



# FCC Test Report

**Test report  
On Behalf of  
Dongguan Zhenghao Electronics & Technology Co., Ltd.**

**For  
EK653 Mouse**

**Model No.: EK653, E703, M703, M701, E760, M706, 3100, E790,  
I210**

**FCC ID: 2BEPS-E703**

**Prepared For :** Dongguan Zhenghao Electronics & Technology Co., Ltd.  
Room 302, Building 6, No.8, Xiegang Xinlong Road, Xiegang Town, Dongguan,  
China

**Prepared By :** Shenzhen HUAK Testing Technology Co., Ltd.  
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**Date of Test:** Apr. 07, 2025~May 14, 2025  
**Date of Report:** May 14, 2025  
**Report Number:** HK2504071687-E

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## Test Result Certification

**Applicant's name** ..... : Dongguan Zhenghao Electronics & Technology Co., Ltd.  
Address ..... : Room 302, Building 6, No.8, Xiegang Xinlong Road, Xiegang Town, Dongguan, China

**Manufacturer's Name** ..... : Dongguan Zhenghao Electronics & Technology Co., Ltd.  
Address ..... : Room 302, Building 6, No.8, Xiegang Xinlong Road, Xiegang Town, Dongguan, China

### Product description

Trade Mark: N/A  
Product name ..... : EK653 Mouse  
Model and/or type reference : EK653, E703, M703, M701, E760, M706, 3100, E790, I210  
Standards ..... : FCC Rules and Regulations Part 15 Subpart C Section 15.249  
ANSI C63.10: 2013

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### Date of Test.....:

Date (s) of performance of tests ..... : Apr. 07, 2025~May 14, 2025

Date of Issue..... : May 14, 2025

Test Result ..... : Pass

Testing Engineer

  
Len Liao

Technical Manager

  
Sliver Wan

Authorized Signatory

  
Jason Zhou

Jason Zhou

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**\*\* Modified History \*\***

Revision	Description	Issued Data	Remark
Revision 1.0	Initial Test Report Release	May 14, 2025	Jason Zhou

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## 1. Test Summary

## 1.1. Test Procedures and Results

DESCRIPTION OF TEST	HUAK TESTING	SECTION NUMBER	RESULT
AC POWER LINE CONDUCTED EMISSION		15.207	N/A
RADIATED EMISSION TEST		15.249(a)/15.209	COMPLIANT
BAND EDGE		15.249(d)/15.205	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

## Measurement Uncertainty

## Conducted Emission Expanded Uncertainty

$$= 2.71 \text{dB, } k=2$$

Radiated emission expanded uncertainty(9kHz-30MHz)

$$= 3.90\text{dB, } k=2$$

Radiated emission expanded uncertainty(30MHz-1000MHz)

$$= 3.90 \text{dB, } k=2$$

Radiated emission expanded uncertainty(Above 1GHz)

$$= 4.28 \text{dB, k=2}$$



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## 2. General Information

### 2.1. General Description of EUT

Equipment:	EK653 Mouse
Model Name:	EK653
Series Model:	E703, M703, M701, E760, M706, 3100, E790, I210
Model Difference:	All model's the function, software and electric circuit are the same, only with a product model named different. Test sample mode: EK653.
FCC ID:	2BEPS-E703
Antenna Type:	PCB Antenna
Antenna Gain:	2.34dBi
Operation frequency:	2403.85-2479.85MHz
Number of Channels:	16CH
Modulation Type:	GFSK
Power Source:	DC 1.5V From Battery
Power Rating:	DC 1.5V From Battery
Note:	<ol style="list-style-type: none"><li>1. For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.</li><li>2. Antenna gain Refer to the antenna specifications.</li><li>3. The cable loss data is obtained from the supplier.</li><li>4. The test results in the report only apply to the tested sample.</li></ol>

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### 2.1.1. Carrier Frequency of Channels

Description of Channel:					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2403.85	7	2436.85	13	2463.85
2	2407.85	8	2439.85	14	2466.85
3	2414.85	9	2441.85	15	2473.85
4	2419.85	10	2445.85	16	2479.85
5	2422.85	11	2453.85		
6	2426.85	12	2459.85		

## 2.2. Operation of EUT During Testing

## Operating Mode

The mode is used: **Transmitting mode**

Low Channel: 2403.85MHz

Middle Channel: 2441.85MHz

High Channel: 2479.85MHz



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### 2.3. Description of Test Setup

