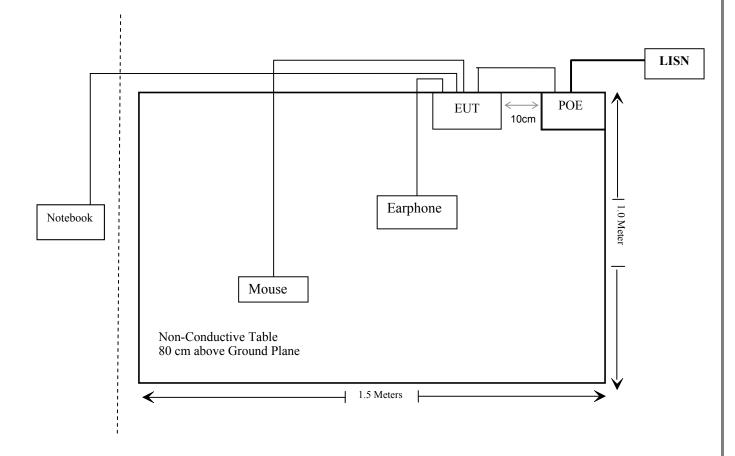
## **Block Diagram of Test Setup**

For conducted emission:



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## For POE Supply:



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## **SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b) (1)& §2.1091	Maximum Permissible exposure (MPE)	Compliance
§15.203	Antenna Requirement	Compliance
§15.207 (a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247 (a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Conducted Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

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## TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date		
	Conducted Emissions Test						
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2018-08-04	2019-08-04		
Rohde & Schwarz	LISN	ENV216	3560.6650.12- 101613-Yb	2017-12-21	2018-12-21		
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2018-05-12	2018-11-21		
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR		
/	Conducted Emission Cable	/	UF A210B-1- 0720-504504	2018-05-12	2018-11-12		
	Radia	ated Emission T	`est				
A.H.System	Horn Antenna	SAS-200/571	135	2018-08-18	2021-08-17		
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-06-23	2019-06-23		
COM-POWER	Pre-amplifier	PA-122	181919	2018-05-22	2018-11-22		
Sonoma instrument	Amplifier	310N	186238	2018-05-12	2018-11-12		
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21		
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-01-11	2019-01-11		
Ducommun technologies	RF Cable	UFA147A- 2362-100100	MFR64639 231029-003	2018-08-01	2019-02-01		
Ducommun technologies	RF Cable	104PEA	218124002	2018-05-21	2018-11-19		
Ducommun technologies	RF Cable	RG-214	1	2018-05-21	2018-11-21		
Ducommun technologies	RF Cable	RG-214	2	2018-05-22	2018-11-22		
Ducommun Technologies	Horn Antenna	ARH-4223- 02	1007726-04	2017-12-29	2020-12-28		
Heatsink Required	Amplifier	QLW- 18405536-J0	15964001002	2018-08-01	2019-02-01		
Sinoscite	Notch Filter	BSF2402- 2480MN- 0898-001	N/A	2018-05-21	2018-11-21		
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR		

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<sup>\*</sup> Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

# FCC §15.247 (i) & §1.1307 (b) (1) & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

#### **Applicable Standard**

According to subpart 15.247 (i) and subpart 1.1307 (b)(1), 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

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Limits for General Population/Uncontrolled Exposure					
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (Minutes)	
0.3-1.34	614	1.63	*(100)	30	
1.34-30	824/f	2.19/f	$*(180/f^2)$	30	
30-300	27.5	0.073	0.2	30	
300-1500	/	/	f/1500	30	
1500-100,000	/	/	1.0	30	

f = frequency in MHz

#### Result

#### **Calculated Formulary:**

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm2)

P = power input to the antenna (in appropriate units, e.g., mW).

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

Frequency	Antenna Gain		Conducted Power		Evaluation	Power	MPE Limit
(MHz)	(dBi)	(numeric)	(dBm)	(mW)	Distance (cm)	Density (mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )
wifi	1.5	1.41	21.0	125.9	20	0.035	1
BLE	1.5	1.41	5.5	3.5	20	0.001	1

Note: To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 20cm from nearby persons.

#### **Result: Compliance**

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<sup>\* =</sup> Plane-wave equivalent power density

## 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:

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- 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.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **Antenna Connector Construction**

The EUT has an internal antenna arrangement, which was permanently attached and the antenna gain is 1.5 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

**Result:** Compliance.

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## FCC §15.207 (a) – AC LINE CONDUCTED EMISSIONS

#### **Applicable Standard**

FCC§15.207

#### **EUT Setup**



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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.

#### **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 outlet of the LISN.

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

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

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#### Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

Correction Factor = LISN VDF + Cable Loss + Transient Limiter Attenuation

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

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Margin = Limit – Corrected Amplitude

#### **Test Results Summary**

According to the recorded data in following table, the EUT complied with the FCC Part 15.207,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_{\rm m} + U_{(L{\rm m})} \leq L_{\rm lim} + U_{\rm cispr}$$

In BACL,  $U_{(Lm)}$  is less than  $U_{cispr}$ , if  $L_m$  is less than  $L_{lim}$ , it implies that the EUT complies with the limit.

#### **Test Data**

#### **Environmental Conditions**

Temperature:	25 ℃
Relative Humidity:	52 %
ATM Pressure:	101.0 kPa

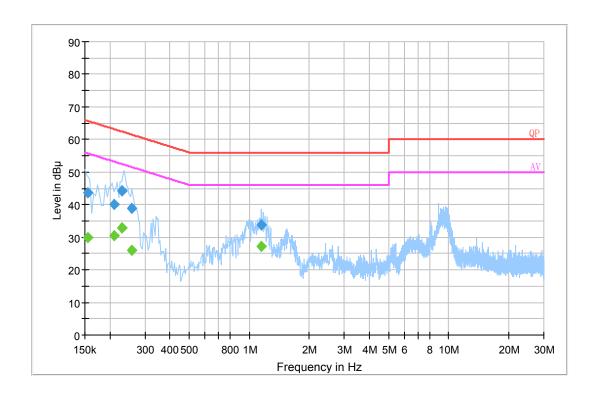
The testing was performed by Shawn Xiao on 2018-10-13.

EUT operation mode: Transmitting(pre-scan with BLE and wifi,worst case is wifi 802.11 G Mode, Middle channel).

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## Adapter power supply:

## AC 120 V/60 Hz, Line:

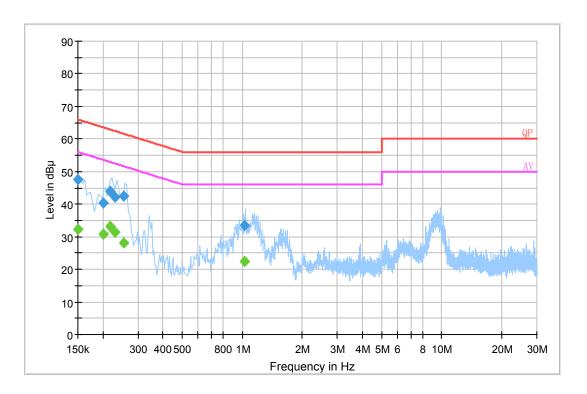


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Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.154500	43.7	19.8	65.8	22.1	QP
0.210500	40.1	19.7	63.2	23.1	QP
0.229500	44.4	19.7	62.5	18.1	QP
0.229500	44.3	19.7	62.5	18.2	QP
0.257500	39.0	19.7	61.5	22.5	QP
1.152750	33.8	19.8	56.0	22.2	QP
0.154500	29.8	19.8	55.8	26.0	Ave.
0.210500	30.4	19.7	53.2	22.8	Ave.
0.229500	32.9	19.7	52.5	19.6	Ave.
0.229500	32.8	19.7	52.5	19.7	Ave.
0.257500	26.1	19.7	51.5	25.4	Ave.
1.152750	27.2	19.8	46.0	18.8	Ave.

