



TEST REPORT

APPLICANT : WeLink Communications LLC

PRODUCT NAME : Peraso 60 Ghz radio Module. Quetzal based

MODEL NAME : PER_200

BRAND NAME : WeLink Communications LLC

STANDARD(S) : 47 CFR Part 15 Subpart B

FCC ID : 2AYX4-PER200

RECEIPT DATE : 2021-03-03

TEST DATE : 2021-03-08 to 2021-03-10

ISSUE DATE : 2021-03-30

Edited by: He sinuo
He Sinuo(Rapporteur)

Approved by: Xiao Xiong
Xiao Xiong(Supervisor)

NOTE: This document is issued by MORLAB, the test report shall not be reproduced except in full without prior written permission of the company. The test results apply only to the particular sample(s) tested and to the specific tests carried out which is available on request for validation and information confirmed at our website.





DIRECTORY

- 1. Technical Information..... 3
 - 1.1. Applicant and Manufacturer Information..... 3
 - 1.2. Equipment Under Test (EUT) Description 3
- 2. Test Results 4
 - 2.1. Applied Reference Documents 4
 - 2.2. EUT Setup and Operating Conditions..... 5
- 3. 47 CFR Part 15B Requirements 6
 - 3.1. Conducted Emission 6
 - 3.2. Radiated Emission 10
- Annex A Test Uncertainty 17
- Annex B Testing Laboratory Information 18

Change History		
Version	Date	Reason for change
1.0	2021-03-30	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	WeLink Communications LLC
Applicant Address:	1881 W Traverse PKWY, Lehi UT, 84043
Manufacturer:	Shenzhen Jaguar Wave Technology LTD
Manufacturer Address:	Unit 1002/1003, Block 2A, Tongtai Times Center, No.6259 Baoan Road, Fuhai Street, Baoan District, Shenzhen City, P.R.China

1.2. Equipment Under Test (EUT) Description

Product Name:	Peraso 60 Ghz radio Module. Quetzal based
Serial No.:	(N/A, marked #1 by test site)
Hardware Version:	PER_200
Software Version:	3.5.3317092
Frequency Range:	802.11ad: 58.32GHz ~ 64.80GHz

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	Method Determination Remark
1	15.107	Conducted Emission	2021.03.10	Wu Runfeng	PASS	No deviation
2	15.109	Radiated Emission	2021.03.08	Yang Jie	PASS	No deviation

Note 1: The tests were performed according to the method of measurements prescribed in ANSI C63.4-2014.

Note 2: Additions to, deviation, or exclusions from the method shall be judged in the "method determination" column of add, deviate or exclude from the specific method shall be explained in the "Remark" of the above table.

Note 3: When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% risk level.



2.2. EUT Setup and Operating Conditions

Note: All of the following test modes are tested in all the test items.

Test Modes	
Mode 1	: EUT + PC Adapter + PC + Working + WIFI Link

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 50μH/50Ω line impedance stabilization network (LISN).

