ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

TESTING Cert No.1152.01

DATE: 5 July 2018

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

Itamar Medical Ltd.

Equipment under test:

WatchPAT ONE Device

WatchPAT ONE/myPAT*

*See customer declaration on page 6

Tested by: _____

M. Zohar

Approved by: _____

D. Shidlowsky

ISRAEL TESTING LABORATORIES
Global Certifications You Can Trust

Measurement/Technical Report for

Itamar Medical Ltd.

WatchPAT ONE Device

WatchPAT ONE/myPAT

FCC ID: 2APUBWPONE

This report concerns:	Original Grant: X Class I Change: Class II Change:
Equipment type:	Digital Transmission System
Limits used:	47CFR15 Section 15.247

Measurement procedure used is KDB 558074 D01 v04 and ANSI C63.4-2014

Application for Certification prepared by:

R. Pinchuck
ITL (Product Testing) Ltd.
1 Bat Sheva St.
Lod 7116002
e-mail Rpinchuck@itl.co.il

Applicant for this device: (different from "prepared by")

Itamar Medical Ltd.
Orit Kelner
9 Halamish St., PO Box 3579
Caesarea, 3088900, Israel
Tel: +972-4-6177000
Fax: +972-4-6275598
E-mail: okelner@itamar-medical.com

TABLE OF CONTENTS

1. General Information

1.1 *Administrative Information*

Manufacturer:	Itamar Medical Ltd.
Manufacturer's Address:	9 Halamish St., PO Box 3579 Caesarea, 3088900, Israel Tel: +972-4-6177000 Fax: +972-4-6275598
Manufacturer's Representative:	Orit Kelner
Equipment Under Test (E.U.T):	WatchPAT ONE Device
Equipment Model No.:	WatchPAT ONE/myPAT*
Equipment Serial No.:	1000
Date of Receipt of E.U.T:	April 15, 2018
Start of Test:	April 15, 2018
End of Test:	April 22, 2018
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	FCC Part 15, Subpart C

*See customer declaration on following page

itamar medical

TO WHOM IT MAY CONCERN

This is to declare that the name WatchPAT™**ONE** has been assigned as the commercial name to a product that is being developed by Itamar Medical.

Do note that the product has been initially developed under a project name as myPAT. The myPAT and the WatchPAT™ONE names refer to the exact same product and may be used interchangeably.

Orit Kelner
QA Manager
Itamar- Medical Ltd.

Sunday, April 15, 2018

Itamar Medical Ltd.
9 Halamish St. P.O Box 3579, Caesarea 3088900, Israel | T: +972-4-617-7000 | F: +972-4-627-5598
US Toll Free: 1-800-206-6952 | **www.itamar-medical.com**

1.2 *List of Accreditations*

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), FCC Designation No. IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. Industry Canada (Canada), IC File No.: 46405-4025; Site Nos. IC 4025A-1, IC 4025A-2.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 *Product Description*

Model name	WatchPAT ONE/myPAT
Working voltage	1.5VDC battery operated
Mode of operation	BLE Transceiver
Modulations	GFSK
Assigned Frequency Range	2400.0-2483.5MHz
Operating Frequency Range	2402MHz-2480MHz
Transmit power	~+3.0dBm
Antenna Gain	1.5 dBi
Modulation BW	>500kHz

1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in KDB 558074 D01 v04 and ANSI C63.4: 2014. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 *Test Facility*

Emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation Number is IL1005.

1.6 *Measurement Uncertainty*

Conducted Emission

(CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)

0.15 – 30 MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 3.44 dB

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site:
30-1000MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 4.96 dB

1 GHz to 6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.19 dB

>6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.51 dB

2. System Test Configuration

2.1 *Justification*

1. The E.U.T contains a transceiver IEEE 802.15.1 using standard (BLE).
2. The E.U.T was evaluated while transmitting at the low channel (2402MHz), the mid channel (2440MHz) and the high channel (2480MHz) with duty cycle above 98%.
3. Exploratory emission testing was performed in 3 orthogonal polarities to determine the "worst case" radiation.
4. Per the results in Figure 1 below, the worst case was the Z axis for low and high channels and X axis for mid channel.

Orientation	Frequency	Field Strength	2rd Harmonic	3th Harmonic	Band edge
	(MHz)	(dBuV/m)	(dBuV/m)	(dBuV/m)	(dBuV/m)
X axis	2402.0	91.4	64.2	51.2	60.7
	2440.0	93.3	64.1	51.5	-
	2480.0	92.0	63.5	51.3	63.1
Y axis	2402.0	88.3	64.0	51.4	62.3
	2440.0	92.9	64.1	51.1	-
	2480.0	91.8	63.0	51.4	62.5
Z axis	2402.0	93.2	64.0	51.7	62.5
	2440.0	92.2	63.7	51.2	-
	2480.0	94.0	64.2	51.7	63.7

Figure 1. Screening Results

2.2 *EUT Exercise Software*

No special exercise software was used.

2.3 *Special Accessories*

No special accessories were needed to achieve compliance.

2.4 *Equipment Modifications*

No modifications were necessary in order to achieve compliance.

