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EMC COMPLIANCE REPORT
Certification Test Report
In accordance with:
CFR47 FCC Part 15, Subpart C, 15.247

Adherium (NZ) Limited

NF0106

Hailie for Ellipta

FCC ID: PN2-LPT1

REPORT: E2112-1497-2
DATE: March, 2022

Accreditation Number: 18553
Accredited for compliance with ISO/IEC 17025 - Testing

Certificate of Compliance
Certification Compliance Report
EMC Bayswater Test Report: E2112-1497-2
Issue Date: March, 2022

Test Sample(s):	Hailie for Ellipta
Model No:	NF0106
Serial No:	B01, B02, B04
FCC ID:	PN2-LPT1
Client Details:	Mr. Igbal Syre Adherium (NZ) Limited Level 11, 16 Kingston Street, Auckland 1010, New Zealand Phone No: +64 9 307 2771 e-mail: IgbalS@adherium.com
Test Specification:	CFR47 FCC Part 15, Subpart C, 15.247

Results Summary:		
	15.203 - Antenna requirement	***Complied***
	15.247 (a) (2) - 6dB Bandwidth	***Complied***
	15.247 (b)(3) – Maximum Output Power	***Complied***
	15.247 (d) - Out-of-Band Emissions - – 100kHz, -20dBc	***Complied***
	15.247 (d) - Emissions on the Band edge	***Complied***
	15.247 (d), 15.209 – Radiated emissions in Restricted bands	***Complied***
	15.247 (e) - Power Spectral Density	***Complied***
	15.247 (i) - Radio frequency hazard	***Complied***

Test Date(s):	9th to 15th December 2021
Test House (Issued By)	EMC Bayswater Pty Ltd 18/88 Merrindale Drive Croydon South Victoria 3136 Australia FCC Accredited Test Firm Registration number: 527798 FCC Accredited Test Firm Designation number: AU0004 Phone No: +61 3 9761 5888 e-mail: sales@emcbayswater.com.au Fax No: +61 3 8761 6547 Web: www.emcbayswater.com.au/

This is to certify that the necessary measurements were made by EMC Bayswater Pty Ltd, and that the Adherium (NZ) Limited, NF0106, Hailie for Ellipta, has been tested in accordance with requirements contained in the appropriate commission regulations..

Tested by:	Approved by:	
		01/03/2022 11:40
Adnan Zaman (EMC Test Engineer)	Neville Liyanapatabendige (Manager)	Date

EMC Compliance Report
for
Adherium (NZ) Limited

Contents

1. Introduction

Electromagnetic Compatibility (EMC) tests were performed on a Adherium (NZ) Limited, NF0106, Hailie for Ellipta in accordance with the requirements of Title 47 of the standard CFR47 FCC Part 15, Subpart C, 15.247.

2. Test Report Revision History

None

3. Report Information

EMC Bayswater Pty Ltd reports apply only to the specific samples tested under the stated test conditions. All samples tested were in good operating condition throughout the entire test program unless otherwise stated. EMC Bayswater Pty Ltd does not in any way guarantee the later performance of the product/equipment. It is the manufacturer's responsibility to ensure that additional production units of the tested model are manufactured with identical electrical and mechanical components. EMC Bayswater Pty Ltd shall have no liability for any deductions, inference or generalisations drawn by the clients or others from EMC Bayswater Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Bayswater Pty Ltd. This report shall not be reproduced except in full (with the exception of the certificate on page 2) without the written approval of EMC Bayswater Pty Ltd. This document may be altered or revised by EMC Bayswater Pty Ltd personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by EMC Bayswater Pty Ltd will nullify the document.

4. Summary of Results

The EUT complied with applicable requirements of CFR47 FCC Part 15, Subpart C, 15.247. Worst-case results are tabled as follows:

FCC Part 15C sections	Test	Result
15.203	Antenna Requirement	Complied[#1]
15.247 (a) (2)	6dB Bandwidth	Complied by 5kHz
15.247 (b)(3)	Maximum Peak Output Power	Complied by 35.7dB
15.247 (d)	Out-of-Band Emissions - – 100kHz, -20dBc	Complied by 19.3dB
15.247 (d)-	Emissions on the Band edge	Complied by 24.6dB
15.247 (d), 15.209	Radiated emissions in Restricted bands	Complied by 6.4dB
15.247 (e)	Power Spectral Density	Complied by 23.3dB
	Occupied Bandwidth (99% Emission Bandwidth)	970kHz

[#1]The Antenna is permanently attached, internal to the device

Table 1: Summary of test results

5. Product Sample Details

5.1. EUT Description

The EUT (Equipment Under Test), as supplied by the client, is described as follows:

Product:	Hailie for Ellipta	
Model No:	NF0106	
Serial No:	B01, B02, B04	
Firmware:	8.7.rf2	
Software:	SoftDevice S112 v6.1.1	
Power Specifications	Battery Powered 1 x CR2032 3.0V coin cell	
Dimensions:	75mm x 37mm x 90mm (Length x Width x Height)	
Weight:	30g	
EUT Type:	Portable	
Transmitter details:	Description:	nRF52832-QFAA-R7
	Type:	Bluetooth Low Energy
	Modulation:	GFSK
	Channels:	40 channels with 2 MHz spacing (3 advertising channels/37 data channels).
	Max power:	0 dBm
	Antenna:	Custom PCB trace antenna on flex tail
	Customer declared Antenna Gain:	+1dBm

(Customer supplied product information)

(Refer to photographs in Annex A & B for views of the EUT)

5.2. Product description

The EUT (Equipment Under Test) has been described by the customer as follows:

"The Hailie for Ellipta device is a small hand-held battery-powered electronic module that clips onto a GSK Ellipta Inhaler to remind the user when medication is due and log when medication is taken.
It is powered by a single CR2032 Coin cell battery and can transfer log data via Bluetooth Low Energy (BLE) for later analysis by a health professional. The user operates the device in a home environment."

(Customer supplied product description information)

The highest frequency generated or used in the device or on which the device operates or tunes as specified by the customer is 2480MHz (BLE IC).

5.3. Support Equipment

Support Equipment 1:	Description:	Incruse Ellipta Inhaler
	Manufacturer:	gsk
	Model No:	Not stated
	Serial No:	0134707

5.4. Product operating modes

"Deep Sleep mode
Device is in deep sleep with all peripherals disabled. This mode is used for long term storage to minimise energy consumption.

Normal operating mode
The standard operating mode with all sub-systems functional. The device is in idle state until movement is detected. Inhaler presence, actuation detection, ambient temperature and flow systems then start sampling. Event logs are created and saved when one of many events is detected. When required, the device can be connected to via BLE and the companion app and event logs downloaded"

(Customer supplied product operating mode information)

5.5. Product operating mode for testing

The customer described the products normal operation modes as the following:

"Device transmits constantly at maximum TX power with modulation at the lowest, middle, and highest channels. The User Button is used to change between the channels"

(Customer supplied product operating mode for testing information)

5.6. Configuration

The EUT was either configured by the customer or configured using the customer's instructions.

The device was connected to an external power supply as the internal battery cannot sustain extended periods of high current draw. The GSK inhaler was present (except for Conducted method testing). The device transmitted at maximum TX power at the lowest, middle and highest TX frequencies. The User Button is used to change between the channels.

Customer supplied a sample with a temporary SMA connector for Conducted method testing (with a SMA connector soldered (after the antenna matching network) in place of the antenna. The onboard PCB trace antenna was disconnected).

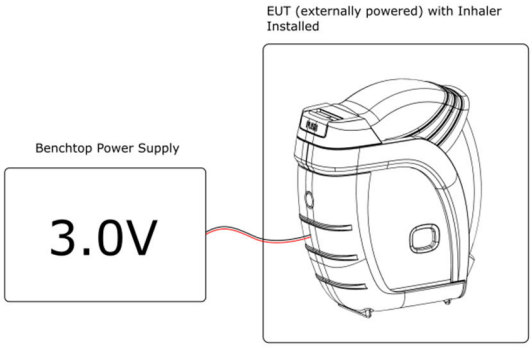


Figure 1: Block diagram of EUT test configuration – Radiated Method

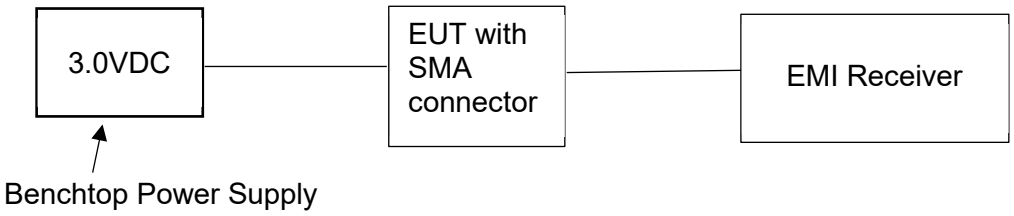


Figure 2: Block diagram of EUT test configuration – Conducted Method

5.7. Modifications

EMC Bayswater Pty Ltd did not modify the EUT.

6. Test Facility & Equipment

6.1. Test Facility

Tests were performed at the indoor Open Area Test Site (iOATS) at EMC Bayswater Pty Ltd, located at 18/88 Merrindale Drive, Croydon South, Victoria, 3136, Australia.

EMC Bayswater Pty Ltd FCC Test Firm registration number is 527798.

EMC Bayswater Pty Ltd FCC Test Firm Designation number is AU0004.

6.2. Test Equipment

Refer to Appendix A for the measurement instrument list.

7. Referenced Standards

CFR47 FCC Part 15, Subpart C, 15.247

CFR47 FCC Part 15, Subpart B

ANSI C63.10 - 2013
American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

ANSI C63.4 - 2014
American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

FCC KDB - 558074 D01 15.247 Meas Guidance v05r02

8. Referenced Documents

Test Plan
Planet Innovation
Goldberg EMC Test Plan
Revision: 01
Date: 17/12/2021

9. Antenna Requirement – FCC Part 15.203

9.1. Requirements

As per section 15.203 of CFR47 FCC Part 15, Subpart C, 15.247:

- An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

9.2. Result

The EUT uses permanent, internally attached antenna which is etched into the PCB. Therefore the EUT complied with the antenna requirements of CFR47 FCC Part 15, Subpart C, 15.247 Section 15.203.

11. 6dB Bandwidth – FCC 15.247 (a) (2)

11.1. Test Procedure

The 6dB Bandwidth was performed in accordance with the section 11.8 of ANSI C63.10 - 2013.

6dB Bandwidth measurements were performed at the antenna port (Conducted method). The transmitter output was connected to a spectrum analyzer through a suitable attenuator. The spectrum analyser was tuned to the fundamental (transmit frequency) of the transmitter bottom, centre and top channels with 100kHz RBW and 300kHz VBW using the peak detector and a suitable span to allow accurate measurements whilst capturing the full intentional transmission including side lobes. The resultant bandwidth measurement was recorded.

(Refer to photographs in Annex C for views of the test configuration)

11.2. Limits

Applicable only to systems using digital modulation techniques:

Transmit operating frequency (MHz)	Minimum 6dB Bandwidth (kHz)
2400 – 2483.5	500

Table 2: 6dB Bandwidth

11.3. Test Results

6dB Bandwidth measurements are tabulated below:

(Refer to graphs in Appendix C.1)

Transmit operating frequency (MHz)	Measured 6dB Bandwidth (kHz)	Minimum 6dB Bandwidth (kHz)	Margin (kHz)	Comment
2402 (Bottom)	510	500	+10	Complied
2440 (Middle)	510	500	+10	Complied
2480 (Top)	505	500	+5	Complied

Table 3: Results for 6dB Bandwidth

The measurement uncertainty was calculated as follows:

Measurement Parameter	Calculated measurement uncertainty
Operating Frequency	±10.5kHz
Bandwidth	±14.96kHz

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	19°C
Humidity:	60%
Atmospheric pressure:	1017.1hPa

Table 4: Climatic conditions

Notes: The minimum required 500kHz 6dB Bandwidth requirements were satisfied by at least 5kHz.

The transmitter was continuously transmitting in modulated transmit mode.

Assessment: The EUT complied with the 6dB Bandwidth requirements of CFR47 FCC Part 15, Subpart C, 15.247 (a)(2).

12. Occupied Channel Bandwidth (99% Emission Bandwidth)

12.1. Test Procedure

The 99% emission Bandwidth was performed in accordance with the section 6.9.3 of ANSI C63.10 - 2013.

99% Emission Bandwidth measurements were performed at at the antenna port (Conducted method). The transmitter output was connected to a spectrum analyzer through a suitable attenuator. The spectrum analyzer centre frequency was tuned to the fundamental (transmit frequency) of the transmitter with the span of the analyzer was set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth (RBW) was set to 1% to 5% of the occupied bandwidth and video bandwidth (VBW) was set to three times the RBW.

A peak detector, maxhold function (worst case) was used to measure the occupied bandwidth, using the built-in 99% occupied bandwidth measurement function of the receiver. The resultant bandwidth measurement was recorded.

(Refer to photographs in Annex C for views of the test configuration)

12.2. Requirements

No limits are defined in CFR47 FCC Part 15, Subpart C, 15.247.

12.3. Test Results

Occupied Bandwidth measurements are tabulated below:

(Refer to graph in Appendix C.7)

Transmit Operating Frequency (MHz)	99%BW Lower Frequency (MHz)	99%BW Upper Frequency (MHz)	Occupied Channel Bandwidth (kHz)
2402 (Lowest Channel)	2401.590	2402.540	950
2440 (Middle Channel)	2439.590	2440.540	950
2480 (Highest Channel)	2479.580	2480.550	970

Table 5: Occupied Bandwidth

The measurement uncertainty was calculated as follows:

Measurement Parameter	Calculated measurement uncertainty
Operating Frequency	±10.5kHz
Bandwidth	±14.96kHz

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	19°C
Humidity:	60%
Atmospheric pressure:	1017.1hPa

Table 6: Climatic conditions

Comments: The transmitter was tested with modulation applied

Assessment: The measured Occupied bandwidth (99% Emission Bandwidth) is 970 kHz (informative only).

13. Maximum Peak Output Power – FCC 15.247 (b)(3)

13.1. Test Procedure

Conducted Method:
The conducted output power measurements were performed in accordance with the section 11.9.1 of ANSI C63.10 - 2013.

The transmitter output was connected to a spectrum analyzer through a suitable attenuator. The Maximum Peak Conducted Output Power of the fundamental transmit frequency was measured using a spectrum analyzer with 1MHz RBW and 3MHz VBW using the peak detector and a suitable span to allow accurate measurement whilst capturing the full intentional transmission including side lobes. An offset for the measurement path insertion loss (attenuators and cables) was used to get a true measurement.

The EUT was tested on the top, middle and bottom channels.

(Refer to photographs in Annex C for views of the test configuration)

13.2. Limits

For systems using digital modulation techniques:

Transmit operating frequency (MHz)	Peak Power (W)	Peak Power (dBm)	e.i.r.p (W)	e.i.r.p (dBm)
2400 – 2483.5	1	30	4	36

Table 7: Limits – Transmitter maximum peak output power

13.3. Test Results

The worst-case maximum output power measurements are tabulated below:

(Refer to plots Appendix C.2)

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (dBm)	Margin (dB)	Result
Bottom	2402	**-5.7***	30.0	**-35.7***	Complied
Middle	2440	-6.1	30.0	-36.1	Complied
Top	2480	-6.4	30.0	-36.4	Complied

**Worst-case emissions*

Table 8: Results for Maximum Peak Conducted Output Power – Conducted Method

The measurement uncertainty was calculated at ±1.4dB. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of approximately *k=2* which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	19°C
Humidity:	52%
Atmospheric pressure:	1017.7hPa

Table 9: Climatic Conditions

Notes: The transmitter maximum output power was below the specified limit for the specified operating frequency.

The transmitter was continuously transmitting in modulated transmit mode

Assessment: The EUT complied with the Transmitter Maximum Peak output power requirements of CFR47 FCC Part 15, Subpart C, 15.247 (b)(3).

14. Radiated emissions in Restricted bands – 15.247 (d), 15.209

14.1. Requirements

As per section 15.247(d) of 47 CFR Part 15 Subpart C:

- Radiated emissions which fall in the restricted bands, as defined in section 15.205(a) of 47 CFR Part 15 Subpart C, must also comply with the radiated emission limits specified in section15.209(a) of 47 CFR Part 15 Subpart C (see §15.205(c) of 47 CFR Part 15 Subpart C)..

As per section 47 CFR Part 15 Subpart C section 15.209 (Radiated emissions, general requirements) the EUT is required to meet the limits that permit the highest field strength of the following table for the radiated emissions which fall in the restricted bands, as defined in section 15.205(a) of 47 CFR Part 15 Subpart C:

Frequency Range (MHz)	Limits at 3m (dBµV/m)
0.009 to 0.490	128.5 to 93.8
0.490 to 1.705	73.8 to 62.9
1.705 to 30.0	69.5
30.0 to 88	40.0
88.0 to 216.0	43.5
216.0 to 960.0	46.0
Above 960	54.0
NOTE: The lower limit shall apply at the transition frequency.	

Note 1: as per CFR FCC Part 15 section15.209 (d) 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

Note 2: as per CFR FCC Part 15.35 (b) Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz. When average radiated emission measurements are specified in this part, including average emission measurements below 1000 MHz, there also is a limit on the peak level of the radio frequency emissions. Unless otherwise specified, e.g., see §§15.250, 15.252, 15.253(d), 15.255, 15.256, and 15.509 through 15.519 of this part, the limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device, e.g., the total peak power level. Note that the use of a pulse desensitization correction factor may be needed to determine the total peak emission level. The instruction manual or application note for the measurement instrument should be consulted for determining pulse desensitization factors, as necessary.

Table 10: Limits for Radiated Spurious Emissions at distance of 3m – Restricted Bands

14.2. Test Procedure

The Radiated Emissions were performed in accordance with the section 11.12 of ANSI C63.10 - 2013.

Radiated Emissions were measured 3 metres (from 9kHz to 25GHz) away from the EUT in the iOATS (indoor Open Area Test Site) facility, which is an ANSI C63.4 compliant semi-anechoic chamber with ground plane. The EUT was placed on a non-conductive support at a height of 0.8m (9kHz to 1GHz) and 1.5m (1GHz to 25GHz) above the ground plane.

In the frequency range of 9kHz to 30MHz, an Active loop antenna was used. For X (Parallel), Y (Perpendicular) and Z (Ground-Parallel) antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The measuring antenna was positioned at 1m fixed height, and the turntable slowly rotated. The peak preview measurements were performed with a resolution bandwidth of 200Hz (9kHz to 150kHz), 9kHz (150kHz to 30MHz) and a video bandwidth of 30kHz. Peak emissions that exceeded the limit or were close to the applicable limit were investigated further. The frequency of each emission was then accurately determined. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees to find the worst-case emission arrangement. Quasi peak measurements were then performed using a measuring time of no less than 15 seconds. The final quasi-peak measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 200Hz (9kHz to 150kHz) and 9kHz (150kHz to 30MHz).

