

FCC TEST REPORT

**Test report
On Behalf of
Segment Bilgisayar Dis. Tic. A.s.**

**For
wireless gaming mouse**

Model No.: Tilion, SMX-G68 SPEAR V2, RADIANT M1

FCC ID: 2BRCY-TILION

Prepared for : Segment Bilgisayar Dis. Tic. A.s.

**Deliklikaya Mahallesi, Fersah Caddesi No:136, 34555 Arnavutkoy istanbul,
Turkey**

Prepared By : Shenzhen HUAK Testing Technology Co., Ltd.
1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping,
Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Date of Test: Jul. 17, 2025 ~ Jul. 24, 2025

Date of Report: Jul. 24, 2025

Report Number: HK2507234045-1E

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TEST RESULT CERTIFICATION

Applicant's name : Segment Bilgisayar Dis. Tic. A.s.
Address : Deliklikaya Mahallesi, Fersah Caddesi No:136, 34555 Arnavutkoy istanbul, Turkey
Manufacturer's Name : Shenzhen Suntek Technology Co.,Ltd
Address : Flat/Rm 1701 17/F , Henan Building. NO. 90, Jafee Road,Wanchai, China

Product description

Trade Mark : Rampage
Product name : wireless gaming mouse
Model and/or type reference .. : Tilion, SMX-G68 SPEAR V2, RADIANT M1
Standards : FCC Rules and Regulations Part 15 Subpart C Section 15.249
ANSI C63.10: 2020

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Date of Test :

Date (s) of performance of tests : Jul. 17, 2025 ~ Jul. 24, 2025

Date of Issue : Jul. 24, 2025

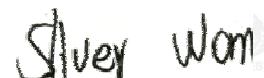
Test Result : Pass

Testing Engineer



Len Liao

Technical Manager



Sliver Wan

Authorized Signatory



Jason Zhou

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** Modified History **

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	Jul. 24, 2025	Jason Zhou
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1. TEST SUMMARY

1.1 Test Procedures And Results

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	§ 15.207 COMPLIANT
RADIATED EMISSION TEST	§ 15.249 (a) / §15.209 COMPLIANT
BAND EDGE	§ 15.249 (d)/ §15.209 COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	§ 15.215 (c) COMPLIANT
ANTENNA REQUIREMENT	§ 15.203 COMPLIANT

1.2 Information of The Test Laboratory

Shenzhen HUAK Testing Technology Co., Ltd.

Add.: 1-2/F., Building B2, Junfeng Zhongcheng Zhizao Innovation Park, Heping, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

Testing Laboratory Authorization :

A2LA Accreditation Code is 4781.01.

FCC Designation Number is CN1229.

Canada IC CAB identifier is CN0045.

CNAS Registration Number is L9589.

1.3 Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	=	4.06dB, k=2



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2. GENERAL INFORMATION

2.1 General Description of EUT

Equipment	wireless gaming mouse
Model Name	Tilion
Serial Model	SMX-G68 SPEAR V2, RADIANT M1
Model Difference	All model's the function, software and electric circuit are the same, only with product model named different. Test sample model: Tilion.
FCC ID	2BRCY-TILION
Antenna Type	PCB Antenna
Antenna Gain	2dBi
Equipment	wireless gaming mouse
Operation frequency	2402MHz to 2480MHz
Number of Channels	40CH
Modulation Type	GFSK
Power Source	DC 5V from Type-C or DC 3.7V from Battery
Power Rating	DC 5V from Type-C or DC 3.7V from Battery
Firmware Version	V2.4
Hardware Version	V2.4

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
2. Antenna gain Refer to the antenna specifications.
3. The cable loss data is obtained from the supplier.
4. The test results in the report only apply to the tested sample.

