

Medtronic Inc. Azure IPG

FCC 15.247:2016

Bluetooth Low Energy Radio

Report # MDTR0446 Rev.1





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.





Last Date of Test: March 28, 2016 Medtronic Inc. Model: Azure IPG

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2016	ANSI C63.10:2013

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	No	N/A	Not required for a battery powered EUT
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	Pass	Characterization of radio
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.2.2.4	Output Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	Yes	Pass	

Deviations From Test Standards

Transmitter Radiated Power and spurious measurements were performed by two methods-

1. Conducted measurements taken at the antenna port performed per ANSI C63.10.

2. Radiated measurements using a human torso simulator and simulation tissue liquid solution with the electrical properties of muscle tissue at 2.44 GHz. Tests performed per the radiated methods in ANSI C63.10 for a radio operating in the 2.4 - 2.5 GHz range. A muscle tissue simulation solution defined in OET Bulletin 65 Supplement C at an implant depth of 2cm to reflect a worst case radiated field from a human torso.

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



Revision Number	Description	Date	Page Number
01	"The 99.9% (approximate 26 dB) emission bandwidth (EBW) was also measured at the same time" was removed in the Test Description for Occupied Bandwidth.	6-7-16	12

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 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: <u>http://www.nwemc.com/accreditations/</u> http://gsi.nist.gov/global/docs/cabs/designations.html

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 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.

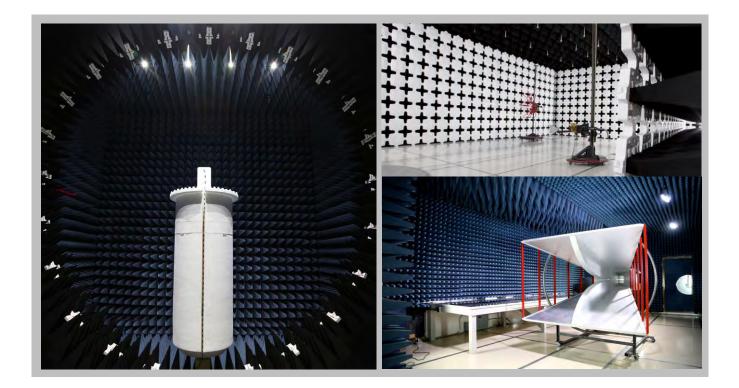
Test	+ MU	<u>- MU</u>
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%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

FACILITIES





California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 98011 (425)984-6600	
		NV	LAP			
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	
		BS	МІ			
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R	
		VC	CI			
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



Client and Equipment Under Test (EUT) Information

Company Name:	Medtronic Inc.
Address:	710 Medtronic Parkway
City, State, Zip:	Fridley, MN 55432
Test Requested By:	Jay Axmann
Model:	Azure IPG
First Date of Test:	February 17, 2016
Last Date of Test:	March 28, 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:

The Azure IPG product family consists of the following models: AZURE S SR MRI AZURE S DR MRI AZURE XT SR MRI AZURE XT DR MRI

S-standard feature model XT- enhanced feature model SR-Single chamber IPG DR-Dual chamber IPG All models have an identical Bluetooth LE radio. Tests were performed on the Azure XT DR; results are representative of all models.

Azure is an Implantable Pulse Generator (IPG) medical device that includes a Bluetooth LE radio.

Radiated testing was performed with the EUT in a body torso simulator at a depth of 2 cm from the side wall, with the following simulant properties:

Simulated Muscle Tissue at 2.44 GHz

Measured Values: Permittivity = 51.51 Conductivity = 2.05

Testing Objective:

To demonstrate compliance of the Bluetooth LE radio to FCC 15.247 requirements.

CONFIGURATIONS



Configuration MDTR0446-1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Azure XT DR	Medtronic Inc.	W1DR01	RNB600111S

Peripherals in test setup boundary					
Description	Manufacturer	Model/Part Number	Serial Number		
Atrial Lead	Medtronic Inc.	5076-65CM	PJN3391150		
Ventricular Lead	Medtronic Inc.	5076-65CM	PJN3624359		

Remote Equipment Outside of Test Setup Boundary						
Description	Manufacturer	Model/Part Number	Serial Number			
Laptop	DELL	Latitude E6410	7KGKYN1			
Laptop Power Adapter	DELL	LA90PE1-01	CN-0J62H3-71615-0BK-1CAA-A01			
Bluetooth Test Instrument	Medtronic Inc.	M960127B001	15B0056			
Near Field Probe	EMCO	7405-902	None			

Cables						
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2	
AC Power	No	0.9m	No	AC Mains	Laptop Power Adapter	
DC Power	No	1.8m	Yes	Laptop Power Adapter	Laptop	
USB	Yes	1.8m	No	Laptop	Bluetooth Test Instrument	
Coax	Yes	0.9m	No	Bluetooth Test Instrument	Near Field Probe	

Configuration MDTR0446-2

Software/Firmware Running during test				
Description	Version			
MFG TIC	1.17			
CRON	3.21			

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Azure XT DR - INC 3.0 DVT Fixture	Medtronic Inc.	W1DR01	RNB308902M

Remote Equipment Outside of Test Setup Boundary							
Description Manufacturer Model/Part Number Serial Number			Serial Number				
Laptop	DELL	Latitude E6410	7KGKYN1				
Laptop Power Adapter	DELL	LA90PE1-01	CN-0J62H3-71615-0BK-1CAA-A01				
Bluetooth Test Instrument	Medtronic Inc.	M960127B001	15B0056				
Near Field Probe	EMCO	7405-902	None				

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DC Power	No	1.8m	Yes	Laptop Power Adapter	Laptop			
USB	Yes	1.8m	No	Laptop	Bluetooth Test Instrument			
Coax	Yes	0.9m	No	Bluetooth Test Instrument	Near Field Probe			





Configuration MDTR0464-1

EUT					
Description	Manufacturer	Model/Part Number	Serial Number		
Azure XT DR	Medtronic Inc.	W1DR01	RNB600111S		

Peripherals in test setup boundary						
Description Manufacturer Model/Part Number Serial Number						
Atrial Lead	Medtronic Inc.	5076-65CM	PJN3391150			
Ventricular Lead	Medtronic Inc.	5076-65CM	PJN3624359			

MODIFICATIONS



Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
		Spurious	Tested as	No EMI suppression	EUT remained at
1	2/17/2016	Radiated	delivered to	devices were added or	Northwest EMC
		Emissions	Test Station.	modified during this test.	following the test.
		Occupied	Tested as	No EMI suppression	EUT remained at
2	2/24/2016	Bandwidth	delivered to	devices were added or	Northwest EMC
		Danuwiutii	Test Station.	modified during this test.	following the test.
		Output	Tested as	No EMI suppression	EUT remained at
3	2/24/2016	Power	delivered to	devices were added or	Northwest EMC
		FOWEI	Test Station.	modified during this test.	following the test.
		Power	Tested as	No EMI suppression	EUT remained at
4	2/24/2016	Spectral	delivered to	devices were added or	Northwest EMC
		Density	Test Station.	modified during this test.	following the test.
		Band Edge	Tested as	No EMI suppression	EUT remained at
5	2/24/2016	Compliance	delivered to	devices were added or	Northwest EMC
		Compliance	Test Station.	modified during this test.	following the test.
		Spurious	Tested as	No EMI suppression	EUT remained at
6	2/24/2016	Conducted	delivered to	devices were added or	Northwest EMC
		Emissions	Test Station.	modified during this test.	following the test.
		Radiated	Tested as	No EMI suppression	EUT remained at
7	3/28/2016	Power	delivered to	devices were added or	Northwest EMC
		(EIRP)	Test Station.	modified during this test.	following the test.
		Spurious	Tested as	No EMI suppression	Scheduled testing
8	3/28/2016	Radiated	delivered to	devices were added or	was completed.
		Emissions	Test Station.	modified during this test.	was completed.

