1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 General Information

Client Information

Applicant:	Shenzhen Sanbao Innovation Robot Co., Ltd.
Address of applicant:	No. 2803, South Area Phrase 2, UpperHills, No. 5001 Huanggang Road, Lianhua No.1 Village, Huafu Street, Futian District, Shenzhen, China
Manufacturer:	Shenzhen Sanbot Innovation Intelligence Co.,Ltd Longgang Branch
Address of manufacturer:	A101, Building 13, Hisense Innovation Industrial City, Ganli 6 Rd, Jihua Street, Longgang District, Shenzhen , China

General Description of EUT:

Product Name:	Intelligent Robot
Trade Name:	Sanbot
Model No.:	S1-B2
Adding Model(s):	/
FCC ID:	2AWMY-S1-B2
Rated Voltage:	DC 14.4V
Power Adapter	ADS-110CL-19-3 190090G Input: AC100-240V 50/60Hz 1.5A Max Output: DC19V 4.7A

Technical Characteristics of EUT:

Wi-Fi

Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n-HT20
RF Output Power:	9.36dBm (Conducted)
Type of Modulation:	DBPSK,BPSK,DQPSK,QPSK,16QAM,64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 72.2Mbps
Quantity of Channels:	11 for 802.11b/g/n-HT20
Channel Separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	2dBi

Bluetooth

Bluetooth Version:	V4.2 (BR/EDR/ BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	2.802dBm (Conducted)
Data Rate:	1Mbps, 2Mbps, 3Mbps
Modulation:	GFSK, Pi/4 DQPSK, 8DPSK
Quantity of Channels:	79/40
Channel Separation:	1MHz/2MHz

Type of Antenna:	Integral
Antenna Gain:	2dBi
Zigbee	
Support Standards:	IEEE802.15.4
Frequency Range:	2405-2480MHz
RF Output Power:	3.429dBm (Conducted)
Type of Modulation:	OQPSK
Quantity of Channels:	16
Channel Separation:	5MHz
Type of Antenna:	Integral antenna
Antenna Gain:	2dBi

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 $\|E\|^2$, $\|H\|^2$ 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 $\|E\|^2$, $\|H\|^2$ 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: 10(dBm)
Maximum peak output power at antenna input terminal: 10.00(mW)
Prediction distance: >20(cm)
Prediction frequency: 2462 (MHz)
Antenna gain: 2 (dBi)
Directional gain (numeric gain): 1.58
The worst case is power density at prediction frequency at 20cm: 0.0032w/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mw/cm^2)

For Bluetooth
Maximum Tune-Up output power: 3(dBm)
Maximum peak output power at antenna input terminal: 2.00(mW)
Prediction distance: >20(cm)
Prediction frequency: 2441(MHz)
Antenna gain: 2 (dBi)
Directional gain (numeric gain): 1.58
The worst case is power density at prediction frequency at 20cm: 0.0006w/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mw/cm^2)

For Zigbee
Maximum Tune-Up output power: 4(dBm)
Maximum peak output power at antenna input terminal: 2.51(mW)
Prediction distance: >20(cm)
Prediction frequency: 2480(MHz)
Antenna gain: 2 (dBi)
Directional gain (numeric gain): 1.58
The worst case is power density at prediction frequency at 20cm: 0.0008w/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mw/cm^2)

WIFI and BT is the use the same antenna cannot simultaneous transmission; WIFI/BT and ZigBee is use the different antenna, but there are also cannot simultaneous transmission. Because the ZigBee is transmitting to search Charging Pile when Robot is Low battery voltage, at the time WIFI/BT is stop to work.

Result: Pass