Medtronic Inc.

Model 24965 Patient Connector
FCC 15.209:2014

Report #: MDTR0319.4

Report Prepared By Northwest EMC Inc.

NORTHWEST EMC – (888) 364-2378 – www.nwemc.com

California – Minnesota – Oregon – New York – Washington

CERTIFICATE OF TEST

WTD 12.5.23

Last Date of Test: July 11, 2014
Medtronic Inc.
Model: Model 24965 Patient Connector

Emissions

Test Description	Specification	Test Method	Pass/Fail
Field Strength of Fundamental	FCC 15.209:2014	ANSI C63.10:2009	Pass
Spurious Radiated Emissions	FCC 15.209:2014	ANSI C63.10:2009	Pass

Deviations From Test Standards

None

Approved By:

Tim O'Shea, Operations Manager

NVLAP Lab Code: 200881-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.

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. This Report may only be duplicated in its entirety. 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.

REVISION HISTORY

REV 2012.08.02

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

NORTHWEST EMC

REV 2012.05.24

ACCREDITATIONS AND AUTHORIZATIONS

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 Guide 65 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

KCC / 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.

Hong Kong

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

Vietnam

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

Russia

GOST – Accredited by Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC to perform EMC and Hygienic testing for Information Technology products to GOST standards.

SCOPE

For details on the Scopes of our Accreditations, please visit:
http://www.nwemc.com/accreditations/

MEASUREMENT UNCERTAINTY

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 listed below. 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 16-4-1 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.

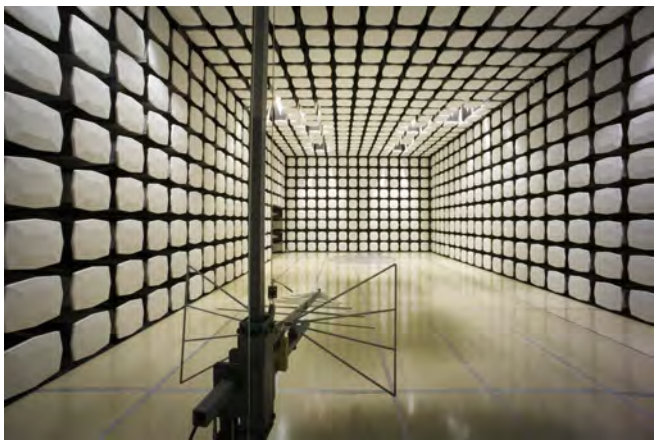
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.12	-0.01
Amplitude Accuracy (dB)	0.49	-0.49
Conducted Power (dB)	0.41	-0.41
Radiated Power via Substitution (dB)	0.69	-0.68
Temperature (degrees C)	0.81	-0.81
Humidity (% RH)	2.89	-2.89
Field Strength (dB)	3.80	-3.80
AC Powerline Conducted Emissions (dB)	2.94	-2.94

