Medtronic MiniMed

TEST REPORT FOR

CareLink USB
Model: MMT-7306

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.207 & 15.247
(DTS 2400-2483.5 MHz)

Report No.: 101100-6

Date of issue: November 26, 2018

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Test Certificate # 803.05

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Testing the Future
CKC LABORATORIES, INC.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Medtronic MiniMed
18000 Devonshire Street
Northridge, CA 91325-1219

Representative: Bob Vitti
Customer Reference Number: 4500127569

REPORT PREPARED BY:

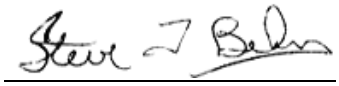
Terri Rayle
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 101100

DATE OF EQUIPMENT RECEIPT: September 20, 2018
DATE(S) OF TESTING: September 20-24, 2018

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.



Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
22116 23rd Drive S.E., Suite A
Canyon Park, Bothell, WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.11

Site Registration & Accreditation Information

Location	NIST CB #	TAIWAN	CANADA	FCC	JAPAN
Canyon Park Bothell, WA	US0081	SL2-IN-E-1145R	3082C-1	US1022	A-0148

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C - 15.247 (DTS)

Test Procedure	Description	Modifications	Results
15.247(a)(2)	6dB Bandwidth	NA	Pass
15.247(b)(3)	Output Power	NA	Pass
15.247(e)	Power Spectral Density	NA	Pass
15.247(d)	RF Conducted Emissions & Band Edge	NA	NA1
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	Pass

NA = Not Applicable
NA1 = Not applicable because EUT does not have an antenna port, antenna is internal to EUT.

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
No modifications were made during testing.

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
CareLink USB	Medtronic MiniMed	MMT-7306	PC0028745F

Support Equipment:

Device	Manufacturer	Model #	S/N
Laptop	Dell	Latitude 7490	NA
AC Adapter (for Laptop)	Dell	LA65N130	NA

EUT Label

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Zigbee (802.15.4)
Operating Frequency Range:	0dBm max
Modulation Type(s):	2420-2480MHz
Maximum Duty Cycle:	100% as worst case
Number of TX Chains:	1
Antenna Type(s) and Gain:	Chip / -0.5dBi
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	Host Device 115VAC (USB 5V)
Firmware / Software used for Test:	TelD 1.0 A /Comets 1.26A

FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

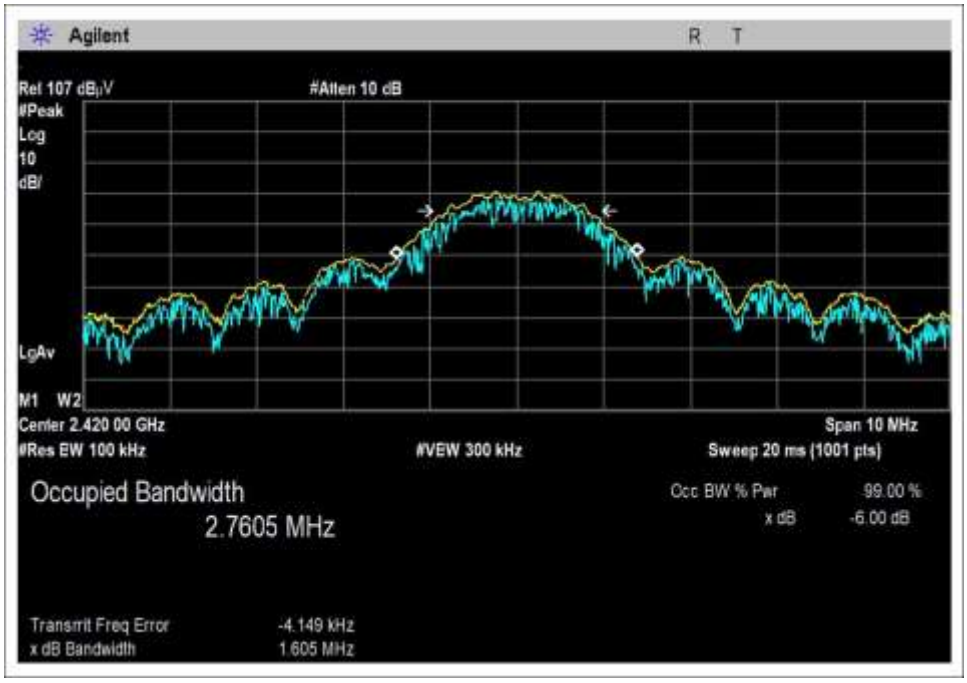
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013), KDB 558074 v05 (Aug 2018)	Test Date(s):	9/20/2018
Configuration:	1		
Test Setup:	Test Mode: Continuously Modulated The EUT is connected to laptop via 3 foot USB extension. Low, Mid, and High channels investigated.		

Environmental Conditions			
Temperature (ºC)	23-25	Relative Humidity (%):	38-42

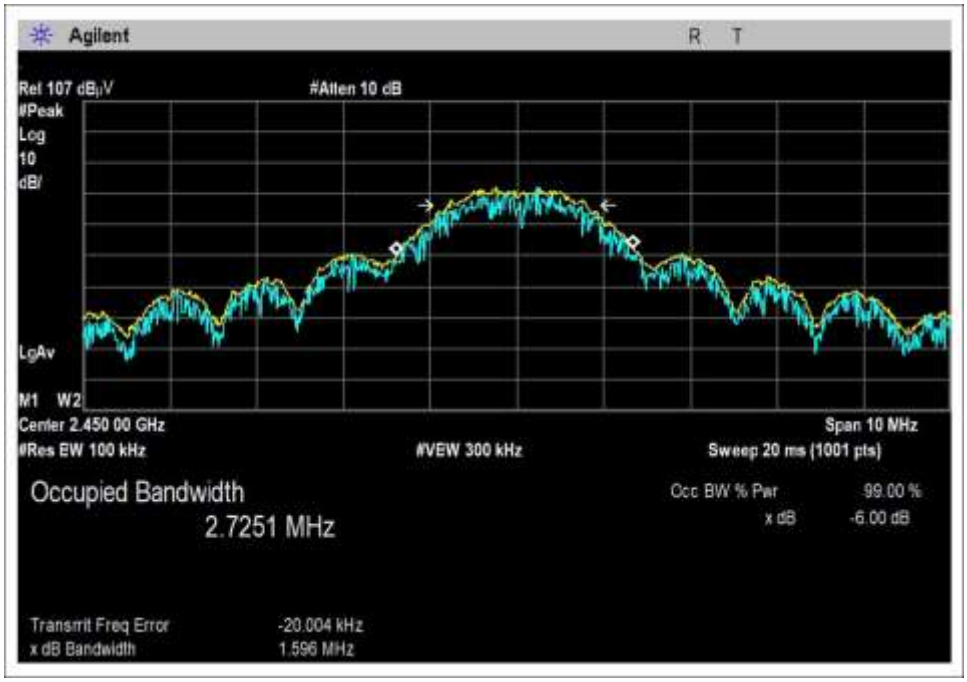
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
AN02871	Spectrum Analyzer	Agilent	E4440A	2/24/2017	2/24/2019
ANP06540	Cable	Andrews	Heliax	10/30/2017	10/30/2019
P06515	Cable	Andrews	Heliax	6/29/2018	6/29/2020
AN03540	Preamp	HP	83017A	5/2/2017	5/2/2019
P06503	Cable	Astrolab	32026-29801-29801-36	3/13/2018	3/13/2020
AN01467	Horn Antenna-ANSI C63.5 Calibration	EMCO	3115	7/21/2017	7/21/2019

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
2420	1	OQPSK	1605	≥500	Pass
2450	1	OQPSK	1596	≥500	Pass
2480	1	OQPSK	1579	≥500	Pass

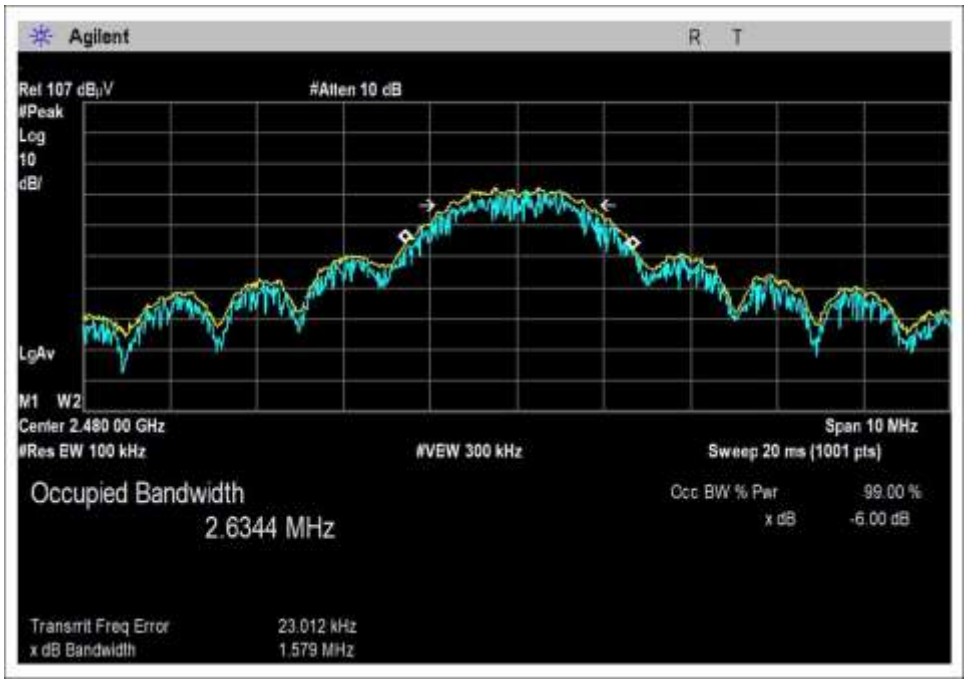
Plots



Low Channel

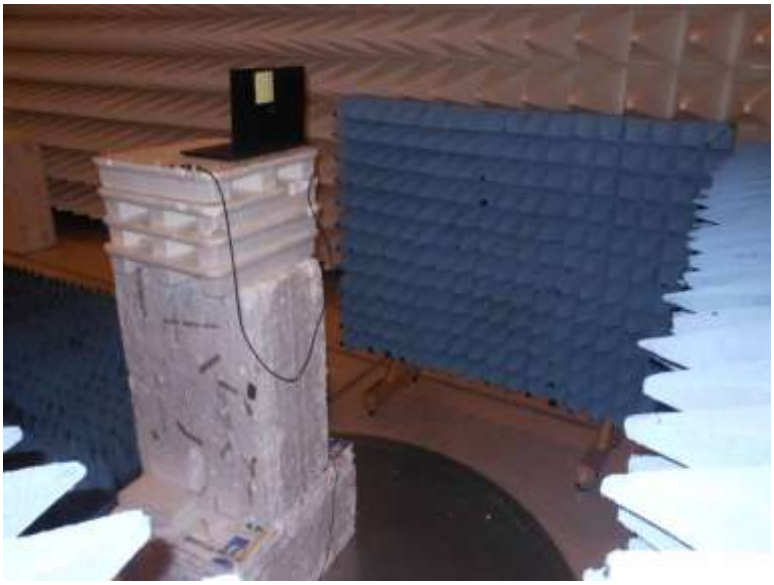


Middle Channel



High Channel

Test Setup Photo



15.247(b)(3) Output Power

Test Data Summary - Voltage Variations					
Frequency (MHz)	Modulation / Ant Port	$V_{Minimum}$ (dBm)	$V_{Nominal}$ (dBm)	$V_{Maximum}$ (dBm)	Max Deviation from $V_{Nominal}$ (dB)
2420	OQPSK	-7.2	-7.2	-7.2	0.0
2450	OQPSK	-6.3	-6.3	-6.3	0.0
2450	OQPSK	-4.5	-4.5	-4.5	0.0

Test performed using operational mode with the highest output power, representing worst case.

