



FCC 47 CFR PART 15 SUBPART C

TEST REPORT

For

Bluetooth Speaker

Model: Lighthouse

Brand: N/A

Test Report Number:

C180157Z01-RP1

Issued for

Microlab Electronics Co., Ltd

South Baozi Rd., Shenzhen Microlab Industrial Park, Shenzhen 518122, China

Issued by:

COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.

No.10-1, Mingkeda Logistics Park, No.18, Huanguan South Rd.,
Guan Lan Town, Baoan District, Shenzhen China

TEL: 86-755-28055000

FAX: 86-755-28055221

E-Mail: service@ccssz.com

Issued Date: Jan 05, 2018



Certificate Number: 2861.01

Note: This report shall not be reproduced except in full, without the written approval of Compliance Certification Services (Shenzhen) Inc. This document may be altered or revised by Compliance Certification Services (Shenzhen) Inc. personnel only, and shall be noted in the revision section of the document. The client should not use it to claim product endorsement by TAF, A2LA, NVLAP, NIST, CNAS or any government agencies. The test result of this report relate only to the tested sample identified in this report.



Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	Jan 05, 2018	Initial Issue	ALL	Anna Liu



TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION	4
2. EUT DESCRIPTION	5
3. TEST METHODOLOGY	6
3.1 DESCRIPTION OF TEST MODES.....	6
3.2 SETUP CONFIGURATION OF EUT.....	6
3.3 SUPPORT EQUIPMENT	6
4. FACILITIES AND ACCREDITATIONS	7
4.1 FACILITIES.....	7
4.2 ACCREDITATIONS.....	7
4.3 MEASUREMENT UNCERTAINTY.....	7
5. FCC PART 15.247 REQUIREMENTS	8
5.1 RADIATED EMISSIONS.....	8



1. TEST RESULT CERTIFICATION

Product	Bluetooth Speaker
Model	Lighthouse
Brand	N/A
Tested	Jan 03, 2018
Applicant	Microlab Electronics Co., Ltd South Baozi Rd., Shenzhen Microlab Industrial Park, Shenzhen 518122, China
Manufacturer	/

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C	No non-compliance noted

We hereby certify that:

The above equipment was tested by Compliance Certification Services (Shenzhen) Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10:2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.207, 15.209 and 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

Approved by:

Reviewed by:

Eve Wang
Supervisor of EMC Dept.
Compliance Certification Services (Shenzhen) Inc.

Nancy Fu
Supervisor of Report Dept.
Compliance Certification Services (Shenzhen) Inc.



2. EUT DESCRIPTION

Product	Bluetooth Speaker
Model Number	Lighthouse
Brand	N/A
Model Discrepancy	N/A
Identify Number	C180157Z01-RP1
Received Date	Jan 03 2018
Power Supply	Input: DC 5V 2A (from PC) Output: DC 5V 1A
Frequency Range	2402 ~ 2480 MHz
Modulation Technique	Supported BT2.1+EDR GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels	79 Channels
Antenna Specification	Ceramic Antenna with 0 dBi gain (Max)
Hardware Version	V1.1
Software Version	V1.1

Note: This submittal(s) (test report) is intended for FCC ID: OR8-LIGHTHOUSE filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



3. TEST METHODOLOGY

3.1 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Use Certification Tool 1.26 to control the EUT for staying in continuous transmitting and receiving mode.

Test Item	Test mode	Worse mode
Radiated Emission	Mode 1: TX	☒

Note:

1. Channel Low (2402MHz) Mid (2440MHz) and High (2480MHz) were chosen for pre-testing for GFSK and print in the report.
2. Radiated band edges were tested with both fixed and hopping mode; the fixed mode was the worse case and recorded in the report.

3.2 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

3.3 SUPPORT EQUIPMENT

No.	Equipment	Model No.	Serial No.	FCC ID	Brand	Data Cable	Power Cord
1	Notebook	TianYi310-14ISK	NA	DoC	Lenovo	NA	NA

Notes:

Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



4. FACILITIES AND ACCREDITATIONS

4.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

☒ **No.10-1, Mingkeda Logistics Park, No.18, Huanguan South Rd.,
Guan Lan Town, Baoan District, Shenzhen, China**

The sites are constructed in conformance with the requirements of ANSI C63.10:2013, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

USA	A2LA
China	CNAS

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

USA	FCC
Japan	VCCI(C-4815, R-4320, T-2317, G-10624)
Canada	INDUSTRY CANADA

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.ccssz.com>

4.3 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Parameter	Uncertainty
Radiated Emission, 30 to 200 MHz Test Site : 966(2)	+/-3.6880dB
Radiated Emission, 200 to 1000 MHz Test Site : 966(2)	+/-3.6695dB
Radiated Emission, 1 to 8 GHz	+/-5.1782dB
Radiated Emission, 8 to 18 GHz	+/-5.2173dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

The measured result is above (below) the specification limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95% level of confidence. However, the result indicates that compliance (non-compliance) is more probable than non-compliance) with the specification limit.