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## **AC 120V/ 60 Hz, Neutral:**



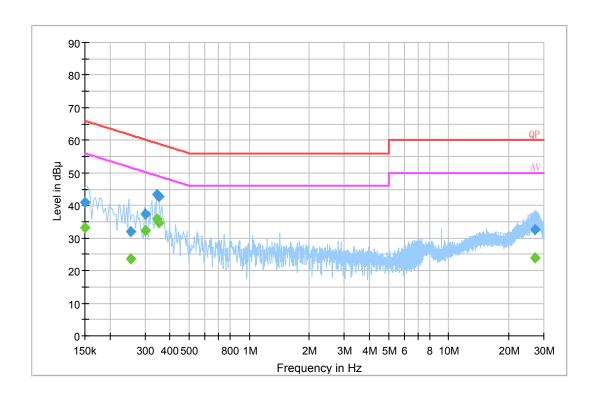
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Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.150000	47.6	19.8	66.0	18.4	QP
0.201500	40.3	19.7	63.5	23.2	QP
0.217500	43.9	19.7	62.9	19.0	QP
0.229500	42.2	19.7	62.5	20.3	QP
0.253500	42.5	19.7	61.6	19.1	QP
1.030430	33.5	19.8	56.0	22.5	QP
0.150000	32.3	19.8	56.0	23.7	Ave.
0.201500	30.8	19.7	53.5	22.7	Ave.
0.217500	33.3	19.7	52.9	19.6	Ave.
0.229500	31.3	19.7	52.5	21.2	Ave.
0.253500	28.0	19.7	51.6	23.6	Ave.
1.030430	22.5	19.8	46.0	23.5	Ave.

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## POE Supply:

## AC 120 V/60 Hz, Line:

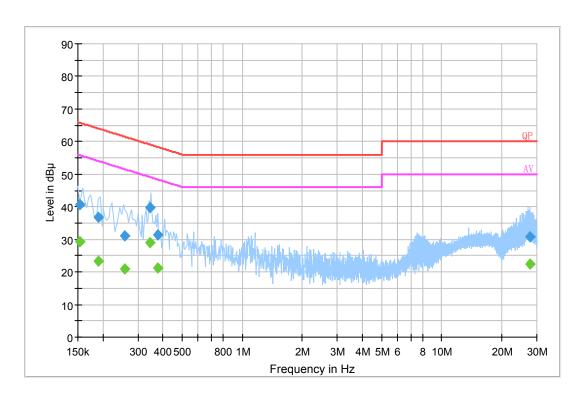


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Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.150000	41.0	19.8	66.0	25.0	QP
0.254500	32.0	19.7	61.6	29.6	QP
0.301500	37.2	19.8	60.2	23.0	QP
0.344810	43.3	19.7	59.1	15.8	QP
0.352690	42.8	19.7	58.9	16.1	QP
26.962630	32.5	20.4	60.0	27.5	QP
0.150000	33.2	19.8	56.0	22.8	Ave.
0.254500	23.7	19.7	51.6	27.9	Ave.
0.301500	32.4	19.8	50.2	17.8	Ave.
0.344810	35.8	19.7	49.1	13.3	Ave.
0.352690	34.7	19.7	48.9	14.2	Ave.
26.962630	24.0	20.4	50.0	26.0	Ave.

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#### **AC 120V/60 Hz, Neutral:**



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Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.154000	40.8	19.8	65.8	25.0	QP
0.189500	36.7	19.7	64.1	27.4	QP
0.257500	31.1	19.7	61.5	30.4	QP
0.344750	39.9	19.7	59.1	19.2	QP
0.376330	31.3	19.7	58.4	27.1	QP
27.668270	30.8	20.4	60.0	29.2	QP
0.154000	29.3	19.8	55.8	26.5	Ave.
0.189500	23.4	19.7	54.1	30.7	Ave.
0.257500	21.0	19.7	51.5	30.5	Ave.
0.344750	29.1	19.7	49.1	20.0	Ave.
0.376330	21.1	19.7	48.4	27.3	Ave.
27.668270	22.5	20.4	50.0	27.5	Ave.

#### **Note:**

- 1) Correction Factor =LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
  3) Margin = Limit Corrected Amplitude

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

#### **Applicable Standard**

FCC §15.247 (d); §15.209; §15.205;

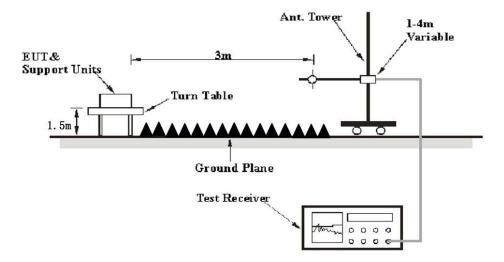
#### **EUT Setup**

#### **Below 1 GHz:**



Report No.: RSZ180809001-00C

#### Above 1GHz:



The radiated emission tests were performed in the 3 meters 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.

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#### **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:

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Frequency Range	Frequency Range RBW		IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1MHz	3 MHz	/	PK
	1MHz	10 Hz Note 1	/	Average
	1MHz	>1/T Note 2	/	Average

Note 1: when duty cycle is no less than 98% Note 2: when duty cycle is less than 98%

#### **Test Procedure**

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

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

#### **Corrected Amplitude & Margin Calculation**

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

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

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

Margin = Limit – Corrected Amplitude

#### **Test Results Summary**

According to the recorded data in following table, the EUT complied with the <u>FCC Title 47, Part 15, Subpart C</u>, section 15.205, 15.209 and 15.247.

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies with the limit if

$$L_{\rm m} + U_{(L{\rm m})} \leq L_{\rm lim} + U_{\rm cispr}$$

In BACL,  $U_{(Lm)}$  is less than  $U_{cispr}$ , if  $L_m$  is less than  $L_{lim}$ , it implies that the EUT complies with the limit.