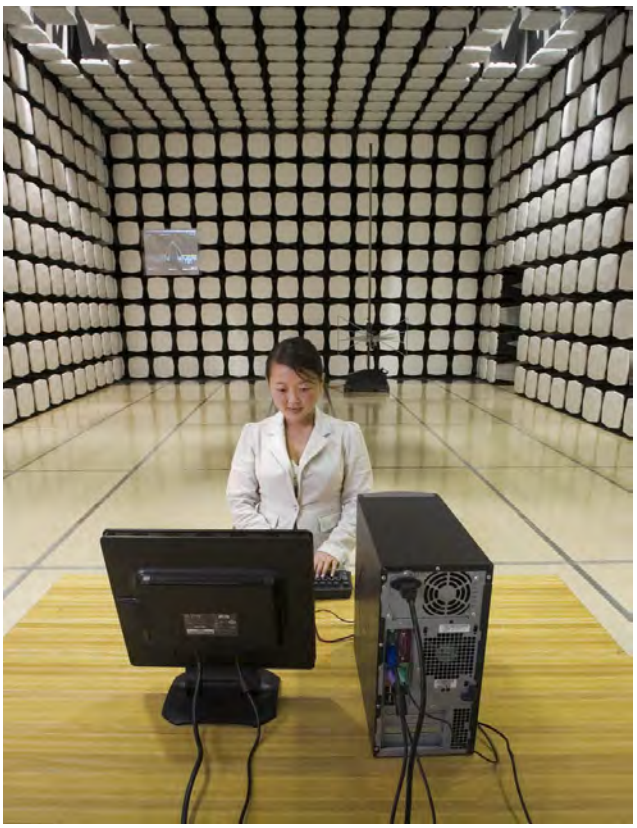
NORTHWEST EMC

REV 2013.06.28

FACILITIES

Oregon	California	New York	Minnesota	Washington
Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Labs NC01-05,SU02,SU07 19201 120th Ave. NE Bothell, WA 98011 (425) 984-6600
VCCI				
A-0108	A-0029		A-0109	A-0110
Industry Canada				
2834D-1, 2834D-2	2834B-1, 2834B-2, 2834B-3		2834E-1	2834F-1
NVLAP				
NVLAP Lab Code: 200630-0	NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200629-0





PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Medtronic Inc.
Address:	710 Medtronic Parkway
City, State, Zip:	Minneapolis, MN 55432
Test Requested By:	Vincent Ganion
Model:	Model 24965 Patient Connector
First Date of Test:	July 11, 2014
Last Date of Test:	July 11, 2014
Receipt Date of Samples:	June 30, 2014
Equipment Design Stage:	Production Equivalent
Equipment Condition:	Fully Operational

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):
Programming head. Inductive radio module with 1 antenna(s).

Testing Objective:
To demonstrate compliance to FCC Part 15.209 specifications.

CONFIGURATIONS

Configuration MDTR0319- 1

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Telemetry Head	Medtronic Inc.	24965	ROB000750P
DC Brick	SL Power	MENB1020A0500C02	None

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Power	No	2.0m	No	DC Brick	Telemetry Head
AC Power	No	1.5m	No	AC mains	DC Brick
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

MODIFICATIONS

WTD 12.5.23

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	7/11/2014	Field Strength of Fundamental	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	7/11/2014	Spurious Radiated Emissions	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

Transmitting inductively at 175 kHz (OOK and FSK)

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MDTR0319 - 1

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
MN04 Cables	ESM Cable Corp.	MN04 Horn Cables	MNE	3/14/2014	12 mo
Antenna, Loop	ETS Lindgren	6502	AOB	2/20/2013	36 mo
Spectrum Analyzer	Agilent	E4440A	AFG	5/20/2014	12 mo

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. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes, the EUT and/or associated antenna is positioned in 3 orthogonal planes (per ANSI C63.10). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

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.

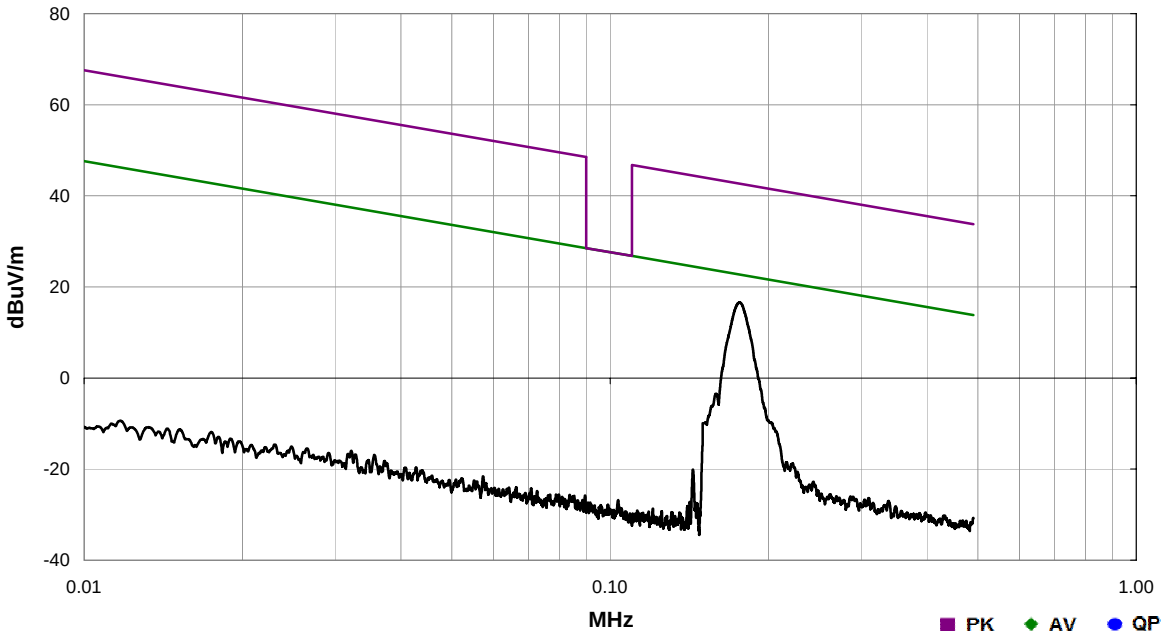
If there are no detectable emissions above the noise floor, the data included will show noise floor measurements for reference only.

