EMISSIONS TEST DATA REPORT

Report Number: 100858069BOX-004
Project Number: G100858069

Report Issue Date: 09/13/2012

Product Designation: Meterless PDM, Model: UST600

Standards: FCC 47CFR Part 15 Subpart C Section 15.231 (2012),
IC RSS-210 Issue 8 December 2010,
IC RSS-Gen Issue 3 December 2010+Notice 2012-DRS0126
ICES-003 Issue 5, August 2012,
CFR47 FCC Part 15 Subpart B:2012

Tested by:
Intertek Testing Services NA, Inc.
70 Codman Hill Road
Boxborough, MA 01719

Client:
Insulet Corporation
9 Oak Park Drive
BEDFORD, MA 01730

Report prepared by

Vathana F. Ven / Senior Project Engineer, EMC

Report reviewed by

Nicholas Abbondante / Transmitter Staff Engineer

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test	--
5	System Setup and Method	--
6	Fundamental Field Strength (CFR47 Part 15 Subpart C Section 15.231(b) IC RSS-210 Annex 1.1.2 and Table A)	Pass
7	Transmitter Radiated Spurious Emissions (CFR47 Part 15 Subpart C Sections 15.205, 15.209, and 15.231(b)(1-3), IC RSS-Gen Section 7.2.2 Table 3 and Section 7.2.5 Table 5, IC RSS-210 Annex 1.1.2 and Table A)	Pass
8	Digital device Radiated Spurious Emissions (ICES-003 Issue 5 August 2012, CFR47 FCC Part 15 Subpart B:2012)	Pass
9	Revision History	--

Note: This testing is to address removal of the Blood Glucose daughter card from the PDM device previously certified under FCC ID: RBV-017. Therefore only parameters that would be affected were retested. Duty cycle, occupied bandwidth, and 5 second shutoff time were not tested.

3 Client Information

This EUT was tested at the request of:

Company: Insulet Corporation
9 Oak Park Drive
BEDFORD, MA 01730
Contact: Mohsen Moghaddami
Telephone: (781) 457-4737
Fax: (781) 457-5011
Email: mmoghaddami@insulet.com

4 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Meterless PDM	Insulet Corporation	UST600	130003561

Receive Date:	09/10/2012
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
Personal diabetes management system.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
3.2Volt Battery	750mA	NA	NA

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	130003561 was configured to transmit nearly continuously

5 System Setup and Method

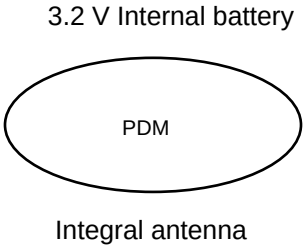
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
	NONE				

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
NONE			

5.1 Method:

Configuration as required by ANSI C63.4 (2003).

5.2 EUT Block Diagram:



6 Fundamental Field Strength

6.1 Method

Tests are performed in accordance with FCC 47CFR Part 15 Subpart C Section 15.231 and RSS 210

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

6.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV003'	Weather Station	Davis Instruments	7400	PE80529A39A	08/17/2011	09/17/2012
145034'	BiLog Antenna (30 MHz to 1GHz)	Schaffner Chase EMC	CBL6111C	2564	02/07/2012	02/07/2013
145-410'	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	09/04/2011	10/04/2012
145128'	EMI Receiver 40 GHz (20 Hz - 40 Ghz)	Rohde & Schwarz	ESI	8392831001	08/23/2011	09/23/2012
145003'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2443A04077	10/04/2011	10/04/2012

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough	Intertek	8/27/2010

6.3 Results:

The sample tested was found to Comply. The Fundamental field strength must meet the following limits:

Fundamental Frequency (MHz), excluding restricted band frequencies of RSS-Gen	Field Strength of the Fundamental (Note 1) (microvolts/m at 3 metres)	Field Strength of Unwanted Emissions (Note 1) (microvolts/m at 3 metres)
40.66-40.70	See Section A2.7	
70-130	1,250	125
130-174	1,250 to 3,750*	125 to 375
174-260 (Note 2)	3,750	375
260-470 (Note 2)	3,750 to 12,500*	375 to 1,250
Above 470	12,500	1,250

