CLASS II PERMISSIVE CHANGE

TEST REPORT

for the

Saw Dash POD

FCC ID: RBV-SAW

REPORT# 16631 REV 1

Prepared for:

Insulet

100 Nagog Park

Acton, MA 01720

Prepared By:

Washington Laboratories, Ltd.

4840 Winchester Boulevard

Frederick, Maryland 21703

Class II Permissive Change
Verification Test Report
for the
Insulet
Saw Dash POD Antenna Optimization

August 19, 2020

WLL Report# 16631 Rev 1

Prepared by:

Steven D. Koster
President

Reviewed by:

Michael F. Violette
CEO

Abstract

This report has been prepared on behalf of Insulet under Part 15 (10/2020) of the Federal Communication Commission (FCC) Rules and Regulations.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 4840 Winchester Boulevard Frederick, MD 21703. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Testing Certificate AT-1448 as an independent FCC test laboratory. These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by the ANAB under certificate and scope of accreditation AT-1448.

The Insulet Saw Dash POD continues to comply with the requirements for Part 15 (10/2020) of the FCC rules.

Revision History	Description of Change	Date
Rev 0	Initial Release	August 19, 2020
Rev 1	Corrected reference errors and calibration dates.	August 31, 2020

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1 Introduction

1.1 Compliance Statement

The Insulet Saw Dash POD Antenna Optimization continues to comply with the limits for a radiated emitter device under Part 15 (10/2020)and ISED Canada.

1.2 Reason for Class II Permissive Change

Testing was to evaluate a change in the antenna to ensure the unit was still in compliance. See supporting exhibit filed with the application. An image of the original Grant is appended to this report.

1.3 Test Scope

Tests for radiated emissions and conducted at the antenna terminal were performed. All measurements were performed in accordance with the 2014 version of ANSI C63.10 The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.4 contract Information

Customer:	Chomerics
Address	77 Dragon Ct.
	Woburn, Massachusetts 01888
On Behalf of:	Insulet
	100 Nagog Park
	Acton, MA 01720
Purchase Order Number:	67028
Quotation Number:	72104

1.5 Test and Support Personnel

Washington Laboratories, LTD	Steve Koster
Customer Representative	Patty Terilli

2 Equipment Under Test

2.1 EUT Identification & Description

The results obtained relate only to the item(s) tested.

Table 1: Device Summary

Model(s) Tested:	Saw Dash POD
FCCID	RBV-SAW
FCC Rule Parts:	§15 (10/2020)
EUT Specifications:	Primary Power (as tested): Battery Powered
Equipment Emissions Class:	B
Test Dates:	7/23/2020 – 7/28/2020

The Insulet Saw Dash POD is an insulin management system which delivers an insulin dose at a programmed time and dose rate.

2.2 Test Configuration

The Saw Dash Antenna Optimization was configured for test in two setups:

For antenna port conducted emissions, the output of the EUT was connected to a spectrum analyzer via a short length of cable and corrected for any cable/attenuator losses.

For radiated emissions, the EUT was placed on an 80cm/150cm high table on an OATS. The output from the measurement antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The appropriate corrections were accounted for in the measurement system.

The EUT was programmed to transmit CW at full power on lower, middle and highest channel.

2.3 Testing Algorithm

The EUT was programmed for operation by the manufacturer for each test case. Output power was checked to ensure the radio was within manufacturers tolerance and still in compliance with the requirements. Radiated emissions were performed to show the new antenna configuration complied with the radiated requirements. Worst cast emission levels are provided in the test results data both in a bench conducted and radiated manner.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Frederick, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Testing Certificate AT-1448 as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

ANSI C63.2 (Jan-2016) Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 (Jan 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

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1 to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm\sqrt{\frac{a^2}{div_a{}^2} + \frac{b^2}{div_b{}^2} + \frac{c^2}{div_c{}^2} + ...}$$

Where:

uc = standard uncertainty

a, b, c,.. = individual uncertainty elements

Diva, b, c = the individual uncertainty element divisor based on the probability distribution

Divisor = 1.732 for rectangular distribution

Divisor = 2 for normal distribution

Divisor = 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$U = ku_c$$

Where

U = expanded uncertainty

k = coverage factor

k ≤ 2 for 95% coverage (ANSI/NCSL Z540-2 Annex G)

uc = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in Table 2 below.

Table 2: Expanded Uncertainty List

Scope	Standard(s)	Expanded Uncertainty
Conducted Emissions	CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15	±2.63 dB
Radiated Emissions	CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15	±4.55 dB

3 Test Equipment

Table 3 shows a list of the test equipment used for measurements along with the calibration information.