FIELD STRENGTH OF FUNDAMENTAL

Work Order:	MDTR0319	**Date:**	07/11/14	FOR REFERENCE ONLY	
Project:	None	**Temperature:**	23.3 °C		
Job Site:	MN04	**Humidity:**	55.8% RH		
Serial Number:	ROB000750P	**Barometric Pres.:**	1017.9 mbar	**Tested by:**	Trevor Buls
EUT:	Model 24965 Patient Connector				
Configuration:	1				
Customer:	Medtronic Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting inductively at 175 kHz (OOK and FSK)				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.209:2014	ANSI C63.10:2009

Run #	7	**Test Distance (m)**	3	**Antenna Height(s)**	1 (m)	**Results**	Evaluation



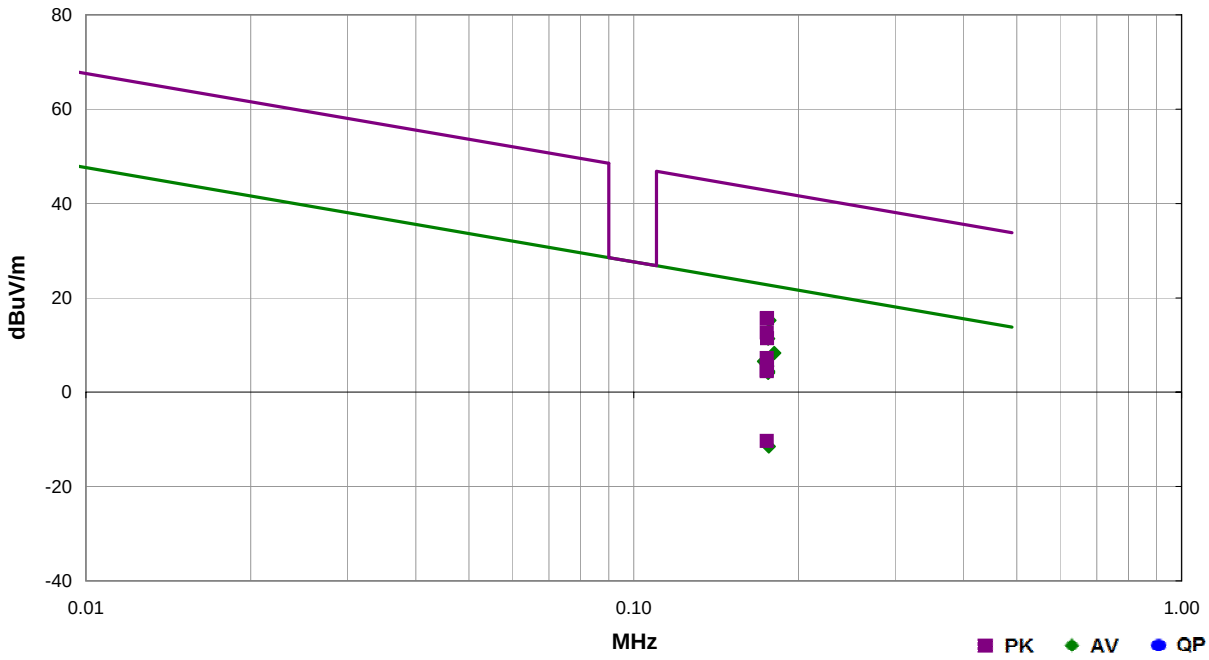
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Antenna Height (meters)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)