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#### Test Data

#### **Environmental Conditions**

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

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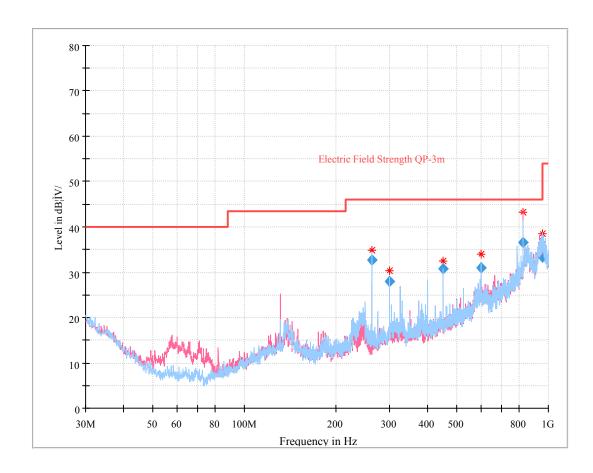
The testing was performed by Shawn Xiao on 2018-09-25.

EUT operation mode: Transmitting(worst case is low channel)

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#### **BLE Mode:**

#### 30 MHz~1 GHz:



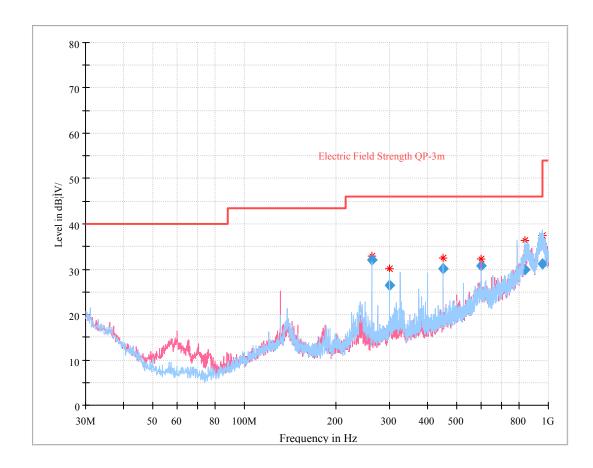
Report No.: RSZ180809001-00C

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
262.499125	32.66	131.0	Н	40.0	-13.2	46.00	13.34
300.021125	28.04	117.0	Н	263.0	-10.6	46.00	17.96
450.007500	30.83	108.0	Н	228.0	-8.2	46.00	15.17
600.017875	30.87	108.0	Н	251.0	-1.6	46.00	15.13
826.251125	36.65	361.0	V	47.0	4.5	46.00	9.35
960.032625	33.26	124.0	Н	0.0	9.2	53.90	20.64

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#### Wi-Fi Mode: (worst case is 802.11 G Mode, Middle channel)

#### 30 MHz~1 GHz:



Report No.: RSZ180809001-00C

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
262.490500	31.95	124.0	Н	30.0	-13.2	46.00	14.05
300.010000	26.39	143.0	Н	116.0	-10.6	46.00	19.61
449.985250	30.05	108.0	Н	221.0	-8.3	46.00	15.95
600.039375	30.65	144.0	V	201.0	-1.6	46.00	15.35
838.282250	29.86	117.0	Н	163.0	5.8	46.00	16.14
953.598375	31.25	337.0	Н	342.0	9.7	46.00	14.75

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## 1 GHz-25 GHz (BLE):

F	Re	eceiver	T4.11.	Rx Ar	itenna	Corrected	Corrected	T	Manda		
Frequency (MHz)	Reading (dBµV)	PK/QP/Ave.	Turntable Degree	Height (m)	Polar (H/V)	Factor (dB/m)	Amplitude (dBµV/m)	Limit (dBμV/m)	Margin (dB)		
Low Channel (2402 MHz)											
2402.00	68.31	PK	185	1.2	Н	33.00	101.31	/	/		
2402.00	67.21	Ave.	185	1.2	Н	33.00	100.21	/	/		
2402.00	60.50	PK	326	2.3	V	33.00	93.50	/	/		
2402.00	59.28	Ave.	326	2.3	V	33.00	92.28	/	/		
2385.69	27.79	PK	355	2.2	Н	33.00	60.79	74	13.21		
2385.69	13.54	Ave.	355	2.2	Н	33.00	46.54	54	7.46		
2484.40	28.02	PK	177	1.2	Н	33.20	61.22	74	12.78		
2484.40	13.37	Ave.	177	1.2	Н	33.20	46.57	54	7.43		
4804.00	47.57	PK	149	1.9	Н	7.88	55.45	74	18.55		
4804.00	43.34	Ave.	149	1.9	Н	7.88	51.22	54	2.78		
		<b>,</b>	Middle C	hannel	(2440 N	(IHz)					
2440.00	68.45	PK	91	2.4	Н	33.10	101.55	/	/		
2440.00	67.04	Ave.	91	2.4	Н	33.10	100.14	/	/		
2440.00	58.96	PK	264	2.2	V	33.10	92.06	/	/		
2440.00	57.55	Ave.	264	2.2	V	33.10	90.65	/	/		
4880.00	45.61	PK	16	2.3	Н	9.21	54.82	74	19.18		
4880.00	39.90	Ave.	16	2.3	Н	9.21	49.11	54	4.89		
	•	1	High Ch	nannel (	2480 M	Hz)					
2480.00	67.64	PK	164	1.4	Н	33.20	100.84	/	/		
2480.00	65.04	Ave.	164	1.4	Н	33.20	98.24	/	/		
2480.00	58.24	PK	40	2.3	V	33.20	91.44	/	/		
2480.00	57.05	Ave.	40	2.3	V	33.20	90.25	/	/		
2390.00	27.13	PK	237	2.5	Н	33.00	60.13	74	13.87		
2390.00	13.24	Ave.	237	2.5	Н	33.00	46.24	54	7.76		
2483.50	30.63	PK	68	1.8	Н	33.20	63.83	74	10.17		
2483.50	20.17	Ave.	68	1.8	Н	33.20	53.37	54	0.63		
4960.00	45.57	PK	72	1.4	Н	9.07	54.64	74	19.36		
4960.00	38.30	Ave.	72	1.4	Н	9.07	47.37	54	6.63		

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1 GHz-25 GHz: 802.11b Mode:

