

Maximum Permissible Exposure Report

1 Product Information

Models Name	DM-4400,MDM-4424,MDM-4424R,MDM-4424E,VR-4400,RCM-4000D
Difference description	Shows in 2.1 of the report(TZ210302094-E).
Test Model	DM-4400
Applicant	Yeonhwa M Tech Co.,Ltd
Address	36, Jeonpa-ro, 44beon-gil, Manan-gu, Anyang-si, Gyeonggi-do, korea 14086
Manufacturer	Yeonhwa M Tech Co.,Ltd
Address	36, Jeonpa-ro, 44beon-gil, Manan-gu, Anyang-si, Gyeonggi-do, korea 14086
Equipment Type	Digital 50W vehicle Radio
Trade Mark	X Radio, MAXON, Brecom, Raditel
Hardware version:	XMD40-R8(SCT3811)
Software version:	V2.5.1.2
EUT Power Rating	DC 12.0V
Operating Frequency	406.1 MHz – 470 MHz
Channel Spacing	12.5 KHz
Modulation Type	FM, 4FSK
Emission Designation	FM VOICE:11K0F3E 4FSK VOICE:7K60F1E 4FSK DATA:7K60F1D
Antenna Type:	Detachable Antenna
Antenna gain:	2.0 dBi
Data of receipt	April 10, 2021
Date of test	April 10, 2021 to April 29, 2021
Deviation	None
Condition of Test Sample	Normal

2. Evaluation Method

Systems operating under the provisions of FCC 47 CFR 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. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power

density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Limit

3.1 Refer evaluation method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices

3.2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled 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 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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

4. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

5. Antenna Information

The max Antenna Gain must below 2 dBi declared by manufacturer.

6. Conducted Power

Modulation	Channel Separation	Test Frequency (MHz)	Reading(dBm)	
			High Power Level	Low Power Level
FM	12.5KHz	406.125	47.40	37.43
		450.5	47.32	37.05
		469.975	47.13	36.93
4FSK	12.5KHz	406.125	47.88	37.98
		450.5	47.67	37.63
		469.975	47.36	37.53
Rated Power			50W(46.99dBm)	5W(36.99dBm)
Result Power			Pass	Pass

7. Manufacturing Tolerance

47 +/- 1 dBm for High Power Level

37 +/- 1 dBm for Low Power Level

8. Measurement Results

8.1 Standalone MPE

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 100 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r = 100\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
dBm	mW					
48.00	63095.7344	2	1.5849	50%	0.3981	1.3009

Remark:

1. Output power including tune-up tolerance;

2. MPE evaluate distance is 100cm from user manual provide by manufacturer;

8.2 Simultaneous Transmission MPE

N/A

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

-----THE END OF REPORT-----