FCC TEST REPORT

Test report
On Behalf of
Shenzhen Simtoo Intelligent Technology Co., Ltd.
For
FPV RACING DRONE
Model No.: DF-280
FCC ID: 2AG45-DF280

Prepared for :	**Shenzhen Simtoo Intelligent Technology Co.,Ltd.** **West Industry Building A5,Park Road, Bao An District,Shenzhen, China 518000**
Prepared By :	**Shenzhen HUAK Testing Technology Co., Ltd.** **F1-008, Tai Yi Building, No.1, Haicheng West Road, Xixiang Street, Bao'an District, Shenzhen City, China**
Date of Test:	**May. 08, 2017 ~ May. 14, 2017**
Date of Report:	**May. 14, 2017**
Report Number:	**HK1700507010-E**

TEST RESULT CERTIFICATION

Applicant's name	:	Shenzhen Simtoo Intelligent Technology Co.,Ltd.
Address	:	West Industry Building A5,Park Road, Bao An District,Shenzhen, China 518000
Manufacture's Name	:	Shenzhen Simtoo Intelligent Technology Co.,Ltd.
Address	:	West Industry Building A5,Park Road, Bao An District,Shenzhen, China 518000

Product description

Trade Mark:		N/A
Product name	:	FPV RACING DRONE
Model and/or type reference	:	DF-280
Standards	:	FCC Rules and Regulations Part 15 Subpart C Section 15.249 ANSI C63.10: 2013

Date of Test	:	
Date (s) of performance of tests	:	**May. 08, 2017 ~ May. 14, 2017**
Date of Issue	:	**May. 14, 2017**
Test Result	:	**Pass**

Testing Engineer : Eric Xie

(Eric Xie)

Technical Manager : Dora Qin

(Dora Qin)

Authorized Signatory :

(Kait Chen)

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1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	N/A
RADIATED EMISSION TEST	COMPLIANT
BAND EDGE	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

1.2 TEST FACILITY

Test Firm : QTC Certification & Testing Co., Ltd.
Certificated by FCC, Registration No.: 588523

Address 2nd Floor,B1 Building,Fengyeyuan Industrial Plant, Liuxian 2st. Road, Xin'an Street, Bao'an District, Shenzhen, China

1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	=	4.06dB, k=2

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	FPV RACING DRONE
Model Name	DF-280
Serial No	N/A
Model Difference	N/A
FCC ID	**2AG45-DF280**
Antenna Type	reverse SMA
Antenna Gain	1 dBi
Operation frequency	5745-5865MHz
Number of Channels	7CH
Modulation Type	FM
Power Source	DC 11.1V
Power Rating	DC 11.1V from battery

2.1.1 Carrier Frequency of Channels

Channel List					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	5745	04	5805	07	5865
01	5765	05	5825		
03	5785	06	5845		

2.2 Operation of EUT during testing

Operating Mode
The mode is used: **Transmitting mode**
Low Channel: 5745MHz
Middle Channel: 5805MHz
High Channel: 5865MHz

2.3 DESCRIPTION OF TEST SETUP

Operation of EUT during below 1GHz Radiation testing:

EUT

Operation of EUT during Above1GHz Radiation testing:

EUT

2.4 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2017	1 Year
2.	LISN	SchwarzBeck	NSLK 8126	8126377	Feb. 19, 2017	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Feb. 19, 2017	1 Year
4.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
5.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2017	1 Year
6.	Trilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Feb. 19, 2017	1 Year
7.	Pre-amplifier	Compliance Direction	PAP-0203	22008	Feb. 19, 2017	1 Year
8.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
9.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2017	1 Year
10.	LISN	SchwarzBeck	NSLK 8126	8126377	Feb. 19, 2017	1 Year
11.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Feb. 19, 2017	1 Year
12.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
13.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2017	1 Year
14.	EMI Receiver	Rohde & Schwarz	ESCI	100627	Feb. 19, 2017	1 Year
15.	LISN	SchwarzBeck	NSLK 8126	8126377	Feb. 19, 2017	1 Year
16.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Feb. 19, 2017	1 Year
17.	EMI Test Software ES-K1	Rohde & Schwarz	N/A	N/A	N/A	N/A
18.	Power Meter	R&S	NRVD	SEL0069	Feb. 19, 2017	1 Year
19.	Power Sensor	R&S	URV5-Z2	SEL0071	Feb. 19, 2017	1 Year
20.	Power Sensor	R&S	URV5-Z2	SEL0072	Feb. 19, 2017	1 Year
21.	Software EMC32	R&S	EMC32-S	SEL0082	N/A	N/A
22.	Log-periodic Antenna	Amplifier Reasearch	ADF-28080	SEL0073	N/A	N/A
23.	Antenna Tripod	Amplifier Reasearch	TP1000A	SEL0074	N/A	N/A
24.	Horn Antenna (1-18GHz)	Rohde & Schwarz	HF907	SEL0075	Feb. 20, 2017	N/A
25.	Horn Antenna (15-40GHz)	Schwarzbeck	BBHA 9170	SEL0076	Feb. 20, 2017	
26.	Spectrum analyzer	Agilent	N9020A	MY499110 048	Feb. 19, 2017	1 Year
27.	Spectrum analyzer	Agilent	E4407B	MY461843 26	Feb. 19, 2017	1 Year
28.	Spectrum analyzer	Agilent	N9030A	MY499221 036	Feb. 19, 2017	1 Year
29.	RF Cable	Micable	C10-01-01-1	100309	Feb. 18, 2017	1 Year
30.	Cable (9KHz-2GHz)	Resenberger	SUCOFLEX 104	309972/2	Feb. 18, 2017	1 Year
31.	Cable(1GHz-40GHz)	Resenberger	SUCOFLEX 104	329112/2	Feb. 18, 2017	1 Year

