NORTHWEST EMC

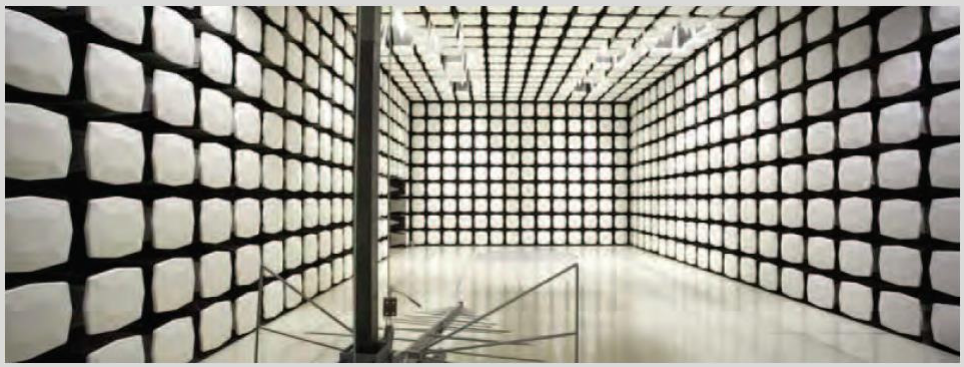
Medtronic, Inc.

CareLink Encore™ 26901

FCC 15.207:2016

FCC 15.209:2016

Report # MDTR0451.2 Rev.1



NVLAP Lab Code: 200881-0

CERTIFICATE OF TEST

NORTHWEST EMC
2014-12-10

Last Date of Test: March 01, 2016
Medtronic, Inc.
CareLink Encore™ 26901

Emissions

Standards

Specification	Method
FCC 15.207:2016	ANSI C63.10:2013
FCC 15.209:2016	

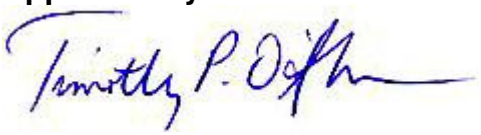
Results

Method Clause	Test Description	Applied	Results	Comments
6.2	AC – Powerline Conducted Emissions	Yes	Pass	
6.4	Field Strength of Fundamental	Yes	Pass	
6.4, 6.5	Spurious Radiated Emissions	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Tim O'Shea, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

NORTHWEST EMC
REV 2014.10.14

Revision Number	Description	Date	Page Number
01	Method Clauses were added to the Certificate of Test.	6-7-16	2

ACCREDITATIONS AND AUTHORIZATIONS

NORTHWEST EMC
REV 2015.2.19

United States

FCC - Designated by the FCC as a Telecommunications Certification Body (TCB). Certification chambers, Open Area Test Sites, and conducted measurement facilities are listed with the FCC.

A2LA - Accredited by A2LA to ISO / IEC 17065 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

IC - Recognized by Industry Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with IC.

European Union

European Commission – Validated by the European Commission as a Conformity Assessment Body (CAB) under the EMC directive and as a Notified Body under the R&TTE Directive.

Australia/New Zealand

ACMA - Recognized by ACMA as a CAB for the acceptance of test data.

Korea

MSIP / RRA - Recognized by KCC's RRA as a CAB for the acceptance of test data.

Japan

VCCI - Associate Member of the VCCI. Conducted and radiated measurement facilities are registered.

Taiwan

BSMI – Recognized by BSMI as a CAB for the acceptance of test data.

NCC - Recognized by NCC as a CAB for the acceptance of test data.

Singapore

IDA – Recognized by IDA as a CAB for the acceptance of test data.

Israel

MOC – Recognized by MOC as a CAB for the acceptance of test data.

Hong Kong

OFCA – Recognized by OFCA as a CAB for the acceptance of test data.

Vietnam

MIC – Recognized by MIC as a CAB for the acceptance of test data.

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/
http://gsi.nist.gov/global/docs/cabs/designations.html

EMISSIONS MEASUREMENTS

NORTHWEST EMC
REV 2014.10.08

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

Measurement Bandwidths

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

Measurements were made using the bandwidths and detectors specified. No video filter was used.

Sample Calculations

Radiated Emissions:

Field Strength		Measured Level		Antenna Factor		Cable Factor		Amplifier Gain		Distance Adjustment Factor		External Attenuation
33.5	=	42.6	+	28.6	+	3.1	-	40.8	+	0.0	+	0.0

Conducted Emissions:

Adjusted Level		Measured Level		Transducer Factor		Cable Factor		External Attenuation
47.1	=	26.7	+	0.3	+	0.1	+	20.0

MEASUREMENT UNCERTAINTY

TMU.2015.07.10

Measurement Uncertainty

When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement uncertainty is a statistical expression of measurement error qualified by a probability distribution.

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is on each data sheet. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-2 as applicable), and are available upon request.

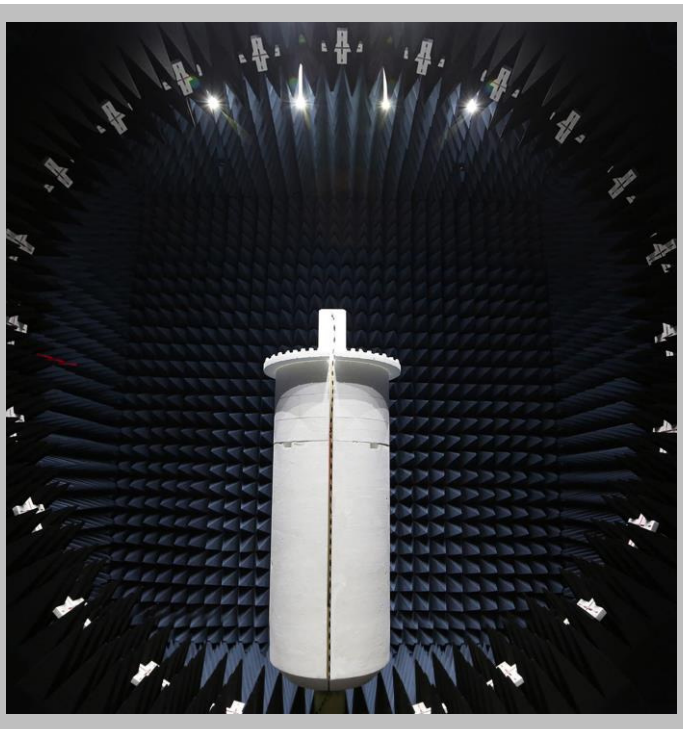
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

