

FCC PART 15.407 TEST REPORT

For

GDU-Tech Co., Ltd

11th floor, Tower 1, Novel Park, 4078 Dong Bin Road, Nanshan District, Shenzhen, China

FCC ID: 2AKIE-PD-RC01-0302

Report Type: Original Report	Product Type: GDU Remote controller
Report Number: RSZ181016811-00C	
Report Date: 2018-12-05	
Reviewed By: RF Engineer	Rocky Kang <i>Rocky Kang</i>
Prepared By: Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn	

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 “*”.

TABLE OF CONTENTS

GENERAL INFORMATION.....	4
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	4
OBJECTIVE	4
RELATED SUBMITTAL(S)/GRANT(S).....	4
TEST METHODOLOGY	4
MEASUREMENT UNCERTAINTY	4
TEST FACILITY	5
SYSTEM TEST CONFIGURATION.....	6
DESCRIPTION OF TEST CONFIGURATION	6
EUT EXERCISE SOFTWARE	6
EQUIPMENT MODIFICATIONS	7
SUPPORT EQUIPMENT LIST AND DETAILS	7
EXTERNAL I/O CABLE.....	8
BLOCK DIAGRAM OF TEST SETUP	8
SUMMARY OF TEST RESULTS.....	9
TEST EQUIPMENT LIST	10
FCC §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION	11
APPLICABLE STANDARD	11
TEST RESULT	11
FCC §15.203 – ANTENNA REQUIREMENT	12
APPLICABLE STANDARD	12
ANTENNA CONNECTOR CONSTRUCTION	12
FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS	13
APPLICABLE STANDARD	13
EUT SETUP.....	13
EMI TEST RECEIVER SETUP.....	13
TEST PROCEDURE	13
TEST RESULTS SUMMARY	14
TEST DATA	14
§15.205 & §15.209 & §15.407(B) (4), (6), (7) – UNDESIRABLE EMISSION	17
APPLICABLE STANDARD	17
EUT SETUP	17
EMI TEST RECEIVER & SPECTRUM ANALYZER SETUP	18
TEST PROCEDURE	18
CORRECTED AMPLITUDE & MARGIN CALCULATION	19
TEST RESULTS SUMMARY	19
TEST DATA	19
§15.407(B) (4) –OUT OF BAND EMISSION	26
APPLICABLE STANDARD	26
TEST PROCEDURE	26
TEST DATA	26
FCC §15.407(e) –6dB EMISSION BANDWIDTH.....	28
APPLICABLE STANDARD	28

TEST PROCEDURE	28
TEST DATA	29
FCC §15.407(a) (3) – CONDUCTED TRANSMITTER OUTPUT POWER.....	33
APPLICABLE STANDARD	33
TEST PROCEDURE	33
TEST DATA	33
FCC §15.407(a) (3) - POWER SPECTRAL DENSITY.....	34
APPLICABLE STANDARD	34
TEST PROCEDURE	34
TEST DATA	35

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *GDU-Tech Co., Ltd*'s product, model number: *CME01-SAGA (FCC ID: 2AKIE-PD-RC01-0302)* or the "EUT" in this report was a *GDU Remote controller*, which was measured approximately: 244 mm (L) * 174 mm (W) * 85 mm (H), rated with input voltage: DC 7.4V from battery.

**All measurement and test data in this report was gathered from production sample serial number: 181016811 (Assigned by BACL, Shenzhen). The EUT supplied by the applicant was received on 2018-10-16.*

Objective

This type approval report is prepared on behalf of *GDU-Tech Co., Ltd* in accordance with Part 2-Subpart J, Part 15-Subparts A and E of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart E, section 15.203, 15.205, 15.207, 15.209 and 15.407 rules.

Related Submittal(s)/Grant(s)

Submissions with the plane unit of a system with FCC ID: 2AKIE-PD-SAGA-0302 and FCC Part 15.247 DSS submissions with FCC ID: 2AKIE-PD-RC01-0302.

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

Measurement Uncertainty

Parameter		uncertainty
Occupied Channel Bandwidth		±5%
RF Output Power with Power meter		±0.5dB
RF conducted test with spectrum		±1.5dB
AC Power Lines Conducted Emissions		±1.95dB
Emissions, Radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB
Temperature		-30~60 °C
Humidity		±6%
Supply voltages		±0.4%

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.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

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

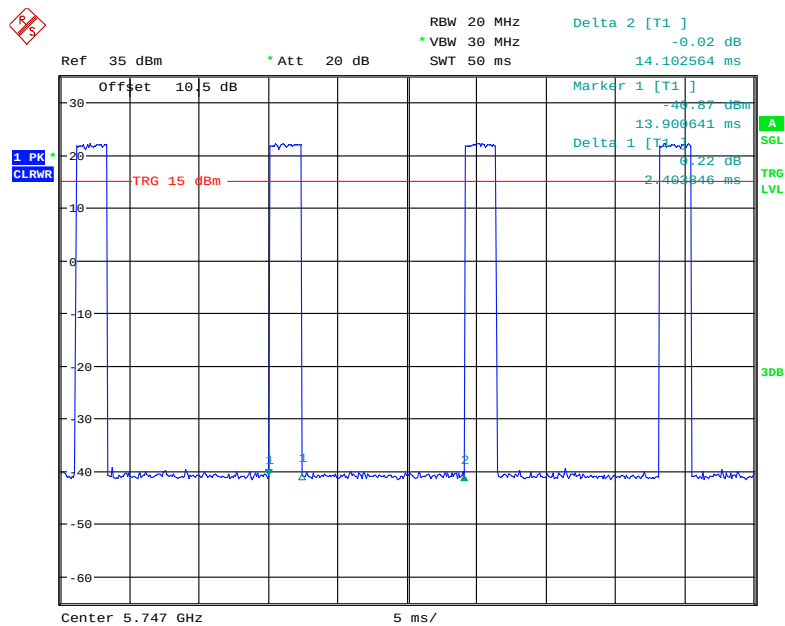
For 5731-5783 MHz Band, 18 channels are provided to testing:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	5731	10	5751
2	5733	11	5753
3	5735	12	5755
4	5737	13	5757
5	5739	14	5759
6	5741	15	5761
7	5743	16	5765
8	5745	17	5769
9	5747	18	5783

Channel 1, 9, 18 were chosen for testing.

EUT Exercise Software

“Artosyn8020PCTool-v4.4.2.exe” software was used for wifi testing. The power level is 21.

Duty cycle:

Date: 13.NOV.2018 23:20:47

Duty Cycle (%)	T(ms)	1/T(kHz)	VBW Setting	Dutycycle factor
17	2.404	0.42	1kHz	7.7

Note: Dutycycle factor= $10 \cdot \log(1/\text{Dutycycle})$ **Equipment Modifications**

No modification was made to the EUT tested.

Support Equipment List and Details

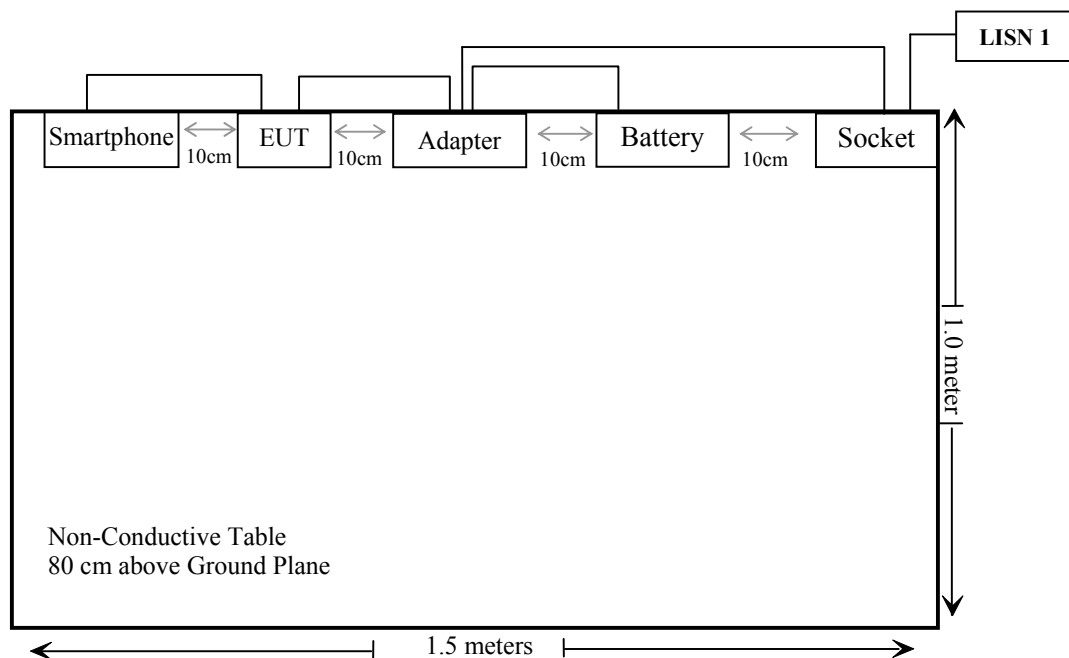
Manufacturer	Description	Model	Serial Number
BULL	Socket	GN-415K	5503290068073
Huawei	Mobile Phone	/	Unknown
GDU-Tech	Adapter	CPD-BC01	Unknown
Prodrone	Battery	PD1-12000mAh-4S	Unknown

