

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



Test Certificate # 803.05

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.

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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

DATE OF EQUIPMENT RECEIPT:

DATE(S) OF TESTING:

REPORT PREPARED BY:

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

Project Number: 101100

September 20, 2018

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

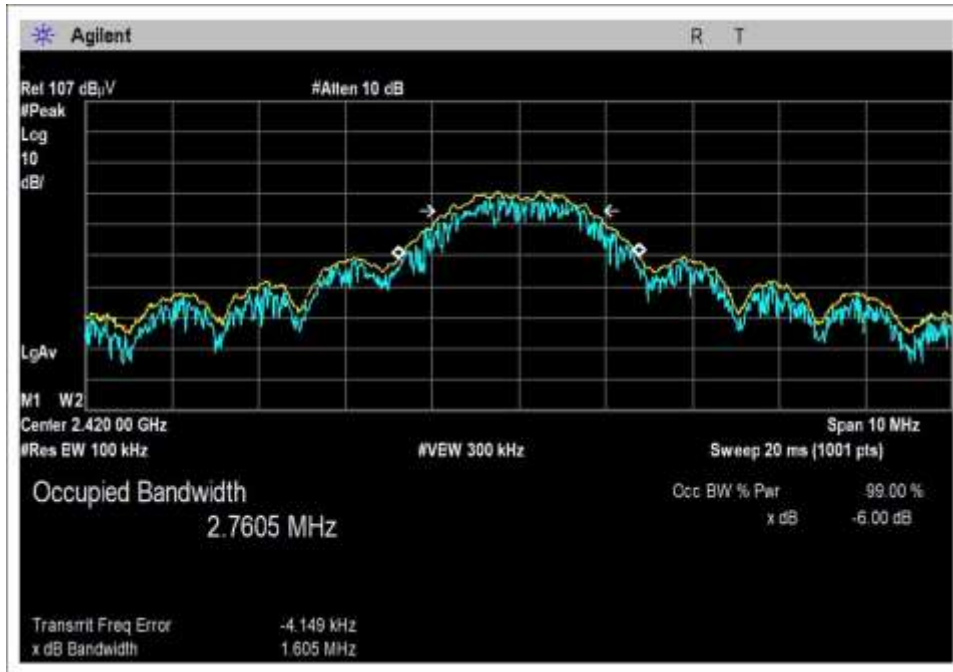
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Atkinson
Test Method:	ANSI C63.10 (2013), KDB 558074 v05 (Aug 2018)	Test Date(s):	9/20/2018
Configuration:	1		
Test Setup:	Test Mode: Continuously Modulated The EUT is connected to laptop via 3 foot USB extension. Low, Mid, and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

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

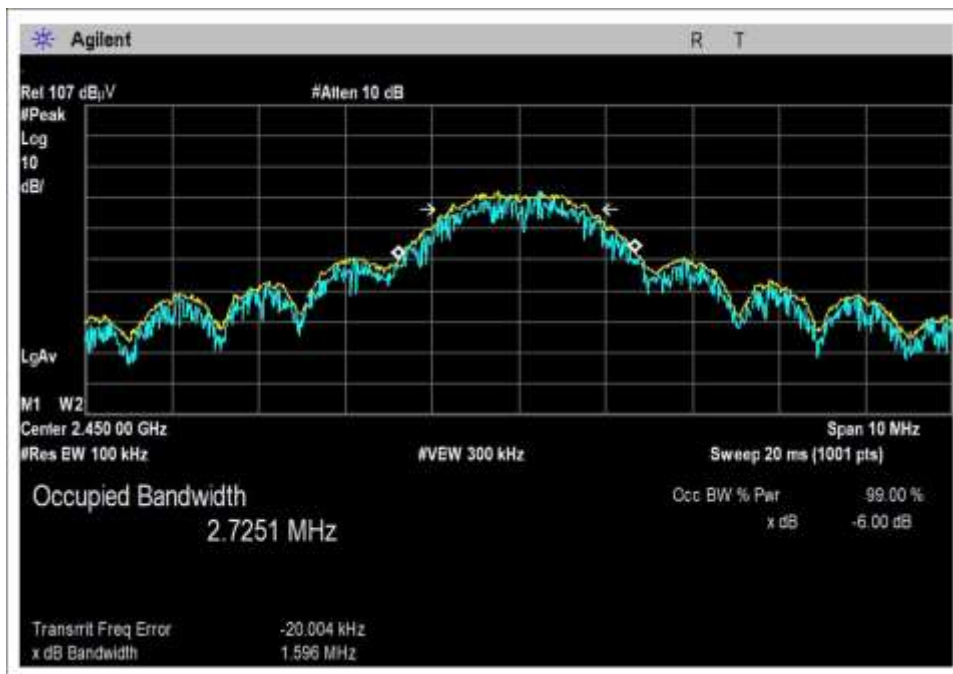
Test Equipment					
Asset#	Description	Manufacturer	Model	Cal Date	Cal Due
AN02871	Spectrum Analyzer	Agilent	E4440A	2/24/2017	2/24/2019
ANP06540	Cable	Andrews	Heliac	10/30/2017	10/30/2019
P06515	Cable	Andrews	Heliac	6/29/2018	6/29/2020
AN03540	Preamp	HP	83017A	5/2/2017	5/2/2019
P06503	Cable	Astrolab	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