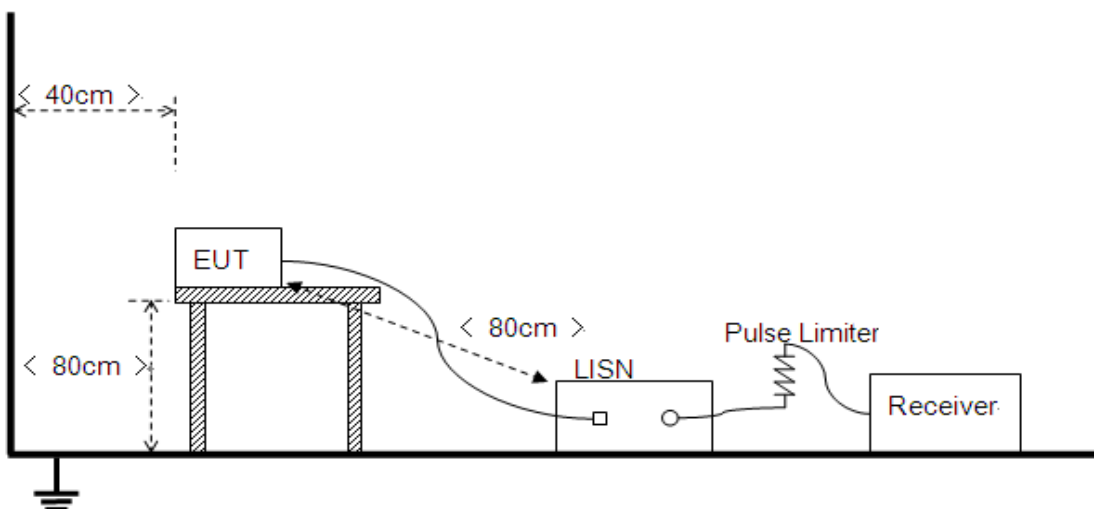
Frequency Range (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

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.





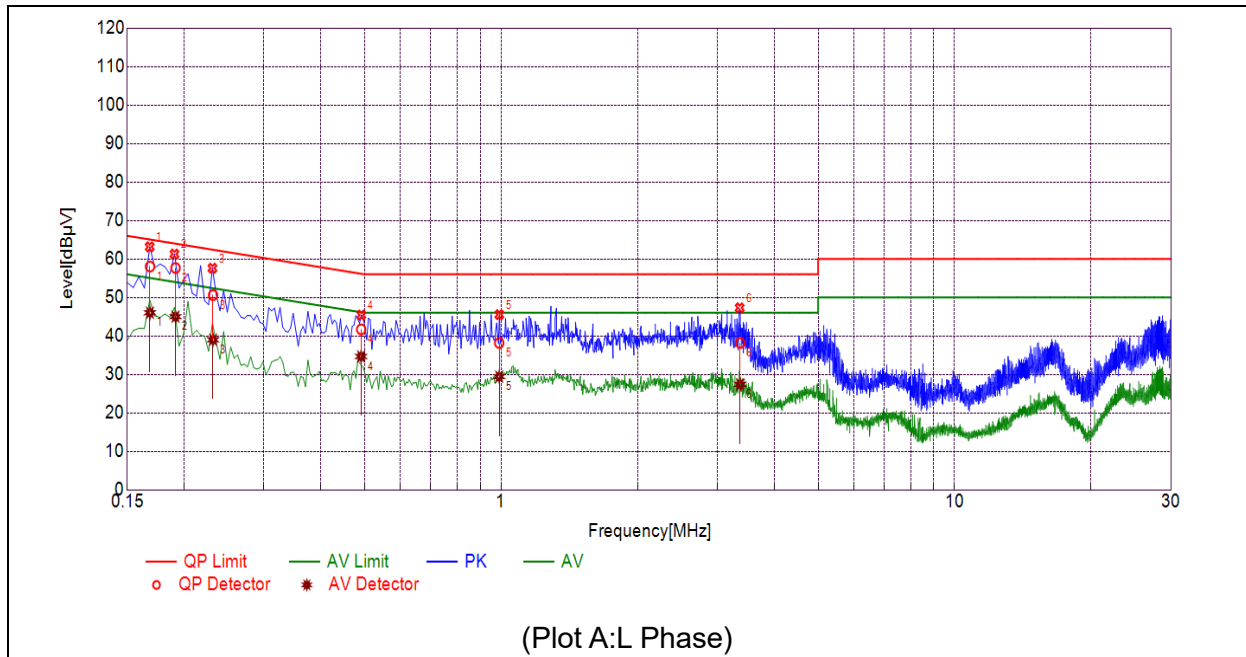
The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides $50\Omega/50\mu\text{H}$ of coupling impedance for the measuring instrument. A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

