CFR 47 FCC PART 15 SUBPART C
ISED RSS-210 ISSUE 10

TEST REPORT

For

TOY Transmitter

MODEL NUMBER: GF31TNRR

FCC ID: G6DGF31TNRR

IC: 9650A-GF31TNRR

REPORT NUMBER: 4789448240-3

ISSUE DATE: May 21, 2020

Prepared for

NEW BRIGHT INDUSTRIAL CO., LTD
9/F., NEW BRIGHT BUILDING, 11 SHEUNG YUET ROAD, KOWLOON BAY, KOWLOON, HONG KONG.

Prepared by

UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch
Building 10, Innovation Technology Park, No. 1, Li Bin Road, Song Shan Lake Hi-Tech Development Zone Dongguan, 523808, People's Republic of China

Tel: +86 769 22038881
Fax: +86 769 33244054
Website: www.ul.com

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.

Revision History

Rev.	Issue Date	Revisions	Revised By
V0	05/21/2020	Initial Issue	

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Summary of Test Results			
Clause	Test Items	FCC/ISED Rules	Test Results
1	20dB Bandwidth and 99% Occupied Bandwidth	CFR 47 FCC §15.215 (c) ISED RSS-Gen Clause 6.7	Pass
2	Radiated Emission	CFR 47 FCC §15.249 (a)(d)(e) ISED RSS-210 Annex B B.10 CFR 47 FCC §15.205 and §15.209 RSS-GEN Clause 8.9 RSS-GEN Clause 8.10	Pass
3	Antenna Requirement	CFR 47 FCC §15.203 ISED RSS-Gen Clause 6.3	Pass
Note 1: This test report is only published to and used by the applicant, and it is not for evidence purpose in China. Note 2: The measurement result for the sample received is <Pass> according to < CFR 47 FCC PART 15 SUBPART C, ISED RSS-210 Issue 10 and ISED RSS-GEN Issue 5 > when <Accuracy Method> decision rule is applied.			

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 5

2. TEST METHODOLOGY 6

3. FACILITIES AND ACCREDITATION 6

4. CALIBRATION AND UNCERTAINTY 7

4.1. MEASURING INSTRUMENT CALIBRATION 7

4.2. MEASUREMENT UNCERTAINTY 7

5. EQUIPMENT UNDER TEST 8

5.1. DESCRIPTION OF EUT 8

5.2. MAXIMUM FIELD STRENGTH 8

5.3. CHANNEL LIST 8

5.4. DESCRIPTION OF AVAILABLE ANTENNAS 8

5.5. TEST CHANNEL CONFIGURATION 8

5.6. THE WORSE CASE POWER SETTING PARAMETER 9

5.7. TEST ENVIRONMENT 9

5.8. DESCRIPTION OF TEST SETUP 10

5.9. MEASURING INSTRUMENT AND SOFTWARE USED 11

6. ANTENNA PORT TEST RESULTS 12

6.1. ON TIME AND DUTY CYCLE 12

6.2. 20 dB BANDWIDTH AND 99% OCCUPIED BANDWIDTH 14

7. RADIATED TEST RESULTS 18

7.1. LIMITS AND PROCEDURE 18

7.2. RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS 25

7.3. SPURIOUS EMISSIONS (1~3GHz) 31

7.4. SPURIOUS EMISSIONS (3~18GHz) 37

7.5. SPURIOUS EMISSIONS (18~26GHz) 43

7.6. SPURIOUS EMISSIONS BELOW 30MHz 45

7.7. SPURIOUS EMISSIONS BELOW 1GHz AND ABOVE 30MHz 48

8. ANTENNA REQUIREMENTS 50

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

1. ATTESTATION OF TEST RESULTS

Applicant Information

Company Name: NEW BRIGHT INDUSTRIAL CO., LTD
Address: 9/F., NEW BRIGHT BUILDING, 11 SHEUNG YUET ROAD, KOWLOON BAY, KOWLOON, HONG KONG.

Manufacturer Information

Company Name: NEW BRIGHT INDUSTRIAL CO., LTD
Address: 9/F., NEW BRIGHT BUILDING, 11 SHEUNG YUET ROAD, KOWLOON BAY, KOWLOON, HONG KONG.

EUT Information

EUT Name: TOY Transmitter
Model: GF31TNRR
Sample ID: 3009706
Sample Received Date: April 15, 2020
Sample Status: Normal
Date of Tested: April 15, 2020~ May 09, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 FCC PART 15 SUBPART C	PASS
ISED RSS-210 Issue 10	PASS
ISED RSS-GEN Issue 5	PASS

Prepared By:

Denny Huang
Project Engineer

Checked By:

Shawn Wen
Laboratory Leader

Approved By:

Stephen Guo
Laboratory Manager

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with KDB 414788 D01 Radiated Test Site v01r01, FCC CFR 47 Part 2, FCC CFR 47 Part 15, ANSI C63.10-2013, ISED RSS-210 Issue 10 and RSS-GEN Issue 5.

3. FACILITIES AND ACCREDITATION

Accreditation Certificate	**A2LA (Certificate No.: 4102.01)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with A2LA. **FCC (FCC Designation No.: CN1187)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. Has been recognized to perform compliance testing on equipment subject to the Commission's Declaration of Conformity (DoC) and Certification rules. **ISED (Company No.: 21320)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been registered and fully described in a report filed with ISED. The Company Number is 21320. **VCCI (Registration No.: G-20019, R-20004, C-20012 and T-20011)** UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch. has been assessed and proved to be in compliance with VCCI, the Membership No. is 3793. Facility Name: Chamber D, the VCCI registration No. is G-20019 and R-20004 Shielding Room B , the VCCI registration No. is C-20012 and T-20011

Note:

1. All tests measurement facilities use to collect the measurement data are located at Building 10, Innovation Technology Park, Song Shan Lake Hi tech Development Zone, Dongguan, 523808, China
2. The test anechoic chamber in UL Verification Services (Guangzhou) Co., Ltd. Song Shan Lake Branch had been calibrated and compared to the open field sites and the test anechoic chamber is shown to be equivalent to or worst case from the open field site.
3. For below 30MHz, lab had performed measurements at test anechoic chamber and comparing to measurements obtained on an open field site. And these measurements below 30MHz had been correlated to measurements performed on an OFS.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Test Item	Uncertainty
Conduction emission	3.62dB
Radiation Emission test (include Fundamental emission) (9KHz-30MHz)	2.2dB
Radiation Emission test (include Fundamental emission) (30MHz-1GHz)	4.00dB
Radiation Emission test (1GHz to 26GHz) (include Fundamental emission)	5.78dB (1GHz-18GHz)
	5.23dB (18GHz-26GHz)
Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.	

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT Name	TOY Transmitter	
EUT Description	The EUT is a wireless remote controller.	
Model	GF31TNRR	
Product Description	Operation Frequency	2410 MHz ~ 2470 MHz
	Modulation Type	GFSK
Battery	DC 3.0V	

5.2. MAXIMUM FIELD STRENGTH

Frequency (MHz)	Channel Number	Max Peak field strength (dBµV/m)
2410	1[32]	99.99

5.3. CHANNEL LIST

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2410	11	2429	21	2450	31	2469
2	2414	12	2430	22	2452	32	2470
3	2415	13	2431	23	2454	/	/
4	2416	14	2433	24	2456	/	/
5	2417	15	2434	25	2458	/	/
6	2418	16	2439	26	2462	/	/
7	2419	17	2441	27	2464	/	/
8	2421	18	2442	28	2465	/	/
9	2426	19	2444	29	2466	/	/
10	2428	20	2446	30	2467	/	/

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

Ant.	Frequency (MHz)	Antenna Type	Antenna Gain (dBi)
1	2410~ 2470	Wire Antenna	0

Test Mode	Transmit and Receive Mode	Description
GFSK	☒1TX, 1RX	Antenna 1 can be used as transmitting/receiving antenna.

5.5. TEST CHANNEL CONFIGURATION

Test Mode	Test Channel	Frequency
GFSK	CH 1(Low Channel), CH 18(MID Channel), CH 32(High Channel)	2410MHz, 2442MHz, 2470MHz

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

5.6. THE WORSE CASE POWER SETTING PARAMETER

The Worse Case Power Setting Parameter under 2410 MHz ~ 2470 MHz Band				
Test Software Version		/		
Modulation Type	Transmit Antenna Number	Test Channel		
		CH 1	CH 18	CH 32
GFSK	1	Default	Default	Default

5.7. TEST ENVIRONMENT

Environment Parameter	Selected Values During Tests	
Relative Humidity	55 ~ 65%	
Atmospheric Pressure:	1025Pa	
Temperature	TN	22 ~ 28°C
Voltage:	VL	/
	VN	DC 3.0V
	VH	/

Note: VL= Lower Extreme Test Voltage
VN= Nominal Voltage
VH= Upper Extreme Test Voltage
TN= Normal Temperature

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Item	Equipment	Brand Name	Model Name	P/N
/	/	/	/	/

I/O CABLES

Cable No	Port	Connector Type	Cable Type	Cable Length(m)	Remarks
/	/	/	/	/	/

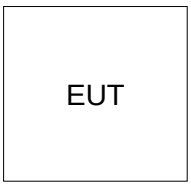
ACCESSORY

Item	Equipment	Mfr/Brand	Model/Type No.	Specification	Series No.
/	/	/	/	/	/

TEST SETUP

The EUT have the engineer mode inside.

SETUP DIAGRAM FOR TEST



Note: New battery was used during all tests.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

5.9. MEASURING INSTRUMENT AND SOFTWARE USED

Radiated Emissions						
Instrument						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	MXE EMI Receiver	KESIGHT	N9038A	MY56400036	Dec. 6, 2019	Dec. 6, 2020
☑	Hybrid Log Periodic Antenna	TDK	HLP-3003C	130959	Sept.17, 2018	Sept.17,2021
☑	Preamplifier	HP	8447D	2944A09099	Dec. 5, 2019	Dec. 5, 2020
☑	EMI Measurement Receiver	R&S	ESR26	101377	Dec. 05, 2019	Dec.05, 2020
☑	Horn Antenna	TDK	HRN-0118	130939	Sept. 17, 2018	Sept.17,2021
☑	Preamplifier	TDK	PA-02-0118	TRS-305-00067	Dec. 05, 2019	Dec.05, 2020
☑	Loop antenna	Schwarzbeck	1519B	00008	Jan.17, 2019	Jan.17, 2022
☑	Preamplifier	TDK	PA-02-001-3000	TRS-302-00050	Dec. 05, 2019	Dec.05, 2020
☑	High Gain Horn Antenna	Schwarzbeck	BBHA-9170	691	Aug.11,2018	Aug.11,2021
☑	Preamplifier	TDK	PA-02-2	TRS-307-00003	Dec. 05, 2019	Dec.05, 2020
Software						
Used	Description		Manufacturer	Name		Version
☑	Test Software for Radiated disturbance		Farad	EZ-EMC		Ver. UL-3A1
Other instruments						
Used	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
☑	High Pass Filter	Wi	WHKX10-2700-3000-18000-40SS	23	Dec. 05, 2019	Dec.05, 2020
☑	Band Reject Filter	Wainwright	WRCJV8-2350-2400-2483.5-2533.5-40SS	4	Dec. 05, 2019	Dec.05, 2020

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

6. ANTENNA PORT TEST RESULTS

6.1. ON TIME AND DUTY CYCLE

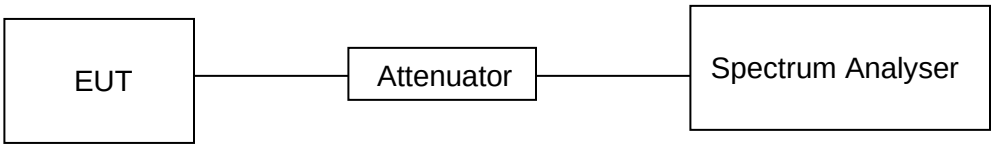
LIMITS

None; for reporting purposes only

PROCEDURE

KDB 558074 Zero-Span Spectrum Analyzer Method

TEST SETUP



TEST ENVIRONMENT

Temperature	23.2°C	Relative Humidity	55%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.0V

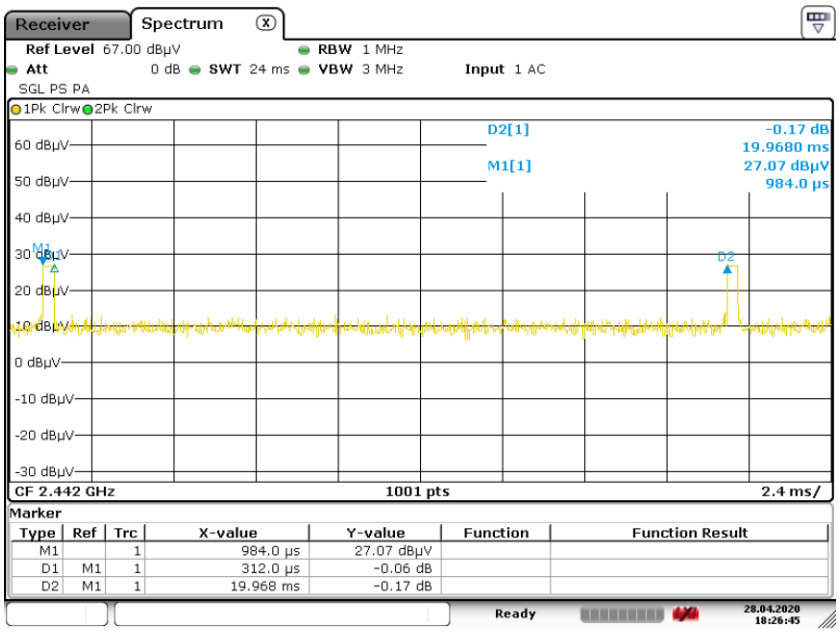
RESULTS

Mode	On Time (msec)	Period (msec)	Duty Cycle x (Linear)	Duty Cycle (%)	Duty Cycle Correction Factor (db)
GFSK	1.56	100	0.0156	1.56	-36.14

Note: Duty Cycle Correction Factor=20log(x).
Where: x is Duty Cycle

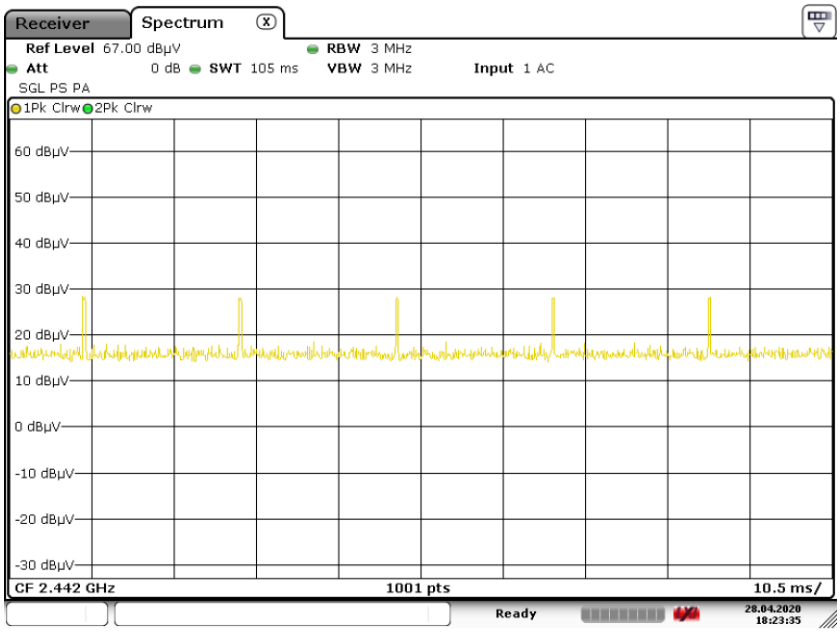
This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

ON TIME AND DUTY CYCLE MID CH PLOT



Date: 28.APR.2020 18:26:45

ON TIME AND DUTY CYCLE MID CH PLOT-2



Date: 28.APR.2020 18:23:34

Note: All the modes had been tested, but only the worst duty cycle recorded in the report.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

6.2. 20 dB BANDWIDTH AND 99% OCCUPIED BANDWIDTH

LIMITS

CFR 47 FCC Part15 (15.249) Subpart C RSS-Gen Issue 5			
Section	Test Item	Limit	Frequency Range (MHz)
CFR 47 FCC §15.215 (c)	20dB Bandwidth	for reporting purposes only	2400-2483.5
ISED RSS-Gen Clause 6.7 Issue 5	99% Occupied Bandwidth	For reporting purposes only.	2400-2483.5

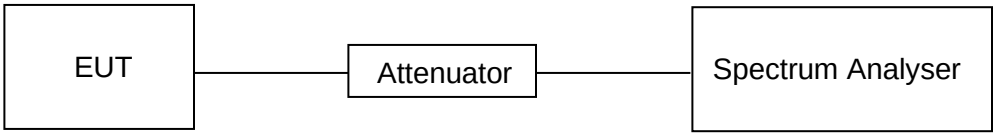
TEST PROCEDURE

Connect the UUT to the spectrum analyser and use the following settings:

Center Frequency	The center frequency of the channel under test
Detector	Peak
RBW	1% to 5% of the occupied bandwidth
VBW	approximately 3×RBW
Trace	Max hold
Sweep	Auto couple

Allow the trace to stabilize and 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 6 dB/99% relative to the maximum level measured in the fundamental emission.

