

RF EXPOSURE REPORT

CERTIFICATE OF CONFORMITY

FCC Rule Part: FCC Part 2 (Section 2.1091)
FCC Part 2 (Section 2.1093)

Report No.: MFBGSN-WTW-P22060933

FCC ID: I4L-GRAX66

Model No.: GRAX66

Received Date: 2022/6/27

Test Date: 2022/9/3

Issued Date: 2022/10/07

Applicant: Micro-Star International Co., Ltd.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

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FCC Registration / 788550 / TW0003

Designation Number:

Approved by:

Jeremy Lin

Date:

2022/10/07

Jeremy Lin / Project Engineer

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Prepared by : Polly Chien / Specialist

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Release Control Record

Issue No.	Description	Date Issued
MFBGSN-WTW-P22060933	Original release.	2022/10/07

1 Certificate

Product: RadiX AX6600 WiFi 6 Tri-Band Gaming Router

Brand: msi

Test Model: GRAX66

Sample Status: Identical Prototype

Applicant: Micro-Star International Co., Ltd.

Test Date: 2022/9/3

FCC Rule Part: FCC Part 2 (Section 2.1091)

FCC Part 2 (Section 2.1093)

Standard: KDB 447498 D04 Interim General RF Exposure Guidance v01

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

2 Applicable RF Exposure Limit

§ 1.1310 Radiofrequency radiation exposure limits.

(a) Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b) of this part within the frequency range of 100 kHz to 6 GHz (inclusive).

(b) The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.

(c) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.

(e) Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields

➤ Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1500	f/1500	30
1500-100,000	1.0	30

f = frequency in MHz. * = Plane-wave equivalent power density.

➤ Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
0.3-3.0	614	1.63	*(100)	≤6
3.0-30	1842/f	4.89/f	*(900/f ²)	<6
30-300	61.4	0.163	1.0	<6
300-1,500			f/300	<6
1,500-100,000			5	<6

f = frequency in MHz. * = Plane-wave equivalent power density.

3 Applicable Evaluation Criteria

Exemption Evaluation

MPE-based Exemption – §1.1307(b)(3)(i)(B)

- For mobile devices that are not exempt per Table 1 of §1.1307(b)(1)(i)(C) and device at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power.

$$P_{th} \text{ (mW)} = ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

Routine Evaluation

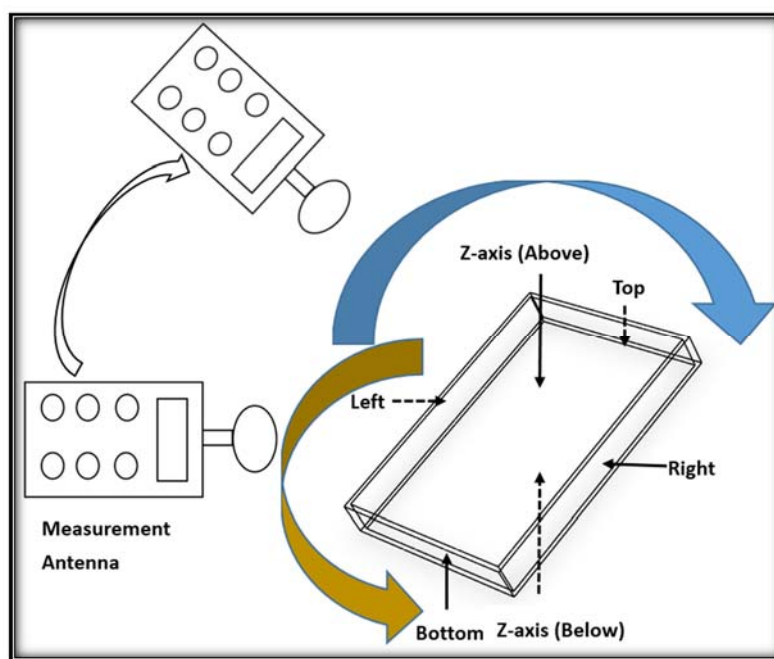
Routine Evaluation Procedure - Single and/or Multiple RF Sources

- MPE compliance are measurement in all directions surrounding the antenna and radiating structures of the device.

For non-directional antennas, MPE evaluation points shall be along radials extending from the antenna (axis) that are no more than 30° apart. The direction of maximum exposure shall be aligned with one of the radials.

For each specific exposure condition, the evaluation points along the longest dimension (e.g., vertical) shall use a spatial resolution of 10 cm or less, and shall extend at least 10 cm beyond the exposed portions of a person's body or until the evaluated results are less than 10% of the MPE limit. For exposures occurring next to the ground or next to a ground plane, the evaluation points shall be no closer than 10 cm from the ground.

