TEST REPORT

Report No.:	8233EU011218E
Applicant:	Shenzhen HTL Electronics Co., Ltd
Address:	1Rd No.3 Building A 4/F Bantian, Shangxue Science Park, Longgang District Shenzhen, China
Product Name:	Portable all-band radio
Model No.:	F20 (refer to clause 2.4)
Trademark:	N/A
FCC ID:	2ARW6-F20
Test Standard(s):	47 CFR FCC Part 15 Subpart B
Test Method(s):	ANSI C63.4-2014
Date of Receipt:	Sep. 13, 2024
Test Date:	Sep. 13, 2024 – Sep. 18, 2024
Date of Issue:	Oct. 12, 2024

ISSUED BY:

SHENZHEN EU TESTING LABORATORY LIMITED

SHENZHEN EU TESTING LABORATORY LIMITED APPROVED

Prepared by:	**Reviewed and Approved by:**
Mikey Zhu/ Engineer	Sally Zhang/ Manager

Revision Record

Report Version	Issued Date	Description	Status
V0	Oct. 12, 2024	Original	Valid

Address: 101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Subdistrict, Baoan District, Shenzhen, Guangdong, China

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2 General Information

2.1 Applicant Information

Applicant	Shenzhen HTL Electronics Co., Ltd
Address	1Rd No.3 Building A 4/F Bantian, Shangxue Science Park,Longgang District Shenzhen, China

2.2 Manufacturer Information

Manufacturer	Shenzhen HTL Electronics Co., Ltd
Address	1Rd No.3 Building A 4/F Bantian, Shangxue Science Park,Longgang District Shenzhen, China

2.3 Factory Information

Factory	Shenzhen HTL Electronics Co., Ltd
Address	1Rd No.3 Building A 4/F Bantian, Shangxue Science Park,Longgang District Shenzhen, China

2.4 General Description of E.U.T.

Product Name	Portable all-band radio
Model No. Under Test	F20
List Model No.	F21, F22
Description of Model differentiation	All models are same with electrical parameters and internal circuit structure, but only differ in appearance colors and model name. (this information provided by the customer)
Rating(s)	Input: 5VDC, 2A, 10W Output: 5VDC, 2A Battery: 3.7VDC 10000mAh, 37Wh
Test Sample No.	-1/1(Normal Sample)
Hardware Version	N/A
Software Version	N/A
Remark	For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

2.5 Technical Information of E.U.T.

Technology Used	N/A

The requirement for the following technical information of the EUT was tested in this report:

The Highest Speed of Processor	N/A

3 Test Summary

3.1 Test Standard

The tests were performed according to following standards:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart B	Unintentional Radiators
2	ANSI C63.4-2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Remark:
Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the emission/immunity should be checked to ensure compliance has been maintained.

3.2 Test Verdict

No.	**Test Items**	**FCC Rule**	**Verdict**
1	Conducted Emission (Power Line)	15.107	PASS
2	Radiated Emission	15.109	PASS
Note: (1) “N/A” denotes test is not applicable in this Test Report.			

3.3 Test Laboratory

Test Laboratory	Shenzhen EU Testing Laboratory Limited
Address	101, Building B1, Fuqiao Fourth Area, Qiaotou Community, Fuhai Substrict, Baoan District, Shenzhen, Guangdong, China
Designation Number	CN1368
Test Firm Registration Number	952583

4 Test Configuration

4.1 Test Environment

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

Relative Humidity	30% to 60%	
Atmospheric Pressure	86 kPa to 106 kPa	
Temperature	NT (Normal Temperature)	+15℃ to +35℃
Working Voltage of the EUT	NV (Normal Voltage)	120VAC, 60Hz for adapter 3.7VDC battery inside

4.2 Test Equipment

Conducted Emission Test					
Equipment	**Manufacturer**	**Model No**	**Serial No**	**Cal Date**	**Cal Due Date**
L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	EE-004	2024/01/09	2025/01/08
EMI Test Receiver	Rohde & Schwarz	ESCI	EE-005	2024/01/09	2025/01/08
Test Software	Farad	EZ-EMC	EE-014	N.C.R	N.C.R