External I/O Cable

Cable Description	Length (m)	From/Port	To
Un-Shielding Detachable USB Cable	0.5	Mobile Phone	EUT
Un-Shielding Un-detachable USB Cable	1.0	Adapter	Battery
Un-Shielding Un-detachable USB Cable	1.0	EUT	Adapter
Unshielded Detachable AC Cable	1.2	Mains	Socket

Block Diagram of Test Setup

For Conducted emission:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.407, §1.1307 (b) (1)& §2.1093	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.407(b)(6)& §15.207(a)	Conducted Emissions	Compliance
§15.205& §15.209 &§15.407(b) (4),(6),(7)	Undesirable Emission& Restricted Bands	Compliance
§15.407(b) (4)	Out Of Band Emission	Compliance
§15.407 (e)	6dB Bandwidth	Compliance
§15.407(a)(1),(3)	Conducted Transmitter Output Power	Compliance
§15.407 (a)(1),(3)	Power Spectral Density	Compliance

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
AC Line Conducted test					
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2018-07-11	2019-07-11
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
N/A	Conducted Emission Cable	N/A	UF A210B-1-0720-504504	2018-05-12	2018-11-12
Radiated Emission Test					
A.H. System	Horn Antenna	SAS-200/571	135	2018-09-01	2021-08-31
Rohde & Schwarz	Signal Analyzer	FSEM	845987/005	2018-06-23	2019-06-23
Agilent	Spectrum Analyzer	8564E	3943A01781	2018-01-04	2019-01-04
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017-12-22	2020-12-21
COM-POWER	Pre-amplifier	PA-122	181919	2018-05-22	2018-11-22
Sonoma instrument	Amplifier	310N	186238	2018-05-12	2018-11-12
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2018-08-01	2019-02-01
UTiFLEX MICRO-C0AX	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-08-01	2019-02-01
Ducommun technologies	RF Cable	104PEA	218124002	2018-05-21	2018-11-21
Ducommun technologies	RF Cable	RG-214	1	2018-05-21	2018-11-19
Ducommun technologies	RF Cable	RG-214	2	2018-05-22	2018-11-22
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2016-11-18	2019-11-18
Ducommun Technologies	Horn Antenna	ARH-2823-02	1007726-04	2016-11-18	2019-11-18
Ducommun Technologies	Pre-amplifier	ALN-22093530-01	991373-01	2018-08-03	2019-08-03
RF Conducted Test					
Rohde & Schwarz	Spectrum Analyzer	FSU26	200120	2017-12-24	2018-12-24
Agilent	USB Wideband Power Meter	U2021XA	MY54250003	2018-06-23	2019-06-23
Ducommun technologies	RF Cable	RG-214	3	Each Time	
WEINSCHL	10dB Attenuator	5324	AU 3842	Each Time	

* **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 §1.1307(b) & §2.1093 - RF EXPOSURE INFORMATION

Applicable Standard

FCC§1.1310 and §2.1093.

Test Result

Compliance, please refer to the SAR report: RSZ181016812-SA.

FCC §15.203 – ANTENNA REQUIREMENT

Applicable Standard

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

- a. Antenna must be permanently attached to the unit.
- b. Antenna must use a unique type of connector to attach to the EUT.

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

And according to FCC 47 CFR section 15.407 (a), if the transmitting antennas of directional gain greater than 6dBi are used, the transmit power and power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Antenna Connector Construction

The EUT has two antennas arrangement for 5.8GHz, which was permanently attached, and one is internal antenna only used to transmit signals and one is external antenna only used to receive signals, and each antenna gain is 2 dBi, fulfill the requirement of this section. Please refer to the EUT photos.

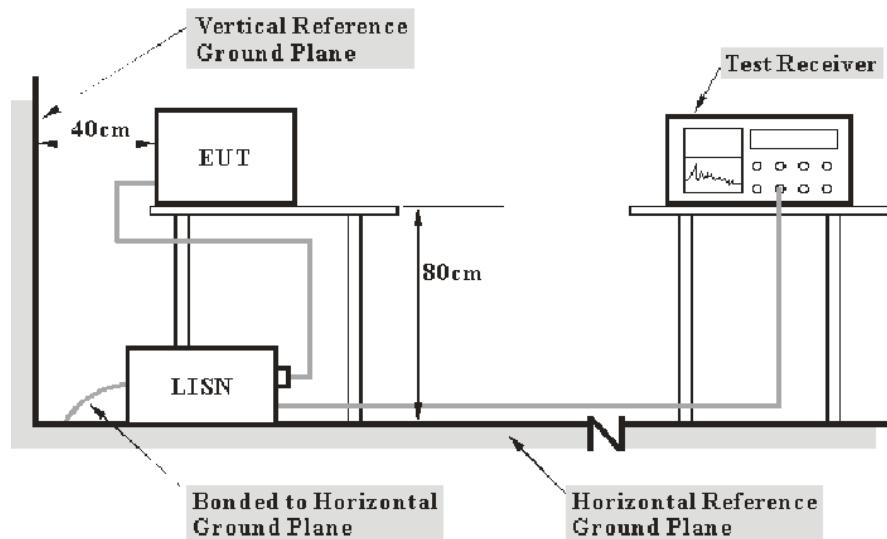
Result: Compliance.

FCC §15.407 (b) (6) §15.207 (a) – CONDUCTED EMISSIONS

Applicable Standard

FCC §15.207, §15.407(b) (6)

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 120VAC/60 Hz 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

Test Procedure

During the conducted emission test, the adapter was connected to the 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 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

