

# 1. RF Exposure Requirements

---

## 1.1 General Information

### Client Information

Applicant: Universal Ubiquitous AI Co., Ltd.  
Address of applicant: Floor 24-26 Building 3, Fashion Vantone City, Cangqian Street, Yuhang District, Hangzhou, Zhejiang, China

Manufacturer: Universal Ubiquitous AI Co., Ltd.  
Address of manufacturer: Floor 24-26 Building 3, Fashion Vantone City, Cangqian Street, Yuhang District, Hangzhou, Zhejiang, China

### General Description of EUT:

Product Name: FACE RECOGNITION TERMINAL  
Trade Name: **UNIUBI**  
Model No.: E53-1711-OS-F  
Adding Model(s): E53-1701-F, E53-1711-F, E53-1701-Q, E53-1711-Q, E53-1701, E53-1711, E53-1702-F, E53-1712-F, E53-1701-OS, E53-1711-OS, E53-1701-OS-F, E53-1701-OS-Q, E53-1711-OS-Q, E53-1701-OS-H  
Rated Voltage: DC 12V  
Power Adapter Model: /  
FCC ID: 2AUI4-E53  
Equipment Type: Fixed device

### Technical Characteristics of EUT:

#### Bluetooth(BLE mode)

Bluetooth Version: V4.2 (BLE mode)  
Frequency Range: 2402-2480MHz  
RF Output Power: 5.03dBm (Conducted)  
Data Rate: 1Mbps  
Modulation: GFSK  
Quantity of Channels: 40  
Channel Separation: 2MHz  
Type of Antenna: FPC Antenna  
Antenna Gain: 5.4dBi

#### Bluetooth(BR/EDR mode)

Bluetooth Version: V4.2 (BR/EDR mode)  
Frequency Range: 2402-2480MHz  
RF Output Power: 6.85dBm (Conducted)  
Data Rate: 1Mbps, 2Mbps, 3Mbps  
Modulation: GFSK,  $\pi/4$  DQPSK, 8DPSK  
Quantity of Channels: 79  
Channel Separation: 1MHz

Type of Antenna:	FPC Antenna
Antenna Gain:	5.4dBi
<b>Wi-Fi(2.4GHz)</b>	
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:	19.52dBm (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:	FPC Antenna
Antenna Gain:	5.4dBi
<b>NFC(125KHz)</b>	
Frequency Range:	125KHz
Modulation Type:	BPSK
Max. Field Strength:	55.64dBuV/m (at 3m)
Antenna Type:	Coil Antenna
Antenna Gain	0dBi
<b>NFC(13.56MHz)</b>	
Frequency Range:	13.56MHz
Modulation Type:	ASK, BPSK
Max. Field Strength:	58.16dBuV/m (at 3m)
Antenna Type:	FPC Antenna
Antenna Gain	0dBi

## 1.2 RF Exposure Exemption

According to §1.1307(b)(3) and KDB 447498 D04 Interim General RF Exposure Guidance v01, 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.

**Option A:** FCC Rule Part 1.1307 (b)(3)(i)(A):The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

**Option B:** FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold  $P_{th}$  (mW) described in the following formula.  $P_{th}$  is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}}(d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

$d$  = the separation distance (cm);

**Option C:** FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	1,920 R <sup>2</sup>
1.34-30	3,450 R <sup>2</sup> /f <sup>2</sup>
30-300	3.83 R <sup>2</sup>
300-1,500	0.0128 R <sup>2</sup> f
1,500-100,000	19.2R <sup>2</sup>

**For Multiple RF sources:** FCC Rule Part 1.1307(b)(3)(ii):

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

### 1.3 Calculated Result

Radio Access Technology	Prediction Frequency (MHz)	Output Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	Tune-Up Time-Averaged Power (dBm)	ERP (dBm)
Bluetooth	2402	6.85	5.4	100	7.00	10.25
2.4G Wi-Fi	2412	19.52	5.4	100	20.00	23.25
NFC	13.56	-37.10	0	/	-132.00	-134.15

Frequency (MHz)	Option	Min. Distance (cm)	Max. Power (dBm) (mW)		Exposure Limit (mW)	Ratio	Result (Pass/Fail)
2402	C	20.00	10.25	10.59	768.00	0.01	Pass
2412	C	20.00	23.25	211.35	768.00	0.28	Pass
13.56	B	20.00	-132.00	0.00	27.66	0.01	Pass

Note: 1. a.  $\text{Time-Averaged Power} = \text{Output Power} * \text{Duty Cycle}$ ;

$\text{ERP} = \text{Time-Averaged Power} + \text{Antenna gain} - 2.15\text{dB}$ ;

b.  $\text{EIRP} = E - 104.8 + 20\log D$ ;  $\text{Output Power} = \text{EIRP} - \text{Antenna Gain}$ ;

$\text{ERP} = \text{EIRP} - 2.15\text{dB}$

2. Option A, B and C refers as clause 1.2.

3. For option B, Max (time-averaged power, effective radiated power (ERP)) converts to Max. Power. For option C, ERP converts to Max. Power;

4. For option B,  $P_{th}$  (mW) converts to Exposure Limit (mW); For option C, ERP (W) converts to Exposure Limit (mW).

5.  $\text{Ratio} = \text{Tune-Up ERP (mW)} / \text{Exposure Limit (mW)}$

#### Mode for Simultaneous Multi-band Transmission:

Radio Access Technology	Ratio 1	Ratio 2	Simultaneous Ratio	Limit	Result (Pass/Fail)
2.4G Wi-Fi + NFC	0.28	0.01	0.29	1	Pass

Note: WIFI and BT is the use the same antenna cannot simultaneous transmission.

Result: Pass