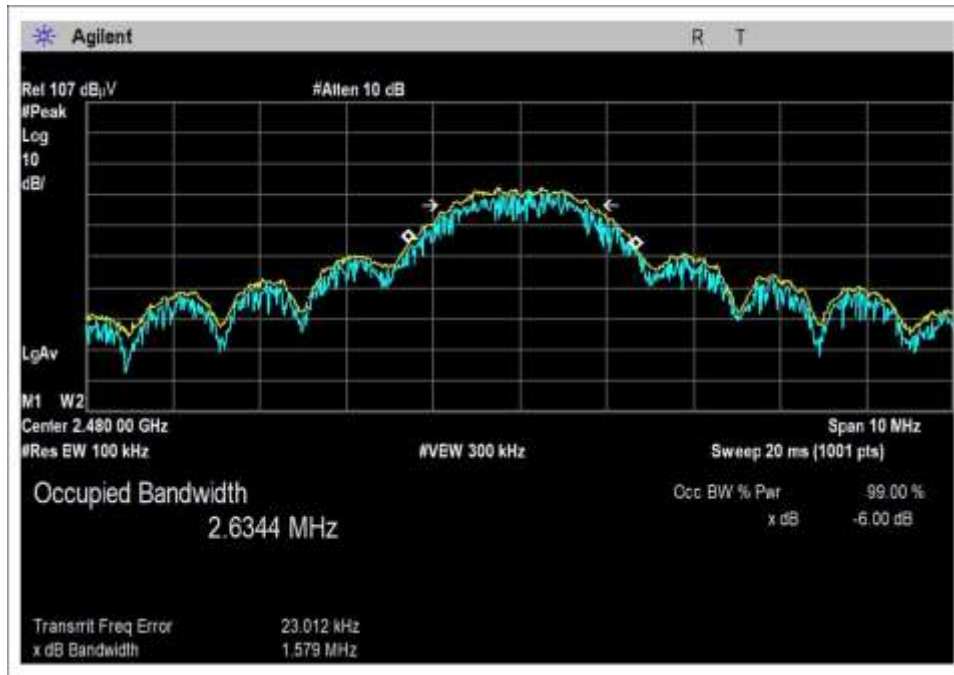
Plots



Low Channel

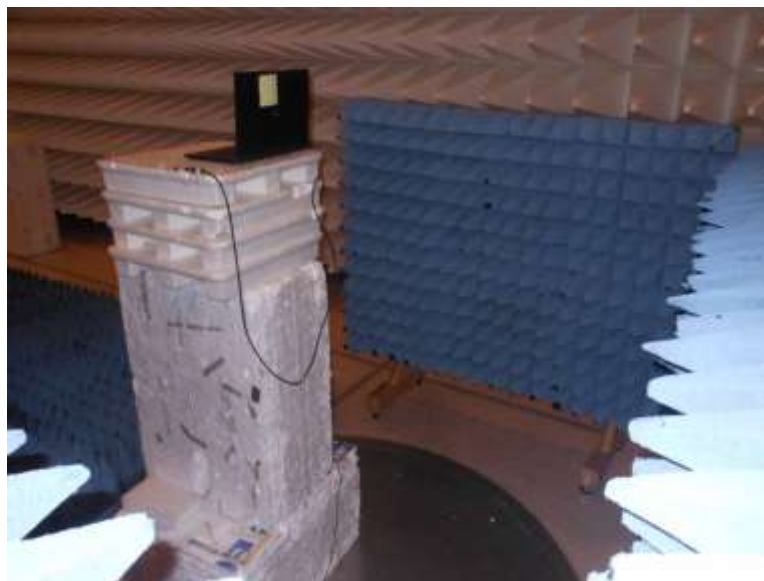


Middle Channel



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.

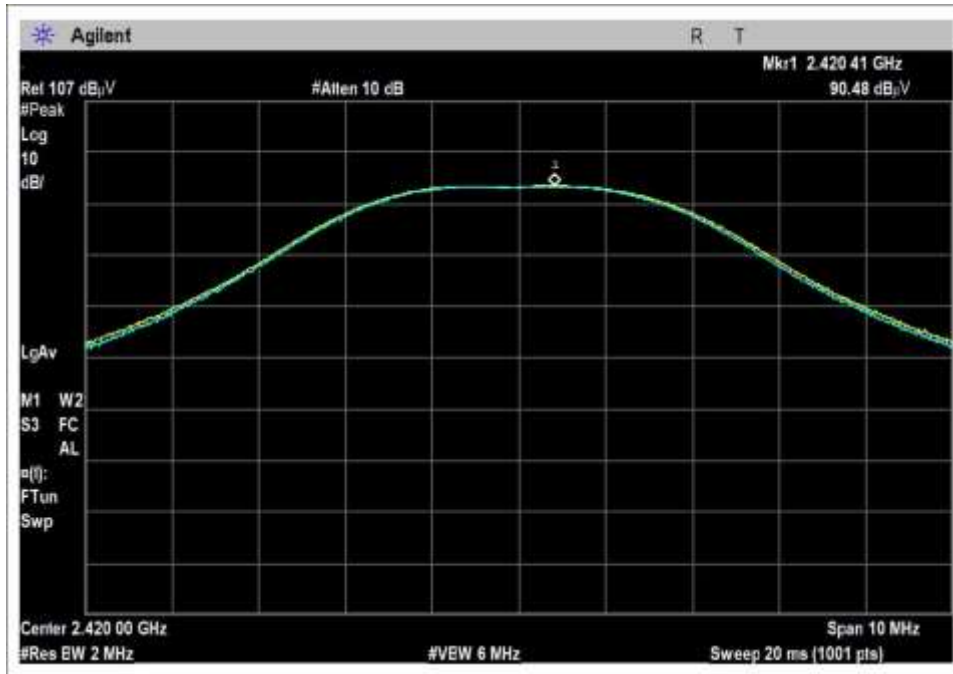
Conducted RF output power calculated in accordance with ANSI C63.10.

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

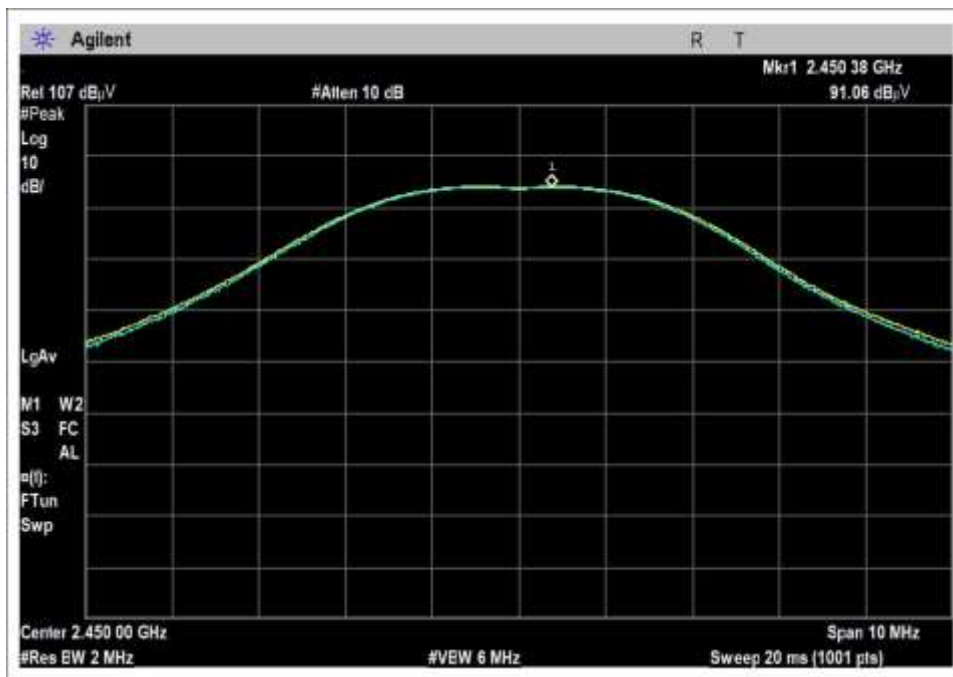
Or equivalently, in logarithmic form:

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

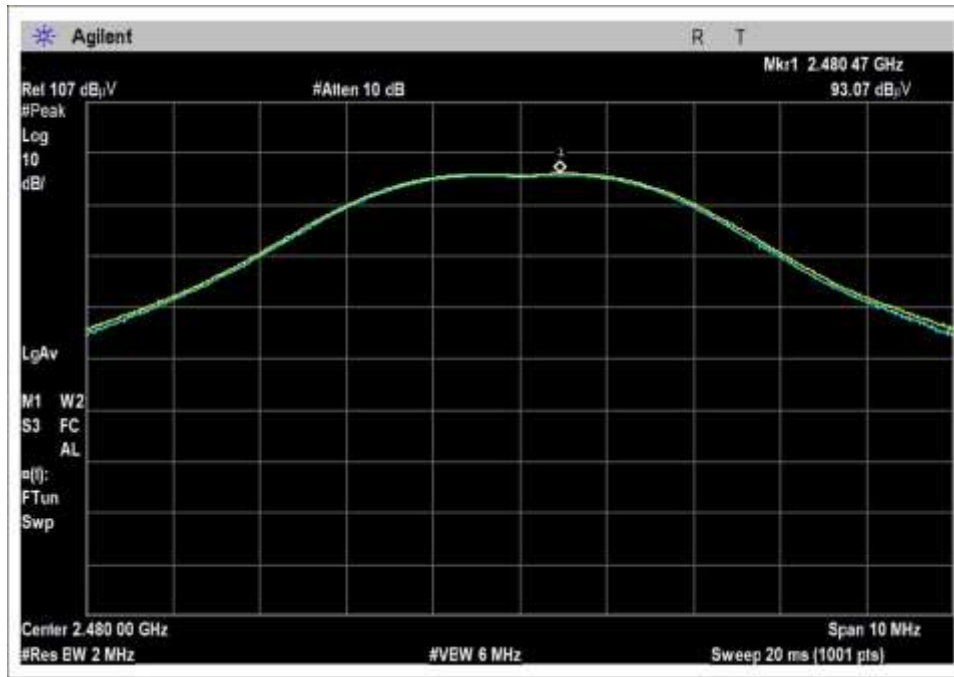
Plots



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			

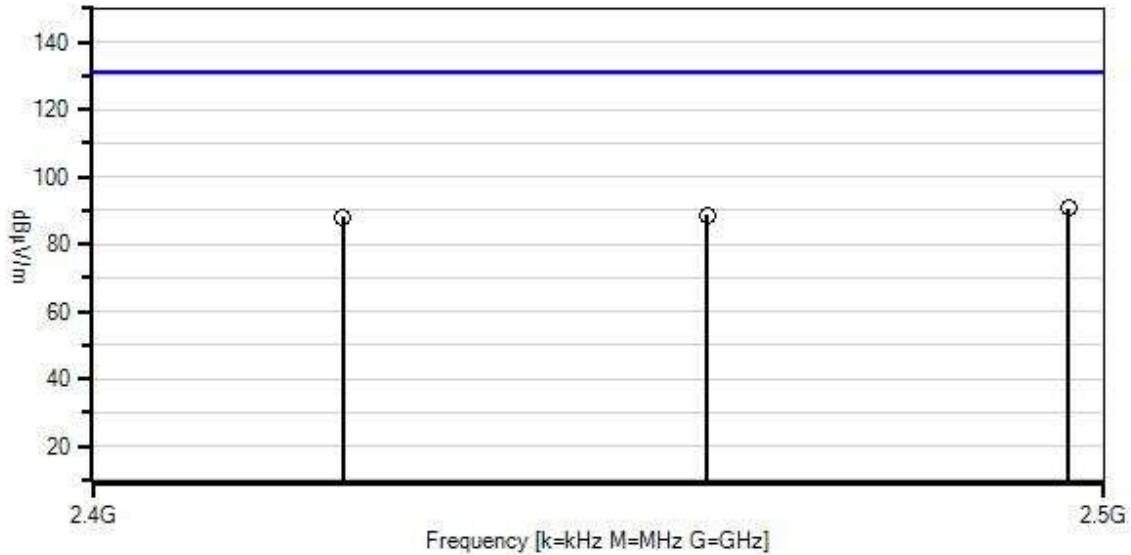
Test Conditions / Notes:

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

 Temperature (°C): 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.

Medtronic MiniMed W/O#: 101100 Sequence#: 3 Date: 9/20/2018
 15.247(b) Power Output (2400-2483.5 MHz DTS) Test Distance: 3 Meters H+V



— Readings
 × QP Readings
 ▼ Ambient
 — 1 - 15.247(b) Power Output (2400-2483.5 MHz DTS)

○ 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	Heliac	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	Heliac	6/29/2018	6/29/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBμV	T5	T6			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



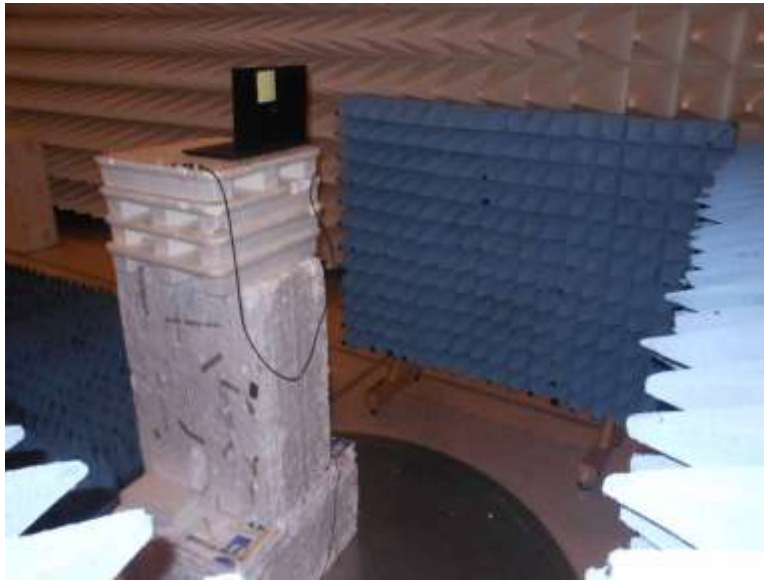
X Axis



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

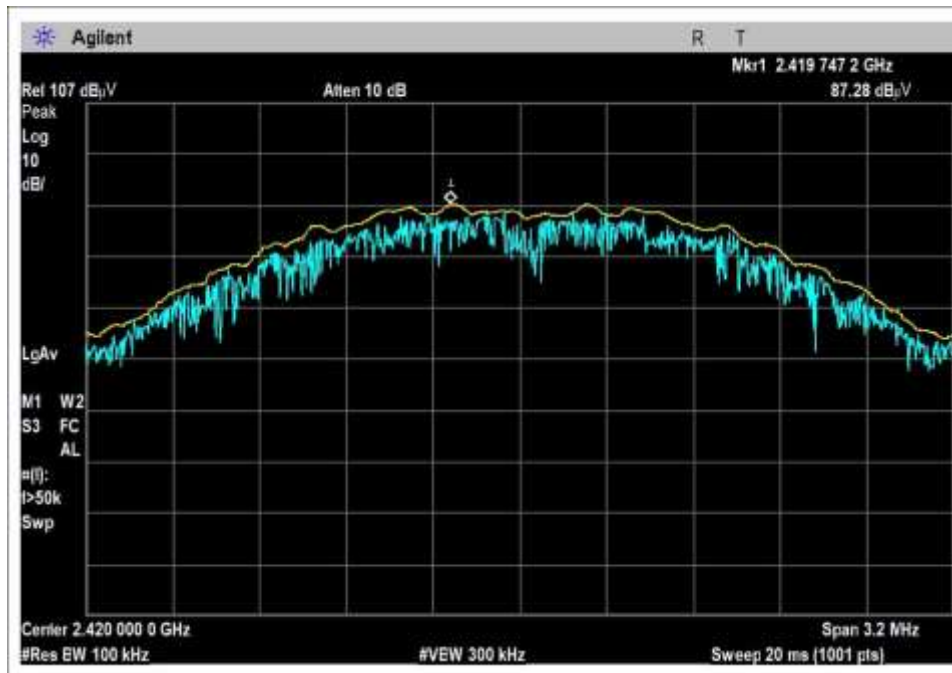
Conducted RF output power calculated in accordance with ANSI C63.10.

