1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 General Information

Client Information

Applicant:	Shenzhen Jimi IOT Co., Ltd
Address of applicant:	4/F, Building C, Gaoxinqi Industrial Park, Liuxian 1st Road, No.67 Xin'an Street, Bao'an District, Shenzhen, China
Manufacturer:	Shenzhen Jimi IOT Co., Ltd
Address of manufacturer:	4/F, Building C, Gaoxinqi Industrial Park, Liuxian 1st Road, No.67 Xin'an Street, Bao'an District, Shenzhen, China

General Description of EUT:

Product Name:	4G Vehicle GPS Tracker
Trade Name:	JIMI
Model No.:	JM-VL01
Adding Model(s):	VL01, VL01A, JM-VL01A, VL01E, JM-VL01E, VL01LA, JM-VL01LA
Rated Voltage:	DC3.7V/DC12V/24V
Battery:	450mAh
Adapter Model:	/
FCC ID:	2AMLFJM-VL01

Technical Characteristics of EUT:

2G	
Support Networks:	GSM, GPRS, EDGE
Support Band:	GSM850/PCS1900
Uplink Frequency:	GSM/GPRS/EDGE 850: 824~849MHz GSM/GPRS/EDGE 1900: 1850~1910MHz
Downlink Frequency:	GSM/GPRS/EDGE 850: 869~894MHz GSM/GPRS/EDGE 1900: 1930~1990MHz
Max RF Output Power:	GSM850: 33.08dBm, GSM1900: 30.56dBm EDGE850: 26.29dBm, EDGE1900: 26.98dBm
Type of Emission:	GSM850: 258KGXW, GSM1900: 252KGXW EDGE850: 249KG7W, EDGE1900: 251KG7W
Type of Modulation:	GMSK, 8PSK
Type of Antenna:	Integral Antenna
Antenna Gain:	GSM850: -1dBi; GSM1900: 0dBi
GPRS/EDGE Class:	Class 12
3G	
Support Networks:	WCDMA, HSDPA, HSUPA
Support Band:	WCDMA Band 2, WCDMA Band 5
Uplink Frequency:	WCDMA Band 2: 1850~1910MHz WCDMA Band 5: 824~849MHz

Downlink Frequency:	WCDMA Band 2: 1930~1990MHz WCDMA Band 5: 869~894MHz
RF Output Power:	WCDMA Band 2: 23.33dBm, WCDMA Band 5: 23.53dBm
Type of Emission:	WCDMA Band 2: 4M19F9W WCDMA Band 5: 4M16F9W
Type of Modulation:	BPSK
Antenna Type:	Integral Antenna
Antenna Gain:	WCDMA Band 2: 0dBi, WCDMA Band 5: -1dBi

4G

Support Networks:	FDD-LTE
Support Band:	FDD-LTE Band 2, 4, 5, 7,12, 66
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 66: Tx: 1710-1780MHz
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 66: Rx: 2110-2200MHz
RF Output Power:	FDD-LTE Band 2: 24.93dBm, FDD-LTE Band 4: 24.75dBm, FDD-LTE Band 5: 24.81dBm, FDD-LTE Band 7: 25.15dBm, FDD-LTE Band 12: 25.14dBm, FDD-LTE Band 66: 24.86dBm
Type of Emission:	FDD-LTE Band 2: 17M9G7D, 17M9W7D FDD-LTE Band 4: 17M9G7D, 17M9W7D FDD-LTE Band 5: 8M964G7D, 8M94W7D FDD-LTE Band 7: 17M9G7D, 17M9W7D FDD-LTE Band 12: 8M95G7D, 8M95W7D FDD-LTE Band66: 17M9G7D, 17M8W7D
Type of Modulation:	QPSK, 16QAM
Antenna Type:	Integral Antenna
Antenna Gain:	FDD-LTE Band 2: 0dBi, FDD-LTE Band 4: 0dBi, FDD-LTE Band 5: -1dBi, FDD-LTE Band 7: 0dBi, FDD-LTE Band 12: -2dBi, FDD-LTE Band 66: 0dBi

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^2)	Averaging Times $\mid E\mid^2$, $\mid H\mid^2$ 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^2)	Averaging Times $\mid E\mid^2$, $\mid H\mid^2$ 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 equivalents power density

