

FCC TEST REPORT

Product Name: 2.4G Wireless Headset
Trade Mark: ATRIX
Model No.: GSHP55C
Report Number: 201215007RFC-1
Test Standards: FCC 47 CFR Part 15 Subpart C
FCC ID: 2AO23-GSHP55C
Test Result: PASS
Date of Issue: January 8, 2021

Prepared for:

Chug, Inc.

7157 Shady Oak Road Eden Prairie, Washington Minnesota United States

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
16/F, Block A, Building 6, Baoneng Science and Technology Park,
Qingxiang Road No.1, Longhua New District, Shenzhen, China

TEL: +86-755-2823 0888

FAX: +86-755-2823 0886

Prepared by:

Kieron Luo

Kieron Luo

Project Engineer

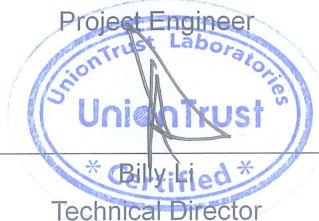
Reviewed by:

Kevin Liang

Kevin Liang

Assistant Manager

Approved by:



Billy Li

Technical Director

Date:

January 8, 2021

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0

Version

Version No.	Date	Description
V1.0	January 8, 2021	Original



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0

CONTENTS

1. GENERAL INFORMATION	4
1.1 CLIENT INFORMATION	4
1.2 EUT INFORMATION	4
1.2.1 GENERAL DESCRIPTION OF EUT	4
1.2.2 DESCRIPTION OF ACCESSORIES	4
1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD	4
1.4 OTHER INFORMATION	5
1.5 DESCRIPTION OF SUPPORT UNITS	5
1.6 TEST LOCATION	5
1.7 TEST FACILITY	5
1.8 DEVIATION FROM STANDARDS	6
1.9 ABNORMALITIES FROM STANDARD CONDITIONS	6
1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER	6
1.11 MEASUREMENT UNCERTAINTY	6
2. TEST SUMMARY	7
3. EQUIPMENT LIST	8
4. TEST CONFIGURATION	9
4.1 ENVIRONMENTAL CONDITIONS FOR TESTING	9
4.1.1 NORMAL OR EXTREME TEST CONDITIONS	9
4.1.2 RECORD OF NORMAL ENVIRONMENT	9
4.2 TEST CHANNELS	9
4.3 EUT TEST STATUS	9
4.4 TEST SETUP	10
4.4.1 FOR RADIATED EMISSIONS TEST SETUP	10
4.4.2 FOR CONDUCTED EMISSIONS TEST SETUP	11
4.4.3 FOR CONDUCTED EMISSIONS TEST SETUP	12
4.5 SYSTEM TEST CONFIGURATION	12
4.6 DUTY CYCLE	13
5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION	14
5.1 REFERENCE DOCUMENTS FOR TESTING	14
5.2 ANTENNA REQUIREMENT	14
5.3 RADIATED EMISSION	14
5.4 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY	24
5.5 20dB OCCUPIED BANDWIDTH	27
5.6 CONDUCTED EMISSION	30
APPENDIX 1 PHOTOS OF TEST SETUP	33
APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS	33

1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Chug, Inc.
Address of Applicant:	7157 Shady Oak Road Eden Prairie, Washington Minnesota United States
Manufacturer:	Dongguan Kuyi Electronic Technology Co., Ltd
Address of Manufacturer:	8 private industrial zones in Shichung, Hengli Town, Dongguan City, Guangdong Province 523465, China.
Factories:	Dongguan Kuyi Electronic Technology Co., Ltd
Address of Factories:	8 private industrial zones in Shichung, Hengli Town Dongguan City, Guangdong Province 523465, China

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	2.4G Wireless Headset
Model No.:	GSHP55C
Trade Mark:	ATRIX
DUT Stage:	Production Unit
EUT Supports Function:	General 2.4GHz Technique
Power Supply:	5V  300mA
Software Version:	V2.0
Hardware Version:	V1.0
Sample Received Date:	December 16, 2020
Sample Tested Date:	December 21, 2020 to December 24, 2020

1.2.2 Description of Accessories

None.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2403 MHz to 2478 MHz
Technique Standards:	General 2.4GHz Technique
Type of Modulation:	GFSK
Number of Channels:	26
Channel Separation:	3 MHz
Antenna Type:	PCB Antenna
Antenna Gain:	2.0 dBi
Maximum Field Strength:	81.75 dBμV/m
Normal Test Voltage:	5.0 Vdc

1.4 OTHER INFORMATION

Operation Frequency Each of Channel	
$f = 2403 + 3 \cdot k \text{ MHz, } k = 0, \dots, 25$	
Note:	
f	is the operating frequency (MHz);
k	is the operating channel.

1.5 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested with associated equipment below.

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
Notebook	Lenovo	E450	SL10G10780	UnionTrust
Notebook	DELL	Latitude 3400	6GJQKT2	UnionTrust

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.30 Meter	UnionTrust

1.6 TEST LOCATION

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

1.7 TEST FACILITY

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

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

A2LA-Lab Certificate No.: 4312.01

Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

ISED Wireless Device Testing Laboratories

CAB identifier: CN0032

FCC Accredited Lab.

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0

Designation Number: CN1194

Test Firm Registration Number: 259480

1.8 DEVIATION FROM STANDARDS

None.

1.9 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.10 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

1.11 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.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	± 3.2 dB
2	Conducted emission 150KHz-30MHz	± 2.7 dB
3	Radiated emission 9KHz-30MHz	± 4.7 dB
4	Radiated emission 30MHz-1GHz	± 4.6 dB
5	Radiated emission 1GHz-18GHz	± 4.4 dB
6	Radiated emission 18GHz-26GHz	± 4.6 dB
7	Radiated emission 26GHz-40GHz	± 4.6 dB

2. TEST SUMMARY

FCC 47 CFR Part 15 Subpart C Test Cases			
Test Item	Test Requirement	Test Method	Result
Antenna Requirement	FCC 47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS
Conducted Emission	FCC 47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Radiated Emission	FCC 47 CFR Part 15 Subpart C Section 15.249 (a)/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	FCC 47 CFR Part 15 Subpart C Section 15.249(a)/15.205	ANSI C63.10-2013	PASS
20dB Occupied Bandwidth	FCC 47 CFR Part 15 Subpart C Section 15.215 (c)	ANSI C63.10-2013	PASS

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 03, 2018	Dec. 03, 2021
☒	Receiver	R&S	ESIB26	100114	Nov. 18, 2020	Nov. 17, 2021
☒	Loop Antenna	ETS-LINDGREN	6502	00202525	Nov. 14, 2019	Nov. 13, 2022
☒	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Nov. 14, 2020	Nov. 13, 2021
☒	6dB Attenuator	Talent	RA6A5-N-18	18103001	Nov. 10, 2020	Nov. 9, 2021
☒	Preamplifier	HP	8447F	2805A02960	Nov. 10, 2020	Nov. 9, 2021
☒	Double-Ridged Waveguide Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201541	May. 30, 2020	May. 29, 2021
☒	Preamplifier	HP	118385	00201874	Nov. 10, 2020	Nov. 9, 2021
☒	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	Receiver	R&S	ESR7	1316.3003K07-101181-K3	Nov. 18, 2020	Nov. 17, 2021
☒	Pulse Limiter	R&S	ESH3-Z2	0357.8810.54	Nov. 18, 2020	Nov. 17, 2021
☒	LISN	R&S	ESH2-Z5	860014/024	Nov. 18, 2020	Nov. 17, 2021
☐	LISN	ETS-Lindgren	3816/2SH	00201088	Nov. 18, 2020	Nov. 17, 2021
☒	Test Software	Audix	e3	Software Version: 9.160323		

Conducted RF test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☒	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Nov. 18, 2020	Nov. 17, 2021

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

Environment Parameter	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
NT/NV	+15 to +35	DC 5V	20 to 75
Remark: 1) NV: Normal Voltage; NT: Normal Temperature			

4.1.2 Record of Normal Environment

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (kPa)	Tested by
Conducted Emission	25.1	47.0	99.8	Tripp Jiang
Radiated Emission	23.5	42.0	100.3	Andy Lin
Restricted bands around fundamental frequency (Radiated Emission)	23.5	42.0	100.3	Andy Lin
20dB Occupied Bandwidth	23.5	42.0	100.3	Andy Lin

4.2 TEST CHANNELS

Type of Modulation	Tx/Rx Frequency	Test RF Channel Lists		
GFSK	2403 MHz to 2478 MHz	Lowest(L)	Middle(M)	Highest(H)
		Channel 0	Channel 12	Channel 25
		2403 MHz	2439 MHz	2478 MHz

