Maximum Permissible Exposure Report

1. Product Information

FCC ID:	2AM5T-VT08S
Product name	GPS Vehicle Tracker
Model number	VT08S, VT08T
Power supply	DC 12.0V from battery or DC 24.0V from battery
Modulation Type	GMSK for GSM/GPRS
Antenna Type	PIFA Antenna
Antenna Gain	-1dBi (max.) for GSM 850; -1dBi (max.) for GSM 900; -1.5dBi (max.) for DCS 1800; -1.5dBi (max.) for PCS 1900;
Hardware version	M6118-MB-V2.2
Software version	VT08S_M6118_V01
GSM/EDGE/GPRS Operation Frequency Band	GSM850/PCS1900/GPRS850/GPRS1900
GSM/EDGE/GPRS	Supported GSM/GPRS
GSM Release Version	R99
GSM/EDGE/GPRS Power Class	GSM850:Power Class 4/ PCS1900:Power Class 1
GPRS/EDGE Multislot Class	GPRS: Multi-slot Class 12
GPRS operation mode	Class B
Extreme temp. Tolerance	-30°C to +70°C
Extreme vol. Limits	10.2VDC to 13.2VDC (nominal: 12.0VDC)
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

VT08S can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain
Antenna 0	Internal Antenna	700 MHz – 2000 MHz	-1dBi (max.) for GSM 850 and GSM 900; -1.5dBi (max.) for DCS 1800 and PCS 1900;

6. Conducted Power

<GSM Conducted Power>
General Note:
1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing, further SAR test reduction and MPE.
2. According to October 2013TCB Workshop, for GSM / GPRS / EGPRS, the number of time slots to test for SAR or MPE should correspond to the highest frame-average maximum output power configuration, considering the possibility of operation.

Conducted Power Measurement Results (GSM900/1800)

GSM 850		Burst Average power (dBm) Channel/Frequency(MHz)			/	Frame Average power (dBm) Channel/Frequency(MHz)		
		128/824.2	190/836.6	251/848.8		128/824.2	190/836.6	251/848.8
GPRS (GMSK)	1TX slot	32.85	32.71	32.86	-9.03dB	23.82	23.68	23.83
	2TX slot	30.89	30.95	30.77	-6.02dB	24.87	24.93	24.75
	3TX slot	29.62	29.78	29.55	-4.26dB	**25.36**	**25.52**	**25.29**
	4TX slot	27.44	27.69	27.62	-3.01dB	24.43	24.68	24.61
GSM 1900		Burst Average power (dBm) Channel/Frequency(MHz)			/	Frame Average power (dBm) Channel/Frequency(MHz)		
		512/ 1850.2	661/ 1880	810/ 1909.8		512/ 1850.2	661/ 1880	810/ 1909.8
GPRS (GMSK)	1TX slot	30.75	30.69	30.54	-9.03dB	21.72	21.66	21.51
	2TX slot	28.81	28.93	28.62	-6.02dB	22.79	22.91	22.60
	3TX slot	27.68	27.76	27.45	-4.26dB	**23.42**	**23.50**	**23.19**
	4TX slot	25.92	25.98	25.83	-3.01dB	22.91	22.97	22.82

Notes:
1) Division Factors
To frame average the power, the division factor is as follows:
1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB
2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB
3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB
4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB
2) GPRS 3TX slot used for MPE as highest frame average power.

7. Manufacturing Tolerance

GSM 850 GPRS (GMSK) (Burst Average Power)				
Channel		128	190	251
1 Txslot	Target (dBm)	32.0	32.0	32.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	30.5	30.5	30.5
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	29.0	29.0	29.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	27.5	27.5	27.5
	Tolerance ±(dB)	1.0	1.0	1.0
GSM 1900 GPRS (GMSK) (Burst Average Power)				
Channel		512	661	810
1 Txslot	Target (dBm)	30.0	30.0	30.0
	Tolerance ±(dB)	1.0	1.0	1.0
2 Txslot	Target (dBm)	28.0	28.0	28.0
	Tolerance ±(dB)	1.0	1.0	1.0
3 Txslot	Target (dBm)	27.0	27.0	27.0
	Tolerance ±(dB)	1.0	1.0	1.0
4 Txslot	Target (dBm)	25.0	25.0	25.0
	Tolerance ±(dB)	1.0	1.0	1.0

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 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

Antenna 0

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
GPRS850	30.00	1000.0000	-1.0000	0.7943	37.5%	0.0593	0.5493
GPRS1900	28.00	630.9573	-1.5000	0.7079	37.5%	0.0333	1.0000

Remark:
1. Output power (Average) including turn-up tolerance;
2. Output power is burst average power;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer;
*4. MPE values = PG/4πR²*Duty Cycle*
5. MPE limits for GPRS850 refer 824MHz as it is lowest frequency.

8.2 Simultaneous Transmission MPE

The sample only support one GSM modular and one transmit antenna, no need consider simultaneous transmission;

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----------