## 1. RF Exposure Requirements

#### 1.1 General Information

**Client Information** 

Applicant: SVEA(HK)LIMITED

Address of applicant: FLAT/RM520, 5/F, CORE BUILDING 1, PH 1,1 SCIENCE PARK EAST

AVE, SHA TIN, NT, HK, CHINA

Manufacturer: Sveaverken Intelligent Technology (shenzhen) Co., Ltd.

Room 401-501, Building 13, Nangang Second Industrial Park,

Address of manufacturer: No.1026, Songbai Road, Sunshine Community, Xili Street, Nanshan

District, Shenzhen

**General Description of EUT:** 

Product Name: 3D Kit

Trade Name: /

Model No.: LD01

Adding Model(s): /

Rated Voltage: DC12V

Battery Capacity: /

Power Adapter: /

FCC ID: 2BPE2-LD01 Equipment Type: Fixed device

**Technical Characteristics of EUT:** 

**Bluetooth AP6275S** 

Bluetooth Version: V5.1(BLE mode)
Frequency Range: 2402-2480MHz

RF Output Power: 3.81dBm (Conducted)

Data Rate: 1Mbps
Modulation: GFSK
Quantity of Channels: 40
Channel Separation: 2MHz

Type of Antenna: Glue stick antenna

Antenna Gain: 2.75dBi

Wi-Fi (2.4G) USB6111

Support Standards: 802.11b, 802.11g, 802.11n

2412-2462MHz for 802.11b/g/n(HT20)

Frequency Range: 2422-2452MHz for 802.11n(HT40)

RF Output Power: 15.99dBm (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: Glue stick antenna

Antenna Gain: 2.75dBi

Wi-Fi (2.4G) AP6275S

RF Output Power:

Support Standards: 802.11b, 802.11g, 802.11n, 802.11ax

Frequency Range: 2412-2462MHz for 802.11b/g/n/ax(HT/HE20)

Antenna 0: 15.71dBm (Conducted)
Antenna 1: 15.94dBm (Conducted)

Type of Modulation: CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM, 256QAM

Quantity of Channels: 11 for 802.11b/g/n/ax(HT/HE20)

Channel Separation: 5MHz

Type of Antenna: Glue stick antenna

Antenna Gain: 2.75dBi

Wi-Fi (5G) USB6111

Support Standards: 802.11a, 802.11n(HT20), 802.11n-HT40,

Frequency Range: 5180-5240MHz, 5745-5825MHz

Max. RF Output Power: 5180-5240MHz: 15.33dBm (Conducted) 5745-5825MHz: 14.99dBm (Conducted)

Type of Modulation: QPSK, 16QAM, 64QAM,256QAM

Type of Antenna: Glue stick antenna

Antenna Gain: 5180-5240MHz: 2.64dBi 5745-5825MHz: 3.20dBi

Wi-Fi (5G) AP6275S

802.11a, 802.11n(HT20), 802.11n-HT40, 802.11ac-VHT20/40/80,

Support Standards: 802.11ax-HE20/40/80

Frequency Range: 5180-5240MHz, 5745-5825MHz

5180-5240MHz: Antenna 0: 15.85dBm (Conducted)

Max. RF Output Power:

Antenna 1: 15.44dBm (Conducted)

5745-5825MHz: Antenna 0: 14.82dBm (Conducted)

Antenna 1: 14.39dBm (Conducted)

Type of Modulation: QPSK, 16QAM, 64QAM, 256QAM, 1024QAM

Type of Antenna: Glue stick antenna

Antenna Gain: 5180-5240MHz: 2.64dBi

5745-5825MHz: 3.20dBi

### 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  $\lambda/2\pi$ , 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	Output Power	Antenna Gain	Duty Cycle	Tune-Up Time-Averaged Power	ERP
	(MHz)	(dBm)	(dBi)	(%)	(dBm)	(dBm)
Bluetooth (AP6275S-ANT 0)	2402	3.81	2.75	100	4.00	4.60
Wi-Fi (2.4G) (USB6111)	2412	15.99	2.75	100	16.00	16.60
Wi-Fi (2.4G) (AP6275S-ANT 0)	2412	15.71	2.75	100	16.00	16.60
Wi-Fi (2.4G) (AP6275S-ANT 1)	2412	15.94	2.75	100	16.00	16.60
Wi-Fi (5G) (USB6111)	5180	15.33	2.64	100	16.00	16.49
Wi-Fi (5G) (USB6111)	5745	14.99	3.20	100	15.00	16.05
Wi-Fi (5G) (AP6275S-ANT 0)	5180	15.85	2.64	100	16.00	16.49
Wi-Fi (5G) (AP6275S-ANT 0)	5745	15.44	3.20	100	16.00	17.05
Wi-Fi (5G) (AP6275S-ANT 1)	5180	14.82	2.64	100	15.00	15.49
Wi-Fi (5G) (AP6275S-ANT 1)	5745	14.39	3.20	100	15.00	16.05

Frequency	Ontion	Min. Distance	Max.	Power	Exposure Limit	Potio	Result
(MHz)	Option	(cm)	(dBm)	(mW)	(mW)	Ratio	Pass/Fail
2402	С	20.00	4.60	2.88	768.00	0.01	Pass
2412	С	20.00	16.60	45.71	768.00	0.06	Pass
2412	С	20.00	16.60	45.71	768.00	0.06	Pass
2412	С	20.00	16.60	45.71	768.00	0.06	Pass
5180	С	20.00	16.49	44.57	768.00	0.06	Pass
5745	С	20.00	16.05	40.27	768.00	0.05	Pass
5180	С	20.00	16.49	44.57	768.00	0.06	Pass
5745	С	20.00	17.05	50.70	768.00	0.07	Pass
5180	С	20.00	15.49	35.40	768.00	0.05	Pass

5745	С	20.00	16.05	40.27	768.00	0.05	Pass
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Note: 1. Time-Averaged Power=Output Power \* Duty Cycle; ERP= Time-Averaged Power+ Antenna gain-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<sub>th</sub> (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	Ratio 1	Ratio 2	Ratio 3	Simultaneous Ratio	Limit	Result
Technology						Pass/Fail
USB6111 +						
(AP6275S-ANT 0) +	0.06	0.07	0.06	0.19	1	Pass
(AP6275S-ANT 1)						

Result: Pass