FCC CERTIFICATION TEST REPORT FOR

FCC ID: 2AHQM-3208WRFS

Report Reference No. ..... :	16FAB01005 21
Date of issue ..... :	2016-5-10
FCC 2.948 No ..... :	923232
Testing Laboratory ..... :	ATT Product Service Co., Ltd.
Address ..... :	No. 3, ChangLianShan Industrial Park, ChangAn Town, DongGuan City, GuangDong, China.
Applicant's name ..... :	K-Rain Manufacturing Corporation.
Address ..... :	1640 Australian Ave., Riviera Beach, FL, Zip Code: 33404, USA.
Manufacturer ..... :	Macson Limited.
Address ..... :	No. 5, Jun Da Zhong Lu,DongKeng, Dongguan, Guangdong, China.
Test specification:	
Test item description ..... :	Wireless Rain-Freeze Sensor
Trade Mark ..... :	--
Model/Type reference ..... :	3208-WRFS
Ratings ..... :	I/P: DC3.6V

Tested by

Lake Hu

（Lake Hu/ Engineer）

Approved by

Brown Lu

（Brown Lu / EMC Manager）

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TEST REPORT DECLARE

Applicant	:	K-Rain Manufacturing Corporation.
Address	:	1640 Australian Ave., Riviera Beach, FL, Zip Code: 33404, USA.
Equipment under Test	:	Wireless Rain-Freeze Sensor
Model No	:	3208-WRFS
Trade Mark	:	--
Manufacturer	:	Macson Limited.
Address	:	No. 5, Jun Da Zhong Lu,DongKeng, Dongguan, Guangdong, China.

Test Standard Used: FCC Rules and Regulations Part 15 Subpart C: 2013

Test procedure used: ANSI C63.10:2013 ANSI C63.4:2014

FCC ID: 2AHQM-3208WRFS

We Declare:

The equipment described above is tested by ATT Product Service Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and ATT Product Service Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.

Report No:	16FAB01005 21		
Date of Test:	2016-01-25---2016-05-10	**Date of Report**:	2016-05-10

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of ATT Product Service Co., Ltd.

1. Summary of test Standards and results

The EUT have been tested according to the applicable standards as referenced below.

Description of Test Item	Standard	Results
Antenna requirement	FCC 15. 203	PASS
Conducted limits	FCC 15.207(a) ANSI C63.10 :2013	N/A
Conditions for intentional radiators to comply with periodic pperation	FCC 15.231(b) ANSI C63.10 :2013	PASS
Field strength emissions	FCC 15.231(b) ANSI C63.10 :2013	PASS
Emission bandwidth	FCC 15.231(c) ANSI C63.10 :2013	PASS
Note: (1) N/A" denotes test is not applicable in this Test Report		

2. General test information

2.1ACCRESITATIONS

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

USA FCC Registration Number :923232
Canada INDUSTRY CANADA Registration Number 11033A

2.2 Description of EUT

EUT* Name	:	Wireless Rain-Freeze Sensor
Model Number	:	3208-WRFS
Trade Mark	:	--
EUT function description	:	Please reference user manual of this device
Power supply	:	I/P: DC3.6V
Operation frequency	:	433 MHz
Modulation	:	ASK
Antenna Type	:	Monopole antenna,maximum PK gain: 2 dBi
Date of Receipt	:	2016-1-25
Sample Type	:	Sole production

Note: EUT is the ab. of equipment under test.

2.3 Accessories of EUT

Description of Accessories	Manufacturer	Model number or Type	Other
Notebook	acer	Aspire E1-472G	FCC DoC

2.4 Block diagram of EUT configuration for test

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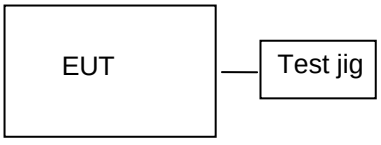