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

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

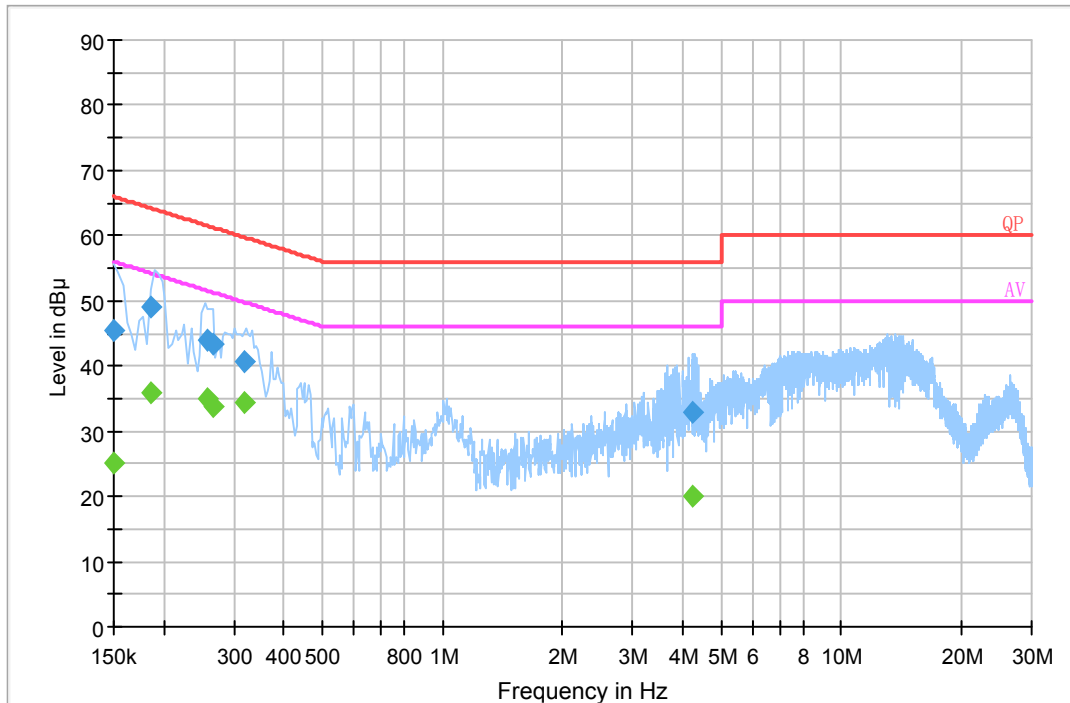
Test Data

Environmental Conditions

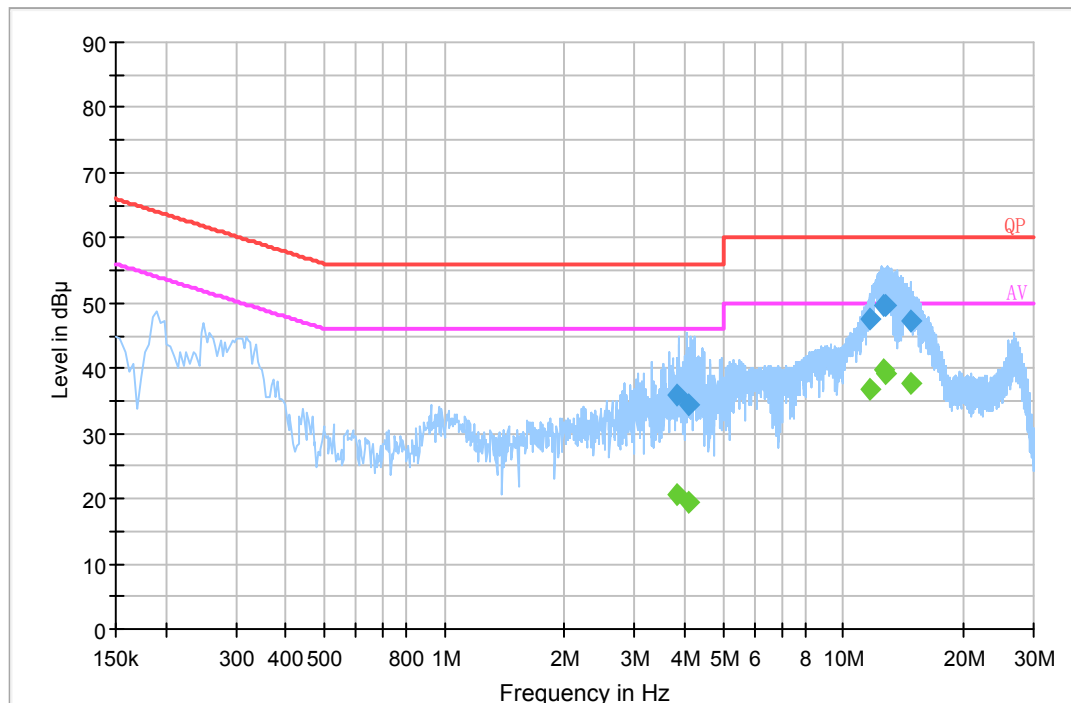
Temperature:	25 °C
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2018-11-06.

EUT operation mode: Charging (RF function no working while it's charging)

AC 120V/60 Hz, Line

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.150000	45.3	19.8	66.0	20.7	QP
0.185500	49.1	19.8	64.2	15.1	QP
0.257500	44.1	19.7	61.5	17.4	QP
0.265500	43.5	19.8	61.3	17.8	QP
0.317170	40.6	19.8	59.8	19.2	QP
4.249830	32.9	20.0	56.0	23.1	QP
0.150000	25.1	19.8	56.0	30.9	Ave.
0.185500	35.8	19.8	54.2	18.4	Ave.
0.257500	35.1	19.7	51.5	16.4	Ave.
0.265500	33.9	19.8	51.3	17.4	Ave.
0.317170	34.5	19.8	49.8	15.3	Ave.
4.249830	20.0	20.0	46.0	26	Ave.

AC 120V/60 Hz, Neutral

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
3.835950	36.0	19.9	56.0	20.0	QP
4.113010	34.3	20.0	56.0	21.7	QP
11.621890	47.5	20.2	60.0	12.5	QP
12.554110	49.7	20.2	60.0	10.3	QP
12.803390	49.7	20.2	60.0	10.3	QP
14.717110	47.4	20.2	60.0	12.6	QP
3.835950	20.5	19.9	46.0	25.5	Ave.
4.113010	19.4	20.0	46.0	26.6	Ave.
11.621890	36.6	20.2	50.0	13.4	Ave.
12.554110	39.9	20.2	50.0	10.1	Ave.
12.803390	39.2	20.2	50.0	10.8	Ave.
14.717110	37.6	20.2	50.0	12.4	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

§15.205 & §15.209 & §15.407(B) (4), (6), (7) – UNDESIRABLE EMISSION**Applicable Standard**

FCC §15.407 (b) (4), (6), (7); §15.209; §15.205;

(b) Undesirable emission limits. Except as shown in paragraph (b) (7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

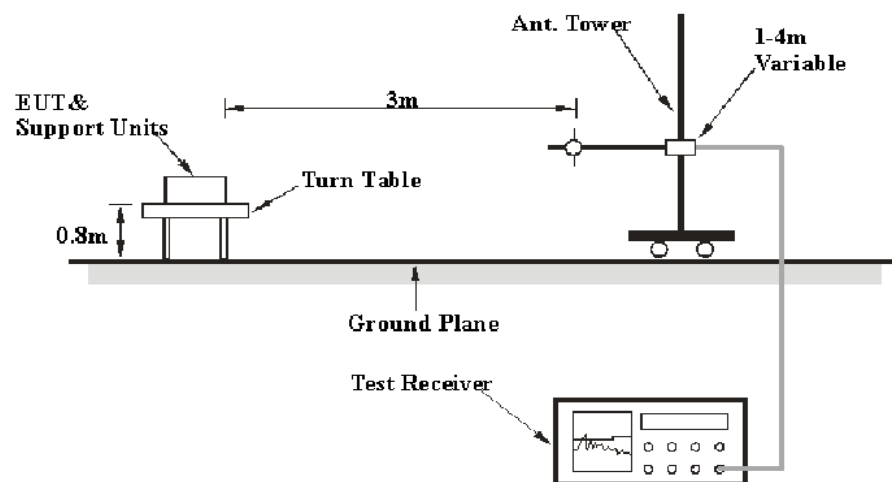
(4) For transmitters operating in the 5.725-5.85 GHz band:

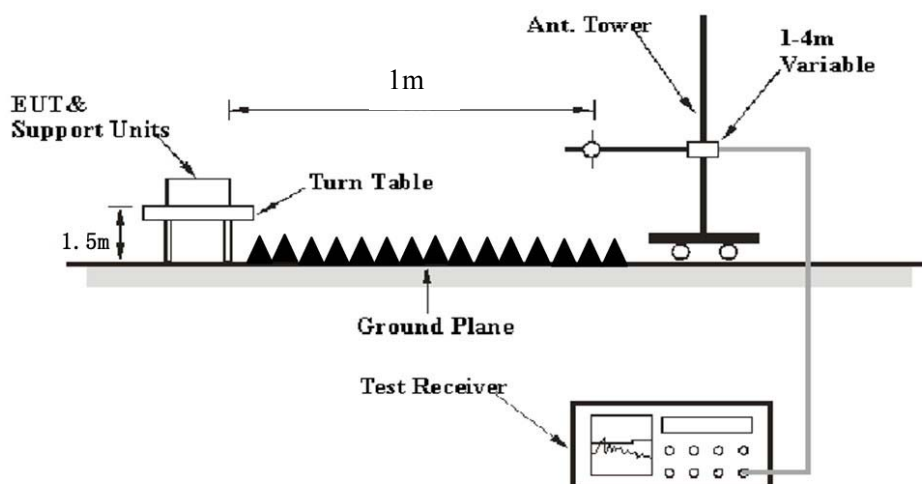
(i) All emissions shall be limited to a level of -27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the 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.

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

EUT Setup

Below 1 GHz:



Above 1 GHz:

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC 15.209 and FCC 15.407 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 40 GHz.

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

Frequency Range	RBW	Video B/W	IF B/W	Measurement
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
Above 1 GHz	1 MHz	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**Radiated Spurious Emission**

During the radiated emission test, the adapter was connected to the AC floor outlet.

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

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

According to ANSI C63.10-2013,9.4: For field strength measurements made at other than the distance at which the applicable limit is specified, extrapolate the measured field strength to the field strength at the distance specified by the limit using an inverse distance correction factor (20 dB/decade of distance). In some cases, a different distance correction factor may be required;

$$E_{\text{SpecLimit}} = E_{\text{Meas}} + 20 \log \left(\frac{d_{\text{Meas}}}{d_{\text{SpecLimit}}} \right)$$

where

$E_{\text{SpecLimit}}$	is the field strength of the emission at the distance specified by the limit, in dB μ V/m
E_{Meas}	is the field strength of the emission at the measurement distance, in dB μ V/m
d_{Meas}	is the measurement distance, in m
$d_{\text{SpecLimit}}$	is the distance specified by the limit, in m

So the extrapolation factor of 1m is $20 \cdot \log(1/3) = -9.5$ dB

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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