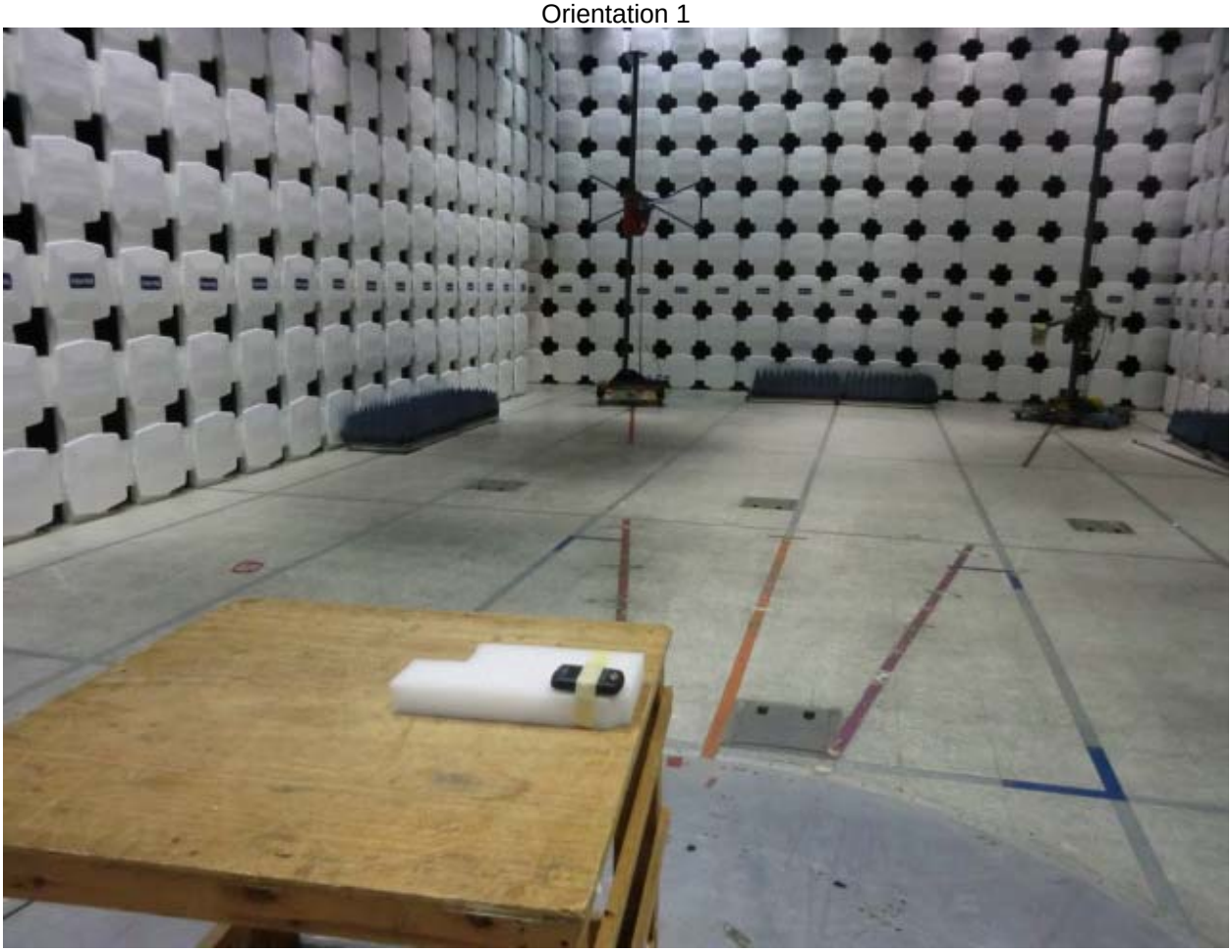
Note 1: Limits on the field strength of emissions, as shown in this table, are based on the average value of the measured emissions. As an alternative, compliance with the limits in this table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

* Linear interpolation with frequency F in MHz:
For 130-174 MHz: FS (microvolts/m) = (56.82 x F)-6136
For 260-470 MHz: FS (microvolts/m) = (41.67 x F)-7083

For a fundamental frequency of 433.9 MHz, this corresponds to a limit of 100.80 dBuV/m peak and 80.80 dBuV/m average at a 3 meter test distance.

6.4 Setup Photographs:

Orientation 1



6.5 Test Data:

Radiated Emissions

Company: Insulet Corporation — Antenna & Cables: N — Bands: N, LF, HF, SHF
Model #: UST600 — Antenna: ANT145-034 10M VER 02-07-13.txt ANT145-034 10M Hor 02-07-13.txt
Serial #: 130003561 — Cable(s): 145-410 10mTrkA 09-04-2012.txt NONE.
Engineers: Vathana Ven — Location: 10m Chamber — Barometer: DAV003 — Filter: NONE
Project #: G100858069 — Date(s): 09/10/12
Standard: FCC Part 15 Subpart C 15.231/RSS-210 — Temp/Humidity/Pressure: 21c 47% 1007mB
Receiver: R&S ESI (145128) 09-23-2012 — Limit Distance (m): 3
PreAmp: PRE145003 10-04-12.txt — Test Distance (m): 10
PreAmp Used? (Y or N): Y — Voltage/Frequency: Battery — Frequency Range: Fundamental

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: X (EUT flat on its back)													
PK	V	433.900	64.80	17.26	3.72	27.64	-10.46	68.59	100.82	-32.23	120/300 kHz		
AVG	V	433.900	44.80	17.26	3.72	27.64	-10.46	48.59	80.82	-32.23	120/300 kHz		
PK	H	433.900	73.91	17.10	3.72	27.64	-10.46	77.55	100.82	-23.27	120/300 kHz		
AVG	H	433.900	53.91	17.10	3.72	27.64	-10.46	57.55	80.82	-23.27	120/300 kHz		
Note: Y (EUT on its short side)													
PK	V	433.900	68.83	17.26	3.72	27.64	-10.46	72.62	100.82	-28.20	120/300 kHz		
AVG	V	433.900	48.83	17.26	3.72	27.64	-10.46	52.62	80.82	-28.20	120/300 kHz		
PK	H	433.900	75.71	17.10	3.72	27.64	-10.46	79.35	100.82	-21.47	120/300 kHz		
AVG	H	433.900	55.71	17.10	3.72	27.64	-10.46	59.35	80.82	-21.47	120/300 kHz		
Note: Z (EUT on its long side)													
PK	V	433.900	73.98	17.26	3.72	27.64	-10.46	77.77	100.82	-23.05	120/300 kHz		
AVG	V	433.900	53.98	17.26	3.72	27.64	-10.46	57.77	80.82	-23.05	120/300 kHz		
PK	H	433.900	68.35	17.10	3.72	27.64	-10.46	71.99	100.82	-28.83	120/300 kHz		
AVG	H	433.900	48.35	17.10	3.72	27.64	-10.46	51.99	80.82	-28.83	120/300 kHz		

Average factor = 20*LOG (12/100) = 20 dB
Average factor of 20dB was measured per report 100193203BOX-004, average readings were obtained by applying average factors to peak readings

