

FCC Test Report

Report No.: AGC00803240904FR03

FCC ID : 2AKHJ-MD230

APPLICATION PURPOSE: Original Equipment

PRODUCT DESIGNATION: Wireless Mouse

BRAND NAME : N/A

MODEL NAME : MD230, M230

APPLICANT: Shenzhen Hangshi Electronic Technology Co., Ltd

DATE OF ISSUE : Oct. 26, 2024

STANDARD(S) : FCC Part 15 Subpart C §15.247

REPORT VERSION: V1.0

Attestation Of Global Congliance (Shenzhen) Co., Ltd



Report No.: AGC00803240904FR03

Page 2 of 52

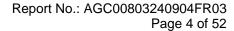
Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Oct. 26, 2024	Valid	Initial Release



Table of Contents

1. General Information	5
2. Product Information	6
2.1 Product Technical Description	6
2.2 Test Frequency List	6
2.3 Related Submittal(S) / Grant (S)	7
2.4 Test Methodology	7
2.5 Special Accessories	7
2.6 Equipment Modifications	7
2.7 Antenna Requirement	7
3. Test Environment	8
3.1 Address of the Test Laboratory	8
3.2 Test Facility	8
3.3 Environmental Conditions	9
3.4 Measurement Uncertainty	9
3.5 List of Equipment Use	10
4.System Test Configuration	12
4.1 EUT Configuration	12
4.2 EUT Exercise	
4.3 Configuration of Tested System	
4.4 Equipment Used In Tested System	
4.5 Summary of Test Results	
5. Description of Test Modes	
6. Duty Cycle Measurement	
7. RF Output Power Measurement	16
7.1 Provisions Applicable	16
7.2 Measurement Procedure	
7.3 Measurement Setup (Block Diagram of Configuration)	16
7.4 Measurement Result	17
8. 6dB Bandwidth Measurement	20
8.1 Provisions Applicable	20
8.2 Measurement Procedure	20
8.3 Measurement Setup (Block Diagram of Configuration)	20
8.4 Measurement Results	21
9. Power Spectral Density Measurement	25
9.1 Provisions Applicable	25
9.2 Measurement Procedure	
9.3 Measurement Setup (Block Diagram of Configuration)	
9.4 Measurement Results	
10. Conducted Band Edge and Out-of-Band Emissions	28





10.1 Provisions Applicable	28
10.2 Measurement Procedure	
10.3 Measurement Setup (Block Diagram of Configuration)	28
10.4 Measurement Results	29
11. Radiated Spurious Emission	35
11.1 Measurement Limit	35
11.2 Measurement Procedure	35
11.3 Measurement Setup (Block Diagram of Configuration)	38
11.4 Measurement Result	39
12. AC Power Line Conducted Emission Test	48
12.1 Measurement Limit	48
12.2 Measurement Setup (Block Diagram of Configuration)	48
12.3 Preliminary Procedure of Line Conducted Emission Test	
12.4 Final Procedure of Line Conducted Emission Test	49
12.5 Measurement Results	49
Appendix I: Photographs of Test Setup	52
Appendix II: Photographs of Test EUT	



1. General Information

Shenzhen Hangshi Electronic Technology Co., Ltd
2nd Floor, Building A1, Zone G, Democratic Western Industrial Zone, Park, Shajing Street, Bao'an District, Shenzhen, 518104, China.
Shenzhen Hangshi Electronic Technology Co., Ltd
2nd Floor, Building A1, Zone G, Democratic Western Industrial Zone, Park, Shajing Street, Bao'an District, Shenzhen, 518104, China.
Shenzhen Hangshi Electronic Technology Co., Ltd
2nd Floor, Building A1, Zone G, Democratic Western Industrial Zone, Park, Shajing Street, Bao'an District, Shenzhen, 518104, China.
Wireless Mouse
N/A
MD230
M230
All the series models are the same as the test model except for the model names.
Sep. 27, 2024
Sep. 27, 2024 – Oct. 26, 2024
No any deviation from the test method
Normal
Pass
AGCER-FCC-SRD-V1

Note: The test results of this report relate only to the tested sample identified in this report.

Prepared By	Jouk Gai	
	Jack Gui (Project Engineer)	Oct, 26, 2024
Reviewed By	Calvin Lin	
	Calvin Liu (Reviewer)	Oct, 26, 2024
Approved By	Max Zhang	
	Max Zhang (Authorized Officer)	Oct, 26, 2024



2. Product Information

2.1 Product Technical Description

Frequency Band	2400MHz-2483.5MHz
Operation Frequency Range	2403MHz-2480MHz
Modulation Type	GFSK
Number of channels	16
Channel Separation	2 MHz
Maximum Transmitter Power	-1.587dBm
Hardware Version	Ver5.0
Software Version	V1.0
Antenna Designation	PCB Antenna
Antenna Gain	2.75dBi
Power Supply	DC 3.7V by battery or DC 5V by adapter

2.2 Test Frequency List

Frequency Band	Channel Number	Frequency	Channel Number	Frequency
	1	2403 MHz	0	2414 MHz
	2	2426 MHz	10	2436 MHz
	3	2441 MHz	11	2459 MHz
0400 0400 5MH-	4	2463MHz	12	2473 MHz
2400~2483.5MHz	5	2407MHz	13	2419 MHz
	6	2422 MHz	14	2439 MHz
	7	2445 MHz	15	2453 MHz
	8	2466 MHz	16	2480 MHz



Report No.: AGC00803240904FR03

Page 7 of 52

2.3 Related Submittal(S) / Grant (S)

This submittal(s) (test report) is intended for **FCC ID: 2AKHJ-MD230**, filing to comply with Part 2, Part 15 of the Federal Communication Commission rules.

2.4 Test Methodology

The tests were performed according to following standards:

No.	Identity	Document Title
1	FCC 47 CFR Part 2	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 15	Radio Frequency Devices
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices
4	KDB 558074 D01 15.247 Meas Guidance v05r02	Guidance for compliance measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum system, and Hybrid system devices operating under Section 15.247 of the FCC rules

2.5 Special Accessories

Not available for this EUT intended for grant.

2.6 Equipment Modifications

Not available for this EUT intended for grant.

2.7 Antenna Requirement

Standard Requirement

15.203 requirement:

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi

EUT Antenna:

The non-detachable antenna inside the device cannot be replaced by the user at will. The gain of the antenna is 2.75dBi.



Report No.: AGC00803240904FR03

Page 8 of 52

3. Test Environment

3.1 Address of the Test Laboratory

Laboratory: Attestation of Global Compliance (Shenzhen) Co., Ltd.

Address: 1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L5488

Attestation of Global Compliance (Shenzhen) Co., Ltd. has been assessed and proved to follow CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories).

A2LA-Lab Cert. No.: 5054.02

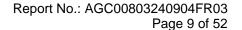
Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to follow ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC-Registration No.: 975832

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files with Registration 975832.

IC-Registration No.: 24842 (CAB identifier: CN0063)

Attestation of Global Compliance (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the Certification and Engineering Bureau of Industry Canada. The acceptance letter from the IC is maintained in our files with Registration 24842.