4.3 EUT TEST STATUS

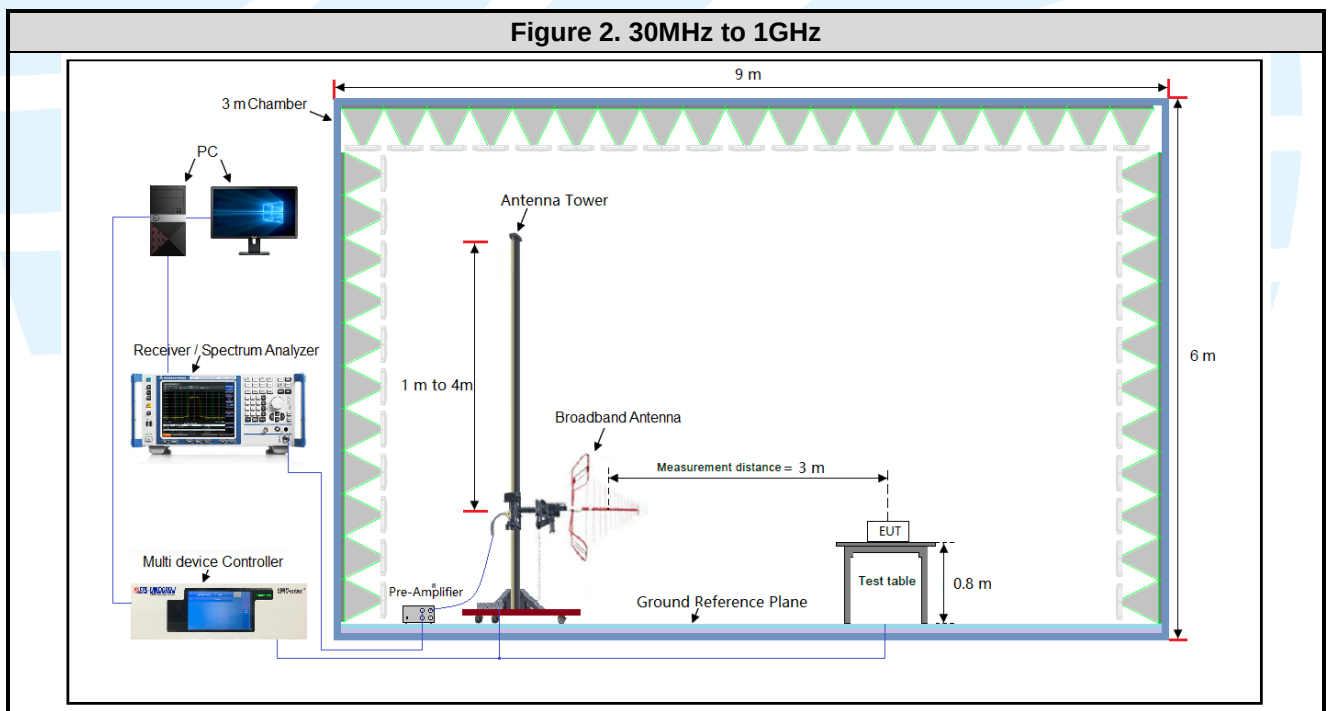
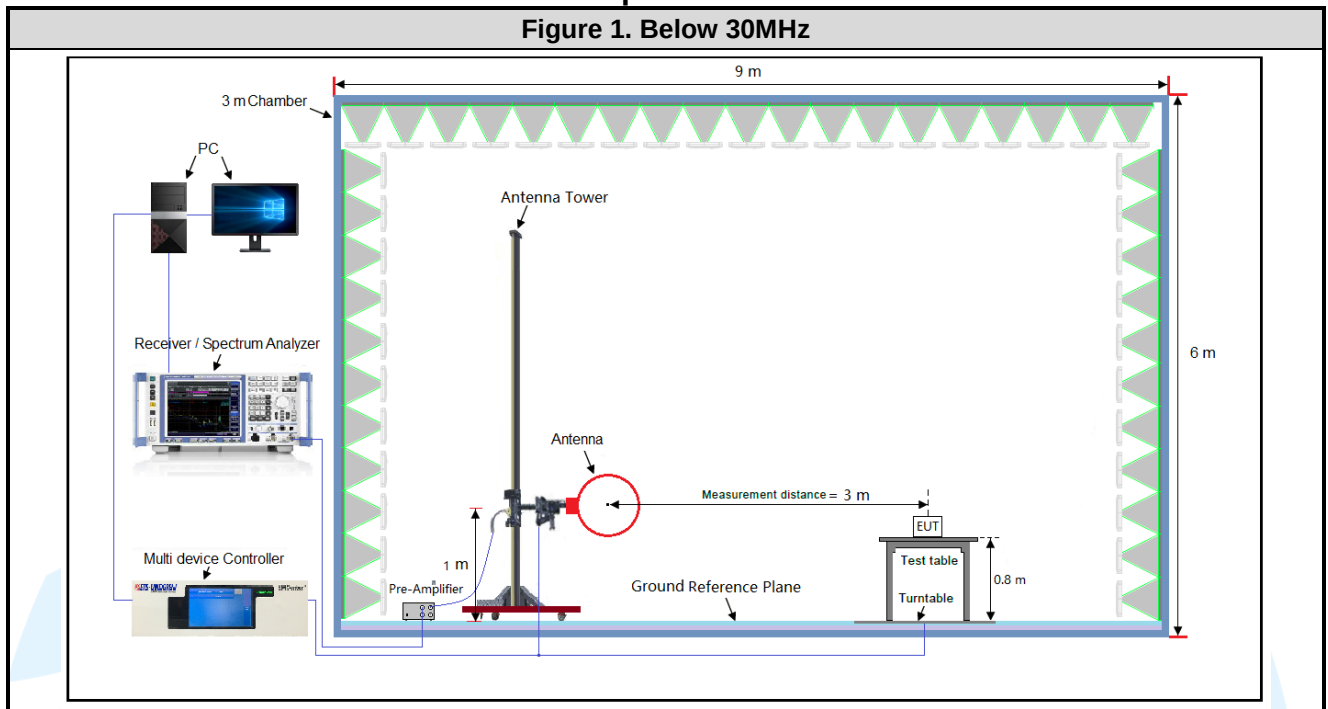
Modulation Mode	Tx Function	Description
GFSK	1Tx	Keep the EUT in continuously transmitting with modulation test single.

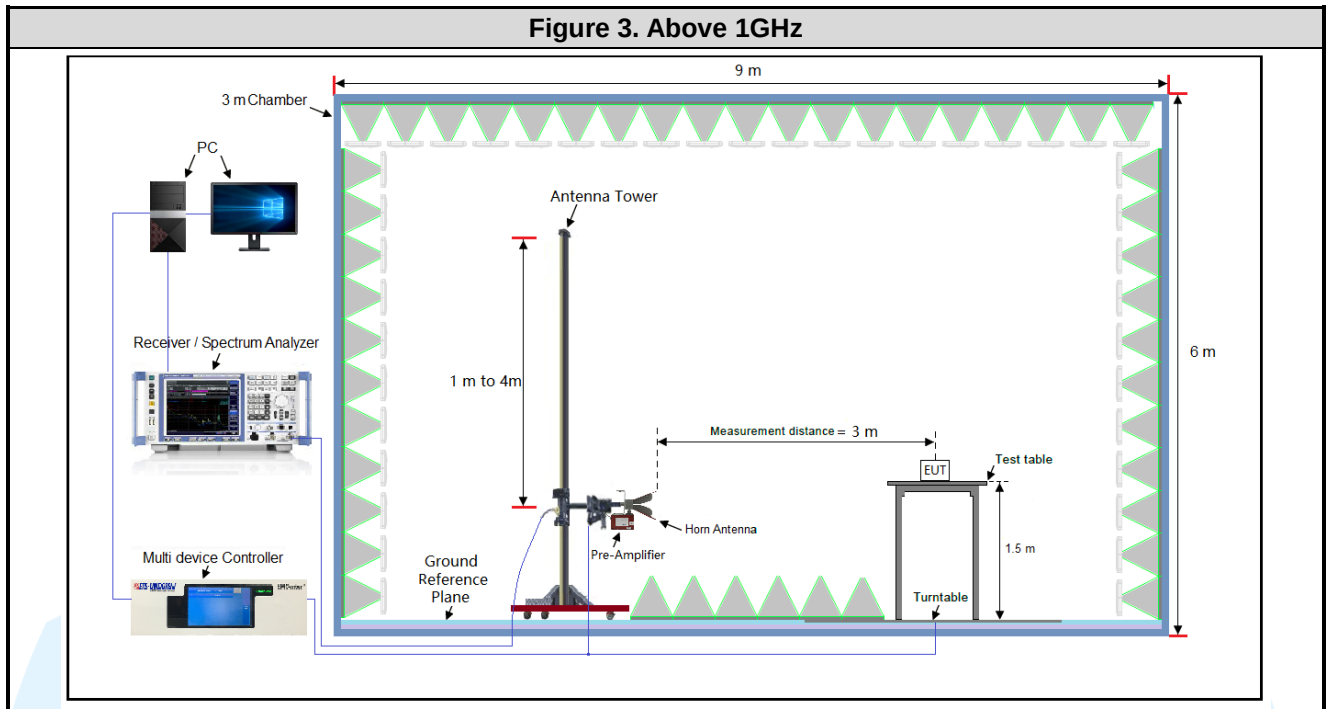
Power Setting
Power Setting: not applicable, test used software default power level.

Test Software
Test software name: N/A

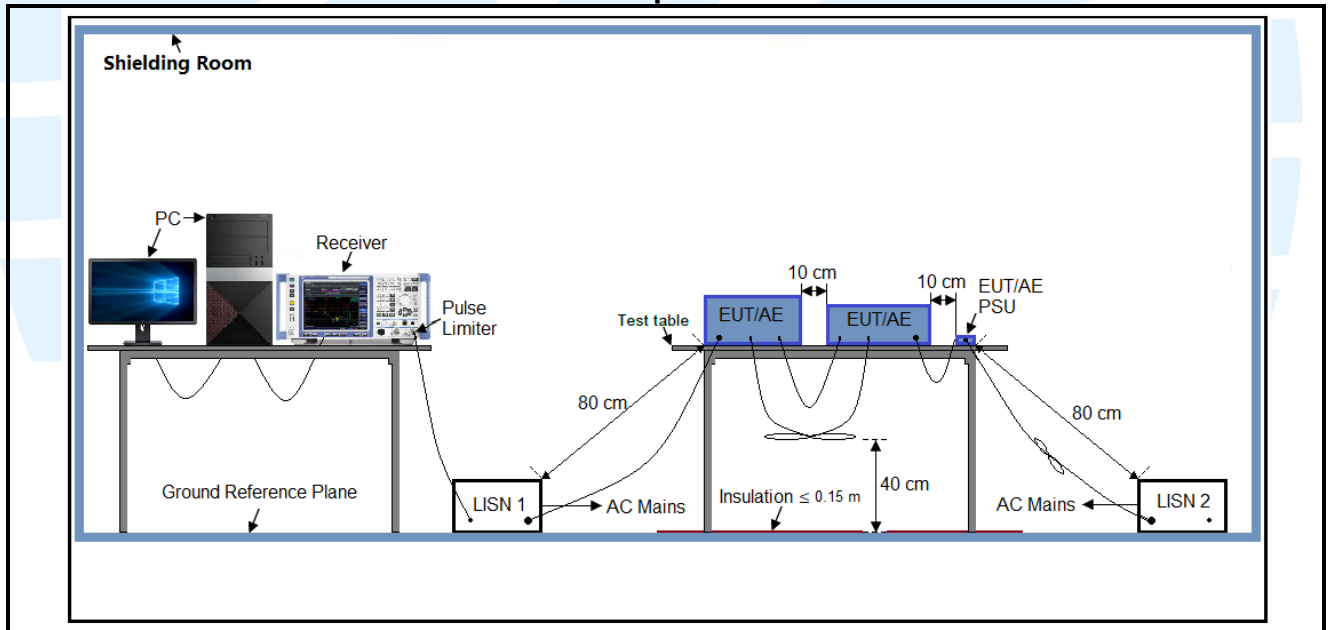
4.4 TEST SETUP

4.4.1 For Radiated Emissions test setup

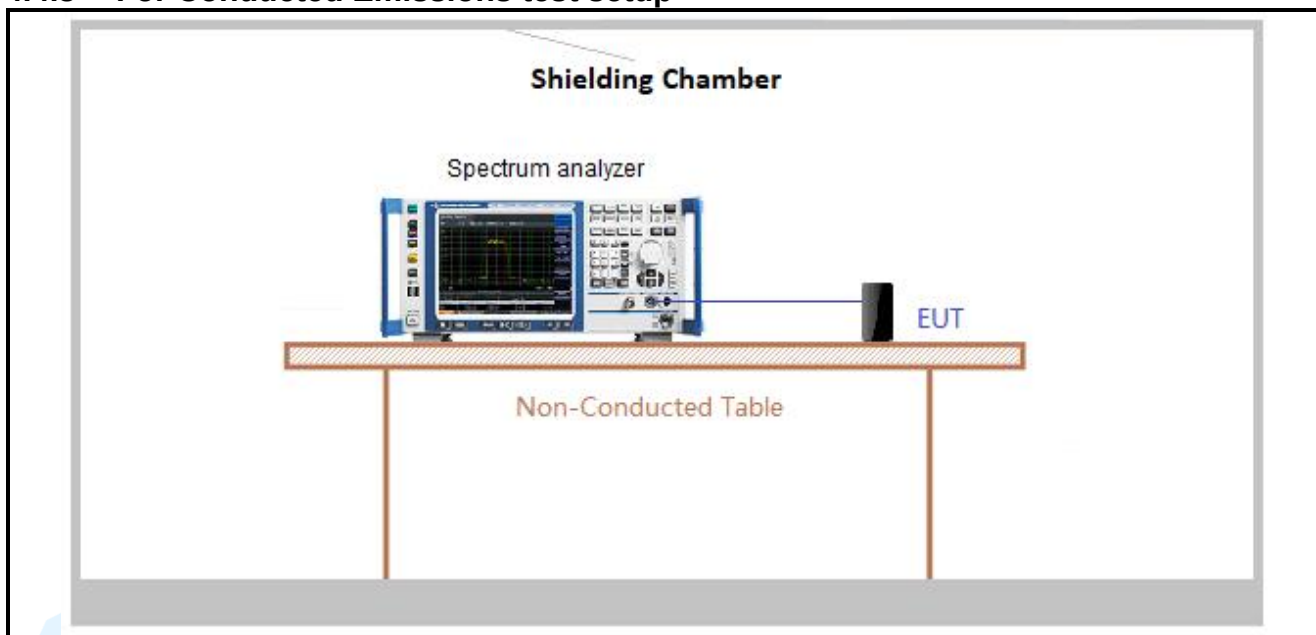




4.4.2 For Conducted Emissions test setup



4.4.3 For Conducted Emissions test setup



4.5 SYSTEM TEST CONFIGURATION

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by DC 5V from computer. Only the worst case data were recorded in this test report.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Therefore, all final radiated testing was performed with the EUT in (see table below) orientation.

