



REPORT No.: SZ18090293E01

TEST REPORT

APPLICANT : Glory Horse Industries Limited
PRODUCT NAME : BT Worksite Radio
MODEL NAME : R 12-18 BT
BRAND NAME : METABO
FCC ID : 2ABL5WSR1701R1218BT
STANDARD(S) : 47 CFR Part 15 Subpart B
TEST DATE : 2018-11-01 to 2018-11-05
ISSUE DATE : 2018-11-12

Tested by:

Wu Zhongwen

Wu Zhongwen (Test Engineer)

Approved by:

Andy Yeh

Andy Yeh (Technical Director)

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MORLAB

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Change History		
Issue	Date	Reason for change
1.0	2018-11-12	First edition



1. Technical Information

Note: Provide by applicant

1.1. Applicant and Manufacturer Information

Applicant:	Glory Horse Industries Limited
Applicant Address:	No.8,4/F, World-Wide IND Centre, 43-47 Shan Mei ST., Fotan Shatin,NT,HKG,Hong Kong
Manufacturer:	Glory Horse Industries Limited
Manufacturer Address:	No.8,4/F, World-Wide IND Centre, 43-47 Shan Mei ST., Fotan Shatin,NT,HKG,Hong Kong

1.2. Equipment Under Test (EUT) Description

EUT Type:	BT Worksite Radio	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	V01	
Software Version:	U24	
Frequency Range:	Bluetooth: 2402 MHz ~ 2480 MHz FM: 87.5 MHz ~ 108 MHz AM: 522 kHz ~ 1620 kHz	
Ancillary Equipment:	AC Adapter Brand Name: KINGWALL Model No.: AS190-180-BA080 Serial No.: (N/A, marked #1 by test site) Rated Input: ~ 100-240V, 50/60Hz,0.7A Rated Output: ==18V,0.8A	

Note:

1. For a more detailed description, please refer to specification or user's manual supplied by the applicant and/or manufacturer.



2. Test Results

2.1. Applied Reference Documents

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result
1	15.107	Conducted Emission	2018.11.05	Wu Zhongwen	PASS
2	15.109	Radiated Emission	2018.11.01	Wu Zhongwen	PASS

NOTE: The tests were performed according to the method of measurements prescribed in ANSI C63.4-2014.



2.2. EUT Setup and Operating Conditions

Test Item	
Radiated Emission	
Mode 1	: EUT + Battery (14.4V) + Adapter + Bluetooth Idle
Mode 2	: EUT + Battery (18V) + Adapter + Bluetooth Idle
Mode 3	: EUT + Battery (14.4V) + Adapter + Bluetooth Idle + FM
Mode 4	: EUT + Battery (18V) + Adapter + Bluetooth Idle + FM
Mode 5	: EUT + Battery (14.4V) + Adapter + Bluetooth Idle + AM
Mode 6	: EUT + Battery (18V) + Adapter + Bluetooth Idle + AM
Conducted Emission	
Mode 1	: EUT + Battery (14.4V) + Adapter + Bluetooth Idle
Mode 2	: EUT + Battery (18V) + Adapter + Bluetooth Idle
Mode 3	: EUT + Battery (14.4V) + Adapter + Bluetooth Idle + FM
Mode 4	: EUT + Battery (18V) + Adapter + Bluetooth Idle + FM
Mode 5	: EUT + Battery (14.4V) + Adapter + Bluetooth Idle + AM
Mode 6	: EUT + Battery (18V) + Adapter + Bluetooth Idle + AM
Remark:	
The above test mode in boldface was the worst cases of conducted emission, radiated emission tests; only the test data of the mode was reported.	