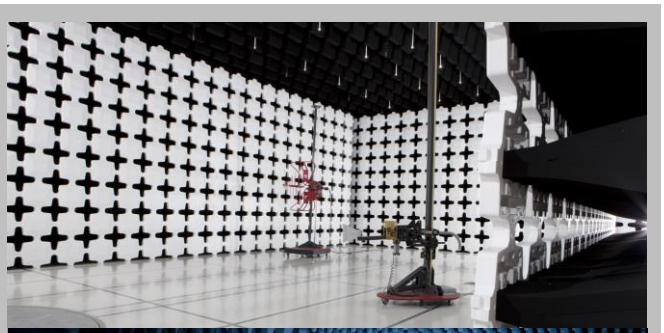
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.4 dB	-2.4 dB

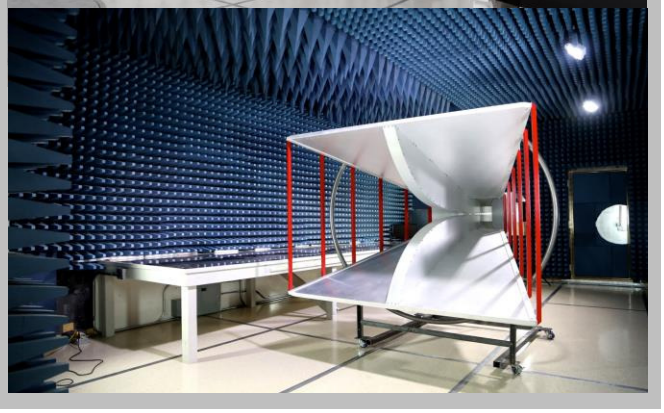
FACILITIES

NORTHWEST EMC
REV 2015.2.19

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-*2*	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







PRODUCT DESCRIPTION

NORTHWEST EMC 2014-12-10

Client and Equipment Under Test (EUT) Information

Company Name:	Medtronic, Inc.
Address:	710 Medtronic Parkway
City, State, Zip:	Minneapolis, MN 55432
Test Requested By:	Joel Peltier
Model:	CareLink Encore™ 26901
First Date of Test:	February 19, 2016
Last Date of Test:	March 01, 2016
Receipt Date of Samples:	February 17, 2016
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
A medical instrument for programming and monitoring Medtronic implantable medical devices.

Highest frequency generated or used in the device:
33kHz, 400kHz, 4MHz,12MHz, 24MHz, 25MHz, 27MHz, 33MHz, 48MHz, 65MHz

Testing Objective:
To demonstrate compliance of the inductive portion of the instrument to FCC Part 15.207 & 15.209 specifications.

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration MDTR0451- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Encore Programmer	Medtronic	29901 (REF 29901A)	JVD100008P
Power Supply	Advanced Power Solutions	AP5100EM-190530	85192011001506001399
Programming Head	Medtronic	26901	PXR001118P

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
ICD (Implant)	Medtronic	Evera S VR	BWL604645S

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Router	Belkin	F9K1103V1 / N750	12112466117433
DC Power Supply (Router)	Leader Electronics Inc	MU24-B120200-A1	PWB781122708646
Laptop	Acer	NAV50	LUSAL0B137011502C81601
DC Power Supply (Laptop)	Delta Electronics	N17908	AP0400100201108409P101

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC	No	2.30m	No	AC Mains	Power Supply
DC	No	1.60m	No	Power Supply	Encore Programmer
Ethernet	No	1.60m	No	Encore Programmer	Unterminated
USB (x2)	No	3.0m	No	Encore Programmer	Unterminated
ECG	No	4.0m	No	Encore Programmer	Unterminated
Serial	No	3.0m	No	Encore Programmer	Unterminated
Programming Head Cable	No	2.50m	No	Encore Programmer	Programming Head
Ethernet	No	10.0m	No	Laptop	Router

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration MDTR0451- 6

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Encore Programmer	Medtronic	29901 (REF 29901A)	JVD100008P
Programming Head	Medtronic	26901	PXR001118P
Power Supply	Advanced Power Solutions	AP5100EM-190530	85192011001506001666

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
ICD (Implant)	Medtronic	Evera S VR	BWL604645S

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Router	Belkin	F9K1103V1 / N750	12112466117433
DC Power Supply (Router)	Leader Electronics Inc	MU24-B120200-A1	PWB781122708646
Laptop	Acer	NAV50	LUSAL0B137011502C81601
DC Power Supply (Laptop)	Delta Electronics	N17908	AP0400100201108409P101

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC	No	2.30m	No	AC Mains	Power Supply
DC	No	1.60m	No	Power Supply	Encore Programmer
USB (x2)	No	3.0m	No	Encore Programmer	Unterminated
ECG	No	4.0m	No	Encore Programmer	Unterminated
Serial	No	3.0m	No	Encore Programmer	Unterminated
Programming Head Cable	No	2.50m	No	Encore Programmer	Programming Head
Ethernet	No	10.0m	No	Laptop	Router
DC	No	2.5m	No	Laptop	DC Power Supply

CONFIGURATIONS

NORTHWEST EMC 2014-12-10

Configuration MDTR0451- 7

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Encore Programmer	Medtronic	29901 (REF 29901A)	JVD100008P
Power Supply	Advanced Power Solutions	AP5100EM-190530	85192011001506001666
Programming Head	Medtronic	26901	PXR001118P

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
IPG	Medtronic	ADDR01	NWB928834S

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC	No	2.30m	No	AC Mains	Power Supply
DC	No	1.60m	No	Power Supply	Encore Programmer
Ethernet	No	1.60m	No	Encore Programmer	Unterminated
USB (x2)	No	3.0m	No	Encore Programmer	Unterminated
ECG	No	4.0m	No	Encore Programmer	Unterminated
Serial	No	3.0m	No	Encore Programmer	Unterminated
Programming Head Cable	No	2.50m	No	Encore Programmer	Programming Head

MODIFICATIONS

NORTHWEST EMC
2014-12-10

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2/19/2016	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	2/26/2016	AC – Powerline Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	3/1/2016	Field Strength of Fundamental	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

FIELD STRENGTH OF FUNDAMENTAL

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

150-200 kHz Telemetry B
175 kHz Telemetry A
175 kHz Telemetry A - Interrogation

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

MDTR0451 - 1
MDTR0451 - 7

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	490 kHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Cable	ESM Cable Corp.	MN04 Horn Cables	MNE	2/26/2016	12
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	6/5/2015	12
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/7/2015	12
Antenna	ETS Lindgren	6502	AOB	4/28/2015	24
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

Per ANSI C63.10 sections 6.4.4.1 and 6.4.4.2, the emissions from the EUT were maximized by rotating the EUT on the turntable. Also, the EUT and/or associated antenna was positioned in 3 orthogonal planes. A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity per section 4.5.1. The center of the loop antenna was maintained at 1m above the ground plane during the testing.

