

# Global United Technology Services Co., Ltd.

Report No.: GTS202210000003F02

# TEST REPORT

Trane US, Inc. Applicant:

6200 Troup Highway, TYLER, Texas 75707, United States **Address of Applicant:** 

Manufacturer/Factory: Computime Electronics (Shenzhen) Company Limited

Address of Yuekenguangyu Industrial Park, Kanggiao Road 88#, Danzhutou Community, Nanwan Street office, Longgang Manufacturer/Factory:

District. Shenzhen. China.

**Equipment Under Test (EUT)** 

Product Name: **COLOR WIFI Z-WAVE THERMOSTAT** 

Model No.: TZON1050AC52ZC, AZON1050AC52ZC

Trade Mark: TRANE

FCC ID: XVRZON1054

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.249

October 08, 2022 Date of sample receipt:

Date of Test: October 09, 2022-November 03, 2022

Date of report issued: November 03, 2022

PASS \* Test Result:

In the configuration tested, the EUT complied with the standards specified above.



Robinson Luo **Laboratory Manager** 



# 2 Version

Version No.	Date	Description
00	November 03, 2022	Original

Prepared By:	Project Engineer	Date:	November 03, 2022	
Check By:	Reviewer	Date:	November 03, 2022	



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# **Test Summary**

Test Item	Section in CFR 47	Result
Antenna requirement	15.203	Pass
AC Power Line Conducted Emission	15.207	Pass
Field strength of the fundamental signal	15.249 (a)	Pass
Spurious emissions	15.249 (a) (d)/15.209	Pass
Band edge	15.249 (d)/15.205	Pass
20dB Occupied Bandwidth	15.215 (c)	Pass

Pass: The EUT complies with the essential requirements in the standard.

Remark: Test according to ANSI C63.10:2013

# 4.1 Measurement Uncertainty

3.1dB (1) 3.8039dB (1)
3.8039dB (1)
0.00000=
3.9679dB (1)
4.29dB (1)
3.30dB (1)
3.44dB (1)



# 5 General Information

# 5.1 General Description of EUT

Product Name:	COLOR WIFI Z-WAVE THERMOSTAT		
Model No.:	TZON1050AC52ZC, AZON1050AC52ZC		
Test Model No.:	TZON1050AC52ZC		
Remark: All above models are identical in the same PCB layout, interior structure and electrical circuits.			
The difference is model nar	ne for commercial purpose.		
Test sample(s) ID:	GTS202210000003-1		
Sample(s) Status:	Engineer sample		
S/ N: N/A			
Hardware Version:	V2.0		
Software Version:	5.9.6.20220530		
Operation Frequency:	908.42MHz, 916MHz		
Rate:	40k, 100k		
Modulation type:	Z-wave		
Antenna Type:	Integral antenna		
Antenna gain:	-6.6dBi(declare by manufacturer)		
Power supply:	AC 24V		



#### 5.2 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode.
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#### Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

#### 908.42MHz:

Axis	X	Υ	Z		
Field Strength(dBuV/m)	Field Strength(dBuV/m) 90.15 91.11		89.25		
916MHz:					
Axis	X	Υ	Z		
Field Strength(dBuV/m)	90.51	91.13	89.56		

## 5.3 Description of Support Units

Manufacture	Description	Model	SN.
N/A	AC-AC adapter	N/A	N/A

## 5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

## • FCC —Registration No.: 381383

Designation Number: CN5029

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files.

#### • IC —Registration No.: 9079A

CAB identifier: CN0091

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing.

#### NVLAP (LAB CODE:600179-0)

Global United Technology Services Co., Ltd., is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

#### 5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

No. 123-128, Tower A, Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480 Fax: 0755-27798960

#### 5.6 Additional Instructions

Test Software	Special test command provided by manufacturer
Power level setup	Default

Telephone: +86 (0) 755 2779 8480 Fax: +86 (0) 755 2779 8960



# 6 Test Instruments list

Rad	iated Emission:					
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.2(L)*6.2(W)* 6.4(H)	GTS250	July 02, 2020	July 01, 2025
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	April 22, 2022	April 21, 2023
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9168	GTS640	March 21, 2022	March 20, 2023
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	BBHA 9120 D	GTS208	June 12, 2022	June 11, 2023
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 23, 2022	June 22, 2023
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	April 22, 2022	April 21, 2023
9	Coaxial Cable	GTS	N/A	GTS211	April 22, 2022	April 21, 2023
10	Coaxial cable	GTS	N/A	GTS210	April 22, 2022	April 21, 2023
11	Coaxial Cable	GTS	N/A	GTS212	April 22, 2022	April 21, 2023
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	April 22, 2022	April 21, 2023
13	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 23, 2022	June 22, 2023
14	Band filter	Amindeon	82346	GTS219	June 23, 2022	June 22, 2023
15	Power Meter	Anritsu	ML2495A	GTS540	June 23, 2022	June 22, 2023
16	Power Sensor	Anritsu	MA2411B	GTS541	June 23, 2022	June 22, 2023
17	Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	GTS575	April 22, 2022	April 21, 2023
18	Splitter	Agilent	11636B	GTS237	June 23, 2022	June 22, 2023
19	Loop Antenna	ZHINAN	ZN30900A	GTS534	Nov. 30, 2021	Nov. 29, 2022
20	Broadband Preamplifier	SCHWARZBECK	BBV9718	GTS535	April 22, 2022	April 21, 2023
21	Breitband hornantenna	SCHWARZBECK	BBHA 9170	GTS579	Oct. 16, 2022	Oct. 15, 2023
22	Amplifier	TDK	PA-02-02	GTS574	Oct. 16, 2022	Oct. 15, 2023
23	Amplifier	TDK	PA-02-03	GTS576	Oct. 16, 2022	Oct. 15, 2023
24	PSA Series Spectrum Analyzer	Rohde & Schwarz	FSP	GTS578	June 23, 2022	June 22, 2023
25	Amplifier(1GHz-26.5GHz)	HP	8449B	GTS601	April 22, 2022	April 21, 2023