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 - 60
Atmospheric Pressure (kPa):	86 - 106

3. 47 CFR Part 15B Requirements

3.1. Conducted Emission

3.1.1. Requirement

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

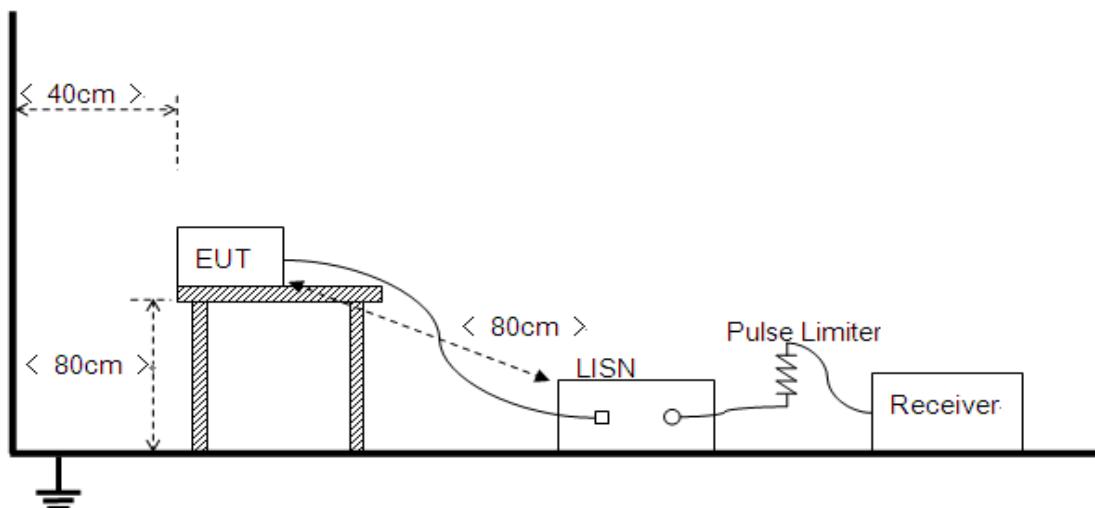
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- a) The limit subjects to the Class B digital device.
- b) The lower limit shall apply at the band edges.
- c) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.1.2. Test Setup

Please refer to Annex A for the photographs of the Test Configuration.