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

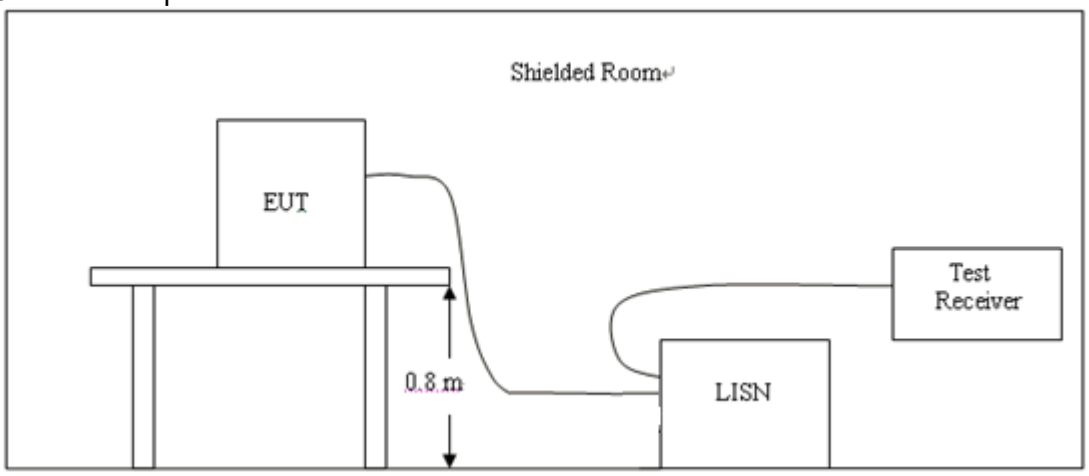
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

3.2 Test Setup



3.3 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 0.1 meters is used and is placed on the ground plane as per ANSI C63.10.
2, Support equipment, if needed, was placed as per ANSI C63.10.
3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
4, If a EUT received DC power from the USB Port of Notebook PC, the PC's 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.

3.4 Test Result

Not applicable.

Note: EUT power supply by battery, so this test item not applicable.

4 RADIATED EMISSION TEST

4.1 Radiation Limit

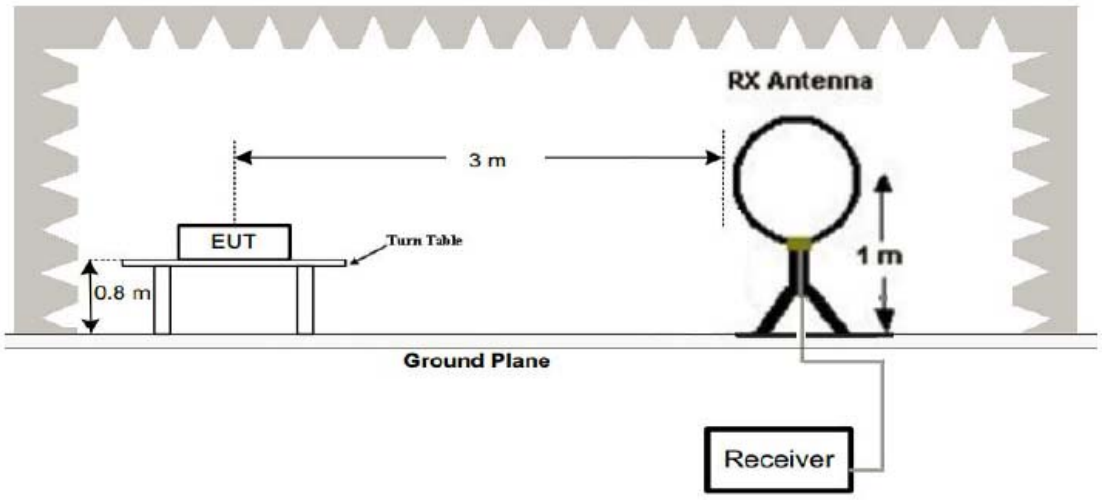
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

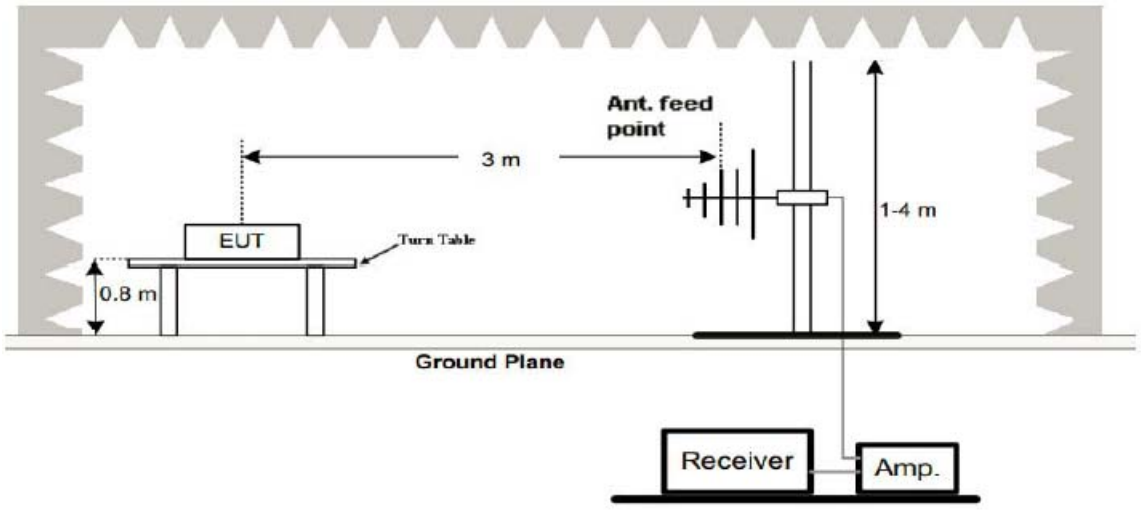
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