2.5 Test environment conditions

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

Temperature range:	21-25℃
Humidity range:	40-75%
Pressure range:	86-106kPa

2.6 Measurement uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.44dB
Uncertainty for Radiation Emission test (150KHz-30MHz)	3.21dB
Uncertainty for Radiation Emission test (30MHz-1GHz)	3.14 dB (Polarize: V)
	3.16 dB (Polarize: H)
Uncertainty for Radiation Emission test (1GHz to 25GHz)	2.08dB(Polarize: V)
	2.56dB (Polarize: H)
Uncertainty for radio frequency	1×10-9
Uncertainty for conducted RF Power	0.65dB

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

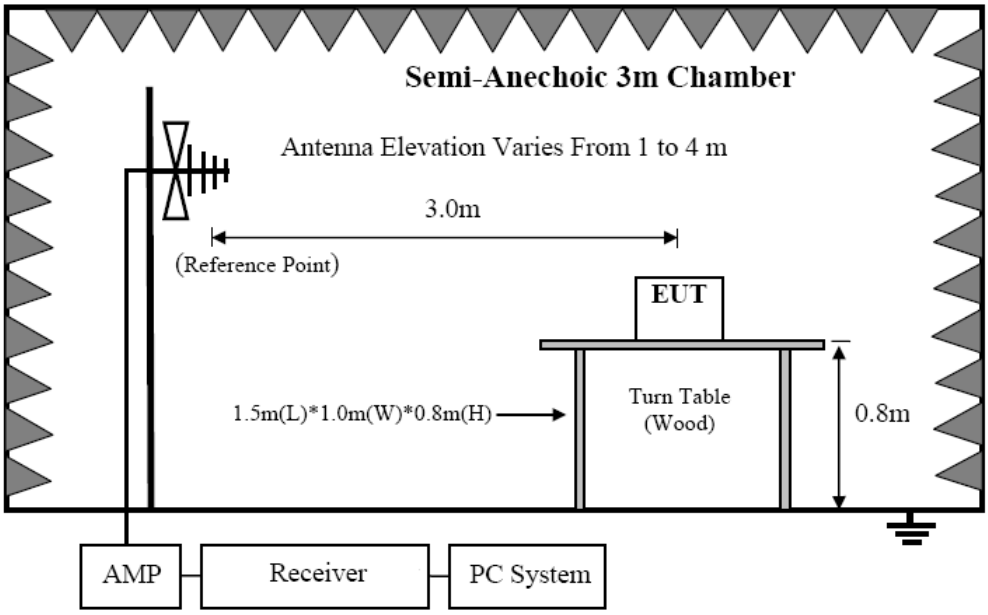
3. Radiated emission

3.1Test equipment

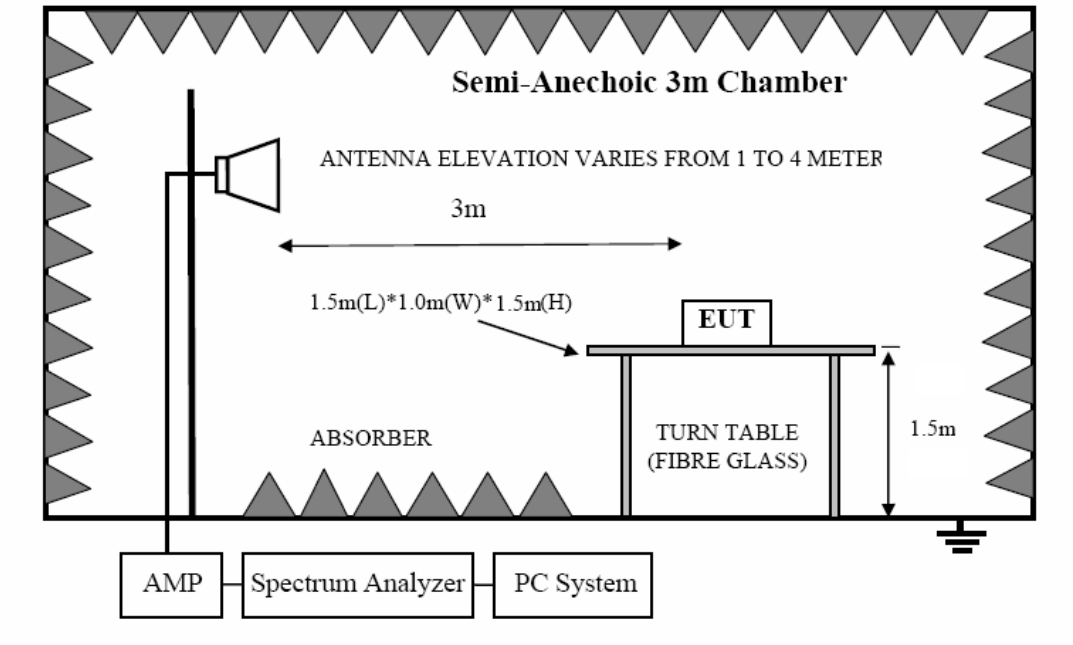
Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2016/12/19	1Y
2	Spectrum analyzer	Agilent	E4407B	US40240708	2016/07/09	1Y
3	Loop antenna	Chase	HLA6120	20129	2016/12/19	1Y
4	Trilog Broadband Antenna	Schwarzbeck	VULB9163	9163-462	2016/12/19	1Y
5	Double Ridged Horn Antenna	Schwarzbeck	BBHA9120D	9120D 1065	2016/12/19	1Y
6	Pre-Amplifier	R&S	SCU-01	10049	2016/12/19	1Y
7	Pre-amplifier	A.H.	PAM0-0118	360	2016/12/19	1Y
8	RF Cable	R&S	R01	10403	2016/12/19	1Y
9	RF Cable	R&S	R02	10512	2016/12/19	1Y

