

RF EXPOSURE

FCC ID: OYUSR20D

KDB447498 was used as the guidance.

SAR test exclusion considerations

Step.1 For 100 MHz to 6 GHz and test separation distances ≤ 50 mm, the 1-g and 10-g SAR test exclusion threshold are determined by the following :

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

where

f(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

The values 3.0 and 7.5 are referred to as numeric thresholds in step.2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

Step.2 For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following(Refer to Appendix B)

Step.2-1 $\{[\text{Power allowed at numeric threshold for 50 mm in step.1}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150)]\}$ mW, for 100 MHz to 1500 MHz

Step.2-2 $\{[\text{Power allowed at numeric threshold for 50 mm in step.1}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\}$ mW, for > 1500 MHz and ≤ 6 GHz

Step.3 For frequencies below 100 MHz, the following may be considered for SAR test exclusion are determined by the following(Refer to Appendix C)

Step.3-1 For test separation distances > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step.2) is multiplied by $[1 + \log(100/f_{(\text{MHz})})]$

Step.3-2 For test separation distances ≤ 50 mm, the power threshold determined by the equation in Step.3-1 for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$

Step.3-3 SAR measurement procedures are not established below 100 MHz.

Appendix C

(SAR Test Exclusion Thresholds for < 100 MHz and < 200 mm)

MHz	<50	50	60	70	80	90	100	110	mm
100	237	474	481	487	494	501	507	514	mW
50	308	617	625	634	643	651	660	669	
10	474	948	961	975	988	1001	1015	1028	
1	711	1422	1442	1462	1482	1502	1522	1542	
0.1	948	1896	1923	1949	1976	2003	2029	2056	
0.05	1019	2039	2067	2096	2125	2153	2182	2211	
0.01	1185	2370	2403	2437	2470	2503	2537	2570	
MHz	120	130	140	150	160	170	180	190	mm
100	521	527	534	541	547	554	561	567	mW
50	677	686	695	703	712	721	729	738	
10	1041	1055	1068	1081	1095	1108	1121	1135	
1	1562	1582	1602	1622	1642	1662	1682	1702	
0.1	2083	2109	2136	2163	2189	2216	2243	2269	
0.05	2239	2268	2297	2325	2354	2383	2411	2440	
0.01	2603	2637	2670	2703	2737	2770	2803	2837	

SAR Test Exclusion Considerations : Bluetooth LE

- Frequency Range : 2402 MHz ~ 2480 MHz

- Measured RF Maximum Output Power : 8.19 dBm

- Target Power & Tolerance : 7.50 dBm & $\pm$ 1.00 dB

(Maximum : 8.50 dBm & Minimum : 6.50 dBm)

- Maximum Peak Antenna Gain : 0.41 dBi

- **Maximum Output Power for the Calculation :** 8.50 dBm

*In the case of Bluetooth LE, Value of the module report was used. Contains FCC ID : SH6MDBT50Q

The EUT will only be used with a separation of 5 millimeters or lesser between the antenna and the body of the SAR Exclusion calculation for this exposure is shown below.

- ERP = $P + G - 2.15$ (dB) = <u>8.50</u> dBm + <u>0.41</u> dBi - <u>2.15</u> dB = <u>6.76</u> dBm = <u>4.74</u> mW	- NOTE P : Max Tuneup Power (dBm) G : Maximum Peak Antenna Gain (dBi)
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Estimated SAR at the Specific Separation

- S = $[(P(\text{mW}) / R)] \times [\sqrt{f}(\text{GHz})]$ = $[(4.74 / 5.00)] \times [\sqrt{(2.48)}]$ = 1.49 < 3	- NOTE S : Maximum Estimated SAR P(mW) : Max Tuneup Power (ERP, mW) R : Distance to the center of the radiation of the antenna (<u>5.00</u> mm) f(GHz) : The RF Channel Transmit Frequency in GHz
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SAR Test Exclusion Considerations : RFID 13.56 MHz

- Frequency : 13.56 MHz
- Measured Maximum Field Strength : 76.0 dBuV/m (at 3 m)

The EUT will only be used with a separation of 5 millimeters or lesser between the antenna and the body of the SAR Exclusion calculation for this exposure is shown below.

- ERP = P + (20 * Log(D)) - 104.77 - 2.15 (dB) = <u>76.00</u> + <u>9.542</u> - <u>104.77</u> - <u>2.15</u> = <u>-21.38</u> dBm = <u>0.0073</u> mW	- NOTE P : Max Field Strength (dBuV/m) D : Measured Distance (m)
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Estimated SAR at the Specific Separation

- S = [(P(mW) / R)] X [√f(GHz)] = [(0.0073 / 5.00)] X [√(0.01356)] = 0.000170 < 442.65	- NOTE S : Maximum Estimated SAR P(mW) : Max Tuneup Power (ERP, mW) R : Distance to the center of the radiation of the antenna (<u>5.00</u> mm) f(GHz) : The RF Channel Transmit Frequency in GHz
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SAR Test Exclusion Considerations : Bluetooth LE+RFID 13.56 MHz

Simultaneous SAR Test Exclusion Considerations for Bluetooth LE+RFID 13.56 MHz

$$\begin{aligned} & \text{- Total(\%)} = \\ & = \left[\left(\frac{\text{Bluetooth LE Result(mW)}}{\text{Bluetooth LE Limit(mW)}} \right) + \left(\frac{\text{RFID 13.56 MHz Result(mW)}}{\text{RFID 13.56 MHz Limit(mW)}} \right) \right] * 100 \\ & = \left[\left(\frac{1.49}{3} \right) + \left(\frac{0.000170}{442.65} \right) \right] * 100 \\ & = 49.79 \% \end{aligned}$$

RF Exposure Compliance Issue

Therefore, EUT is not required the SAR Evaluation.