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# Wireless CCTV, LTD. MPE REPORT

**SCOPE OF WORK**

MPE CALCULATION  
ON THE BODYWORN CONNECT 1.6

**REPORT NUMBER**

104286003LEX-010B

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## MPE TEST REPORT

Report Number: **104286003LEX-010B**  
Project Number: **G104286003**

Report Issue Date: **12/9/2021**

Product Name: **Bodyworn Connect 1.6**

Standards: **FCC Part 1.1310 Limits for Maximum  
Permissible Exposure (MPE)**

**RSS-102 Issue 5 RF Field Strength Limits for  
Devices Used by the General Public**

**IEC62311: 2019**

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## 1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

## 2 Test Summary

Section	Test full name	Result
9	FCC Part 1.1310 Limits for Maximum Permissible Exposure (MPE) (Limits for General Population / Uncontrolled Exposure)	Pass
	RSS-102 Issue 5 RF Field Strength Limits (For Devices Used by the General Public)	Pass
	IEC62311: 2019 MPE Limits (For General Public Exposure)	Pass



### 3 Client Information

This product was tested at the request of the following:

Client Information	
<b>Client Name:</b>	Wireless CCTV, LTD.
<b>Address:</b>	Charles Babbage House Kingsway Business Park Rochdale Lancashire OL16 4NW United Kingdom
<b>Contact:</b>	Ian Ramsdale
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Manufacturer Information	
<b>Manufacturer Name:</b>	Wireless CCTV, LTD.
<b>Manufacturer Address:</b>	Charles Babbage House Kingsway Business Park Rochdale Lancashire OL16 4NW United Kingdom



#### 4 Description of Equipment under Test and Variant Models

Equipment Under Test	
<b>Product Name</b>	Bodyworn Connect 1.6
<b>Model Number</b>	Bodyworn Connect 1.6
<b>Serial Number</b>	35850206473249
<b>Hardware Version</b>	Rev 1.9us
<b>Software Version</b>	V1.5.6.106
<b>Supported Transmit Bands</b>	LTE Bands: 2, 4, 5, 13, 17 WCDMA Bands: 2, 5 802.11b, g, n: 2412 – 2462MHz
<b>Embedded Modules</b>	Ublox Toby L201 Texas Instruments WL18MODGB
<b>Cellular Embedded Module hardware Version</b>	TOBY-L201-02S-01 (218B01)
<b>Cellular Embedded Module Software Version</b>	20.06,A01.00
<b>Embedded Module FCCIDs</b>	XPYTOBYL201 2AUUQ-CONNECTV1-6
<b>WiFi/BT Antenna Type</b>	Taoglas FXP74.07.072A
<b>Receive Date</b>	5/7/2021
<b>Test Start Date</b>	11/9/2021
<b>Test End Date</b>	11/26/2021
<b>Device Received Condition</b>	Good
<b>Test Sample Type</b>	Production
<b>Rated Voltage</b>	3.7VDC
Description of Equipment Under Test (provided by client)	
The Bodyworn Connect 1.6 is a CCTV device which has the ability to stream live video via LTE to a cloud environment. While charging the WiFi radio onboard is active.	

##### 4.1 Variant Models:

There were no variant models covered by this evaluation.



## 5 FCC Limits

**§ 1.1310:** The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

### Part 1.1310 Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	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

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

**6 RSS-102 Issue 5 Exposure Limits:****Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Reference Period (minutes)
0.003-10 <sup>21</sup>	83	90	-	Instantaneous*
0.1-10	-	0.73/ $f$	-	6**
1.1-10	87/ $f^{0.5}$	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	58.07/ $f^{0.25}$	0.1540/ $f^{0.25}$	8.944/ $f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 $f^{0.3417}$	0.008335 $f^{0.3417}$	0.02619 $f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ $f^{1.2}$
150000-300000	0.158 $f^{0.5}$	4.21 x 10 <sup>-4</sup> $f^{0.5}$	6.67 x 10 <sup>-5</sup> $f$	616000/ $f^{1.2}$

Note:  $f$  is frequency in MHz.

\* Based on nerve stimulation (NS).

\*\* Based on specific absorption rate (SAR).



## 7 IEC62311 (ICNIRP) Exposure Limits:

**Table 7.** Reference levels for general public exposure to time-varying electric and magnetic fields (unperturbed rms values).<sup>a</sup>

Frequency range	E-field strength (V m <sup>-1</sup> )	H-field strength (A m <sup>-1</sup> )	B-field ( $\mu$ T)	Equivalent plane wave power density $S_{eq}$ (W m <sup>-2</sup> )
up to 1 Hz	—	$3.2 \times 10^4$	$4 \times 10^4$	—
1–8 Hz	10,000	$3.2 \times 10^4/f^2$	$4 \times 10^4/f^2$	—
8–25 Hz	10,000	$4,000/f$	$5,000/f$	—
0.025–0.8 kHz	$250/f$	$4/f$	$5/f$	—
0.8–3 kHz	$250/f$	5	6.25	—
3–150 kHz	87	5	6.25	—
0.15–1 MHz	87	$0.73/f$	$0.92/f$	—
1–10 MHz	$87/f^{1/2}$	$0.73/f$	$0.92/f$	—
10–400 MHz	28	0.073	0.092	2
400–2,000 MHz	$1.375f^{1/2}$	$0.0037f^{1/2}$	$0.0046f^{1/2}$	$f/200$
2–300 GHz	61	0.16	0.20	10

