

FCC CERTIFICATION TEST REPORT FOR

FCC ID: 2AHQM-3209

Report Reference No. : 16FAB01005 41

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 : Wifi Hub

Trade Mark : --

Model/Type reference : 3209

Ratings : I/P: AC 100-240V 50-60Hz 0.5A

Tested by



(Lake Hu/ Engineer)

Approved by



(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	:	Wifi Hub
Model No	:	3209
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-3209

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 41
Date of Test:	2016-01-25---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	PASS
Conditions for intentional radiators to comply with periodic pperation	FCC 15.231(e) ANSI C63.10 :2013	PASS
Field strength emissions	FCC 15.231(e) 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

2.1 ACCREDITATIONS

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

USA FCC
Canada INDUSTRY CANADA

Registration Number :923232
Registration Number 11033A

2.2 Description of EUT

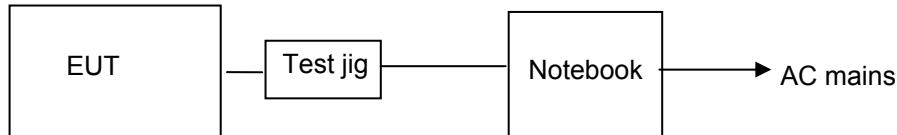
EUT* Name	:	Wifi Hub
Model Number	:	3209
Trade Mark	:	--
EUT function description	:	Please reference user manual of this device
Power supply	:	I/P: AC 120V/60Hz
Operation frequency	:	433 MHz
Modulation	:	ASK
Antenna Type	:	Omni antenna ,maximum PK gain: 2 dBi
Date of Receipt	:	2016-1-25
Sample Type	:	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



2.5 Test environment conditions

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

Temperature range:	21-25°C
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.

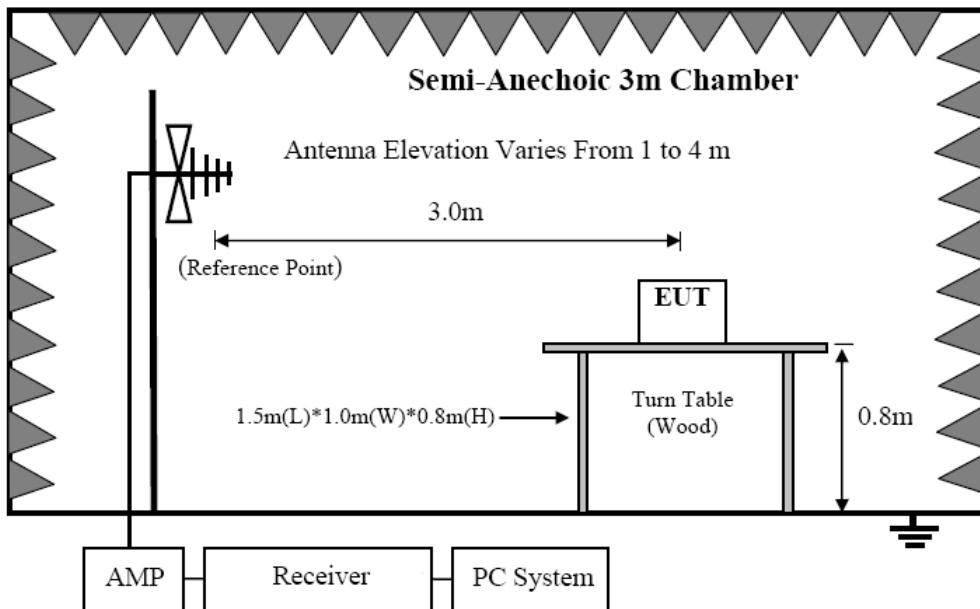
3. Radiated emission

3.1 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
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

