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RADIO REPORT FOR CERTIFICATION to 47 CFR Part 15 Subpart C (Section 15.247)		
Report No:	T170818_C	
FCC ID:	PN2–STC3	
	Adherium(NZ) Ltd Medication reminder and actuation monitor For use with medication inhalers	
Model Number : Serial Number:	SmartTouch™ 803493 and 803494	
Issue Date:	24 April 2018	

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RADIO REPORT FOR CERTIFICATION

47 CFR Part 15 Subpart C (Section 15.247)

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Aaron Fan



RADIO REPORT FOR CERTIFICATION

Product:	Medication reminder and actuation monitor For use with medication inhalers		
Model: Serial Number:	SmartTouch™ 803493 and 803494		
Manufacturer:	Adherium (NZ) Ltd.		
Tested for: Address:	Adherium (NZ) Ltd. Level 2, 204 Quay Street, Aucland 1010, New Zealand.		
Phone:	+64 9 307 2771		
Contact:	Hemant Pundpal		
Email:	HemantP@adherium.com		
	47 CFR Part 15 – Radio Frequency Devices Subpart C – Intentional Radiators Section 15.247 – Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz		
Standards:	Subpart C – Intentional Radiators Section 15.247 – Operation within the bands 902-928 MHz, 2400-2483.5		
Standards: Test Dates:	Subpart C – Intentional Radiators Section 15.247 – Operation within the bands 902-928 MHz, 2400-2483.5		
	Subpart C – Intentional Radiators Section 15.247 – Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz		
Test Dates:	Subpart C – Intentional Radiators Section 15.247 – Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz 10 th October 2017 to 29 th March 2018		

James Guo

Authorised Signatory:

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Issued by: EMC TECHNOLOGIES PTY. LTD.

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RADIO REPORT FOR CERTIFICATION to 47 CFR Part 15 Subpart C (section 15.247)

1.0 INTRODUCTION

Radio tests were performed on Medication reminder and actuation moniitor, Model: SmartTouch in accordance with the applicable requirements of 47 CFR, Part 15 Subpart C – Section 15.247 Operating within the band: 2400 MHz to 2483.5 MHz.

1.1 Test Procedure

Radio measurements were performed in accordance with the appropriate procedures of ANSI C63.10: 2013 and KDB 558074 D01 v04 - Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

The measurement instrumentation conformed to the requirements of ANSI C63.2: 2016.

1.2 Summary of 47 CFR Part 15 Subpart C Results

FCC Part 15	Test Performed	Results
Subpart C		
15.203	Antenna requirement	Complied
15.204	Antenna information	Complied
15.205	Restricted bands of operation	Complied
15.207	Disturbance voltage on AC Mains	Not Applicable
15.247(c)	Spurious radiated emission 15.209 limit applied	Complied
15.247 (a2)	6 dB Bandwidth	Complied: 696 kHz
15.247 (e)	3 kHz Peak Power Density	Complied: -10.47 dBm/3kHz
15.247 (b)	Peak Output Power	Complied: 0.38 dBm
15.247 (c)	Antenna Gain > 6 dBi	Not Applicable Antenna gain < 6 dBi
15.247 (d)	Out of Band Emissions	Complied
15.247 (f)	Hybrid Systems	Not Applicable Did not employ a hybrid system
15.247 (i)	Radio Frequency Hazard	Complied
	Occupied Bandwidth – 99% power	Complied

1.3 Modifications by EMC Technologies

No modifications were performed.

2.0 GENERAL INFORMATION

Device are small hand-held battery-powered electronic modules that clip onto a medication inhaler to log when the medication is taken.Confirmation of correct performance involves connection the device via USB cable to a PC running Adherium software to ensure that logs and settings are correctly maintained.

Modication romindor and actuation monitor

2.1 EUT (Transmitter) Details

Product:

Medication reminder and actuation monitor
For use with medication inhalers
SmartTouch™
803493 and 803494
BlueTooth Low Energy
2400 to 2483.5 MHz
2402 to 2480 MHz
GFSK (1Mbps)
F1D
40
Integral omnidirectional Antenna, 1dBi
liPo Battery 3.7VDC

2.2 Test Configuration

EUT was configured to operate on top, middle, bottom channels and transmit a modulated signal continuously. Channel and operation modes can be changed by pressing the button on EUT itself. An external USB connection was required to maintain the continuous transmission.

2.3 Test Facility

2.3.1 General

EMC Technologies Pty Ltd has been accredited as a Conformity Assessment Body (CAB) by Australian Communications and Media Authority (ACMA) under the APECTEL MRA and is designated to perform compliance testing on equipment subject to Declaration of Conformity (DoC) and Certification under Parts 15 and 18 of the FCC Commission's rules – **Registration Number 494713 & Designation number AU0002.**

Measurements in this report were performed at EMC Technologies' laboratory in Seven Hills, New South Wales Australia.

2.3.2 NATA Accreditation

NATA is the Australian National laboratory accreditation body and has accredited EMC Technologies to operate to the IEC/ISO17025 requirements. A major requirement for accreditation is the assessment of the company and its personnel as being technically competent in testing to the standards. This requires fully documented test procedures, continued calibration of all equipment to the National Standard at the National Measurements Institute (NMI) and an internal quality system to ISO 9002. NATA has mutual recognition agreements with the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Association for Laboratory Accreditation (A²LA).

EMC Technologies is accredited in Australia by the National Association of Testing Authorities (NATA). All testing in this report has been conducted in accordance with EMC Technologies' scope of NATA accreditation.

The current full scope of accreditation can be found on the NATA website: <u>www.nata.asn.au</u>

2.4 Test Equipment Calibration

Measurement instrumentation and transducers were calibrated in accordance with the applicable standards by an independent NATA registered laboratory such as Agilent Technologies (Australia) Pty Ltd or the National Measurement Institute (NMI) or in-house. All equipment calibration is traceable to Australian national standards at the National Measurements Institute.

Equipment Type	Make/Model Serial Number	Last Cal. DD/MM/YY	Due Date DD/MM/Y	-
EMI Receivers	ESCI EMI Test Receiver (Asset No: R029) SN: 100012 9kHz – 3GHz	12/04/18	05/04/18	*1
	Model: ESU40 (Asset No: R038) S/N: 100183 20Hz – 40GHz	04/05/17	04/05/18	*1
Antennas	EMCO 3146 Log Periodic (Asset No: A003-1) S/N: 2066 300-1000MHz	17/02/17	17/02/18	*2
	Active Loop Antenna (Asset No: A008) Model: 6502 S/N: 9108-2660	26/11/15	26/11/18	*3
	ETS Lindgren Standard Gain Horn Antenna (Asset No: A262) 12.4 to 18GHz Model: 3160-08 S/N: 28245	29/01/16	29/01/19	*2
	EMCO 3110B Biconical (Asset No: A111) S/N: 9612-2790 20-300 MHz	18/02/16	18/02/18	*2
	Double Ridged Horn Antenna (Asset No: A324) Model: EMCO 3115 S/N: 3823 1-18GHz	27/01/15	27/01/18	*2
	Standard Gain Horn Antenna (Asset No: A305) Model: 3160-09, S/N: 00066033 18 GHz – 26.5GHz	31/05/16	31/05/19	*2
Cables	3m Sucoflex Blue Cable (Asset No: SC024)	10/08/17	10/08/18	*2
	13m RG214 MIL-C-17 N-Type Cable (Asset No: C028)	10/08/17	10/08/18	*2
	Sucoflex 104 4m Cable (Asset No: C041)	10/08/17	10/08/18	*2
Preamplifier	HP 8449B (Asset No: A138) S/N: 3008A01113	14/08/18	14/08/18	*2

Note *1: NATA Calibration by Rohde & Schwarz.