Table 3: Test Equipment List

Test Name:	Radiated Emissions	Test Date:	7/28/2020
Asset #	Manufacturer/Model	Description	Cal. Due
00528	AGILENT	E4446A	1/21/2021
00066	B&Z (HP)	BZ-01002650-401545-282525	6/19/2021
00626	ARA	DRG-118/A	8/1/2020
00849	AH SYSTEMS	SAC-18G-16	8/31/2021

4 Test Results

4.1 AC Conducted Emissions

Not applicable. The EUT is a battery-powered device.

4.2 RF Power Output:

To measure the output power the unit was set to dwell on the low, high and middle channel with a continuous 100% duty cycle. Testing was performed using the method from C63.10 section 11.9.1.1 "RBW ≥ DTS bandwidth" at the antenna port as follows:

a) Set the RBW ≥ DTS bandwidth.

b) Set VBW ≥ [3 × RBW].

c) Set span ≥ [3 × RBW].

d) Sweep time = auto couple.

e) Detector = peak.

f) Trace mode = max hold.

g) Allow trace to fully stabilize.

h) Use peak marker function to determine the peak amplitude level.

Measurement Method:

ANSI C63.10 section "11.9.1 Maximum peak conducted output power" subsection "11.9.1.1 RBW > DTS bandwidth"

Table 4: Spectrum Analyzer Settings

Resolution Bandwidth	Video Bandwidth
1MHz	3MHz

Table 5: RF Power Output Summary

Frequency	Original Level (dBm) Reported	Original Level (W) Reported	Level (dBm) Measured	Level (W) Measured	Limit (W)	Pass/Fail
Low Channel: 2402MHz	2.90	0.0019	-0.34	0.0009	1	Pass
Center Channel: 2440MHz	1.59	0.0014	-0.58	0.0009	1	Pass
High Channel: 2480MHz	1.98	0.0016	0.62	0.0012	1	Pass

