

RF Exposure Evaluation Report

Report Reference No...... : **MTWG22030166-H**

FCC ID..... : **2AUK4-GMR15W**

Compiled by

(position+printed name+signature)..: File administrators Alisa Luo

Supervised by

(position+printed name+signature)..: Test Engineer Sunny Deng

Approved by

(position+printed name+signature)..: Manager Yvette Zhou

Date of issue..... : **March 23,2022**

Representative Laboratory Name.: **Shenzhen Most Technology Service Co., Ltd.**

Address..... : No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park,
Nanshan, Shenzhen, Guangdong, China.

Applicant's name..... : **MAXXSONICS USA,INC.**

Address..... : 851 E Park Ave. Libertyville ILUnited States 60048.

Test specification/ Standard..... : **47 CFR Part 1.1307**

47 CFR Part 1.1310

KDB447498D01 General RF Exposure Guidance v06

TRF Originator..... : Shenzhen Most Technology Service Co., Ltd.

Shenzhen Most Technology Service Co., Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen Most Technology Service Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen Most Technology Service Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test item description..... : MARINE

Trade Mark..... : MBQUART

Manufacturer..... : **MAXXSONICS USA,INC.**

Model/Type reference..... : GMR1.5W

Listed Models : MDR2.0,MDR2.0W,GMR1.5B,RVM2.0,RVDVD3.0,RVM7.0

Modulation Type..... : GFSK, $\pi/4$ DQPSK, 8DPSK

Operation Frequency..... : From 2402MHz to 2480MHz

Hardware Version..... : 1121-M3BAMP-MB04.sch-1

Software Version..... : 2021.06.29V1

Rating..... : DC12V

Result..... : **PASS**

TEST REPORT

Equipment under Test : MARINE

Model /Type : GMR1.5W

Listed Models : MDR2.0,MDR2.0W,GMR1.5B,RVM2.0,RVDVD3.0,RVM7.0

Remark : Only with different model names.

Applicant : **MAXXSONICS USA,INC.**

Address : 851 E Park Ave. Libertyville ILUnited States 60048.

Manufacturer : **MAXXSONICS USA,INC.**

Address : 851 E Park Ave. Libertyville ILUnited States 60048.

Test Result:	PASS
---------------------	-------------

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

1. Revision History

Revision	Issue Date	Revisions	Revised By
00	2022-03-23	Initial Issue	Alisa Luo

2. SAR Evaluation

2.1 RF Exposure Compliance Requirement

2.1.1 Standard Requirement

According to KDB447498D01 General RF Exposure Guidance v06

4.3.1. Standalone SAR test exclusion considerations

Unless specifically required by the published RF exposure KDB procedures, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding SAR Exclusion Threshold condition, listed below, is satisfied.

2.1.2 Limits

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
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
300–1500			f/300	6
1500–100,000			5	6
(B) 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

Friis Formula

Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2)$ Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

2.1.3 EUT RF Exposure

Antenna Gain: -2dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.4 in linear scale. Output Power Into Antenna & RF Exposure Evaluation Distance:

EDR

GFSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402 MHz)	0.12	0.12 ± 1	1.12
Middle(2441MHz)	0.39	0.39 ± 1	1.39
Highest(2480MHz)	-1.02	-1.02 ± 1	-0.02

$\pi/4$ DQPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402 MHz)	0.62	0.62 ± 1	1.62
Middle(2441MHz)	0.54	0.54 ± 1	1.54
Highest(2480MHz)	0.25	0.25 ± 1	1.25

8DPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402 MHz)	0.04	0.04 ± 1	1.04
Middle(2441MHz)	-0.23	-0.23 ± 1	0.77
Highest(2480MHz)	0.41	0.41 ± 1	1.41

EDR

Worst case: $\pi/4$ DQPSK						
Channel	Maximum Peak Conducted Output Power (dBm)	Maximum Peak Conducted Output Power (MW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm ²)	Limit	Result
Highest(2402 MHz)	1.62	1.45	-2	0.0002	1.0	Pass

Note: 1) Refer to report **MTWG22020120-R1** for EUT test Max Conducted average Output Power value.Note: 2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (1.45 \cdot 0.63) / (4 \cdot 3.1416 \cdot 20^2) = 0.0002$

.....THE END OF REPORT.....