Medtronic MiniMed

TEST REPORT FOR

Guardian Link
Model: MMT-7763*
(*See Appendix A for Manufacturer Declaration)

Tested to The Following Standards:

FCC Part 15 Subpart C Section(s)

15.247
(DTS 2400-2483.5 MHz)

Report No.: 101765-7

Date of issue: April 25, 2019

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

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:

Morgan Tramontin
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 101765

DATE OF EQUIPMENT RECEIPT: March 19, 2019
DATE(S) OF TESTING: March 19 – 28, 2019

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.
Canyon Park
22116 23rd Drive S.E., Suite A
Bothell, WA 98021

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.12

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	JAPAN
Canyon Park, Bothell, WA	US0081	US1022	A-0148

*CKC's list of NIST designated countries can be found at: https://standards.gov/cabs/designations.html

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	NA1

NA = Not Applicable
NA1 = Not applicable because the EUT has integral antenna.

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
Guardian Link	Medtronic MiniMed	MMT-7763	GT 6305468M

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:	802.15.4
Operating Frequency Range:	2420-2480MHz
Modulation Type(s):	O-QPSK
Maximum Duty Cycle:	NA
Number of TX Chains:	1
Antenna Type(s) and Gain:	Integral Folded Monopole Antenna- 0dBi Gain
Beamforming Type:	NA
Antenna Connection Type:	Integral
Nominal Input Voltage:	3.7V
Firmware / Software used for Test:	Main App Version: 1.0G

FCC Part 15 Subpart C

15.247(a)(2) 6dB Bandwidth

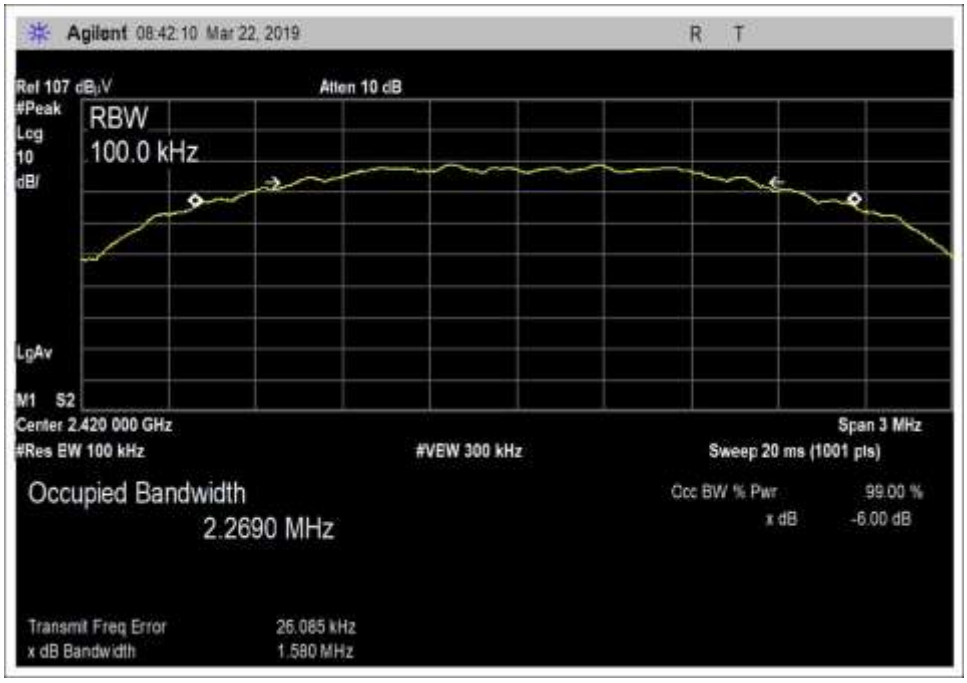
Test Setup/Conditions			
Test Location:	Bothell Lab C3	Test Engineer:	M. Harrison
Test Method:	ANSI C63.10 (2013), KDB 558074 v05r01	Test Date(s):	3/22/2019
Configuration:	1		
Test Setup:	Test Mode: Continuously Modulated The EUT is operating with fresh battery installed. The EUT is set 1.5 meters high on a Styrofoam table. X, Y and Z axis are investigated with the worst case reported. Final measurements are then made using antenna substitution.		

Environmental Conditions			
Temperature (ºC)	20	Relative Humidity (%):	30

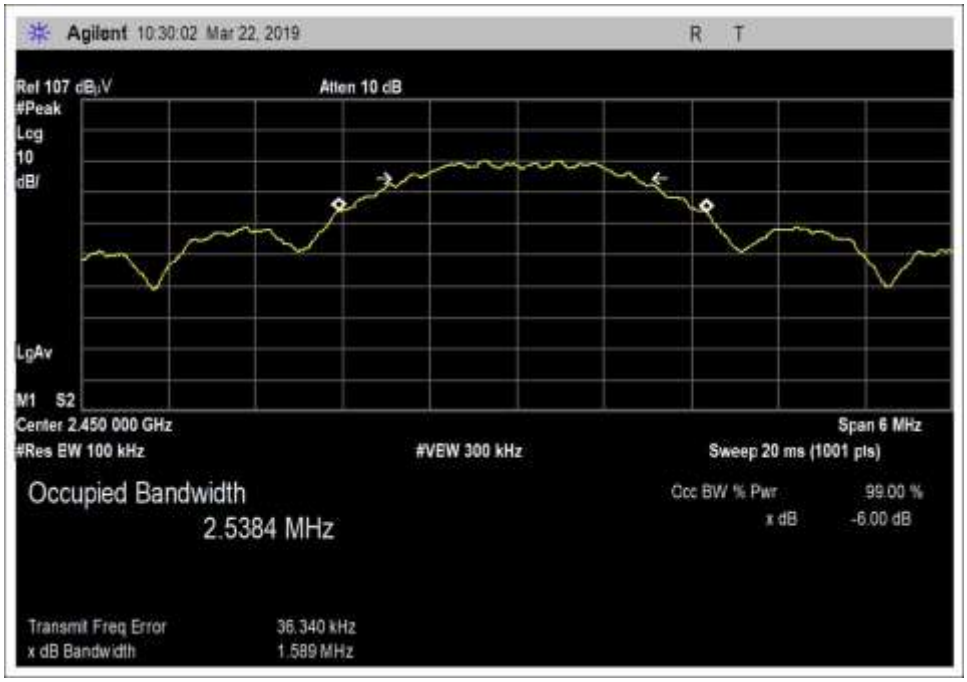
Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
01467	Horn Antenna	EMCO	3115	7/21/2017	7/21/2019
02871	Spectrum Analyzer	Agilent	E4440A	1/9/2019	1/9/2021
P06503	Cable	Astrolab	32026-29801-29801-36	3/13/2018	3/13/2020
P06515	Cable	Andrews	Heliax	6/29/2018	6/29/2020
P06540	Cable	Andrews	Heliax	10/30/2017	10/30/2019
03540	Preamp	HP	83017A	5/2/2017	5/2/2019

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
2420	1	O-QPSK	1580	≥500	Pass
2450	1	O-QPSK	1589	≥500	Pass
2480	1	O-QPSK	1583	≥500	Pass