FIELD STRENGTH OF FUNDAMENTAL

Work Order:	MDTR0319	**Date:**	07/11/14	Trevor Buls	
Project:	None	**Temperature:**	23.3 °C		
Job Site:	MN04	**Humidity:**	55.8% RH		
Serial Number:	ROB000750P	**Barometric Pres.:**	1017.9 mbar	**Tested by:**	Trevor Buls
EUT:	Model 24965 Patient Connector				
Configuration:	1				
Customer:	Medtronic Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting inductively at 175 kHz (OOK and FSK)				
Deviations:	None				
Comments:	None				

Test Specifications	**Test Method**
FCC 15.209:2014	ANSI C63.10:2009

Run #	7	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 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
0.175	84.0	11.6	1.0	213.0	3.0	0.0	Par to EUT	AV	-80.0	15.6	22.8	-7.1	EUT Vertical
0.177	83.6	11.6	1.0	295.0	3.0	0.0	Par to EUT	AV	-80.0	15.2	22.7	-7.4	EUT on Side
0.176	79.7	11.6	1.0	328.0	3.0	0.0	Perp to GND	AV	-80.0	11.3	22.7	-11.4	EUT on Side
0.181	76.7	11.6	1.0	270.0	3.0	0.0	Perp to GND	AV	-80.0	8.3	22.5	-14.2	EUT Vertical
0.173	74.9	11.6	1.0	0.0	3.0	0.0	Par to GND	AV	-80.0	6.5	22.9	-16.3	EUT Horizontal
0.175	73.9	11.6	1.0	284.0	3.0	0.0	Par to GND	AV	-80.0	5.5	22.8	-17.2	EUT on Side
0.176	72.8	11.6	1.0	200.0	3.0	0.0	Par to EUT	AV	-80.0	4.4	22.7	-18.3	EUT Horizontal
0.176	72.5	11.6	1.0	335.0	3.0	0.0	Par to GND	AV	-80.0	4.1	22.7	-18.6	EUT Vertical
0.175	84.1	11.6	1.0	295.0	3.0	0.0	Par to EUT	PK	-80.0	15.7	42.8	-27.0	EUT on Side
0.175	84.0	11.6	1.0	213.0	3.0	0.0	Par to EUT	PK	-80.0	15.6	42.8	-27.1	EUT Vertical
0.175	81.0	11.6	1.0	270.0	3.0	0.0	Perp to GND	PK	-80.0	12.6	42.8	-30.1	EUT Vertical
0.175	79.8	11.6	1.0	328.0	3.0	0.0	Perp to GND	PK	-80.0	11.4	42.8	-31.3	EUT on Side
0.176	56.9	11.6	1.0	73.0	3.0	0.0	Perp to GND	AV	-80.0	-11.5	22.7	-34.2	EUT Horizontal
0.175	75.6	11.6	1.0	0.0	3.0	0.0	Par to GND	PK	-80.0	7.2	42.8	-35.5	EUT Horizontal
0.175	73.9	11.6	1.0	284.0	3.0	0.0	Par to GND	PK	-80.0	5.5	42.8	-37.2	EUT on Side
0.175	73.0	11.6	1.0	200.0	3.0	0.0	Par to EUT	PK	-80.0	4.6	42.8	-38.1	EUT Horizontal
0.175	72.8	11.6	1.0	335.0	3.0	0.0	Par to GND	PK	-80.0	4.4	42.8	-38.3	EUT Vertical
0.175	58.0	11.6	1.0	73.0	3.0	0.0	Perp to GND	PK	-80.0	-10.4	42.8	-53.1	EUT Horizontal

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

Transmitting inductively at 175 kHz (OOK and FSK)

POWER SETTINGS INVESTIGATED

110VAC/60Hz

CONFIGURATIONS INVESTIGATED

MDTR0319 - 1

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
Low Pass Filter 0-1000 MHz	Micro-Tronics	LPM50004	HGW	9/27/2012	24 mo
Antenna, Biconilog	ETS Lindgren	3142D	AXO	11/18/2013	24 mo
Pre-Amplifier	Miteq	AM-1551	AVS	3/14/2014	12 mo
MN04 Cables	ESM Cable Corp.	MN04 Bilog Cables	MND	3/14/2014	12 mo
MN04 Cables	ESM Cable Corp.	MN04 Horn Cables	MNE	3/14/2014	12 mo
Antenna, Loop	ETS Lindgren	6502	AOB	2/20/2013	36 mo
Spectrum Analyzer	Agilent	E4440A	AFG	5/20/2014	12 mo

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. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height and orientation in 3 orthogonal planes, the EUT and/or associated antenna is positioned in 3 orthogonal planes (per ANSI C63.10). An active loop antenna was used for this test in order to provide sufficient measurement sensitivity.

