Shenzhen CTL Testing Technology Co., Ltd.
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TEST REPORT

FCC PART 15 SUBPART E 15.407

Report Reference No. .....: **CTL1805075061-WF02**

Compiled by: (position+printed name+signature)	Allen Wang (File administrators)	Allen Wang
Tested by: (position+printed name+signature)	Nice Nong (Test Engineer)	Nice Nong
Approved by: (position+printed name+signature)	Ivan Xie (Manager)	Ivan Xie

Product Name.....: ShotKam Action Camera

Model/Type reference .....: SK3

List Model(s).....: N/A

Trade Mark .....: ShotKam

FCC ID .....: 2AP6Y-SK3

Applicant's name .....: **BVT Video Technology Shenzhen Limited**

Address of applicant .....: #1404,Sangtai Building, Lishan Road, Xili, Nanshan, Shenzhen, China

Test Firm .....: **Shenzhen CTL Testing Technology Co., Ltd.**

Address of Test Firm .....: Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

Test specification.....:

Standard.....: **47 CFR FCC Part 15 Subpart E 15.407**

TRF Originator .....: Shenzhen CTL Testing Technology Co., Ltd.

Master TRF .....: Dated 2011-01

Date of Receipt.....: May 09, 2018

Date of Test Date.....: May 10, 2018–Jun. 15, 2018

Data of Issue.....: Jun. 15, 2018

Result.....: Pass

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TEST REPORT

Test Report No. :	CTL1805075061-WF02	Jun. 15, 2018 Date of issue

Equipment under Test	:	ShotKam Action Camera
Model /Type	:	SK3
Listed Models	:	N/A
Applicant	:	**BVT Video Technology Shenzhen Limited**
Address	:	#1404,Sangtai Building, Lishan Road, Xili, Nanshan, Shenzhen, China
Manufacturer	:	**BVT Video Technology Shenzhen Limited**
Address	:	#1404,Sangtai Building, Lishan Road, Xili, Nanshan, Shenzhen, China

Test result	**Pass ***

* In the configuration tested, the EUT complied with the standards specified page 5.

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

** Modified History **

Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2018-06-15	CTL1805075061-WF02	Tracy Qi

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15 Subpart E—Unlicensed National Information Infrastructure Devices

ANSI C63.10:2013 : American National Standard for Testing Unlicensed Wireless Devices

KDB789033 D02: General UNII Test Procedures New Rules v01r02

1.2. Test Description

FCC Requirement		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.407(a)	Emission Bandwidth(26dBm Bandwidth)	PASS
FCC Part 15.407(e)	Minimum Emission Bandwidth(6dBm Bandwidth)	N/A$_{Note1}$
FCC Part 15.407(a)	Maximum Conducted Output Power	PASS
FCC Part 15.407(a)	Peak Power Spectral Density	PASS
FCC Part 15.407(g)	Frequency Stability	PASS
FCC Part 15.407(b)	Undesirable emission	PASS
FCC Part 15.407(b)/15.205/15.209	Radiated Emissions	PASS
FCC Part 15.407(h)	Dynamic Frequency Selection	N/A$_{Note\ 2}$
FCC Part 15.203/15.247(b)	Antenna Requirement	PASS

Note 1: Apply to U-NII 3 band only.
Note 2: The device cannot operating at DFS band.

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1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.
Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

IC Registration No.: 9618B

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration No.: 9618B on November 13, 2013.

FCC-Registration No.: 399832

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832, December 08, 2017.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power conducted	±0.57 dB	(1)
Transmitter power Radiated	±2.20 dB	(1)
Conducted spurious emission 9KHz-40 GHz	±2.20 dB	(1)
Occupied Bandwidth	±0.01ppm	(1)
Radiated Emission 30~1000MHz	±4.10dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±3.20dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	ShotKam Action Camera			
Model/Type reference:	SK3			
Power supply:	DC 3.7V from battery			
WIFI				
Supported type:	20MHz system	40MHz system	80MHz system	160MHz system
	802.11a 802.11n 802.11ac	802.11n 802.11ac	802.11ac	N/A
Operation frequency:	5180-5240MHz	5190-5230MHz	5210MHz	N/A
Modulation:	OFDM	OFDM	OFDM	N/A
Channel number:	4	2	1	N/A
Channel separation:	20MHz	40MHz	80MHz	N/A
Antenna type/gain:	Ceramic antenna: 4.5dBi on 5GHz			

Note: For more details, please refer to the user's manual of the EUT.

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2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.

All test performed at the low, middle and high of operational frequency range of each mode.

Operation Frequency List WIFI on 5G Band：

Operating band	20MHz		40MHz		80MHz	
	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
U-NII 1 (5150MHz-5250MHz)	36	5180	38	5190	42	5210
	40	5200				
	44	5220	46	5230		
	48	5240				

The line display in grey is those Channels/Frequencies select to test in this report for each operation mode.

Data Rate Used:

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate
Maximum Conducted Output Power Power Spectral Density Emission Bandwidth(26dBm Bandwidth) Undesirable emission Frequency Stability	11a/OFDM	6 Mbps
	11n(20MHz),11ac(20MHz)/OFDM	7.2 Mbps
	11n(40MHz),11ac(40MHz)/OFDM	15.0Mbps
	11ac(80MHz)/OFDM	65.0Mbps

2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Calibration Date last time	Calibration Date recent	Calibration Due Date
LISN	R&S	ENV216	3560.6550.12	2017/06/02	2018/06/01	2019/05/31
LISN	R&S	ESH2-Z5	860014/010	2017/06/02	2018/06/01	2019/05/31
Power Meter	Agilent	U2531A	TW53323507	2017/06/02	2018/06/01	2019/05/31
Power Sensor	Agilent	U2021XA	MY5365004	2017/05/21	2018/05/20	2019/05/19
EMI Test Receiver	R&S	ESCI	103710	2017/06/02	2018/06/01	2019/05/31
Spectrum Analyzer	Agilent	E4407B	MY41440676	2017/05/21	2018/05/20	2019/05/19
Spectrum Analyzer	Agilent	N9020	US46220290	2017/01/17	2018/01/16	2019/01/15
Controller	EM Electronics	Controller EM 1000	N/A	2017/05/21	2018/05/20	2019/05/19
Active Loop Antenna	Daze	ZN30900A	N/A	2017/05/19	2018/05/18	2019/05/17
Bilog Antenna	Sunol Sciences Corp.	JB1	A061713	2017/06/02	2018/06/01	2019/05/31
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2017/05/19	2018/05/18	2019/05/17
Horn Antenna	SCHWARZBACK	BBHA 9170	BBHA9170184	2017/05/19	2018/05/18	2019/05/17
Amplifier	Agilent	8349B	3008A02306	2017/05/19	2018/05/18	2019/05/17
Amplifier	Agilent	8447D	2944A10176	2017/05/19	2018/05/18	2019/05/17
Temperature/Humidity Meter	Gangxing	CTH-608	02	2017/05/20	2018/05/19	2019/05/18
High-Pass Filter	K&L	9SH10-2700/ X12750-O/O	N/A	2017/05/20	2018/05/19	2019/05/18
High-Pass Filter	K&L	41H10-1375/ U12750-O/O	N/A	2017/05/20	2018/05/19	2019/05/18
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	2017/06/02	2018/06/01	2019/05/31
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2017/06/02	2018/06/01	2019/05/31
Coaxial Cables	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	2017/06/02	2018/06/01	2019/05/31
RF Cable	Megalon	RF-A303	N/A	2017/06/02	2018/06/01	2019/05/31