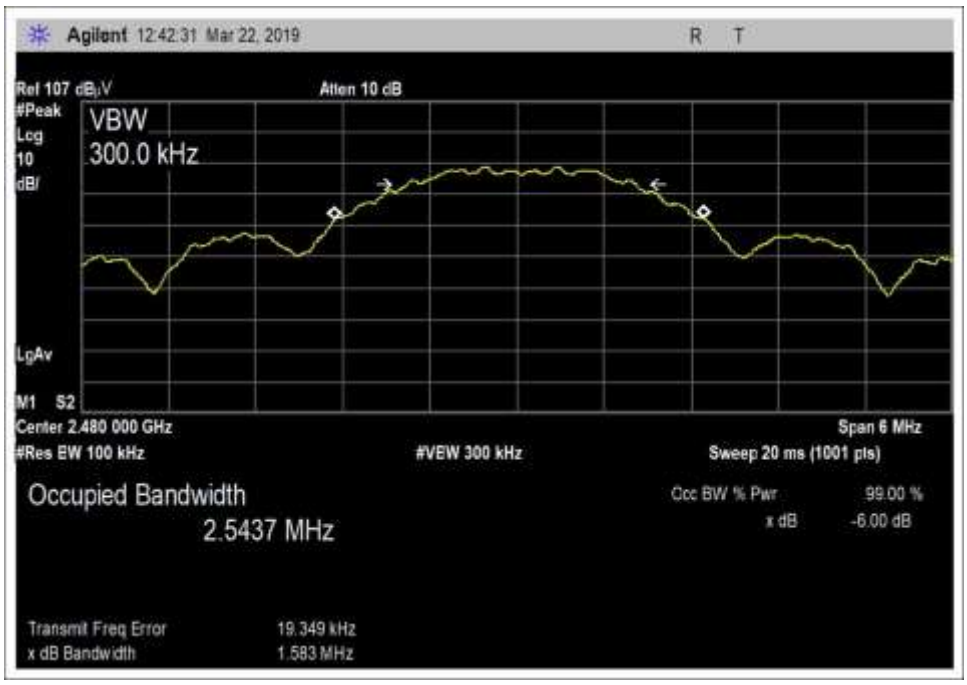
Plot(s)



Low Channel



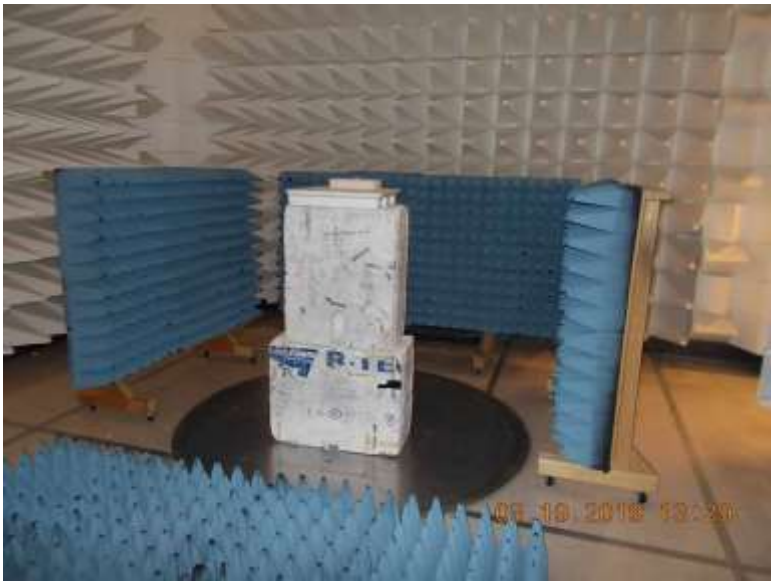
Middle Channel



High Channel

Test Setup Photo(s)

Above 1GHz



X-Axis

Y-Axis

Z-Axis

15.247(b)(3) Output Power

Test Data Summary - Voltage Variations

This equipment is battery powered and manufacturer declares the equipment cannot operate while charging. Power output tests were performed using a fresh battery.

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	O-QPSK	Integral Folded Monopole Antenna-0dBi Gain	88.4	-6.82	≤30	Pass
2450	O-QPSK	Integral Folded Monopole Antenna-0dBi Gain	88.4	-6.82	≤30	Pass
2480	O-QPSK	Integral Folded Monopole Antenna-0dBi Gain	86.6	-8.62	≤30	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.

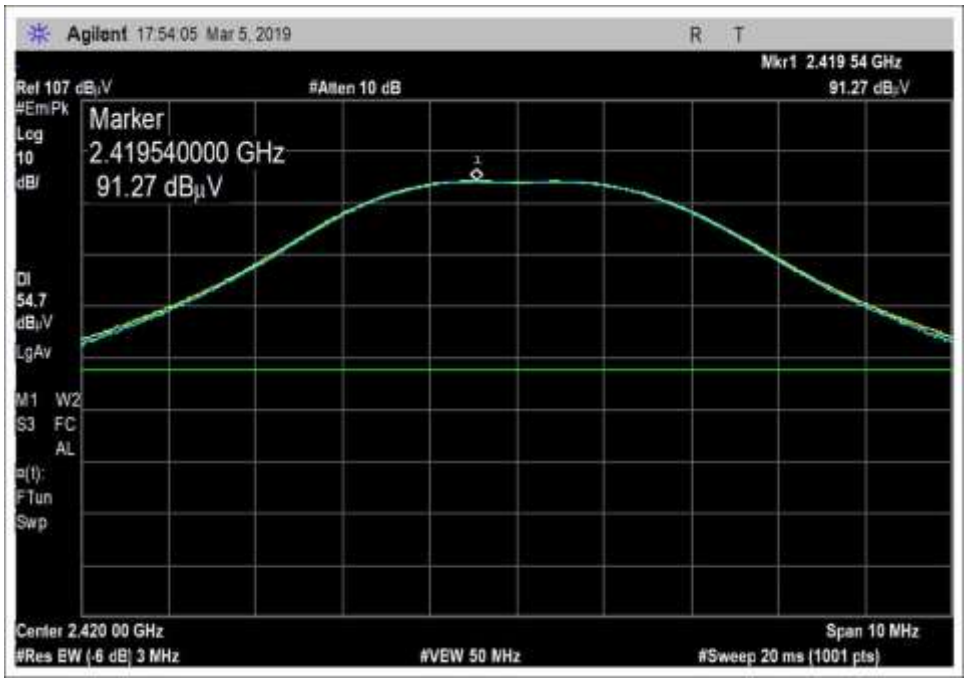
Conducted RF output power calculated in accordance with ANSI C63.10.

