Medtronic MiniMed

ADDENDUM TO TEST REPORT 98227-9

GST4C
Model: MMT-7821XNA

Tested To The Following Standard:

FCC Part 15 Subpart C Section

15.247
(DTS 2400-2483.5 MHz)

Report No.: 98227-9A

Date of issue: April 6, 2016

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

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 EMC 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.

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: 4500110418

REPORT PREPARED BY:

Dianne Dudley
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 98227

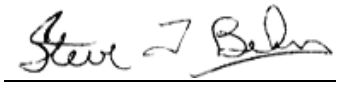
DATE OF EQUIPMENT RECEIPT: February 19, 2016
DATE(S) OF TESTING: February 19-21, 2016

Revision History

Original: Testing of the GST4C, Model: MMT-7821XNA to FCC Part 15 Subpart C Section 15.247.
Addendum A: To correct Field Strength limit from 54.1dBuV/m to 51.1dBuV/m in Section 15.247(d), Band Edge.

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment 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
Bothell, WA 98021-4413

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.02

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Bothell	US0081	SL2-IN-E-1145R	3082C-1	318736	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	NA2
15.247(d)	Radiated Emissions & Band Edge	NA	Pass
15.207	AC Conducted Emissions	NA	NA1

NA = Not Applicable
NA1 = Not Applicable because the EUT is only battery operated.
NA2 = Not Applicable because the EUT does not have an antenna connector.

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
GST4C	Medtronic MiniMed	MMT-7821XNA	GT7009680M

Support Equipment:

Device	Manufacturer	Model #	S/N
None			

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	802.11 BLE
Operating Frequency Range:	2402-2480MHz
Modulation Type(s):	GFSK, 1 Mbps
Maximum Duty Cycle:	7.5%
Number of TX Chains:	1
Antenna Type(s) and Gain:	Integral Folded Monopole
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.7V Battery
Firmware / Software used for Test:	Continuous Modulation Software

FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

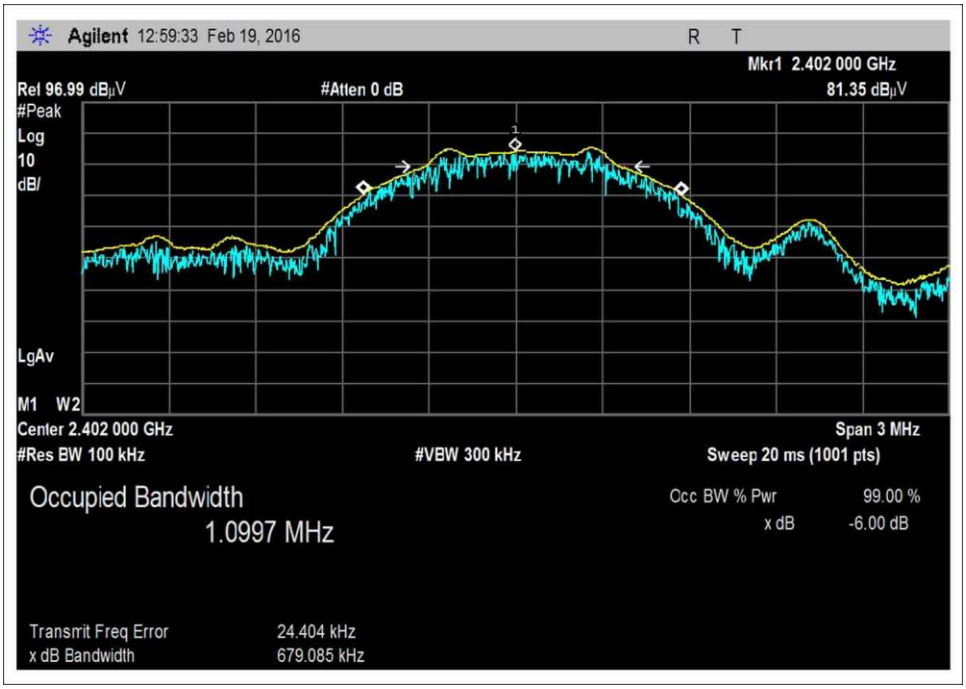
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	S. Pittsford
Test Method:	ANSI C63.10 (2013), KDB 558074 D01 DTS Meas Guidance v03r04 Jan 7th, 2016	Test Date(s):	2/19/2016
Configuration:	1		
Test Setup:	Frequency tested: 2420MHz, 2450MHz & 2480MHz Firmware power setting: Max Power EUT Firmware: Continuous Modulation Software Modulation: GFSK Antenna type: Integral Monopole Dipole Antenna Gain: 0.0 dBi. Duty Cycle: 100% Test Mode: Continuously modulated Setup: The EUT is set on a Styrofoam test bench centered on the turntable. The EUT is oriented in X, Y & Z axis with only the worst case reported. EUT has a fresh battery installed. Corrections due to antennas cables and amplifiers are added as an offset in the Spectrum Analyzer screen captures. Environmental Conditions Temperature: 20ºC Relative Humidity: 38%		

Environmental Conditions			
Temperature (ºC)	22	Relative Humidity (%):	42

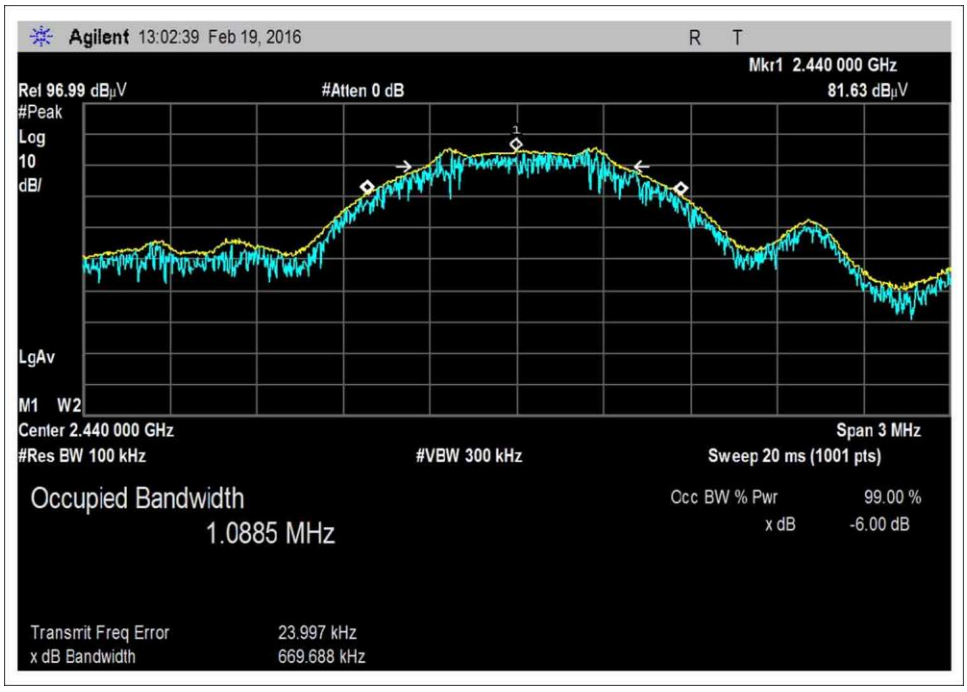
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
02872	Spectrum Analyzer	Agilent	E4440A	11/18/2015	11/18/2017
P06540	Cable	Andrews	Heliax	10/29/2015	10/29/2017
03540	Preamp	HP	83017A	4/30/2015	4/30/2017
01467	Horn Antenna	EMCO	3115	8/12/2015	8/12/2017
P05305	Cable	Andrews	ETSI-50T	2/15/2016	2/15/2018

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
2402	1	GFSK	679.1	≥500	Pass
2440	1	GFSK	669.7	≥500	Pass
2480	1	GFSK	680.0	≥500	Pass