Con	Conducted Emission							
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)		
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May 14, 2022	May 13, 2025		
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 24, 2022	April 23, 2023		
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June 23, 2022	June 22, 2023		
4	ENV216 2-L-V- NETZNACHB.DE	ROHDE&SCHWARZ	ENV216	GTS226	April 22, 2022	April 21, 2023		
5	Coaxial Cable	GTS	N/A	GTS227	N/A	N/A		
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A		
7	Thermo meter	JINCHUANG	GSP-8A	GTS639	April 28, 2022	April 27, 2023		
8	Absorbing clamp	Elektronik- Feinmechanik	MDS21	GTS229	April 15, 2022	April 14, 2023		
9	ISN	SCHWARZBECK	NTFM 8158	GTS565	April 22, 2022	April 21, 2023		
10	High voltage probe	SCHWARZBECK	TK9420	GTS537	April 22, 2022	April 21, 2023		

RF Conducted Test:								
Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)		
1	MXA Signal Analyzer	Agilent	N9020A	GTS566	April 22, 2022	April 21, 2023		
2	EMI Test Receiver	R&S	ESCI 7	GTS552	April 22, 2022	April 21, 2023		
3	Spectrum Analyzer	Agilent	E4440A	GTS536	April 22, 2022	April 21, 2023		
4	MXG vector Signal Generator	Agilent	N5182A	GTS567	April 22, 2022	April 21, 2023		
5	ESG Analog Signal Generator	Agilent	E4428C	GTS568	April 22, 2022	April 21, 2023		
6	USB RF Power Sensor	DARE	RPR3006W	GTS569	April 22, 2022	April 21, 2023		
7	RF Switch Box	Shongyi	RFSW3003328	GTS571	April 22, 2022	April 21, 2023		
8	Programmable Constant Temp & Humi Test Chamber	WEWON	WHTH-150L-40-880	GTS572	April 22, 2022	April 21, 2023		

Ge	General used equipment:							
Iten	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)		
1	Humidity/ Temperature Indicator	KTJ	TA328	GTS243	April 25, 2022	April 24, 2023		
2	Barometer	KUMAO	SF132	GTS647	July 26, 2022	July 25, 2023		



## 7 Test results and Measurement Data

## 7.1 Antenna requirement:

Standard requirement: FCC Part15 C Section 15.203

#### 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.

#### **EUT Antenna:**

The antenna is integral antenna, reference to the appendix II for details.



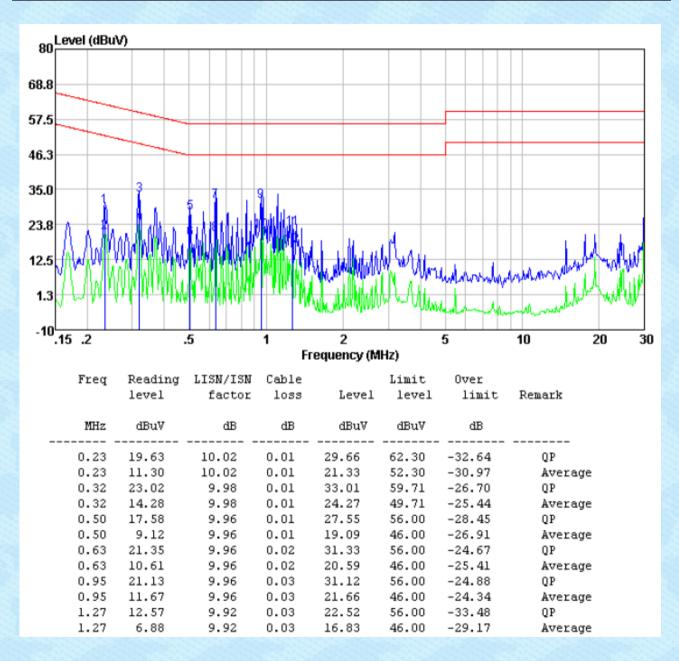
## 7.2 Conducted Emissions

7.2 Conducted Emissions								
Test Requirement:	FCC Part15 C Section 15.207							
Test Method:	ANSI C63.10:2013							
Test Frequency Range:	150KHz to 30MHz							
Class / Severity:	Class B	Class B						
Receiver setup:	RBW=9KHz, VBW=30KHz, S	weep time=auto						
Limit:		Limit	(dBuV)					
	Frequency range (MHz)	Quasi-peak	Average					
	0.15-0.5	66 to 56*	56 to 46*					
	0.5-5	56	46					
	5-30	60	50					
	* Decreases with the logarithr	n of the frequency.						
Test setup:	Reference Plane							
	AUX Filter AC power Equipment E.U.T  Test table/Insulation plane  Remark: E.U.T. Equipment Under Test LISN: Line Impedence Stabilization Network Test table height=0.8m							
Test procedure:	<ol> <li>The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 500hm/50uH coupling impedance for the measuring equipment.</li> <li>The peripheral devices are also connected to the main power through a LISN that provides a 500hm/50uH coupling impedance with 500hm termination. (Please refer to the block diagram of the test setup and photographs).</li> <li>Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.</li> </ol>							
Test environment:	Temp.: 25 °C Hun	nid.: 52%	Press.: 1 012mbar					
Test Instruments:	Refer to section 6.0 for details							
Test mode:	Refer to section 5.2 for details							
Test voltage:	AC 120V/60Hz							
Test results:	Pass							
	A CAN CAN CAN CAN CAN CAN CAN CAN CAN CA							