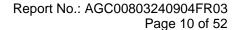
3.3 Environmental Conditions

	Normal Conditions		
Temperature range (℃)	15 - 35		
Relative humidity range	20 % - 75 %		
Pressure range (kPa)	86 - 106		
Power supply	DC 3.7V by battery or DC 5V by adapter		

3.4 Measurement Uncertainty

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Item	Measurement Uncertainty		
Uncertainty of Conducted Emission for AC Port	$U_c = \pm 2.9 \text{ dB}$		
Uncertainty of Radiated Emission below 1GHz	$U_c = \pm 3.9 \text{ dB}$		
Uncertainty of Radiated Emission above 1GHz	$U_c = \pm 4.9 \text{ dB}$		
Uncertainty of total RF power, conducted	$U_c = \pm 0.8 \text{ dB}$		
Uncertainty of RF power density, conducted	$U_c = \pm 2.6 \text{ dB}$		
Uncertainty of spurious emissions, conducted	$U_c = \pm 2 \%$		
Uncertainty of Occupied Channel Bandwidth	U _c = ±2 %		



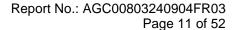


3.5 List of Equipment Use

RF Conducted Test System							
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
\boxtimes	AGC-ER-E036	Spectrum Analyzer	Agilent	N9020A	MY49100060	2024-05-24	2025-05-23
\boxtimes	AGC-ER-E062	Power Sensor	Agilent	U2021XA	MY54110007	2024-02-01	2025-01-31
\boxtimes	AGC-ER-E063	Power Sensor	Agilent	U2021XA	MY54110009	2024-02-01	2025-01-31
\boxtimes	AGC-ER-A001	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-09-21	2025-09-20
\boxtimes	AGC-ER-E083	Signal Generator	Agilent	E4421B	US39340815	2024-05-23	2025-05-22
\boxtimes	N/A	RF Connection Cable	N/A	1#	N/A	Each time	N/A
\boxtimes	N/A	RF Connection Cable	N/A	2#	N/A	Each time	N/A

• F	Radiated Spurio	ous Emission					
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
	AGC-EM-E046	EMI Test Receiver	R&S	ESCI	10096	2024-02-01	2025-01-31
\boxtimes	AGC-EM-E116	EMI Test Receiver	R&S	ESCI	100034	2024-05-24	2025-05-23
\boxtimes	AGC-EM-E061	Spectrum Analyzer	Agilent	N9010A	MY53470504	2024-05-28	2025-05-27
\boxtimes	AGC-EM-E086	Loop Antenna	ZHINAN	ZN30900C	18051	2024-03-05	2026-03-04
\boxtimes	AGC-EM-E001	Wideband Antenna	SCHWARZBECK	VULB9168	D69250	2023-05-11	2025-05-10
\boxtimes	AGC-EM-E029	Broadband Ridged Horn Antenna	ETS	3117	00034609	2024-03-31	2025-03-30
\boxtimes	AGC-EM-E082	Horn Antenna	SCHWARZBECK	BBHA 9170	#768	2023-09-24	2025-09-23
\boxtimes	AGC-EM-E146	Pre-amplifier	ETS	3117-PA	00246148	2024-07-24	2026-07-23
\boxtimes	AGC-EM-A119	2.4G Filter	SongYi	N/A	N/A	2024-05-23	2025-05-22
\boxtimes	AGC-EM-A138	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2025-06-08
	AGC-EM-A139	6dB Attenuator	Eeatsheep	LM-XX-6-5W	N/A	2023-06-09	2025-06-08

•	AC Power Line Conducted Emission							
ι	Jsed	Equipment No.	Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal. Date (YY-MM-DD)	Next Cal. Date (YY-MM-DD)
	\boxtimes	AGC-EM-E045	EMI Test Receiver	R&S	ESPI	101206	2024-05-28	2025-05-27
	\boxtimes	AGC-EM-A130	6dB Attenuator	Eeatsheep	LM-XX-6-5W	DC-6GZ	2023-06-09	2025-06-08
	\boxtimes	AGC-EM-E023	AMN	R&S	100086	ESH2-Z5	2024-05-28	2025-05-27





• Tes	Test Software					
Used	Equipment No.	Test Equipment	Manufacturer	Model No.	Version Information	
\boxtimes	AGC-EM-S001	CE Test System	R&S	ES-K1	V1.71	
\boxtimes	AGC-EM-S003	RE Test System	FARA	EZ-EMC	VRA-03A	
	AGC-EM-S004	RE Test System	Tonscend	TS+Ver2.1(JS32-RE)	4.0.0.0	
\boxtimes	AGC-ER-S012	BT/WIFI Test System	Tonscend	JS1120-2	2.6	
\boxtimes	AGC-EM-S011	RSE Test System	Tonscend	TS+-Ver2.1(JS36-RSE)	4.0.0.0	



Report No.: AGC00803240904FR03

Page 12 of 52

4.System Test Configuration

4.1 EUT Configuration

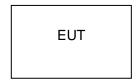
The EUT configuration for testing is installed on RF field strength measurement to meet the Commission's requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

4.2 EUT Exercise

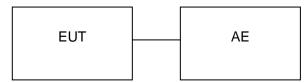
The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

4.3 Configuration of Tested System

Radiated Emission Configure:



Conducted Emission Configure:



4.4 Equipment Used In Tested System

The following peripheral devices and interface cables were connected during the measurement:

☐ Test Accessories Come From The Laboratory

No.	Equipment	Manufacturer	Model No.	Specification Information	Cable
1	Adapter	Huawei	HW-200440C00		
2	Notebook PC	Redmi	XMA2002-AB		
3	Control Box	RISYM	USB-TTL		

Test Accessories Come From The Manufacturer

No.	Equipment	Manufacturer	Model No.	Specification Information	Cable
1			-		-



Report No.: AGC00803240904FR03

Page 13 of 52

4.5 Summary of Test Results

Item	FCC Rules	Description of Test	Result
1	§15.203&15.247(b)(4)	Antenna Equipment	Pass
2	§15.247 (b)(3)	RF Output Power	Pass
3	§15.247 (a)(2)	6 dB Bandwidth	Pass
4	§15.247 (e)	Power Spectral Density	Pass
5	§15.247 (d)	Conducted Band Edge and Out-of-Band Emissions	Pass
6	§15.209	Radiated Emission& Band Edge	Pass
7	§15.207	AC Power Line Conducted Emission	Pass



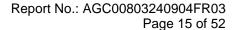
Report No.: AGC00803240904FR03 Page 14 of 52

5. Description of Test Modes

Summary Table of Test Cases				
	Data Rate / Modulation			
Test Item	SRD – 2.4G / GFSK			
	Mode 1: SRD 2.4G Tx CH00_2403 MHz(Battery powered or AC/DC adapter)			
Radiated & Conducted Test Cases	Mode 2: SRD 2.4G Tx CH19_2441 MHz(Battery powered or AC/DC adapter)			
1001 04000	Mode 3: SRD 2.4G Tx CH39_2480 MHz(Battery powered or AC/DC adapter)			
AC Conducted Emission	Mode 1: SRD 2.4G + Battery + USB Cable (Charging from AC Adapter)			

Note:

- 1. Only the result of the worst case was recorded in the report, if no other cases.
- 2. The battery is full-charged during the test.
- 3. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
- 4. For Conducted Test method, a temporary antenna connector is provided by the manufacture.
- 5. Set the EUT into the individual test modes by pressing the EUT buttons.





