



**FCC Part 1 Subpart I
FCC Part 2 Subpart J
INDUSTRY CANADA RSS 102 ISSUE 5**

RF EXPOSURE REPORT

FOR

SLEEP MONITOR

MODEL NUMBER: 3.5

**FCC ID: BCG-B35
IC: 579C-B35**

REPORT NUMBER: 12290553-E4V1

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Prepared for
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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: APPLE, INC.
1 APPLE PARK WAY
CUPERTINO, CA 95014, U.S.A.

EUT DESCRIPTION: SLEEP MONITOR

MODEL: 3.5

SERIAL NUMBER: DLC8364003YJQJT13, DLC8364003SJQJT19

DATE TESTED: SEPTEMBER 21 – OCTOBER 17, 2018

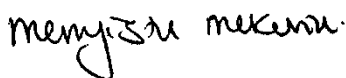
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 1 SUBPART I & PART 2 SUBPART J	Complies
INDUSTRY CANADA RSS 102 ISSUE 5	Complies

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

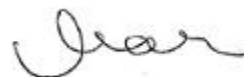
This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
UL Verification Services Inc. By:



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Prepared By:



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UL Verification Services Inc.

2. TEST METHODOLOGY

All calculations were made in accordance with FCC OET Bulletin 65 Edition 97-01 and IC Safety Code 6.

3. REFERENCES

All measurements were made as documented in test report UL Verification Services Inc., UL Verification Services Inc.12289553-E1V1 for operation in the 2.4 GHz band

Output power, Duty cycle and Antenna gain data is excerpted from the applicable test reports.

4. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 and 47266 Benicia Street, and 47658 Kato Road, Fremont, California, USA. Line conducted emissions are measured only at the 47173 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

47173 Benicia Street	47266 Benicia Street	47658 Kato Rd.
<input type="checkbox"/> Chamber A (IC:2324B-1)	<input type="checkbox"/> Chamber D (IC:22541-1)	<input type="checkbox"/> Chamber I (IC: 2324A-5)
<input type="checkbox"/> Chamber B (IC:2324B-2)	<input type="checkbox"/> Chamber E (IC:22541-2)	<input type="checkbox"/> Chamber J (IC: 2324A-6)
<input type="checkbox"/> Chamber C (IC:2324B-3)	<input checked="" type="checkbox"/> Chamber F (IC:22541-3)	<input type="checkbox"/> Chamber K (IC: 2324A-1)
	<input type="checkbox"/> Chamber G (IC:22541-4)	<input type="checkbox"/> Chamber L (IC: 2324A-3)
	<input type="checkbox"/> Chamber H (IC:22541-5)	

The above test sites and facilities are covered under FCC Test Firm Registration # 208313. Chambers above are covered under Industry Canada company address and respective code.

UL Verification Services Inc. is accredited by NVLAP, Laboratory Code 200065-0.

5. MAXIMUM PERMISSIBLE RF EXPOSURE

5.1. FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Notes:

- (1) Occupational/controlled exposure limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when a person is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
- (2) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure

5.2. IC RULES

For the purpose of this standard, Industry Canada has adopted the SAR and RF field strength limits established in Health Canada's RF exposure guideline, Safety Code 6.

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}

Note: *f* is frequency in MHz.

* Based on nerve stimulation (NS).

** Based on specific absorption rate (SAR).

5.3. EQUATIONS

POWER DENSITY

Power density is given by:

$$S = \text{EIRP} / (4 * \text{Pi} * D^2)$$

Where

S = Power density in mW/cm²

EIRP = Equivalent Isotropic Radiated Power in mW

D = Separation distance in cm

Power density in units of mW/cm² is converted to units of W/m² by multiplying by 10.

DISTANCE

Distance is given by:

$$D = \text{SQRT} (\text{EIRP} / (4 * \text{Pi} * S))$$

Where

D = Separation distance in cm

EIRP = Equivalent Isotropic Radiated Power in mW

S = Power density in mW/cm²

SOURCE-BASED DUTY CYCLE

Where applicable (for example, multi-slot cell phone applications) a duty cycle factor may be applied.

$$\text{Source-based time-averaged EIRP} = (\text{DC} / 100) * \text{EIRP}$$

Where

DC = Duty Cycle in %, as applicable

EIRP = Equivalent Isotropic Radiated Power in W

MIMO AND COLOCATED TRANSMITTERS (IDENTICAL LIMIT FOR ALL TRANSMITTERS)

For multiple chain devices, and colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the EIRP (in linear units) of each transmitter.

$$\text{Total EIRP} = (\text{EIRP1}) + (\text{EIRP2}) + \dots + (\text{EIRPn})$$

where

EIRPx = Source-based time-averaged EIRP of chain x or transmitter x

The total EIRP is then used to calculate the Power Density or the Distance as applicable.