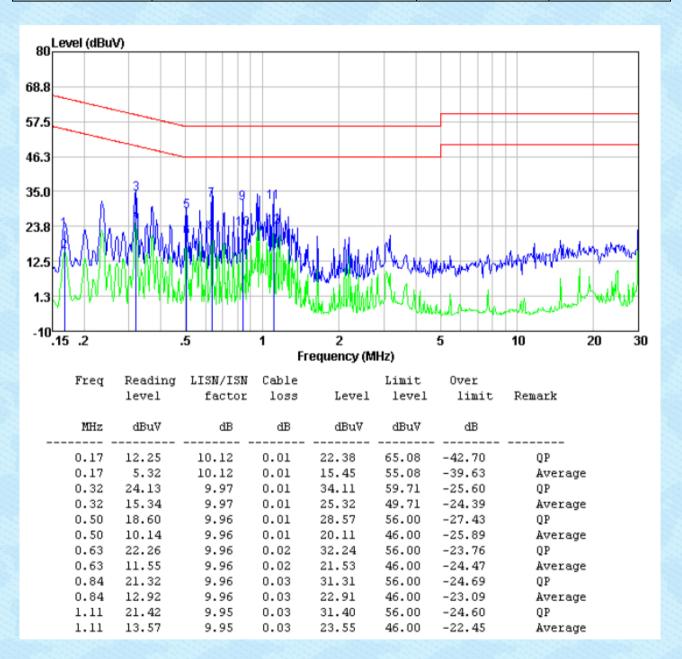
#### Measurement data:

Test mode:	Transmitting mode(908.42MHz)	Phase Polarity:	Line
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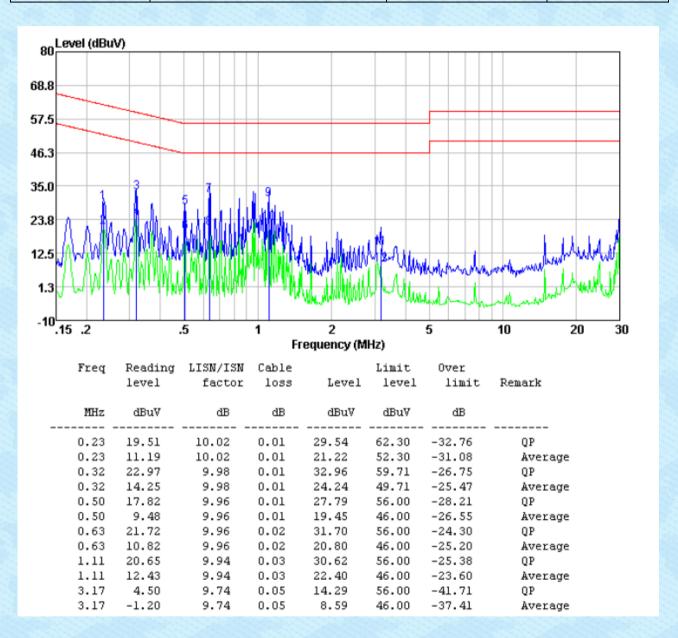




Test mode: Transmitting mode(908.42MHz) Phase Polarity: Neutral

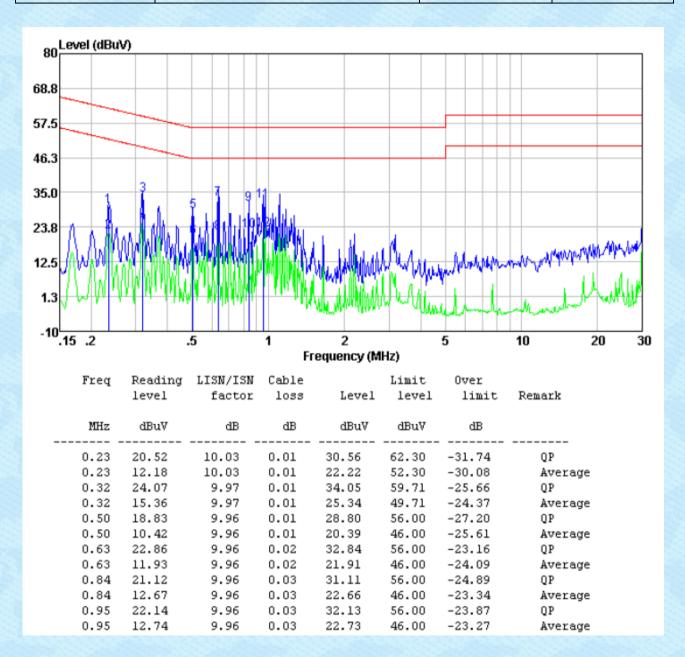








Test mode: Transmitting mode(916MHz) Phase Polarity: Neutral



#### Notes:

- 1. An initial pre-scan was performed on the line and neutral lines with peak detector.
- 2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
- 3. Final Level =Receiver Read level + LISN Factor + Cable Loss
- 4. If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.
- 5. Only the worst data report(Rate: 100k)



