

RF Exposure Evaluation Report

Report Reference No......: **MTWC21120930-H**

FCC ID..... : **2AYOQ-MRX100**

IC : **N/A**

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Date of issue.....: **December 21, 2021**

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

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Applicant's name.....: **SPIRIT LLC .**

Address: 1400 NW 159th ST (BAY 101) Miami Gardens , FL 33169.

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.

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Test item description: **MARINE**

Trade Mark: DS18

Manufacturer: SPIRIT LLC .

Model/Type reference.....: MRX100

Listed Models: MRX300

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

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

Hardware Version.....: 1121-MRX100-KMB01

Software Version: MPEG VERSION: V1.0

Rating: DC 12V

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

TEST REPORT

Equipment under Test : MARINE

Model /Type : MRX100

Listed Models : MRX300

Remark : Only the model name is different.

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Test Result:	PASS
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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	2021.12.21	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: -0.58dBi

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

BT classic

GFSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	1.138	1.138 ± 1	2.138
Middle(2440MHz)	1.152	1.152 ± 1	2.152
Highest(2480MHz)	0.924	0.924 ± 1	1.924

$\pi/4$ DQPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	3.007	3.007 ± 1	4.007
Middle(2440MHz)	3.040	3.040 ± 1	4.040
Highest(2480MHz)	2.839	2.839 ± 1	3.839

8DPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	3.207	3.207 ± 1	4.207
Middle(2440MHz)	3.211	3.211 ± 1	4.211
Highest(2480MHz)	3.056	3.056 ± 1	4.056

Worst case: 8DPSK						
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(2440MHz)	3.211	2.095	-0.58	0.0004	1.0	Pass

Note: 1) Refer to report MTWC21100788 for EUT test Max Conducted average Output Power value.

Note: 2) $P_d = (P_{out} * G) / (4 * \pi * R^2) = (2.095 * 0.88) / (4 * 3.1416 * 20^2) = 0.0004$

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