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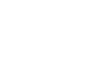
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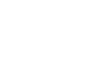
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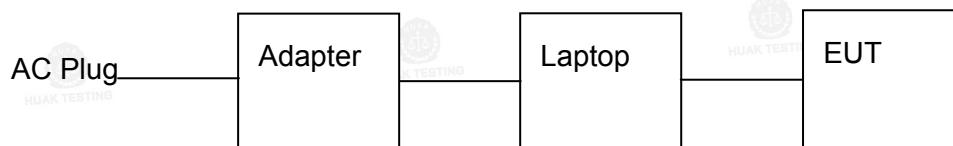
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2.2 Carrier Frequency of Channels

Description of Channel:							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

2.4 Description of Test Setup

Operation of EUT during below 1GHz Radiation testing AC Conducted testing:



Operation of EUT during above 1GHz Radiation testing:



Operation of EUT during RF Conducted testing:



The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages. The worst case is X position



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2.5 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

Item	Equipment	Mfr/Brand	Model/Type No.	Specification	Note
1	wireless gaming mouse	Rampage	Tilion	N/A	EUT
2	Laptop	Lenovo	Thinkpad E450	Input: 20V 2.25A/3.25A	Peripheral
3	Adapter	Lenovo	ADLX65YCC3A	Input: AC100-240V, 1.8A, 50-60Hz Output: DC20V/3.25A, DC15V/3A, DC12V/3A, DC9V/2A, DC5V/2A	Peripheral

Note:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.
3. For conducted measurements (Output Power, 6dB Emission Bandwidth, Power Spectral Density, Spurious Emissions), the antenna of EUT is connected to the test equipment via temporary antenna connector, the antenna connector is soldered on the antenna port of EUT, and the temporary antenna connector is listed in the Test Instruments.



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2.6 Measurement Instruments List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N.	R&S	ENV216	HKE-002	Feb. 19, 2025	1 Year
2	L.I.S.N.	R&S	ENV216	HKE-059	Feb. 19, 2025	1 Year
3	EMI Test Receiver	R&S	ESR	HKE-005	Feb. 19, 2025	1 Year
4	Spectrum analyzer	Agilent	N9020A	HKE-025	Feb. 19, 2025	1 Year
5	Spectrum analyzer	Agilent	N9020A	HKE-117	Feb. 19, 2025	1 Year
6	Spectrum analyzer	R&S	FSV3044	HKE-126	Feb. 19, 2025	1 Year
7	Preamplifier	EMCI	EMC051845S	HKE-006	Feb. 19, 2025	1 Year
8	Preamplifier	Schwarzbeck	BBV 9743	HKE-016	Feb. 19, 2025	1 Year
9	Preamplifier	A.H. Systems	SAS-574	HKE-182	Feb. 19, 2025	1 Year
10	6d Attenuator	Pasternack	6db	HKE-184	Feb. 19, 2025	1 Year
11	EMI Test Receiver	Rohde & Schwarz	ESR-7	HKE-010	Feb. 19, 2025	1 Year
12	Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	Feb. 21, 2024	2 Year
13	Loop Antenna	COM-POWER	AL-130R	HKE-014	Feb. 21, 2024	2 Year
14	Horn Antenna	Schwarzbeck	9120D	HKE-013	Feb. 21, 2024	2 Year
15	EMI Test Software	Tonscend	JS32-CE 2.5.0.6	HKE-081	N/A	N/A
16	EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	N/A	N/A
17	RF Automatic control unit	Tonscend	JS0806-1	HKE-096	Feb. 19, 2025	1 Year
18	High pass filter unit	Tonscend	JS0806-F	HKE-055	Feb. 19, 2025	1 Year
19	Wireless Communication Test Set	R&S	CMU200	HKE-026	Dec. 09, 2021	3 Year
20	Wireless Communication Test Set	R&S	CMW500	HKE-027	Feb. 19, 2025	1 Year
21	High-low temperature chamber	Guangke	HT-80L	HKE-118	Jun. 10, 2024	1 Year
22	Temperature and humidity meter	Boyang	HTC-1	HKE-075	Jun. 10, 2024	1 Year
23	RF Test Software	Tonscend	JS1120-3 Version 3.5.39	HKE-083	N/A	N/A
24	10dB Attenuator	Schwarzbeck	VTSD9561F	HKE-153	Feb. 19, 2025	1 Year
25	RSE Test Software	Tonscend	JS36-RSE 5.0.0	HKE-184	N/A	N/A

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3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