## 7.3 Radiated Emission Method

7.3 Radiated Emission Method														
Test Requirement:	FCC Part15 C Section	on 15.	209											
Test Method:	ANSI C63.10:2013													
Test Frequency Range:	9kHz to 10GHz													
Test site:	Measurement Distar	Measurement Distance: 3m												
Receiver setup:	Frequency	De	etector	RB\	Ν	VBV	٧	Value						
	9KHz-150KHz	Qua	asi-peak	200H	Ηz	600H	lz	Quasi-peak						
	150KHz-30MHz	Qua	asi-peak	9KH	lz	30KH	łz	Quasi-peak						
	30MHz-1GHz	Qua	asi-peak	120K	Hz	300KI	Hz	Quasi-peak						
	Above 1GHz		Peak	1MF	łz	3MH	Z	Peak						
		F	Peak	1MF	4 36	10H	Z	Average						
Limit:	Frequency		Limit	(dBuV/		3m)		Remark						
(Field strength of the fundamental signal)	902-928MHz	7		94.00	)			QP Value						
Limit: (Spurious Emissions)	Frequency		Limit (u\	//m)	١	/alue		Measurement Distance						
,	0.009MHz-0.490M	lHz	2400/F(k	(Hz)	PK/QP/AV		/	300m						
	0.490MHz-1.705M	lHz	24000/F(KHz)		QP			300m						
	1.705MHz-30MHz		30		1	QP		30m						
	30MHz-88MHz		100		QP									
	88MHz-216MHz		150			QP								
	216MHz-960MHz		200			QP		3m						
	960MHz-1GHz Above 1GHz		500			QP								
			500 5000			verage Peak								
Limit: (band edge)	Emissions radiated of harmonics, shall be fundamental or to the	attenu e gene	e of the sp ated by at eral radiate	ecified least 5	freq	uency k 3 below	the	level of the						
_	whichever is the less	ser atte	enuation.											
Test setup:	Below 30MHz													
	Turn Table    Socm >=   Turn Table   Turn Ta													
	Below 1GHz							Below 1GHz						



Report No.: GTS202210000003F02 Test Antenna EUT. Turn Table < 80cm Turn Tables Receiver-Preamplifier. Above 1GHz Test Antenna+ < 1m ... 4m > FUT. Tum Table <150cm> Receiver-Preamplifier+ Test Procedure: 1. The EUT was placed on the top of a rotating table (0.8m for below 1GHz and 1.5 meters for above 1GHz) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna 3. 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. 4. 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 and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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. Test environment: 25 °C Humid.: 52% Press.: Temp.: 1 012mbar Test Instruments: Refer to section 6.0 for details



Test mode:	Refer to section 5.2 for details				
Test voltage:	AC 120V/60Hz				
Test results:	Pass				

## Measurement data:

#### ■ 9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.



# 7.3.1 Field Strength of The Fundamental Signal and spurious emissions

## QP value:

## Rate:40k

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
908.42	86.94	23.97	4.88	37.36	78.43	94.00	-15.57	Vertical
908.42	99.62	23.97	4.88	37.36	91.11	94.00	-2.89	Horizontal
916.00	94.85	24.03	4.91	37.36	86.43	94.00	-7.57	Vertical
916.00	99.55	24.03	4.91	37.36	91.13	94.00	-2.87	Horizontal

#### Rate:100k

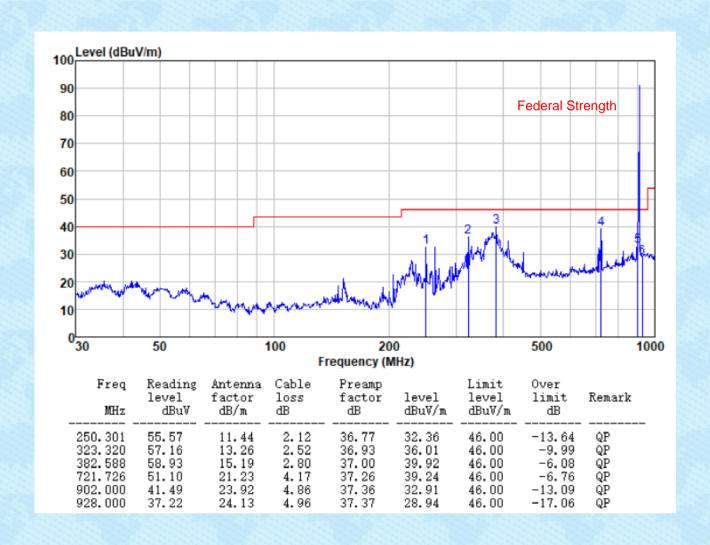
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
908.42	84.29	23.97	4.88	37.36	75.78	94.00	-18.22	Vertical
908.42	98.89	23.97	4.88	37.36	90.38	94.00	-3.62	Horizontal
916.00	93.82	24.03	4.91	37.36	85.40	94.00	-8.60	Vertical
916.00	99.39	24.03	4.91	37.36	90.97	94.00	-3.03	Horizontal