3.2Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz



Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP

3.3 Limits

In addition to the provisions of &15.205 and &15.209,the field strength of emissions from intentional radiators

FCC &15.209 Limit at 3m

Frequency	Distance	Field Strength	
MHz	Meter	μV/m	dBμV/m
0.009–0.490	300-3	2400/F(kHz)	128.5-93.8
0.490–1.705	30-3	24000/F(kHz)	93.8-62.9
1.705–30.0	30-3	30	62.9-40.0
30 to 88	3	100	40.0
88 to 216	3	150	43.5
216 to 960	3	200	46.0
Above 960	3	500	54.0

Frequency range GHz	Average limit dB(μV/m)	Peak limit dB(μV/m)
Above 1000	54	74

Operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental		Field strength of spurious emissions	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66-40.70	2250	67	225	47
70-130	1250	61.9	125	41.9
130-174	1250 to 3750	61.9-71.5	125 to 375	41.9 to 51.5
174-260	3750	71.5	375	51.5
260-470	3750 to 12500	71.5-81.94	375 to 1250	51.5 to 61.9
Abover 470	12500	81.94	1250	61.9

3.4 Test Procedure

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.

(2) Test antenna was located 3m from the EUT on an adjustable mast.

(3) Spectrum frequency from 30MHz to 4.5GHz (tenth harmonic of fundamental frequency) was swept Note: According FCC 15.33(a) the spectrum shall be investigated from the lowest radio frequency signal generated in the device. so radiated emissions were investigated start from 30MHz.Below pre-scan procedure was first performed in order to find prominent radiated emissions.

(a) Change work frequency or channel of device if practicable.

(b) Change modulation type of device if practicable.

(c) Change power supply range from 85% to 115% of the rated supply voltage.

(d) Adjust the EUT's antenna length and position is practicable.

(e) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produce highest emissions.

(f) Rotated EUT from 0 degree to 360 degree and varied test antenna height from 1m to 4m in both horizontal and vertical polarities.

(4) When the relative maximum emissions were swept in step 4, holding the EUT's state, use the follow procedures to measure out the final emissions of device.

(a) Marked to the interested frequency point with appropriate span to see the whole signal wave.

(b) For emissions below 1GHz except fundamental, the Spectrum Analyzer's RBW is set at 120 KHz,VBW is set at 300 KHz, for emissions above 1GHz except fundamental, the Spectrum Analyzer's RBW is set at 1MHz, and VBW is set at 3MHz. For fundamental emission the Spectrum Analyzer's RBW is set at 200 KHz (above 20dB bandwidth of fundamental signal), and VBW is set at 300 KHz.