Note *2 : In-house calibration. Traceable to Australian National Standards

Note *3: NATA Calibration by NPL.

TEST SITES

Equipment Type	Make/Model Serial Number	Last Cal. DD/MM/YY	Due Date DD/MM/YY
Shielded Room/ Test Laboratory	$7.23m \times 4.83m \times 2.45m$	N/A	N/A
Indoor Open Area Test Site (iOATS)	RFI Industries S800 Serial Number: 876, 3 metre site iOATS situated at Seven Hills, NSW	20/04/17	20/04/18

3.0 TEST RESULTS

3.1 §15.203 Antenna Requirement

Requirement:

No antenna other than that furnished by the responsible party shall be used with the device.

Results:

The antenna was integral to the device ensuring that it could not be replaced. EUT was fully enclosed.

Conclusion: Complied.

3.2 §15.204 Antenna Information

Requirement:

Provide information for every antenna proposed for the use with the EUT.

Results:

- a) Antenna type:
- b) Manufacture and model No.:

c) Gain with reference to an isotropic radiator:

Integral omnidirectional NA 1 dBi

Conclusion: Complied.

3.3 §15.207 Disturbance Voltage on AC Mains

Applicable only to equipment designed to be connected to the public utility power line.

Conclusion: Not Applicable as EUT is powered by internal battery.

3.4 §15.247(a2) 6 dB Bandwidth

Requirement:

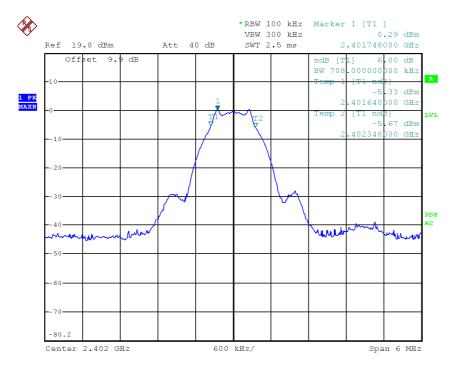
Systems using digital modulation techniques may operate in the 902-928MHz, 2400- 2483.5MHz, and 5725-5850MHz bands. The minimum bandwidth shall be at least 500kHz.

Results:

6 dB Emission Bandwidth:

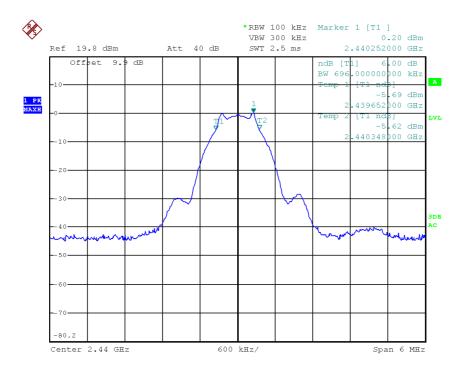
Centre Frequency [MHz]	6 dB Bandwidth [kHz]
2402	708
2440	696
2480	720

Channel 2402 MHz

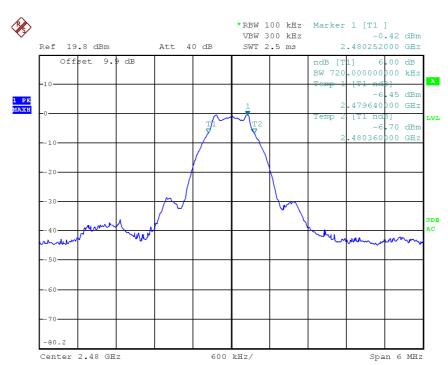


Date: 19.FEB.2018 08:08:02

Channel 2440 MHz



Date: 19.FEB.2018 08:09:30



Channel 2480 MHz

Date: 19.FEB.2018 08:11:43

Conclusion: Complied.

3.5 §15.247(e) 3 kHz Peak Power Density

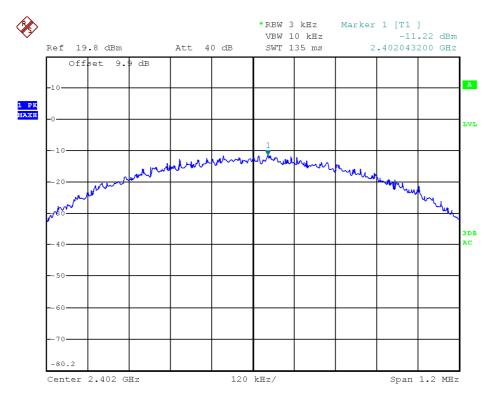
Requirement:

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.

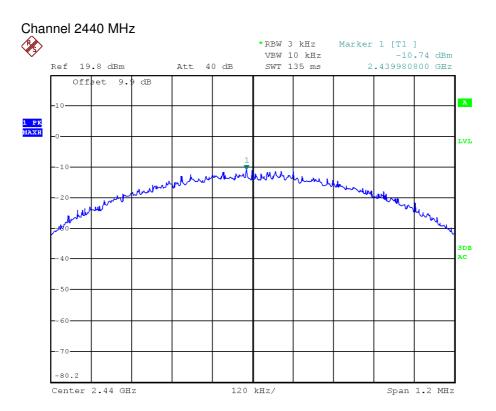
Results:

Centre Frequency [MHz]	3 kHz Peak Power density [dBm]
2402	-11.22
2440	-10.74
2480	-11.86

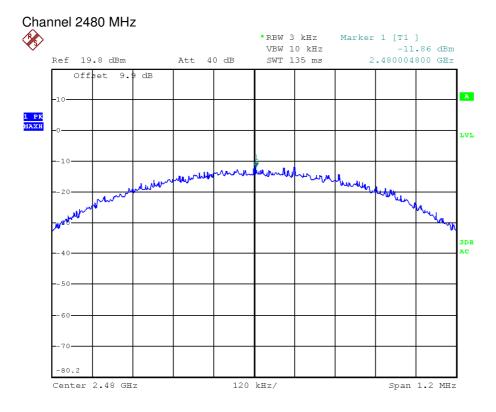
Channel 2402 MHz



Date: 19.FEB.2018 08:25:05



Date: 19.FEB.2018 08:22:47



Date: 19.FEB.2018 08:23:47

Conclusion: Complied.