TEST SETUP



TEST ENVIRONMENT

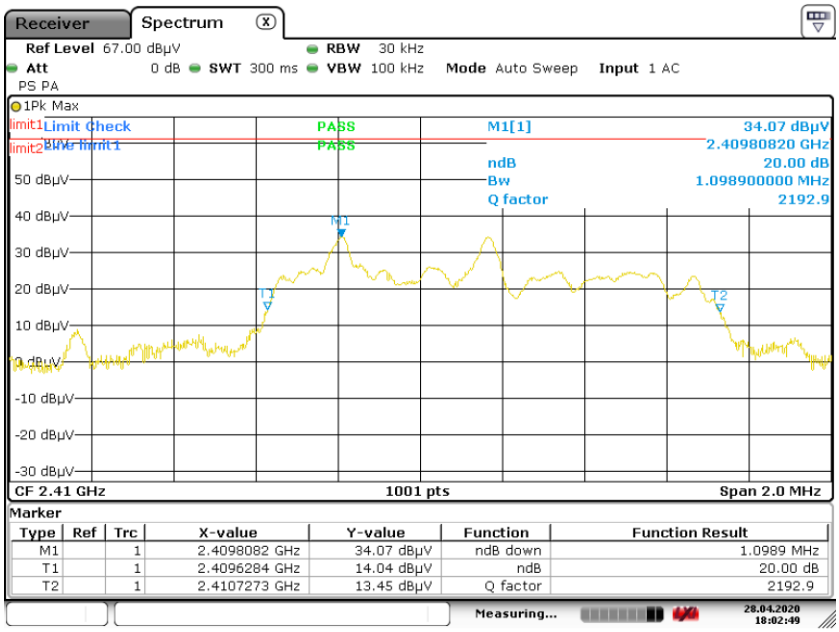
Temperature	23.2°C	Relative Humidity	53%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.0V

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

RESULTS

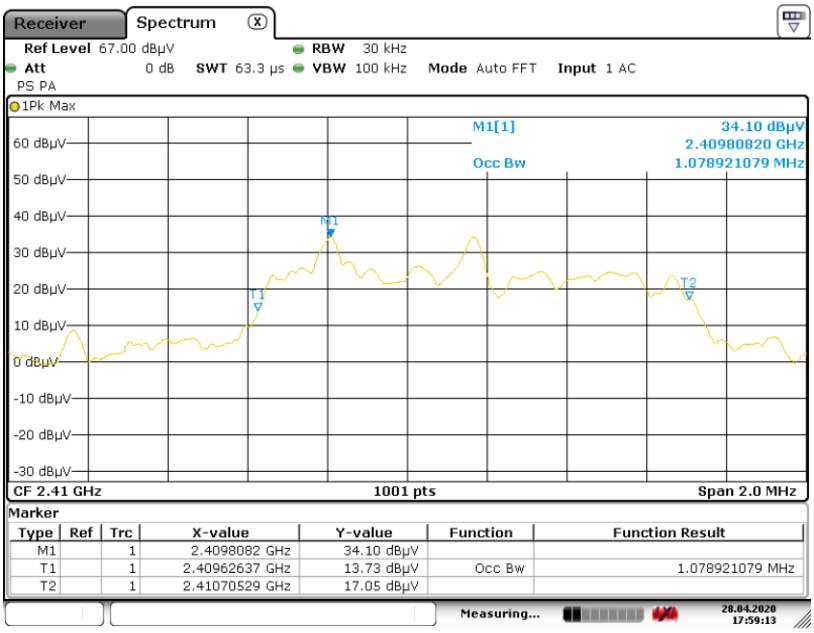
Frequency (MHz)	20dB bandwidth (MHz)	99% bandwidth (MHz)	Result
2410	1.0989	1.0789	PASS

20 dB BANDWIDTH LOW CH



Date: 28.APR.2020 18:02:50

99% OCCUPIED BANDWIDTH LOW CH

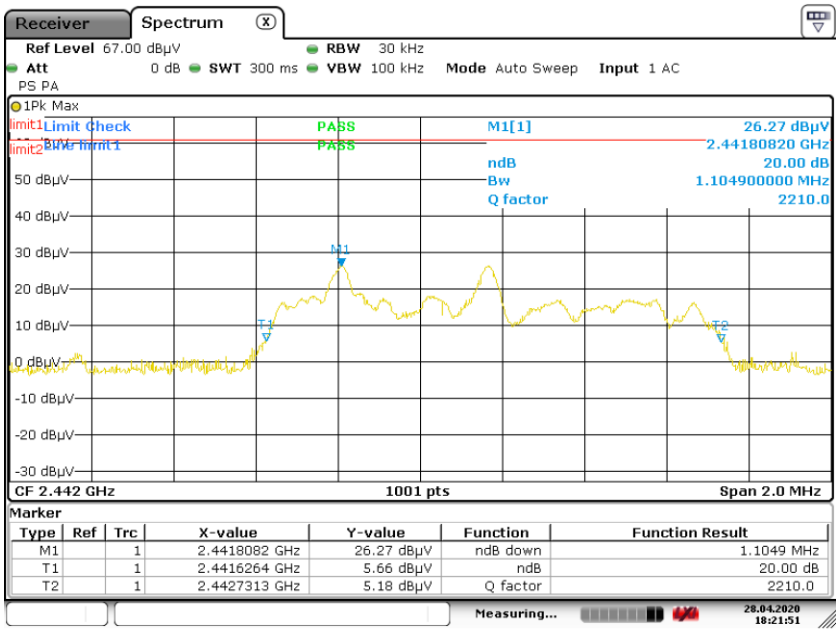


Date: 28.APR.2020 17:59:14

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

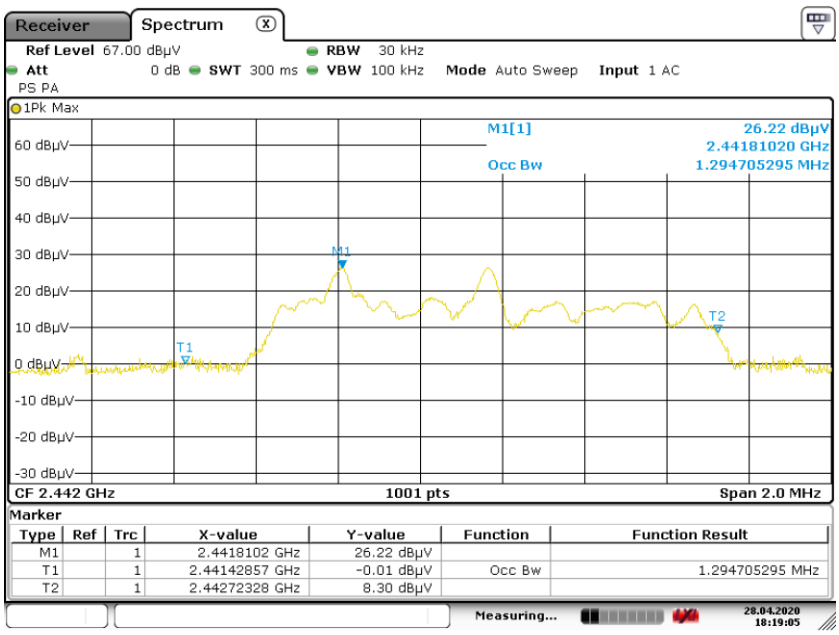
Frequency (MHz)	20dB bandwidth (MHz)	99% bandwidth (MHz)	Result
2442	1.1049	1.2947	PASS

20 dB BANDWIDTH MID CH



Date: 28.APR.2020 18:21:52

99% OCCUPIED BANDWIDTH MID CH

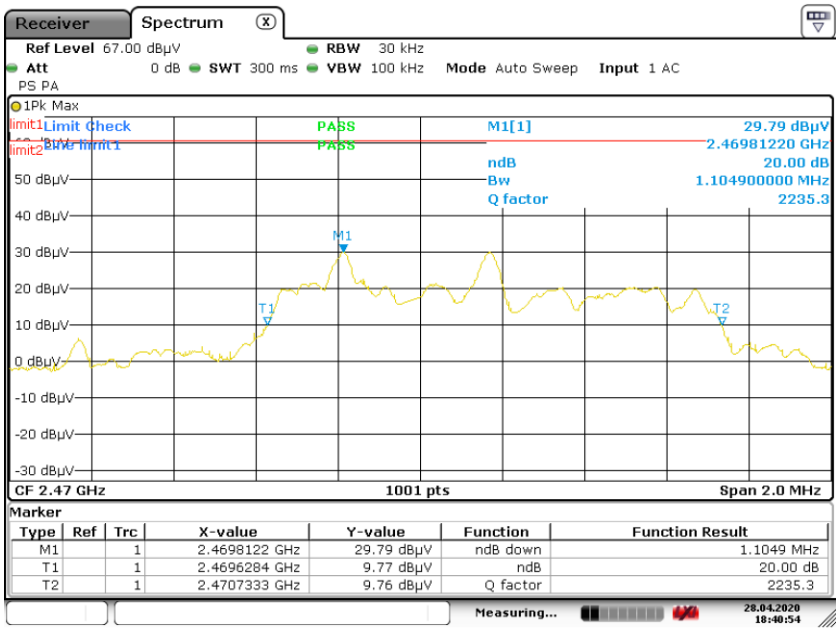


Date: 28.APR.2020 18:19:05

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

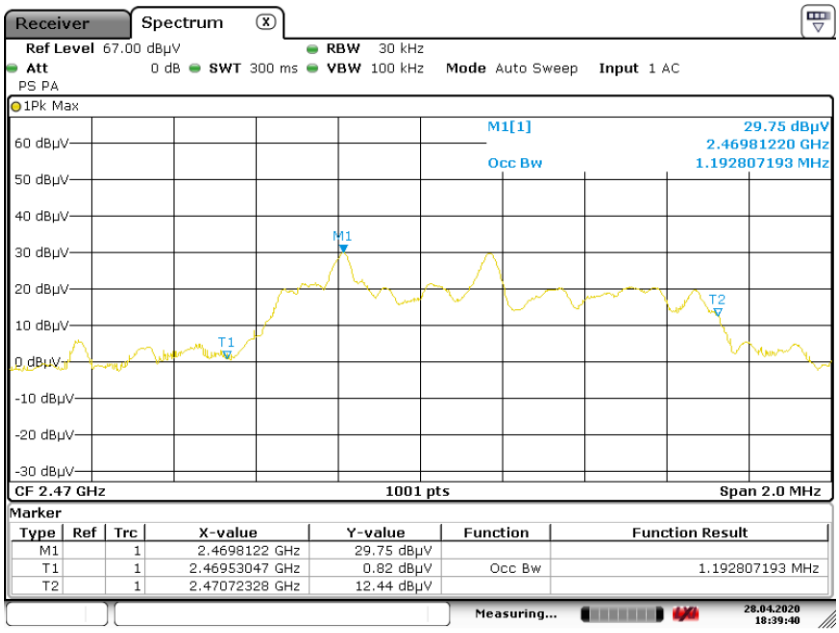
Frequency (MHz)	20dB bandwidth (MHz)	99% bandwidth (MHz)	Result
2470	1.1049	1.1928	PASS

20 dB BANDWIDTH HIG CH



Date: 28.APR.2020 18:40:54

99% OCCUPIED BANDWIDTH HIG CH



Date: 28.APR.2020 18:39:40

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7. RADIATED TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMITS

CFR 47 FCC §15.205 and §15.209

CFR 47 FCC §15.249 (a)(d)(c)(e)

ISED RSS-210 Issue 10 Annex B B.10

RSS-GEN Clause 8.9

The field strength of emissions from intentional radiators operated within these frequency bands			
Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 - 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3

Emissions radiated outside of the specified frequency bands above 30MHz			
Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m	
		Quasi-Peak	
30 - 88	100	40	
88 - 216	150	43.5	
216 - 960	200	46	
Above 960	500	54	
Above 1000	500	Peak	Average
		74	54

FCC Emissions radiated outside of the specified frequency bands below 30MHz		
Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

ISED General field strength limits at frequencies below 30 MHz

Table 6 – General field strength limits at frequencies below 30 MHz		
Frequency	**Magnetic field strength (H-Field) (µA/m)**	**Measurement distance (m)**
9 - 490 kHz[Note 1]	6.37/F (F in kHz)	300
490 - 1705 kHz	63.7/F (F in kHz)	30
1.705 - 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

ISED Restricted bands please refer to ISED RSS-GEN Clause 8.10

Table 7 – Restricted frequency bands[Note 1]		
MHz	**MHz**	**GHz**
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 – 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 – 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

FCC Restricted bands of operation:

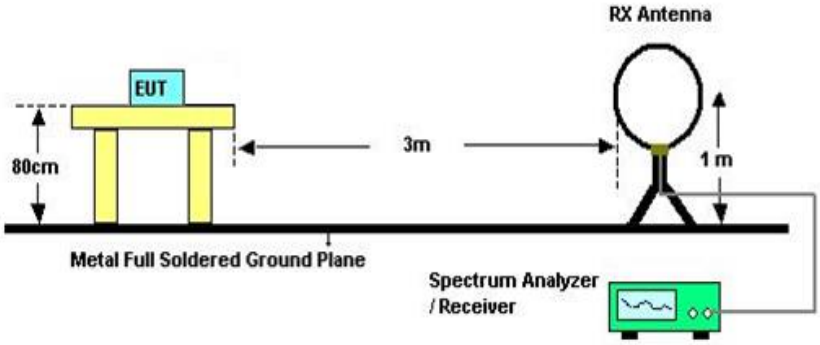
MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

Note: [1]Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2]Above 38.6c

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

TEST SETUP AND PROCEDURE

Below 30MHz



The setting of the spectrum analyser

RBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
VBW	200Hz (From 9kHz to 0.15MHz)/ 9KHz (From 0.15MHz to 30MHz)
Sweep	Auto
Detector	Peak/QP/ Average
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both Horizontal, Face-on and Face-off polarizations of the antenna are set to make the measurement.