DUTY CYCLE



TEST DESCRIPTION

The Duty Cycle (x) were measured for each of the EUT operating modes. The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

The EUT operates at 100% Duty Cycle.



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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Power Supply - DC	EZ Digital Co., Ltd.	GP-4030D	TQK	NCR	0
Meter - Multimeter	Fluke	117/EFSP	MLR	5/27/2015	36
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/18/2015	12
Attenuator	S.M. Electronics	SA26B-20	RFW	3/10/2015	12
Block - DC	Fairview Microwave	SD3379	AMI	9/18/2015	12
Generator - Signal	Agilent	N5183A	TIK	10/17/2014	36
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	2/10/2015	15

TEST DESCRIPTION

The 6dB occupied bandwidth was measured using 100 kHz resolution bandwidth and 300 kHz video bandwidth.

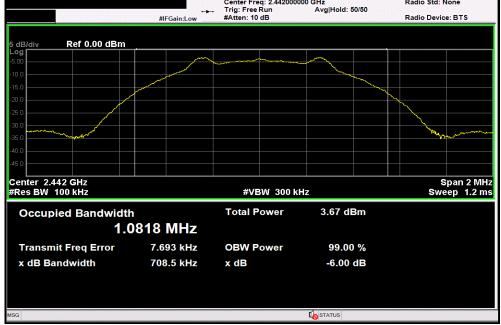
The EUT was set to the channels and modes listed in the datasheet. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer.



FUT	Azure IPG		Work Order:			
Serial Number:				02/24/16		
			Temperature: 22°C			
	Medtronic Inc.					
	Nick Blake		Humidity:			
Project:		Power: Battery	Barometric Pres.:			
Tested by:	Trevor Buls	Job Site:	MN08			
TEST SPECIFICAT	ONS	Test Method				
FCC 15.247:2016		ANSI C63.10:2013				
COMMENTS						
Tested per Medtro						
DEVIATIONS FROM	TEST STANDARD					
None						
Configuration #	2 Signature	revor Buls				
				Limit		
			Value	(≥)	Result	
Low Channel, 2402	ЛНz		699.315 kHz	500 kHz	Pass	
Mid Channel, 2442 I			708.53 kHz	500 kHz	Pass	
High Channel, 2480			720.451 kHz	500 kHz	Pass	
	¥11 12		720.451 KHZ	000 KI IZ	1 433	













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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Power Supply - DC	EZ Digital Co., Ltd.	GP-4030D	TQK	NCR	0
Meter - Multimeter	Fluke	117/EFSP	MLR	5/27/2015	36
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/18/2015	12
Attenuator	S.M. Electronics	SA26B-20	RFW	3/10/2015	12
Block - DC	Fairview Microwave	SD3379	AMI	9/18/2015	12
Generator - Signal	Agilent	N5183A	TIK	10/17/2014	36
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	2/10/2015	15

TEST DESCRIPTION

The transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

Prior to measuring peak transmit power the DTS bandwidth (B) and the transmission pulse duration (T) were measured. Both are required to determine the method of measuring Maximum Conducted Output Power. The transmission pulse duration (T) was measured using a zero span on the spectrum analyzer to see the pulses in the time domain.

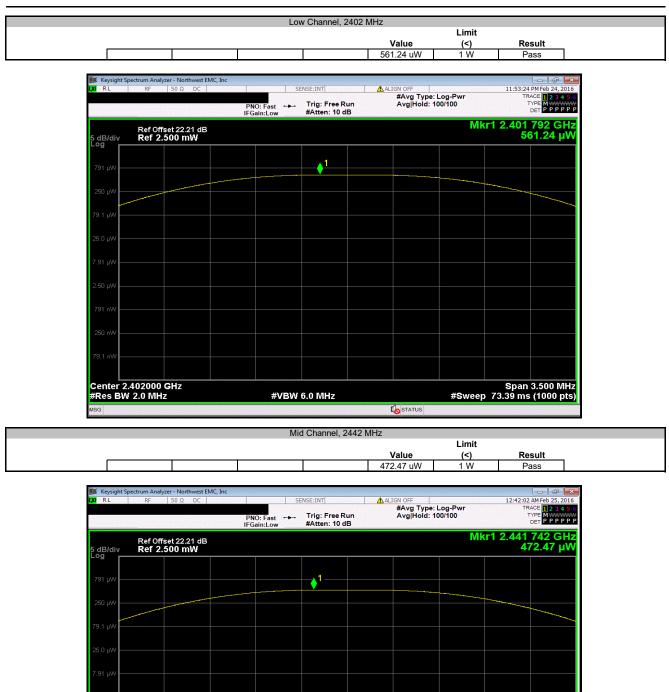
The method found in ANSI C63.10:2013 Section 11.10.2 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio..

De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36 dBm.



EUT:	Azure IPG			Work Order:	MDTR0446	
Serial Number:	RNB308902M			Date:	02/24/16	
	Medtronic Inc.			Temperature:		
	Nick Blake			Humidity:		
Project:				Barometric Pres.:		
	Trevor Buls				MN08	
TEST SPECIFICATI	IONS		Test Method			
FCC 15.247:2016			ANSI C63.10:2013			
COMMENTS						
Tested per Medtror	•					
DEVIATIONS FROM	I TEST STANDARD					
None						
Configuration #	2	Signature	revor Buls			
					Limit	
				Value	(<)	Result
Low Channel, 2402				561.24 uW	1 W	Pass
Mid Channel, 2442 M				472.47 uW	1 W	Pass
High Channel, 2480	MHz			426.76 uW	1 W	Pass





#VBW 6.0 MHz

STATUS

Center 2.442000 GHz #Res BW 2.0 MHz Span 3.500 MHz #Sweep 73.39 ms (1000 pts)



				Limit	
			Value	(<)	Result
			426.76 uW	1 W	Pass
📜 Keysight Spectrum Analyzer - Northwest EMC, In	c				
XIRL RF 50Ω DC		ENSE:INT	ALIGN OFF		12:47:17 AM Feb 25, 2016
			#Avg Type: L	og-Pwr	TRACE 1 2 3 4 5 6
	PNO: Fast +++	Trig: Free Run #Atten: 10 dB	Avg Hold: 10	0/100	TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P
	II Gain.Low			Milard	
Ref Offset 22.21 dB				WIKI	2.479 837 GHz 426.76 μW
5 dB/div Ref 1.500 mW					420.70 µw
474 µW		↓ ¹			
474 100					
152.101					
150 μW					
47.4 μW					
15.0 μW					
4.74 μW					
1.50 μW					
474 nW					
150 nW					
47.4 nW					
47.4 1100					
Center 2.480000 GHz					Span 3.500 MHz
#Res BW 2.0 MHz	#VBW	6.0 MHz		#Sweep 7	3.39 ms (1000 pts)

EMC

RADIATED POWER (EIRP)

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 BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz)

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

MDTR0464 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency 2400 MHz Stop Frequency 2483.5 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)
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	3/1/2016	12
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/7/2015	12
Antenna - Double Ridge	ETS Lindgren	3115	AJA	6/3/2014	24
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	12

MEASUREMENT BANDWIDTHS

Frequency Range	Peak Data	Quasi-Peak Data	Average Data
(MHz)	(kHz)	(kHz)	(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 peak output power was measured with the EUT set to low, medium and high transmit frequencies. A field strength measurement was made of the fundamental with the carrier fully maximized for its highest radiated power.