(c) At each measured frequency point, the maximum Peak levels were measured by rotated EUT and varied test antenna.

(5) The duty cycle factor was use to calculate Average Level as below formula:

Average level = PK Level – duty cycle factor

3.5 Test Result

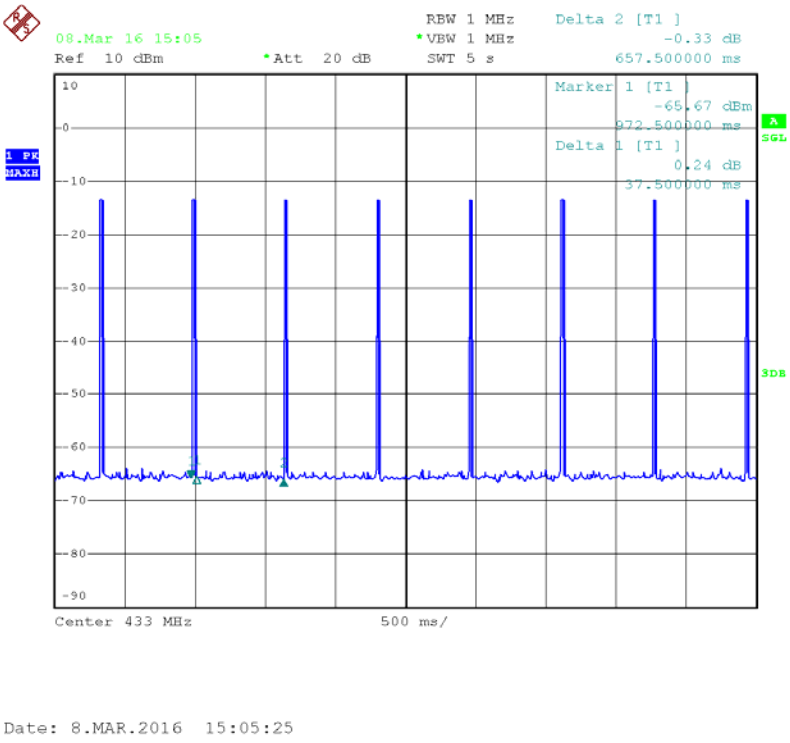
PASS. (See below detailed test result)

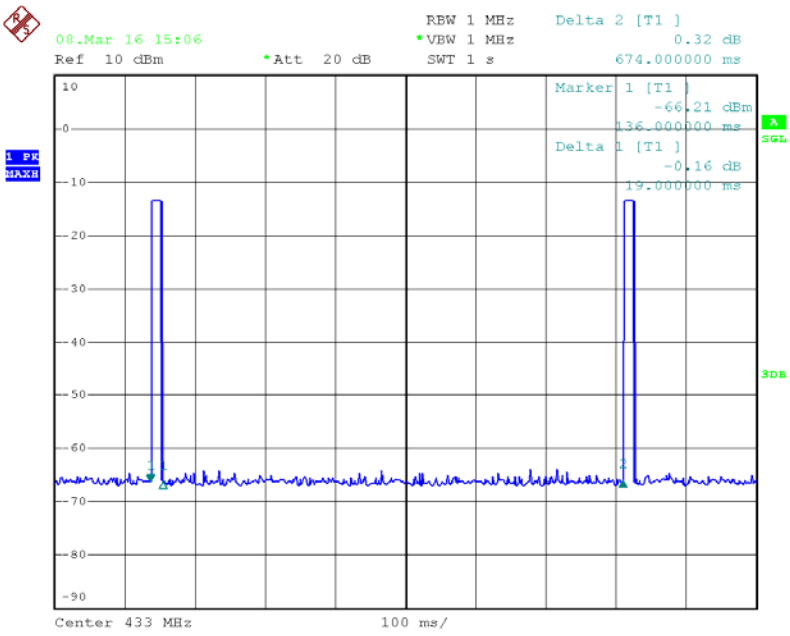
The frequency range from 30MHz to 4500MHz was investigated. When PK measured levels comply with average limit, then the average levels were deemed to comply with average limit. When PK measured levels exceed average limit, and, Duty cycle factor is used to calculate

average level. Vertical and Horizontal mode all have been tested ，Vertica mode is the worse case

