

# 1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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## 1.1 General Information

### Client Information

Applicant: Shenzhen Jimi IoT Co., Ltd  
Address of applicant: 3-4/F, Block A, Building #7, Shenzhen International Innovation Valley, Dashi 1st Road, Nanshan District, Shenzhen, Guangdong, China

Applicant: Shenzhen Jimi IoT Co., Ltd  
Address of applicant: 3-4/F, Block A, Building #7, Shenzhen International Innovation Valley, Dashi 1st Road, Nanshan District, Shenzhen, Guangdong, China

### General Description of EUT:

Product Name: GNSS Vehicle Terminal  
Trade Name: JIMI  
Model No.: JM-VL03  
Adding Model(s): VL03L, JM-VL03M, JM-VL03E, VL03, JM-EL103, EL103, JM-EV40, EV40, VL03MX, VL03CO, JM-C41  
Rated Voltage: Input:DC12/24V  
Battery: Built-in battery DC3.7V  
Adapter Model: /  
Software Version: VT81\_V141\_WAAP  
Hardware Version: VT81-MB  
FCC ID: 2AMLF-JM-VL03  
Equipment Type: Mobile

*Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model JM-VL03, but the circuit and the electronic construction do not change, declared by the manufacturer.*

Technical Characteristics of EUT:	
<b>2G</b>	
Support Networks:	GSM, GPRS
Support Band:	GSM850/PCS1900
Uplink Frequency:	GSM/GPRS 850: 824~849MHz GSM/GPRS 1900: 1850~1910MHz
Downlink Frequency:	GSM/GPRS 850: 869~894MHz GSM/GPRS 1900: 1930~1990MHz
Max RF Output Power:	GSM850: 32.69dBm, GSM1900: 29.62dBm
Type of Emission:	GSM850: 235KGXW, GSM1900: 236KGXW
Type of Modulation:	GMSK
Type of Antenna:	Integral Antenna
Antenna Gain:	GSM850: -2.4dBi; GSM1900: -2.1dBi

GPRS/EDGE Class:	Class 12
<b>4G</b>	
Support Networks:	FDD-LTE
Support Band:	FDD-LTE Band 2, 4, 5, 7,12, 13, 17
Uplink Frequency:	FDD-LTE Band 2: Tx: 1850-1910MHz, FDD-LTE Band 4: Tx: 1710-1755MHz, FDD-LTE Band 5: Tx: 824-849MHz, FDD-LTE Band 7: Tx: 2500-2570MHz, FDD-LTE Band 12: Tx: 699-716MHz, FDD-LTE Band 13: Tx: 777-787MHz, FDD-LTE Band 17: Tx: 704-716MHz
Downlink Frequency:	FDD-LTE Band 2: Rx: 1930-1990MHz, FDD-LTE Band 4: Rx: 2110-2155MHz, FDD-LTE Band 5: Rx: 869-894MHz, FDD-LTE Band 7: Rx: 2620-2690MHz, FDD-LTE Band 12: Rx: 729-746MHz, FDD-LTE Band 13: Rx: 746-756MHz, FDD-LTE Band 17: Rx: 734-746MHz
RF Output Power:	FDD-LTE Band 2: 24.22dBm, FDD-LTE Band 4: 24.41dBm, FDD-LTE Band 5: 23.83dBm, FDD-LTE Band 7: 23.57dBm, FDD-LTE Band 12: 23.91dBm, FDD-LTE Band 13: 23.96dBm, FDD-LTE Band 17: 23.49dBm
Type of Emission:	FDD-LTE Band 2: 17M9G7D, 17M9W7D FDD-LTE Band 4: 17M9G7D, 17M9W7D FDD-LTE Band 5: 8M98G7D, 8M97W7D FDD-LTE Band 7: 17M9G7D, 17M9W7D FDD-LTE Band 12: 9M00G7D, 8M99W7D FDD-LTE Band13: 8M99G7D, 8M99W7D FDD-LTE Band 17: 9M00G7D,9M00W7D
Type of Modulation:	QPSK, 16QAM
Antenna Type:	Integral Antenna
Antenna Gain:	FDD-LTE Band 2: -2.1dBi, FDD-LTE Band 4: -1.8dBi, FDD-LTE Band 5: -2.4dBi, FDD-LTE Band 7: -1.6dBi, FDD-LTE Band 12: -2.8dBi, FDD-LTE Band 13: -2.5dBi, FDD-LTE Band 17: -0.5dBi

## 1.2 Standard Applicable

According to § 1.1307(b)(1) and KDB 447498 D01 General RF Exposure Guidance v06, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