Frequency (MHz)	Receiver		T4.2.1	Rx Antenna		Corrected	Corrected	Limit	M		
	Reading	PK/QP/Ave.	Turntable Degree	Height		Factor (dB/m)	Amplitude (dBµV/m)	(dBµV/m)	Margin (dB)		
	(dBµV)		T 61	(m)	(H/V)	,	(абµу/ш)				
Low Channel (2412 MHz)											
2412.00	78.28	PK	315	2.1	Н	33.00	111.28	/	/		
2412.00	72.79	Ave.	315	2.1	Н	33.00	105.79	/	/		
2412.00	68.59	PK	220	1.8	V	33.00	101.59	/	/		
2412.00	63.05	Ave.	220	1.8	V	33.00	96.05	/	/		
2385.79	29.85	PK	339	1.4	Н	33.00	62.85	74	11.15		
2385.79	18.37	Ave.	339	1.4	Н	33.00	51.37	54	2.63		
2483.50	27.36	PK	24	2.0	Н	33.20	60.56	74	13.44		
2483.50	13.35	Ave.	24	2.0	Н	33.20	46.55	54	7.45		
4824.00	47.22	PK	192	1.7	Н	7.88	55.10	74	18.90		
4824.00	40.37	Ave.	192	1.7	Н	7.88	48.25	54	5.75		
			Middle C	Channel	(2437N	IHz)					
2437.00	77.69	PK	353	2.2	Н	33.10	110.79	/	/		
2437.00	72.41	Ave.	353	2.2	Н	33.10	105.51	/	/		
2437.00	67.84	PK	271	2.2	V	33.10	100.94	/	/		
2437.00	62.60	Ave.	271	2.2	V	33.10	95.70	/	/		
4874.00	45.14	PK	74	1.4	Н	9.21	54.35	74	19.65		
4874.00	41.69	Ave.	74	2.2	Н	9.21	50.90	54	3.1		
			High Ch	annel (	2462 M	Hz)					
2462.00	76.82	PK	1	1.2	Н	33.10	109.92	/	/		
2462.00	71.23	Ave.	1	1.2	Н	33.10	104.33	/	/		
2462.00	67.95	PK	211	1.6	V	33.10	101.05	/	/		
2462.00	62.54	Ave.	211	1.6	V	33.10	95.64	/	/		
2368.95	27.35	PK	27	2.2	Н	33.00	60.35	74	13.65		
2368.95	13.26	Ave.	27	2.2	Н	33.00	46.26	54	7.74		
2488.00	28.72	PK	245	1.4	Н	33.20	61.92	74	12.08		
2488.00	16.22	Ave.	245	1.4	Н	33.20	49.42	54	4.58		
4924.00	46.25	PK	117	1.6	Н	9.21	55.46	74	18.54		
4924.00	39.28	Ave.	117	1.6	Н	9.21	48.49	54	5.51		

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## 802.11g Mode:

Enganona	Receiver		T (1)	Rx Antenna		Corrected	Corrected	T • •,	3.7 .	
Frequency (MHz)	Reading (dBµV)	PK/QP/Ave.	Turntable Degree	Height (m)		Factor (dB/m)	Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)	
Low Channel (2412 MHz)										
2412.00	78.37	PK	316	1.7	Н	33.00	111.37	/	/	
2412.00	66.41	Ave.	316	1.7	Н	33.00	99.41	/	/	
2412.00	67.20	PK	88	1.9	V	33.00	100.20	/	/	
2412.00	55.48	Ave.	88	1.9	V	33.00	88.48	/	/	
2388.89	32.97	PK	133	1.2	Н	33.00	65.97	74	8.03	
2388.89	18.50	Ave.	133	1.2	Н	33.00	51.50	54	2.50	
2483.50	27.45	PK	143	2.0	Н	33.20	60.65	74	13.35	
2483.50	13.36	Ave.	143	2.0	Н	33.20	46.56	54	7.44	
4824.00	44.56	PK	260	1.7	Н	7.88	52.44	74	21.56	
4824.00	30.67	Ave.	260	1.7	Н	7.88	38.55	54	15.45	
			Middle C	hannel	(2437N	IHz)				
2437.00	77.26	PK	121	2.3	Н	33.10	110.36	/	/	
2437.00	65.38	Ave.	121	2.3	Н	33.10	98.48	/	/	
2437.00	66.79	PK	219	1.3	V	33.10	99.89	/	/	
2437.00	54.89	Ave.	219	1.3	V	33.10	87.99	/	/	
4874.00	44.35	PK	148	2.1	Н	9.21	53.56	74	20.44	
4874.00	30.87	Ave.	148	2.1	Н	9.21	40.08	54	13.92	
			High Ch	annel (	2462 M	Hz)				
2462.00	76.45	PK	137	2.1	Н	33.10	109.55	/	/	
2462.00	64.68	Ave.	137	2.1	Н	33.10	97.78	/	/	
2462.00	66.23	PK	205	2.5	V	33.10	99.33	/	/	
2462.00	54.72	Ave.	205	2.5	V	33.10	87.82	/	/	
2390.00	27.21	PK	26	1.2	Н	33.00	60.21	74	13.79	
2390.00	13.35	Ave.	26	1.2	Н	33.00	46.35	54	7.65	
2483.60	28.37	PK	79	1.1	Н	33.20	61.57	74	12.43	
2483.60	16.04	Ave.	79	1.1	Н	33.20	49.24	54	4.76	
4924.00	44.40	PK	186	1.3	Н	9.21	53.61	74	20.39	
4924.00	31.21	Ave.	186	1.3	Н	9.21	40.42	54	13.58	

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#### 802.11n-HT20 Mode:

Frequency (MHz)	Receiver		T	Rx Antenna		Corrected	Corrected	T,		
	Reading (dBµV)	PK/QP/Ave.	Turntable Degree	Height (m)	Polar (H/V)	Factor (dB/m)	Amplitude (dBµV/m)	Limit (dBµV/m)	Margin (dB)	
Low Channel (2412 MHz)										
2412.00	77.82	PK	354	1.3	Н	33.00	110.82	/	/	
2412.00	65.80	Ave.	354	1.3	Н	33.00	98.80	/	/	
2412.00	66.54	PK	38	1.2	V	33.00	99.54	/	/	
2412.00	54.67	Ave.	38	1.2	V	33.00	87.67	/	/	
2390.00	34.58	PK	334	1.7	Н	33.00	67.58	74	6.42	
2390.00	18.84	Ave.	334	1.7	Н	33.00	51.84	54	2.16	
2483.50	27.60	PK	34	2.3	Н	33.20	60.80	74	13.20	
2483.50	13.34	Ave.	34	2.3	Н	33.20	46.54	54	7.46	
4824.00	43.27	PK	303	1.5	Н	7.88	51.15	74	22.85	
4824.00	29.80	Ave.	303	1.5	Н	7.88	37.68	54	16.32	
	r	T	Middle C	Channel	(2437N	(IHz)				
2437.00	77.35	PK	139	1.9	Н	33.10	110.45	/	/	
2437.00	65.34	Ave.	139	1.9	Н	33.10	98.44	/	/	
2437.00	66.29	PK	53	1.1	V	33.10	99.39	/	/	
2437.00	54.50	Ave.	53	1.1	V	33.10	87.60	/	/	
4874.00	43.06	PK	289	1.6	Н	9.21	52.27	74	21.73	
4874.00	29.27	Ave.	289	1.6	Н	9.21	38.48	54	15.52	
	•		High Ch	nannel (	2462 M	Hz)		•		
2462.00	77.82	PK	250	1.3	Н	33.10	110.92	/	/	
2462.00	65.80	Ave.	250	1.3	Н	33.10	98.90	/	/	
2462.00	66.32	PK	100	2.0	V	33.10	99.42	/	/	
2462.00	54.20	Ave.	100	2.0	V	33.10	87.30	/	/	
2390.00	27.25	PK	235	2.0	Н	33.00	60.25	74	13.75	
2390.00	13.36	Ave.	235	2.0	Н	33.00	46.36	54	7.64	
2484.00	29.80	PK	276	2.0	Н	33.20	63.00	74	11.00	
2484.00	16.53	Ave.	276	2.0	Н	33.20	49.73	54	4.27	
4924.00	43.18	PK	115	1.4	Н	9.21	52.39	74	21.61	
4924.00	29.56	Ave.	115	1.4	Н	9.21	38.77	54	15.23	

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#### Note:

Corrected Factor = Antenna factor (RX) + Cable Loss – Amplifier Factor

Corrected Amplitude = Corrected Factor + Reading

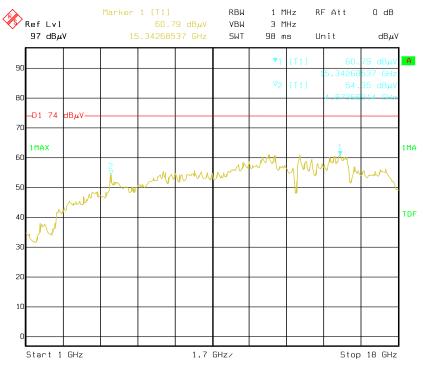
Margin = Limit - Corrected. Amplitude

The other spurious emission which is 20dB to the limit was not recorded.