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

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

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

Test Data

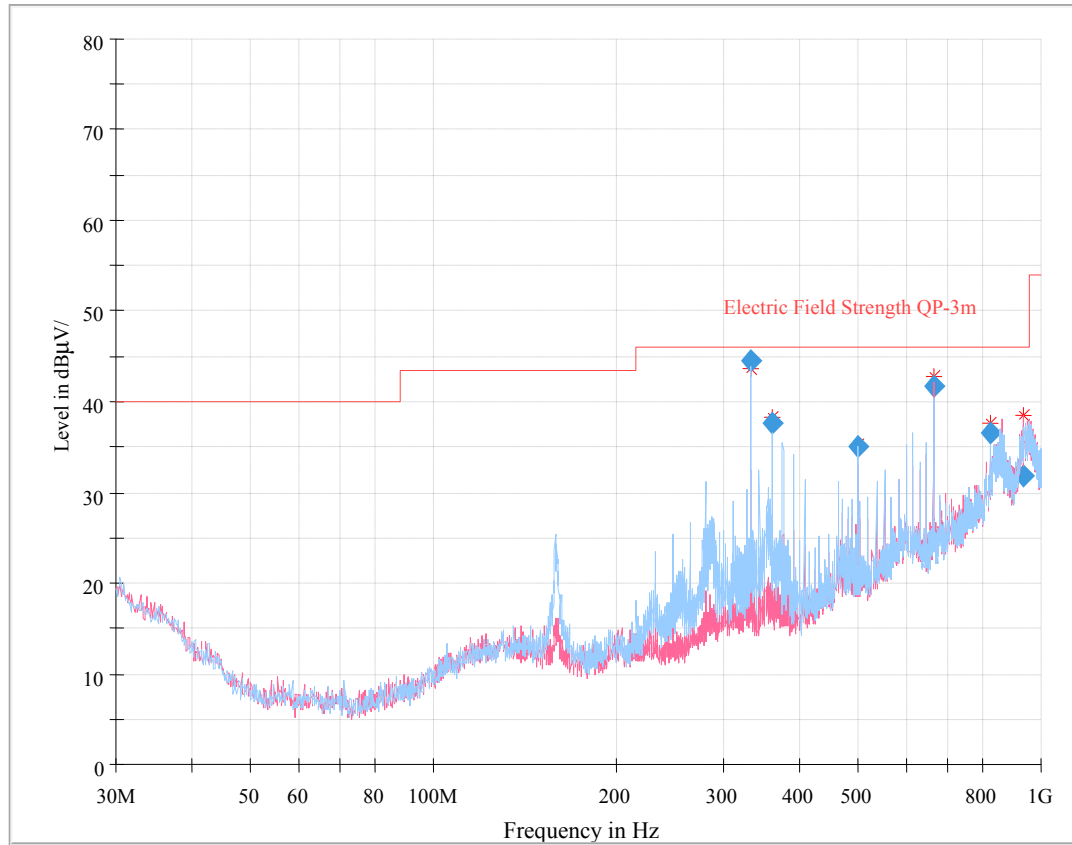
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Baston Chen on 2018-11-05.

EUT operation mode: Transmitting

30 MHz – 1 GHz: (worst case is low channel)



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
332.017375	44.54	102.0	H	261.0	-10.8	46.00	1.46
359.995500	37.65	109.0	H	89.0	-10.7	46.00	8.35
498.022125	35.15	167.0	H	315.0	-7.2	46.00	10.85
664.009625	41.72	100.0	V	18.0	-2.9	46.00	4.28
824.015875	36.66	129.0	H	46.0	4.3	46.00	9.34
938.330125	31.79	133.0	V	0.0	8.6	46.00	14.21

1 GHz ~ 40 GHz:

Frequency (MHz)	Receiver		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)@1m	FCC Part 15.407/205/209	
	Reading (dBμV)@1m	PK/QP/Ave.		Height (m)	Polar (H/V)			Limit (dBμV/m)@1m	Margin (dB)
5731 MHz									
5731.00	67.89	PK	348	1.7	H	42.78	110.67	/	/
5731.00	62.75	Ave.	348	1.7	H	42.78	105.53	/	/
5731.00	78.77	PK	7	1.9	V	42.78	121.55	/	/
5731.00	73.33	Ave.	7	1.9	V	42.78	116.11	/	/
5725.00	37.90	PK	86	1.2	V	42.78	80.68	131.7	51.02
5720.00	29.39	PK	86	1.2	V	42.78	72.17	120.3	48.13
5700.00	28.40	PK	248	1.9	V	42.78	71.18	114.7	43.52
11462.00	48.49	PK	275	1.1	V	24.17	72.66	83.5	10.84
11462.00	37.03	Ave.	275	1.1	V	24.17	61.20	63.5	2.30
5747 MHz									
5747.00	63.78	PK	47	1.3	H	42.78	106.56	/	/
5747.00	58.41	Ave.	47	1.3	H	42.78	101.19	/	/
5747.00	76.74	PK	337	1.1	V	42.78	119.52	/	/
5747.00	71.73	Ave.	337	1.1	V	42.78	114.51	/	/
11494.00	45.87	PK	323	1.5	V	24.17	70.04	83.5	13.46
11494.00	33.97	Ave.	323	1.5	V	24.17	58.14	63.5	5.36
5783 MHz									
5783.00	72.02	PK	180	2.3	H	42.92	114.94	/	/
5783.00	67.55	Ave.	180	2.3	H	42.92	110.47	/	/
5783.00	82.41	PK	245	2.1	V	42.92	125.33	/	/
5783.00	77.42	Ave.	245	2.1	V	42.92	120.34	/	/
5850.00	28.40	PK	266	2.1	V	42.87	71.27	131.7	60.43
5855.00	27.90	PK	266	2.1	V	42.87	70.77	120.3	49.53
5875.00	27.65	PK	40	2.0	V	42.87	70.52	114.7	44.18
11566.00	43.79	PK	241	1.4	V	23.10	66.89	83.5	16.61
11566.00	31.85	Ave.	241	1.4	V	23.10	54.95	63.5	8.55

Note:

Corrected Amplitude = Corrected Factor + Reading

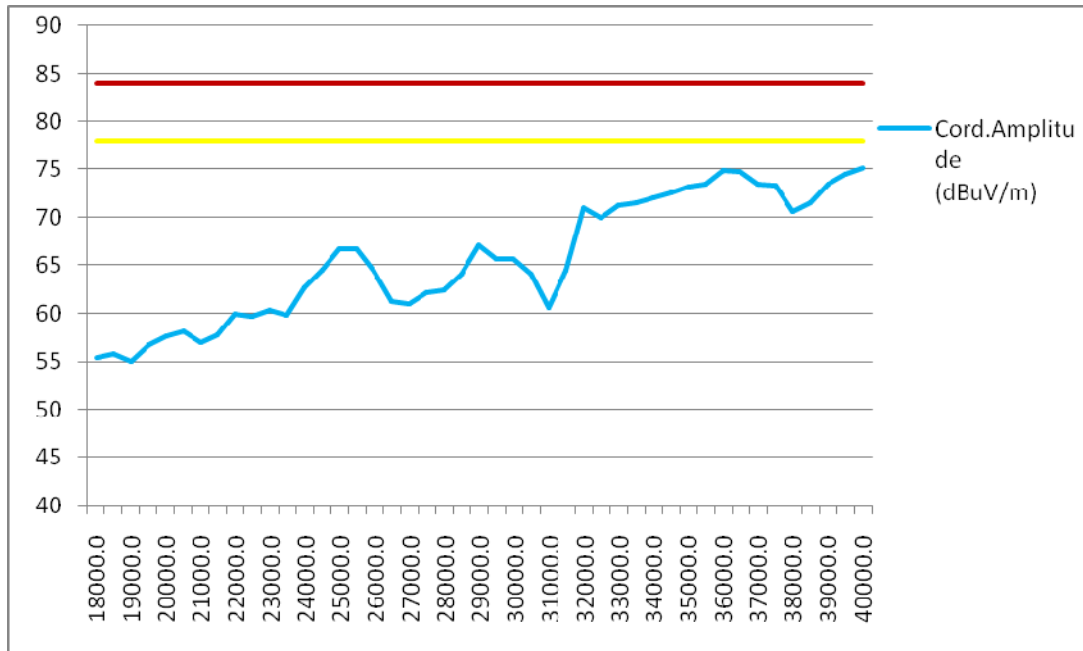
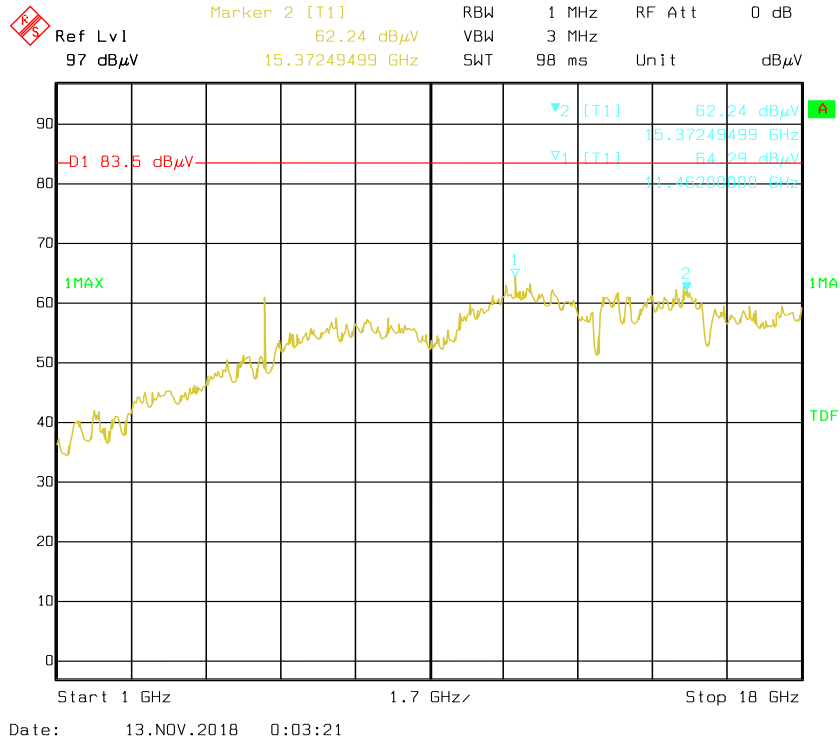
Corrected Factor=Antenna factor (RX) + Cable Loss – Amplifier Factor