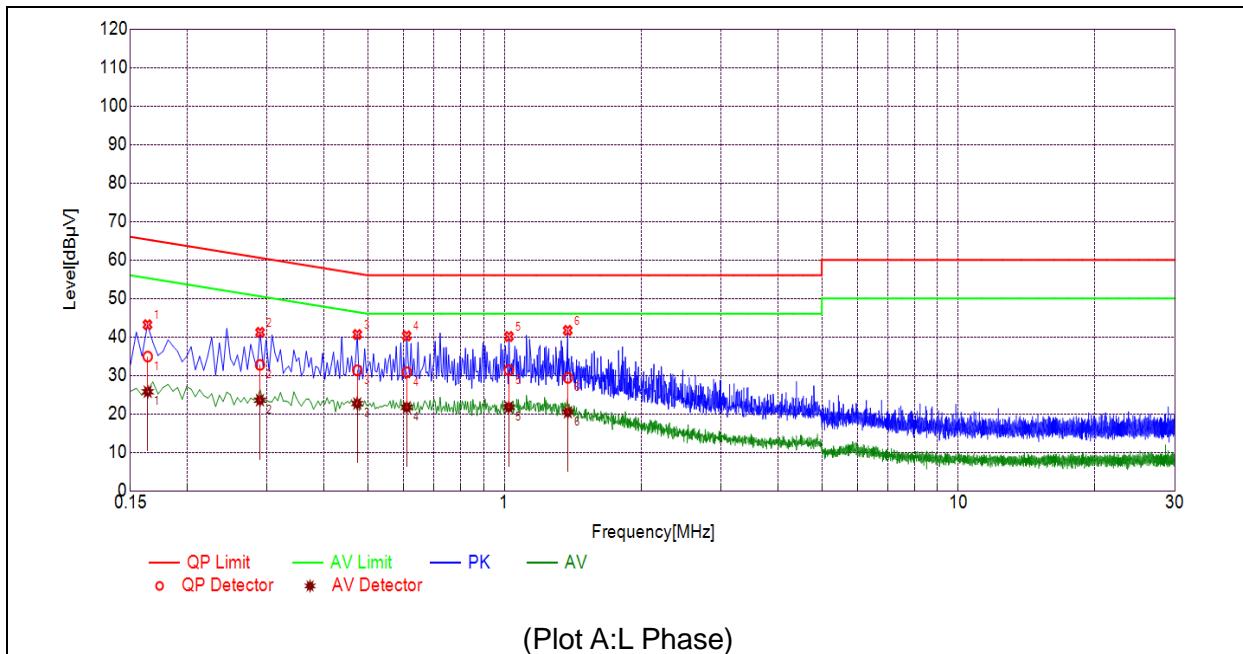


The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides $50\Omega/50\mu\text{H}$ of coupling impedance for the measuring instrument. A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

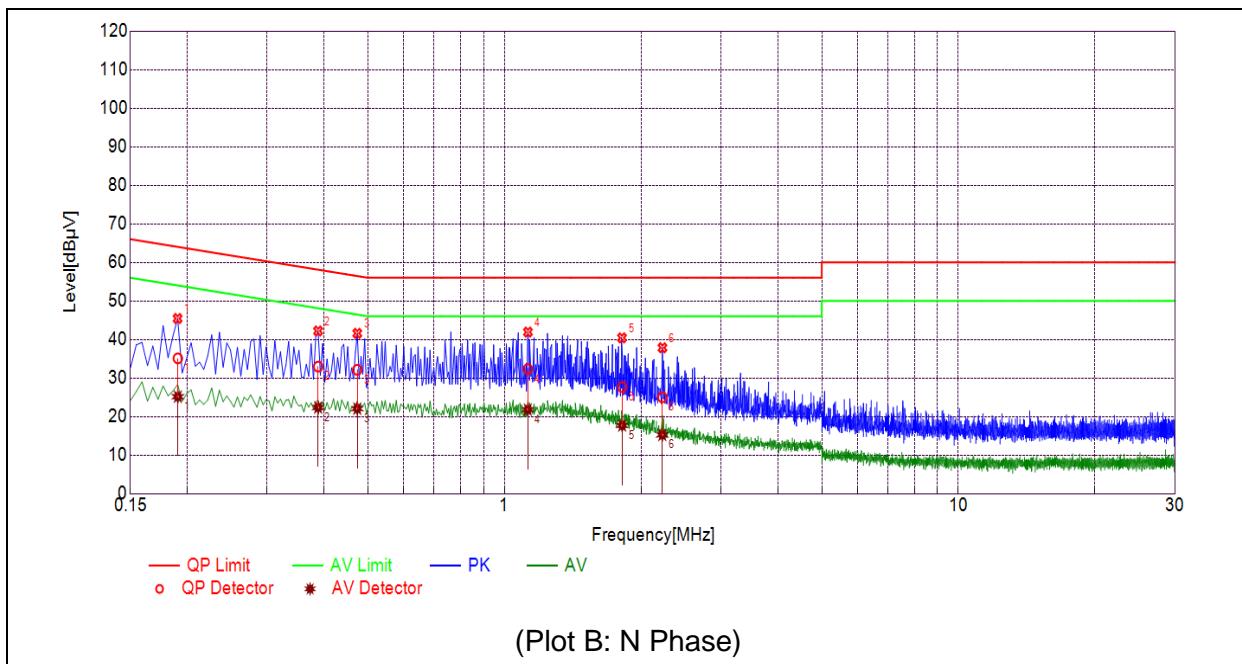
The power strip or extension cord has been investigated to make sure that the LISN integrity is maintained with respect to the impedance characteristics as prescribed in ANSI C63.4-2014 at Clause 4.3.