6. Duty Cycle Measurement

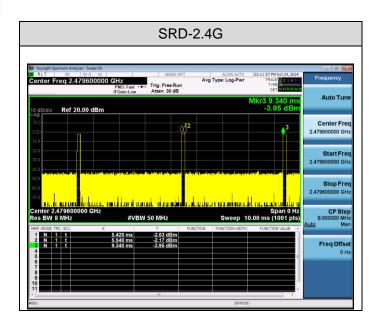
The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = Peak. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Operating mode	T(µs)	Duty Cycle (%)	Duty Cycle Factor (dB)	1/ T Minimum VBW (kHz)
SRD-2.4G	120	3.06	15.14	8.33

Remark:

- 1. Duty Cycle factor = 10 * log (1/ Duty cycle)
- The duty cycle of each frequency band mode reflects the determination requirements of the low channel measurement value

The test plots as follows:





7. RF Output Power Measurement

7.1 Provisions Applicable

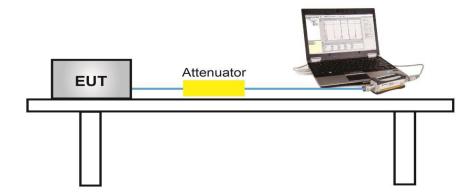
For DTSs employing digital modulation techniques operating in the bands 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1 W.

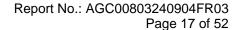
7.2 Measurement Procedure

- For Peak Power, the testing follows ANSI C63.10 Section 11.9.1.1 Method Max peak power:
- 1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
- 2. Set the RBW ≥ DTS bandwidth
- 3. Set the VBW ≥ [3 x RBW].
- 4. Span ≥ [3 x RBW].
- 5. Sweep= auto couple.
- 6. Detector Function= Peak.
- 7. Trace mode= Max hold.
- 8. Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.
- For Average power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G:
- The RF output of EUT was connected to the power meter by RF cable and attenuator.
- 2. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Measure the conducted output power and record the results in the test report.

7.3 Measurement Setup (Block Diagram of Configuration)

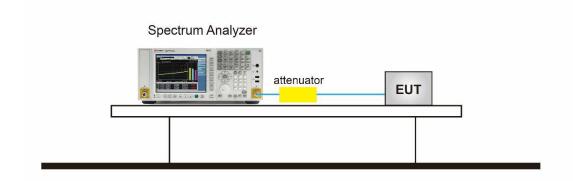
For Average power test setup





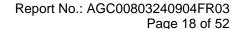


⊠For peak power test setup

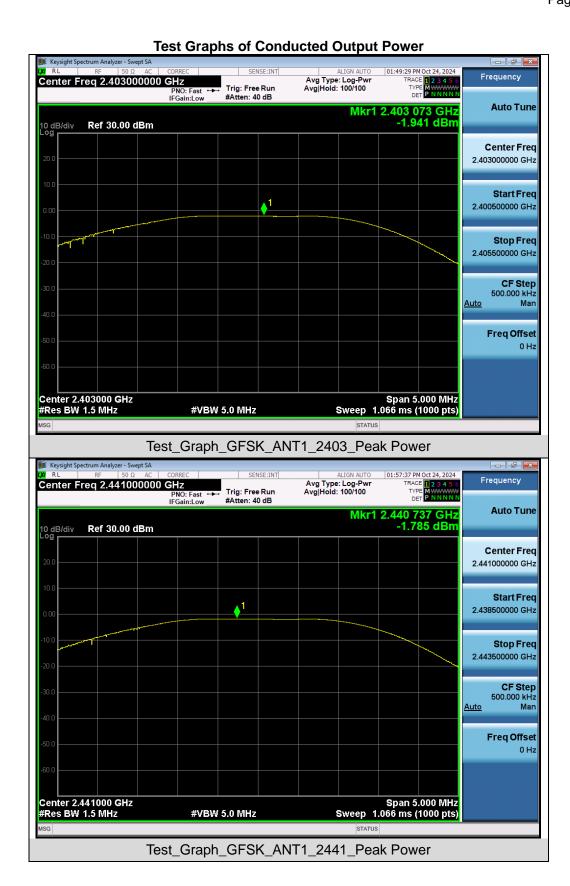


7.4 Measurement Result

Test Data of Conducted Output Power					
Test Mode	Test Frequency (MHz)	Peak Power (dBm)	Limits (dBm)	Pass or Fail	
	2403	-1.941	≤30	Pass	
GFSK	2441	-1.785	≤30	Pass	
	2480	-1.587	≤30	Pass	

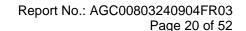














8. 6dB Bandwidth Measurement

8.1 Provisions Applicable

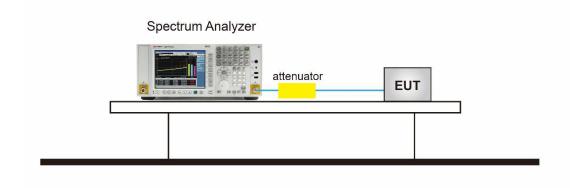
The minimum 6dB bandwidth shall be 500 kHz.

8.2 Measurement Procedure

The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).

- 1. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously.
- 3. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
- For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the OBW and set the Video bandwidth (VBW) ≥ 3 * RBW.
- 5. Measure and record the results in the test report.

8.3 Measurement Setup (Block Diagram of Configuration)





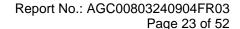
8.4 Measurement Results

Test Data of Occupied Bandwidth and DTS Bandwidth					
Test Mode	Test Frequency (MHz)	Occupied Bandwidth (MHz)	DTS BW (MHz)	DTS BW Limits	Pass or Fail
	2403	2.278	1.522	≥0.5	Pass
GFSK	2441	2.250	1.435	≥0.5	Pass
	2480	2.239	1.527	≥0.5	Pass

Test Graphs of Occupied Bandwidth 01:48:32 PM Oct 24, 2024 Radio Std: None Center Freq: 2.403000000 GHz
Trig: Free Run Avg|Hold:>10/10
#Atten: 30 dB Radio Device: BTS Ref 20.00 dBm Center Freq 2.403000000 GHz Center 2.403 GHz #Res BW 30 kHz Span 5 MHz Sweep 6.867 ms **CF Step #VBW 100 kHz** <u>Auto</u> Man **Total Power** 4.22 dBm **Occupied Bandwidth** 2.2780 MHz Freq Offset **Transmit Freq Error** -38.405 kHz **OBW Power** 99.00 % x dB Bandwidth 2.769 MHz x dB -26.00 dB Test_Graph_GFSK_ANT1_2403_OBW