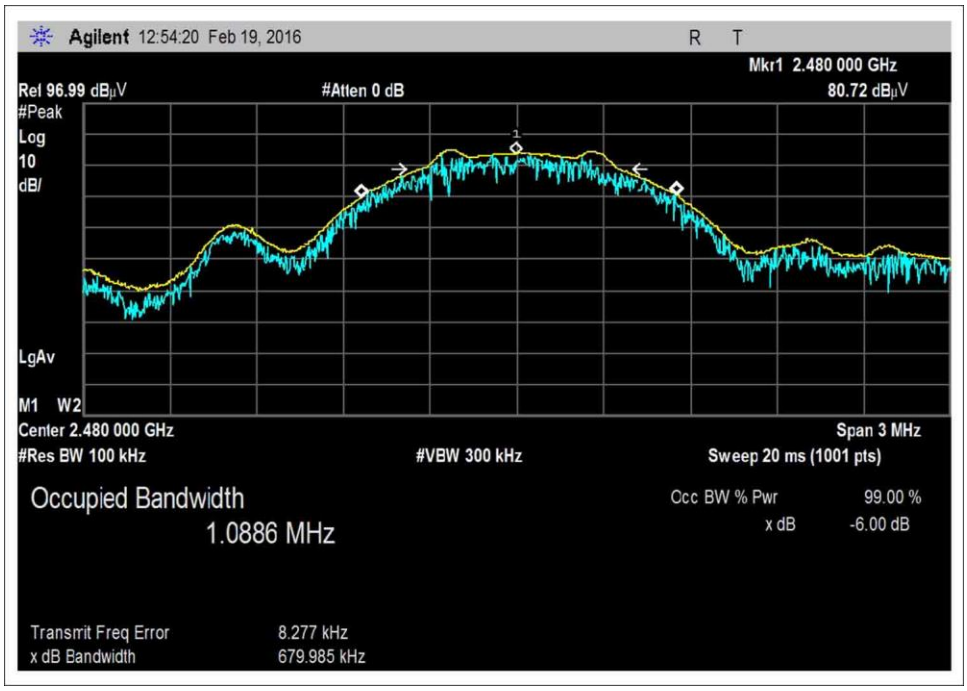
Plots



Low


Agilent 13:02:39 Feb 19, 2016
R T
Mkr1 2.440 000 GHz
Ref 96.99 dBµV
#Atten 0 dB
81.63 dBµV
#Peak
Log
10
dB/
LgAv
M1 W2
Center 2.440 000 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 20 ms (1001 pts)
Occupied Bandwidth
1.0885 MHz
Ccc BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 23.997 kHz
x dB Bandwidth 669.688 kHz

Middle


Agilent 12:54:20 Feb 19, 2016
R T
Mkr1 2.480 000 GHz
Ref 96.99 dBµV
#Atten 0 dB
80.72 dBµV
#Peak
Log
10
dB/
LgAv
M1 W2
Center 2.480 000 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 300 kHz
Sweep 20 ms (1001 pts)
Occupied Bandwidth
1.0886 MHz
Ccc BW % Pwr 99.00 %
x dB -6.00 dB
Transmit Freq Error 8.277 kHz
x dB Bandwidth 679.985 kHz

High

Test Setup Photos

Above 1GHz

X Axis

Y Axis

Z Axis

15.247(b)(3) Output Power

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(b) Power Output (2400-2483.5 MHz DTS)**		
Work Order #:	**97869**	Date:	2/21/2016
Test Type:	**Maximized Emissions**	Time:	08:20:37
Tested By:	Steven Pittsford	Sequence#:	4
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Method: ANSI C63.10 (2013) & KDB 558074 D01 DTS Meas Guidance v03r04 Jan 7th, 2016

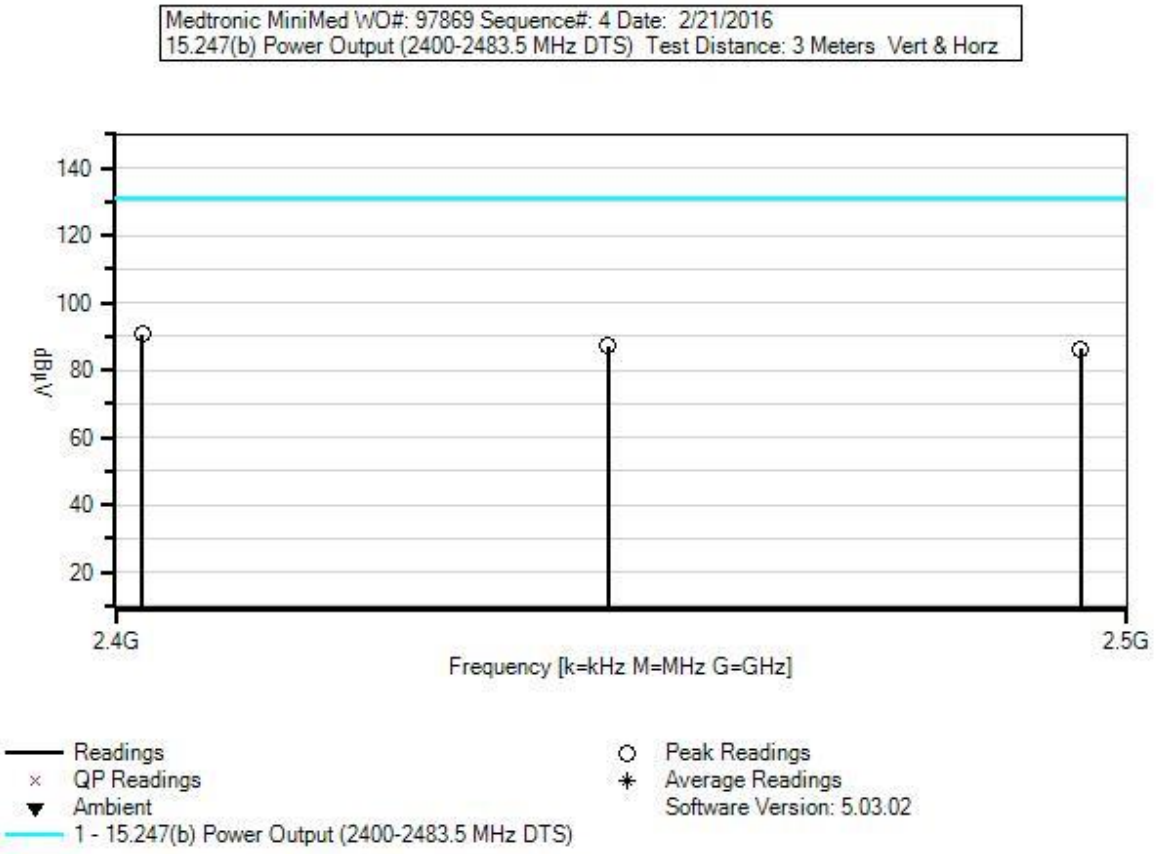
Frequency tested: 2402MHz, 2440MHz & 2480MHz
Firmware power setting: Max Power
EUT Firmware: Continuous Modulation Software
Modulation: GFSK

Antenna type: Integral Monopole Dipole
Antenna Gain : 0.0 dBi.

Duty Cycle: 100%

Test Mode: Continuously modulated
Setup: The EUT is set on a Styrofoam test bench centered on the turntable.
The EUT is oriented in X, Y & Z axis with only the worst case reported.
The EUT has a fully charged battery.
Corrections due to antennas cables and amplifiers are added as an offset in the Spectrum Analyzer screen captures.

Environmental Conditions
Temperature: 22ºC
Relative Humidity: 40%



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T3	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T4	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
T5	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018

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	dBµV	dB	Ant
1	2402.167M	94.3	+0.6 +2.8	+0.0	-34.6	+27.7	+0.0 -2	90.8	131.2	-40.4	Vert 149
2	2440.300M	90.7	+0.6 +2.9	+0.0	-34.6	+27.7	+0.0 323	87.3	131.2	-43.9	Vert 153
3	2479.600M	89.5	+0.6 +2.9	+0.0	-34.5	+27.7	+0.0 338	86.2	131.2	-45.0	Vert 161

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**
2402	GFSK	0	90.8	-4.429	≤30	Pass
2440	GFSK	0	87.3	-7.929	≤30	Pass
2480	GFSK	0	86.2	-9.079	≤30	Pass

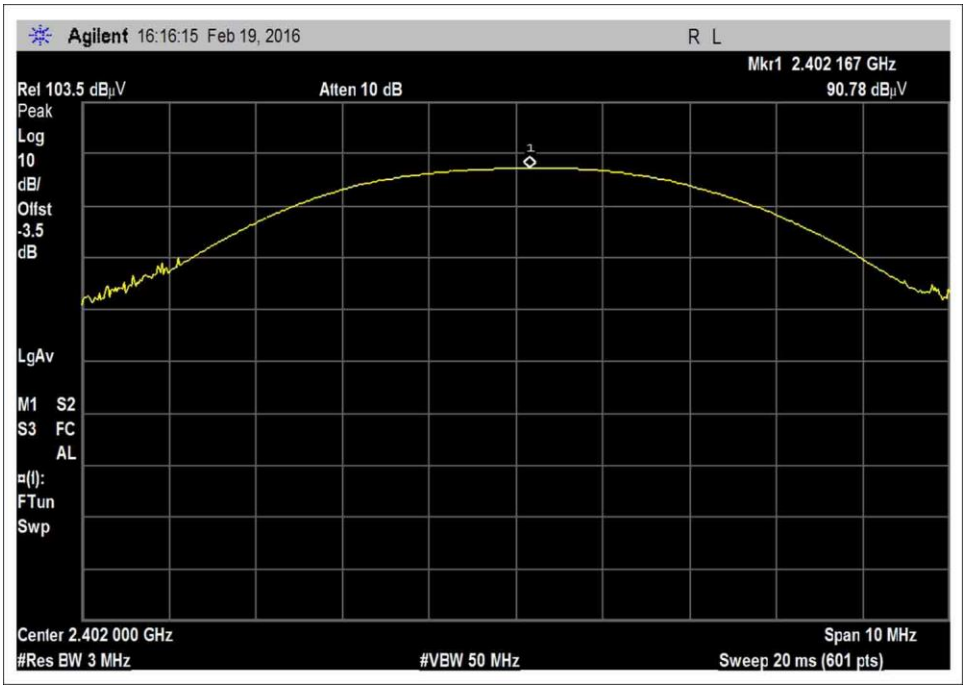
Conducted RF output power calculated in accordance with ANSI C63.10.

