



TEST REPORT

Product Name: wireless doorbell

FCC ID: 2A6IP-WHM07
Trademark: DODOLINK

Model Number: WHM07, WHM01, WHM02, WHM03, WHM04, WHM05, WHM06, WHM08,

WHM09, WHM10, WHMF01, WHMF02, WHMF03, WHMF04, WHMF05,

WHMF06, WHMF07, WHMF08, WHMF09, WHMF10

Prepared For: Shenzhen Kangda Xin Intelligent Network Technology Co., Ltd.

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Manufacturer: Shenzhen Kangda Xin Intelligent Network Technology Co., Ltd.

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Prepared By: Shenzhen CTB Testing Technology Co., Ltd.

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Shenzhen, Guangdong, China

Sample Received Date: Apr. 26, 2024

Sample tested Date: Apr. 26, 2024 to May. 06, 2024

Issue Date: May. 06, 2024

Report No.: CTB240506054RFX

Test Standards FCC CFR Title 47 Part 15 Subpart C Section 15.231

ANSI C63.10:2013

Test Results PASS

Remark: This is 433MHz radio test report.

Compiled by: Reviewed by: Approved by:

Zhou kui Arron 2iu

Zhou Kui Arron Liu Bin Mei / Director

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report r Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "*" indicates the testing items were fulfilled by subcontracted lab. "#" indicates the items are not in CNAS accreditation scope.



TABLE OF CONTENT

est F	Report Declaration	Page
1.	VERSION	3
2.	TEST SUMMARY	4
3.	MEASUREMENT UNCERTAINTY	
4.	PRODUCT INFORMATION AND TEST SETUP	
4.1	Product Information	6
4.2	Test Setup Configuration	6
4.3	Support Equipment	6
4.4	<u> </u>	
4.5	Test Environment	7
5.	TEST FACILITY AND TEST INSTRUMENT USED	
5.1	Test Facility	8
5.2		
6.	AC POWER LINE CONDUCTED EMISSION	10
6.1	Block Diagram Of Test Setup	10
6.2	Limit	10
6.3		
6.4		11
7.	RADIATED EMISSION	12
7.1	Block Diagram Of Test Setup	12
7.2	Limit	12
7.3		
7.4	Test Result	14
8.	DWELL TIME	20
8.1	Block Diagram Of Test Setup	
8.2	O=	
8.3	Test procedure	20
8.4		
9.	OCCUPIED BANDWIDTH	
9.1	Block Diagram Of Test Setup	
9.2		
9.3		
9.4		
10.		24
44	EUT TEST SETUD PHOTOGRAPHS	25

(Note: N/A means not applicable)



1. VERSION

Report No.	Issue Date	Description	Approved	
CTB240506054RFX	May. 06, 2024	Original	Valid	

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 3 of 25



2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item	Test Requirement	Test method	Result	
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	N/A	
Radiated Emission	47 CFR Part 15 Subpart C Section 15.209; 15.231(b)	ANSI C63.10-2013	PASS	
Dwell Time	47 CFR Part 15 Subpart C Section 15.231 (a)	ANSI C63.10-2013	PASS	
Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.231(c)	ANSI C63.10-2013	PASS	
Antenna requirement	47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS	

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 4 of 25



3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

ltem	Uncertainty
Occupancy bandwidth	U=±54.3Hz
Conducted output power Above 1G	U=±1.0dB
Conducted output power below 1G	U=±0.9dB
Power Spectral Density , Conduction	U=±1.0dB
Conduction spurious emissions	U=±2.8dB
Out of band emission	U=±54Hz
3m camber Radiated spurious emission(30MHz-1GHz)	U=±4.3dB
3m chamber Radiated spurious emission(1GHz-18GHz)	U=±4.5dB
humidity uncertainty	U=±5.3%
Temperature uncertainty	U=±0.59°C
Supply voltages	U=±3%
Time C C C C	U=±5%

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 5 of 25



4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):

WHM07, WHM01, WHM02, WHM03, WHM04, WHM05, WHM06, WHM08,

WHM09, WHM10, WHMF01, WHMF02, WHMF03, WHMF04, WHMF05,

Report No.: CTB240506054RFX

WHMF06, WHMF07, WHMF08, WHMF09, WHMF10

Model Description:

All model's the function, software and electric circuit are the same, only with the

product size and model named different. Test sample model: WHM07

Hardware Version: V1.0

Software Version: V1.0

Operation Frequency: 433.917MHz

Type of Modulation: ASK

Antenna installation: PCB antenna

Antenna Gain: 1.0dBi

Ratings: DC 3V by battery

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
⇔ 1	Adapter	JIYIN	JY-05100C	\$ 1\$	4 / 4

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode			
Keep the EUT in transmitting mode with modulation.	C.	0	0

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 6 of 25



4.5 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(DC)V:	3.0
Normal Temperature(°C)	23

Report No.: CTB240506054RFX

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 7 of 25



5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at 1&2F., Building A, No. 26, Xinhe Road, Xinqiao, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	A.14.16	2024.07.05
2	Power Sensor	Agilent	U2021XA	MY56120032	0 b	2024.07.05
3	Power Sensor	Agilent	U2021XA	MY56120034		2024.07.05
4	Communication test set	R&S	CMW500	108058	V3.5.80	2024.07.05
5	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2024.07.05
6	Signal Generator	Agilent	N5181A	MY50140365	A.01.60	2024.07.05
7	Vector signal generator	Agilent	N5182A	MY47420195	A.01.87	2024.07.05
8	Communication test set	Agilent	E5515C	MY50102567	B.19.07 (E1962B)	2024.07.06
9	2.4 GHz Filter	Shenxiang	MSF2400-24 83.5MS-1154	20181015001	\$ 15 S	2024.07.05
10	5 GHz Filter	Shenxiang	MSF5150-58 50MS-1155	20181015001	0/0	2024.07.06
11	Filter	Xingbo	XBLBQ-DZA 120	190821-1-1		2024.07.06
12	BT&WI-FI Automatic test software	Micowave	MTS8000	Ver. 2.0.0.0		C 1 C 1
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	7 57 55	2024.10.30
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	\$ 5P 5	2024.07.05
15	234G Automatic test software	Micowave	MTS8200	Ver. 2.0.0.0	♦ 10	
16	966 chamber	C.R.T.	966	0/ 0	070	2024.08.11
17	Receiver	R&S	ESPI	100362	RF_ATTEN_7 (104489/003)	2024.07.05
18	Amplifier	HP	8447E	2945A02747	6 b 6	2024.07.05
19	Amplifier	Agilent	8449B	3008A01838		2024.07.05
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	* csp cs	2024.07.08

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 8 of 25



21	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA9120D	01911	\$ 5 5 5 S	2024.07.08
22	EMI test software	Fala	EZ-EMC	FA-03A2 RE	/	
23	Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-224		2024.07.08
24	loop antenna	ZHINAN	ZN30900A	GTS534	a b a	
25	40G Horn antenna	A/H/System	SAS-574	588		2024.10.30
26	Amplifier	AEROFLEX	Aeroflex	097	a b a	2024.07.05

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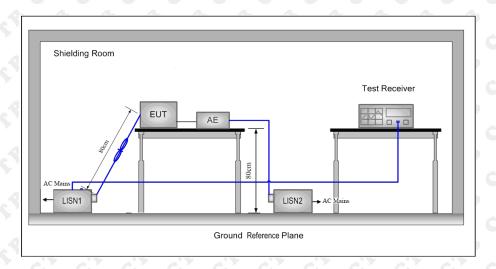
		Radia	ated emission			
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware Version	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	01911	, i	2024.07.08
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	\$ 1,8	2024.07.08
3	Amplifier	Agilent	8449B	3008A01838		2024.07.05
4	Amplifier	HP	8447E	2945A02747	1	2024.07.05
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428/003	V4.42.SP3	2024.07.05
6	Coaxial cable	ETS	RFC-SNS-100-N MS-80 NI	07 6		2024.07.05
7	Coaxial cable	ETS	RFC-SNS-100-N MS-20 NI	\$ 18 A	**	2024.07.05
8	Coaxial cable	ETS	RFC-SNS-100-S MS-20 NI	o 10	0 10	2024.07.05
9	Coaxial cable	ETS	RFC-NNS-100- NMS-300 NI	07 0		2024.07.05
10	Communication test set	Agilent	E5515C	MY50102567	B.19.07 (E1962B)	2024.07.05
11	Communication test set	R&S	CMW500	108058	V3.5.80	2024.07.05
12	EZ-EMC	Frad	EMC-con3A1.1	67 6		

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 9 of 25



6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

I	F	Maximum RF Line Voltage (dBμV)					
2	Frequency (MHz)	CLASS A		C	LASS B		
9	(111112)	Q.P.	Ave.	Q.P.	Ave.		
	0.15 - 0.50	79	66	66-56*	56-46*		
9	0.50 - 5.00	73	60	56	46		
	5.00 - 30.0	73	60	60	50		

^{*} Decreasing linearly with the logarithm of the frequency

6.3 Test procedure

- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0,4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 10 of 25



6.4 Test Result

N/A

NOTE: This EUT is powered by DC power only, this test item is not applicable.