Radiated Emission Test					
Equipment	**Manufacturer**	**Model No**	**Serial No**	**Cal Date**	**Cal Due Date**
EMI Test Receiver	ROHDE & SCHWARZ	ESPI	EE-006	2024/01/09	2025/01/08
Bilog Broadband Antenna	SCHWARZBECK	VULB 9163	EE-007	2023/01/14	2026/01/13
Double Ridged Horn Antenna	A-INFOMW	LB-10180-NF	EE-008	2023/01/12	2026/01/11
Pre-amplifier	Agilent	8447D	EE-009	2024/01/09	2025/01/08
Pre-amplifier	Agilent	8449B	EE-010	2024/01/09	2025/01/08
MXA Signal Analyzer	Agilent	N9020A	EE-011	2024/01/09	2025/01/08
MXG RF Vector Signal Generator	Agilent	N5182A	EE-012	2024/01/09	2025/01/08
Test Software	Farad	EZ-EMC	EE-015	N.C.R	N.C.R

4.3 Description of Support Unit

No.	Title	Manufacturer	Model No.	Serial No.
1	Adapter	MI	A232-050200U-CN2	EMC-PJ-004

4.4 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned bellow was evaluated respectively.

No.	Test Modes	Description
TM1	Charging+Working mode	Keep the EUT in Charging+Working mode

4.5 Measurement Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2.
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test Item	Measurement Uncertainty
Radiated Emission (30MHz- 1GHz)	Ur = 2.70 dB (Horizontal)
	Ur = 2.70 dB (Vertical)
Radiated Emission (1GHz- 18GHz)	Ur = 3.50 dB (Horizontal)
	Ur = 3.50 dB (Vertical)
Radiated Emission (18GHz- 40GHz)	Ur = 5.15 dB (Horizontal)
	Ur = 5.24 dB (Vertical)
Conducted Emission	Uc = 2.50 dB

5 Emission Test

5.1 Conducted Emission at AC Power Line

5.1.1 Test Requirement

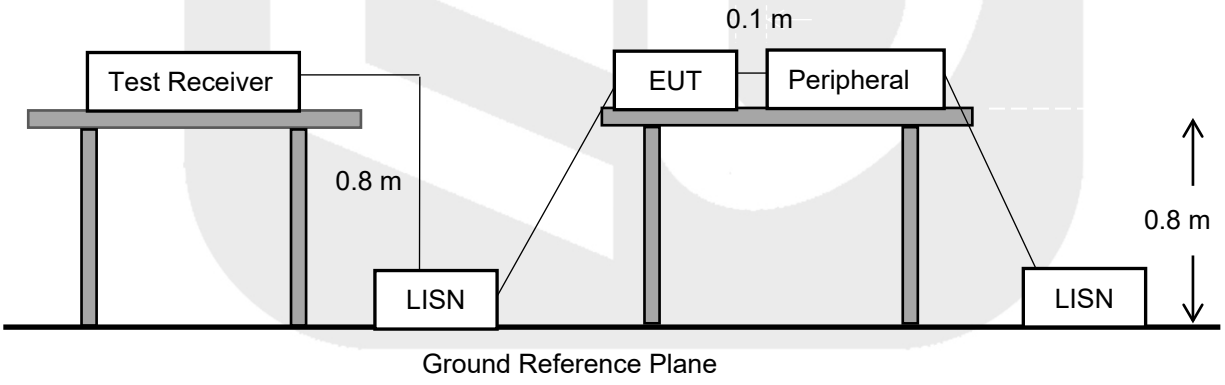
Test Limit

Frequency of emission (MHz)	Class A	
	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.50	79	66
0.50 - 30	73	60

Frequency of emission (MHz)	Class B	
	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

Note:
1) The lower limit shall apply at the transition frequency.
2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2 Test Setup Diagram



5.1.3 Test Procedure

The EUT is put on the plane 0.8 m high above the ground by insulating support and connected to the AC mains through Line Impedance Stability Network (L.I.S.N). This provided a 50ohm coupling impedance for the tested equipment. Both sides of AC line are investigated to find out the maximum conducted emission according to the test standard regulations during conducted emission measurement.
The bandwidth of the field strength meter (R&S Test Receiver ESCI) is set at 9kHz in 150kHz~30MHz.
The maximum conducted interference is searched using Peak (PK), if 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. Refer to recorded points and plots below.
Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal

120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

5.1.4 Test Data

PASS.

The test curves are shown in the following pages.

Only the worst case data was showed in the report, please to see the following pages.

