

Analysis Report

FCC ID: A2HRTS739BWSE

The Equipment Under Test (EUT) is a Home Theatre Sound Bar. It can accept analog input sources (RCA aux-in and 3.5mm phone jack line-in), SPDIF digital audio input (optical TOSLINK) and wireless Bluetooth device. The Bluetooth module in the EUT is operating in the frequency range from 2402MHz to 2480MHz (79 channels with 1MHz channel spacing). The audio signal is amplified and fed to the built-in passive loudspeakers. The EUT is powered by an AC/DC adaptor. (Input: 120VAC 50/60Hz; Output: 13VDC 1.8ADC).

The system includes a separate wireless Subwoofer unit in the product package. The audio signal can be sent via the 2.4GHz Wireless Modules, which are incorporated in both soundbar unit and subwoofer unit. The frequency range of the 2.4GHz Wireless Module in the Soundbar is 2404MHz to 2479MHz (16 channels with 5MHz channel spacing).

Bluetooth Module:

Antenna Type: Internal, integral antenna

Antenna Gain: 0dBi

Nominal rated field strength: 98.2dB μ V/m at 3m

Maximum allowed field strength of production tolerance: +/- 3dB

2.4GHz Wireless Module:

Antenna Type: Internal, integral antenna

Antenna Gain: 0dBi

Nominal rated field strength: 91.2dB μ V/m at 3m

Maximum allowed field strength of production tolerance: +/- 3dB

According to the KDB 447498:

For Bluetooth Module:

Based on the Maximum allowed field strength of production tolerance was 101.2dB μ V/m at 3m in frequency 2.479GHz, thus;

$$\text{The EIRP} = [(FS \cdot D)^2 \cdot 1000 / 30] = 3.96\text{mW}$$

Conducted power = Radiated Power (EIRP) – Antenna Gain

So;

$$\text{Conducted Power} = 3.96\text{mW}.$$

The SAR Exclusion Threshold Level:

$$= 3.0 \cdot (\text{min. test separation distance, mm}) / \sqrt{\text{freq. in GHz}}$$

$$= 3.0 \cdot 5 / \sqrt{(2.480)} \text{ mW}$$

$$= 9.53 \text{ mW}$$

Since the above conducted output power is well below the SAR Exclusion threshold level, so the EUT is considered to comply with SAR requirement without testing.

For 2.4GHz Wireless Module:

Based on the Maximum allowed field strength of production tolerance was 94.2dB μ V/m at 3m in frequency 2.479GHz, thus;

$$\text{The EIRP} = [(FS \cdot D)^2 \cdot 1000 / 30] = 0.79\text{mW}$$

Conducted power = Radiated Power (EIRP) – Antenna Gain

So;

$$\text{Conducted Power} = 0.79\text{mW}.$$

The SAR Exclusion Threshold Level:

$$= 3.0 \cdot (\text{min. test separation distance, mm}) / \sqrt{\text{freq. in GHz}}$$

$$= 3.0 \cdot 5 / \sqrt{(2.479)} \text{ mW}$$

$$= 9.53 \text{ mW}$$

Since the above conducted output power is well below the SAR Exclusion threshold level, so the EUT is considered to comply with SAR requirement without testing.

Simultaneous Transmission SAR exclusion considerations

Since the Bluetooth and 2.4GHz Wireless Modules of this device may operate simultaneously, simultaneous transmission analysis is required. Per KDB 447498, simultaneous transmission SAR test exclusion can be applied when the sum of 1-g SAR of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit ($\leq 1.6\text{W/kg}$). When the standalone SAR test exclusion is applied, the standalone 1-g SAR must be estimated according to the following equation,

$$\text{Estimated SAR} = (\sqrt{F(\text{GHz}) / 7.5}) \times (P_{\text{max}} / TD)$$

where

$F(\text{GHz})$ is the RF channel transmit frequency in GHz

P_{max} is the max. power of channel, including tune-up tolerance, mW

TD is the min. test separation distance, mm

For Bluetooth operation,

Maximum Time-averaged Conducted Power of this device = 3.96 mW

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned}\text{Estimated SAR} &= (\sqrt{F(\text{GHz}) / 7.5}) \times (P_{\text{max}} / TD) \\ &= 0.166 \text{ W/kg}\end{aligned}$$

where $P_{\text{max}} = 3.96\text{mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 2.480 \text{ GHz}$

For 2.4GHz Wireless Module operation,

Maximum Time-averaged Conducted Power of this device = 0.79 mW

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned}\text{Estimated SAR} &= (\sqrt{F(\text{GHz}) / 7.5}) \times (P_{\text{max}} / TD) \\ &= 0.033 \text{ W/kg}\end{aligned}$$

where $P_{\text{max}} = 0.79 \text{ mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 2.479 \text{ GHz}$

Simultaneous Transmission Analysis

2.4GHz Wirelss Module SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simultaneous SAR Required
0.033	0.166	0.199	No

Conclusion

Since the above summed SAR result for all simultaneous transmission conditions were below the SAR limit (1.6 W/kg), SAR evaluation for simultaneous transmission configuration are not required.