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

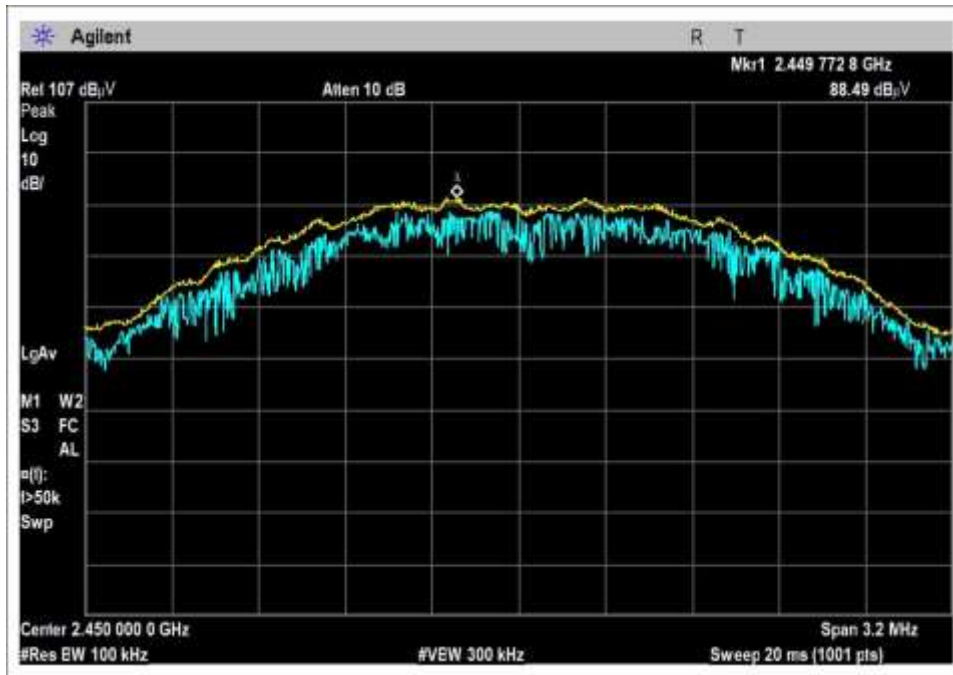
Or equivalently, in logarithmic form:

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

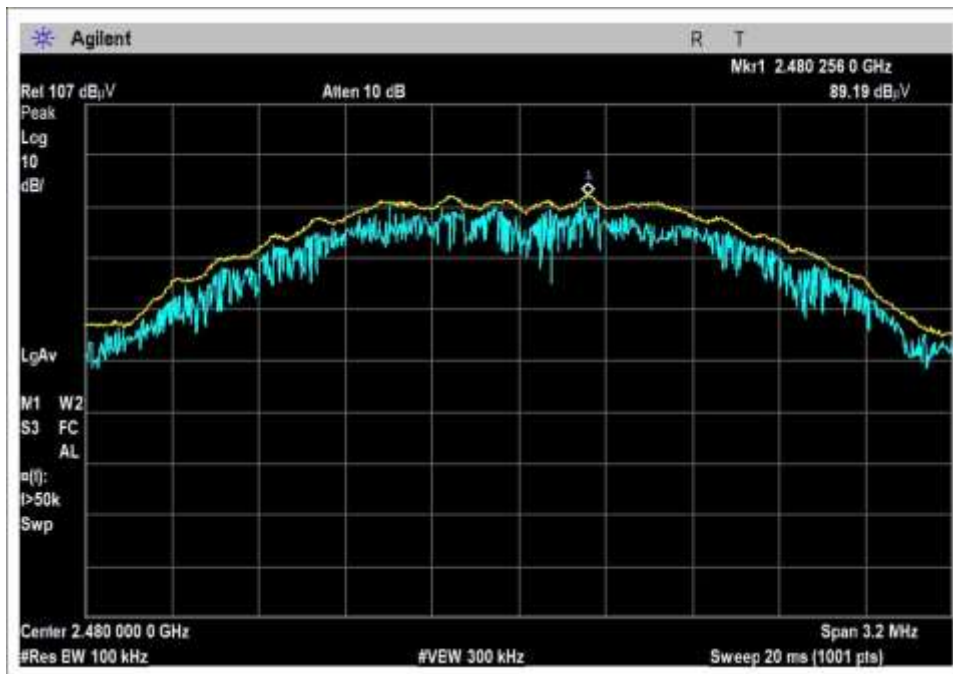
Plots



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			

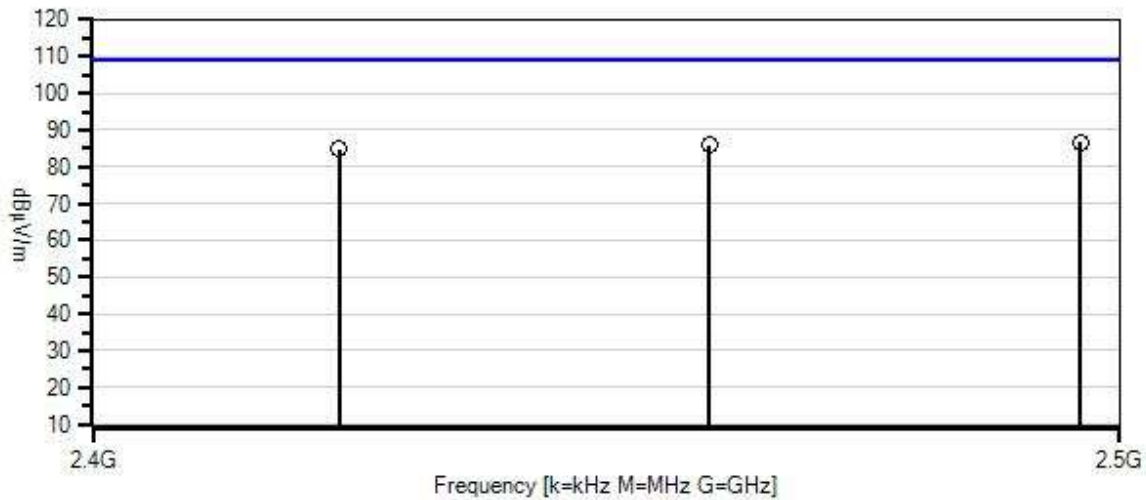
Test Conditions / Notes:

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

 Temperature (°C): 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.