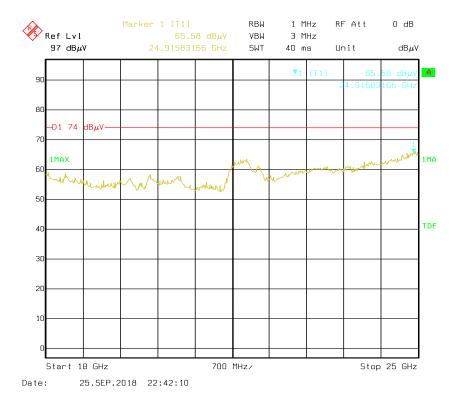
And for the pre-scan is performed with the 2400-2483.5MHz band filter.

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# Pre-scan with 802.11G Mode, middle channel Horizontal

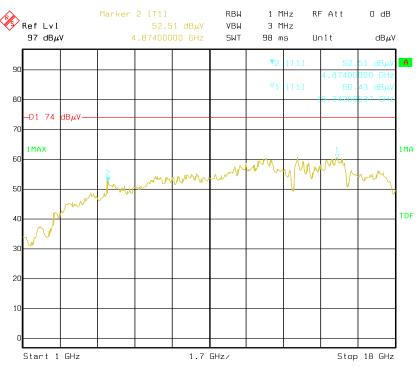




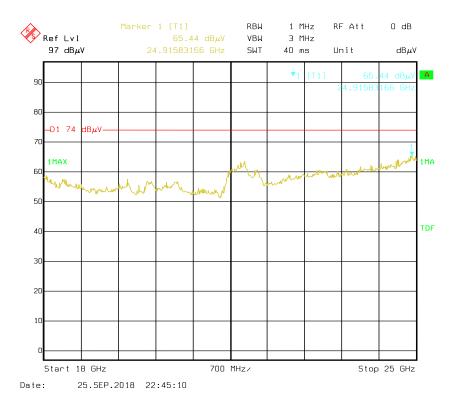


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#### Vertical

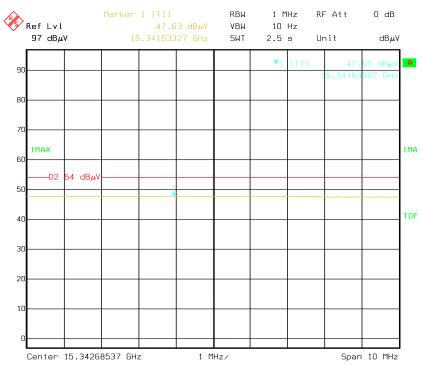


Date: 25.SEP.2018 21:59:22

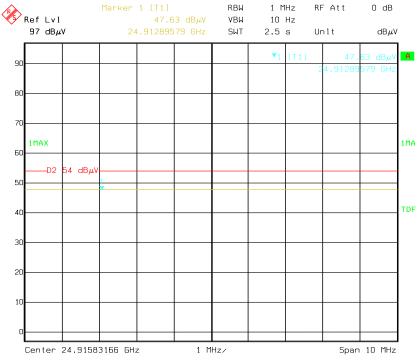


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#### Pre-scan for Average Horizontal

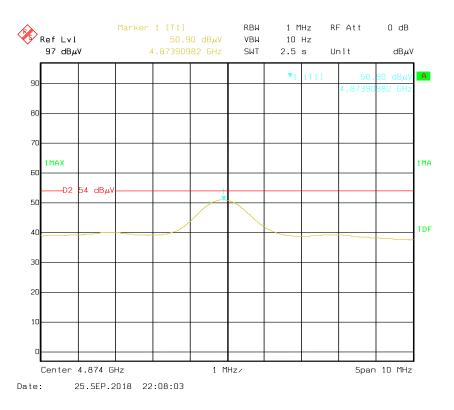


Date: 25.SEP.2018 22:02:07



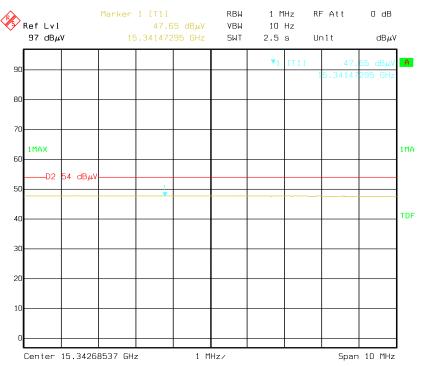
Date: 25.SEP.2018 22:47:12

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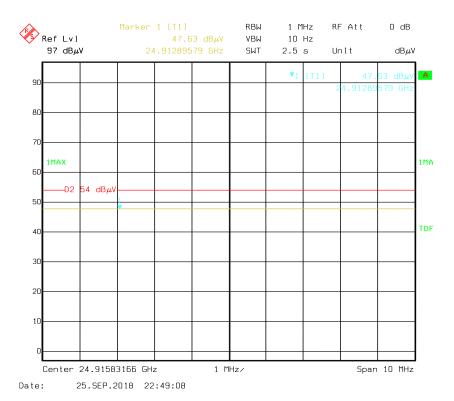


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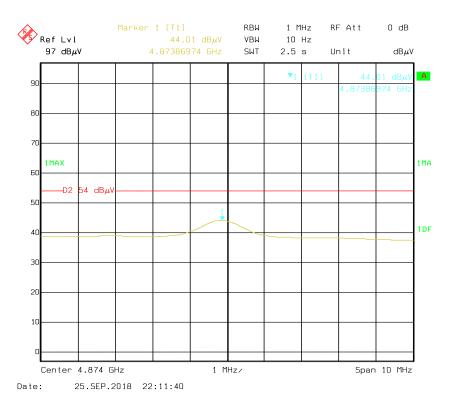
#### Vertical



Date: 25.SEP.2018 22:04:12



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# FCC $\S15.247(a)$ (2) – 6 dB EMISSION BANDWIDTH

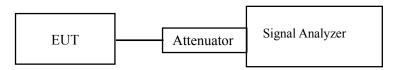
### **Applicable Standard**

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.

Report No.: RSZ180809001-00C

#### **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 Data**

#### **Environmental Conditions**

Temperature:	25 ℃	
Relative Humidity:	52 %	
ATM Pressure:	101.0 kPa	

The testing was performed by Shawn Xiao on 2018-09-30.