3.6 §15.247(b)(3) Peak Output power

Requirement:

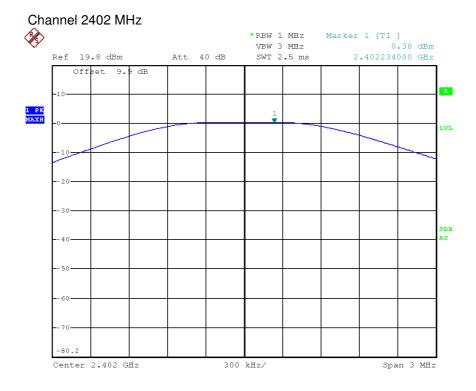
For system using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz Bands: 1 Watt.

1W=30dBm.

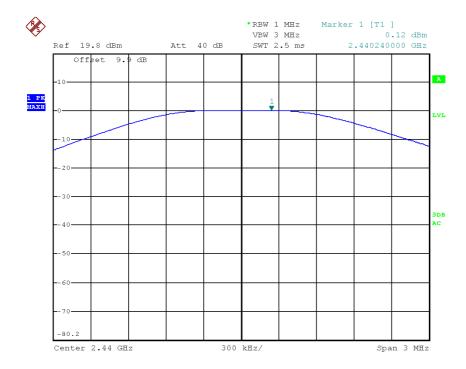
The antenna gain of integral antenna is 1 dBi.

Results:

Frequency (MHz)	Conducted Power Measured (dBm)
2402	0.38
2440	0.12
2480	-0.32

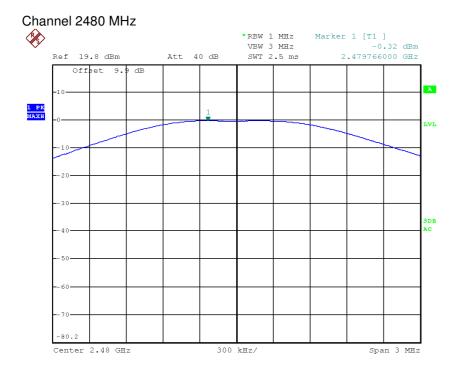


Date: 19.FEB.2018 08:15:25



Channel 2440 MHz

Date: 19.FEB.2018 08:16:08



Date: 19.FEB.2018 08:14:38

Conclusion: Complied.

3.7 §15.205 Restricted Bands of Operation

Requirement:

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).

Results:

The15.209 limit was applied across the applicable spectrum and therefore complied with the restricted band requirements. Refer to result plots in 3.8 of this report. Two restricted bands are located either side of operating band: 2310-2390MHz, 2483.5-2500MHz. 2390MHz was checked as band edge of bottom channel and 2483.5MHz was checked as band edge of top channel. Refer to result plots in 3.9 of this report.

Conclusion: Complied.

3.8 §15.247(c) Spurious Radiated Emission

Requirement:

In any 100KHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a)

Results

Radiated spurious emission measurements were performed in a semi-anechoic chamber compliant with ANSI C63.4: 2014.

The test frequency range was sub-divided into smaller bands with sufficient frequency resolution to permit reliable display and identification of emissions.

Frequency range [MHz]	Measurement Bandwidth [kHz]	Measurement Distance [m]	Antenna
0.009 to 30	9	3	Active loop antenna
30 to 1000	120	3	Biconcal and log periodic antennas
1000 to 18 000	1000	3	Broad band horn
18 000 to 25 000	1000	1	Broad band horn

The sample was slowly rotated with the spectrum analyser set to Max-Hold. This was performed for at least two antenna heights. When an emission was located, it was positively identified and its maximum level found by rotating the automated turntable and by varying the antenna height. Devices design for a fixed position were tested in that position, portable devices were prescanned in three orthogonal orientations to decide maximum emission direction.

The measurement data for each frequency range was corrected for cable losses, antenna factors and preamplifier gain. This process was performed for both horizontal and vertical antenna polarisations.

Calculation of field strength

The field strength was calculated automatically by software using pre-stored calibration data. The method of calculation is shown below:

E = V + AF - G + L

Where:

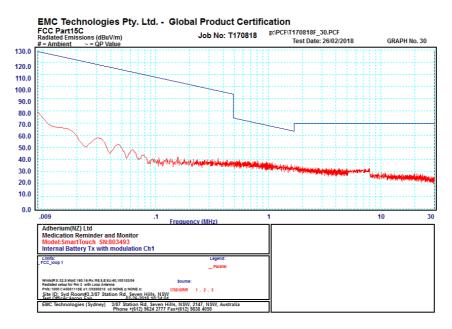
Е	=	Radiated Field Strength in dBµV/m.
V	=	EMI Receiver Voltage in dBµV. (measured value)
AF	=	Antenna Factor in dB. (stored as a data array)
G	=	Preamplifier Gain in dB. (stored as a data array)
L	=	Cable loss in dB. (stored as a data array of Insertion Loss versus frequency)

Frequency Band: 0.009 - 30 MHz

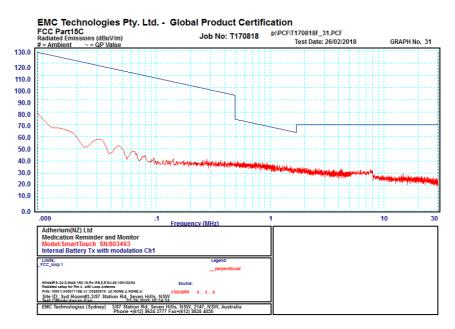
Measurements were made at a distance of 3 metres. The measurement of emissions between 0.009 - 30 MHz were made with a resolution bandwidth (RBW) of 9 kHz and the video bandwidth (VBW) of 30 kHz.