As outlined in 15.209(e) and 15.31(f)(2), measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit.

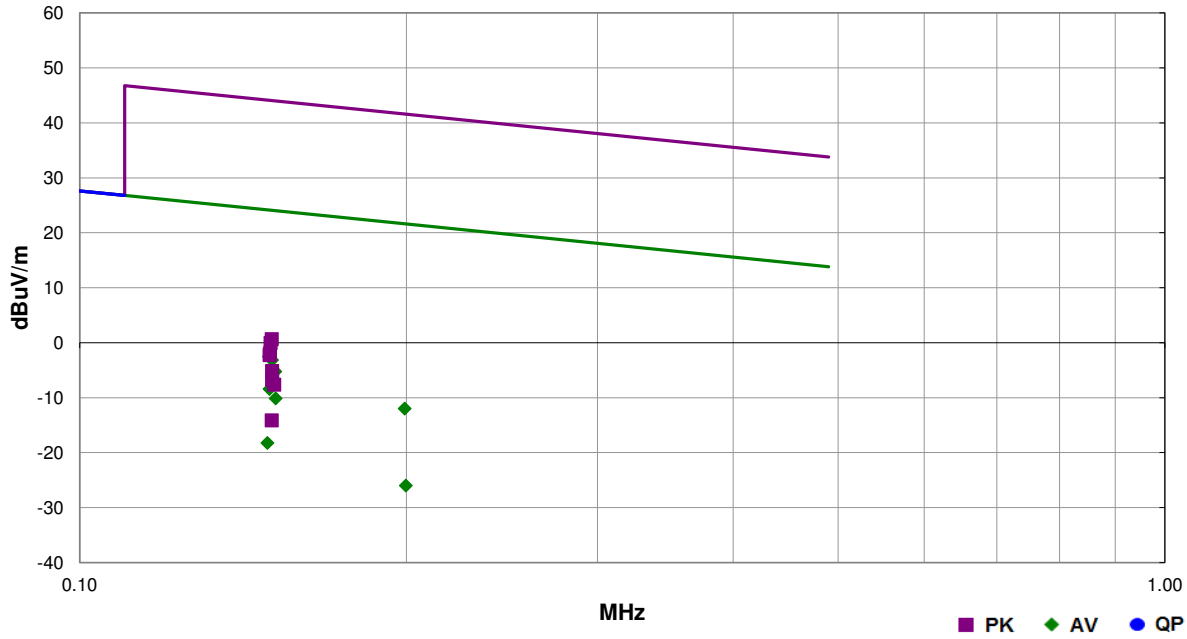
If there are no detectable emissions above the noise floor, the data included will show noise floor measurements for reference only.

FIELD STRENGTH OF FUNDAMENTAL

Work Order:	MDTR0451	**Date:**	02/19/16		
Project:	None	**Temperature:**	22.1 °C		
Job Site:	MN05	**Humidity:**	26.2% RH		
Serial Number:	JVD100008P	**Barometric Pres.:**	963.4 mbar	**Tested by:**	Jared Ison
EUT:	CareLink Encore™ 26901				
Configuration:	1				
Customer:	Medtronic, Inc.				
Attendees:	Taylor Dowden				
EUT Power:	120VAC/60Hz				
Operating Mode:	Inductive radio set to continuous transmit. Carrier set to frequency range of 150-200 kHz.				
Deviations:	None				
Comments:	Telemetry B setup. RF Head communicating to implant. Radio setup using typical communication rate. Measurement span is set wide enough to cover the entire emission envelope.				