#### ■ 30MHz-1GHz

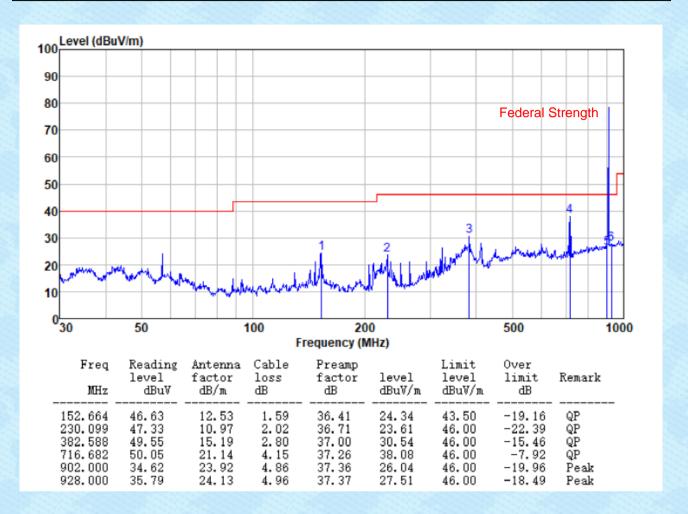
#### Rate:40k

Test mode: Transmit	ting mode (908.42MHz) Anten	na Polarity:	Horizontal
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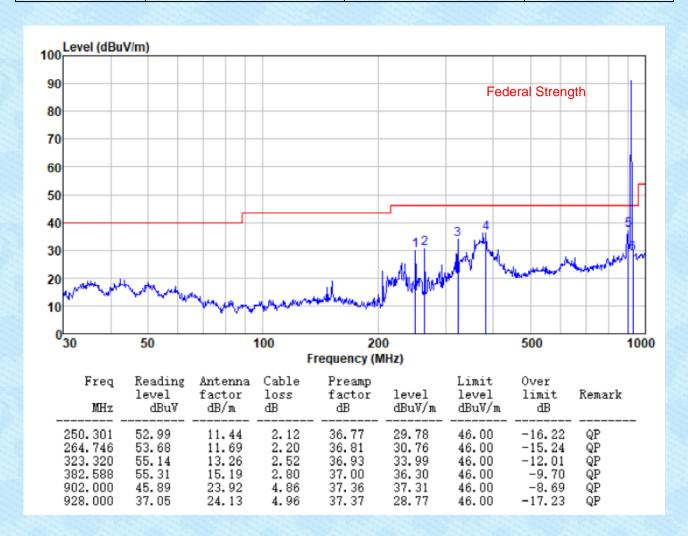


Test mode:	Transmitting mode (908.42MHz)	Antenna Polarity:	Vertical
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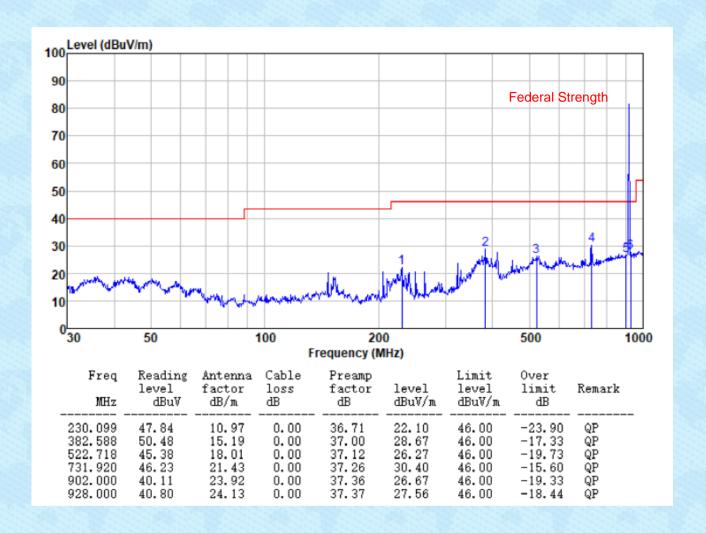


Test	mode:	Transmitting mode (916MHz)	Antenna Polarity:	Horizontal
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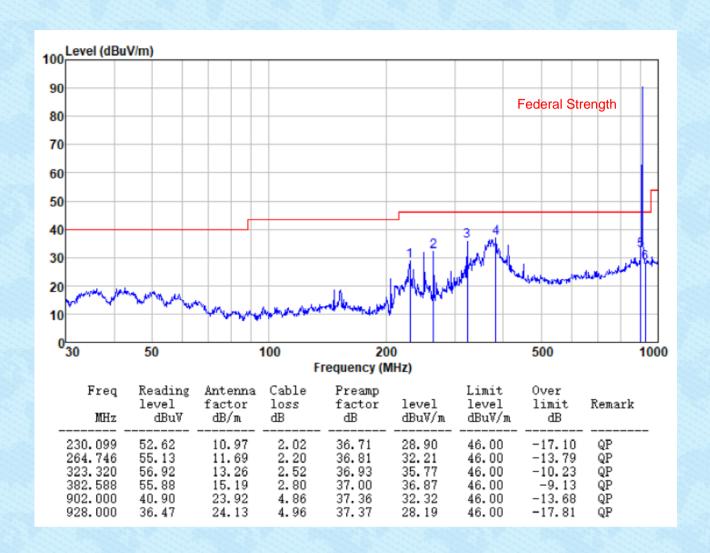
est mode: Transmitting mode (9	916MHz) Antenna Polarity:	Vertical
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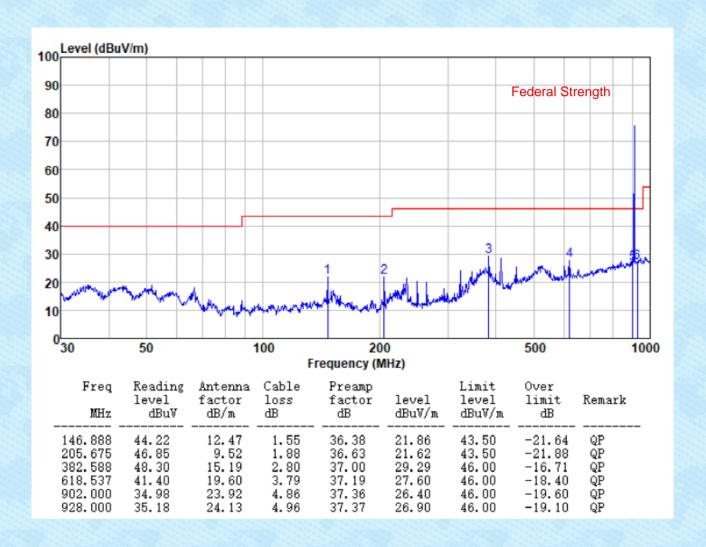
#### Rate:100k