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.

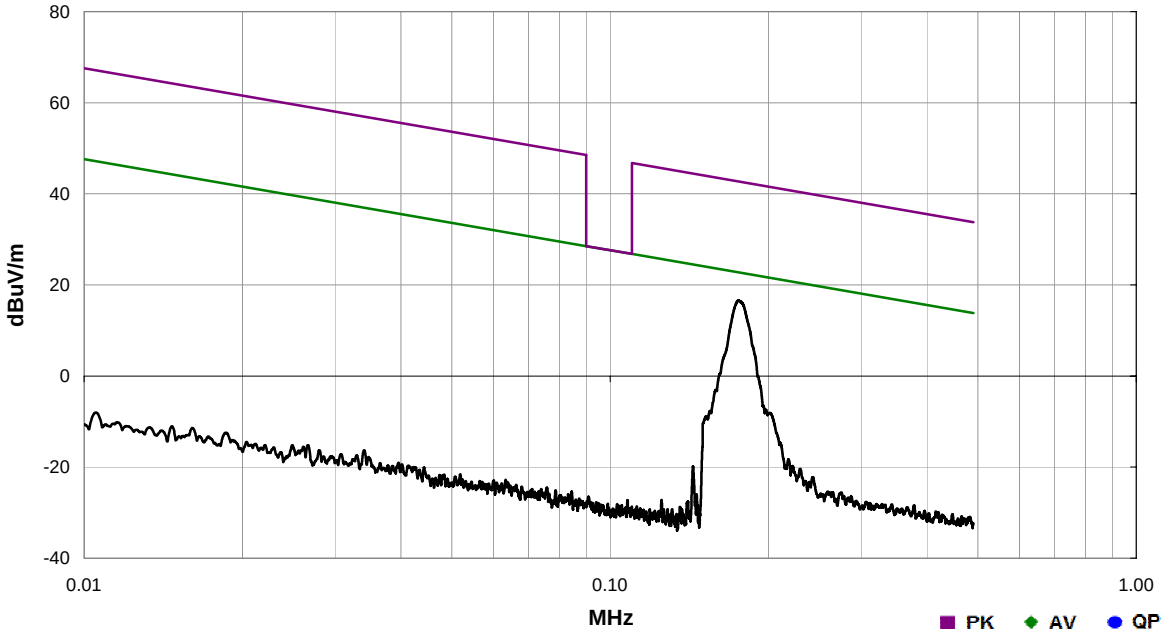
If there are no detectable emissions above the noise floor, the data included will show noise floor measurements for reference only.

SPURIOUS RADIATED EMISSIONS

Work Order:	MDTR0319	**Date:**	07/11/14	FOR REFERENCE ONLY	
Project:	None	**Temperature:**	23.3 °C		
Job Site:	MN04	**Humidity:**	55.8% RH		
Serial Number:	ROB000750P	**Barometric Pres.:**	1017.9 mbar	**Tested by:**	Trevor Buls
EUT:	Model 24965 Patient Connector				
Configuration:	1				
Customer:	Medtronic Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting inductively at 175 kHz (OOK and FSK)				
Deviations:	None				
Comments:	EUT Vertical				