Test Specifications	**Test Method**
FCC 15.209:2016	ANSI C63.10:2013

Run #	0	**Test Distance (m)**	3	**Antenna Height(s)**	1(m)	**Results**	Pass



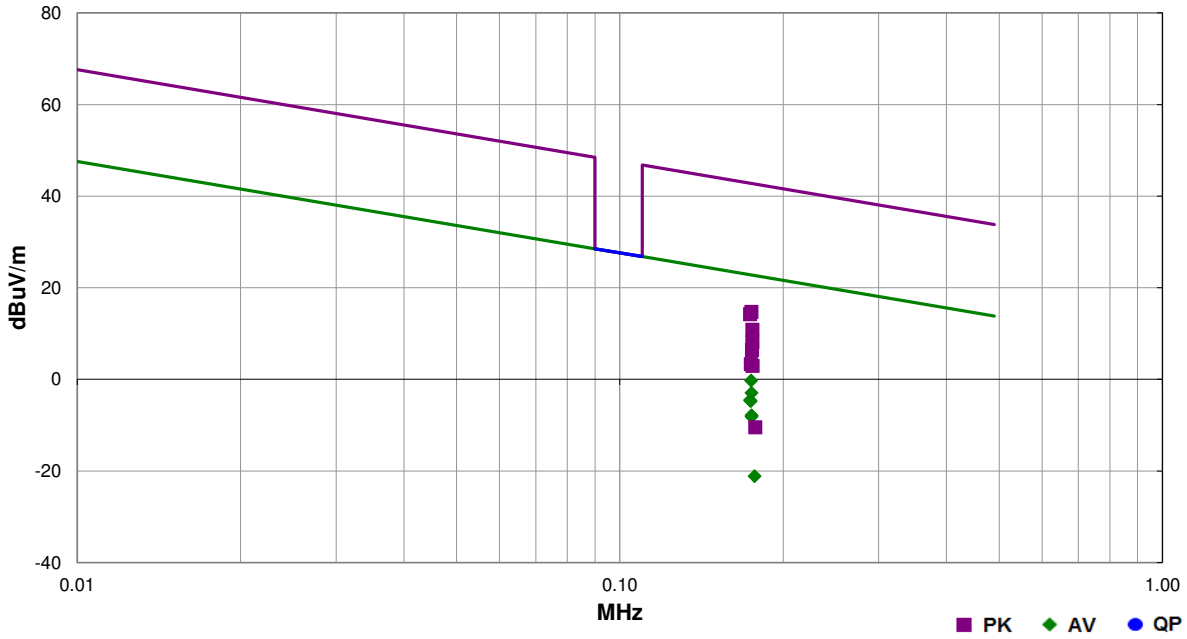
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.149	65.8	11.7	1.0	29.1	3.0	0.0	Para to EUT	AV	-80.0	-2.5	24.1	-26.7	EUT On Side
0.150	65.2	11.6	1.0	26.1	3.0	0.0	Para to EUT	AV	-80.0	-3.2	24.1	-27.2	EUT Vert
0.151	63.1	11.6	1.0	274.0	3.0	0.0	Perp To Gnd	AV	-80.0	-5.3	24.0	-29.3	EUT On Side
0.151	62.8	11.6	1.0	307.9	3.0	0.0	Perp To Gnd	AV	-80.0	-5.6	24.1	-29.6	EUT Vert
0.150	59.9	11.7	1.0	1.1	3.0	0.0	Para to Gnd	AV	-80.0	-8.4	24.1	-32.6	EUT On Side
0.199	56.4	11.6	1.0	340.9	3.0	0.0	Para to Gnd	AV	-80.0	-12.0	21.6	-33.6	EUT Vert
0.152	58.2	11.6	1.0	279.0	3.0	0.0	Para to Gnd	AV	-80.0	-10.2	24.0	-34.2	EUT Horz
0.149	50.1	11.7	1.0	95.1	3.0	0.0	Para to EUT	AV	-80.0	-18.2	24.2	-42.4	EUT Horz
0.150	69.0	11.6	1.0	26.1	3.0	0.0	Para to EUT	PK	-80.0	0.6	44.1	-43.4	EUT Vert
0.150	68.3	11.7	1.0	29.1	3.0	0.0	Para to EUT	PK	-80.0	0.0	44.1	-44.2	EUT On Side
0.150	66.4	11.7	1.0	274.0	3.0	0.0	Perp To Gnd	PK	-80.0	-1.9	44.1	-46.1	EUT On Side
0.150	66.1	11.7	1.0	307.9	3.0	0.0	Perp To Gnd	PK	-80.0	-2.2	44.1	-46.4	EUT Vert
0.200	42.4	11.6	1.0	28.0	3.0	0.0	Perp To Gnd	AV	-80.0	-26.0	21.6	-47.6	EUT Horz
0.150	63.2	11.6	1.0	1.1	3.0	0.0	Para to Gnd	PK	-80.0	-5.2	44.1	-49.2	EUT On Side
0.150	61.6	11.6	1.0	279.0	3.0	0.0	Para to Gnd	PK	-80.0	-6.8	44.1	-50.8	EUT Horz
0.151	60.7	11.6	1.0	340.9	3.0	0.0	Para to Gnd	PK	-80.0	-7.7	44.0	-51.7	EUT Vert
0.150	54.2	11.6	1.0	95.1	3.0	0.0	Para to EUT	PK	-80.0	-14.2	44.1	-58.2	EUT Horz

FIELD STRENGTH OF FUNDAMENTAL

Work Order:	MDTR0451	**Date:**	03/01/16		
Project:	None	**Temperature:**	22.7 °C		
Job Site:	MN04	**Humidity:**	14.8% RH		
Serial Number:	JVD100008P	**Barometric Pres.:**	991.58 mbar	**Tested by:**	Trevor Buls, William Hoffa
EUT:	CareLink Encore™ 26901				
Configuration:	7				
Customer:	Medtronic, Inc.				
Attendees:	Taylor Dowden				
EUT Power:	120VAC/60Hz				
Operating Mode:	Inductive radio set to continuous transmit. Carrier set to frequency 175 kHz.				
Deviations:	None				
Comments:	Telemetry A setup. RF Head communicating to implant. Radio setup using typical communication rate.				

