1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 General Information

Client Information

Applicant:	Invengo Information Technology Co.,Ltd.
Address of applicant:	27th and 28th Floor,Hi-Tech Zone Union Tower, NO.63, Gaoxin South 10th Road, Yuehai Sub-district, Nanshan District，Shenzhen, China
Manufacturer:	Invengo Information Technology Co.,Ltd.
Address of manufacturer:	27th and 28th Floor,Hi-Tech Zone Union Tower, NO.63, Gaoxin South 10th Road, Yuehai Sub-district, Nanshan District，Shenzhen, China

General Description of EUT:

Product Name:	Reader
Trade Name:	INVENGO
Model No.:	XC-RF868
Adding Model(s):	/
Rated Voltage:	DC24V
Power Adapter:	MODEL NO.:FSP060-DAAN3 INPUT:AC 100-240V,1.8A 50/60Hz OUTPUT:DC24V, 2.5A
FCC ID:	TQ4-XC-RF868
Equipment Type:	Mobile Device

Technical Characteristics of EUT:	
Wi-Fi	
Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20) 2422-2452MHz for 802.11n(HT40)
RF Output Power:	15.97dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Quantity of Channels:	11 for 802.11b/g/n(HT20); 7 for 802.11n(HT40)
Channel Separation:	5MHz
Type of Antenna:	PCB Antenna
Antenna Gain:	0dBi
UHF	
Frequency Range:	902.75-927.25MHz
RF Output Power:	Antenna 1: 23.35dBm (Conducted) Antenna 2: 21.84dBm (Conducted) Antenna 3: 21.71dBm (Conducted) Antenna 4: 21.98dBm (Conducted) Antenna 5: 21.89dBm (Conducted)

	Antenna 6: 21.60dBm (Conducted)
Modulation:	PR-ASK
Quantity of Channels:	50
Channel Separation:	500kHz
Type of Antenna:	External Antenna
Antenna Gain:	4dBi

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 $\lvert E \rvert^2$, $\lvert H \rvert^2$ 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 $\lvert E \rvert^2$, $\lvert H \rvert^2$ 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 Wi-Fi:

Maximum Tune-Up output power: 16.0(dBm)

Maximum peak output power at antenna input terminal: 39.81 (mW)

Prediction distance: >20(cm)

Prediction frequency: 2412 (MHz)

Antenna gain:0(dBi)

Directional gain (numeric gain): 1.0

The worst case is power density at prediction frequency at 20cm: 0.0079 (mw/cm^2)

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

For UHF:

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: 915.25 (MHz)

Antenna gain: 4 (dBi)

Directional gain (numeric gain): 2.51

The worst case is power density at prediction frequency at 20cm: 0.1119 (mw/cm^2)

MPE limit for general population exposure at prediction frequency: 0.6102 (mw/cm^2)

Mode for Simultaneous Multi-band Transmission

The worst case is Wi-Fi(2.4G)+ UHF

Evaluation Result:

0.0079/1+0.1119/0.6102+0.0792/0.6102+0.0792/0.6102+0.0792/0.6102+0.0792/0.6102+0.0792/0.6102=0.8403

Limit: 1

Result: Pass