3.2 Block diagram of test setup

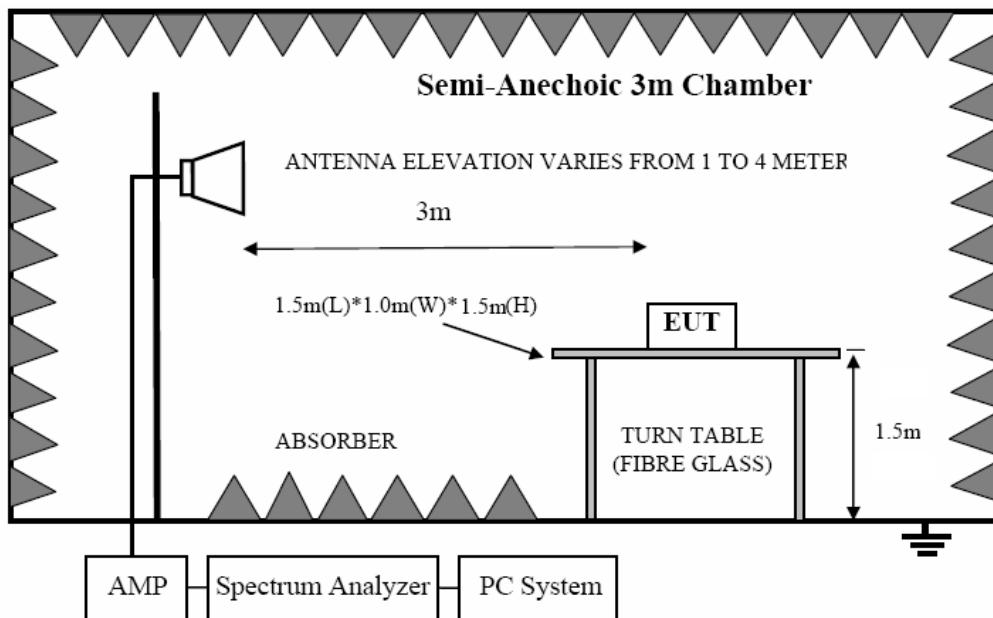
In 3m Anechoic Chamber Test Setup Diagram for below 1GHz



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

ATT Product Service Co., Ltd. (CBTL Lab of UL/Demko)

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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	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
0.009–0.490	300-3	2400/F(kHz)	300-3	2400/F(kHz)	128.5-93.8
0.490–1.705	30-3	24000/F(kHz)	30-3	24000/F(kHz)	93.8-62.9
1.705–30.0	30-3	30	30-3	30	62.9-40.0
30 to 88	3	100	3	100	40.0
88 to 216	3	150	3	150	43.5
216 to 960	3	200	3	200	46.0
Above 960	3	500	3	500	54.0

Frequency range GHz	Average limit $\text{dB}(\mu\text{V/m})$	Peak limit $\text{dB}(\mu\text{V/m})$
Above 1000	54	74



ATT

NO.L3098

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	1000	60	100	40
70-130	500	54	50	34
130-174	500 to 1500	54-63.5	50 to 150	34 to 43.5
174-260	1500	63.5	150	43.5
260-470	1500 to 5000	63.5-74	150 to 500	43.5 to 54
Above 470	5000	74	500	54

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:

$$\text{Average level} = \text{PK Level} - \text{duty cycle factor}$$

3.5 Test Result

PASS. (See below detailed test result)

