Analysis Report

The Equipment Under Test (EUT) is a Hue Tone Luminaries. The EUT can operate while connected and controlled by a Zigbee Remote (Provided by Applicant) via Zigbee radio link. The EUT can only support Zigbee. The Zigbee portion occupies frequency range of 2405MHz to 2480MHz (15 channels with channel spacing of 5MHz). The EUT is powered by 120VAC 60Hz.

Chipset 1(450lm) OR Chipset 2(900lm) OR Chipset 3(1800lm):
Antenna Type: Internal integral antenna
Antenna Gain: -1.8dBi
Nominal rated field strength: 100dBµV/m at 3m
Maximum allowed field strength of production tolerance: +/- 5dB

According to the KDB 447498:

Based on the Maximum allowed field strength of production tolerance was 105dBµV/m at 3m in frequency 2.4GHz, thus;

Duty cycle = 0.068.

The EIRP = [(FS*D) ^2*1000 / 30] = 0.650mW

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

Conducted Power = 0.976mW.

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

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 two Zigbee 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 Zigbee chipset 1(450lm) operation,

Maximum Time-averaged EIRP of this device = **0.98mW**

Therefore, the Estimated SAR will be determined as follow,

$$\text{Estimated SAR} = (\sqrt{F(GHz)}/7.5)x(P\max/TD)$$
$$= \textbf{0.04 W/kg}$$

where *Pmax* = 0.98W, *TD* = 5 mm and *F(GHz)* = 2.480 GHz

For Zigbee chipset 2(900lm) operation,

Maximum Time-averaged EIRP of this device = **0.98 mW**

Therefore, the Estimated SAR will be determined as follow,

$$\text{Estimated SAR} = (\sqrt{F(GHz)}/7.5)x(P\max/TD)$$
$$= \textbf{0.04 W/kg}$$

where *Pmax* = 0.98mW, *TD* = 5 mm and *F(GHz)* = 2.480 GHz

For Zigbee chipset 3(1800lm) operation,

Maximum Time-averaged EIRP of this device = **0.98 mW**

Therefore, the Estimated SAR will be determined as follow,

$$\text{Estimated SAR} = (\sqrt{F(GHz)}\,/\,7.5)x(P\max/TD)$$
$$= \textbf{0.04 W/kg}$$

where *Pmax* = 0.98mW, *TD* = 5 mm and *F(GHz)* = 2.480 GHz

Simultaneous Transmission Analysis

Σ SAR (W/kg)	Simultaneous SAR Required
0.12	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.