Duty cycle(x)= 19ms/674ms*100%=2.8%
Duty cycle factor = 20 log (1/x) = -31dB

duty cycle：





Date: 8.MAR.2016 15:06:03

Radiated Emission Test Result

Test Site : 3m Chamber

Test Date : 2016-3-21 **Tested By** : Lake

EUT : Wireless Rain-Freeze Sensor **Model Number** : 3208-WRFS

Power Supply : AC 120V/60Hz; **Test Mode** : Tx mode

Condition : Temp:24.5'C,Humi:55% **Antenna/Distance** : 3m

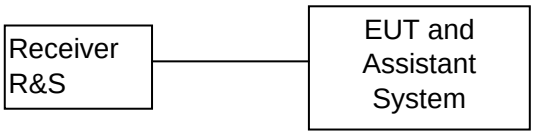
Frequency	Receiver		Polar	FCC 15.231	
(MHz)	Reading (dBμV)	Detector (PK/AV)	(H/V)	Limit (dBμV/m)	Margin (dB)
433	90.38	PK	H	100.79	10.41
433	59.38	AV	H	80.79	21.41
433	81.54	PK	V	100.79	19.25
433	50.54	AV	V	80.79	30.25
866	51.94	PK	H	80.79	28.85
866	20.94	AV	H	60.79	39.85
866	46.16	PK	V	80.79	34.63
866	15.16	AV	V	60.79	45.63
1299	44.08	PK	H	74	29.92
1299	13.08	AV	H	54	40.92
1299	44.45	PK	V	74	29.55
1299	13.45	AV	V	54	40.55
1732	58.54	PK	H	74	15.46
1732	27.54	AV	H	54	26.46
1732	44.20	PK	V	74	29.80
1732	13.20	AV	V	54	40.80
0.69	45.15	QP	0°	73.66	28.51
0.57	47.54	QP	90°	72.37	24.83

4. transmitting time test

4.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	EMI Test Receiver	R&S	ESCI	101307	2016/12/19	1Y

4.2 Block diagram of test setup



4.3 Limits

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

4.4 Test Procedure

(1). The EUT's RF signal was coupled to spectrum analyzer by a antenna connected to spectrum analyzer..

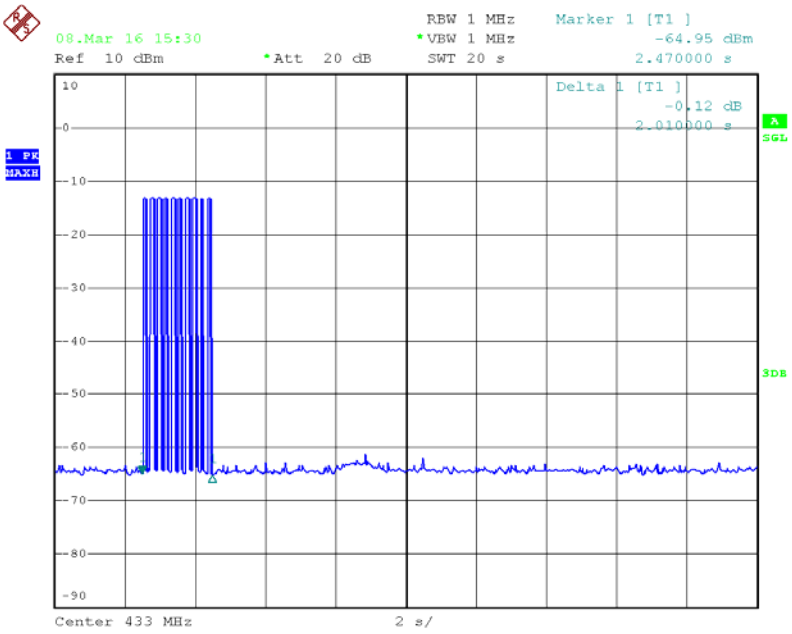
(2). Set the spectrum to zero span mode, and centered of EUT frequency.