Parameter Definitions:

Measurements performed at input voltage according to manufacturer specification.

Parameter	Value
$V_{Nominal}$:	5.0VDC
$V_{Minimum}$:	4.5VDC
$V_{Maximum}$:	5.5VDC

Power Output Test Data Summary - Radiated Measurement						
Measurement Option: RBW > DTS Bandwidth						
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Field Strength (dBuV/m @3m)	Calculated (dBm)	Limit (dBm)	Results
2420	OQPSK	Chip / -0.5dBi	88.0	-7.2	≤36	Pass
2450	OQPSK	Chip / -0.5dBi	88.6	-6.3	≤36	Pass
2480	OQPSK	Chip / -0.5dBi	90.7	-4.5	≤36	Pass

For fixed point-to-point antennas, the limit is calculated in accordance with 15.247(c)(1): $Limit = 30 - Roundup\left(\frac{G-6}{3}\right)$

For directional beamforming antennas, the limit is calculated in accordance with 15.247(c)(2) and KDB 662911.

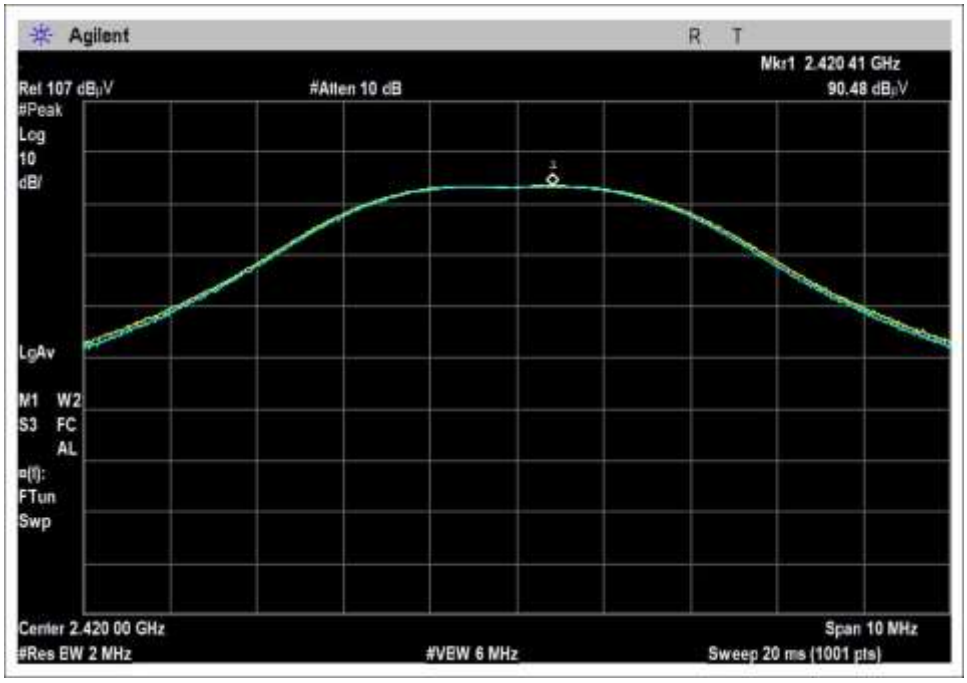
Conducted RF output power calculated in accordance with ANSI C63.10.

$$P(W) = \frac{(E \cdot d)^2}{30\ G}$$

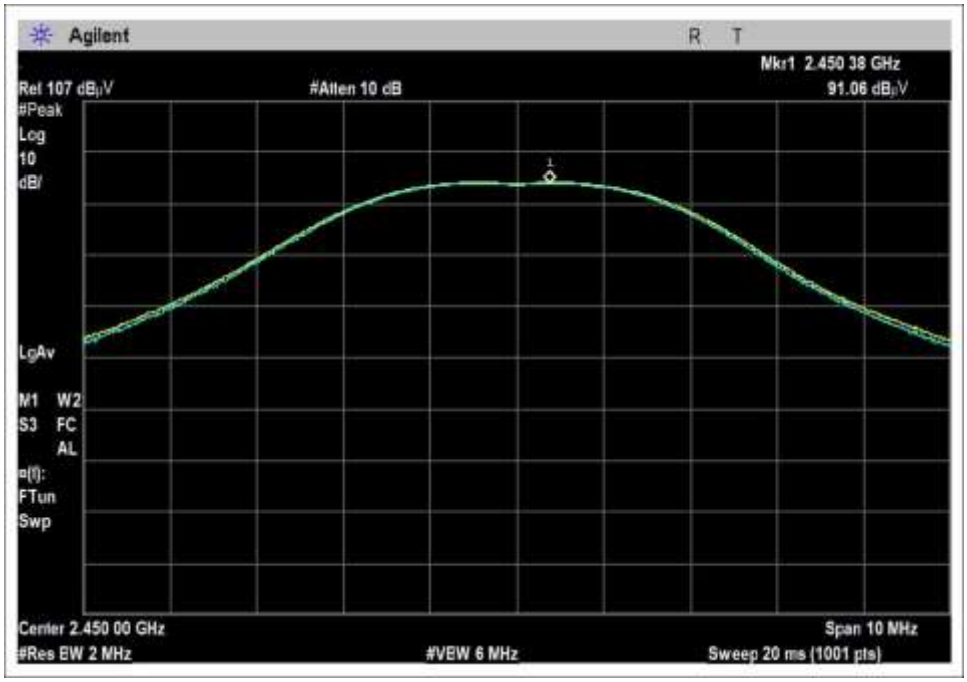
Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G\ - 104.77$$

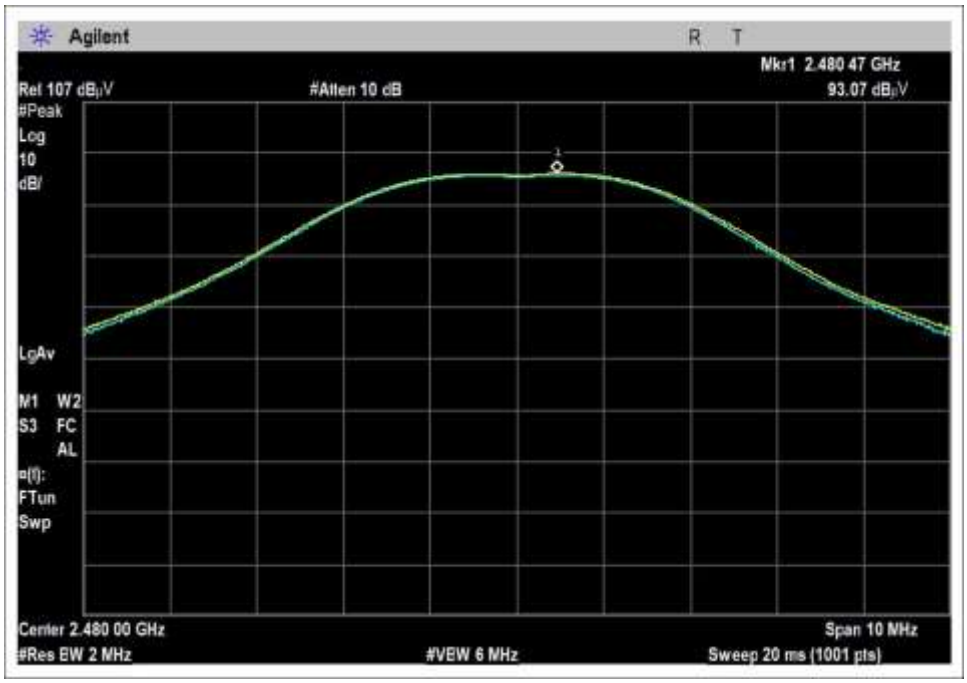
Plots



Low Channel



Middle Channel



High Channel

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(b) Power Output (2400-2483.5 MHz DTS)**		
Work Order #:	**101100**	Date:	9/20/2018
Test Type:	**Radiated Scan**	Time:	16:24:26
Tested By:	Michael Atkinson	Sequence#:	3
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

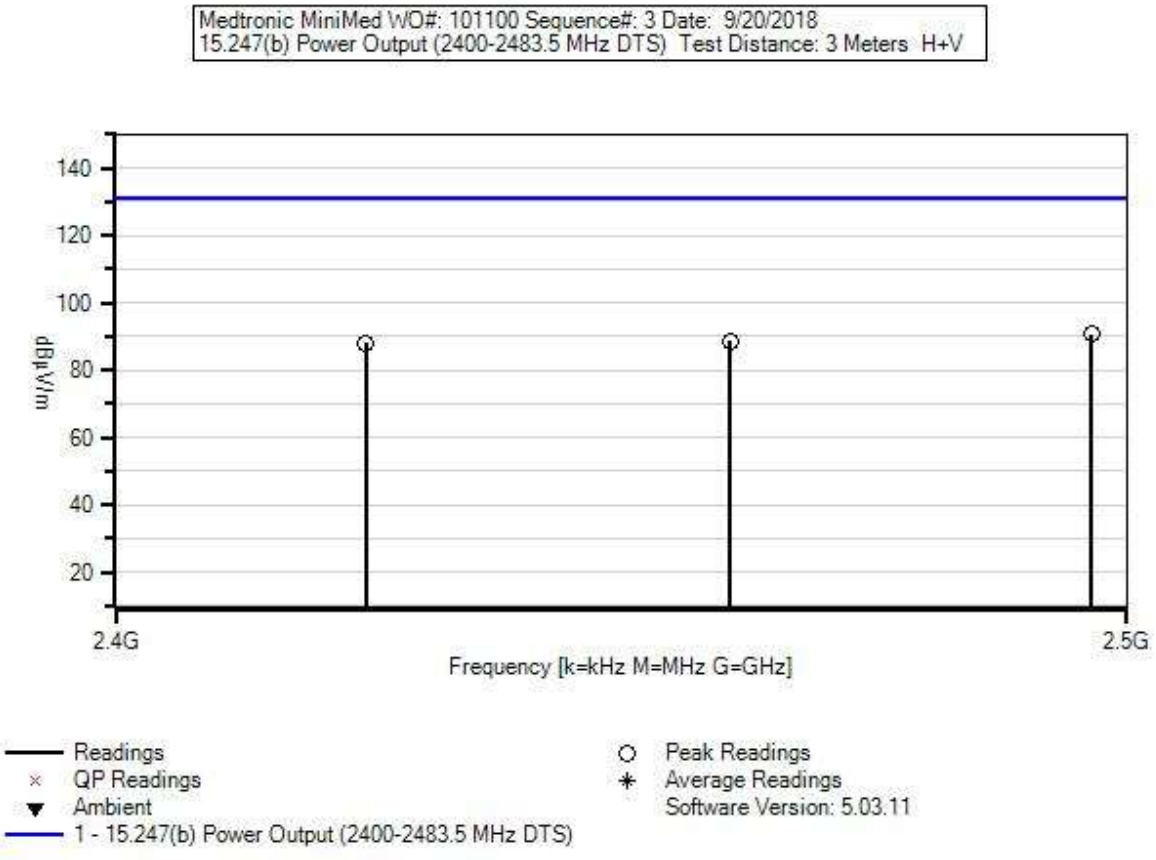
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Tested: 2420MHz, 2450MHz, 2480MHz
Firmware Power Setting: Max Power
Protocol/MCS/Modulation: QPSK
Duty Cycle: 100%
Test Mode: Continuously Modulated

Temperature (ºC): 22-25
Relative Humidity (%): 38-42
Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013), KDB 558074 v05 (Aug 2018)

Setup: The EUT is connected to laptop via 3 foot USB extension.
Low, Mid, High channels investigated.
Both antenna polarities investigated and X, Y, Z Axis investigated, only worst case reported.