MIMO AND COLOCATED TRANSMITTERS

For multiple colocated transmitters operating simultaneously in frequency bands where different limits apply:

The Power Density at the specified separation distance is calculated for each transmitter chain or transmitter.

The fraction of the exposure limit is calculated for each chain or transmitter as
(Power Density of chain or transmitter) / (Limit applicable to that chain or transmitter).

The fractions are summed.

Compliance is established if the sum of the fractions is less than or equal to one.

5.4. LIMITS AND IC EXEMPTION

VARIABLE LIMITS

For mobile radio equipment operating in the cellular phone band, the lowest power density limit is calculated using the lowest frequency:

$$824 \text{ MHz} / 1500 = 0.55 \text{ mW/cm}^2 \text{ (FCC)}$$
$$S = 0.02619 f^{0.6834} \text{ W/m}^2 \text{ (IC)}.$$

FIXED LIMITS

For operation in the PCS band, the 2.4 GHz band and the 5 GHz bands:

From FCC §1.1310 Table 1 (B), the maximum value of $S = 1.0 \text{ mW/cm}^2$
From IC Safety Code 6, Section 4 Table 4 Column 4, $S = 0.02619 f^{0.6834} \text{ W/m}^2$

INDUSTRY CANADA EXEMPTION

RSS-102 Clause 2.5.2 RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5} \text{ W}$ (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834} \text{ W}$ (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

6. STANDALONE SAR TEST EXCLUSION CONSIDERATIONS

6.1. FCC

SAR test exclusion in accordance with KDB 447498.

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:

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

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 is applied to determine SAR test exclusion.

SAR Exclusion Calculations Table for Portable Devices (separation distance $< 20\text{cm}$)

Antenna	Tx	Frequency (MHz)	Avg Output power		Separation distances (mm)	Calculated Threshold
			dBm	mW		
BLE	BLE	2480	5.00	3	5	0.9

Conclusion:

The computed value is < 3 ; therefore, Bluetooth qualifies for Standalone SAR test exclusion.

6.2. INDUSTRY CANADA

Industry Canada notice 2013 DRS0911 states that the SAR exclusion limits contained in Draft RSS-102 issue 5 will be accepted prior to its release. The SAR exclusion table from Draft RSS-102 issue 5 is reproduced below:

Table 1: SAR evaluation - exemption limits for routine evaluation based on frequency and separation distance.

Frequency MHz	Exemption Limits (mW)				
	At separation distance of ≤5mm	At separation distance of 10mm	At separation distance of 15mm	At separation distance of 20mm	At separation distance of 25mm
≤300	71 mW	101 mW	132 mW	162 mW	193 mW
450	52 mW	70 mW	88 mW	106 mW	123 mW
835	17 mW	30 mW	42 mW	55 mW	67 mW
1900	7 mW	10 mW	18 mW	34 mW	60 mW
2450	4 mW	7 mW	15 mW	30 mW	52 mW
3500	2 mW	6 mW	16 mW	32 mW	55 mW
5800	1 mW	6 mW	15 mW	27 mW	41 mW

Frequency MHz	Exemption Limits (mW)				
	At separation distance of 30mm	At separation distance of 35mm	At separation distance of 40mm	At separation distance of 45mm	At separation distance of ≥50mm
≤300	223 mW	254 mW	284 mW	315 mW	345 mW
450	141 mW	159 mW	177 mW	195 mW	213 mW
835	80 mW	92 mW	105 mW	117 mW	130 mW
1900	99 mW	153 mW	225 mW	316 mW	431 mW
2450	83 mW	123 mW	173 mW	235 mW	309 mW
3500	86 mW	124 mW	170 mW	225 mW	290 mW
5800	56 mW	71 mW	85 mW	97 mW	106 mW

The minimum antenna to user distance that will be encountered in normal use is 0mm. This results in an exemption limit of 4mW at 2450 MHz.

As the maximum output power is 3mW the DUT qualifies for SAR test exclusion.

END OF TEST REPORT