Test Specifications	**Test Method**
FCC 15.209:2014	ANSI C63.10:2009

Run #	8	**Test Distance (m)**	3	**Antenna Height(s)**	1m	**Results**	Evaluation



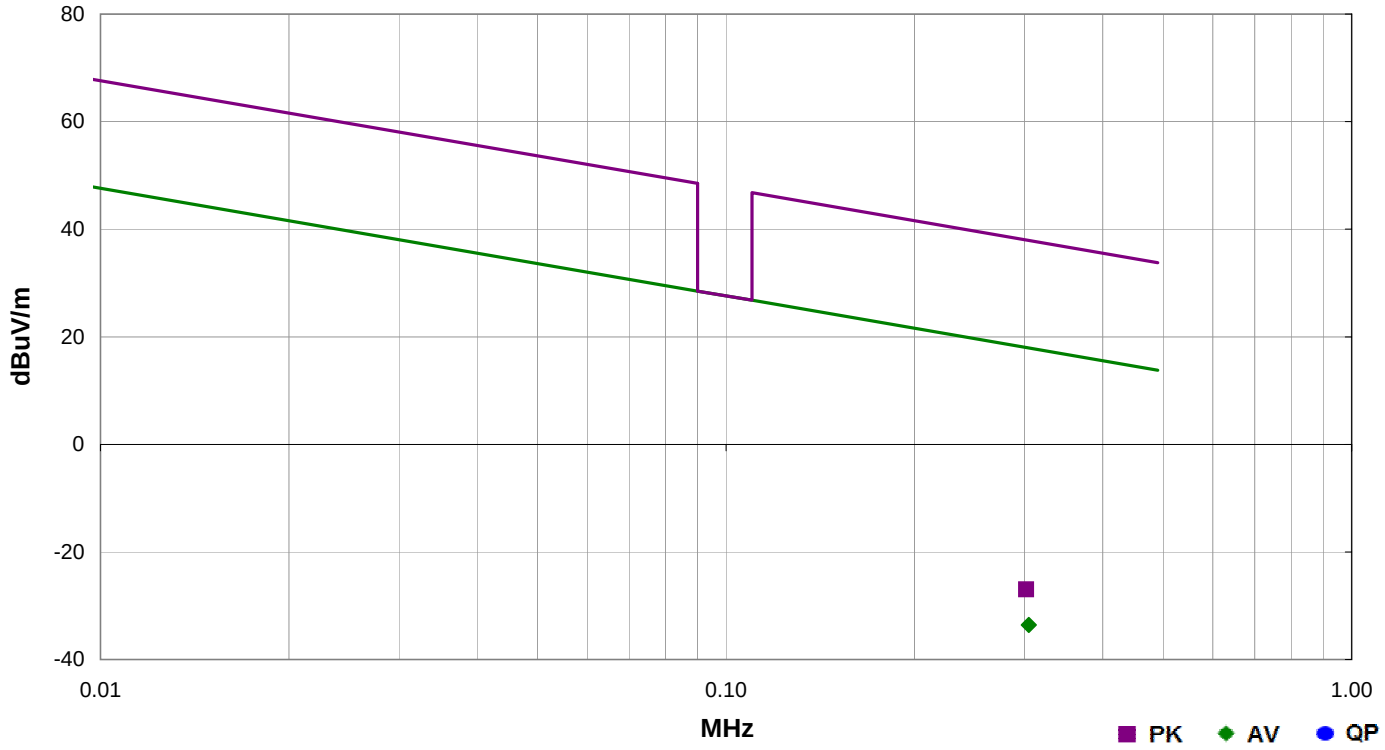
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Antenna Height (meters)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)

SPURIOUS RADIATED EMISSIONS

Work Order:	MDTR0319	**Date:**	07/11/14	Trevor Buls	
Project:	None	**Temperature:**	23.3 °C		
Job Site:	MN04	**Humidity:**	55.8% RH		
Serial Number:	ROB000750P	**Barometric Pres.:**	1017.9 mbar	**Tested by:**	Trevor Buls
EUT:	Model 24965 Patient Connector				
Configuration:	1				
Customer:	Medtronic Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting inductively at 175 kHz (OOK and FSK)				
Deviations:	None				
Comments:	EUT Vertical				