Margin = Limit- Corr. Amplitude

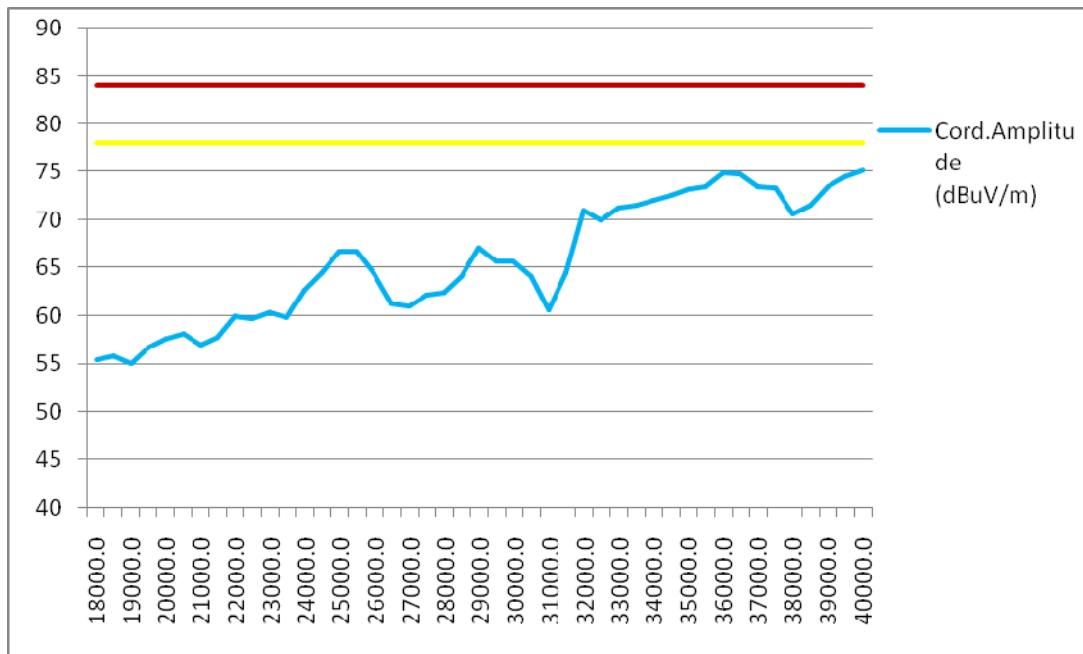
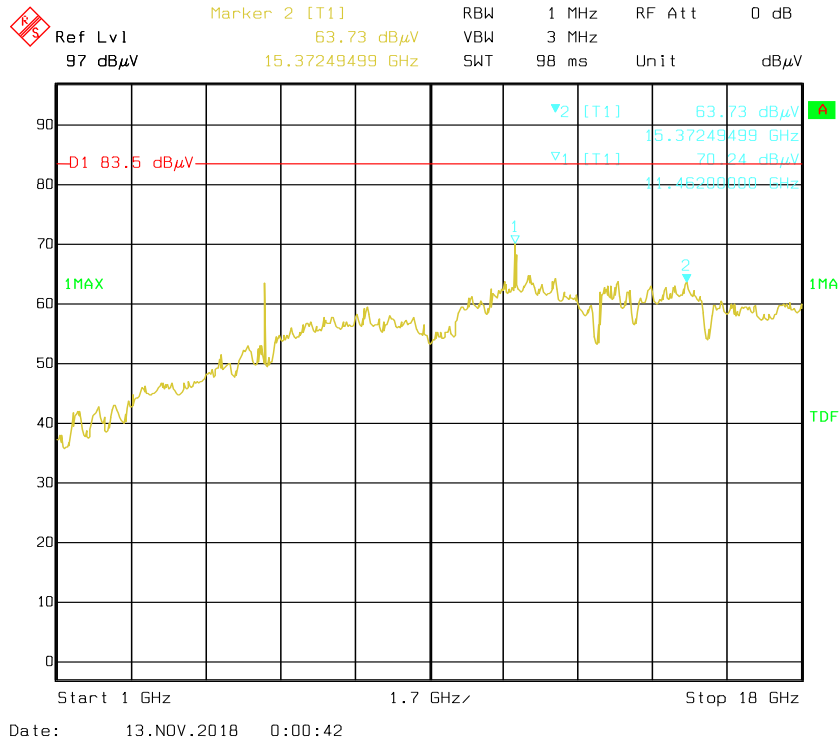
All other spurious emissions are 20 dB below the limit or are on the system noise floor level.

Pre-scan with Low channel, Peak

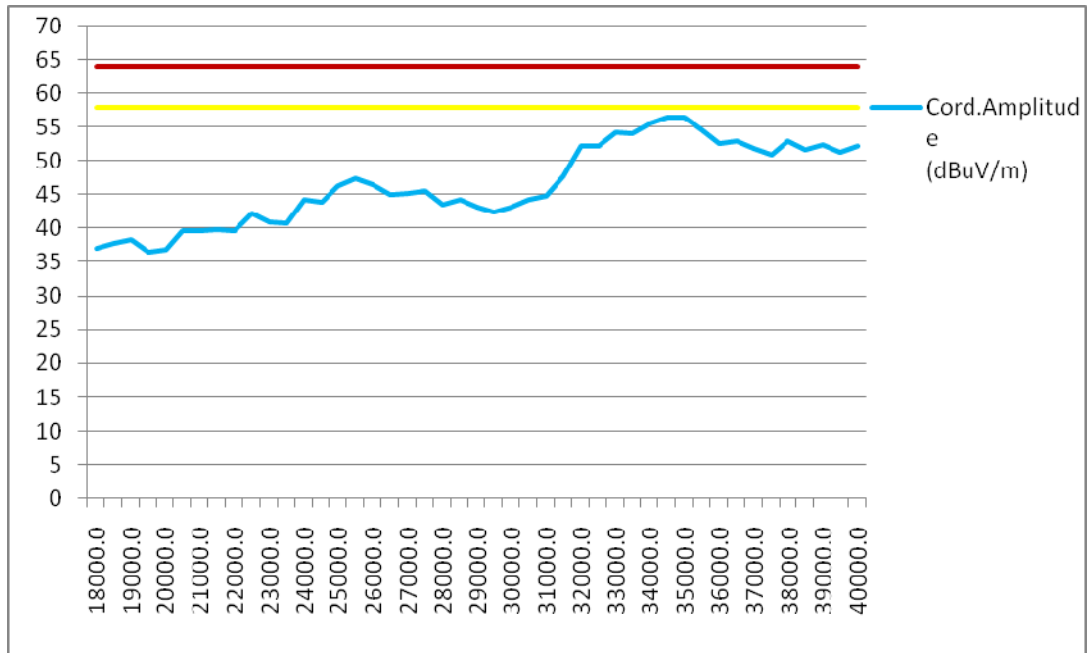
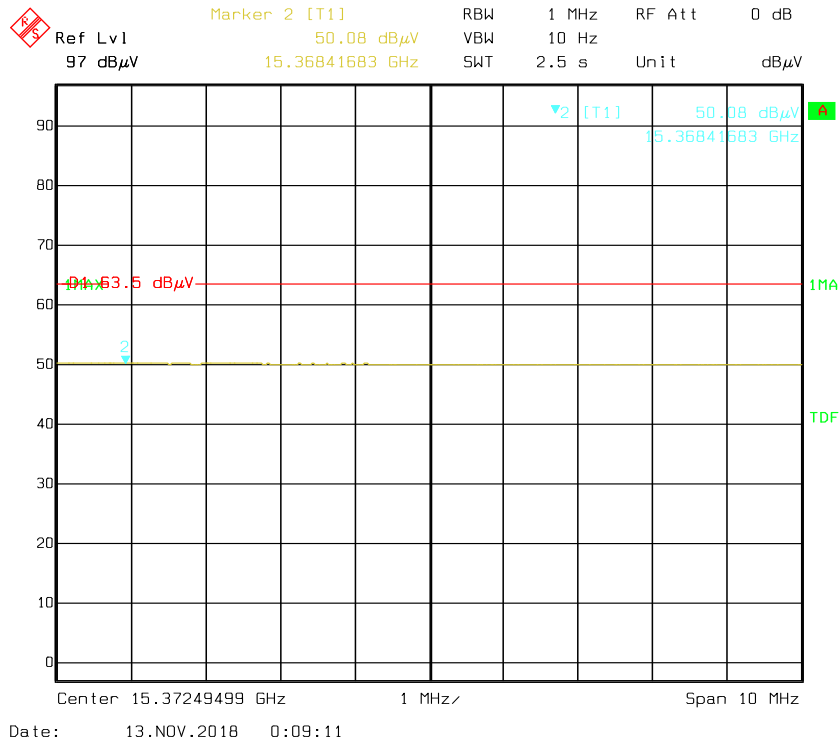
Horizontal