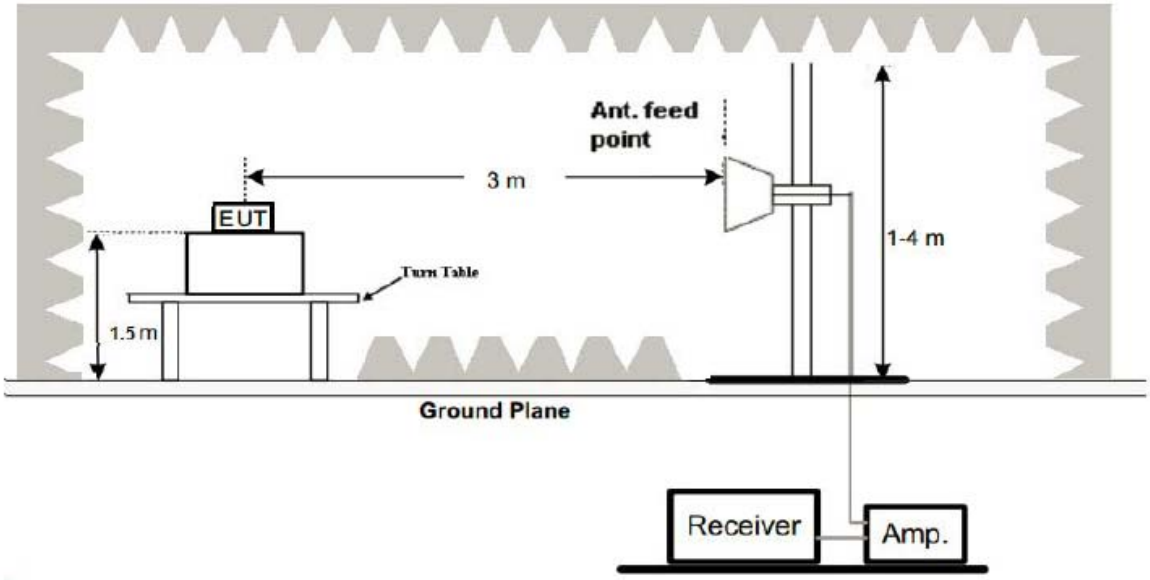
（1）Radiated Emission Test-Up Frequency Below 30MHz



（2）Radiated Emission Test-Up Frequency 30MHz~1GHz



（3）Radiated Emission Test-Up Frequency Above 1GHz



4.3 Test Procedure

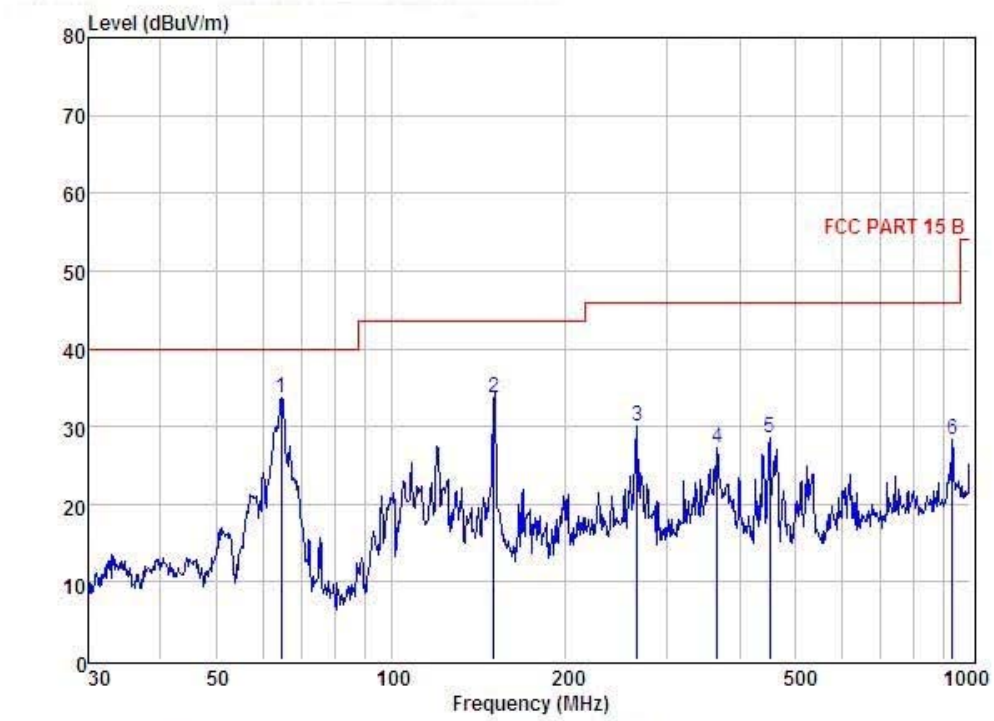
1. Below 1GHz measurement the EUT is placed on turntable which is 0.1m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The test frequency range from 9KHz to 40GHz per FCC PART 15.33(a).

Note:
For battery operated equipment, the equipment tests shall be performed using a new battery.

4.4 Test Result

PASS
All the test modes completed for test. The worst case of Radiated Emission below 1 GHz is TX CH 5745 test mode; the test data of this mode was reported.