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

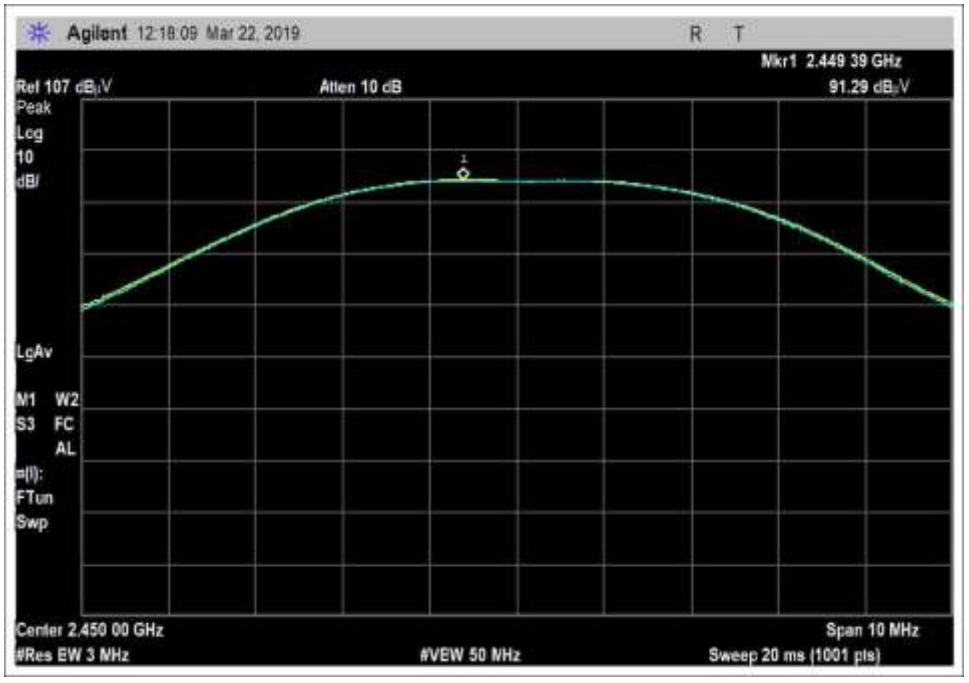
Or equivalently, in logarithmic form:

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

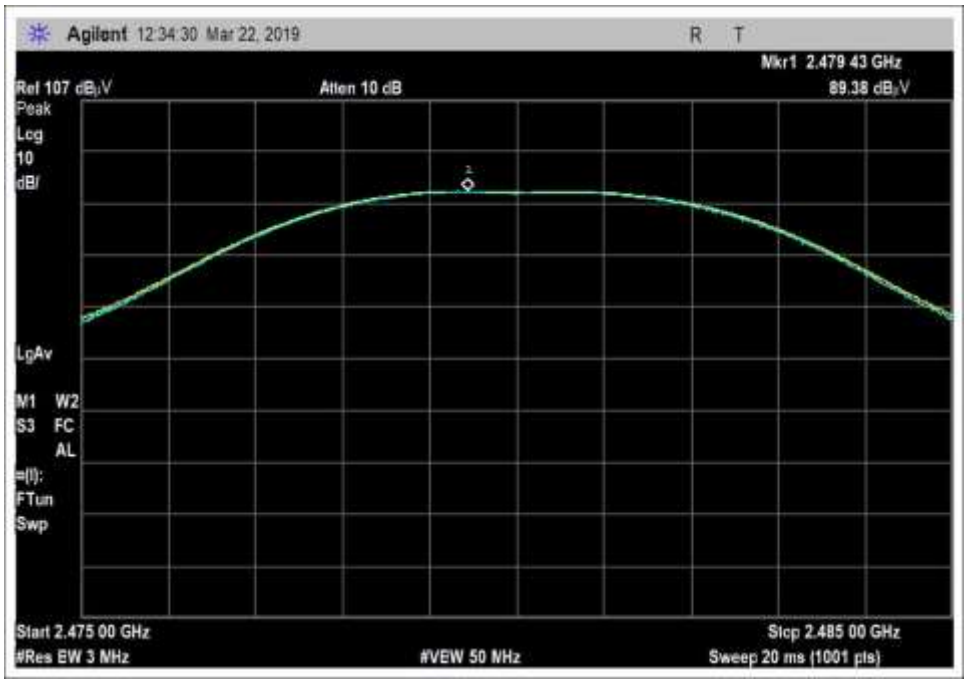
Plots



Low Channel



Middle Channel



High Channel

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(b) Power Output (2400-2483.5 MHz DTS)**		
Work Order #:	**101765**	Date:	3/22/2019
Test Type:	**Maximized Emissions**	Time:	12:35:12
Tested By:	Matthew Harrison	Sequence#:	3
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

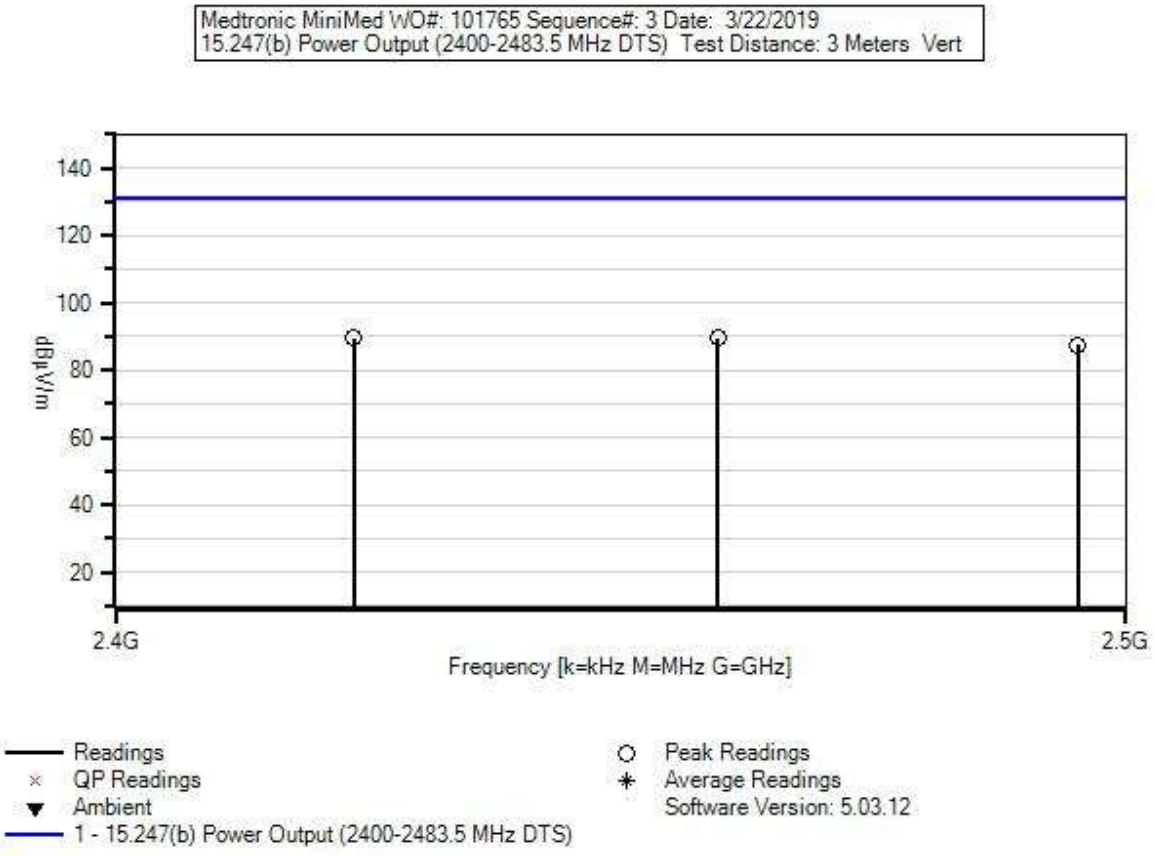
Test Conditions / Notes:

Temperature: 19-23°C
Humidity: 25-40%
Pressure: 101-102.5kPa

Frequency Range: 2420-2480MHz

Test Method: ANSI C63.10 2013, KDB 558074 v05r01

Test Setup: Continuously transmitting
Setup: The EUT is operating with fresh battery installed. Low, Mid, and High channels investigated. X, Y, and Z EUT axes investigated as well as horizontal and vertical measurement antenna polarities investigated, worst case reported.