## Operation of EUT during 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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## 2.4. 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	Trade Mark	Model/Type No.	Specification	Remark
1	EK653 Mouse	N/A	EK653	N/A	EUT
			HUAK TESTING		
TING					

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 (Occupied Bandwidth), 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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**2.5. Measurement Instruments List**

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	L.I.S.N.	R&S	ENV216	HKE-002	2025/02/19	1 Year
2	L.I.S.N.	R&S	ENV216	HKE-059	2025/02/19	1 Year
3	EMI Test Receiver	R&S	ESR	HKE-005	2025/02/19	1 Year
4	Spectrum analyzer	Agilent	N9020A	HKE-025	2025/02/19	1 Year
5	Spectrum analyzer	R&S	FSV3044	HKE-126	2025/02/19	1 Year
6	Preamplifier	EMCI	EMC051845S	HKE-006	2025/02/19	1 Year
7	Preamplifier	Schwarzbeck	BBV 9743	HKE-016	2025/02/19	1 Year
8	Preamplifier	A.H. Systems	SAS-574	HKE-182	2025/02/19	1 Year
9	6d Attenuator	Pasternack	6db	HKE-184	2025/02/19	1 Year
10	EMI Test Receiver	Rohde & Schwarz	ESR-7	HKE-010	2025/02/19	1 Year
11	Broadband Antenna	Schwarzbeck	VULB9168	HKE-167	2024/02/21	2 Year
12	Loop Antenna	COM-POWER FMZB 1519 012 May 11, 2016 1 Year	AL-130R	HKE-014	2024/02/21	2 Year
13	Horn Antenna	Schwarzbeck	9120D	HKE-013	2024/02/21	2 Year
14	EMI Test Software	Tonscend	JS32-CE 2.5.0.6	HKE-081	/	/
15	EMI Test Software	Tonscend	JS32-RE 5.0.0	HKE-082	/	/
16	RF Automatic control unit	Tonscend	JS0806-2	HKE-060	2025/02/19	1 Year
17	High pass filter unit	Tonscend	JS0806-F	HKE-055	2025/02/19	1 Year
18	Wireless Communication Test Set	R&S	CMU200	HKE-026	2025/02/19	1 Year
19	Wireless Communication Test Set	R&S	CMW500	HKE-027	2025/02/19	1 Year
20	High-low temperature chamber	Guangke	HT-80L	HKE-118	2024/06/10	1 Year
21	Temperature and humidity meter	Boyang	HTC-1	HKE-075	2024/06/10	1 Year
22	RF Test Software	Tonscend	JS1120-3 Version V3.5.39	HKE-083	/	/
23	10dB Attenuator	Schwarzbeck	VTSD9561F	HKE-153	2025/02/19	1 Year
24	RSE Test Software	Tonscend	JS36-RSE 5.0 .0	HKE-184	/	/

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### 3.4. Test Result

Not applicable.

Note: EUT power supply by DC Power, so this test item not applicable.



## 4. Radiated Emission Test

### 4.1. Radiation Limit

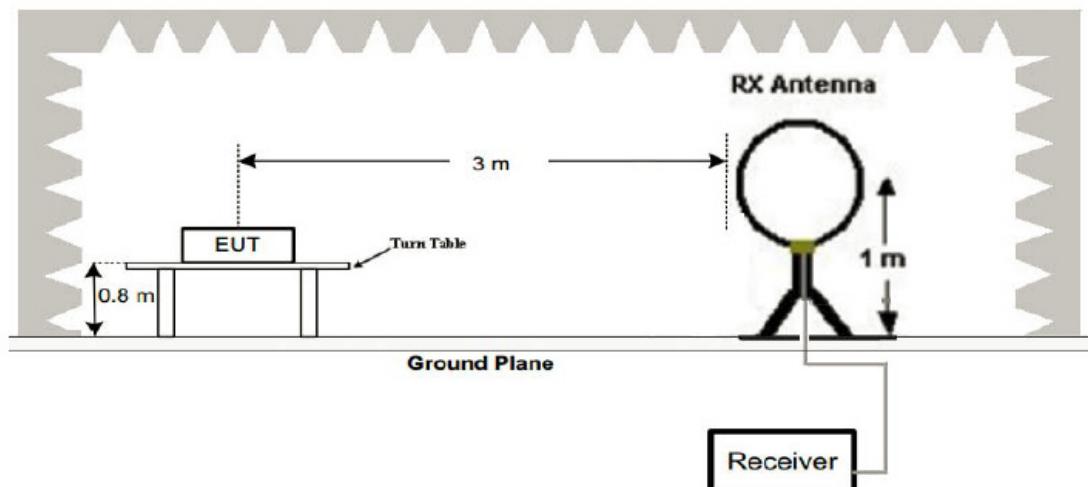
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB $\mu$ V/m)	Radiated ( $\mu$ V/m)
0.009-0.490	300	20log 2400/F (kHz)	2400/F (kHz)
0.490-1.705	30	20log 24000/F (kHz)	24000/F (kHz)
1.705-30	30	20log 30	30
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