2.5 *Configuration of Tested System*

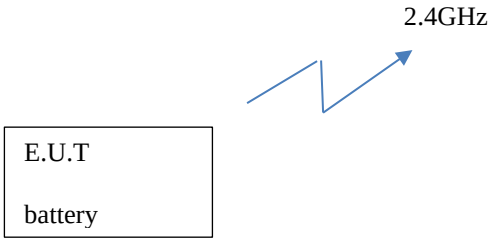

Figure 2. Configuration of Tested System

3. Radiated Measurement Test Set-Up Photos

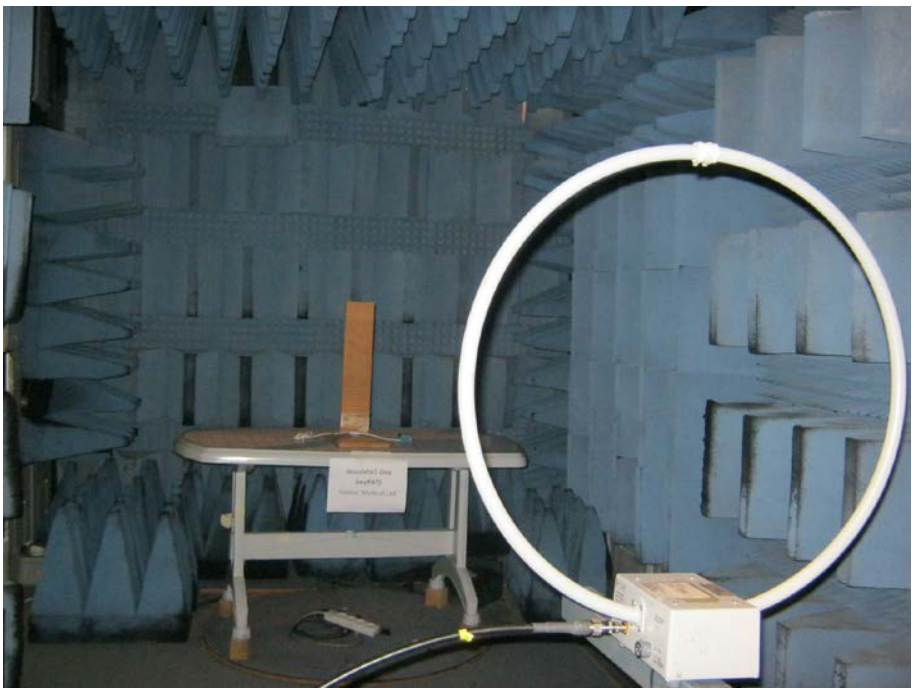

Figure 3. Radiated Emission Test 0.009-30MHz

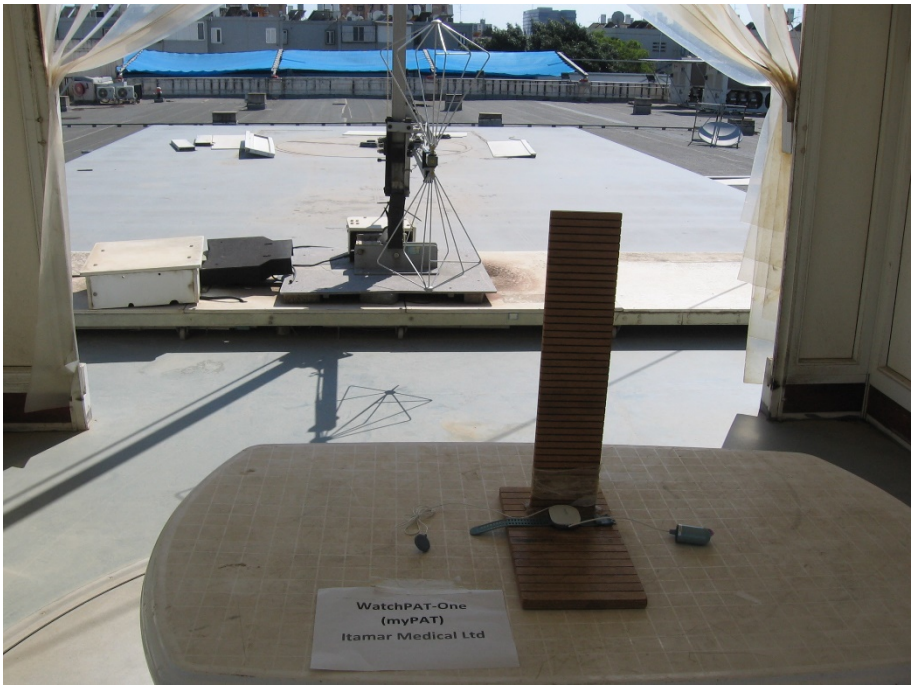

Figure 4. Radiated Emission Test, 30-200MHz

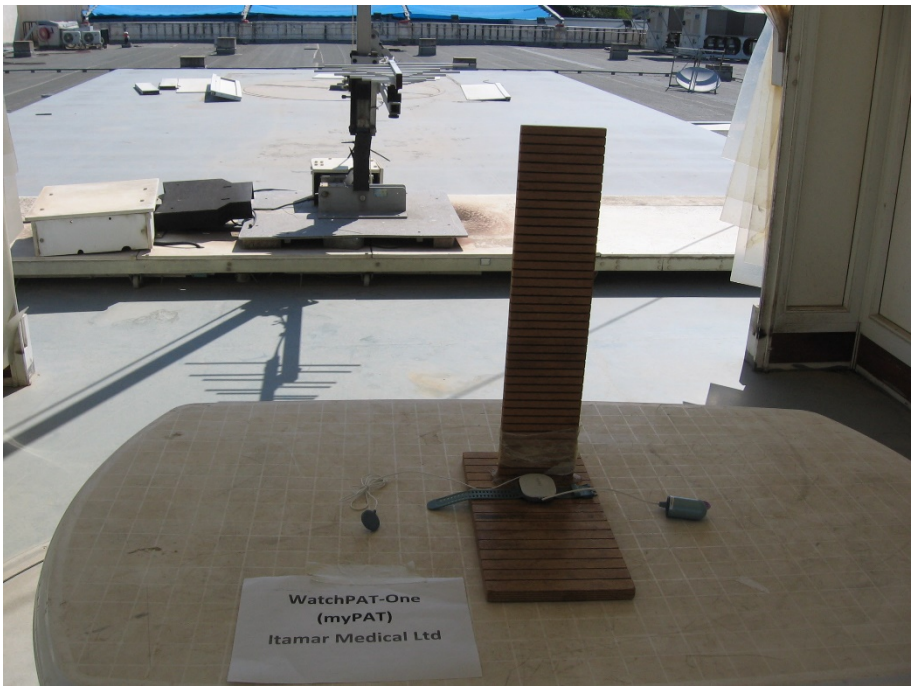

Figure 5. Radiated Emission Test, 200-1000MHz

Figure 6. Radiated Emission Test, 1-18GHz

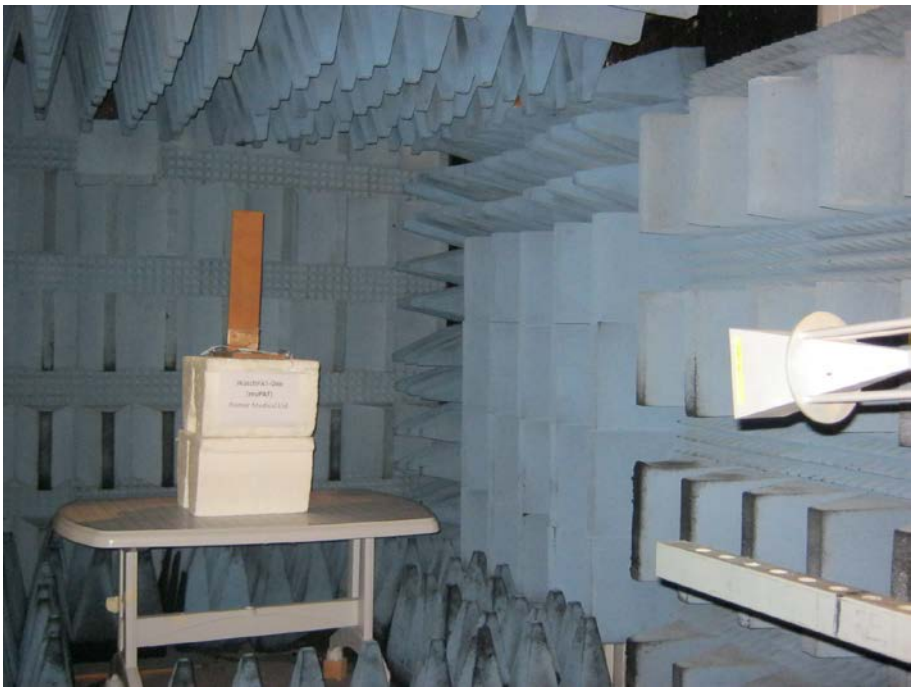

Figure 7. Radiated Emission Test, 18-26.5GHz

4. 6 dB Minimum Bandwidth

4.1 *Test Specification*

FCC Part 15, Subpart C, Section 247(a)(2)

4.2 *Test Procedure*

(Temperature (20°C)/ Humidity (60%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The emissions were measured at a distance of 3 meters.