The calibration interval was one year

2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.407 of the FCC Part 15, Subpart E Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

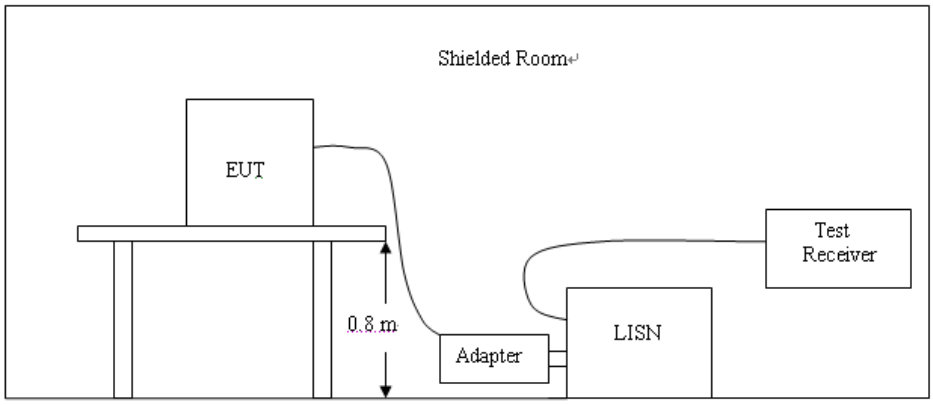
LIMIT

According to FCC CFR Title 47 Part 15 Subpart C Section 15.207 and RSS Gen 8.8, AC Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus as below:

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

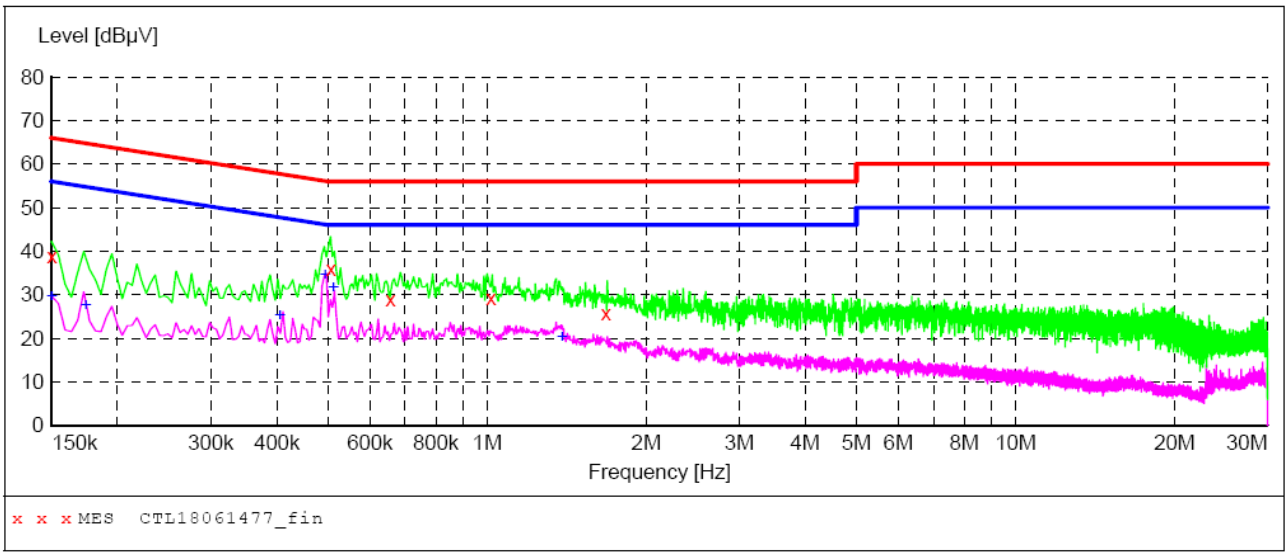
1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2013.
2. Support equipment, if needed, was placed as per ANSI C63.10:2013.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

Remark: 802.11a / 802.11n (HT20) / 802.11ac (HT20) / 802.11n (HT40) / 802.11ac (HT40) / 802.11ac (HT80)mode all have been tested, only worse case is reported

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL18061477_fin"

14/06/2018 11:42

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	38.90	10.2	66	27.1	QP	L1	GND
0.506000	35.80	10.2	56	20.2	QP	L1	GND
0.656000	29.00	10.2	56	27.0	QP	L1	GND
1.016000	29.30	10.3	56	26.7	QP	L1	GND
1.676000	25.60	10.3	56	30.4	QP	L1	GND

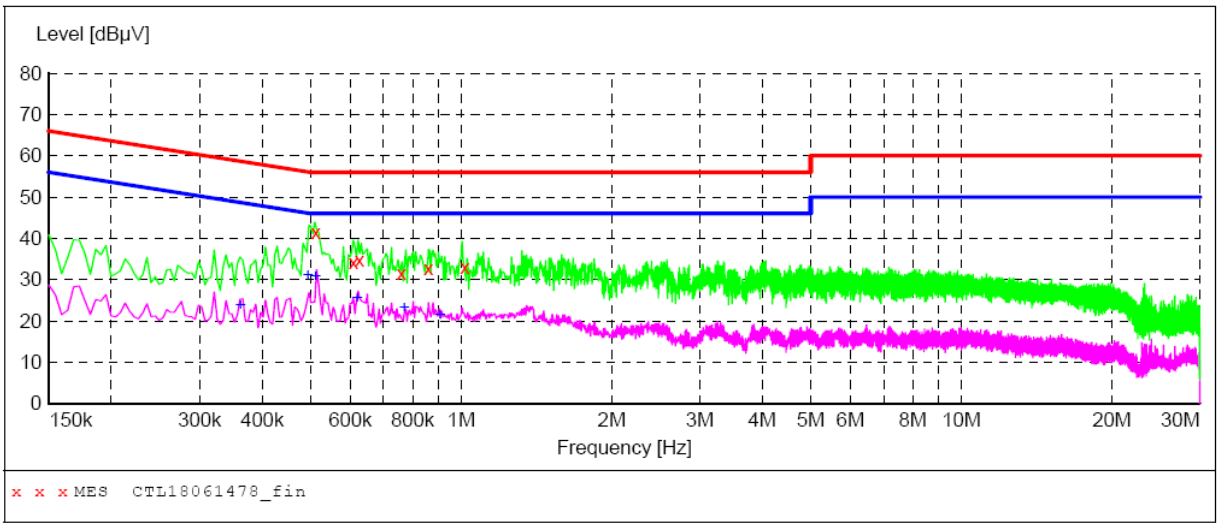
MEASUREMENT RESULT: "CTL18061477_fin2"

14/06/2018 11:42

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	29.60	10.2	56	26.4	AV	L1	GND
0.174000	27.40	10.2	55	27.4	AV	L1	GND
0.406000	25.10	10.2	48	22.6	AV	L1	GND
0.494000	34.40	10.2	46	11.7	AV	L1	GND
0.512000	31.60	10.2	46	14.4	AV	L1	GND
1.388000	20.30	10.3	46	25.7	AV	L1	GND