Test Specifications	**Test Method**
FCC 15.209:2016	ANSI C63.10:2013

Run #	1	**Test Distance (m)**	3	**Antenna Height(s)**	1(m)	**Results**	Pass



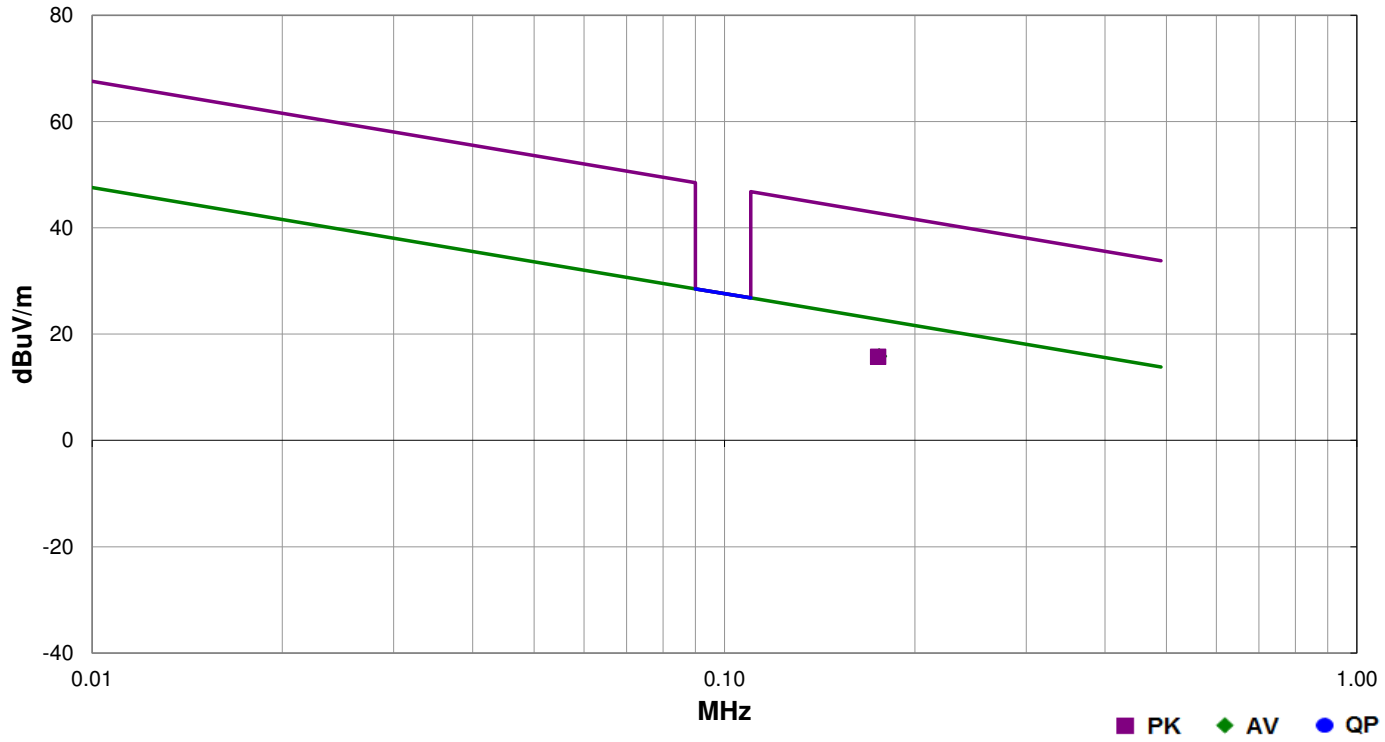
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.174	72.1	11.5	1.0	21.0	3.0	0.0	Par to EUT	AV	-80.0	3.6	22.8	-19.2	EUT vertical
0.176	71.6	11.5	1.0	187.0	3.0	0.0	Par to EUT	AV	-80.0	3.1	22.7	-19.6	EUT on side
0.175	68.2	11.5	1.0	263.0	3.0	0.0	Perp to GND	AV	-80.0	-0.3	22.8	-23.1	EUT on side
0.175	65.5	11.5	1.0	240.0	3.0	0.0	Perp to GND	AV	-80.0	-3.0	22.8	-25.7	EUT vertical
0.174	63.9	11.5	1.0	55.0	3.0	0.0	Par to GND	AV	-80.0	-4.6	22.8	-27.4	EUT horizontal
0.174	63.7	11.5	1.0	6.0	3.0	0.0	Par to GND	AV	-80.0	-4.8	22.8	-27.6	EUT vertical
0.175	83.2	11.5	1.0	21.0	3.0	0.0	Par to EUT	PK	-80.0	14.7	42.8	-28.0	EUT vertical
0.174	82.7	11.5	1.0	187.0	3.0	0.0	Par to EUT	PK	-80.0	14.2	42.8	-28.6	EUT on side
0.175	60.6	11.5	1.0	120.0	3.0	0.0	Par to EUT	AV	-80.0	-7.9	22.8	-30.6	EUT horizontal
0.175	60.3	11.5	1.0	0.0	3.0	0.0	Par to GND	AV	-80.0	-8.2	22.8	-30.9	EUT on side
0.176	79.3	11.5	1.0	263.0	3.0	0.0	Perp to GND	PK	-80.0	10.8	42.7	-31.9	EUT on side
0.176	76.6	11.5	1.0	240.0	3.0	0.0	Perp to GND	PK	-80.0	8.1	42.7	-34.6	EUT vertical
0.175	75.0	11.5	1.0	6.0	3.0	0.0	Par to GND	PK	-80.0	6.5	42.8	-36.2	EUT vertical
0.175	74.8	11.5	1.0	55.0	3.0	0.0	Par to GND	PK	-80.0	6.3	42.8	-36.4	EUT horizontal
0.174	71.8	11.5	1.0	120.0	3.0	0.0	Par to EUT	PK	-80.0	3.3	42.8	-39.5	EUT horizontal
0.176	71.4	11.5	1.0	0.0	3.0	0.0	Par to GND	PK	-80.0	2.9	42.7	-39.8	EUT on side
0.177	47.3	11.5	1.0	194.0	3.0	0.0	Perp to GND	AV	-80.0	-21.2	22.7	-43.8	EUT horizontal
0.178	58.0	11.5	1.0	194.0	3.0	0.0	Perp to GND	PK	-80.0	-10.5	42.6	-53.1	EUT horizontal

FIELD STRENGTH OF FUNDAMENTAL

Work Order:	MDTR0451	**Date:**	03/01/16	Trevor Buls	
Project:	None	**Temperature:**	22.7 °C		
Job Site:	MN04	**Humidity:**	14.8% RH		
Serial Number:	JVD100008P	**Barometric Pres.:**	991.58 mbar	**Tested by:**	Trevor Buls, William Hoffa
EUT:	CareLink Encore™ 26901				
Configuration:	7				
Customer:	Medtronic, Inc.				
Attendees:	Taylor Dowden				
EUT Power:	120VAC/60Hz				
Operating Mode:	Inductive Radio set to Tel A interrogation. Carrier set to frequency 175 kHz.				
Deviations:	None				
Comments:	Telemetry A setup. RF Head communicating to implant. Radio setup using typical communication rate. EUT Vertical				

Test Specifications	**Test Method**
FCC 15.209:2016	ANSI C63.10:2013

Run #	2	**Test Distance (m)**	3	**Antenna Height(s)**	1(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.176	84.3	11.5	1.0	44.0	3.0	0.0	Par to EUT	AV	-80.0	15.8	22.7	-6.9
0.175	84.2	11.5	1.0	44.0	3.0	0.0	Par to EUT	PK	-80.0	15.7	42.8	-27.0

SPURIOUS RADIATED EMISSIONS

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

MODES OF OPERATION

150-200 kHz, Telemetry B and Telemetry A modes investigated

POWER SETTINGS INVESTIGATED

120VAC/60Hz

CONFIGURATIONS INVESTIGATED

MDTR0451 - 1
MDTR0451 - 7

FREQUENCY RANGE INVESTIGATED

Start Frequency	9 kHz	Stop Frequency	1000 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Cable	ESM Cable Corp.	MN04 Horn Cables	MNE	2/26/2016	12
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFG	6/5/2015	12
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVY	11/12/2015	12
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/7/2015	12
Antenna	ETS Lindgren	6502	AOB	4/28/2015	24
Analyzer - Spectrum Analyzer	Agilent	E4440A	AAX	4/20/2015	12

MEASUREMENT BANDWIDTHS

Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 - 0.15	1.0	0.2	0.2
0.15 - 30.0	10.0	9.0	9.0
30.0 - 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0

TEST DESCRIPTION

The antennas to be used with the EUT were tested. The EUT was continuously transmitting while set to the channel specified.

Per ANSI C63.10 sections 6.4.4.1 and 6.4.4.2, the emissions from the EUT were maximized by rotating the EUT on the turntable. Also, the EUT and/or associated antenna was positioned in 3 orthogonal planes. A calibrated active loop antenna was used for this test in order to provide sufficient measurement sensitivity per section 4.5.1. The center of the loop antenna was maintained at 1m above the ground plane during the testing.