3.1.3. Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

A. Test Plot and Suspicious Points:


NO.	Fre. (MHz)	Emission Level (dB μ V)		Limit (dB μ V)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1637	34.89	25.75	65.28	55.28	Line	PASS
2	0.2893	32.72	23.56	60.54	50.54		PASS
3	0.4739	31.31	22.69	56.45	46.45		PASS
4	0.6093	30.81	21.69	56.00	46.00		PASS
5	1.0223	31.36	21.72	56.00	46.00		PASS
6	1.3793	29.36	20.42	56.00	46.00		PASS



NO.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1907	35.10	25.15	64.01	54.01	Neutral	PASS
2	0.3886	32.96	22.34	58.09	48.09		PASS
3	0.4739	32.13	22.04	56.45	46.45		PASS
4	1.1257	32.34	21.79	56.00	46.00		PASS
5	1.8167	27.66	17.68	56.00	46.00		PASS
6	2.2268	25.01	15.24	56.00	46.00		PASS



3.2. Radiated Disturbance

3.2.1. Requirement

According to FCC section 15.109 (a), the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength Limitation at 3m Measurement Dist	
	(μ V/m)	(dB μ V/m)
30.0 - 88.0	100	20log 100
88.0 - 216.0	150	20log 150
216.0 - 960.0	200	20log 200
Above 960.0	500	20log 500

As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

Note:

- 1) The tighter limit shall apply at the boundary between two frequency range.
- 2) Limitation expressed in dB μ V/m is calculated by 20log Emission Level(μ V/m).

3.2.2. Frequency range of measurement

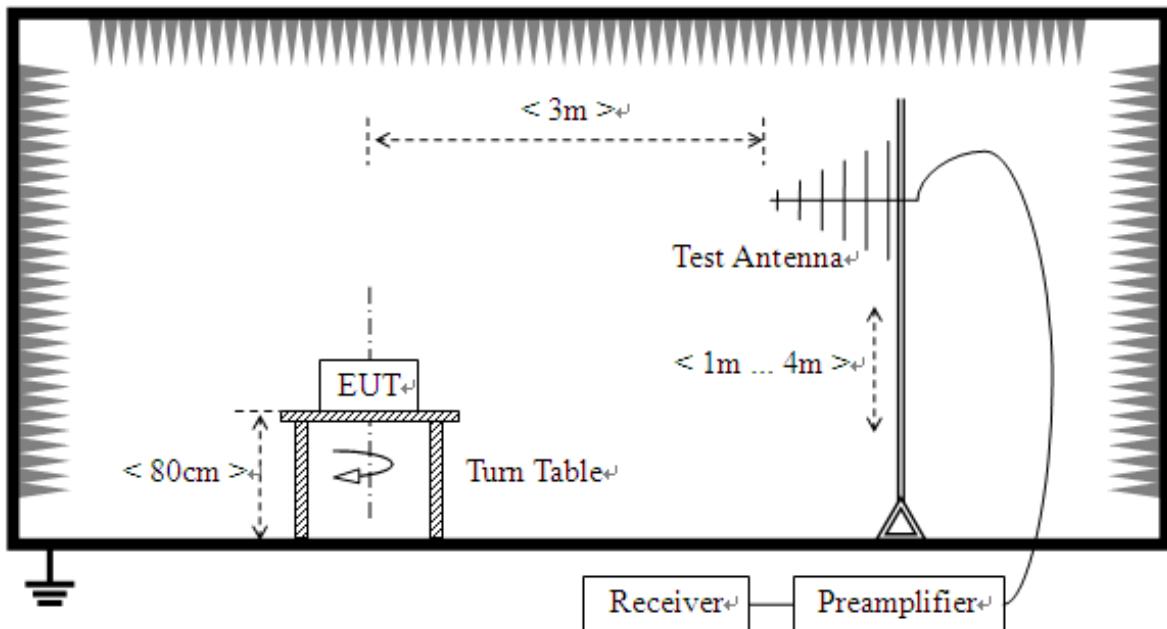
According to 15.33(b)(1), the frequency range of radiated measurement for the EUT is listed in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705–108	1000.
108–500	2000.
500–1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

The highest frequency of the internal sources of the EUT is less than 108MHz, the measurement shall only be made up to 1G.