Test Equipment:

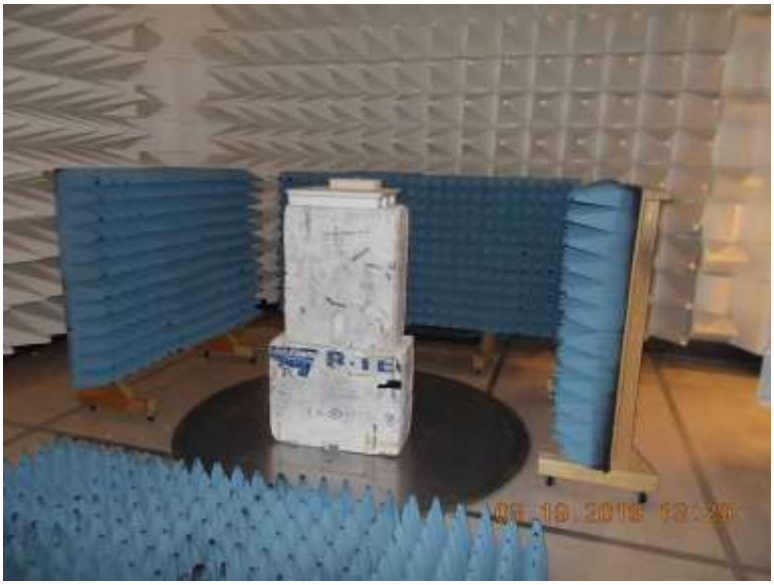
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T1	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T3	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T4	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T5	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020

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	2449.390M	91.3	-34.0 +1.0	+28.1	+2.6	+0.4	+0.0 150	89.4	131.2 Z-Axis	-41.8	Horiz 139
2	2419.450M	91.3	-34.0 +1.0	+28.1	+2.6	+0.4	+0.0 120	89.4	131.2 Y-Axis	-41.8	Vert 105
3	2479.430M	89.4	-34.0 +1.0	+28.1	+2.7	+0.4	+0.0 120	87.6	131.2 Y-Axis	-43.6	Vert 209

Test Setup Photo(s)

Above 1GHz



X-Axis

Y-Axis

Z-Axis

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	O-QPSK	Integral Folded Monopole Antenna- 0dBi Gain	73.7	-21.52	≤8	Pass
2450	O-QPSK	Integral Folded Monopole Antenna- 0dBi Gain	72.6	-22.62	≤8	Pass
2480	O-QPSK	Integral Folded Monopole Antenna- 0dBi Gain	71.9	-23.32	≤8	Pass

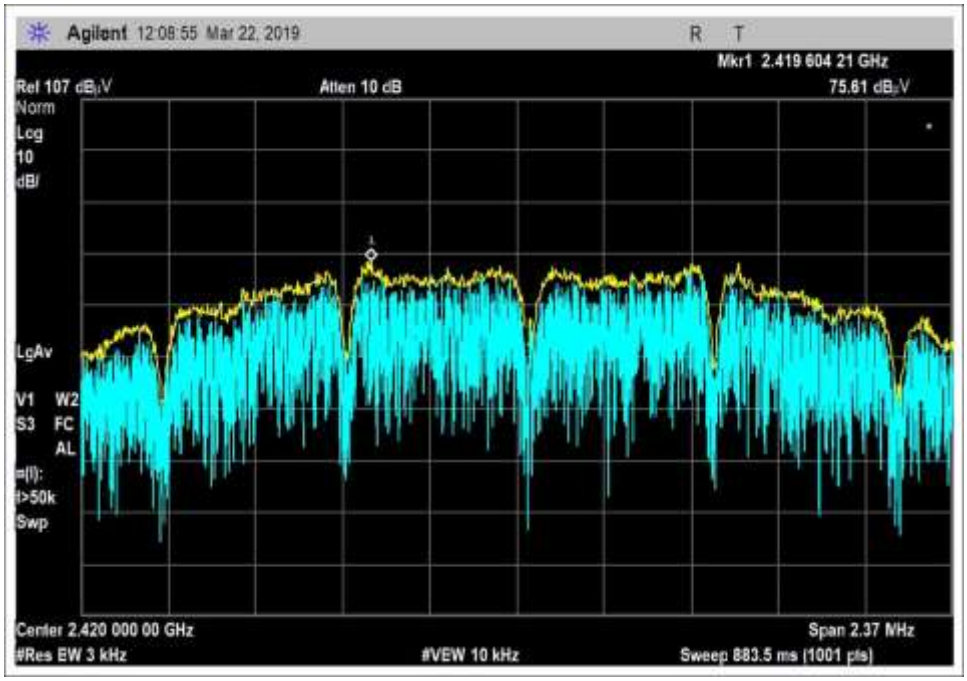
Conducted RF output power calculated in accordance with ANSI C63.10.

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

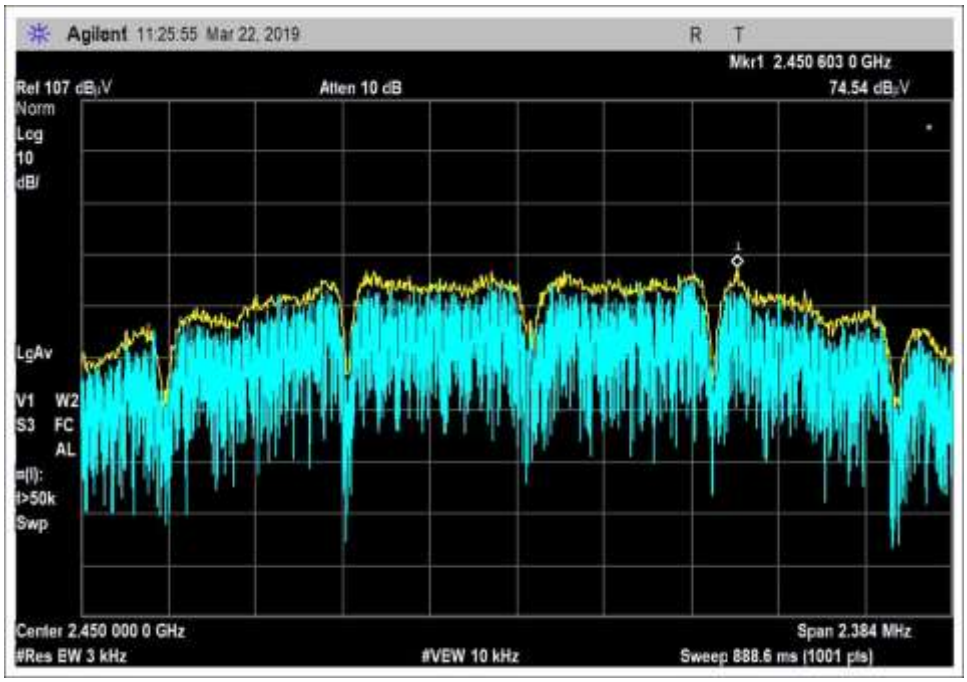
Or equivalently, in logarithmic form:

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

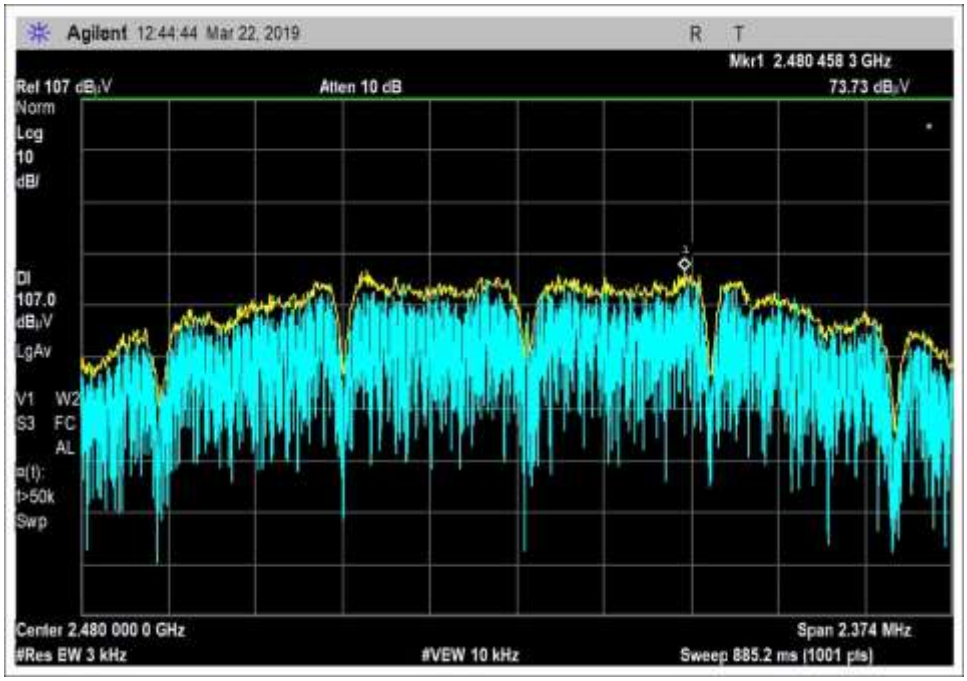
Plots



Low Channel



Middle Channel



High Channel

Test Setup / Conditions / Data

Test Location:	CKC Labs • 22116 23rd Dr SE • Bothell, WA 98021 • 800-500-4362		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(e) Peak Power Spectral Density (2400-2483.5 MHz DTS)**		
Work Order #:	**101765**	Date:	3/22/2019
Test Type:	**Maximized Emissions**	Time:	12:45:08
Tested By:	Matthew Harrison	Sequence#:	3
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

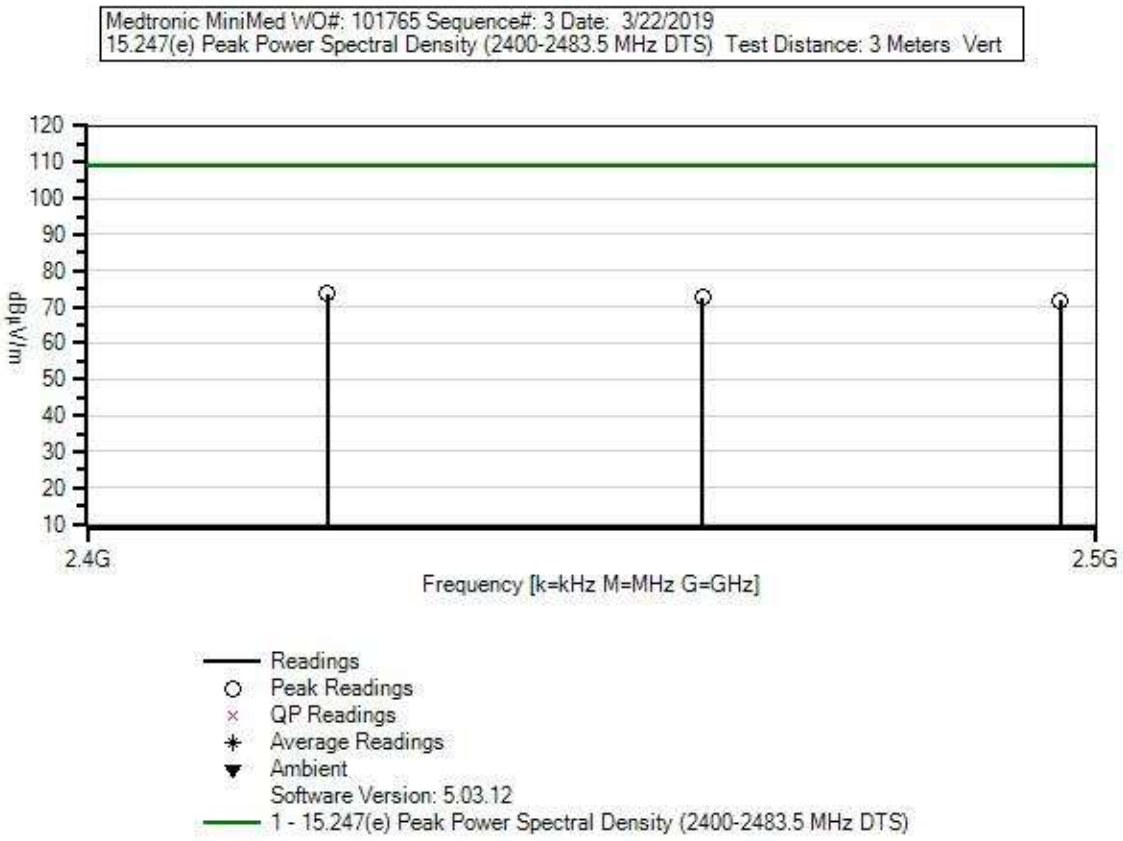
Test Conditions / Notes:

Temp: 19-23°C
Humid: 25-40%
Pressure: 101-102.5kPa

Frequency Range: 2420-2480MHz

Test Method: ANSI C63.10 2013

Test Setup: Continuously transmitting
Setup: EUT is operating with fresh battery installed.
Low, Mid, and High channels investigated.
X, Y, and Z EUT axes investigated as well as horizontal and vertical measurement antenna polarities investigated, worst case reported.



Test Equipment:

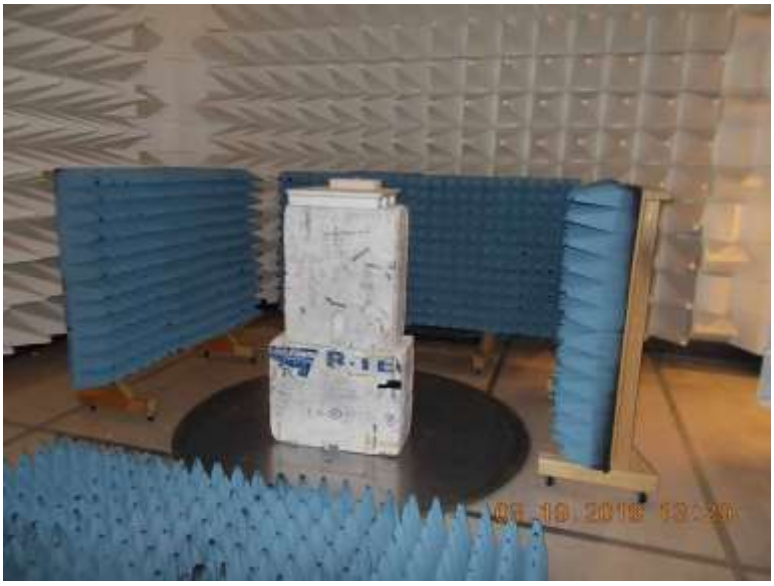
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T1	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T3	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T4	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T5	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020