Test mode:	Transmitting mode (908.42MHz)	Antenna Polarity:	Horizontal
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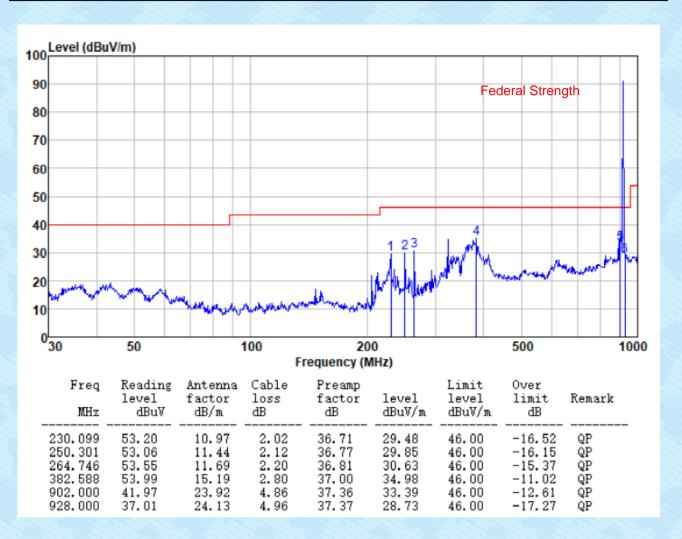
	Test mode:	Transmitting mode (908.42MHz)	Antenna Polarity:	Vertical
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Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102



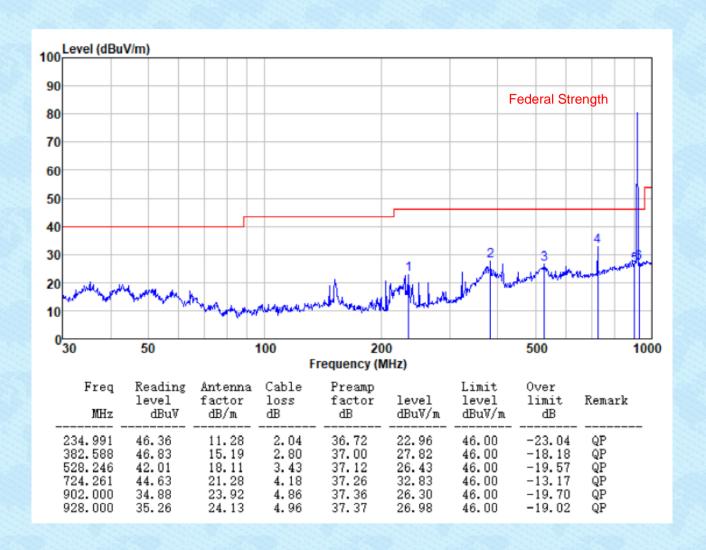
node: Transmitting mode (916MHz	) Antenna Polarity:	Horizontal
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Test mode:	Transmitting mode (916MHz)	Antenna Polarity:	Vertical	
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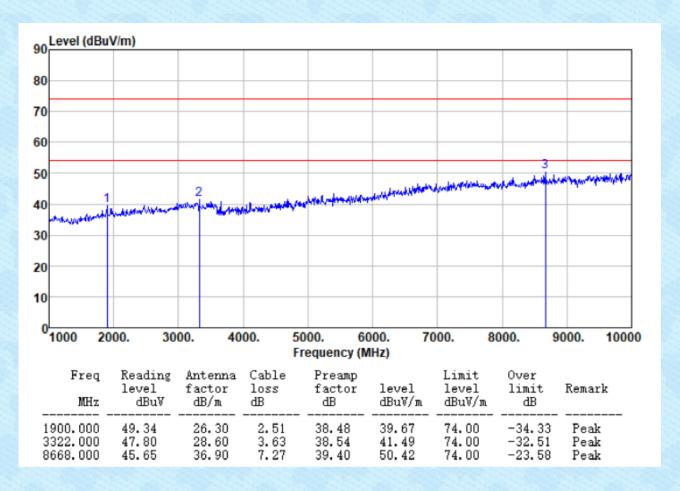