The §15.209 limit applied

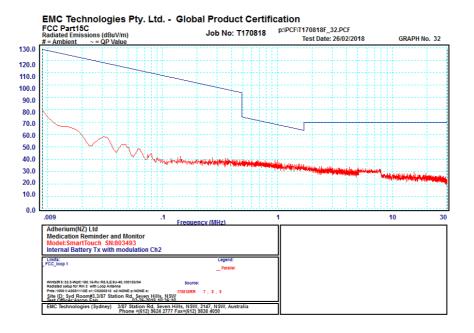
Channel 2402, Parallel Polarisation



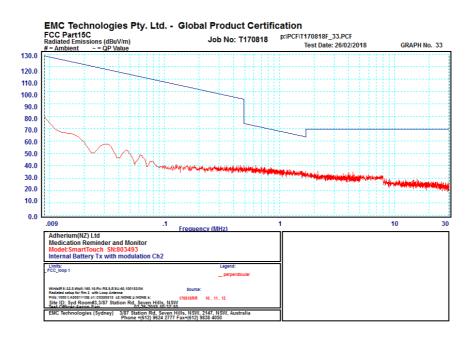
Channel 2402, Perpendicular Polarisation



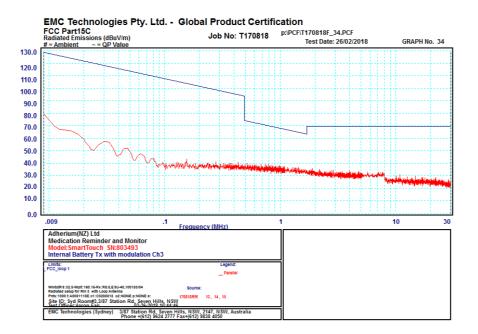
Channel 2440, Parallel Polarisation



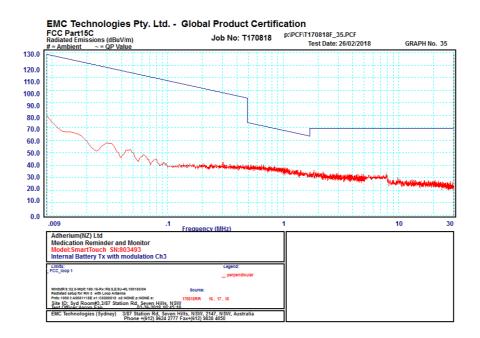
Channel 2440, Perpendicular Polarisation



Channel 2480, Parallel Polarisation



Channel 2480, Perpendicular Polarisation

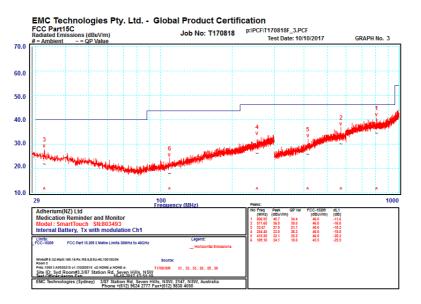


Frequency Band: 30 - 1000 MHz

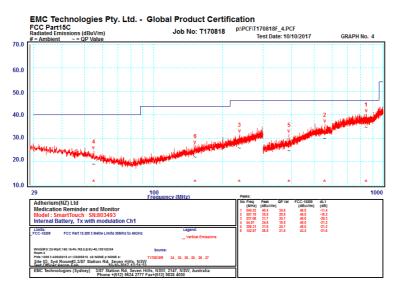
Measurements were made at a distance of 3 metres. The measurement of emissions between 30 - 1000 MHz were made with a resolution bandwidth (RBW) of 120 kHz and the video bandwidth (VBW) of 300 kHz.

The §15.209 limit applied

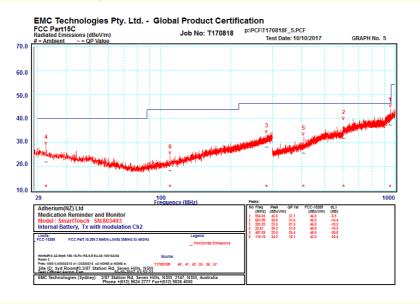
Channel 2402, Vertical Polarisation



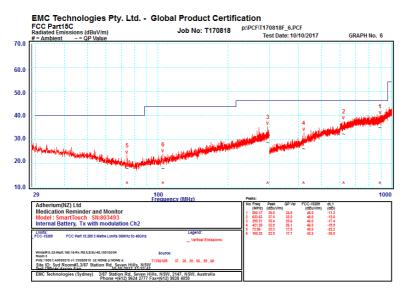
Channel 2402, Horizontal Polarisation



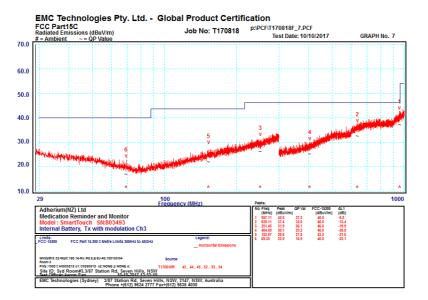
Channel 2440, Vertical Polarisation



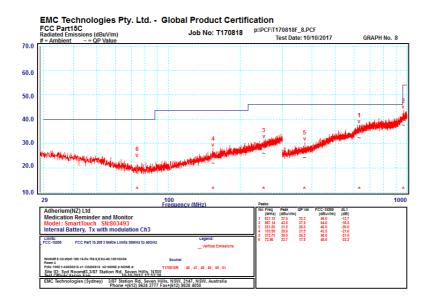
Channel 2440, Horizontal Polarisation



Channel 2480, Vertical Polarisation



Channel 2480, Horizontal Polarisation



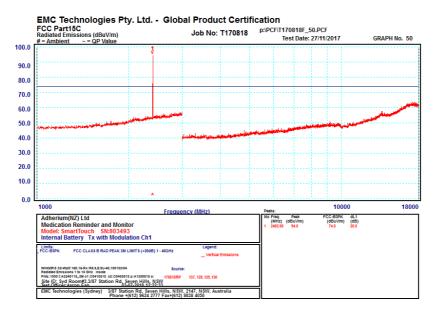
Frequency Band: 1 000 – 25 000 MHz

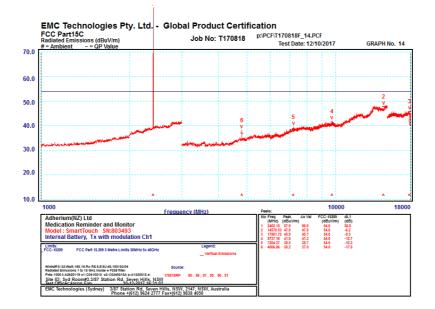
Measurements to 18 GHz were made at a distance of 3 metres and 18 to 25 GHz at 1 metre. The peak measurements were made with a resolution bandwidth (RBW) of 1000 kHz and the video bandwidth (VBW) of 1000 kHz, The average measurement were made with a resolution bandwidth(RBW) of 1000kHz and the video bandwidth(VBW) of 10kHz. 2.4G Band stop notch filter was used from above 3GHz.

The §15.209 limits applied.