Test Personnel: Vathana Ven VSV — Test Date: 09/10/2012
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: FCC CFR 47 Part 15 Subpart C and IC RSS-210 — Test Levels: See Data
Input Voltage: 3.2V Battery — Ambient Temperature: 21 ºC
Pretest Verification w/ Ambient Signals or BB Source: **YES** — Relative Humidity: 47 %
Atmospheric Pressure: 1007 mbars

Deviations, Additions, or Exclusions: None

7 Transmitter Radiated Spurious Emissions

7.1 Method

Tests are performed in accordance with FCC 47CFR Part 15 Subpart C Section 15.231 and RSS 210 ICES-003 Issue 5 August 2012, CFR47 FCC Part 15 Subpart B:2012

.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
145034	BiLog Antenna (30 MHz to 1GHz)	Schaffner Chase EMC	CBL6111C	2564	02/07/2012	02/07/2013
145003'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2443A04077	10/04/2011	10/04/2012
145 128	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESI	837771/027	08/23/2011	09/23/2012
145-410	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	09/04/2011	10/04/2012
145-416	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	09/04/2011	10/04/2012
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	10/24/2011	10/24/2012
145 014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	12/16/2011	12/16/2012
DAV003	Weather Station	Davis Instruments	7400	PE80529A39A	08/17/2011	09/17/2012

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough	Intertek	8/27/2010

7.3 Results:

The sample tested was found to Comply. The spurious emissions must meet the following limits:

Fundamental Frequency (MHz), excluding restricted band frequencies of RSS-Gen	Field Strength of the Fundamental (Note 1) (microvolts/m at 3 metres)	Field Strength of Unwanted Emissions (Note 1) (microvolts/m at 3 metres)
40.66-40.70	See Section A2.7	
70-130	1,250	125
130-174	1,250 to 3,750*	125 to 375
174-260 (Note 2)	3,750	375
260-470 (Note 2)	3,750 to 12,500*	375 to 1,250
Above 470	12,500	1,250

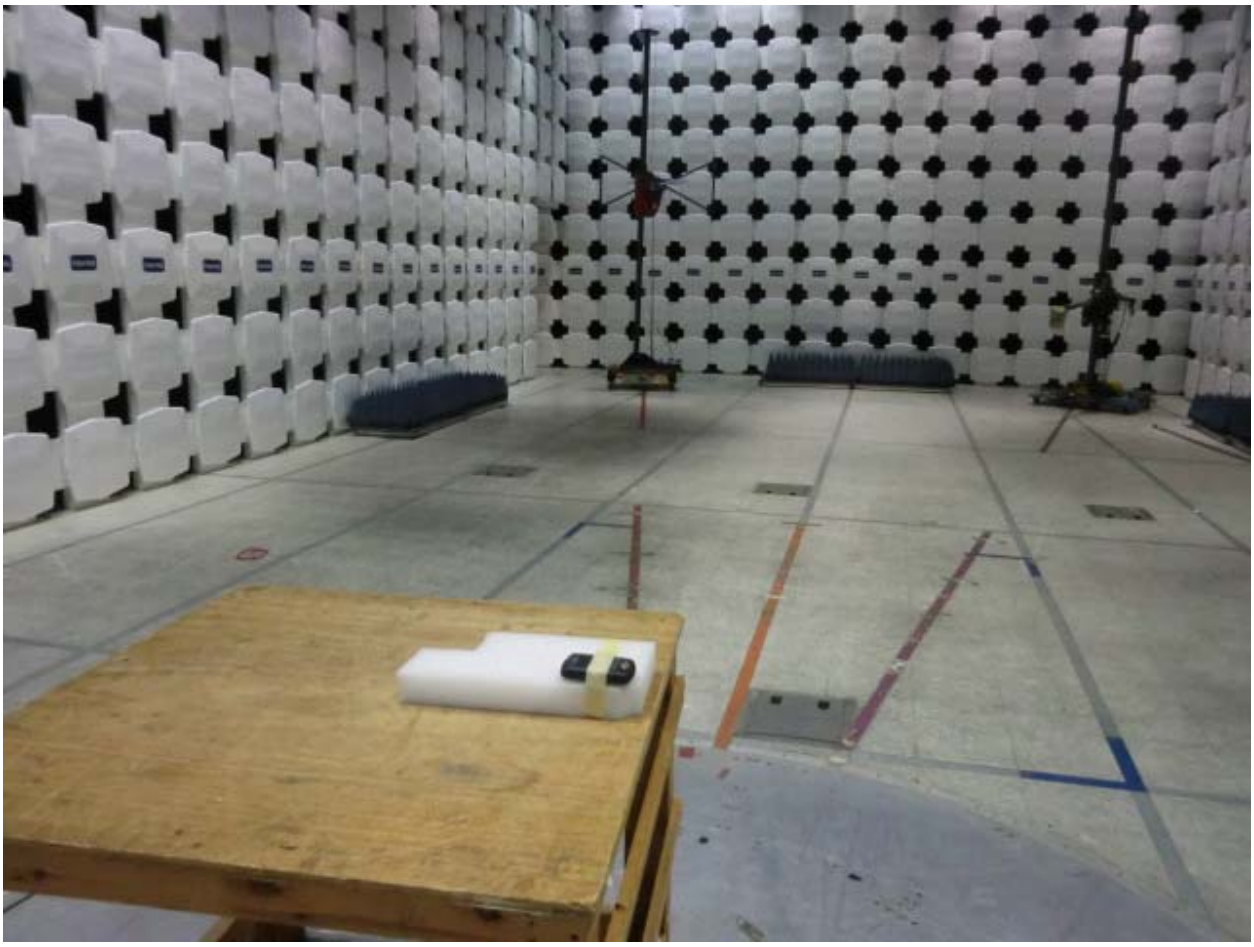
Note 1: Limits on the field strength of emissions, as shown in this table, are based on the average value of the measured emissions. As an alternative, compliance with the limits in this table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