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL18061478_fin"

14/06/2018 11:46

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.512000	41.40	10.2	56	14.6	QP	N	GND
0.608000	34.30	10.2	56	21.7	QP	N	GND
0.626000	34.90	10.2	56	21.1	QP	N	GND
0.758000	31.60	10.2	56	24.4	QP	N	GND
0.860000	32.70	10.2	56	23.3	QP	N	GND
1.016000	33.10	10.3	56	22.9	QP	N	GND

MEASUREMENT RESULT: "CTL18061478_fin2"

14/06/2018 11:46

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.362000	23.80	10.2	49	24.9	AV	N	GND
0.494000	31.10	10.2	46	15.0	AV	N	GND
0.512000	30.70	10.2	46	15.3	AV	N	GND
0.620000	25.30	10.2	46	20.7	AV	N	GND
0.770000	23.10	10.2	46	22.9	AV	N	GND
0.908000	21.50	10.2	46	24.5	AV	N	GND

3.2. Radiated Emissions

Limit

The maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

(1) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

Undesirable emission limits

Requirement	Limit(EIRP)	Limit (Field strength at 3m) Note1
15.407(b)(1)	PK:-27(dBm/MHz)	PK:68.2(dBμV/m)
15.407(b)(2)		
15.407(b)(3)		
15.407(b)(4)		

Note1: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

$$E = \frac{1000000\sqrt{30P}}{3}$$ μV/m, where P is the eirp (Watts)

(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209

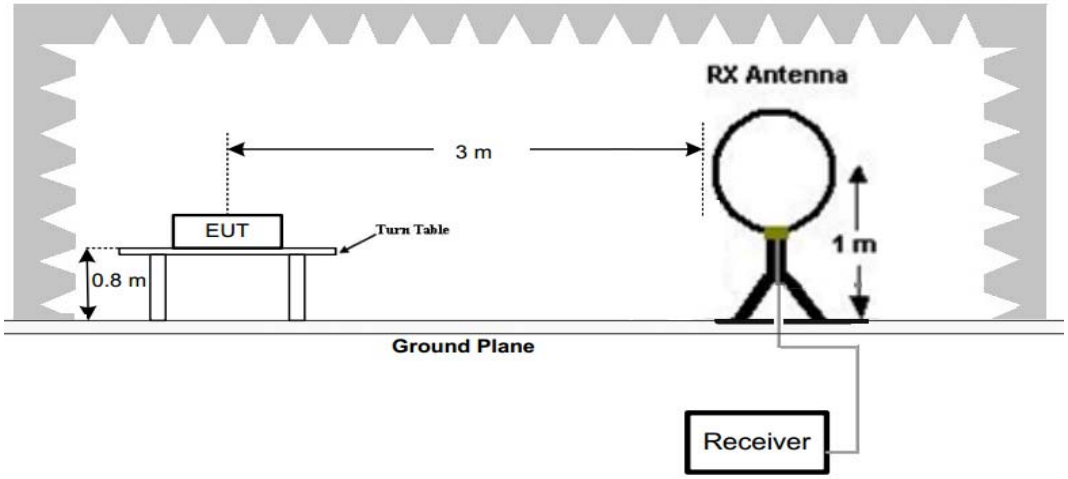
(6)In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

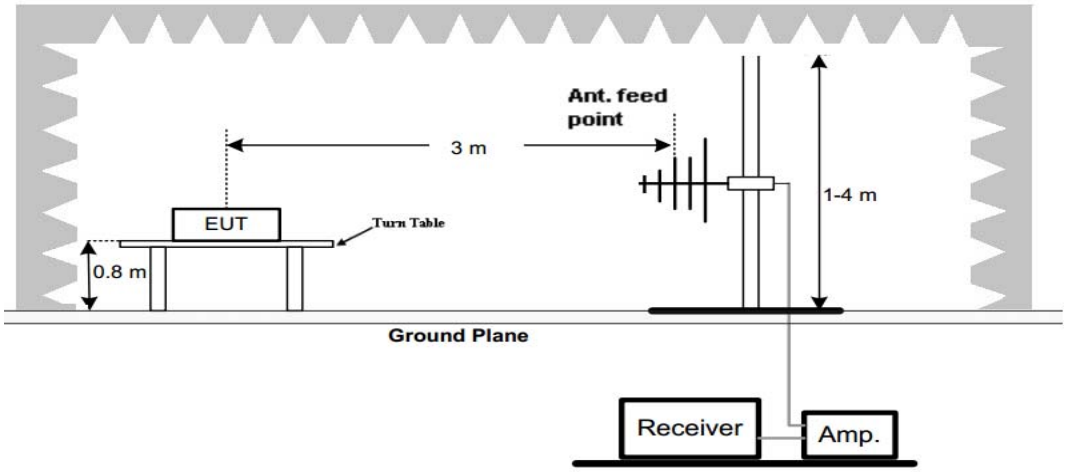
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

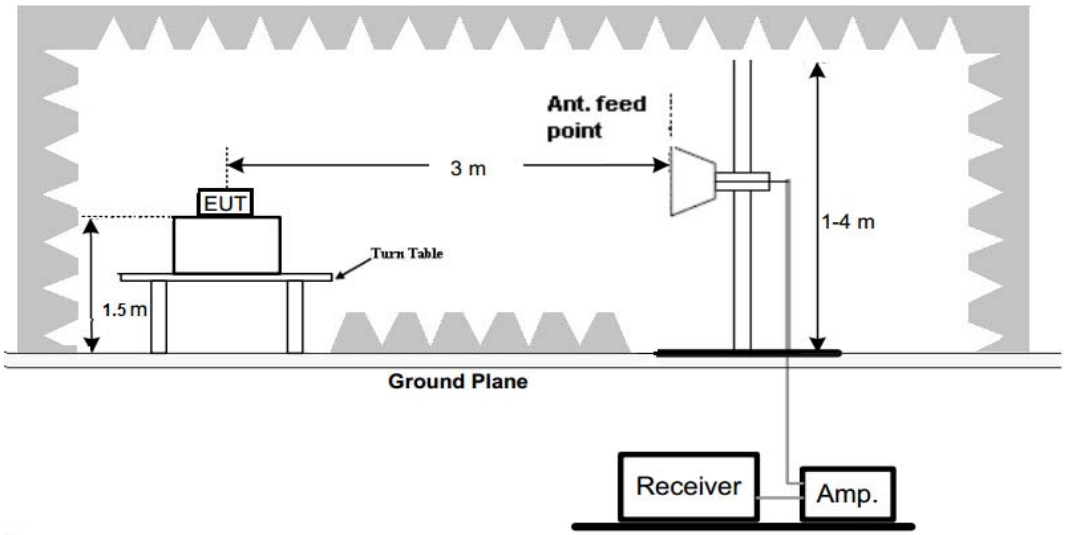
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
4. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.
5. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency measurements have been completed.