Channel 2402 MHz – Vertical, 1 to 18 GHz

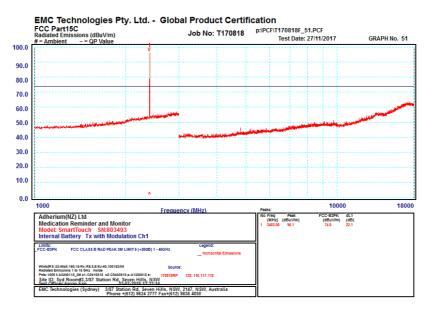
Peak Measurement

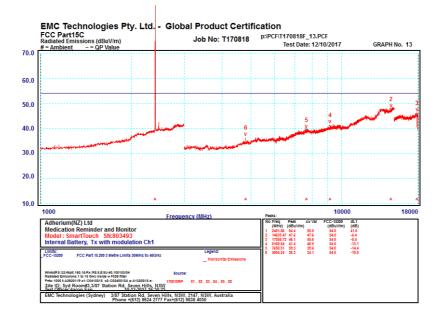




Channel 2402 MHz – Horizontal, 1 to 18 GHz

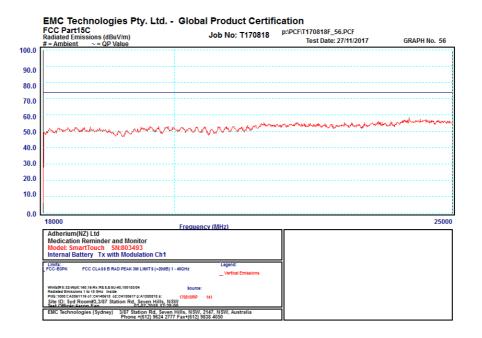
Peak Measurement

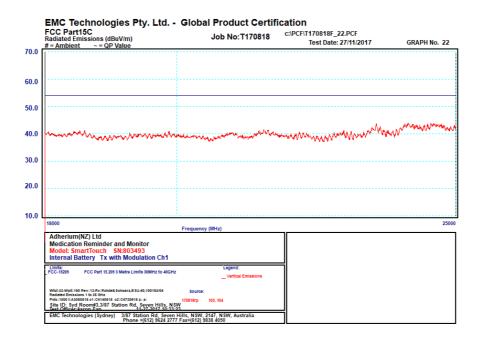




Channel 2402 MHz – Vertical 18 to 25 GHz

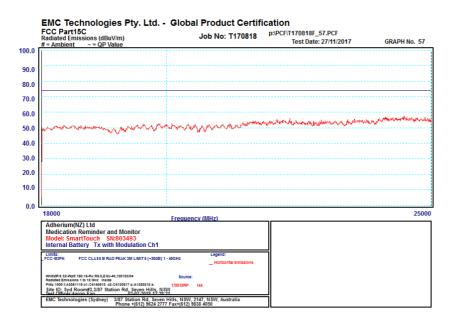
Peak Measurement

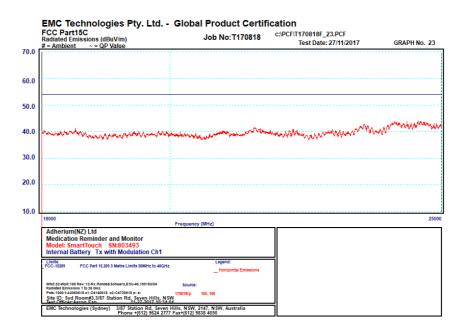




Channel 2402 MHz – Horizontal 18 to 25 GHz

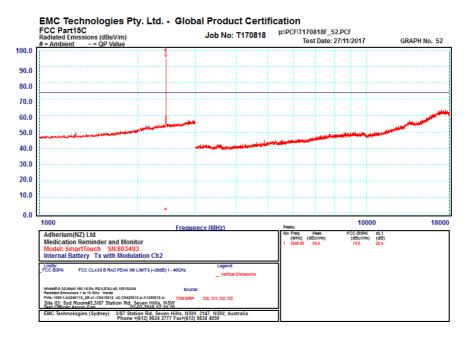
Peak Measurement



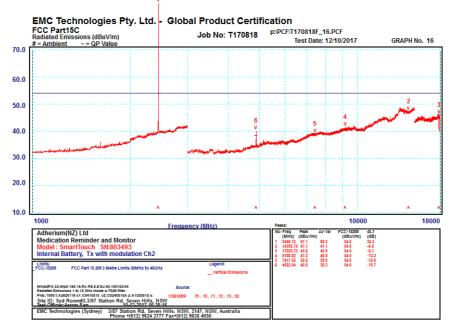


Channel 2440 MHz – Vertical, 1 to 18 GHz

Peak Measurement

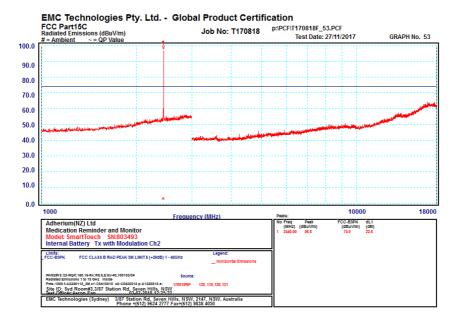


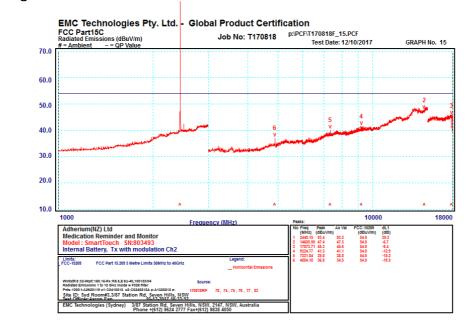
Average Measurement



Channel 2440 MHz – Horizontal, 1 to 18 GHz

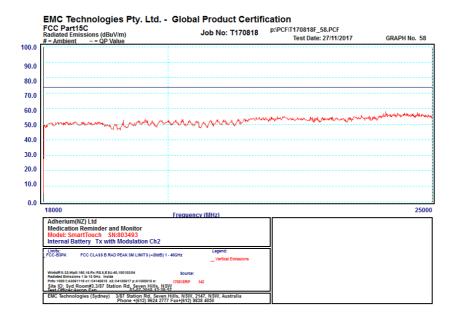
Peak Measurement



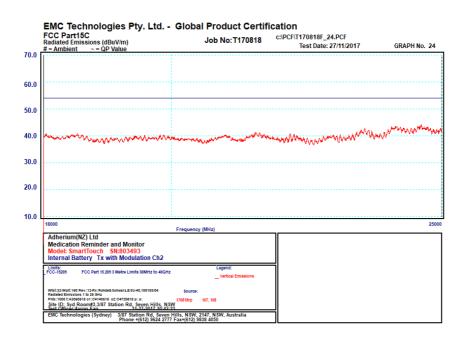


Channel 2440 MHz – Vertical 18 to 25 GHz

Peak Measurement



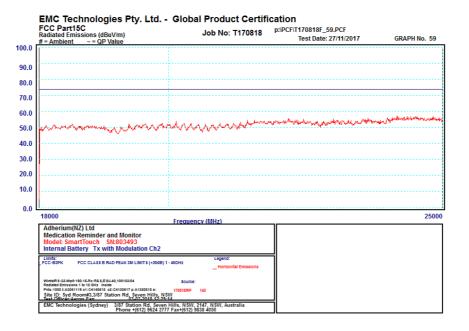
Average Measurement

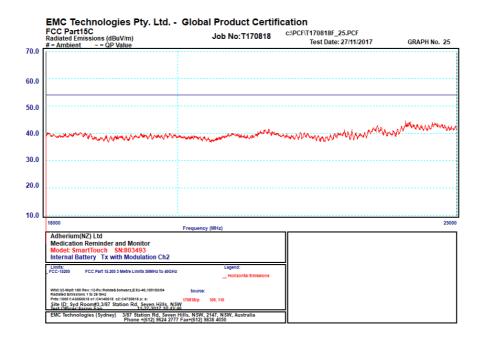


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Channel 2440 MHz – Horizontal 18 to 25 GHz