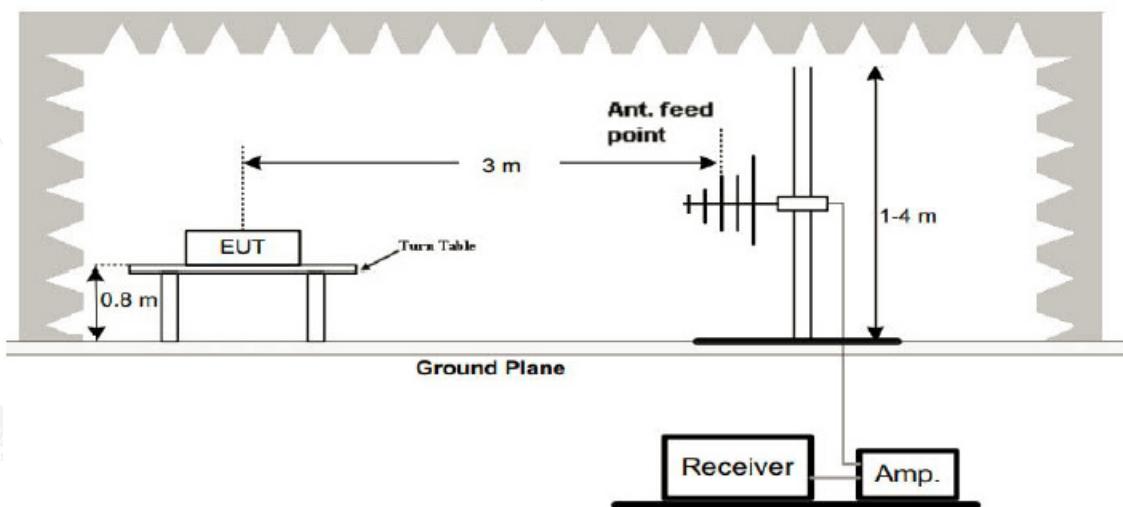
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

### 4.2. Test Setup

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



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



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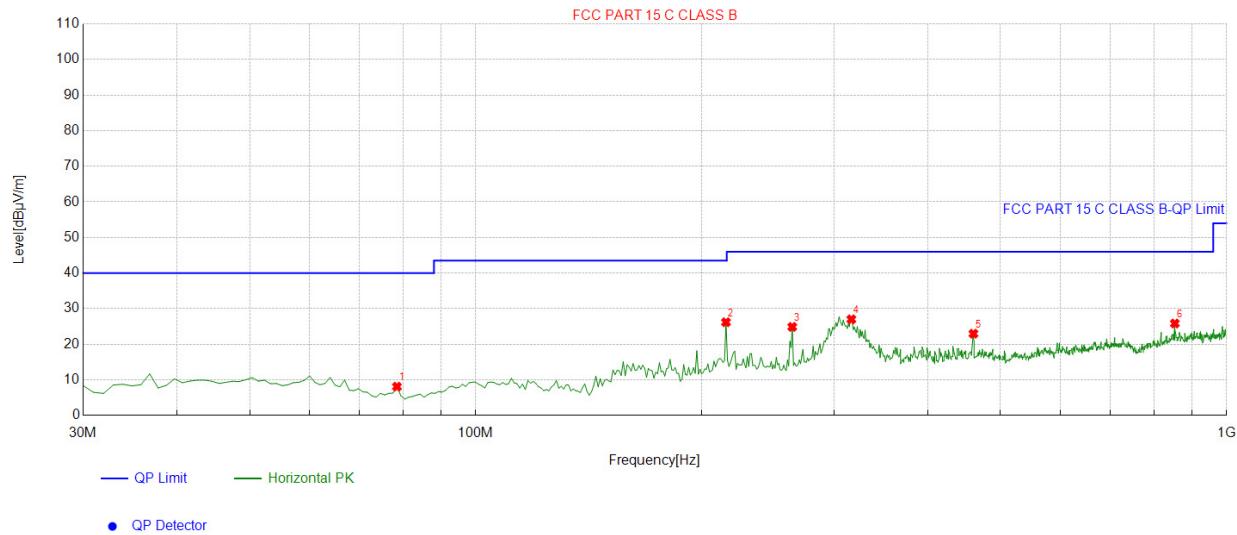