Medtronic MiniMed W/O#: 101100 Sequence#: 4 Date: 9/21/2018
 15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS) Test Distance: 3 Meters Horiz



- Readings
- Peak Readings
- × QP Readings
- * Average Readings
- ▼ Ambient
- Software Version: 5.03.11
- 1 - 15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	2/24/2017	2/24/2019
T1	ANP06540	Cable	Heliac	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	Heliac	6/29/2018	6/29/2020

Measurement Data:

Reading listed by margin.

Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	T5	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	-22.4	Horiz
2	2449.773M	88.5	+0.4 +2.6	-34.0	+0.4	+28.1	+0.0	86.0	109.2	-23.2	Horiz
3	2419.747M	87.3	+0.4 +2.6	-34.0	+0.4	+28.1	+0.0	84.8	109.2	-24.4	Horiz

Test Setup Photos



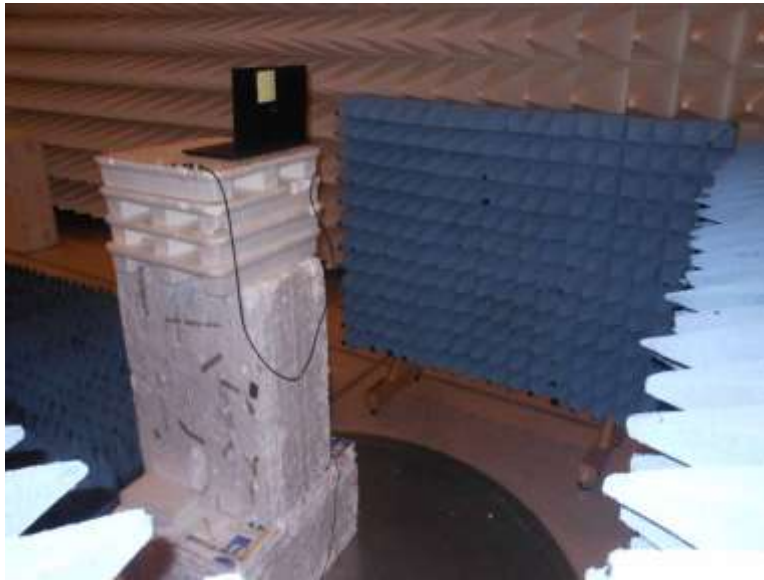
X Axis



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			

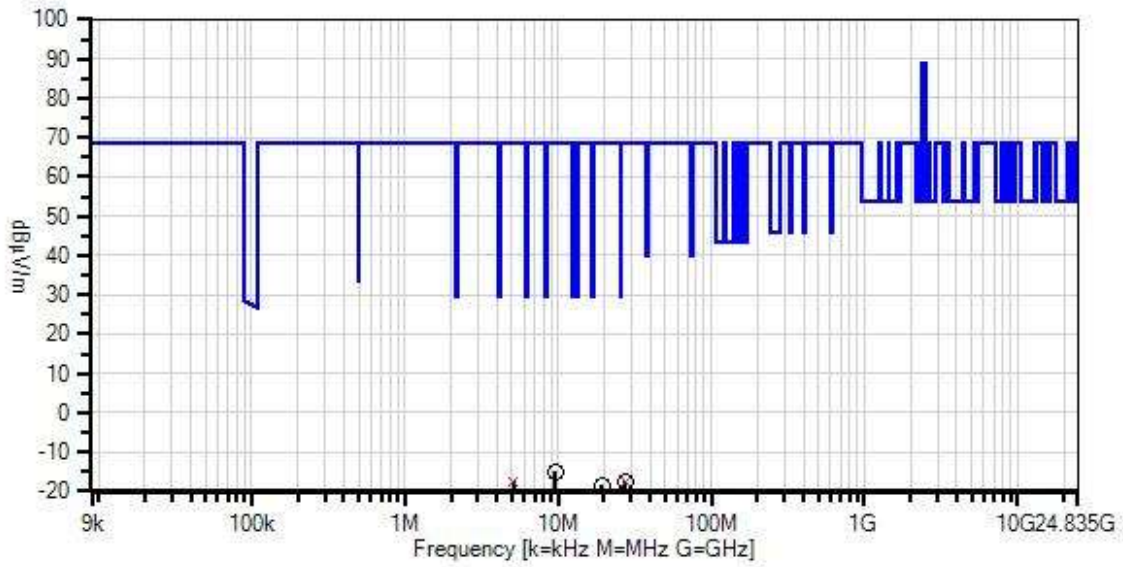
Test Conditions / Notes:

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 (°C): 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 W/O#: 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	Heliac	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliac	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 dB μ V	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V/m	Spec dB μ V/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	27.442M	16.0	+0.0	+0.1	+0.3	+6.3	-40.0	-17.3	68.8	-86.1	Groun
	QP										
^	27.451M	17.4	+0.0	+0.1	+0.3	+6.3	-40.0	-15.9	68.8	-84.7	Groun
4	5.107M	12.8	+0.0	+0.0	+0.1	+9.7	-40.0	-17.4	68.8	-86.2	Para
	QP										
^	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			

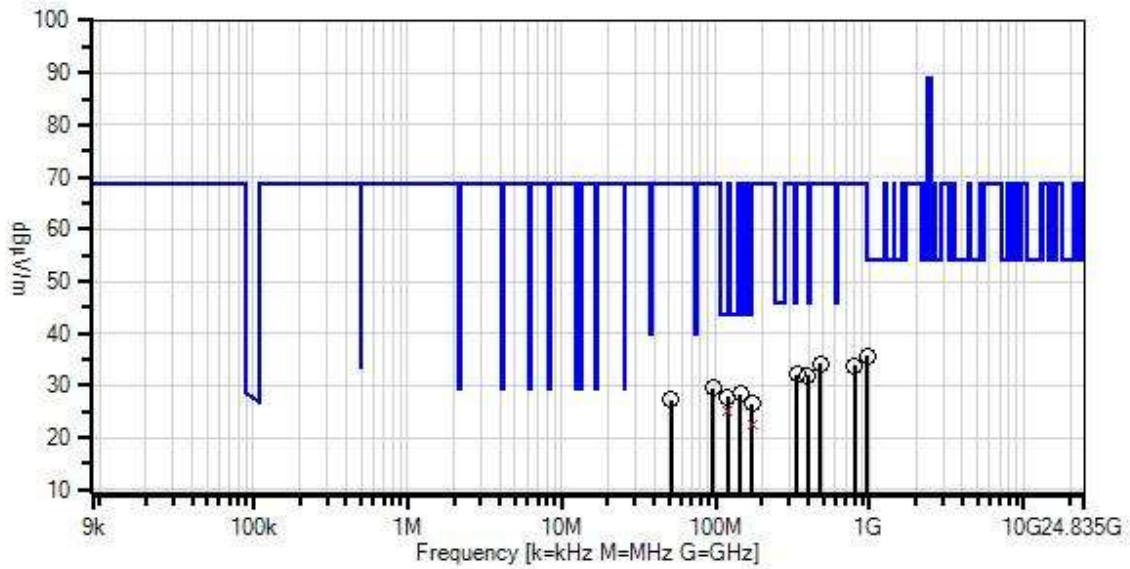
Test Conditions / Notes:

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



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			

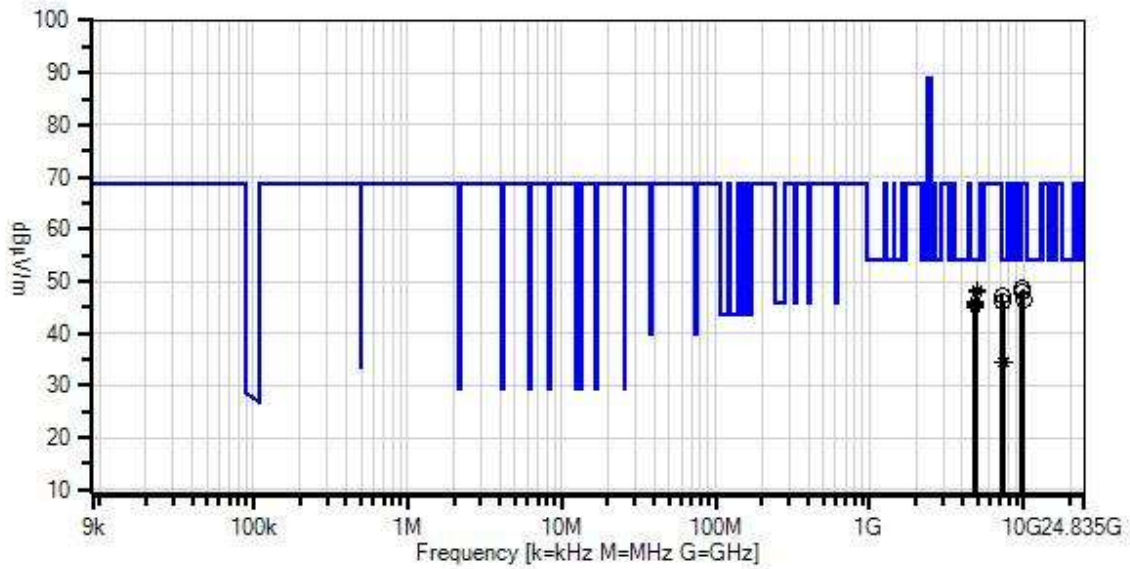
Test Conditions / Notes:

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 (°C): 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 W/D#: 101100 Sequence#: 8 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	Heliac	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	Heliac	6/29/2018	6/29/2020

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

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

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



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			

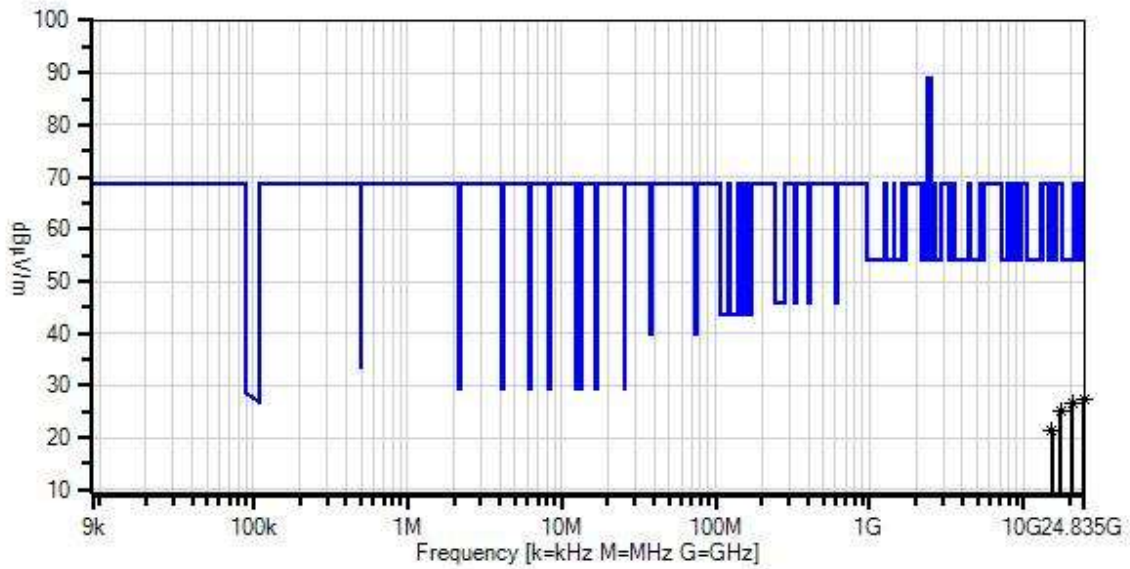
Test Conditions / Notes:

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 (°C): 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 W/D#: 101100 Sequence#: 9 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	Heliac	10/30/2017	10/30/2019
T3	ANP06515	Cable	Heliac	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

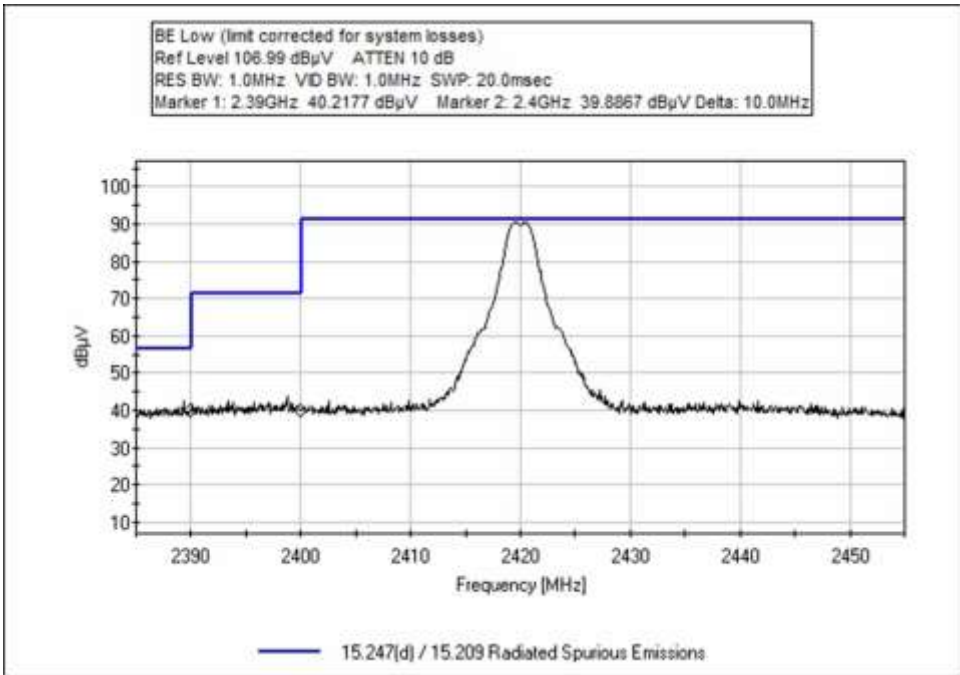
#	Freq MHz	Rdng dB μ V	Reading listed by margin				Dist Table	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
			T1 T5 dB	T2 T6 dB	T3 T7 dB	T4 T8 dB					
1	20730.000 M	26.8	+0.0 -13.1	+0.0 +2.3	+0.0 +8.7	+0.0 +1.9	+0.0	26.6	54.0	-27.4	Horiz
	Ave										
^	20730.000 M	48.5	+0.0 -13.1	+0.0 +2.3	+0.0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