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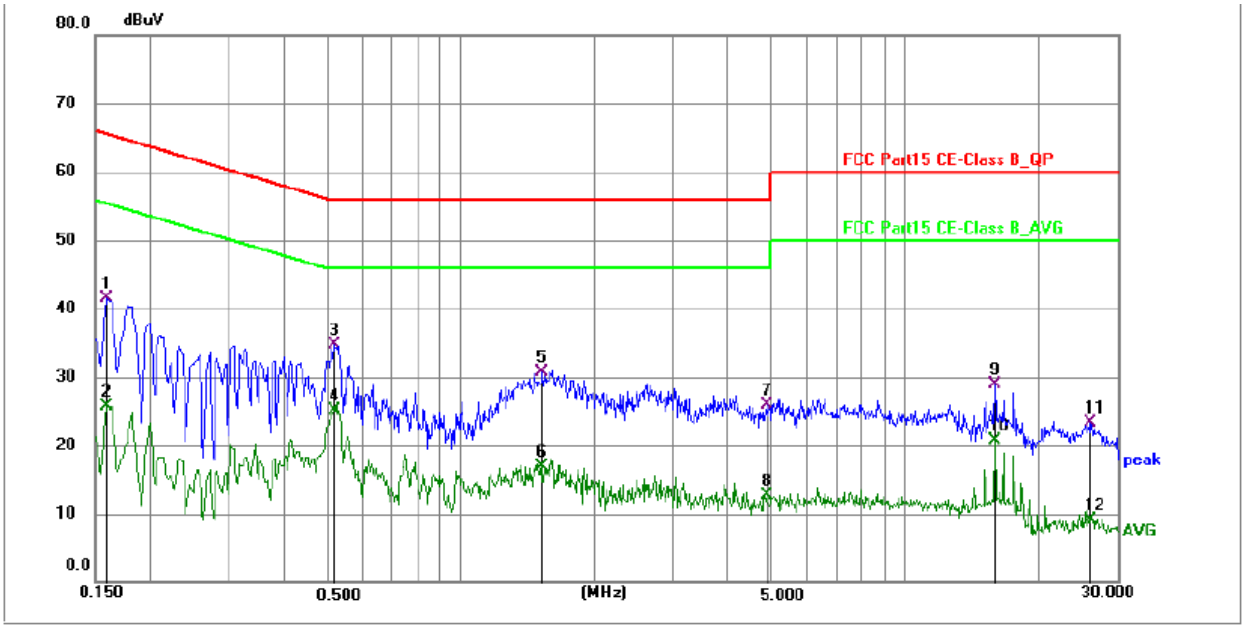
Conducted Emission Test Data