Figure 1: RF Peak Power, Low Channel

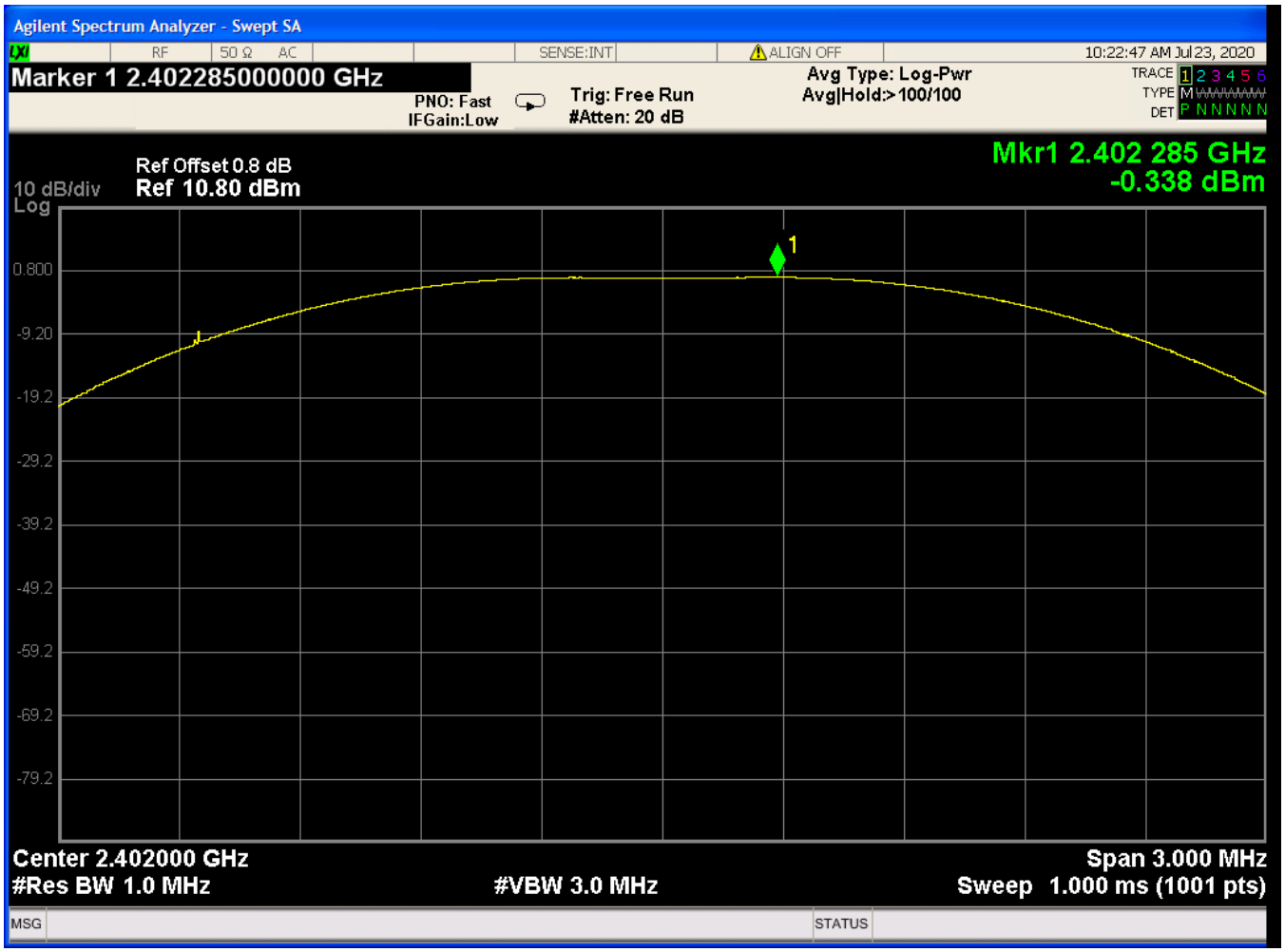


Figure 2: RF Peak