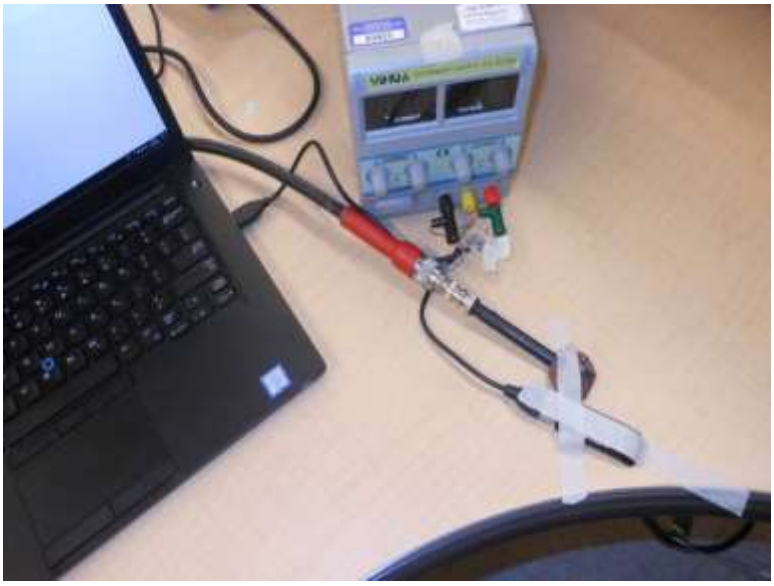
Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T4	ANP06934	Cable	32026-29801-29801-18	3/13/2018	3/13/2020
T5	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T6	ANP06515	Cable	Heliax	6/29/2018	6/29/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2480.470M	93.1	+0.0 +28.1	+0.4 +2.7	-34.0	+0.4	+0.0	90.7	131.2 X	-40.5	Horiz
2	2450.380M	91.1	+0.0 +28.1	+0.4 +2.6	-34.0	+0.4	+0.0	88.6	131.2 X	-42.6	Horiz
3	2420.410M	90.5	+0.0 +28.1	+0.4 +2.6	-34.0	+0.4	+0.0	88.0	131.2 X	-43.2	Horiz

Test Setup Photos

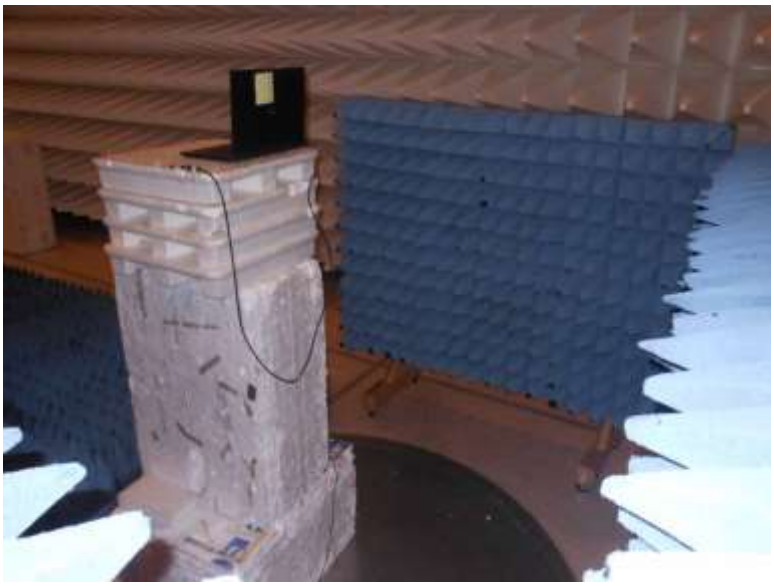


Voltage Variation

X Axis

Y Axis

Z Axis



Above 1GHz, Cone placement

15.247(e) Power Spectral Density

PSD Test Data Summary - Radiated Measurement						
Measurement Method: PKPSD						
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Field Strength (dBuV/m @3m)**	**Calculated (dBm/3kHz)**	**Limit (dBm/3kHz)**	**Results**
2420	OQPSK	Chip / -0.5dBi	84.8	-10.4	≤8	Pass
2450	OQPSK	Chip / -0.5dBi	86.0	-9.2	≤8	Pass
2480	OQPSK	Chip / -0.5dBi	86.8	-8.4	≤8	Pass

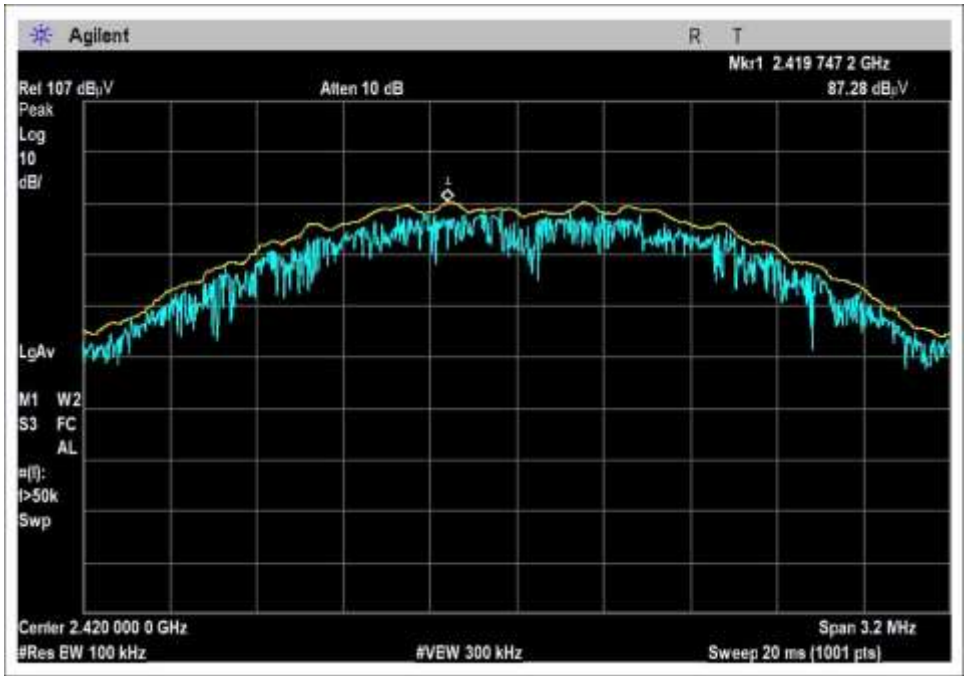
Conducted RF output power calculated in accordance with ANSI C63.10.

$$P(W) = \frac{(E \cdot d)^2}{30\ G}$$

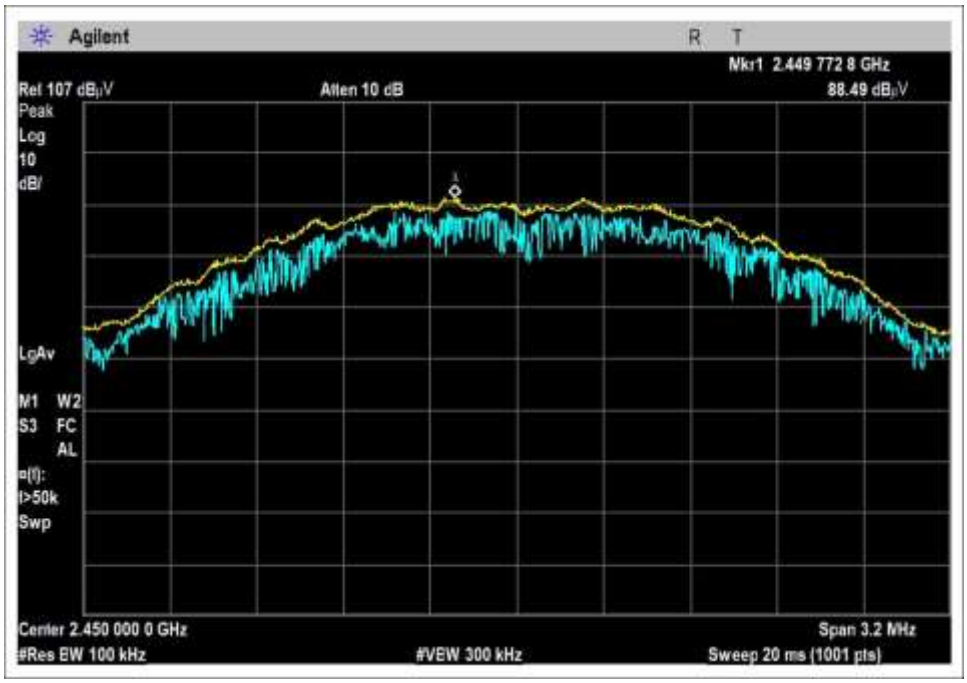
Or equivalently, in logarithmic form:

$$P(dBm) = E(dBuV/m) + 20LOG(d) - G\ - 104.77$$

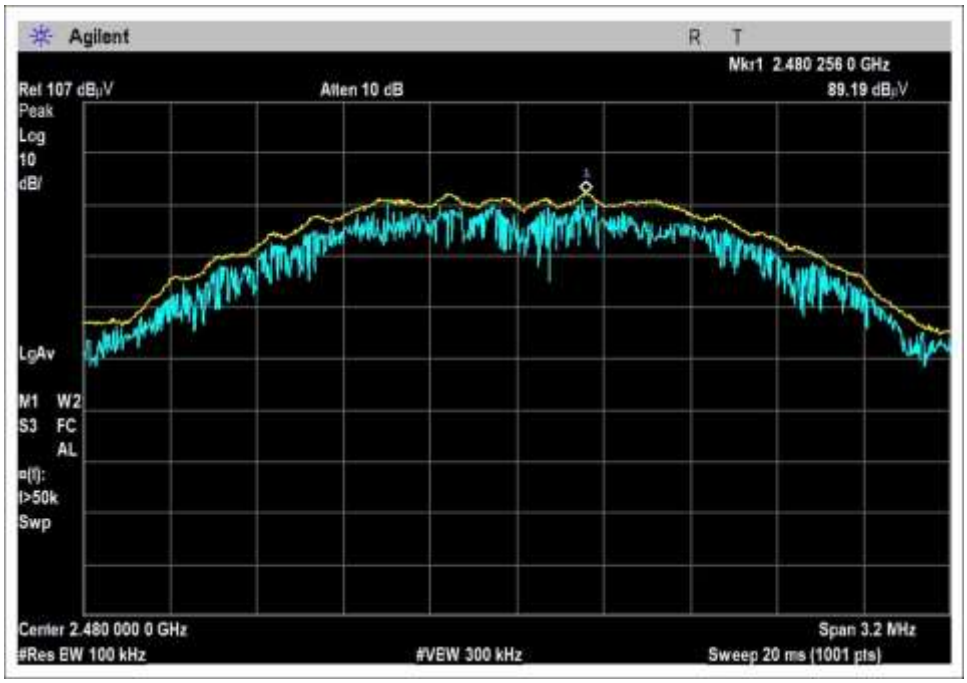
Plots



Low Channel



Middle Channel



High Channel

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**		
Work Order #:	**101100**	Date:	9/21/2018
Test Type:	**Radiated Scan**	Time:	10:27:36
Tested By:	Michael Atkinson	Sequence#:	4
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