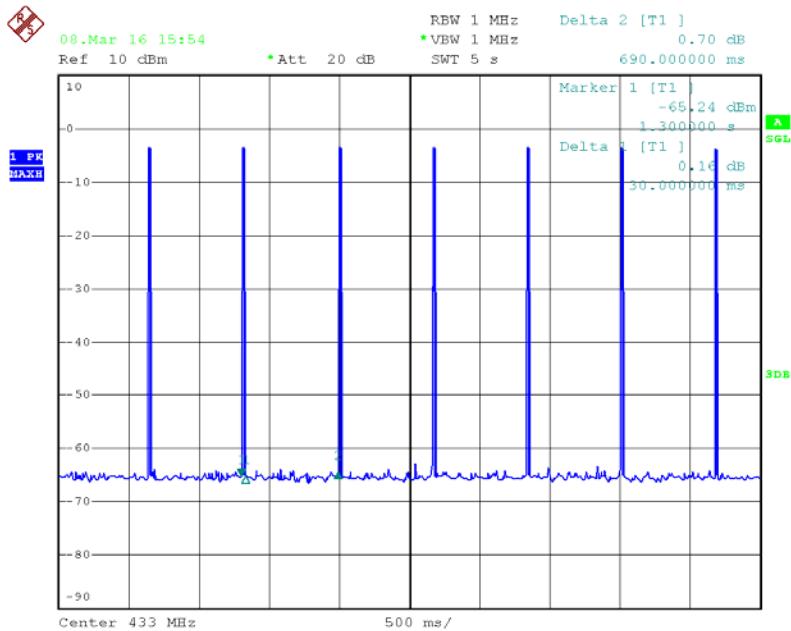
The frequency range from 30MHz to 4500MHz was investigated. When PK measured levels comply with average limit, then the average levels were deemed to comply with average limit. When PK measured levels exceed average limit, and, Duty cycle factor is used to calculate

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

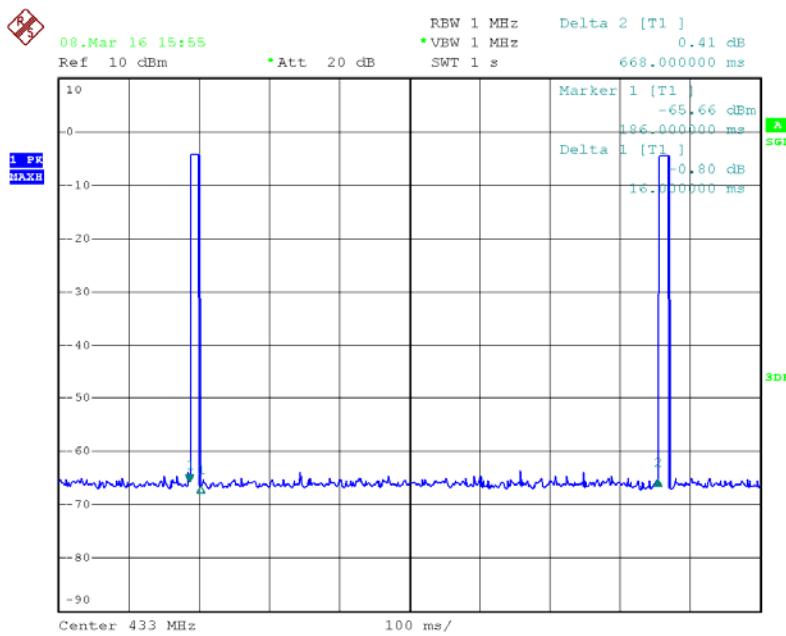
$$\text{Duty cycle}(x) = 16\text{ms}/668\text{ms} * 100\% = 2.4\%$$

$$\text{Duty cycle factor} = 20 \log (1/x) = -32.4 \text{ dB}$$

duty cycle:



Date: 8.MAR.2016 15:54:44



Date: 8.MAR.2016 15:55:31

**ATT**

Radiated Emission Test Result

Test Site : 3m Chamber
Test Date : 2016-3-21 **Tested By** : Lake
EUT : Wifi Hub **Model Number** : 3209
Power Supply : AC 120V/60Hz; **Test Mode** : Tx mode
Condition : Temp:24.5'C,Humi:55% **Antenna/Distance** : 3m