* Linear interpolation with frequency F in MHz:
For 130-174 MHz: FS (microvolts/m) = (56.82 x F)-6136
For 260-470 MHz: FS (microvolts/m) = (41.67 x F)-7083

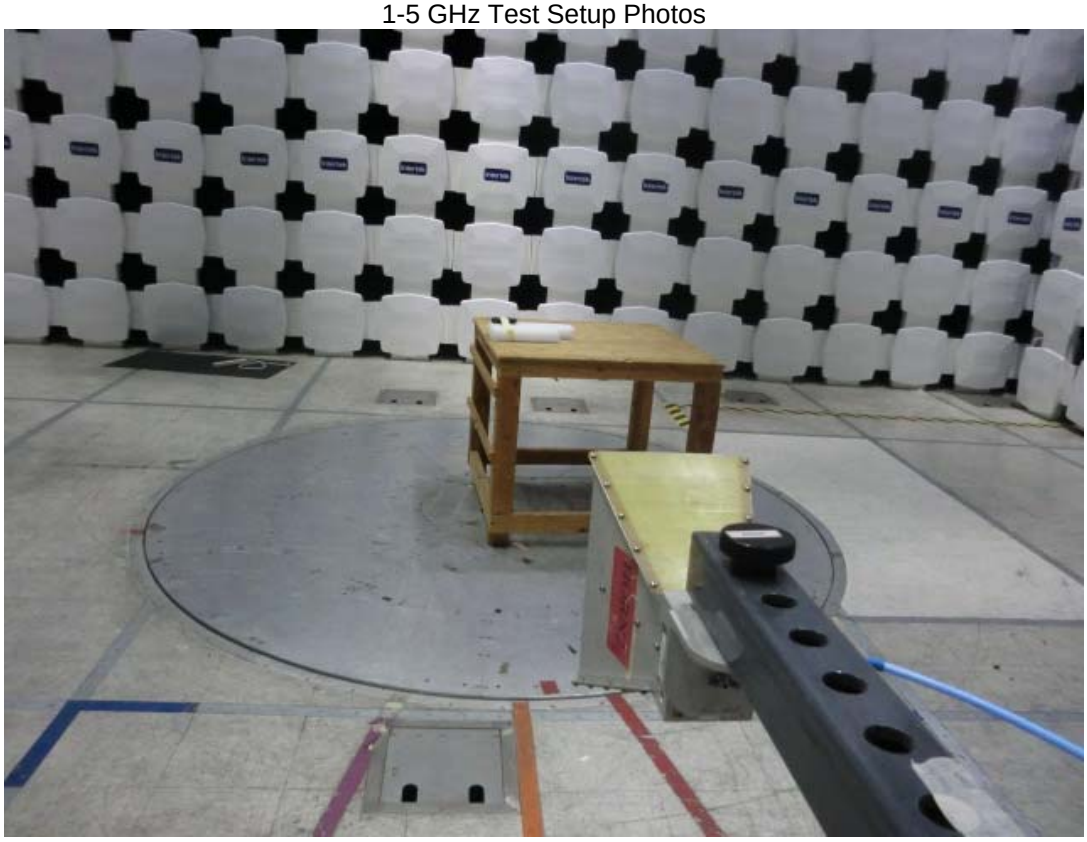
For a fundamental frequency of 433.9 MHz, this corresponds to a limit of 80.80 dBuV/m peak and 60.80 dBuV/m average at a 3 meter test distance.

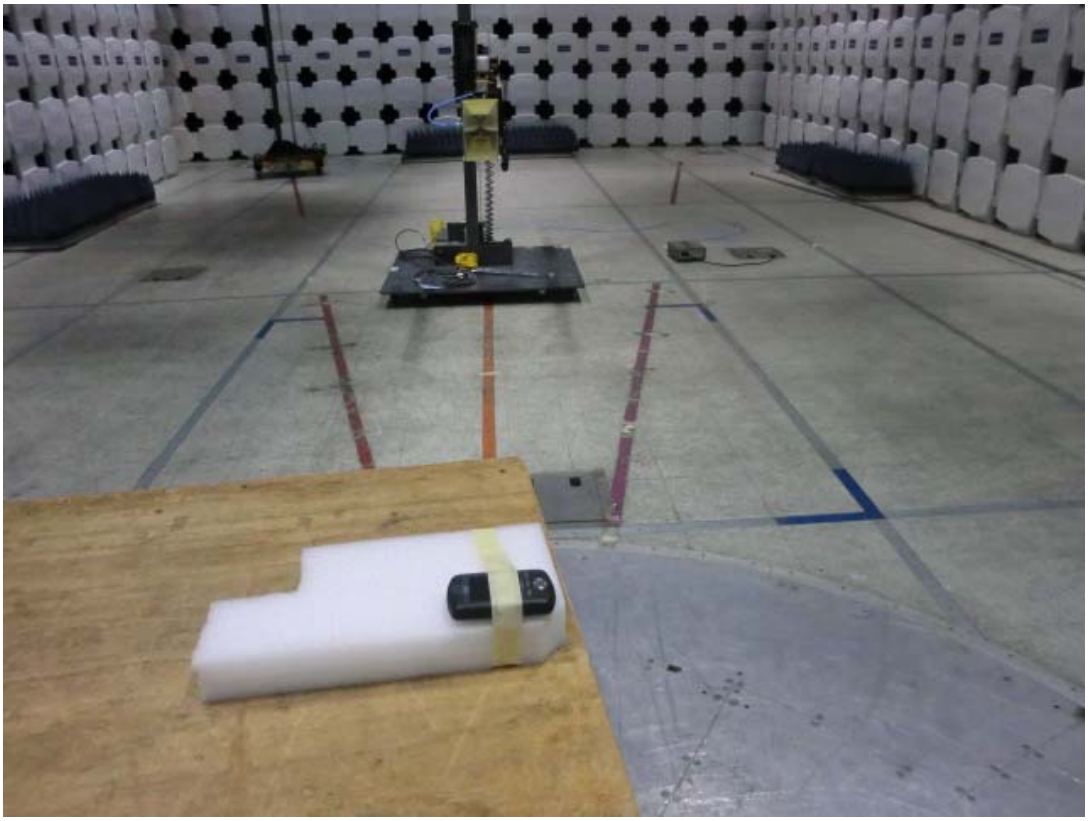
7.4 Setup Photographs:

30-1000 MHz Test Setup Photos



1-5 GHz Test Setup Photos





7.5 Plots/Data:

Radiated Emissions

Company: Insulet Corporation
Model #: UST600
Serial #: 130003561
Engineers: Vathana Ven
Project #: G100858069
Standard: FCC Part 15C 15.231/RSS-210
Receiver: R&S ESI (145128) 09-23-2012
PreAmp: PRE145003 10-04-12.txt
PreAmp Used? (Y or N): Y

Date(s): 09/10/12
Limit Distance (m): 3
Test Distance (m): 10
Voltage/Frequency: Battery

Location: 10m Chamber
Antenna & Cables: N
Antenna: ANT145-034 10M VER 02-07-13.txt ANT145-034 10M Hor 02-07-13.txt
Cable(s): 145-410 10mTrkA 09-04-2012.txt NONE.
Barometer: DAV003
Temp/Humidity/Pressure: 21c 47% 1007mB
Filter: NONE
Bands: N, LF, HF, SHF
Frequency Range: 30 MHz - 1000 MHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC
Note: X (EUT flat on its back)													
PK	V	867.800	28.62	23.20	5.05	27.95	-10.46	39.38	80.80	-41.44	120/300 kHz		
AVG	V	867.800	15.80	23.20	5.05	27.95	-10.46	26.56	60.80	-34.26	120/300 kHz		
PK	H	867.800	28.78	22.74	5.05	27.95	-10.46	39.08	80.80	-41.74	120/300 kHz		
AVG	H	867.800	15.56	22.74	5.05	27.95	-10.46	25.86	60.80	-34.96	120/300 kHz		
Note: Y (EUT on its short side)													
PK	V	867.800	28.24	23.20	5.05	27.95	-10.46	39.00	80.80	-41.82	120/300 kHz		
AVG	V	867.800	15.56	23.20	5.05	27.95	-10.46	26.32	60.80	-34.50	120/300 kHz		
PK	H	867.800	28.01	22.74	5.05	27.95	-10.46	38.31	80.80	-42.51	120/300 kHz		
AVG	H	867.800	15.80	22.74	5.05	27.95	-10.46	26.10	60.80	-34.72	120/300 kHz		
Note: Z (EUT on its long side)													
PK	V	867.800	28.73	23.20	5.05	27.95	-10.46	39.49	80.80	-41.33	120/300 kHz		
AVG	V	867.800	15.80	23.20	5.05	27.95	-10.46	26.56	60.80	-34.26	120/300 kHz		
PK	H	867.800	28.24	22.74	5.05	27.95	-10.46	38.54	80.80	-42.28	120/300 kHz		
AVG	H	867.800	15.80	22.74	5.05	27.95	-10.46	26.10	60.80	-34.72	120/300 kHz		

1-5 GHz

Special Radiated Emissions

Company: Insulet Corporation — Antenna & Cables: HF — Bands: N, LF, HF, SHF
Model #: UTC 600 — Antenna: HORN2 V3m 10-24-2012.txt — HORN2 H3m 10-24-2012.txt
Serial #: 130003561 — Cable(s): 145-416 3mTrkB 09-04-2012.txt — NONE.
Engineers: Vathana Ven — Location: 10m Chamber — Barometer: DAV003 — Filter: REA003
Project #: G100858069 — Date(s): 10/26/10
Standard: FCC Part 15C 15.231/RSS-210 — Temp/Humidity/Pressure: 21c — 47% — 1007mB
Receiver: R&S ESI (145128) 09-23-2012 — Limit Distance (m): 3
PreAmp: PRE145014 12-16-2012.txt — Test Distance (m): 3
PreAmp Used? (Y or N): Y — Voltage/Frequency: Battery — Frequency Range: 1-5 GHz

Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
PK	V	1301.760	44.24	26.23	4.54	33.93	0.00	41.09	74.00	-32.91	1/3 MHz	RB	RB	
AVG	V	1301.760	35.92	26.23	4.54	33.93	0.00	32.77	54.00	-21.23	1/3 MHz	RB	RB	
PK	H	1735.565	45.26	26.88	5.19	33.79	0.00	43.54	80.80	-37.26	1/3 MHz			
AVG	H	1735.565	34.43	26.88	5.19	33.79	0.00	32.71	60.80	-28.09	1/3 MHz			
PK	H	2169.443	46.64	27.73	5.61	34.00	0.00	45.98	80.80	-34.82	1/3 MHz			
AVG	H	2169.443	41.56	27.73	5.61	34.00	0.00	40.90	60.80	-19.90	1/3 MHz			
PK	H	2603.306	43.76	28.93	6.33	34.30	0.00	44.72	80.80	-36.08	1/3 MHz			
AVG	H	2603.306	35.11	28.93	6.33	34.30	0.00	36.07	60.80	-24.73	1/3 MHz			
PK	H	3037.440	40.84	30.34	7.40	34.53	0.00	44.05	80.80	-36.75	1/3 MHz			Noise Floor
AVG	H	3037.440	28.24	30.34	7.40	34.53	0.00	31.45	60.80	-29.35	1/3 MHz			Noise Floor
PK	H	3471.200	40.19	31.27	7.51	35.04	0.00	43.94	80.80	-36.86	1/3 MHz			Noise Floor
AVG	H	3471.200	28.05	31.27	7.51	35.04	0.00	31.80	60.80	-29.00	1/3 MHz			Noise Floor
PK	H	3905.100	40.35	32.79	8.23	36.00	0.00	45.37	74.00	-28.63	1/3 MHz	RB	RB	Noise Floor
AVG	H	3905.100	27.02	32.79	8.23	36.00	0.00	32.04	54.00	-21.96	1/3 MHz	RB	RB	Noise Floor
PK	H	4339.000	39.54	32.17	8.58	35.49	0.00	44.80	74.00	-29.20	1/3 MHz	RB	RB	Noise Floor
AVG	H	4339.000	26.82	32.17	8.58	35.49	0.00	32.08	54.00	-21.92	1/3 MHz	RB	RB	Noise Floor

Test Personnel: Vathana Ven VSV — Test Date: 09/10/2012
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: FCC CFR 47 Part 15 Subpart C and IC RSS-210 — Test Levels: See Data
Input Voltage: 3.2V Battery — Ambient Temperature: 21 ºC
Pretest Verification w/ Ambient Signals or BB Source: **YES** — Relative Humidity: 47 %
Atmospheric Pressure: 1007 mbars

Deviations, Additions, or Exclusions: None

8 Digital device Radiated Spurious Emissions

8.1 Method

Tests are performed in accordance with ICES-003 Issue 5 August 2012, CFR47 FCC Part 15 Subpart B:2012

.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A wooden table 80 cm high is used for table-top equipment.

Measurement Uncertainty

For radiated emissions, U_{lab} (3.5 dB at 3m and 3.5 dB at 10m below 1 GHz, and 4.2 dB at 3m above 1 GHz) < U_{CISPR} (5.2 dB), which is the reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

8.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
145034	BiLog Antenna (30 MHz to 1GHz)	Schaffner Chase EMC	CBL6111C	2564	02/07/2012	02/07/2013
145003'	Preamplifier (150 KHz to 1.3 GHz)	Hewlett Packard	8447D	2443A04077	10/04/2011	10/04/2012
145 128	EMI Test Receiver (20Hz - 40GHz)	Rohde & Schwarz	ESI	837771/027	08/23/2011	09/23/2012
145-410	Cables 145-400 145-403 145-405 145-406 145-407	Huber + Suhner	10m Track A Cables	multiple	09/04/2011	10/04/2012
145-416	Cables 145-400 145-402 145-404 145-408	Huber + Suhner	3m Track B cables	multiple	09/04/2011	10/04/2012
HORN2'	HORN ANTENNA	EMCO	3115	9602-4675	10/24/2011	10/24/2012
145 014'	Preamplifier (1 GHz to 26.5 GHz)	Hewlett Packard	8449B	3008A00232	12/16/2011	12/16/2012
DAV003	Weather Station	Davis Instruments	7400	PE80529A39A	08/17/2011	09/17/2012

Software Utilized:

Name	Manufacturer	Version
EMI Boxborough	Intertek	8/27/2010

8.3 Results:

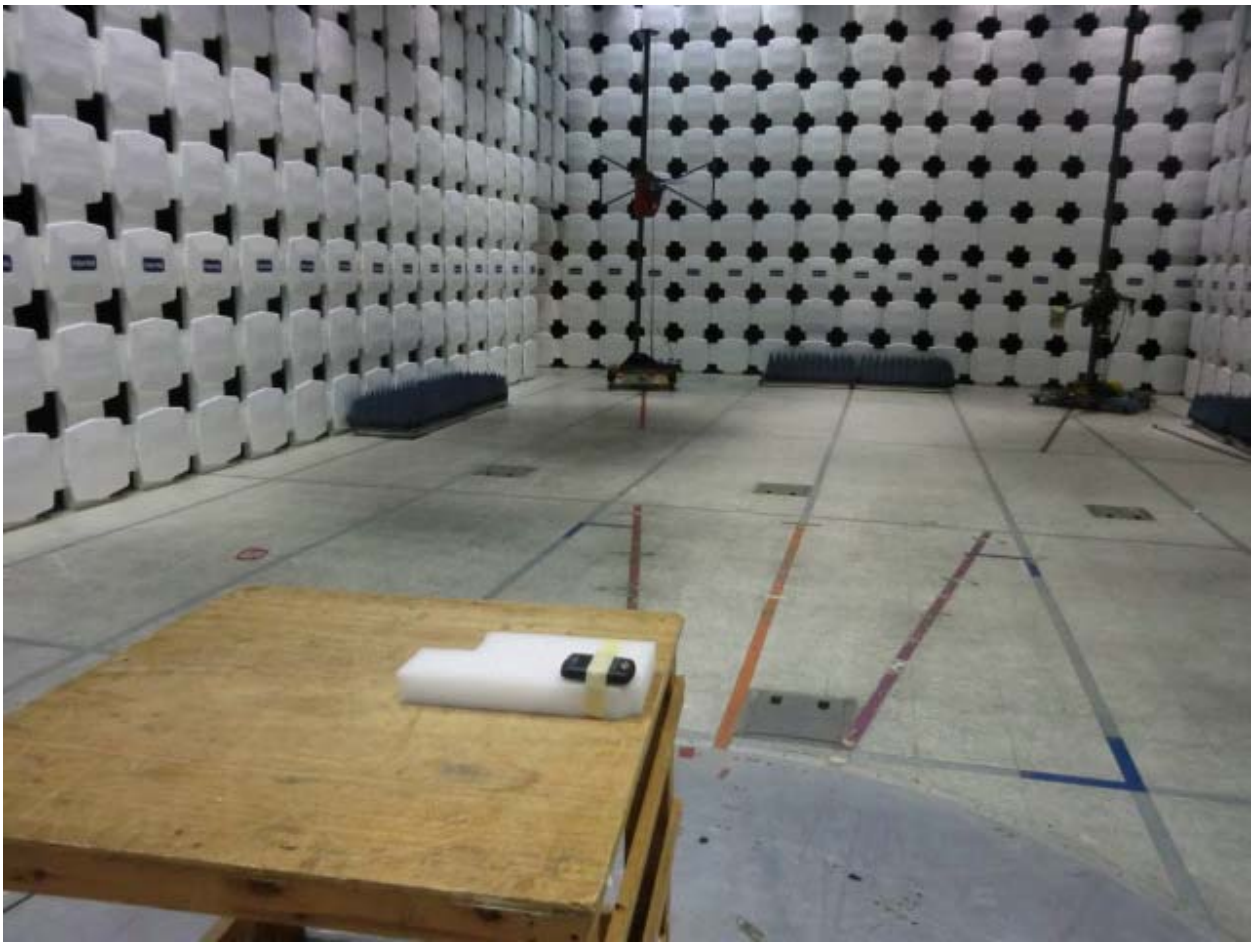
The sample tested was found to Comply. The spurious emissions must meet the following limits:

Frequency of emission (MHz)	Field strength (microvolts/ meter)
30–88	100
88–216	150
216–960	200
Above 960	500

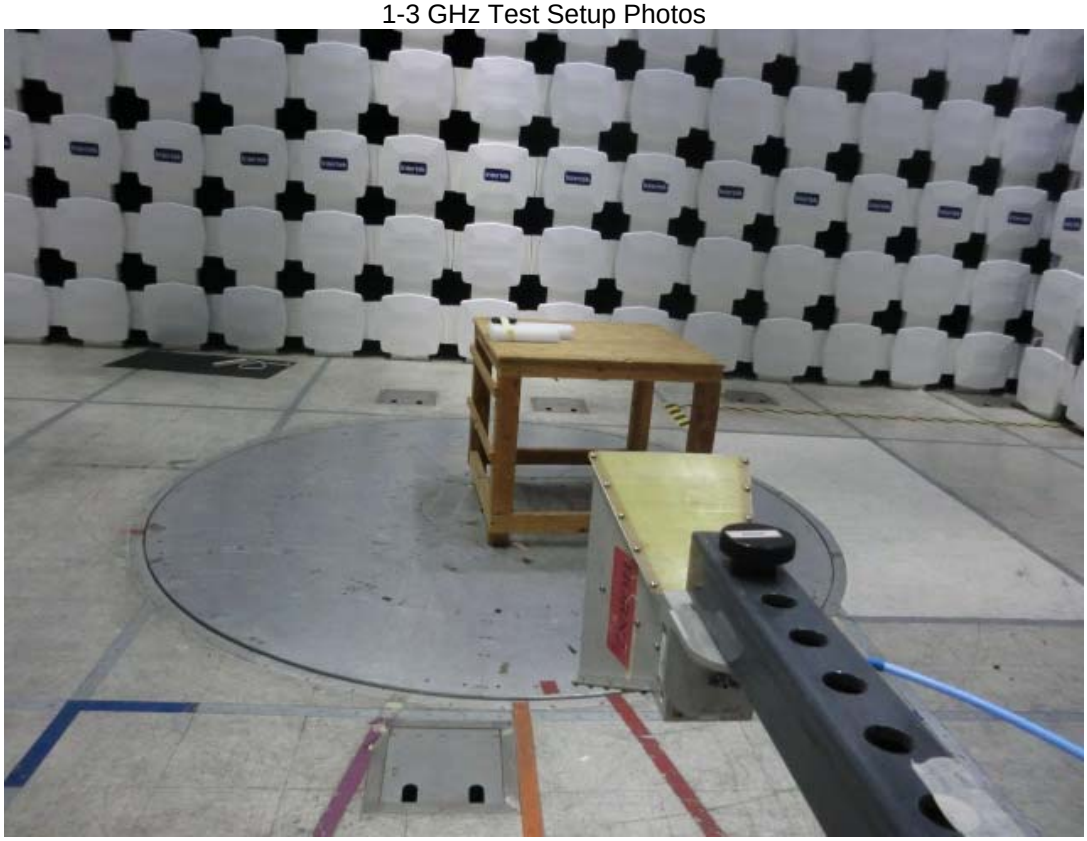
At a 3 meter test distance.