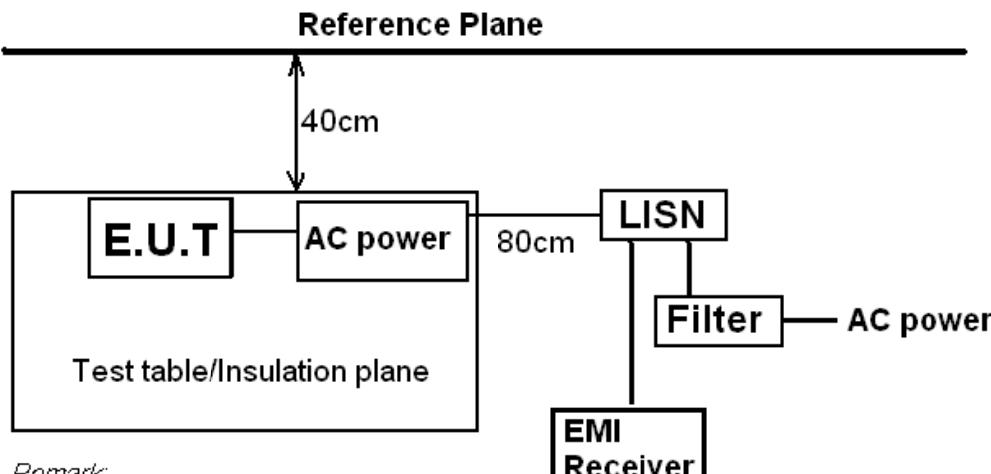
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dB μ V)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

3.2 Test Setup



Remark:

E.U.T: Equipment Under Test

LISN: Line Impedance Stabilization Network

Test table height=0.8m

3.3 Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

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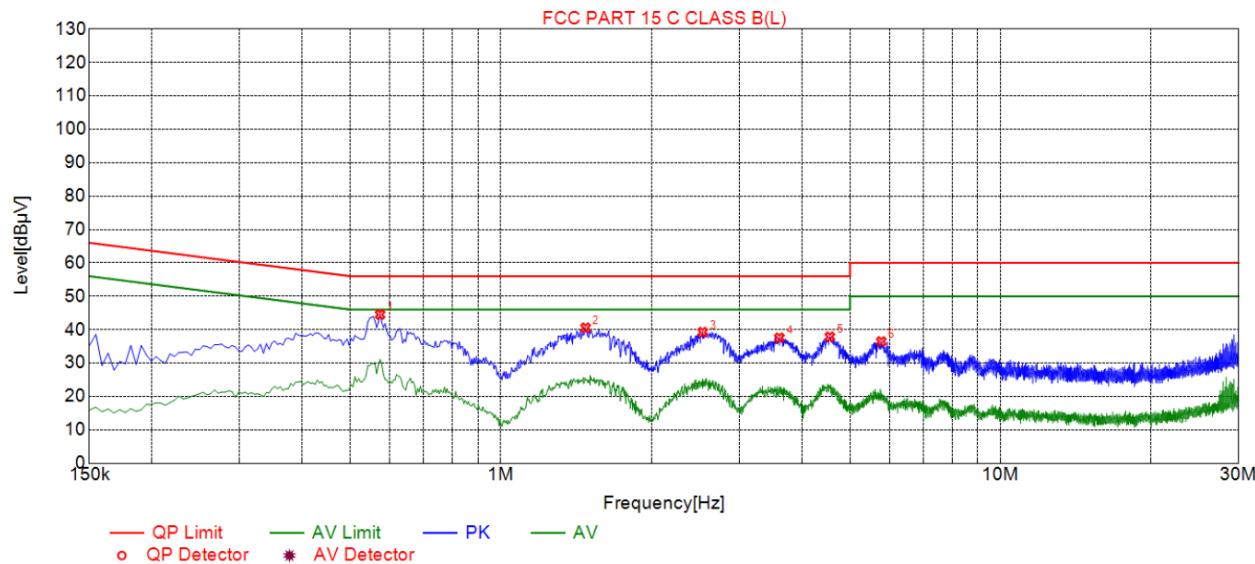


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3.4 Test Result

All modes have been tested, only the worst result was reported as below:

Test Specification: Line



Suspected List

NO.	Freq. [MHz]	Level [dB μ V]	Factor [dB]	Limit [dB μ V]	Margin [dB]	Reading [dB μ V]	Detector	Type
1	0.5730	44.53	19.78	56.00	11.47	24.75	PK	L
2	1.4775	40.56	19.95	56.00	15.44	20.61	PK	L
3	2.5350	39.25	20.22	56.00	16.75	19.03	PK	L
4	3.6105	37.58	20.33	56.00	18.42	17.25	PK	L
5	4.5555	37.88	20.37	56.00	18.12	17.51	PK	L
6	5.7750	36.46	20.40	60.00	23.54	16.06	PK	L