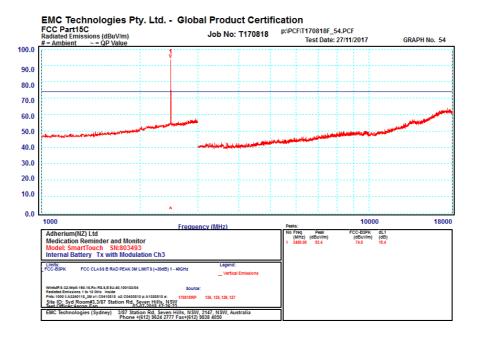
Peak Measurement

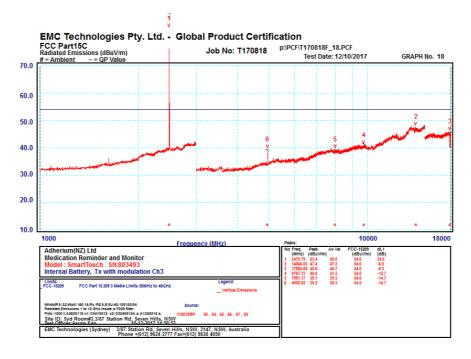




Channel 2480 MHz – Vertical, 1 to 18 GHz

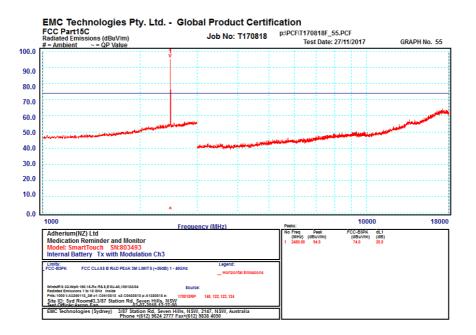
Peak Measurement

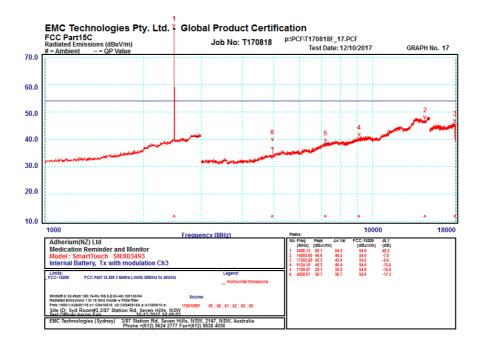




Channel 2480 MHz – Horizontal, 1 to 18 GHz

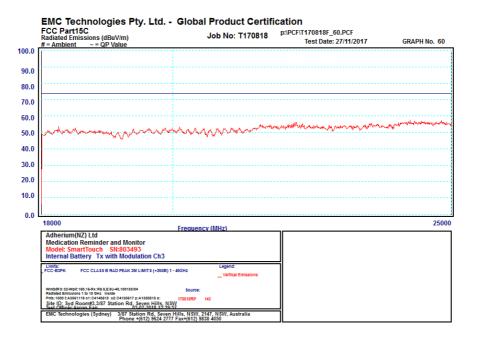
Peak Measurement

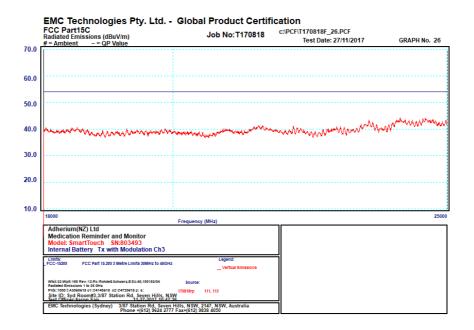




Channel 2480 MHz - Vertical 18 to 25 GHz

Peak Measurement



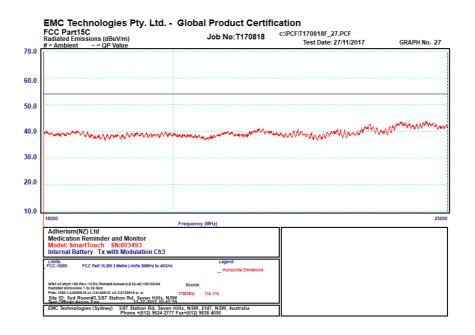


Channel 2480 MHz – Horizontal 18 to 25 GHz

Peak Measurement

EMC Technologies Pty. Ltd. - Global Product Certification FCC Part15C Radiated Emissions (dBuV/m) # = Ambient ~= QP Value Job No: T170818 r:\fsydl2017/08_August\T170818 Adherium (NZ) LtdlT170818rp\T170818F_t Test Date: 27/11/2017 GRAPH No. 61 100.0 90.0 80.0 70.0 60.0 50.0 40.0 30.0 20.0 10.0 0.0 18000 25000 E. cv (MHz Adherium(NZ) Ltd Medication Reminder and Monitor Model: SmartTouch SN:803493 Internal Battery Tx with Modulation Ch FCC CLASS B RAD PEAK 3M LIMITS (+20dB) 1 180.16-Rx:R&3.E 8U-40,100183.04 is 1 to 18 0Hz Inside 1119 01:04140518 02:04130517 p:A1380 800m#3.3187 Station Rd, Seven 80.12.21 (Sydney) 3/87 St +(612) 9624 2777

Average Measurement



Conclusion:

The EUT complied with the limits of FCC Rule Part 15 Subpart C, 15.209.

