

Medtronic Inc. Reveal LINQ<sup>™</sup> FCC 95I:2013

Report #: MDTR0228.1



Report Prepared By Northwest EMC Inc.

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

California – Minnesota – Oregon – New York – Washington



## **CERTIFICATE OF TEST**

## Last Date of Test: June 11, 2013 Medtronic Inc. Model: Reveal LINQ

## **Emissions**

Test Description	Specification	Test Method	Pass/Fail
Radiated Power (EIRP)	FCC 95I:2013, FCC 2.1046:2013	ANSI/TIA/EIA-603-C:2004	Pass
Spurious Radiated Emissions	FCC 95I:2013, FCC 2.1053:2013	ANSI/TIA/EIA-603-C:2004	Pass
Emission Bandwidth	FCC 95I:2013, FCC 2.1049:2013	ANSI/TIA/EIA-603-C:2004	Pass
Emission Mask	FCC 95I:2013, FCC 2.1049:2013	ANSI/TIA/EIA-603-C:2004	Pass
Frequency Stability	FCC 95I:2013, FCC 2.1055:2013	ANSI/TIA/EIA-603-C:2004	Pass

## **Deviations From Test Standards**

None

Approved By:

Tim O'Shea, Operations Manager

NVLAP Lab Code: 200881-0

Test Facility

The measurement facility used to collect the data is located at:

Northwest EMC, Inc. 9349 W Broadway Ave. Brooklyn Park, MN 55445

Phone: (763) 425-2281 Fax: (763) 424-3469

This site has been fully described in a report filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada (Site filing #2834E-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.

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 Number	Description	Date	Page Number
00	None		
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## **Barometric Pressure**

The recorded barometric pressure has been normalized to sea level.



## **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







Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	<b>California</b> Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	<b>New York</b> Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Minnesota Labs MN01-08 9349 W Broadway Ave. Brooklyn Park, MN 55445 (763) 425-2281	Washington Labs NC01-05,SU02,SU07 19201 120 <sup>th</sup> 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	2834C-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:	8200 Coral Sea St NE
City, State, Zip:	Mounds View, MN 55112
Test Requested By:	Yogi Shah
Model:	Reveal LINQ
First Date of Test:	June 6, 2013
Last Date of Test:	June 11, 2013
Receipt Date of Samples:	June 11, 2013
Equipment Design Stage:	Production
Equipment Condition:	New

## Information Provided by the Party Requesting the Test

## Functional Description of the EUT (Equipment Under Test):

The Medtronic Reveal LINQ Insertable Cardiac Monitor is a programmable device which continuously monitors a patient's ECG and other physiological parameters. The Reveal LINQ records cardiac information in response to automatically detected arrhythmias and patient activation. The device communicates via an inductive transceiver and a MEDS band transmitter operating in the lower MEDS wing band of 401-402 MHz

## **Testing Objective:**

To demonstrate compliance with the MEDS lower wing band frequency of operation at 401.5 MHz  $\pm$  0.14 MHz for FCC Part 95. The conducted output power and conducted spurious emissions required by 2.1046 and 2.1051 cannot be run on the device because the device is a small sealed system with no direct connect possibility. Instead, radiated power and radiated spurious emissions were performed to demonstrate compliance. The EUT will shut down RF transmission before a low voltage condition is reached, therefore no voltage conditions were tested in frequency stability because the RF transmission would cease.

## **Customer Provided Information:**

Simulated Biological Solution Measurements				
Material/Liquid Type	Date Measured	Permittivity e' @ 403.5 MHz	Sigma - σ (Calculated Conductivity)	
Simulated Biological Solution	11Jul-2013	57.98	0.88	



## Configuration MDTR0228-1

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
ICM	Medtronic Inc	LNQ11	RLA600209S

## Configuration MDTR0228-2

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
ICM	Medtronic Inc	LNQ11	RLA600212S

## Configuration MDTR0228-3

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
ICM	Medtronic Inc	LNQ11	RLA600216S



## **MODIFICATIONS**

## **Equipment Modifications**

Item	Date	Test	Modification	Note	Disposition of EUT
		Field	Tested as	No EMI suppression	EUT remained at
1	6/6/2013	Strength of	delivered to	devices were added or	Northwest EMC
		Fundamental	Test Station.	modified during this test.	following the test.
		Spurious	Tested as	No EMI suppression	EUT remained at
2	6/6/2013	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
3	6/11/2013	Bandwidth	delivered to	devices were added or	Northwest EMC
		Danuwiutin	Test Station.	modified during this test.	following the test.
		Emission	Tested as	No EMI suppression	EUT remained at
4	6/11/2013	Bandwidth	delivered to	devices were added or	Northwest EMC
		Danuwiutin	Test Station.	modified during this test.	following the test.
		Frequency	Tested as	No EMI suppression	EUT remained at
5	6/11/2013	Stability	delivered to	devices were added or	Northwest EMC
		Stability	Test Station.	modified during this test.	following the test.
		Emissions	Tested as	No EMI suppression	Scheduled testing
6	6/11/2013	Mask	delivered to	devices were added or	was completed.
		IVIASN	Test Station.	modified during this test.	was completed.