3. The EUT was placed on a turntable with 80cm meter above ground.

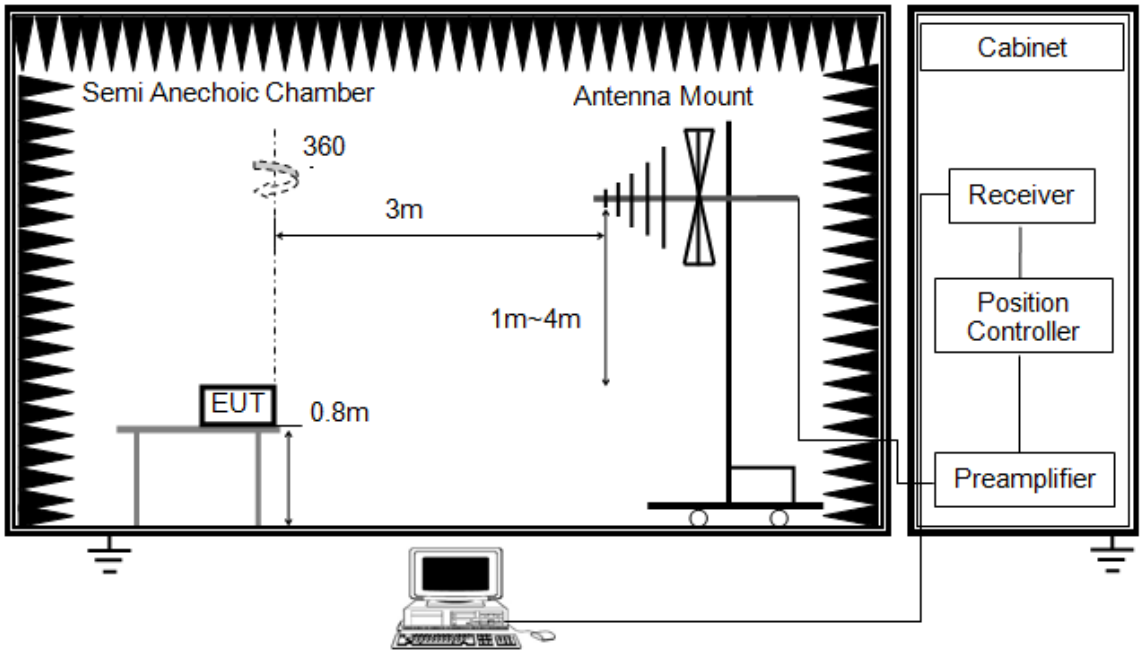
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a 1m height antenna tower.

5. The radiated emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

6. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30m open field site. Therefore, the sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Below 1G



The setting of the spectrum analyser

RBW	120K
VBW	300K
Sweep	Auto
Detector	Peak/QP
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

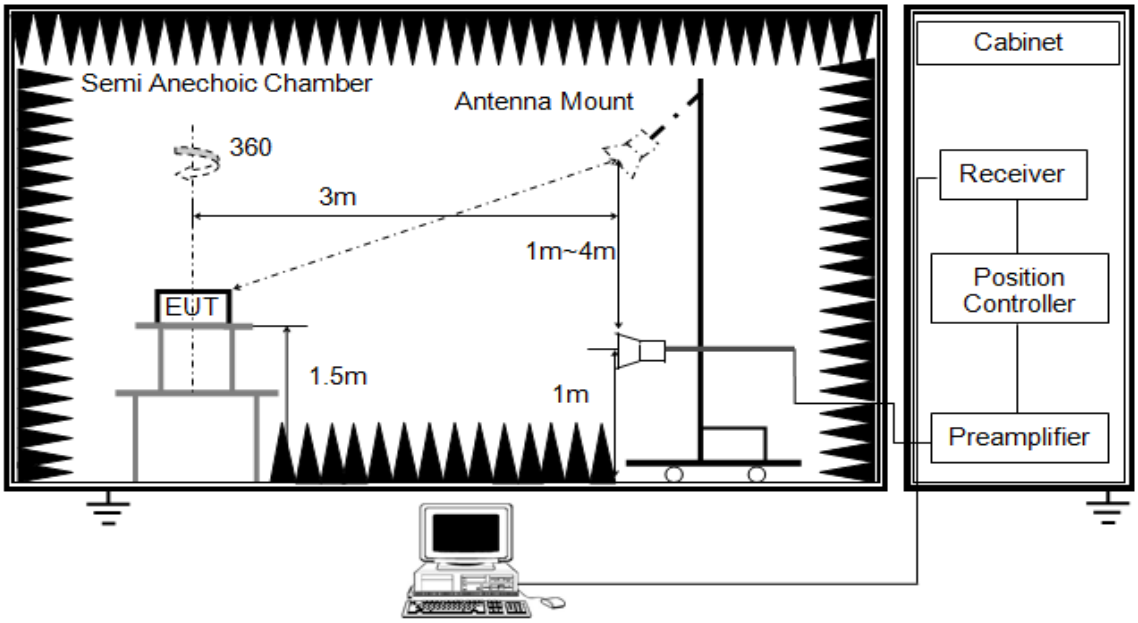
3. The EUT was placed on a turntable with 80cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

Above 1G



The setting of the spectrum analyser

RBW	1M
VBW	PEAK: 3M AVG: see note 6
Sweep	Auto
Detector	Peak
Trace	Max hold

1. The testing follows the guidelines in ANSI C63.10-2013.

2. The EUT was arranged to its worst case and then tune the antenna tower (1.5 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter or band reject filter are used for the test in order to get better signal level. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

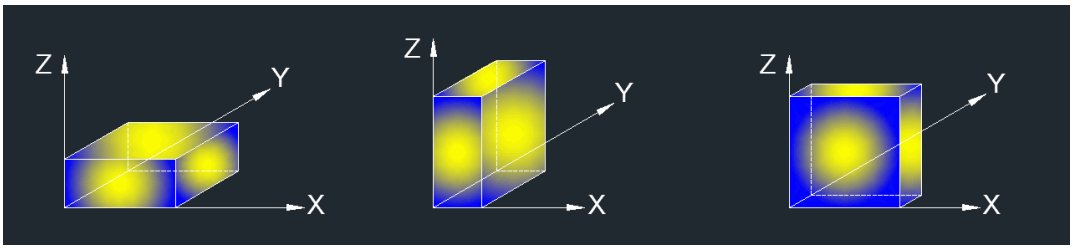
3. The EUT was placed on a turntable with 150cm above ground.

4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.

5. For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements. Where necessary, average emission are determined by applying the Duty Cycle Correction Factor to the peak measurements. For the Duty Cycle and Correction Factor please refer to clause 6.1. ON TIME AND DUTY CYCLE.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

X axis, Y axis, Z axis positions:



Note 1: For all radiated test, EUT in each of three orthogonal axis emissions had been tested, but only the worst case (X axis) data recorded in the report.

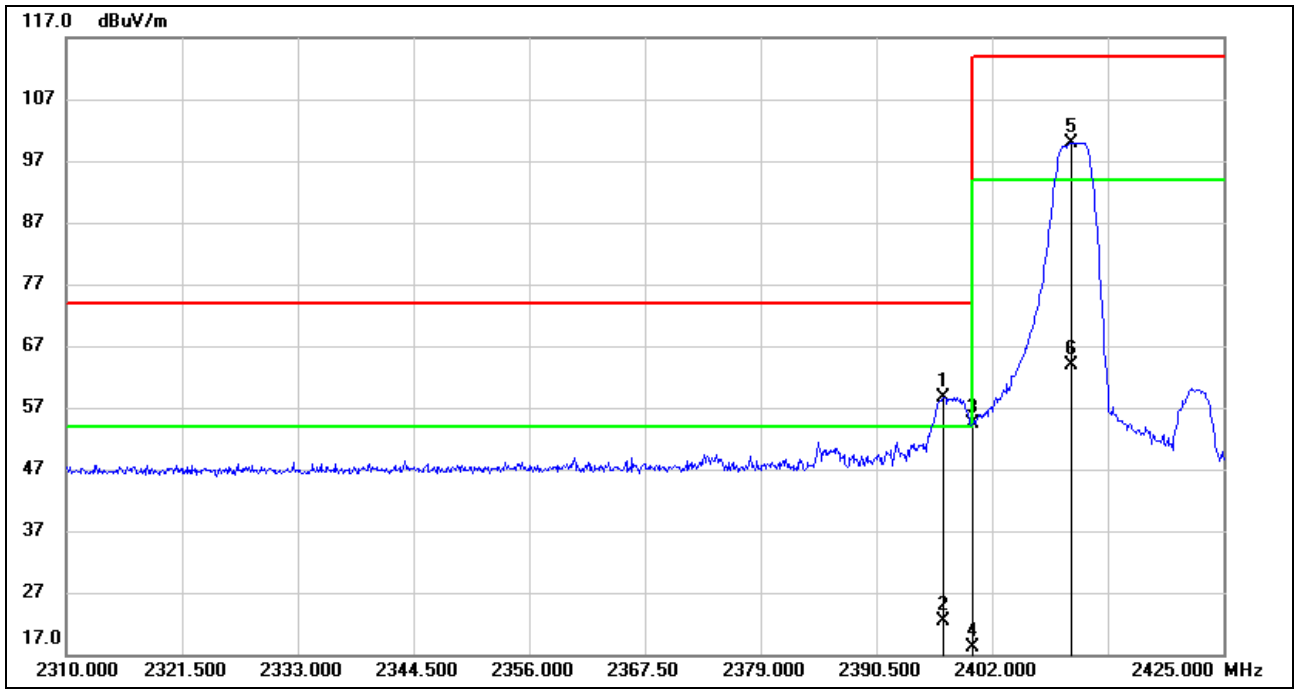
TEST ENVIRONMENT

Temperature	22.6°C	Relative Humidity	55%
Atmosphere Pressure	101kPa	Test Voltage	DC 3.0V

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.2. RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS

RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, HORIZONTAL)

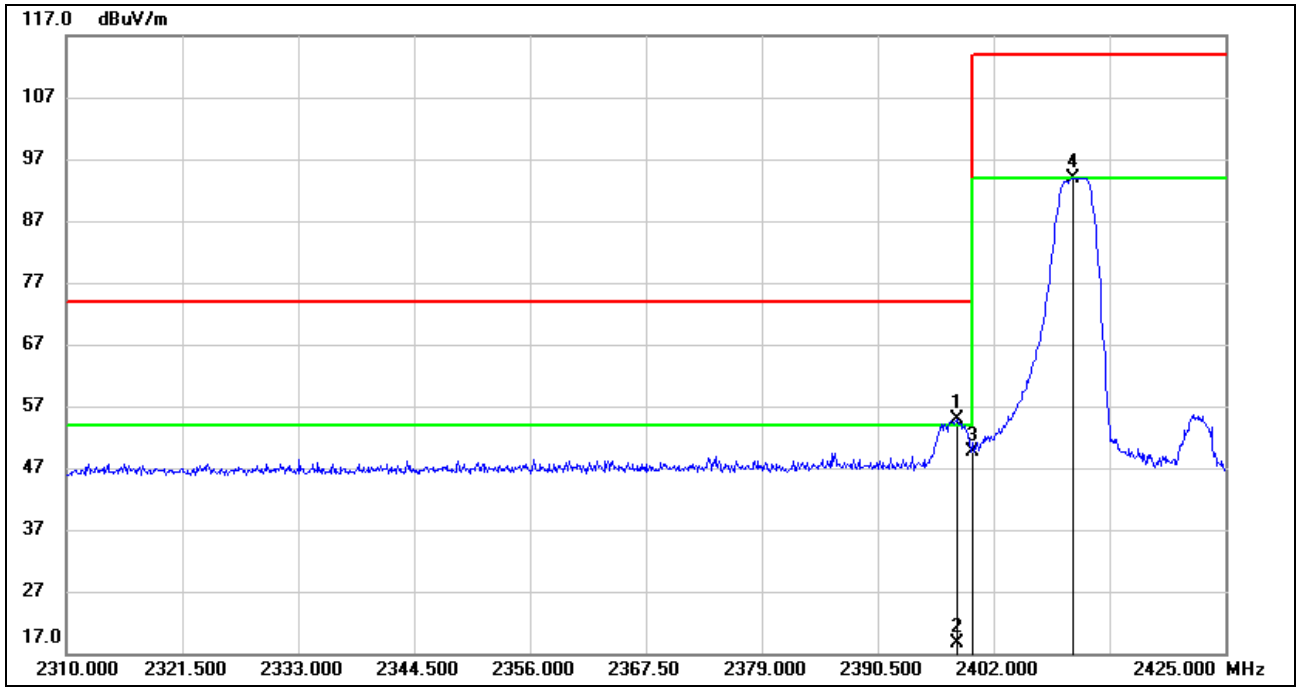


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2397.170	25.61	32.97	58.58	74.00	-15.42	peak
2	2397.170	-10.53	32.97	22.44	54.00	-31.56	AVG
3	2400.000	21.41	32.98	54.39	74.00	-19.61	peak
4	2400.000	-14.73	32.98	18.25	54.00	-35.75	AVG
5	2409.820	66.94	33.05	99.99	114.00	-14.01	peak
6	2409.820	30.80	33.05	63.85	94.00	-30.15	AVG

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS (LOW CHANNEL, VERTICAL)

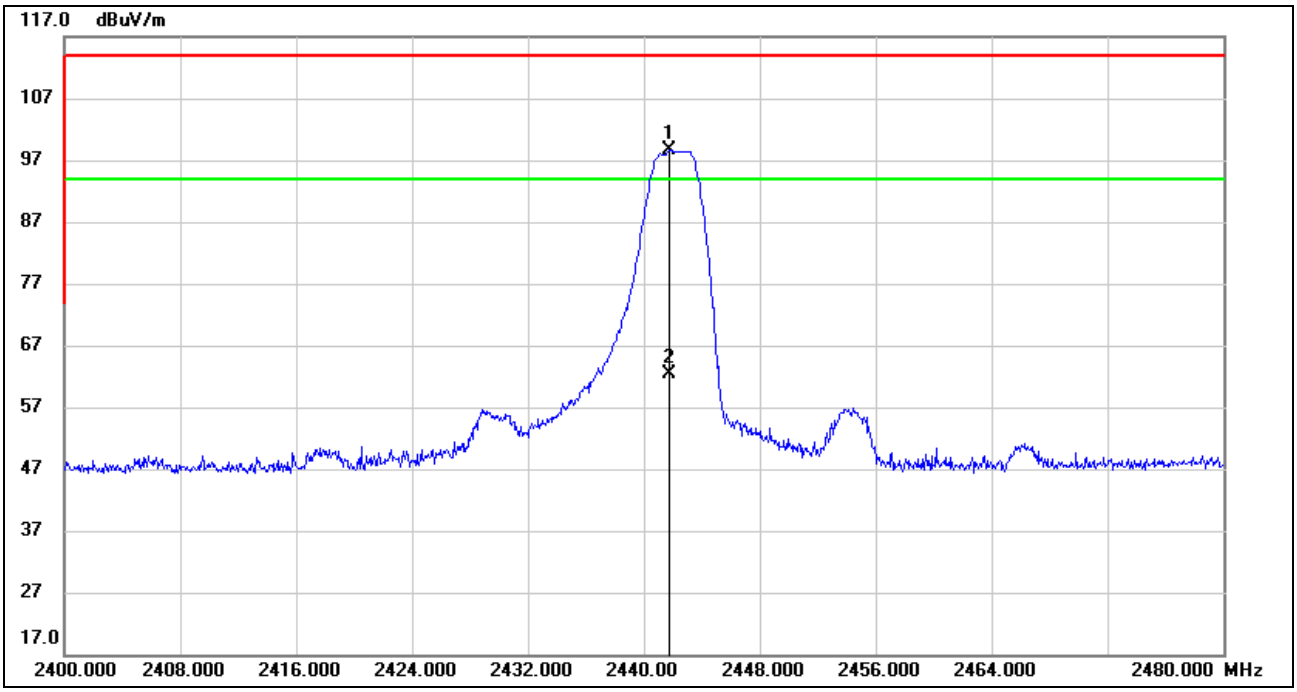


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2398.435	21.84	32.98	54.82	74.00	-19.18	peak
2	2398.435	-14.30	32.98	18.68	54.00	-35.32	AVG
3	2400.000	16.70	32.98	49.68	74.00	-24.32	peak
4	2409.820	60.88	33.05	93.93	114.00	-20.07	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, HORIZONTAL)