3.2.3. Test Setup

- 1) For radiated emissions from 30MHz to 1GHz



The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) is used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

3.2.4. Test Result

The maximum radiated emission is searched using PK, QP detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

The amplitude of emissions which (6GHz-12.5GHz) are attenuated more than 20 dB below the



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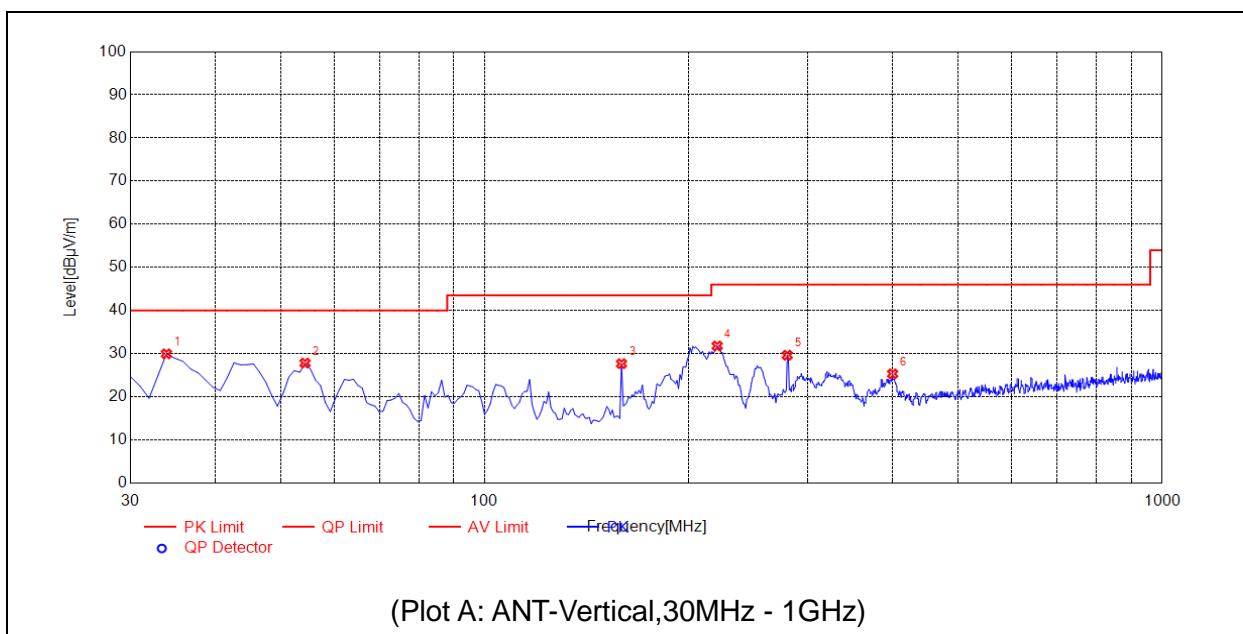
permissible value need not be reported.

Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.