Remark: Margin = Limit – Level

Correction factor = Cable loss + LISN insertion loss

Level=Test receiver reading + correction factor

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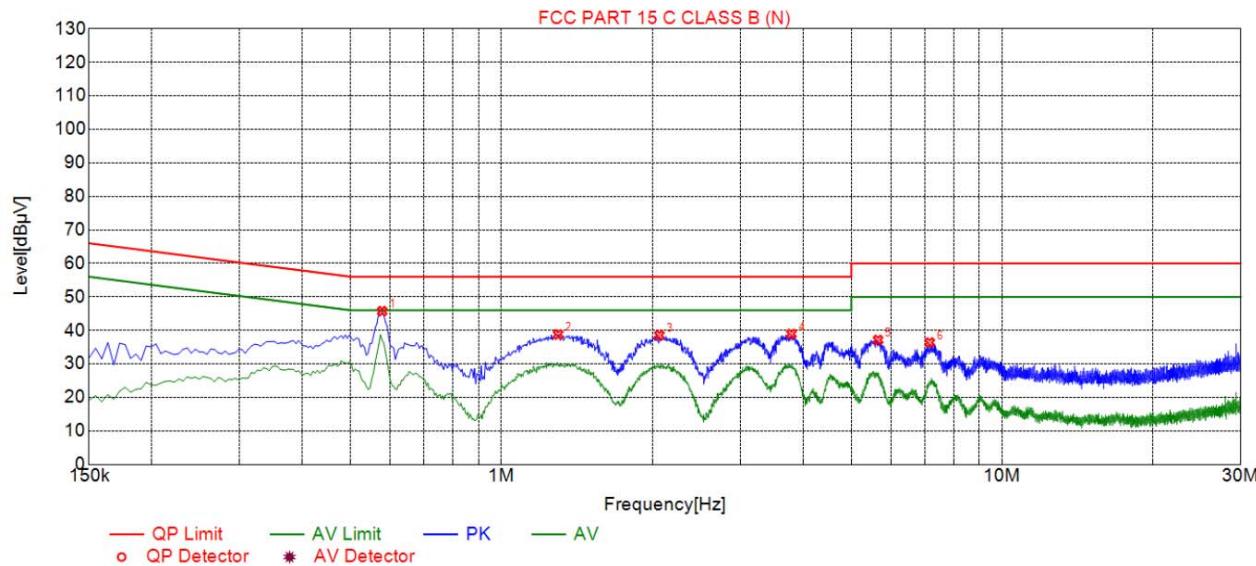
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Test Specification: Neutral



Suspected List

NO.	Freq. [MHz]	Level [dBμV]	Factor [dB]	Limit [dBμV]	Margin [dB]	Reading [dBμV]	Detector	Type
1	0.5775	45.75	19.75	56.00	10.25	26.00	PK	N
2	1.2975	38.77	19.83	56.00	17.23	18.94	PK	N
3	2.0670	38.56	19.95	56.00	17.44	18.61	PK	N
4	3.7950	38.94	20.14	56.00	17.06	18.80	PK	N
5	5.6535	37.16	20.37	60.00	22.84	16.79	PK	N
6	7.1700	36.38	20.52	60.00	23.62	15.86	PK	N

