Maximum Permissible Exposure Report

1. Product Information

EUT	: DMR Digital Repeater
Test Model	: AR8000
Additional Model No.	: AR8000-ASC, AR8000-AST, AR8000S, AR8100, AR8500, AR8800
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Ratings	: Input: 100-240V~, 50/60Hz or DC 13.6V
Hardware Version	: SV2
Software Version	: V2.04.0122
PMR	:
Operating Frequency	: 400MHz-470MHz
Channel Separation	: Analog Voice 12.5KHz Digital Voice/Data 12.5KHz
Modulation Type	: FM for Analog Voice 4FSK for Digital Voice/Digital Data
rated power	: 45Watts(High Power)/5Watts(Low Power)
Antenna Description	: External, 3.5dBi (Max.)
Extreme temp. Tolerance	: -30°C to +60°C
Extreme vol. Limits	: DC13.8V±15%
Exposure category	: Occupational/Controlled Exposure
EUT Type	: Production Unit
Device Type	: Mobile Device

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

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. Conducted Power and Manufacturing Tolerance

Modulation/Channel Bandwidth		Channel	Max. Conducted Output Power(dBm)	Max. Tune Up Power (dBm)
12.5kHz	FM	400.0125	46.26	46.0±1.0
		453.2125	46.73	46.0±1.0
		469.9875	46.71	46.0±1.0
	4FSK	400.0125	46.46	46.0±1.0
		453.2125	46.69	46.0±1.0
		469.9875	46.45	46.0±1.0

6. Evaluation Results

6.1 Standalone MPE Evaluation

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 85 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =85cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm2)	MPE Limits (mW/cm2)
	dBm	mW				
400-470MHz	47.0	50118.7234	3.5	2.2387	1.2358	1.33

Remark:
1. Output power including tune-up tolerance;
2. Output power is burst average power;
3. MPE evaluate distance is 85cm from user manual provide by manufacturer;
4. MPE values = $PG/4\pi R^2$

7 Simultaneous Transmission MPE

This test only transmit antenna, so it's not a consideration Simultaneous Transmission MPE.

8. 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----------