5. FCC PART 15.247 REQUIREMENTS

5.1 RADIATED EMISSIONS

LIMIT

1. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (mV/m)	Measurement Distance (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100*	3
88-216	150*	3
216-960	200*	3
Above 960	500	3

Note: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

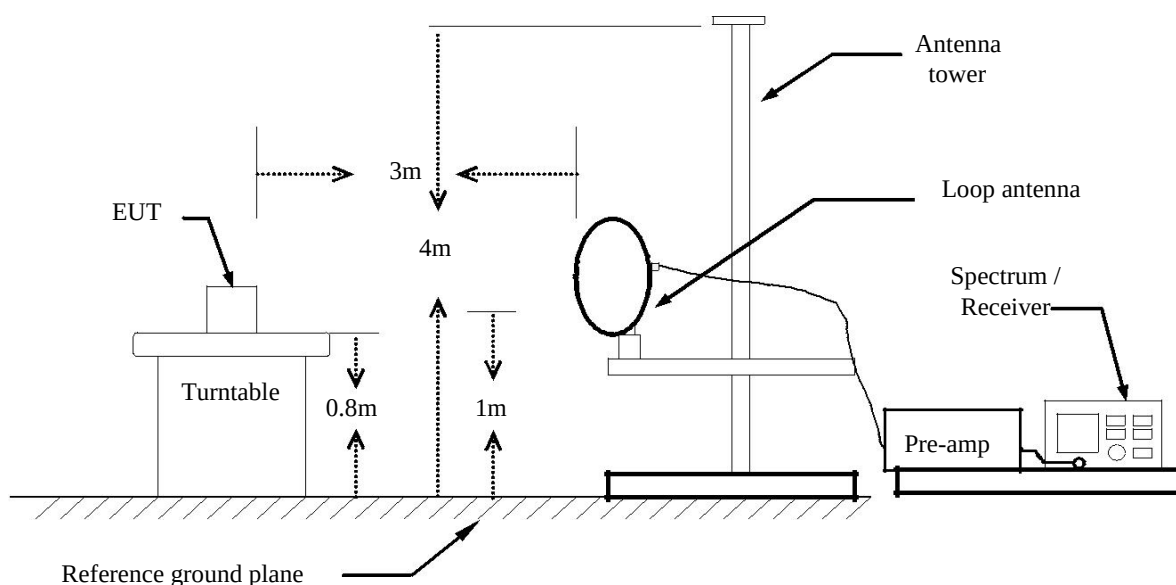
2. In the above emission table, the tighter limit applies at the band edges.

Frequency (Hz)	Field Strength (μ V/m at 3-meter)	Field Strength (dB μ V/m at 3-meter)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