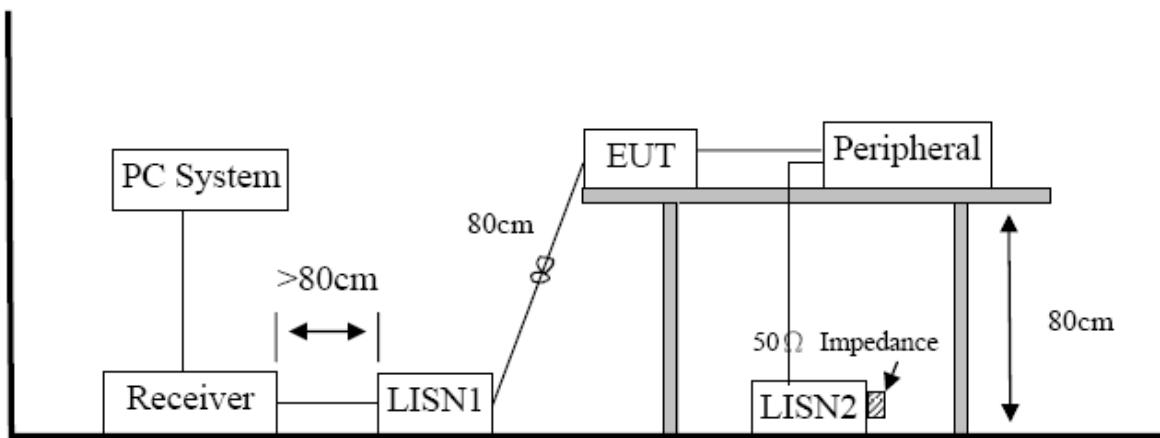
Frequency (MHz)	Receiver		Polar (H/V)	FCC 15.231	
	Reading (dB μ V)	Detector (PK/AV)		Limit (dB μ V/m)	Margin (dB)
433	88.32	PK	H	92.84	4.52
433	55.92	AV	H	72.84	16.92
433	83.12	PK	V	92.84	9.72
433	50.72	AV	V	72.84	22.12
866	52.71	PK	H	72.84	20.13
866	20.31	AV	H	52.84	32.53
866	43.30	PK	V	72.84	29.54
866	10.90	AV	V	52.84	41.94
1299	52.31	PK	H	74	21.69
1299	19.91	AV	H	54	34.09
1299	50.00	PK	V	74	24.00
1299	17.60	AV	V	54	36.40
1732	45.09	PK	H	74	28.91
1732	12.69	AV	H	54	41.31
1732	44.44	PK	V	74	29.56
1732	12.04	AV	V	54	41.96
0.72	51.10	QP	0°	70.40	19.30
0.60	49.52	QP	90°	71.97	22.45

4. Power Line Conducted Emission

4.1 Test equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until	Cal. Interval
1	Test Receiver	R&S	ESCI	101308	2016/12/19	1 Year
2	LISN 1	AFJ	LS16	16011103219	2016/12/19	1 Year
3	LISN 2	R&S	ESH2-Z5	100309	2016/12/19	1 Year
4	Pulse Limiter	MTS-systemtechnik	MTS-IMP-136	261115-010-0024	2016/12/19	1 Year

4.2 Block diagram of test setup



4.3 Power Line Conducted Emission Limits (Class B)

Frequency	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Note 1: * Decreasing linearly with logarithm of frequency.