Frequency	Mode	Antenna Port	Worst-case axis positioning
Above 1GHz	1TX	Chain 0	X axis

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000 MHz. The resolution is 1 MHz or greater for frequencies above 1000 MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

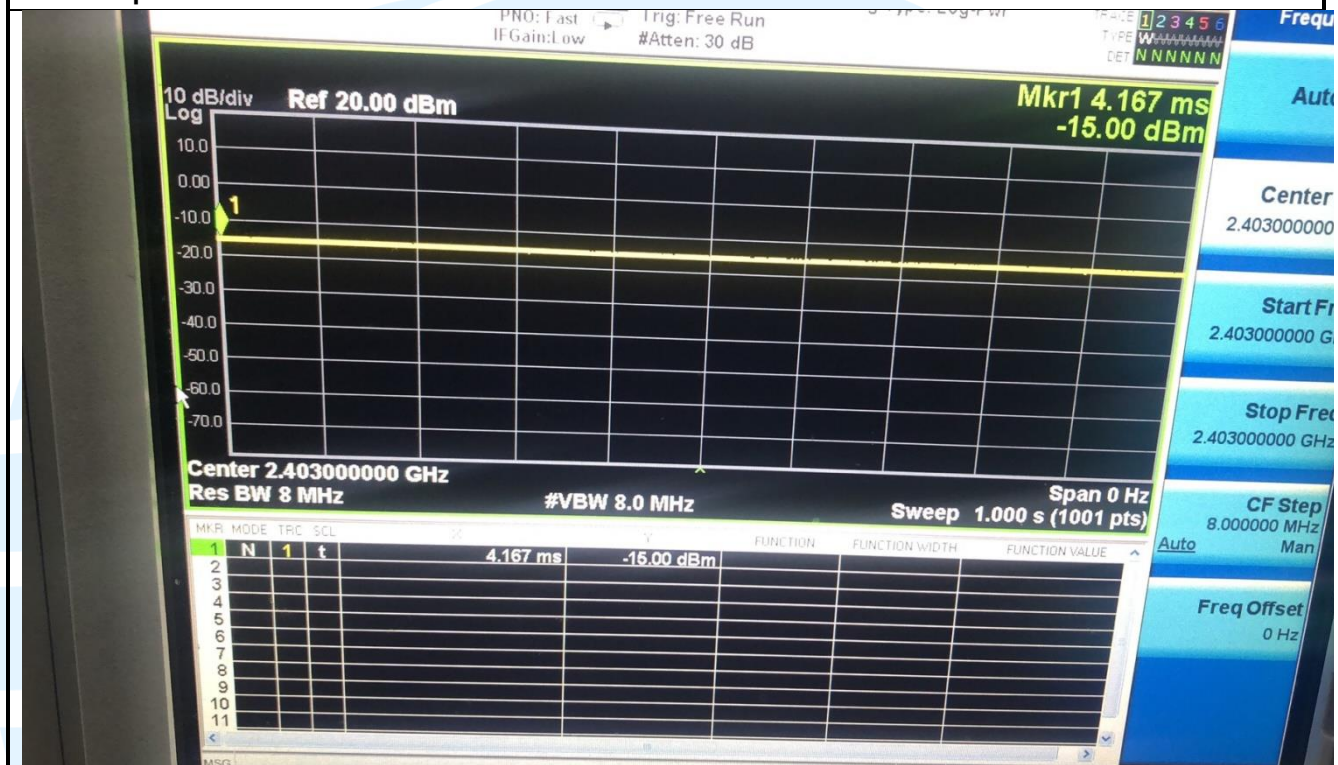
Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.6 DUTY CYCLE

Type of Modulation	On Time (msec)	Period (msec)	Duty Cycle (linear)	Duty Cycle (%)	Average Factor (dB)
GFSK	-	-	1.0	100	0

Remark:

- 1) Duty cycle= On Time/ Period;
- 2) Duty Cycle factor = $10 * \log(1/ \text{Duty cycle})$;
- 3) Average factor = $20 \log_{10} \text{Duty Cycle}$.

The test plot as follows


5. RADIO TECHNICAL REQUIREMENTS SPECIFICATION

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 15	Radio Frequency Devices
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

5.2 ANTENNA REQUIREMENT

Standard 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.
EUT Antenna: Antenna in the interior of the equipment and no consideration of replacement. The gain of the antenna is 1.9 dBi.

5.3 RADIATED EMISSION

Test Requirement: FCC 47 CFR Part 15.209 and 15.249

Test Method: ANSI C63.10-2013 Section 6.6.4.3

Receiver Setup:

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

Limits:

Spurious Emissions

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009 MHz-0.490 MHz	2400/F(kHz)	--	--	300
0.490 MHz-1.705 MHz	24000/F(kHz)	--	--	30
1.705 MHz-30 MHz	30	--	--	30
30 MHz-88 MHz	100	40.0	Quasi-peak	3
88 MHz-216 MHz	150	43.5	Quasi-peak	3
216 MHz-960 MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1 GHz	500	54.0	Average	3

Field strength of the fundamental signal

Frequency	Limit (dBμV/m @3m)	Remark
2400 MHz-2483.5 MHz	94.0	Average
	114.0	Peak

Remark:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

1. From 30 MHz to 1GHz test procedure as below:
 - 1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. 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 tower.
 - 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 (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.
 - 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.
2. Above 1GHz test procedure as below:
 - 1) 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).
 - 2) Test the EUT in the lowest channel ,middle channel, the Highest channel
 - 3) The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.
 - 4) Repeat above procedures until all frequencies measured was complete.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0

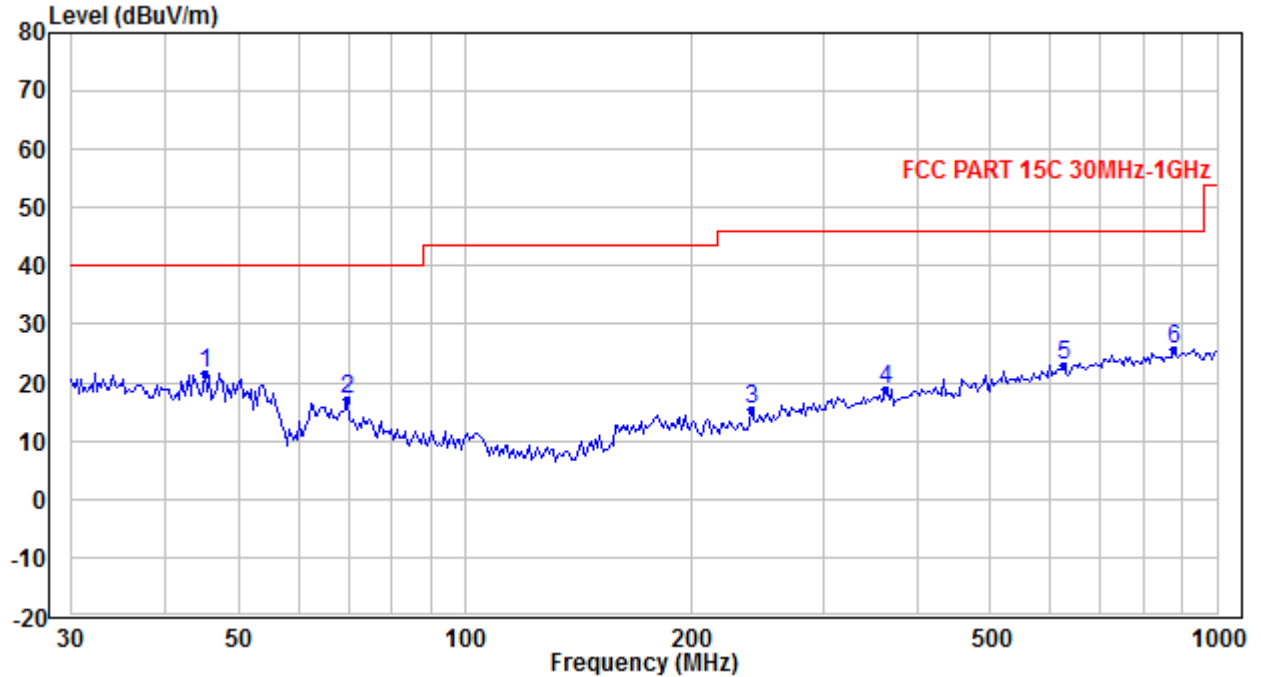
The measurement data as follows:

Field Strength of the Fundamental Signal					
Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark	Antenna Polaxis	Pass/Fail
Lowest Channel					
81.75	94.00	-12.25	Average	Horizontal	Pass
81.75	114.00	-32.25	Peak	Horizontal	Pass
79.88	94.00	-14.12	Average	Vertical	Pass
79.88	114.00	-34.12	Peak	Vertical	Pass
Middle Channel					
80.55	94.00	-13.45	Average	Horizontal	Pass
80.55	114.00	-33.45	Peak	Horizontal	Pass
77.75	94.00	-16.25	Average	Vertical	Pass
77.75	114.00	-36.25	Peak	Vertical	Pass
Highest Channel					
78.29	94.00	-15.71	Average	Horizontal	Pass
78.29	114.00	-35.71	Peak	Horizontal	Pass
76.48	94.00	-17.52	Average	Vertical	Pass
76.48	114.00	-37.52	Peak	Vertical	Pass

Remark: Average result = Peak result + Average Factor

Radiated Emission Test Data (9 KHz ~ 30 MHz):