## 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, 401.5 MHz ± 0.14 MHz

#### POWER SETTINGS INVESTIGATED

Battery

#### **CONFIGURATIONS INVESTIGATED**

MDTR0228 - 1 MDTR0228 - 2 MDTR0228 - 3

## FREQUENCY RANGE INVESTIGATED

Start Frequency 401 MHz

Stop Frequency 406 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
Pre-Amplifier	Miteq	AM-1616-1000	PAD	5/20/2013	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	5/20/2013	12 mo
Antenna, Bilog	Teseq	CBL 6141B	AYD	12/17/2012	12 mo
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24 mo

#### **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**

Per 95.627(g)(3), the maximum EIRP for a MEDS transmitter is 250nW. The Field Strength of the Fundamental data was converted to EIRP with the formula based upon the Friis transmission equation modified with 6 dB removed due to reflections from the ground plane: EIRP =  $((E/2)*d)^2/30$  where E is V/m and d = distance = 3m, and EIRP = W.

The Field Strength of the Fundamental was measured in the far-field at an FCC Listed Semi-anechoic Chamber. Spectrum analyzer and linearly polarized antennas were used to measure the radiated field strength of the fundamental.

The orientation of the EUT and measurement antenna were manipulated to maximize the level of emissions. The turntable azimuth was varied to maximize the level of radiated emissions. The height of the measurement antenna was also varied from 1 to 4 meters. The amplitude and frequency of the emissions were noted.

The EUT was configured to transmit in a fixture that simulates the human torso. The dimensions of the test fixture and the characteristics of the tissue substitute material met the requirements 95.627(i) and FCC KDB 617965. The height of the transmitter was 1.5-meter above the reference ground plane.

## **Radiated Power (EIRP)**

	Wor	k Order:	МПТ	R0228		Date:	06/0	6/13		1		0	
		Project:		one	Ten	nperature:	21.7		-1	-	1.		2
-		ob Site:		N05		Humidity:	43.99		0				
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			Reveal LI	٧Q									
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			Medtronic										
		Power:	Nick Blake	;									
			Tronomitti	ng, 401.5 N	1Hz + 0 14	MHz							
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			Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)		Comments	
			401.519	1.7	0.0	Vert	6.26E-09	-52.0	-36.0	-16.0	EUT Vertical		
			401.527 401.512	1.9 1.2	220.0 55.0	Horz Horz	1.40E-09 2.07E-10	-58.5 -66.8	-36.0 -36.0	-22.5 -30.8	EUT Vertical EUT on Side		
			401.522	1.1	255.0	Horz	9.26E-11	-70.3	-36.0	-34.3	EUT Horizon	tal	
			401.530 401.538	1.0 1.0	351.0 344.0	Vert Vert	9.05E-11 5.46E-11	-70.4 -72.6	-36.0 -36.0	-34.4 -36.6	EUT Horizon EUT on Side		
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## **Radiated Power (EIRP)**

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		b Site:		N05		Humidity:	43.9%		U U				
Seri	ial Nu	mber:		00212S	Barom	etric Pres.:	1015.3	mbar		Tested by:	Johnny Can	delas	
			Reveal LIN	Q									
Cor		ration:											
	Cust	omer:	Medtronic I	nc.									
	Atter	ndees:	Nick Blake										
			Battery										
		Mode:	Transmittin	g, 401.5 MI	Hz ± 0.14 N	1Hz							
	Devia	ations:											
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est Spe		tions						Test Meth					
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			Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)		Comments	
			401.516 401.530 401.524 401.514 401.543 401 529	1.6 1.9 1.2 1.2 1.0 1.0	359.0 233.0 42.0 39.0 339.0 336.0	Vert Horz Horz Horz Vert	7.19E-09 1.65E-09 3.69E-10 2.80E-10 9.93E-11 6.26E-11	-51.4 -57.8 -64.3 -65.5 -70.0 -72.0	-36.0 -36.0 -36.0 -36.0 -36.0 -36.0	-15.4 -21.8 -28.3 -29.5 -34.0 -36.0	EUT Vertical EUT Vertical EUT on Side EUT Horizonta EUT Horizonta		