1.3 MPE Calculation Method

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

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

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: 33.5(dBm)

Maximum peak output power at antenna input terminal: 2238.72(mW)

Prediction distance: >20(cm)

Prediction frequency: 824.20(MHz)

Antenna gain: -1(dBi)

Directional gain (numeric gain): 0.79

The worst case is power density at prediction frequency at 20cm: 0.3538 (mw/cm^2)

MPE limit for general population exposure at prediction frequency: 0.5495 (mw/cm^2)

For PCS1900

Maximum Tune-Up output power: 31(dBm)

Maximum peak output power at antenna input terminal: 1258.93(mW)

Prediction distance: >20(cm)

Prediction frequency: 1850.20 (MHz)

Antenna gain: 0(dBi)

Directional gain (numeric gain): 1.0

The worst case is power density at prediction frequency at 20cm: 0.2504 (mw/cm2)

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

For WCDMA Band 2

Maximum Tune-Up output power: 23.5(dBm)

Maximum peak output power at antenna input terminal: 223.87(mW)

Prediction distance: >20(cm)

Prediction frequency: 1852.4 (MHz)

Antenna gain: 0 (dBi)

Directional gain (numeric gain): 1.0

The worst case is power density at prediction frequency at 20cm: 0.0445(mw/cm2)

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

For WCDMA Band 5

Maximum Tune-Up output power: 24(dBm)

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

Prediction distance: >20(cm)

Prediction frequency: 836.6 (MHz)

Antenna gain: -1 (dBi)

Directional gain (numeric gain): 0.79

The worst case is power density at prediction frequency at 20cm: 0.0397 (mw/cm2)

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

For FDD-LTE Band 2

Maximum Tune-Up output power: 25(dBm)

Maximum peak output power at antenna input terminal: 316.23(mW)

Prediction distance: >20(cm)

Prediction frequency: 1850.7(MHz)

Antenna gain: 0 (dBi)

Directional gain (numeric gain): 1.0

The worst case is power density at prediction frequency at 20cm: 0.0629 (mw/cm2)

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

For FDD-LTE Band 4

Maximum Tune-Up output power: 25(dBm)

Maximum peak output power at antenna input terminal: 316.23(mW)

Prediction distance: >20(cm)

Prediction frequency: 1710.7 (MHz)

Antenna gain: 0 (dBi)

Directional gain (numeric gain): 1.0

The worst case is power density at prediction frequency at 20cm: 0.0629 (mw/cm2)

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

For FDD-LTE Band 5

Maximum Tune-Up output power: 25(dBm)

Maximum peak output power at antenna input terminal: 316.23(mW)

Prediction distance: >20(cm)

Prediction frequency: 824.7 (MHz)

Antenna gain: -1 (dBi)

Directional gain (numeric gain): 0.79

The worst case is power density at prediction frequency at 20cm: 0.0500(mw/cm2)

MPE limit for general population exposure at prediction frequency: 0.5498(mw/cm^2)

For FDD-LTE Band 7

Maximum Tune-Up output power: 25.5(dBm)

Maximum peak output power at antenna input terminal: 354.81(mW)

Prediction distance: >20(cm)

Prediction frequency: 2502.5 (MHz)

Antenna gain: 0 (dBi)

Directional gain (numeric gain): 1.0

The worst case is power density at prediction frequency at 20cm: 0.0706 (mw/cm2)

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

For FDD-LTE Band 12

Maximum Tune-Up output power: 25.5(dBm)

Maximum peak output power at antenna input terminal: 354.81(mW)

Prediction distance: >20(cm)

Prediction frequency: 699.7 (MHz)

Antenna gain: -2 (dBi)

Directional gain (numeric gain): 0.63

The worst case is power density at prediction frequency at 20cm: 0.0445 (mw/cm2)

MPE limit for general population exposure at prediction frequency: 0.4665 (mw/cm^2)

For FDD-LTE Band 66

Maximum Tune-Up output power: 25 (dBm)

Maximum peak output power at antenna input terminal: 316.23(mW)

Prediction distance: >20(cm)

Prediction frequency: 1710.7 (MHz)

Antenna gain: 0 (dBi)

Directional gain (numeric gain): 1

The worst case is power density at prediction frequency at 20cm: 0.0397(mw/cm2)

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

Result: Pass