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

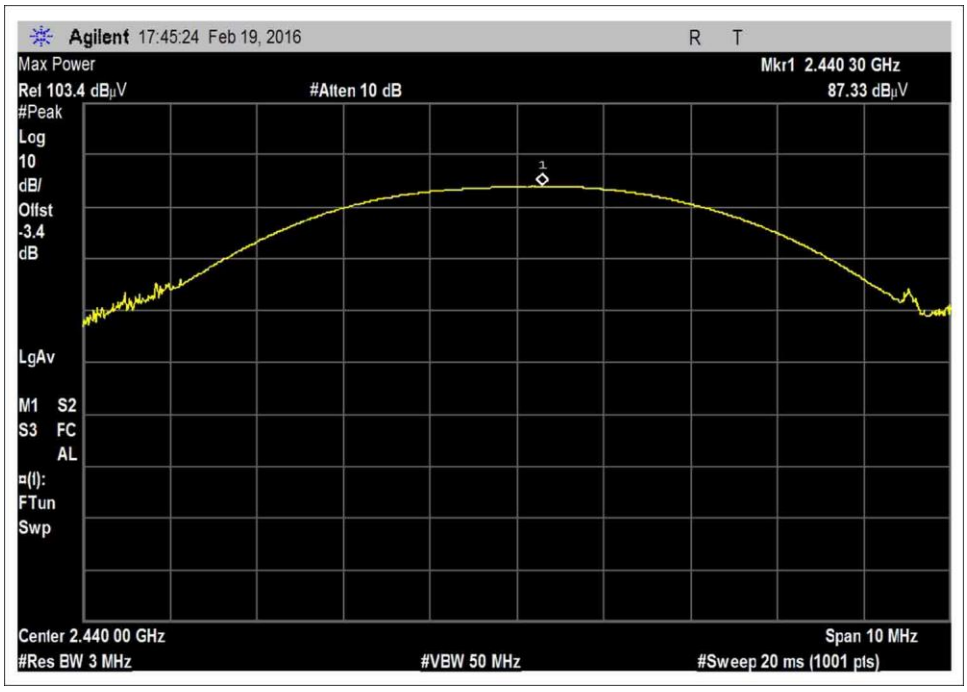
Or equivalently, in logarithmic form:

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

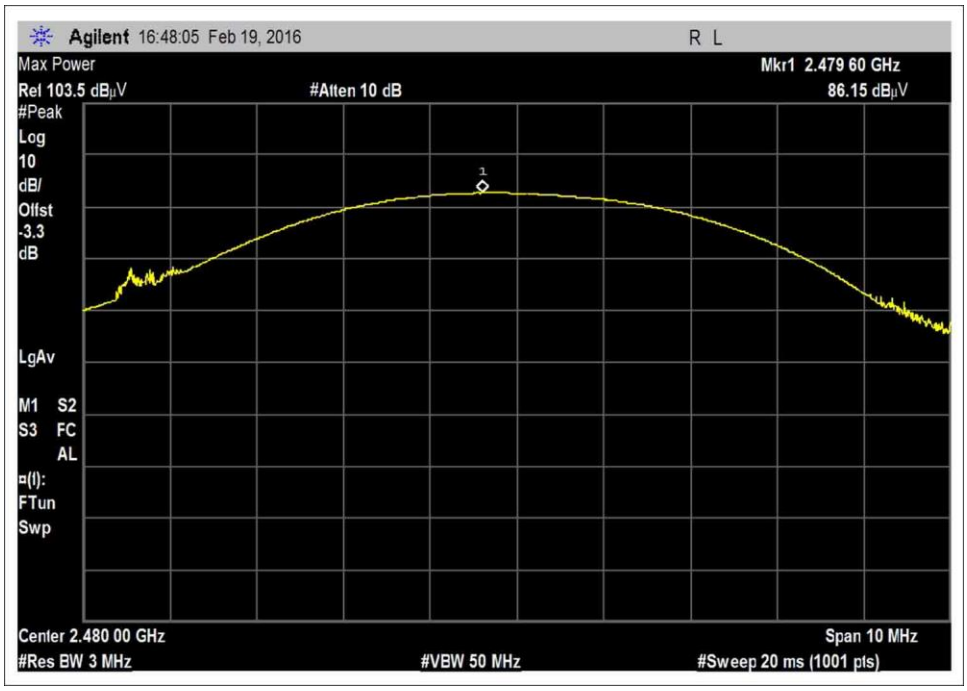
Plots



Low


Agilent 17:45:24 Feb 19, 2016
R T
Max Power
Mkr1 2.440 30 GHz
Ref 103.4 dBµV
#Atten 10 dB
87.33 dBµV
#Peak
Log
10
dB/
Offst
-3.4
dB
LgAv
M1 S2
S3 FC
AL
¤(!):
FTun
Swp
Center 2.440 00 GHz
Span 10 MHz
#Res BW 3 MHz
#VBW 50 MHz
#Sweep 20 ms (1001 pts)

Middle


Agilent 16:48:05 Feb 19, 2016
R L
Max Power
Mkr1 2.479 60 GHz
Ref 103.5 dBµV
#Atten 10 dB
86.15 dBµV
#Peak
Log
10
dB/
Offst
-3.3
dB
LgAv
M1 S2
S3 FC
AL
¤(!):
FTun
Swp
Center 2.480 00 GHz
Span 10 MHz
#Res BW 3 MHz
#VBW 50 MHz
#Sweep 20 ms (1001 pts)

High

Test Setup Photos

Above 1GHz

X Axis

Y Axis

Z Axis

15.247(e) Power Spectral Density

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717
Customer: **Medtronic MiniMed**
Specification: **15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**
Work Order #: **97869** Date: 2/21/2016
Test Type: **Maximized Emissions** Time: 08:23:21
Tested By: Steven Pittsford Sequence#: 4
Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Method: ANSI C63.10 (2013) & KDB 558074 D01 DTS Meas Guidance v03r04 Jan 7th, 2016

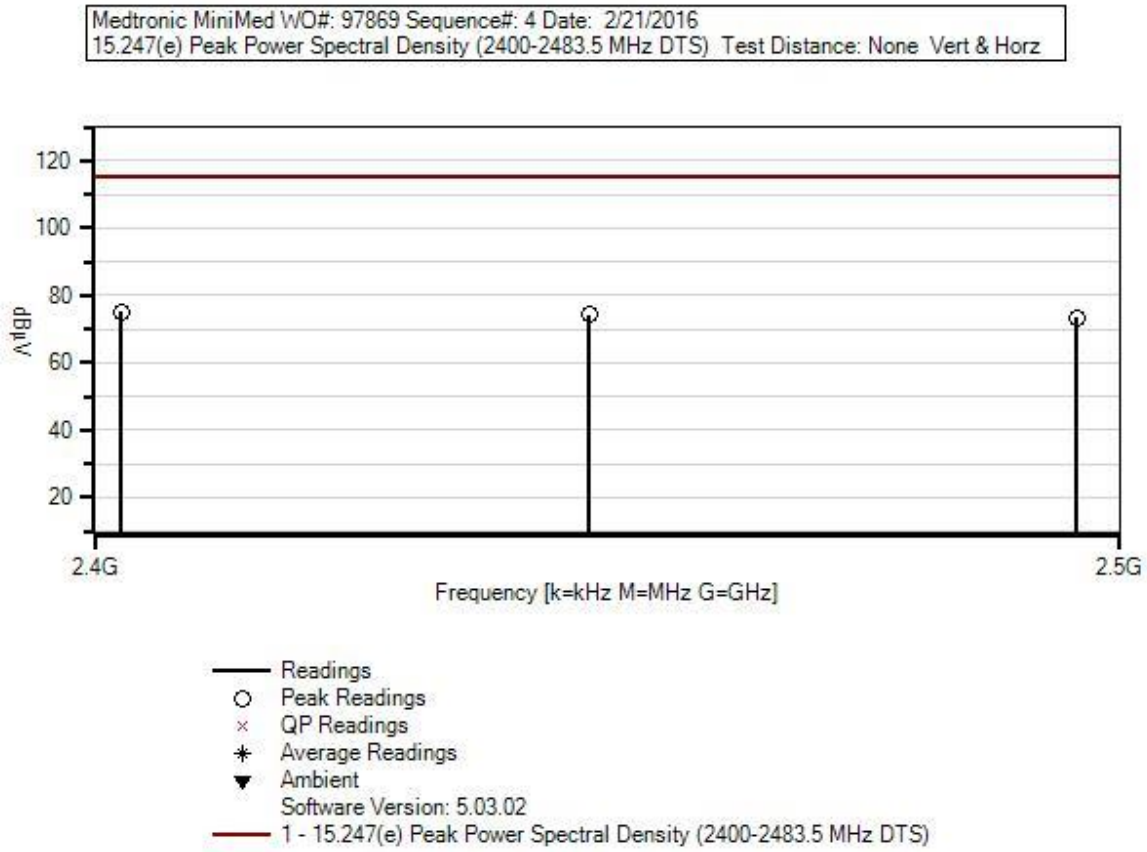
Frequency tested: 2402MHz, 2440MHz & 2480MHz
Firmware power setting: Max Power
EUT Firmware: Continuous Modulation Software
Modulation: GFSK