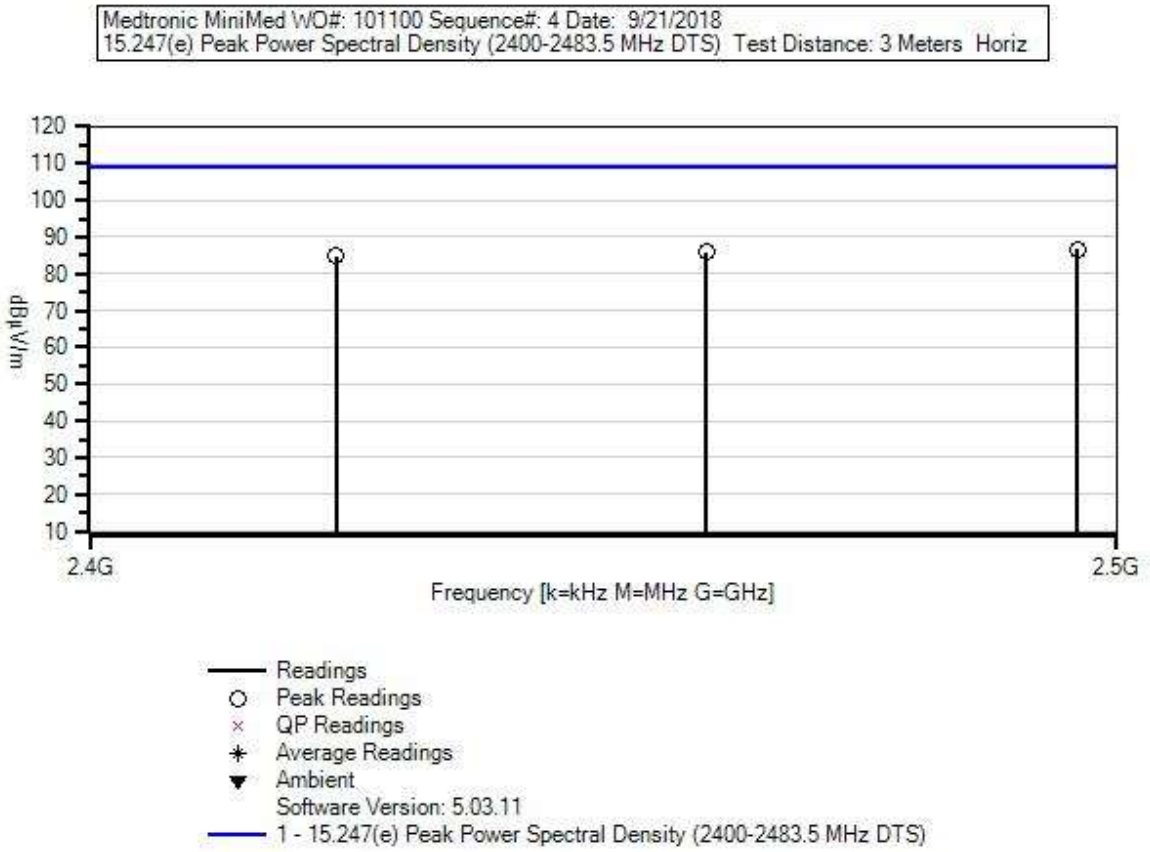
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Tested: 2420MHz, 2450MHz, 2480MHz
Firmware Power Setting: Max Power
Protocol/MCS/Modulation: QPSK
Duty Cycle: 100%
Test Mode: Continuously Modulated

Temperature (ºC): 22-25
Relative Humidity (%): 38-42
Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013), KDB 558074 v05 (Aug 2018)

Setup: The EUT is connected to laptop via 3 foot USB extension.
Low, Mid, High channels investigated.
Both antenna polarities investigated and X, Y, Z Axis investigated, only worst case reported.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T1	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T2	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T3	ANP06934	Cable	32026-29801-29801-18	3/13/2018	3/13/2020
T4	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T5	ANP06515	Cable	Heliax	6/29/2018	6/29/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

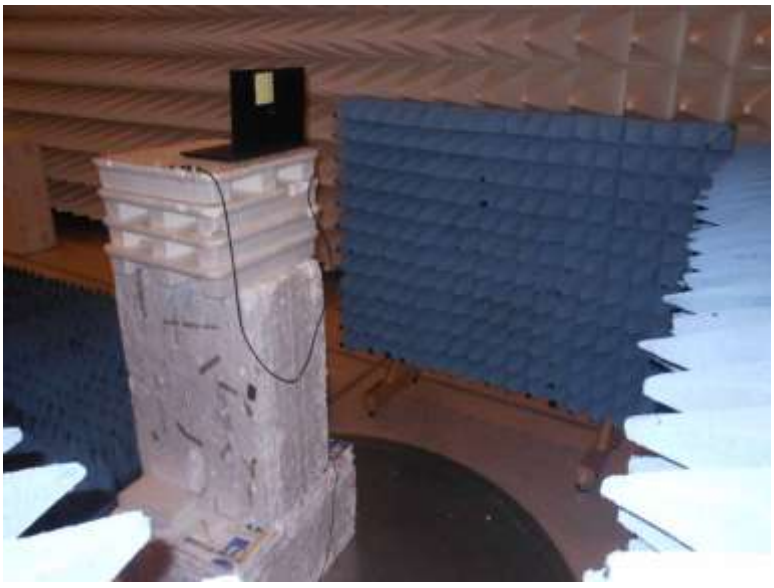
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2480.256M	89.2	+0.4 +2.7	-34.0	+0.4	+28.1	+0.0	86.8	109.2 X	-22.4	Horiz
2	2449.773M	88.5	+0.4 +2.6	-34.0	+0.4	+28.1	+0.0	86.0	109.2 X	-23.2	Horiz
3	2419.747M	87.3	+0.4 +2.6	-34.0	+0.4	+28.1	+0.0	84.8	109.2 X	-24.4	Horiz

Test Setup Photos

X Axis

Y Axis

Z Axis



Above 1GHz, Cone placement

15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**101100**	Date:	9/24/2018
Test Type:	**Maximized Emissions**	Time:	15:20:57
Tested By:	Michael Atkinson	Sequence#:	15
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

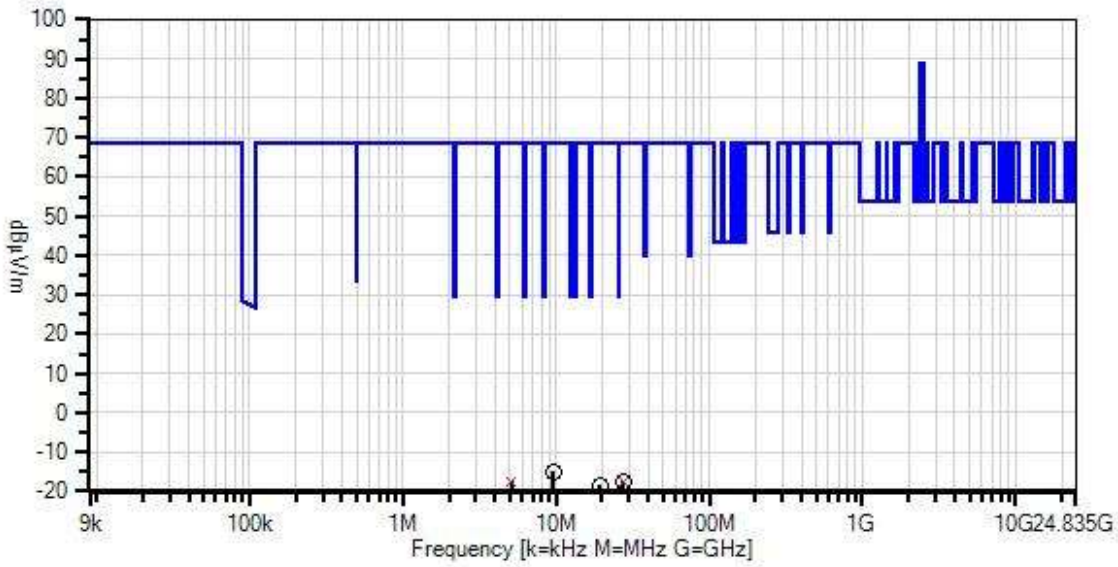
Test Conditions / Notes:

Frequency Range: 9kHz-30MHz
Frequency Tested: 2420MHz, 2450MHz, 2480MHz
Firmware Power Setting: Max Power
Protocol/MCS/Modulation: QPSK
Duty Cycle: 100%
Test Mode: Continuously Modulated

Temperature (ºC): 22-25
Relative Humidity (%): 38-42
Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013), KDB 558074 v05 (Aug 2018)

Setup: The EUT is connected to laptop via 3 foot USB extension.
Low, Mid, High channels investigated. 3 orthogonal antenna polarities investigated as well as EUT X, Y, Z axes investigated, only worst case reported.

Medtronic MiniMed WO#: 101100 Sequence#: 15 Date: 9/24/2018
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Various



Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T4	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	9.636M	15.7	+0.0	+0.0	+0.2	+9.2	-40.0	-14.9	68.8	-83.7	Perp
2 QP	27.442M	16.0	+0.0	+0.1	+0.3	+6.3	-40.0	-17.3	68.8	-86.1	Groun
^	27.451M	17.4	+0.0	+0.1	+0.3	+6.3	-40.0	-15.9	68.8	-84.7	Groun
4 QP	5.107M	12.8	+0.0	+0.0	+0.1	+9.7	-40.0	-17.4	68.8	-86.2	Para
^	5.107M	17.9	+0.0	+0.0	+0.1	+9.7	-40.0	-12.3	68.8	-81.1	Para
6	27.511M	15.8	+0.0	+0.1	+0.3	+6.3	-40.0	-17.5	68.8	-86.3	Para
7	19.323M	13.3	+0.0	+0.0	+0.2	+8.1	-40.0	-18.4	68.8	-87.2	Groun

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**101100**	Date:	9/24/2018
Test Type:	**Maximized Emissions**	Time:	15:01:51
Tested By:	Michael Atkinson	Sequence#:	14
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

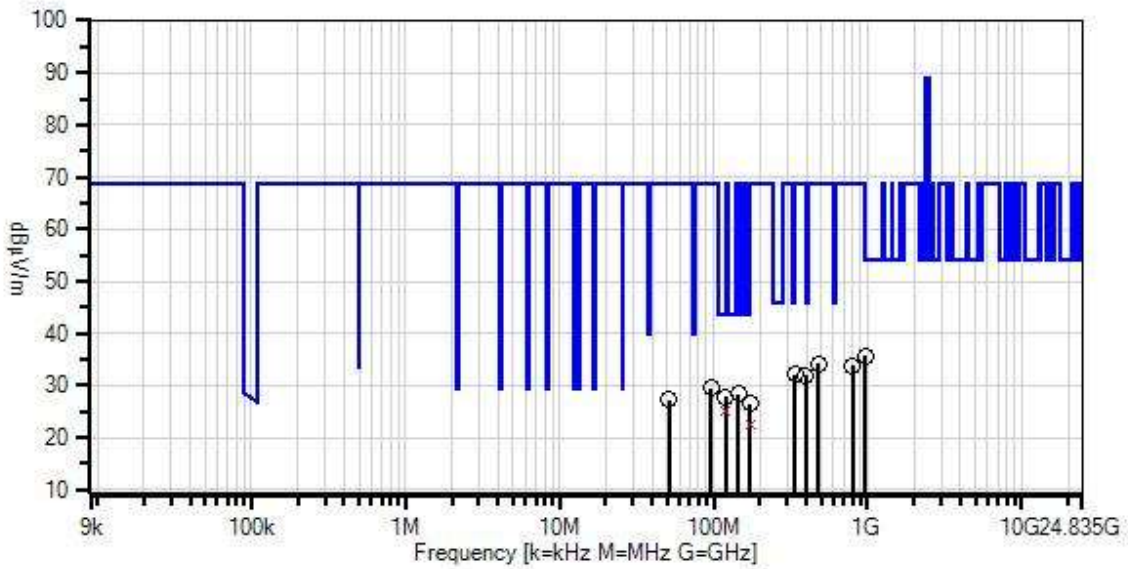
Test Conditions / Notes:

Frequency Range: 30-1000MHz
Frequency Tested: 2420MHz, 2450MHz, 2480MHz
Firmware Power Setting: Max Power
Protocol/MCS/Modulation: QPSK
Duty Cycle: 100%
Test Mode: Continuously Modulated

Temperature (ºC): 22-25
Relative Humidity (%): 38-42
Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013), KDB 558074 v05 (Aug 2018)

Setup: The EUT is connected to laptop via 3 foot USB extension.
Low, Mid, High channels investigated. Horizontal and Vertical antenna polarities investigated as well as EUT X, Y, Z axes investigated, only worst case reported.