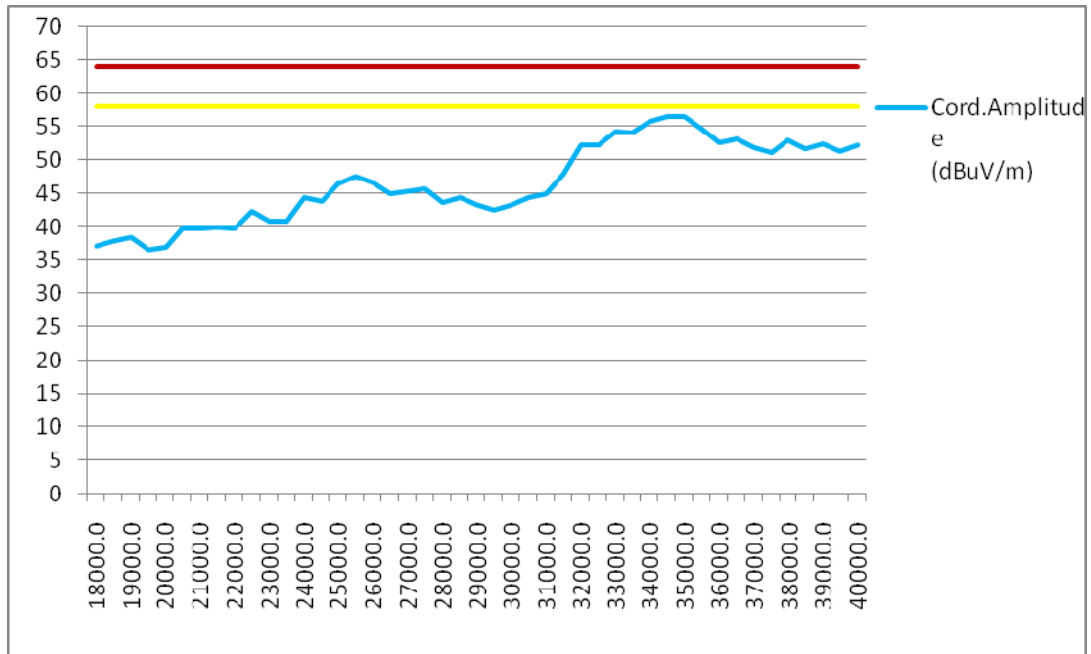
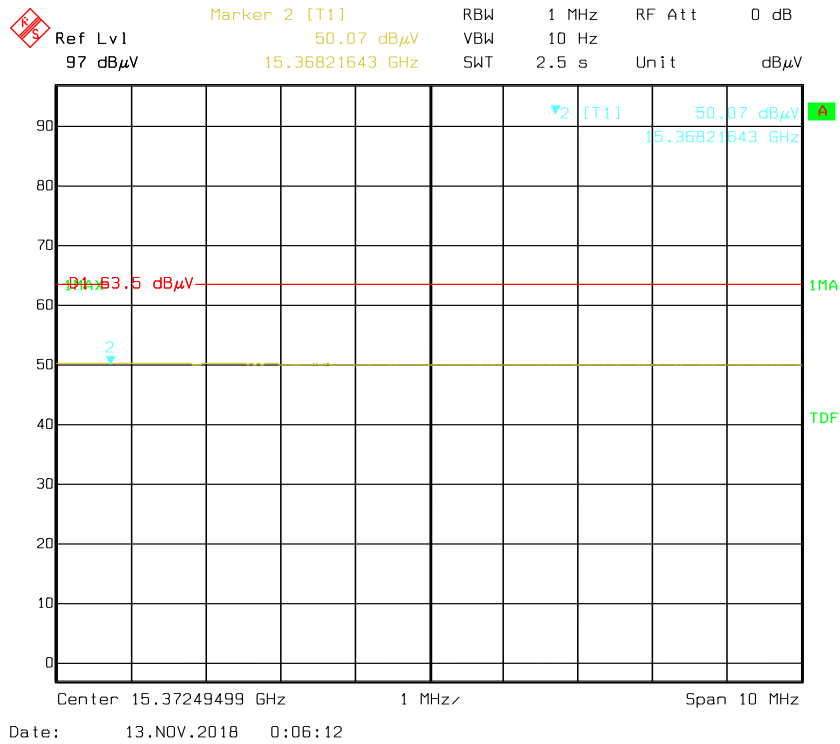
Vertical



Average Horizontal



Vertical



§15.407(B) (4) –OUT OF BAND EMISSION

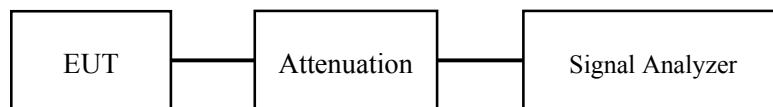
Applicable Standard

FCC §15.407 (b) (4);

For transmitters operating in the 5.725–5.825 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.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. The Resolution bandwidth is set to 1MHz, The Video bandwidth is set to ≥ 1 MHz, report the peak value out of the operating band.
3. Repeat above procedures until all frequencies measured were complete.
4. When necessary, provided the measured energy is integrated to show the total power over 1 MHz.



Test Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

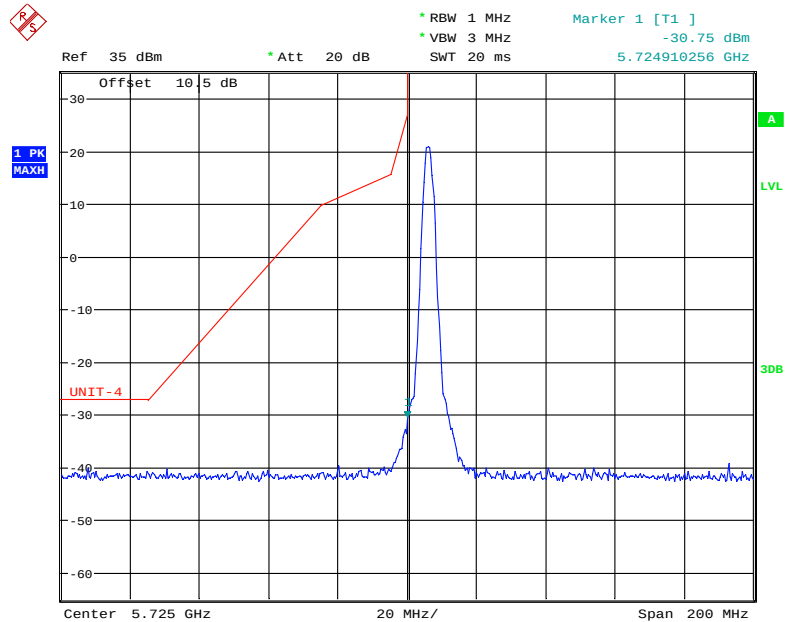
The testing was performed by Shawn Xiao on 2018-11-13.

EUT operation mode: Transmitting

Please refer to the following plots.

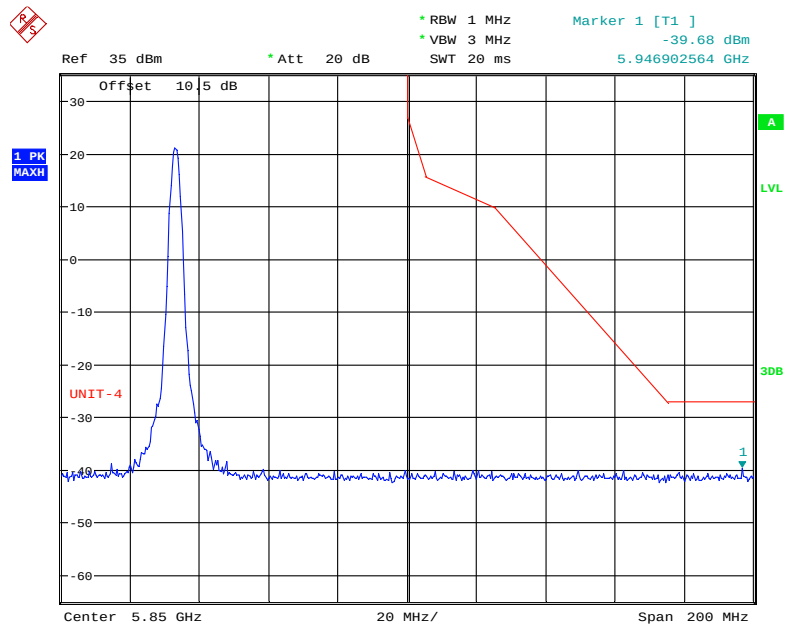
Note: When adding the antenna gain of 2dBi, still comply with the requirement of limit.