The final data was converted from field strength to a radiated power value using equations found in ANSI C63.10:2013 Annex G.2

EMC

RADIATED POWER (EIRP)

Project: None Temperature: 22.1 °C Communication: Serial Number: RNB601115 Barometric Press: 1021 mbar Tested by: [Dustin Sparks Configuration: 1	Mork	k Ordori	MDTD	0464		Data	02/2	0/16					
Serial Number Name EUT Azure XT DR Configurations I Customer Meditoria Ic. Attendes Name EUT Power Batery Operating Mode Transmitting BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz) Operating Mode Transmitting BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz) Operating Mode Transmitting BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz) Deviations None 2cm spacing between EUT and wall of tissue simulant tank Comments: 2cm spacing between EUT and wall of tissue simulant tank St Specifications Test Method ANSI C63.10.2013					Tor	Date:			2	7-0	.0	0	
Serial Number: RNB600111S Barometric Pres:: 1021 mbar Tested by: Dustin Sparks Configuration: 1			MN		101					use	mos	Jards	-
EUT: Azure XT DR Configuration: I Customer: Meditonic Inc. Attendes: Nick Bake, Jay Axmann EUT Power: Battery Operating Mode: Transmiting BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz) Deviations: None 2cm spacing between EUT and wall of tissue simulant tank St Specifications: Test Method ANSI C63.10:2013 ANSI C63.10:2013					Baromo					Tested by	r Dustin Sna	arks	_
Configuration: 1 Custome: Medicinal Inc. Attendees: Nick Blake, Jay Axmann EUT Power: Battery Operating Mode: Transmitting BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz) Deviations: None 2cm spacing between EUT and wall of tissue simulant tank ANSI C63.10:2013 st Specifications Ansi C63.10:2013 Comments: Ansi C63.10:2013	Genaria				Daronik		1021	mbai		Tested by	. Dustin Ope	1113	
Customer Meditonic Inc. Attendes None Operating Mode Transmitting BLE - Iow channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz) Deviations None Comments Zem spacing between EUT and wall of tissue simulant tank St Specifications Test Method C 1: 5.247:2016 Antenna Height(s) 1 to 4(m) Results Pass 40<	Config	uration:											
Attendes: Nick Blake, Jay Akmann EUT Power Baltery Operating Mode: Transmitting BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz) Deviations: None Comments: Zem spacing between EUT and wall of tissue simulant tank St Specifications Test Method Cc 15.247:2016 ANSI C63.10:2013 Run # 1 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass 40				nc									
EUT Power Baltery Operating Mode Transmitting BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz) Deviations: None Comments: 20m spacing between EUT and wall of tissue simulant tank st Specifications					nn								
Operating Mode: Transmitting BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz) Deviations: None Comments: Zem spacing between EUT and wall of tissue simulant tank St Specifications C 15.247:2016 Test Method ANSI C63.10:2013 Run # 1 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass go of the second secon				Jay Axilla									
Operating mode. None 2cm spacing between EUT and wall of tissue simulant tank st Specifications C 15.247:2016 Run # 1 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass 40			Tuese and itting		, chonnol /		mid abann	al (0440 M	Uz) and b	iah ahann	al (2490 MU-	•)	
Deviations: Comments: St Specifications C 15.247.2016 Test Method Run # 1 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass 40	Operating	g Mode:		у БLЕ - ЮV	v channei (2402 MHZ)	, miù chani	ei (2442 ivi	nz), and n	ign chann		.)	
St Specifications Test Method C 15.247:2016 ANSI C63.10:2013 Run # 1 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass 40	Dev	viations:											
Run # 1 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass 40	Com	nments:	2cm spacin	g between	EUT and v	wall of tissue	e simulant t	ank					
ANSI C63.10:2013	st Specific	cations						Test Meth	od				
Run # 1 Test Distance (m) 3 Antenna Height(s) 1 to 4(m) Results Pass 40	C 15 247	2016											
20 0 0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -0 -	Run #	1	Test Dis	tance (m)	3	Antenna	Height(s)		1 to 4(m)		Results	Pass	
20 0 0 -0 -0 -0 -0 -0 -0 -0 -0	40 —												_
0 0	_	+											-
0 6 6 6 6 6 6 6 6 6 6 6 6 6													
0 0 0 0 0 0 0 0 0 0 0 0 0 0													
G -20 -40 -60 -80 -200 -40 -40 -60 -80 -200 -40 -40 -40 -40 -40 -40 -40 -40 -40 -	20												
G -20 -40 -40 -60 -80 -200 -201 -40 -40 -40 -40 -40 -40 -40 -40 -40 -40													
G -20 -40 -40 -60 -80 -200 -2410 -2410 -2420 -2430 -2430 -2440 -2450 -2450 -2460 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2480 -2470 -2470 -2480 -2470 -													
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MHz PK ◆ AV ●													
PR * AV •	-80												
PR * AV •	-80)	2410	2420	2	2430	2440	2450)	2460	2470	2480	
	-80)	2410	2420	2	2430		2450)	2460			
Polarity/	-80)	2410	2420	2	2430		2450)	2460			QF

Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
2401.783	1.0	328.0	Horz	PK	3.24E-06	-24.9	36.0	-60.9	Low ch, EUT horz
2442.192	1.0	340.9	Horz	PK	3.08E-06	-25.1	36.0	-61.1	Mid ch, EUT horz
2479.758	1.0	355.9	Horz	PK	2.79E-06	-25.5	36.0	-61.5	High ch, EUT horz
2441.800	1.0	2.0	Horz	PK	7.73E-07	-31.1	36.0	-67.1	Mid ch, EUT on side
2442.317	1.0	9.0	Horz	PK	5.00E-07	-33.0	36.0	-69.0	Mid ch, EUT vert
2442.225	1.0	339.0	Vert	PK	3.88E-07	-34.1	36.0	-70.1	Mid ch, EUT on side
2441.967	1.0	7.0	Vert	PK	3.45E-07	-34.6	36.0	-70.6	Mid ch, EUT vert
2441.683	4.0	260.0	Vert	PK	1.85E-07	-37.3	36.0	-73.3	Mid ch, EUT horz



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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Meter - Multimeter	Fluke	117/EFSP	MLR	5/27/2015	36
Power Supply - DC	EZ Digital Co., Ltd.	GP-4030D	TQK	NCR	0
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/18/2015	12
Block - DC	Fairview Microwave	SD3379	AMI	9/18/2015	12
Attenuator	S.M. Electronics	SA26B-20	RFW	3/10/2015	12
Generator - Signal	Agilent	N5183A	TIK	10/17/2014	36
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	2/10/2015	15

TEST DESCRIPTION

The maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

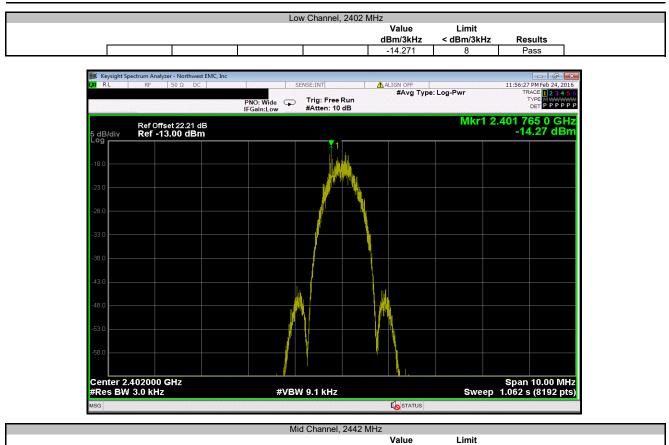
A direct connection was made between the RF output of the EUT and a spectrum analyzer. External attenuation and a DC block were used. The reference level offset on the spectrum analyzer was adjusted to compensate for cable loss and the external attenuation used between the RF output and the spectrum analyzer input.

