

Analysis Report

The Equipment Under Test (EUT), is a portable Composite Device (Turret Unit) which contains a 2.4GHz Transceiver and a 2Mbps BLE Transceiver. For the 2.4GHz portion, the sample supplied operated on 29 channels, normally at 2440 - 2468MHz. The channels are separated with 1MHz spacing. For the BLE portion, the sample supplied operated on 40 channels, normally at 2402 - 2480MHz. The channels are separated with 2MHz spacing.

The EUT is powered by 1 x 7.4V Lithium-ion battery. After switching on the EUT, the EUT, the turret can be paired up with the controller. The turret will undergo automatic shooting action with different angle based on the switches pressed in the controller. The turret can be further paired up with a smartphone together with other external units to play different shooting game. The 2.4GHz portion will be disabled while the BLE portion will keep on functioning when the EUT is charging.

Antenna Gain: 0 dBi

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

2.4GHz Portion

Frequency Range: 2440MHz to 2468MHz, 1MHz channel spacing, 29 channels

Average Radiated range: 60.7dBμV/m to 63.7dBμV/m

Bluetooth BLE Portion

Frequency Range: 2402MHz to 2480MHz, 2MHz channel spacing, 40 channels

Average Radiated range: 63.9dBμV/m to 69.0dBμV/m

According to the KDB447498 D01 v06:

Radiated Power (maximum)
= 72.0 dBμV/m (0.005 mW)

The SAR Exclusion Threshold Level:
= $3.0 * (\text{min. test separation distance, mm}) / \text{sqrt}(\text{freq. in GHz})$
= $3.0 * 5 / \text{sqrt}(2.480)$ 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 the 2.4GHz and Bluetooth transmitters of this device may operate simultaneously, simultaneous transmission analysis is required. Per KDB447498 D01 v06, 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 2.4GHz operation,

Maximum Time-averaged Conducted Power of this device = 0.001403 mW (66.7dBμV/m)

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned}\text{Estimated SAR} &= (\sqrt{F(\text{GHz})} / 7.5) \times (P_{\text{max}} / TD) \\ &= \mathbf{0.0000586 \text{ W/kg}}\end{aligned}$$

where $P_{\text{max}} = 0.001403 \text{ mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 2.454 \text{ GHz}$

For Bluetooth BLE operation,

Maximum Time-averaged Conducted Power of this device = 0.004755 mW (72.0dBμV/m)

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned}\text{Estimated SAR} &= (\sqrt{F(\text{GHz})} / 7.5) \times (P_{\text{max}} / TD) \\ &= \mathbf{0.0001981 \text{ W/kg}}\end{aligned}$$

where $P_{\text{max}} = 0.004755 \text{ mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 2.440 \text{ GHz}$

Simultaneous Transmission Analysis

2.4GHz SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simultaneous SAR Required
0.0000586	0.0001981	0.0002567	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 is not required.