In the frequency range of 30MHz to 1GHz, a Biconilog antenna was used. For both horizontal and vertical antenna polarizations, the peak detector was set to MAX-HOLD and the range selected continuously scanned. The measuring antenna was positioned at 4 different fixed height positions and the turntable slowly rotated. The peak preview measurements were performed with a resolution bandwidth of 120kHz and a video bandwidth of 300kHz. Peak emissions that exceeded the limit or were close to the applicable limit were investigated further. The frequency of each emission was then accurately determined. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and varying the height of the antenna between 1 and 4 metres to find the worst-case emission arrangement. Quasi peak measurements were then performed using a measuring time of no less than 15 seconds. The final quasi-peak measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 120kHz.

In the frequency range 1.0GHz to 25GHz a Horn antenna was used and an area of 3m x 3m was covered between the antenna and the EUT using RF absorbing material with a rated attenuation more than 20dB over the frequency range. The height of the horn antenna was varied using the antenna bore-sighting technique and the turntable slowly rotated to maximise the emissions. For both horizontal and vertical antenna polarizations, the Peak and Average preview measurements were performed with a resolution bandwidth of 1 MHz and a video bandwidth of 3MHz. Peak and average emissions that exceeded the applicable limit or were close to the applicable limit were investigated further. Each emission of interest was then in-turn maximised by using the turntable to rotate the EUT through 360 degrees and the antenna height varied (if applicable, using the antenna bore-sighting technique) to find the worst-case emission arrangement. Peak and CISPR Average measurements were then performed using a

measuring time of no less than 15 seconds, the maximum emission level in the observed duration was recorded as the final result. The final peak and CISPR Average measurements were performed using a receiver bandwidth of 6dB and a resolution bandwidth of 1 MHz. Peak and Average measurements were performed at spot frequencies where the peak or average emission was close to, or exceeded the applicable limit line with the EUT rotation and antenna height varied (if applicable, using the antenna bore-sighting technique) to produce the highest emission.

Plots of the accumulated measurement data for both horizontal and vertical antenna polarizations, including all transducer and other measuring system correction factors were produced using commercially available compliant software (as listed in the test equipment list of this report).

(Refer to photographs in Annex C for views of the test configuration)

14.3.Test Results

Transmitter Spurious Emissions measurements are detailed as follows:

(Refer to graphs in Appendix C.4)

Operating Channel: Bottom, Middle and Top				
Measurement Antenna Polarisation	**Frequency (MHz)**	**Result peak (dBµV/m)**	**Limit Quasi-peak/ Average (dBµV/m)**	**Delta limit (dB)**
X	Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed			
Y	Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed			
Z	Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed			

Table 11: Transmitter Spurious Emissions – 9kHz to 30MHz

Operating Channel: Bottom, Middle and Top				
Measurement Antenna Polarisation	**Frequency (MHz)**	**Result Quasi-peak (dBµV/m)**	**Limit Quasi-peak (dBµV/m)**	**Delta limit (dB)**
Horizontal	Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed			
Vertical				

Table 12: Transmitter Spurious Emissions – 30MHz to 1GHz

Operating Channel: Bottom, (2402MHz)								
Measurement Antenna Polarisation	**Peak Measurements**				**Average Measurements**			
	Frequency (MHz)	**Result (dBµV/m)**	**Limit (dBµV/m)**	**Delta Limit (dB)**	**Frequency (MHz)**	**Result (dBµV/m)**	**Limit (dBµV/m)**	**Delta Limit (dB)**
Horizontal	Peak emissions were not above the measurements system noise floor or at least 20dB below the limit				2274.000	38.4	54.0	-15.6
					2337.960	34.6	54.0	-19.4
					4804.320	39.5	54.0	**-14.5***
Vertical	Peak emissions were not above the measurements system noise floor or at least 20dB below the limit				2274.000	37.6	54.0	-16.4
					2296.360	30.0	54.0	-24.0
					2338.220	34.2	54.0	-19.8
					4804.320	37.1	54.0	-16.9
					4804.320	37.1	54.0	-16.9

**Worst-case emissions*

Table 13: Transmitter Spurious Emissions – 1GHz to 25GHz

Operating Channel: Middle, (2440MHz)								
Measurement Antenna Polarisation	**Peak Measurements**				**Average Measurements**			
	Frequency (MHz)	**Result (dBµV/m)**	**Limit (dBµV/m)**	**Delta Limit (dB)**	**Frequency (MHz)**	**Result (dBµV/m)**	**Limit (dBµV/m)**	**Delta Limit (dB)**
Horizontal	Peak emissions were not above the measurements system noise floor or at least 20dB below the limit				2312.220	39.5	54.0	-14.5
					2334.580	30.1	54.0	-23.9
					2375.920	32.8	54.0	-21.2
					4879.680	40.5	54.0	-13.5
					7319.920	47.1	54.0	**-6.8***
Vertical	Peak emissions were not above the measurements system noise floor or at least 20dB below the limit				2311.960	38.7	54.0	-15.3
					2334.320	30.2	54.0	-23.8
					2376.180	32.7	54.0	-21.3
					4880.160	40.2	54.0	-13.7
					7320.880	44.4	54.0	-9.6
					7320.880	44.4	54.0	-9.6

**Worst-case emission*

Table 14: Transmitter Spurious Emissions – 1GHz to 25GHz

Operating Channel: Top, (2480MHz)								
Measurement Antenna Polarisation	**Peak Measurements**				**Average Measurements**			
	Frequency (MHz)	**Result (dBµV/m)**	**Limit (dBµV/m)**	**Delta Limit (dB)**	**Frequency (MHz)**	**Result (dBµV/m)**	**Limit (dBµV/m)**	**Delta Limit (dB)**
Horizontal	Peak emissions were not above the measurements system noise floor or at least 20dB below the limit				2340.820	27.6	54.0	-26.4
					2352.000	38.2	54.0	-15.8
					2608.100	31.0	54.0	-23.0
					4960.320	47.6	54.0	**-6.4***
					7439.680	45.6	54.0	-8.4
Vertical	Peak emissions were not above the measurements system noise floor or at least 20dB below the limit				2352.000	36.7	54.0	-17.3
					2374.360	27.6	54.0	-26.4
					2608.100	30.2	54.0	-23.8
					4960.320	41.9	54.0	-12.1
					7440.880	41.6	54.0	-12.3
					7440.880	41.6	54.0	-12.3

**Worst-case emissions, +Refer to measurement uncertainty statement*

Table 15: Transmitter Spurious Emissions – 1GHz to 25GHz

The measurement uncertainty was calculated as follows:

Measurement frequency range	Calculated measurement uncertainty
30MHz to 1GHz	±4.65dB
1GHz to 6GHz	±4.83dB
6GHz to 18GHz	±4.49dB
18GHz to 26.5GHz	±4.46dB

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	22 – 26°C
Humidity:	49 – 56%
Atmospheric pressure:	1010.2 to 1011.6 hPa

Table 16: Climatic conditions

Calculation: The above results are based upon the following calculation:

$$E = V_{QP/PK/AV} + AF - G_{Amp} + L_C$$

Where:

E	=	E-field in dBμV/m
$V_{QP/PK/AV}$	=	Measured Voltage (Quasi Peak, Peak or Average) in dBμV
AF	=	Antenna Factor in dB(/m)
L_C	=	Cable and attenuator Loss in dB
G_{Amp}	=	Pre Amplifier Voltage Gain in dB

Example calculation:

$E = V_{PK} + AF - G_{Amp} + L_C$
$E = 30dB\mu V + 12dB/m - 0dB + 2.3dB$
$E = 44.3\ dB\mu V/m$

Notes: All Transmitter Radiated spurious emissions in restricted bands measurements were below the specified limits.

Radiated Emissions measurements were made up to the 10th harmonic.

The transmitter was continuously transmitting in modulated transmit mode.

Assessment: The EUT complied with the Radiated emissions in Restricted bands requirements of CFR47 FCC Part 15, Subpart C, 15.247 (d).

15. Out of Band emissions (100kHz, -20dBc) - FCC 15.247 (d)

15.1. Test Procedure

The Out of band emissions in non-restricted bands were performed in accordance with the section 11.11 of ANSI C63.10 – 2013.

Measurements were performed at the antenna port.

The EUT was placed inside a shielded chamber. The transmitter output was connected to a spectrum analyzer through a suitable attenuator (Conducted method). The out of band emissions were measured by spectrum analyzer with 100kHz RBW and 300kHz VBW using the peak detector. All measuring system correction factors (attenuators and cables) were used to get a true measurement.

Reference and emission level measurements were performed as per section 11.11.2 and 11.11.3 of ANSI ANSI C63.10 - 2013.

(Refer to photographs in Annex C for views of the test configuration)

15.2. Limits

As per section 15.247(d) of 47 CFR Part 15 Subpart C:

- 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, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of section 15.247 of 47 CFR Part 15 Subpart C, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section 15.209(a) of 47 CFR Part 15 Subpart C is not required. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a) of 47 CFR Part 15 Subpart C, must also comply with the radiated emission limits specified in section15.209(a) of 47 CFR Part 15 Subpart C (see §15.205(c) of 47 CFR Part 15 Subpart C).

The measured highest fundamental channel PSD in 100kHz was -6.2dBm

Frequency Range (MHz)	Limits (dBm)
30MHz and 25GHz	-26.2

Table 17: Limits for Unwanted Emissions - -20dBc (Non-restricted bands)

15.3.Test Results

Unwanted emissions measurements are detailed as follows:

Channel	Frequency (MHz)	Measured Level (dBm)	Limit (dBm)	Delta limit (dB)
Bottom	2530.133	-52.3	-26.2	-26.1
	7205.666	-45.5	-26.2	**-19.3***
	Peak emissions >20dB below limit or no significant emissions above the noise floor observed			
Middle	2568.133	-49.3	-26.2	-23.1
	Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed			
Top	2596.800	-54.1	-26.2	-27.9
	Peak preview emissions >20dB below limit or no significant emissions above the noise floor observed			

**Worst-case emissions*

Table 18: Transmitter Out of Band emissions - -20dBc/100kHz

The measurement uncertainty was calculated as follows:

Measurement frequency range	Calculated measurement uncertainty
30MHz to 25GHz	±1.4dB

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

Notes: All Transmitter Out of Band emissions measurements were below the specified limits (-20dBc).

Radiated measurements were made up to the 10th harmonic.

The transmitter was continuously transmitting in modulated transmit mode.

Assessment: The EUT complied with the Out of Band emissions (100kHz, -20dBc) requirements of CFR47 FCC Part 15, Subpart C, 15.247 (d).

16. Emissions on the Band edge – FCC 15.247 (d)

16.1. Test Procedure

The Band edge Measurement (100kHz, -20dB from fc & Restricted bands) was performed in accordance with the section 11.11, 11.12 and 11.13 of ANSI C63.10 – 2013.

Conducted measurements were performed within 2 MHz of the authorised lower band-edge.

At the lowest channel, 99% Occupied Band Width of the fundamental channel emission was within 2 MHz of the authorised Lower band edge therefore Marker-delta method was used. Unwanted emission at the lower band-edge were performed as per section 6.10.4 of ANSI C63.10 - 2013. At authorised-band band edge where the requiring band-edge emission attenuation is -20dB in a 100kHz bandwidth relative to the highest fundamental channel PSD in 100kHz. Radiated peak measurements were performed as per as section 6.10.4 of ANSI C63.10 - 2013.

The higher end of the band-edge was in restricted-band therefore measurements were performed as per section 6.10.5 of ANSI C63.10 - 2013. The FCC 15.209 limits are applicable to emission in restricted-band band-edge

(Refer to photographs in Annex C for views of the test configuration)

16.2. Limits

Band edge in Non-restricted Bands

As per CFR47 FCC Part 15, Subpart C, 15.247 (d) the EUT shall meet the requirements that in any given 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.

The measured highest fundamental channel PSD in 100kHz was -6.2dBm

Band edge Frequencies	Limits (dBm)
Lower Edge (2402MHz)	-26.2

Table 19: Limits for Band edge - -20dBc (Non-restricted bands)

Band edge in Restricted Bands

As per CFR47 FCC Part 15, Subpart C, 15.247 (d) and 15.209 (Transmitter emission limits) the EUT is required to meet the limits that permit the highest field strength of the following table for the radiated emissions which fall in the restricted bands, as defined in section 15.205(a) of 47 CFR Part 15 Subpart C :

Band edge Frequencies	Limits at 3m (dBμV/m)
2483.5MHz to 2485.5	54.0

Note 1: as per CFR FCC Part 15.35 (b), The emission limits shown in the above table are based on measurements employing an average detector.

Table 20: Limits for Radiated Spurious Emissions at distance of 3m – Restricted Bands.

16.3.Test Results

Band edge measurements are detailed as follows:

(Refer to graphs in Appendix C.2)

Operating Channel: Bottom (2402MHz)			
Frequency (MHz)	**Result Radiated Peak Power Spectral Density (dBm/100kHz)**	**Limit Radiated Peak Power Spectral Density (dBm/100kHz)**	**Delta limit (dB)**
2399.999	-58.6	-26.2	-32.4

Table 21: Transmitter Emissions on the Band edge - Low end

Operating Channel: Top (2480MHz)								
Measurement Antenna Polarisation	**Peak Measurements**				**Average Measurements**			
	Frequency (MHz)	**Result (dBμV/m)**	**Limit (dBμV/m)**	**Delta Limit (dB)**	**Frequency (MHz)**	**Result (dBμV/m)**	**Limit (dBμV/m)**	**Delta Limit (dB)**
Horizontal	2483.500	39.3	74.0	-34.7	2483.500	29.3	54.0	-24.7
	2485.320	38.5	74.0	-35.5	2485.320	28.4	54.0	-25.6
Vertical	2483.500	40.1	74.0	**-33.9***	2483.500	29.4	54.0	**-24.6***
	2485.400	38.2	74.0	-35.8	2485.400	27.2	54.0	-26.8

**Worst-case emissions*

Table 22: Transmitter Emissions on the Band edge - High end

The measurement uncertainty was calculated as follows:

Measurement frequency range	Calculated measurement uncertainty
Radiated (1GHz to 6GHz)	±4.83dB
Conducted (1GHz to 6GHz)	±1.4dB

The reported uncertainty is an expanded uncertainty calculated using a coverage factor of *k=2* which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	22 to 24°C
Humidity:	35 to 38%
Atmospheric pressure:	1016.9 to 1017.7 hPa

Table 23: Climatic conditions

Calculation: The above results are based upon the following calculation:

$$E = V_{QP/PK/AV} + AF - G_{Amp} + L_C$$

Where:

E = E-field in dBμV/m
$V_{QP/PK/AV}$ = Measured Voltage (Quasi Peak, Peak or Average) in dBμV
AF = Antenna Factor in dB(/m)
L_C = Cable and attenuator Loss in dB
G_{Amp} = Pre Amplifier Voltage Gain in dB

Example calculation:

$E = V_{PK} + AF - G_{Amp} + L_C$
$E = 30dB\mu V + 12dB/m - 0dB + 2.3dB$
$E = 44.3\ dB\mu V/m$

Notes: All Band edge measurements were below the specified limits.

The transmitter was continuously transmitting in modulated transmit mode.

Assessment: The EUT complied with the Transmitter Emissions on the Band edge requirements of CFR47 FCC Part 15, Subpart C, 15.247 (d).

17. Power Spectral Density – FCC 15.247 (e)

17.1. Test Procedure

The Power Spectral Density was performed in accordance with the section 11.10 of ANSI C63.10 - 2013.

The transmitter output was connected to a spectrum analyzer through a suitable attenuator (Conducted method). The Power Spectral density was measured in a 3kHz bandwidth of the fundamental frequency by spectrum analyzer with 3kHz RBW and 30kHz VBW using the peak detector and a suitable span to allow accurate measurements whilst capturing the full intentional transmission including side lobes.

(Refer to photographs in Annex C for views of the test configuration)

17.2. Limits

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. This power spectral density shall be determined in accordance with the provisions of CFR47 FCC Part 15, Subpart C, 15.247 (e). The same method of determining the conducted output power shall be used to determine the power spectral density.

Applicable only to systems using digital modulation techniques:

Transmit operating frequency (MHz)	Limit
2400 – 2483.5	8dBm/3kHz

Table 24: Power Spectral Density limits

17.3. Test Results

Power Spectral Density measurements are tabulated below:

(Refer to graphs in Appendix C.10)

Channel	Frequency (MHz)	Measured Power (dBm)	Limit (dBm/3kHz)	Margin (dB)	Result
Bottom	2402.212	-15.3	8.00	**-23.3***	Complied
Middle	2440.066	-16.0	8.00	-24.0	Complied
Top	2480.078	-16.6	8.00	-24.6	Complied

Table 25: Results for Power Spectral Density

The measurement uncertainty was calculated at ±1.4dB. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of approximately *k*=2 which gives a level of confidence of approximately 95%.

Climatic Conditions	
Temperature:	19°C
Humidity:	60%
Atmospheric pressure:	1017.1hPa

Table 26: Climatic conditions

Notes: All Power Spectral Density measurements were below the specified limits.

The transmitter was supplied by the customer to be continuously transmitting in modulated transmit mode.

Assessment: The EUT complied with the Power Spectral Density requirements of CFR47 FCC Part 15, Subpart C, 15.247 (e).

18. Exposure of Humans to RF fields (Radio Frequency Hazard)

SAR and RF Exposure exception evaluation

SAR exception evaluation

As per Appendix A of KDB 447498 D01 General RF Exposure Guidance v06

***SAR Test Exclusion Thresholds* for 100 MHz – 6 GHz and ≤ 50 mm**

Approximate SAR Test Exclusion Power Thresholds at Selected Frequencies and Test Separation Distances are illustrated in the following Table. The equation and threshold in 4.3.1 must be applied to determine SAR test exclusion.

MHz	5	10	15	20	25	mm
150	39	77	116	155	194	*SAR Test Exclusion Threshold* (mW)
300	27	55	82	110	137	
450	22	45	67	89	112	
835	16	33	49	66	82	
900	16	32	47	63	79	
1500	12	24	37	49	61	
1900	11	22	33	44	54	
2450	10	19	29	38	48	
3600	8	16	24	32	40	
5200	7	13	20	26	33	
5400	6	13	19	26	32	
5800	6	12	19	25	31	

SAR test exclusion threshold for 2402MHz transmitter is 10.16mW for 5mm distance.

The measured maximum peak conducted power is 0.27mW (-5.7dBm)
Customer declared antenna gain is +1dBi
Therefore the maximum EIRP is 0.34mW (Worst-case, Without Duty Cycle correction factor).

The measured EIRP is below the SAR exception threshold.

RF Exposure Evaluation

As per section 1.1310 of CFR 47 following Maximum Permissible Exposure (MPE) limits are applicable.

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

Limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields for 2402 to 2480MHz as per Table 1 of Section 15.1310 is 1 mW/cm^2 (General Population/Un-controlled).

Using equation

$$S = PG / 4\pi R^2$$

where: S = Power density
P = Power input to the antenna
G = Antenna gain
R = Distance to the center of radiation of the antenna

Prediction Worst case:

Maximum EIRP: 0.34mW (Worst-case, Without Duty Cycle correction factor)
Distance: 20cm
Calculated Power Density= 0.0000674 mW/cm^2
MPE limit for General Population/Un-controlled exposure: 1 mW/cm^2

Result: The measured EIRP is below the SAR exception threshold (5mm distance) and the calculated power density level at a distance of 20cm are below the maximum levels allowed by regulations.