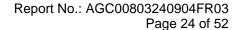




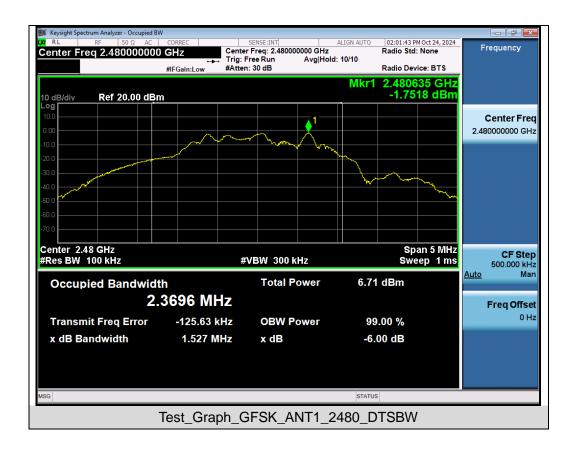


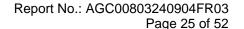














9. Power Spectral Density Measurement

9.1 Provisions Applicable

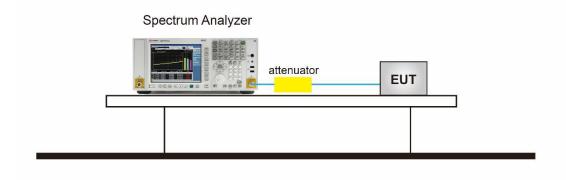
The transmitter power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

9.2 Measurement Procedure

The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.

- The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss
 was compensated to the results for each measurement.
- 2. Set to the maximum power setting and enable the EUT transmit continuously.
- Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz in order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
- 4. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
- 5. Measure and record the results in the test report.
- 6. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

9.3 Measurement Setup (Block Diagram of Configuration)

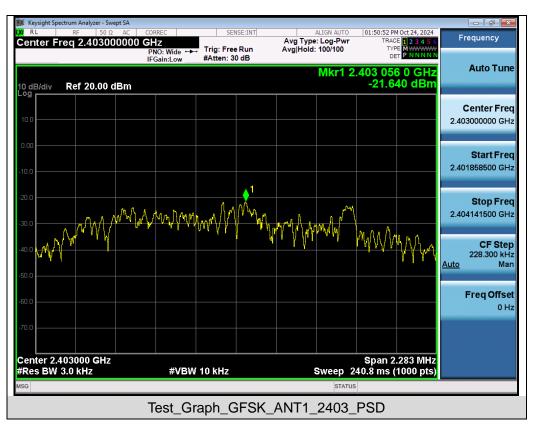




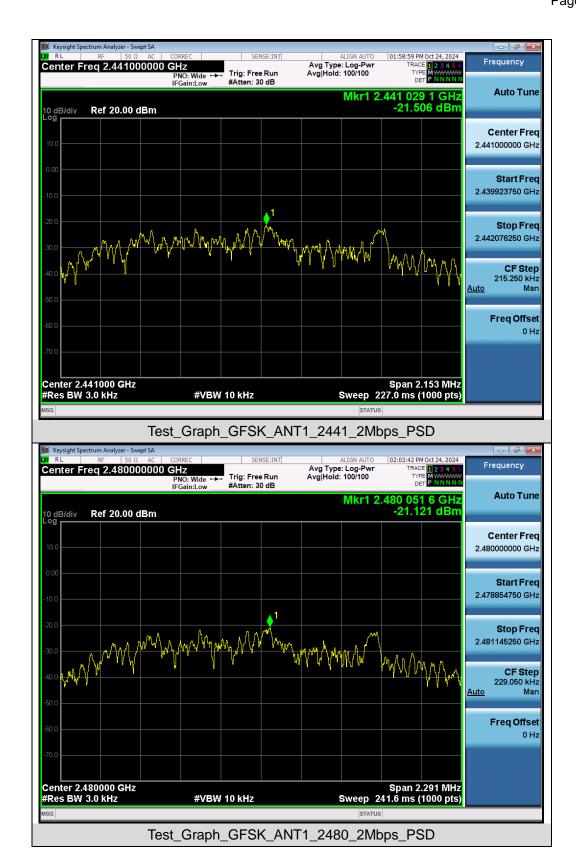
9.4 Measurement Results

Test Data of Conducted Output Power Spectral Density				
Test Mode	Test Frequency (MHz)	Power density (dBm/3kHz)	Limit (dBm/3kHz)	Pass or Fail
	2403	-21.640	≪8	Pass
GFSK	2441	-21.506	≤8	Pass
	2480	-21.121	≤8	Pass

Test Graphs of Conducted Output Power Spectral Density









10. Conducted Band Edge and Out-of-Band Emissions

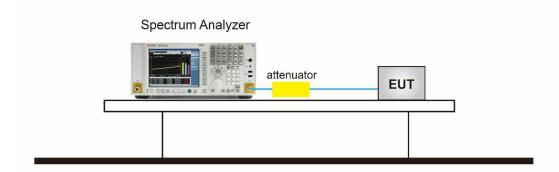
10.1 Provisions Applicable

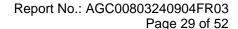
The limit for out-of-band spurious emissions at the band edge is 20dB below the fundamental emission level, as determined from the in-band power measurement of the DTS channel performed in a 100kHz bandwidth per the PSD procedure.

10.2 Measurement Procedure

- Reference level measurement
- 1. Set instrument center frequency to DTS channel center frequency
- 2. Set the span to ≥ 1.5 times the DTS bandwidth
- 3. Set the RBW = 100 kHz
- Set the VBW ≥ 3 x RBW
- 5. Detector = peak
- 6. Sweep time = auto couple
- Trace mode = max hold
- 8. Allow trace to fully stabilize
- Emission level measurement
- 1. Set the center frequency and span to encompass frequency range to be measured
- 2. RBW = 100kHz
- 3. VBW = 300kHz
- 4. Detector = Peak
- 5. Trace mode = max hold
- 6. Sweep time = auto couple
- 7. The trace was allowed to stabilize

10.3 Measurement Setup (Block Diagram of Configuration)







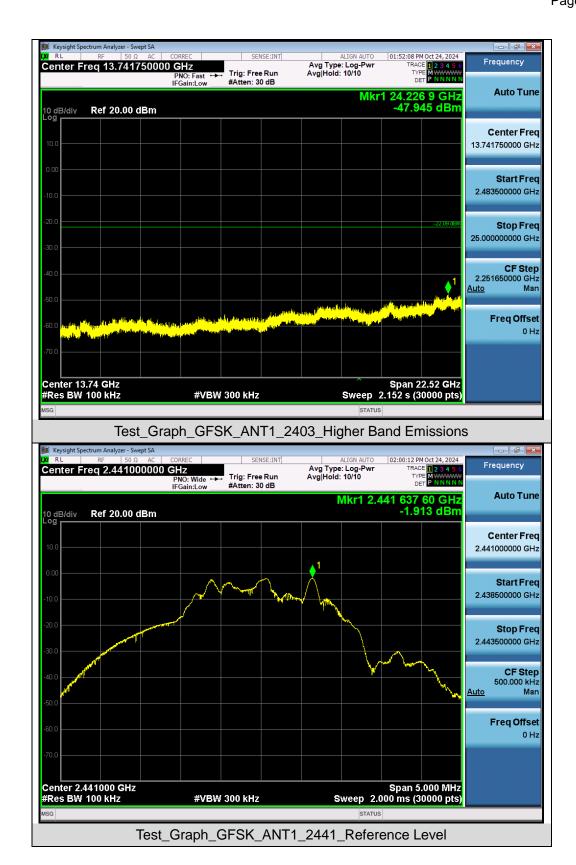
10.4 Measurement Results

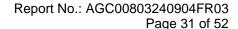


Test_Graph_GFSK_ANT1_2403_Lower Band Emissions Any report having not been signed by Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. $Further\ enquiry\ of\ validity\ or\ verification\ of\ the\ test\ report\ should\ be\ addressed\ to\ AGC\ by\ agc 01@agccert.com.$