Test Site:	#1 Shielded Room
Test Mode:	TM1
Comments:	Live Line

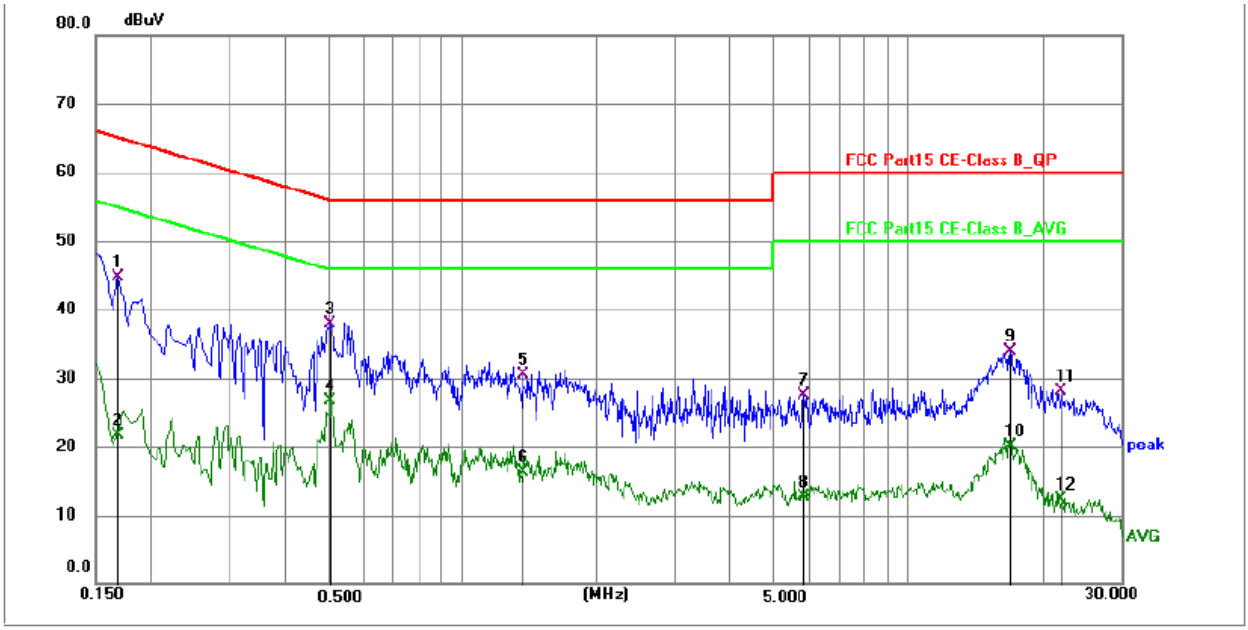


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1590	31.45	9.96	41.41	65.52	-24.11	QP	P	
2	0.1590	15.84	9.96	25.80	55.52	-29.72	AVG	P	
3	0.5190	24.58	10.04	34.62	56.00	-21.38	QP	P	
4 *	0.5190	15.10	10.04	25.14	46.00	-20.86	AVG	P	
5	1.5225	20.65	10.03	30.68	56.00	-25.32	QP	P	
6	1.5225	6.91	10.03	16.94	46.00	-29.06	AVG	P	
7	4.8570	15.82	10.04	25.86	56.00	-30.14	QP	P	
8	4.8570	2.68	10.04	12.72	46.00	-33.28	AVG	P	
9	15.8550	18.97	9.99	28.96	60.00	-31.04	QP	P	
10	15.8550	10.79	9.99	20.78	50.00	-29.22	AVG	P	
11	26.0205	13.09	10.20	23.29	60.00	-36.71	QP	P	
12	26.0205	-1.01	10.20	9.19	50.00	-40.81	AVG	P	

Note: Level = Reading + Factor Margin = Level - Limit

Conducted Emission Test Data

Test Site:	#1 Shielded Room
Test Mode:	TM1
Comments:	Neutral Line



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F	Remark
1	0.1680	34.69	9.98	44.67	65.06	-20.39	QP	P	
2	0.1680	11.74	9.98	21.72	55.06	-33.34	AVG	P	
3 *	0.5055	27.90	10.07	37.97	56.00	-18.03	QP	P	
4	0.5055	16.61	10.07	26.68	46.00	-19.32	AVG	P	
5	1.3605	20.51	10.06	30.57	56.00	-25.43	QP	P	
6	1.3605	6.21	10.06	16.27	46.00	-29.73	AVG	P	
7	5.8290	17.50	10.04	27.54	60.00	-32.46	QP	P	
8	5.8290	2.70	10.04	12.74	50.00	-37.26	AVG	P	
9	16.8810	23.84	10.02	33.86	60.00	-26.14	QP	P	
10	16.8810	10.02	10.02	20.04	50.00	-29.96	AVG	P	
11	22.0605	17.98	10.11	28.09	60.00	-31.91	QP	P	
12	22.0605	2.24	10.11	12.35	50.00	-37.65	AVG	P	

Note: Level = Reading + Factor Margin = Level - Limit

5.2 Radiated Emission Test

5.2.1 Test Requirement

Test Limit

Frequency (MHz)	Class A	
	Distance (Meters)	Field Strength (dBμV/m)
30 - 88	3	39
88 - 216	3	43.5
216 - 960	3	46.5
Above 960	3	49.5

Frequency (MHz)	Class B	
	Distance (Meters)	Field Strength (dBμV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note:
1) Field Strength (dBμV/m) = 20*log [Field Strength (μV/m)].
2) The lower limit shall apply at the transition frequency.