Antenna type: Integral Monopole Dipole
Antenna Gain : 0.0 dBi.

Duty Cycle: 100%

Test Mode: Continuously modulated
Setup: The EUT is set on a Styrofoam test bench centered on the turntable.
The EUT is oriented in X, Y & Z axis with only the worst case reported.
The EUT has a fully charged battery.
Corrections due to antennas cables and amplifiers are added as an offset in the Spectrum Analyzer screen captures.

Environmental Conditions
Temperature: 22ºC
Relative Humidity: 40%



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T3	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T4	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
T5	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018

Measurement Data: Reading listed by margin. Test Distance: None

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	2402.136M	78.6	+0.6 +2.8	+0.0	-34.6	+27.7	+0.0 -2	75.1	115.0	-39.9	Vert 149
2	2439.899M	77.8	+0.6 +2.9	+0.0	-34.6	+27.7	+0.0 323	74.4	115.0	-40.6	Vert 153
3	2479.878M	76.7	+0.6 +2.9	+0.0	-34.5	+27.7	+0.0 338	73.4	115.0	-41.6	Vert 161

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**
2402	GFSK	0	75.1	-20.129	≤8	Pass
2440	GFSK	0	74.4	-20.829	≤8	Pass
2480	GFSK	0	73.4	-21.829	≤8	Pass

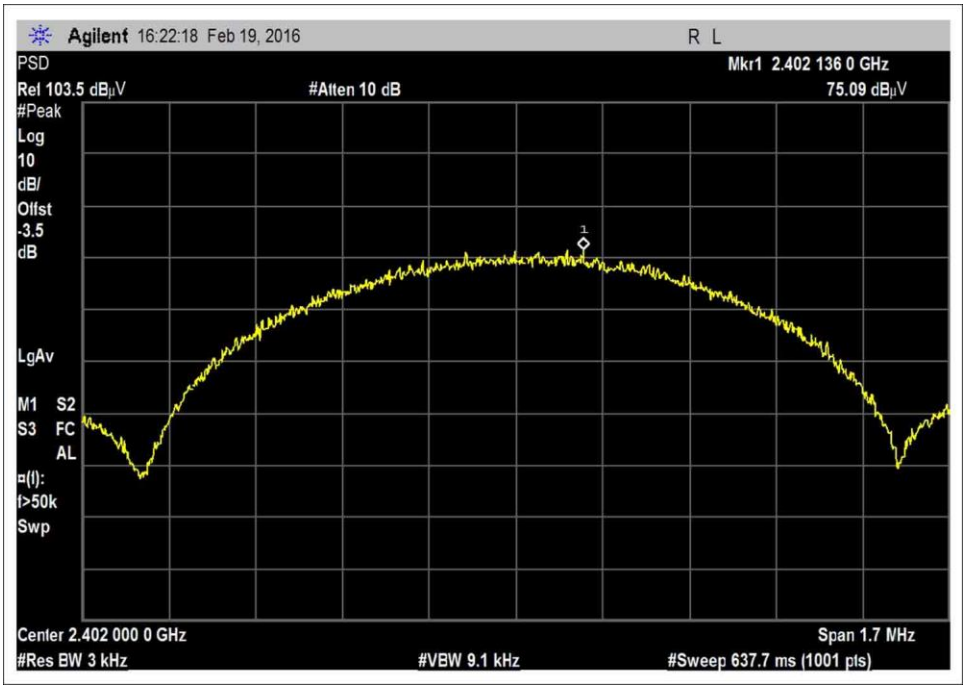
Conducted RF output power calculated in accordance with ANSI C63.10.

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

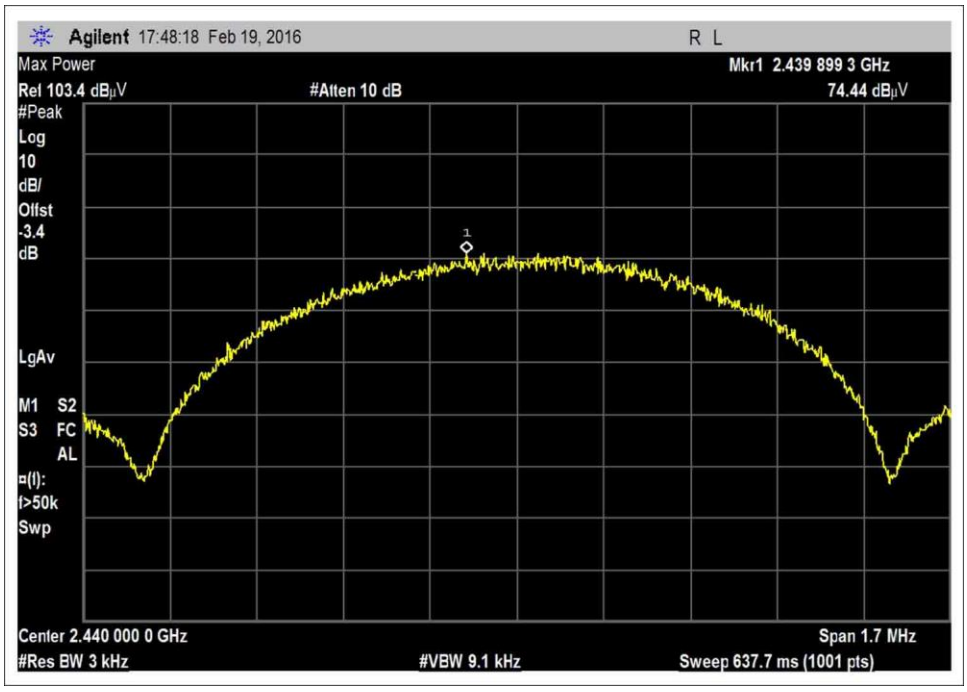
Or equivalently, in logarithmic form:

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

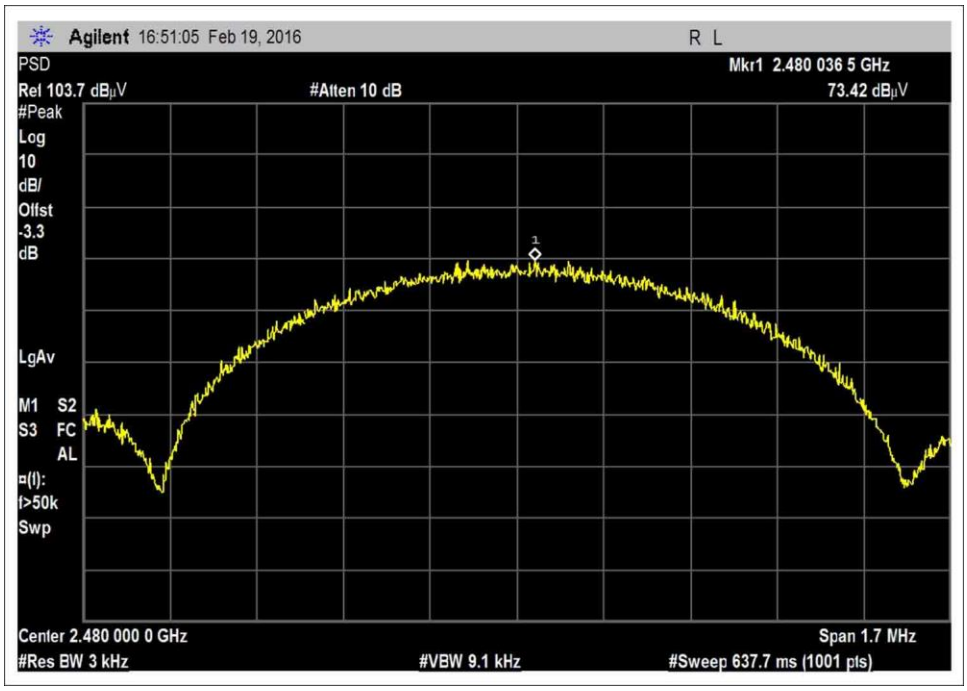
Plots



Low


Agilent 17:48:18 Feb 19, 2016
R L
Max Power
Mkr1 2.439 899 3 GHz
Ref 103.4 dBµV
#Atten 10 dB
74.44 dBµV
#Peak
Log
10
dB/
Offst
-3.4
dB
LgAv
M1 S2
S3 FC
AL
¤(f):
f>50k
Swp
Center 2.440 000 0 GHz
Span 1.7 MHz
#Res BW 3 kHz
#VBW 9.1 kHz
Sweep 637.7 ms (1001 pts)