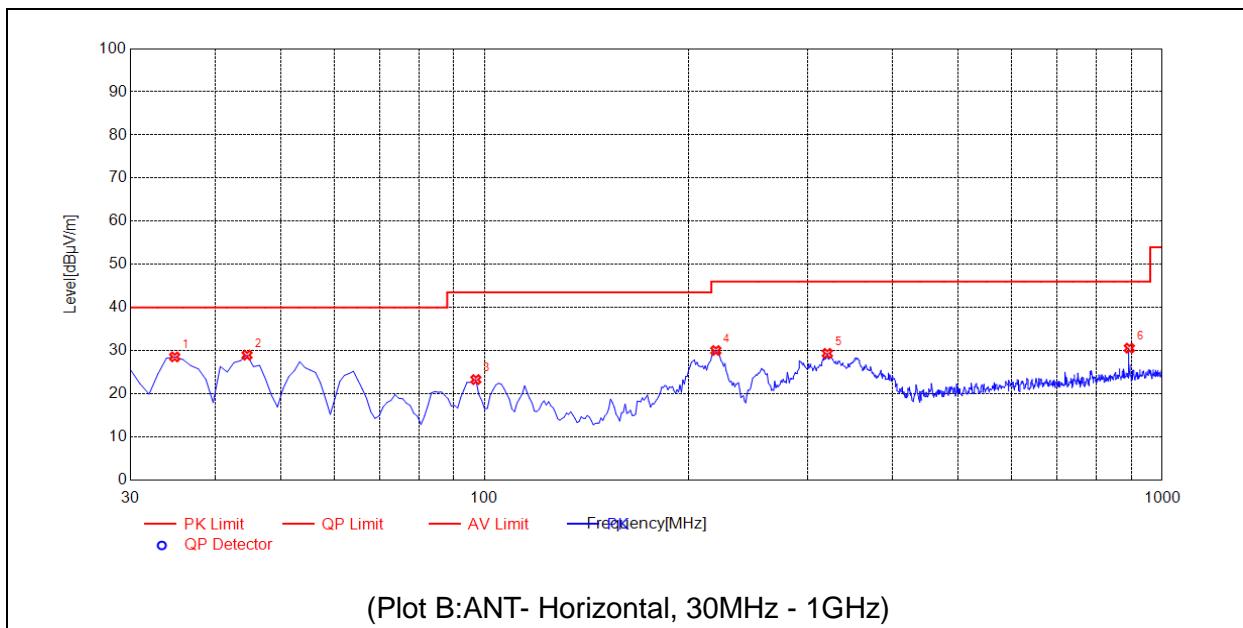
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No.	Fre. MHz	Pk dB μ V/m	QP dB μ V/m	AV dB μ V/m	Limit-PK dB μ V/m	Limit-QP dB μ V/m	Limit-AV dB μ V/m	ANT	Verdict
1	33.8839	29.97	N.A.	N.A.	N.A.	40.00	N.A.	V	PASS
2	54.2743	27.83	N.A.	N.A.	N.A.	40.00	N.A.	V	PASS
3	159.1391	27.69	N.A.	N.A.	N.A.	43.50	N.A.	V	PASS
4	220.3103	31.80	N.A.	N.A.	N.A.	46.00	N.A.	V	PASS
5	279.5395	29.66	N.A.	N.A.	N.A.	46.00	N.A.	V	PASS
6	399.9399	25.34	N.A.	N.A.	N.A.	46.00	N.A.	V	PASS



No.	Fre. MHz	Pk dB μ V/m	QP dB μ V/m	AV dB μ V/m	Limit-PK dB μ V/m	Limit-QP dB μ V/m	Limit-AV dB μ V/m	ANT	Verdict
1	34.8549	28.57	N.A.	N.A.	N.A.	40.00	N.A.	H	PASS
2	44.5646	28.98	N.A.	N.A.	N.A.	40.00	N.A.	H	PASS
3	96.9970	23.30	N.A.	N.A.	N.A.	43.50	N.A.	H	PASS
4	219.3393	30.04	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
5	320.3203	29.39	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
6	894.1642	30.59	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS

Annex A Photographs of Test Setup

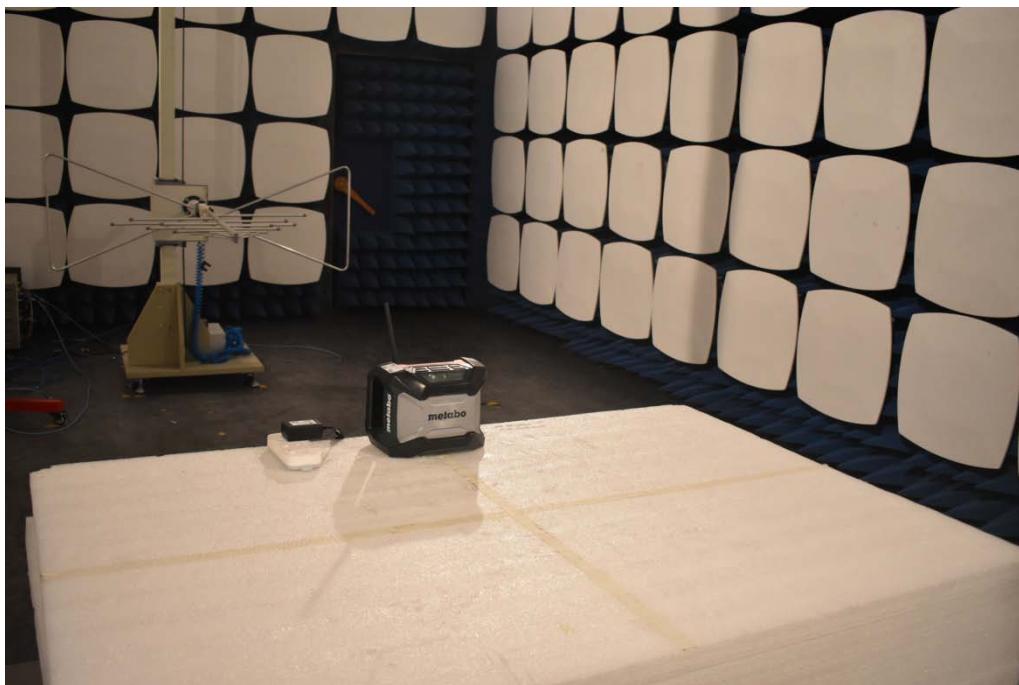
1. Mains Terminal Disturbance Voltage Measurement



2. Conducted emission main's port side view



3. Radiated Field Strength Measurement(30MHz-1GHz)



4. Radiated Field Strength Measurement(above 1GHz)





Annex B Test Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission Measurement

Measuring Uncertainty for a Level of Confidence of 95%(U=2U _c (y))	9kHz-150kHz	±4.1 dB
	150kHz-30MHz	±3.7dB

Uncertainty of Radiated Emission Measurement

Measuring Uncertainty for a Level of Confidence of 95%(U=2U _c (y))	30MHz-200MHz	±5.06dB
	200MHz-1000MHz	±5.24dB
	1GHz-6GHz	±5.18dB
	6GHz-18GHz	±5.48dB



Annex C Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Department:	Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Responsible Test Lab Manager:	Mr. Su Feng
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Accreditation Certificate

Accredited Testing Laboratory:	The FCC designation number is CN1192 Test firm registration number is 226174.. (Shenzhen Morlab Communications Technology Co., Ltd.)
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4. Test Software Utilized

Model	Version Number	Producer
JS32-RE	Version 2.0.2.0	Tonscend
TS+ -[JS32-CE]	Version2.5.0.0	Tonscend



5. Test Equipments Utilized

Description	Manufacturer	Model	Serial No.	Cal. Date	Due. Date
MXE EMI Receiver	Agilent	N9038A	MY54130016	2018.08.04	2019.08.03
Test Receiver	R&S	ESPI	101052	2018.08.04	2019.08.03
LISN	Schwarzbeck	NSLK 8127	812744	2018.05.08	2019.05.07
Pulse Limiter (20dB)	VTSD	9561D	9537	2018.05.08	2019.05.07
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-519	2018.05.08	2019.05.07
Radiated Disturbance Preamplifier	rflight	S020180L3 203	61171/61172	2018.07.12	2019.07.11
Radiated Disturbance Preamplifier	rflight	S10M100L 3802	46732	2018.07.12	2019.07.11
Semi-Anechoic Chamber	CRT	9m*6m*6m	N/A	2017.01.12	2020.01.11

— END OF REPORT —