Test Result: Pass.

Please refer to the following table and plots.

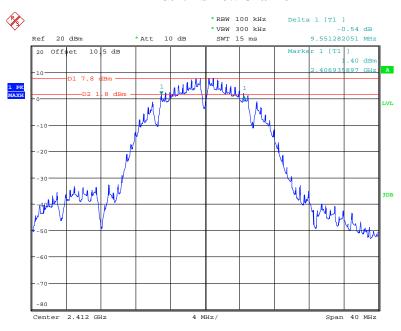
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Channel	Frequency (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)	
	802.	11b mode		
Low	2412	9.551	≥500	
Middle	2437	9.551	≥500	
High	2462	9.103	≥500	
	8	02.11g		
Low	2412	15.192	≥500	
Middle	2437	15.192	≥500	
High	2462	15.192	≥500	
802.11n-HT20 mode				
Low	2412	15.192	≥500	
Middle	2437	15.192	≥500	
High	2462	15.192	≥500	

Channel	Frequency (MHz)	6 dB Emission Bandwidth(MHz)	Limit (kHz)
BLE mode			
Low	2402	0.721	≥500
Middle	2440	0.718	≥500
High	2480	0.718	≥500

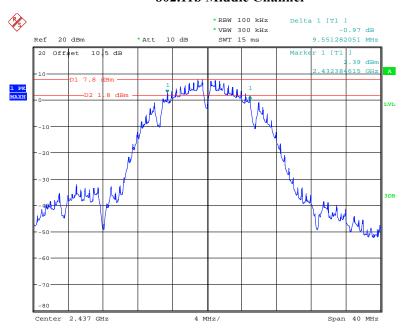
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### 802.11b Low Channel



Date: 30.SEP.2018 20:19:03

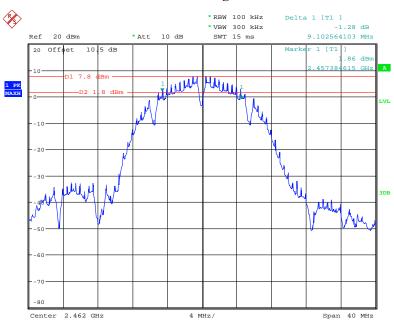
### 802.11b Middle Channel



Date: 30.SEP.2018 20:17:26

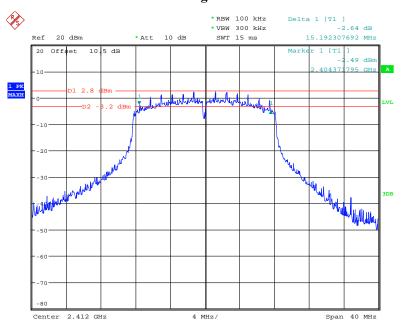
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### 802.11b High Channel



Date: 30.SEP.2018 20:16:09

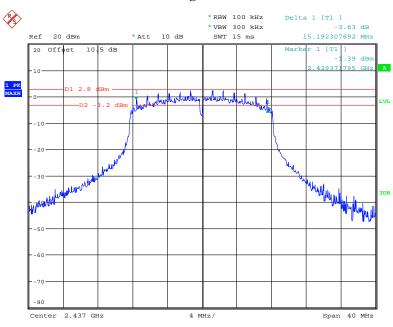
# 802.11g Low Channel



Date: 30.SEP.2018 20:13:20

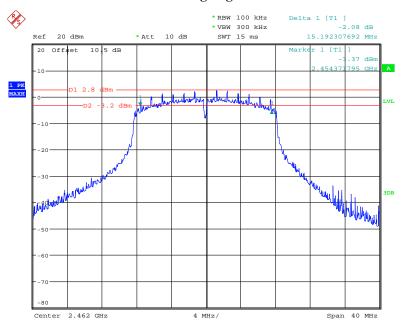
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### 802.11g Middle Channel



Date: 30.SEP.2018 20:11:44

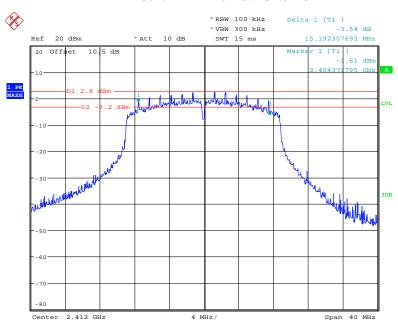
# 802.11g High Channel



Date: 30.SEP.2018 20:09:31

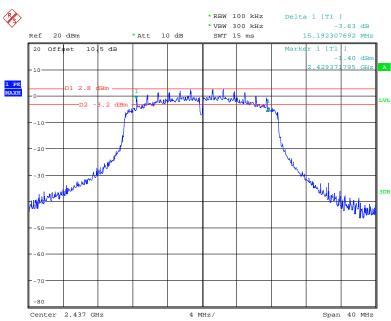
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### 802.11n-HT20 Low Channel



Date: 30.SEP.2018 20:08:03

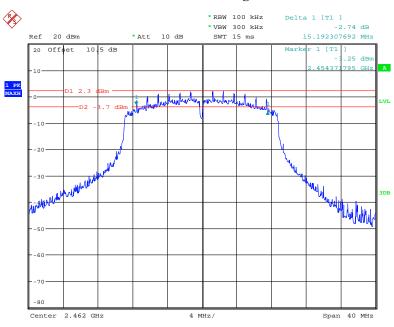
### 802.11n-HT20 Middle Channel



Date: 30.SEP.2018 20:04:56

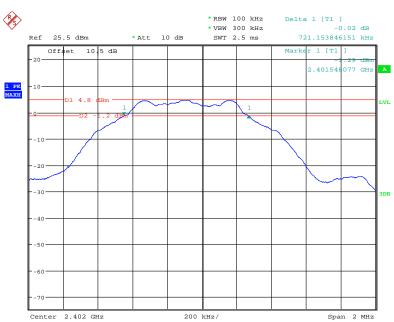
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### 802.11n-HT20 High Channel



Date: 30.SEP.2018 20:01:22

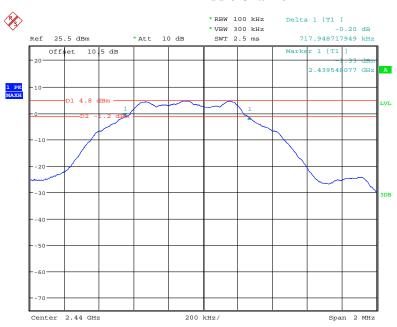
### **BLE Low Channel**



Date: 30.SEP.2018 21:41:39

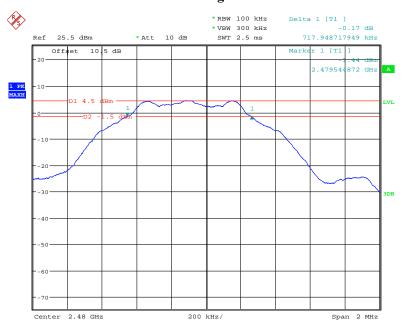
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### **BLE Middle Channel**



Date: 30.SEP.2018 21:40:30

# **BLE High Channel**



Date: 30.SEP.2018 21:39:37

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# 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.