Below 1GHz Test Results:
Antenna polarity: H

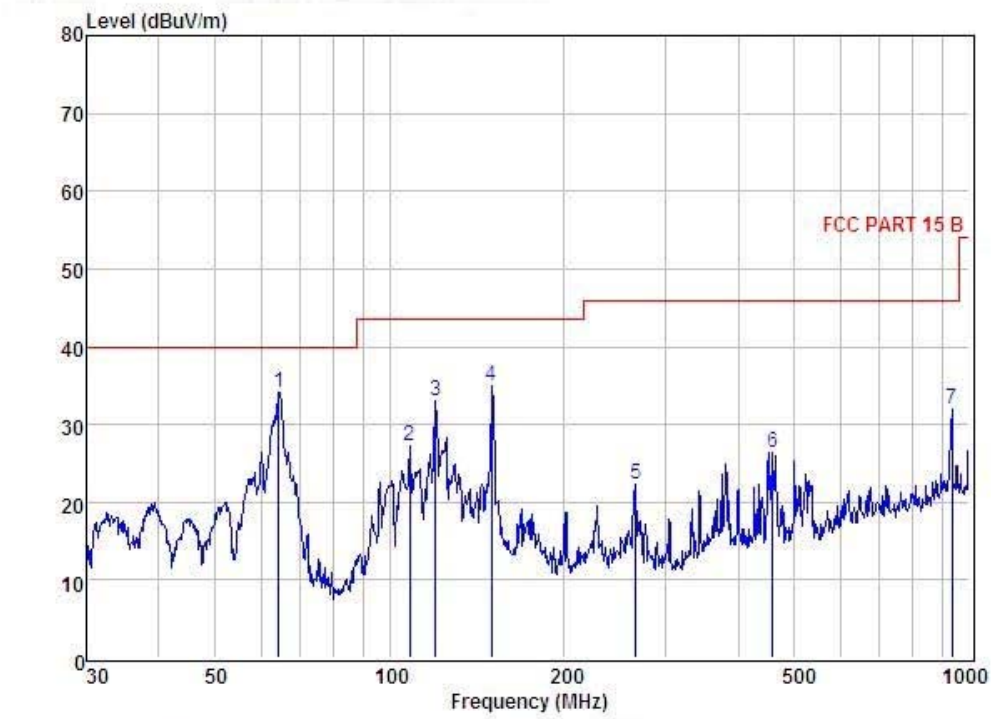


Condition : FCC PART 15 B 3m POL: HORIZONTAL

Item	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	64.66	49.10	11.59	27.20	0.25	33.74	40.00	-6.26	QP
2	150.54	46.12	14.16	26.91	0.39	33.76	43.50	-9.74	QP
3	265.68	44.53	11.96	27.13	0.61	29.97	46.00	-16.03	QP
4	365.54	39.68	14.16	27.32	0.78	27.30	46.00	-18.70	QP
5	451.14	38.93	15.99	27.49	1.08	28.51	46.00	-17.49	QP
6	932.27	32.99	22.02	27.63	0.97	28.35	46.00	-17.65	QP

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Antenna polarity: V



Condition : FCC PART 15 B 3m POL: VERTICAL

Item	Freq	Read Level	Antenna Factor	Preamp Factor	Cable Loss	Level	Limit	Margin	Remark
	MHz	dBuV	dB	dB	dB	dBuV	dBuV	dBuV	
1	64.43	49.32	11.98	27.43	0.24	34.11	40.00	-5.89	QP
2	108.27	42.56	11.13	26.86	0.41	27.24	43.50	-16.26	QP
3	120.28	47.21	12.24	26.88	0.36	32.93	43.50	-10.57	QP
4	150.01	47.23	14.16	26.91	0.39	34.87	43.50	-8.63	QP
5	265.68	36.89	11.96	27.13	0.61	22.33	46.00	-23.67	QP
6	457.51	36.74	16.04	27.50	1.16	26.44	46.00	-19.56	QP
7	935.55	36.67	22.04	27.63	0.95	32.03	46.00	-13.97	QP

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

Remark：
(1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

Above 1 GHz Test Results:

CH Low (5745MHz)
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5745	109.67	-3.21	106.46	114	-7.54	peak
5745	84.42	-3.21	81.21	94	-12.79	AVG
11490	51.44	3.76	55.2	74	-18.80	peak
11490	36.78	3.76	40.54	54	-13.46	AVG
17235	53.24	4.84	58.08	74	-15.92	peak
17235	38.01	4.84	42.85	54	-11.15	AVG
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5745	108.73	-3.21	105.52	114	-8.48	peak
5745	83.10	-3.21	79.89	94	-14.11	AVG
11490	54.71	3.76	58.47	74	-15.53	peak
11490	41.06	3.76	44.82	54	-9.18	AVG
17235	53.59	4.84	58.43	74	-15.57	peak
17235	37.62	4.84	42.46	54	-11.54	AVG
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---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH Middle (5805MHz)
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5805	108.58	-3.06	105.52	114	-8.48	peak
5805	82.95	-3.06	79.89	94	-14.11	AVG
11610	54.66	3.81	58.47	74	-15.53	peak
11610	41.01	3.81	44.82	54	-9.18	AVG
17415	53.51	4.92	58.43	74	-15.57	peak
17415	37.54	4.92	42.46	54	-11.54	AVG
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---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5805	106.09	-3.06	103.03	114	-10.97	peak
5805	85.07	-3.06	82.01	94	-11.99	AVG
11610	54.52	3.81	58.33	74	-15.67	peak
11610	38.76	3.81	42.57	54	-11.43	AVG
17415	50.37	4.92	55.29	74	-18.71	peak
17415	34.48	4.92	39.4	54	-14.60	AVG
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---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

CH High (5865MHz)
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5865	108.39	-3.01	105.38	114	-8.62	peak
5865	79.54	-3.01	76.53	94	-17.47	AVG
11730	54.08	3.85	57.93	74	-16.07	peak
11730	38.65	3.85	42.5	54	-11.50	AVG
17595	50.77	4.94	55.71	74	-18.29	peak
17595	37.27	4.94	42.21	54	-11.79	AVG
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---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5865	105.71	-3.01	102.7	114	-11.30	peak
5865	82.98	-3.01	79.97	94	-14.03	AVG
11730	51.10	3.85	54.95	74	-19.05	peak
11730	35.70	3.85	39.55	54	-14.45	AVG
17595	51.02	4.94	55.96	74	-18.04	peak
17595	35.17	4.94	40.11	54	-13.89	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Remark：
(1) Measuring frequencies from 1 GHz to the 40 GHz。
(2) “F” denotes fundamental frequency; “H” denotes spurious frequency. “E” denotes band edge frequency.
(3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
(4) Data of measurement within this frequency range shown “--- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
(5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
(6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