<sup>a</sup> Note:

1.  $f$  as indicated in the frequency range column.
2. Provided that basic restrictions are met and adverse indirect effects can be excluded, field strength values can be exceeded.
3. For frequencies between 100 kHz and 10 GHz,  $S_{eq}$ ,  $E^2$ ,  $H^2$ , and  $B^2$  are to be averaged over any 6-min period.
4. For peak values at frequencies up to 100 kHz see Table 4, note 3.
5. For peak values at frequencies exceeding 100 kHz see Figs. 1 and 2. Between 100 kHz and 10 MHz, peak values for the field strengths are obtained by interpolation from the 1.5-fold peak at 100 kHz to the 32-fold peak at 10 MHz. For frequencies exceeding 10 MHz it is suggested that the peak equivalent plane wave power density, as averaged over the pulse width does not exceed 1,000 times the  $S_{eq}$  restrictions, or that the field strength does not exceed 32 times the field strength exposure levels given in the table.
6. For frequencies exceeding 10 GHz,  $S_{eq}$ ,  $E^2$ ,  $H^2$ , and  $B^2$  are to be averaged over any  $68/f^{1.05}$ -min period ( $f$  in GHz).
7. No E-field value is provided for frequencies  $<1$  Hz, which are effectively static electric fields. Perception of surface electric charges will not occur at field strengths less than  $25$  kVm<sup>-1</sup>. Spark discharges causing stress or annoyance should be avoided.



## 8 Test Procedure

An MPE evaluation was performed in order to show that the device was compliant with the general population exposure limits from FCC §2.1091 and RSS-102 Issue 5. The maximum power density was calculated for each transmitter band at a separation distance of 20cm using the maximum declared output power including tune up tolerance.

For each transmitter the maximum RF exposure at a 20 cm distance using the formula:

$$ConductedPower_{mW} = 10^{\frac{ConductedPower(dBm)}{10}}$$

$$PowerDensity = \frac{ConductedPower_{mW} \times Ant.Gain}{4\pi \times (20_{cm})^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.



## 9 Results:

The calculated maximum power density at 20cm distance was equal to or less than the required limits for general population exposure for FCC Part 1.1310, RSS-102 Issue 5, and IEC62311: 2019.

Additionally, to demonstrate compliance for simultaneous transmission between WiFi and Bluetooth, the worst-case limit to MPE ratios for each radio were summed. Since that sum was less than 1 that combination of radios is deemed to comply with the simultaneous transmission RF exposure criteria. Note that the cellular radio onboard was not part of this MPE calculation as it is only active while the Bodyworn Connect 1.6 is being worn on the body. The BT / WiFi radios are only active while on the charger.

The antenna gain used in the calculations below was obtained from the Taoglas FXP74.07.072A antennas specifications. The output power used in the calculations below was obtained from the modules MPE exhibit currently on file with the FCC.

### FCC MPE Data

Duty Cycle		100 (%)		Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Margin to Limit (mW/cm <sup>2</sup> )	MPE / Limit Ratio (for Co-Location)
Separation Dist.		20 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Margin to Limit (mW/cm <sup>2</sup> )	MPE / Limit Ratio (for Co-Location)	
Bluetooth	2402	13	13.00	1.8	0.0060	1.0000	0.9940	0.0060	
WiFi	2412	19	19.00	1.8	0.0239	1.0000	0.9761	0.0239	

Sum of limit to MPE ratios = 0.006 + 0.0239 = 0.0299

### RSS-102 Issue 5 MPE Data

Duty Cycle		100 (%)		Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m <sup>2</sup> )	MPE Limit (W/m <sup>2</sup> )	Margin to Limit (W/m <sup>2</sup> )	MPE / Limit Ratio (for Co-Location)
Separation Dist.		20 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m <sup>2</sup> )	MPE Limit (W/m <sup>2</sup> )	Margin to Limit (W/m <sup>2</sup> )	MPE / Limit Ratio (for Co-Location)	
Bluetooth	2402	13	13.00	1.8	0.0601	5.3508	5.2907	0.0112	
WiFi	2412	19	19.00	1.8	0.2392	5.3660	5.1268	0.0446	

Sum of limit to MPE ratios = 0.0112 + 0.0446 = 0.0558

### IEC62311 MPE Data

Duty Cycle		100 (%)		Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m <sup>2</sup> )	MPE Limit (W/m <sup>2</sup> )	Margin to Limit (W/m <sup>2</sup> )	MPE / Limit Ratio (for Co-Location)
Separation Dist.		20 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m <sup>2</sup> )	MPE Limit (W/m <sup>2</sup> )	Margin to Limit (W/m <sup>2</sup> )	MPE / Limit Ratio (for Co-Location)	
Bluetooth	2402	13	13.00	1.8	0.0601	10.0000	9.9399	0.0060	
WiFi	2412	19	19.00	1.8	0.2392	10.0000	9.7608	0.0239	

Sum of limit to MPE ratios = 0.006 + 0.0239 = 0.0299



## 10 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	12/9/2021	104286003LEX-010B	BCT	BZ	Original Issue