Test Specifications	**Test Method**
FCC 15.209:2014	ANSI C63.10:2009

Run #	8	**Test Distance (m)**	3	**Antenna Height(s)**	1m	**Results**	Pass



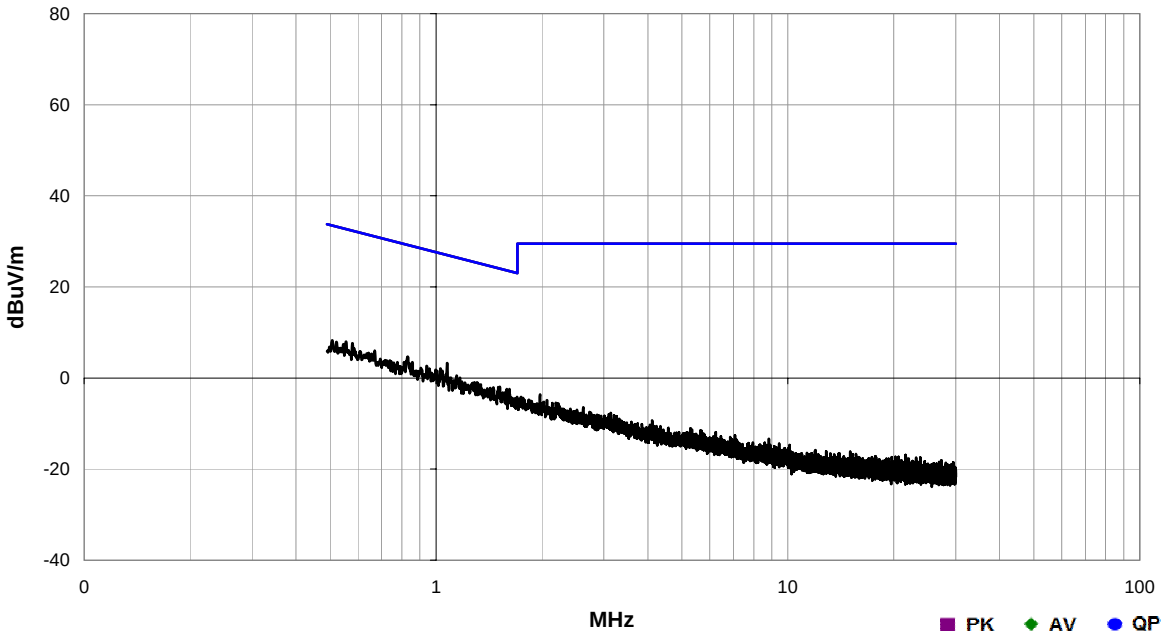
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
0.305	34.8	11.6	1.0	274.0	3.0	0.0	Par to EUT	AV	-80.0	-33.6	17.9	-51.5
0.302	41.4	11.6	1.0	274.0	3.0	0.0	Par to EUT	PK	-80.0	-27.0	38.0	-65.0

SPURIOUS RADIATED EMISSIONS

Work Order:	MDTR0319	**Date:**	07/11/14	FOR REFERENCE ONLY	
Project:	None	**Temperature:**	23.3 °C		
Job Site:	MN04	**Humidity:**	55.8% RH		
Serial Number:	ROB000750P	**Barometric Pres.:**	1017.9 mbar	**Tested by:**	Trevor Buls
EUT:	Model 24965 Patient Connector				
Configuration:	1				
Customer:	Medtronic Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting inductively at 175 kHz (OOK and FSK)				
Deviations:	None				
Comments:	EUT Vertical				