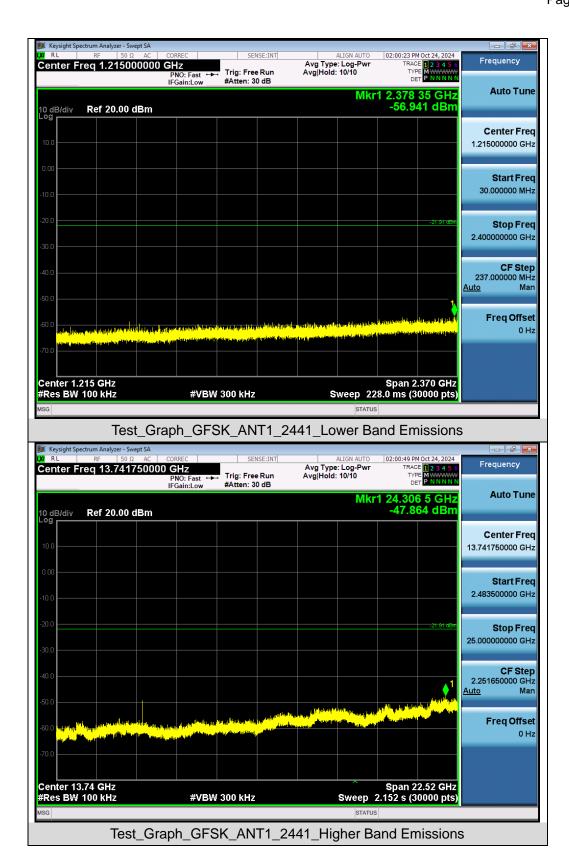
#VBW 300 kHz









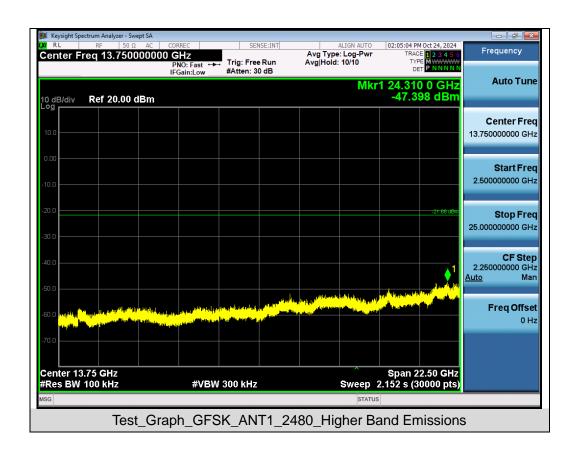


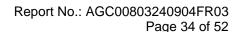
Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/



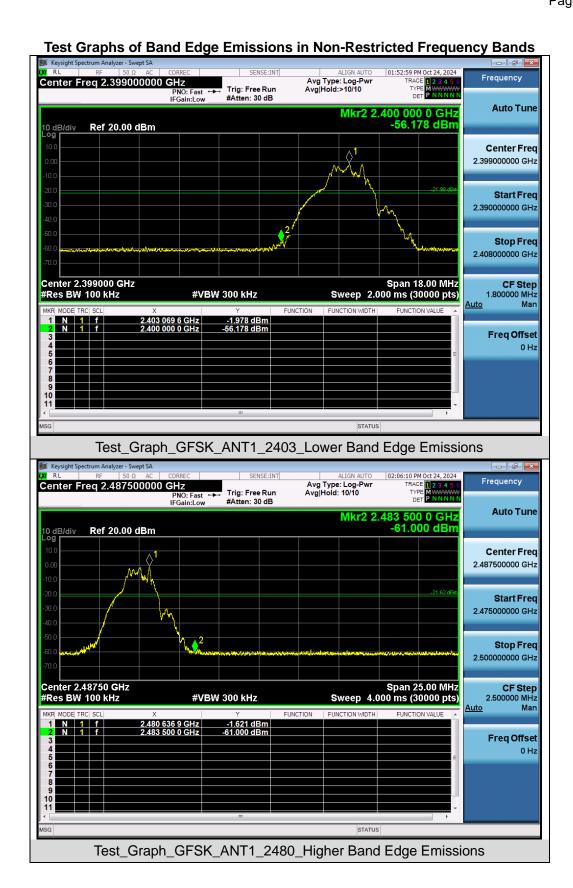














Report No.: AGC00803240904FR03

Page 35 of 52

11. Radiated Spurious Emission

11.1 Measurement Limit

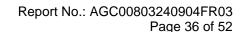
FCC Part 15.209 Limit in the below table to be followed

1 00 1 art 13.203 Elithit in the below to	1 OC 1 art 15.209 Einfit in the below table to be followed				
Frequencies	Field Strength	Measurement Distance			
(MHz)	(microvolts/meter)	(meters)			
0.009~0.490	2400/F(kHz)	300			
0.490~1.705	24000/F(kHz)	30			
1.705~30.0	30	30			
30~88	100	3			
88~216	150	3			
216~960	200	3			
Above 960	500	3			

Note: All modes were tested for restricted band radiated emission, the test records reported below are the worst result compared to other modes.

11.2 Measurement Procedure

- The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
- 2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
- 3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
- 4. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
- 5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
- 6. For emissions above 1GHz, use 1MHz RBW and 3MHz VBW for peak reading. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- 7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.
- 8. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.





- pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
- 9. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
- 10. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- 11. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High Low scan is not required in this case.

The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Start ~Stop Frequency	9kHz~150kHz/RB 200Hz for QP
Start ~Stop Frequency	150kHz~30MHz/RB 9kHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120kHz for QP
Start ~Stop Frequency	1GHz~26.5GHz
Start ~Stop i requerity	1MHz/3MHz for Peak, 1MHz/3MHz for Average

Receiver Parameter	Setting
Start ~Stop Frequency	9kHz~150kHz/RB 200Hz for QP
Start ~Stop Frequency	150kHz~30MHz/RB 9kHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120kHz for QP



Report No.: AGC00803240904FR03

Page 37 of 52

Quasi-Peak Measurements below 1GHz

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. Span was set greater than 1MHz
- 3. RBW = as shown in the table above
- 4. Detector = CISPR quasi-peak
- 5. Sweep time = auto couple
- 6. Trace was allowed to stabilize

Peak Measurements above 1GHz

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 1MHz
- 3. VBW = 3MHz
- 4. Detector = peak
- 5. Sweep time = auto couple
- 6. Trace mode = max hold
- 7. Trace was allowed to stabilize

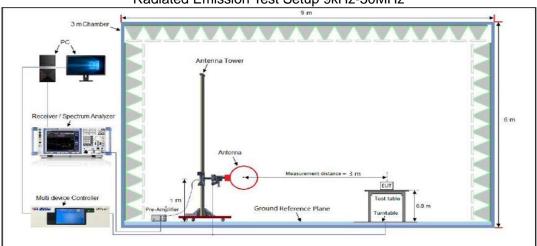
Average Measurements above 1GHz

- 1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- 2. RBW = 1MHz
- 3. $VBW \ge [3 \times RBW]$
- 4. Detector = Power averaging (rms)
- 5. Averaging type = power (i.e., rms)
- 6. Sweep time = auto
- 7. Perform a trace average of at least 100 traces.
- 8. The applicable correction factor is [10*log (1 / D)], where D is the duty cycle. The factor had been edited in the "Input Correction" of the Spectrum Analyzer.

