

RF EXPOSURE EVALUATION

FCC ID: 2ARPD-CB8500

EUT Specification

EUT	Multi-Biometric Time Clock
Frequency band (Operating)	☐ BLE: 2.402GHz ~ 2.480GHz ☒ WIFI: 2.412GHz ~ 2.462GHz ☒ RFID: 122.5-127.5KHz
Device category	☒ Portable (<20cm separation) ☐ Mobile (>20cm separation)
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☐ Tx/Rx diversity
Max. output power	2.4GWIFI: IEEE 802.11b: 1.14 dBm IEEE 802.11g: 3.47 dBm IEEE 802.11n HT20: 3.51 dBm RFID: 70.18dB μ V/m(-25.05dBm)
Antenna gain (Max)	WIFI: 2.21dBi RFID: 0.dBi

Test Requirement:

According to §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

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

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

- $f_{\text{(GHz)}}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation²⁵
- 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

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 5) in section 4.1 is applied to determine SAR test exclusion.

- c) For frequencies below 100 MHz, the following may be considered for SAR test exclusion (also illustrated in Appendix C):³³
- 1) For *test separation distances* > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by $[1 + \log(100/f_{\text{(MHz)}})]$
 - 2) For *test separation distances* ≤ 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$
 - 3) SAR measurement procedures are not established below 100 MHz.

When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any SAR test results below 100 MHz to be acceptable.³⁴

test separation distances ≤ 50 mm as follows:

$$P_b(\text{mW}) \cdot [1 + \log(100/f(\text{MHz}))] \cdot 0.5 = 474 \text{ mW} \cdot [1 + \log(100/f(\text{MHz}))] \cdot 0.5 = 237 \cdot [1 + \log(100/f(\text{MHz}))]$$

Routine SAR evaluation refers to that specifically required by §2.1093, using measurements or computer simulation. When routine SAR evaluation is not required, portable transmitters with output power greater than the applicable low threshold require SAR evaluation to qualify for TCB approval.

For multiple RF sources: Multiple RF sources are exempt if:
in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation

$$\sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

$Evaluated_k$: the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

$Exposure Limit_k$: either the general population/uncontrolled maximum permissible exposure (MPE) or specific Absorption rate (SAR) limit for each fixed, mobile, or portable RF source k.

One antenna is available for the EUT. The minimum separation distance is 5mm.

2.4G WiFi

Transmit Frequency (MHz)	Mode	Measured Power (dBm)	Tune up Power (dBm)	Max tune up power(dBm)	Calculation Result	1-g SAR
2462	802.11b	1.14	1 ± 1	2	0.491268	3
2462	802.11g	3.47	3 ± 1	4	0.788272	3
2462	802.11n HT20	3.51	4 ± 1	5	0.992378	3

RFID:

Mode	Field Strength of Fundamental (dBuV/m)	Max Output power (dBm)	Max Output power (mW)
RFID	70.18	-25.05	0.0031

SAR Exemption Power= $237 \times [1 + \log(100/f(\text{MHz}))]$ = $237 \times [1 + \log(100/0.125)]$ = 925mW
0.0031mW < 925mW

Maximum Simultaneous transmission MPE Ratio for RFID & 2.4G WIFI

Maximum MPE Ratio (2.4G WIFI)	Maximum MPE Ratio (RFID)	Σ MPE ratios	Limit	Results
0.992378	0.0031	0.995478	1.000	Pass

Signature:



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