19. Conclusion

The Adherium (NZ) Limited, NF0106, Hailie for Ellipta complied with the applicable requirements of CFR47 FCC Part 15, Subpart C, 15.247.

Appendix A – Test Equipment

Inv	Equipment	Make	Model No.	Serial No.	Calibration		
					Interval	Due	Type
Transmitter Maximum EIRP, Power Spectral Density, 6dB Bandwidth and Band-edge – Conducted Method							
1217	Analyser, EMI Receiver	Rohde & Schwarz	ESU40	100182	1 year	May-22	E
1092	ATTENUATOR, 6dB, 2W	Fairview Microwave	SA26B-06	1092	1 year	Jan-22	I
1248	Hygrometer, Temp, Humidity	Thomas Scientific	6066N53	181037404	2 years	Feb-22	I
0666	Enclosure, Semi-Anechoic, No 1	RFI Industries	S800 iOATS	1229	2.5 years	Jul-22	I
Radiated Emissions							
1217	ANALYSER, EMI Receiver	Rohde & Schwarz	ESU40	100182	1 year	May-22	E
0935	ANTENNA, Biconilog	Sunol Sciences	JB5	A071106	2 years	Feb-23	E
0718	ATTENUATOR, 6dB	JFW	50FPE-006	N/A	3 years	Jan-22	I
0633	ANTENNA, Double Ridge Horn	EMCO	3115	9712-5369	3 years	Aug-24	I
0559	PRE-AMP, Microwave, 18GHz	Miteq	AFS8	605305	1 year	Mar-22	I
1193	Standard Gain Horn Antenna - 5.85GHz to 8.2GHz	A.H. Systems, inc	SAS-584	186	1 year	May-22	E
1194	Standard Gain Horn Antenna - 8.2GHz to 12.4GHz	A.H. Systems, inc	SAS-585	224	1 year	May-22	E
1195	Standard Gain Horn Antenna - 12.4GHz to 18.0GHz	A.H. Systems, inc	SAS-586	195	1 year	May-22	E
1196	Standard Gain Horn Antenna - 18.0GHz to 26.5GHz	A.H. Systems, inc	SAS-587	181	1 year	Apr-22	E
0932	CONTROLLER, Position	Sunol Sciences	SC104V-3	081006-1	N/A	N/A	V
0933	TURNTABLE	Sunol Sciences	SM46C	081006-2	N/A	N/A	V
0934	MAST, Antenna	Sunol Sciences	TLT2	081006-5	N/A	N/A	V
1143	CABLE, Coax, Sucoflex 104PA	Huber + Suhner	84287041	SN MY058/4PA	1 year	Jan-23	I
1145	CABLE, Coax, Sucoflex 104PA	Huber + Suhner	84279564	SN MY056/4PA	1 year	Jan-23	I
1238	CABLE, Coax, Sucoflex 126 E	Huber + Suhner	10422876	8000495/126E	1 year	Jan-23	I
1248	Hygrometer, Temp, Humidity	Thomas Scientific	6066N53	181037404	2 years	Feb-22	I
0666	Enclosure, Semi-Anechoic, No 1	RFI Industries	S800 iOATS	1229	2.5 years	Jul-22	I
SW007	EMC Measurement Software	Rohde & Schwarz	EMC 32	Version 8.53.0	N/A	N/A	N/A

V: Verification of operation against an internal reference
I: Internal calibration against a traceable standard
E: External calibration by a NATA endorsed facility
N/A: Not Applicable

Appendix B – Photographs

Annex	Number	Photograph Description
A	1	EUT - External views
A	2	
A	3	
A	4	
A	5	
A	6	EUT – View of sample with temporary DC power supply connection – Radiated method testing
A	7	Support Equipment – Inhaler – Radiated method testing
B	1	EUT - Internal views
B	2	
B	3	
B	4	
B	5	
B	6	
B	7	
B	8	
B	9	
B	10	
B	11	EUT – View of the PCB trace antenna
B	12	EUT – View of the sample with temporary SMA antenna port connector and DC external power supply connection for Conducted method testing.
C	1	Radiated measurements – EUT X Orientation
C	2	Radiated measurements – EUT Y Orientation
C	3	Radiated measurements – EUT Z Orientation
C	4	Radiated measurements – 9kHz to 30MHz – X Antenna orientation
C	5	Radiated measurements – 9kHz to 30MHz – Y Antenna orientation
C	6	Radiated measurements – 9kHz to 30MHz – Z Antenna orientation
C	7	Radiated measurements – below 1GHz
C	8	Radiated measurements – above 1GHz
C	9	Conducted measurements

EUT External Photographs	EMC Bayswater Test Report E2112-1497-2 Annex A
EUT Internal Photographs	EMC Bayswater Test Report E2112-1497-2 Annex B
EUT Orientations & Test Configurations Photographs	EMC Bayswater Test Report E2112-1497-2 Annex C

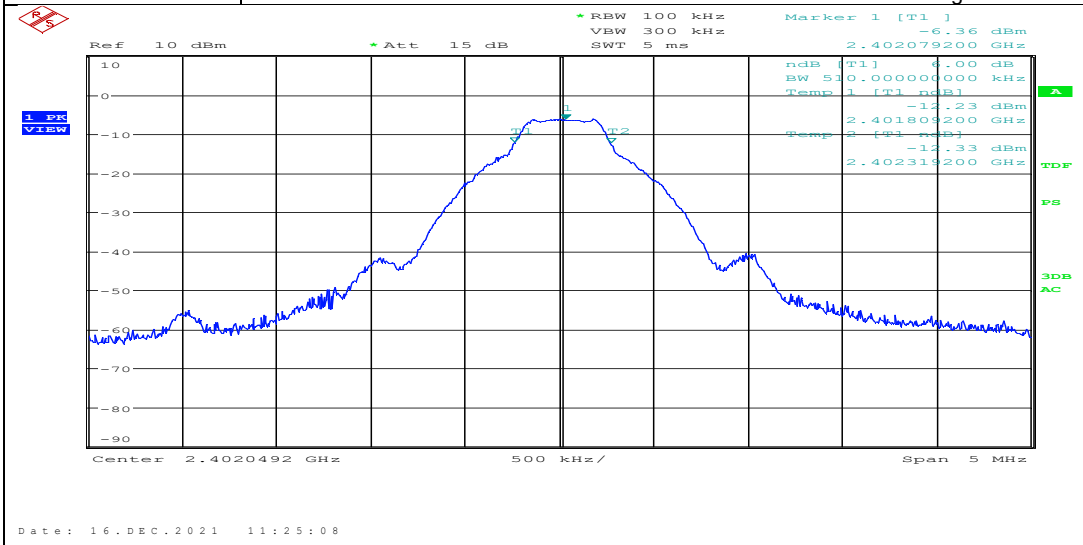
Appendix C.1 – Measurement Graphs –6dB Bandwidth - 15.247 (a) (2)

No.	Test	Graph Description
1	6dB Bandwidth	2402MHz Channel
2		2440MHz Channel
3		2480MHz Channel

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - 6dB Bandwidth
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel

Job Number: E2112-1497-2
Test Engineer: **NL**

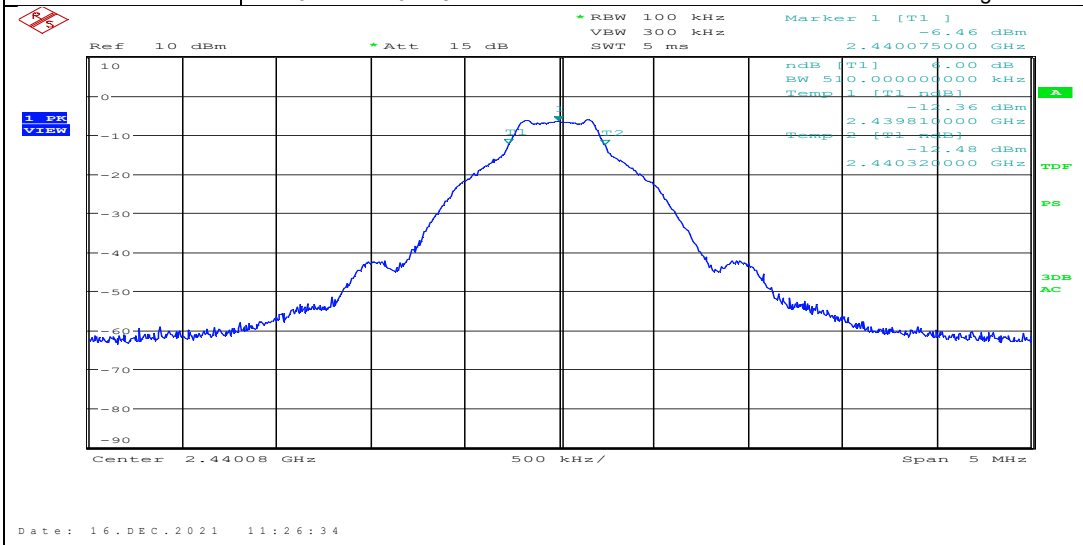


Graph 1

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - 6dB Bandwidth
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel

Job Number: E2112-1497-2
Test Engineer: **NL**



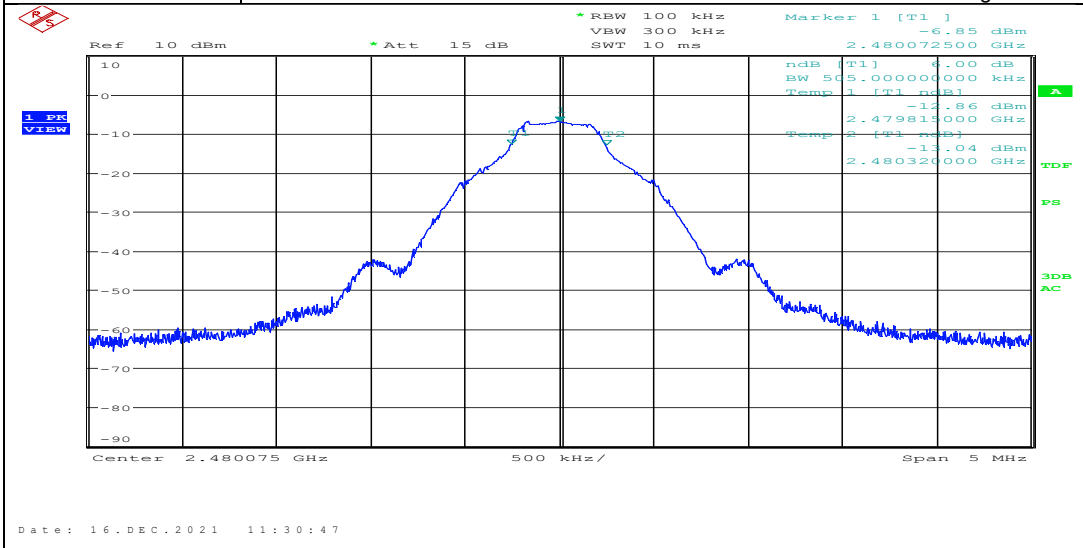
Graph 2

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - 6dB Bandwidth
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel

Job Number: E2112-1497-2

Test Engineer: **NL**



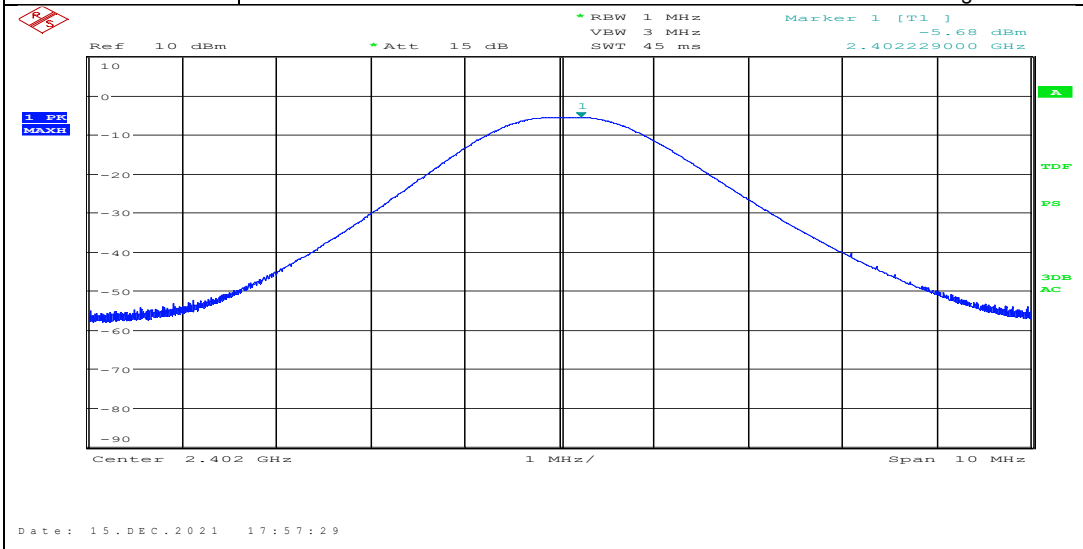
Appendix C.2 – Measurement Graphs – Maximum Peak Conducted Output Power - 15.247 (b)(3)

No.	Test	Graph Description
3	Maximum Peak Conducted Output Power	2402MHz Channel
4		2440MHz Channel
5		2480MHz Channel

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Maximum Peak Conducted Output Power
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel

Job Number: E2112-1497-2
Test Engineer: NL

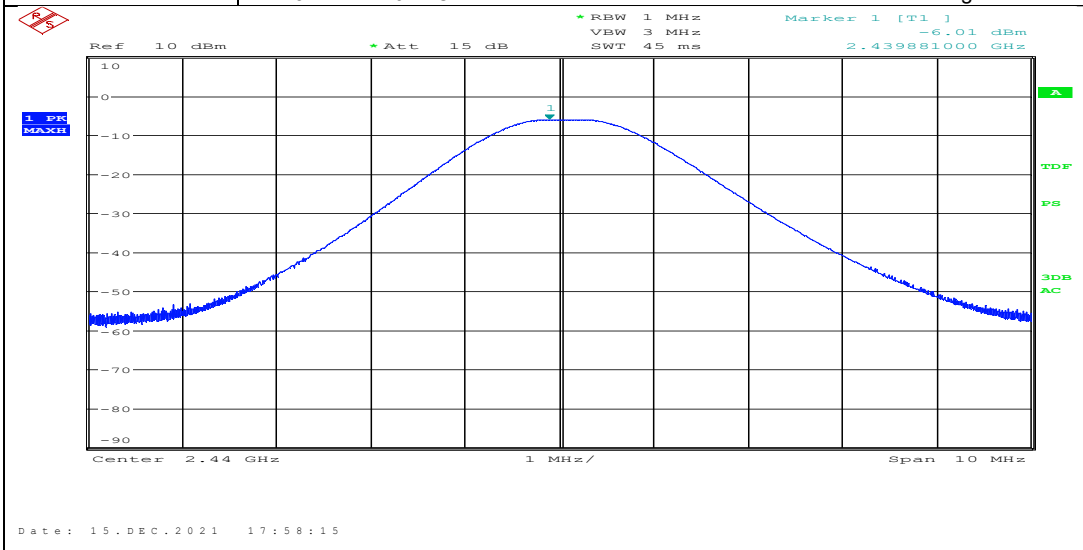


Graph 3

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Maximum Peak Conducted Output Power
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel

Job Number: E2112-1497-2
Test Engineer: NL



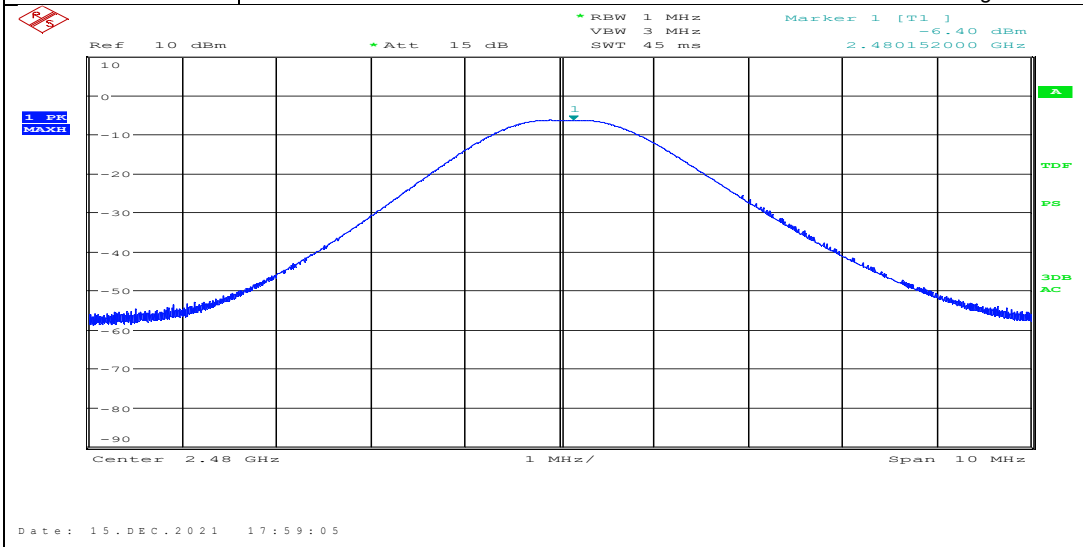
Graph 4

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Maximum Peak Conducted Output Power
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel

Job Number: E2112-1497-2

Test Engineer: NL



Graph 5

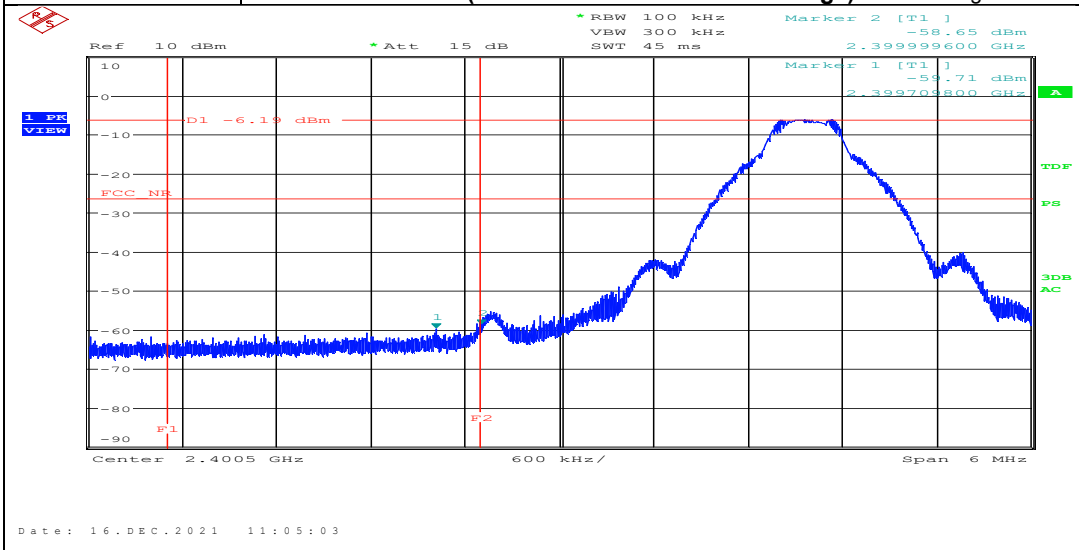
Appendix C.3 – Measurement Graphs – Band Edge - 15.247 (d)-