Remark: Margin = Limit – Level

Correction factor = Cable lose + LISN insertion loss

Level=Test receiver reading + correction factor

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4 RADIATED EMISSION TEST

4.1 Radiation Limit

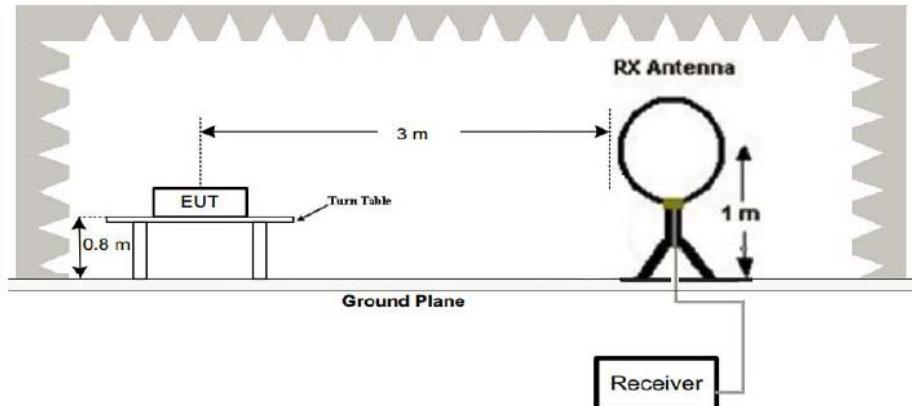
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

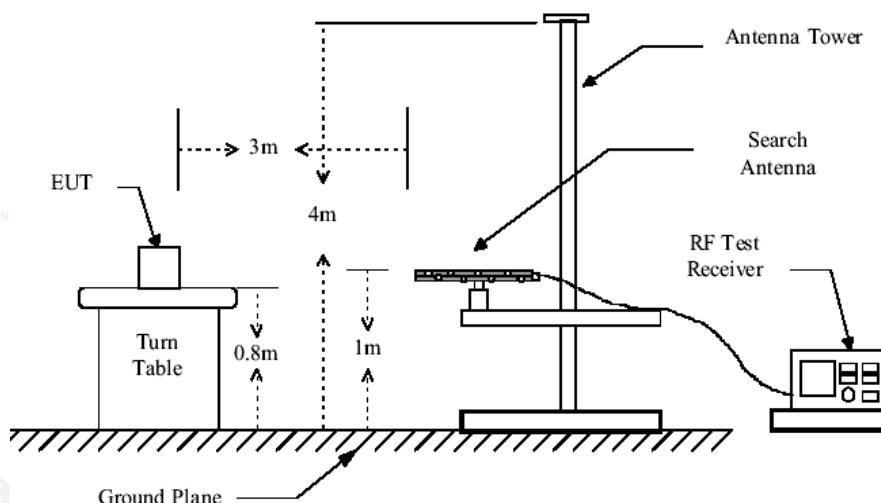
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

(1) Radiated Emission Test-Up Frequency Below 30MHz



(2) Radiated Emission Test-Up Frequency 30MHz~1GHz



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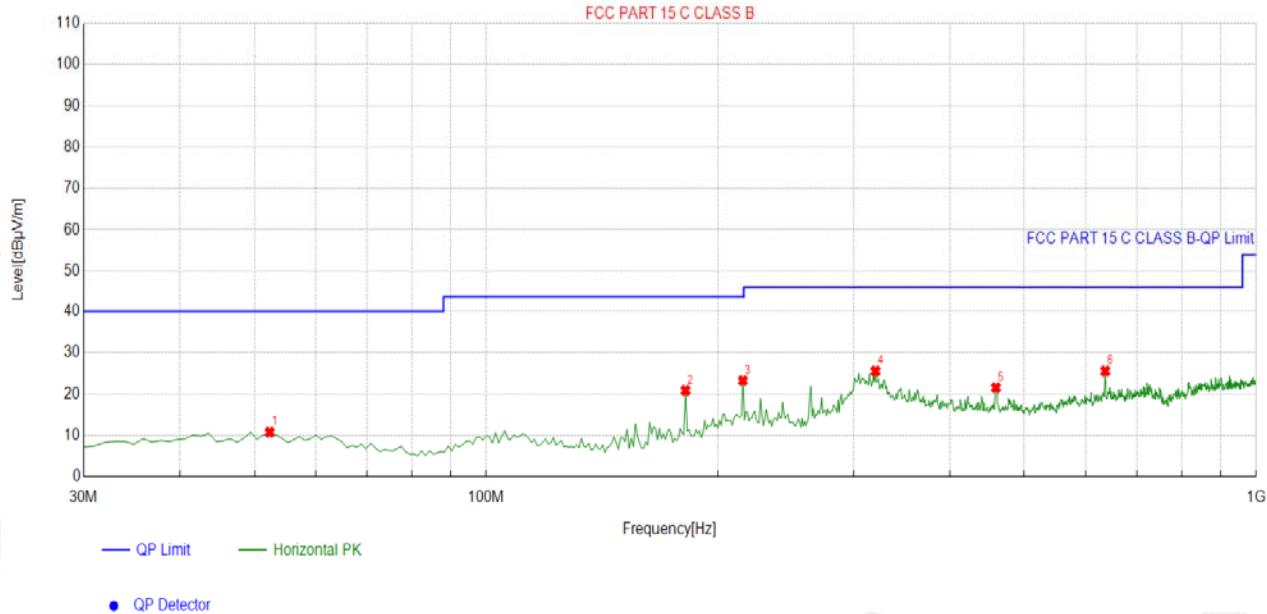