Middle


Agilent 16:51:05 Feb 19, 2016
R L
PSD
Mkr1 2.480 036 5 GHz
Ref 103.7 dBµV
#Atten 10 dB
73.42 dBµV
#Peak
Log
10
dB/
Offst
-3.3
dB
LgAv
M1 S2
S3 FC
AL
¤(f):
f>50k
Swp
Center 2.480 000 0 GHz
Span 1.7 MHz
#Res BW 3 kHz
#VBW 9.1 kHz
#Sweep 637.7 ms (1001 pts)

High

Test Setup Photos

Above 1GHz

X Axis

Y Axis

Z Axis

15.247(d) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**97869**	Date:	2/21/2016
Test Type:	**Maximized Emissions**	Time:	13:43:07
Tested By:	Steven Pittsford	Sequence#:	4
Software:	EMITest 5.03.02		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Method: ANSI C63.10 (2013) & KDB 558074 D01 DTS Meas Guidance v03r04 Jan 7th, 2016

Frequency Range: 9k-25GHz
Frequency tested: 2402MHz, 2440MHz & 2480MHz
Firmware power setting: Max Power
EUT Firmware: Continuous Modulation Software
Modulation: GFSK

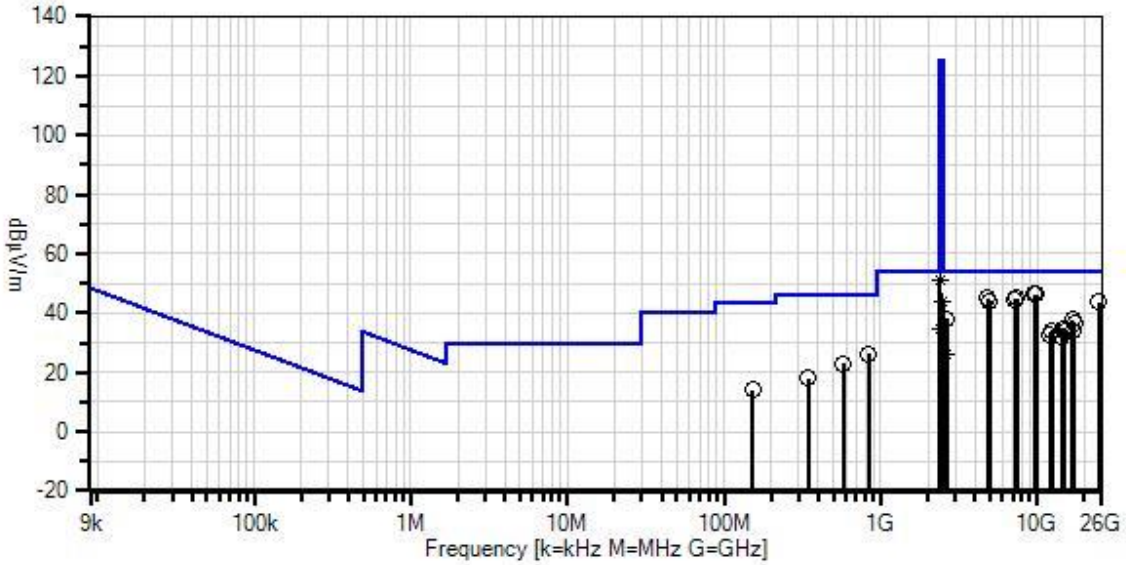
Antenna type: Integral Monopole Dipole
Antenna Gain : 0.0 dBi.

Duty Cycle: 100%

Test Mode: Continuously modulated
Setup: The EUT is set on a Styrofoam test bench centered on the turntable.
The EUT is oriented in X, Y & Z axis with only the worst case reported.
The EUT has a fully charged battery.

Environmental Conditions
Temperature: 22ºC
Relative Humidity: 38% to 40%

Medtronic MiniMed WO#: 97869 Sequence#: 4 Date: 2/21/2016
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert & Horz



Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.02

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T2	AN02741	Active Horn Antenna	AMFW-5F-12001800-20-10P	1/14/2015	1/14/2017
T3	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	1/14/2015	1/14/2017
T4	AN02763-69	Waveguide	Multiple	5/21/2014	5/21/2016
T5	AN03122	Cable	32026-2-29801-36	5/13/2014	5/13/2016
T6	ANP06678	Cable	32026-29801-29801-144	9/18/2014	9/18/2016
T7	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T8	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
T9	AN02307	Preamp	8447D	2/15/2016	2/15/2018
T10	AN01996	Biconilog Antenna	CBL6111C	7/16/2014	7/16/2016
T11	ANP05360	Cable	RG214	12/1/2014	12/1/2016
T12	ANP05963	Cable	RG-214	2/21/2014	2/21/2016
T13	AN00052	Loop Antenna	6502	5/20/2014	5/20/2016
T14	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018

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

#	Freq	Rdng	T1 T5 T9 T13	T2 T6 T10 T14	T3 T7 T11	T4 T8 T12	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2400.000M	54.6	+0.6 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +2.8	+0.0 -34.6 +0.0	+0.0 +27.7 +0.0	+0.0 -2	51.1	54.0	-2.9	Vert 149
	Ave										
^	2400.000M	62.3	+0.6 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +2.8	+0.0 -34.6 +0.0	+0.0 +27.7 +0.0	+0.0 -2	58.8	54.0	+4.8	Vert 149
3	9918.935M	37.1	+1.3 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +6.1	+0.0 -35.2 +0.0	+0.0 +37.2 +0.0	+0.0 84	46.5	54.0 High	-7.5	Vert 151
4	9607.900M	36.4	+1.5 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +6.1	+0.0 -35.0 +0.0	+0.0 +37.4 +0.0	+0.0 19	46.4	54.0 Low	-7.6	Vert 159

5	9756.730M	36.6	+1.4	+0.0	+0.0	+0.0	+0.0	46.3	54.0	-7.7	Vert
			+0.0	+0.0	-35.1	+37.3	141		Mid		134
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+6.1							
6	7318.440M	37.8	+1.2	+0.0	+0.0	+0.0	+0.0	45.2	54.0	-8.8	Vert
			+0.0	+0.0	-34.6	+36.1	279		Mid		134
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+4.7							
7	7438.295M	36.9	+1.3	+0.0	+0.0	+0.0	+0.0	44.9	54.0	-9.1	Vert
			+0.0	+0.0	-34.7	+36.6	293		High		145
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+4.8							
8	4804.498M	41.2	+0.9	+0.0	+0.0	+0.0	+0.0	44.9	54.0	-9.1	Vert
			+0.0	+0.0	-34.2	+32.7	11		Low		159
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+4.3							
9	7207.075M	37.4	+1.2	+0.0	+0.0	+0.0	+0.0	44.3	54.0	-9.7	Vert
			+0.0	+0.0	-34.5	+35.7	360		Low		159
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+4.5							
10	4880.600M	40.1	+0.9	+0.0	+0.0	+0.0	+0.0	43.9	54.0	-10.1	Vert
			+0.0	+0.0	-34.2	+32.7	360		Mid		134
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+4.4							
11	4959.830M	40.0	+0.9	+0.0	+0.0	+0.0	+0.0	43.9	54.0	-10.1	Vert
			+0.0	+0.0	-34.2	+32.8	360		High		140
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+4.4							
12	2483.500M	47.0	+0.6	+0.0	+0.0	+0.0	+0.0	43.7	54.0	-10.3	Vert
	Ave		+0.0	+0.0	-34.5	+27.7	338				161
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+2.9							
^	2483.500M	54.8	+0.6	+0.0	+0.0	+0.0	+0.0	51.5	54.0	-2.5	Vert
			+0.0	+0.0	-34.5	+27.7	338				161
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+2.9							
14	24788.265	42.7	+0.0	+0.0	-12.3	+2.7	+0.0	43.6	54.0	-10.4	Vert
	M		+2.7	+7.8	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0					147
			+0.0	+0.0							
15	2655.000M	40.5	+0.7	+0.0	+0.0	+0.0	+0.0	38.1	54.0	-15.9	Vert
			+0.0	+0.0	-34.5	+28.4	338				161
			+0.0	+0.0	+0.0	+0.0					
			+0.0	+3.0							
16	16815.050	38.3	+2.1	-11.2	+0.0	+0.0	+0.0	37.8	54.0	-16.2	Vert
	M		+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0	374		Low		147
			+0.0	+8.6							
17	17360.320	37.6	+2.0	-11.5	+0.0	+0.0	+0.0	36.9	54.0	-17.1	Vert
	M		+0.0	+0.0	+0.0	+0.0					
			+0.0	+0.0	+0.0	+0.0	324		High		147
			+0.0	+8.8							