Medtronic MiniMed WO#: 101100 Sequence#: 14 Date: 9/24/2018
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters H+V



Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	ANP05305	Cable	ETSI-50T	10/24/2017	10/24/2019
T4	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T5	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T6	ANP06123	Attenuator	18N-6	5/5/2017	5/5/2019
T7	AN03628	Biconilog Antenna	3142E	6/7/2017	6/7/2019

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5	T6	T7						
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	120.200M	40.9	+0.0	+0.2	+0.6	-27.6	+0.0	27.9	43.5	-15.6	Horiz
			+0.6	+5.9	+7.3						
2	120.200M	40.9	+0.0	+0.2	+0.6	-27.6	+0.0	27.9	43.5	-15.6	Vert
			+0.6	+5.9	+7.3						
3	171.600M	36.9	+0.0	+0.2	+0.6	-27.4	+0.0	26.5	43.5	-17.0	Horiz
			+0.7	+5.9	+9.6						
4	971.900M	28.1	+0.0	+0.4	+1.6	-27.1	+0.0	35.7	54.0	-18.3	Horiz
			+2.1	+5.9	+24.7						
5	120.047M	38.0	+0.0	+0.2	+0.6	-27.6	+0.0	25.0	43.5	-18.5	Vert
	QP		+0.6	+5.9	+7.3						
6	171.968M	32.8	+0.0	+0.2	+0.6	-27.4	+0.0	22.4	43.5	-21.1	Horiz
	QP		+0.7	+5.9	+9.6						
7	480.100M	35.2	+0.0	+0.3	+1.1	-28.0	+0.0	34.1	68.8	-34.7	Vert
			+1.3	+5.9	+18.3						
8	795.300M	29.0	+0.0	+0.3	+1.5	-27.8	+0.0	33.9	68.8	-34.9	Vert
			+1.8	+5.9	+23.2						
9	337.500M	36.8	+0.0	+0.2	+0.9	-27.2	+0.0	32.1	68.8	-36.7	Horiz
			+1.1	+5.9	+14.4						
10	396.700M	34.1	+0.0	+0.2	+1.0	-27.6	+0.0	32.0	68.8	-36.8	Horiz
			+1.2	+5.9	+17.2						
11	96.000M	42.6	+0.0	+0.1	+0.5	-27.7	+0.0	29.5	68.8	-39.3	Horiz
			+0.5	+5.9	+7.6						
12	144.500M	40.3	+0.0	+0.2	+0.6	-27.6	+0.0	28.4	68.8	-40.4	Vert
			+0.7	+5.9	+8.3						
13	51.300M	41.7	+0.0	+0.1	+0.4	-27.9	+0.0	27.3	68.8	-41.5	Vert
			+0.4	+5.9	+6.7						

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**101100**	Date:	9/24/2018
Test Type:	**Maximized Emissions**	Time:	10:18:39
Tested By:	Michael Atkinson	Sequence#:	8
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

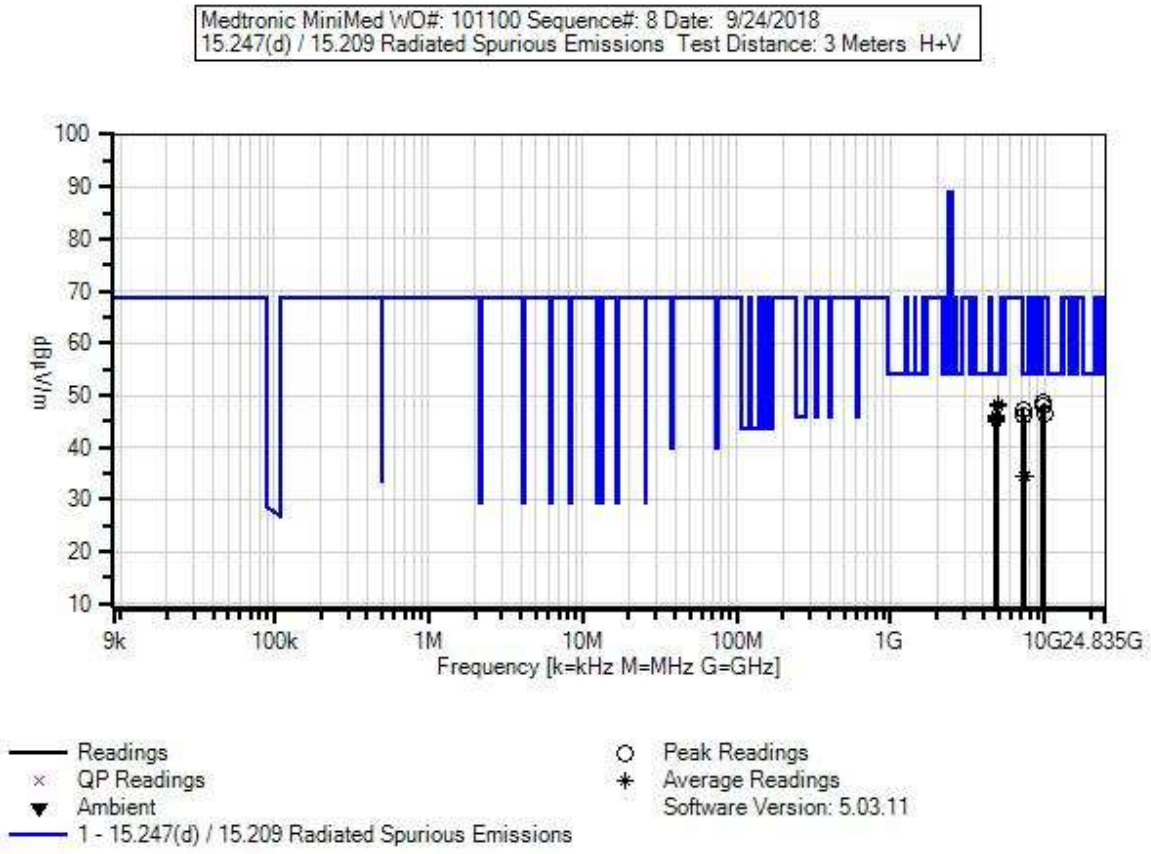
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 1-10GHz
Frequency Tested: 2420MHz, 2450MHz, 2480MHz
Firmware Power Setting: Max Power
Protocol/MCS/Modulation: QPSK
Duty Cycle: 100%
Test Mode: Continuously Modulated

Temperature (ºC): 22-25
Relative Humidity (%): 38-42
Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013), KDB 558074 v05 (Aug 2018)

Setup: The EUT is connected to laptop via 3 foot USB extension.
Low, Mid, High channels investigated. Horizontal and Vertical antenna polarities investigated as well as EUT X, Y, Z axes investigated, only worst case reported.


Medtronic MiniMed WO#: 101100 Sequence#: 8 Date: 9/24/2018
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters H+V
100
90
80
70
60
50
40
30
20
10
dBµV/m
9k
100k
1M
10M
100M
1G
10G24.835G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T4	ANP06934	Cable	32026-29801-29801-18	3/13/2018	3/13/2020
T5	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T6	ANP06515	Cable	Heliax	6/29/2018	6/29/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	4959.053M	43.5	+0.0	+0.5	-33.2	+0.7	+0.0	48.2	54.0	-5.8	Vert
	Ave		+32.5	+4.2					High Z		
^	4959.053M	50.6	+0.0	+0.5	-33.2	+0.7	+0.0	55.3	54.0	+1.3	Vert
			+32.5	+4.2					High Z		
3	4958.980M	43.2	+0.0	+0.5	-33.2	+0.7	+0.0	47.9	54.0	-6.1	Horiz
	Ave		+32.5	+4.2					High X		
^	4958.980M	49.4	+0.0	+0.5	-33.2	+0.7	+0.0	54.1	54.0	+0.1	Horiz
			+32.5	+4.2					High X		
^	4958.994M	47.4	+0.0	+0.5	-33.2	+0.7	+0.0	52.1	54.0	-1.9	Horiz
			+32.5	+4.2					High Z		
^	4959.053M	46.4	+0.0	+0.5	-33.2	+0.7	+0.0	51.1	54.0	-2.9	Horiz
			+32.5	+4.2					High Y		
7	7260.080M	38.2	+0.0	+0.8	-33.9	+0.5	+0.0	47.3	54.0	-6.7	Horiz
			+36.3	+5.4					Low X		
8	7348.810M	36.8	+0.0	+1.0	-34.2	+0.5	+0.0	46.1	54.0	-7.9	Horiz
			+36.6	+5.4					Mid X		
9	4900.729M	41.1	+0.0	+0.5	-33.2	+0.8	+0.0	45.9	54.0	-8.1	Horiz
	Ave		+32.5	+4.2					Mid X		
^	4900.729M	49.8	+0.0	+0.5	-33.2	+0.8	+0.0	54.6	54.0	+0.6	Horiz
			+32.5	+4.2					Mid X		
11	4898.960M	41.0	+0.0	+0.5	-33.2	+0.8	+0.0	45.8	54.0	-8.2	Vert
	Ave		+32.5	+4.2					Mid Z		
^	4898.960M	48.1	+0.0	+0.5	-33.2	+0.8	+0.0	52.9	54.0	-1.1	Vert
			+32.5	+4.2					Mid Z		
13	4838.960M	41.1	+0.0	+0.5	-33.2	+0.8	+0.0	45.7	54.0	-8.3	Vert
	Ave		+32.4	+4.1					Low Z		
^	4838.960M	48.5	+0.0	+0.5	-33.2	+0.8	+0.0	53.1	54.0	-0.9	Vert
			+32.4	+4.1					Low Z		
15	4838.996M	40.7	+0.0	+0.5	-33.2	+0.8	+0.0	45.3	54.0	-8.7	Horiz
	Ave		+32.4	+4.1					Low X		

16	4839.990M Ave	40.4	+0.0 +32.4	+0.5 +4.1	-33.2	+0.8	+0.0	45.0	54.0 Low X	-9.0	Horiz
^	4839.990M	49.3	+0.0 +32.4	+0.5 +4.1	-33.2	+0.8	+0.0	53.9	54.0 Low X	-0.1	Horiz
18	7351.651M Ave	25.3	+0.0 +36.6	+1.0 +5.4	-34.2	+0.5	+0.0	34.6	54.0 Mid X	-19.4	Horiz
19	7441.606M Ave	24.8	+0.0 +36.8	+1.1 +5.5	-34.4	+0.5	+0.0	34.3	54.0 High X	-19.7	Horiz
^	7441.606M	38.6	+0.0 +36.8	+1.1 +5.5	-34.4	+0.5	+0.0	48.1	54.0 High X	-5.9	Horiz
21	9799.990M	36.8	+0.0 +37.6	+0.5 +6.3	-33.6	+1.0	+0.0	48.6	68.8 Mid X	-20.2	Horiz
22	9679.310M	36.4	+0.0 +37.5	+0.6 +6.2	-33.6	+1.0	+0.0	48.1	68.8 Low X	-20.7	Horiz
23	9920.470M	34.7	+0.0 +37.7	+0.4 +6.3	-33.7	+0.9	+0.0	46.3	68.8 High X	-22.5	Horiz