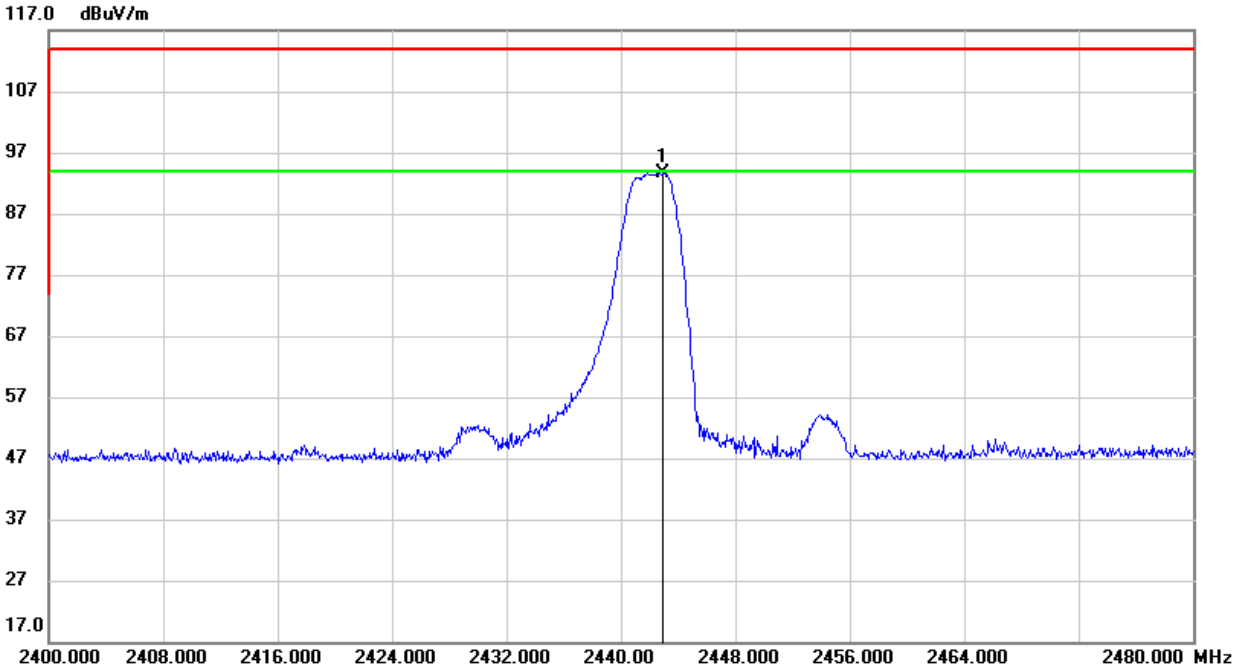


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2441.760	65.25	33.28	98.53	114.00	-15.47	peak
2	2441.760	29.11	33.28	62.39	94.00	-31.61	AVG

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

FIELD STRENGTH OF INTENTIONAL EMISSIONS (MIDDLE CHANNEL, VERTICAL)

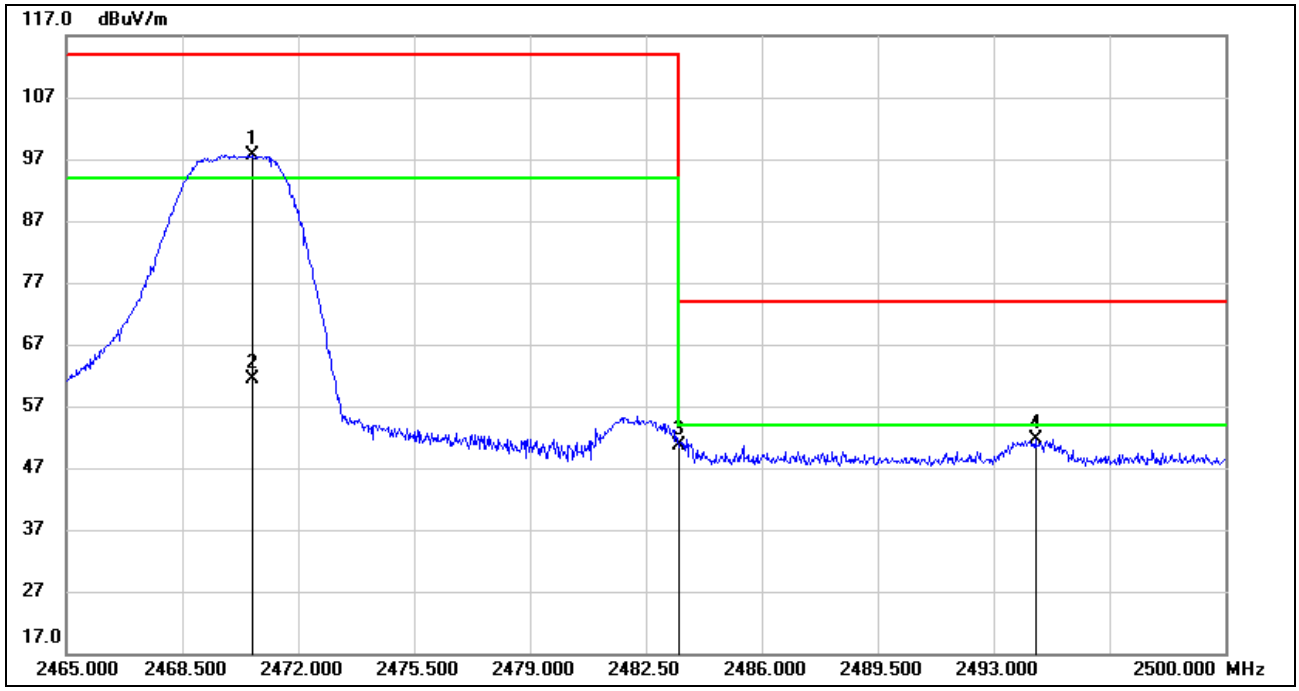


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2442.960	60.28	33.29	93.57	114.00	-20.43	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS (HIGH CHANNEL, HORIZONTAL)

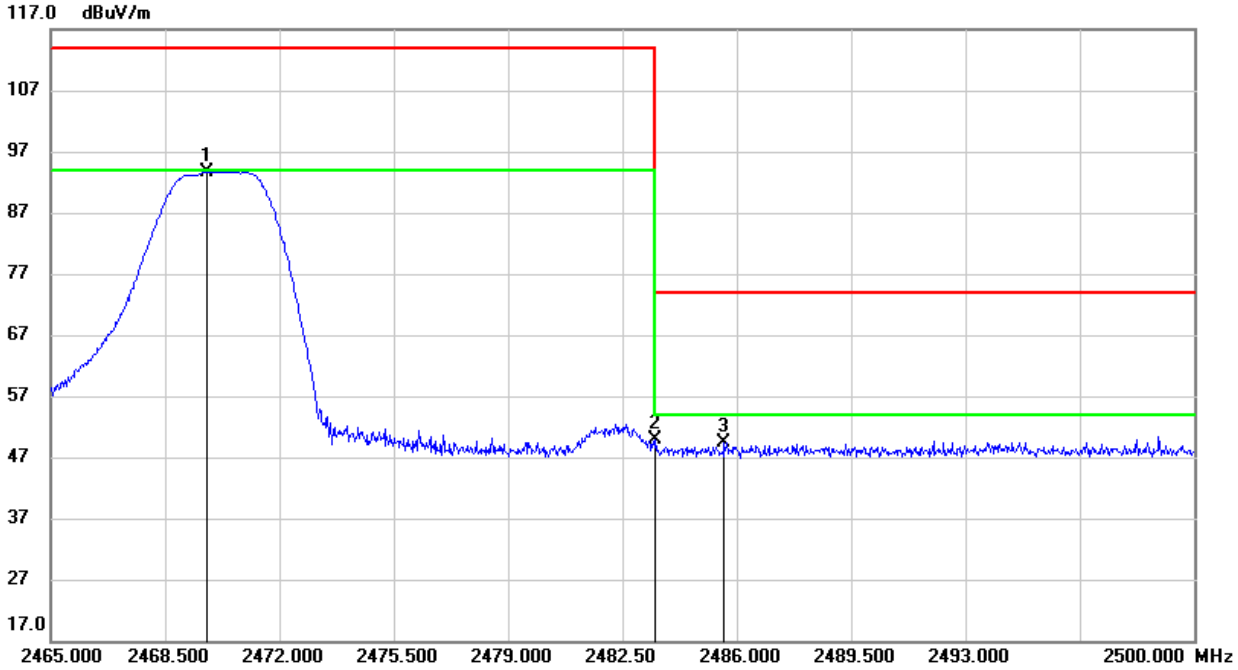


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2470.600	64.07	33.49	97.56	114.00	-16.44	peak
2	2470.600	27.93	33.49	61.42	94.00	-32.58	AVG
3	2483.500	17.10	33.58	50.68	74.00	-23.32	peak
4	2494.260	17.95	33.66	51.61	74.00	-22.39	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. Only the worst case emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

RESTRICTED BANDEDGE AND FIELD STRENGTH OF INTENTIONAL EMISSIONS (HIGH CHANNEL, VERTICAL)



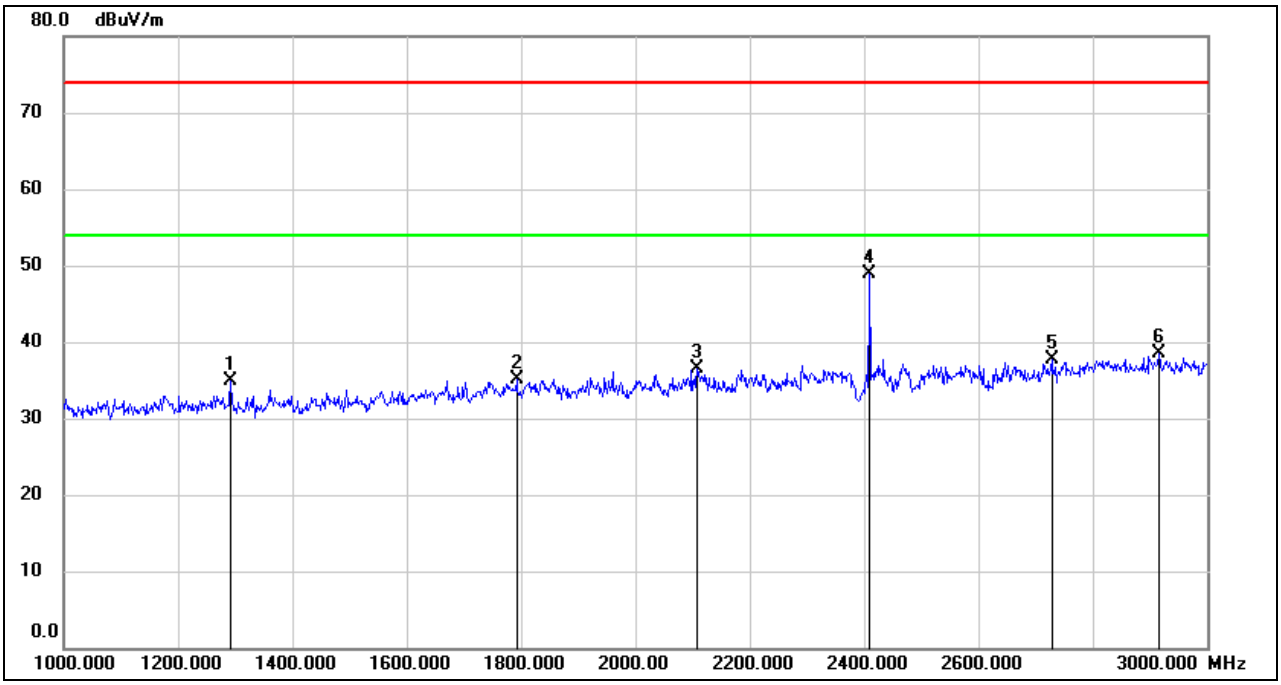
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2469.795	60.18	33.49	93.67	114.00	-20.33	peak
2	2483.500	16.40	33.58	49.98	74.00	-24.02	peak
3	2485.615	15.73	33.59	49.32	74.00	-24.68	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Only the worst emission was recorded, if it complies with the limit, the other emissions deemed to comply with the limit.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.3. SPURIOUS EMISSIONS (1~3GHz)

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)

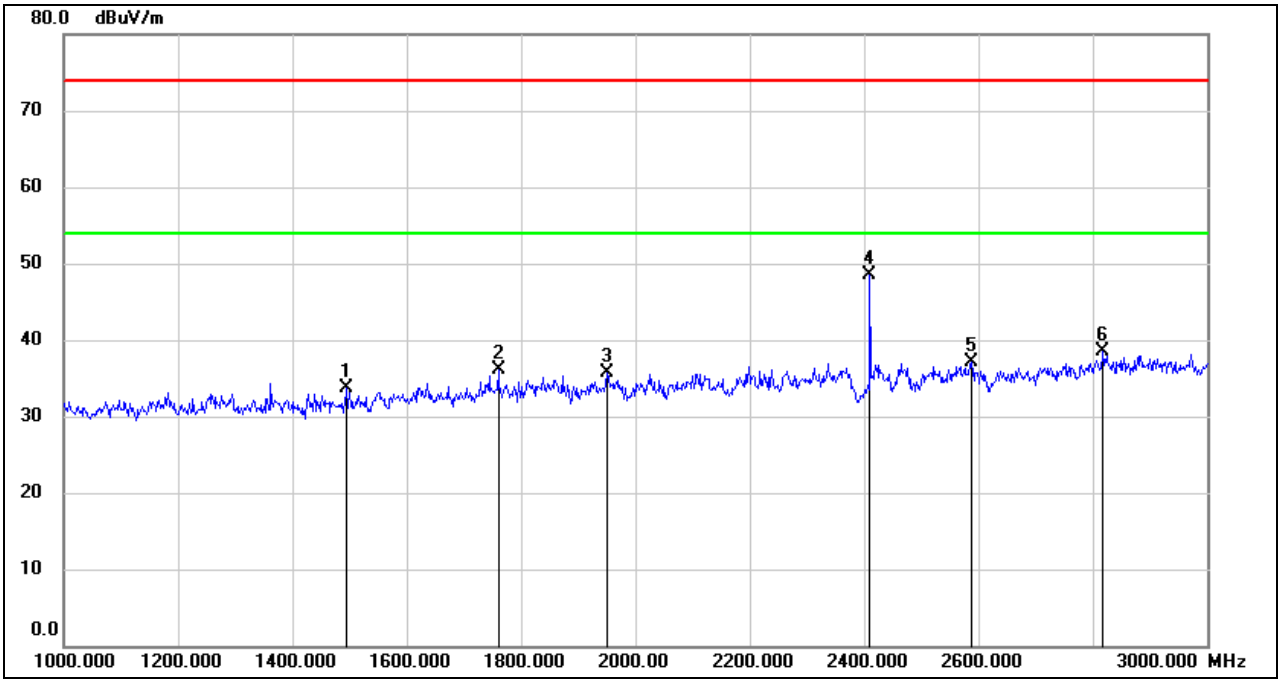


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1292.000	47.18	-12.36	34.82	74.00	-39.18	peak
2	1792.000	45.15	-9.99	35.16	74.00	-38.84	peak
3	2108.000	45.69	-9.12	36.57	74.00	-37.43	peak
4	2410.000	56.64	-7.78	48.86	/	/	fundamental
5	2728.000	44.46	-6.83	37.63	74.00	-36.37	peak
6	2916.000	44.05	-5.48	38.57	74.00	-35.43	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for Band Reject Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)