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.



EUT: Az	ure IPG				Work Order	MDTR0446	
Serial Number: RN						02/24/16	
Customer: Me	edtronic Inc.				Temperature	22°C	
Attendees: Nic	ck Blake				Humidity	26%	
Project: No	one				Barometric Pres.	986.1	
Tested by: Tre	evor Buls			Power: Battery	Job Site	MN08	
EST SPECIFICATION	IS			Test Method			
CC 15.247:2016				ANSI C63.10:2013			
OMMENTS							
	test protocol.						
Tested per Medtronic t DEVIATIONS FROM TE	-						
ested per Medtronic t	-	Signature	Tree	or Buls			
ested per Medtronic t EVIATIONS FROM TE one	EST STANDARD	Signature	Tree	or Buls	Value dBm/3kHz	Limit < dBm/3kHz	Results
ested per Medtronic t EVIATIONS FROM TE one onfiguration #	EST STANDARD	Signature	Tree	or Buls			Results Pass
ested per Medtronic t EVIATIONS FROM TE one	2 z	Signature	Tree	or Buls	dBm/3kHz	< dBm/3kHz	

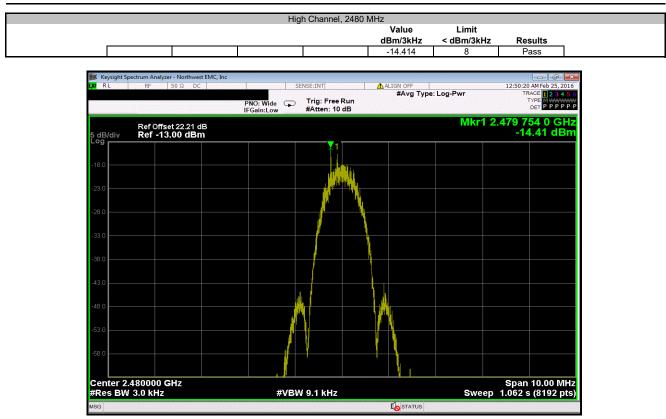




		Value	Limit	
		dBm/3kHz	< dBm/3kHz	Results
		-14.967	8	Pass

RL RF 50 Ω	hwest EMC, Inc	SENSE:INT	ALIGN OFF	12:44:49 AM Feb 25, 20
	PNO: Wide IFGain:Lov	🖵 Trig: Free Run	#Avg Type: Lo	
Ref Offset 22.2 dB/div Ref -13.00 c	21 dB IBm			Mkr1 2.441 893 2 G⊦ -14.97 dBi
3.0				
3.0				
3.0				
3.0				
3.0				
.0				
.0				
3.0				
3.0				
enter 2.442000 GHz				Spap 10.00 M
Res BW 3.0 kHz		#VBW 9.1 kHz		Span 10.00 MI Sweep 1.062 s (8192 pi
3			STATUS	





BAND EDGE COMPLIANCE



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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Meter - Multimeter	Fluke	117/EFSP	MLR	5/27/2015	36
Power Supply - DC	EZ Digital Co., Ltd.	GP-4030D	TQK	NCR	0
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/18/2015	12
Attenuator	S.M. Electronics	SA26B-20	RFW	3/10/2015	12
Block - DC	Fairview Microwave	SD3379	AMI	9/18/2015	12
Generator - Signal	Agilent	N5183A	TIK	10/17/2014	36
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	2/10/2015	15

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized bands were measured with the EUT set to low and high transmit frequencies in each available band. The channels closest to the band edges were selected. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet.

The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

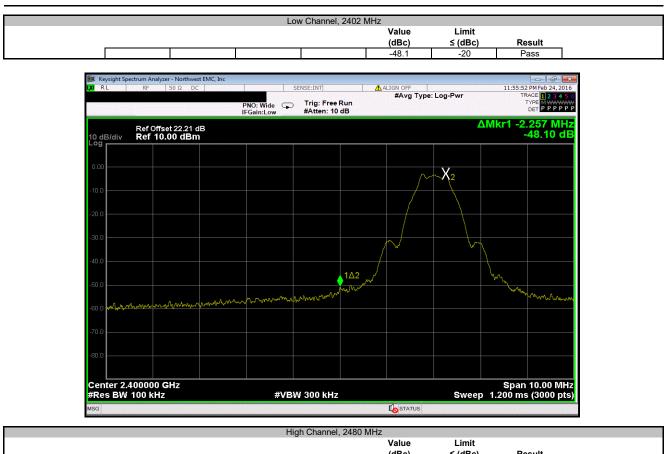


Work Order:	MDTR0446	
Date:	02/24/16	
Temperature:	22°C	
Humidity:	26%	
Barometric Pres.:	986.1	
Job Site:	MN08	
Value	Limit	
(dBc)	≤ (dBc)	Result
-48.1	-20	Pass
-51.53	-20	Pass
	Value (dBc) -48.1	(dBc) ≤ (dBc) -48.1 -20

Report No. MDTR0446 Rev.1

BAND EDGE COMPLIANCE





(dBc) ≤ (dBc) Result -51.53 -20 Pass			value	Limit	
-51.53 -20 Pass			(dBc)	≤ (dBc)	Result
				-20	Pass





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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Power Supply - DC	EZ Digital Co., Ltd.	GP-4030D	TQK	NCR	0
Meter - Multimeter	Fluke	117/EFSP	MLR	5/27/2015	36
Cable	ESM Cable Corp.	TTBJ141 KMKM-72	MNU	9/18/2015	12
Attenuator	S.M. Electronics	SA26B-20	RFW	3/10/2015	12
Block - DC	Fairview Microwave	SD3379	AMI	9/18/2015	12
Generator - Signal	Agilent	N5183A	TIK	10/17/2014	36
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	2/10/2015	15

TEST DESCRIPTION

The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the data rate(s) listed in the datasheet. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.



