

1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 General Information

Client Information

Applicant: HiVi Acoustics Technology Co., Ltd.
Address of applicant: NO.1, South Dongcheng Road, Liangang Industrial Zone,
Zhuhai, Guangdong, P.R.China

Manufacturer: HiVi Acoustics Technology Co., Ltd.
Address of manufacturer: NO.1, South Dongcheng Road, Liangang Industrial Zone,
Zhuhai, Guangdong, P.R.China

General Description of EUT:

Product Name: High Fidelity Active Speaker
Trade Name: 
Model No.: Swans M500
Adding Model(s): HiVi M500, HiVi M3AMKIII, HiVi H8, HiVi H6, HiVi M300MKII,
HiVi M5A, Swans M3AMKIII, Swans H8, Swans H6,
Swans M300MKII, Swans M5A
FCC ID: 2AWE2-M500
Rated Voltage: AC120V/60Hz

Technical Characteristics of EUT:

Bluetooth

Bluetooth Version: V5.0 (BR/EDR mode)
Frequency Range: 2402-2480MHz
RF Output Power: 4.38dBm (Conducted)
Data Rate: 1Mbps, 2Mbps, 3Mbps
Modulation: GFSK, Pi/4 DQPSK, 8DPSK
Quantity of Channels: 79
Channel Separation: 1MHz
Type of Antenna: Integral Antenna
Antenna Gain: 3.0dBi

WiFi

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:	17.09dBm (Conducted)
Type of Modulation:	DBPSK,BPSK,DQPSK,QPSK,16QAM,64QAM
Data Rate:	1-11Mbps, 6-54Mbps, up to 150Mbps
Quantity of Channels:	11 for 802.11b/g/n-HT20 7 for 802.11n-HT40
Channel Separation:	5MHz
Type of Antenna:	Integral Antenna
Antenna Gain:	3.0dBi

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/cm²)

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

Bluetooth

Maximum Tune-Up output power: 5(dBm)

Maximum peak output power at antenna input terminal:3.16(mW)

Prediction distance: >20(cm)

Prediction frequency: 2441 (MHz)

Antenna gain:3.0(dBi)

Directional gain (numeric gain): 2.00

The worst case is power density at prediction frequency at 20cm: 0.0013(mw/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm²)

WiFi

Maximum Tune-Up output power: 18(dBm)

Maximum peak output power at antenna input terminal:63.10(mW)

Prediction distance: >20(cm)

Prediction frequency: 2437 (MHz)

Antenna gain:3.0(dBi)

Directional gain (numeric gain): 2.00

The worst case is power density at prediction frequency at 20cm: 0.0250(mw/cm²)

MPE limit for general population exposure at prediction frequency: 1 (mw/cm²)

Mode for Simultaneous Multi-band Transmission

Bluetooth+Wi-Fi

The worst case is power density at prediction frequency at 20cm: $0.0013 + 0.0250 = 0.0163(\text{mw/cm}^2)$

MPE limit for general population exposure at prediction frequency: 1 (mw/cm²)

Result: Pass