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Below 1GHz Test Results:

Antenna polarity: H



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dB μ V/m]	Level [dB μ V/m]	Limit [dB μ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	52.3323	-13.35	24.16	10.81	40.00	29.19	100	344	Horizontal
2	181.4715	-16.13	36.97	20.84	43.50	22.66	100	86	Horizontal
3	215.4555	-14.72	38.01	23.29	43.50	20.21	100	100	Horizontal
4	320.3203	-11.20	36.77	25.57	46.00	20.43	100	52	Horizontal
5	459.1692	-8.94	30.49	21.55	46.00	24.45	100	111	Horizontal
6	636.8569	-5.13	30.72	25.59	46.00	20.41	100	49	Horizontal

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; Level = Reading + Factor; Margin = Limit – Level

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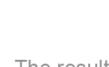
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Above 1 GHz Test Results:

CH Middle (2402MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2402	96.17	-5.71	90.46	114	23.54	peak
2402	76.02	-5.71	70.31	94	23.69	AVG
4804	41.51	-3.51	38	74	36	peak
4804	31.4	-3.51	27.89	54	26.11	AVG
7206	43.54	-0.82	42.72	74	31.28	peak
7206	31.62	-0.82	30.8	54	23.2	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Limit – Level

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2402	93.7	-5.71	87.99	114	26.01	peak
2402	76.99	-5.71	71.28	94	22.72	AVG
4804	41.79	-3.51	38.28	74	35.72	peak
4804	32.8	-3.51	29.29	54	24.71	AVG
7206	44.02	-0.82	43.2	74	30.8	peak
7206	32.37	-0.82	31.55	54	22.45	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Limit – Level



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CH Middle (2440MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2440	95.56	-5.71	89.85	114	24.15	peak
2440	74.98	-5.71	69.27	94	24.73	AVG
4880	40.65	-3.51	37.14	74	36.86	peak
4880	31.19	-3.51	27.68	54	26.32	AVG
7320	45.76	-0.82	44.94	74	29.06	peak
7320	31.48	-0.82	30.66	54	23.34	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Limit – Level

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2440	94.45	-5.71	88.74	114	25.26	peak
2440	75.02	-5.71	69.31	94	24.69	AVG
4880	40.58	-3.51	37.07	74	36.93	peak
4880	30.43	-3.51	26.92	54	27.08	AVG
7320	45.66	-0.82	44.84	74	29.16	peak
7320	31.68	-0.82	30.86	54	23.14	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Limit Level

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CH High (2480MHz)**Horizontal:**

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2480	95.49	-5.65	89.84	114	24.16	peak
2480	74.78	-5.65	69.13	94	24.87	AVG
4960	41.48	-3.43	38.05	74	35.95	peak
4960	31.74	-3.43	28.31	54	25.69	AVG
7440	43.40	-0.75	42.65	74	31.35	peak
7440	31.44	-0.75	30.69	54	23.31	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Limit – Level

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2480	94	-5.65	88.35	114	25.65	peak
2480	75.77	-5.65	70.12	94	23.88	AVG
4960	42.85	-3.43	39.42	74	34.58	peak
4960	32.58	-3.43	29.15	54	24.85	AVG
7440	43.87	-0.75	43.12	74	30.88	peak
7440	30.58	-0.75	29.83	54	24.17	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Limit – Level

Remark :

- (1) Measuring frequencies from 1 GHz to the 25 GHz .
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) The emissions are attenuated more than 20dB below the permissible limits are not record in the report.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detection at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dB μ V/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dB μ V/m(PK Value) <54 dB μ V/m(AV Limit), the Average Detected not need to completed.