5 BAND EDGE

5.1 Limits

FCC PART 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

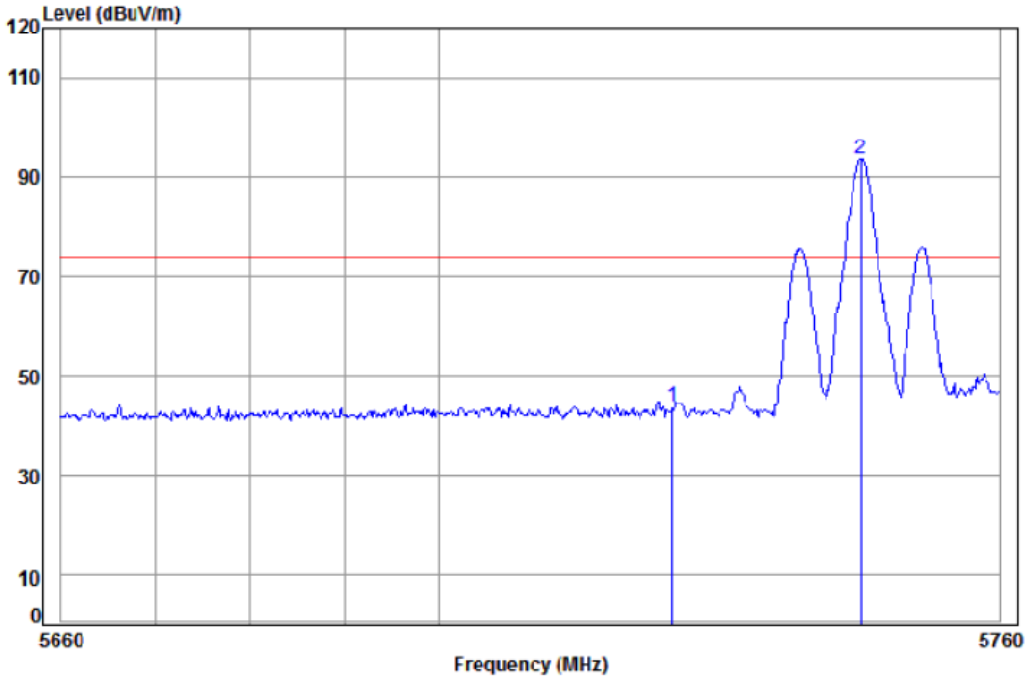
5.2 Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 100KHz and VBM to 300KHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength.The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW to 100 KHz and VBW to 300 KHz, to measure the conducted peak band edge.

5.3 Test Result

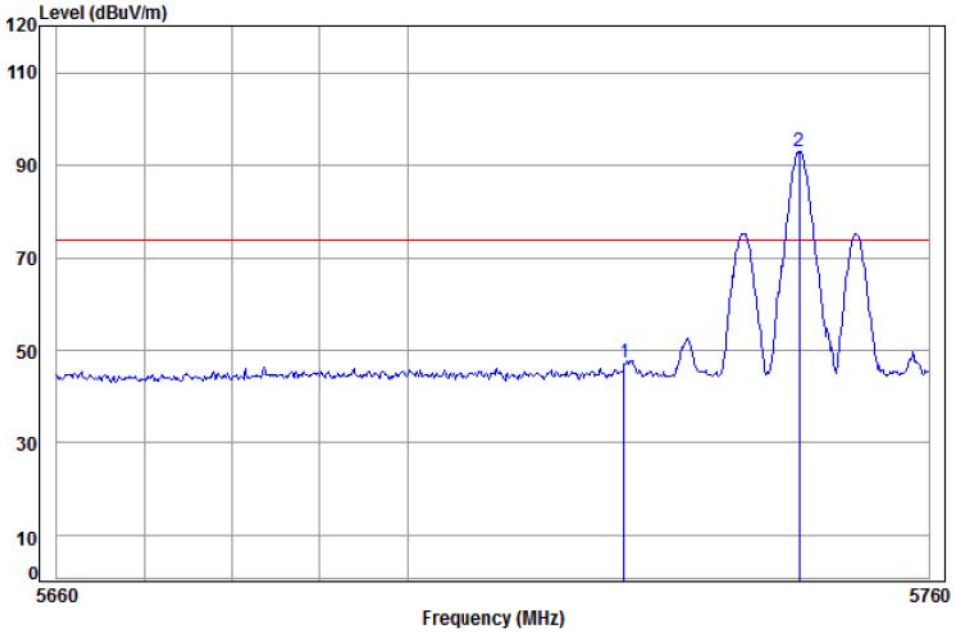
PASS

Radiated Band Edge Test:
Operation Mode: TX CH Low (5745MHz)
Horizontal



Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5725	50.83	-3.38	47.45	74	-26.55	peak
5725	/	-3.38	/	54	/	AVG
/	/	/	/	/	/	/
/	/	/	/	/	/	/
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

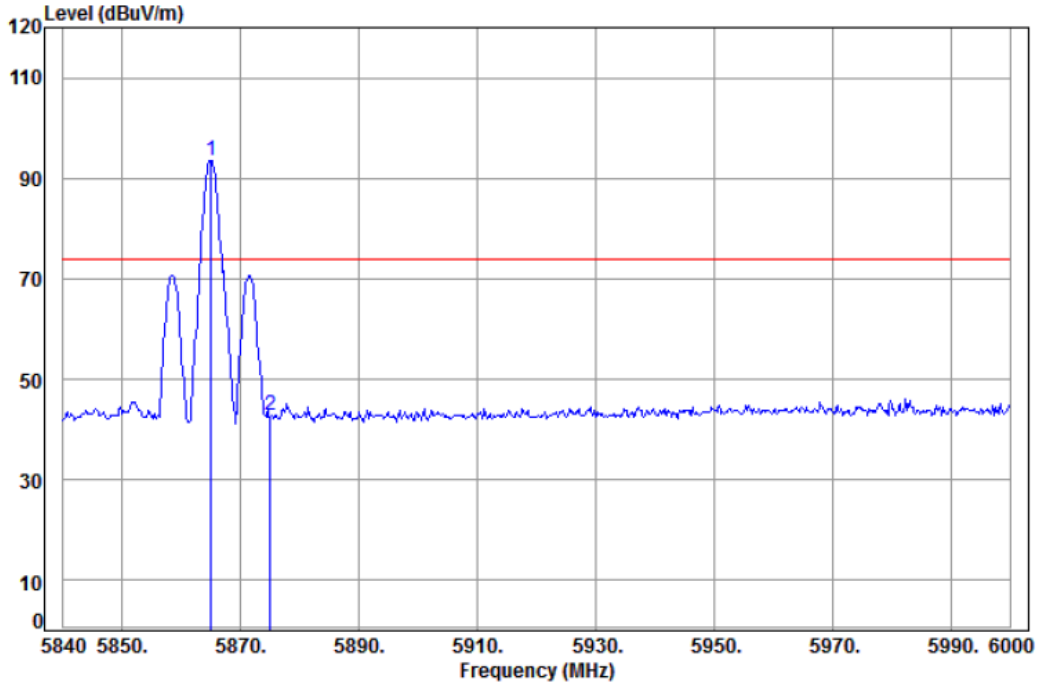
Vertical:



Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5725	50.77	-3.38	47.39	74	-26.61	peak
5725	/	-3.38	/	54	/	AVG
/	/	/	/	/	/	/
/	/	/	/	/	/	/
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

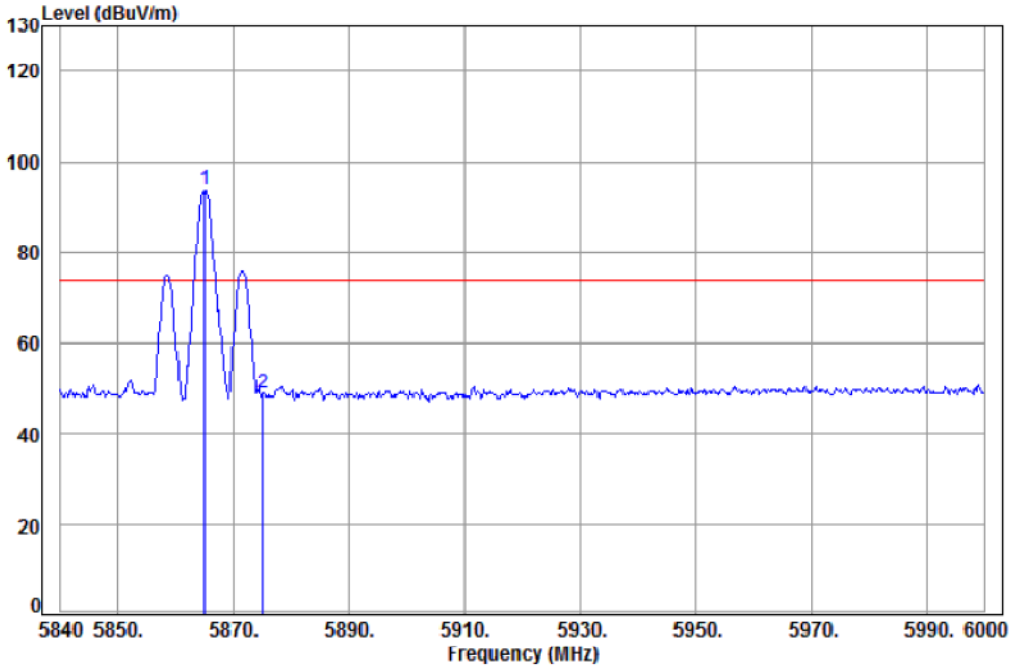
Operation Mode: TX CH High (5865MHz)

Horizontal



Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	
5875	49.24	-2.99	46.25	74	-27.75	peak
5875	/	-2.99	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:



Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
5875	49.50	-2.99	46.51	74	-27.49	peak
5875	/	-2.99	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

6 OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Setup

Same as Radiated Emission Measurement

6.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on FCC Part15 C Section 15.249(a): RBW= 30KHz. VBW= 100 KHz, Span=3MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