Power, Mid Channel

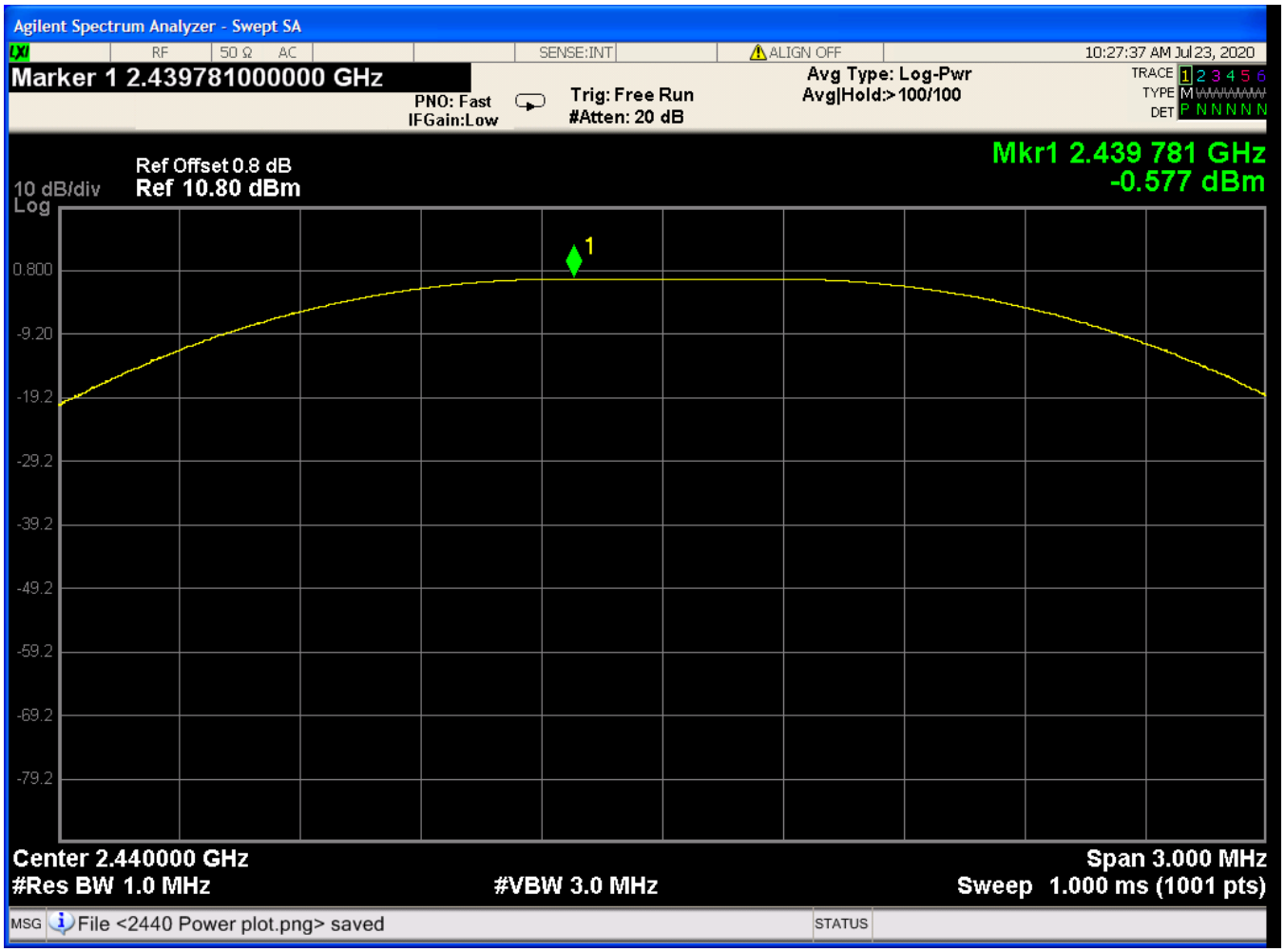
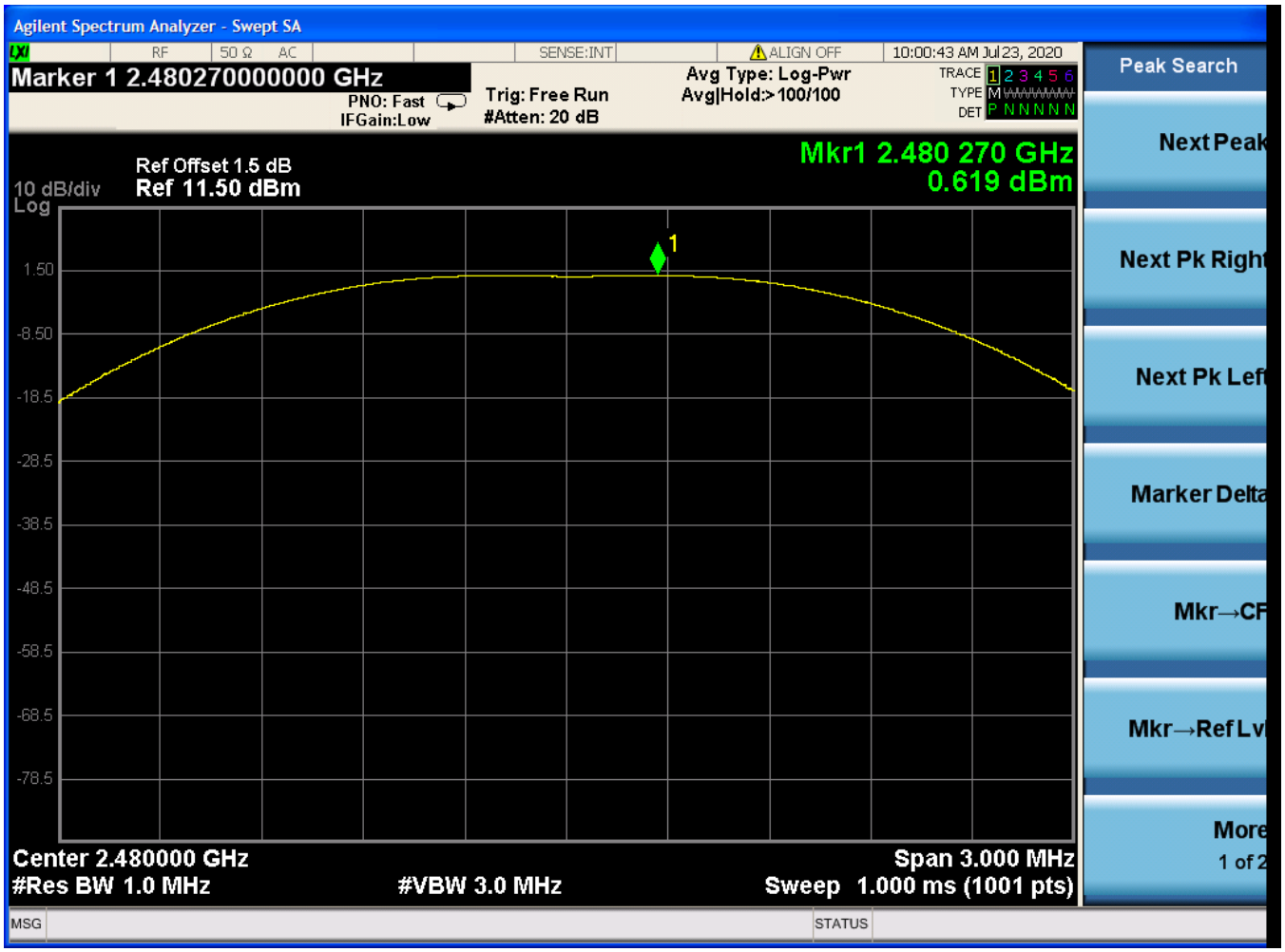