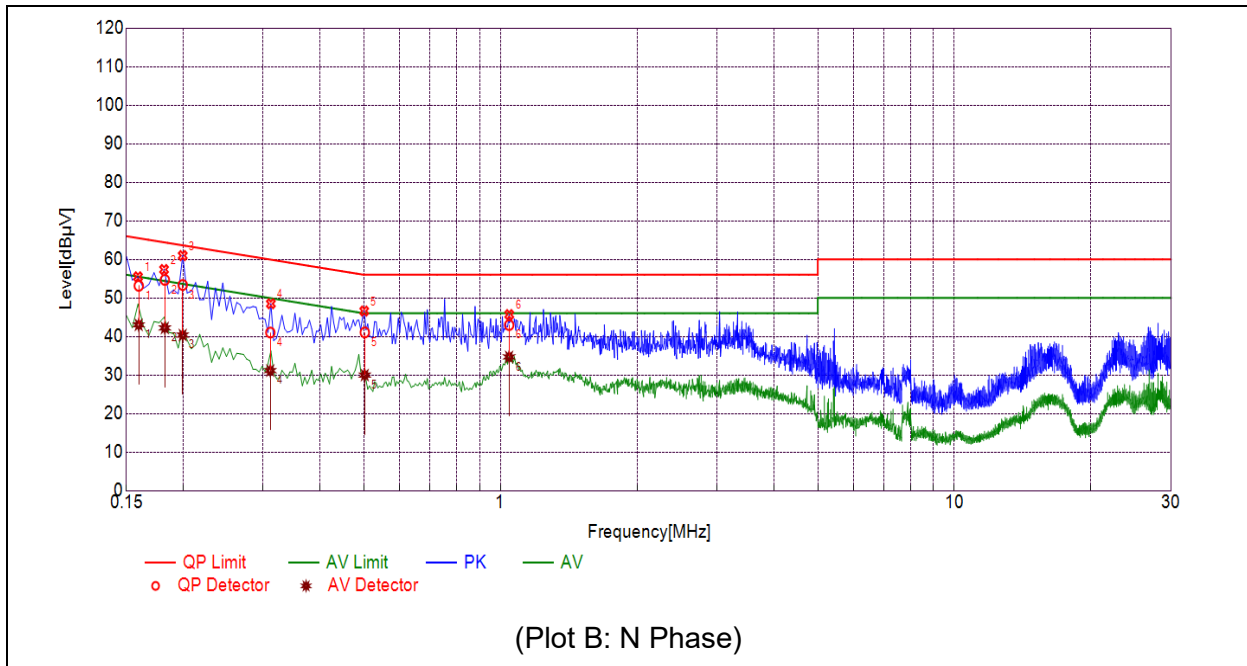
3.1.3. Test Result

Set RBW=9 kHz, VBW=30 kHz. 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 (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1682	58.03	46.02	65.05	55.05	Line	PASS
2	0.1915	57.64	45.00	63.97	53.97		PASS
3	0.2317	50.59	39.00	62.39	52.39		PASS
4	0.4913	41.70	34.65	56.15	46.15		PASS
5	0.9905	38.18	29.42	56.00	46.00		PASS
6	3.3666	38.17	27.39	56.00	46.00		PASS



NO.	Fre. (MHz)	Emission Level (dBμV)		Limit (dBμV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1596	53.14	43.01	65.48	55.48	Neutral	PASS
2	0.1822	54.68	42.21	64.38	54.38		PASS
3	0.1995	53.37	40.36	63.63	53.63		PASS
4	0.3111	41.01	31.14	59.94	49.94		PASS
5	0.5024	41.05	29.98	56.00	46.00		PASS
6	1.0447	42.95	34.69	56.00	46.00		PASS



3.2. Radiated Emission

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	
	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)
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 $\text{dB}\mu\text{V/m}$ is calculated by $20\log$ Emission Level($\mu\text{V/m}$).