5.2.2 Test Setup Diagram

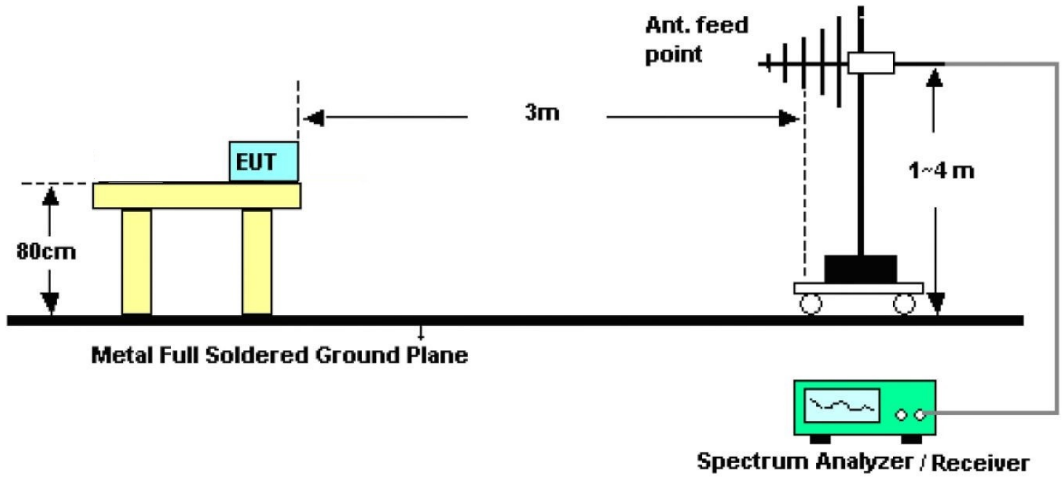


Figure 1. 30MHz to 1GHz

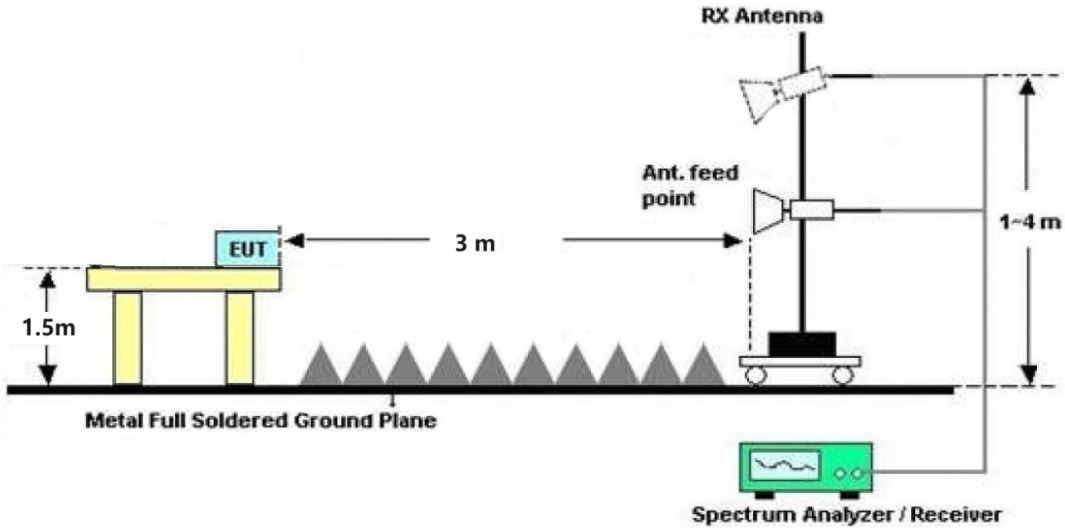


Figure 2. Above 1 GHz

5.2.3 Test Procedure

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.
An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.
The measurement frequency range is from 30 MHz to the 5th harmonic of the maximum frequency of the EUT internal source. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.
Use the following spectrum analyzer settings:
Span = wide enough to fully capture the emission being measured
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz
VBW ≥ RBW
Sweep = auto
Detector function = peak for f <1 GHz, peak & RMS Average for f ≥ 1 GHz
Trace = max hold