TEST RESULTS

Remark:
1. All 802.11a / 802.11n (HT20) / 802.11ac (HT20) / 802.11n (HT40) / 802.11ac (HT40) / 802.11ac (HT80) modes have been tested for below 1GHz test, only the worst case 802.11ac (HT20) low channel of U-NII 1 band was recorded.
2. All 802.11a / 802.11n (HT20) / 802.11ac (HT20) / 802.11n (HT40) / 802.11ac (HT40) / 802.11ac (HT80) modes have been tested for above 1GHz test, only the worst case 802.11ac (HT20) was recorded.
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

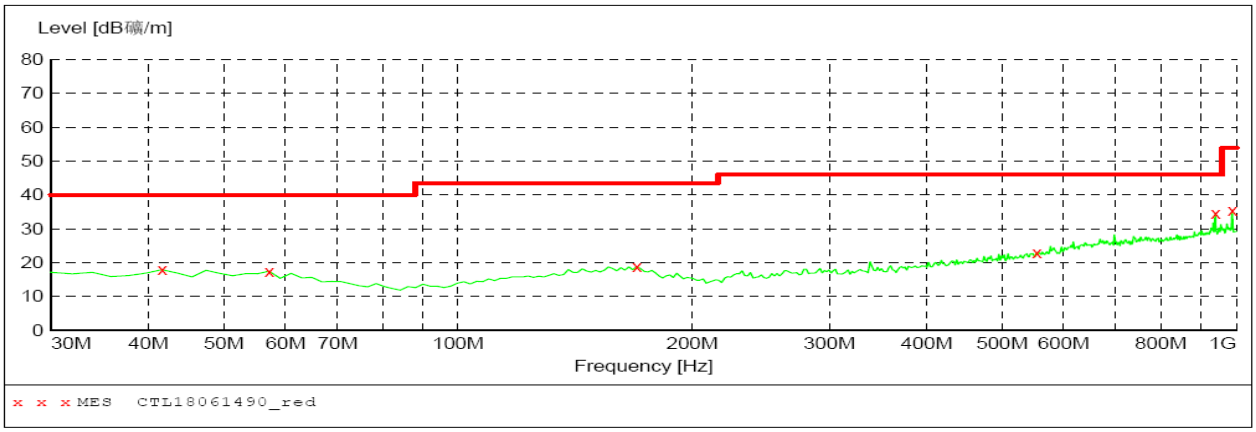
For 30MHz-1GHz

Horizontal

SWEEP TABLE: "test (30M-1G)"

Short Description: Field Strength

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	200.0 ms	120 kHz	VULB 9168



MEASUREMENT RESULT: "CTL18061490_red"

2018-6-15 9:34

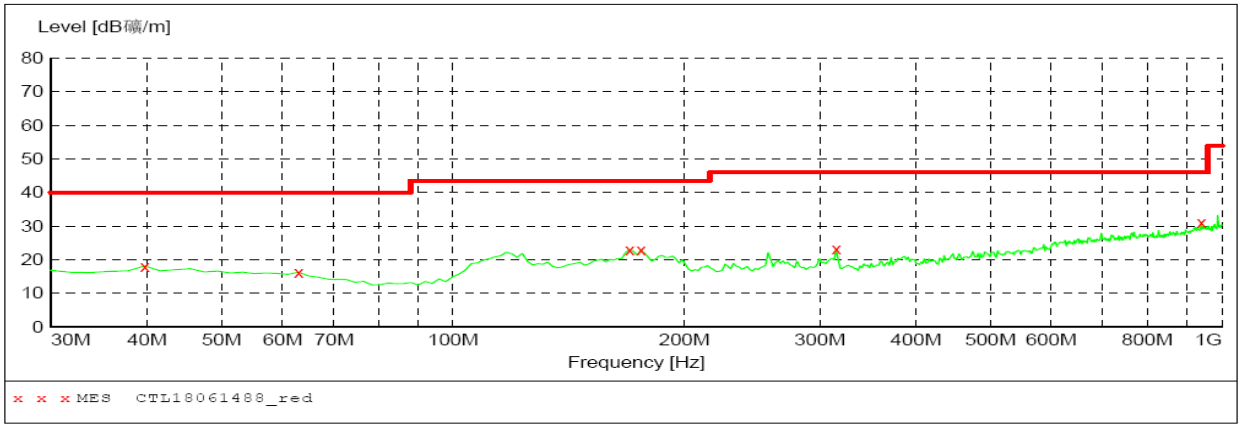
Frequency MHz	Level dB磺/m	Transd dB	Limit dB磺/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
41.640000	17.90	14.1	40.0	22.1	---	0.0	0.00	HORIZONTAL
57.160000	17.50	13.3	40.0	22.5	---	0.0	0.00	HORIZONTAL
169.680000	18.80	14.3	43.5	24.7	---	0.0	0.00	HORIZONTAL
553.800000	22.90	20.1	46.0	23.1	---	0.0	0.00	HORIZONTAL
939.860000	34.50	25.7	46.0	11.5	---	0.0	0.00	HORIZONTAL
988.360000	35.50	26.0	53.9	18.4	---	0.0	0.00	HORIZONTAL

Vertical

SWEEP TABLE: "test (30M-1G)"

Short Description: Field Strength

Start Frequency	Stop Frequency	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	MaxPeak	200.0 ms	120 kHz	VULB 9168



MEASUREMENT RESULT: "CTL18061488_red"

2018-6-15 9:31

Frequency MHz	Level dB磺/m	Transd dB	Limit dB磺/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
39.700000	18.10	14.2	40.0	21.9	---	0.0	0.00	VERTICAL
62.980000	16.30	12.5	40.0	23.7	---	0.0	0.00	VERTICAL
169.680000	23.00	14.3	43.5	20.5	---	0.0	0.00	VERTICAL
175.500000	22.80	13.5	43.5	20.7	---	0.0	0.00	VERTICAL
315.180000	23.10	14.9	46.0	22.9	---	0.0	0.00	VERTICAL
939.860000	31.00	25.7	46.0	15.0	---	0.0	0.00	VERTICAL

For 1GHz to 25GHz

Note: All 802.11a / 802.11n (HT20) / 802.11ac (HT20) / 802.11n (HT40) / 802.11ac (HT40) / 802.11ac (HT80) modes have been tested for above 1GHz test, only the worst case 802.11ac (HT20) was recorded.

U-NII 1 & 802.11ac (HT20) Mode (above 1GHz)

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
36 (5180MHz)	5150.00	46.25	PK	H	68.20	21.95	34.89	37.64	9.28	35.56	11.36
	10360.00	50.23	PK	H	68.20	17.97	34.50	39.20	11.45	34.92	15.73
	--	--	--	--	--	--	--	--	--	--	--
40 (5200MHz)	10400.00	51.59	PK	H	68.20	16.61	35.78	39.22	11.48	34.89	15.81
	--	--	--	--	--	--	--	--	--	--	--
48 (5240MHz)	5350.50	44.26	PK	H	68.20	23.94	32.85	37.64	9.28	35.51	11.41
	10480.00	49.87	PK	H	68.20	18.33	33.88	39.27	11.55	34.83	15.99
	--	--	--	--	--	--	--	--	--	--	--

Tested Channel	Frequency (MHz)	Emission Level (dBuV/m)	Detector Mode	ANT Pol	Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre amplifier (dB)	Correction Factor (dB/m)
36 (5180MHz)	5150.00	48.56	PK	V	68.20	19.64	37.20	37.64	9.28	35.56	11.36
	10360.00	52.49	PK	V	68.20	15.71	36.76	39.20	11.45	34.92	15.73
	--	--	--	--	--	--	--	--	--	--	--
40 (5200MHz)	10400.00	51.66	PK	V	68.20	16.54	35.85	39.22	11.48	34.89	15.81
	--	--	--	--	--	--	--	--	--	--	--
48 (5240MHz)	5350.50	45.03	PK	V	68.20	23.17	33.62	37.64	9.28	35.51	11.41
	10480.00	50.65	PK	V	68.20	17.55	34.66	39.27	11.55	34.83	15.99
	--	--	--	--	--	--	--	--	--	--	--

REMARKS:

1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3. Margin value = Limit value- Emission level.
4. -- Mean the other emission levels were very low against the limit.
5. RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.