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	2419.604M	75.6	-34.0 +1.0	+28.1	+2.6	+0.4	+0.0	73.7	109.2	-35.5	Vert
2	2450.603M	74.5	-34.0 +1.0	+28.1	+2.6	+0.4	+0.0	72.6	109.2	-36.6	Vert
3	2480.458M	73.7	-34.0 +1.0	+28.1	+2.7	+0.4	+0.0	71.9	109.2	-37.3	Vert

Test Setup Photo(s)

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 Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions**		
Work Order #:	**101765**	Date:	3/19/2019
Test Type:	**Maximized Emissions**	Time:	11:56:22
Tested By:	Matthew Harrison	Sequence#:	3
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

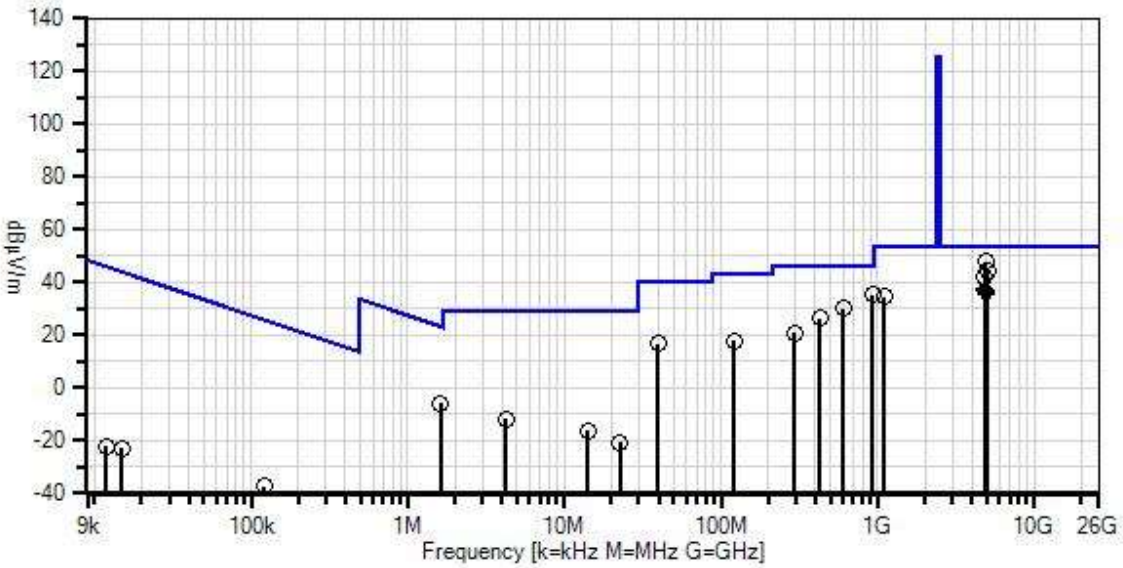
Temperature: 19-23°C
Humidity: 25-40%
Pressure: 101-102.5kPa

Frequency Range: 9kHz - 26GHz

Test Method: ANSI C63.10 2013, KDB 558074 v05r01

Test Setup: Continuously transmitting
Setup: The EUT is operating with fresh battery installed. Low, Mid, and High channels investigated. X, Y, and Z EUT axes investigated as well as horizontal and vertical measurement antenna polarities investigated, worst case reported.

Medtronic MiniMed WO#: 101765 Sequence#: 3 Date: 3/19/2019
15.247(d) / 15.209 Radiated Spurious Emissions Test Distance: 3 Meters Vert



Readings
QP Readings
Ambient
1 - 15.247(d) / 15.209 Radiated Spurious Emissions
Peak Readings
Average Readings
Software Version: 5.03.12

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02307	Preamp	8447D	1/15/2018	1/15/2020
T2	AN03628	Biconilog Antenna	3142E	6/7/2017	6/7/2019
T3	ANP06123	Attenuator	18N-6	5/5/2017	5/5/2019
T4	ANP05305	Cable	ETSI-50T	10/24/2017	10/24/2019
T5	ANP05360	Cable	RG214	1/31/2018	1/31/2020
T6	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T7	AN00052	Loop Antenna	6502	5/7/2018	5/7/2020
T8	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T9	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T10	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T11	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020
	AN02741	Active Horn Antenna	AMFW-5F-12001800-20-10P	3/30/2017	3/30/2019
	AN02742	Active Horn Antenna	AMFW-5F-18002650-20-10P	10/16/2018	10/16/2020
	AN02763-69	Waveguide	Multiple	4/23/2018	4/23/2020
	AN03122	Cable	32026-2-29801-36	3/13/2018	3/13/2020
	ANP06678	Cable	32026-29801-29801-144	3/13/2018	3/13/2020

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

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	935.000M	28.1	-27.2 +2.0 +0.0	+24.7 +0.4 +0.0	+5.9 +0.0 +0.0	+1.6 +0.0	+0.0	35.5	46.0	-10.5	Horiz
2	608.100M	28.4	-28.2 +1.5 +0.0	+20.9 +0.3 +0.0	+5.9 +0.0 +0.0	+1.3 +0.0	+0.0	30.1	46.0	-15.9	Vert
3	4899.180M	42.5	+0.0 +0.0 -33.2	+0.0 +0.5 +32.5	+0.0 +0.0 +1.6	+0.0 +4.2	+0.0 90	48.1	65.2 Z-Axis	-17.1	Vert 204
4	426.700M	28.9	-27.8 +1.2 +0.0	+17.2 +0.2 +0.0	+5.9 +0.0 +0.0	+1.0 +0.0	+0.0	26.6	46.0	-19.4	Horiz
5	5020.000M	38.7	+0.0 +0.0 -33.2	+0.0 +0.5 +32.7	+0.0 +0.0 +1.6	+0.0 +4.2	+0.0	44.5	65.2	-20.7	Vert