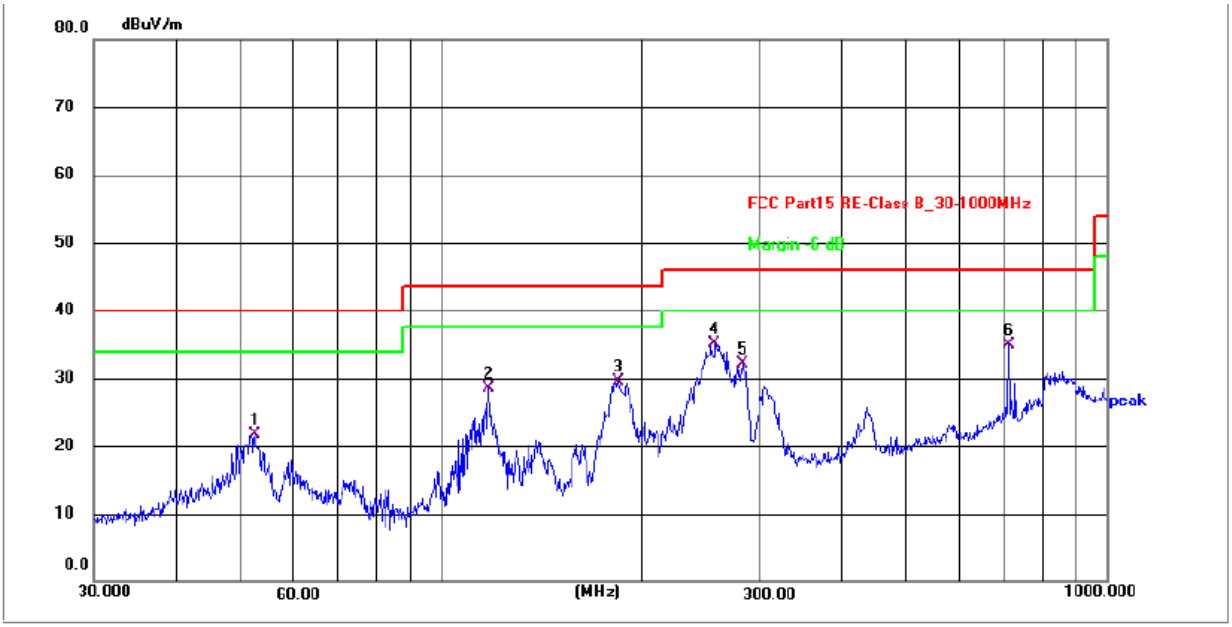
5.2.4 Test Data

PASS.

Please refer to the following pages.
Only the worst case data was showed in the report, please to see the following pages.

Radiated Emission Test Data (30-1000MHz)

Test Site:	**966 Chamber #1**	**Polarization:**	**Horizontal**
Distance:	**3m**	**Test Mode:**	**TM1**

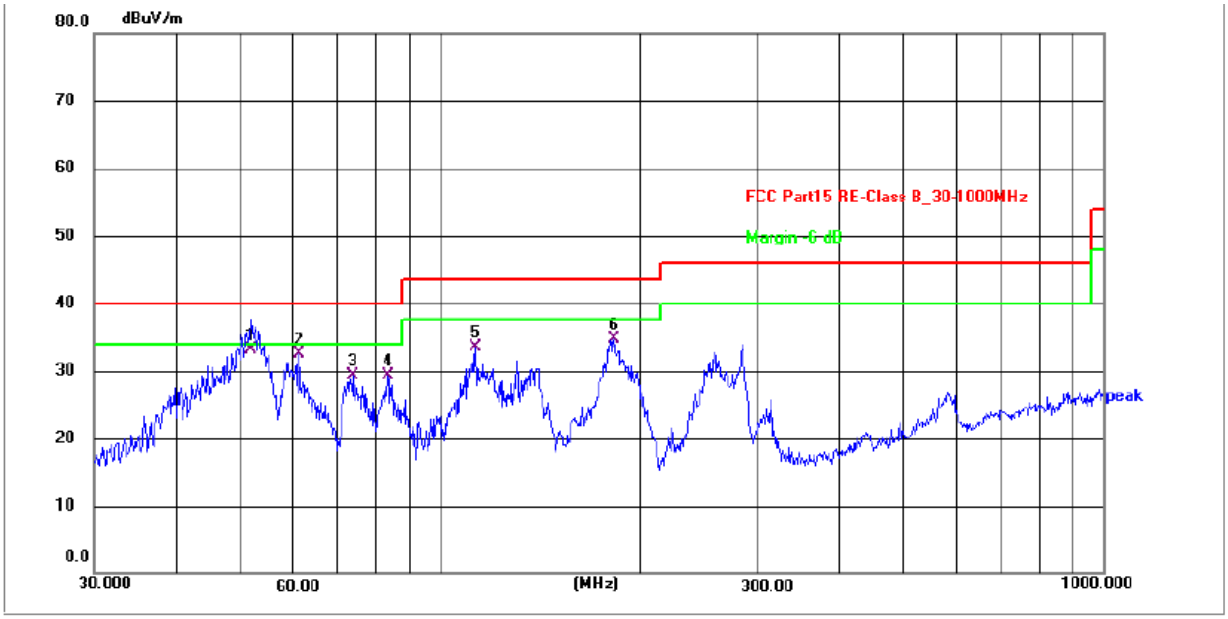


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1	52.3912	36.09	-14.33	21.76	40.00	-18.24	QP	P	
2	117.7725	45.35	-16.78	28.57	43.50	-14.93	QP	P	
3	184.4898	45.76	-16.18	29.58	43.50	-13.92	QP	P	
4 *	257.4222	48.22	-13.13	35.09	46.00	-10.91	QP	P	
5	283.9791	44.53	-12.42	32.11	46.00	-13.89	QP	P	
6	711.6734	40.07	-5.09	34.98	46.00	-11.02	QP	P	