3.3. Maximum Conducted Output Power

Limit

FCC requirement:
For the band 5.15-5.25 GHz.
(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi.

(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W

IC requirement:
Frequency band 5150-5250 MHz
For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 $\log_{10}$B, dBm, whichever is less.
For other devices, the maximum e.i.r.p. shall not exceed 200 mW or 10 + 10 $\log_{10}$B, dBm, whichever power is less. B is the 99% emission bandwidth in megahertz.

Frequency band 5250-5350 MHz
For OEM devices installed in vehicles, the maximum e.i.r.p. shall not exceed 30 mW or 1.76 + 10 log10B, dBm, whichever is less. Devices shall implement TPC in order to have the capability to operate at least 3 dB below the maximum permitted e.i.r.p. of 30 mW.

Devices, other than devices installed in vehicles, shall comply with the following:

a)The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band;

b) The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz. Note that devices with a maximum e.i.r.p. greater than 500 mW shall implement TPC in order to have the capability to operate at least 6 dB below the maximum permitted e.i.r.p. of 1 W.

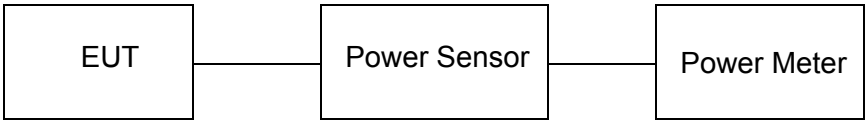
Frequency bands 5470-5600 MHz and 5650-5725 MHz
The maximum conducted output power shall not exceed 250 mW or 11 + 10 log10B, dBm, whichever is less.
The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10B, dBm, whichever is less. B is the 99% emission bandwidth in megahertz.

Frequency band 5725-5850 MHz
The maximum conducted output power shall not exceed 1 W.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results

U-NII 1

Type	Channel	Output power (dBm)	Limit (dBm)	Result
802.11a	36	5.59	23.98	Pass
	40	5.44		
	48	5.25		
802.11n(HT20)	36	5.21	23.98	Pass
	40	4.93		
	48	4.69		
802.11n(HT40)	38	5.89	23.98	Pass
	46	4.88		
802.11ac(HT20)	36	5.37	23.98	Pass
	40	5.26		
	48	4.41		
802.11ac(HT40)	38	5.83	23.98	Pass
	46	4.95		
802.11ac(HT80)	42	6.08	23.98	Pass

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3.4. Power Spectral Density

Limit

FCC requirement:
For the band 5.15-5.25 GHz.

(i) For an outdoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.[note1]

(ii) For an indoor access point operating in the band 5.15 - 5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 MHz band.[note1]

(iii) For fixed point-to-point access points operating in the band 5.15 - 5.25 GHz, transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi.

(iv) For mobile and portable client devices in the 5.15 - 5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 MHz band. [note1]

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands

The maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band.

IC requirement:

For the band 5.15-5.25 GHz.

The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

Frequency band 5250-5350 MHz

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band

Frequency bands 5470-5600 MHz and 5650-5725 MHz

The power spectral density shall not exceed 11 dBm in any 1.0 MHz band.

For the band 5.725 - 5.85 GHz

The maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. [note1, note2]

Note1: If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Note2: Fixed point - to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information.

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 = 1MHz for U-NII 1, U-NII 2A, U-NII C band and 510KHz for U-NII 3 band.
3. Set the VBW ≥ 3× RBW.
4. Set the span to encompass the entire EBW.
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 power level.

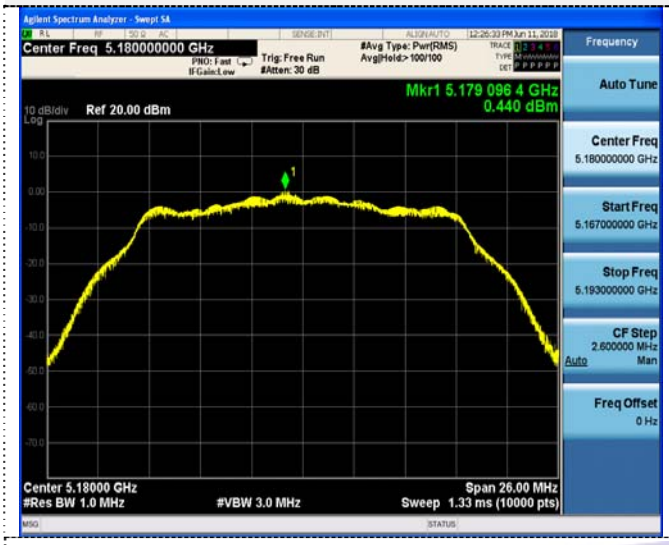
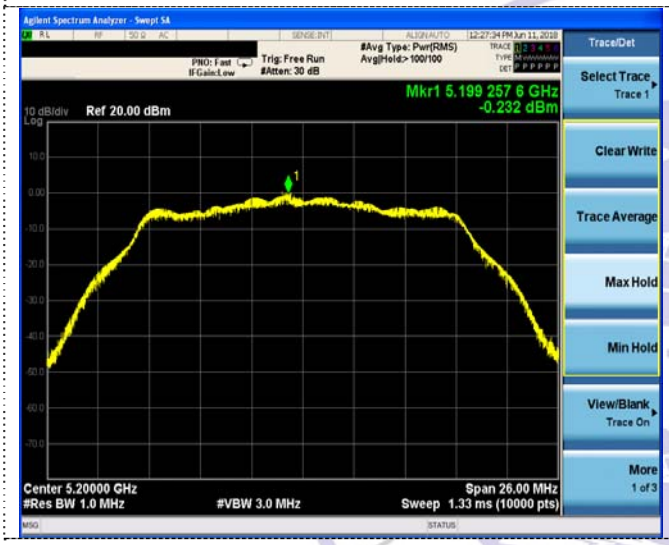
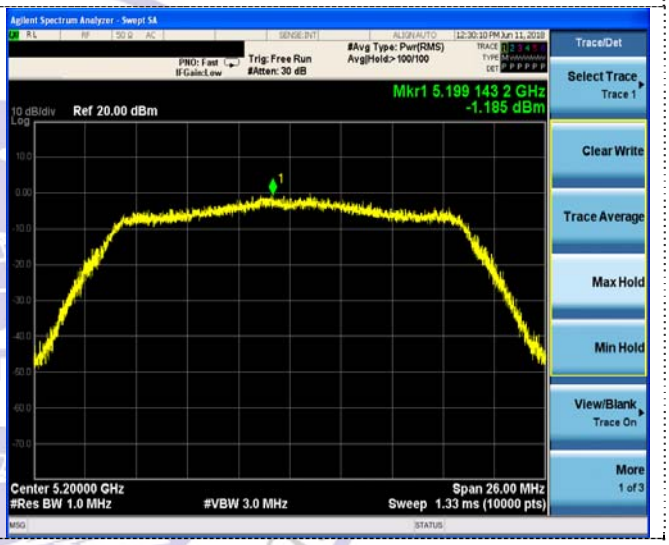
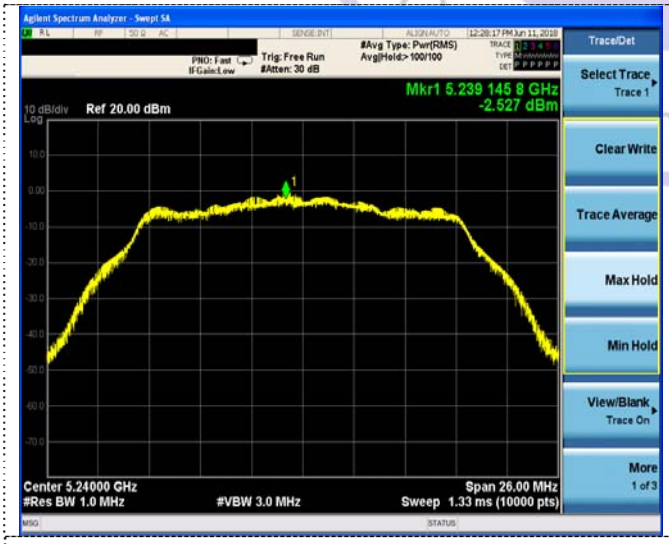
Test Configuration