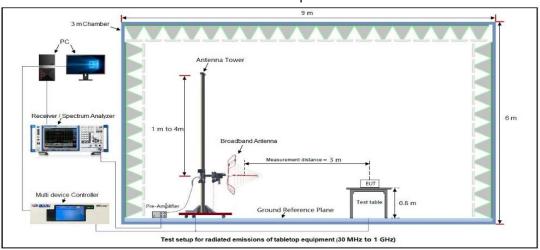


11.3 Measurement Setup (Block Diagram of Configuration)

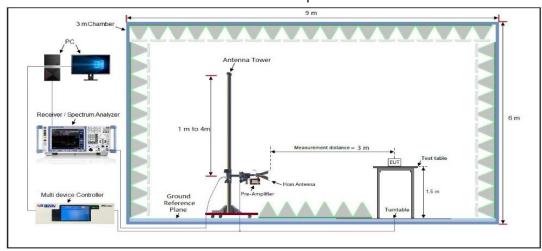
Radiated Emission Test Setup 9kHz-30MHz



Radiated Emission Test Setup 30MHz-1000MHz



Radiated Emission Test Setup Above 1000MHz



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Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/

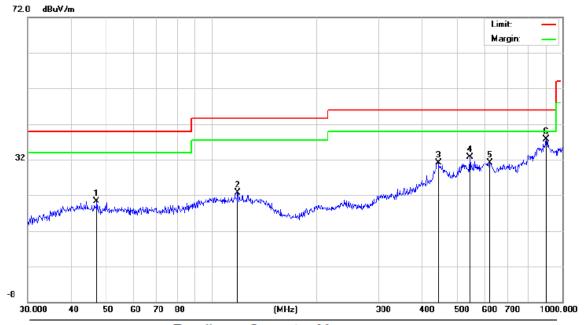


11.4 Measurement Result

Radiated Emission Below 30MHz

The amplitude of spurious emissions from 9kHz to 30MHz which are attenuated more than 20 dB below the permissible value need not be reported.

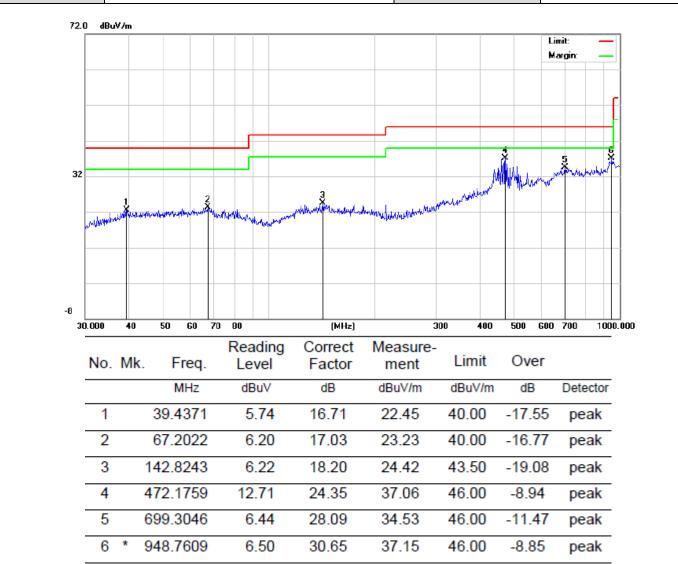
Radiated Emission Test Results at 30MHz-1GHz					
EUT Name	Wireless Mouse	Model Name	MD230		
Temperature	23.2℃	Relative Humidity	59.4%		
Pressure	960hPa	Test Voltage	DC 3.7V by battery		
Test Mode	Mode 3	Antenna Polarity	Horizontal		



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector
1		47.1599	6.98	13.40	20.38	40.00	-19.62	peak
2		119.0180	6.37	16.39	22.76	43.50	-20.74	peak
3		443.2943	6.12	24.98	31.10	46.00	-14.90	peak
4		545.1826	8.63	23.98	32.61	46.00	-13.39	peak
5		622.8900	6.27	24.93	31.20	46.00	-14.80	peak
6	*	900.1474	5.98	31.78	37.76	46.00	-8.24	peak



Radiated Emission Test Results at 30MHz-1GHz					
EUT Name	Wireless Mouse	Model Name	MD230		
Temperature	23.2℃	Relative Humidity	59.4%		
Pressure	960hPa	Test Voltage	DC 3.7V by battery		
Test Mode	Mode 3	Antenna Polarity	Vertical		



RESULT: Pass

Note: 1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.

2. All test modes had been pre-tested. The mode 3 is the worst case and recorded in the report.





Radiated Emissions Test Results for Above 1GHz

EUT Name	Wireless Mouse	Model Name	MD230
Temperature	23.2℃	Relative Humidity	59.4%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 1	Antenna Polarity	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4806.000	47.56	0.08	47.64	74	-26.36	peak
4806.000	38.54	0.08	38.62	54	-15.38	AVG
7209.000	41.94	2.21	44.15	74	-29.85	peak
7209.000	31.25	2.21	33.46	54	-20.54	AVG
omark:	•		<u> </u>		•	•

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

EUT Name	Wireless Mouse	Model Name	MD230
Temperature	23.2℃	Relative Humidity	59.4%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 1	Antenna Polarity	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4806.000	47.54	0.08	47.62	74	-26.38	peak
4806.000	38.52	0.08	38.6	54	-15.4	AVG
7209.000	42.34	2.21	44.55	74	-29.45	peak
7209.000	31.69	2.21	33.9	54	-20.1	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

RESULT: Pass



Report No.: AGC00803240904FR03

Page 42 of 52

Radiated Emissions Test Results for Above 1GHz

EUT Name	Wireless Mouse	Model Name	MD230
Temperature	23.2℃	Relative Humidity	59.4%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 2	Antenna Polarity	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4882.000	45.77	0.14	45.91	74	-28.09	peak
4882.000	38.19	0.14	38.33	54	-15.67	AVG
7323.000	41.63	2.36	43.99	74	-30.01	peak
7323.000	34.25	2.36	36.61	54	-17.39	AVG

Remark:

Factor = Antenna Factor + Cable Loss - Pre-amplifier.