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Below 1GHz Test Results:

Antenna polarity: H



<b>Suspected List</b>									
NO.	Freq. [MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	78.5485	-17.92	26.01	8.09	40.00	31.91	100	19	Horizontal
2	215.4555	-14.72	40.91	26.19	43.50	17.31	100	121	Horizontal
3	264.0040	-13.15	38.03	24.88	46.00	21.12	100	154	Horizontal
4	316.4364	-11.36	38.37	27.01	46.00	18.99	100	115	Horizontal
5	460.1401	-8.95	31.92	22.97	46.00	23.03	100	268	Horizontal
6	853.3834	-1.67	27.51	25.84	46.00	20.16	100	54	Horizontal

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

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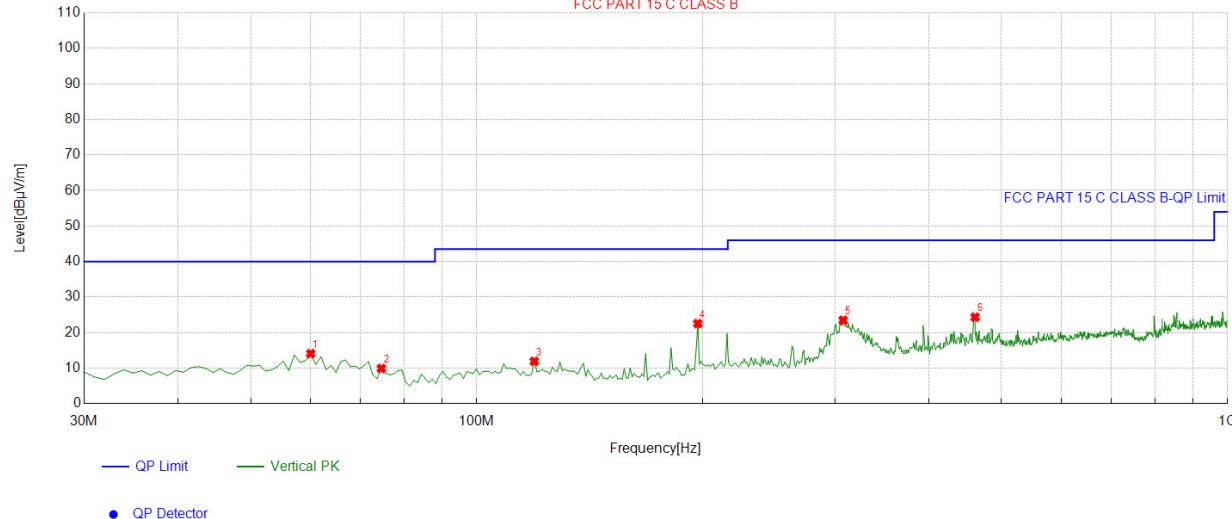
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Antenna polarity: V



Suspected List									
NO.	Freq. [MHz]	Factor [dB]	Reading [dB $\mu$ V/m]	Level [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]	Height [cm]	Angle [°]	Polarity
1	60.1001	-13.96	28.05	14.09	40.00	25.91	100	318	Vertical
2	74.6647	-17.94	27.85	9.91	40.00	30.09	100	148	Vertical
3	119.3293	-15.94	27.87	11.93	43.50	31.57	100	233	Vertical
4	197.0070	-14.97	37.51	22.54	43.50	20.96	100	148	Vertical
5	307.6977	-11.88	35.36	23.48	46.00	22.52	100	185	Vertical
6	461.1111	-8.91	33.25	24.34	46.00	21.66	100	140	Vertical

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

### Harmonics and Spurious Emissions

#### Frequency Range (9 kHz-30MHz)

Frequency (MHz)	Level@3m (dB $\mu$ V/m)	Limit@3m (dB $\mu$ V/m)
--	--	--
--	--	--
--	--	--
--	--	--

**Note:** 1. Emission Level=Reading+ Cable loss+ Antenna factor-Amp factor.

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement.