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5.3 Test Result

PASS

Radiated Band Edge Test:

Operation Mode: TX CH Low (2402MHz)

Horizontal (Worst case)

Frequency (MHz)	Meter Reading (dBµV)	Factor (dB)	Emission Level (dBµV/m)	Limits (dBµV/m)	Margin (dB)	Detector Type
2310	54.65	-5.81	48.84	74	25.16	peak
2310	/	-5.81	/	54	/	AVG
2390	56.82	-5.84	50.98	74	23.02	peak
2390	/	-5.84	/	54	/	AVG
2400	54.74	-5.84	48.9	74	25.1	peak
2400	/	-5.84	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Limit – Level

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2310	54.27	-5.81	48.46	74	25.54	peak
2310	/	-5.81	/	54	/	AVG
2390	56.84	-5.84	51	74	23	peak
2390	/	-5.84	/	54	/	AVG
2400	56.82	-5.84	50.98	74	23.02	peak
2400	/	-5.84	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Limit – Level

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Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB μ V)	(dB)	(dB μ V/m)	(dB μ V/m)	(dB)	
2483.50	55.26	-5.65	49.61	74	24.39	peak
2483.50	/	-5.65	/	54	/	AVG
2500.00	54.25	-5.65	48.6	74	25.4	peak
2500.00	/	-5.65	/	54	/	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier; Level = Reading + Factor; Margin = Limit – Level

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.

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6 OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Setup

Same as Radiated Emission Measurement

6.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Based on ANSI C63.10 section 6.9.2: RBW= 30KHz. VBW= 91KHz, Span=5MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

6.3 Measurement Equipment Used

Same as Radiated Emission Measurement

6.4 Test Result

PASS

Frequency	20dB Bandwidth (MHz)	Result
2402 MHz	2.292	HUAWEI TESTING PASS
2440 MHz	2.295	
2480 MHz	2.295	

CH: 2402MHz



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CH: 2440MHz



CH: 2480MHz



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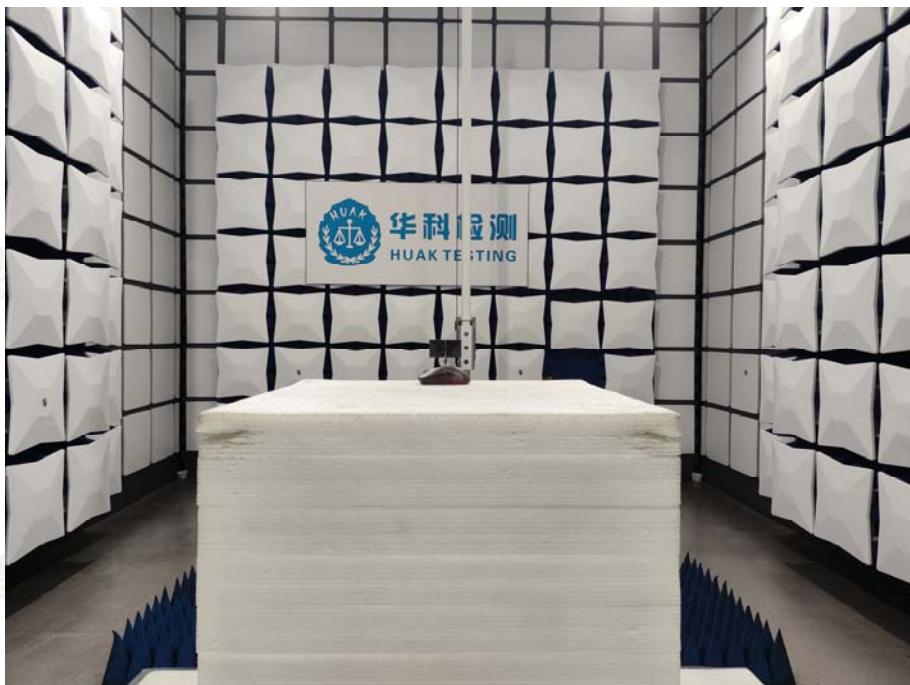
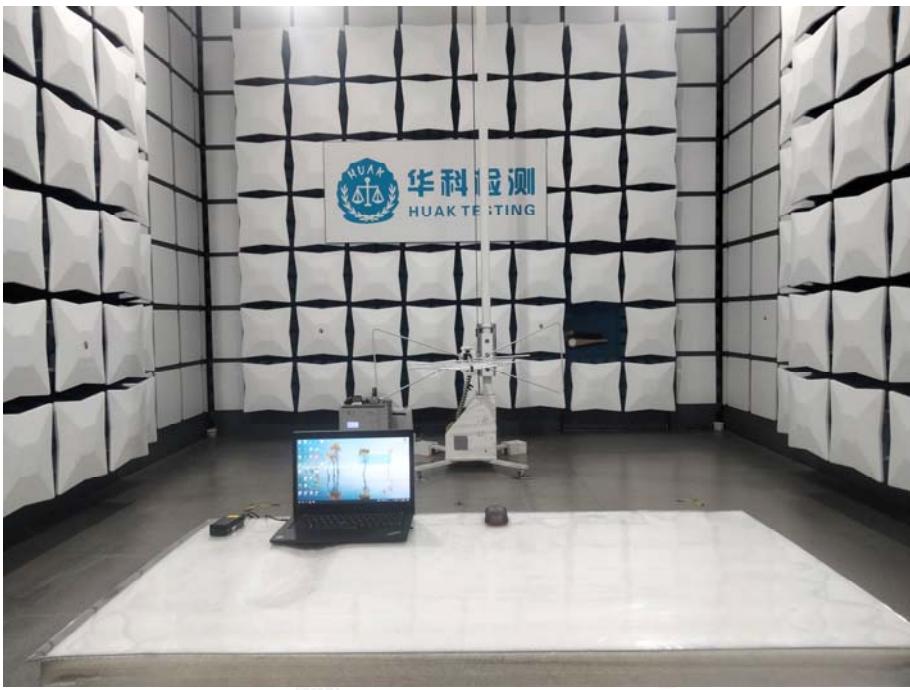
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8 PHOTOGRAPH OF TEST