The spectrum bandwidth of the E.U.T. at the point of 6 dB below maximum peak power was measured and recorded. The RBW was set to 100 kHz.

4.3 *Test Limit*

Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

4.4 *Test Results*

Operation Frequency	Reading	Specification
(MHz)	(kHz)	(kHz)
2402.0	503.0	≥500.0
2440.0	503.0	≥500.0
2480.0	503.0	≥500.0

Figure 8 6 dB Minimum Bandwidth

JUDGEMENT: Passed

For additional information see *Figure 9* to *Figure 11*.

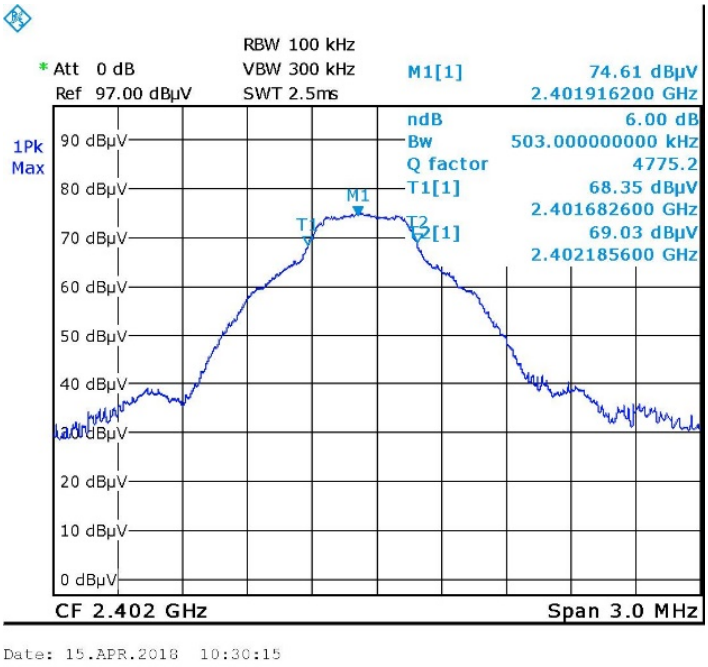

Figure 9. 2402.0 MHz

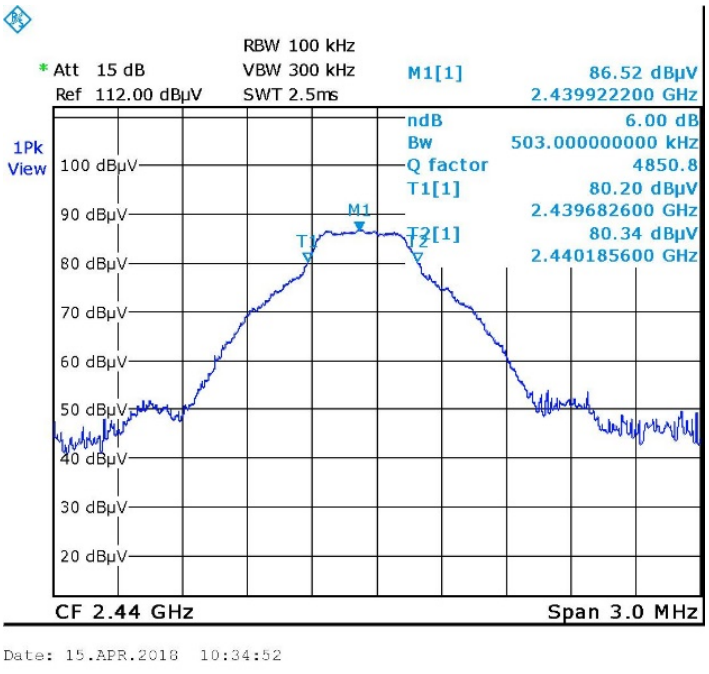

Figure 10. 2440.0 MHz

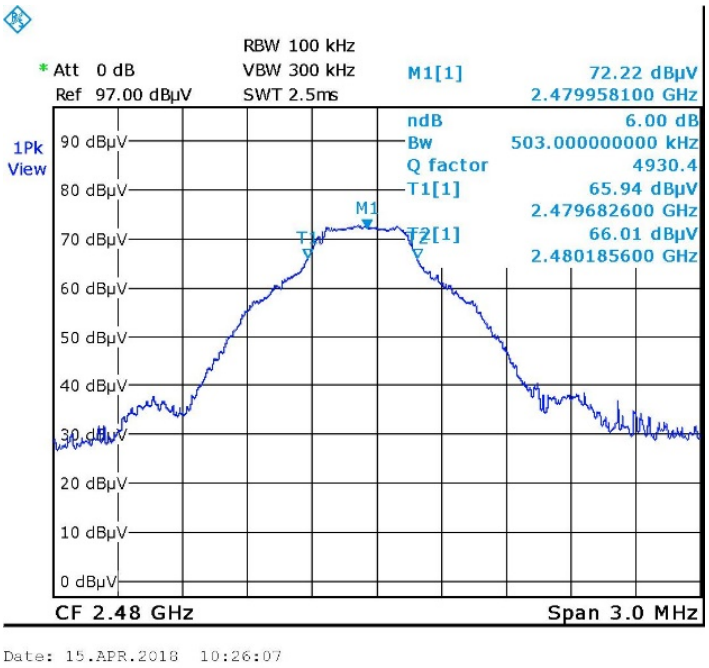

Figure 11. 2480.0 MHz

4.5 *Test Equipment Used; 6dB Bandwidth*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 12 Test Equipment Used

5. Maximum Transmitted Peak Power Output

5.1 *Test Specification*

FCC, Part 15, Subpart C, Section 247(b)(3)

5.2 *Test Procedure*

(Temperature (22°C)/ Humidity (60%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

E - Field Strength (V/m)

d – Distance from transmitter (m)

G – Antenna gain

P – Peak power (W)