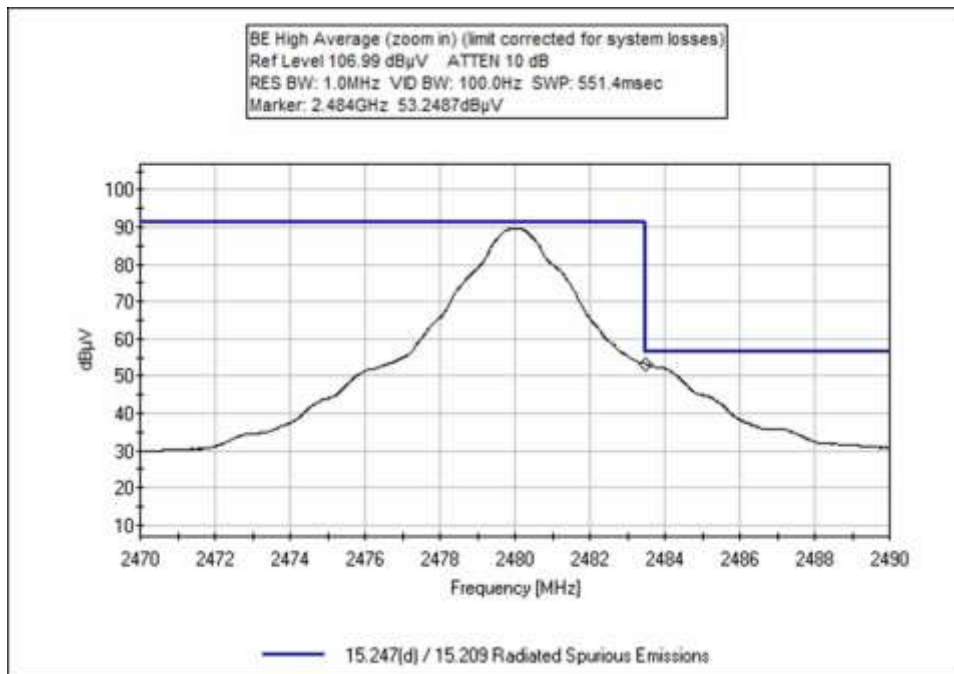
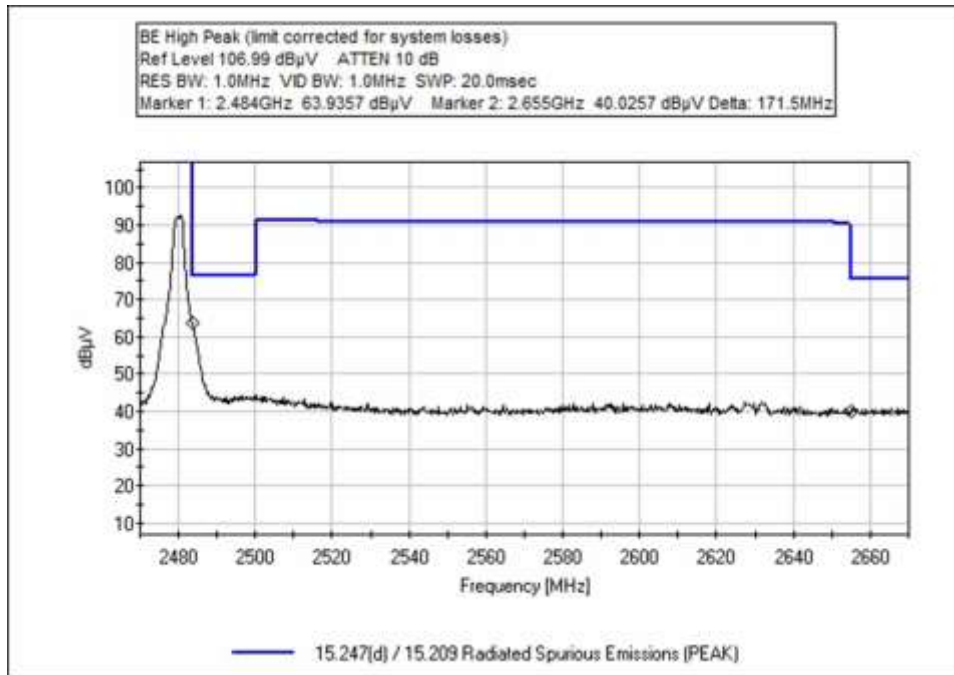
Band Edge

