

Manufacturer: Silicon Laboratories Finland Oy
Device: Wi-Fi 802.11b/g/n SiP transceiver radio module
Model: WFM200SA, WFM200SN
FCC ID: QOQWFM200
ISED ID: 5123A-WFM200

REFERENCE DOCUMENTS

KDB447498 D01 General RF Exposure Guidance v06, 23 October 2015
FCC CFR 47 §1.1310, Radio frequency exposure limits
FCC CFR 47 §2.1091, Radio frequency exposure evaluation: mobile devices
297217-1-1, FCC IC RF Test Report, 23 September 2019

EUT SPECIFICATION

RF characteristics of the assessed radio:

Operating Frequency Range:	2412-2462 MHz
Channels:	11
Nominal channel bandwidth:	20 MHz
Channel separation:	5 MHz
Maximum conducted power:	16.4 dBm
Modulation:	CCK, QPSK, OFDM
Integral Antenna gain:	4.7 dBi
External Antenna gain:	4.7 dBi
Antenna type:	internal and external
Antenna count:	1-2 (Not transmit simultaneously)
Device category:	Mobile and portable

SAR EXCLUSION JUSTIFICATION

Guidance document reference: KDB447498 D01 General RF Exposure Guidance v06, page 12, section 4.3.1.

Step a)

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined:

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

- f (GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric threshold in the step b)

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 distance is < 5 mm, a distance of 5 mm according to f) in section 4.1 is applied to determine SAR test exclusion.

Step b)

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:

$\{[\text{Power allowed at numeric threshold for 50 mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) * 10]\} \text{ mW, for } > 1500 \text{ MHz and } \leq 6 \text{ GHz}$

These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum test separation distance required for the exposure conditions.

CALCULATIONS AND ASSUMPTIONS

Analysis for FCC, portable use:

EUT maximum TX power is 44 mW at frequency 2.437 GHz. 23 mm separation distance was used in calculation. The SAR exemption method was applied.

Actual evaluation:

SAR test exclusion threshold for 23 mm separation distance in step a)

$$\left(\frac{44 \text{ mW}}{23 \text{ mm}} \right) * \sqrt{2.437 \text{ GHz}} = 2.99 \leq 3.0$$

Analysis for FCC, mobile use:

$$S = \frac{E.I.R.P}{4\pi R^2} = \frac{129 \text{ mW}}{4\pi * (20 \text{ cm})^2} = 0.026 \frac{\text{mW}}{\text{cm}^2}$$

E.I.R.P	Evaluation distance	Power density	MPE Limit	Margin	Result
129 mW	20 cm	0.026 mW/cm ²	1.0 mW/cm ²	0.974 mW/cm ²	PASS

CONCLUSION

The analysis shows that the device qualifies for exemption from SAR testing in portable and mobile use. In portable use SAR evaluation is not required for separation distance of 23 mm or more.

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Mikko Halonen
Development Engineer