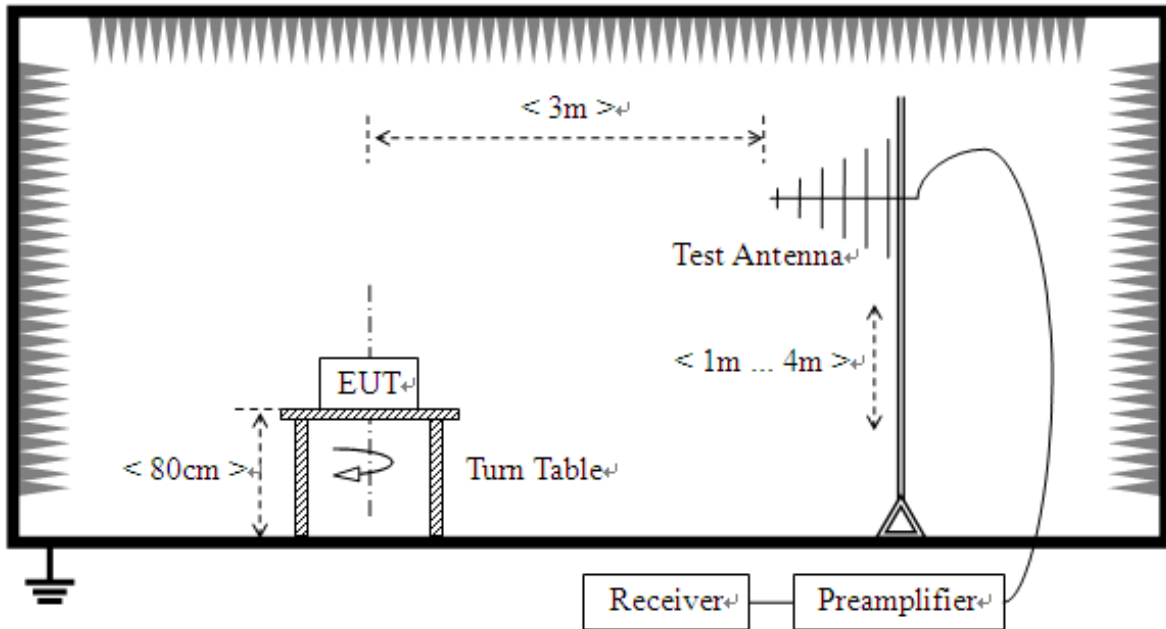
3.2.2. Frequency Range of Measurement

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

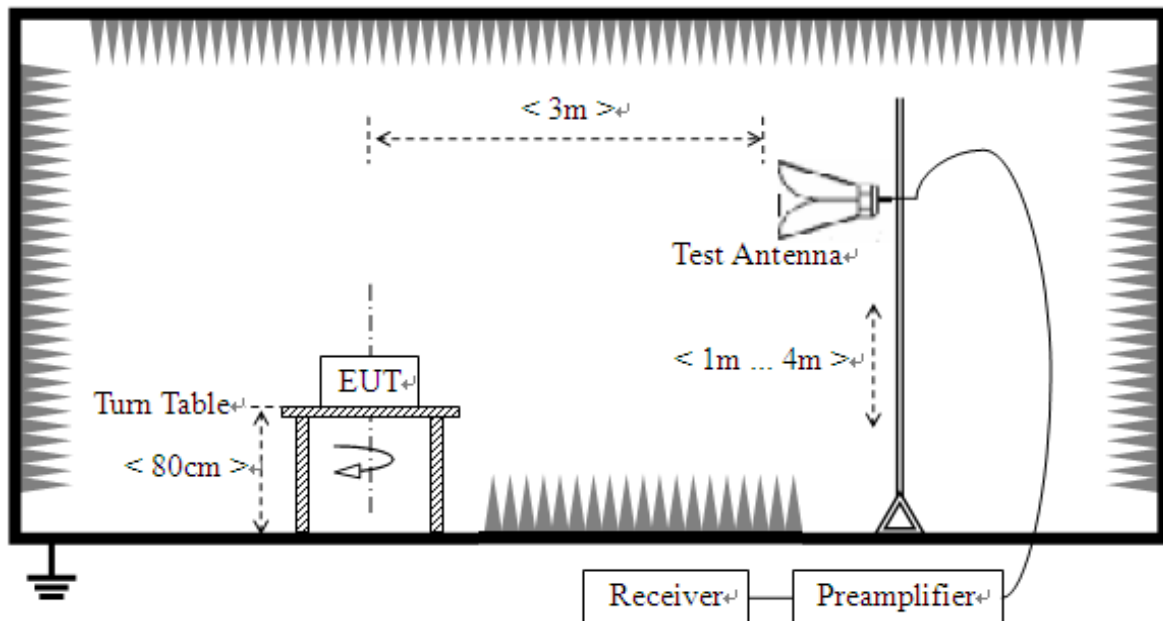
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705–108	1000.
108–500	2000.
500–1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