EUT: Azu				Work Order:		
Serial Number: RNI					02/24/16	
Customer: Med				Temperature:		
Attendees: Nic				Humidity:		
Project: Nor				Barometric Pres.:		
Tested by: Tre			Power: Battery	Job Site:	MN08	
TEST SPECIFICATIONS	S		Test Method			
FCC 15.247:2016			ANSI C63.10:2013			
COMMENTS						
Fested per Medtronic te	test protocol.					
· · · · · · · · · · · · · · · · · · ·						
DEVIATIONS FROM TE	EST STANDARD					
	EST STANDARD					
	EST STANDARD		0			
None	2		Tranger Buls			
None		Signature	Trevor Buls			
None		Signature	Trevor Buls Frequency	Max Value	Limit	
None		Signature		Max Value (dBc)	Limit ≤ (dBc)	Result
None Configuration #	2	Signature	Frequency			Result N/A
None Configuration #	2	Signature	Frequency Range	(dBc)	≤ (dBc)	
None Configuration # Low Channel, 2402 MHz Low Channel, 2402 MHz	2	Signature	Frequency Range Fundamental	(dBc) N/A	≤ (dBc) N/A	N/A
None Configuration # .ow Channel, 2402 MHz .ow Channel, 2402 MHz .ow Channel, 2402 MHz	2	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz	(dBc) N/A -49.53	≤ (dBc) N/A -20	N/A Pass
tone Configuration # .ow Channel, 2402 MHz .ow Channel, 2402 MHz .ow Channel, 2402 MHz did Channel, 2442 MHz	2 Z Z	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	(dBc) N/A -49.53 -48.44	≤ (dBc) N/A -20 -20	N/A Pass Pass
tone Configuration # .ow Channel, 2402 MHz .ow Channel, 2402 MHz .ow Channel, 2402 MHz .did Channel, 2442 MHz .did Channel, 2442 MHz	2 Z Z	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental	(dBc) N/A -49.53 -48.44 N/A	≤ (dBc) N/A -20 -20 N/A	N/A Pass Pass N/A
tone Configuration # Low Channel, 2402 MHz Low Channel, 2402 MHz Jul Channel, 2424 MHz Jild Channel, 2442 MHz Jild Channel, 2442 MHz	2 Z Z	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz	(dBc) N/A -49.53 -48.44 N/A -49.61	≤ (dBc) N/A -20 -20 N/A -20	N/A Pass Pass N/A Pass
tone Configuration # Low Channel, 2402 MHz Low Channel, 2402 MHz Jul Channel, 2424 MHz Jild Channel, 2442 MHz Jild Channel, 2442 MHz	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	(dBc) N/A -49.53 -48.44 N/A -49.61 -47.99	≤ (dBc) N/A -20 -20 N/A -20 -20 -20	N/A Pass Pass N/A Pass Pass
DEVIATIONS FROM TE None Configuration # Low Channel, 2402 MHz Low Channel, 2402 MHz Low Channel, 2402 MHz Mid Channel, 2442 MHz Mid Channel, 2442 MHz High Channel, 2440 MHz Lingh Channel, 2440 MHz	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental	(dBc) N/A -49.53 -48.44 N/A -49.61 -47.99 N/A	≤ (dBc) N/A -20 -20 N/A -20 -20 N/A	



Frequency Max Value Limit Range (dBc) ≤ (dBc) Result Fundamental N/A N/A N/A Resolution Sector Allon off 11:53:48 PHE 34:02 Ref Offset 22.21 dB Trig: Free Run FGsint.low Mkr1 2.402 254 24:01 Ref Offset 22.21 dB -2.78 dI Configuration -2.78 dI Configuratio			w Channel, 2402			
Fundamental N/A N/A N/A Image: Registive Spectrum Analyzer - Northwest BMC, Inc. Image: Registive Spectrum Analyzer - Nor						
Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC, Inc. Image: Section Analyzer - Northweit EMC,						
RL RF 59.0 DC SENSEINT ALIM OF 11:3346 PMFeb 24 PNC: Wide Trig: Free Run #Avg Type: Log-Pwr Trice: PWF Image: Comparison of the sense run of the s	Fundame	ental		N/A	N/A	N/A
RL RF 50.0. DC SENSE.IVIT ALIGN OFF 11:33:46 PM Feb 20 PNO: Wide Trig: Free Run IFGaint.cov Trig: Free Run #Atten: 10 dB #Avg Type: Log-Pwr Trig: Free Run Type: PWP 0 dB/div Ref 0ffset 22:21 dB Mikr1 2:402 254 24 G -2.78 dI 0 dB/div Ref 10:00 dBm -2.78 dI -2.78 dI 10.0						
PRO: Wide (FGain:Low) Trig: Free Run #Atten: 10 dB #Avg Type: Log-Pwr Trig: Free Run #Atten: 10 dB Ref Offset 22.21 dB (2.78 d1) Mkr1 2.402 254 24 G (2.78 d1) 0.00 0.00 0.00 0.01 0.01 0.01 0.02 0.01 0.03 0.01 0.01 0.01 0.02 0.01 0.03 0.01 0.04 0.01 0.05 0.01						
Ref Offset 22.21 dB Mkr1 2.402 254 24 G 0 dB/div Ref 10.00 dBm 0 dB/div Ref 10.00 dBm 0 dB/div Ref 10.00 dBm 10 dB/div 1 200 dB/div 2 200 dB/div 2 200 dB/div 2 200 dB/div 2 200 dB/div 2 <tr< td=""><td>L RF 50 Ω DC</td><td></td><td>ENSE:INT</td><td></td><td>Log-Pwr</td><td>11:53:46 PM Feb 24, 2016 TRACE 1 2 3 4 5</td></tr<>	L RF 50 Ω DC		ENSE:INT		Log-Pwr	11:53:46 PM Feb 24, 2016 TRACE 1 2 3 4 5
Center 2.4020000 GHz #VBW 300 kHz Span 1.000 fM **** ************************************		PNO: Wide 😱 IFGain:Low	Trig: Free Run #Atten: 10 dB			DET P P P P
Cog 1 000 1	Ref Offset 22.21 dB				Mkr1 2.4	402 254 24 GHz
0.00 1				1	1	-2.78 aBn
Center 2.4020000 GHz #Res BW 100 kHz #VBW 300 kHz Low Channel, 2402 MHz						
200 200 400 400 400 400 400 400					↓ 1	
200 200 200 200 200 200 200 200						
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30.0 40.0 50.0						and the second sec
40.0 50.0 60.0 77.0						
40.0 50.0 60.0 77.0						
50.0 60.0 70.0 80.0 Center 2.4020000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.092 ms (8192) MSG Low Channel, 2402 MHz						
500 500 700 700 500 700 500 700 500 700 500 700 500 700 500 5						
60.0 Image: Constraint of the second sec						
700						
700						
-80.0 -80.0 Span 1.000 M Center 2.4020000 GHz #VBW 300 kHz Span 1.000 M #Res BW 100 kHz #VBW 300 kHz Sweep 1.092 ms (8192 M) MsG Low Channel, 2402 MHz						
E00.0						
Center 2.4020000 GHz #Res BW 100 kHz #VBW 300 kHz Sweep 1.092 ms (8192 Msg Low Channel, 2402 MHz						
Center 2.4020000 GHz #Res BW 100 kHz Msg Low Channel, 2402 MHz						
MSG Low Channel, 2402 MHz						
MSG Low Channel, 2402 MHz						
MSG STATUS					•	Span 1.000 MHz
Low Channel, 2402 MHz	s BW 100 kHz	#VB\	W 300 kHz		Sweep 1	.092 ms (8192 pts
				STATUS		
Frequency Max Value Limit		Lo	w Channel, 2402			
Range (dBc) ≤ (dBc) Result 30 MHz - 12.5 GHz -49.53 -20 Pass			1			

	ectrum Analyzer - Nort	hwest EMC, Inc							
KI RL	RF 50 Ω	DC		SENSE:INT	<u>/</u>	ALIGN OFF			10 PM Feb 24, 201
			PNO: Fast (IFGain:Low	Trig: Fre #Atten: 1		#Avg Type	: Log-Pwr		TYPE M WWWW DET P P P P P
0 dB/div	Ref Offset 22.2 Ref 10.00 di	21 dB Bm						Mkr1 3. -5	744 7 GH 2.31 dBn
0.00									
10.0									
20.0									
80.0									
10.0									
50.0		A STREET OF STREET		والمقار والمارين	القاملية. 11. بالتأكمان	in a sur an it for a state of	فأندره أستندر ومطالقاته	and grant distribution in the	lette die des siddieses w
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0.0									
itart 30 N Res BW	/IHz 100 kHz		#\	/BW 300 kH	z		Sw	Stop /eep 1.192	12.500 GH s (8192 pt
SG						STATUS			