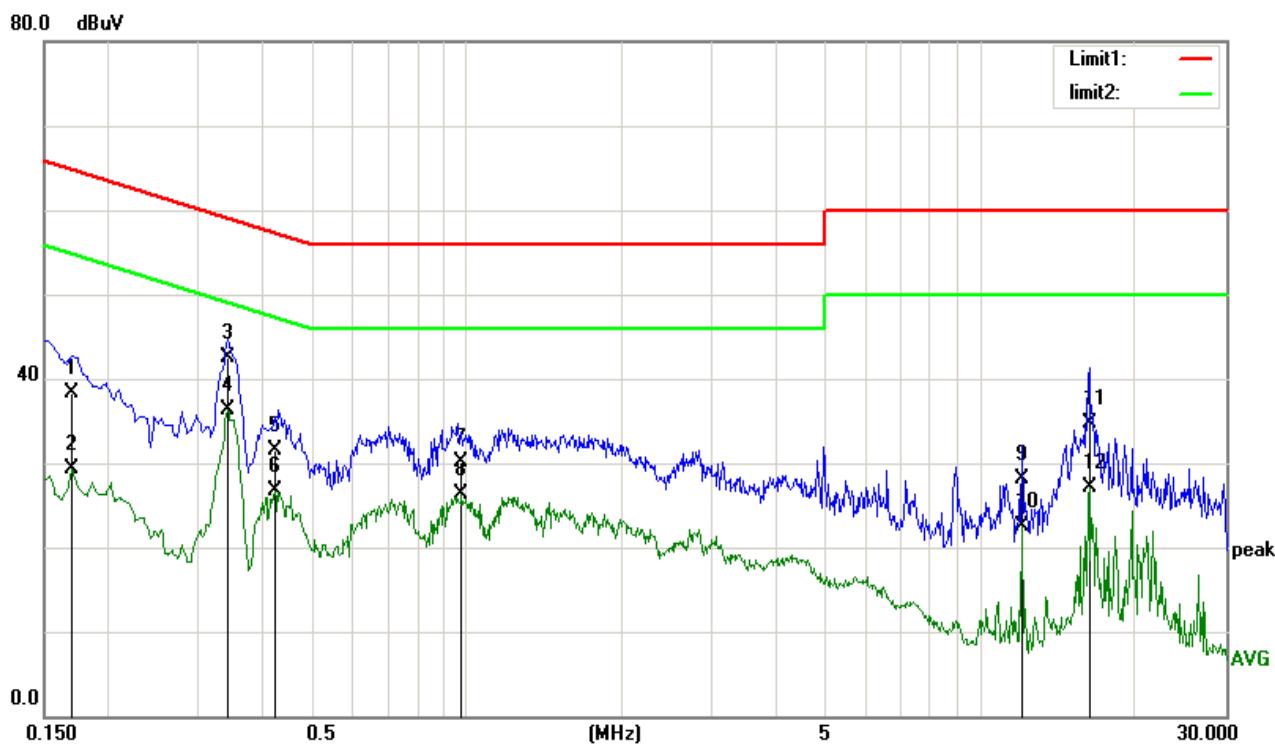
Note 2: The lower limit shall apply at the transition frequencies

4.4 Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane. Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4: 2009. All support equipment power received from a second LISN. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT. The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes. During the above scans, the emissions were maximized by cable manipulation. The test mode(s) described in clause 2.4 were scanned during the preliminary test. After the preliminary scan, we found the test mode producing the highest emission level. The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test. EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test. A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. The test data of the worst-case condition(s) was recorded. The bandwidth of test receiver is set at 9 KHz.