5.3 *Test Limit*

The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

5.4 *Test Results*

Operation Frequency	Polarization	Field Strength	Power	Power	Limit	Margin
(MHz)	(V/H)	(dBuV/m)	(dBm)	(mW)	(mW)	(mW)
2402.0	V	89.3	-5.9	0.257	1000.0	-999.743
	H	94.5	-0.7	0.851	1000.0	-999.149
2440.0	V	91.3	-3.9	0.407	1000.0	-999.593
	H	89.8	-5.4	0.288	1000.0	-999.712
2480.0	V	94.0	-1.2	0.759	1000.0	-999.241
	H	96.6	1.4	1.38	1000.0	-998.62

Figure 13 Maximum Peak Power Output

JUDGEMENT: Passed by 998.62 mW

For additional information see *Figure 14* to *Figure 19.*

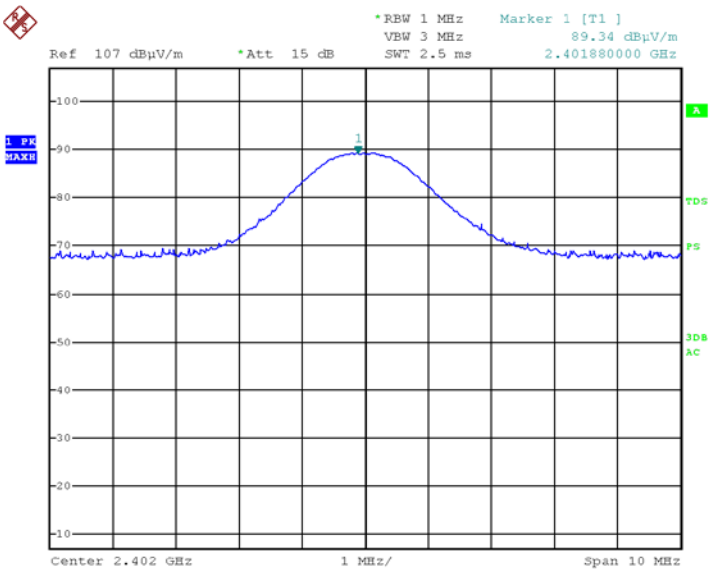

Figure 14 2402.0 MHz – Vertical

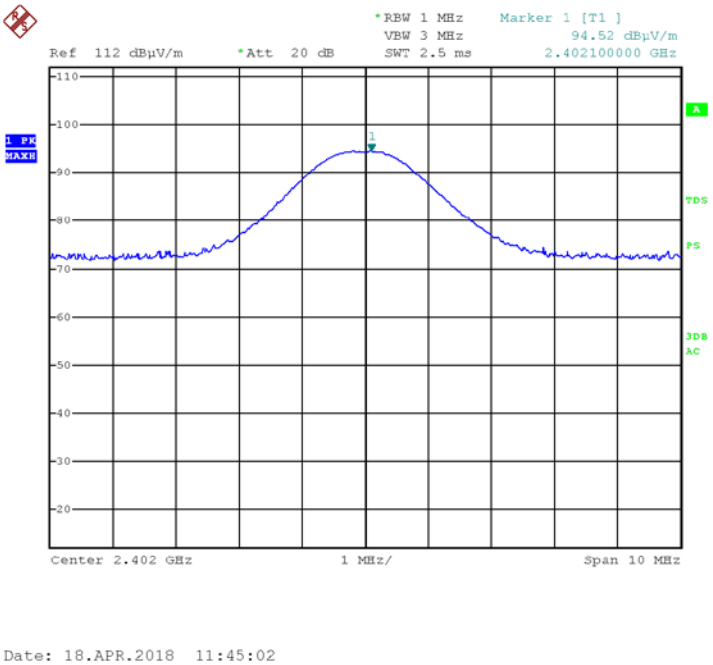

Figure 15 2402.0 MHz – Horizontal

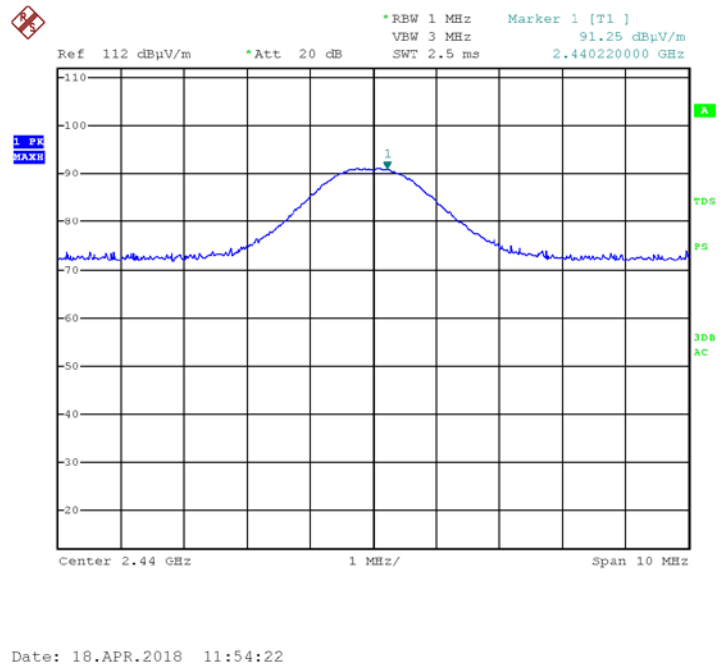

Figure 16 2440.0 MHz – Vertical

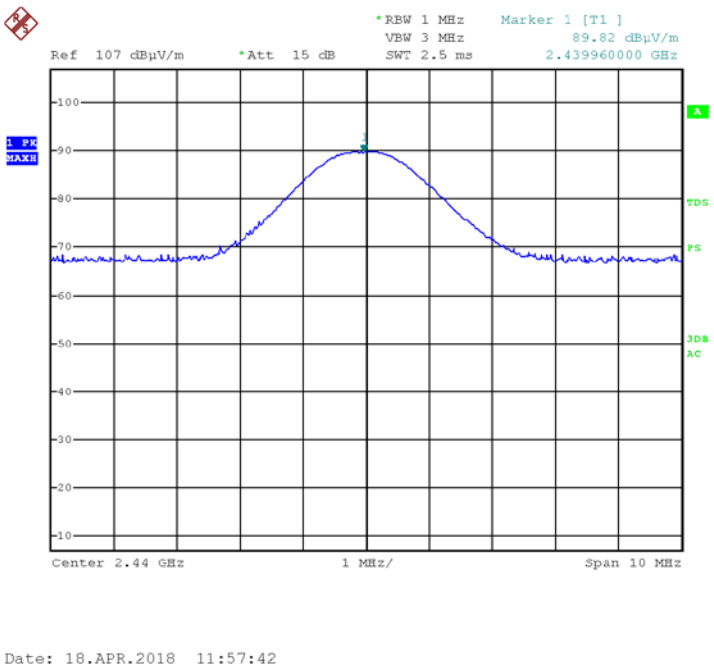

Figure 17 2440.0 MHz – Horizontal