3.2.3. Test Setup

- 1) For radiated emissions from 30MHz to1GHz



- 2) For radiated emissions above 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) and Horn Test Antenna (above 1GHz) are 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.

For measurements below 1GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

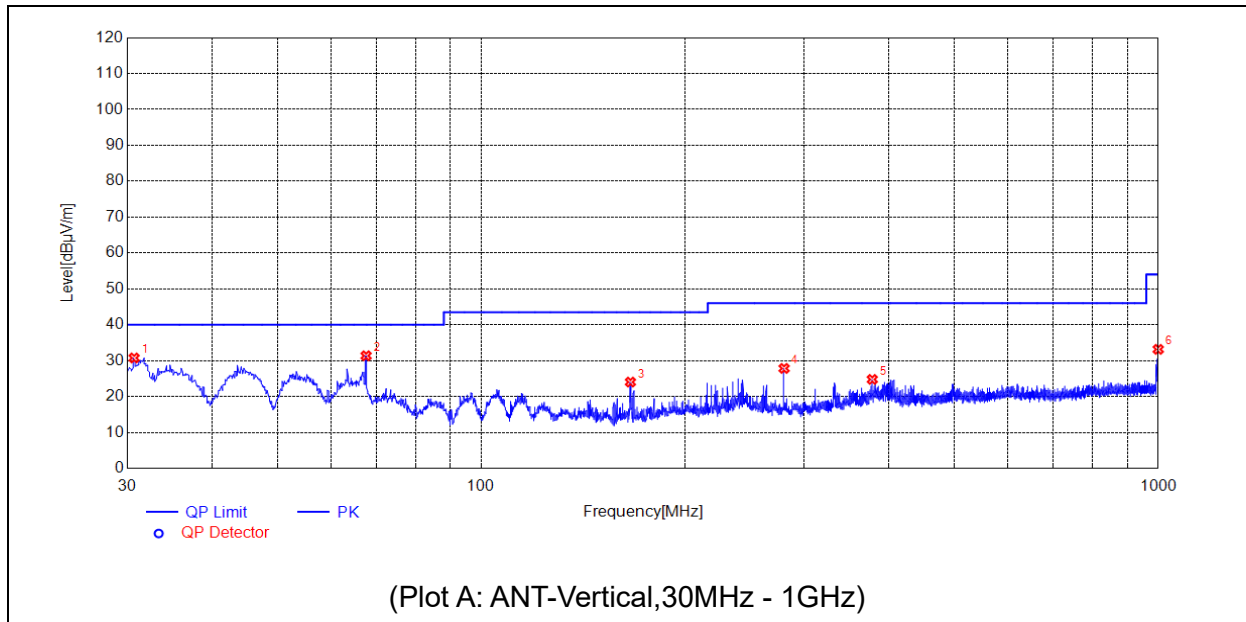
For measurements above 1GHz the resolution bandwidth is set to 1MHz, the video bandwidth is set to 3MHz for peak measurements and as applicable for average measurements.