Figure 3: RF Peak Power, High Channel



4.3 Radiated Emissions

4.3.1 Requirements

Compliance Standard: FCC Part 15, Class B

FCC Compliance Limits

Frequency Range	Limit (distance)	
	Class A (10 meter)	Class B (3 meter)
30-88 MHz	90 µV/m	100 µV/m
88-216 MHz	150 µV/m	150 µV/m
216-960 MHz	210 µV/m	200 µV/m
>960MHz	300 µV/m	500 µV/m

4.3.2 Test Procedure

The requirements of FCC Part 15 and ICES-003 call for the EUT to be placed on an 80/150 cm high 1 X 1.5 meters non-conductive motorized turntable for radiated testing on a 3-meter open field test site.

The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Bi-conical and log periodic broadband antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The output of the antenna was connected to the input of the spectrum analyzer and the emissions in the frequency range of 30 MHz to 25 GHz were measured. The peripherals were placed on the table in accordance with ANSI C63.4. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured for all 3 orthogonal planes of the EUT.

The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The detector function was set to quasi-peak or peak, as appropriate. Above 1GHz average measurement are recorded. The measurement bandwidth of the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth. Frequencies above 1GHz were performed using a measurement bandwidth of 1MHz with a video bandwidth setting of 10 Hz for the average measurement.

4.3.3 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are included into the antenna factor (AF) column of the table and in the cable factor (CF) column of the table. The AF (in dB/m) and the CF (in dB) is algebraically added to the raw Spectrum Analyzer Voltage in dBµV to obtain the Radiated Electric Field in dBµV/m. This logarithm amplitude is converted to a linear amplitude, then compared to the FCC limit.

Example:

Spectrum Analyzer Voltage: VdBµV

Antenna Correction Factor: AFdB/m

Cable Correction Factor: CFdB

Pre-Amplifier Gain (if applicable): GdB

Electric Field: EdBµV/m = V dBµV + AFdB/m + CFdB - GdB

To convert to linear units of measure: EdBµV/m/20 Inv log

4.3.4 Test Data

The EUT complied with the spurious Radiated Emissions requirements. Table 6 through Table 8 provide the test results for radiated emissions. Figure 4 and Figure 5 show samples of the radiated emissions test configuration.

Table 6: Radiated Emission Test Data Low channel

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2400.00	V	180.0	1.5	34.5	-11.5	14.1	500.0	-31.0	X BE
4804.00	V	90.0	1.5	37.3	-0.1	72.9	500.0	-16.7	X
12001.00	V	135.0	1.5	27.8	21.3	285.7	500.0	-4.9	X
2400.00	V	0.0	1.5	43.4	-11.5	39.2	500.0	-22.1	Y BE
4804.00	V	90.0	1.5	41.0	-0.1	111.6	500.0	-13.0	Y
12001.00	V	180.0	1.5	28.0	21.3	292.4	500.0	-4.7	Y
2400.00	V	0.0	1.5	43.1	-11.5	37.9	500.0	-22.4	Z BE
4804.00	V	135.0	1.5	48.4	-0.1	261.5	500.0	-5.6	Z
12001.00	V	90.0	1.5	27.8	21.3	285.7	500.0	-4.9	Z
2400.00	H	180.0	1.5	45.0	-11.5	47.1	500.0	-20.5	X BE
4804.00	H	90.0	1.5	48.1	-0.1	252.6	500.0	-5.9	X
12001.00	H	135.0	1.5	28.1	21.3	296.1	500.0	-4.6	X
2400.00	H	0.0	1.5	44.0	-11.5	42.0	500.0	-21.5	Y BE
4804.00	H	90.0	1.5	49.5	-0.1	296.8	500.0	-4.5	Y
12001.00	H	180.0	1.5	28.1	21.3	295.8	500.0	-4.6	Y
2400.00	H	0.0	1.5	34.0	-11.5	13.3	500.0	-31.5	Z BE
4804.00	H	135.0	1.5	43.4	-0.1	147.1	500.0	-10.6	Z
12001.00	H	90.0	1.5	27.9	21.3	289.0	500.0	-4.8	Z