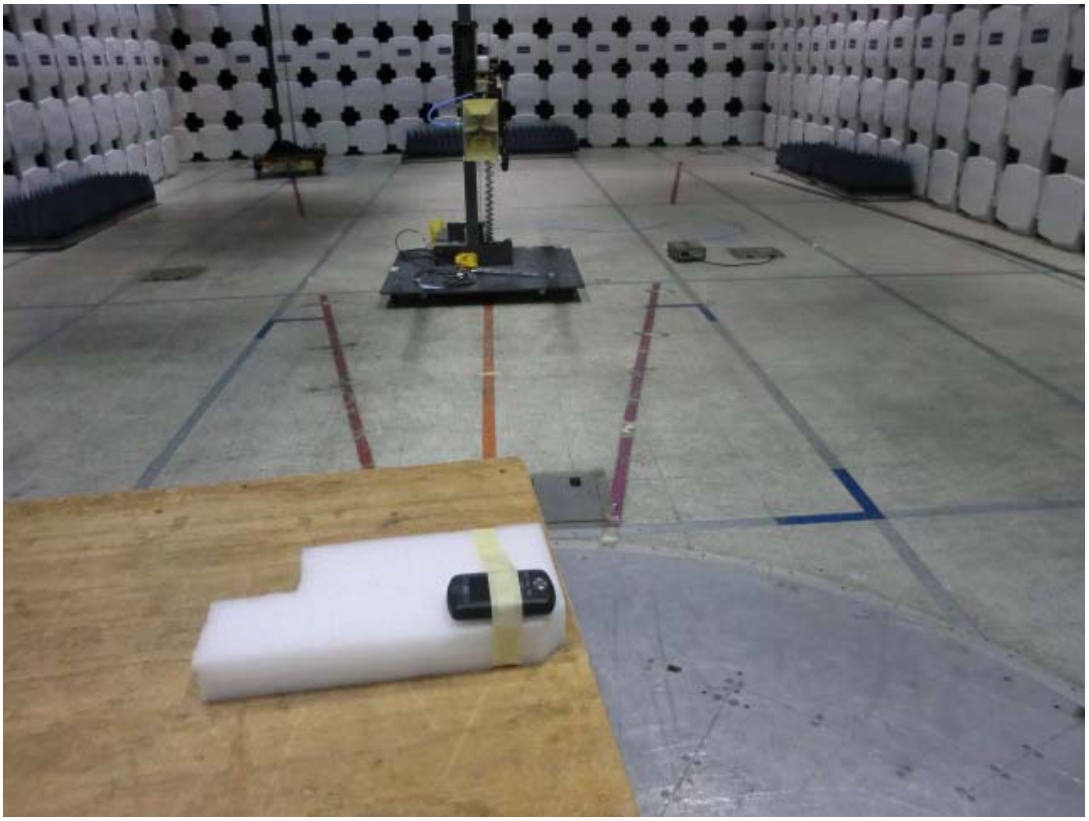
8.4 Setup Photographs:

30-1000 MHz Test Setup Photos



1-3 GHz Test Setup Photos





8.5 Plots/Data:

Special Radiated Emissions

Company: Insulet Corporation — Antenna & Cables: N — Bands: N, LF, HF, SHF
Model #: UTC 600 — Antenna: ANT145-034 10M VER 02-07-13.txt ANT145-034 10M Hor 02-07-13.txt
Serial #: 130003561 — Cable(s): 145-410 10mTrkA 09-04-2012.txt NONE.
Engineers: Vathana Ven — Location: 10m Chamber — Barometer: DAV003 — Filter: NONE
Project #: G100858069 — Date(s): 09/10/12
Standard: FCC Part 15 Subpart B/ICES003 Class B — Temp/Humidity/Pressure: 21c 47% 1007mB
Receiver: R&S ESI (145128) 09-23-2012 — Limit Distance (m): 3
PreAmp: PRE145003 10-04-12.txt — Test Distance (m): 10
PreAmp Used? (Y or N): Y — Voltage/Frequency: Battery — Frequency Range: 30MHz-3GHz
Net = Reading (dBuV/m) + Antenna Factor (dB1/m) + Cable Loss (dB) - Preamp Factor (dB) - Distance Factor (dB)
Peak: PK Quasi-Peak: QP Average: AVG RMS: RMS; NF = Noise Floor, RB = Restricted Band; Bandwidth denoted as RBW/VBW

Detector Type	Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Distance Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	Bandwidth	FCC	IC	Harmonic?
QP	V	30.000	21.81	18.70	1.29	27.41	-10.46	24.85	40.00	-15.15	120/300 kHz			Noise Floor
QP	V	200.000	22.82	10.20	2.59	26.91	-10.46	19.16	43.50	-24.34	120/300 kHz			Noise Floor
QP	V	300.000	19.85	13.50	3.14	27.21	-10.46	19.74	46.00	-26.26	120/300 kHz			Noise Floor
QP	H	600.000	21.70	20.00	4.29	28.34	-10.46	28.11	46.00	-17.89	120/300 kHz			Noise Floor
QP	H	800.000	22.16	21.90	4.90	28.11	-10.46	31.31	46.00	-14.69	120/300 kHz			Noise Floor
QP	H	900.000	22.28	23.50	5.18	27.88	-10.46	33.54	46.00	-12.46	120/300 kHz			Noise Floor

Test Personnel: Vathana Ven VSV — Test Date: 09/10/2012
Supervising/Reviewing Engineer: (Where Applicable) N/A
Product Standard: FCC CFR 47 Part 15 Subpart B and ICES003 — Test Levels: See Data
Input Voltage: 3.2V Battery — Ambient Temperature: 21 ºC
Pretest Verification w/ Ambient Signals or BB Source: **YES** — Relative Humidity: 47 %
Atmospheric Pressure: 1007 mbars

Deviations, Additions, or Exclusions: None

9 Revision History

Revision Level	Date	Report Number	Notes
0	09/13/2012	100858069BOX-004	Original Issue