Test Results

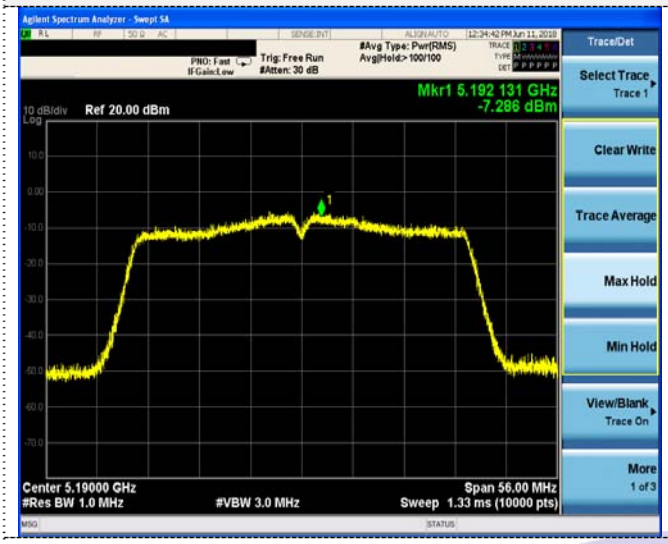
U-NII 1

Type	*Channel*	*P.S.D (dBm/MHz)*	*Limit (dBm/ MHz)*	*Result*
802.11a	36	0.440	11.00	Pass
	40	-0.232		
	48	-2.527		
802.11n(HT20)	36	-0.014		Pass
	40	-1.185		
	48	-0.744		
802.11n(HT40)	38	-7.286		Pass
	46	-6.212		
802.11ac(HT20)	36	-2.454		Pass
	40	-0.503		
	48	-1.448		
802.11ac(HT40)	38	-4.310		Pass
	46	-5.015		
802.11ac(HT80)	42	-2.591		Pass

Test plot as follows:

802.11a	802.11n(HT20)
	
CH36	CH36
	
CH40	CH40
	
CH48	CH48

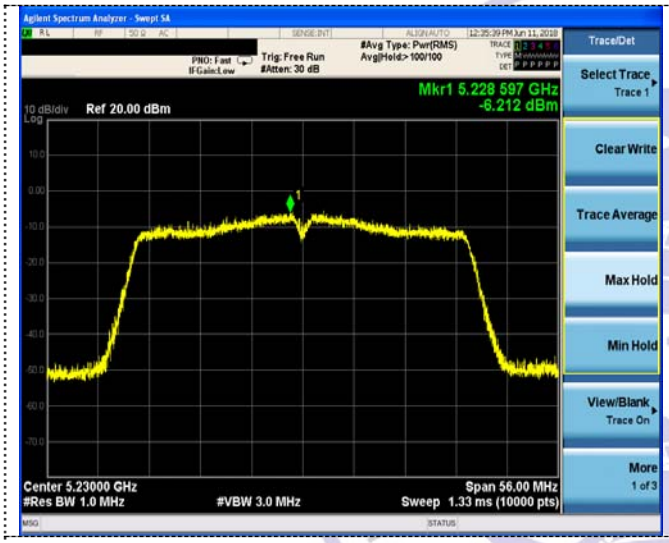
802.11n(HT40)



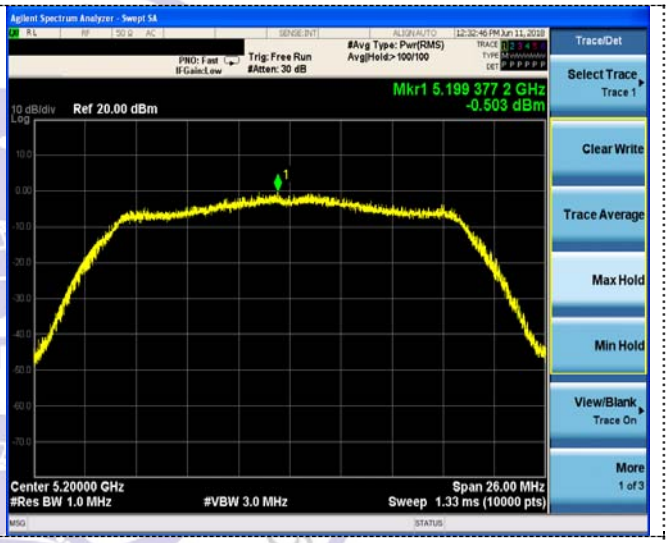
CH38

802.11ac(HT20)