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 11 of 25



7. RADIATED EMISSION

7.1 Block Diagram Of Test Setup

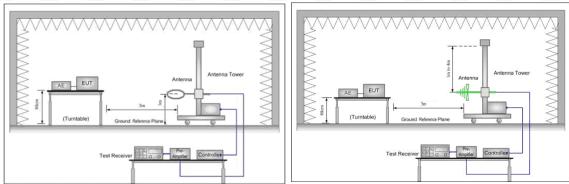


Figure 1. Below 30MHz

Figure 2. 30MHz to 1GHz

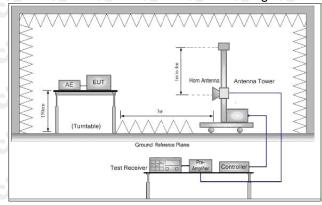


Figure 3. Above 1GHz

7.2 Limit

Spurious Emissions:

Frequency	Field strength (dBµV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	20log 2400/F (kHz) + 80	C- C	3
0.490MHz-1.705MHz	20log 24000/F (kHz) + 40	ф <u>-</u> Ф	3
1.705MHz-30MHz	20log 30 + 40	7 67 6	3
30MHz-88MHz	40.0	Quasi-peak	3
88MHz-216MHz	43.5	Quasi-peak	3
216MHz-960MHz	46.0	Quasi-peak	♦ 3 ♠
960MHz-1GHz	54.0	Quasi-peak	3
Above 1GHz	54.0	Average	3 <

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 12 of 25



Field Strength of Fundamental Limit:

	Fundamental and	Field strength of	Field strength of spurious
, r	narmonics emission	Fundamental((microvolts/meter)	emissions(microvolts/meter)
I	imits Frequency(MHz)		0' 0' 0' 0'
4	40.66-40.70	2280	225
7	70-130	1250	125
•	130-174	1250 to 3750**	125 to 375**
45	174-260	3750	375
2	260-470	3750 to 12500**	375 to 1250**
1	Above 470	12500	1250

^{**} linear interpolations

[Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, μ V/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, μ V/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.]

Frequency	Limit (dBµV/m @3m)	Remark
433MHz	80.8	Average Value
433IVIDZ	100.8	Peak Value

7.3 Test procedure

Below 1GHz test procedure as below:

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c.The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement
- d.For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f.If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- g.Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter (Above 18GHz the distance is 1 meter and table is 1.5 meter).
- h.Test the EUT in the lowest channel ,the middle channel ,the Highest channel
- j.Repeat above procedures until all frequencies measured was complete.

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 13 of 25



Receiver set:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	100 kHz	300KHz	Quasi-peak
Above 4011-	Peak	1MHz	3MHz	Peak
Above 1GHz	Peak	1MHz	10Hz	Average

7.4 Test Result

7.4.1 Calculation of average factor

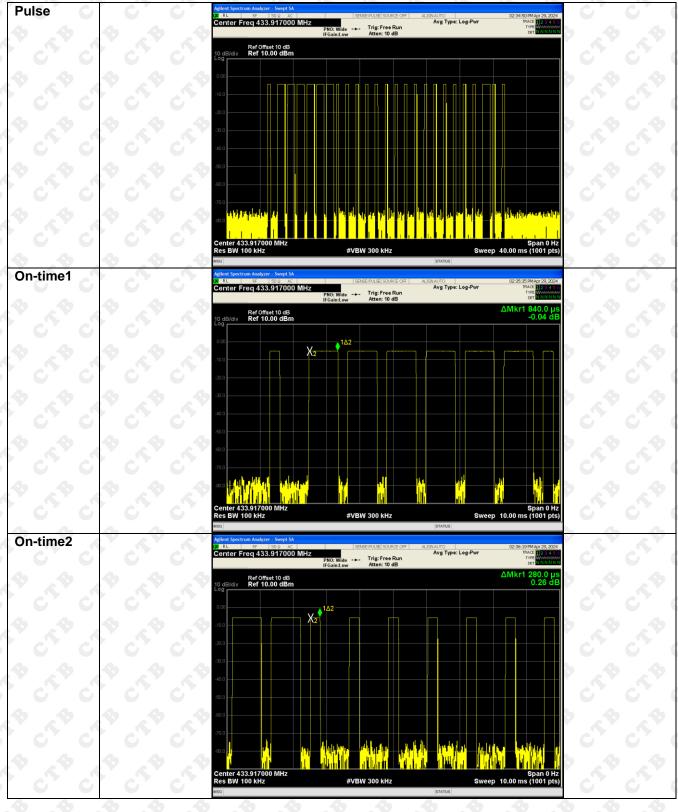
The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.



Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 14 of 25





Average factor:		
A A A	Average value=Peak value + PDCF	
Calculate Formula: PDCF=20 log(Duty cycle)		
0'0'	Duty cycle = T on time / T period	
Calculated average Ton time = 0.84×7+0.28×18=10.92(ms); T period =37.12(ms)		
factor:	PDCF = 20 log(1.92/37.12)= -10.63dB	

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 15 of 25



7.4.2 Radiated Spurious Emission

Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dBµV/m)	Limit@3m (dBµV/m)		
	0 0 0			
.0 0 -0 0	0 0 0 0	4 4 - 4		
~ · · · · · · · · · · · · · · · · · · ·	A A A			
	0 0 0	0 0 0		

Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

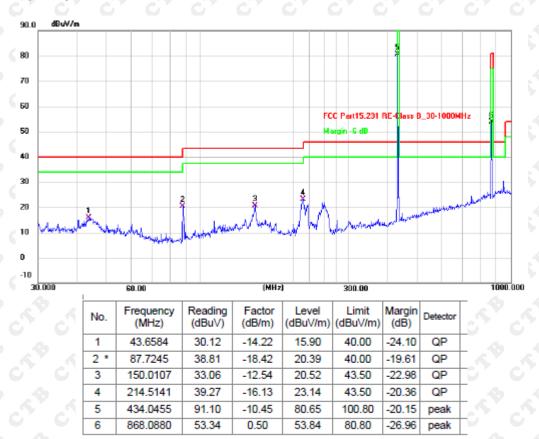
Report No.: CTB240506054RFX

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 16 of 25



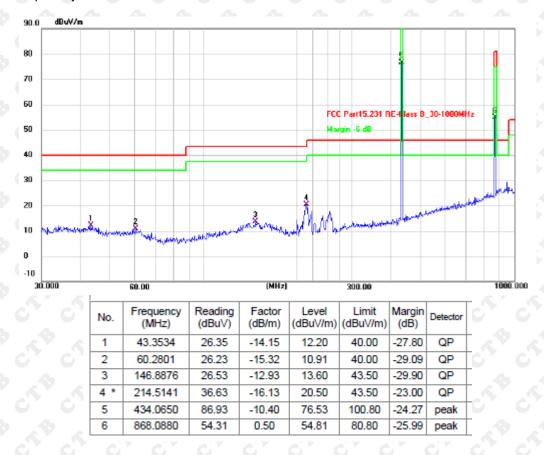
About 30MHz-1GHz Test Results:

Antenna polarity: H





Antenna polarity: V



Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 18 of 25



For average Emission

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	AverageLev el dBuV/m	Limit AV	Margin	Polarization
434.05	80.65	-10.63	70.02	80.8	-10.78	Horizontal
868.09	53.84	-10.63	43.21	60.8	-17.59	Horizontal
434.05	76.53	-10.63	65.90	80.8	-14.90	Vertical
868.09	54.81	-10.63	44.18	60.8	-16.62	Vertical

