

# 1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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## 1.1 General Information

### Client Information

Applicant: KEEPWAY INDUSTRIAL(ASIA)CO.,LTD  
Address of applicant: Flat D,8/F.,SuccessInd.Bld G.,No.17SheungHeiSt.,  
SanPoKong,Kowloon,HongKong

Manufacturer: HuaRui Technology(ShenZhen)CO.,LTD  
Address of manufacturer: 401,building 3,No.32,Dafu Road, Zhang ge community,  
Fucheng street, Longhua, District Shenzhen

### General Description of EUT:

Product Name: Covert Wireless Trail Camera  
Trade Name: /  
Model No.: WC20  
Adding Model(s): WC20-A, WC20-V, CT660-A, CT660-V  
Rated Voltage: Adapter DC12V; 12x AA batteries  
Power Adapter: /  
FCC ID: 2APIQ-WC20  
Equipment Type: Mobile Device

### Technical Characteristics of EUT:

4G

Support Networks: FDD-LTE  
Support Band: FDD-LTE Band 2, 4, 12, 13, 25, 26, 66  
FDD-LTE Band 2: Tx: 1850-1910MHz,  
FDD-LTE Band 4: Tx: 1710-1755MHz,  
FDD-LTE Band 12: Tx: 699-716MHz,  
Uplink Frequency: FDD-LTE Band 13: Tx: 777-787MHz,  
FDD-LTE Band 25: Tx: 1850-1915MHz,  
FDD-LTE Band 26: Tx: 814-849MHz,  
FDD-LTE Band 66: Tx: 1710-1780MHz  
FDD-LTE Band 2: Rx: 1930-1990MHz,  
FDD-LTE Band 4: Rx: 2110-2155MHz,  
FDD-LTE Band 12: Rx: 729-746MHz,  
Downlink Frequency: FDD-LTE Band 13: Rx: 746-756MHz,  
FDD-LTE Band 25: Rx: 1930-1995MHz,  
FDD-LTE Band 26: Rx: 859-894MHz,  
FDD-LTE Band 66: Rx: 2110-2200MHz  
FDD-LTE Band 2: 21.87dBm,  
RF Output Power: FDD-LTE Band 4: 23.39dBm,  
FDD-LTE Band 12: 22.32dBm,

Type of Emission:	FDD-LTE Band 13: 22.73dBm, FDD-LTE Band 25: 23.14dBm, FDD-LTE Band 26: 22.77dBm, FDD-LTE Band 66: 24.14dBm FDD-LTE Band 2: 1M80G7D, 1M80W7D FDD-LTE Band 4: 1M80G7D, 1M80W7D FDD-LTE Band 12: 1M30G7D, 1M30W7D FDD-LTE Band 13: 1M30G7D, 1M30W7D FDD-LTE Band 25: 1M80G7D, 1M80W7D FDD-LTE Band 26: 1M30G7D, 1M30W7D FDD-LTE Band 66: 1M80G7D, 1M80W7D
Type of Modulation:	QPSK, 16QAM
Antenna Type:	External Antenna
Antenna Gain:	FDD-LTE Band 2: 3dBi, FDD-LTE Band 4: 3dBi, FDD-LTE Band 12: 3dBi, FDD-LTE Band 13: 3dBi, FDD-LTE Band 25: 3dBi, FDD-LTE Band 26: 3dBi, FDD-LTE Band 66: 3dBi

## 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 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<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 FDD-LTE 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: 1880.0 (MHz)

Antenna gain: 3 (dBi)

Directional gain (numeric gain): 2.00

The worst case is power density at prediction frequency at 20cm: 0.0889 (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: 24.0 (dBm)

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

Prediction distance: >20(cm)

Prediction frequency: 1752.5 (MHz)

Antenna gain: 3 (dBi)

Directional gain (numeric gain): 2.00

The worst case is power density at prediction frequency at 20cm: 0.0997 (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: 23.5 (dBm)

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

Prediction distance: >20(cm)

Prediction frequency: 711.0 (MHz)

Antenna gain: 3 (dBi)

Directional gain (numeric gain): 2.00

The worst case is power density at prediction frequency at 20cm: 0.0889 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 0.474 (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: 3 (dBi)

Directional gain (numeric gain): 2.00

The worst case is power density at prediction frequency at 20cm: 0.0997 (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 25:

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: 1905.0 (MHz)

Antenna gain: 3 (dBi)

Directional gain (numeric gain): 2.00

The worst case is power density at prediction frequency at 20cm: 0.0997 (mw/cm<sup>2</sup>)

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

For FDD-LTE Band 26:

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: 831.5 (MHz)

Antenna gain: 3 (dBi)

Directional gain (numeric gain): 2.00

The worst case is power density at prediction frequency at 20cm: 0.0889 (mw/cm<sup>2</sup>)

MPE limit for general population exposure at prediction frequency: 0.5543 (mw/cm<sup>2</sup>)

For FDD-LTE Band 66:

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: 3 (dBi)

Directional gain (numeric gain): 2.00

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

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

Result: Pass