#### ■ Above 1GHz

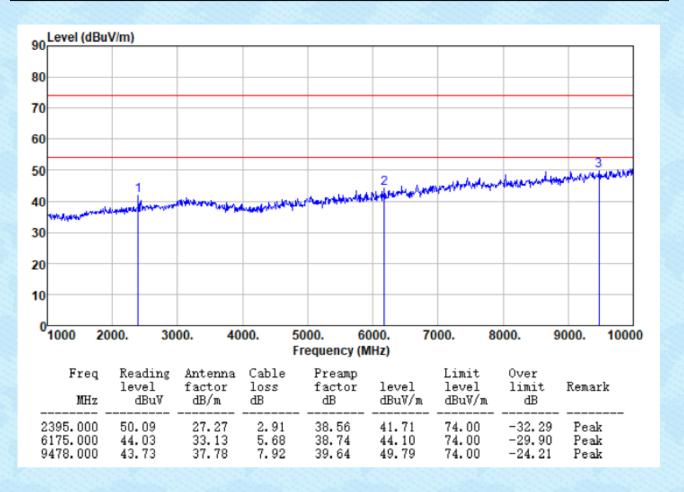
#### Rate:40k

Test mode:	Transmitting mode (908.42MHz)	Antenna Polarity:	Horizontal
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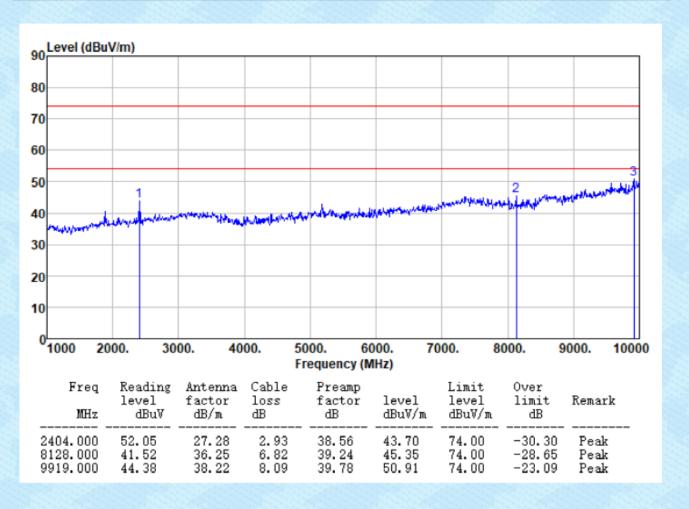


Test mode:	Transmitting mode (908.42MHz)	Antenna Polarity:	Vertical
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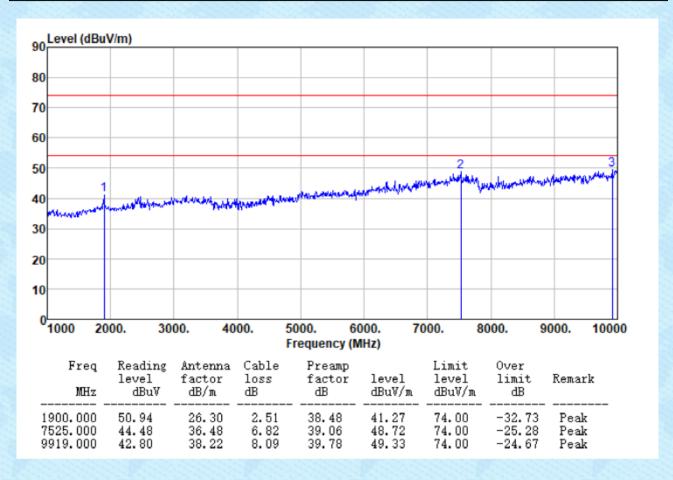


Test mode:	Transmitting mode (916MHz)	Antenna Polarity:	Horizontal
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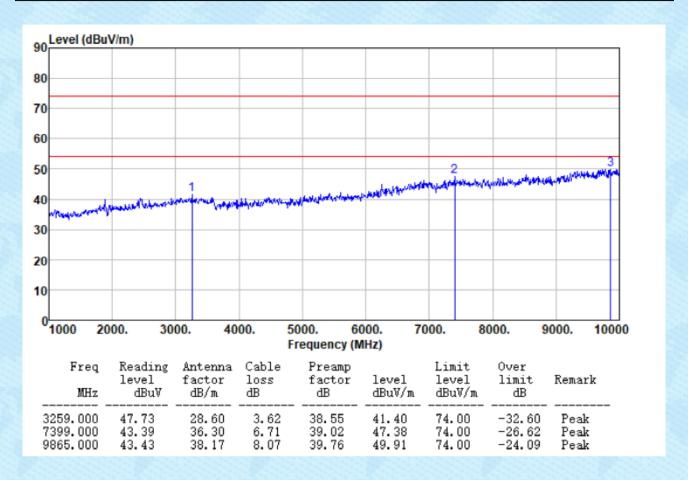
Test mode: Transmitting mode (916MHz) Antenna Polarity: Vertical