Note: Level = Reading + Factor Margin = Level - Limit

Radiated Emission Test Data (30-1000MHz)

Test Site:	**966 Chamber #1**	**Polarization:**	**Vertical**
Distance:	**3m**	**Test Mode:**	**TM1**



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	P/F	Remark
1 *	51.6616	47.48	-14.28	33.20	40.00	-6.80	QP	P	
2	61.1316	48.10	-15.61	32.49	40.00	-7.51	QP	P	
3	73.8756	48.24	-18.89	29.35	40.00	-10.65	QP	P	
4	83.2298	48.35	-19.07	29.28	40.00	-10.72	QP	P	
5	112.9196	49.98	-16.50	33.48	43.50	-10.02	QP	P	
6	182.5592	51.00	-16.33	34.67	43.50	-8.83	QP	P	

Note 1: Level = Reading + Factor Margin = Level – Limit

Radiated Emission Test Data (1GHz-6GHz)

Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Detector
1637.79	54.58	-2.98	51.60	70.00	-18.40	H	PEAK
1867.18	41.60	-2.44	39.16	70.00	-30.84	H	PEAK
2152.56	49.74	-3.81	45.93	70.00	-24.07	H	PEAK
4055.97	48.19	-5.16	43.03	74.00	-30.97	H	PEAK
4483.55	54.71	-4.77	49.94	74.00	-24.06	H	PEAK
5168.99	52.07	-5.46	46.61	74.00	-27.39	H	PEAK
1628.38	36.54	-2.98	33.56	50.00	-16.44	H	AVG
1871.06	38.11	-2.44	35.67	50.00	-14.33	H	AVG
2155.94	44.35	-3.81	40.54	50.00	-9.46	H	AVG
4051.56	42.00	-5.16	36.84	54.00	-17.16	H	AVG
4483.11	46.73	-4.77	41.96	54.00	-12.04	H	AVG
5168.31	37.76	-5.46	32.30	54.00	-21.70	H	AVG
1336.53	48.57	-2.80	45.77	70.00	-24.23	V	PEAK
2076.86	48.61	-2.96	45.65	70.00	-24.35	V	PEAK
2076.17	53.48	-4.40	49.08	70.00	-20.92	V	PEAK
3959.27	47.33	-5.26	42.07	74.00	-31.93	V	PEAK
4581.69	46.25	-5.36	40.89	74.00	-33.11	V	PEAK
4974.44	45.81	-5.34	40.47	74.00	-33.53	V	PEAK
1330.64	32.14	-2.80	29.34	50.00	-20.66	V	AVG
2080.36	46.71	-2.96	43.75	50.00	-6.25	V	AVG
2078.90	42.20	-4.40	37.80	50.00	-12.20	V	AVG
3951.63	40.27	-5.26	35.01	54.00	-18.99	V	AVG
4584.35	43.40	-5.36	38.04	54.00	-15.96	V	AVG
4971.62	37.52	-5.34	32.18	54.00	-21.82	V	AVG

Remark:
1. Level = Reading + Factor, Margin= Level – Limit.
2: Other emissions above 6GHz are attenuated 20dB below the limit, so it does not record.

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ANNEX A TEST SETUP PHOTOS

Please refer to the document “8233EU011218E-AA.PDF”

ANNEX B EXTERNAL PHOTOS

Please refer to the document “8233EU011218E-AB.PDF”

ANNEX C INTERNAL PHOTOS

Please refer to the document “8233EU011218E-AC.PDF”

STATEMENT

1. The laboratory guarantees the scientificity, accuracy and impartiality of the test, and is responsible for all the information in the report, except the information provided by the customer. The customer is responsible for the impact of the information provided on the validity of the results.
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5. The test data and results are only valid for the tested samples provided by the customer.
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--- End of Report ---