6.3 Measurement Equipment Used

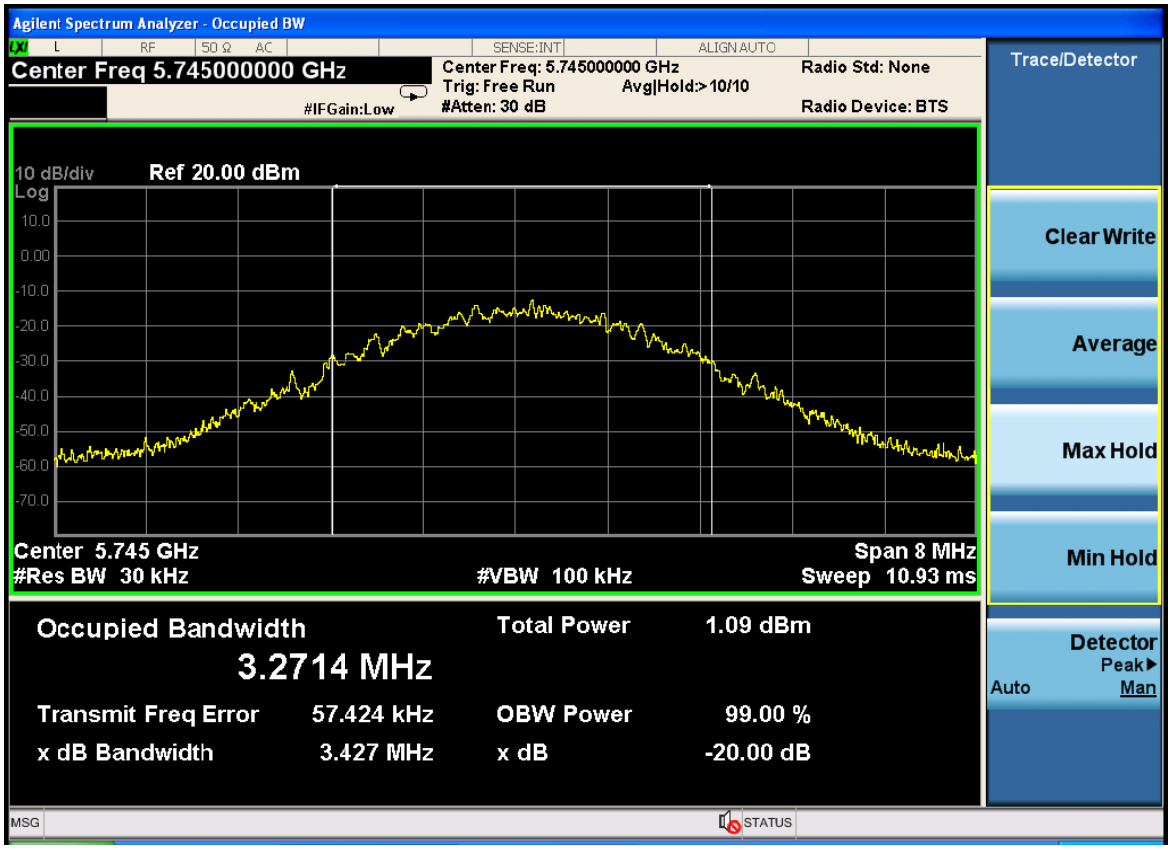
Same as Radiated Emission Measurement

6.4 Test Result

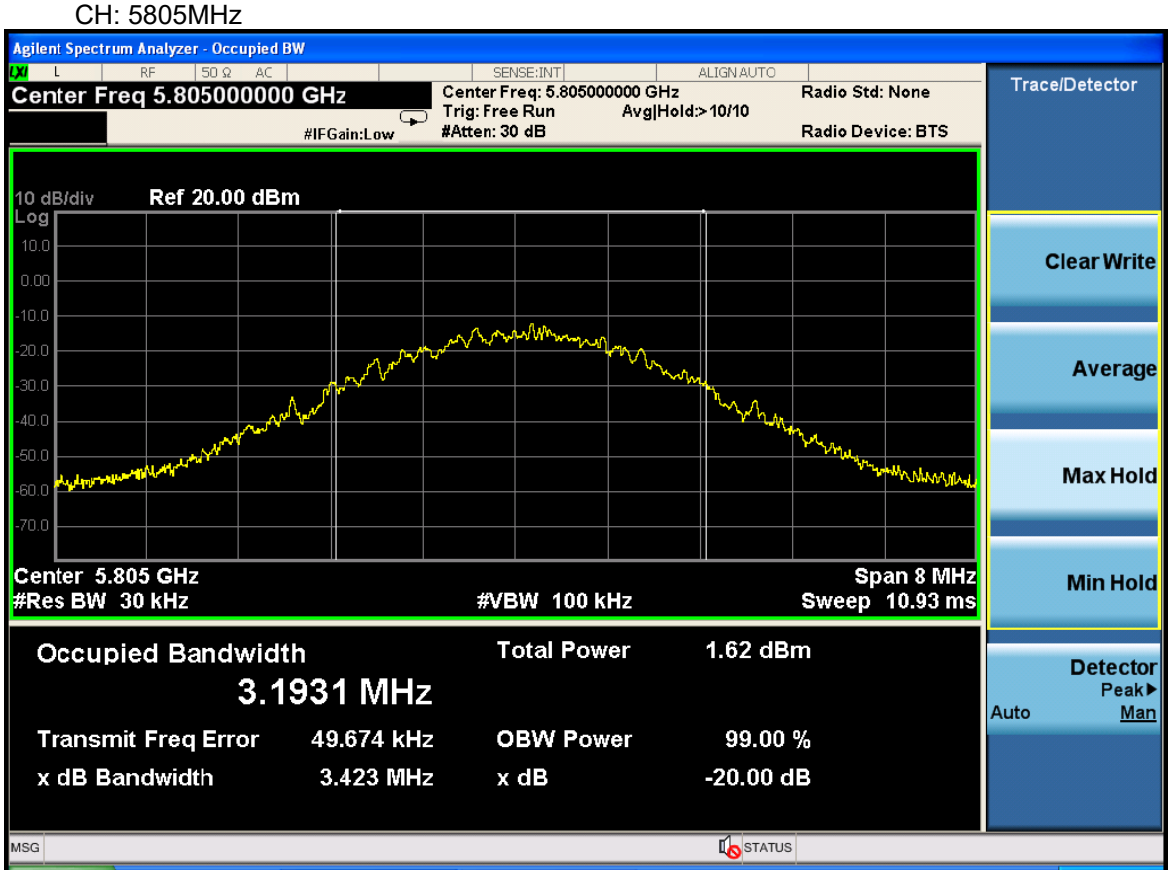
PASS

Frequency	20dB Bandwidth (MHz)	Result
5745 MHz	3.427	**PASS**
5805 MHz	3.423	**PASS**
5865 MHz	3.395	**PASS**