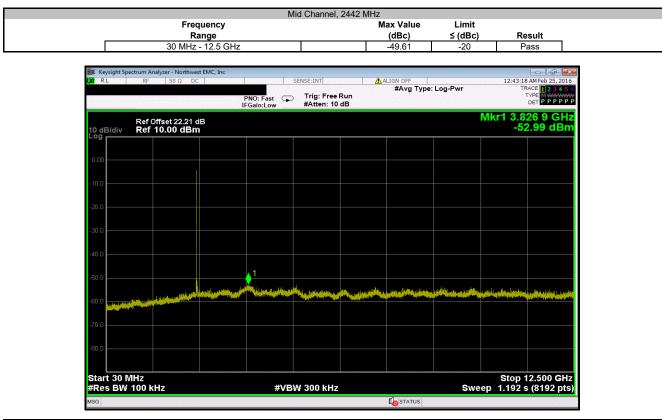


		L	ow Channel,				
	Frequency				Max Value	Limit	
	Range				(dBc)	≤ (dBc)	Result
	12.5 GHz - 25 GH	Z			-48.44	-20	Pass
	Analyzer - Northwest EMC, Inc		anuar um			444444444444444444444444	
LXI RL RF	50 Ω DC		SENSE:INT	4	ALIGN OFF #Avg Type:	Log-Pwr	11:55:36 PM Feb 24, 201 TRACE 2 3 4 5
		PNO: Fast 🖵 IFGain:Low	Trig: Free F #Atten: 10 c				TRACE 1 2 3 4 5 TYPE M WWW DET P P P P P
Ref	Offset 22.21 dB					Mk	r1 24.145 4 GH -51.22 dBn
10 dB/div Rei	f 10.00 dBm				1		-01.22 (10)
0.00							
-10.0							
-20.0							
-30.0							
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-40.0							
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-50.0							• ¹
to be a state	فيتستعيم بليمان وعرابا يمري والتنو يتنتقن فأق	التاطلين برا وفائلت فمصرون	La adressate a superior al alte	والقساب والل	وحلولية بتبر ويتتج بالخيطية فروة	ويواجعه يتباغ فاعتمره ويه	المتعادلة المتعناه أحفيه ومالا المحمارين
-60.0	a second de la de la companya de la	within a set of starting and the set of	offering states and second				
-70.0							
-80.0							
Start 12.500 G							Stop 25.000 GH
#Res BW 100	kHz	#VB	W 300 kHz			Swee	o 1.195 s (8192 pts
MSG							
		Ν	1id Channel, 2	2442 MH ,	7		
	Frequency				- Max Value	Limit	
	Range				(dBc)	≤ (dBc)	Result
	Fundamental				N/A	N/A	N/A

Mid Channel, 2442 MHz						
Frequency			Max Value	Limit		
Range			(dBc)	≤ (dBc)	Result	
Fundamental			N/A	N/A	N/A	

Ceysight Spectrum Analyzer - Northwest EMC, Inc RL RF 50 Ω DC	5	ENSE:INT	ALIGN OFF		12:42:2	3 AM Feb 25, 20
	PNO: Wide 😱 IFGain:Low	Trig: Free Run #Atten: 10 dB	#Avg Type: L	og-Pwr	т	RACE 1234 TYPE MWWW DET PPPP
Ref Offset 22.21 dB B/div Ref 10.00 dBm				Mkr1	2.442 24	18 14 GH 3.38 dBi
0	-			1		
0						
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0						
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0						
nter 2.4420000 GHz es BW 100 kHz	#VBV	V 300 kHz		Swee	Spar p 1.092 m	1.000 M s (8192 p





Mid Channel, 2442 MHz					
Frequency	Max Value	Limit			
Range	(dBc)	≤ (dBc)	Result		
12.5 GHz - 25 GHz	-47.99	-20	Pass		

RL RF 50 Ω DC		SENSE:INT	ALIGN OFF		12:44:14 AM Feb 25, 201
	PNO: Fast G		#Avg Type:	Log-Pwr	TRACE 1 2 3 4 5 TYPE MWWW DET P P P P F
Ref Offset 22.21 dB 0 dB/div Ref 10.00 dBm				М	kr1 21.947 9 GH -51.36 dBr
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				1	
		an a	ويرجعونه المترافعة والمتحد والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع والمراجع	الأفلاق ووالعراقة المرود	and a second state of the
			kalefation of a statistic sector (لالتظيرين الكالمحديث وبال	
0.0					
0.0					
tart 12.500 GHz			I		Stop 25.000 GH
Res BW 100 kHz	#VB	W 300 kHz	STATUS	Swee	ep 1.195 s (8192 pt



		High Channel,			
	Frequency		Max Value	Limit	
	Range		(dBc)	≤ (dBc)	Result
	Fundamental		N/A	N/A	N/A
Keysight Spectrum Analyze	r - Northwest EMC, Inc				
	50 Ω DC	SENSE:INT	ALIGN OFF		12:47:38 AM Feb 25, 2016
	PNO: IFGai	Wide Trig: Free F n:Low #Atten: 10 d		Log-Pwr	TRACE 1 2 3 4 5 6 TYPE M WWWW DET P P P P P P
Ref Offse 10 dB/div Ref 10.	et 22.21 dB 00 dBm			Mkr1 2.4	480 254 73 GHz -3.80 dBm
Log				4	
0.00					
-10.0					man and a second
-20.0					
-30.0					
-40.0					
-50.0					
-60.0					
-70.0					
-80.0					
Center 2.4800000 #Res BW 100 kHz	GHZ	#VBW 300 kHz		Sweep 1	Span 1.000 MHz .092 ms (8192 pts)
MSG			STATUS		
	-	High Channel,			
	Frequency		Max Value	Limit	Desult
			(dBc)	<u>≤ (dBc)</u>	Result
	30 MHz - 12.5 GHz		-48.45	-20	Pass

	ctrum Analyzer - Northwe								
UXI RL	RF 50 Ω DC	F	PNO: Fast 🖵	SENSE:INT Trig: Free #Atten: 10	Run	#Avg Type:		TF	AM Feb 25, 2016 ACE 1 2 3 4 5 6 TYPE M WWWW DET P P P P P P
10 dB/div Log	Ref Offset 22.21 o Ref 10.00 dBm							Mkr1 3.8 -52	11 6 GHz 2.25 dBm
0.00									
-10.0									
-20.0									
-30.0									
-40.0									
-50.0		فأفلس بالمتلقظ وحمساط	1 Miliana di kami	han a supplicit of the supplicity of the supplic	ر ماند. بن بن اطغ		ومططقة والدارية ومعاقفه	والمتحر المعاملة المتأوي	اللافر ورويون الترابي
-60.0		in the second	in an air ann an Air Charach		and the second statements			andelle sedile bareats.	and a second
-70.0									
Start 30 Ⅳ #Res BW			#VB	W 300 kHz			Swe	Stop 1 ep 1.192 s	2.500 GHz (8192 pts)
MSG									