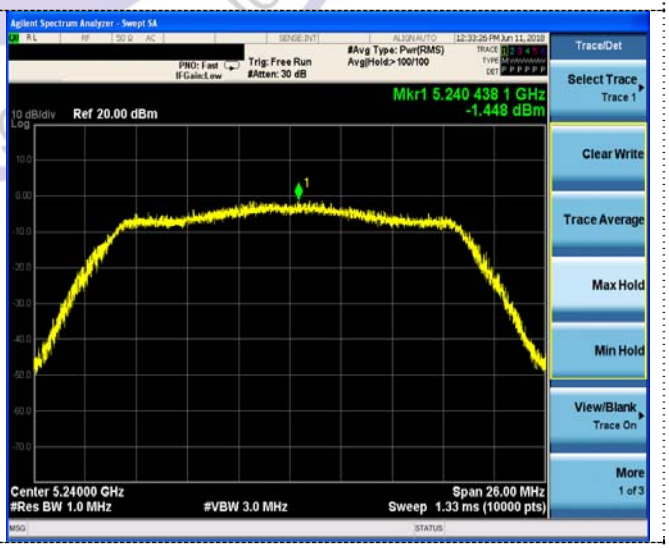
CH36



CH46

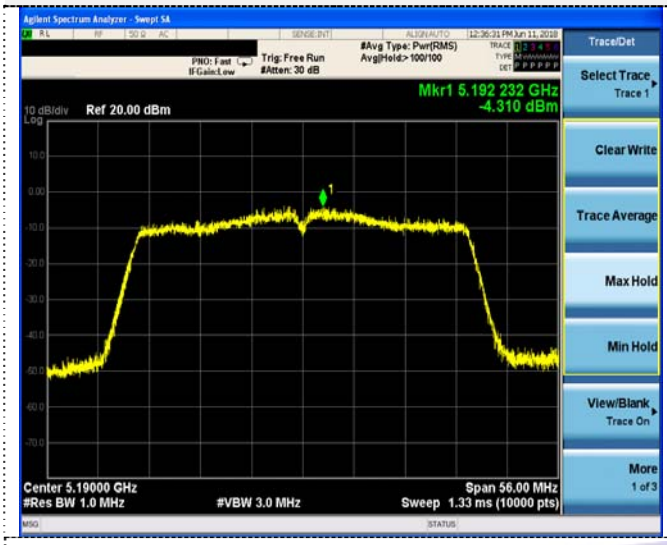


CH36



CH48

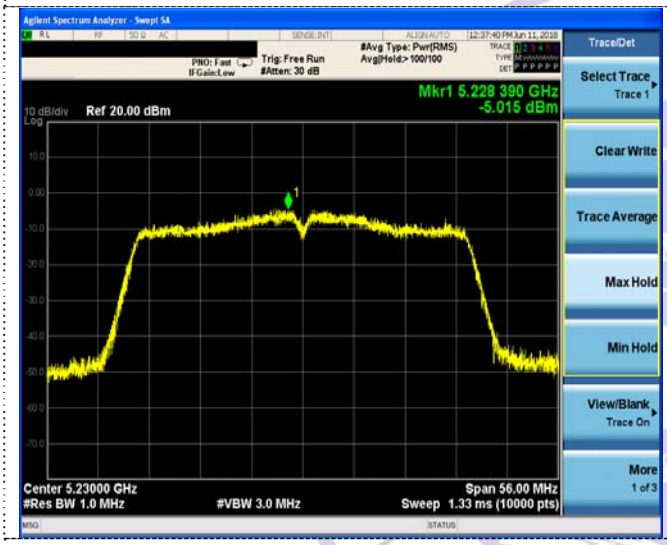
802.11ac(HT40)



CH38

802.11ac(HT80)

CH42



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3.5. Emission Bandwidth (26dBm Bandwidth)

Limit

N/A

Test Procedure

1. Set resolution bandwidth (RBW) = approximately 1 % of the EBW.
2. Set the video bandwidth (VBW) > RBW.
3. Detector = Peak.
4. Trace mode = Max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW / EBW ratio is approximately 1 %.

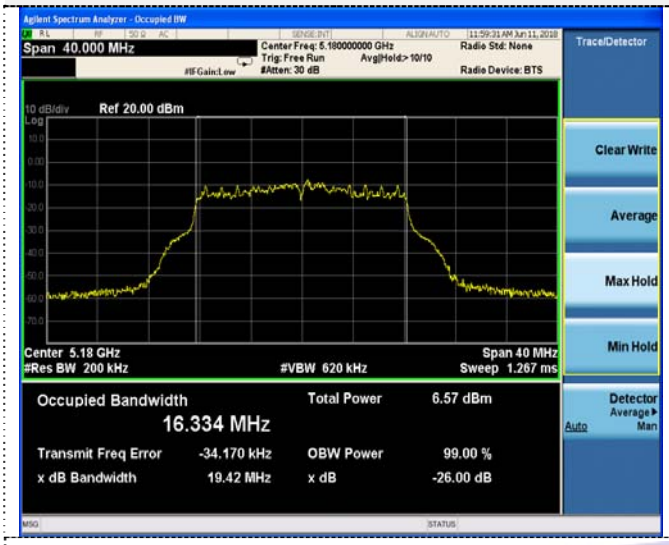
Test Configuration

Test Results

Type	Bands	Channel	26dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Result
802.11a	U-NII 1	36	19.42	16.334	N/A	Pass
		40	19.29	16.345		
		48	19.35	16.334		
802.11n(HT20)	U-NII 1	36	20.59	17.619		
		40	20.83	17.649		
		48	20.66	17.589		
802.11n(HT40)	U-NII 1	38	38.79	36.067		
		46	38.63	36.024		
802.11ac(HT20)	U-NII 1	36	20.78	17.637	N/A	Pass
		40	20.71	17.632		
		48	20.75	17.617		
802.11ac(HT40)	U-NII 1	38	39.26	36.121		
		46	39.03	36.001		
802.11ac(HT80)	U-NII 1	42	79.80	74.869		

Test plot as follows:

802.11a

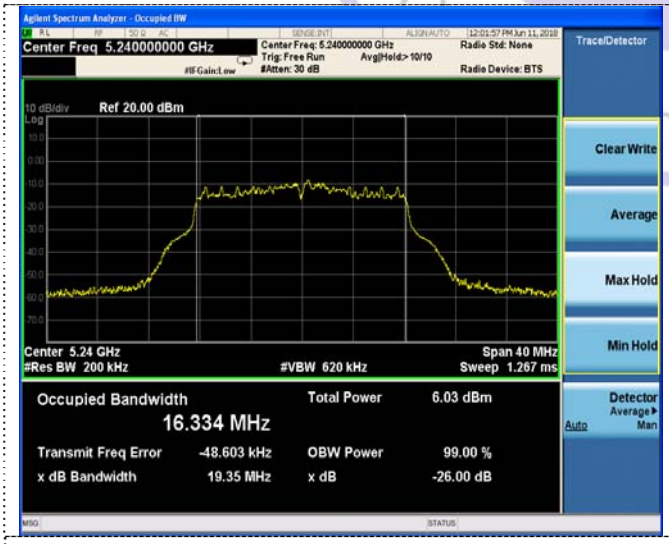


802.11n(HT20)