3.9 15.247(d) Out of Band Emissions

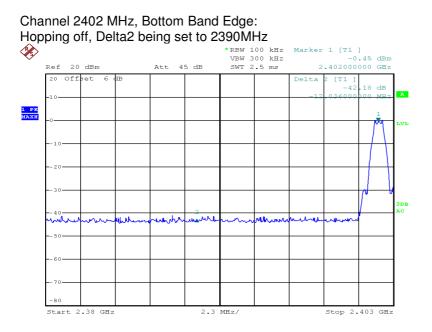
Requirement:

In any 100kHz 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 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

3.9.1 Authorized-band band-edge

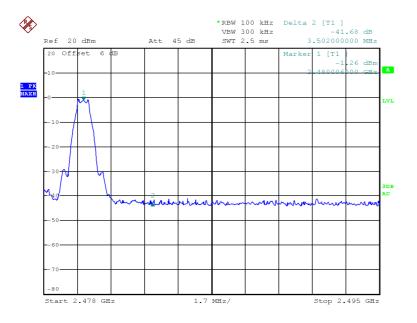
Test was done by conducted measurement according to C63.10 Clause 6.10.4

Results:

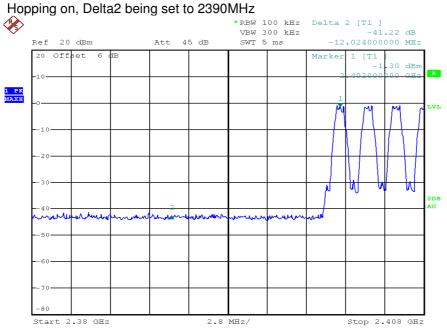


Date: 20.0CT.2017 08:36:15

Channel 2480 MHz, Top Band Edge: Hopping off, Delta2 being set to 2483.5MHz

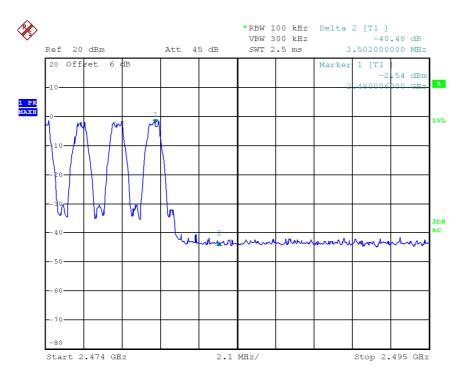


Date: 20.0CT.2017 08:38:58



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Date: 20.0CT.2017 08:43:29
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Channel 2480 MHz, Top Band Edge: Hopping on, Delta2 being set to 2483.5MHz



Date: 20.0CT.2017 08:41:18

Conclusion: Complied.

3.9.2 Restricted-band band-edge

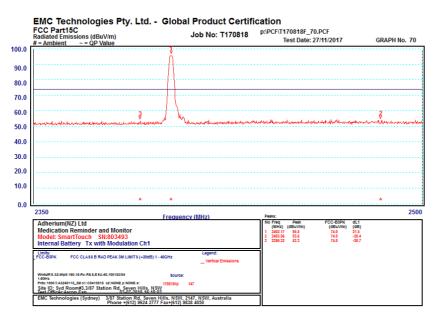
This was done by radiated measurement according to C63.10 Clause 6.10.5

The peak measurements were made with a resolution bandwidth (RBW) of 1000 kHz and the video bandwidth (VBW) of 1000 kHz, The average measurement were made with a resolution bandwidth(RBW) of 1000kHz and the video bandwidth(VBW) of 10kHz.

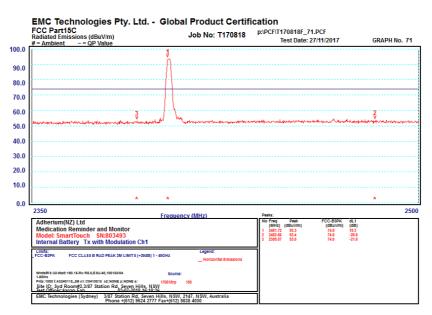
Results:

Channel 2402 MHz, Bottom Band Edge: Hopping off, Mark1 and Mark2 being set to around 2390MHz and 2483.5MHz

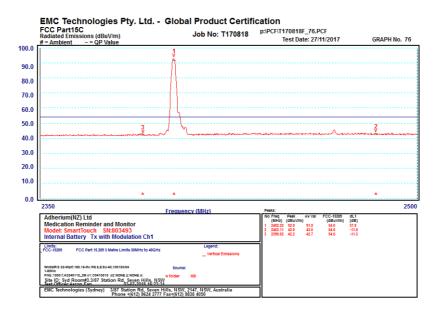
Peak measurement - Vertical



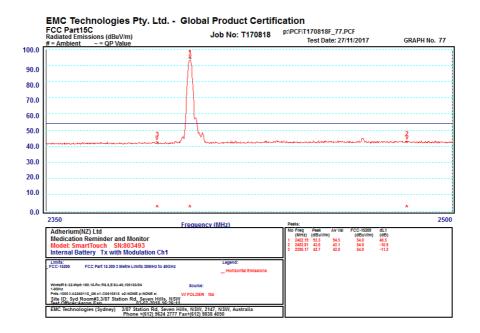
Peak measurement – Horizontal



Average measurement – Vertical

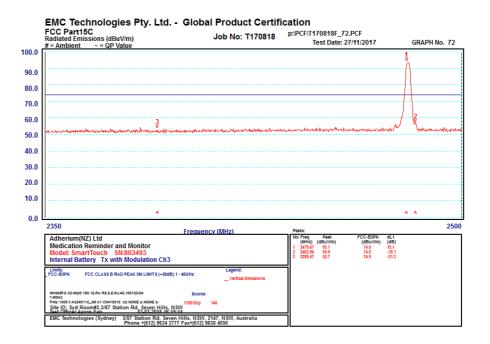


Average measurement – Horizontal

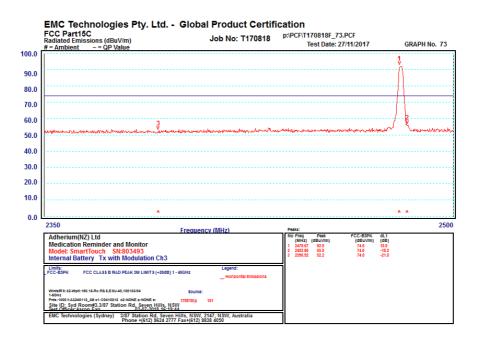


Channel 2480 MHz, Top Band Edge: Hopping off, Mark1 and Mark2 being set to around 2390MHz and 2483.5MHz

