

Analysis Report

The Equipment Under Test (EUT), is a BIT Bitzee Interactive Hamsterball with two 2.4GHz transceiver modules. The sample supplied operated on 4 channels, normally at 2420 MHz, 2435 MHz, 2450 MHz and 2465 MHz.

The EUT is powered by 3 x 1.5V AA batteries. After switching on EUT, the rotor will keep rotating and the LED on the rotor can show different image during rotation and emit different sound.

Antenna Gain: 0 dBi

Stator

Frequency Range: 2420MHz, 2435MHz, 2450MHz and 2465MHz, 4 channels

Average Radiated range: 72.3dBμV/m to 79.3 dBμV/m

Rotor

Frequency Range: 2420MHz, 2435MHz, 2450MHz and 2465MHz, 4 channels

Average Radiated range: 56.8dBμV/m to 63.9dBμV/m

According to the KDB447498 D01 v06:

For Stator

Radiated Power (maximum)
= 79.3 dBμV/m (0.0257) mW)

For Rotor

Radiated Power (maximum)
= 63.9 dBμV/m (0.0007 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 for both stator and rotor are well below the SAR Exclusion threshold level, 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 Stator operation,

Maximum Time-averaged Conducted Power of this device = 0.0257 mW (79.3dBμV/m)

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned}\text{Estimated SAR} &= (\sqrt{F(\text{GHz})} / 7.5) \times (P_{\text{max}} / TD) \\ &= \mathbf{0.00108 \text{ W/kg}}\end{aligned}$$

where $P_{\text{max}} = 0.0257 \text{ mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 2.465 \text{ GHz}$

For Rotor operation,

Maximum Time-averaged Conducted Power of this device = 0.0007 mW (63.9dBμV/m)

Therefore, the Estimated SAR will be determined as follow,

$$\begin{aligned}\text{Estimated SAR} &= (\sqrt{F(\text{GHz})} / 7.5) \times (P_{\text{max}} / TD) \\ &= \mathbf{0.0000293 \text{ W/kg}}\end{aligned}$$

where $P_{\text{max}} = 0.0007 \text{ mW}$, $TD = 5 \text{ mm}$ and $F(\text{GHz}) = 2.465 \text{ GHz}$

Simultaneous Transmission Analysis

Stator SAR (W/kg)	Rotor SAR (W/kg)	Σ SAR (W/kg)	Simultaneous SAR Required
0.00108	0.0000293	0.0011093	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.