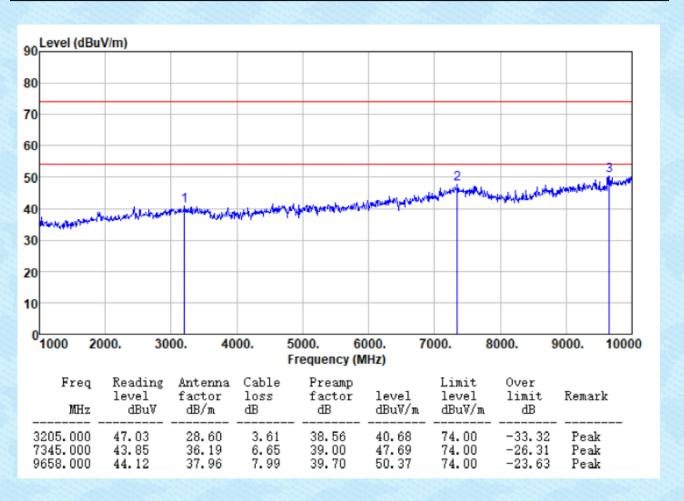
Rate:100k

Test mode: Transmitting mode (908.42MHz) Antenna Polarity: Horizontal

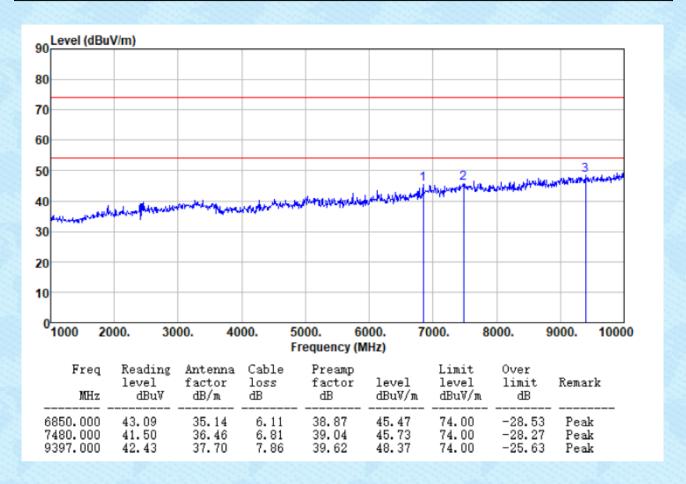




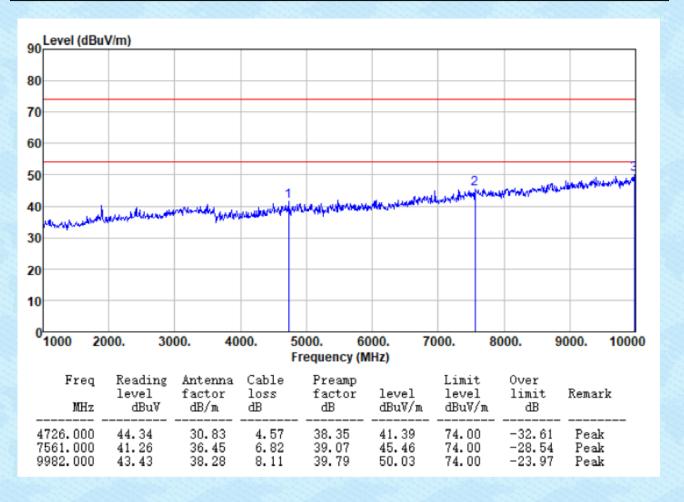
Test mode:	Transmitting mode (908.42MHz)	Antenna Polarity:	Vertical
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## Remark:

1. Final Level =Receiver Read level + Antenna Factor + Cable Loss - Preamplifier Factor



# 7.4 20dB Occupy Bandwidth

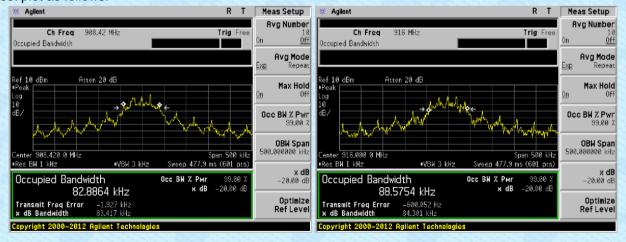
Test Requirement:	FCC Part15 C Section 15.249/15.215	
Test Method:	ANSI C63.10:2013	
Limit:	Operation Frequency range 902MHz~928MHz	
Test setup:	Spectrum Analyzer  E.U.T  Non-Conducted Table  Ground Reference Plane	
Test Instruments:	Refer to section 6.0 for details	
Test mode:	Refer to section 5.2 for details	
Test results:	Pass	

#### **Measurement Data**

#### Rate:40k

Operation Frequency	20dB bandwidth(kHz)	Result
908.42MHz	83.417	Pass
916MHz	84.301	Pass

## Test plot as follows:

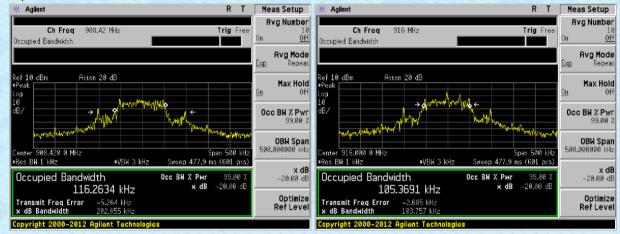




#### Rate:100k

Operation Frequency	20dB bandwidth(kHz)	Result
908.42MHz	202.655	Pass
916MHz	103.757	Pass

## Test plot as follows:





# 8 Test Setup Photo

Reference to the appendix I for details.

## 9 EUT Constructional Details

Reference to the appendix II for details.

-----End-----