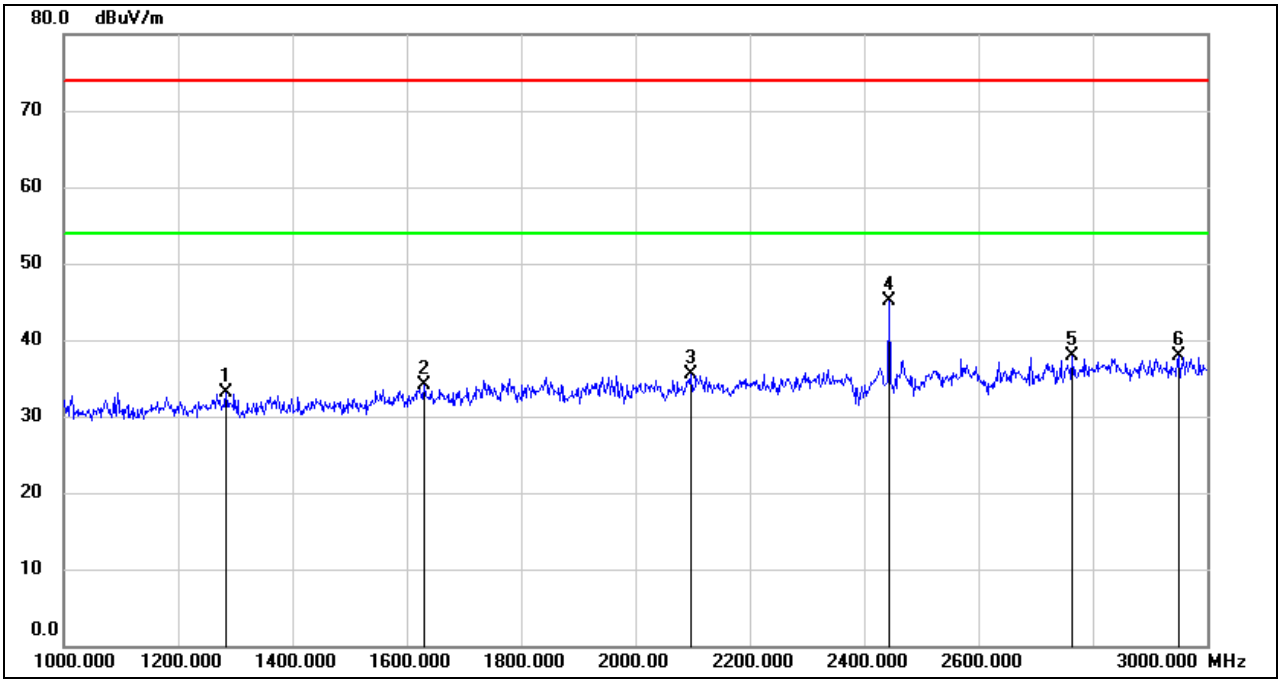


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1494.000	45.95	-12.22	33.73	74.00	-40.27	peak
2	1760.000	46.43	-10.31	36.12	74.00	-37.88	peak
3	1950.000	45.67	-9.89	35.78	74.00	-38.22	peak
4	2410.000	56.36	-7.78	48.58	/	/	fundamental
5	2588.000	44.81	-7.64	37.17	74.00	-36.83	peak
6	2818.000	44.42	-5.97	38.45	74.00	-35.55	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for Band Reject Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)

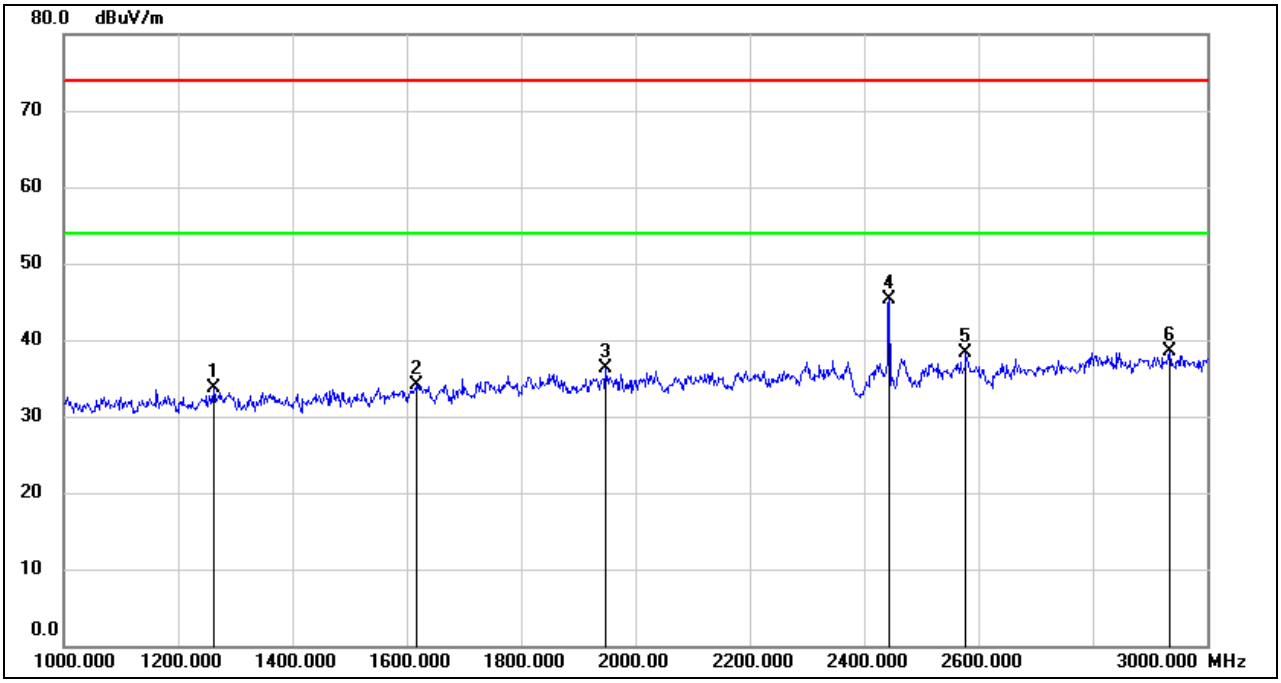


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1284.000	45.54	-12.40	33.14	74.00	-40.86	peak
2	1630.000	45.39	-11.25	34.14	74.00	-39.86	peak
3	2096.000	44.60	-9.19	35.41	74.00	-38.59	peak
4	2442.000	52.68	-7.55	45.13	/	/	fundamental
5	2764.000	44.42	-6.45	37.97	74.00	-36.03	peak
6	2950.000	43.25	-5.41	37.84	74.00	-36.16	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for Band Reject Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)

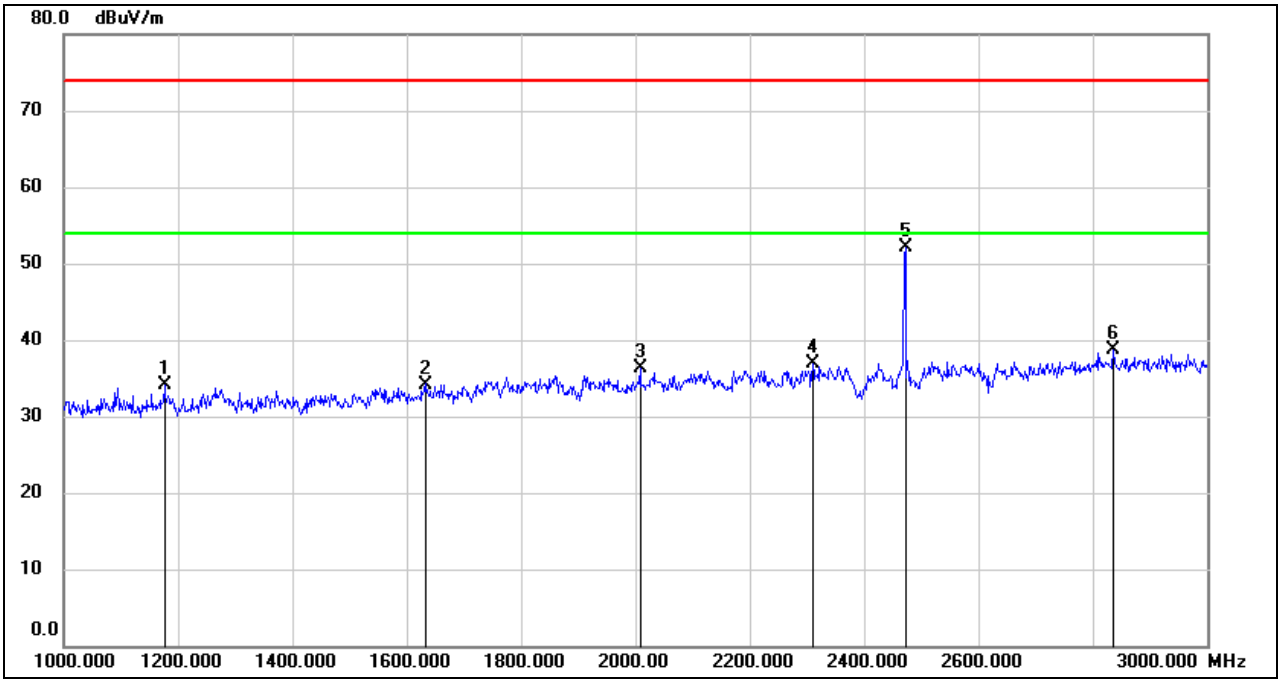


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1262.000	46.18	-12.47	33.71	74.00	-40.29	peak
2	1616.000	45.33	-11.32	34.01	74.00	-39.99	peak
3	1948.000	46.17	-9.89	36.28	74.00	-37.72	peak
4	2442.000	52.86	-7.55	45.31	/	/	fundamental
5	2578.000	45.91	-7.58	38.33	74.00	-35.67	peak
6	2934.000	43.92	-5.44	38.48	74.00	-35.52	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for Band Reject Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)

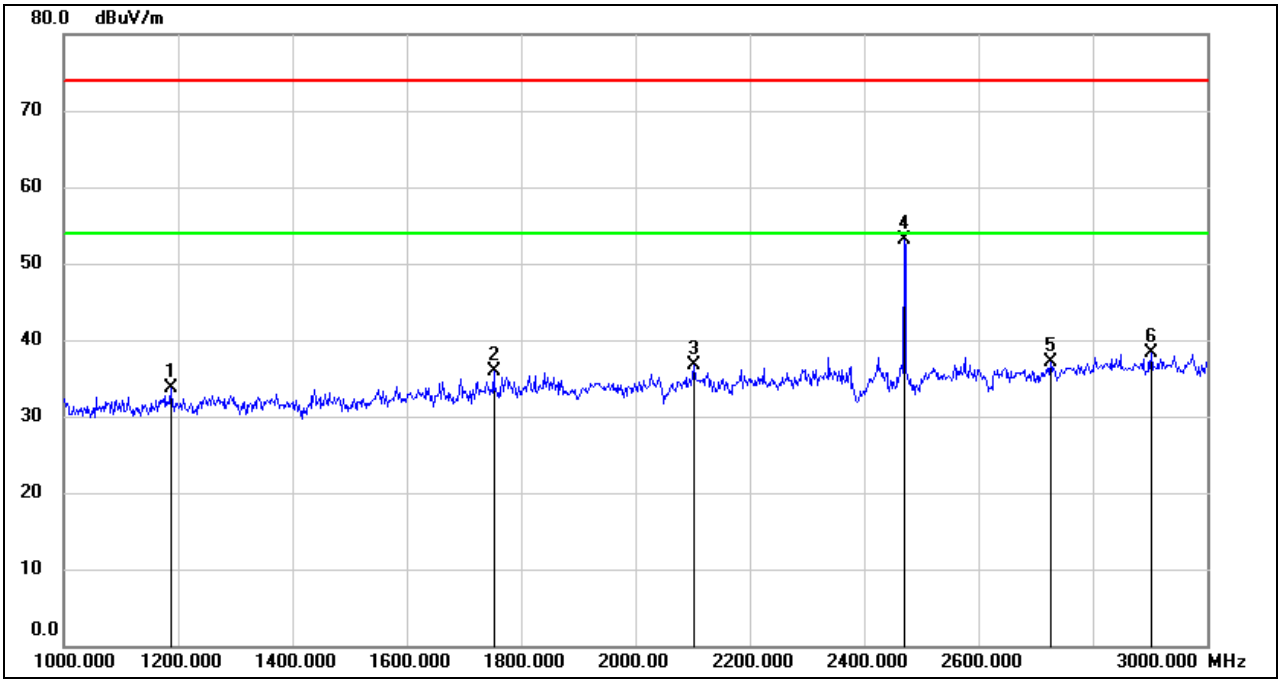


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1176.000	47.05	-12.87	34.18	74.00	-39.82	peak
2	1632.000	45.44	-11.24	34.20	74.00	-39.80	peak
3	2008.000	46.11	-9.78	36.33	74.00	-37.67	peak
4	2310.000	45.09	-8.16	36.93	74.00	-37.07	peak
5	2470.000	59.55	-7.36	52.19	/	/	fundamental
6	2836.000	44.48	-5.87	38.61	74.00	-35.39	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for Band Reject Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