For measurements below 30 MHz, as outlined in 15.209(e) and 15.31(f)(2), measurements may be performed at a distance closer than what is specified with the limit. The limit at the specified distance is shown on the data sheet. Measurements are made at a closer distance and the data is adjusted using a distance correction factor of 40dB/decade for comparison to the limit. Per FCC 15.33(a)(4), measurements were taken up to the highest frequency range of either the 10th harmonic of the fundamental or the applicable digital frequency test range.

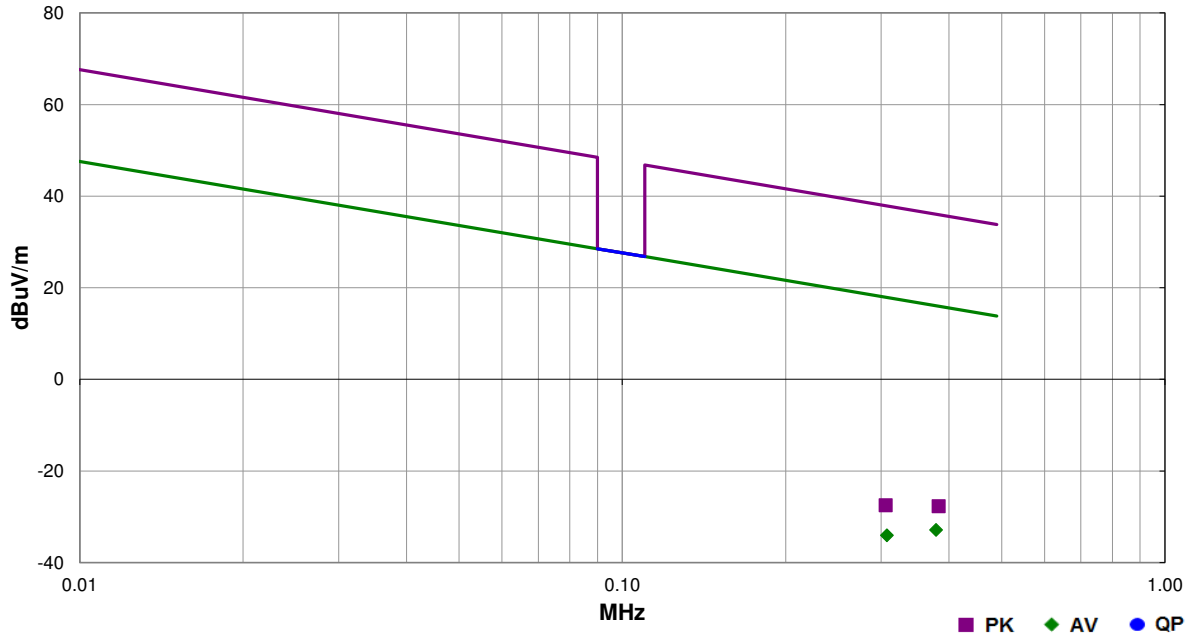
If there are no detectable emissions above the noise floor, the data included will show noise floor measurements for reference only.

SPURIOUS RADIATED EMISSIONS

Work Order:	MDTR0451	**Date:**	02/19/16		
Project:	None	**Temperature:**	22.1 °C		
Job Site:	MN05	**Humidity:**	26.2% RH		
Serial Number:	JVD100008P	**Barometric Pres.:**	963.4 mbar	**Tested by:**	Jared Ison, Trevor Buls
EUT:	CareLink Encore™ 26901				
Configuration:	1, 7				
Customer:	Medtronic, Inc.				
Attendees:	Taylor Dowden				
EUT Power:	120VAC/60Hz				
Operating Mode:	Inductive radio set to continuous transmit. Carrier set to frequency range of 150-200 kHz and worst case measurements of all modes noted below.				
Deviations:	None				
Comments:	RF Head communicating to implant. Radio setup using typical communication rate. Measurement span is set wide enough to cover the entire emission envelope.				

Test Specifications	**Test Method**
FCC 15.209:2016	ANSI C63.10:2013

Run #	2	**Test Distance (m)**	3	**Antenna Height(s)**	1(m)	**Results**	Pass



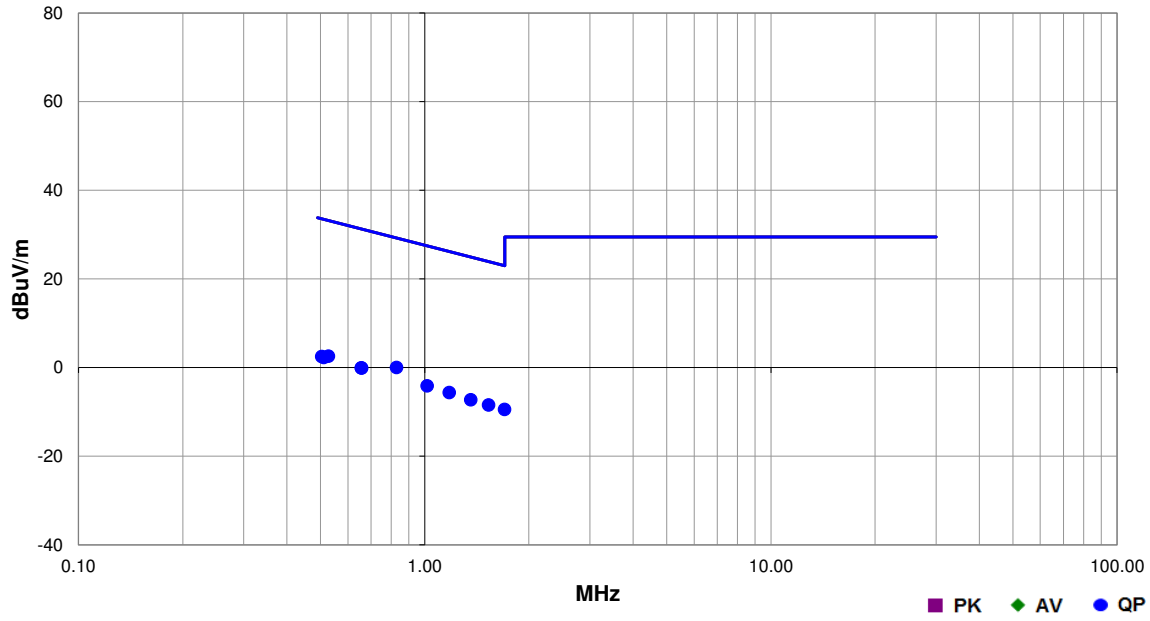
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.379	35.5	11.6	1.0	325.0	3.0	0.0	Par to EUT	AV	-80.0	-32.9	16.0	-49.0	EUT On Side Tel B
0.307	34.5	11.4	1.0	321.0	3.0	0.0	Par to EUT	AV	-80.0	-34.1	17.9	-51.9	EUT Vertical Tel A
0.383	40.7	11.6	1.0	325.0	3.0	0.0	Par to EUT	PK	-80.0	-27.7	35.9	-63.7	EUT On Side Tel B
0.306	41.1	11.4	1.0	321.0	3.0	0.0	Par to EUT	PK	-80.0	-27.5	37.9	-65.4	EUT Vertical Tel A