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**Above 1 GHz Test Results:****CH Low (2403.85MHz)****Horizontal:**

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2403.85	97.93	-5.84	92.09	114	21.91	peak
2403.85	81.09	-5.84	75.25	94	18.75	AVG
4807.70	51.03	-3.64	47.39	74	26.61	peak
4807.70	42.03	-3.64	38.39	54	15.61	AVG
7211.55	50.69	-0.95	49.74	74	24.26	peak
7211.55	40.61	-0.95	39.66	54	14.34	AVG

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

**Vertical:**

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2403.85	101.16	-5.84	95.32	114	18.68	peak
2403.85	81.07	-5.84	75.23	94	18.77	AVG
4807.70	52.66	-3.64	49.02	74	24.98	peak
4807.70	41.60	-3.64	37.96	54	16.04	AVG
7211.55	50.69	-0.95	49.74	74	24.26	peak
7211.55	40.04	-0.95	39.09	54	14.91	AVG

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

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**CH Middle (2441.85MHz)****Horizontal:**

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2441.85	100.15	-5.71	94.44	114	19.56	
2441.85	72.59	-5.71	66.88	94	27.12	AVG
4883.70	52.99	-3.51	49.48	74	24.52	peak
4883.70	45.18	-3.51	41.67	54	12.33	AVG
7325.55	51.35	-0.82	50.53	74	23.47	peak
7325.55	41.95	-0.82	41.13	54	12.87	AVG

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

**Vertical:**

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2441.85	104.14	-5.71	98.43	114	15.57	
2441.85	79.25	-5.71	73.54	94	20.46	AVG
4883.70	53.11	-3.51	49.6	74	24.4	peak
4883.70	42.27	-3.51	38.76	54	15.24	AVG
7325.55	50.23	-0.82	49.41	74	24.59	peak
7325.55	39.53	-0.82	38.71	54	15.29	AVG

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

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**CH High (2479.85MHz)****Horizontal:**

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
2479.85	100.95	-5.65	95.3	114	18.7	peak
2479.85	75.06	-5.65	69.41	94	24.59	AVG
4959.70	53.02	-3.43	49.59	74	24.41	peak
4959.70	41.74	-3.43	38.31	54	15.69	AVG
7439.55	51.20	-0.75	50.45	74	23.55	peak
7439.55	40.25	-0.75	39.5	54	14.5	AVG

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

**Vertical:**

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
2479.85	102.01	-5.65	96.36	114	17.64	peak
2479.85	76.56	-5.65	70.91	94	23.09	AVG
4959.70	52.65	-3.43	49.22	74	24.78	peak
4959.70	43.52	-3.43	40.09	54	13.91	AVG
7439.55	51.20	-0.75	50.45	74	23.55	peak
7439.55	39.48	-0.75	38.73	54	15.27	AVG

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; 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 keyboard 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 detector 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 $\mu$ V/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dB $\mu$ V/m(PK Value) <54 dB $\mu$ V/m(AV Limit), the Average Detected not need to completed.
- (7) All modes of operation were investigated and the worst-case emissions are reported.

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## 5. Band Edge

### 5.1. Limits

FCC PART 15.249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

### 5.2. Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 1MHz and VBM to 3MHz to measure the peak field strength and set RBW to 1MHz and VBW to 10Hz to measure the average radiated field strength.