Test Setup



Note: The measurement antenna are moving and surrounding the EUT when performed the test, the test results recorded the highest values for each sides of the EUT (left/right/top/bottom/z-axis)

Test Instruments

The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

3.1 RF Exposure

Description Manufacturer	Model No.	Serial No.	Calibrated Date	Calibrated Until
EM Field Meter Wavecontrol	SMP2 Dual	22SN1913	2022/4/21	2023/4/20

Notes:

1. The test was performed in Oven room.
2. Tested Date: 2022/9/3

Multiple RF Sources (Simultaneous Operations)

Fixed RF sources operating in the same time-averaging period – §1.1307(b)(3)(ii)(B)

- Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR (Evaluated_k term) should be used to determine exemption for simultaneous transmission according to Formula below,

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE should be less than 1, to determine simultaneous transmission exposure compliance.

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using [paragraph \(b\)\(3\)\(i\)\(B\)](#) of this section for P_{th} , including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

$P_{th,i}$ = the exemption threshold power (P_{th}) according to [paragraph \(b\)\(3\)\(i\)\(B\)](#) of this section for fixed, mobile, or portable RF source i .

$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$ according to the applicable formula of [paragraph \(b\)\(3\)\(i\)\(C\)](#) of this section.

$Exposure Limit_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k , as applicable from [§ 1.1310 of this chapter](#).

b = number of fixed, mobile, or portable RF sources claiming exemption using [paragraph \(b\)\(3\)\(i\)\(C\)](#) of this section for Threshold ERP, including existing exempt transmitters and those being added.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

ERP_j = the ERP of fixed, mobile, or portable RF source j .

$Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

4 Test Results

4.1 RF Exposure

Environmental Conditions:	25°C, 60% RH	Tested By:	Wayne Lin
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For Signal RF Source

MPE-based Exemption §1.1307(b)(3)(i)(B)							
Operation Mode	Frequency Band (MHz)	Average Power (mW)	Antenna Gain (dBi)	Maximum ERP (mW)	Distance (cm)	Limit Threshold (mW)	Test Result
CDD_WLAN 2.4GHz	2412-2462	983.839	2.07	965.882	20	3060	Pass
CDD_WLAN 5GHz	5180-5825	962.109	3.72	1381.097	20	3060	Pass
BF_WLAN 2.4GHz	2412-2462	854.555	4.24	1382.738	20	3060	Pass

Routine Evaluation (General Population)					
Operation Mode	Frequency Band (MHz)	Power Density (mW/cm ²)	Test Distance (cm)	Limit (mW/cm ²)	Test Result
BF_WLAN 5GHz	5180-5825	0.254	10	1	Pass

For Multiple RF Sources (Simultaneous Operations)

Multiple RF Sources (Simultaneous Operations)							
Exemption Evaluation					Sum of Ratios	Limit of Ratios	Test Result
Operation Mode	Frequency Band (MHz)	Maximum ERP (mW)	Limit Threshold (mW)	Ratio			
BF_WLAN 2.4GHz	2412-2462	1382.738	3060	0.452	0.706	1	Pass
Routine Evaluation (General Population)							
Operation Mode	Operation Mode	Power Density (mW/cm²)	Limit (mW/cm²)	Ratio			
BF_WLAN 5GHz	5180-5825	0.254	1	0.254			

The antenna information is listed as below.

RF Chain NO.	Type	Connector	Brand	Model	Frequency Range (MHz)	Gain (dBi)				Directional Gain (dBi)		
						Chain 0	Chain 1	Chain 2	Chain 3	NSS 1	NSS 2	NSS 4
2G	Dipole	I-PEX	Wieson	Chain 0: ARY121-0307-001-00 Chain 1: ARY121-0307-003-00	2400 ~ 2483.5	2.05	2.07	-	-	4.24	1.97	-
5G_L				Chain 0: ARY121-0307-001-00 Chain 1: ARY121-0307-003-00	5150 ~ 5250	4.54	4.59	-	-	5.68	3.21	-
				Chain 0: ARY121-0307-001-00 Chain 1: ARY121-0307-003-00	5250 ~ 5350	4.60	4.65	-	-	5.69	3.54	-
5G_H				Chain 0: ARY121-0307-002-00 Chain 1: ARY121-0307-004-00 Chain 2: ARY121-0307-005-00 Chain 3: ARY121-0307-006-00	5470 ~ 5725	3.02	3.69	2.89	3.02	7.59	5.56	2.47
				Chain 0: ARY121-0307-002-00 Chain 1: ARY121-0307-004-00 Chain 2: ARY121-0307-005-00 Chain 3: ARY121-0307-006-00	5725 ~ 5850	3.01	2.88	3.72	3.27	6.99	4.91	2.33

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

5 Conclusion

Source-base time average power is below Exemption Criteria and/or Routine Evaluation MPE thresholds, therefore the device is compliant FCC RF exposure requirement.

The antenna of this product, under normal use condition, is at least 20cm away form the body of the user.

6 Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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