18	2390.000M Ave	37.9	+0.6 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +2.8	+0.0 -34.6 +0.0	+0.0 +27.7 +0.0	+0.0 -2	34.4	54.0	-19.6	Vert 149
^	2390.000M	49.1	+0.6 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +2.8	+0.0 -34.6 +0.0	+0.0 +27.7 +0.0	+0.0 -2	45.6	54.0	-8.4	Vert 149
20	14640.980 M	38.9	+1.8 +0.0 +0.0 +0.0	-14.1 +0.0 +0.0 +7.8	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 204	34.4	54.0 Mid	-19.6	Vert 147
21	842.900M	27.5	+0.0 +0.0 -27.6 +0.0	+0.0 +0.0 +23.0 +0.0	+0.0 +0.0 +1.9	+0.0 +0.0 +1.4	+0.0 360	26.2	46.0	-19.8	Vert 147
22	14879.490 M	38.8	+1.8 +0.0 +0.0 +0.0	-14.1 +0.0 +0.0 +7.7	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 360	34.2	54.0 High	-19.8	Vert 147
23	12398.060 M	39.5	+1.6 +0.0 +0.0 +0.0	-13.3 +0.0 +0.0 +6.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 211	34.2	54.0 High	-19.8	Vert 147
24	12203.960 M	39.2	+1.5 +0.0 +0.0 +0.0	-13.4 +0.0 +0.0 +6.6	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 307	33.9	54.0 Mid	-20.1	Vert 147
25	17080.980 M	35.1	+2.1 +0.0 +0.0 +0.0	-12.0 +0.0 +0.0 +8.6	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 151	33.8	54.0 Mid	-20.2	Vert 147
26	12006.780 M	37.8	+1.5 +0.0 +0.0 +0.0	-13.1 +0.0 +0.0 +6.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 -16	32.6	54.0 Low	-21.4	Vert 147
27	14408.780 M	37.0	+1.8 +0.0 +0.0 +0.0	-14.4 +0.0 +0.0 +7.7	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 -3	32.1	54.0 Low	-21.9	Vert 147
28	579.000M	28.4	+0.0 +0.0 -28.2 +0.0	+0.0 +0.0 +19.9 +0.0	+0.0 +0.0 +1.6	+0.0 +0.0 +1.2	+0.0 360	22.9	46.0	-23.1	Vert 147
29	2654.800M Ave	28.5	+0.7 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0 +3.0	+0.0 -34.5 +0.0	+0.0 +28.4 +0.0	+0.0 338	26.1	54.0	-27.9	Vert 161
30	346.200M	28.0	+0.0 +0.0 -27.2 +0.0	+0.0 +0.0 +15.1 +0.0	+0.0 +0.0 +1.1	+0.0 +0.0 +0.9	+0.0 360	17.9	46.0	-28.1	Vert 147

31	153.200M	29.1	+0.0 +0.0 -27.5 +0.0	+0.0 +0.0 +11.2 +0.0	+0.0 +0.0 +0.7	+0.0 +0.0 +0.6	+0.0 360	14.1	43.5	-29.4	Vert 147
32	150.000k	49.6	+0.0 +0.0 +0.0 +9.6	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-80.0 360	-20.8	24.1	-44.9	Perp 147
33	21.642M	10.3	+0.0 +0.0 +0.0 +6.7	+0.0 +0.0 +0.0 +0.3	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-40.0 360	-22.7	29.5	-52.2	Perp 147
34	12.525k	45.1	+0.0 +0.0 +0.0 +14.4	+0.0 +0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	-80.0 360	-20.5	45.6	-66.1	Perp 147

Band Edge Summary					
Frequency (MHz)	Modulation	Ant. Type	Field Strength (dBuV/m @3m)	Limit (dBuV/m @3m)	Results
2390.0	GFSK	Integral Folded Monopole	34.4	<54	Pass
2400.0	GFSK	Integral Folded Monopole	51.1	<54	Pass
2483.5	GFSK	Integral Folded Monopole	43.7	<54	Pass

Band Edge Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 22116 23rd Dr. SE, Suite A • Bothell, WA 98021 • (425) 402-1717
Customer: **Medtronic MiniMed**
Specification: **15.247(d) / 15.209 Radiated Spurious Emissions (Peak Limit)**
Work Order #: **97869** Date: 2/21/2016
Test Type: **Maximized Emissions** Time: 08:12:57
Tested By: Steven Pittsford Sequence#: 4
Software: EMITest 5.03.02

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Test Method: ANSI C63.10 (2013) & KDB 558074 D01 DTS Meas Guidance v03r04 Jan 7th, 2016

Frequency tested: 2402MHz & 2480MHz
Firmware power setting: Max Power
EUT Firmware: Continuous Modulation Software
Modulation: GFSK

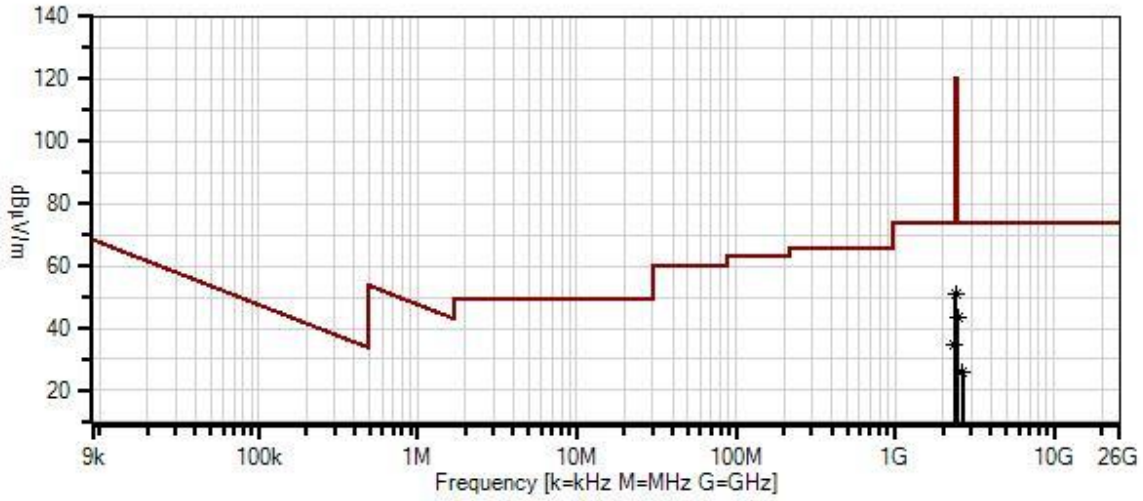
Antenna type: Integral Monopole Dipole
Antenna Gain : 0.0 dBi.

Duty Cycle: 100%

Test Mode: Continuously modulated
Setup: The EUT is set on a Styrofoam test bench centered on the turntable.
The EUT is oriented in X, Y & Z axis with only the worst case reported.
The EUT has a fully charged battery.