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

Radiated Emission Test Data (30 MHz ~ 1 GHz):
Lowest Channel
Horizontal


No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	45.095	34.24	-12.50	21.74	40.00	-18.26	QP
2	69.718	35.39	-18.33	17.06	40.00	-22.94	QP
3	240.144	26.23	-11.00	15.23	46.00	-30.77	QP
4	363.523	26.16	-7.17	18.99	46.00	-27.01	QP
5	624.490	25.80	-2.77	23.03	46.00	-22.97	QP
6	875.013	25.02	0.69	25.71	46.00	-20.29	QP

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

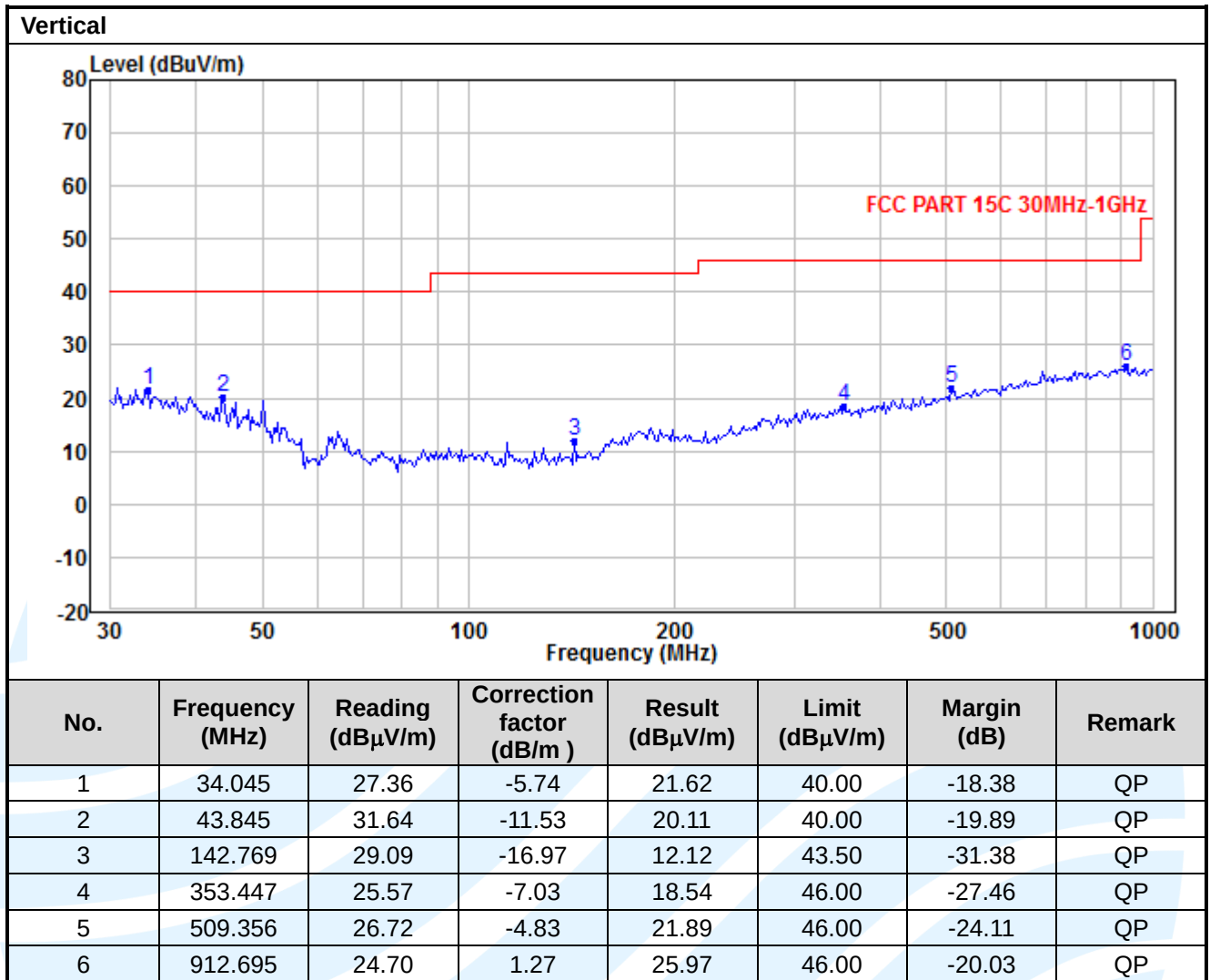
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

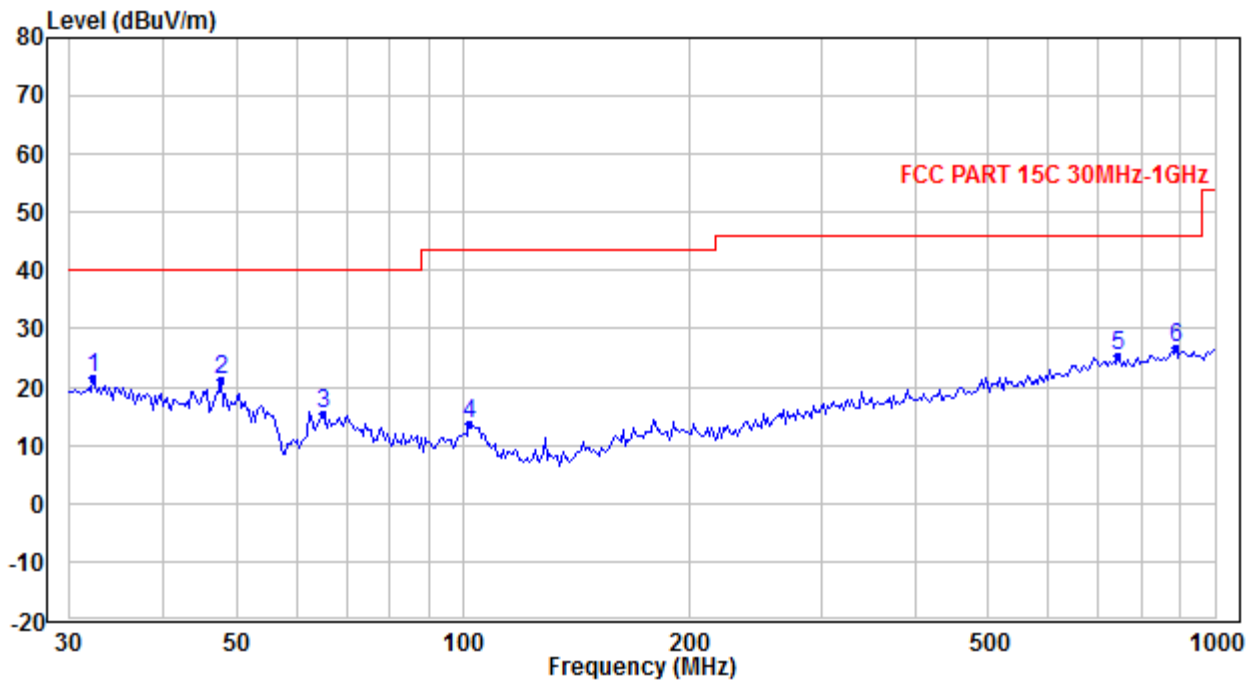
<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0



Middle Channel

Horizontal



No.	Frequency (MHz)	Reading (dBμV/m)	Correction factor (dB/m)	Result (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
1	32.184	27.24	-5.79	21.45	40.00	-18.55	QP
2	47.703	35.39	-14.09	21.30	40.00	-18.70	QP
3	64.987	33.56	-18.00	15.56	40.00	-24.44	QP
4	101.893	30.64	-17.08	13.56	43.50	-29.94	QP
5	744.427	26.41	-0.89	25.52	46.00	-20.48	QP
6	887.398	25.64	1.07	26.71	46.00	-19.29	QP

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

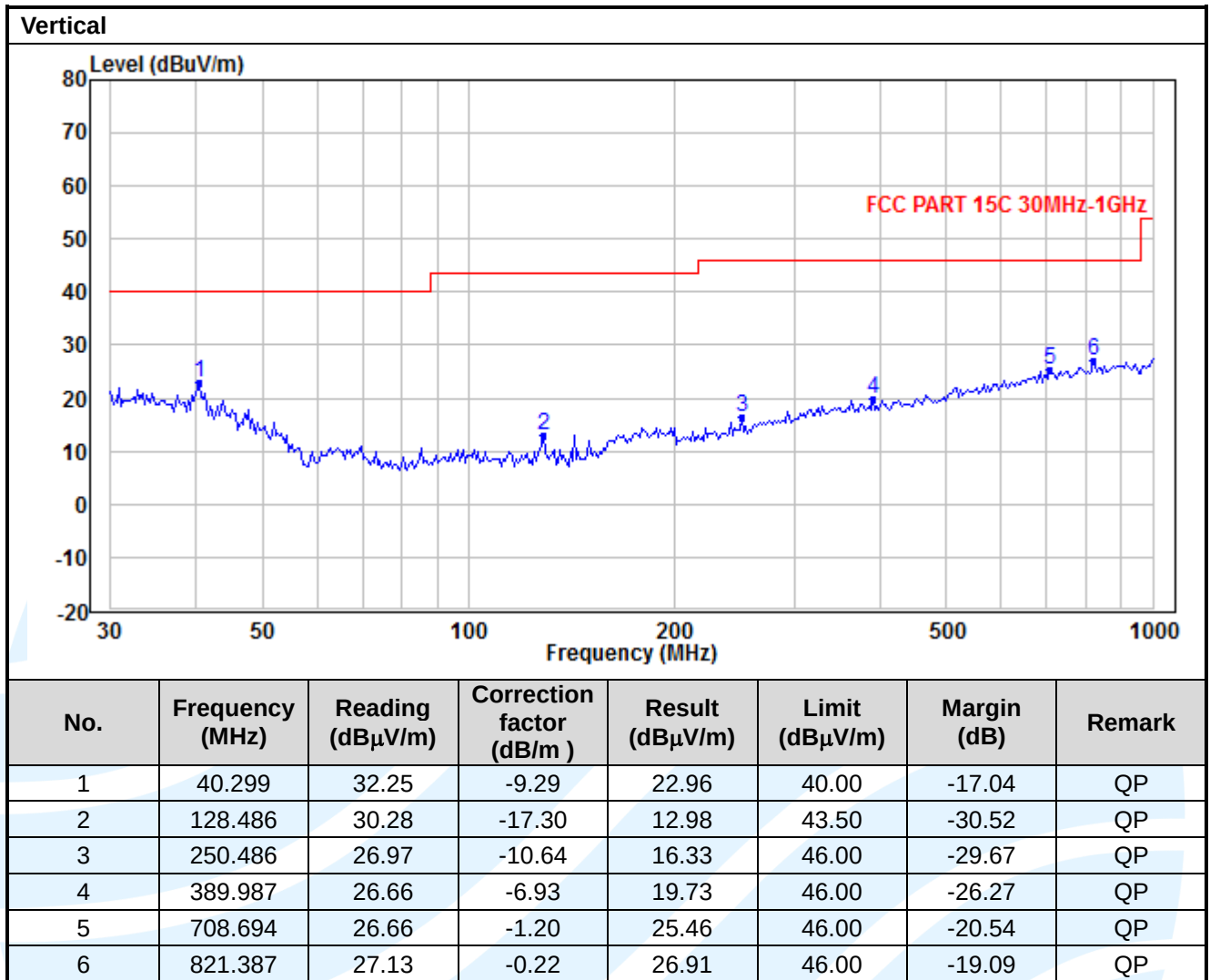
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