Test Specifications	**Test Method**
FCC 15.209:2014	ANSI C63.10:2009

Run #	9	**Test Distance (m)**	3	**Antenna Height(s)**	1m	**Results**	Evaluation



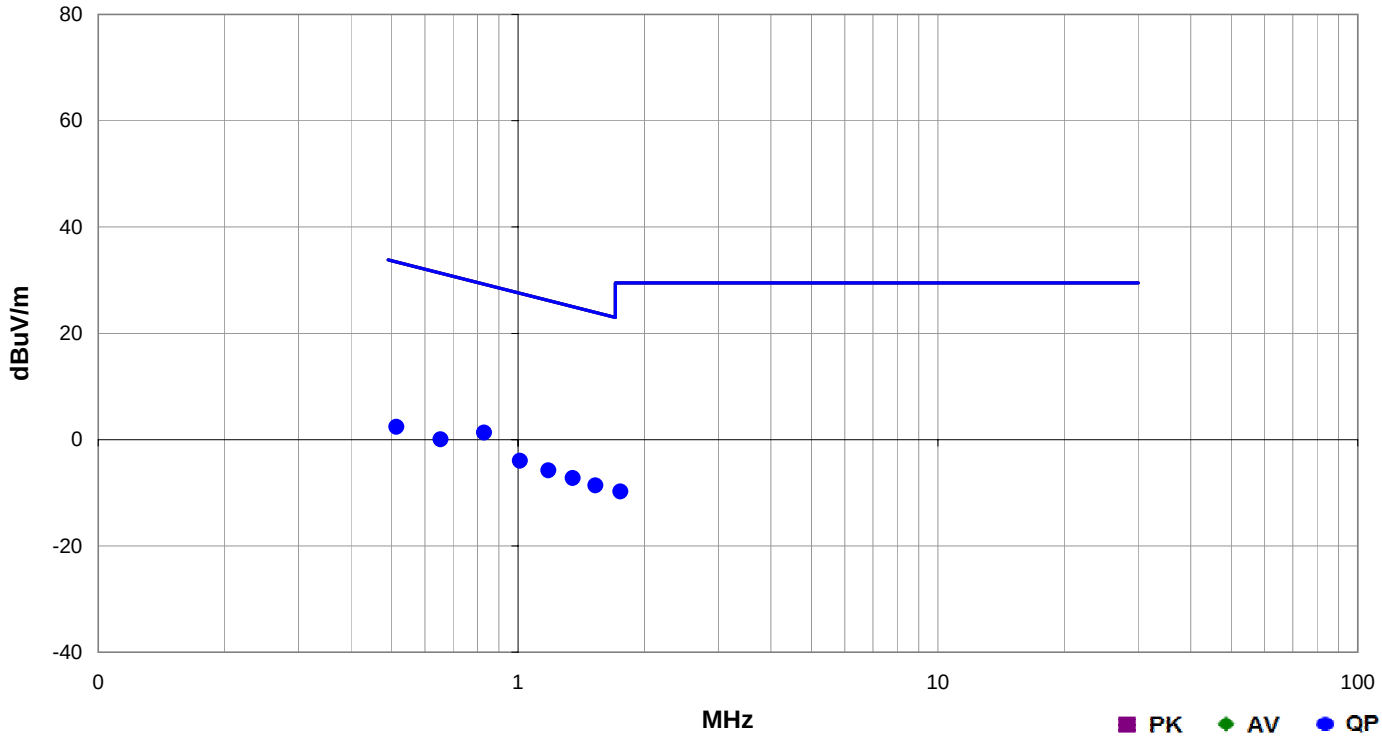
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Antenna Height (meters)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)

SPURIOUS RADIATED EMISSIONS

Work Order:	MDTR0319	**Date:**	07/11/14	Trevor Buls	
Project:	None	**Temperature:**	23.3 °C		
Job Site:	MN04	**Humidity:**	55.8% RH		
Serial Number:	ROB000750P	**Barometric Pres.:**	1017.9 mbar	**Tested by:**	Trevor Buls
EUT:	Model 24965 Patient Connector				
Configuration:	1				
Customer:	Medtronic Inc.				
Attendees:	None				
EUT Power:	110VAC/60Hz				
Operating Mode:	Transmitting inductively at 175 kHz (OOK and FSK)				
Deviations:	None				
Comments:	EUT Vertical				

Test Specifications	**Test Method**
FCC 15.209:2014	ANSI C63.10:2009

Run #	9	**Test Distance (m)**	3	**Antenna Height(s)**	1m	**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)
0.830	29.5	11.8	1.0	30.0	3.0	0.0	Par to EUT	QP	-40.0	1.3	29.2	-27.9
0.513	30.6	11.8	1.0	200.0	3.0	0.0	Par to EUT	QP	-40.0	2.4	33.4	-31.0
0.654	28.3	11.7	1.0	30.0	3.0	0.0	Par to EUT	QP	-40.0	0.0	31.3	-31.3
1.011	23.9	12.1	1.0	133.0	3.0	0.0	Par to EUT	QP	-40.0	-4.0	27.5	-31.5
1.181	22.2	12.0	1.0	112.0	3.0	0.0	Par to EUT	QP	-40.0	-5.8	26.2	-32.0
1.350	20.8	12.0	1.0	199.0	3.0	0.0	Par to EUT	QP	-40.0	-7.2	25.0	-32.3
1.530	19.5	11.9	1.0	237.0	3.0	0.0	Par to EUT	QP	-40.0	-8.6	23.9	-32.6
1.755	18.4	11.8	1.0	100.0	3.0	0.0	Par to EUT	QP	-40.0	-9.8	29.5	-39.3