SPURIOUS RADIATED EMISSIONS

Work Order:	MDTR0451	**Date:**	02/19/16		
Project:	None	**Temperature:**	22.1 °C		
Job Site:	MN05	**Humidity:**	26.2% RH		
Serial Number:	JVD100008P	**Barometric Pres.:**	963.4 mbar	**Tested by:**	Jared Ison, Trevor Buls
EUT:	CareLink Encore™ 26901				
Configuration:	1, 7				
Customer:	Medtronic, Inc.				
Attendees:	Taylor Dowden				
EUT Power:	120VAC/60Hz				
Operating Mode:	Inductive radio set to continuous transmit. Carrier set to frequency range of 150-200 kHz and worst case measurements of all modes noted below.				
Deviations:	None				
Comments:	RF Head communicating to implant. Radio setup using typical communication rate. Measurement span is set wide enough to cover the entire emission envelope.				

Test Specifications	**Test Method**
FCC 15.209:2016	ANSI C63.10:2013

Run #	3	**Test Distance (m)**	3	**Antenna Height(s)**	1(m)	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
0.829	28.4	11.6	1.0	209.0	3.0	0.0	Par to EUT	QP	-40.0	0.0	29.2	-29.2	EUT Vertical, Tel A
0.527	30.9	11.7	1.0	44.0	3.0	0.0	Par to EUT	QP	-40.0	2.6	33.2	-30.6	EUT Vertical, Tel A Interrogation
0.504	30.8	11.7	1.0	53.0	3.0	0.0	Par to EUT	QP	-40.0	2.5	33.6	-31.1	EUT Vertical, Tel A
0.511	30.5	11.8	1.0	140.0	3.0	0.0	Para to EUT	QP	-40.0	2.3	33.4	-31.1	EUT On Side Tel B
0.655	28.2	11.7	1.0	40.1	3.0	0.0	Para to EUT	QP	-40.0	-0.1	31.3	-31.4	EUT On Side Tel B
0.658	28.3	11.6	1.0	76.0	3.0	0.0	Par to EUT	QP	-40.0	-0.1	31.3	-31.4	EUT Vertical, Tel A
1.017	23.9	12.0	1.0	33.0	3.0	0.0	Par to EUT	QP	-40.0	-4.1	27.5	-31.6	EUT Vertical, Tel A
1.178	22.4	12.0	1.0	200.0	3.0	0.0	Par to EUT	QP	-40.0	-5.6	26.2	-31.8	EUT Vertical, Tel A
1.358	20.8	11.9	1.0	49.0	3.0	0.0	Par to EUT	QP	-40.0	-7.3	25.0	-32.2	EUT Vertical, Tel A
1.529	19.7	11.9	1.0	103.0	3.0	0.0	Par to EUT	QP	-40.0	-8.4	23.9	-32.4	EUT Vertical, Tel A
1.700	18.7	11.9	1.0	360.0	3.0	0.0	Par to EUT	QP	-40.0	-9.4	23.0	-32.5	EUT Vertical, Tel A

AC - POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC

WTD.2015.12.01
PSA-ESCI 2015.07.01, EmiR5 2015.11.06

TEST DESCRIPTION

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote I/O cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50ohm measuring port is terminated by a 50ohm EMI meter or a 50ohm resistive load. All 50ohm measuring ports of the LISN are terminated by 50ohm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Receiver	Rohde & Schwarz	ESR7	ARI	5/21/2015	5/21/2016
LISN	Solar Electronics	9252-50-R-24-BNC	LIY	3/23/2015	3/23/2016
Cable - Conducted Cable Assembly	Northwest EMC	MNC, HGN, TYK	MNCA	1/29/2016	1/29/2017

MEASUREMENT UNCERTAINTY

Description		
Expanded k=2	2.4 dB	-2.4 dB

CONFIGURATIONS INVESTIGATED

MDTR0451-6

MODES INVESTIGATED

Standard operating with inductive communication and wifi pinging at 5GHz.

AC - POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.12.01
PSA-ESCI 2015.07.01, EmiR5 2015.11.06

EUT:	CareLink Encore™ 26901	Work Order:	MDTR0451
Serial Number:	JVD100008P	Date:	02/26/2016
Customer:	Medtronic, Inc.	Temperature:	22.7°C
Attendees:	Taylor Dowden	Relative Humidity:	20.7%
Customer Project:	None	Bar. Pressure:	992.9 mb
Tested By:	Kyle McMullan, Trevor Buls	Job Site:	MN03
Power:	120VAC/60Hz	Configuration:	MDTR0451-6

TEST SPECIFICATIONS

Specification: Equipment Class B	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	19	Line:	Neutral	Add. Ext. Attenuation (dB):	0

COMMENTS

None

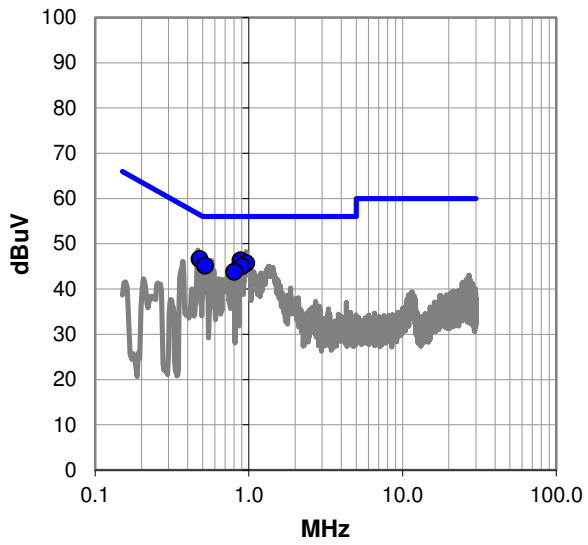
EUT OPERATING MODES

Standard operating with inductive communication and wifi pinging at 5GHz.