Report No.: RSZ180809001-00C

### **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 one test equipment.
- 3. Add a correction factor to the display.



#### **Test Data**

### **Environmental Conditions**

Temperature:	25 ℃	
Relative Humidity:	50 %	
ATM Pressure:	100.0 kPa	

The testing was performed by Shawn Xiao on 2018-09-30.

EUT operation mode: Transmitting

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Channel	Frequency (MHz)	Max Conducted Peak Output Power (dBm)	Max Conducted Average Output Power (dBm)	Limit (dBm)
		802.11b		
Low	2412	19.35	16.70	30
Middle	2437	18.99	16.41	30
High	2462	19.09	16.44	30
		802.11g		
Low	2412	20.93	14.78	30
Middle	2437	20.88	14.98	30
High	2462	20.70	15.38	30
802.11n HT20				
Low	2412	20.60	14.62	30
Middle	2437	20.71	14.74	30
High	2462	20.58	14.64	30

# **BLE** mode

Channel	Frequency (MHz)	Max Peak Output Power (dBm)	Limit (dBm)	Result
Low	2402	5.35	30	Pass
Middle	2440	5.25	30	Pass
High	2480	5.22	30	Pass

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

Report No.: RSZ180809001-00C

### **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:	25 ℃	
Relative Humidity:	52 %	
ATM Pressure:	101.0 kPa	

The testing was performed by Shawn Xiao on 2018-09-30.

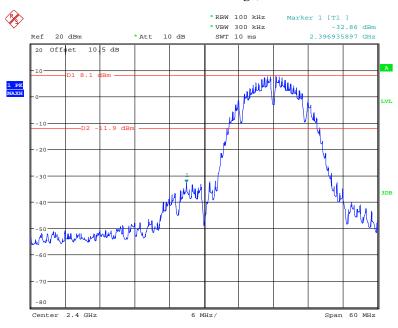
EUT operation mode: Transmitting

Test Result: Compliance

Please refer to the following plots.

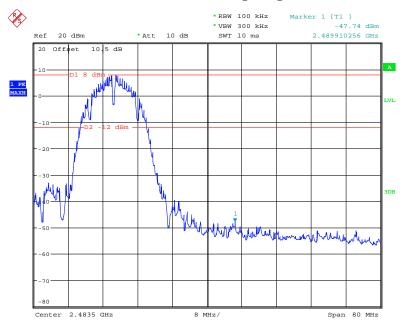
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802.11b: Band Edge, Left Side



Date: 30.SEP.2018 20:22:47

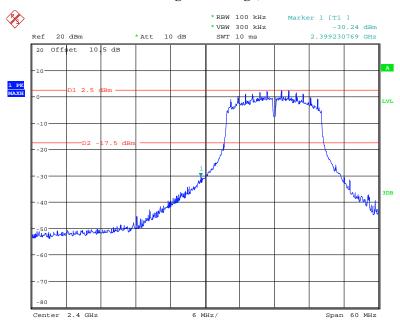
802.11b: Band Edge, Right Side



Date: 30.SEP.2018 20:25:07

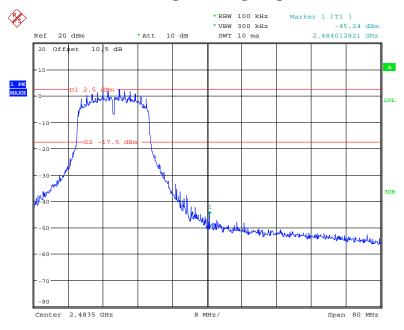
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# 802.11g: Band Edge, Left Side



Date: 30.SEP.2018 20:28:08

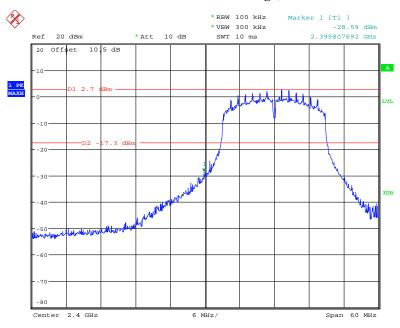
### 802.11g: Band Edge, Right Side



Date: 30.SEP.2018 20:30:11

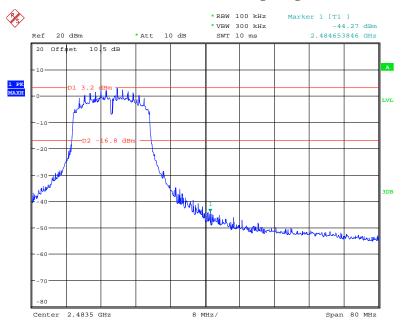
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### 802.11n-HT20: Band Edge, Left Side



Date: 30.SEP.2018 20:31:48

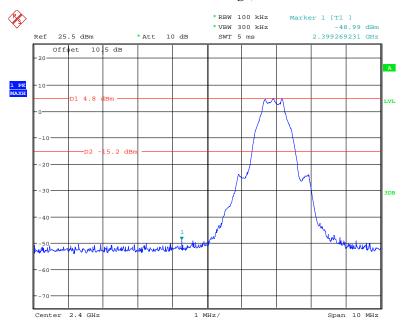
### 802.11n-HT20: Band Edge, Right Side



Date: 30.SEP.2018 20:34:38

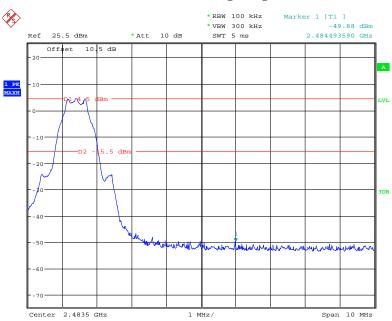
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**BLE: Band Edge, Left Side** 



Date: 30.SEP.2018 21:42:54

BLE: Band Edge, Right Side



Date: 30.SEP.2018 21:43:49

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# 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.

Report No.: RSZ180809001-00C

### **Test Procedure**

- 1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
- 2. Set the RBW to: 3kHz≤ RBW≤100 kHz.
- 3. Set the VBW  $> 3 \times RBW$ .
- 4. Set the span to 1.5 times the DTS bandwidth.
- 5. Detector = peak.
- 6. Sweep time = auto couple.
- 7. Trace mode = max hold.
- 8. Allow trace to fully stabilize.
- 9. Use the peak marker function to determine the maximum amplitude level within the RBW.
- 10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



### **Test Data**

#### **Environmental Conditions**

Temperature:	25 ℃	
Relative Humidity:	52 %	
ATM Pressure:	101.0 kPa	

The testing was performed by Shawn Xiao on 2018-09-30.