Band Edge, Left Side



Date: 13.NOV.2018 22:56:23

Band Edge, Right Side



Date: 13.NOV.2018 23:02:49

FCC §15.407(e) –6dB EMISSION BANDWIDTH**Applicable Standard**

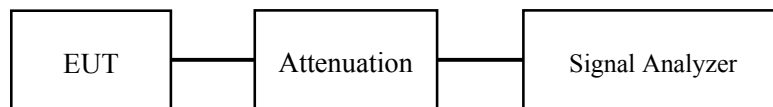
The maximum power spectral density is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used. Measurements in the 5.725-5.85 GHz band are made over a reference bandwidth of 500 kHz or the 26 dB emission bandwidth of the device, whichever is less. Measurements in the 5.47-5.725 GHz bands are made over a bandwidth of 1 MHz or the 26 dB emission bandwidth of the device, whichever is less. A narrower resolution bandwidth can be used, provided that the measured power is integrated over the full reference bandwidth.

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Test Procedure**Minimum Emission Bandwidth for the band 5.725-5.85 GHz**

Section 15.407(e) specifies the minimum 6 dB emission bandwidth of at least 500 kHz for the band 5.725-5.85 GHz. The following procedure shall be used for measuring this bandwidth:

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



Test Data**Environmental Conditions**

Temperature:	26℃
Relative Humidity:	55 %
ATM Pressure:	101.0 kPa

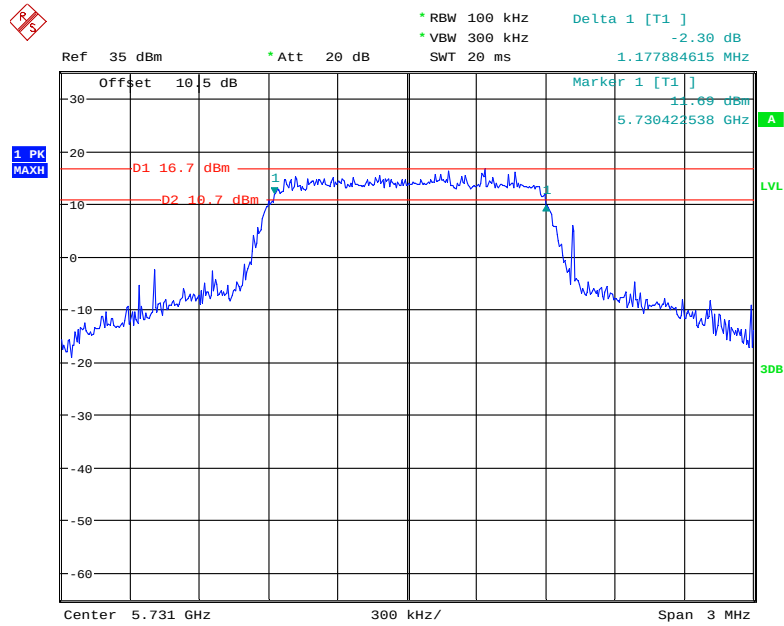
The testing was performed by Shawn Xiao on 2018-11-13.

EUT operation mode: Transmitting

Test Result: Pass; please refer to the following tables and plots.

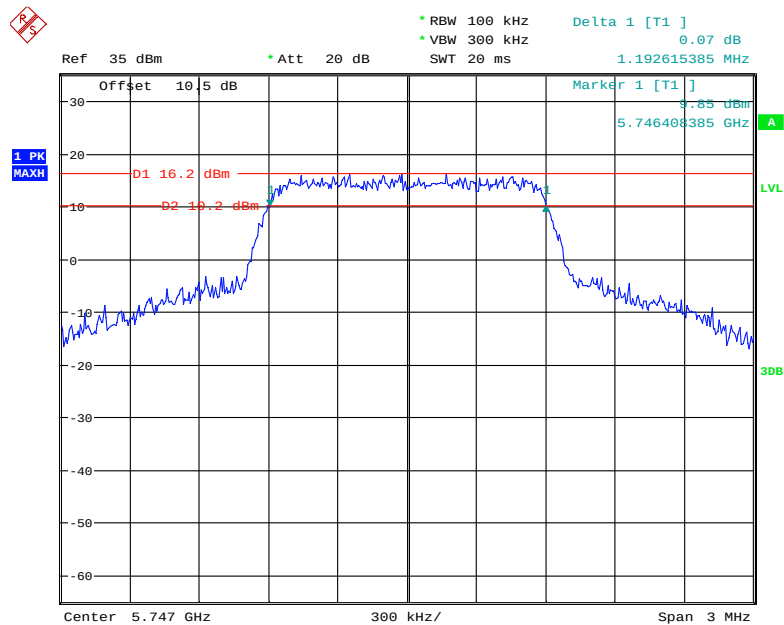
Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	99% Bandwidth (MHz)	Note
5731	1.178	≥ 0.5	1.236	Within 5725-5850MHz
5747	1.193	≥ 0.5	1.242	Within 5725-5850MHz
5783	1.178	≥ 0.5	1.224	Within 5725-5850MHz

6dB Emission Bandwidth, 5731 MHz



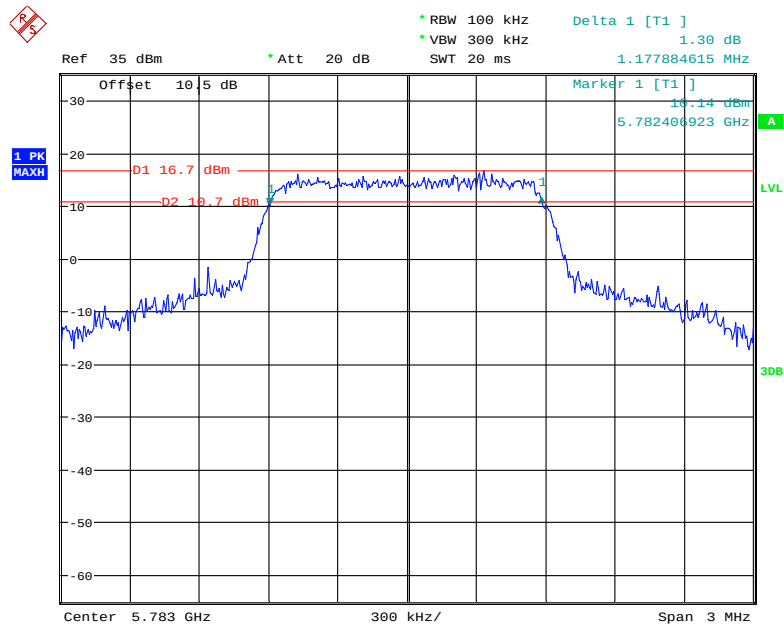
Date: 13.NOV.2018 22:48:42

6dB Emission Bandwidth, 5747 MHz



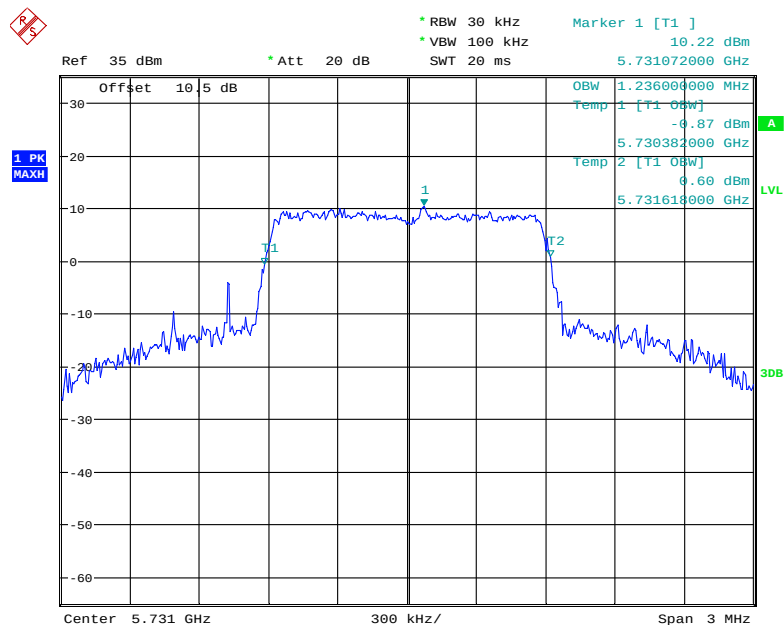
Date: 13.NOV.2018 22:46:38

6dB Emission Bandwidth, 5783 MHz



Date: 13.NOV.2018 22:37:47

99% Occupied Bandwidth, 5731 MHz



Date: 13.NOV.2018 22:52:09

Ref 35 dBm
 * Att 20 dB
 RBW 30 kHz
 VBW 100 kHz
 SWT 20 ms

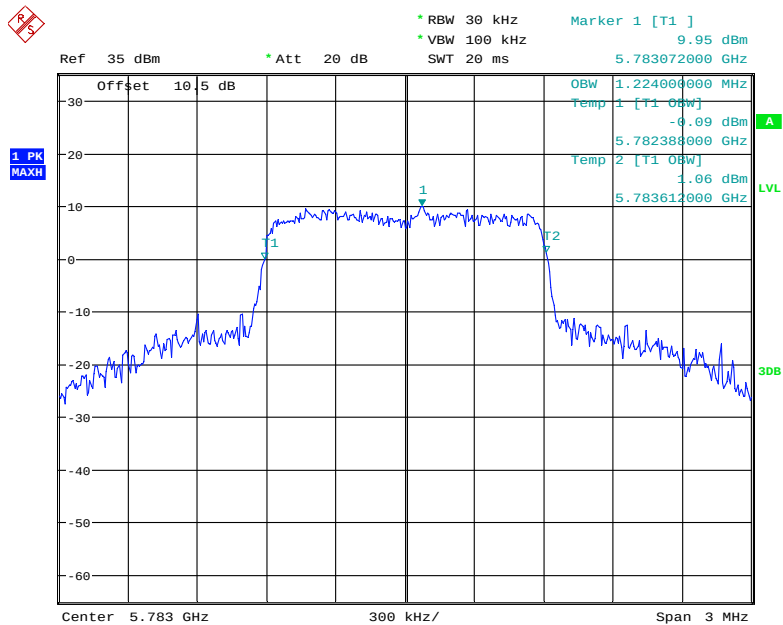
Marker 1 [T1]
 10.39 dBm
 5.747072000 GHz