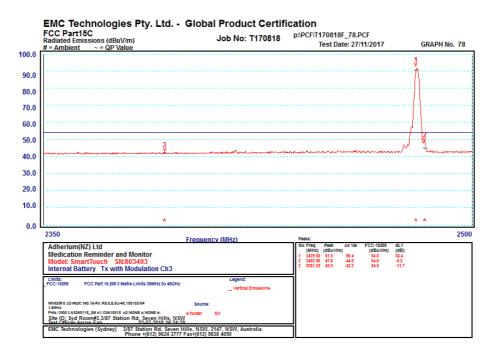
Peak measurement – Vertical



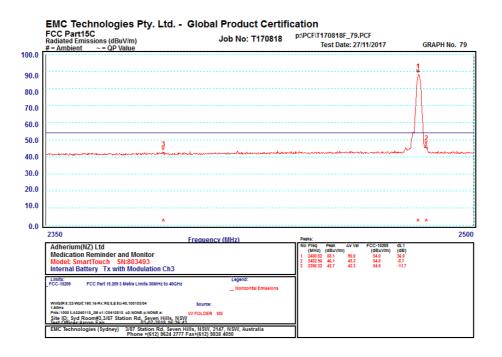
Peak measurement – Horizontal



Average measurement – Vertical

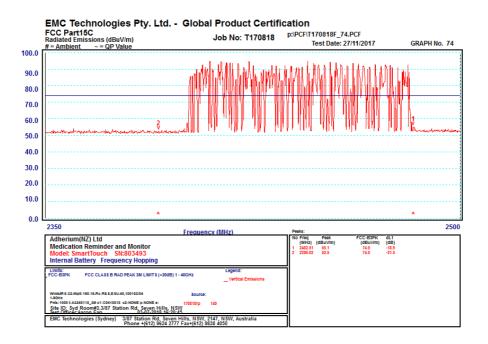


Average measurement – Horizontal

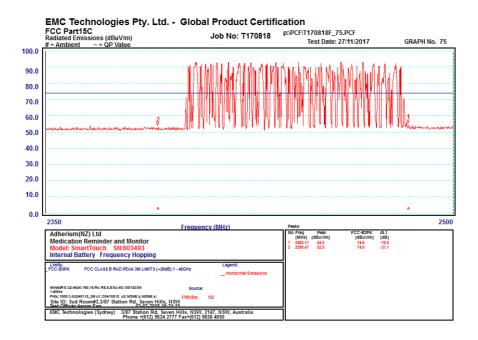


Hopping on, Mark1 and Mark2 being set to around 2390MHz and 2483.5MHz

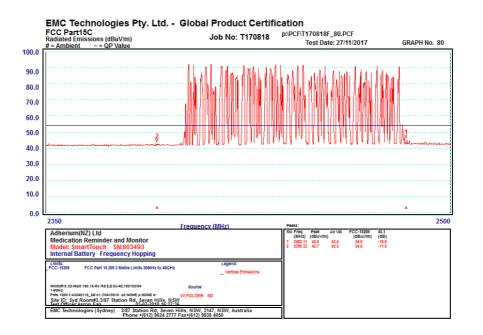
Peak measurement – Vertical



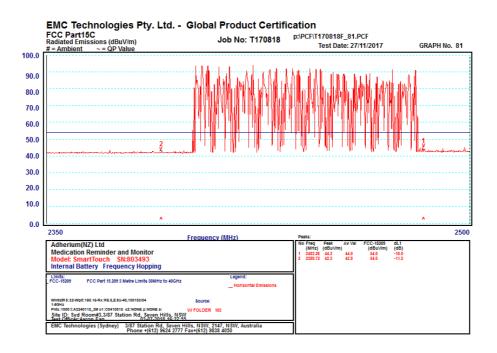
Peak measurement – Horizontal



Average measurement – Vertical



Average measurement – Horizontal



3.10 §15.247(i) Maximum Permissible Exposure

Requirement:

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 levels in excess of the commision's guidelines. See \$1.1307(b)(1) of this chaper.

Due to the nature of EUT, Calculations were performed according to devices used within 20 cm of person (FCC2.1093) - < 50mm test separation.

KDB 447498 D01 V06 was used to calculate the minimum separation distance allowed before SAR measurements were required.

1-g Head or Body SAR: $\left(\frac{max.channel power,mW}{min.separation distance,mm}\right) \times \sqrt{f(GHz)} \le 3.0$

10-g Extremity SAR:

$$\left(\frac{max. channel power, mW}{min. separation distance, mm}\right) \times \sqrt{f(GHz)} \le 7.5$$

Result:

Maximum measured power, E.I.R.P. = 0.38dBm + 1dBi =1.38dBm = 1.37mW Minimum separation distance = 5mm Highest frequency = 2.48 GHz

 $1.37 \text{mW} / 5 \text{ mm} \times \sqrt{2.48 \text{ GHz}} = 0.43$

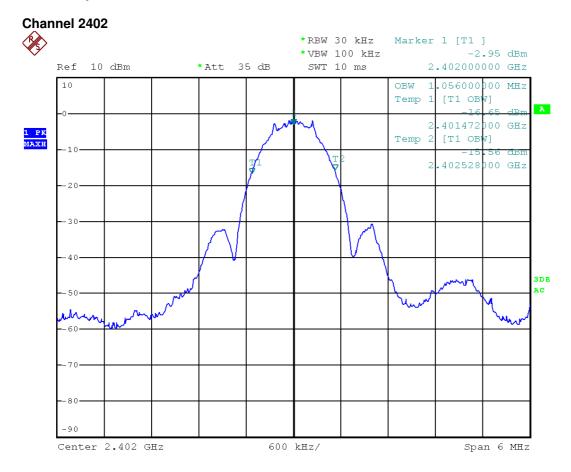
Conclusion: Complied.

3.11 §2.1049 Occupied bandwidth – 99% power

The bandwidth containing 99% power of the transmitted signal was measured using the procedure from ANSI C63.10 section 6.9.

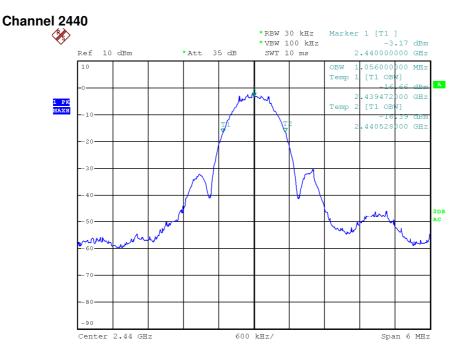
Channel [kHz]	99% Bandwidth [MHz]	Low Frequency [GHz]	High Frequency [GHz]
2402	1.056	2.401472	2.402528
2440	1.056	2.439472	2.440528
2480	1.056	2.479472	2.480528

99% Occupied Bandwidth



Date: 29.MAR.2018 07:48:29

99% Occupied Bandwidth



Date: 29.MAR.2018 07:51:44





Date: 29.MAR.2018 07:55:05

4.0 COMPLIANCE STATEMENT

The Medication reminder and actuation monitor for use with medication inhalers, Model: SmartTouchTM tested on behalf of Adherium(NZ) Ltd. complied with the requirements of 47 CFR, Part 15 Subpart C - Rules for Radio Frequency Devices (intentional radiators) operating within the band: 2400 MHz to 2483.5 MHz.

5.0 MEASUREMENT UNCERTAINTY

EMC Technologies has evaluated the equipment and the methods used to perform the emissions testing. The estimated measurement uncertainties for emissions tests shown within this report are as follows:

Radiated Emissions:	9 kHz to 30 MHz 30 MHz to 300 MHz	±4.1 dB +5.1 dB
	300 MHz to 1000 MHz 1 GHz to 18 GHz	±4.7 dB ±4.6 dB

The above expanded uncertainties are based on standard uncertainties multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.