CH36

CH36

CH40

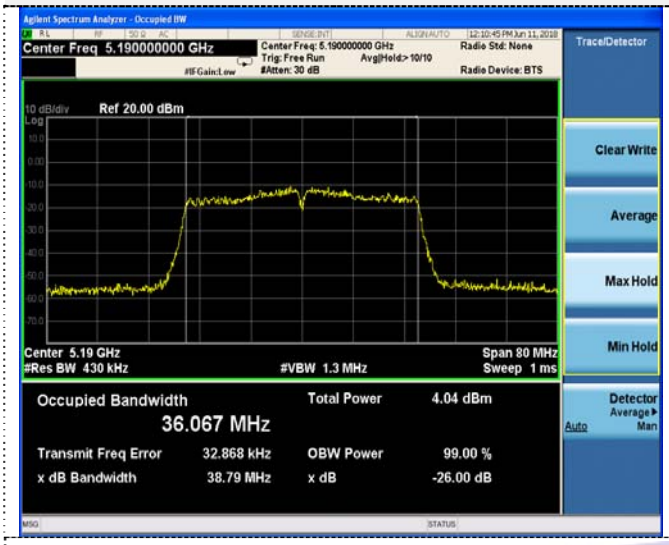


CH40

CH48

CH48

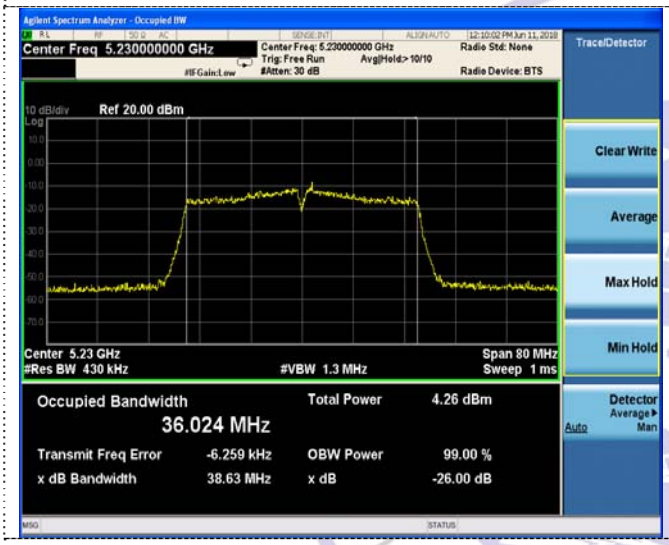
802.11n(HT40)



CH38

802.11ac(HT20)

CH36

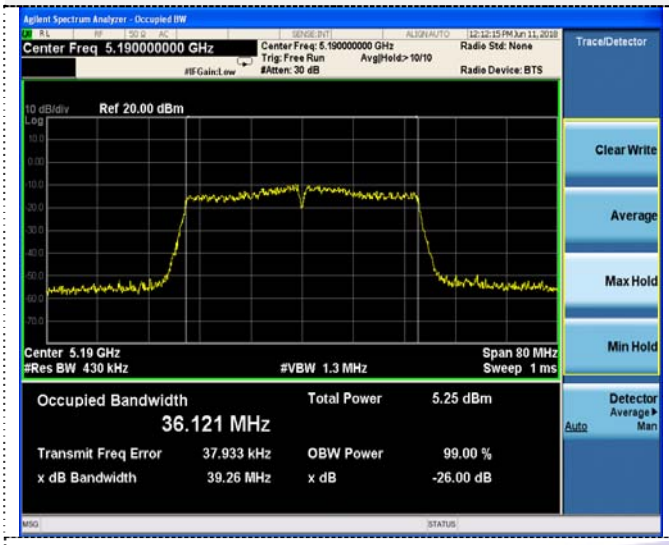


CH46

CH40

CH48

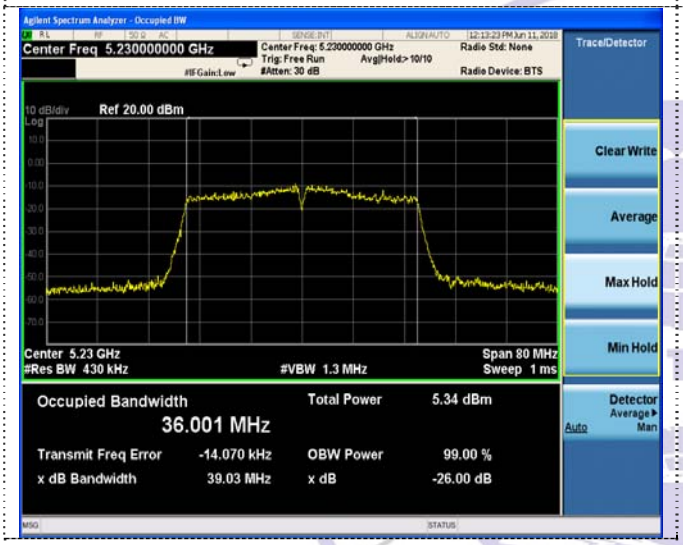
802.11ac(HT40)



802.11ac(HT80)

CH38

CH42



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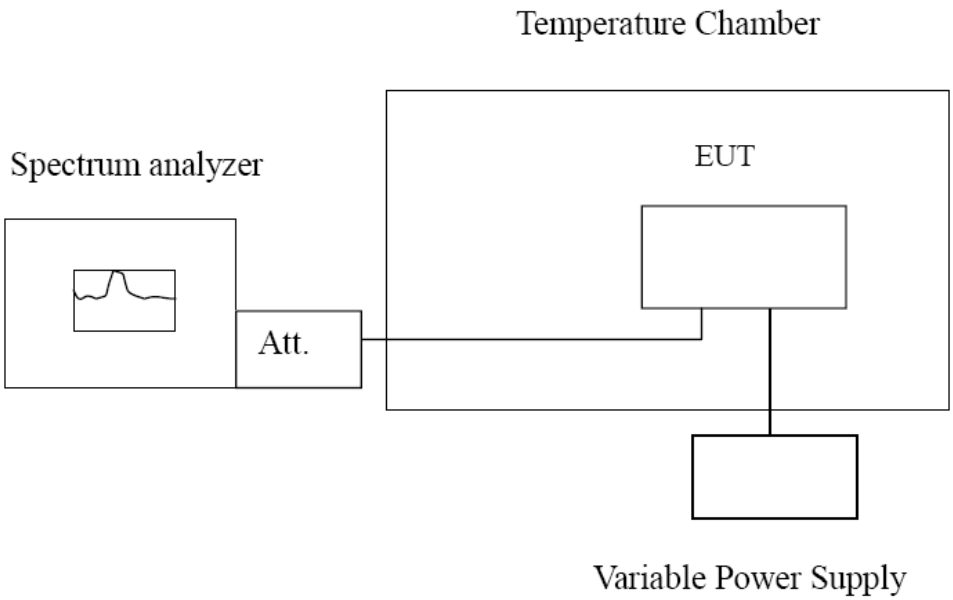
3.6. Frequency Stability

LIMIT

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

TEST CONFIGURATION



TEST PROCEDURE

Frequency Stability under Temperature Variations:
The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20℃ operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -30℃. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10℃ increased per stage until the highest temperature of +50℃ reached.

Frequency Stability under Voltage Variations:
Set chamber temperature to 20℃. Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency.
Reduce the input voltage to specify extreme voltage variation (±15%) and endpoint, record the maximum frequency change.

TEST RESULTS

Record worst case as below:

Reference Frequency: 802.11ac channel=36 frequency=5180MHz					
Voltage (V)	Temperature (℃)	Frequency error		Limit (ppm)	Result
		Hz	ppm		
3.70V	-30	554	0.11	Within the band of operation	Pass
	-20	659	0.13		
	-10	785	0.15		
	0	558	0.11		
	10	648	0.13		
	20	874	0.17		
	30	495	0.10		
	40	778	0.15		
	50	689	0.13		
4.26V	25	735	0.14		
3.15V	25	722	0.14		

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4. Test Setup Photos of the EUT

5. Photos of the EUT

Reference to the test report No. CTL1805075061-WF01

**********End of Report**********

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华检检测