3.2.4. Test Result

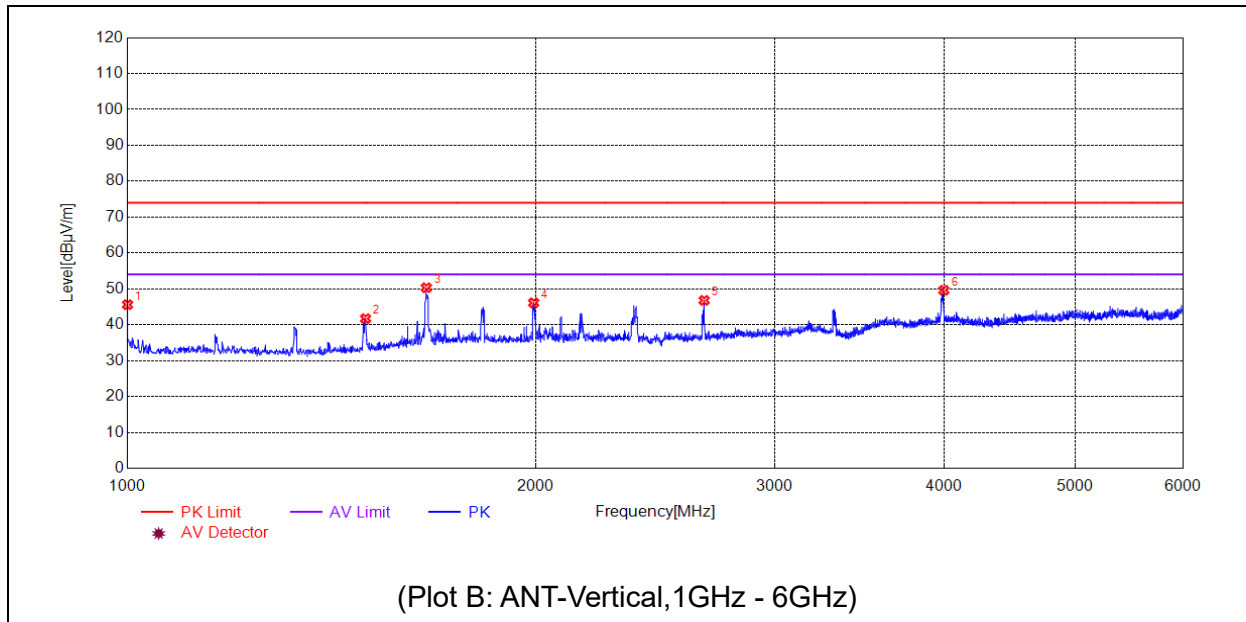
The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform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

The amplitude of emissions (6GHz-40GHz) which are attenuated more than 20 dB below the permissible value need not be reported.