Environmental Conditions
Temperature: 22ºC
Relative Humidity: 40%

Medtronic MiniMed WO#: 97869 Sequence#: 4 Date: 2/21/2016
15.247(d) / 15.209 Radiated Spurious Emissions (Peak Limit) Test Distance: 3 Meters Vert & Horz



Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.02
1 - 15.247(d) / 15.209 Radiated Spurious Emissions (Peak Limit)

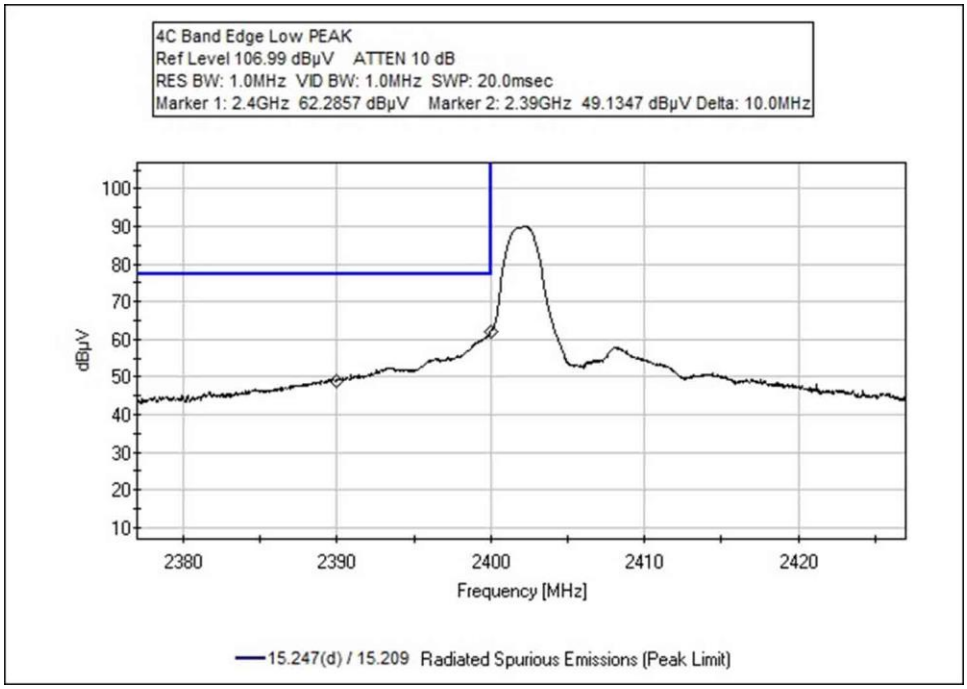
Test Equipment:

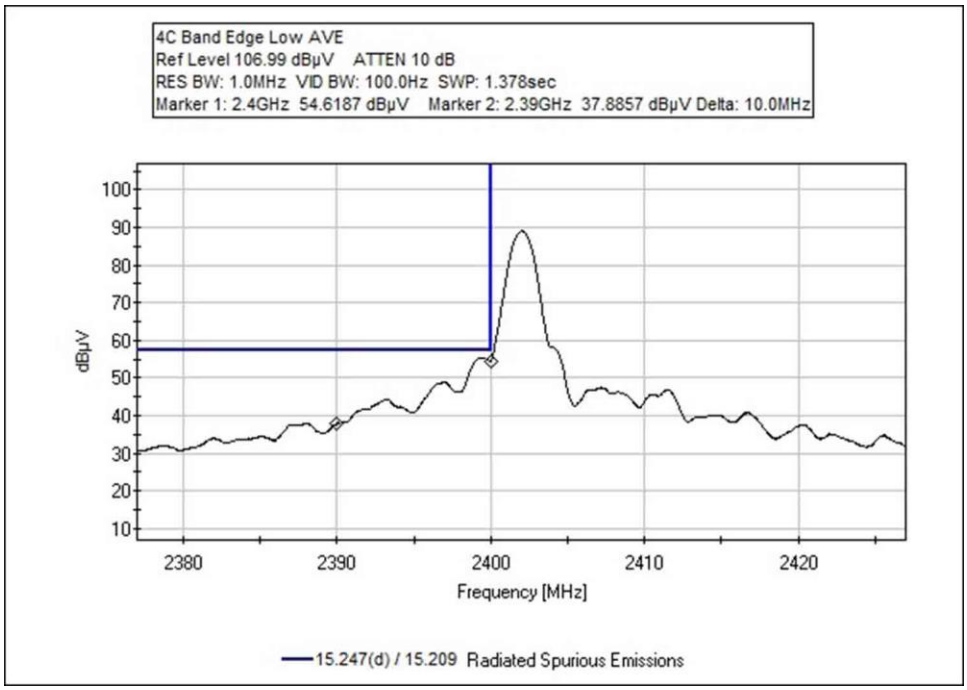
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06540	Cable	Heliax	10/29/2015	10/29/2017
T2	AN02872	Spectrum Analyzer	E4440A	11/18/2015	11/18/2017
T3	AN03540	Preamp	83017A	4/30/2015	4/30/2017
T4	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	8/12/2015	8/12/2017
T5	ANP05305	Cable	ETSI-50T	2/15/2016	2/15/2018

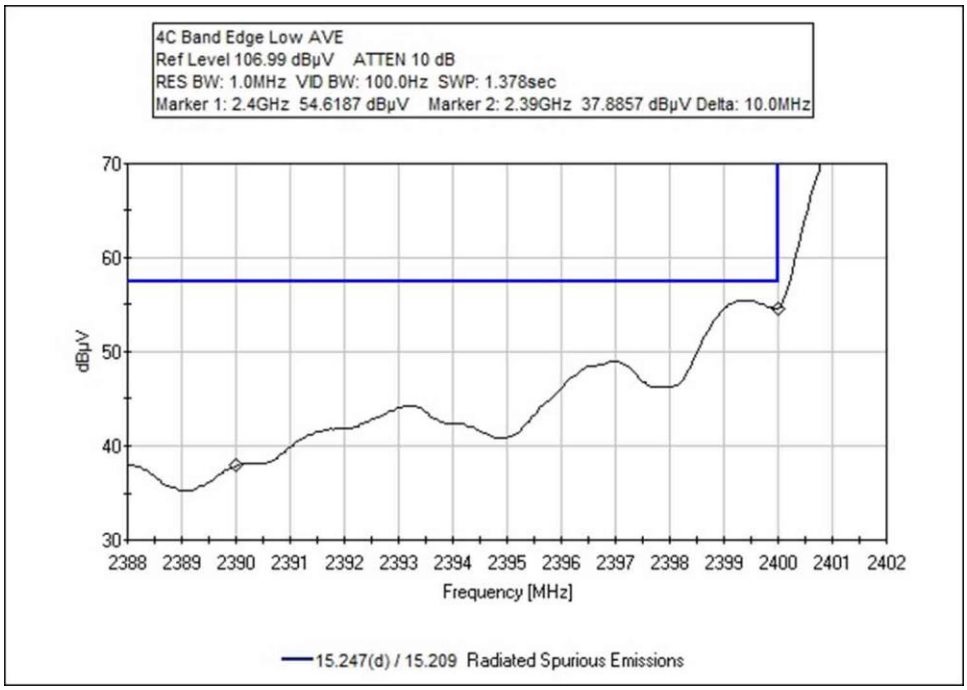
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

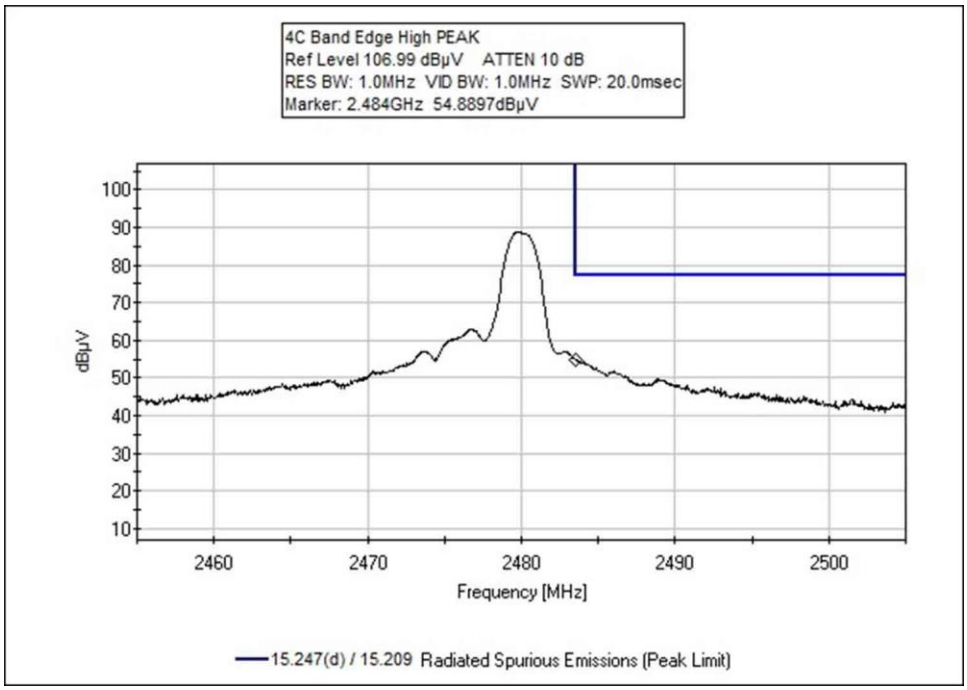
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2400.000M	54.6	+0.6	+0.0	-34.6	+27.7	+0.0	51.1	54.0	-2.9	Vert
	Ave		+2.8				-2				149
^	2400.000M	62.3	+0.6	+0.0	-34.6	+27.7	+0.0	58.8	74.0	-15.2	Vert
			+2.8				-2				149
3	2483.500M	47.0	+0.6	+0.0	-34.5	+27.7	+0.0	43.7	54.0	-10.3	Vert
	Ave		+2.9				338				161
^	2483.500M	54.8	+0.6	+0.0	-34.5	+27.7	+0.0	51.5	74.0	-22.5	Vert
			+2.9				338				161
5	2390.000M	37.9	+0.6	+0.0	-34.6	+27.7	+0.0	34.4	54.0	-19.6	Vert
	Ave		+2.8				-2				149
^	2390.000M	49.1	+0.6	+0.0	-34.6	+27.7	+0.0	45.6	74.0	-28.4	Vert
			+2.8				-2				149
7	2654.800M	28.5	+0.7	+0.0	-34.5	+28.4	+0.0	26.1	54.0	-27.9	Vert
	Ave		+3.0				338				161
^	2654.800M	40.5	+0.7	+0.0	-34.5	+28.4	+0.0	38.1	74.0	-35.9	Vert
			+3.0				338				161