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**101100**	Date:	9/24/2018
Test Type:	**Maximized Emissions**	Time:	11:41:24
Tested By:	Michael Atkinson	Sequence#:	9
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

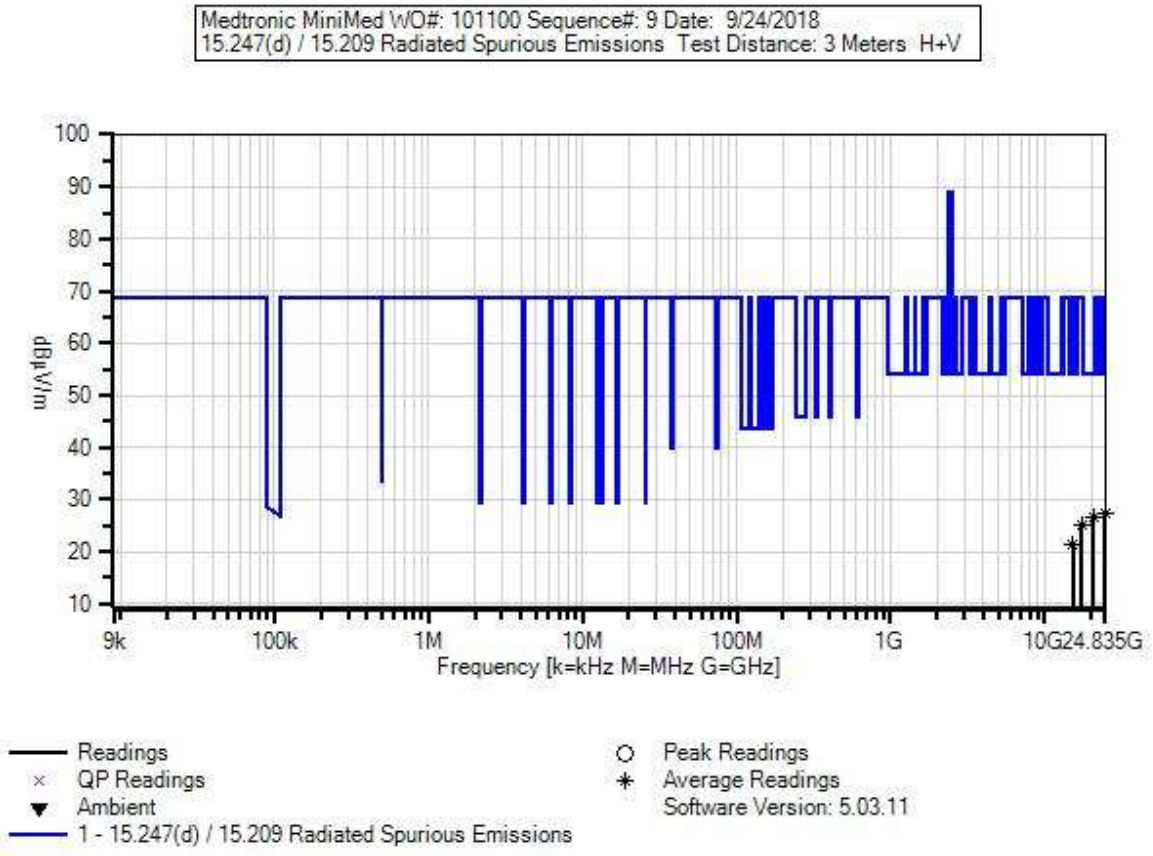
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: 10-25GHz
Frequency Tested: 2420MHz, 2450MHz, 2480MHz
Firmware Power Setting: Max Power
Protocol/MCS/Modulation: QPSK
Duty Cycle: 100%
Test Mode: Continuously Modulated

Temperature (ºC): 22-25
Relative Humidity (%): 38-42
Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013), KDB 558074 v05 (Aug 2018)

Setup: The EUT is connected to laptop via 3 foot USB extension.
Low, Mid, High channels investigated. Horizontal and Vertical antenna polarities investigated as well as EUT X, Y, Z axes investigated, only worst case reported.


Medtronic MiniMed WO#: 101100 Sequence#: 9 Date: 9/24/2018
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters H+V
100
90
80
70
60
50
40
30
20
10
dBµV/m
9k
100k
1M
10M
100M
1G
10G24.835G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.11

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T4	AN02741	Active Horn Antenna	AMFW-5F-12001800-20-10P	3/30/2017	3/30/2019
T5	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	10/7/2016	10/7/2018
T6	AN03122	Cable	32026-2-29801-36	3/13/2018	3/13/2020
T7	ANP06678	Cable	32026-29801-29801-144	3/13/2018	3/13/2020
T8	AN02763-69	Waveguide	Multiple	4/23/2018	4/23/2020

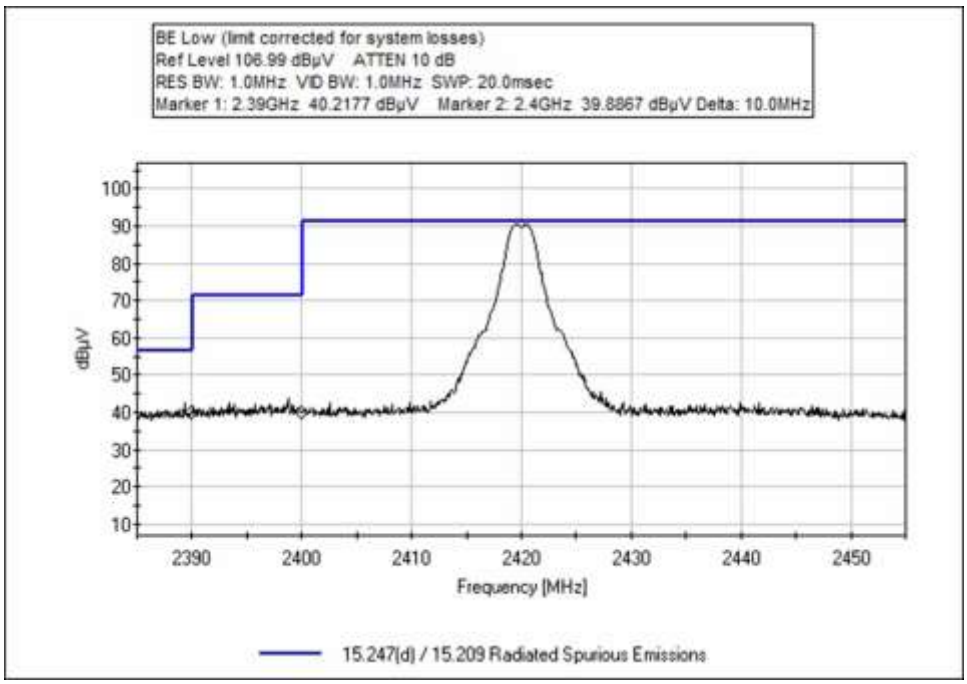
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

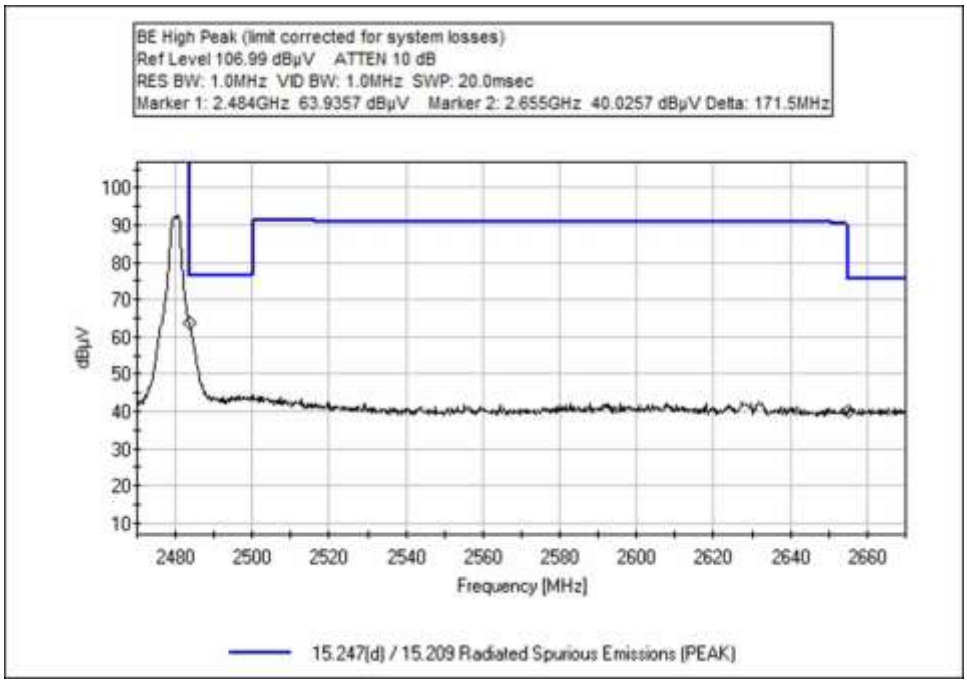
#	Freq	Rdng	T1 T5	T2 T6	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	20730.000	26.8	+0.0	+0.0	+0.0	+0.0	+0.0	26.6	54.0	-27.4	Horiz
	M		-13.1	+2.3	+8.7	+1.9					
	Ave										
^	20730.000	48.5	+0.0	+0.0	+0.0	+0.0	+0.0	48.3	54.0	-5.7	Horiz
	M		-13.1	+2.3	+8.7	+1.9					
3	24675.000	25.3	+0.0	+0.0	+0.0	+0.0	+0.0	27.5	68.8	-41.3	Vert
	M		-12.0	+2.6	+9.8	+1.8					
	Ave										
^	24675.000	42.5	+0.0	+0.0	+0.0	+0.0	+0.0	44.7	68.8	-24.1	Vert
	M		-12.0	+2.6	+9.8	+1.8					
5	17400.000	26.1	+0.0	+1.2	+8.5	-10.7	+0.0	25.1	68.8	-43.7	Vert
	M		+0.0	+0.0	+0.0	+0.0					
	Ave										
^	17400.000	39.5	+0.0	+1.2	+8.5	-10.7	+0.0	38.5	68.8	-30.3	Vert
	M		+0.0	+0.0	+0.0	+0.0					
7	15335.900	25.3	+0.0	+1.0	+8.3	-13.2	+0.0	21.4	68.8	-47.4	Horiz
	M		+0.0	+0.0	+0.0	+0.0					
	Ave										
^	15335.950	44.8	+0.0	+1.0	+8.3	-13.2	+0.0	40.9	68.8	-27.9	Horiz
	M		+0.0	+0.0	+0.0	+0.0					