Offset 10.5 dB
 1 PK
 MAXH

OBW 1.242000000 MHz
 Temp 1 [T1 OBW]
 1.87 dBm
 5.746382000 GHz
 Temp 2 [T1 OBW]
 -1.62 dBm
 5.747624000 GHz

Center 5.747 GHz
 300 kHz/
 Span 3 MHz

99% Occupied Bandwidth, 5783 MHz



Page 32 of 37

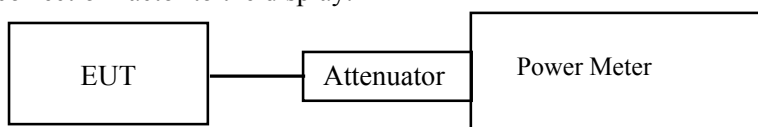
FCC §15.407(a) (3) – CONDUCTED TRANSMITTER OUTPUT POWER

Applicable Standard

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, 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. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

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:	26 °C
Relative Humidity:	54 %
ATM Pressure:	101.0 kPa

The testing was performed by Shawn Xiao on 2018-11-13.

EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables.

Frequency (MHz)	Reading (dBm)	Dutycycle Factor	Output Power (dBm)	Limit (dBm)
5731	21.56	7.7	29.26	30
5747	21.49	7.7	29.19	
5783	21.26	7.7	28.96	

FCC §15.407(a) (3) - POWER SPECTRAL DENSITY

Applicable Standard

(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. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. However, 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. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

Test Procedure

For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the above procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 MHz, or 500 kHz, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz bandwidth, the following adjustments to the procedures apply:

- a) Set $RBW \geq 1/T$, where T is defined in section II.B.1.a).
- b) Set $VBW \geq 3 RBW$.
- c) If measurement bandwidth of Maximum PSD is specified in 500 kHz, add $10 \log (500 \text{ kHz}/RBW)$ to the measured result, whereas $RBW (< 500 \text{ kHz})$ is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
- d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add $10 \log (1\text{MHz}/RBW)$ to the measured result, whereas $RBW (< 1 \text{ MHz})$ is the reduced resolution bandwidth of spectrum analyzer set during measurement.
- e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Test Data**Environmental Conditions**

Temperature:	26 °C
Relative Humidity:	55 %
ATM Pressure:	101 kPa

The testing was performed by Shawn Xiao on 2018-11-13.

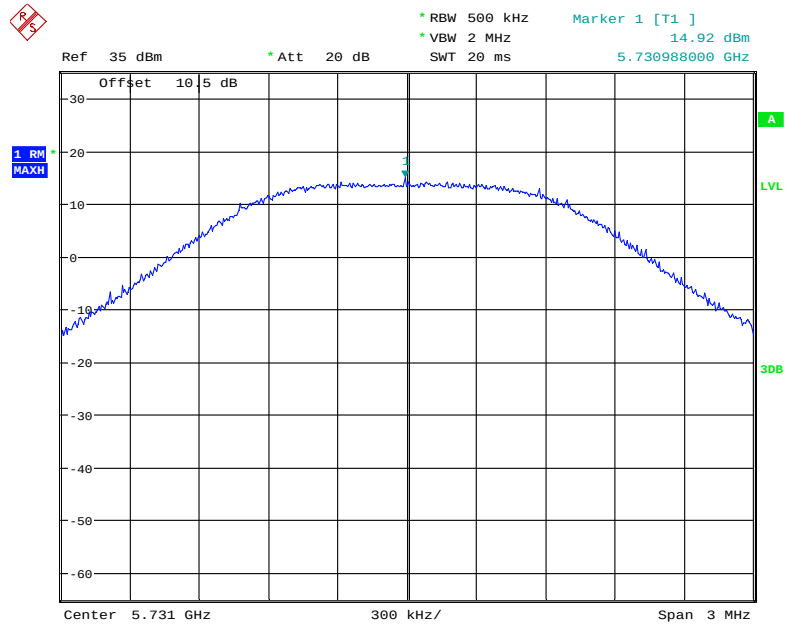
EUT operation mode: Transmitting

Test Result: Pass

Please refer to the following tables and plots.

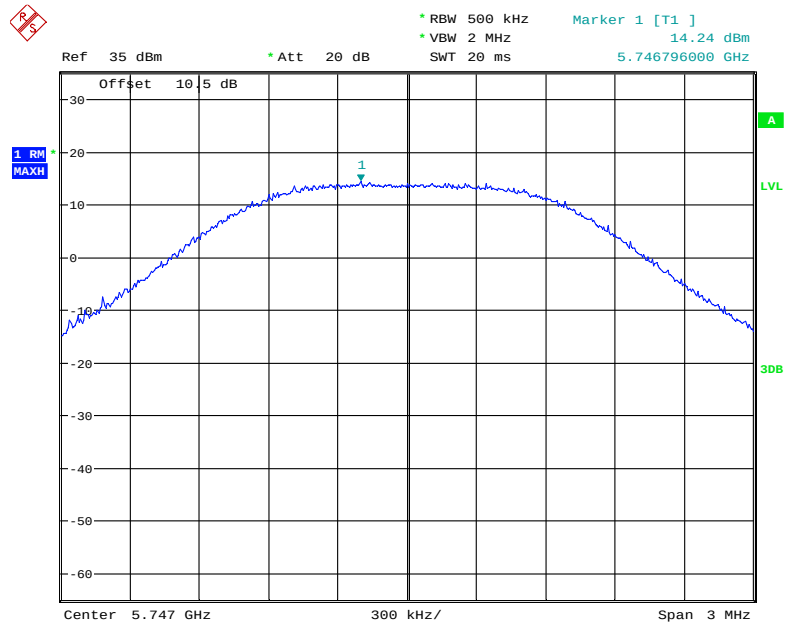
Frequency (MHz)	Reading (dBm/500kHz)	Dutycycle Factor (dB)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)
5731	14.92	7.70	22.62	30
5747	14.24	7.70	21.94	
5783	14.66	7.70	22.36	

Power Spectral Density, 5731 MHz



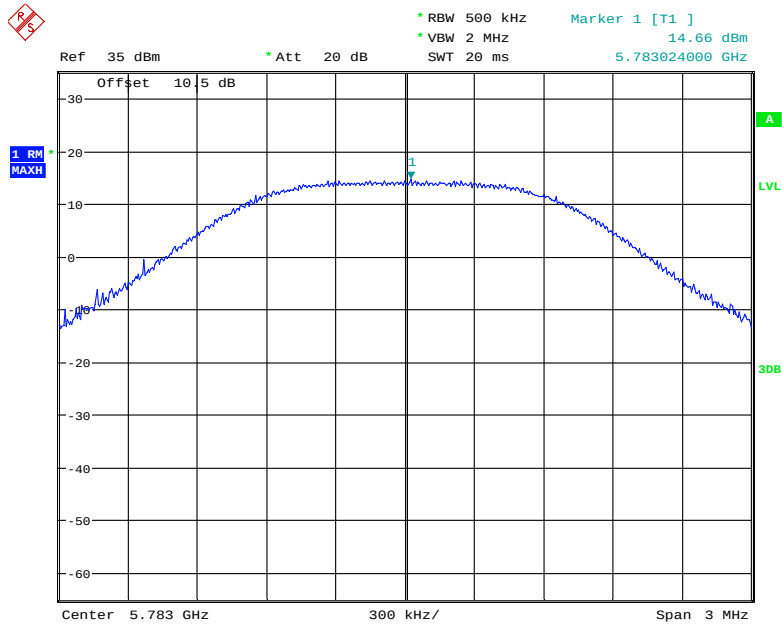
Date: 13.NOV.2018 23:17:39

Power Spectral Density, 5747 MHz



Date: 13.NOV.2018 23:15:47

Power Spectral Density, 5783 MHz



Date: 13.NOV.2018 23:14:33

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