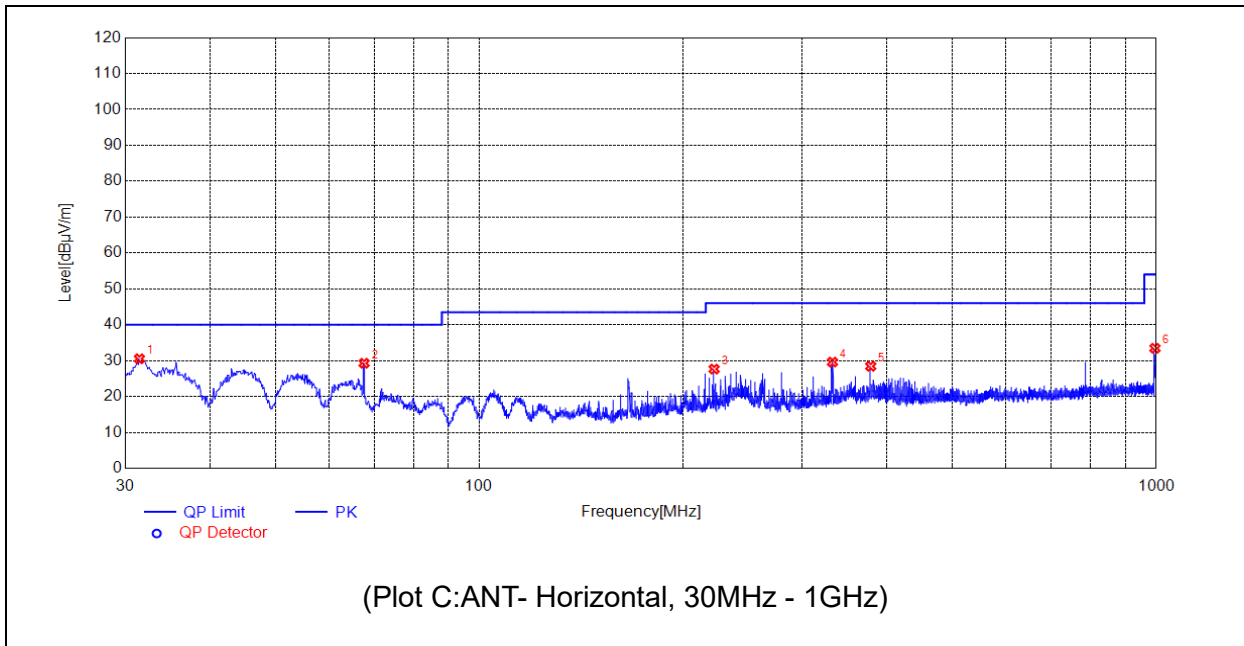
Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.



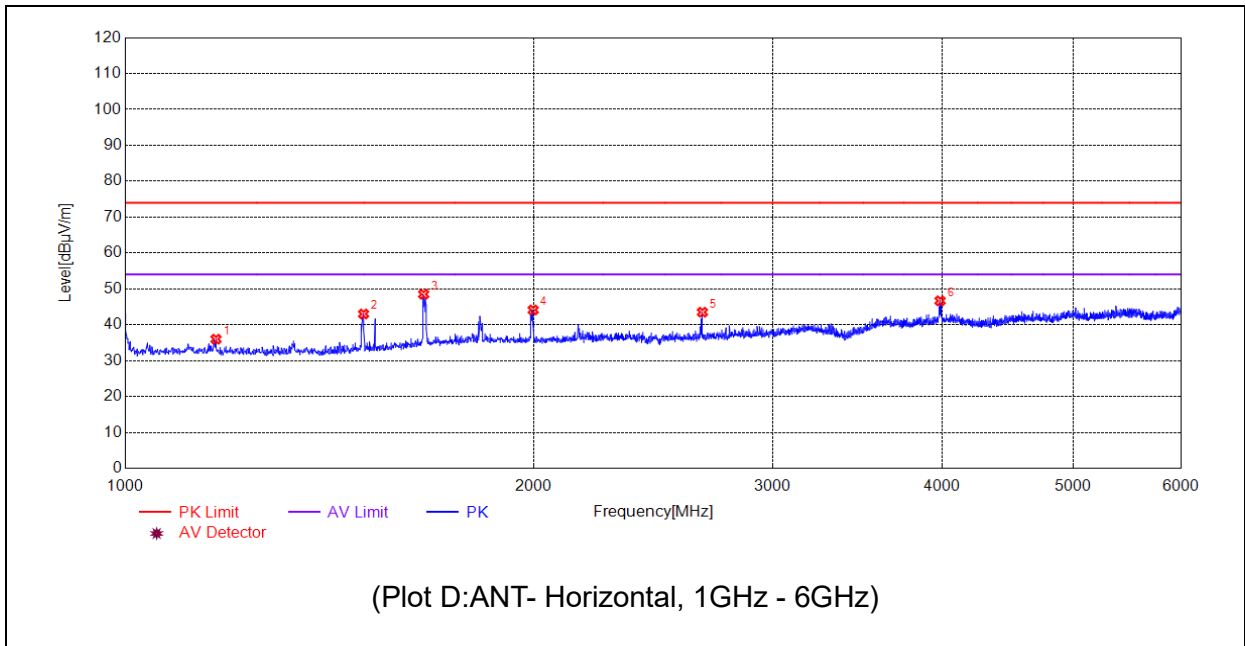
No.	Fre. MHz	PK dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	30.6791	30.75	N.A.	N.A.	N.A.	40.00	N.A.	V	PASS
2	67.5428	31.36	N.A.	N.A.	N.A.	40.00	N.A.	V	PASS
3	166.0076	24.03	N.A.	N.A.	N.A.	43.50	N.A.	V	PASS
4	279.9940	27.84	N.A.	N.A.	N.A.	46.00	N.A.	V	PASS
5	377.9738	24.77	N.A.	N.A.	N.A.	46.00	N.A.	V	PASS
6	999.8060	33.15	N.A.	N.A.	N.A.	54.00	N.A.	V	PASS



