

RF Exposure Evaluation Report

Report Reference No.....: MTEB22120048-H

FCC ID.....: 2AYOQ-MRX150

Compiled by

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

Address: 1400 NW 159th ST BAY 101 MIAMI Gardens,MIAMI,Florida,
33169,United States

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.....: MRX150

Listed Models: N/A

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

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

Hardware Version.....: MB PCB 1120-MRX301-MB01 VER

Software Version: MRX150_V1.05

Rating: DC 12V

Result.....: PASS

TEST REPORT

Equipment under Test : MARINE

Model /Type : MRX150

Listed Models : N/A

Remark : N/A

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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	2022.12.08	Initial Issue	Alisa Luo

2. SAR Evaluation

2.1 RF Exposure Compliance Requirement

2.1.1 Standard Requirement

According to §1.1307(e)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB447498 D01: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

2.1.2 Limits

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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$ 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:

BT classic

GFSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	4.230	4.230 ± 1	5.230
Middle(2441MHz)	3.998	3.998 ± 1	4.998
Highest(2480MHz)	4.121	4.121 ± 1	5.121

$\pi/4$ DQPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	4.010	4.010 ± 1	5.010
Middle(2441MHz)	4.360	4.360 ± 1	5.360
Highest(2480MHz)	3.978	3.978 ± 1	4.978

8DPSK			
Test channel	Peak Output Power (dBm)	Tune up tolerance (dBm)	Maximum tune-up Power
			(dBm)
Lowest(2402MHz)	4.111	4.111 ± 1	4.111
Middle(2441MHz)	4.032	4.032 ± 1	5.032
Highest(2480MHz)	3.899	3.899 ± 1	4.899

BT classic

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(2441MHz)	5.360	3.43	-2	0.0004	1.0	Pass

Note: 1) Refer to report **MTEB22111697-R** for EUT test Max Conducted average Output Power value.Note: 2) $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (3.43 \cdot 0.63) / (4 \cdot 3.1416 \cdot 20^2) = 0.0004$

Note: 3) EUT's Bluetooth module is more than 20cm away from the human body..

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