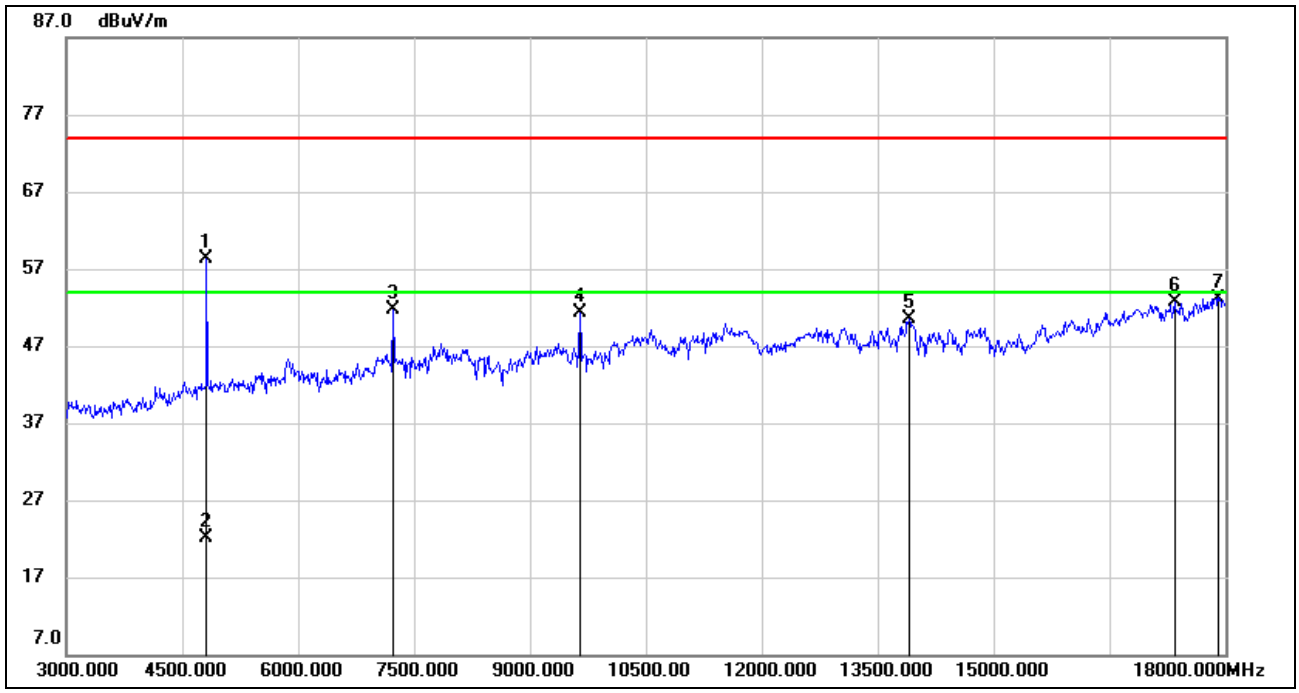
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	1188.000	46.47	-12.77	33.70	74.00	-40.30	peak
2	1752.000	46.26	-10.39	35.87	74.00	-38.13	peak
3	2102.000	45.78	-9.15	36.63	74.00	-37.37	peak
4	2470.000	60.55	-7.37	53.18	/	/	fundamental
5	2726.000	43.91	-6.86	37.05	74.00	-36.95	peak
6	2902.000	43.80	-5.51	38.29	74.00	-35.71	peak

Note: 1. Peak Result = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. Filter losses were only considered in then spurious frequency bands and the authorized band was not corrected for Band Reject Filter losses.
5. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.4. SPURIOUS EMISSIONS (3~18GHz)

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, HORIZONTAL)

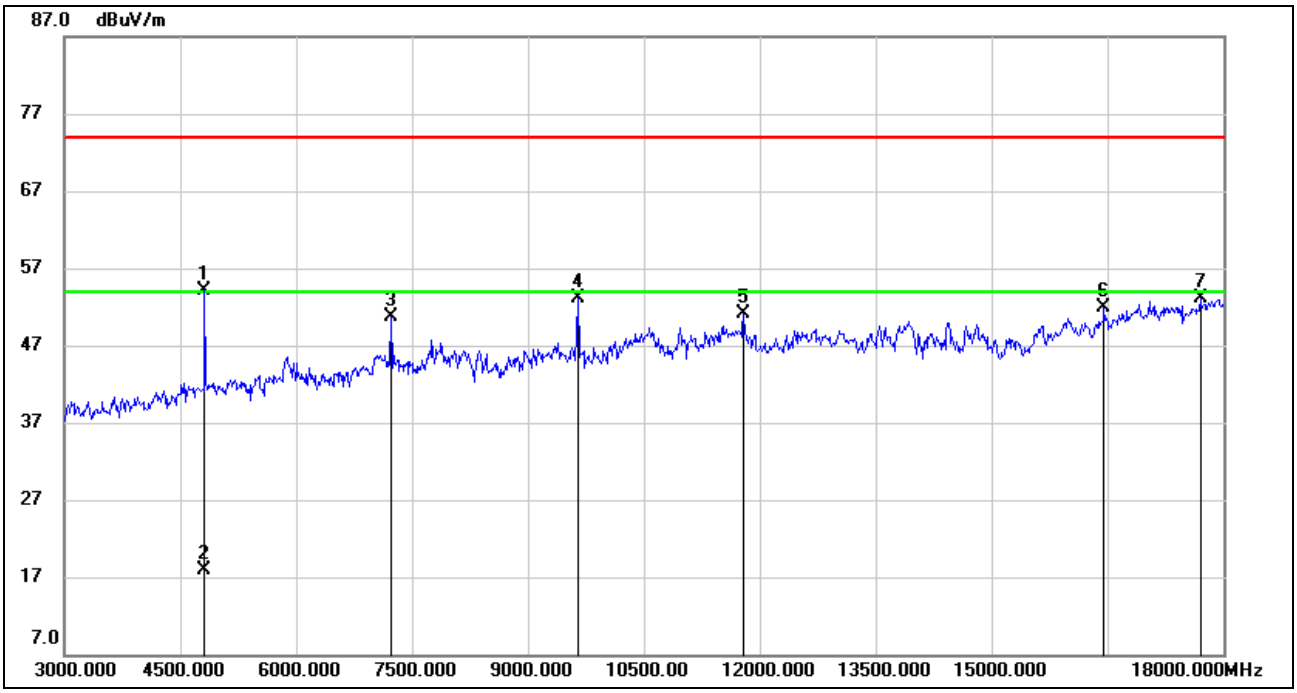


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4820.000	57.67	0.54	58.21	74.00	-15.79	peak
2	4820.000	21.53	0.54	22.07	54.00	-31.93	AVG
3	7230.000	45.79	5.89	51.68	74.00	-22.32	peak
4	9645.000	41.60	9.66	51.26	74.00	-22.74	peak
5	13905.000	34.26	16.20	50.46	74.00	-23.54	peak
6	17340.000	31.19	21.61	52.80	74.00	-21.20	peak
7	17910.000	29.85	23.35	53.20	74.00	-20.80	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Cycle Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. The High Pass filter loss factor already add into the correct factor.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (LOW CHANNEL, VERTICAL)

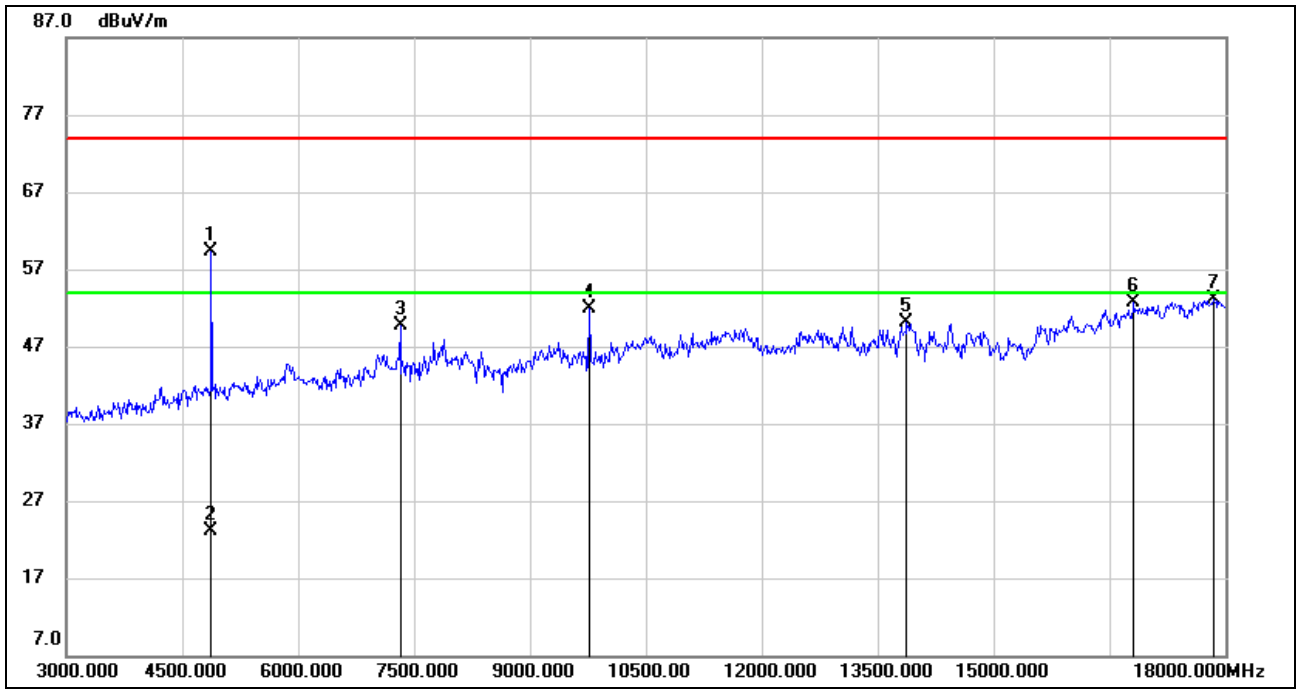


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4820.000	53.55	0.54	54.09	74.00	-19.91	peak
2	4820.000	17.41	0.54	17.95	54.00	-36.05	AVG
3	7230.000	44.82	5.89	50.71	74.00	-23.29	peak
4	9645.000	43.35	9.66	53.01	74.00	-20.99	peak
5	11790.000	37.96	13.17	51.13	74.00	-22.87	peak
6	16455.000	32.87	19.00	51.87	74.00	-22.13	peak
7	17700.000	30.69	22.43	53.12	74.00	-20.88	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Cycle Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. The High Pass filter loss factor already add into the correct factor.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, HORIZONTAL)

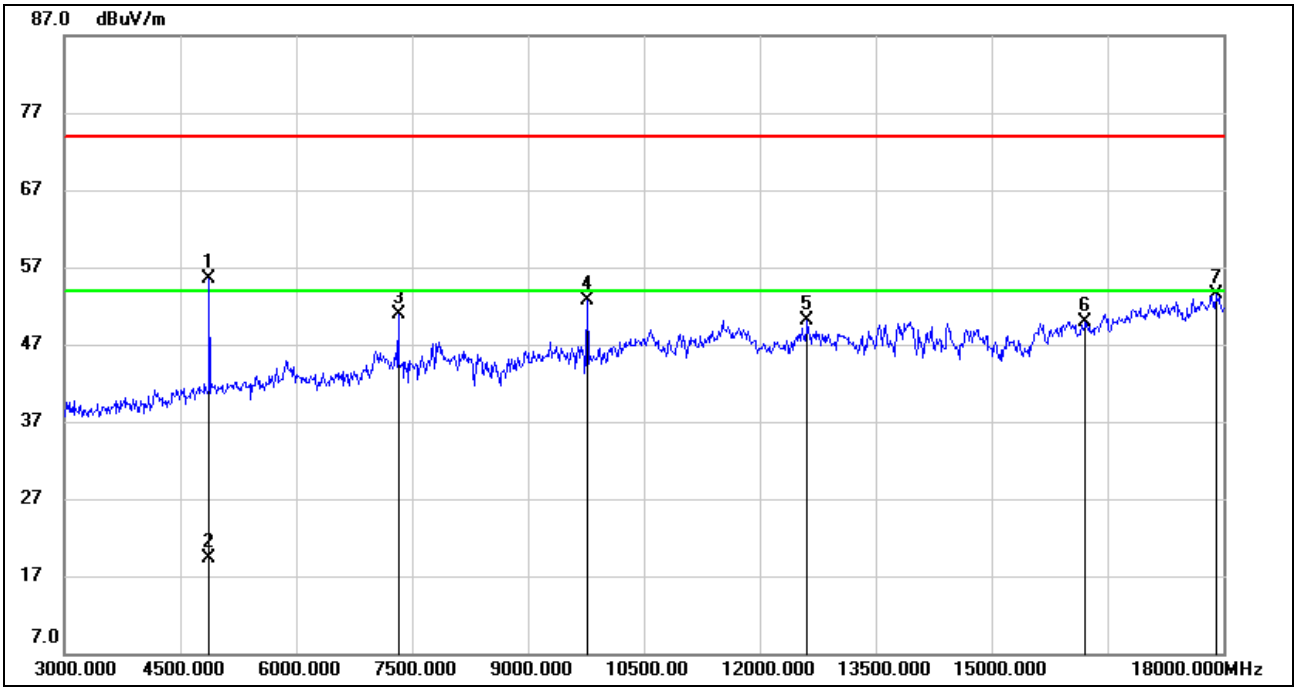


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4884.000	58.52	0.79	59.31	74.00	-14.69	peak
2	4884.000	22.38	0.79	23.17	54.00	-30.83	AVG
3	7320.000	43.66	6.14	49.80	74.00	-24.20	peak
4	9765.000	42.21	9.69	51.90	74.00	-22.10	peak
5	13875.000	33.58	16.44	50.02	74.00	-23.98	peak
6	16815.000	32.82	19.96	52.78	74.00	-21.22	peak
7	17850.000	29.76	23.32	53.08	74.00	-20.92	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Cycle Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. The High Pass filter loss factor already add into the correct factor.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (MID CHANNEL, VERTICAL)

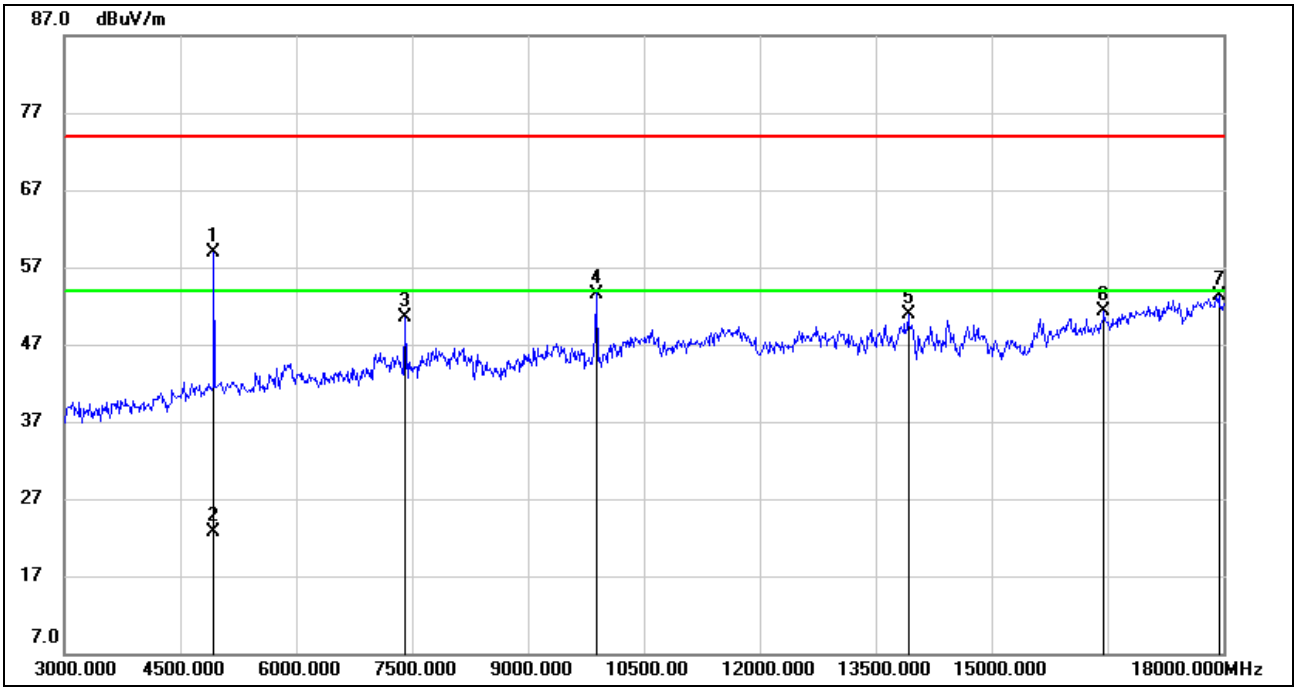


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4884.000	54.74	0.79	55.53	74.00	-18.47	peak
2	4884.000	18.60	0.79	19.39	54.00	-34.61	AVG
3	7320.000	44.73	6.14	50.87	74.00	-23.13	peak
4	9765.000	43.08	9.69	52.77	74.00	-21.23	peak
5	12615.000	36.09	14.03	50.12	74.00	-23.88	peak
6	16215.000	31.49	18.48	49.97	74.00	-24.03	peak
7	17910.000	30.16	23.35	53.51	74.00	-20.49	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Cycle Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. The High Pass filter loss factor already add into the correct factor.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, HORIZONTAL)