**MEASUREMENT EQUIPMENT USED**

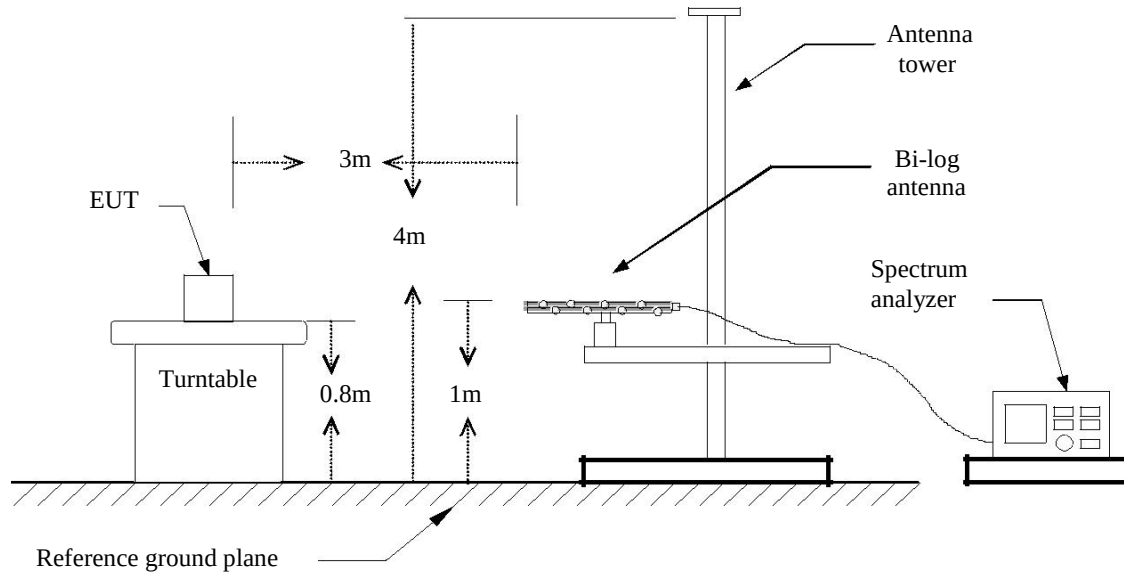
Radiated Emission Test Site 966(2)					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
PSA Series Spectrum Analyzer	Agilent	N9010A	MY52221469	02/21/2017	02/20/2018
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100783	02/21/2017	02/20/2018
Amplifier	EMEC	EM330	060661	03/18/2017	03/17/2018
High Noise Amplifier	Agilent	8449B	3008A01838	02/21/2017	02/20/2018
Loop Antenna	COM-POWER	AL-130	121044	09/25/2017	09/24/2018
Bilog Antenna	SCHAFFNER	CBL6143	5082	02/21/2017	02/20/2018
Horn Antenna	SCHWARZBECK	BBHA9120	D286	02/27/2017	02/27/2018
Board-Band Horn Antenna	Schwarzbeck	BBHA 9170	9170-497	02/27/2017	02/27/2018
Turn Table	N/A	N/A	N/A	N.C.R	N.C.R
Antenna Tower	SUNOL	TLT2	N/A	N.C.R	N.C.R
Controller	Sunol Sciences	SC104V	022310-1	N.C.R	N.C.R
Controller	CT	N/A	N/A	N.C.R	N.C.R
Temp. / Humidity Meter	Anymetre	JR913	N/A	02/21/2017	02/20/2018
Test S/W	FARAD	LZ-RF / CCS-SZ-3A2			

Remark: Each piece of equipment is scheduled for calibration once a year.

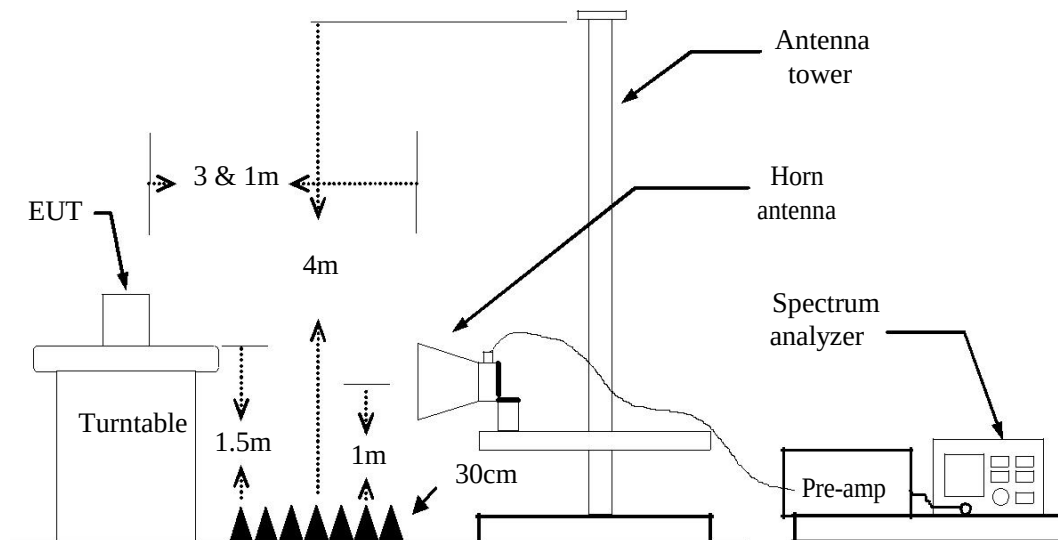
Test Configuration**Below 30MHz**



Below 1 GHz



Above 1 GHz





MEASURING SETTING

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

TEST PROCEDURE

1) Sequence of testing 9 kHz to 30

MHz Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Pre measurement:

- The turntable rotates from 0°to 315°using 45°steps.
- The antenna height is 0.8 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions



Final measurement:

--- Identified emissions during the pre measurement the software maximizes by rotating the turntable position (0°to 360°) and by rotating the elevation axes (0°to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1

GHz Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Pre measurement:

--- The turntable rotates from 0°to 315°using 45°steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 3 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.



Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18

GHz Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Pre measurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height scan range is 1 meter to 2.5 meter.
- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.



Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the pre measurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Pre measurement:

--- The antenna is moved spherical over the EUT in different polarisations of the antenna.

Final measurement:

--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.



TEST RESULTS

Above 1 GHz

GFSK

Test Mode: TX(CH Low)

Tested by: Fade Zhong

Ambient temperature: 24°C Relative humidity: 52% RH

Date: Jan 05,2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1751	46.82	-3.42	43.40	74	-30.60	V	peak
1974	42.60	-3.11	39.49	74	-34.51	V	peak
4804	46.02	1.31	47.33	74	-26.67	V	peak
7206	41.95	4.15	46.10	74	-27.90	V	peak
1592	46.89	-3.41	43.48	74	-30.52	H	Peak
1953	41.73	-3.12	38.61	74	-35.39	H	Peak
4804	48.07	1.31	49.38	74	-24.62	H	Peak
7206	43.00	4.15	47.15	74	-26.85	H	peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 3MHz, Sweep time = auto.
 - b. AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = auto.
5. Frequency (MHz). = Emission frequency in MHz
Reading (dBμV/m) = Uncorrected Analyzer / Receiver Reading
Correction Factor (dB) = Antenna factor + Cable loss – Amplifier gain
Limit (dBμV/m) = Limit stated in standard
Margin (dB) = Result (dBμV/m)- Limit (dBμV/m)
Peak =Peak Reading
AVG. =Average Reading
Remark = Mark Peak Reading or Average Reading

**Test Mode:** TX(CH Mid)**Tested by:** Fade Zhong**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** Jan 05,2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1233	45.17	-5.91	39.26	74	-34.74	V	peak
2077	41.09	-2.29	38.80	74	-35.20	V	peak
4884	44.88	1.33	46.21	74	-27.79	V	peak
7326	40.63	4.17	44.80	74	-29.20	V	peak
1267	42.92	-5.84	37.08	74	-36.92	H	peak
2191	41.17	-2.07	39.10	74	-34.90	H	peak
4884	44.19	1.33	45.52	74	-28.48	H	peak
7326	40.88	4.17	45.05	74	-28.95	H	peak

Remark:

- Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
- Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
- Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
- Spectrum setting:
 - Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 3MHz, Sweep time = auto.
 - AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = auto.
- | | |
|------------------------|--|
| Frequency (MHz). | = Emission frequency in MHz |
| Reading (dBμV/m) | = Uncorrected Analyzer / Receiver Reading |
| Correction Factor (dB) | = Antenna factor + Cable loss – Amplifier gain |
| Limit (dBμV/m) | = Limit stated in standard |
| Margin (dB) | = Result (dBμV/m)- Limit (dBμV/m) |
| Peak | =Peak Reading |
| AVG. | =Average Reading |
| Remark | = Mark Peak Reading or Average Reading |

**Test Mode:** TX(CH High)**Tested by:** Fade Zhong**Ambient temperature:** 24°C**Relative humidity:** 52% RH**Date:** Jan 05,2018

Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Pole (V/H)	Remark
1472	43.75	-4.85	38.90	74	-35.10	V	peak
2155	44.17	-2.14	42.03	74	-31.97	V	peak
4960	43.45	1.33	44.78	74	-29.22	V	peak
7440	43.46	4.17	47.63	74	-26.37	V	peak
1391	44.17	-5.62	38.55	74	-35.45	H	peak
1782	43.98	-3.49	40.49	74	-33.51	H	peak
4960	45.42	1.38	46.80	74	-27.20	H	peak
7440	42.91	4.25	47.16	74	-26.84	H	peak

Remark:

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
 - a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 3MHz, Sweep time = auto.
 - b. AV Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = auto.
5. Frequency (MHz). = Emission frequency in MHz
Reading (dBμV/m) = Uncorrected Analyzer / Receiver Reading
Correction Factor (dB) = Antenna factor + Cable loss – Amplifier gain
Limit (dBμV/m) = Limit stated in standard
Margin (dB) = Result (dBμV/m)- Limit (dBμV/m)
Peak =Peak Reading
AVG. =Average Reading
Remark = Mark Peak Reading or Average Reading