Radiated Emission



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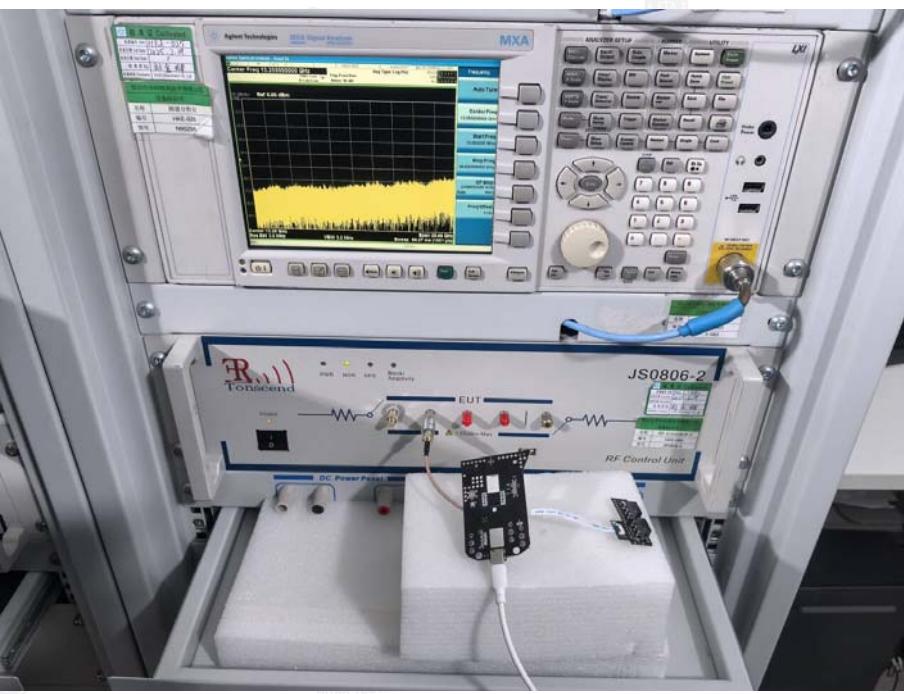


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AC Conducted Emission



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9 PHOTOS OF THE EUT

Reference to the report: ANNEX A of external photos and ANNEX B of internal photos

-----End of test report-----

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