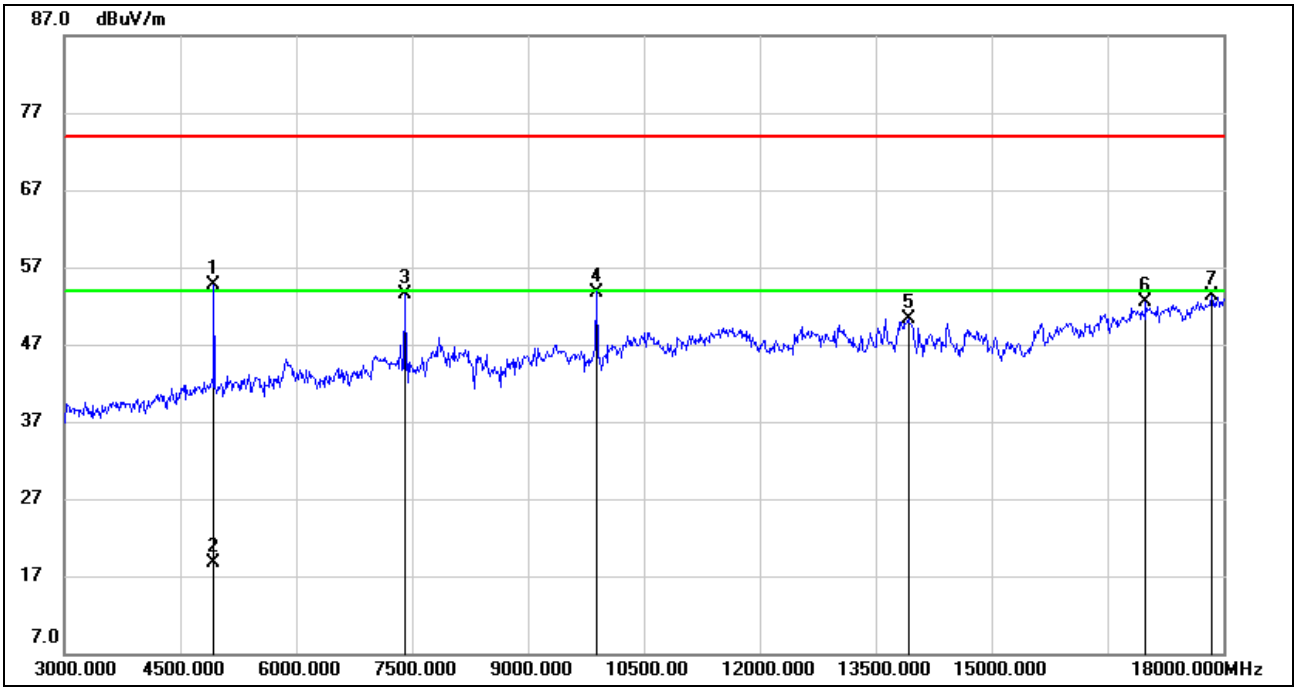


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4940.000	57.82	1.07	58.89	74.00	-15.11	peak
2	4940.000	21.68	1.07	22.75	54.00	-31.25	AVG
3	7410.000	44.00	6.45	50.45	74.00	-23.55	peak
4	9885.000	43.57	10.03	53.60	74.00	-20.40	peak
5	13920.000	34.78	16.17	50.95	74.00	-23.05	peak
6	16455.000	32.24	19.00	51.24	74.00	-22.76	peak
7	17940.000	29.88	23.39	53.27	74.00	-20.73	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Cycle Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. The High Pass filter loss factor already add into the correct factor.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, VERTICAL)



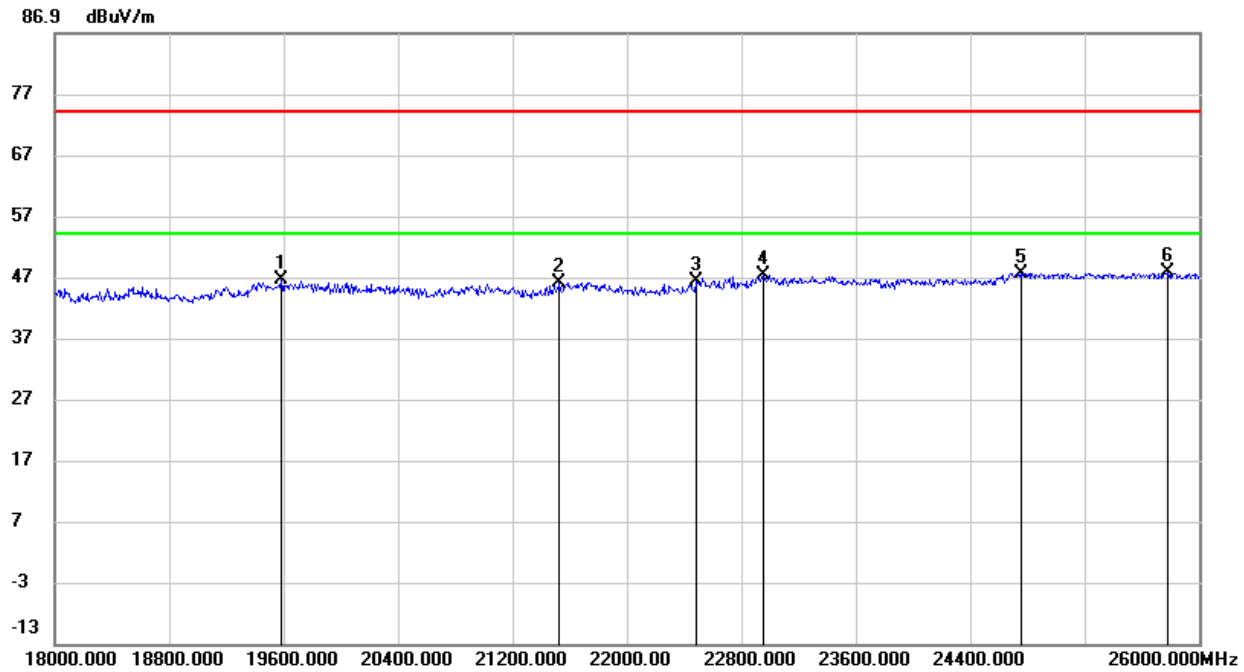
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	4940.000	53.67	1.07	54.74	74.00	-19.26	peak
2	4940.000	17.53	1.07	18.60	54.00	-35.40	AVG
3	7410.000	47.07	6.45	53.52	74.00	-20.48	peak
4	9885.000	43.77	10.03	53.80	74.00	-20.20	peak
5	13920.000	34.16	16.17	50.33	74.00	-23.67	peak
6	16995.000	32.15	20.38	52.53	74.00	-21.47	peak
7	17850.000	30.02	23.32	53.34	74.00	-20.66	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.
4. AVG Result=Peak Result + Duty Cycle Correction Factor.
5. For the Duty Cycle and Correction Factor, please refer to clause 6.1.
6. The High Pass filter loss factor already add into the correct factor.
7. Proper operation of the transmitter prior to adding the filter to the measurement chain.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.5. SPURIOUS EMISSIONS (18~26GHz)

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)

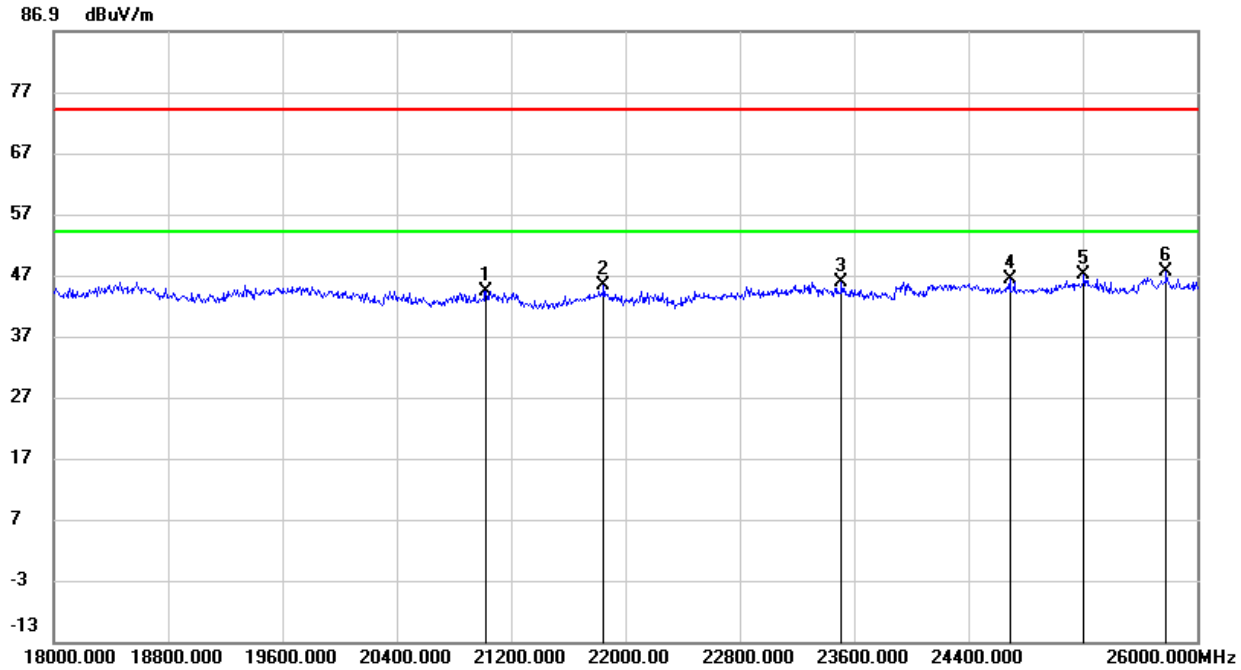


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	19584.000	51.17	-4.64	46.53	74.00	-27.47	peak
2	21528.000	51.92	-5.78	46.14	74.00	-27.86	peak
3	22480.000	51.98	-5.82	46.16	74.00	-27.84	peak
4	22952.000	53.03	-5.63	47.40	74.00	-26.60	peak
5	24752.000	49.58	-1.94	47.64	74.00	-26.36	peak
6	25784.000	49.23	-1.49	47.74	74.00	-26.26	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

HARMONICS AND SPURIOUS EMISSIONS (HIGH CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	21024.000	49.64	-5.30	44.34	74.00	-29.66	peak
2	21848.000	51.26	-5.95	45.31	74.00	-28.69	peak
3	23512.000	50.51	-4.76	45.75	74.00	-28.25	peak
4	24688.000	48.39	-2.11	46.28	74.00	-27.72	peak
5	25208.000	48.13	-1.16	46.97	74.00	-27.03	peak
6	25784.000	49.08	-1.49	47.59	74.00	-26.41	peak

Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV limit, AV Result is deemed to comply with AV limit.
3. Peak: Peak detector.

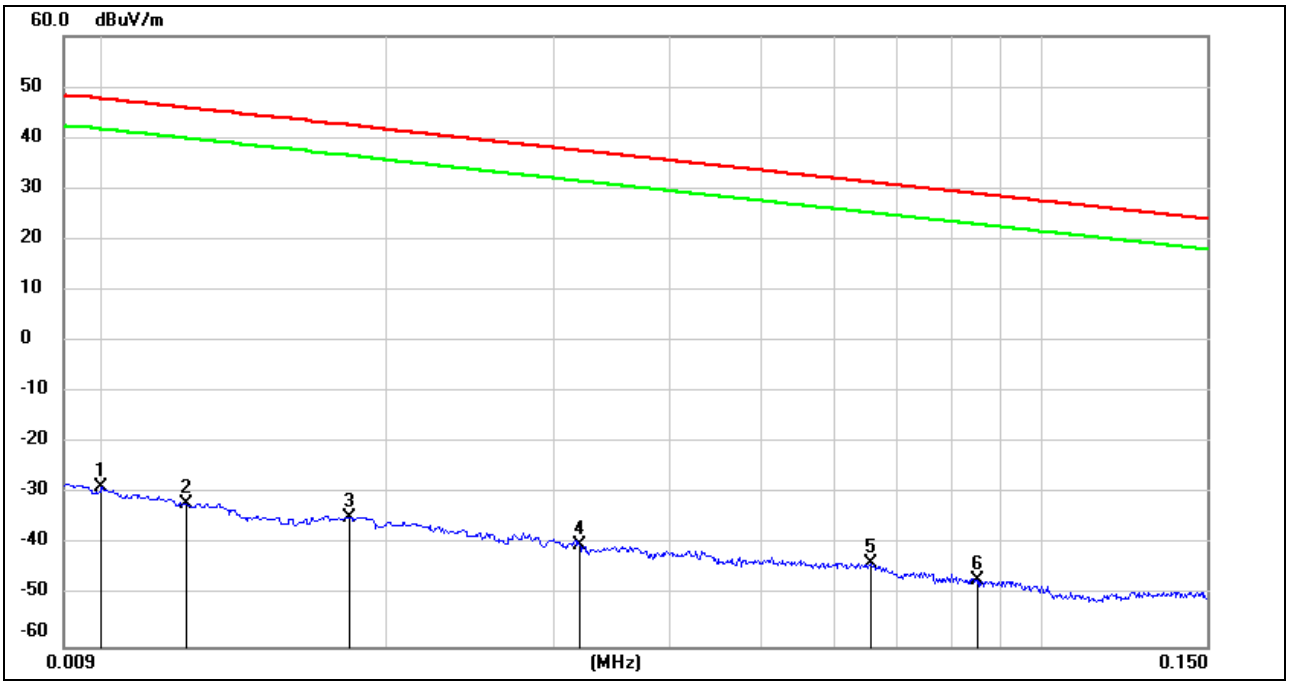
Note: All test modes had been tested, only the worst data record in the report.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.6. SPURIOUS EMISSIONS BELOW 30MHz

SPURIOUS EMISSIONS (HIGH CHANNEL, LOOP ANTENNA FACE ON TO THE EUT, WORST-CASE CONFIGURATION)

9kHz~ 150kHz



No.	Frequency	Reading	Correct	FCC Result	FCC Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.0100	72.72	-101.40	-28.68	47.60	-80.18	-3.90	-76.28	peak
2	0.0122	69.50	-101.39	-31.89	45.87	-83.39	-5.63	-77.76	peak
3	0.0182	66.85	-101.36	-34.51	42.40	-86.01	-9.10	-76.91	peak
4	0.0320	61.34	-101.40	-40.06	37.50	-91.56	-14.00	-77.56	peak
5	0.0656	57.86	-101.55	-43.69	31.26	-95.19	-20.24	-74.95	peak
6	0.0854	54.85	-101.68	-46.83	28.97	-98.33	-22.53	-75.80	peak

Note: 1. Measurement = Reading Level + Correct Factor.