	Hi	gh Channel, 248			
Frequency			Max Value	Limit	
Range		-	(dBc)	≤ (dBc)	Result
12.5 GHz - 25 GH	Ζ		-46.21	-20	Pass
Keysight Spectrum Analyzer - Northwest EMC, Inc					
KL RF 50Ω DC		SENSE:INT	ALIGN OFF #Avg Type		12:49:29 AM Feb 25, 2016 TRACE 1 2 3 4 5 6
	PNO: Fast	Trig: Free Run	#Avg Type	. Log-Fwi	TYPE M WWWWW DET P P P P P P
	IFGain:Low	#Atten: 10 dB			
Ref Offset 22.21 dB				Mkr	1 24.513 2 GHz
10 dB/div Ref 10.00 dBm					-50.01 dBm
Log					
0.00					
0.00					
-10.0					
-10.0					
-20.0					
-20.0					
-30.0					
-30.0					
-40.0					
-40.0					.1
-50.0					· · · · · · · · · · · · · · · · · · ·
		فأفاقا والمعادية والمراجع والمراجع	addition of the stands believe and	a lot finder built of birth ab	والمواجد والملو والمتحالية فيبالا فسيته فالمسر وحالة
	and a substantian design of the local distance of the local distan	the second s			
-70.0					
-80.0					
Start 12.500 GHz #Res BW 100 kHz	#\/D\	W 300 kHz		Surear	Stop 25.000 GHz 1.195 s (8192 pts)
#Res DW TOURHZ	#VB\	W 300 KHZ	STATUS	Sweep	1. 195 S (8192 pts)

EMC

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 BLE - low channel (2402 MHz), mid channel (2442 MHz), and high channel (2480 MHz)

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

MDTR0464 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz
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Stop Frequency 26500 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
Filter - Low Pass	Micro-Tronics	LPM50004	LFK	10/21/2015	12
Filter - High Pass	Micro-Tronics	HPM50111	LFN	10/21/2015	12
Attenuator	Fairview Microwave	SA18E-20	TWZ	10/21/2015	12
Amplifier - Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	9/18/2015	12
Cable	Northwest EMC	18-26GHz Standard Gain Horn Cable	MNP	9/18/2015	12
Antenna - Standard Gain	ETS Lindgren	3160-09	AHG	NCR	0
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	3/1/2016	12
Antenna - Standard Gain	ETS Lindgren	3160-08	AIQ	NCR	0
Cable	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	12/7/2015	12
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	3/1/2016	12
Antenna - Standard Gain	ETS Lindgren	3160-07	AXP	NCR	0
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVT	3/1/2016	12
Cable	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	12/7/2015	12
Antenna - Double Ridge	ETS Lindgren	3115	AJA	6/3/2014	24
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	AVO	12/10/2015	12
Cable	ESM Cable Corp.	Bilog Cables	MNH	12/7/2015	12
Antenna - Biconilog	Teseq	CBL 6141B	AYD	1/6/2016	24
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2016	12

MEASUREMENT BANDWIDTHS

Frequency Range	Peak Data	Quasi-Peak Data	Average Data
(MHz)	(kHz)	(kHz)	(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 highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization. A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.



SPURIOUS RADIATED EMISSIONS

14/00	بير مامير ما										
Wor	rk Order:		Date:	03/28/16	29-1	indpa	0				
	Project:		Temperature: Humidity:	22.4 °C 27% RH	Just	mopa	rito				
	Job Site: Number:		Barometric Pres.:	1022 mbar	Tested b	Tastad huu Dustin Caselys					
Serial			Barometric Pres.:	TUZZ IIIDAI	Tested b	Tested by: Dustin Sparks					
Canfie		Azure XT DR									
	guration:										
		Medtronic Inc.									
At	tendees:	Nick Blake, Jay Axma	inn								
EU	T Power:	Battery			hannel (2442 MHz), and high channel (2480 MHz)						
Operatin	ng Mode:	-	w channel (2402 MHz), r	nid channel (24	42 MHz), and high channe	el (2480 MHz)					
De	viations:										
Co	mments:		EUT and wall of tissue	simulant tank							
est Specifi	ications			Test	Method						
CC 15.247	2016				C63.10:2013						
Run #	16	Test Distance (m)	3 Antenna	Height(s)	1 to 4(m)	Results	Pass				
80 T	16	Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
	16	Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
	16	Test Distance (m)	3 Antenna	Height(s)	1 to 4(m)	Results	Pass				
	16	Test Distance (m)	3 Antenna	Height(s)	1 to 4(m)	Results	Pass				
80	16	Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80	16	Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80	16	Test Distance (m)	3 Antenna I	leight(s)	1 to 4(m)	Results	Pass				
80	16	Test Distance (m)	3 Antenna	Height(s)	1 to 4(m)	Results	Pass				
80	16	Test Distance (m)	3 Antenna	Height(s)	1 to 4(m)	Results	Pass				
80 — 70 — 60 —	16	Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80	16	Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80	16	Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80	16	Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80	16	Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80		Test Distance (m)	3 Antenna	Height(s)	1 to 4(m)	Results	Pass				
80		Test Distance (m)	3 Antenna	Height(s)	1 to 4(m)	Results Image: state	Pass				
80 70 60 50 40		Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80 70 60 50 40		Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80 70 60 50 40		Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80 70 60 50 40 30		Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80 70 60 50 40 30		Test Distance (m)	3 Antenna	Height(s)	1 to 4(m)	Results	Pass				
80		Test Distance (m)	3 Antenna	Height(s)	1 to 4(m)	Results Image: state	Pass				
80 70 60 50 40 30 20		Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results Image: state	Pass				
80 70 60 50 40 30 20		Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80 70 60 50 40 30 20 10		Test Distance (m)	3 Antenna	leight(s)	1 to 4(m)	Results	Pass				
80 70 60 50 40 30 20 10 0			3 Antenna								
80 70 60 50 40 30 20 10		Test Distance (m)	3 Antenna		1 to 4(m)		Pass				