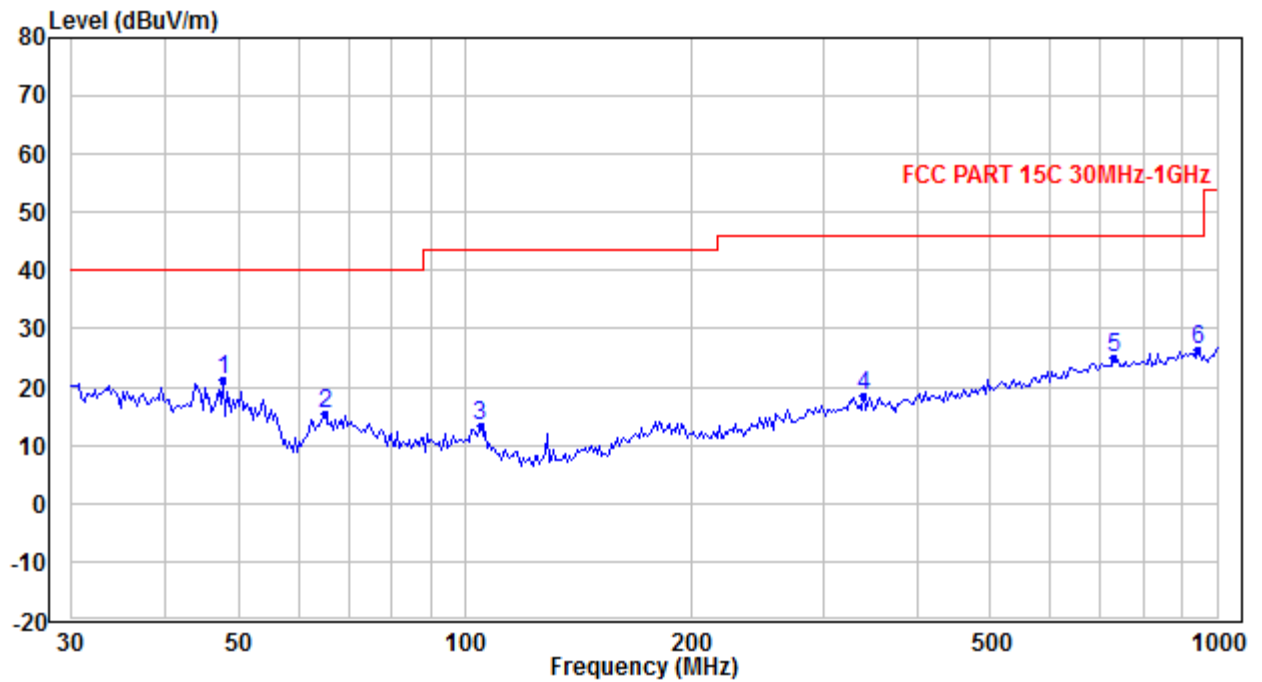
<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0



Highest Channel

Horizontal



No.	Frequency (MHz)	Reading (dB μ V/m)	Correction factor (dB/m)	Result (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Remark
1	47.703	35.33	-14.09	21.24	40.00	-18.76	QP
2	64.987	33.39	-18.00	15.39	40.00	-24.61	QP
3	104.798	30.31	-17.06	13.25	43.50	-30.25	QP
4	338.855	25.93	-7.49	18.44	46.00	-27.56	QP
5	728.897	26.04	-0.90	25.14	46.00	-20.86	QP
6	945.334	25.40	0.96	26.36	46.00	-19.64	QP

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

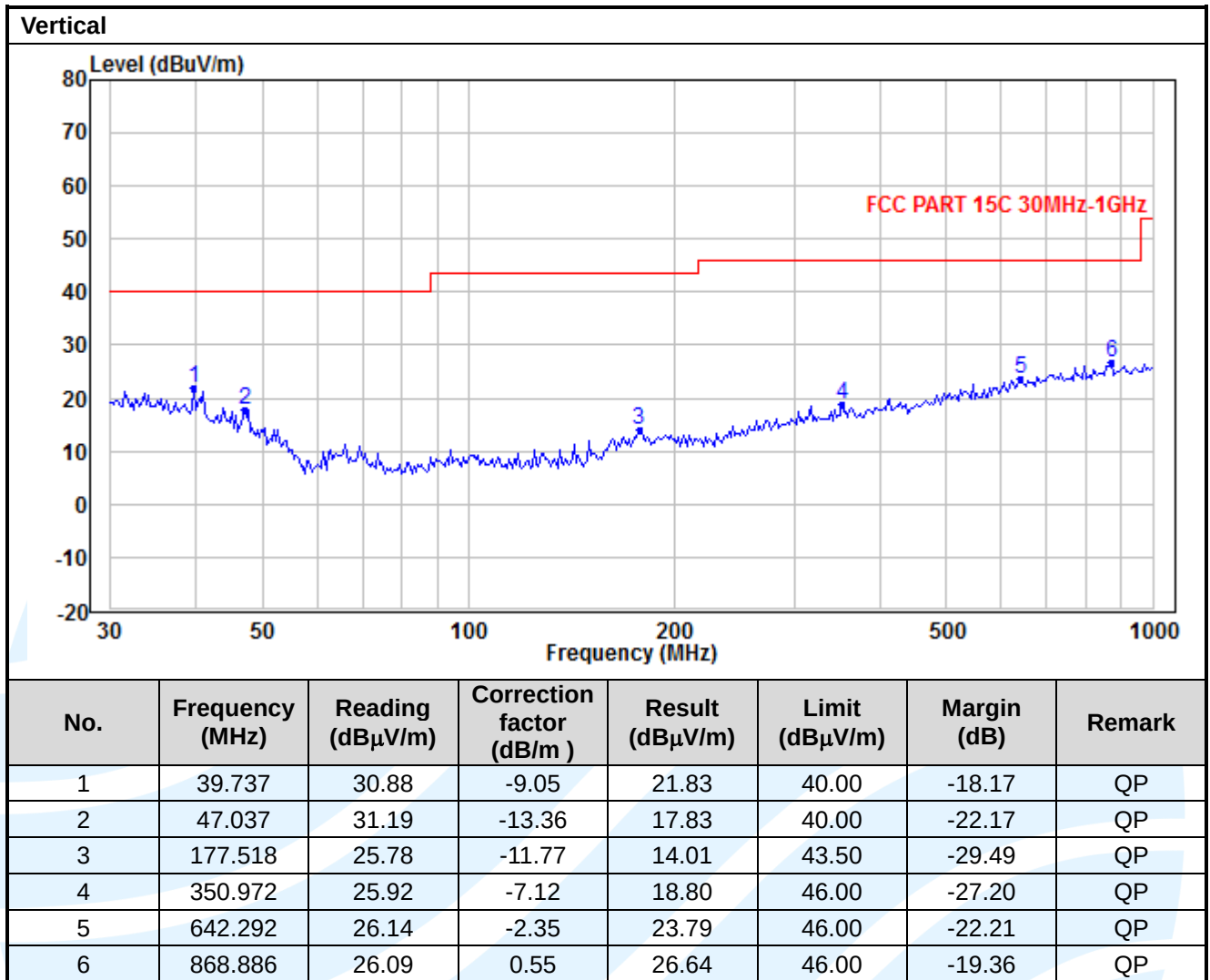
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0



Remark:

1. Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit

Radiated Emission Test Data (Above 1GHz):
Lowest Channel:

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4806.00	40.30	74.00	-33.70	Peak	Horizontal
2	7209.00	40.18	74.00	-33.82	Peak	Horizontal
3	4806.00	39.10	74.00	-34.90	Peak	Vertical
4	7209.00	39.47	74.00	-34.53	Peak	Vertical

Middle Channel:

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4878.00	38.03	74.00	-35.97	Peak	Horizontal
2	7317.00	40.76	74.00	-33.24	Peak	Horizontal
3	4878.00	42.70	74.00	-31.30	Peak	Vertical
4	7317.00	42.25	74.00	-31.75	Peak	Vertical

Highest Channel:

No.	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Antenna Polaxis
1	4956.00	42.50	74.00	-31.50	Peak	Horizontal
2	7434.00	44.77	74.00	-29.23	Peak	Horizontal
3	4956.00	41.38	74.00	-32.62	Peak	Vertical
4	7434.00	45.95	74.00	-28.05	Peak	Vertical

Remark:

1. Result = Reading + Correct Factor.
2. Margin = Result – Limit
3. the peak emission value comply with the averagevalue limit, so no need to test the average emission

5.4 RESTRICTED BANDS AROUND FUNDAMENTAL FREQUENCY

Test Requirement: FCC 47 CFR Part 15.209 and 15.205

Test Method: ANSI C63.10-2013

Limits:

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 Section 15.209, whichever is the lesser attenuation.

Frequency	Limit (dB μ V/m @3m)	Remark
30 MHz-88 MHz	40.0	Quasi-peak Value
88 MHz-216 MHz	43.5	Quasi-peak Value
216 MHz-960 MHz	46.0	Quasi-peak Value
960 MHz-1 GHz	54.0	Quasi-peak Value
Above 1 GHz	54.0	Average Value
	74.0	Peak Value

Test Setup: Refer to section 4.4.1 for details.

Test Procedures:

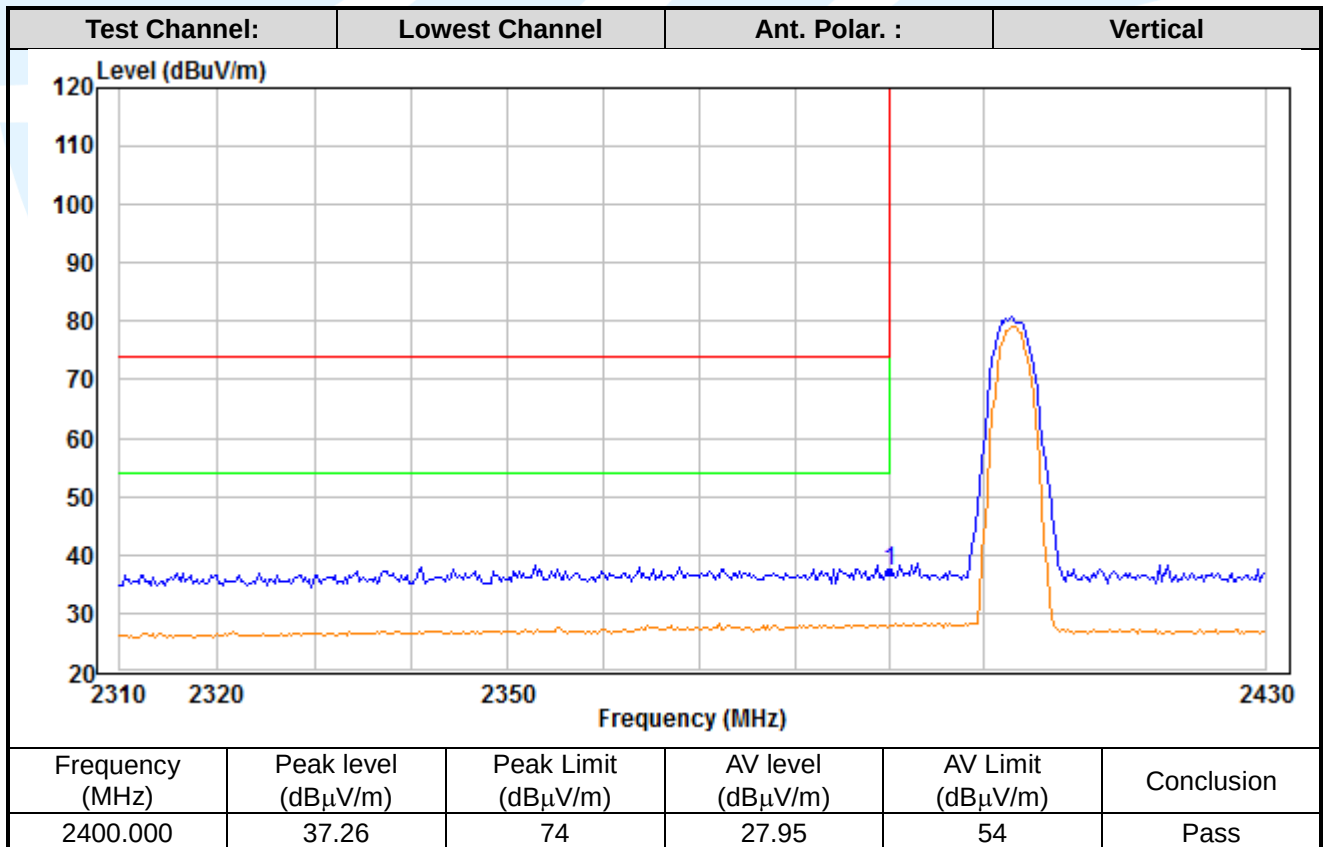
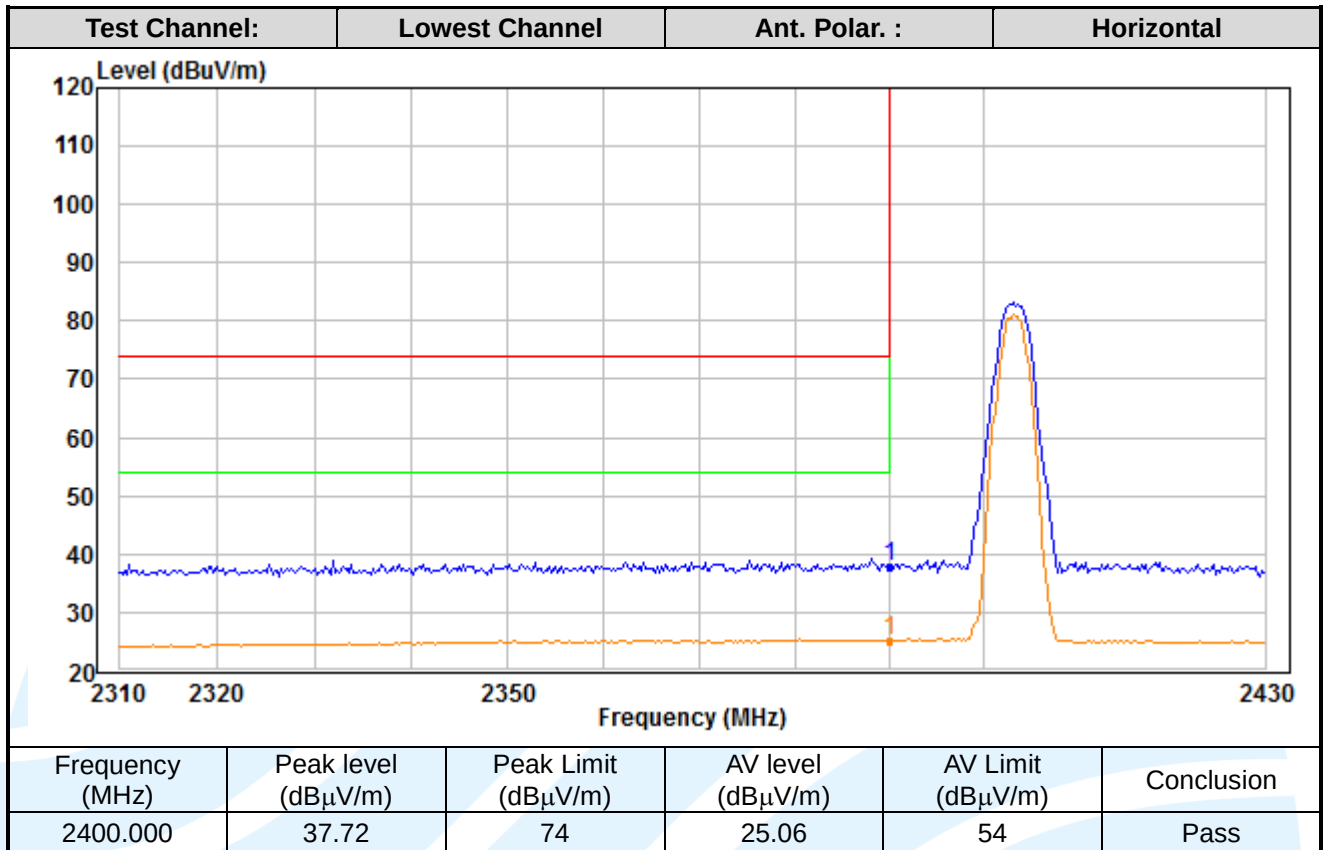
Radiated band edge measurements at 2400 MHz and 2483.5 MHz were made with the unit transmitting in the low end of the channel range and the high end closest to the restricted bands respectively. The emissions were made on the 966 Semi-Chamber. Use (resolution bandwidth (RBW) = 1 MHz, video bandwidth (VBW) = 3 MHz for peak levels and RBW = 1 MHz and VBW = 10 Hz or 1/T for average levels).

1. Use radiated spurious emission test procedure described in clause 5.3. The transmitter output (antenna port) was connected to the test receiver.
2. Set the PK and AV limit line.
3. Record the fundamental emission and emissions out of the band-edge.
4. Determine band-edge compliance as required.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

The measurement data as follows:



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

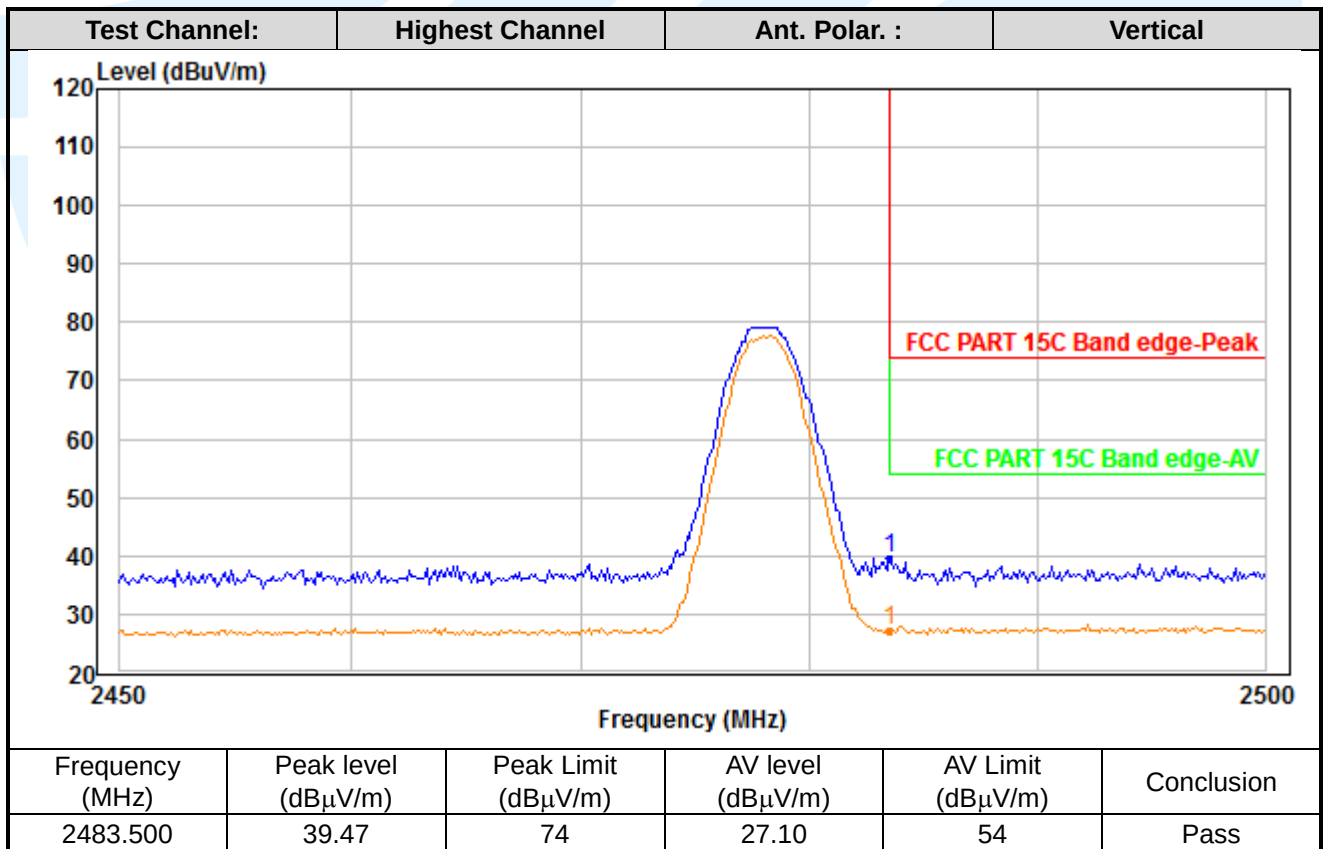
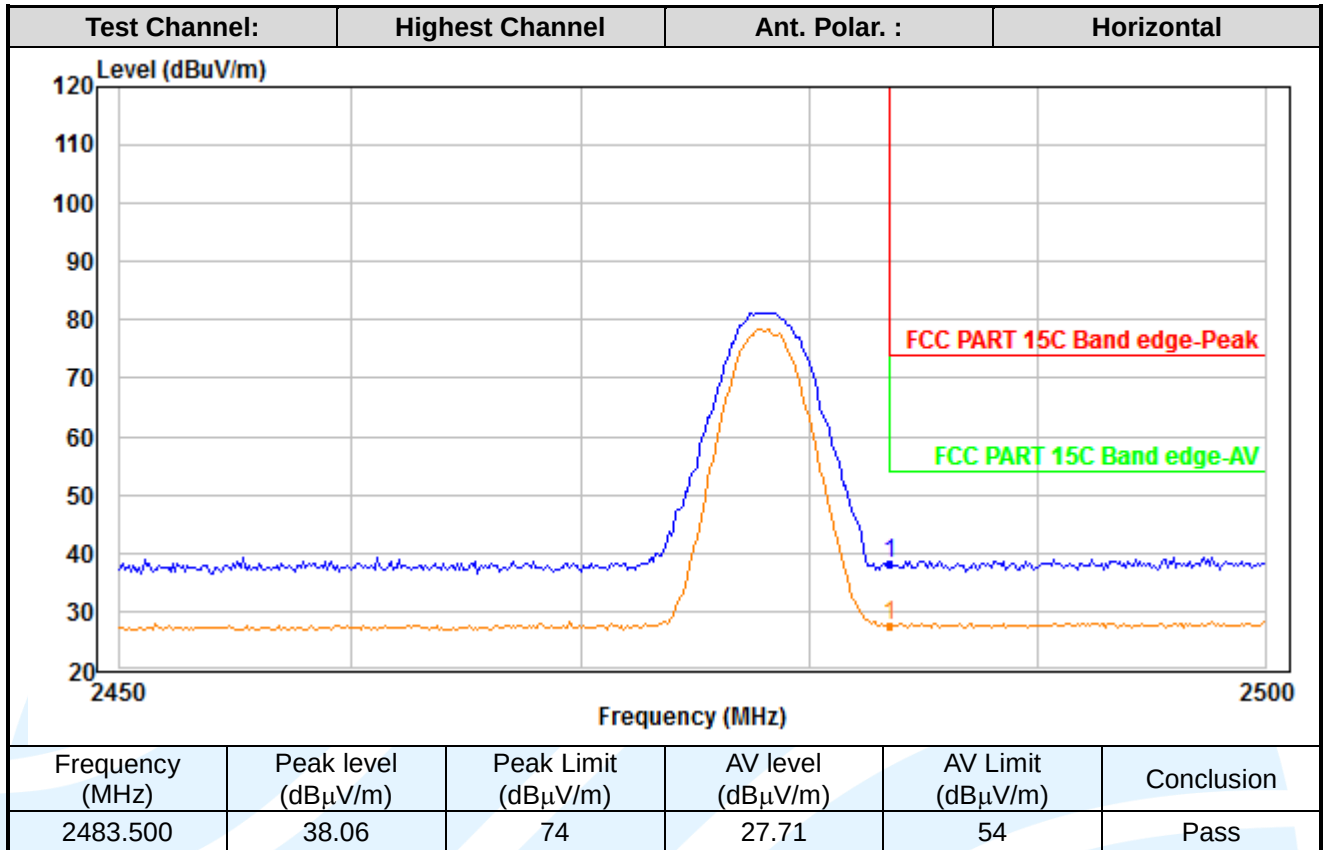
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0