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### 5.3. Test Result

PASS

### Radiated Band Edge Test:

Operation Mode: TX CH Low (2403.85MHz)

## Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
2310	55.23	-5.81	49.42	74	24.58	peak
2310	/	-5.81	/	54	/	AVG
2390	54.18	-5.84	48.34	74	25.66	peak
2390	/	-5.84	/	54	/	AVG
2400	53.96	-5.84	48.12	74	25.88	peak
2400	/	-5.84	/	54	/	AVG

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dB $\mu$ V)	(dB)	(dB $\mu$ V/m)	(dB $\mu$ V/m)	(dB)	
2310	56.03	-5.81	50.22	74	23.78	peak
2310	/	-5.81	/	54	/	AVG
2390	55.74	-5.84	49.9	74	24.1	peak
2390	/	-5.84	/	54	/	AVG
2400	52.19	-5.84	46.35	74	27.65	peak
2400	/	-5.84	/	54	/	AVG

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Operation Mode: TX CH High (2479.85MHz)

Horizontal

Frequency (MHz)	Reading Result (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2483.50	54.81	-5.65	49.16	74	24.84	peak
2483.50	/	-5.65	/	54	/	AVG
2500.00	52.09	-5.65	46.44	74	27.56	peak
2500.00	/	-5.65	/	54	/	AVG

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

Vertical:

Frequency (MHz)	Reading Result (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type
2483.50	54.66	-5.65	49.01	74	24.99	peak
2483.50	/	-5.65	/	54	/	AVG
2500.00	52.91	-5.65	47.26	74	26.74	peak
2500.00	/	-5.65	/	54	/	AVG

Remark: Factor = Cable loss + Antenna factor + Attenuator – Preamplifier; 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.

Remark:

1. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.
2. In restricted bands of operation, the spurious emissions below the permissible value more than 20dB.
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

## 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=91 KHz, Span=6MHz.
4. The useful radiated emission from the EUT was detected by the spectrum analyzer with peak detector.

### 6.3. Measurement Equipment Used

Same as Radiated Emission Measurements

## 6.4. Test Result

## PASS

Frequency HUAK TESTING	20dB Bandwidth HUAK TESTING (MHz)	Result
2403.85 MHz	2.023	<b>PASS</b>
2441.85 MHz	2.028	<b>PASS</b>
2479.85 MHz	2.031	<b>PASS</b>

CH: 2403.85MHz



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CH: 2441.85MHz



CH: 2479.85MHz



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## 7. Antenna Requirement

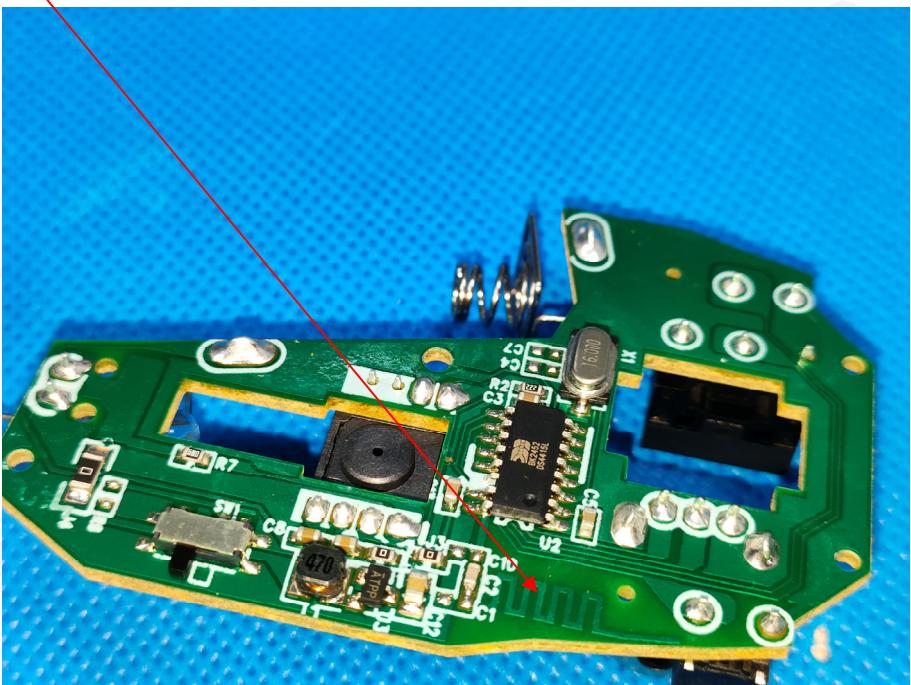
### Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

### Antenna Connected Construction

The antenna used in this product is a PCB Antenna, which permanently attached. It conforms to the standard requirements. The directional gains of antenna used for transmitting is 2.34dBi.