No.	Test	Graph Description
6	Band edge Measurement	2402MHz Channel (Non-restricted Band – Bandedge)
7	Band edge Measurement	2480MHz Channel (Restricted Bands) – Horizontal measurement Antenna
8		2480MHz Channel (Restricted Bands) – Vertical measurement Antenna

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Band edge Measurement (100kHz, -20dB from fc)
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel (Non-restricted Band – Bandedge)

Job Number: E2112-1497-2
Test Engineer: NL

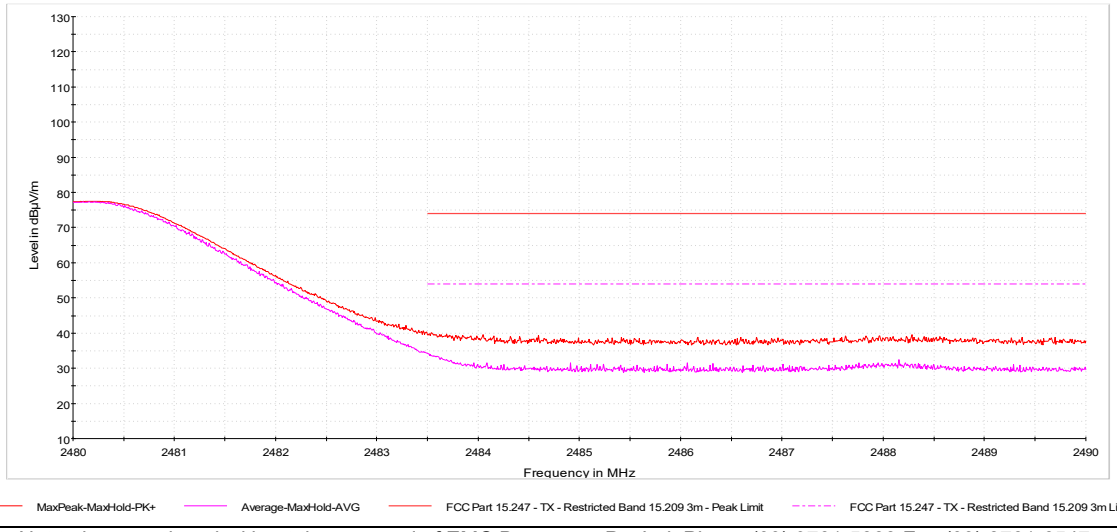


Graph 6

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Band edge Measurement
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel (Restricted Bands) – Horizontal measurement Antenna

Job Number: E2112-1497-2
Test Engineer: AZ



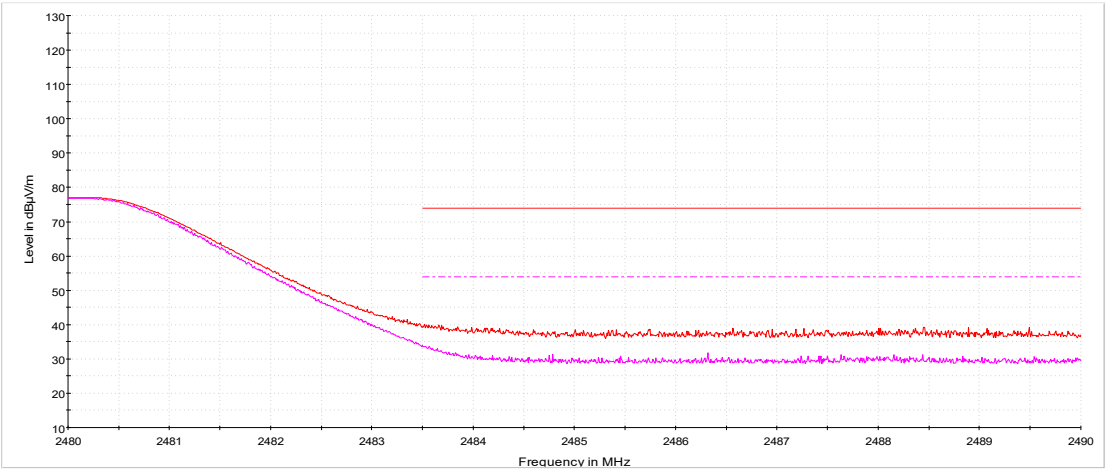
Graph 7

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Band edge Measurement
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel (Restricted Bands) – Horizontal measurement Antenna

Job Number: E2112-1497-2

Test Engineer: AZ



Graph 8

Appendix C.4 – Measurement Graphs – Radiated emissions in Restricted bands – FCC 15.247 (d), 15.209

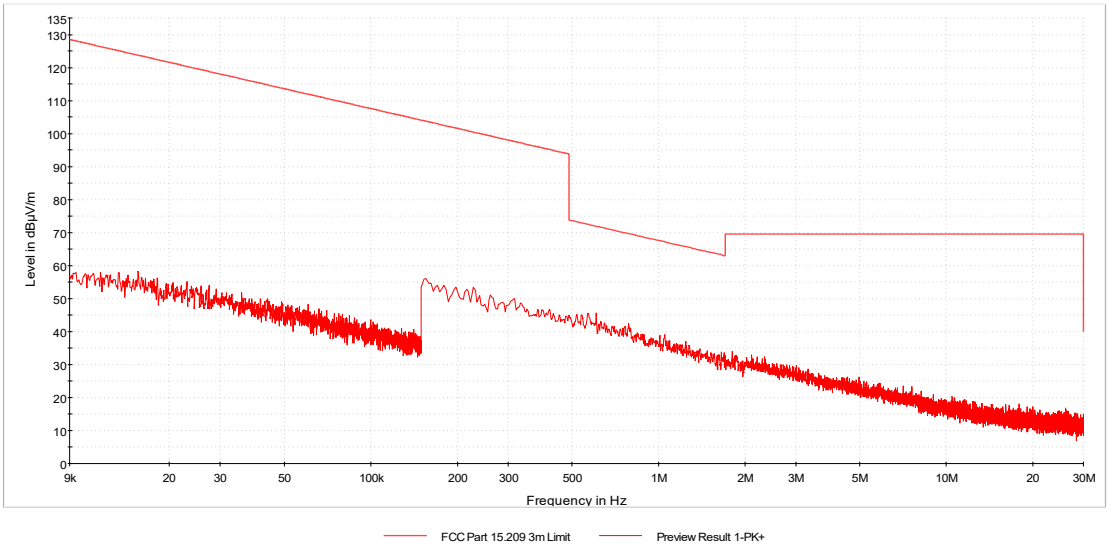
No.	Test	Graph Description
9	Radiated emissions in Restricted bands 2402MHz Channel	9kHz to 30MHz
10		30MHz to 1GHz
11		1GHz to 6GHz
12		5.8GHz to 8.2GHz
13		8.2GHz to 12.4GHz
14		12.4GHz to 18GHz
15		18GHz to 25GHz
16	Radiated emissions in Restricted bands 2440MHz Channel	9kHz to 30MHz
17		30MHz to 1GHz
18		1GHz to 6GHz
19		5.8GHz to 8.2GHz
20		8.2GHz to 12.4GHz
21		12.4GHz to 18GHz
22		18GHz to 25GHz
23	Radiated emissions in Restricted bands 2440MHz Channel	9kHz to 30MHz
24		30MHz to 1GHz
25		1GHz to 6GHz
26		5.8GHz to 8.2GHz
27		8.2GHz to 12.4GHz
28		12.4GHz to 18GHz
29		18GHz to 25GHz

Note: Only worst-case graphs are presented

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel — 9KHz to 30MHz - X Antenna Orientation – EUT X

Job Number: E2112-1497-2
Test Engineer: AZ

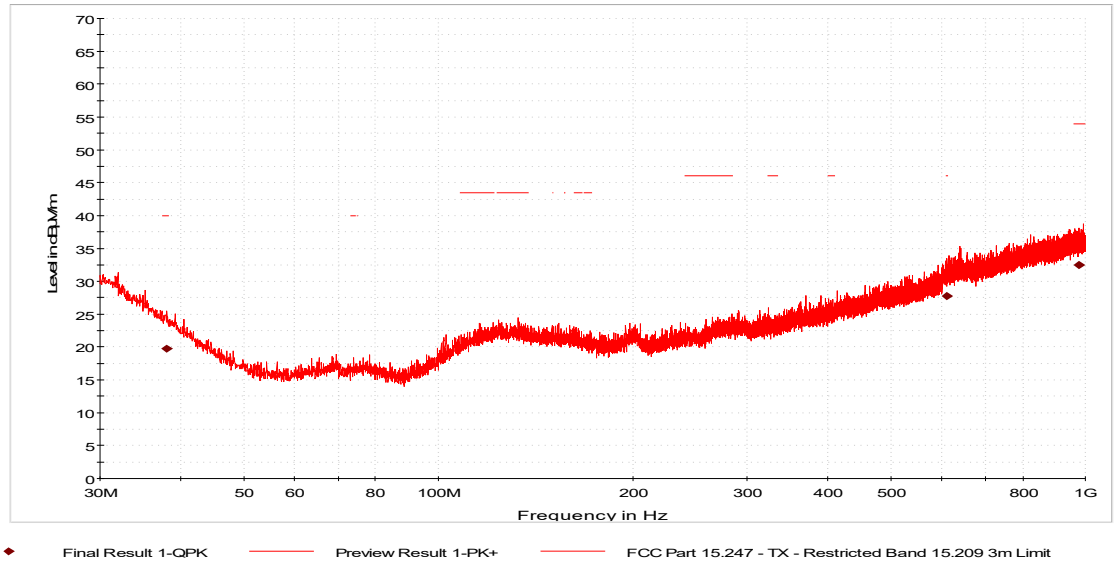


Graph 9

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel – 30MHz to 1GHz - Vertical Antenna Polarization – EUT X Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

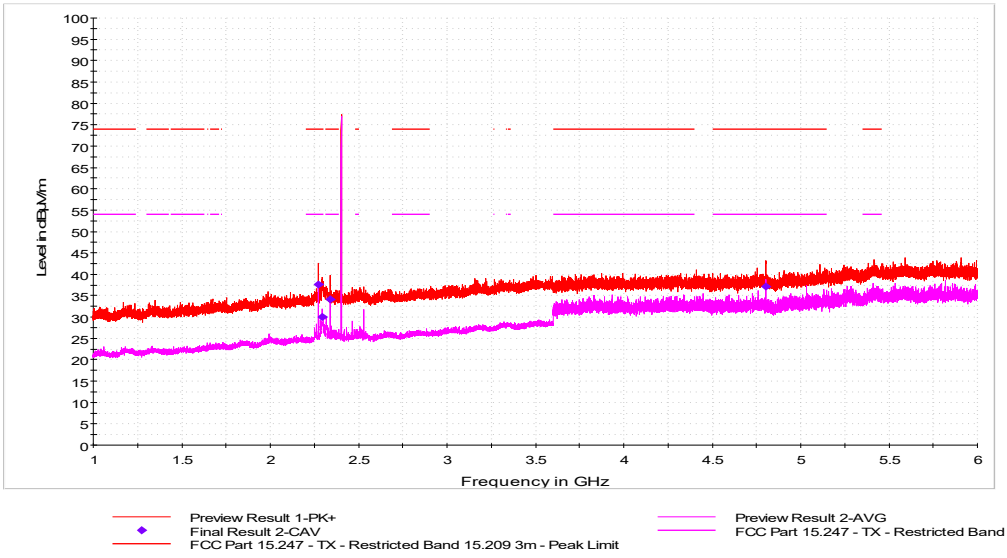


Graph 10

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel – 1GHz to 6GHz - Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: NL

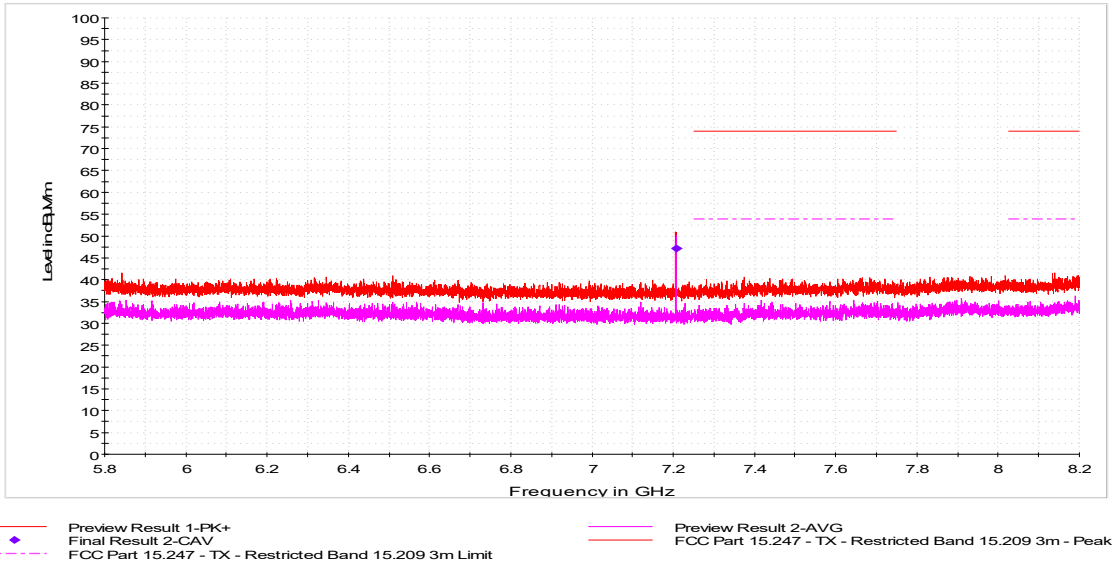


Graph 11

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel –5.8GHz to 8.2GHz – Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

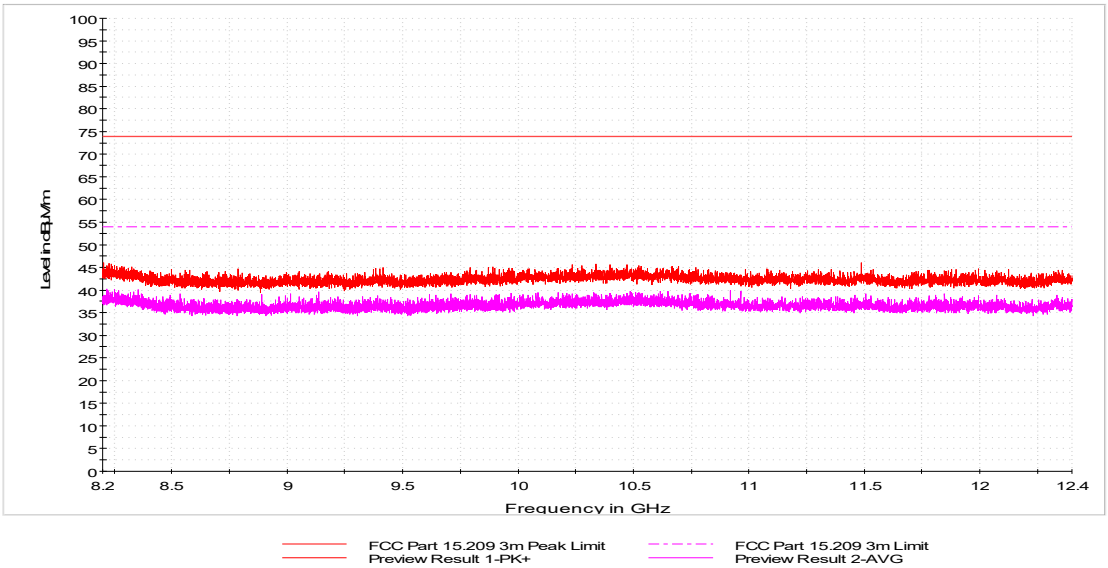


Graph 12

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel –8.2GHz to 12.4GHz - Horizontal Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

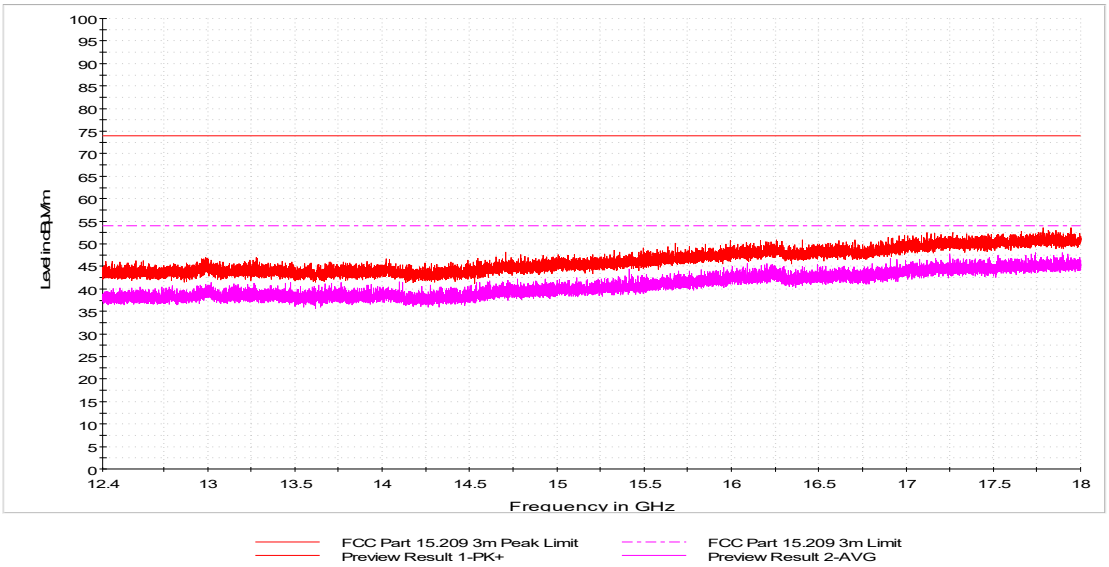


Graph 13

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel – 12.4GHz to 18GHz - Horizontal Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ



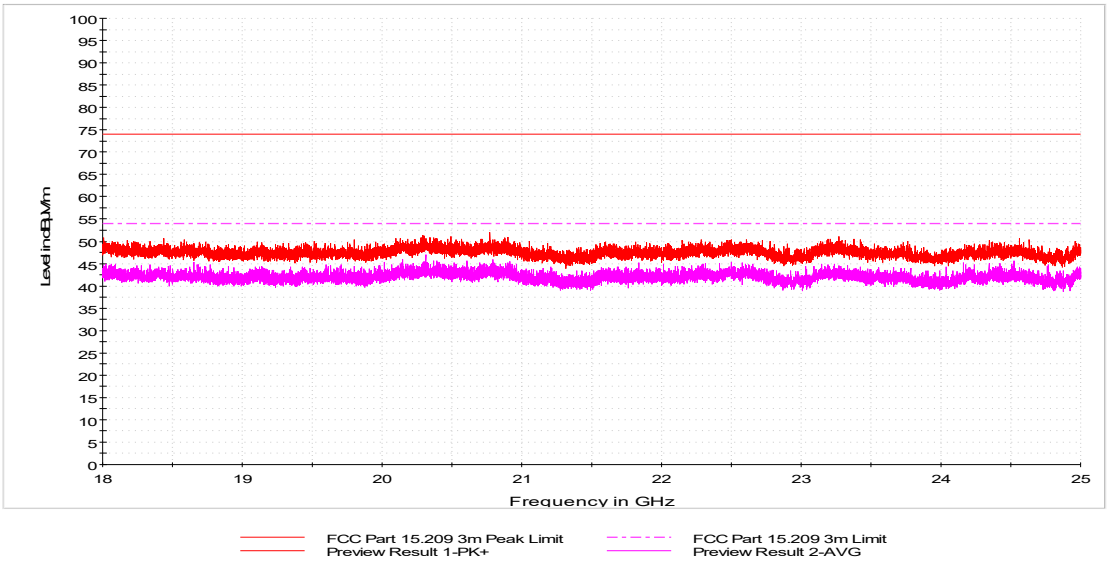
Graph 14

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel – 18GHz to 25GHz - Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2

Test Engineer: AZ

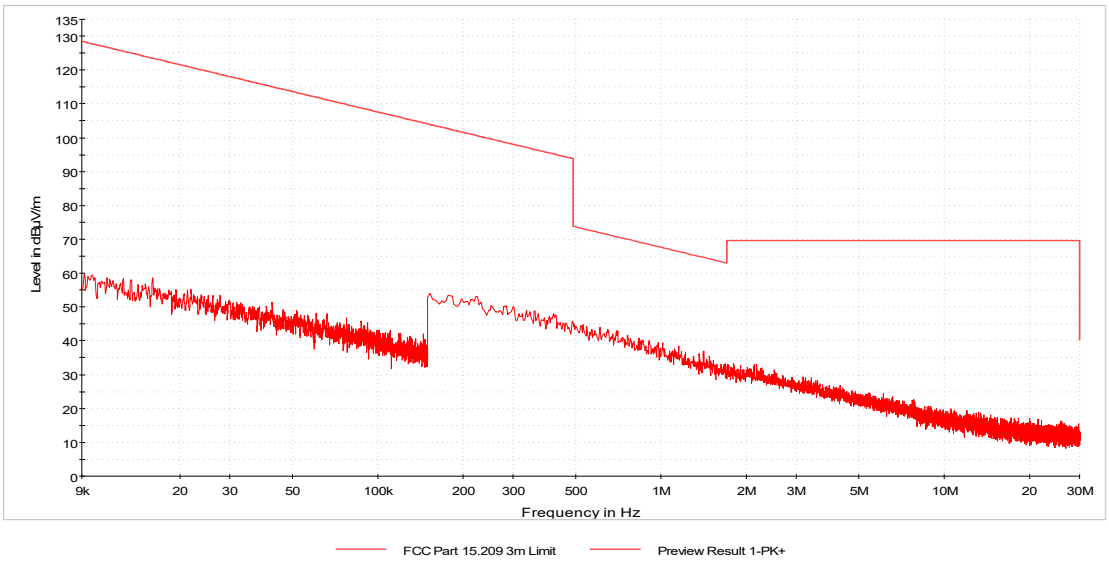


Graph 15

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel — 9KHz to 30MHz - X Antenna Orientation – EUT X

Job Number: E2112-1497-2
Test Engineer: AZ

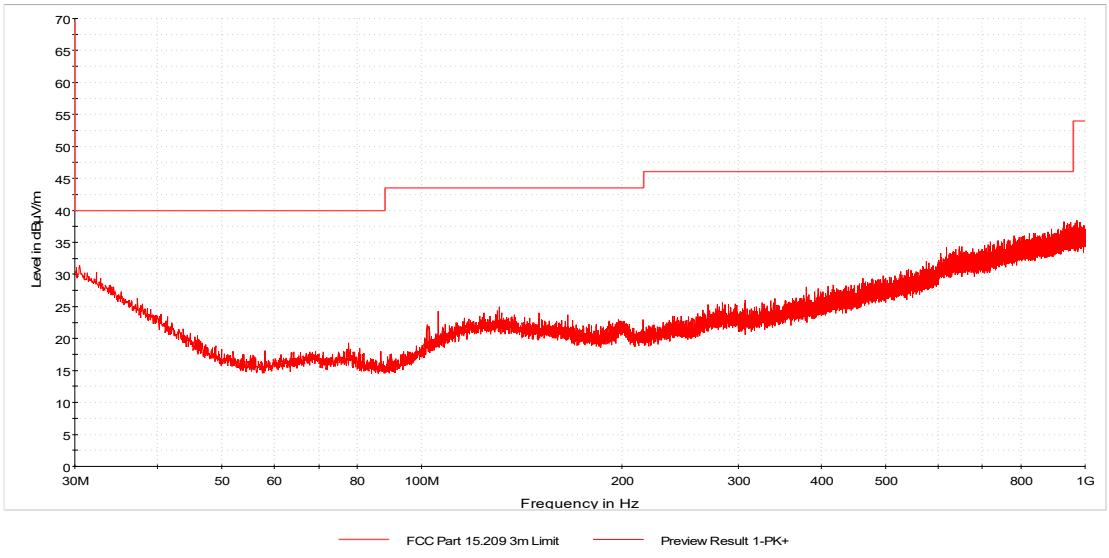


Graph 16

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel – 30MHz to 1GHz - Vertical Antenna Polarization – EUT X Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

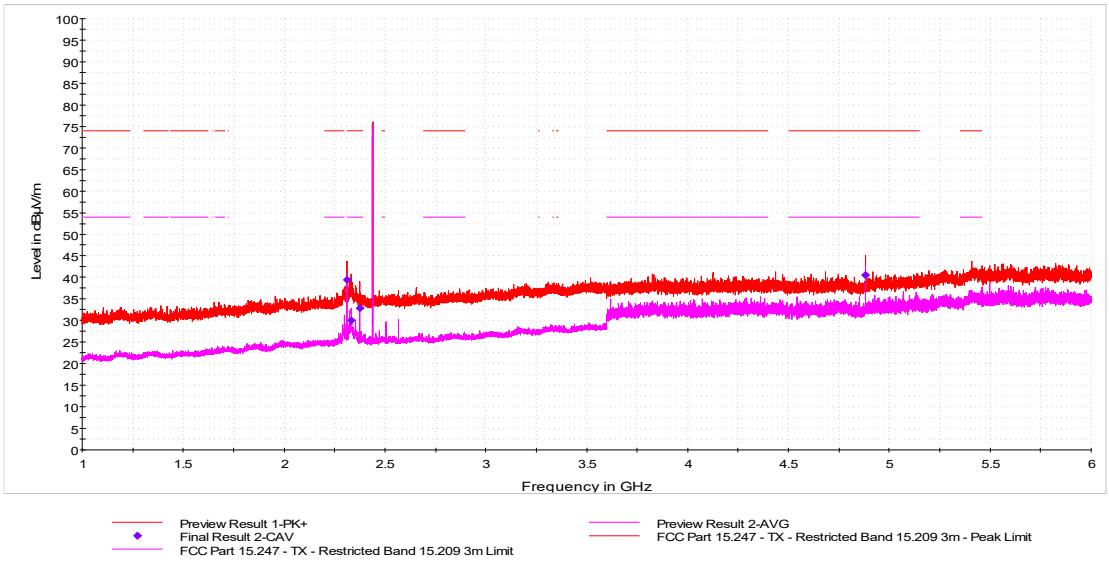


Graph 17

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel – 1GHz to 6GHz - Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: NL

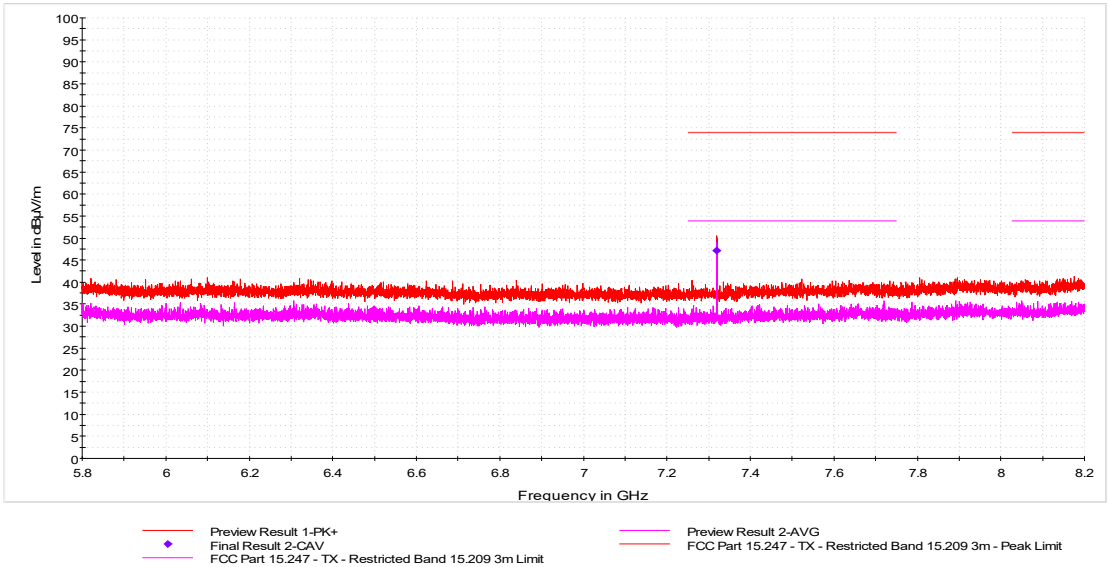


Graph 18

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel –5.8GHz to 8.2GHz – Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

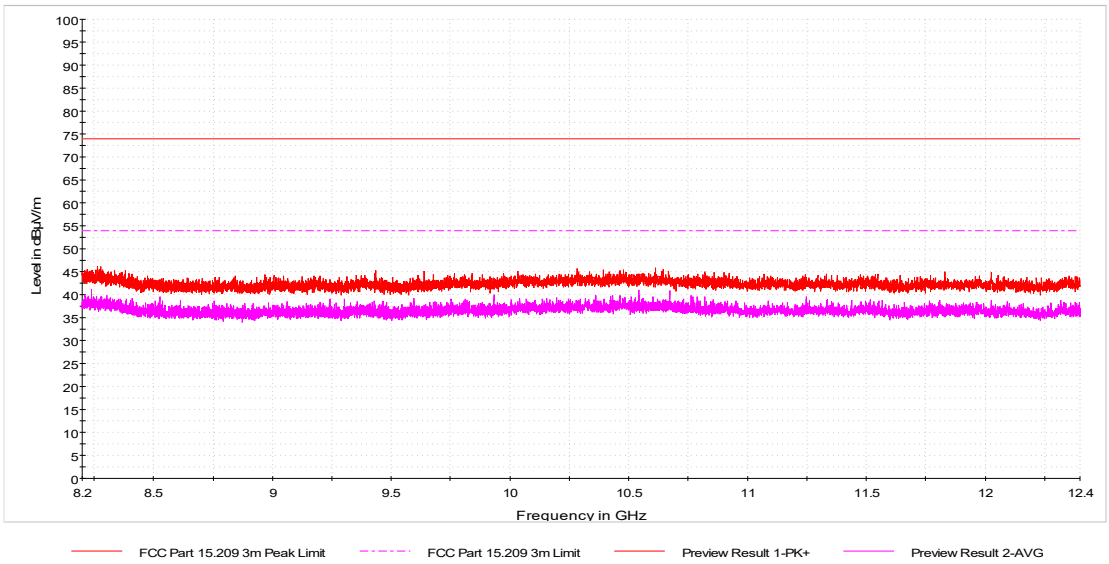


Graph 19

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel –8.2GHz to 12.4GHz - Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

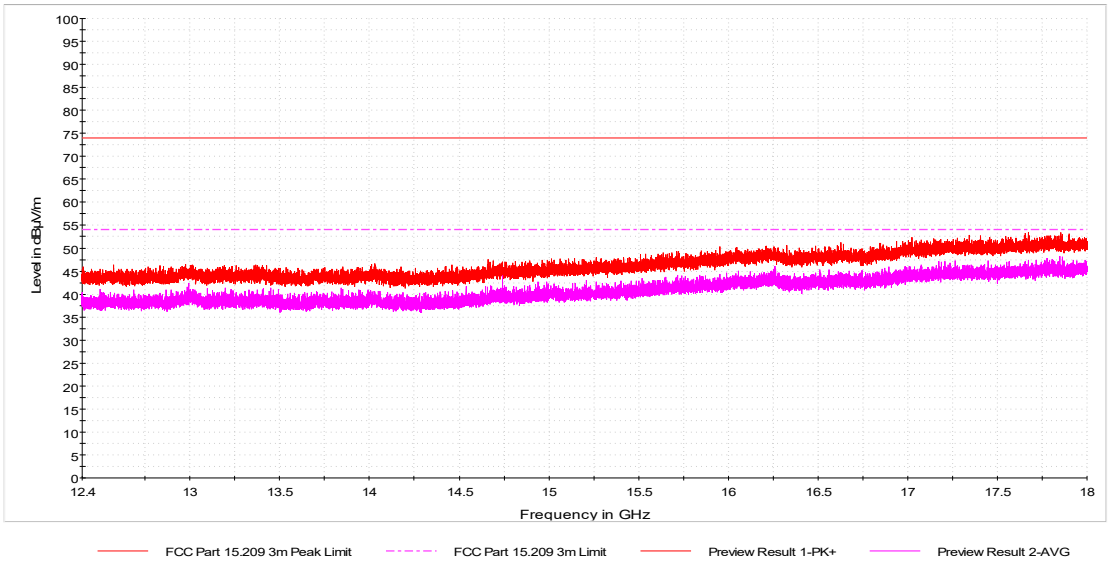


Graph 20

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel – 12.4GHz to 18GHz - Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

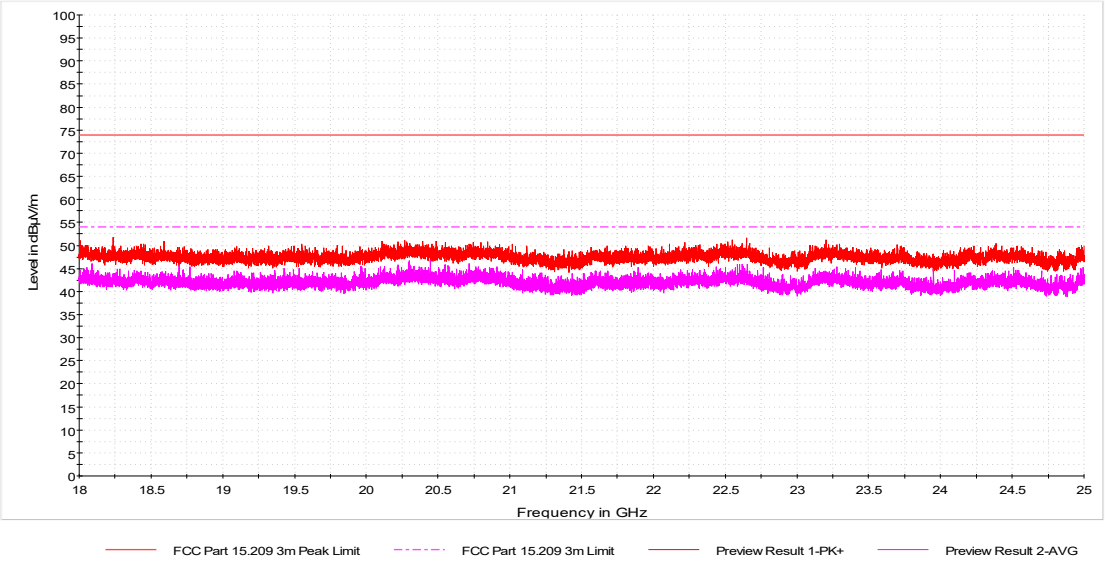


Graph 21

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel – 18GHz to 25GHz - Horizontal Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

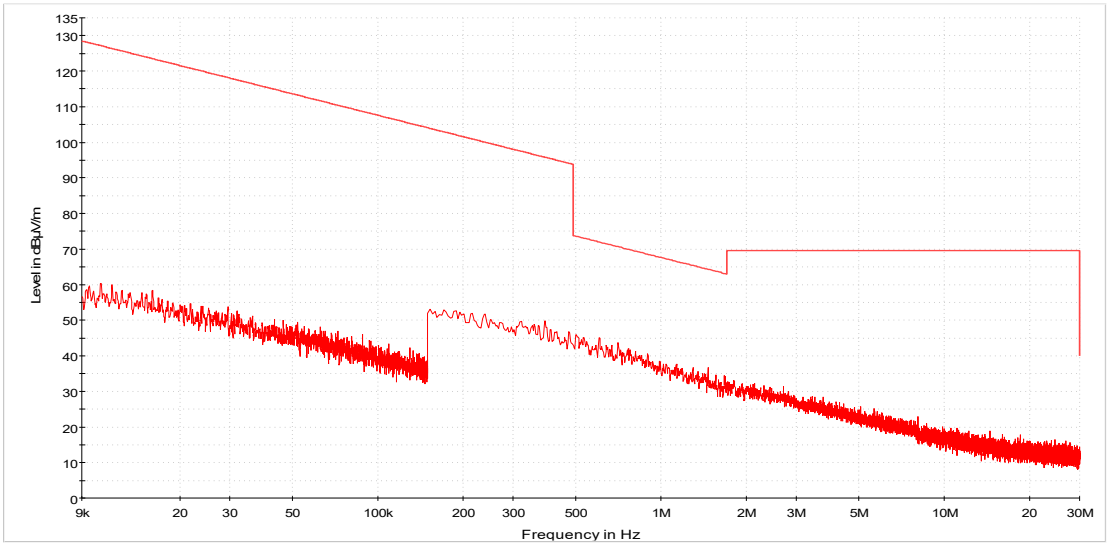


Graph 22

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel — 9KHz to 30MHz - X Antenna Orientation – EUT X Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

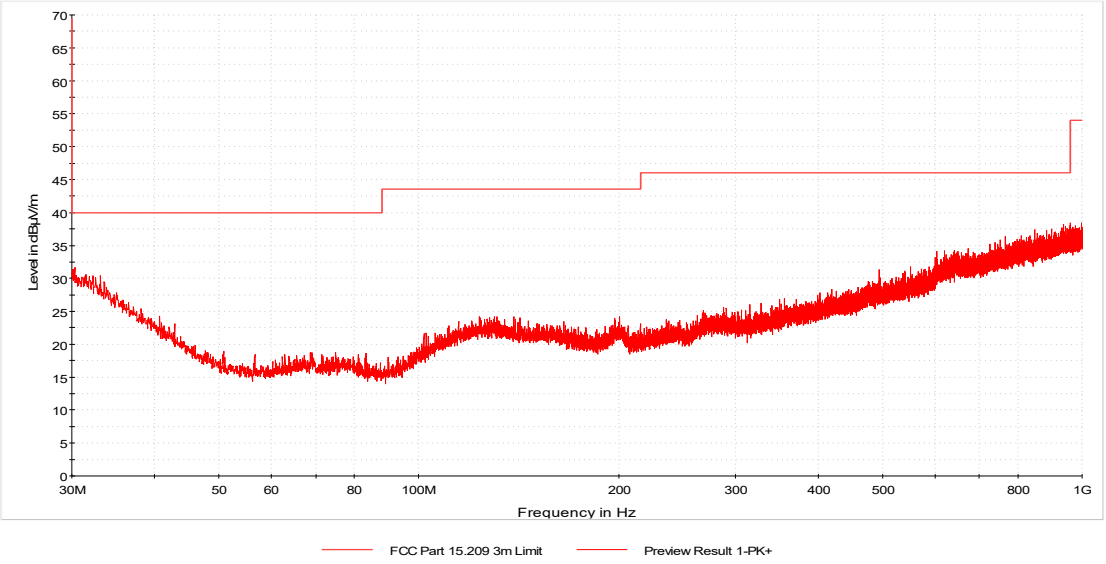


Graph 23

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel – 30MHz to 1GHz - Vertical Antenna Polarization – EUT X Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