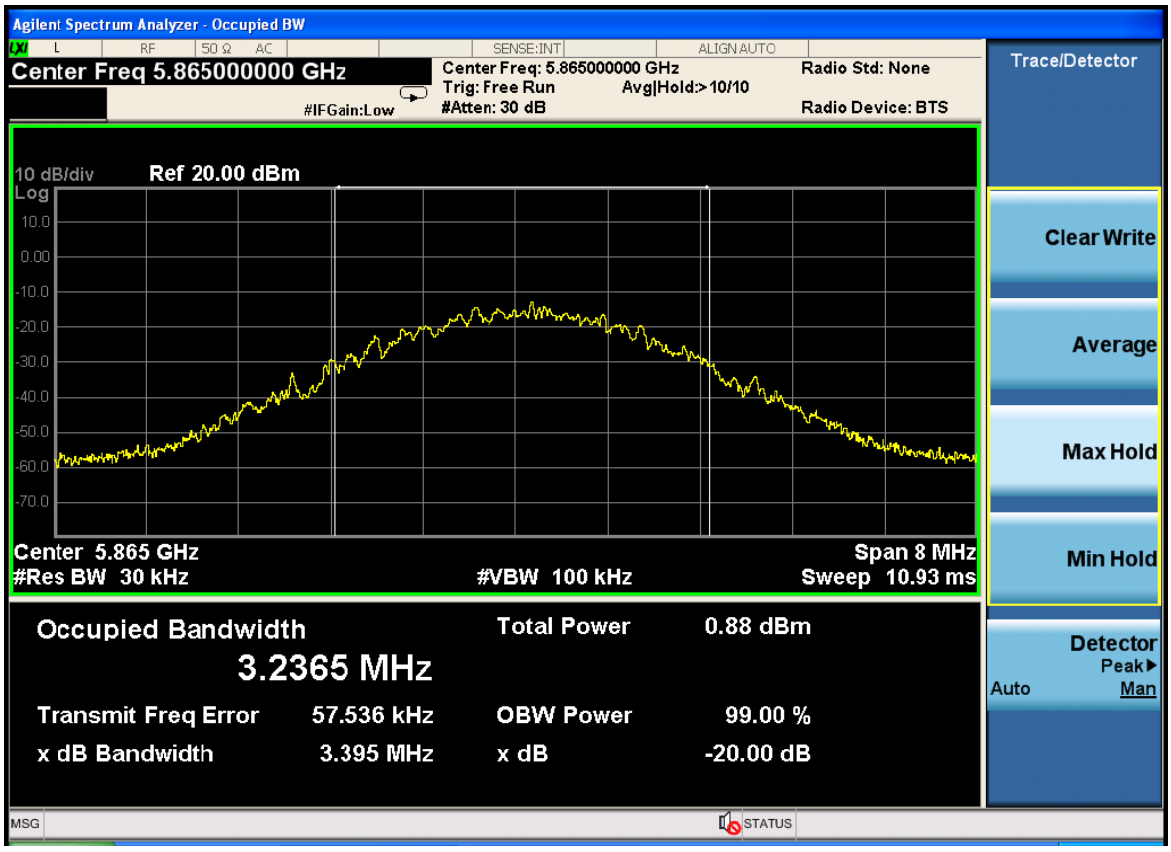
CH: 5745MHz



CH: 5805MHz



CH: 5865MHz



7 ANTENNA REQUIREMENT

Standard Applicable

For intentional device, according to FCC 47 CFR Section 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. And according to FCC 47 CFR Section 15.249, if 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 6dBi.

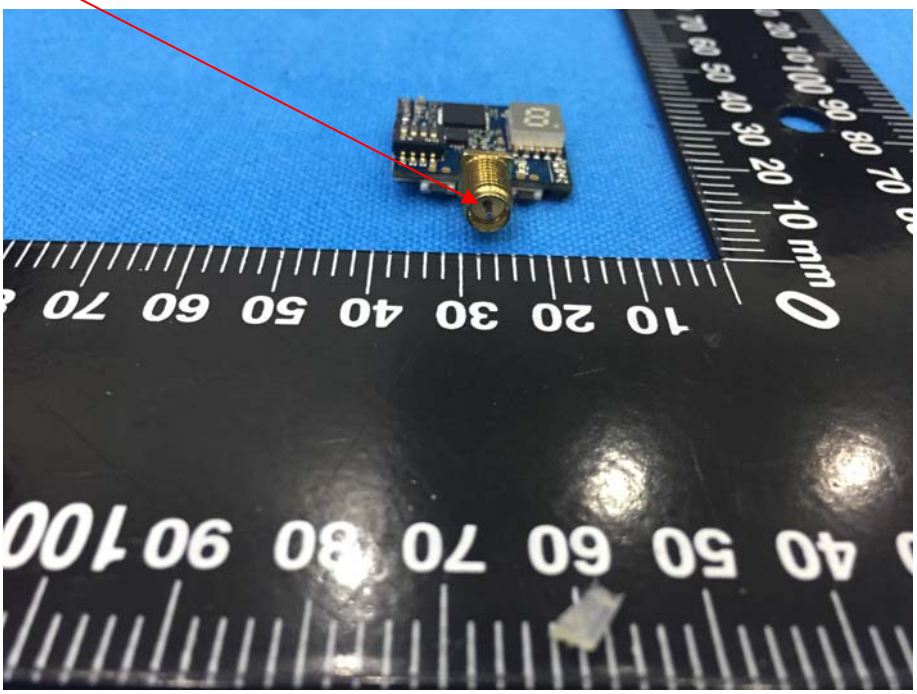
Refer to statement below for compliance.

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

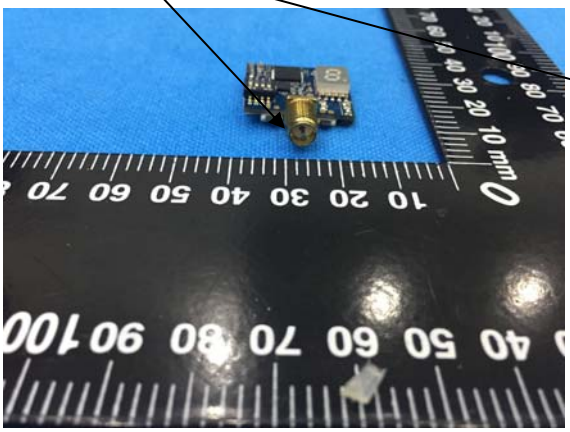
Antenna Connected Construction

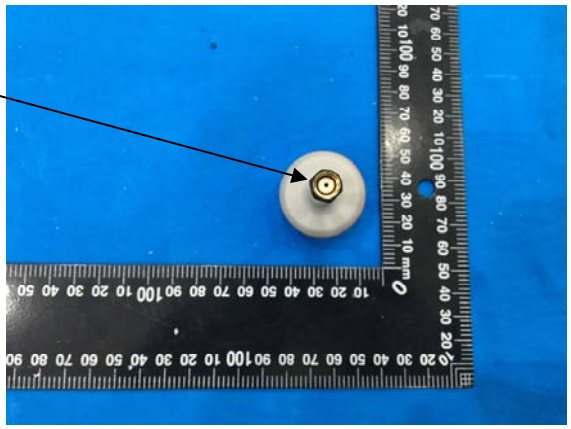
The antenna used is a detachable antenna, using a reverse SMA connector (Provided by non-manufacturers will use the product can not work), considered a special connector accepted by the FCC to comply with rule part 15.203. Please see EUT photos for details, it comply with the standard requirement, The directional gains of antenna used for transmitting is 1dBi.

ANTENNA



reverse SMA connector





8 PHOTOGRAPH OF TEST

8.1 Radiated Emission