FCC RF Exposure Evaluation

1. Product Information

FCC ID	:	2ACHBGNSSPOLE
Product name	:	Antenna Holder
Test Model	:	GNSS pole
Power Supply	:	Input: DC 12-14V
Hardware Version	:	V1.5
Software Version	:	V001.02
PMR	:	
Operating Frequency	:	410 ~ 470MHz
Channel Separation	:	12.5KHz
Modulation Type	:	GMSK
Emission Designator	:	8K24G1D for GMSK Modulation at 12.5KHz Channel Separation
Antenna Type	:	TNC Antenna
Antenna Gain	:	5.0dBi (max.) for PMR

2.Evaluation method and Limit

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

Ceramics Antenna can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Note
Antenna	TNC Antenna	410MHz-470MHz	5dBi	Antenna

6. Conducted Power Results

Channel	Frequency (MHz)	Peak Conducted Output Power (dBm)
101	410.125	32.940
27	453.125	32.939
20	469.625	32.874

7. Manufacturing Tolerance

Channel	Channel 101	Channel 27	Channel 20
Target (dBm)	32	32	32
Tolerance ± (dB)	1.0	1.0	1.0

8. Evaluation Results

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 50 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =50cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

Channel	RF output power		Antenna Gain (dBi)	MPE (mW/cm2)	MPE Limits (mW/cm2)
	dBm	mW			
101	33	1995.26	5	0.2009	0.273
27	33	1995.26	5	0.2009	0.302
20	33	1995.26	5	0.2009	0.313

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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