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.:	E73-1711-OS-V
Adding Model(s):	E73-1701-V, E73-1711-V, E73-1701-OS-V, E73-1701, E73-1711, E73-1701-OS, E73-1711-OS
Rated Voltage:	DC 12V
Power Adapter Model:	/
FCC ID:	2AUI4-E73
Equipment Type:	Fixed device

Technical Characteristics of EUT:

Bluetooth(BLE mode)

Bluetooth Version:	V4.2 (BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	4.98dBm (Conducted)
Data Rate:	1Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	FPC Antenna
Antenna Gain:	2.9dBi

Bluetooth(BR/EDR mode)

Bluetooth Version:	V4.2 (BR/EDR mode)
Frequency Range:	2402-2480MHz
RF Output Power:	6.78dBm (Conducted)
Data Rate:	1Mbps, 2Mbps, 3Mbps
Modulation:	GFSK, π/4 DQPSK, 8DPSK
Quantity of Channels:	79
Channel Separation:	1MHz
Type of Antenna:	FPC Antenna

Antenna Gain:	2.9dBi
Wi-Fi(2.4GHz)	
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:	19.70dBm (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:	2.9dBi
NFC(125KHz)	
Frequency Range:	125kHz
Modulation Type:	BPSK
Max. Field Strength:	50.75dBuV/m (at 3m)
Antenna Type:	Coil Antenna
Antenna Gain	0dBi
NFC(13.56MHz)	
Frequency Range:	13.56MHz
Modulation Type:	ASK, BPSK
Max. Field Strength:	39.52dBuV/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:

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

Where

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

and

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

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 λ/2π, where λ 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^2
1.34-30	3,450 R^2/f^2
30-300	3.83 R^2
300-1,500	0.0128 R^2f
1,500-100,000	19.2R^2

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.

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

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	6.78	2.9	100	7.00	7.75
2.4G Wi-Fi	2412	19.70	2.9	100	20.75	20.00
NFC	13.56	-55.74	0	/	-151.00	-153.15

Frequency (MHz)	Option	Min. Distance (cm)	Max. Power		Exposure Limit (mW)	Ratio	Result Pass/Fail
			(dBm)	(mW)			
2402	C	20.00	7.75	5.96	768.00	0.01	Pass
2412	C	20.00	20.75	118.85	768.00	0.15	Pass
13.56	B	20.00	-151.00	0.00	27.66	0.01	Pass

Note: 1. a. *Time-Averaged Power=Output Power * Duty Cycle;*

ERP= Time-Averaged Power+ Antenna gain-2.15dB;

b. EIRP= E-104.8+20logD; Output Power=EIRP- Antenna Gain;

ERP=EIRP-2.15dB

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. Ratio= Tune-Up ERP (mW)/ 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	0.15	0.01	0.16	1	Pass

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

Result: Pass