Table 7: Radiated Emission Test Data Middle channel

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
4880	V	180.0	1.5	31.0	0.1	36.0	500.0	-22.9	MID-X
7320	V	245.0	1.5	28.1	7.9	63.0	500.0	-18.0	MID-X
4880	V	0.0	1.5	36.7	0.1	69.4	500.0	-17.2	MID-Y
7320	V	90.0	1.5	28.1	7.9	63.0	500.0	-18.0	MID-Y
4880	V	180.0	1.5	38.0	0.1	80.6	500.0	-15.9	MID-Z
7320	V	290.0	1.5	28.2	7.9	63.7	500.0	-17.9	MID-Z
4880	H	245.0	0.0	38.5	0.1	85.4	500.0	-15.4	MID-X
7320	H	180.0	0.0	28.3	7.9	64.5	500.0	-17.8	MID-X
4880	H	90.0	0.0	34.9	0.1	56.4	500.0	-19.0	MID-Y
7320	H	180.0	0.0	28.1	7.9	63.0	500.0	-18.0	MID-Y
4880	H	0.0	0.0	34.6	0.1	54.5	500.0	-19.3	MID-Z
7320	H	180.0	0.0	28.2	7.9	63.7	500.0	-17.9	MID-Z

Table 8: Radiated Emission Test Data High channel

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Comments
2483.5	V	0.0	1.5	31.0	-10.7	10.4	500.0	-33.6	HI-X BE
4960	V	180.0	1.8	34.5	0.4	55.8	500.0	-19.0	HI-X
7440	V	235.0	1.8	26.8	8.0	54.7	500.0	-19.2	HI-X
2483.5	V	45.0	1.5	35.9	-10.7	18.3	500.0	-28.7	HI-Y BE
4960	V	270.0	1.4	41.1	0.4	119.3	500.0	-12.4	HI-Y
7440	V	180.0	1.5	26.7	8.0	54.1	500.0	-19.3	HI-Y
2483.5	V	90.0	1.8	32.2	-10.7	11.9	500.0	-32.4	HI-Z BE
4960	V	90.0	2.1	43.7	0.4	161.0	500.0	-9.8	HI-Z
7440	V	135.0	1.2	27.0	8.0	56.2	500.0	-19.0	HI-Z
									0
2483.5	H	0.0	0.0	35.0	-10.7	16.5	500.0	-29.6	HI-X BE
4960	H	180.0	0.0	45.7	0.4	202.6	500.0	-7.8	HI-X
7440	H	45.0	0.0	27.6	8.0	60.0	500.0	-18.4	HI-X
2483.5	H	135.0	0.0	31.9	-10.7	11.5	500.0	-32.7	HI-Y BE
4960	H	90.0	0.0	41.4	0.4	123.5	500.0	-12.1	HI-Y
7440	H	180.0	0.0	27.3	8.0	58.0	500.0	-18.7	HI-Y
2483.5	H	90.0	0.0	31.5	-10.7	11.0	500.0	-33.1	HI-Z BE
4960	H	135.0	0.0	36.6	0.4	71.1	500.0	-16.9	HI-Z
7440	H	360.0	0.0	27.0	8.0	56.0	500.0	-19.0	HI-Z

Figure 4: Radiated Emissions Test Configuration - Front

Figure 5: Radiated Emissions Test Configuration - Rear

Appendix. Original Grant FCC ID: RBV-SAW

TCB

GRANT OF EQUIPMENT AUTHORIZATION

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

TCB

ACB, Inc.
6731 Whittier Avenue Suite C110
McLean, VA 22101

Date of Grant: 04/16/2020

Application Dated: 04/15/2020

Insulet Corporation
600 Technology Park Drive
Suite 200
Billerica, MA 01821-4150

Attention: Chuck Vadala , Sr Director, Systems Engineering

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER:	RBV-SAW
Name of Grantee:	Insulet Corporation
Equipment Class:	**Digital Transmission System**
Notes:	**OmniPod Dash**

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	15C	2402.0 - 2480.0	0.0019		

Output power is conducted. This device meets the SAR exemption threshold listed in KDB447498 and is authorized for portable or mobile operation. Installers and end-users must be provided with transmitter installation and operation conditions for satisfying RF exposure compliance. The antenna(s) used for this transmitter must not transmit simultaneously with any other antenna or transmitter, except in accordance with FCC multi- transmitter product procedures. Grantee must provide installation and operating instructions for complying with FCC multi-transmitter product procedures and RF exposure compliance.