6.26E-11

Vert

-72.0

-36.0

-36.0 EUT on Side

## **Radiated Power (EIRP)**

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					1.453			2.1			91.			Но			.16E			69.3			36.0			33.3		EUT								
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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, 401.5 MHz ± 0.14 MHz

#### POWER SETTINGS INVESTIGATED

Battery

#### **CONFIGURATIONS INVESTIGATED**

MDTR0228 - 1 MDTR0228 - 2 MDTR0228 - 3

#### FREQUENCY RANGE INVESTIGATED

Start Frequency 30 MHz

Stop Frequency 5 GHz

## 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
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	5/20/2013	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	5/20/2013	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	6/29/2011	36 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAD	5/20/2013	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	5/20/2013	12 mo
Antenna, Bilog	Teseq	CBL 6141B	AYD	12/17/2012	12 mo
Spectrum Analyzer	Agilent	E4446A	AAT	6/28/2012	24 mo

#### 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**

For each configuration, the spectrum was scanned throughout the specified range. 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, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.10:2009). A preamp was used for this test in order to provide sufficient measurement sensitivity.



Work O			TR0228			Date:	06/06/13	3		1.6	00
			None		Те	mperature:	22.5 °C		The	a. C.	allen
						Humidity:			0		
				5	Barom	etric Pres.:	1015.3 mi	bar	lested	by: Johnny Cande	elas
			NQ								
Custo	tion: 3	Andtronia	0.100								
			.e								
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	ons										
5l:2013							AN	SI/TIA/EIA	-603-C:2004		
in #	1	Test	Distanc	e (m)	3	Antenna	Height(s)		1-4m	Results	Pass
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- 1									1.1		
0 +									1		
	Job           erial Num           Configura           Custo           Attence           erating M           Deviati           Common           pecificati           51:2013           m #           20           60           60           60           60           60           60	Configuration: 3         Customer: M         Attendees: N         EUT Power: B         erating Mode: T         Deviations: N         Comments: N         pecifications         51:2013         n #         4         30         50         60	Job Site: N erial Number: RLAI EUT: Reveal LI Configuration: 3 Customer: Medtronic Attendees: Nick Blak EUT Power: Battery erating Mode: Transmitt Deviations: None Comments: None Comments: 51:2013	Job Site: MN05 erial Number: RLA6002163 EUT: Reveal LINQ Configuration: 3 Customer: Medtronic Inc. Attendees: Nick Blake EUT Power: Battery erating Mode: Transmitting, 40° Deviations: None Comments: None Pecifications 51:2013 n # 4 Test Distanc 10 10 10 10 10 10 10 10 10 10	Job Site: MN05 erial Number: RLA600216S EUT: Reveal LINQ Configuration: 3 Customer: Medtronic Inc. Attendees: Nick Blake EUT Power: Battery erating Mode: Transmitting, 401.5 MH. Deviations: None Comments: None Pecifications 51:2013 n # 4 Test Distance (m) 0 10 10 10 10 10 10 10 10 10	Job Site: MN05 erial Number: RLA600216S Barom EUT: Reveal LINQ Configuration: 3 Customer: Medtronic Inc. Attendees: Nick Blake EUT Power: Battery erating Mode: Transmitting, 401.5 MHz ± 0.14   Deviations: None None Comments: pecifications 51:2013 n# 4 Test Distance (m) 3 0 	Job Site:     MN05     Humidity:       erial Number:     RLA600216S     Barometric Pres.:       EUT:     Reveal LINQ       Configuration:     3       Customer:     Medtronic Inc.       Attendees:     Nick Blake       EUT Power:     Battery       erating Mode:     Transmitting, 401.5 MHz ± 0.14 MHz       Deviations:     None       Comments:     None       pecifications     51:2013	Job Site: MN05 Humidity: 47% RH erial Number: RLA600216S Barometric Pres.: 1015.3 mt EUT: Reveal LINQ Configuration: 3 Customer: Meditonic Inc. Attendees: Nick Blake EUT Power: Battery erating Mode: Deviations: None Comments: None None Comments: None None n# 4 Test Distance (m) 3 Antenna Height(s)	Job Site: MN05 Humidity: 47% RH erial Number: RLA600216S Barometric Pres.: 1015.3 mbar EUT: Reveal LINQ Configuration: 3 Customer: Medtronic Inc. Attendees: Nick Blake EUT Power: Battery erating Mode: Transmitting, 401.5 MHz ± 0.14 MHz Deviations: None Comments: None Comments: None Pecifications Test Method 51:2013 Antenna Height(s) 0 0 0 0 0 0 0 0 0 0 0 0 0	Job Site: MN05 Humidity: 47% RH erial Number: RLA600216S Barometric Pres.: 1015.3 mbar Tested EUT: Reveal LINQ Configuration: 3 Customer: Meditonic Inc. Attendees: Nick Blake EUT Power: Battery erating Mode: Transmitting, 401.5 MHz ± 0.14 MHz Deviations: None Comments: pecifications None	Job Site:     MN05     Humidity:     47% RH       erial Number:     RLA600216S     Barometric Press:     1015.3 mbar     Tested by: Johnny Cande       2onfiguration:     3     Customer:     Mone       Comments:     None     Image: Strateging Mode     Image: Strateging Mode       Deviations:     None       Strateging Mode:     Transmitting, 401.5 MHz ± 0.14 MHz