### (a) Limits for Occupational / Controlled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	F/300	6
1500-100000	/	/	5	6

### (b) Limits for General Population / Uncontrolled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Times   E   <sup>2</sup> ,   H   <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	1	30

Note: f = frequency in MHz: \* = Plane-wave equivalent power density

## 1.3 MPE Calculation Method

$$S = (30 * P * G) / (377 * R^2)$$

S = power density (in appropriate units, e.g., mw/cm<sup>2</sup>)

P = power input to the antenna (in appropriate units, e.g., mw)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

## 1.4 MPE Calculation Result

For GSM850

Maximum Tune-Up output power: 33.0(dBm)

Maximum peak output power at antenna input terminal: 1995.26 (mW)

Prediction distance: >20(cm)

Prediction frequency: 836.6 (MHz)

Antenna gain: -2.4(dBi)

Directional gain (numeric gain): 0.58

The worst case is power density at prediction frequency at 20cm: 0.2284 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 0.5577 (mw/cm<sup>2</sup>)

For PCS1900

Maximum Tune-Up output power: 30.0(dBm)

Maximum peak output power at antenna input terminal: 1000.00 (mW)

Prediction distance: >20(cm)

Prediction frequency: 1880.0 (MHz)

Antenna gain: -2.1 (dBi)

Directional gain (numeric gain): 0.62

The worst case is power density at prediction frequency at 20cm: 0.1227 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

For FDD-LTE Band 2

Maximum Tune-Up output power: 24.5(dBm)

Maximum peak output power at antenna input terminal: 281.84 (mW)

Prediction distance: >20(cm)

Prediction frequency: 1900.0 (MHz)

Antenna gain: -2.1 (dBi)

Directional gain (numeric gain): 0.62

The worst case is power density at prediction frequency at 20cm: 0.0346 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

For FDD-LTE Band 4

Maximum Tune-Up output power: 24.5 (dBm)

Maximum peak output power at antenna input terminal: 281.84 (mW)

Prediction distance: >20(cm)

Prediction frequency: 1745.0 (MHz)

Antenna gain: -1.8 (dBi)

Directional gain (numeric gain): 0.66

The worst case is power density at prediction frequency at 20cm: 0.0370 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

For FDD-LTE Band 5

Maximum Tune-Up output power: 24.0(dBm)

Maximum peak output power at antenna input terminal: 251.19 (mW)

Prediction distance: >20(cm)

Prediction frequency: 844.0 (MHz)

Antenna gain: -2.4 (dBi)

Directional gain (numeric gain): 0.58

The worst case is power density at prediction frequency at 20cm: 0.0288 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 0.5626 (mw/cm<sup>2</sup>)

For FDD-LTE Band 7

Maximum Tune-Up output power: 24.0(dBm)

Maximum peak output power at antenna input terminal: 251.19 (mW)

Prediction distance: >20(cm)

Prediction frequency: 2560.0 (MHz)

Antenna gain: -1.6 (dBi)

Directional gain (numeric gain): 0.69

The worst case is power density at prediction frequency at 20cm: 0.0346 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm<sup>2</sup>)

For FDD-LTE Band 12

Maximum Tune-Up output power: 24.0(dBm)

Maximum peak output power at antenna input terminal: 251.19 (mW)

Prediction distance: >20(cm)

Prediction frequency: 704 (MHz)

Antenna gain: -2.8 (dBi)

Directional gain (numeric gain): 0.52

The worst case is power density at prediction frequency at 20cm: 0.0262 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 0.4693 (mw/cm<sup>2</sup>)

For FDD-LTE Band 13

Maximum Tune-Up output power: 24.0(dBm)

Maximum peak output power at antenna input terminal: 251.19 (mW)

Prediction distance: >20(cm)

Prediction frequency: 782.0(MHz)

Antenna gain: -2.5 (dBi)

Directional gain (numeric gain): 0.56

The worst case is power density at prediction frequency at 20cm: 0.0281 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 0.5213 (mw/cm<sup>2</sup>)

For FDD-LTE Band 17

Maximum Tune-Up output power: 24.0(dBm)

Maximum peak output power at antenna input terminal: 251.19 (mW)

Prediction distance: >20(cm)

Prediction frequency: 710.0(MHz)

Antenna gain: -0.5 (dBi)

Directional gain (numeric gain): 0.89

The worst case is power density at prediction frequency at 20cm: 0.0445 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 0.4733 (mw/cm<sup>2</sup>)

Result: Pass