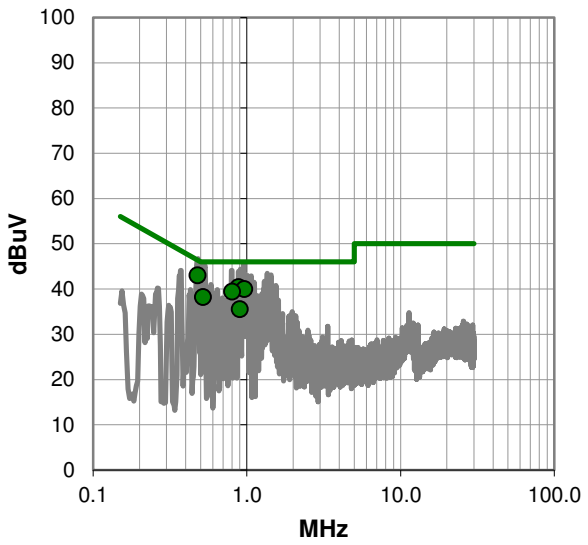
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



AC - POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC

WTD.2015.12.01
PSA-ESCI 2015.07.01, EmiR5 2015.11.06

RESULTS - Run #19

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.885	26.2	20.1	46.3	56.0	-9.7
0.478	26.5	20.1	46.6	56.4	-9.8
0.962	25.6	20.1	45.7	56.0	-10.3
0.520	25.0	20.1	45.1	56.0	-10.9
0.899	24.9	20.1	45.0	56.0	-11.0
0.801	23.7	20.1	43.8	56.0	-12.2

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.478	22.9	20.1	43.0	46.4	-3.4
0.885	20.3	20.1	40.4	46.0	-5.6
0.962	19.9	20.1	40.0	46.0	-6.0
0.801	19.3	20.1	39.4	46.0	-6.6
0.520	18.1	20.1	38.2	46.0	-7.8
0.899	15.4	20.1	35.5	46.0	-10.5

CONCLUSION

Pass

Trevor Buls

Tested By

AC - POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC
WTD.2015.12.01
PSA-ESCI 2015.07.01, EmiR5 2015.11.06

EUT:	CareLink Encore™ 26901	Work Order:	MDTR0451
Serial Number:	JVD100008P	Date:	02/26/2016
Customer:	Medtronic, Inc.	Temperature:	22.7°C
Attendees:	Taylor Dowden	Relative Humidity:	20.7%
Customer Project:	None	Bar. Pressure:	992.9 mb
Tested By:	Kyle McMullan, Trevor Buls	Job Site:	MN03
Power:	120VAC/60Hz	Configuration:	MDTR0451-6

TEST SPECIFICATIONS

Specification: Equipment Class B	Method:
FCC 15.207:2016	ANSI C63.10:2013

TEST PARAMETERS

Run #:	20	Line:	High Line	Add. Ext. Attenuation (dB):	0

COMMENTS

None

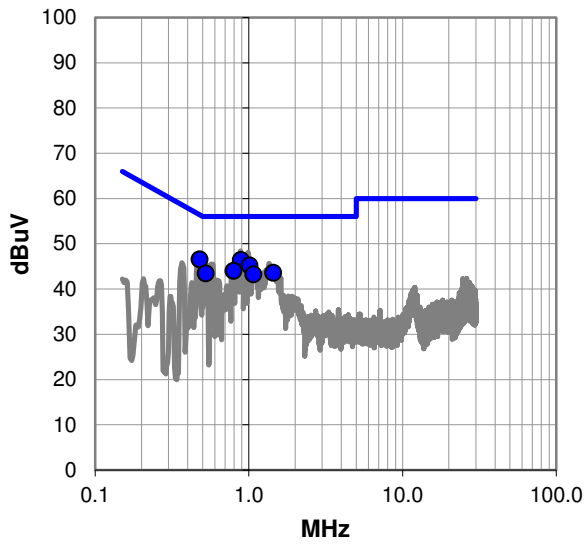
EUT OPERATING MODES

Standard operating with inductive communication and wifi pinging at 5GHz.

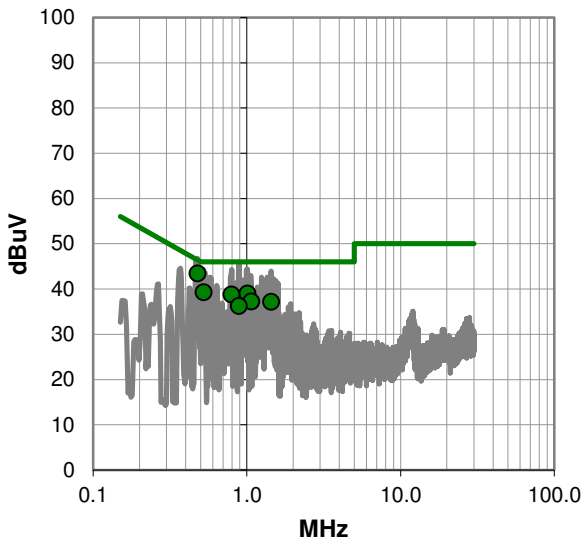
DEVIATIONS FROM TEST STANDARD

None

Quasi Peak Data - vs - Quasi Peak Limit



Average Data - vs - Average Limit



AC - POWERLINE CONDUCTED EMISSIONS

NORTHWEST EMC

WTD.2015.12.01
PSA-ESCI 2015.07.01, EmiR5 2015.11.06

RESULTS - Run #20

Quasi Peak Data - vs - Quasi Peak Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.887	26.3	20.1	46.4	56.0	-9.6
0.478	26.4	20.1	46.5	56.4	-9.9
1.010	25.1	20.1	45.2	56.0	-10.8
0.797	23.9	20.1	44.0	56.0	-12.0
1.438	23.4	20.1	43.5	56.0	-12.5
0.525	23.3	20.1	43.4	56.0	-12.6
1.069	23.1	20.1	43.2	56.0	-12.8

Average Data - vs - Average Limit

Freq (MHz)	Amp. (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Margin (dB)
0.478	23.3	20.1	43.4	46.4	-3.0
0.525	19.2	20.1	39.3	46.0	-6.7
1.010	18.9	20.1	39.0	46.0	-7.0
0.797	18.7	20.1	38.8	46.0	-7.2
1.069	17.1	20.1	37.2	46.0	-8.8
1.438	17.0	20.1	37.1	46.0	-8.9
0.887	16.1	20.1	36.2	46.0	-9.8

CONCLUSION

Pass

Trevor Buls

Tested By