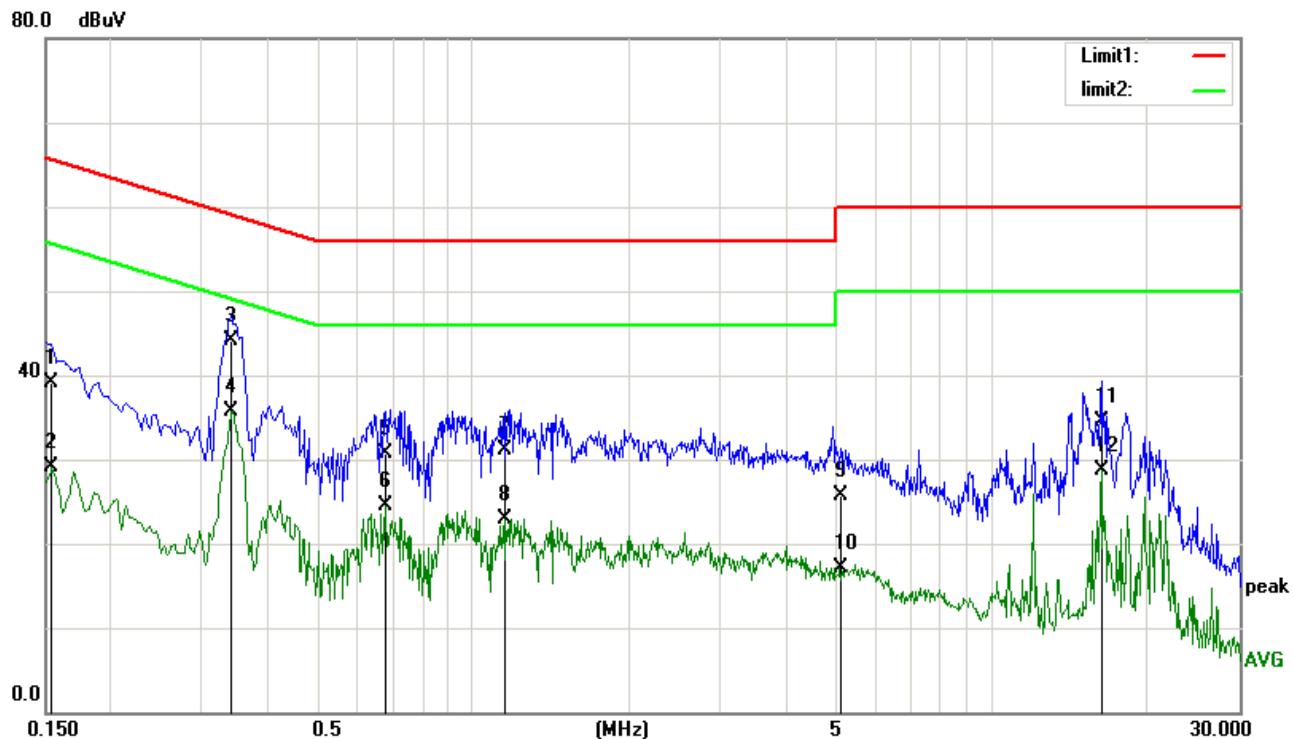
4.5 Test Result

EUT:	Wifi Hub	Model No.:	3209
Temperature:	24°C	Relative Humidity:	55%
Probe:	L1	Test Power:	AC 120V/60Hz
Standard:	(CE)FCC PART 15_B	Test Result:	Pass
Test Mode:	Tx	Test By:	Lake
Note:	433 MHz		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1700	26.96	11.33	38.29	64.96	-26.67	QP
2	0.1700	17.98	11.33	29.31	54.96	-25.65	AVG
3	0.3420	32.08	10.39	42.47	59.15	-16.68	QP
4	0.3420	25.95	10.39	36.34	49.15	-12.81	AVG
5	0.4220	21.30	10.28	31.58	57.41	-25.83	QP
6	0.4220	16.51	10.28	26.79	47.41	-20.62	AVG
7	0.9780	19.92	10.10	30.02	56.00	-25.98	QP
8	0.9780	16.13	10.10	26.23	46.00	-19.77	AVG
9	12.0020	17.96	10.16	28.12	60.00	-31.88	QP
10	12.0020	12.28	10.16	22.44	50.00	-27.56	AVG
11	16.2300	24.59	10.16	34.75	60.00	-25.25	QP
12	16.2300	16.85	10.16	27.01	50.00	-22.99	AVG

EUT:	Wifi Hub	Model No.:	3209
Temperature:	24°C	Relative Humidity:	55%
Probe:	N	Test Power:	AC 120V/60Hz
Standard:	(CE)FCC PART 15_B	Test Result:	Pass
Test Mode:	Tx	Test By:	Lake
Note:	433 MHz		