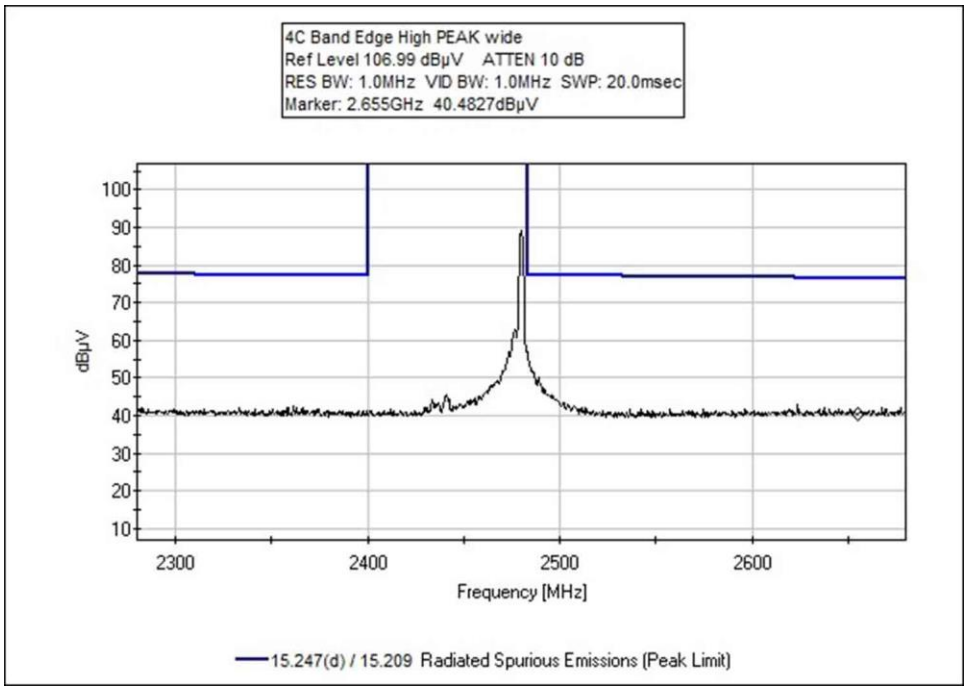
Band Edge Plots

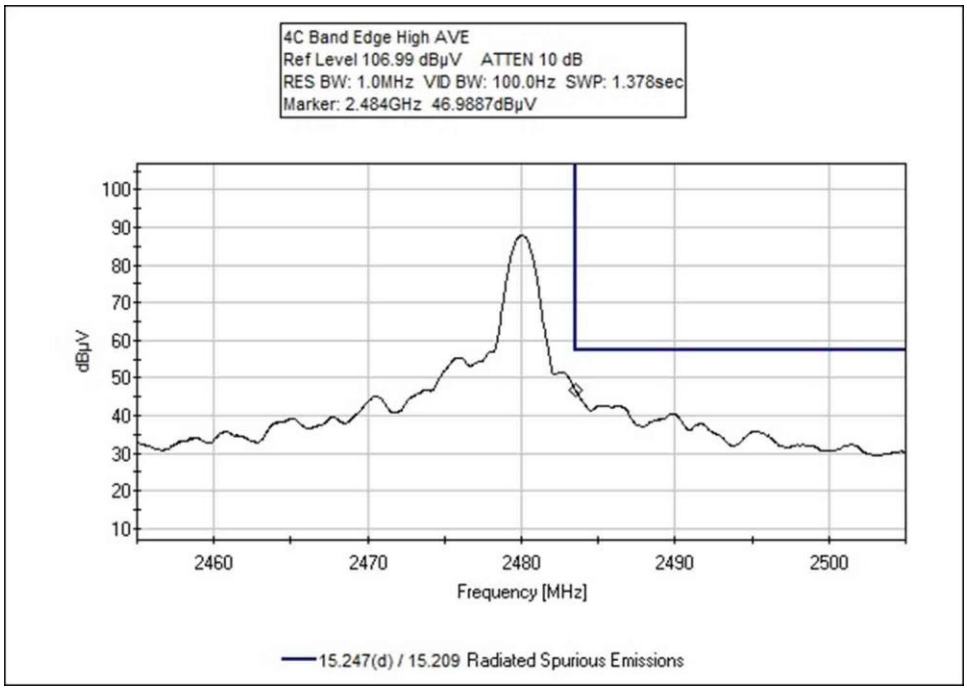


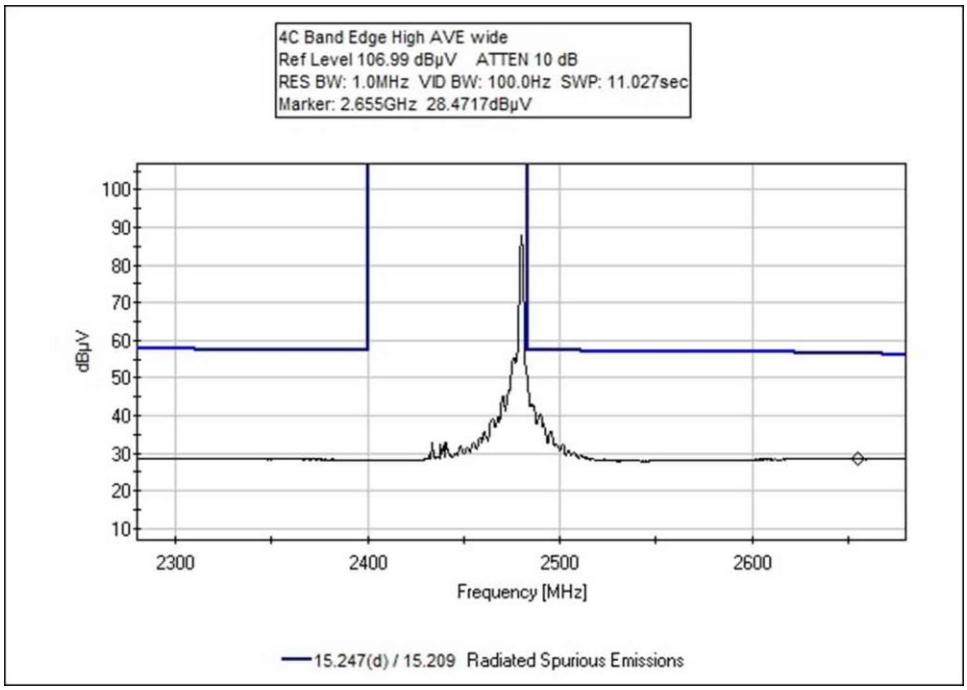



4C Band Edge Low AVE
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 100.0Hz SWP: 1.378sec
Marker 1: 2.4GHz 54.6187 dBµV Marker 2: 2.39GHz 37.8857 dBµV Delta: 10.0MHz
dBµV
70
60
50
40
30
2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


4C Band Edge High PEAK
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 2.484GHz 54.8897dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2460
2470
2480
2490
2500
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions (Peak Limit)


4C Band Edge High PEAK wide
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 1.0MHz SWP: 20.0msec
Marker: 2.655GHz 40.4827dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2300
2400
2500
2600
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions (Peak Limit)


4C Band Edge High AVE
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 100.0Hz SWP: 1.378sec
Marker: 2.484GHz 46.9887dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2460
2470
2480
2490
2500
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions


4C Band Edge High AVE wide
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 100.0Hz SWP: 11.027sec
Marker: 2.655GHz 28.4717dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
2300
2400
2500
2600
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup Photos

Below 1GHz

Above 1GHz

X Axis

Y Axis

Z Axis

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

Reported uncertainties 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 the limit value subtracting the corrected measured value; a negative margin represents a measurement less than the limit while a positive margin represents a measurement exceeding 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.