Antenna



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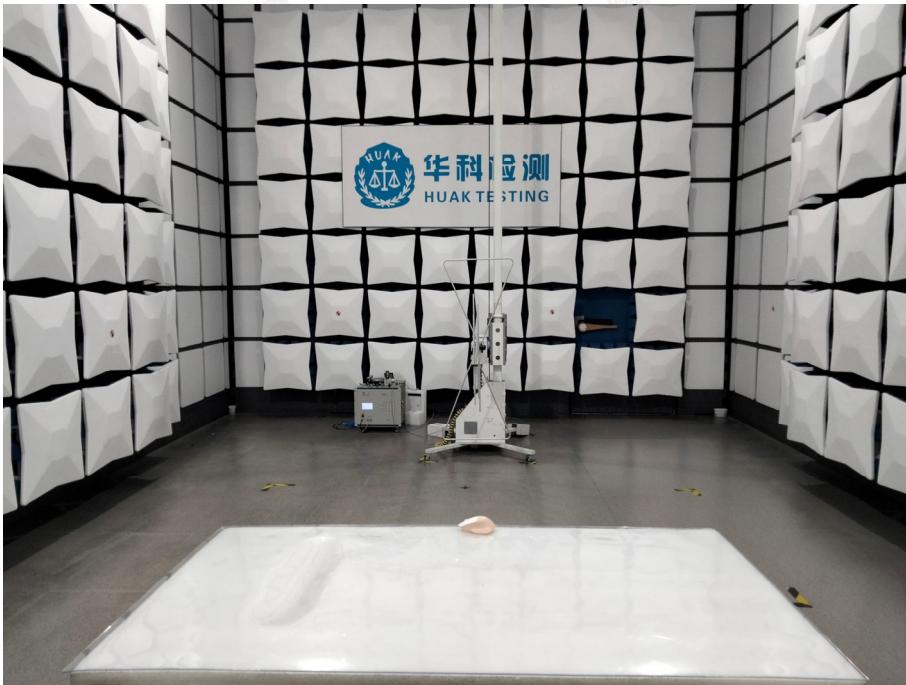
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## 8. Photograph of Test

### Radiated Emission



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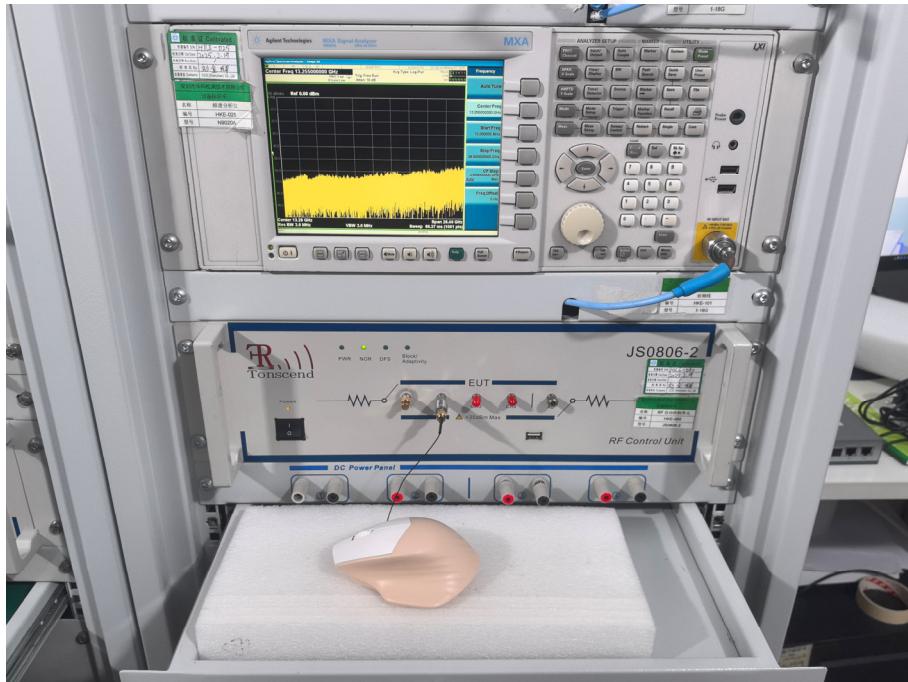
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## RF Conducted Emission



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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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