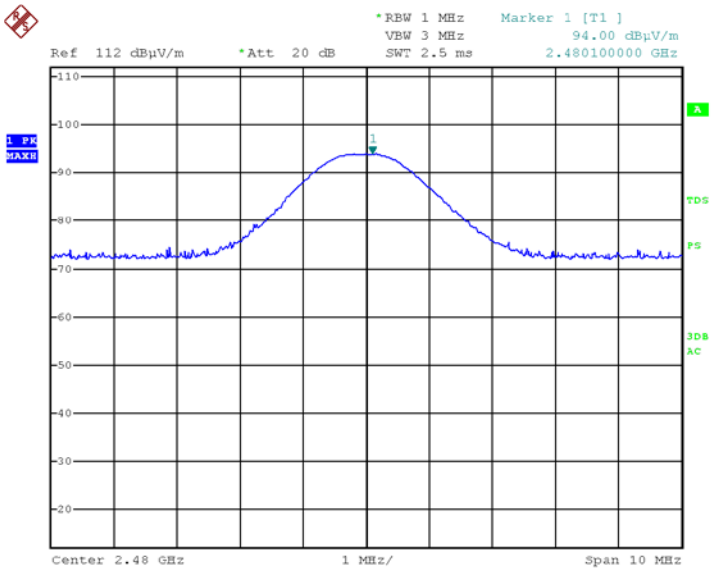

Figure 18 2480.0 MHz – Vertical

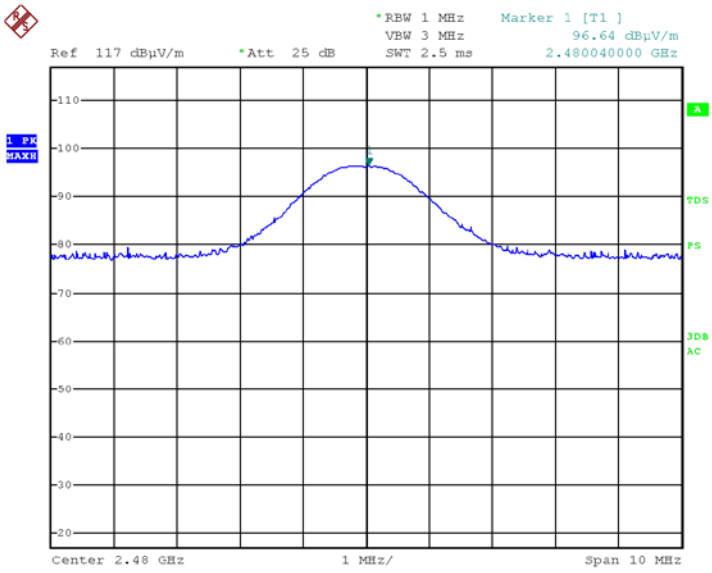

Figure 19 2480.0 MHz – Horizontal

5.5 *Test Equipment Used; Maximum Peak Power Output*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	February 19, 2019
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 20 Test Equipment Used

6. Band Edge Spectrum

6.1 *Test Specification*

FCC, Part 15, Subpart C, Section 247(d)

6.2 *Test Procedure*

(Temperature (20°C)/ Humidity (60%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

The RBW was set to 100 kHz.

6.3 *Test Limit*

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

6.4 *Test Results*

Operation Frequency	Band Edge Frequency	Spectrum Level	Limit	Margin
(MHz)	(MHz)	(dBuV/m)	(dBuV/m)	(dB)
Low	2400.0	39.2	66.3	-27.1
High	2483.5	41.6	64.0	-22.4