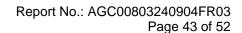
EUT Name	Wireless Mouse	Model Name	MD230
Temperature	23.2℃	Relative Humidity	59.4%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 2	Antenna Polarity	Vertical

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4882.000	45.29	0.14	45.43	74	-28.57	peak
4882.000	37.62	0.14	37.76	54	-16.24	AVG
7323.000	40.95	2.36	43.31	74	-30.69	peak
7323.000	33.79	2.36	36.15	54	-17.85	AVG

Remark:

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

RESULT: Pass





Radiated Emissions Test Results for Above 1GHz

EUT Name	Wireless Mouse	Model Name	MD230
Temperature	23.2℃	Relative Humidity	59.4%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 3	Antenna Polarity	Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type	
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	Value Type	
4960.000	47.19	0.22	47.41	74	-26.59	peak	
4960.000	38.54	0.22	38.76	54	-15.24	AVG	
7440.000	42.34	2.64	44.98	74	-29.02	peak	
7440.000	31.56	2.64	34.2	54	-19.8	AVG	

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

EUT Name	Wireless Mouse	Model Name	MD230
Temperature	23.2℃	Relative Humidity	59.4%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 3	Antenna Polarity	Vertical

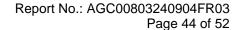
Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Value Type
(MHz)	(dBµV)	(dB)	(dBµV/m)	(dBµV/m)	(dB)	value Type
4960.000	47.51	0.22	47.73	74	-26.27	peak
4960.000	38.52	0.22	38.74	54	-15.26	AVG
7440.000	42.16	2.64	44.8	74	-29.2	peak
7440.000	31.65	2.64	34.29	54	-19.71	AVG
Remark:						

Factor = Antenna Factor + Cable Loss - Pre-amplifier.

RESULT: Pass

Note:

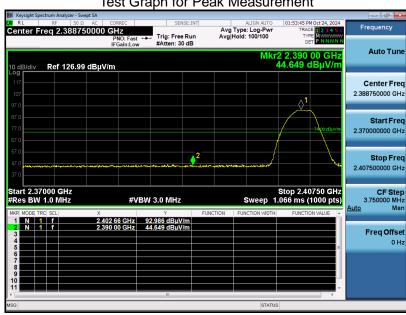
- The amplitude of other spurious emissions from 1G to 25 GHz which are attenuated more than 20 dB below the permissible value need not be reported.
- 2. Factor = Antenna Factor + Cable loss – Pre-amplifier gain, Margin = Emission Level-Limit.
- The "Factor" value can be calculated automatically by software of measurement system.

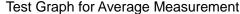




EUT Name	Wireless Mouse	Model Name	MD230
Temperature	25.1℃	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 1	Antenna Polarity	Horizontal

Test Graph for Peak Measurement





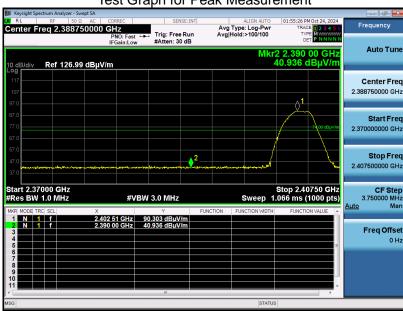


RESULT: Pass

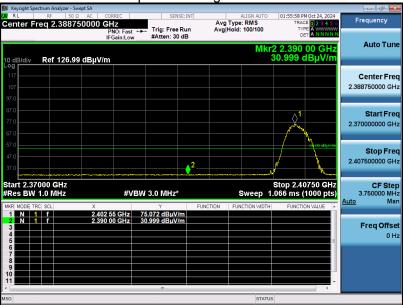


EUT Name	Wireless Mouse	Model Name	MD230
Temperature	25.1℃	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 1	Antenna Polarity	Vertical

Test Graph for Peak Measurement





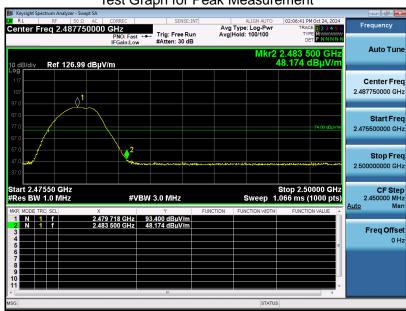


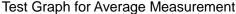
RESULT: Pass



EUT Name	Wireless Mouse	Model Name	MD230
Temperature	25.1℃	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 3	Antenna Polarity	Horizontal

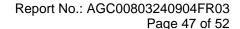
Test Graph for Peak Measurement







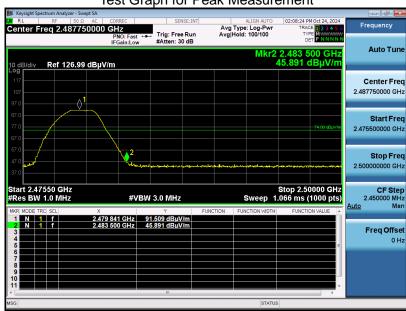
RESULT: Pass

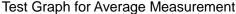




EUT Name	Wireless Mouse	Model Name	MD230
Temperature	25.1℃	Relative Humidity	55%
Pressure	960hPa	Test Voltage	DC 3.7V by battery
Test Mode	Mode 3	Antenna Polarity	Vertical

Test Graph for Peak Measurement







RESULT: Pass

Note: The factor had been edited in the "Input Correction" of the Spectrum Analyzer.



12. AC Power Line Conducted Emission Test

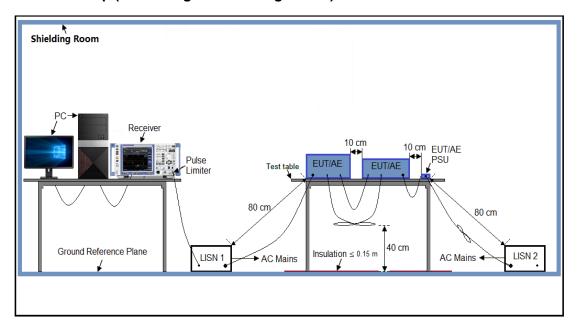
12.1 Measurement Limit

Francisco	Maximum RF	Line Voltage
Frequency	Q.P. (dBμV)	Average (dBμV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	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 MHz to 0.50 MHz

12.2 Measurement Setup (Block Diagram of Configuration)





Report No.: AGC00803240904FR03 Page 49 of 52

12.3 Preliminary Procedure of Line Conducted Emission Test

- 1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When 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 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
- 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. All support equipment received AC120V/60Hz power from a LISN, if any.
- 5. The EUT received DC 5V power from adapter which received AC120V/60Hz power from a LISN.
- 6. The 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.
- 8. During the above scans, the emissions were maximized by cable manipulation.
- 9. The test mode(s) were scanned during the preliminary test.

