



Maximum Permissible Exposure Report

1. Product Information

FCC ID	: 2AWVX-8400
EUT	: Telematics Module
Test Model	: 8400-13001-00
Power Supply	: Input: DC 9-32V, 500mA, Max 8W DC 3.7V by Rechargeable Li-ion Battery, 1000mAh
Hardware Version	: 8.05.00
Software Version	: 06.002.0001
LTE	
Support Band	: ☒ E-UTRA Band 2(U.S.-Band) ☒ E-UTRA Band 4(U.S.-Band) ☒ E-UTRA Band 5(U.S.-Band) ☒ E-UTRA Band 12(U.S.-Band) ☒ E-UTRA Band 13(U.S.-Band) ☒ E-UTRA Band 26(U.S.-Band) ☒ E-UTRA Band 38(U.S.-Band) ☒ E-UTRA Band 41(U.S.-Band)
LTE Release Version	: R10
Type Of Modulation	: QPSK/16QAM
Antenna Description	: Internal Antenna 3.7dBi (max.) For E-UTRA Band 2 3.7dBi (max.) For E-UTRA Band 4 1.9dBi (max.) For E-UTRA Band 5 0.4dBi (max.) For E-UTRA Band 12 0.4dBi (max.) For E-UTRA Band 13 1.9dBi (max.) For E-UTRA Band 26 3.9dBi (max.) For E-UTRA Band 38 3.9dBi (max.) For E-UTRA Band 41
Power Class	: Class 3
Extreme temp. Tolerance	: -30°C to +50°C
Extreme vol. Limits	: 3.3VDC to 4.2VDC (nominal: 3.7VDC)
EUT Type	: Production Unit
Device Type	: Mobile Device



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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



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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

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

Internal/ External Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Notes
Internal	Internal Antenna	600 MHz – 3000 MHz	3.7dBi (max.) For E-UTRA Band 2 3.7dBi (max.) For E-UTRA Band 4 1.9dBi (max.) For E-UTRA Band 5 0.4dBi (max.) For E-UTRA Band 12 0.4dBi (max.) For E-UTRA Band 13 1.9dBi (max.) For E-UTRA Band 26 3.9dBi (max.) For E-UTRA Band 38 3.9dBi (max.) For E-UTRA Band 41	LTE Antenna

6. Conducted Power and Manufacturing Tolerance

[LTE Max Average Power]

Test Mode		Channel	Max Average Power (dBm)	ANT Max. Tune Up Power (dBm)
LTE	Band 2	LCH	21.75	21.0±1.0
		MCH	21.67	21.0±1.0
		HCH	22.27	22.0±1.0
	Band 4	LCH	22.72	22.0±1.0
		MCH	22.62	22.0±1.0
		HCH	22.47	22.0±1.0
	Band 5	LCH	23.28	23.0±1.0
		MCH	22.65	22.0±1.0
		HCH	23.28	23.0±1.0
	Band 12	LCH	23.02	23.0±1.0
		MCH	22.91	22.0±1.0
		HCH	22.97	22.0±1.0
	Band 13	LCH	23.13	23.0±1.0
		MCH	23.33	23.0±1.0
		HCH	23.20	23.0±1.0
	Band 26	LCH	22.82	22.0±1.0
		MCH	22.48	22.0±1.0
		HCH	22.85	22.0±1.0
	Band 38	LCH	21.94	21.0±1.0
		MCH	21.63	21.0±1.0
		HCH	21.18	21.0±1.0
	Band 41	LCH	21.65	21.0±1.0
		MCH	21.51	21.0±1.0
		HCH	21.19	21.0±1.0



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7. Measurement Results

7.1 Standalone MPE Evaluation

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, $r=50\text{cm}$, 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				
LTE Band 2	23.00	199.5262	3.7	2.3442	0.0149	1.0000
LTE Band 4	23.00	199.5262	3.7	2.3442	0.0149	1.0000
LTE Band 5	24.00	251.1886	1.9	1.5488	0.0124	0.5493
LTE Band 12	24.00	251.1886	0.4	1.0965	0.0088	0.4700
LTE Band 13	24.00	251.1886	0.4	1.0965	0.0088	0.5180
LTE Band 26	23.00	199.5262	1.9	1.5488	0.0098	0.5427
LTE Band 38	22.00	158.4893	3.9	2.4547	0.0124	1.0000
LTE Band 41	22.00	158.4893	3.9	2.4547	0.0124	1.0000

Remark:

1. Output power including turn-up tolerance;
2. Output power is burst average power;
3. MPE evaluate distance is 50cm from user manual provide by manufacturer;
4. MPE values = $PG/4\pi R^2$





7.2 Simultaneous Transmission MPE

The sample support one BT&BLE&2.4GWLAN, another one LTE&WCDMA&GSM transmit antenna, so need consider simultaneous transmission;

PMR cannot work with LTE&WCDMA&GSM at the same time

Simultaneous transmission MPE

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;

$\sum$ of MPE ratios ≤ 1.0

Mode	MPE ₁ Max.	MPE ₂ Max.	$\sum$ MPE ratios	Limit	Results
BT+GSM	0.0005	0.3620	0.3625	1.000	Pass
BT LE+GSM	0.0002	0.3620	0.3622	1.000	Pass
2.4GWIFI+GSM	0.0108	0.3620	0.3728	1.000	Pass
BT+WCDMA	0.0005	0.0552	0.0557	1.000	Pass
BT LE+WCDMA	0.0002	0.0552	0.0554	1.000	Pass
2.4GWIFI+WCDMA	0.0108	0.0552	0.0660	1.000	Pass
BT+LTE	0.0005	0.0550	0.0555	1.000	Pass
BT LE+LTE	0.0002	0.0550	0.0552	1.000	Pass
2.4GWIFI+LTE	0.0108	0.0550	0.0658	1.000	Pass

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-----



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