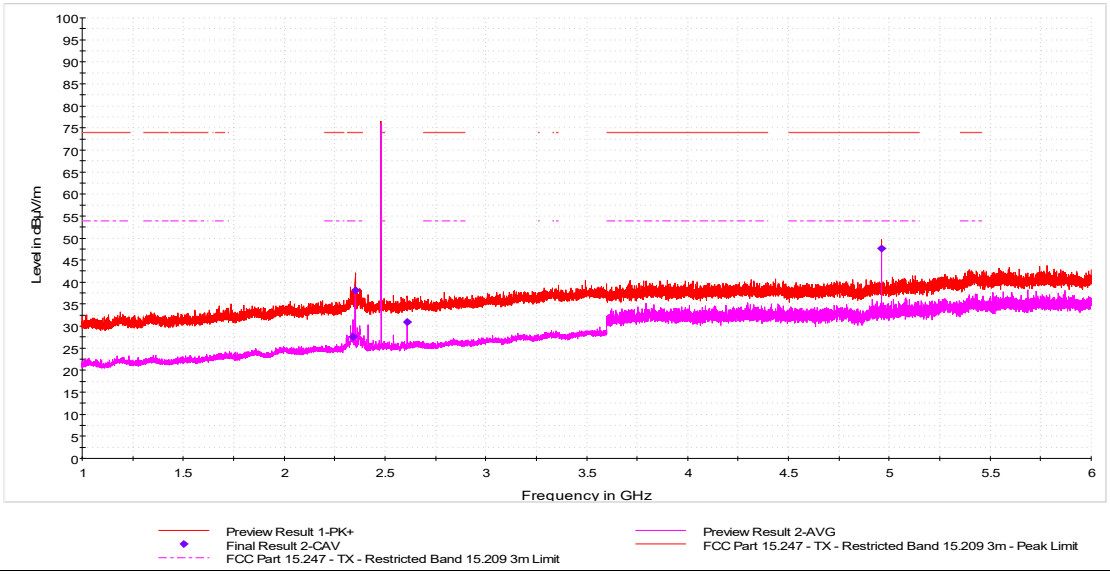


Graph 24

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel – 1GHz to 6GHz - Horizontal Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: NL

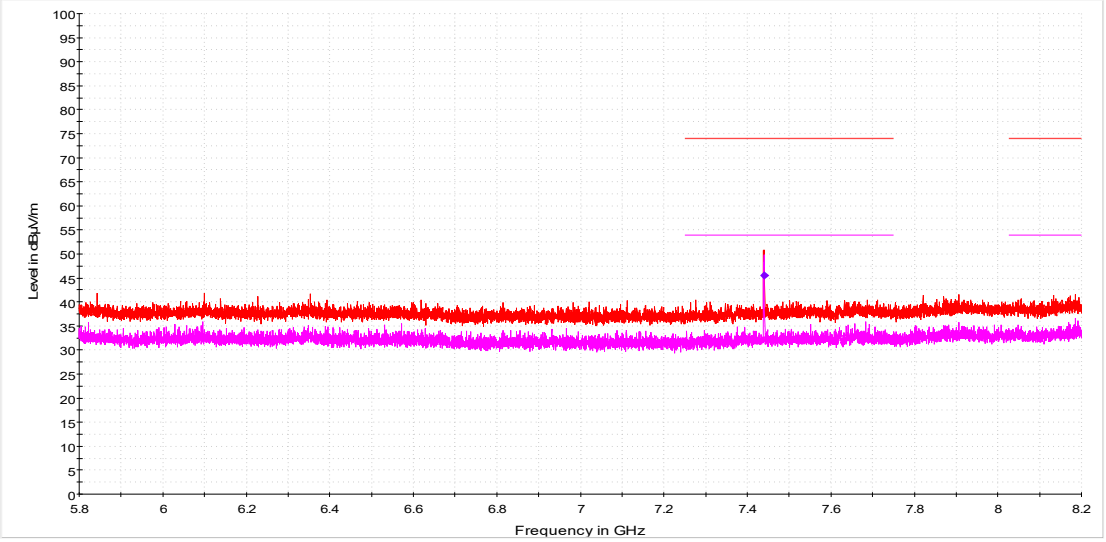


Graph 25

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel –5.8GHz to 8.2GHz – Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

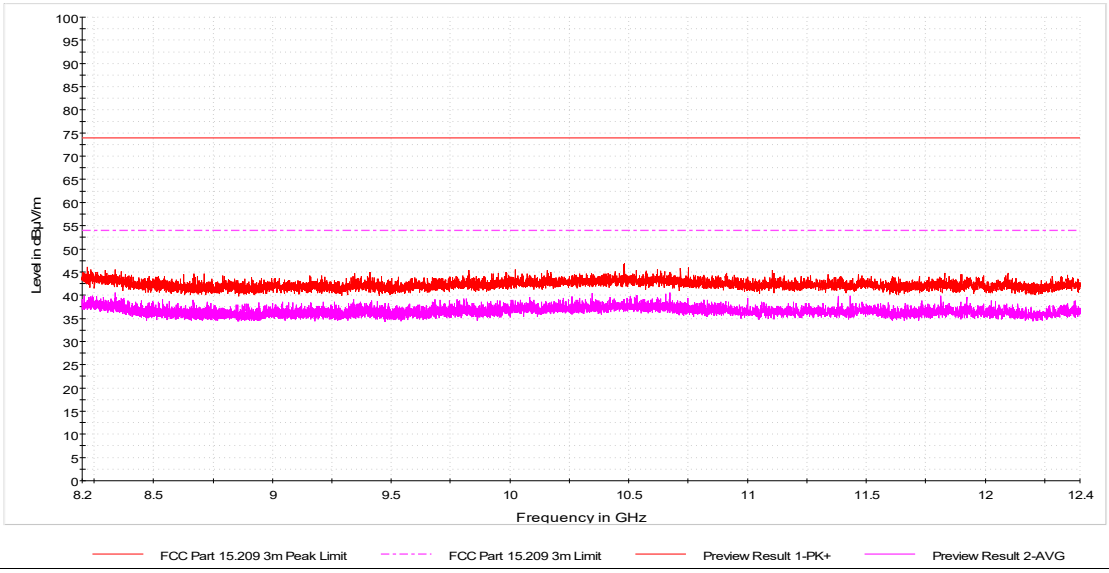


Graph 26

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel –8.2GHz to 12.4GHz - Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

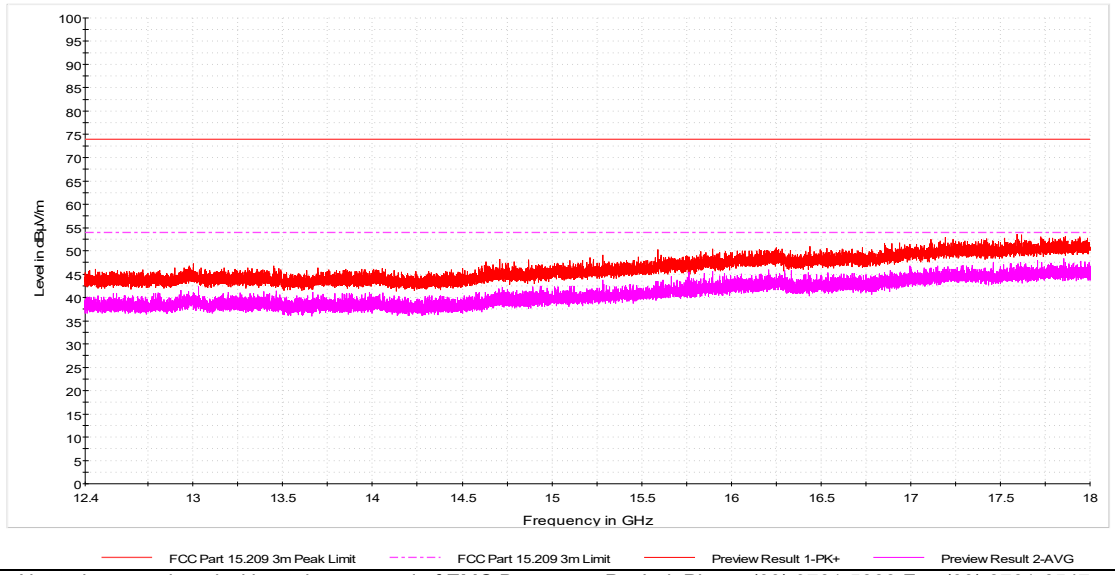


Graph 27

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel – 12.4GHz to 18GHz - Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ

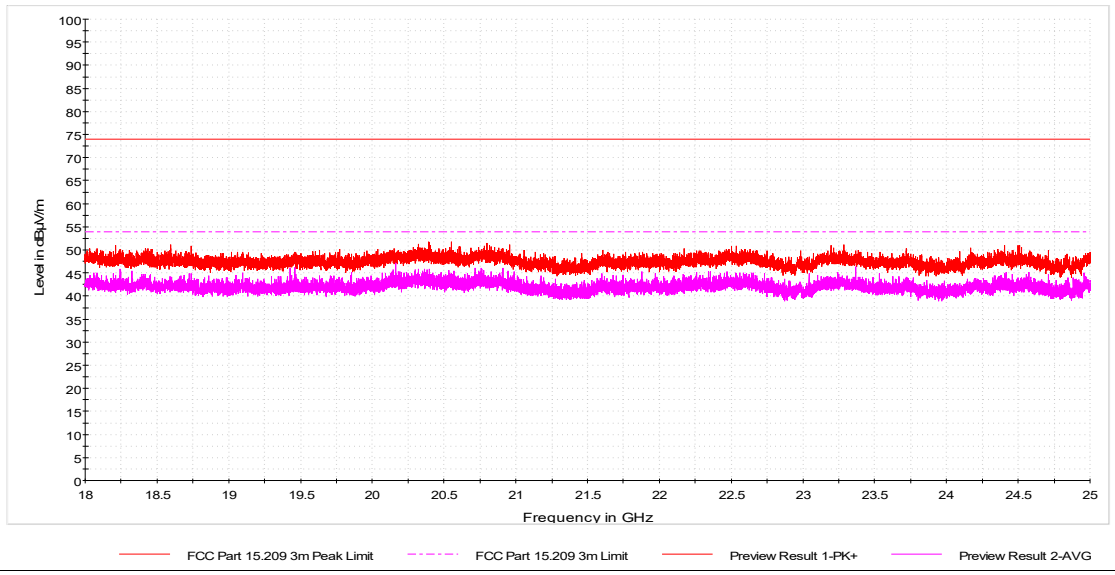


Graph 28

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Radiated emissions in Restricted bands
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel – 18GHz to 25GHz - Horizontal
Antenna Polarisation – EUT Z Orientation

Job Number: E2112-1497-2
Test Engineer: AZ



Graph 29

Appendix C.5 – Out-of-Band Emissions – 100kHz, -20dBc – FCC 15.247(d)

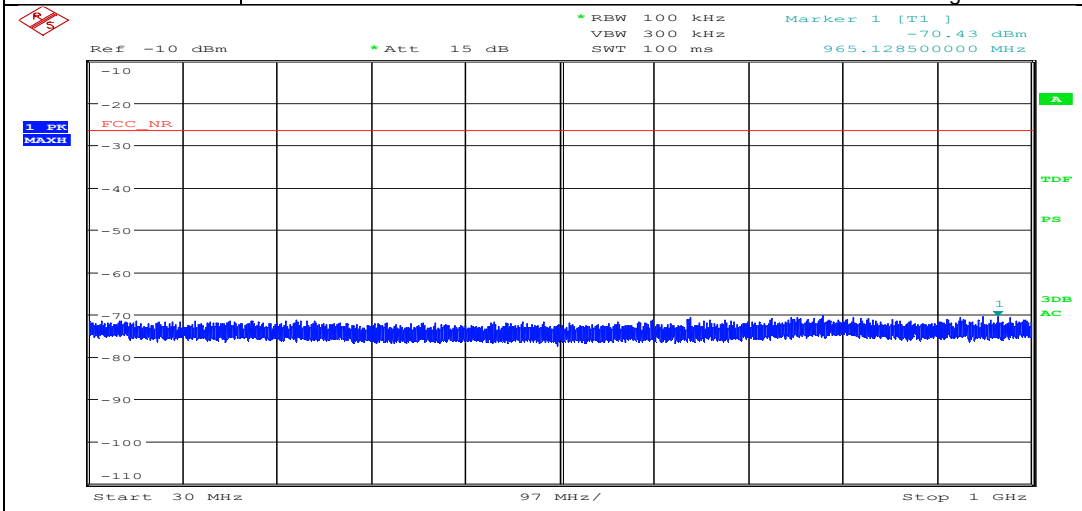
No.	Test	Graph Description
30	Out-of-Band Emissions - – 100kHz, -20dBc 2402MHz Channel	30MHz to 1GHz
31		1GHz to 5GHz
32		5GHz to 10GHz
33		10GHz to 15GHz
34		15GHz to 25GHz
35	Out-of-Band Emissions - – 100kHz, -20dBc 2440MHz Channel	30MHz to 1GHz
36		1GHz to 5GHz
37		5GHz to 10GHz
38		10GHz to 15GHz
39		15GHz to 25GHz
40	Out-of-Band Emissions - – 100kHz, -20dBc 2440MHz Channel	30MHz to 1GHz
41		1GHz to 5GHz
42		5GHz to 10GHz
43		10GHz to 15GHz
44		15GHz to 25GHz