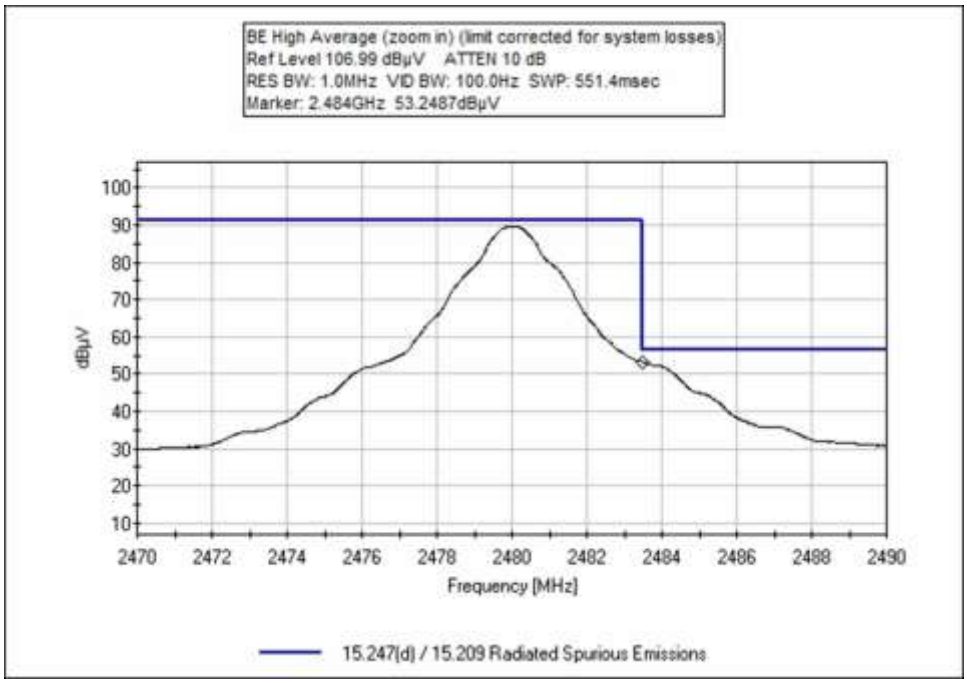
Band Edge

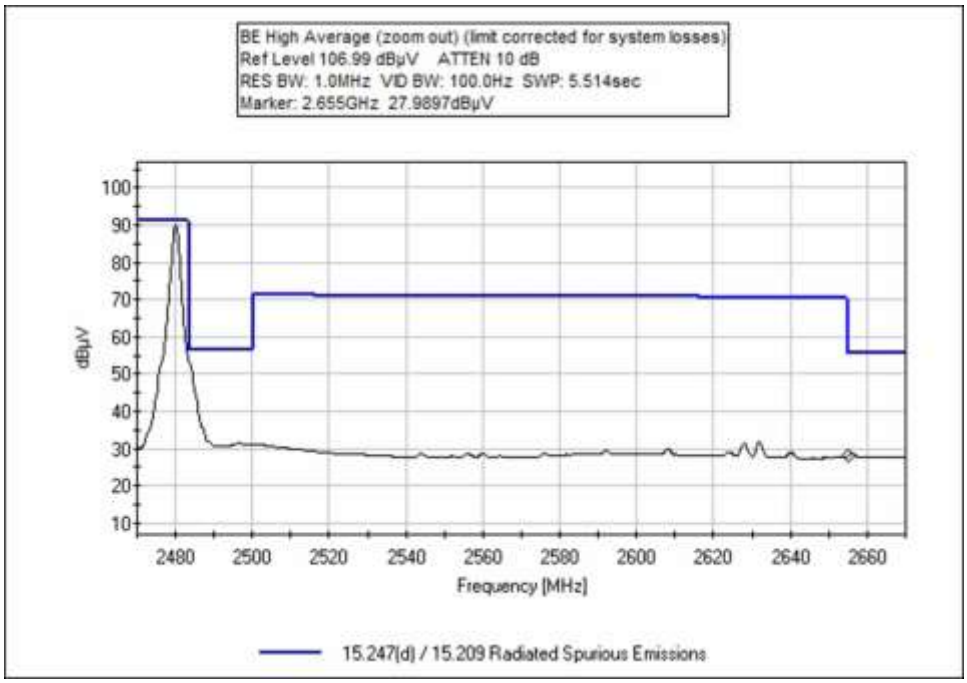
Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
2390.0	OQPSK	Chip / -0.5dBi	37.7	<54	Pass
2400.0	OQPSK	Chip / -0.5dBi	37.4	<68.8	Pass
2483.5	OQPSK	Chip / -0.5dBi	50.8	<54	Pass
2483.5 (PEAK)	OQPSK	Chip / -0.5dBi	61.5	<74	Pass

Band Edge Plots




BE High Peak (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 1.0MHz SWP: 20.0msec
Marker 1: 2.484GHz 63.9357 dBµV Marker 2: 2.655GHz 40.0257 dBµV Delta: 171.5MHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions (PEAK)


BE High Average (zoom in) (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 100.0Hz SWP: 551.4msec
Marker: 2.484GHz 53.2487dBµV
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


BE High Average (zoom out) (limit corrected for system losses)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 100.0Hz SWP: 5.514sec
Marker: 2.655GHz 27.9897dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2480
2500
2520
2540
2560
2580
2600
2620
2640
2660
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**101100**	Date:	9/21/2018
Test Type:	**Maximized Emissions**	Time:	14:36:03
Tested By:	Michael Atkinson	Sequence#:	7
Software:	EMITest 5.03.11		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

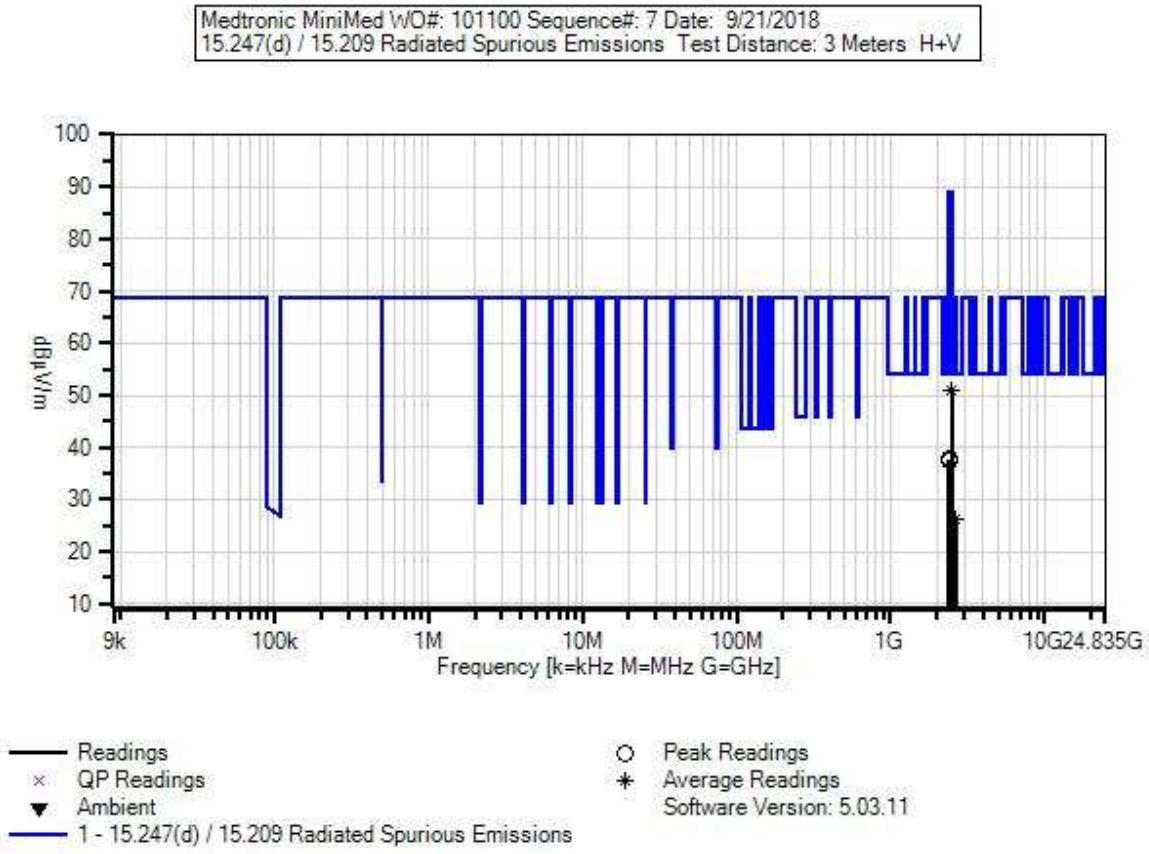
Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Frequency Range: Band Edge
Frequency Tested: 2420MHz, 2480MHz
Firmware Power Setting: Max Power
Protocol/MCS/Modulation: QPSK
Duty Cycle: 100%
Test Mode:Continuously Modulated

Temperature (ºC): 22-25
Relative Humidity (%): 38-42
Test Location: Bothell Lab C3
Test Method: ANSI C63.10 (2013), KDB 558074 v05 (Aug 2018)

Setup: The EUT is connected to laptop via 3 foot USB extension.
Low, High channels investigated. Both antenna polarities investigated and X, Y, Z Axis investigated, only worst case reported.


Medtronic MiniMed WO#: 101100 Sequence#: 7 Date: 9/21/2018
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters H+V
100
90
80
70
60
50
40
30
20
10
dBµV/m
9k
100k
1M
10M
100M
1G
10G24.835G
Frequency [k=kHz M=MHz G=GHz]
Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.11

Test Equipment:

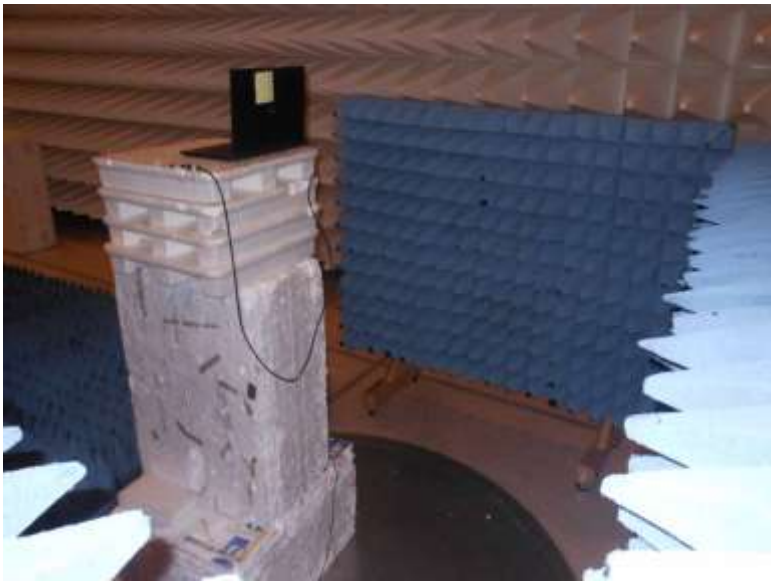
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T4	ANP06934	Cable	32026-29801-29801-18	3/13/2018	3/13/2020
T5	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T6	ANP06515	Cable	Heliax	6/29/2018	6/29/2020

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2483.500M	53.2	+0.0	+0.4	-34.0	+0.4	+0.0	50.8	54.0	-3.2	Horiz
	Ave		+28.1	+2.7							
^	2483.500M	63.9	+0.0	+0.4	-34.0	+0.4	+0.0	61.5	74.0	-12.5	Horiz
			+28.1	+2.7							
3	2390.000M	40.2	+0.0	+0.4	-34.0	+0.4	+0.0	37.7	54.0	-16.3	Horiz
			+28.1	+2.6							
4	2655.000M	28.0	+0.0	+0.5	-33.9	+0.4	+0.0	26.2	54.0	-27.8	Horiz
	Ave		+28.6	+2.6							
^	2655.000M	40.0	+0.0	+0.5	-33.9	+0.4	+0.0	38.2	74.0	-35.8	Horiz
			+28.6	+2.6							
6	2400.000M	39.9	+0.0	+0.4	-34.0	+0.4	+0.0	37.4	68.8	-31.4	Horiz
			+28.1	+2.6							