Remark: Average result = Peak result + Average Factor

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0

5.5 20DB OCCUPIED BANDWIDTH

Test Requirement: FCC 47 CFR Part 15.215
Test Method: ANSI C63.10-2013
Test Setup: Refer to section 4.4.3 for details.
Limits: N/A
Equipment Used: Refer to section 3 for details.
Test Result: Pass

The measurement procedure shall be as follows:

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Use the following spectrum analyzer settings:

- a) Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
- b) RBW $\geq$ 1% of the 20 dB bandwidth
- c) VBW $\geq$ RBW
- d) Sweep = auto;
- e) Detector function = peak
- f) Trace = max hold
- g) All the trace to stabilize, use the marker-to-peak function to set the marker to the peak of the emission, use the marker-delta function to measure and record the 20dB down bandwidth of the emission.

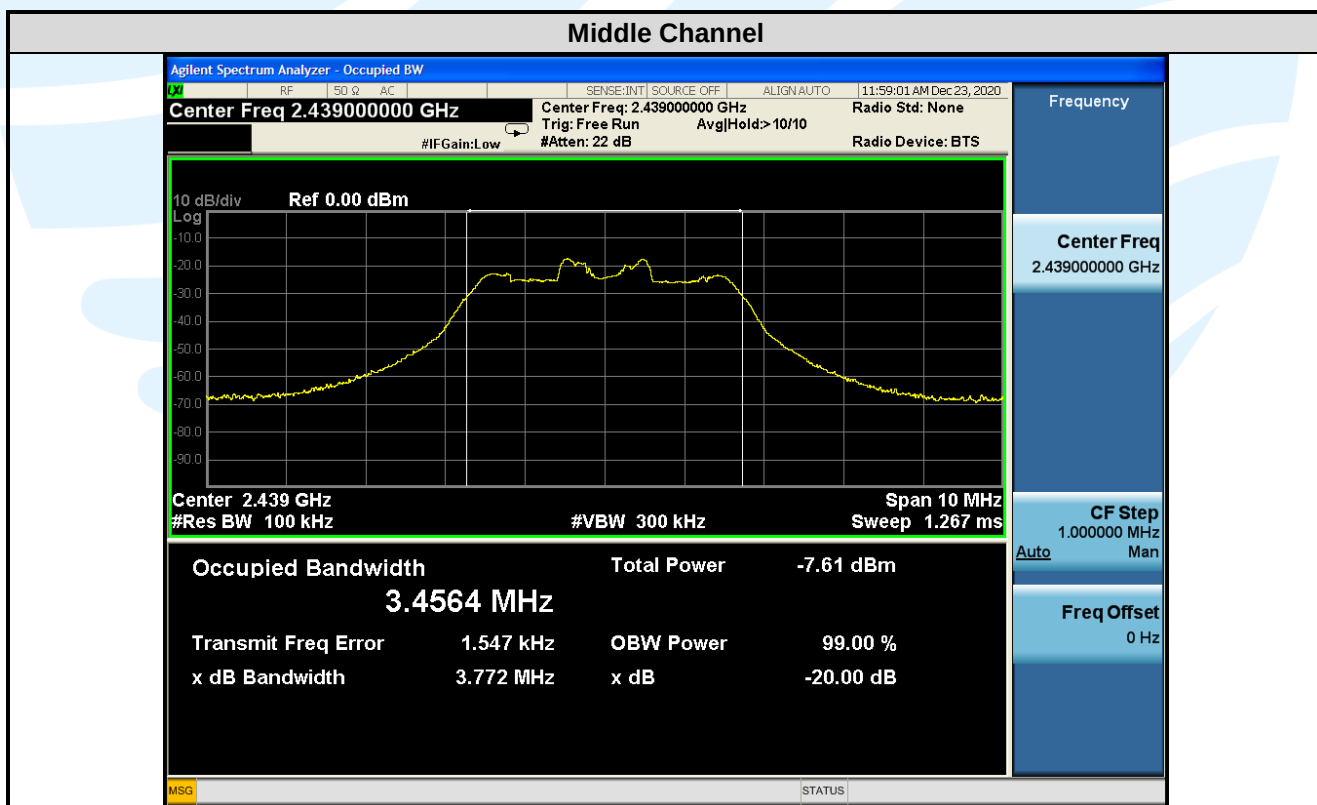
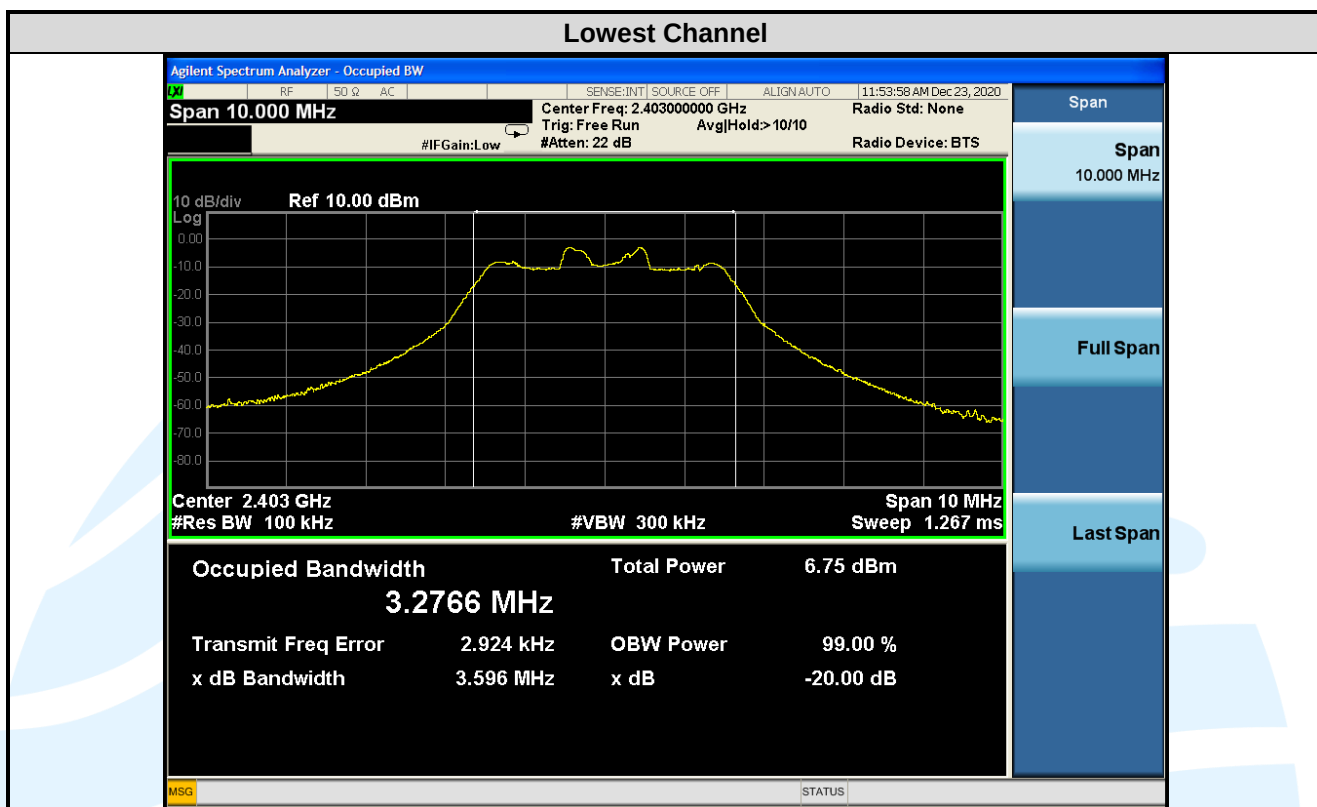
Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Result: Pass

The measurement data as follows:

Test Channel	20 dB Bandwidth (MHz)
Lowest	3.596
Middle	3.772
Highest	3.625

The test plot as follows:



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

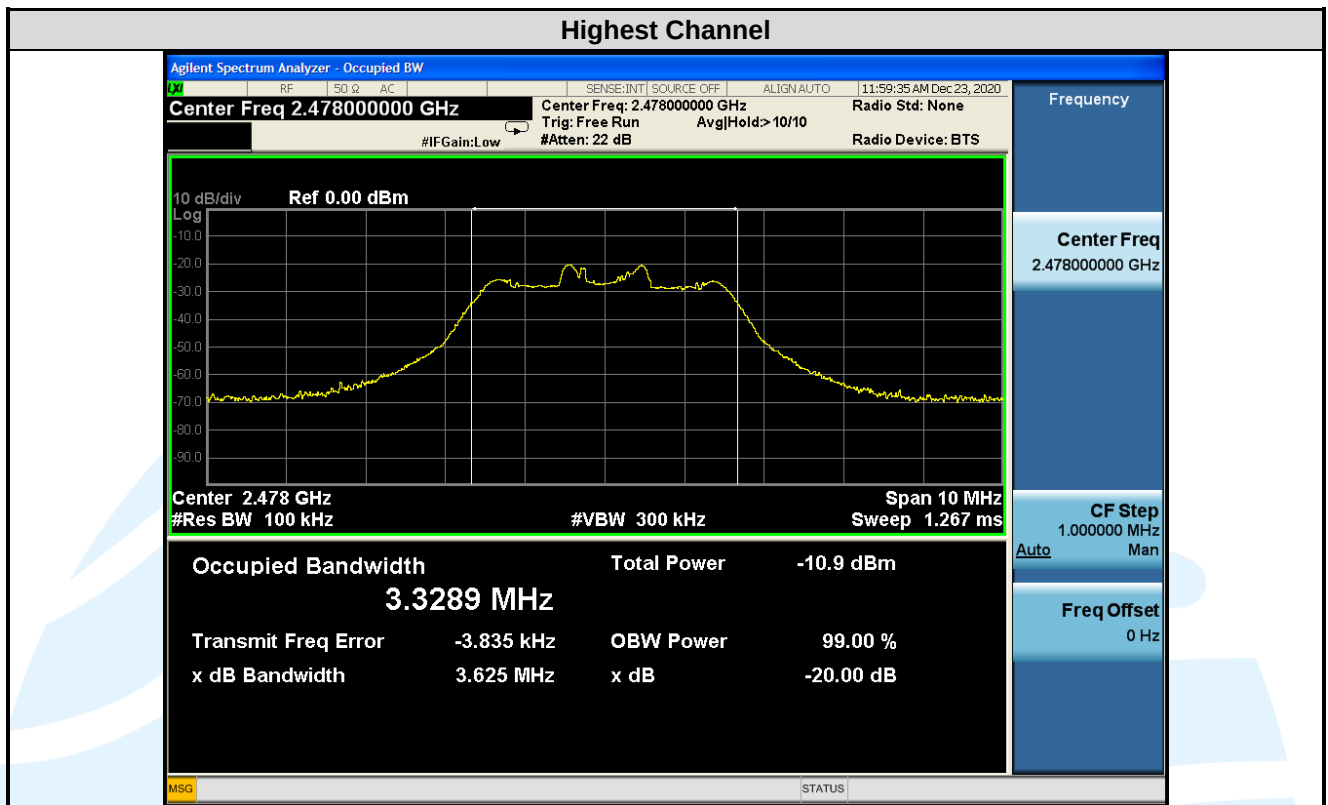
Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0



Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0

5.6 CONDUCTED EMISSION

Test Requirement: FCC 47 CFR Part 15.207

Test Method: ANSI C63.10-2013 Section 6.2

Limits:

Frequency range (MHz)	Limits (dB(μV))	
	Quasi-peak	Average
0,15 to 0,50	66 to 56	56 to 46
0,50 to 5	56	46
5 to 30	60	50

Remark:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

Test Setup: Refer to section 4.4.2 for details.

Test Procedures:

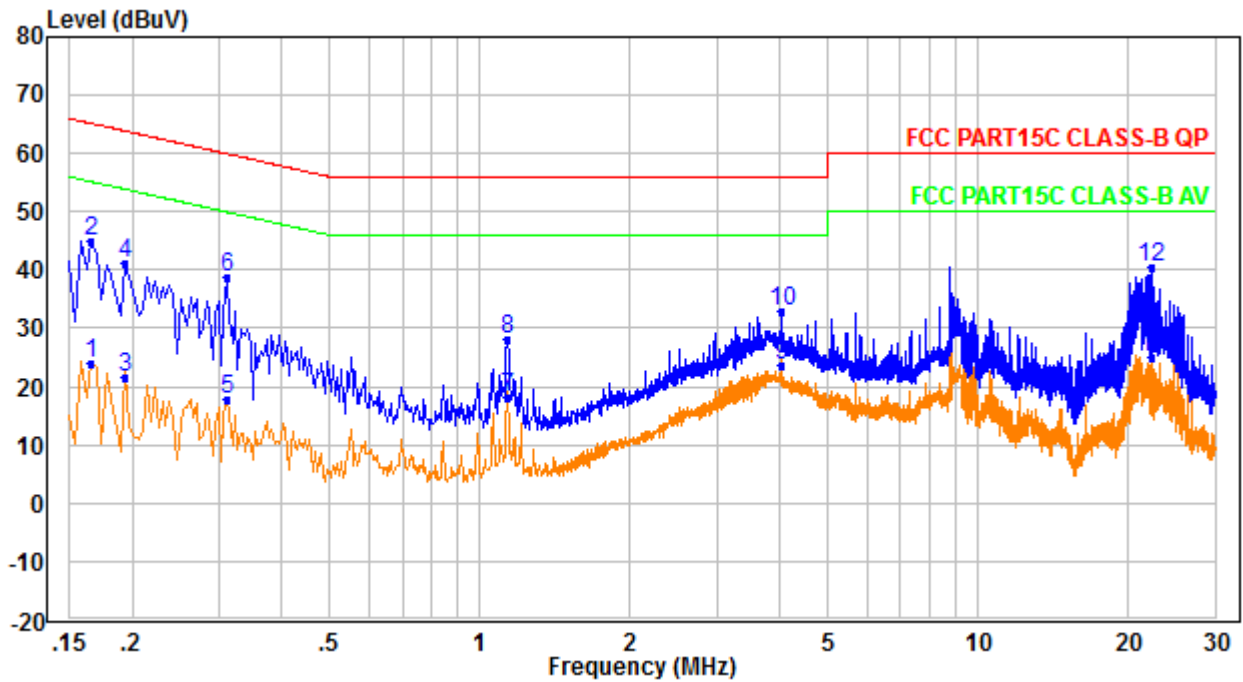
- 1) The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
- 2) The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
- 3) For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

Equipment Used: Refer to section 3 for details.

Test Result: Pass

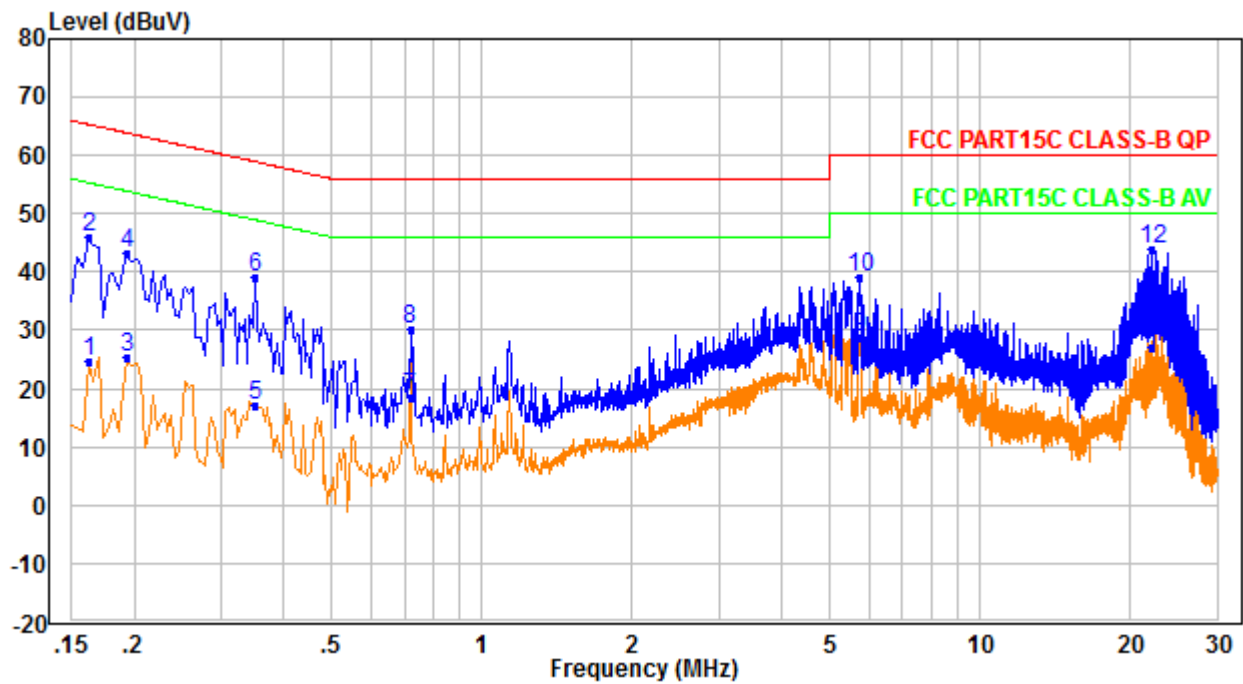
The measurement data as follows:
Quasi Peak and Average:

Live Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Remark
1	0.166	14.29	9.75	24.04	55.16	-31.12	Average
2	0.166	35.12	9.75	44.87	65.16	-20.29	QP
3	0.194	12.00	9.74	21.74	53.86	-32.12	Average
4	0.194	31.50	9.74	41.24	63.86	-22.62	QP
5	0.310	8.11	9.75	17.86	49.97	-32.11	Average
6	0.310	29.01	9.75	38.76	59.97	-21.21	QP
7	1.138	8.38	9.89	18.27	46.00	-27.73	Average
8	1.138	18.33	9.89	28.22	56.00	-27.78	QP
9	4.034	13.64	10.11	23.75	46.00	-22.25	Average
10	4.034	22.97	10.11	33.08	56.00	-22.92	QP
11	22.305	14.30	10.57	24.87	50.00	-25.13	Average
12	22.305	29.93	10.57	40.50	60.00	-19.50	QP

Neutral Line



No.	Frequency (MHz)	Reading (dBμV)	Correction factor (dB)	Result (dBμV)	Limit (dBμV)	Margin (dB)	Remark
1	0.162	14.92	9.75	24.67	55.36	-30.69	Average
2	0.162	36.19	9.75	45.94	65.36	-19.42	QP
3	0.194	15.50	9.74	25.24	53.86	-28.62	Average
4	0.194	33.35	9.74	43.09	63.86	-20.77	QP
5	0.350	7.43	9.76	17.19	48.96	-31.77	Average
6	0.350	29.43	9.76	39.19	58.96	-19.77	QP
7	0.718	8.85	9.78	18.63	46.00	-27.37	Average
8	0.718	20.49	9.78	30.27	56.00	-25.73	QP
9	5.750	18.65	10.18	28.83	50.00	-21.17	Average
10	5.750	28.87	10.18	39.05	60.00	-20.95	QP
11	22.109	16.54	10.57	27.11	50.00	-22.89	Average
12	22.109	33.35	10.57	43.92	60.00	-16.08	QP

Remark:

1. Correct Factor = LISN Factor + Cable Loss + Pulse Limiter Factor, the value was added to Original Receiver Reading by the software automatically.
2. Result = Reading + Correct Factor.
3. Margin = Result - Limit
4. An initial pre-scan was performed on the Phase and neutral lines with peak detector. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-FCCPART15.249-V1.0

APPENDIX 1 PHOTOS OF TEST SETUP

See test photos attached in Appendix 1 for the actual connections between Product and support equipment.

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal photos.

*** End of Report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.