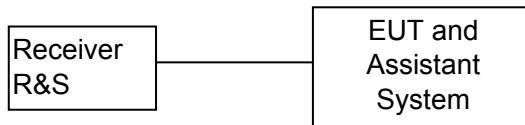
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.1539	27.62	11.44	39.06	65.78	-26.72	QP
2	0.1539	17.58	11.44	29.02	55.78	-26.76	AVG
3	0.3420	33.80	10.39	44.19	59.15	-14.96	QP
4	0.3420	25.36	10.39	35.75	49.15	-13.40	AVG
5	0.6780	20.51	10.13	30.64	56.00	-25.36	QP
6	0.6780	14.37	10.13	24.50	46.00	-21.50	AVG
7	1.1580	20.98	10.10	31.08	56.00	-24.92	QP
8	1.1580	12.81	10.10	22.91	46.00	-23.09	AVG
9	5.0900	15.53	10.10	25.63	60.00	-34.37	QP
10	5.0900	7.04	10.10	17.14	50.00	-32.86	AVG
11	16.2300	24.36	10.16	34.52	60.00	-25.48	QP
12	16.2300	18.47	10.16	28.63	50.00	-21.37	AVG

5. transmitting and silent period time test

5.1 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

5.2 Block diagram of test setup



5.3 Limits

the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

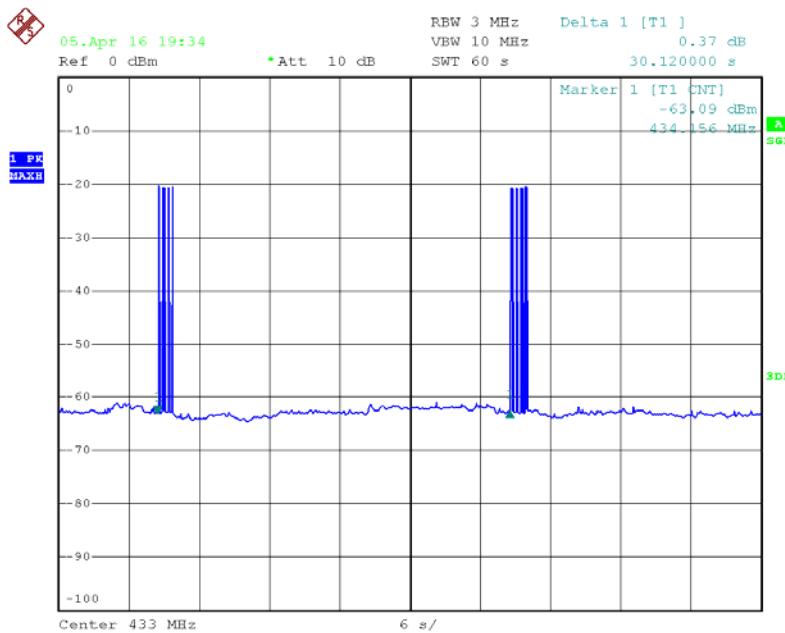
5.4 Test Procedure

- (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 transmitting and silent period time.

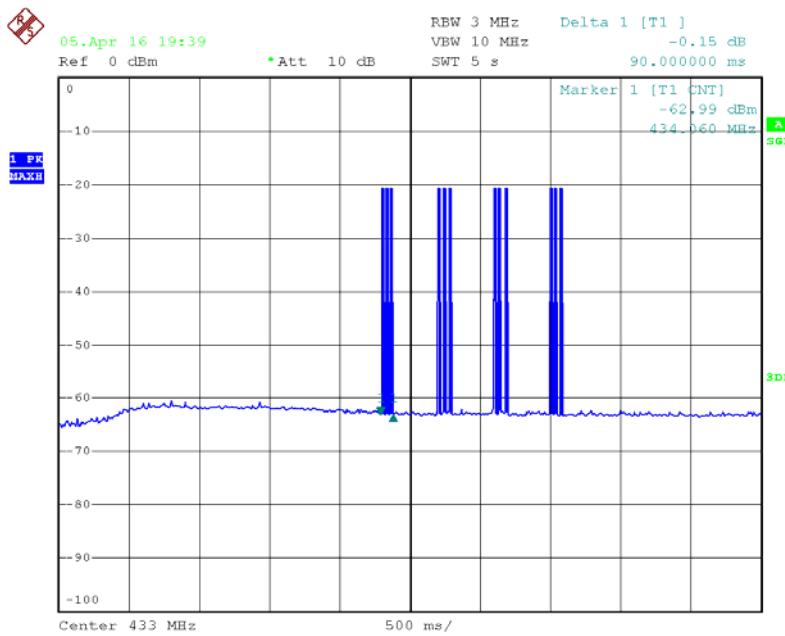
5.5 Test Result

PASS. (See below detailed test result)