Test Setup Photos

Below 1GHz



Above 1GHz, Cone placement

X Axis

Y Axis

Z Axis

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Medtronic MiniMed**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**101100**	Date:	9/24/2018
Test Type:	**Conducted Emissions**	Time:	15:54:39
Tested By:	Michael Atkinson	Sequence#:	17
Software:	EMITest 5.03.11		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 22-25°C
Humidity: 38-42%
Pressure: 101.8-102.9kPa

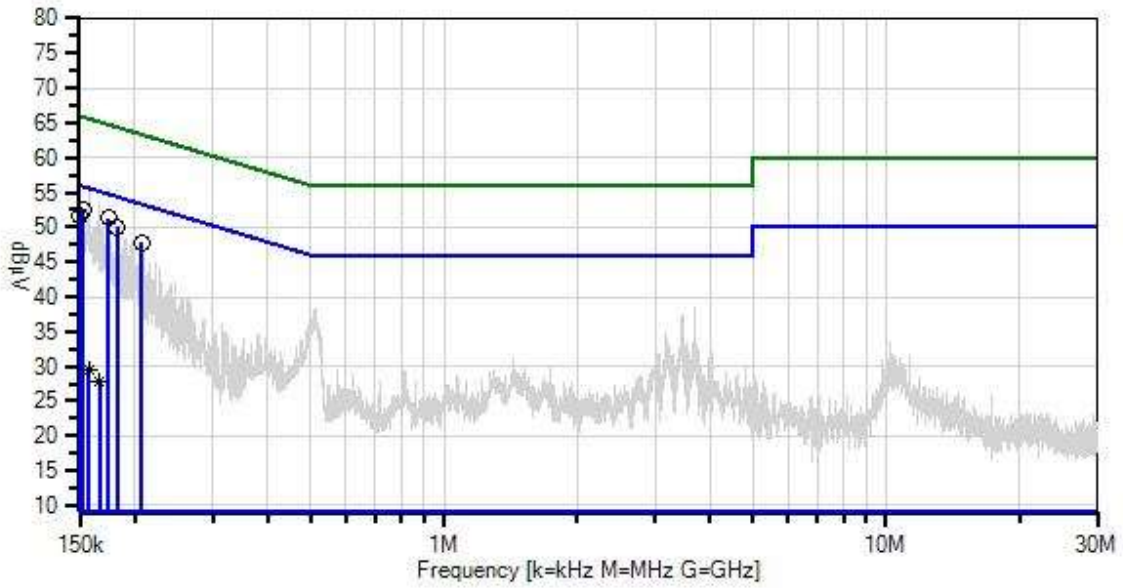
Method: ANSI C63.10 (2013)

Frequency: 0.15-30MHz

Frequency Tested: 2450MHz
Firmware Power Setting: Max Power
EUT Firmware: Comets NGP 1.26A
Protocol/MCS/Modulation: QPSK
Antenna type: Integral Folded Monopole
Antenna Gain: 0.0dBi
Duty Cycle: 100%

Setup: The EUT is connected to laptop which is connected to AC mains through AC Adapter.
The EUT is in Tx mode continuously modulated on mid channel.

Medtronic MiniMed WO#: 101100 Sequence#: 17 Date: 9/24/2018
15.207 AC Mains - Average Test Lead: 115VAC 60Hz Line



Sweep Data
× QP Readings
Software Version: 5.03.11
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T4	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
T5	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020

Measurement Data: Reading listed by margin. Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	152.724k	40.8	+0.9 +1.8	+0.0	+0.0	+9.1	+0.0	52.6	55.9	-3.3	Line
2	173.893k	40.3	+0.4 +1.5	+0.0	+0.0	+9.1	+0.0	51.3	54.8	-3.5	Line
3	150.000k	37.9	+2.9 +1.8	+0.0	+0.0	+9.1	+0.0	51.7	56.0	-4.3	Line
4	182.172k	39.2	+0.3 +1.4	+0.0	+0.0	+9.1	+0.0	50.0	54.4	-4.4	Line
5	207.114k	37.4	+0.2 +1.1	+0.0	+0.0	+9.1	+0.0	47.8	53.3	-5.5	Line
6	157.755k Ave	18.1	+0.7 +1.7	+0.0	+0.0	+9.1	+0.0	29.6	55.6	-26.0	Line
^	157.755k	43.4	+0.7 +1.7	+0.0	+0.0	+9.1	+0.0	54.9	55.6	-0.7	Line
^	156.392k	42.0	+0.8 +1.7	+0.0	+0.0	+9.1	+0.0	53.6	55.7	-2.1	Line
^	155.659k	39.2	+0.8 +1.7	+0.0	+0.0	+9.1	+0.0	50.8	55.7	-4.9	Line
^	161.213k	38.5	+0.6 +1.6	+0.0	+0.0	+9.1	+0.0	49.8	55.4	-5.6	Line
11	166.558k Ave	16.7	+0.5 +1.6	+0.0	+0.0	+9.1	+0.0	27.9	55.1	-27.2	Line
^	166.558k	42.2	+0.5 +1.6	+0.0	+0.0	+9.1	+0.0	53.4	55.1	-1.7	Line
^	164.776k	39.4	+0.5 +1.6	+0.0	+0.0	+9.1	+0.0	50.6	55.2	-4.6	Line
^	169.073k	39.1	+0.4 +1.5	+0.0	+0.0	+9.1	+0.0	50.1	55.0	-4.9	Line
^	167.501k	39.0	+0.4 +1.6	+0.0	+0.0	+9.1	+0.0	50.1	55.1	-5.0	Line
^	165.824k	38.6	+0.5 +1.6	+0.0	+0.0	+9.1	+0.0	49.8	55.2	-5.4	Line
^	162.051k	38.6	+0.6 +1.6	+0.0	+0.0	+9.1	+0.0	49.9	55.4	-5.5	Line

Test Location:	CKC Laboratories • 22116 23rd Drive SE, Suite A • Bothell, WA 98021 • 1-800-500-4EMC (4362)		
Customer:	**Medtronic MiniMed**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**101100**	Date:	9/24/2018
Test Type:	**Conducted Emissions**	Time:	15:57:18
Tested By:	Michael Atkinson	Sequence#:	18
Software:	EMITest 5.03.11		115VAC 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 22-25°C
Humidity: 38-42%
Pressure: 101.8-102.9kPa

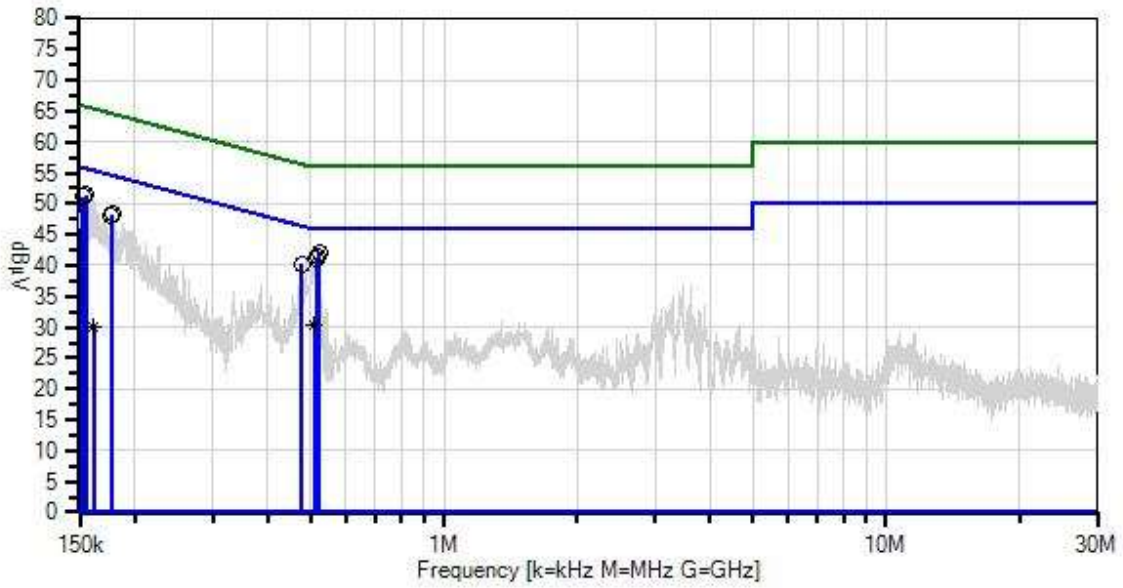
Method: ANSI C63.10 (2013)

Frequency: 0.15-30MHz

Frequency Tested: 2450MHz
Firmware Power Setting: Max Power
EUT Firmware: Comets NGP 1.26A
Protocol/MCS/Modulation: QPSK
Antenna type: Integral Folded Monopole
Antenna Gain: 0.0dBi
Duty Cycle: 100%

Setup: The EUT is connected to laptop which is connected to AC mains through AC Adapter.
The EUT is in Tx mode continuously modulated on mid channel.sly modulated on mid channel.

Medtronic MiniMed WO#: 101100 Sequence#: 18 Date: 9/24/2018
15.207 AC Mains - Average Test Lead: 115VAC 60Hz Return



Sweep Data
× QP Readings
Software Version: 5.03.11
Readings
✱ Average Readings
1 - 15.207 AC Mains - Average
○ Peak Readings
▼ Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T1	AN02611	High Pass Filter	HE9615-150K-50-720B	1/15/2018	1/15/2020
T2	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T4	ANP06219	Attenuator	768-10	4/13/2018	4/13/2020
	AN01311	50uH LISN-Line1 (L)	3816/2	3/16/2018	3/16/2020
T5	AN01311	50uH LISN-Line2 (N)	3816/2	3/16/2018	3/16/2020

Measurement Data: Reading listed by margin. Test Lead: Return

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	523.826k	32.5	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	42.2	46.0	-3.8	Retur
2	155.239k	40.0	+0.7 +1.7	+0.0	+0.0	+9.1	+0.0	51.5	55.7	-4.2	Retur
3	152.934k	39.5	+0.8 +1.7	+0.0	+0.0	+9.1	+0.0	51.1	55.8	-4.7	Retur
4	519.593k	31.6	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	41.3	46.0	-4.7	Retur
5	513.545k	31.4	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	41.1	46.0	-4.9	Retur
6	476.353k	30.6	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	40.3	46.4	-6.1	Retur
7	177.876k	37.5	+0.3 +1.4	+0.0	+0.0	+9.1	+0.0	48.3	54.6	-6.3	Retur
8	176.723k	37.2	+0.3 +1.4	+0.0	+0.0	+9.1	+0.0	48.0	54.6	-6.6	Retur
9	508.406k Ave	20.5	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	30.2	46.0	-15.8	Retur
^	508.405k	33.5	+0.2 +0.4	+0.0	+0.0	+9.1	+0.0	43.2	46.0	-2.8	Retur
11	161.262k Ave	18.6	+0.6 +1.6	+0.0	+0.0	+9.1	+0.0	29.9	55.4	-25.5	Retur
^	161.003k	39.7	+0.6 +1.6	+0.0	+0.0	+9.1	+0.0	51.0	55.4	-4.4	Retur
^	162.575k	39.2	+0.5 +1.6	+0.0	+0.0	+9.1	+0.0	50.4	55.3	-4.9	Retur
^	159.012k	39.0	+0.6 +1.6	+0.0	+0.0	+9.1	+0.0	50.3	55.5	-5.2	Retur
^	157.545k	38.1	+0.7 +1.6	+0.0	+0.0	+9.1	+0.0	49.5	55.6	-6.1	Retur
^	163.938k	37.7	+0.5 +1.5	+0.0	+0.0	+9.1	+0.0	48.8	55.3	-6.5	Retur
^	166.243k	37.3	+0.5 +1.5	+0.0	+0.0	+9.1	+0.0	48.4	55.1	-6.7	Retur

Test Setup Photo

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret (“^”) was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.