EUT operation mode: Transmitting

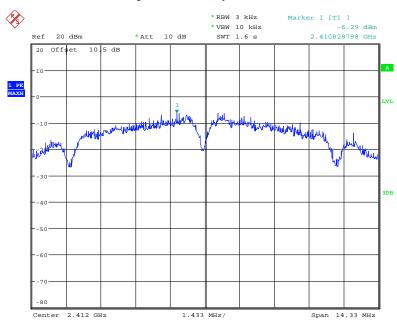
**Test Result:** Pass

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Channel	Frequency (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)			
	802.11b mode					
Low	2412	-6.29	≤8			
Middle	2437	-7.28	≤8			
High	2462	-5.14	≤8			
	802.11g	mode				
Low	2412	-11.51	≤8			
Middle	2437	-12.64	≤8			
High	2462	-11.90	≤8			
	802.11n-H	Γ20 mode				
Low	Low 2412 -11.80		≤8			
Middle	2437	-12.27	≤8			
High	2462	-12.90	≤8			
BLE mode						
Low	2402	-8.97	≤8			
Middle	2440	-8.98	≤8			
High	2480	-9.11	≤8			

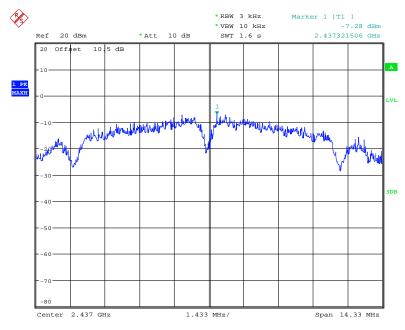
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# Power Spectral Density, 802.11b Low Channel



Date: 30.SEP.2018 20:51:35

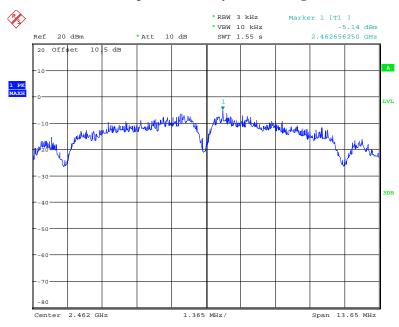
# Power Spectral Density, 802.11b Middle Channel



Date: 30.SEP.2018 20:50:50

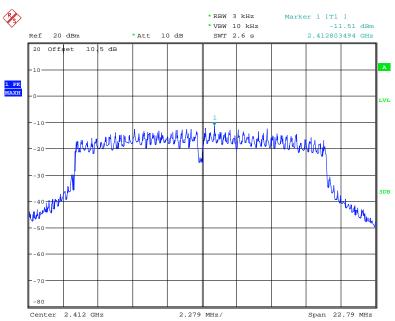
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# Power Spectral Density, 802.11b High Channel



Date: 30.SEP.2018 20:49:50

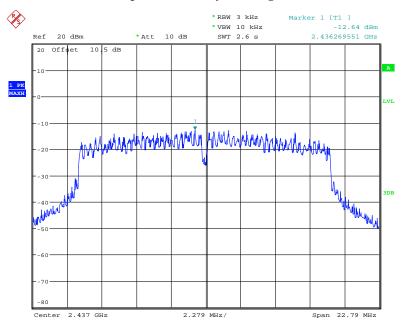
# Power Spectral Density, 802.11g Low Channel



Date: 30.SEP.2018 20:46:27

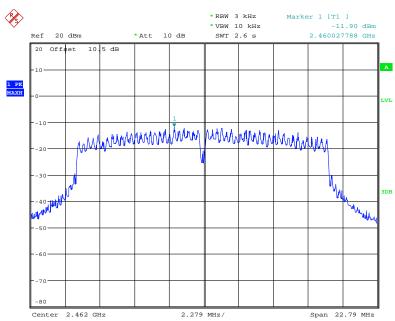
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### Power Spectral Density, 802.11g Middle Channel



Date: 30.SEP.2018 20:45:29

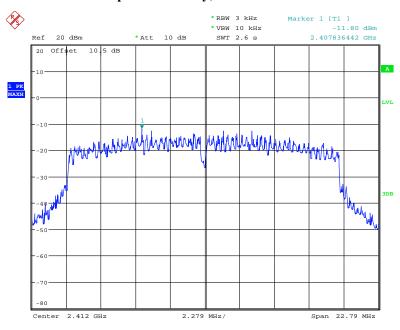
# Power Spectral Density, 802.11g High Channel



Date: 30.SEP.2018 20:44:24

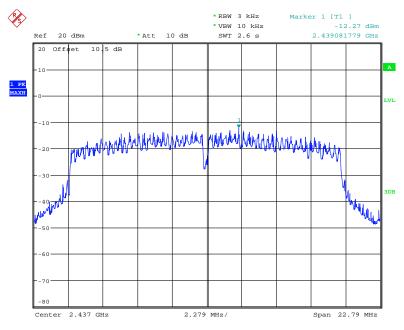
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### Power Spectral Density, 802.11n-HT20 Low Channel



Date: 30.SEP.2018 20:48:39

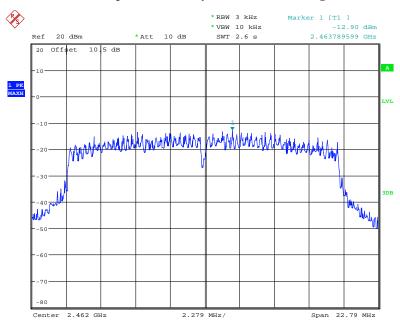
# Power Spectral Density, 802.11n-HT20 Middle Channel



Date: 30.SEP.2018 20:48:02

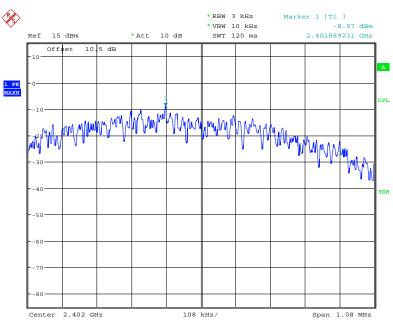
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### Power Spectral Density, 802.11n-HT20 High Channel



Date: 30.SEP.2018 20:47:18

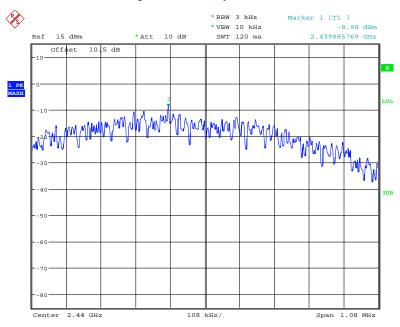
# **Power Spectral Density, BLE Low Channel**



Date: 30.SEP.2018 21:46:49

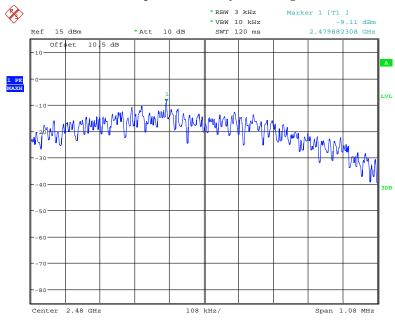
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### Power Spectral Density, BLE Middle Channel



Date: 30.SEP.2018 21:47:39

### **Power Spectral Density, BLE High Channel**



Date: 30.SEP.2018 21:45:50

# \*\*\*\*\* END OF REPORT \*\*\*\*\*

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