Notes: Average emission Level = Peak Level + Duty cycle factor

Above 1GHz Test Results

Frequency	Peak	Duty	Average	Li	mit	Margi	n dB	6
MHz	Level dBuV/m	cycle factor	Level dBuV/m	PK	AV	PK	AV	Polarization
1301.71	50.73	-10.63	40.49	80.8	60.8	-30.07	-20.31	Vertical
1735.26	48.75	-10.63	38.51	80.8	60.8	-32.05	-22.29	Vertical
2603.56	43.23	-10.63	32.99	80.8	60.8	-37.57	-27.81	Vertical
3037.43	43.25	-10.63	33.01	80.8	60.8	-37.55	-27.79	Vertical
3471.35	40.06	-10.63	29.82	80.8	60.8	-40.74	-30.98	Vertical
3905.24	40.44	-10.63	30.20	80.8	60.8	-40.36	-30.60	Vertical
1301.71	50.52	-10.63	40.28	80.8	60.8	-30.28	-20.52	Horizontal
1735.26	46.45	-10.63	36.21	80.8	60.8	-34.35	-24.59	Horizontal
2603.56	42.08	-10.63	31.84	80.8	60.8	-38.72	-28.96	Horizontal
3037.43	43.63	-10.63	33.39	80.8	60.8	-37.17	-27.41	Horizontal
3471.35	41.44	-10.63	31.20	80.8	60.8	-39.36	-29.60	Horizontal
3905.24	41.92	-10.63	31.68	80.8	60.8	-38.88	-29.12	Horizontal

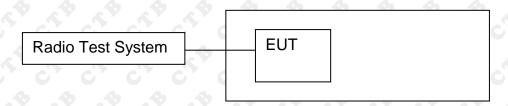
Notes: Average emission Level = Peak Level + Duty cycle factor

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 19 of 25



8. DWELL TIME

8.1 Block Diagram Of Test Setup



8.2 Limit

According to FCC 15.231(a) requirement:

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

8.3 Test procedure

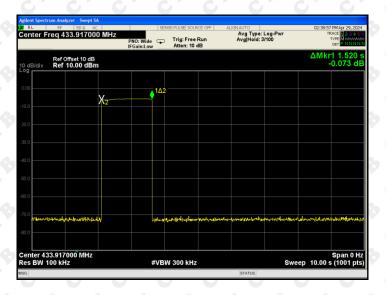
- a) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b) Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
- c) Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
- d) Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
- e) Repeat above procedures until all measured frequencies were complete.

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 20 of 25



8.4 Test Result

Transmitting time(S)	Limit (S)	Results
1.52	≤5	Pass

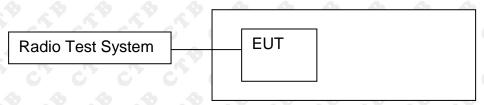


Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 21 of 25



9. OCCUPIED BANDWIDTH

9.1 Block Diagram Of Test Setup



9.2 Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier. B.W (20dBc) Limit = 0.25% * f(MHz) = 0.25% * 433.92MHz = 1.0848MHz

9.3 Test procedure

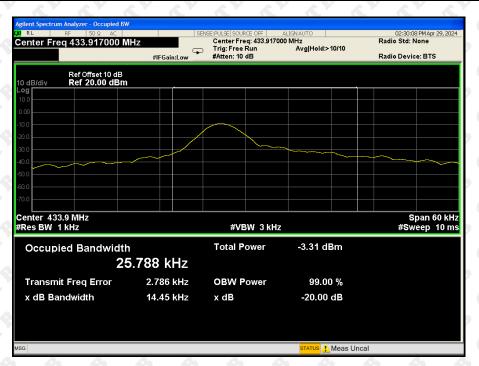
- 1. Set RBW = 10 kHz.
- 2. Set the video bandwidth (VBW) ≥RBW.
- 3. Detector = Peak.
- 4. Trace mode = max hold.
- 5. Sweep = auto couple.
- 6. Allow the trace to stabilize.
- 7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 22 of 25



9.4 Test Result

20dB bandwidth (kHz)	Limit (MHz)	Results
14.45	1.0848	Pass



Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 23 of 25



10. ANTENNA REQUIREMENT

15.203 requirement:

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, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Report No.: CTB240506054RFX

EUT Antenna:

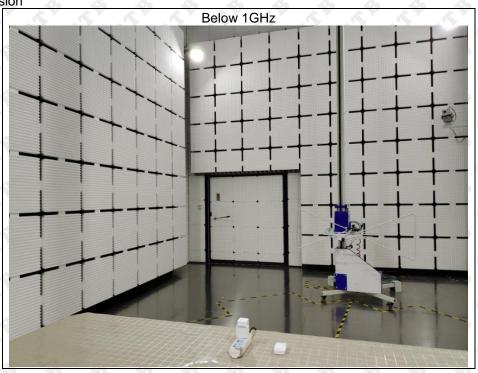
The antenna is PCB antenna and no consideration of replacement. The best case gain of the antenna is 1.0dBi.

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 24 of 25



11. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission





**** END OF REPORT ***

Report Tel: 4008-707-283 Web: http://www.ctb-lab.net Page 25 of 25