(3). Measure the EUT stop transmitting time.

4.5 Test Result

PASS. (See below detailed test result)

4.6 Original test data



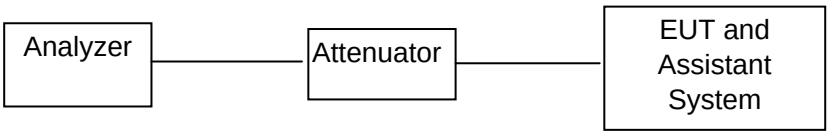
THE DURATION TIME	LIMIT	RESULT
2.01 s	<5s	PASS

5. 20dB bandwidth

5.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	Analyzer	KEYSIGHT	N9010A	55150427	2017/04/20	1Y

5.2 Block diagram of test setup



5.3 Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency of devices operation above 70MHz and below 900MHz

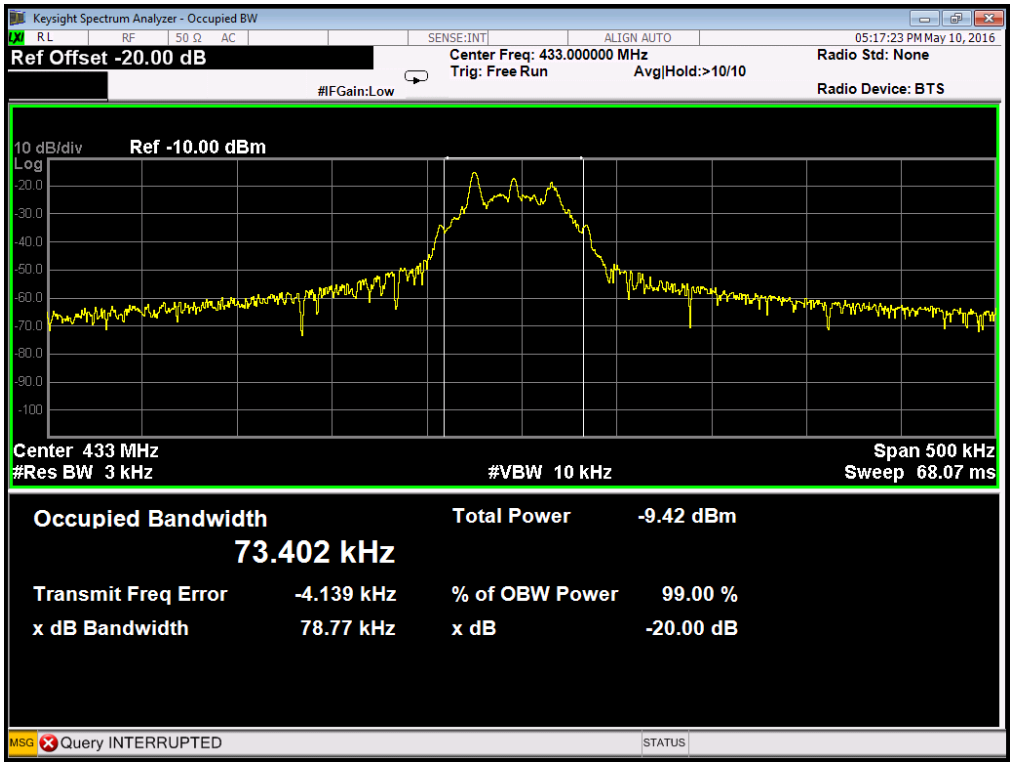
5.4 Test Procedure

1. The EUT's RF signal was coupled to spectrum analyzer by a antenna connected to spectrum analyzer.
2. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW = 1% ~ 5% * OBW, VBW=3*RBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

5.5 Test Result

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit(kHz): No wider than 0.25% of the center frequency	Conclusion
433	78.77	433*0.25%=1.0825MHz	PASS

5.6 Original test data



6. Antenna Requirements

6.1. Limit

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, 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.

6.2. Result

The antennas used for this product are built-out undetachable permanent attachment, the maximum peak gain of the transmit antenna is only 2dBi. Therefore the EUT is considered sufficient to comply with the provision.