Figure 21 Band Edge Spectrum

JUDGEMENT: Passed by 22.4 dB

For additional information see *Figure 22* and *Figure 23.*

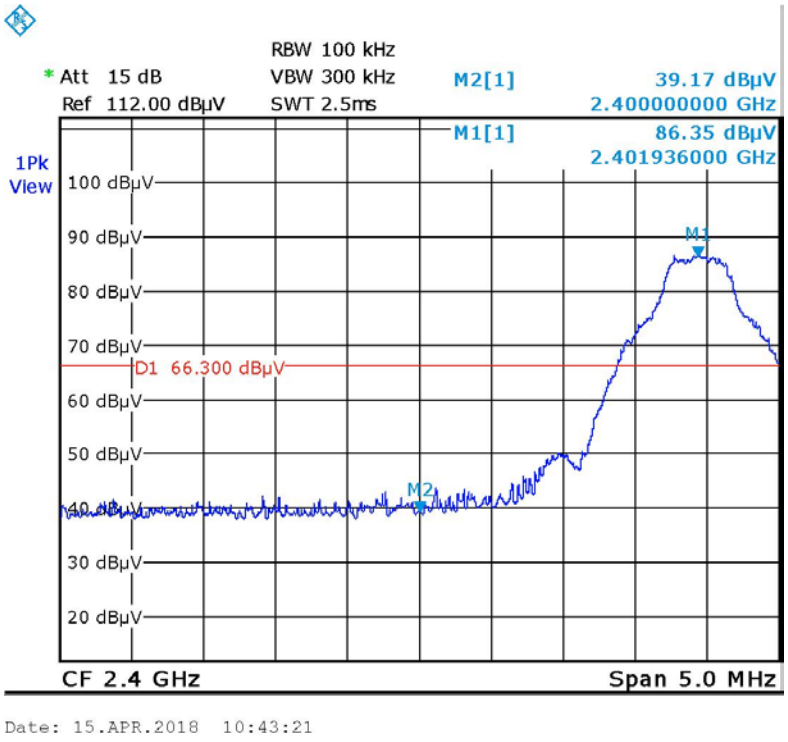

Figure 22 —Lower Band Edge

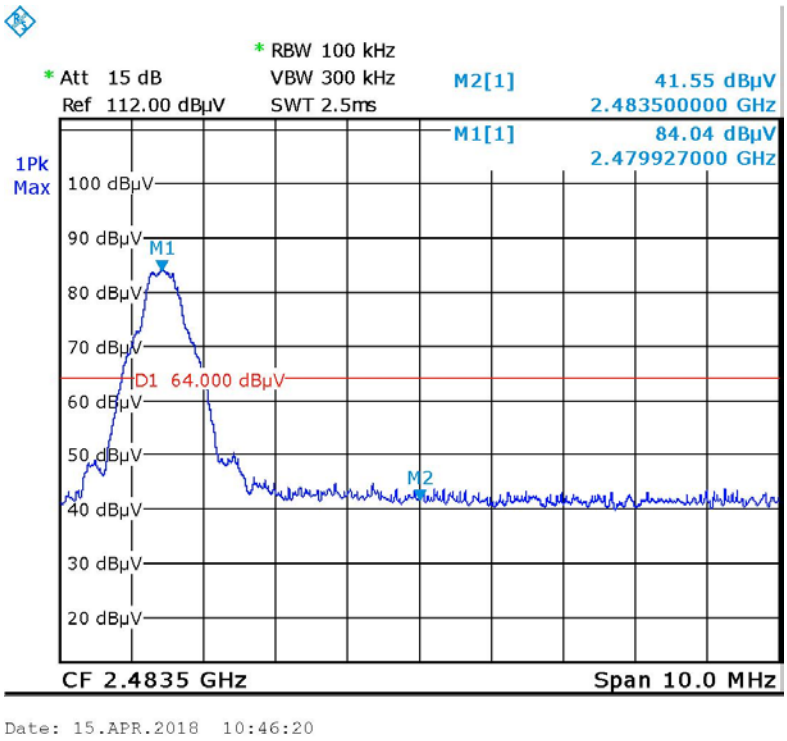

Figure 23 —Upper Band Edge

6.5 *Test Equipment Used; Band Edge Spectrum*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	R&S	FSL6	100194	February 19, 2018	February 19, 2019
Horn Antenna	ETS	3115	6142	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 24 Test Equipment Used

7. Emissions in Non-Restricted Frequency Bands

7.1 *Test Specification*

FCC, Part 15, Subpart C, Section 247(d)

7.2 *Test Procedure*

(Temperature (22°C)/ Humidity (58%RH))
The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

For measurements between 0.009MHz-30MHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 0.009MHz-30MHz was scanned.

For measurements between 30.0MHz-1.0GHz:
A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. The frequency range 30.0MHz -1.0GHz was scanned and the list of the highest emissions was verified and updated accordingly.

For measurements between 1.0GHz-25.0GHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 1.5 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 1.0GHz -25.0GHz was scanned.
RBW was set to 100kHz, detector set to max peak and trace to “max hold”.

7.3 *Test Limit*

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

7.4 *Test Results*

JUDGEMENT: Passed
All detected emissions were greater than 20dBc below the fundamental level.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 247(d) specification.

7.5 *Test Instrumentation Used, Emission in Non Restricted Frequency Bands*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	February 19, 2019
Spectrum Analyzer	HP	8592L	3826A01204	February 19, 2018	February 19, 2019
EMI Receiver	HP	8542E	3906A00276	February 19, 2018	February 19, 2019
RF Filter Section	HP	85420E	3705A00248	February 19, 2018	February 19, 2019
Spectrum Analyzer	HP	8564E	3442A00275	February 28, 2018	February 28, 2019
Biconical Antenna	EMCO	3110B	9912-3337	May 15, 2017	May 15, 2019
Log Periodic Antenna	EMCO	3146	9505-4081	May 15, 2017	May 15, 2018
Horn Antenna	ETS	3115	29845	May 19, 2015	May 19, 2018
Horn Antenna	ARA	SWH-28	1007	December 13, 2017	December 13, 2020
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2017	October 19, 2018
MicroWave System Amplifier	HP	83006A	3104A00589	October 1, 2017	October 1, 2018
Low noise amplifier 1GHz-18GHz	Miteq	AFSX4-02001800-50-8P	-	October 1, 2017	October 1, 2018
Spectrum Analyzer	HP	8593EM	3536A00120 ADI	February 20, 2018	February 20, 2019
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
RF Cable (OATS)	EIM	RG214-11N(X2)		August 13, 2017	August 13, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR
Antenna Mast	ETS	2070-2	9608-1497	NCR	NCR
Turntable	ETS	2087	-	NCR	NCR
Mast & Table Controller	ETS/EMCO	2090	9608-1456	NCR	NCR

Figure 25 Test Equipment Used

7.6 *Field Strength Calculation*

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors", using the following equation:

$$FS = RA + AF + CF$$

FS:	Field Strength [dBμv/m]
RA:	Receiver Amplitude [dBμv]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable Attenuation Factor [dB]

Example: FS = 30.7 dBμV (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dBμV

No external pre-amplifiers are used.

8. Emissions in Restricted Frequency Bands

8.1 *Test Specification*

FCC Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d)

8.2 *Test Procedure*

(Temperature (23°C)/ Humidity (65%RH))
The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

For measurements between 0.009-30MHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 0.009MHz-30MHz was scanned.

For measurements between 30-1000MHz:
A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. The frequency range 30MHz -1000MHz was scanned and the list of the highest emissions was verified and updated accordingly.

For measurements between 1GHz-25GHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 1.5 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 1GHz -25GHz was scanned.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

8.3 *Test Limit*

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)	Field strength* (dBµV/m)	Field strength* (dBµV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

Figure 26 Table of Limits

8.4 *Test Results*

JUDGEMENT: Passed by 0.2 dB

For the operation frequency of 2402 MHz, the margin between the emission level and the specification limit is in the worst case 9.7dB at the frequency of 2390.0 MHz, horizontal polarization.

For the operation frequency of 2440 MHz, the margin between the emission level and the specification limit is in the worst case 22.3 dB at the frequency of 7320.0 MHz, horizontal polarization.

For the operation frequency of 2480 MHz, the margin between the emission level and the specification limit is in the worst case 0.2 dB at the frequency of 2483.5 MHz, horizontal polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C Sections 15.209, 15.205, 15.247(d) specifications.

The details of the highest emissions are given in *Figure 27.*

Radiated Emission

E.U.T Description WatchPAT ONE Device
Type WatchPAT ONE/myPAT
Serial Number: 1000

Specification: FCC, Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d)

Antenna Polarization: Horizontal/Vertical Frequency Range: 9 kHz to 25.0 GHz
Protocol type: BLE Detector: Peak ,Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2402.0	2390.0	V	53.3	74.0	-20.7	44.1	54.0	-9.9
	2390.0	H	53.7	74.0	-20.3	44.3	54.0	-9.7
	4804.0	V	52.0	74.0	-22.0	-	54.0	-
	4804.0	H	48.8	74.0	-25.2	-	54.0	-
2440.0	4880.0	V	49.9	74.0	-24.1	-	54.0	-
	4880.0	H	50.8	74.0	-23.2	-	54.0	-
	7320.0	V	51.6	74.0	-22.4	-	54.0	-
	7320.0	H	51.7	74.0	-22.3	-	54.0	-
2480.0	4960.0	V	47.1	74.0	-26.9	-	54.0	-
	4960.0	H	44.2	74.0	-29.8	-	54.0	-
	2483.5	V	56.8	74.0	-17.2	50.6	54.0	-3.4
	2483.5	H	63.2	74.0	-10.8	53.8	54.0	-0.2

