



Radio Frequency Exposure Evaluation Report

FOR:

Respironics Inc.

Model:

See Section 3.2

Marketing Name:

DreamStation 2 Auto CPAP Advanced

Product Description:

CPAP machine with integral Cell modem and BT

FCC ID: THO1141623

IC: 3234B-1141623

Per:

CFR Part Part1 (1.1307 & 1.1310), Part 2 (2.1091),
FCC KDB 447498 D01 General RF Exposure Guidance v06
ISED RSS-102 Issue 6

Report number: EMC_PHIL4_114_22001_FCC_ISED_RF_Exposure

DATE: 2024-02-15



CETECOM Inc.

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1 Assessment

This RF Exposure evaluation report provides evidence for compliance of the below identified device with the RF Exposure limits for mobile devices as defined in FCC CFR Part 1 (1.1307 & 1.1310), Part 2 (2.1091) and IC standard RSS-102 issue 6 under worst case conditions (measured or rated RF output power, antenna gain, distance towards human body, multiple transmitter information as presented by the applicant).

In addition, maximum antenna gain or minimum distance towards the human body is calculated respectively, where relevant.

The device meets the limits as stipulated by the above given FCC and IC rule parts based on available specifications for worst case conditions at 20cm distance to the body.

Company	Description	Model #
Respironics Inc.	CPAP machine with integral Cell modem and BT	See Section 3.2

Report reviewed by: TCB Evaluator

James Donnellan

2024-02-15 Compliance (Senior Technical Project Engineer)

Date	Section	Name	Signature
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Responsible for the Report:

Cheng Song

2024-02-15 Compliance (EMC Engineer)

Date	Section	Name	Signature
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2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Senior Technical Project Engineer:	James Donnellan
Responsible Project Leader:	Sangeetha Sivaraman

2.2 Identification of the Client / Manufacturer

Client's Name:	Respironics Inc.
Street Address:	6501 Living Place
City/Zip Code	Pittsburgh, PA 15206
Country	USA

Identification of the Manufacturer

Manufacturer's Name:	Same as Client
Manufacturers Address:	
City/Zip Code	
Country	

3 Equipment under Assessment

3.1 EUT Specifications

Brand	Respironics Inc.
Model No	See Section 3.2
HW Version	00
SW Version	V1.0.8
FCC-ID	THO1141623
IC:	3234B-1141623
Marketing Name:	DreamStation 2 Auto CPAP Advanced
Product Description	CPAP machine with integral Cell modem and BT
Radio Information as declared	<p>Cellular:</p> <ul style="list-style-type: none"> • u-blox LARA-R6001D (CAT-1) • FCC ID: XPYUBX21BE01; IC ID: 8595A-UBX21BE01 • LTE Bands: 1, 2, 3, 4, 5, 7, 8, 12, 13, 18, 19, 20, 26, 28, 38, 39, 40, 41 • UMTS Bands I, II, V, VIII • GSM Bands 850, 900, 1800, 1900 <p>Bluetooth:</p> <ul style="list-style-type: none"> • Dialog DA14585 SoC • Bluetooth 5.0 Low Energy
Antenna Information as declared	Cellular: Flexible Polymer Antenna, 4dBi gain Bluetooth LE: PCB Trace Antenna, 2.81dBi gain
Power Supply/ Rated Operating Voltage Range	Vmin: 10.8 VDC / Vnom: 12 VDC / Vmax: 13.2 VDC
Operating Temperature Range	5 °C to 35 °C
EUT Diameter:	n < 60 cm
Sample Revision	<input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production
Note: Details about the Equipment Under Test (EUT) are provided by the client or applicant.	

3.2 Model Number

Model Number	Description	Market
LAX410H15C	DreamStation 2 CPAP w/ Humid cell/BT	FCC
LAX420H15C	DreamStation 2 Advanced CPAP w/ Humid cell/BT	FCC
LAX520H15C	DreamStation 2 Advanced Auto CPAP w/ Humid cell/BT	FCC
ARX410H15C	DreamStation 2 CPAP w/ Humid cell/BT	FCC
ARX420H15C	DreamStation 2 Advanced CPAP w/ Humid cell/BT	FCC
ARX520H15C	DreamStation 2 Advanced Auto CPAP w/ Humid cell/BT	FCC
BRX410H18C	DreamStation 2 Auto CPAP (w/ dummytank) cell/BT	FCC
BRX420H18C	DreamStation 2 Advanced CPAP w/ Humid cell/BT	FCC
BRX520H18C	DreamStation 2 Advanced Auto CPAP w/ Humid cell/BT	FCC
CAX410T12C	DreamStation 2 Auto CPAP	ISED
CAX410H12C	DreamStation 2 Auto CPAP	ISED
CAX510T12C	DreamStation 2 Auto CPAP	ISED
CAX510H12C	DreamStation 2 Auto CPAP	ISED
CAX521H12C	DreamStation 2 Auto CPAP Advanced	ISED
CAX521T12C	DreamStation 2 Auto CPAP Advanced	ISED
CAX521T12C15	DreamStation 2 Auto CPAP Advanced	ISED

4 RF Exposure Limits and FCC and IC Basic Rules

4.1 Routine Environmental Evaluation Categorical Exclusion Limits according to FCC 1.1307(b)(3)(i)(B), and FCC 1.1307(b)(3)(ii)(B)

Single RF sources is exempt if the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

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.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

4.2 Field reference level (FRL) exposure exemption limits according to RSS-102 Issue 6, section 6.6

Field reference level (FRL) 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 (i.e. mobile devices), except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum EIRP. 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 $4.49/f^{0.5}$ 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 $1.31 \times 10^{-2} f^{0.6834}$ 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 EIRP was derived.