Note: Only worst-case graphs are presented

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel — 30MHz to 1GHz

Job Number: E2112-1497-2
Test Engineer: AZ

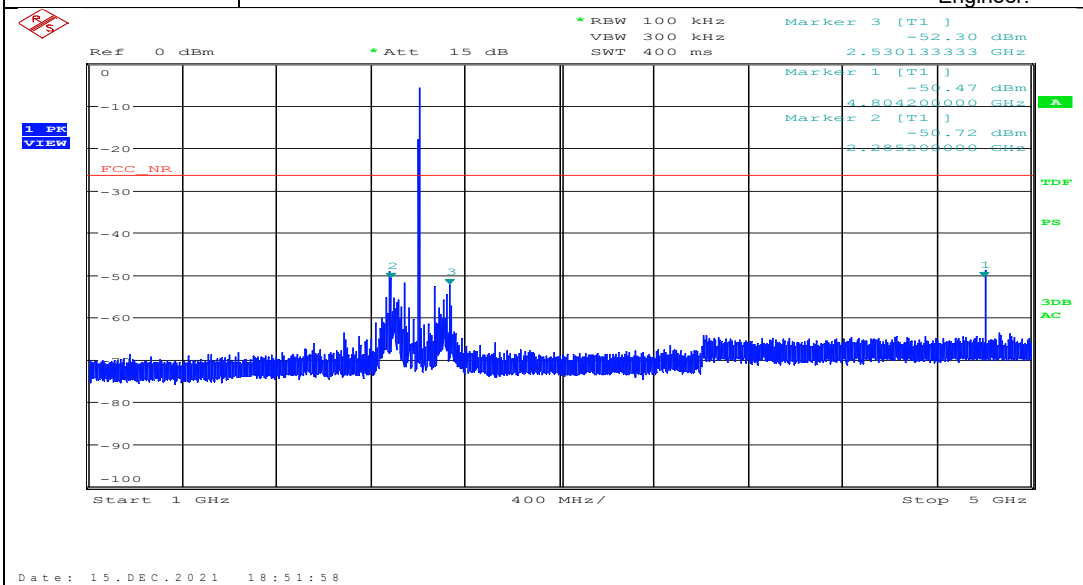


Graph 30

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel – 1GHz to 5GHz

Job Number: E2112-1497-2
Test Engineer: AZ

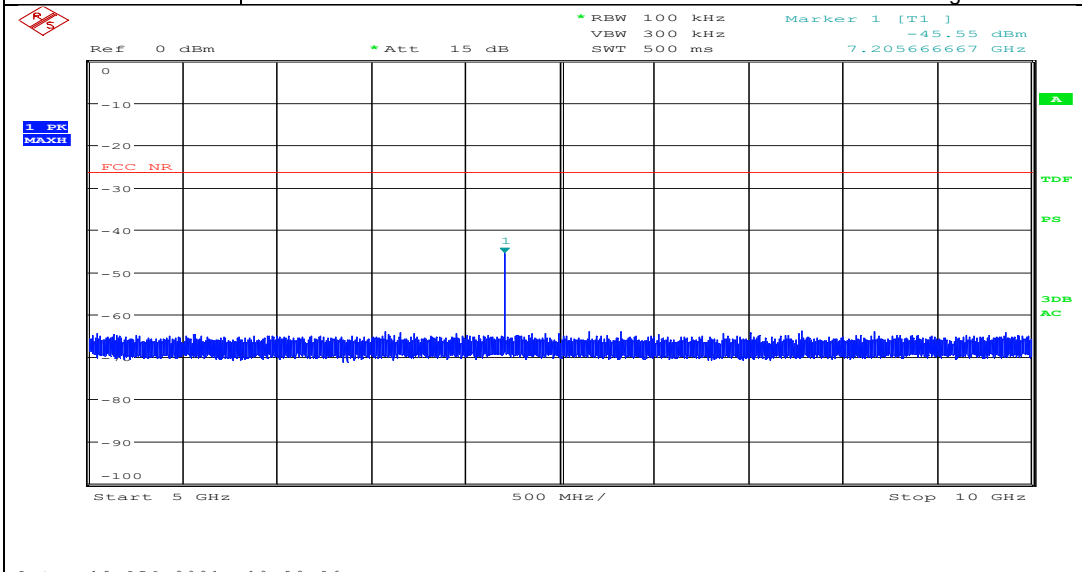


Graph 31

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel – 5GHz to 10GHz

Job Number: E2112-1497-2
Test Engineer: AZ

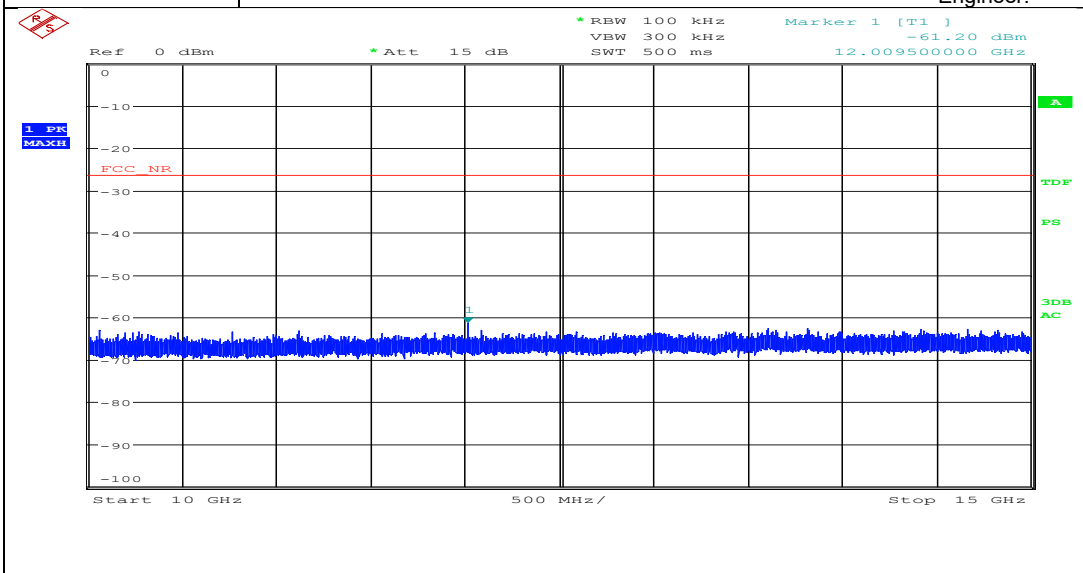


Graph 32

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel – 10GHz to 15GHz

Job Number: E2112-1497-2
Test Engineer: AZ

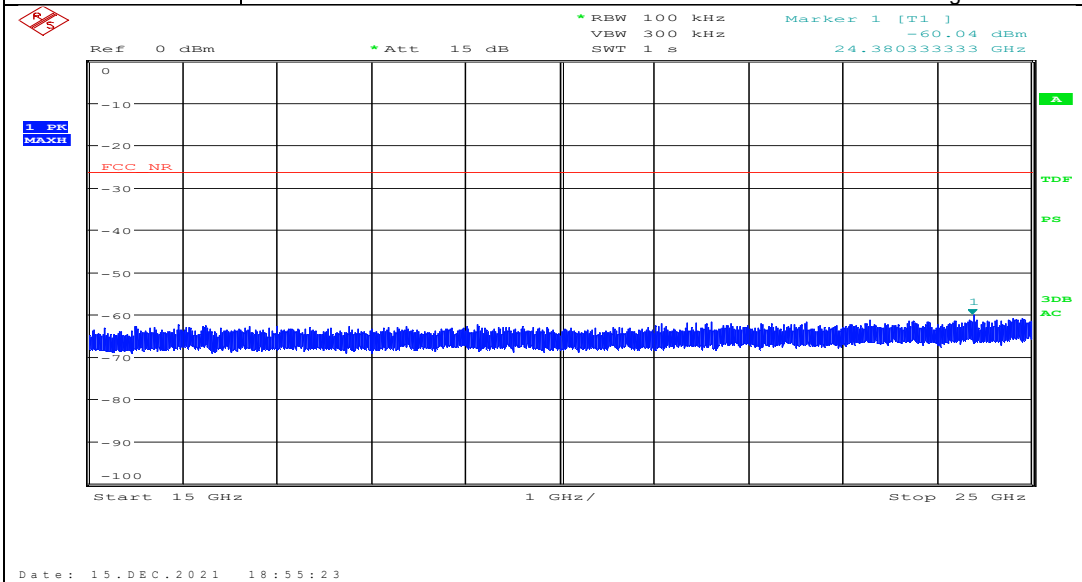


Graph 33

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel – 15GHz to 25GHz

Job Number: E2112-1497-2
Test Engineer: AZ

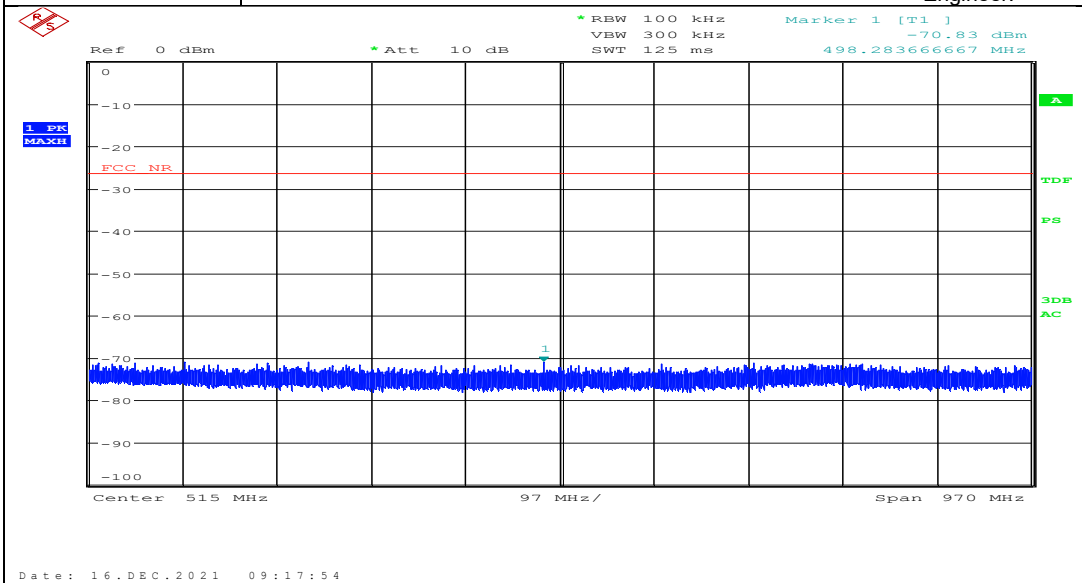


Graph 34

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel — 30MHz to 1GHz

Job Number: E2112-1497-2
Test Engineer: AZ

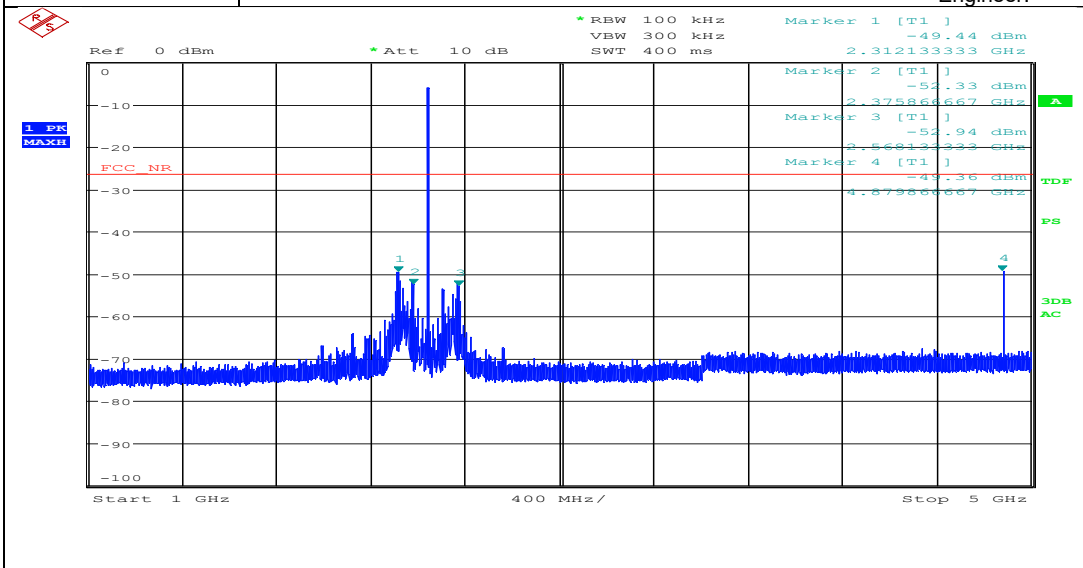


Graph 35

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel – 1GHz to 5GHz

Job Number: E2112-1497-2
Test Engineer: AZ

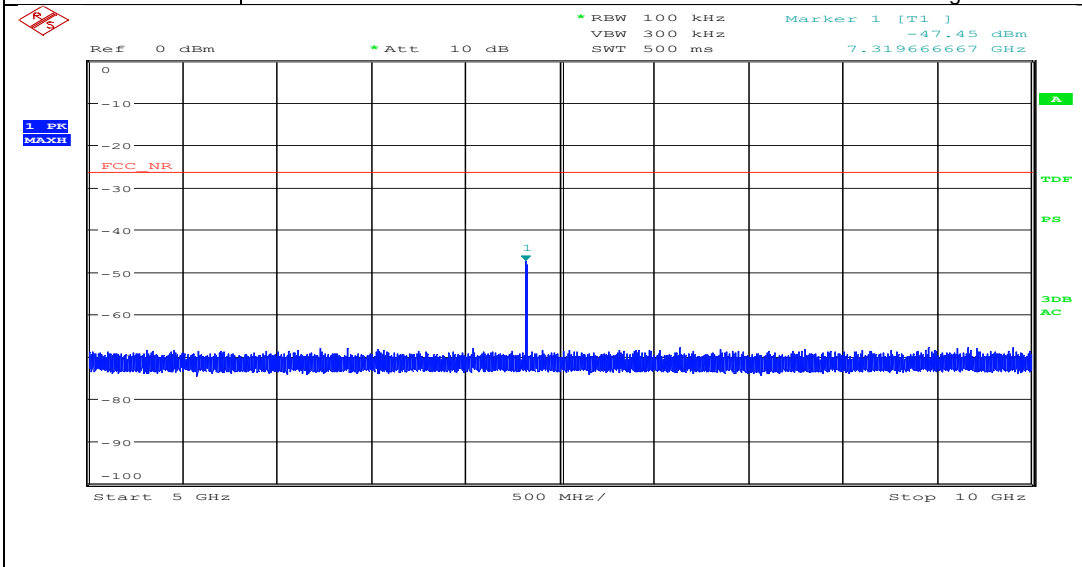


Graph 36

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel – 5GHz to 10GHz

Job Number: E2112-1497-2
Test Engineer: AZ

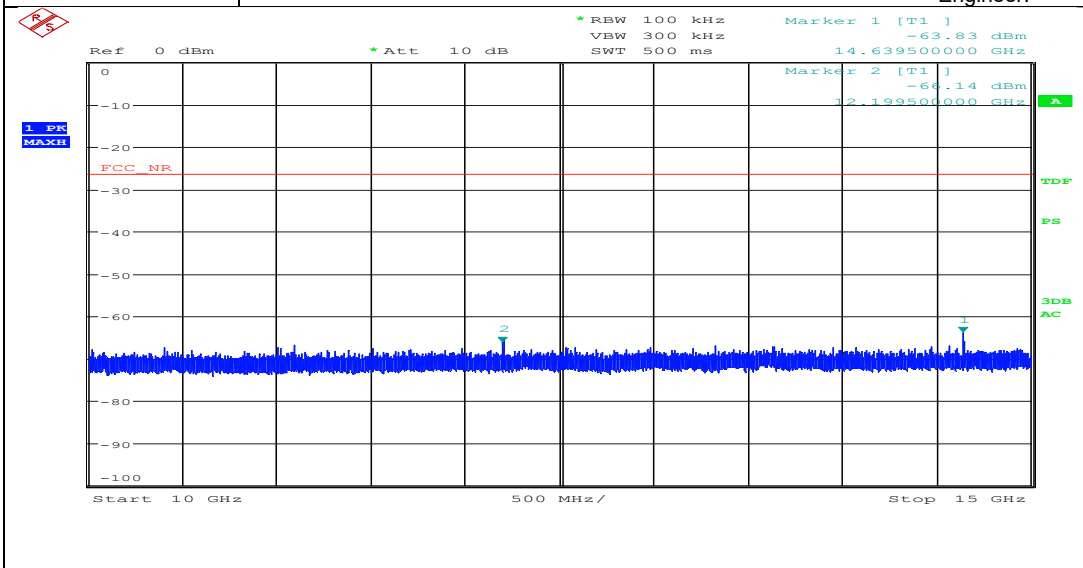


Graph 37

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel – 10GHz to 15GHz

Job Number: E2112-1497-2
Test Engineer: AZ

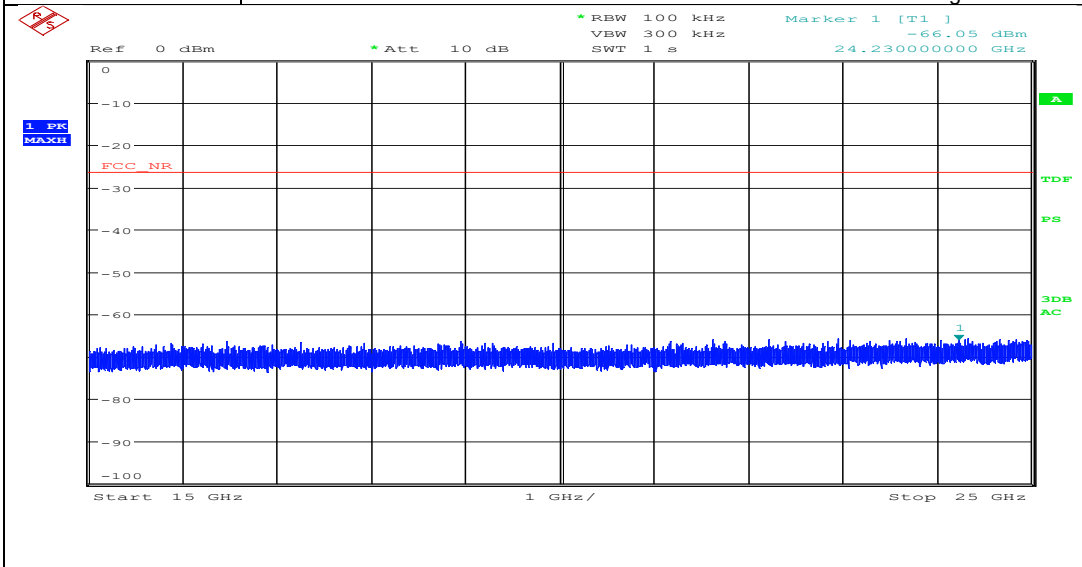


Graph 38

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel – 15GHz to 25GHz

Job Number: E2112-1497-2
Test Engineer: AZ

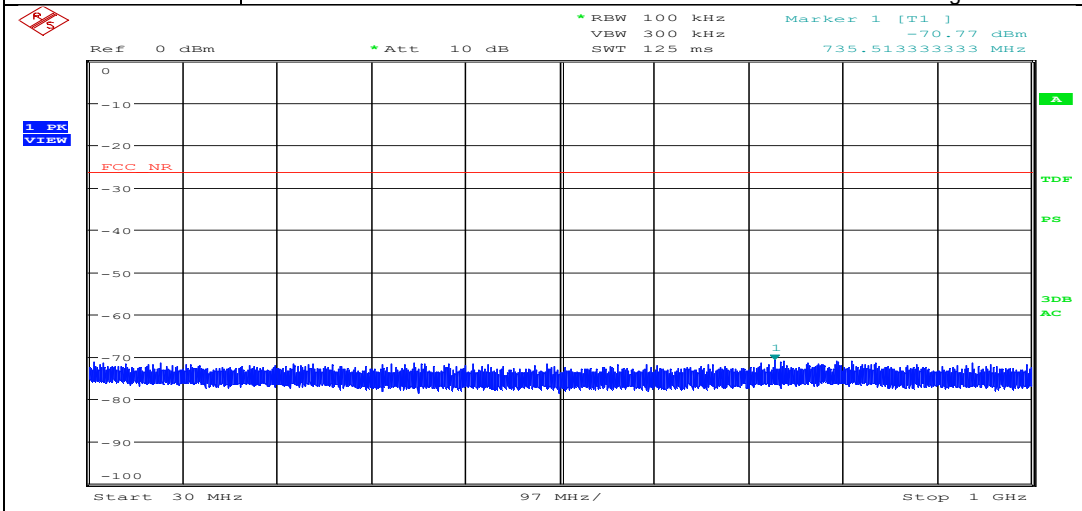


Graph 39

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel — 30MHz to 1GHz

Job Number: E2112-1497-2
Test Engineer: AZ

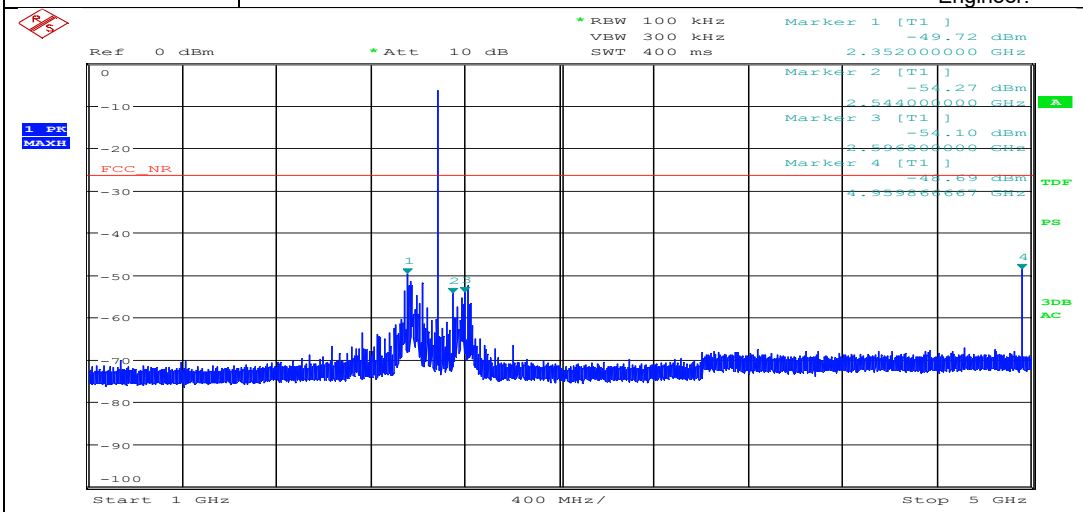


Graph 40

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel – 1GHz to 5GHz

Job Number: E2112-1497-2
Test Engineer: AZ

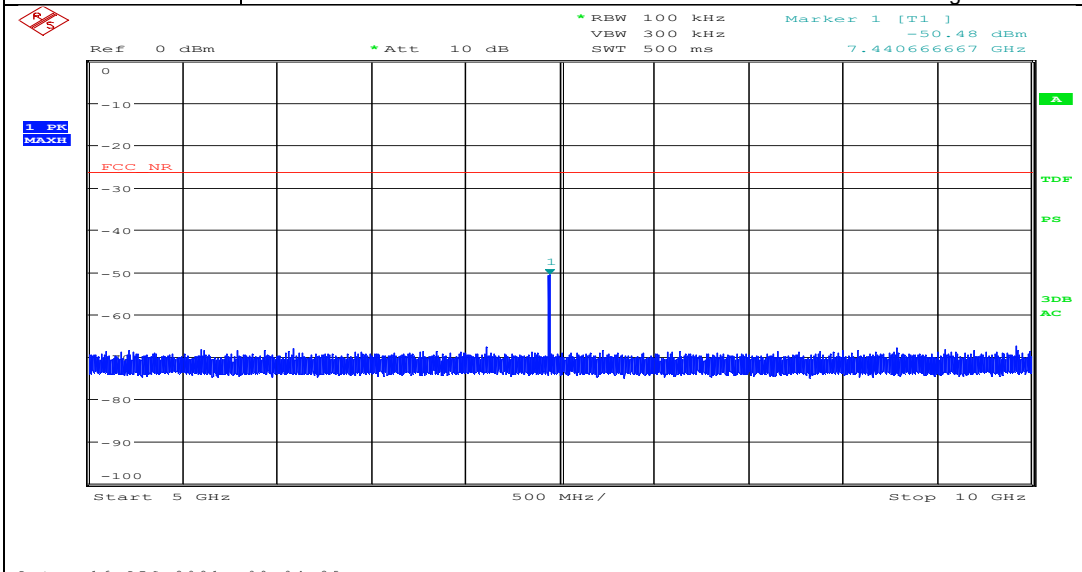


Graph 41

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel – 5GHz to 10GHz

Job Number: E2112-1497-2
Test Engineer: AZ

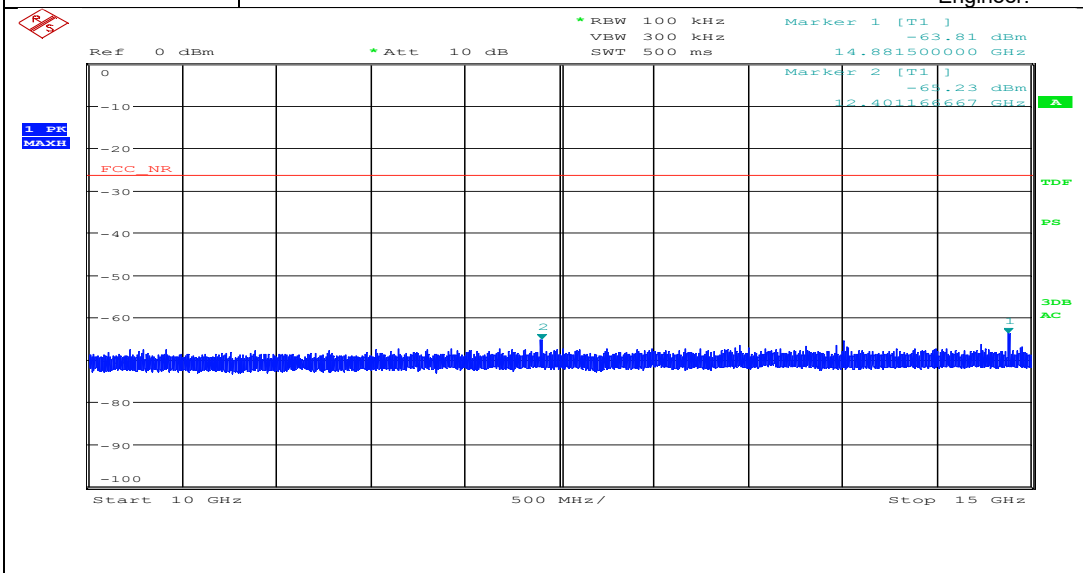


Graph 42

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel – 10GHz to 15GHz

