Analysis Report

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), digital input source 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 can also transmit audio signal to a separate active subwoofer via a 2.4GHz Wireless link. This 2.4G Wireless Module is operating in the frequency range from 2404MHz to 2479MHz (16 channels with 5MHz channel spacing). The EUT is powered by a 27.5V AC/DC adaptor. The adaptor can accept 100-240VAC input.

For Bluetooth Module:
Modulation Type: GFSK
Antenna Type: Integral, Internal (PCB Trace)
Frequency Range: 2402MHz - 2480MHz, 1MHz channel spacing, 79 channels

Nominal field strength is 96.8dBµV/m @ 3m
Production Tolerance of field strength is +/- 3dB
Antenna gain is 0dBi

For 2.4G Wireless Module:
Modulation Type: GFSK
Antenna Type: Integral, Internal (PCB Trace)
Frequency Range: 2404MHz - 2479MHz, 5MHz channel spacing, 16 channels

Nominal field strength is 89.2dBµV/m @ 3m
Production Tolerance of field strength is +/- 3dB
Antenna gain is 0dBi

According to the KDB 447498:

For Bluetooth Module:
Based on the Maximum allowed field strength of production tolerance was 99.8dBμV/m at 3m in frequency 2.480GHz, thus;

The EIRP = [(FS*D) ^2*1000 / 30] = 2.865mW

Conducted power = Radiated Power (EIRP) – Antenna Gain
So;
Conducted Power = 2.865mW.

The SAR Exclusion Threshold Level:
= 3.0 * (min. test separation distance, mm) / sqrt(freq. in GHz)
= 3.0 * 5 / sqrt (2.480) mW
= 9.53 mW

For Bluetooth 2.4G Wireless Module:
Based on the Maximum allowed field strength of production tolerance was 92.2dBμV/m at 3m in frequency 2.479GHz, thus;

The EIRP = [(FS*D) ^2*1000 / 30] = 0.498mW

Conducted power = Radiated Power (EIRP) – Antenna Gain
So;
Conducted Power = 0.498mW.

The SAR Exclusion Threshold Level:
= 3.0 * (min. test separation distance, mm) / sqrt(freq. in GHz)
= 3.0 * 5 / sqrt (2.479) mW
= 9.53 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 Module and 2.4G Wireless Module transmitters 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 (≤ 1.6W/kg). When the standalone SAR test exclusion is applied, the standalone 1-g SAR must be estimated according to the following equation,

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

where
F(GHz) is the RF channel transmit frequency in GHz
Pmax is the max. power of channel, including tune-up tolerance, mW
TD is the min. test separation distance, mm

For Bluetooth Module,

Maximum Time-averaged Conducted Power of this device = 2.865 mW

Therefore, the Estimated SAR will be determined as follow,

$$\text{Estimated SAR} = (\sqrt{F(GHz)}/7.5)x(P\max/TD)$$
$$= 0.12 \text{ W/kg}$$

where *Pmax* = 2.865 mW, *TD* = 5 mm and *F(GHz)* = 2.480 GHz

For 2.4G Wireless Module,

Maximum Time-averaged Conducted Power of this device = 0.498 mW

Therefore, the Estimated SAR will be determined as follow,

$$\text{Estimated SAR} = (\sqrt{F(GHz)}/7.5)x(P\max/TD)$$
$$= 0.02 \text{ W/kg}$$

where *Pmax* = 0.498mW, *TD* = 5 mm and *F(GHz)* = 2.479 GHz

Simultaneous Transmission Analysis

Bluetooth Module SAR (W/kg)	2.4G Wirelss Module SAR (W/kg)	Σ SAR (W/kg)	Simultaneous SAR Required
0.12	0.02	0.14	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.