Freq	Amplitude	Factor	Antenna Height	Azimuth	Test Distance	External Attenuation	Polarity/ Transducer Type	Detector	Distance Adjustment	Adjusted	Spec. Limit	Compared to Spec.	
(MHz)	(dBuV)	(dB)	(meters)	(degrees)	(meters)	(dB)			(dB)	(dBuV/m)	(dBuV/m)	(dB)	Comments
2487.600	31.2	-3.4	1.0	304.0	3.0	20.0	Vert	AV	0.0	47.8	54.0	-6.2	High ch, EUT vert
2487,250	31.2	-3.4	1.0	160.1	3.0	20.0	Horz	AV	0.0	47.8	54.0	-6.2	High ch, EUT horz
2486.883	31.2	-3.4	3.2	108.0	3.0	20.0	Vert	AV	0.0	47.8	54.0	-6.2	High ch, EUT horz
2485.867	31.2	-3.4	2.8	101.1	3.0	20.0	Horz	AV	0.0	47.8	54.0	-6.2	High ch, EUT on side
2487.642	31.1	-3.4	1.2	185.1	3.0	20.0	Vert	AV	0.0	47.7	54.0	-6.3	High ch, EUT on side
2487.150	31.1	-3.4	1.0	281.0	3.0	20.0	Horz	AV	0.0	47.7	54.0	-6.3	High ch, EUT vert
2388.508	30.8	-3.7	1.0	218.0	3.0	20.0	Vert	AV	0.0	47.1	54.0	-6.9	Low ch, EUT vert
7324.742	31.4	13.3	1.0	46.0	3.0	0.0	Horz	AV	0.0	44.7	54.0	-9.3	Mid ch, EUT horz
7327.750	31.3	13.3	1.0	96.0	3.0	0.0	Vert	AV	0.0	44.6	54.0	-9.4	Mid ch, EUT horz
7442.500	30.9	13.5	1.0	122.0	3.0	0.0	Vert	AV	0.0	44.4	54.0	-9.6	High ch, EUT horz
7442.017	30.9	13.5	3.0	23.1	3.0	0.0	Horz	AV	0.0	44.4	54.0	-9.6	High ch, EUT horz
2486.108	44.6	-3.4	1.0	160.1	3.0	20.0	Horz	PK	0.0	61.2	74.0	-12.8	High ch, EUT horz
2483.633	43.0	-3.4	1.0	281.0	3.0	20.0	Horz	PK	0.0	59.6	74.0	-14.4	High ch, EUT vert
2484.175	42.6	-3.4	3.2	108.0	3.0	20.0	Vert	PK	0.0	59.2	74.0	-14.8	High ch, EUT horz
2485.583	42.4	-3.4	1.2	185.1	3.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	High ch, EUT on side
2484.692	42.2	-3.4	2.8	101.1	3.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	High ch, EUT on side
2487.542	42.1	-3.4	1.0	304.0	3.0	20.0	Vert	PK	0.0	58.7	74.0	-15.3	High ch, EUT vert
2387.608	42.1	-3.7	1.0	218.0	3.0	20.0	Vert	PK	0.0	58.4	74.0	-15.6	Low ch, EUT vert
4962.433	31.7	5.6	1.6	358.9	3.0	0.0	Horz	AV	0.0	37.3	54.0	-16.7	High ch, EUT horz
4962.467	31.6	5.6	1.2	344.9	3.0	0.0	Vert	AV	0.0	37.2	54.0	-16.8	High ch, EUT horz
4962.242	31.6	5.6	1.4	325.9	3.0	0.0	Vert	AV	0.0	37.2	54.0	-16.8	High ch, EUT vert
4962.217	31.6	5.6	1.0	279.0	3.0	0.0	Vert	AV	0.0	37.2	54.0	-16.8	High ch, EUT on side

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
4962.142	31.6	5.6	1.0	339.0	3.0	0.0	Horz	AV	0.0	37.2	54.0	-16.8	High ch, EUT on side
4961.850	31.6	5.6	1.0	99.0	3.0	0.0	Horz	AV	0.0	37.2	54.0	-16.8	High ch, EUT vert
4885.933	31.7	5.4	1.9	134.1	3.0	0.0	Horz	AV	0.0	37.1	54.0	-16.9	Mid ch, EUT horz
4884.867	31.6	5.4	1.6	325.9	3.0	0.0	Vert	AV	0.0	37.0	54.0	-17.0	Mid ch, EUT horz
4801.867	31.8	5.2	1.0	91.1	3.0	0.0	Horz	AV	0.0	37.0	54.0	-17.0	Low ch, EUT horz
4801.967	31.6	5.2	1.0	271.0	3.0	0.0	Vert	AV	0.0	36.8	54.0	-17.2	Low ch, EUT horz
7440.625	42.6	13.5	1.0	122.0	3.0	0.0	Vert	PK	0.0	56.1	74.0	-17.9	High ch, EUT horz
7327.400	42.7	13.3	1.0	46.0	3.0	0.0	Horz	PK	0.0	56.0	74.0	-18.0	Mid ch, EUT horz
7324.175	42.4	13.3	1.0	96.0	3.0	0.0	Vert	PK	0.0	55.7	74.0	-18.3	Mid ch, EUT horz
7441.833	42.0	13.5	3.0	23.1	3.0	0.0	Horz	PK	0.0	55.5	74.0	-18.5	High ch, EUT horz
12401.530	29.2	5.5	1.0	130.1	3.0	0.0	Vert	AV	0.0	34.7	54.0	-19.3	High ch, EUT horz
12402.000	29.1	5.5	1.0	41.1	3.0	0.0	Horz	AV	0.0	34.6	54.0	-19.4	High ch, EUT horz
12207.600	30.1	-0.7	1.0	312.9	3.0	0.0	Vert	AV	0.0	29.4	54.0	-24.6	Mid ch, EUT horz
12207.730	30.0	-0.7	1.0	191.1	3.0	0.0	Horz	AV	0.0	29.3	54.0	-24.7	Mid ch, EUT horz
12399.410	29.3	0.0	1.0	0.0	3.0	0.0	Vert	AV	0.0	29.3	54.0	-24.7	High ch, EUT horz
12397.720	29.3	0.0	1.0	247.9	3.0	0.0	Horz	AV	0.0	29.3	54.0	-24.7	High ch, EUT horz
4962.283	43.6	5.6	1.0	99.0	3.0	0.0	Horz	PK	0.0	49.2	74.0	-24.8	High ch, EUT vert
12008.780	30.4	-1.4	1.0	224.1	3.0	0.0	Vert	AV	0.0	29.0	54.0	-25.0	Low ch, EUT horz
12008.040	30.3	-1.4	1.0	336.0	3.0	0.0	Horz	AV	0.0	28.9	54.0	-25.1	Low ch, EUT horz
4960.675	43.1	5.6	1.0	339.0	3.0	0.0	Horz	PK	0.0	48.7	74.0	-25.3	High ch, EUT on side
4957.925	43.1	5.6	1.2	344.9	3.0	0.0	Vert	PK	0.0	48.7	74.0	-25.3	High ch, EUT horz
4961.258	43.0	5.6	1.0	279.0	3.0	0.0	Vert	PK	0.0	48.6	74.0	-25.4	High ch, EUT on side
4885.925	43.0	5.4	1.9	134.1	3.0	0.0	Horz	PK	0.0	48.4	74.0	-25.6	Mid ch, EUT horz
4962.358	42.7	5.6	1.4	325.9	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	High ch, EUT vert
4883.708	42.9	5.4	1.6	325.9	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Mid ch, EUT horz
4802.292	43.1	5.2	1.0	271.0	3.0	0.0	Vert	PK	0.0	48.3	74.0	-25.7	Low ch, EUT horz
4803.392	43.0	5.2	1.0	91.1	3.0	0.0	Horz	PK	0.0	48.2	74.0	-25.8	Low ch, EUT horz
4958.150	42.5	5.6	1.6	358.9	3.0	0.0	Horz	PK	0.0	48.1	74.0	-25.9	High ch, EUT horz
12401.750	41.6	5.5	1.0	130.1	3.0	0.0	Vert	PK	0.0	47.1	74.0	-26.9	High ch, EUT horz
12400.770	40.7	5.5	1.0	41.1	3.0	0.0	Horz	PK	0.0	46.2	74.0	-27.8	High ch, EUT horz
12398.840	41.5	0.0	1.0	247.9	3.0	0.0	Horz	PK	0.0	41.5	74.0	-32.5	High ch, EUT horz
12208.030	42.0	-0.7	1.0	191.1	3.0	0.0	Horz	PK	0.0	41.3	74.0	-32.7	Mid ch, EUT horz
12209.930	41.7	-0.7	1.0	312.9	3.0	0.0	Vert	PK	0.0	41.0	74.0	-33.0	Mid ch, EUT horz
12007.600	42.3	-1.4	1.0	336.0	3.0	0.0	Horz	PK	0.0	40.9	74.0	-33.1	Low ch, EUT horz
12398.980	40.8	0.0	1.0	0.0	3.0	0.0	Vert	PK	0.0	40.8	74.0	-33.2	High ch, EUT horz
12012.000	42.0	-1.4	1.0	224.1	3.0	0.0	Vert	PK	0.0	40.6	74.0	-33.4	Low ch, EUT horz