5 Evaluations

5.1 Analysis of RF Exposure

Duty Cycle

The table below illustrates the highest possible duty cycle for each type of radio during operation.

Mode	Duty Cycle	Duty Cycle Correction [dBm]
LTE	1:1	0
GSM (1 Slot)	1:8	-9.031

FCC

Tech-Band	Freq-Low[GHz]	Pwr[dBm]	Power Corrected by Duty Cycle [dBm]	Power[W]	Ant-G[dBi]	EIRP[W]	ERP[mW]	FCC 2.1091(c)(1) Pth[mW] = ERP _{20cm}
UMTS II	1.8524	24.00	24.00	0.251	4.00	0.631	384.592	3060.00
UMTS V	0.8264	24.00	24.00	0.251	4.00	0.631	384.592	1685.86
LTE 2	1.8550	24.00	24.00	0.251	4.00	0.631	384.592	3060.00
LTE 4	1.7150	24.00	24.00	0.251	4.00	0.631	384.592	3060.00
LTE 5	0.8290	24.00	24.00	0.251	4.00	0.631	384.592	1691.16
LTE 7	2.5050	23.50	23.50	0.224	4.00	0.562	342.768	3060.00
LTE 12	0.7040	24.00	24.00	0.251	4.00	0.631	384.592	1436.16
LTE 13	0.7795	24.00	24.00	0.251	4.00	0.631	384.592	1590.18
LTE 26	0.8190	24.00	24.00	0.251	4.00	0.631	384.592	1670.76
LTE 38	2.5750	24.00	24.00	0.251	4.00	0.631	384.592	3060.00
LTE 41	2.5010	24.00	24.00	0.251	4.00	0.631	384.592	3060.00
GSM 850	0.8242	33.50	24.47	0.280	4.00	0.703	428.450	1681.37
GSM 1900	1.8502	30.50	21.47	0.140	4.00	0.352	214.734	3060.00
Tech-Band	Freq-Low[GHz]	Pwr[dBm]	Power Corrected by Duty Cycle [dBm]	Power[W]	Ant-G[dBi]	EIRP[W]	ERP[mW]	FCC 2.1091(c)(1) Pth[mW] = ERP _{20cm}
BT LE	2.4020	9.29	9.29	0.008	2.81	0.016	9.895	3060.00

The worst simultaneous transmissions is LTE B12 and BTLE:

TER (Total Exposure Ratio) = 0.27

RF exposure exemption applicable

IC

Tech-Band	Freq-Low [MHZ]	Pwr _[dBm]	Power Corrected by Duty Cycle [dBm]	Power _[W]	Ant-G [dBi]	EIRP _[W]	Exemption limit for Routine Evaluation
UMTS II	1852.4	24.00	24.00	0.251	4.00	0.631	2.2
UMTS V	826.4	24.00	24.00	0.251	4.00	0.631	1.29
LTE 2	1855.0	24.00	24.00	0.251	4.00	0.631	2.24
LTE 4	1715.0	24.00	24.00	0.251	4.00	0.631	2.13
LTE 5	829.0	24.00	23.50	0.251	4.00	0.631	1.29
LTE 7	2505.0	23.50	23.50	0.224	4.00	0.562	2.75
LTE 12	704.0	24.00	24.00	0.251	4.00	0.631	1.16
LTE 13	779.5	24.00	24.00	0.251	4.00	0.631	1.24
LTE 26	819.0	24.00	24.00	0.251	4.00	0.631	1.28
LTE 38	2575.0	24.00	24.00	0.251	4.00	0.631	2.81
LTE 41	2501.0	24.00	24.00	0.251	4.00	0.631	2.75
GSM 850	824.2	33.50	24.47	0.280	4.00	0.703	1.29
GSM 1900	1850.2	30.50	21.47	0.140	4.00	0.352	2.24
Tech-Band	Freq-Low [MHZ]	Pwr _[dBm]	Power Corrected by Duty Cycle [dBm]	Power _[W]	Ant-G [dBi]	EIRP _[W]	Exemption limit for Routine Evaluation
BT LE	2402.0	9.294	9.294	0.008	2.81	0.016	2.68

The worst simultaneous transmissions is LTE B12 and BTLE:
 TER (Total Exposure Ratio) = 0.55
 RF exposure exemption applicable

6 Revision History

Date	Report Name	Changes to report	Prepared by
2024-02-15	EMC_PHIL4_114_22001_FCC_ISED_RF_Exposure	Initial Release	Cheng Song

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