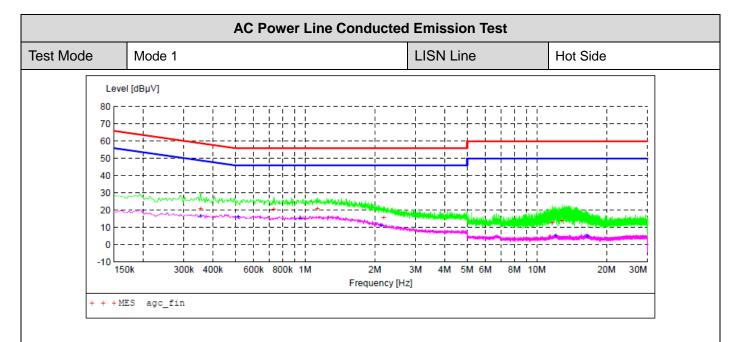
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

12.4 Final Procedure of Line Conducted Emission Test

- 1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
- 2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less 2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
- 3. The test data of the worst case condition(s) was reported on the Summary Data page.

12.5 Measurement Results





MEASUREMENT RESULT: "agc fin"

2024/10/8 15:	38					
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line
0.354000	20.90	6.1	59	38.0	QP	L1
0.734000	20.40	6.2	56	35.6	QP	L1
1.130000	21.10	6.2	56	34.9	QP	L1
2.186000	15.60	6.3	56	40.4	QP	L1
11.654000	12.50	6.7	60	47.5	QP	L1
12.870000	13.80	6.8	60	46.2	OP	L1

MEASUREMENT RESULT: "agc fin2"

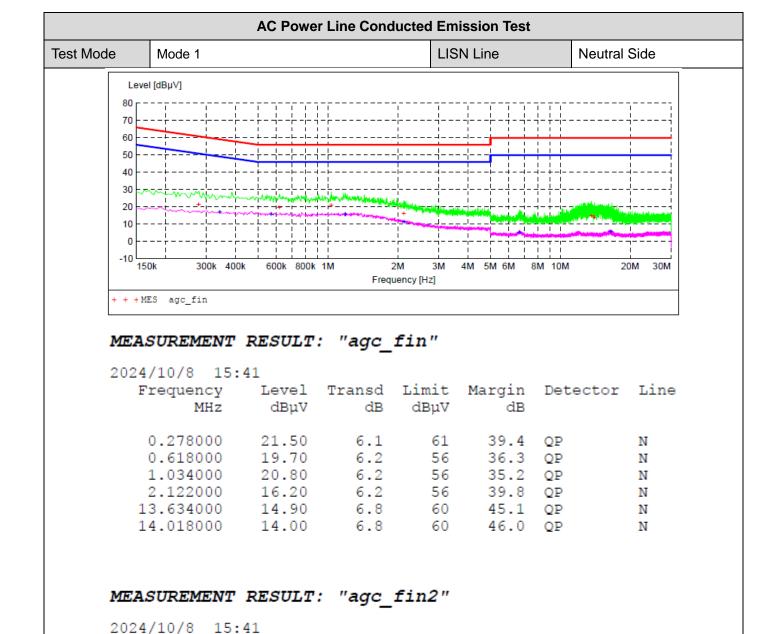
2024/10/8	15:38					
Frequen M	cy Level Hz dBµV		Limit dBµV	Margin dB	Detector	Line
0.3540	00 16.70	6.1	49	32.2	AV	L1
0.5140	00 16.00	6.2	46	30.0	AV	L1
0.9500	00 15.30	6.2	46	30.7	AV	L1
2.1220	00 11.20	6.2	46	34.8	AV	L1
12.0660	00 5.40	6.8	50	44.6	AV	L1
16.4700	00 5.00	6.9	50	45.0	AV	L1

RESULT: Pass

Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Tel: +86-755 2523 4088 E-mail: agc@agccert.com Web: http://www.agccert.com/





RESULT: PASS

Any report having not been signed by authorized approver, or having been altered without authorization, or having not been stamped by the "Dedicated Testing/Inspection Stamp" is deemed to be invalid. Copying or excerpting portion of, or altering the content of the report is not permitted without the written authorization of AGC. The test results presented in the report apply only to the tested sample. Any objections to report issued by AGC should be submitted to AGC within 15days after the issuance of the test report. Further enquiry of validity or verification of the test report should be addressed to AGC by agc01@agccert.com.

Limit

dΒμV

49

46

46

46

50

50

Transd

dΒ

6.1

6.2

6.2

6.2

6.5

6.9

Margin

dΒ

32.4

30.1

30.3

34.8

44.9

44.3

Detector

ΑV

ΑV

ΑV

ΑV

ΑV

ΑV

Line

Ν

Ν

Ν

Ν

Ν

Ν

Frequency

0.342000

0.570000

1.186000

2.126000

6.650000

16.462000

MHz

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Level

dΒμV

16.80

15.90

15.70

11.20

5.10

5.70



Report No.: AGC00803240904FR03 Page 52 of 52

Appendix I: Photographs of Test Setup

Refer to the Report No.: AGC00803240904AP02

Appendix II: Photographs of Test EUT

Refer to the Report No.: AGC00803240904AP03

----End of Report----



Conditions of Issuance of Test Reports

- 1. All samples and goods are accepted by the Attestation of Global Compliance (Shenzhen) Co., Ltd (the "Company") solely for testing and reporting in accordance with the following terms and conditions. The company provides its services on the basis that such terms and conditions constitute express agreement between the company and any person, firm or company requesting its services (the "Clients").
- 2. Any report issued by Company as a result of this application for testing services (the "Report") shall be issued in confidence to the Clients and the Report will be strictly treated as such by the Company. It may not be reproduced either in its entirety or in part and it may not be used for advertising or other unauthorized purposes without the written consent of the Company. The Clients to whom the Report is issued may, however, show or send it, or a certified copy thereof prepared by the Company to its customer, supplier or other persons directly concerned. The Company will not, without the consent of the Clients, enter into any discussion or correspondence with any third party concerning the contents of the Report, unless required by the relevant governmental authorities, laws or court orders.
- 3. The Company shall not be called or be liable to be called to give evidence or testimony on the Report in a court of law without its prior written consent, unless required by the relevant governmental authorities, laws or court orders.
- 4. In the event of the improper use of the report as determined by the Company, the Company reserves the right to withdraw it, and to adopt any other additional remedies which may be appropriate.
- 5. Samples submitted for testing are accepted on the understanding that the Report issued cannot form the basis of, or be the instrument for, any legal action against the Company.
- 6. The Company will not be liable for or accept responsibility for any loss or damage however arising from the use of information contained in any of its Reports or in any communication whatsoever about its said tests or investigations.
- 7.Clients wishing to use the Report in court proceedings or arbitration shall inform the Company to that effect prior to submitting the sample for testing.
- 8. The Company is not responsible for recalling the electronic version of the original report when any revision is made to them. The Client assumes the responsibility to providing the revised version to any interested party who uses them.
- 9. Subject to the variable length of retention time for test data and report stored hereinto as otherwise specifically required by individual accreditation authorities, the Company will only keep the supporting test data and information of the test report for a period of six years. The data and information will be disposed of after the aforementioned retention period has elapsed. Under no circumstances shall we provide any data and information which has been disposed of after retention period. Under no circumstances shall we be liable for damage of any kind, including (but not limited to) compensatory damages, lost profits, lost data, or any form of special, incidental, indirect, consequential or punitive damages of any kind, whether based on breach of contract of warranty, tort (including negligence), product liability or otherwise, even if we are informed in advance of the possibility of such damages.