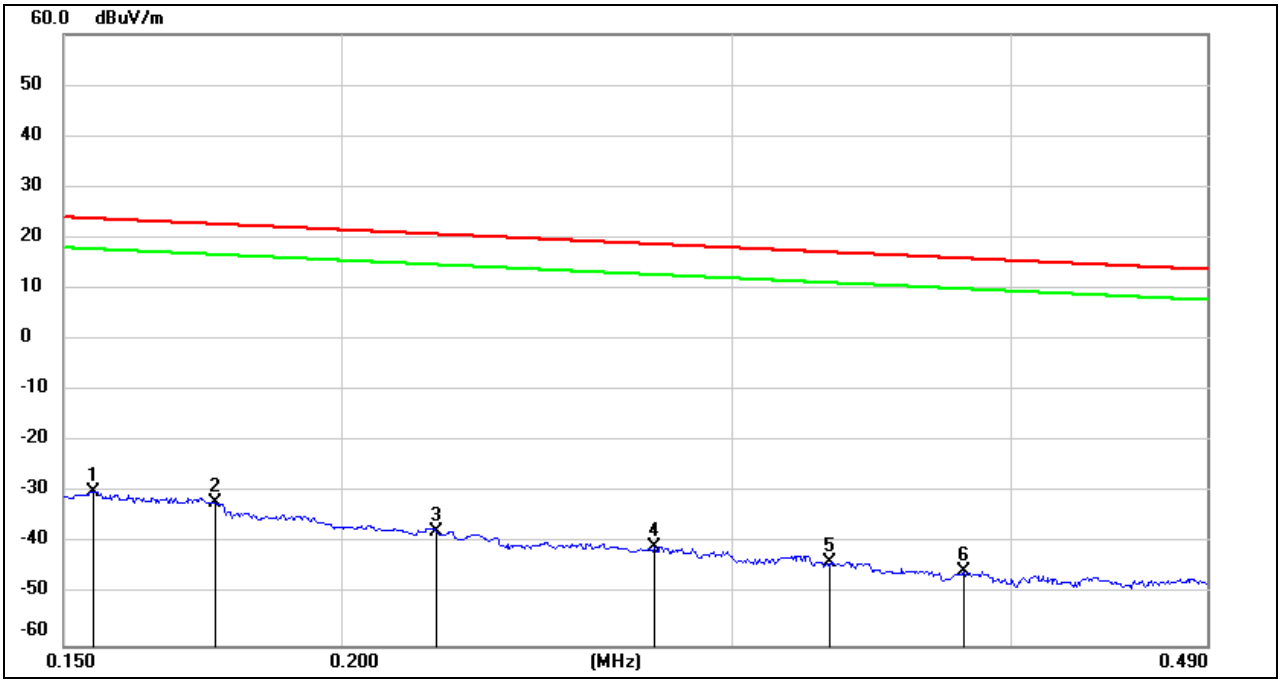
2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

4. dBuA/m = dBuV/m – 20log10(120π) = dBuV/m -51.5.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

150kHz ~ 490kHz



No.	Frequency	Reading	Correct	FCC Result	FCC Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.1547	71.81	-101.65	-29.84	23.81	-81.34	-27.69	-53.65	peak
2	0.1756	69.84	-101.68	-31.84	22.72	-83.34	-28.78	-54.56	peak
3	0.2207	64.02	-101.75	-37.73	20.72	-89.23	-30.78	-58.45	peak
4	0.2767	61.32	-101.83	-40.51	18.76	-92.01	-32.74	-59.27	peak
5	0.3316	58.35	-101.88	-43.53	17.19	-95.03	-34.31	-60.72	peak
6	0.3809	56.41	-101.94	-45.53	15.99	-97.03	-35.51	-61.52	peak

Note: 1. Measurement = Reading Level + Correct Factor.

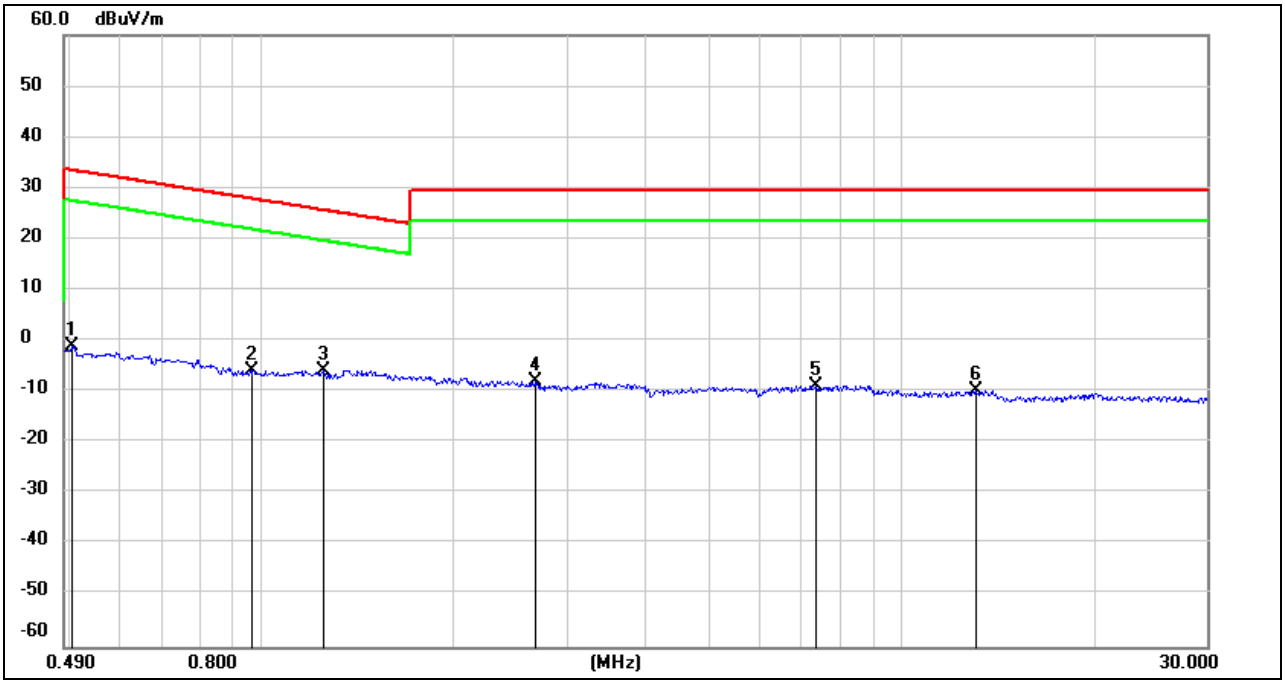
2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.

3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.

4. dBuA/m = dBuV/m – 20log10(120π) = dBuV/m -51.5.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

490kHz ~ 30MHz



No.	Frequency	Reading	Correct	FCC Result	FCC Limit	ISED Result	ISED Limit	Margin	Remark
	(MHz)	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dBuA/m)	(dBuA/m)	(dB)	
1	0.5039	60.94	-62.07	-1.13	33.56	-52.63	-17.94	-34.69	peak
2	0.9657	56.39	-62.25	-5.86	27.90	-57.36	-23.6	-33.76	peak
3	1.2461	56.25	-62.16	-5.91	25.69	-57.41	-25.81	-31.60	peak
4	2.6737	53.64	-61.65	-8.01	29.54	-59.51	-21.96	-37.55	peak
5	7.3658	52.33	-61.16	-8.83	29.54	-60.33	-21.96	-38.37	peak
6	13.0907	51.13	-60.93	-9.80	29.54	-61.3	-21.96	-39.34	peak

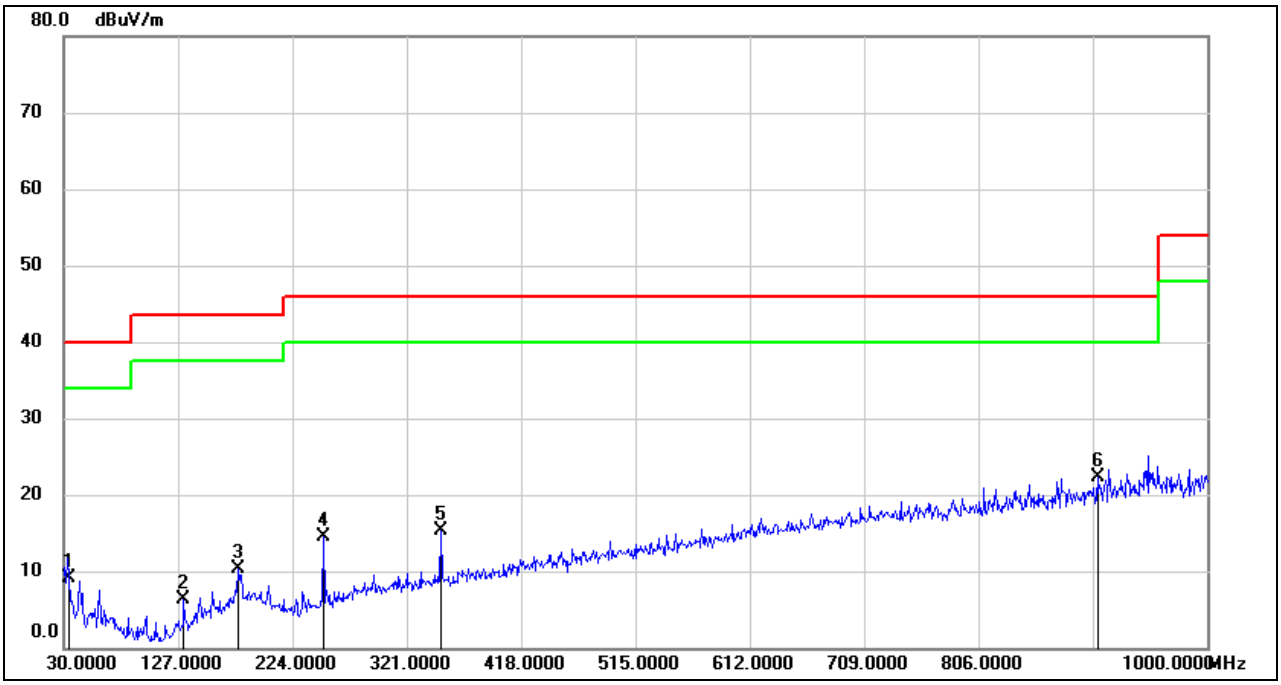
Note: 1. Measurement = Reading Level + Correct Factor.
2. If Peak Result complies with AV and QP limit, AV and QP Result are deemed to comply with AV limit.
3. All 3 polarizations (Horizontal, Face-on and Face-off) of the loop antenna had been tested, but only the worst data recorded in the report.
4. dBuA/m = dBuV/m – 20log10(120π) = dBuV/m -51.5.

Note: All test modes had been tested, only the worst data record in the report.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

7.7. SPURIOUS EMISSIONS BELOW 1GHz AND ABOVE 30MHz

SPURIOUS EMISSIONS (HIGH CHANNEL, WORST-CASE CONFIGURATION, HORIZONTAL)

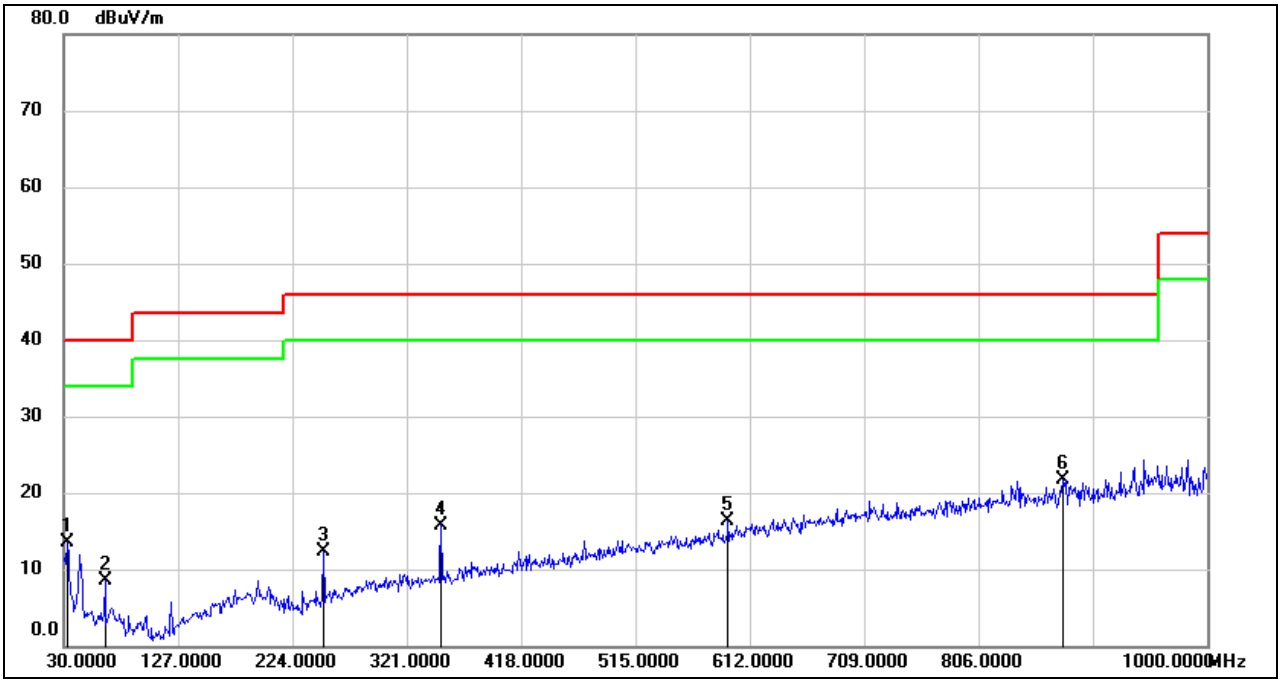


No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	34.8500	26.49	-17.45	9.04	40.00	-30.96	QP
2	131.8500	25.83	-19.54	6.29	43.50	-37.21	QP
3	178.4100	27.00	-16.65	10.35	43.50	-33.15	QP
4	250.1900	30.77	-16.34	14.43	46.00	-31.57	QP
5	350.1000	28.76	-13.52	15.24	46.00	-30.76	QP
6	906.8800	26.37	-4.14	22.23	46.00	-23.77	QP

Note: 1. Result Level = Read Level + Correct Factor.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

SPURIOUS EMISSIONS (HIGH CHANNEL, WORST-CASE CONFIGURATION, VERTICAL)



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	32.9100	30.77	-17.17	13.60	40.00	-26.40	QP
2	64.9200	28.04	-19.63	8.41	40.00	-31.59	QP
3	250.1900	28.66	-16.34	12.32	46.00	-33.68	QP
4	350.1000	29.32	-13.52	15.80	46.00	-30.20	QP
5	593.5700	25.35	-9.01	16.34	46.00	-29.66	QP
6	877.7800	26.07	-4.44	21.63	46.00	-24.37	QP

Note: 1. Result Level = Read Level + Correct Factor.
2. If Peak Result complies with QP limit, QP Result is deemed to comply with QP limit.
3. Test setup: RBW: 120 kHz, VBW: 300 kHz, Sweep time: auto

Note: All test modes had been tested, only the worst data record in the report.

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.

8. ANTENNA REQUIREMENTS

APPLICABLE REQUIREMENTS

Please refer to FCC §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. 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.

Please refer to FCC §15.247(b)(4)
The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

RESULTS

Complies

END OF REPORT

This report shall not be reproduced except in full, without the written approval of UL Verification Services (Guangzhou) Co., Ltd, Song Shan Lake Branch.