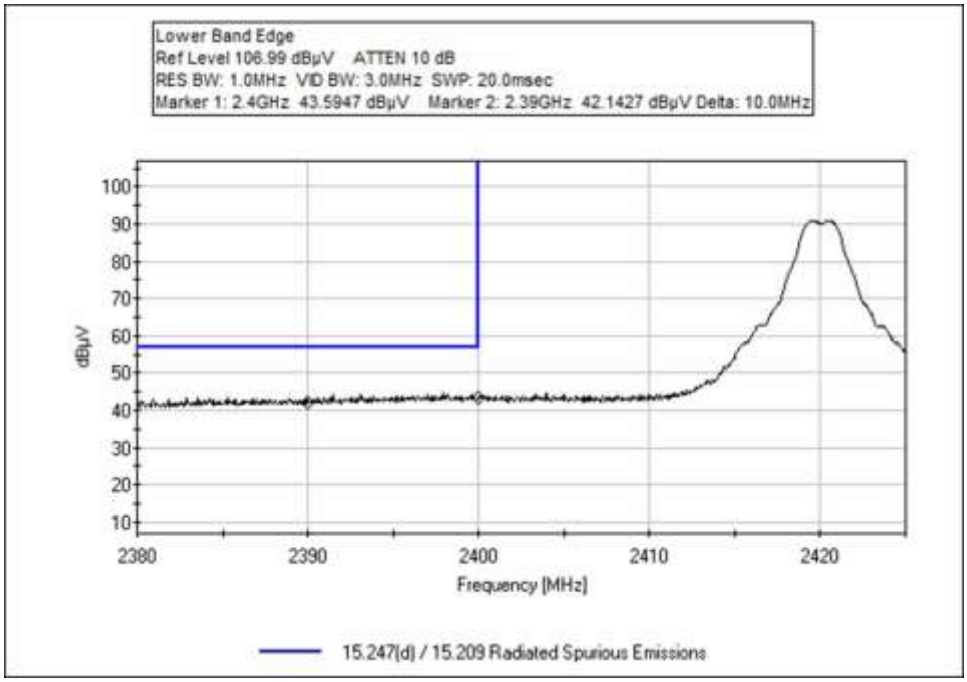
6	4840.000M	36.8	+0.0 +0.0 -33.2	+0.0 +0.5 +32.4	+0.0 +0.0 +1.5	+0.0 +4.1	+0.0	42.1	65.2	-23.1	Vert
7	39.700M	27.5	-27.9 +0.3 +0.0	+10.6 +0.1 +0.0	+5.9 +0.0 +0.0	+0.3 +0.0	+0.0	16.8	40.0	-23.2	Vert
8	294.800M	27.6	-27.1 +1.0 +0.0	+12.6 +0.2 +0.0	+5.9 +0.0 +0.0	+0.9 +0.0	+0.0	21.1	46.0	-24.9	Horiz
9	122.200M	31.0	-27.6 +0.6 +0.0	+7.3 +0.2 +0.0	+5.9 +0.0 +0.0	+0.6 +0.0	+0.0	18.0	43.5	-25.5	Vert
10	4841.160M Ave	32.7	+0.0 +0.0 -33.2	+0.0 +0.5 +32.4	+0.0 +0.0 +1.5	+0.0 +4.1	+0.0	38.0	65.2	-27.2	Horiz
^	4841.070M	42.9	+0.0 +0.0 -33.2	+0.0 +0.5 +32.4	+0.0 +0.0 +1.5	+0.0 +4.1	+0.0	48.2	65.2 X-Axis	-17.0	Horiz 180
12	4841.070M Ave	31.9	+0.0 +0.0 -33.2	+0.0 +0.5 +32.4	+0.0 +0.0 +1.5	+0.0 +4.1	+0.0	37.2	65.2	-28.0	Vert
^	4841.160M	43.7	+0.0 +0.0 -33.2	+0.0 +0.5 +32.4	+0.0 +0.0 +1.5	+0.0 +4.1	+0.0 45	49.0	65.2 Y-Axis	-16.2	Vert 182
14	4960.880M Ave	31.3	+0.0 +0.0 -33.2	+0.0 +0.5 +32.5	+0.0 +0.0 +1.6	+0.0 +4.2	+0.0	36.9	65.2	-28.3	Horiz
^	4960.880M	42.5	+0.0 +0.0 -33.2	+0.0 +0.5 +32.5	+0.0 +0.0 +1.6	+0.0 +4.2	+0.0	48.1	65.2 X-Axis	-17.1	Horiz 129
16	4899.060M Ave	30.6	+0.0 +0.0 -33.2	+0.0 +0.5 +32.5	+0.0 +0.0 +1.6	+0.0 +4.2	+0.0	36.2	65.2	-29.0	Horiz
^	4899.060M	41.0	+0.0 +0.0 -33.2	+0.0 +0.5 +32.5	+0.0 +0.0 +1.6	+0.0 +4.2	+0.0	46.6	65.2 X-Axis	-18.6	Horiz 161
18	1.613M	24.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +9.8 +0.0	+0.0 +0.1	-40.0	-5.7	23.5	-29.2	Perp
19	4899.180M Ave	30.3	+0.0 +0.0 -33.2	+0.0 +0.5 +32.5	+0.0 +0.0 +1.6	+0.0 +4.2	+0.0	35.9	65.2	-29.3	Horiz
20	1100.000M	44.2	+0.0 +0.0 -36.3	+0.0 +0.4 +24.2	+0.0 +0.0 +0.5	+0.0 +1.8	+0.0	34.8	65.2	-30.4	Vert
21	4.269M	18.5	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +9.7 +0.0	+0.0 +0.1	-40.0	-11.7	29.5	-41.2	Para
22	14.209M	14.6	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +9.1 +0.0	+0.0 +0.2	-40.0	-16.1	29.5	-45.6	Para

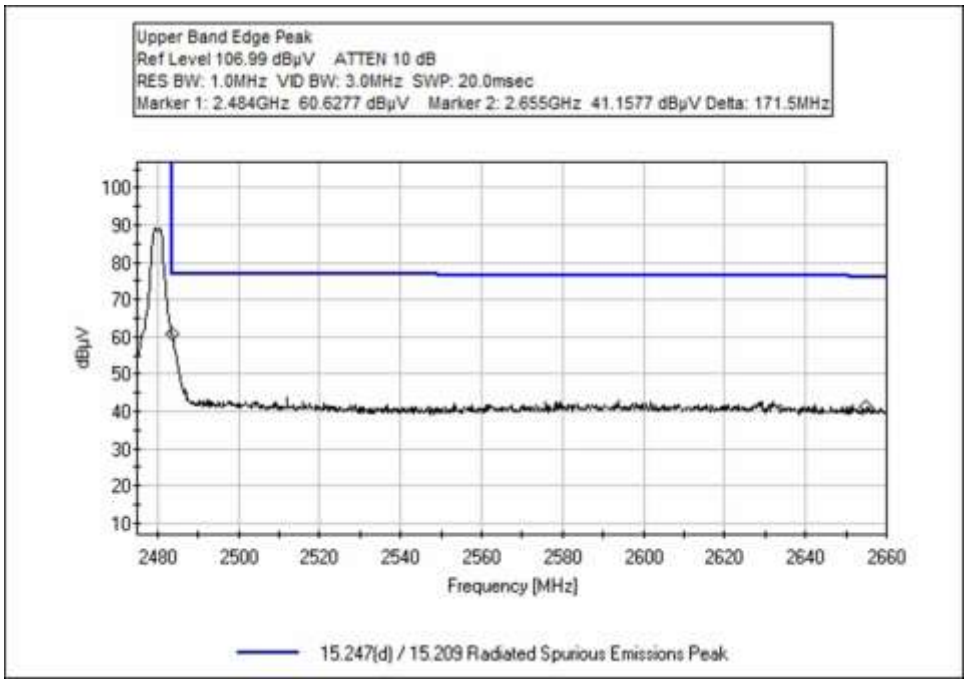
23	22.687M	11.7	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +7.4 +0.0	+0.0 +0.3	-40.0	-20.6	29.5	-50.1	Perp
24	121.972k	33.3	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +9.5 +0.0	+0.0 +0.0	-80.0	-37.2	25.9	-63.1	Perp
25	14.981k	44.6	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +12.8 +0.0	+0.0 +0.0	-80.0	-22.6	44.1	-66.7	Para
26	11.862k	44.4	+0.0 +0.0 +0.0	+0.0 +0.0 +0.0	+0.0 +13.6 +0.0	+0.0 +0.0	-80.0	-22.0	46.1	-68.1	Perp

