

Maximum Permissible Exposure Report

1. Product Information

Name of EUT	GPS Vehicle Tracke
Test Model	VT05S
Additional Models	VT05C
Model Declaration	PCB board, structure and internal of these models are the same, So no additional models were tested.
Power Supply	DC 3.7V by Rechargeable Li-ion Battery, 90mAh
Hardware Version	GW007-03-MB-V1.1
Software Version	VT05S_GW007_03_V03
2G	
Support Band	<input checked="" type="checkbox"/> GSM 900 (EU-Band) <input checked="" type="checkbox"/> DCS 1800 (EU-Band) <input checked="" type="checkbox"/> GSM 850 (U.S.-Band) <input checked="" type="checkbox"/> PCS 1900 (U.S.-Band)
Release Version	R99
GPRS Class	Class 12
EGPRS Class	Class 12
Type Of Modulation	GMSK for GSM/GPRS
Antenna Description	PIFA Antenna; -2.5dBi (max.) For GSM 850; -2.0dBi (max.) For PCS 1900.
GPS function	Not Supported
Extreme vol. Limits	3.15VDC to 4.26VDC (nominal: 3.7VDC)
Exposure category	General population/uncontrolled environment
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

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

Cellular Wi-Fi Router can only use antennas certificated as follows provided by manufacturer;

Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Notes
PIFA Antenna	600 MHz – 3000 MHz	-2.5dBi (max.) For GSM 850 -2.0dBi (max.) For PCS 1900	GSM

6. Conducted Power

[GSM Max Average Power]

Test Mode	Channel	Frequency (MHz)	Max Average Power (dBm)
GSM 850	Low	824.2	32.37
	Middle	836.6	32.42
	High	848.8	32.39
GSM 1900	Low	1850.2	29.66
	Middle	1880.0	29.70
	High	1909.8	29.67

7. Manufacturing Tolerance

[GSM Max Average Power]

Test Mode	Channel	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
GSM 850	LCH	32.37	32.0±1.0
	MCH	32.42	32.0±1.0
	HCH	32.39	32.0±1.0
GSM 1900	LCH	29.66	29.0±1.0
	MCH	29.70	29.0±1.0
	HCH	29.67	29.0±1.0

8. Measurement Results

8.1 Standalone MPE Evaluation

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r = 20\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW				
GSM 850	33.00	1995.2623	-2.5	0.5623	0.2232	0.5495
GSM 1900	30.00	1000.0000	-2.0	0.6310	0.1255	1.0000

Remark:

1. Output power including turn-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;
3. We choose the lowest frequency operate to calculate MPE limit as higher frequency will have higher MPE limits.
4. MPE values = $PG/4\pi R^2$

9. Conclusion

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

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