Job Number: E2112-1497-2
Test Engineer: AZ

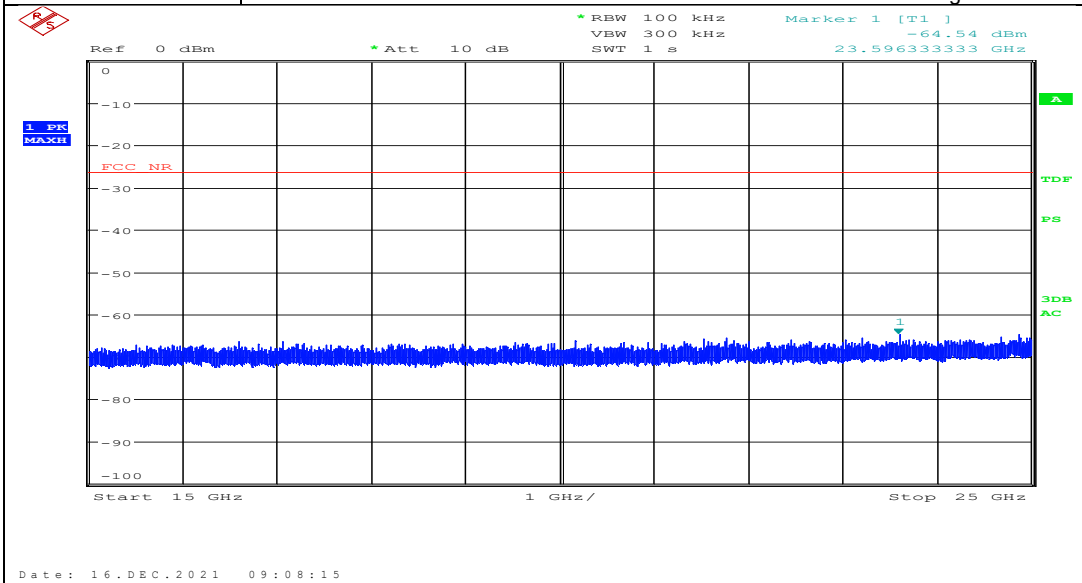


Graph 43

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Out-of-Band Emissions - – 100kHz, -20dBc
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel – 15GHz to 25GHz

Job Number: E2112-1497-2
Test Engineer: AZ



Graph 44

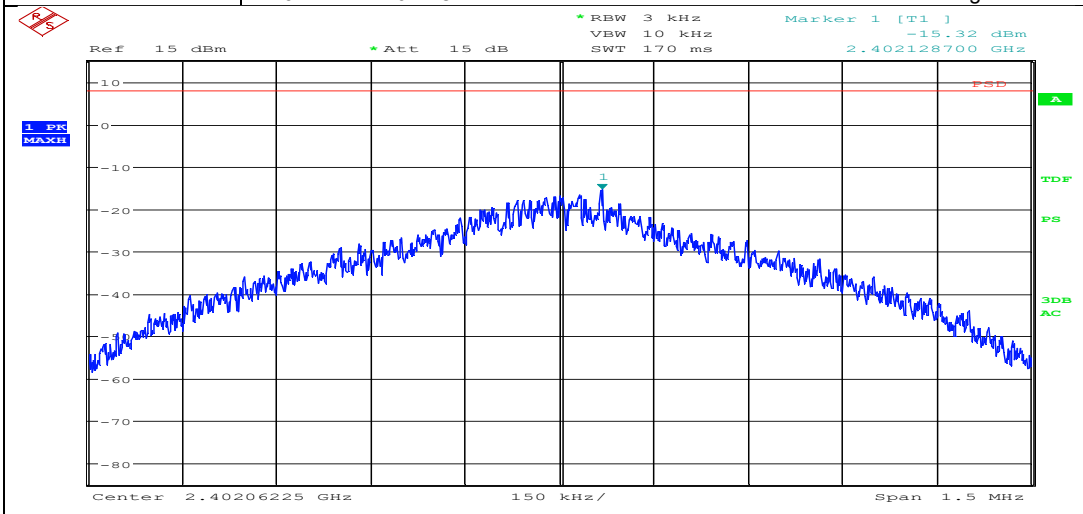
Appendix C.6 – Measurement Graphs – Power Spectral Density – FCC 15.247 (e)

No.	Test	Graph Description
45	Power Spectral Density	2402MHz Channel
46		2440MHz Channel
47		2480MHz Channel

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Peak Power Spectral Density
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2402MHz Channel

Job Number: E2112-1497-2
Test Engineer: NL

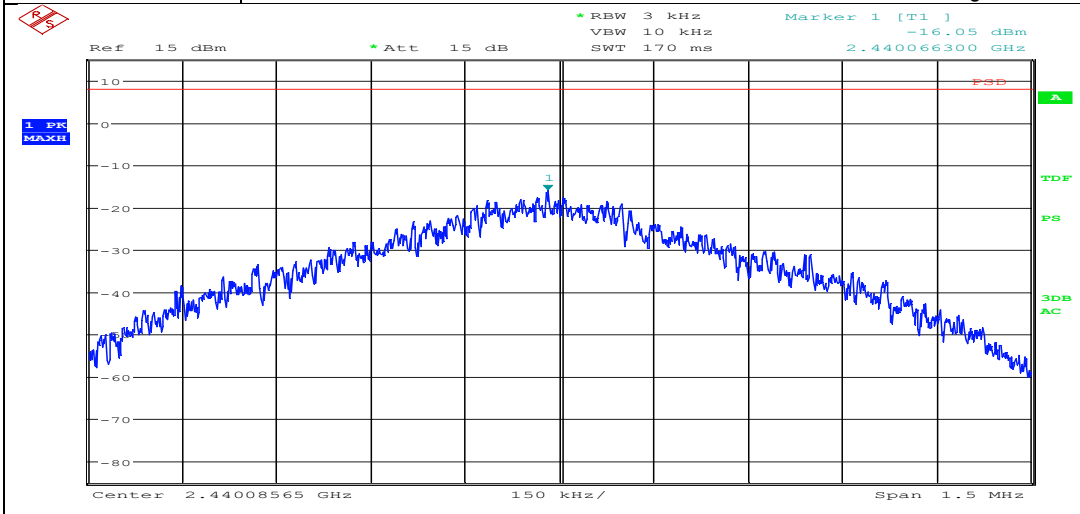


Graph 45

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Peak Power Spectral Density
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2440MHz Channel

Job Number: E2112-1497-2
Test Engineer: NL



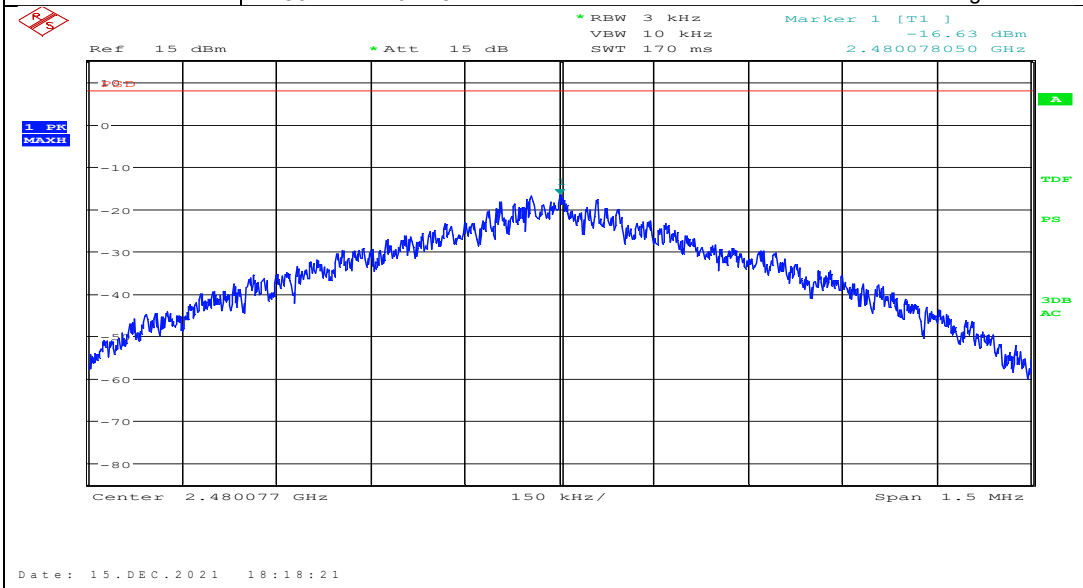
Graph 46

EMC Bayswater Pty. Ltd.

CFR47 FCC Part 15, Subpart C, 15.247 - Peak Power Spectral Density
Adherium (NZ) Limited - NF0106 - Hailie for Ellipta
2480MHz Channel

Job Number: E2112-1497-2

Test Engineer: NL



Graph 47

Appendix C.7 – Occupied Bandwidth (99% Emission Bandwidth)

No.	Test	Graph Description
48	Occupied Bandwidth (99% Emission Bandwidth)	2402MHz Channel
49		2440MHz Channel
50		2480MHz Channel

EMC Bayswater Pty. Ltd.

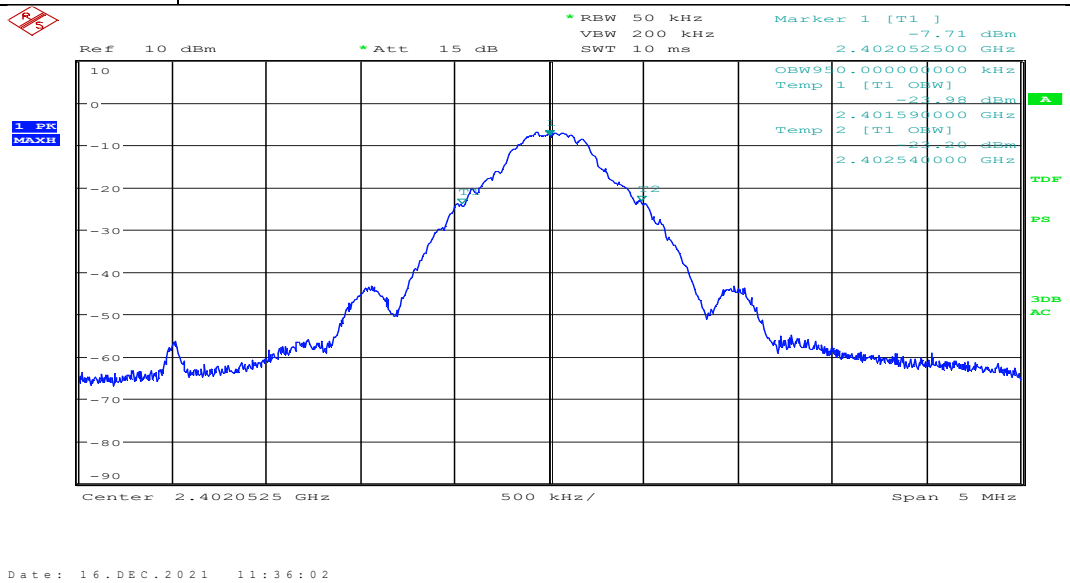
CFR47 FCC Part 15, Subpart C, 15.247 - Occupied Bandwidth (99% Emission Bandwidth)

Adherium (NZ) Limited - NF0106 - Hailie for Ellipta

2402MHz Channel

Job Number: E2112-1497-2

Test Engineer: NL



Graph 48

EMC Bayswater Pty. Ltd.

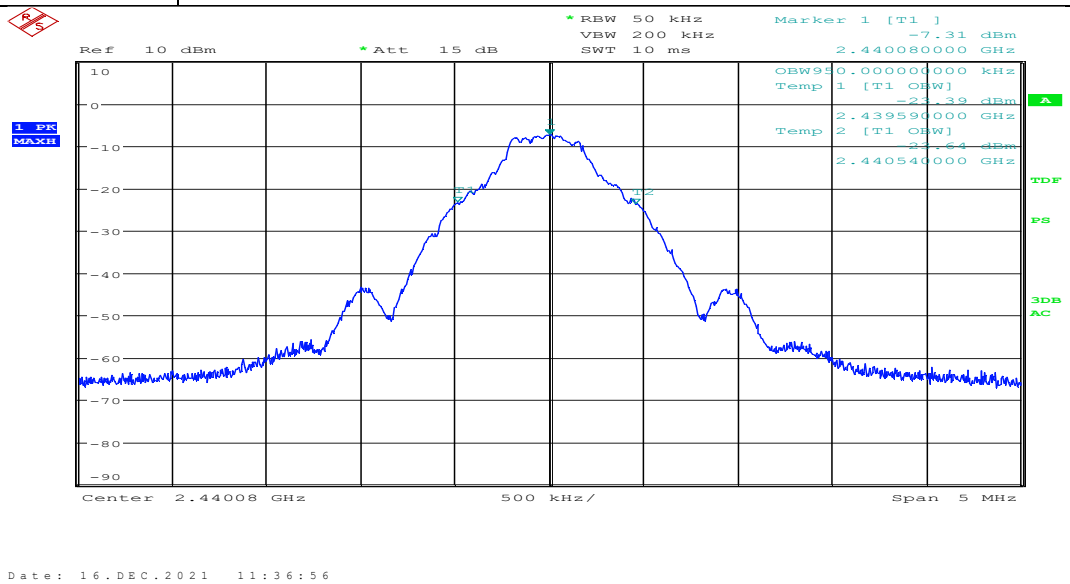
CFR47 FCC Part 15, Subpart C, 15.247 - Occupied Bandwidth (99% Emission Bandwidth)

Adherium (NZ) Limited - NF0106 - Hailie for Ellipta

2440MHz Channel

Job Number: E2112-1497-2

Test Engineer: NL



Graph 49

EMC Bayswater Pty. Ltd.

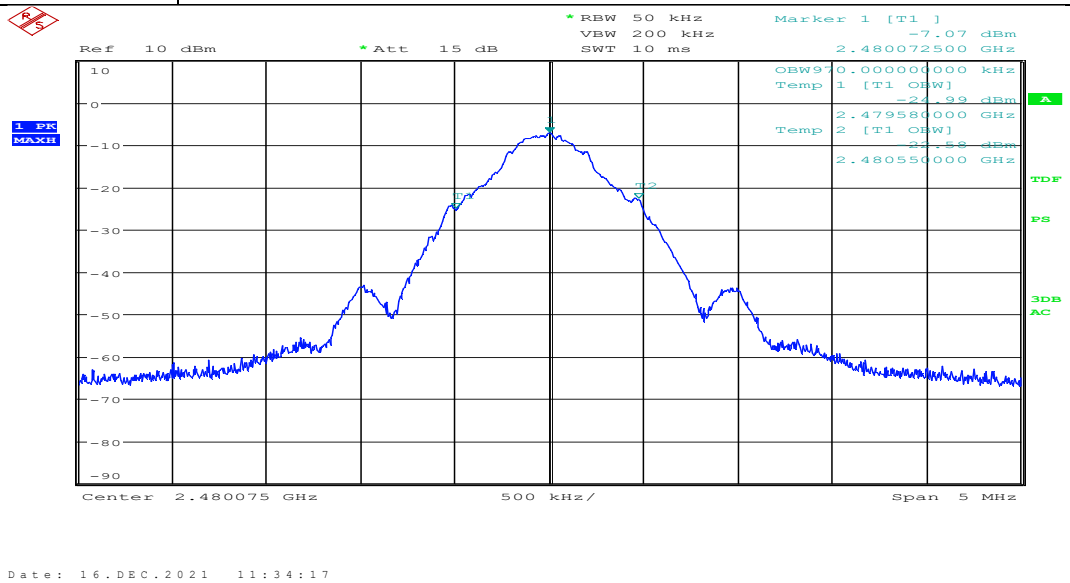
CFR47 FCC Part 15, Subpart C, 15.247 - Occupied Bandwidth (99% Emission Bandwidth)

Adherium (NZ) Limited - NF0106 - Hailie for Ellipta

2480MHz Channel

Job Number: E2112-1497-2

Test Engineer: NL



Graph 50