Figure 27. Radiated Emission Results

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

8.5 *Test Instrumentation Used; Emissions in Restricted Frequency Bands*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	February 19, 2019
Spectrum Analyzer	HP	8592L	3826A01204	February 19, 2018	February 19, 2019
EMI Receiver	HP	8542E	3906A00276	February 19, 2018	February 19, 2019
RF Filter Section	HP	85420E	3705A00248	February 19, 2018	February 19, 2019
Spectrum Analyzer	HP	8564E	3442A00275	February 28, 2018	February 28, 2019
Biconical Antenna	EMCO	3110B	9912-3337	May 15, 2017	May 15, 2019
Log Periodic Antenna	EMCO	3146	9505-4081	May 15, 2017	May 15, 2018
Horn Antenna	ETS	3115	29845	May 19, 2015	May 19, 2018
Horn Antenna	ARA	SWH-28	1007	December 13, 2017	December 13, 2020
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2017	October 19, 2018
MicroWave System Amplifier	HP	83006A	3104A00589	October 1, 2017	October 1, 2018
Low noise amplifier 1GHz-18GHz	Miteq	AFSX4-02001800-50-8P	-	October 1, 2017	October 1, 2018
Spectrum Analyzer	HP	8593EM	3536A00120 ADI	February 20, 2018	February 20, 2019
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
RF Cable (OATS)	EIM	RG214-11N(X2)		August 13, 2017	August 13, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR
Antenna Mast	ETS	2070-2	9608-1497	NCR	NCR
Turntable	ETS	2087	-	NCR	NCR
Mast & Table Controller	ETS/EMCO	2090	9608-1456	NCR	NCR

Figure 28 Test Equipment Used

9. Transmitted Power Density

9.1 *Test Specification*

FCC, Part 15, Subpart C, Section 247(e)

9.2 *Test Procedure*

(Temperature (22°C)/ Humidity (60%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report.

The E.U.T was tested in the chamber, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 1.5 meters above the ground.

The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

The spectrum analyzer was set to 3 kHz RBW and VBW to 10 kHz.

Radiated output power levels were measured at selected operation frequencies and the results were converted to power level according to the formula as shown below:

$$P = \frac{(E_{V/m} \times d)^2}{(30 \times G)} \text{ [W]}$$

E - Field Strength (V/m)

d – Distance from transmitter (m)

G – Antenna gain

P – Peak power (W)

9.3 *Test Limit*

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

9.4 *Test Results*

Operation Frequency	Reading Spectrum Analyzer	Reading Spectrum Analyzer	Limit	Margin
(MHz)	(dBµV/m)	(dBm)	(dBm)	(dB)
2402.0	84.2	-11.0	8.0	-19.0
2440.0	78.3	-16.9	8.0	-24.9
2480.0	83.9	-11.3	8.0	-19.3

Figure 29 Test Results

JUDGEMENT: Passed by 19.0 dB

For additional information see *Figure 30* to *Figure 32*.

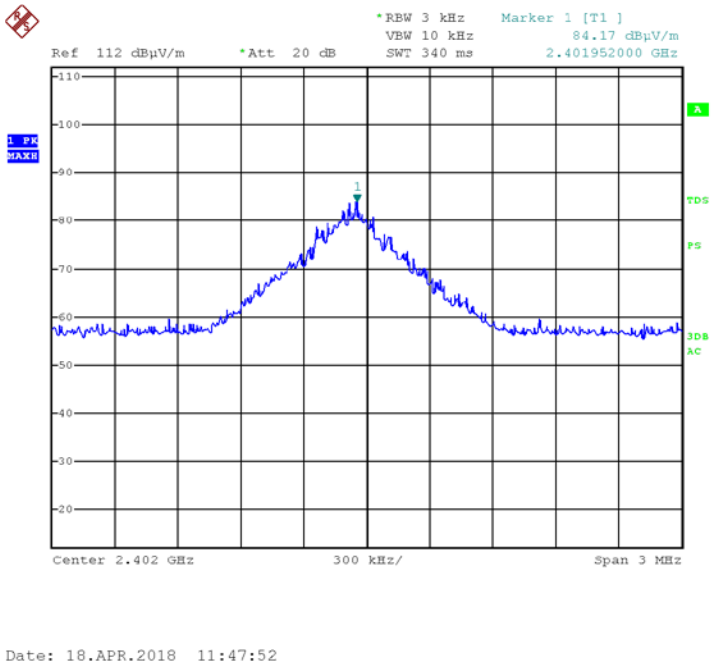

Figure 30 — 2402.0 MHz

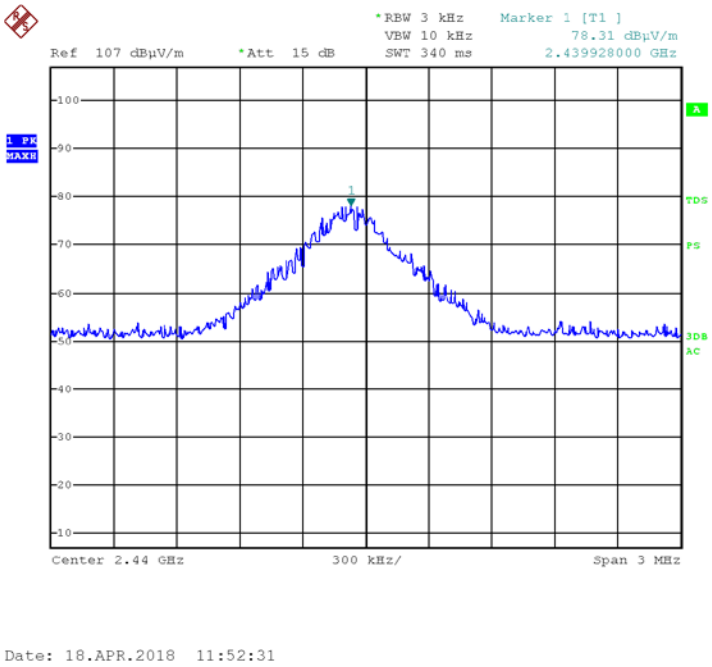

Figure 31 — 2440.0 MHz

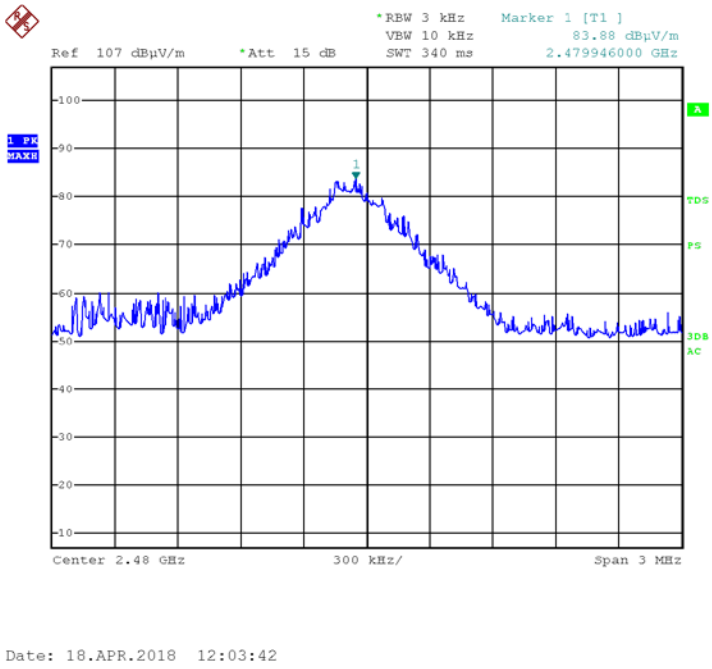

Figure 32 — 2480.0 MHz

9.5 *Test Equipment Used; Transmitted Power Density*

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
EMI Receiver	R&S	ESCI7	100120	February 19, 2018	February 19, 2019
Horn Antenna	ETS	3115	29845	May 19, 2015	May 19, 2018
RF Cable	Commscope ORS	0623 WBC-400	G020132	October 1, 2017	October 1, 2018
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR

Figure 33 Test Equipment Used

10. Antenna Gain/Information

The antenna gain is 1.5 dBi, printed.

11. R.F Exposure/Safety

Typical use of the E.U.T. is as a diagnostic device for patients suspected of having sleep breathing disorders.

The typical placement of the E.U.T. is on the patient's wrist (like a watch). The typical distance between the E.U.T. and the user is 0.5cm

SAR Testing Exclusion Based on Section 4.3.1 and Appendix A of KDB 447498 D01 V05 Requirements

Section 4.3.1 and Appendix A of KDB447498 D01 V05 was used as the guidance as follows:

Peak power output = 96.6 dBuV/m (Peak) = 1.4dBm=1.38mW.

[(max. power of channel, including tune-up tolerance, mW)/(min. test separation distance, mm)] *· [√f(GHz)]

=1.38/5 * 1.55=0.4278 this value is less than 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR.

The SAR measurement is not necessary.

RF Exposure Calculation Based on Section 1.1310 Requirements

(a) FCC limits at 2480 MHz is:

$$1\frac{mW}{cm^2}$$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power 96.6 dBuV/m (Peak) =1.38 mW (includes antenna gain)

G_T- Antenna Gain, 1.5 dBi

R- Distance from Transmitter using 0.5cm worst case

(c) The peak power density is:

$S= 1.38/4\pi(0.5)^2=0.439$ mW/cm^2

(d) This is below the FCC limit.

12. APPENDIX A - CORRECTION FACTORS

12.1 *Correction factors for RF OATS Cable 35m ITL #1879*

Frequency (MHz)	Cable loss (dB)
30.0	1.1
50.0	1.1
100.0	1.7
150.0	2.1
200.0	2.5
250.0	2.7
300.0	2.9
350.0	3.1
400.0	3.5
450.0	3.7
500.0	3.9
550.0	4.0
600.0	4.2
650.0	4.4
700.0	4.9
750.0	5.0
800.0	5.0
850.0	4.9
900.0	5.0
950.0	5.1
1000.0	5.4

12.2 *Correction factor for RF CABLE for Semi Anechoic Chamber*

ITL # 1841

FREQ (MHz)	LOSS (dB)
1000.0	1.5
2000.0	2.1
3000.0	2.7
4000.0	3.1
5000.0	3.5
6000.0	4.1
7000.0	4.6
8000.0	4.9
9000.0	5.7
10000.0	5.7
11000.0	6.1
12000.0	6.1
13000.0	6.2
14000.0	6.7
15000.0	7.4
16000.0	7.5
17000.0	7.9
18000.0	8.1
19000.0	8.8
20000.0	9.1

NOTES:

1. *The cable is manufactured by Commscope*
2. *The cable type is 0623 WBC-400, serial # G020132 and 10m long*

12.3 *Correction factors for Active Loop Antenna*

Model 6502 S/N 9506-2950

ITL # 1075:

f(MHz)	MAF(dBs/m)	AF(dB/m)
0.01	-33.1	18.4
0.02	-37.2	14.3
0.03	-38.2	13.3
0.05	-39.8	11.7
0.1	-40.1	11.4
0.2	-40.3	11.2
0.3	-40.3	11.2
0.5	-40.3	11.2
0.7	-40.3	11.2
1	-40.1	11.4
2	-40	11.5
3	-40	11.5
4	-40.1	11.4
5	-40.2	11.3
6	-40.4	11.1
7	-40.4	11.1
8	-40.4	11.1
9	-40.5	11
10	-40.5	11
20	-41.5	10
30	-43.5	8

12.4 *Correction factors for biconical antenna – ITL # 1356*

Model: EMCO 3110B

Serial No.:9912-3337

Frequency [MHz]	**ITL 1356 AF [dB/m]**
30	13.00
35	10.89
40	10.59
45	10.63
50	10.12
60	9.26
70	7.74
80	6.63
90	8.23
100	11.12
120	13.16
140	13.07
160	14.80
180	16.95
200	17.17

12.5 *Correction factors for log periodic antenna – ITL # 1349*

Model: EMCO 3146

Serial No.:9505-4081

Frequency [MHz]	**ITL 1349 AF [dB/m]**
200	11.58
250	12.04
300	14.76
400	15.55
500	17.85
600	18.66
700	20.87
800	21.15
900	22.32
1000	24.22

12.6 *Correction factors for Double –Ridged Waveguide Horn ANTENNA*

Model: 3115
Serial number:29845
3 meter range; ITL # 1352

FREQUENCY (GHz)	AFE (dB/m)	FREQUENCY (GHz)	AFE (dB/m)
0.75	25	9.5	38
1.0	23.5	10.0	38.5
1.5	26.0	10.5	38.5
2.0	29.0	11.0	38.5
2.5	27.5	11.5	38.5
3.0	30.0	12.0	38.0
3.5	31.5	12.5	38.5
4.0	32.5	13.0	40.0
4.5	32.5	13.5	41.0
5.0	33.0	14.0	40.0
5.5	35.0	14.5	39.0
6.0	36.5	15.0	38.0
6.5	36.5	15.5	37.5
7.0	37.5	16.0	37.5
7.5	37.5	16.5	39.0
8.0	37.5	17.0	40.0
8.5	38.0	17.5	42.0
9.0	37.5	18.0	42.5

12.7 *Correction factors for* *Horn Antenna*

Model: SWH-28
at 3 meter range.
ITL #:1353

CALIBRATION DATA

3 m distance

Frequency, MHz	Measured antenna factor, dB/m [1]
18000	32.4
18500	32.0
19000	32.3
19500	32.4
20000	32.3
20500	32.8
21000	32.8
21500	32.7
22000	33.1
22500	33.0
23000	33.1
23500	33.8
24000	33.5
24500	33.5
25000	33.8
25500	33.9
26000	34.2
26500	34.7

[1] The antenna factor shall be added to receiver reading in dBµV to obtain field strength in dBµV/m.