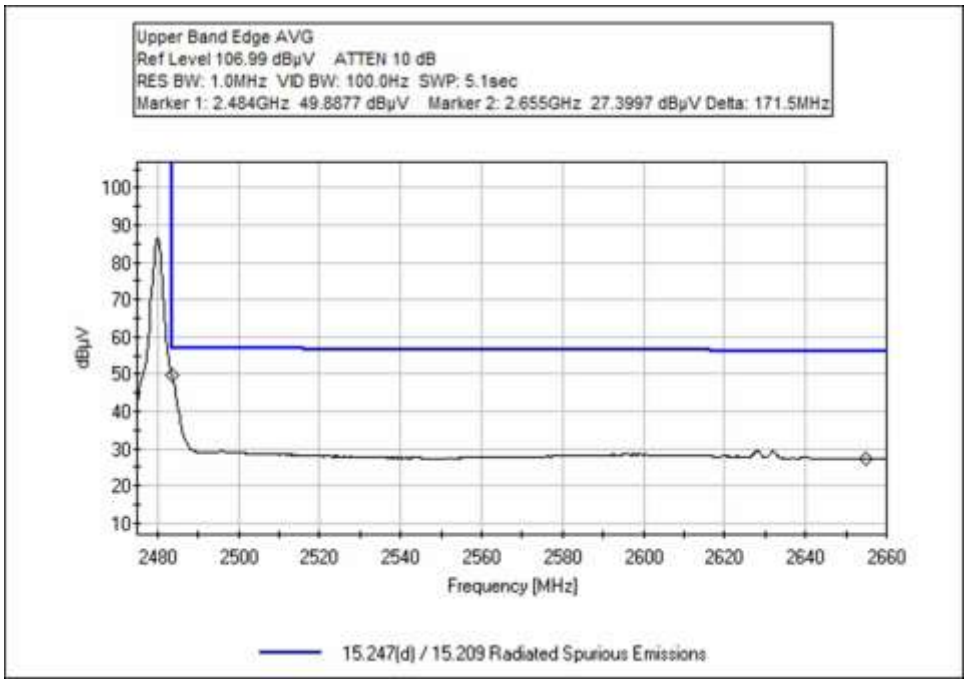
Band Edge

Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
2390.0	O-QPSK	Integral Folded Monopole Antenna- 0dBi Gain	39.2	<54	Pass
2400.0	O-QPSK	Integral Folded Monopole Antenna- 0dBi Gain	40.7	<54	Pass
2483.5	O-QPSK	Integral Folded Monopole Antenna- 0dBi Gain	47.1	<54	Pass

Band Edge Plots




Upper Band Edge Peak
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker 1: 2.484GHz 60.6277 dBµV Marker 2: 2.655GHz 41.1577 dBµV Delta: 171.5MHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions Peak


Upper Band Edge AVG
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 100.0Hz SWP: 5.1sec
Marker 1: 2.484GHz 49.8877 dBµV Marker 2: 2.655GHz 27.3997 dBµV Delta: 171.5MHz
dBµV
Frequency [MHz]
15.247(d) / 15.209 Radiated Spurious Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 22116 23rd Drive SE, Suite A • Bothell, WA. 98021 • 1-800-500-4EMC		
Customer:	**Medtronic MiniMed**		
Specification:	**15.247(d) / 15.209 Radiated Spurious Emissions Peak**		
Work Order #:	**101765**	Date:	3/22/2019
Test Type:	**Maximized Emissions**	Time:	13:06:45
Tested By:	Matthew Harrison	Sequence#:	3
Software:	EMITest 5.03.12		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Temperature: 19-23°C
Humidity: 25-40%
Pressure: 101-102.5kPa

Frequency Range: 2420-2480MHz

Test Method: ANSI C63.10 2013, KDB 558074 v05r01

Test Setup: Continuously transmitting
Setup: The EUT is operating with fresh battery installed. Low, Mid, and High channels investigated. X, Y, and Z EUT axes investigated as well as horizontal and vertical measurement antenna polarities investigated, worst case reported.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02871	Spectrum Analyzer	E4440A	1/9/2019	1/9/2021
T1	AN03540	Preamp	83017A	5/2/2017	5/2/2019
T2	AN01467	Horn Antenna-ANSI C63.5 Calibration	3115	7/21/2017	7/21/2019
T3	ANP06515	Cable	Heliax	6/29/2018	6/29/2020
T4	ANP06540	Cable	Heliax	10/30/2017	10/30/2019
T5	ANP06503	Cable	32026-29801-29801-36	3/13/2018	3/13/2020

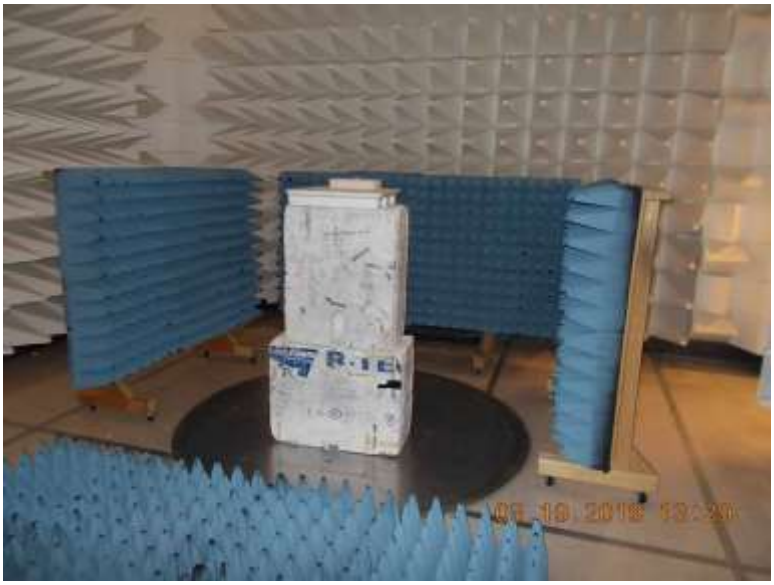
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	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	2483.500M Ave	49.9	-34.0 +1.0	+28.1	+2.7	+0.4	+0.0	48.1	54.0	-5.9	Vert
^	2483.500M	60.7	-34.0 +1.0	+28.1	+2.7	+0.4	+0.0	58.9	74.0	-15.1	Vert
3	2400.000M	43.6	-34.0 +1.0	+28.1	+2.6	+0.4	+0.0	41.7	54.0	-12.3	Vert
4	2390.000M	42.1	-34.0 +1.0	+28.1	+2.6	+0.4	+0.0	40.2	54.0	-13.8	Vert
5	2655.000M Ave	27.4	-33.9 +1.1	+28.6	+2.6	+0.5	+0.0	26.3	54.0	-27.7	Vert
^	2655.000M	41.2	-33.9 +1.1	+28.6	+2.6	+0.5	+0.0	40.1	74.0	-33.9	Vert

Test Setup Photo(s)

Below 1GHz

Above 1GHz



X-Axis

Y-Axis

Z-Axis

Appendix A: Manufacturer Declaration

The following model has been tested by CKC Laboratories:
MMT-7763

The manufacturer declares that the following additional models are identical electrically or any differences between them do not affect their EMC characteristics, and therefore meets the level of testing equivalent to the tested model.
MMT-7761

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.