No.	Fre. MHz	PK dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	1000.0000	45.59	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
2	1498.0996	41.71	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
3	1661.1322	50.31	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
4	1993.1986	46.12	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
5	2662.3325	46.80	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
6	3999.5999	49.62	N.A.	N.A.	74.00	N.A.	54.00	V	PASS



No.	Fre. MHz	PK dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	31.4551	30.53	N.A.	N.A.	N.A.	40.00	N.A.	H	PASS
2	67.5428	29.29	N.A.	N.A.	N.A.	40.00	N.A.	H	PASS
3	222.1762	27.65	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
4	332.2822	29.61	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
5	378.5559	28.43	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
6	995.5376	33.45	N.A.	N.A.	N.A.	54.00	N.A.	H	PASS



No.	Fre. MHz	PK dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	1166.0332	35.98	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
2	1498.0996	43.01	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
3	1659.1318	48.50	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
4	1998.1996	44.12	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
5	2663.3327	43.50	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
6	3987.5975	46.67	N.A.	N.A.	74.00	N.A.	54.00	H	PASS



Annex A 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=2Uc(y))	9kHz-150kHz	±3.3dB
	150kHz-30MHz	±2.8dB

Uncertainty of Radiated Emission Measurement

Measuring Uncertainty for a Level of Confidence of 95%(U=2Uc(y))	30MHz-200MHz	±5.06dB
	200MHz-1000MHz	±5.04dB
	1GHz-6GHz	±5.18dB
	6GHz-18GHz	±5.48dB



Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

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

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	2020.07.21	2021.07.20
Test Receiver	R&S	ESPI	101052	2020.07.21	2021.07.20
LISN	Schwarzbeck	NSLK 8127	8127449	2020.03.26	2021.03.25
Pulse Limiter (10dB)	Schwarzbeck	VTSD 9561-F	VTSD 9561 F-B #206	2020.07.24	2021.07.23
Radiated Disturbance Preamplifier	rflight	S020180L3 203	61171/61172	2020.07.21	2021.07.20
Radiated Disturbance Preamplifier	rflight	S10M100L 3802	46732	2020.07.21	2021.07.20
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-519	2019.05.24	2022.05.23
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	01774	2019.07.26	2022.07.25
Test Antenna - Horn	Schwarzbeck	BBHA 9170	BBHA9170#773	2019.07.26	2022.07.25
Semi-Anechoic Chamber	CRT	9m*6m*6m	N/A	2020.01.06	2023.01.05

6. Ancillary Equipment Utilized

Description	Manufacturer	Model	Serial No.
PC	Made in China	Vostro 5370	N/A
PC adapter	Lite-On Technology Co., Ltd.	LA45NM140	N/A

————— END OF REPORT —————