5.6 Original test data



Date: 8.MAR.2016 19:34:11



Date: 8.MAR.2016 19:39:17

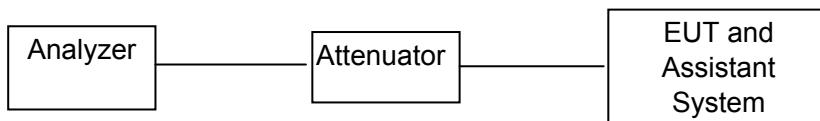
THE DURATION AND SILENT PERIOD TIME	LIMIT	RESULT
Duration time 0.36 s	≤ 1 s	PASS
silent period 30.12 s	$\geq (10 \text{ s and 30 times the duration})$	PASS

6. 20dB bandwidth

6.1 Test equipment

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

6.2 Block diagram of test setup



6.3 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

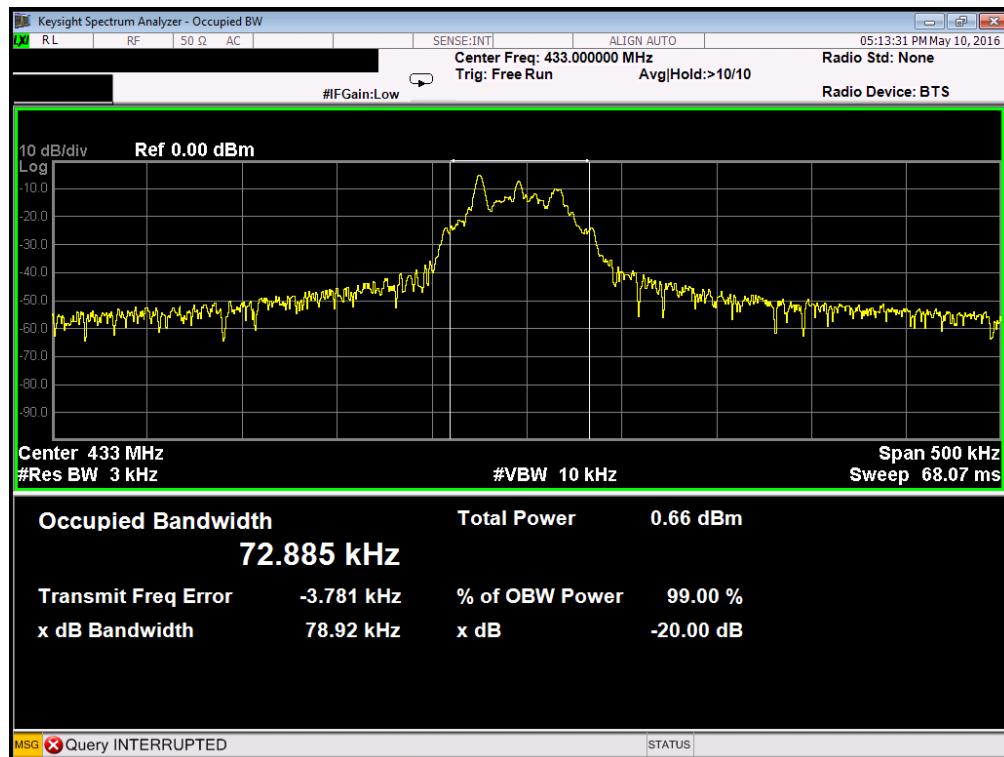
6.4 Test Procedure

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.

6.5 Test Result

Frequency (MHz)	20 dB Bandwidth (kHz)	Limit(kHz): No wider than 0.25% of the center frequency	Conclusion
433	78.92	433*0.25%=1.0825MHz	PASS

6.6 Original test data



7. Antenna Requirements

7.1. 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.

7.2. Result

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