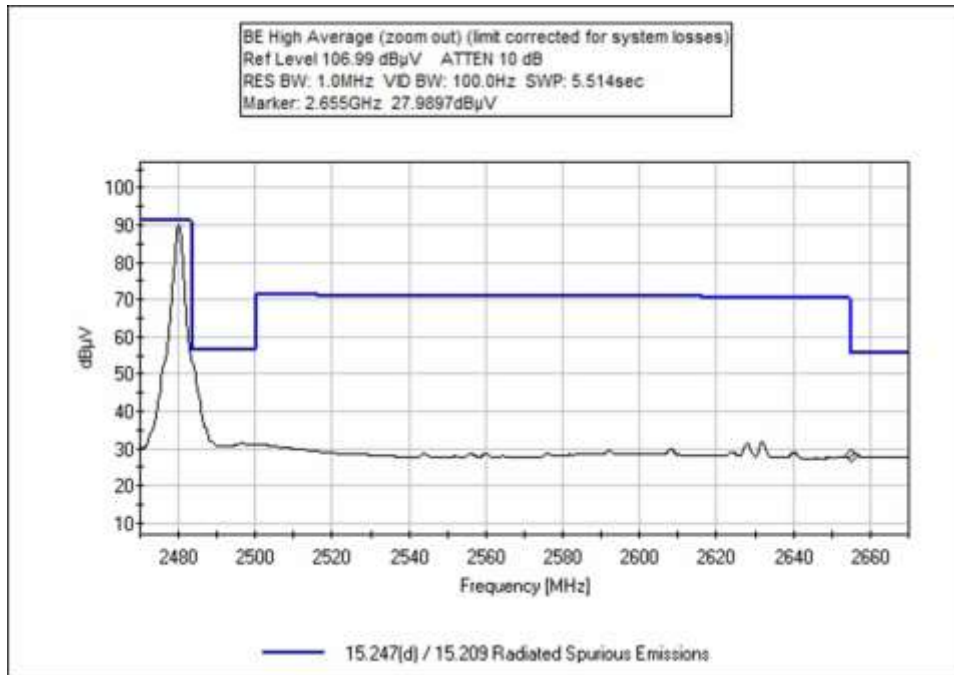
Band Edge Summary

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







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			

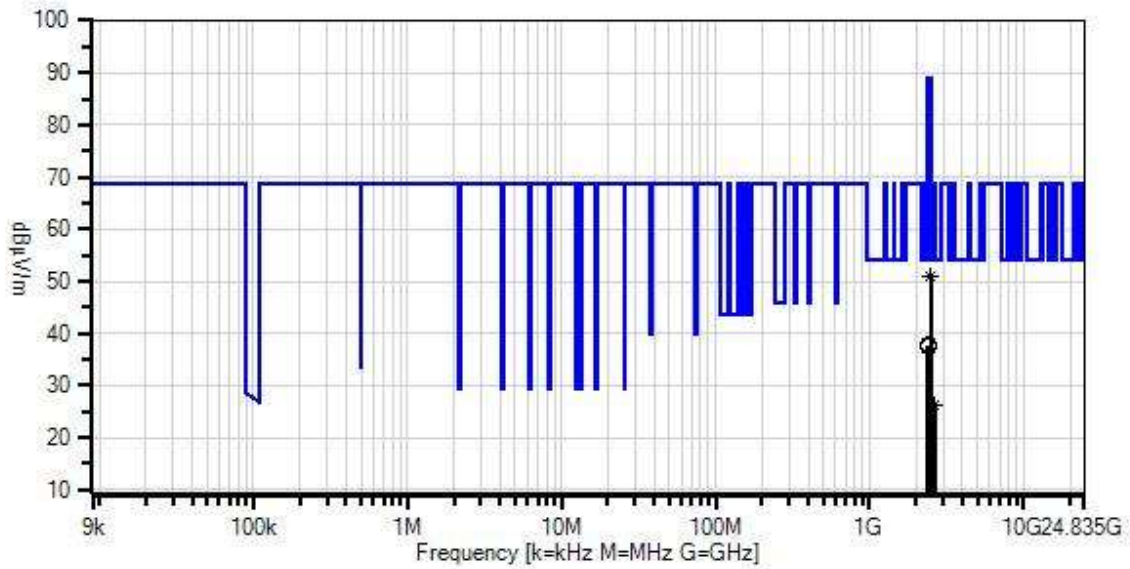
Test Conditions / Notes:

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 (°C): 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 W/D#: 101100 Sequence#: 7 Date: 9/21/2018
 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	Heliac	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	Heliac	6/29/2018	6/29/2020

Measurement Data:

Reading listed by margin.

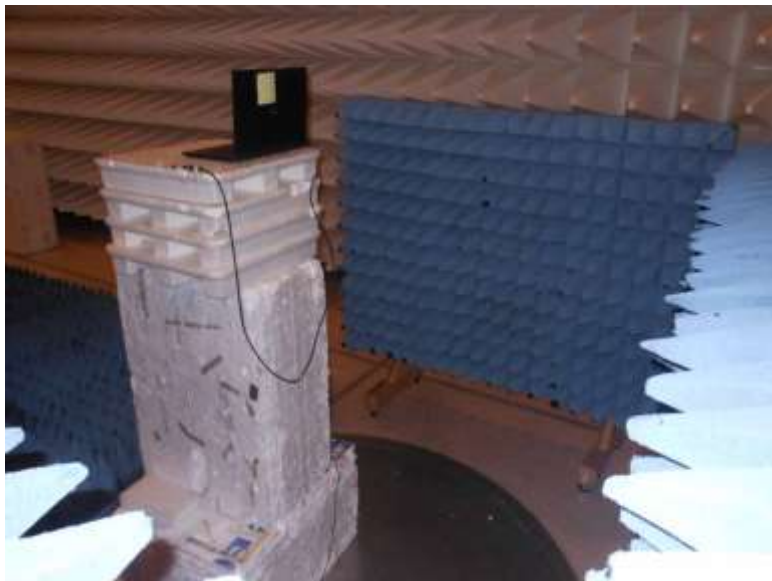
Test Distance: 3 Meters

#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dB μ V	T5	T6			Table	dB μ V/m	dB μ V/m	dB	Ant
			dB	dB	dB	dB					
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

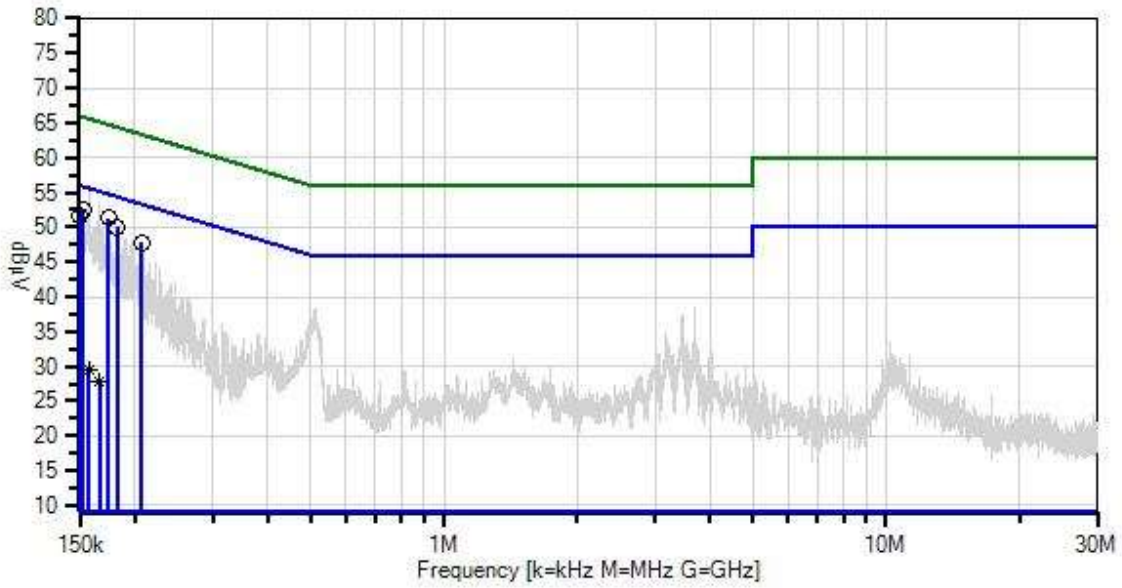
 Method: ANSI C63.10 (2013)

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



— Sweep Data
 x 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	Helix	10/30/2017	10/30/2019
T3	ANP06515	Cable	Helix	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 MHz	Rdng dB μ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar 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	18.1	+0.7 +1.7	+0.0	+0.0	+9.1	+0.0	29.6	55.6	-26.0	Line
	Ave										
^	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	16.7	+0.5 +1.6	+0.0	+0.0	+9.1	+0.0	27.9	55.1	-27.2	Line
	Ave										
^	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.

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	Helix	10/30/2017	10/30/2019
T3	ANP06515	Cable	Helix	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 MHz	Rdng dB μ V	T1 T5 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dB μ V	Spec dB μ V	Margin dB	Polar 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	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	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.