

Appendix 5

RF Exposure Information

Maximum transmitter power:

Frequency (MHz)	Maximum peak output power (dBm)	Max Duty Cycle (%)	Average Output power(mW)
2402	7.22	35	1.85
2442	6.51	35	1.57
2480	5.62	35	1.28

Max Duty Cycle Calculation

The connection interval is from 7.5ms to 30ms which depends on the model and OS of smart phone. The Bluetooth controller in this sensor can transmit up to 7 packets in 7.5ms time slot. Refer to the Bluetooth core v4.1 Vol.6 Part 4.1.6, the packet interval is 625us. That means the duty cycle per time slot is $0.625\text{ms} * 7\text{times} / 7.5\text{ms} = 58.3\%$

Refer to the Bluetooth core v4.1, we know that the Maximum packet length is 47 Bytes in PHY layer while the packet interval is 625 μ s. Since the baud rate is 1Mbit/s, the max duty cycle in every packet interval is $47\text{ Bytes} * 8\text{ bit} / 625\mu\text{s} = 60.16\%$.

Then we can tell the total duty cycle in every connection interval is $58.3\% * 60.16\% \approx 35\%$

According to KDB 447498 D01:

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* $\leq 50\text{ mm}$ are determined by:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,²⁴ where

- $f_{(\text{GHz})}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

Result:

$$(1.85/5) * \sqrt{2.402} = 0.571 < 3.0$$

$$(1.57/5) * \sqrt{2.442} = 0.489 < 3.0$$

$$(1.28/5) * \sqrt{2.480} = 0.402 < 3.0$$

Conclusion:

No SAR is required.

For IC

According to table 1 in RSS-102 Issue 5, below exemption limit is applied:

- Frequency: 2450MHz
- At separation distance of $\leq 5\text{mm}$
- Exemption limits: 4mW

Conclusion:

The maximum peak output power of the transmitter is less than the SAR evaluation exemption threshold and hence it complies with the RSS-102 RF exposure requirement without SAR evaluation..