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
803.086	17.1	8.2	1.0	262.0	3.0	0.0	Horz	QP	0.0	25.3	46.0	-20.7	EUT Vertical
803.109	17.0	8.2	4.0	250.0	3.0	0.0	Vert	QP	0.0	25.2	46.0	-20.8	EUT Horizontal
803.002	17.0	8.2	1.2	106.0	3.0	0.0	Horz	QP	0.0	25.2	46.0	-20.8	EUT Horizontal
802.848	17.0	8.2	2.0	353.0	3.0	0.0	Vert	QP	0.0	25.2	46.0	-20.8	EUT on Side
802.828	17.0	8.2	1.0	117.0	3.0	0.0	Vert	QP	0.0	25.2	46.0	-20.8	EUT Vertical
802.817	17.0	8.2	2.9	255.0	3.0	0.0	Horz	QP	0.0	25.2	46.0	-20.8	EUT on Side
1606.032	30.2	-5.6	3.7	153.0	3.0	0.0	Vert	AV	0.0	24.6	54.0	-29.4	EUT Vertical
1605.995	30.2	-5.6	1.7	34.0	3.0	0.0	Horz	AV	0.0	24.6	54.0	-29.4	EUT Vertical
1204.540	30.3	-7.2	1.2	239.0	3.0	0.0	Horz	AV	0.0	23.1	54.0	-30.9	EUT Vertical
1204.500	30.2	-7.2	1.2	194.0	3.0	0.0	Vert	AV	0.0	23.0	54.0	-31.0	EUT Vertical
1605.952	41.2	-5.6	1.7	34.0	3.0	0.0	Horz	PK	0.0	35.6	74.0	-38.4	EUT Vertical
1606.000	41.1	-5.6	3.7	153.0	3.0	0.0	Vert	PK	0.0	35.5	74.0	-38.5	EUT Vertical
1204.496	41.5	-7.2	1.2	194.0	3.0	0.0	Vert	PK	0.0	34.3	74.0	-39.7	EUT Vertical
1204.501	41.2	-7.2	1.2	239.0	3.0	0.0	Horz	PK	0.0	34.0	74.0	-40.0	EUT Vertical



	W	ork Order:	M	DTR022	2			Date	06	/06/1	3			1		1	
		Project:	IVI	None	.0		Ten	nperature	2	2.5 °C	2		_	Le.	1.		
		Job Site:		MN05				Humidity	4	'% RI	, -			0			
	Seria	I Number:		A600212	2S	Ba		tric Pres.:		5.3 m				Tested by:	Johnny Ca	Indelas	
-			Reveal														
-	Conf	figuration:	2														
	(	Customer:	Medtror	nic Inc.													
		Attendees:															
	EL	UT Power:	Battery														
(	Operat	ing Mode:	Transm	itting, 4	01.5 M	Hz ± (	0.14 N	1Hz									
	D	eviations:	None														
		omments:	None														
		ifications									st Me						
FCC	951:20	013								AN	ISI/TI	VEIA	-603	-C:2004			
	Run #	5	Tes	t Distan	ice (m)		3	Antenn	a Height(	5)			1-4n	1	Results	P	ass
	80 T																
	70 -																
	10																
	60 -																
	50 -																
<u>ع</u>																	
Š	40 +																
dBuV/m														_			
0																	
	30 +									_			$\square$				+++-
												ΙT		• •			
	20 -																
	10 -																
	0 +																
	10	)					100						1000	)			10000
		•							NA1 1-								
									MHz						PK	AV	o QP
										_		_					

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
802.860	17.1	8.2	3.7	197.0	3.0	0.0	Vert	QP	0.0	25.3	46.0	-20.7	EUT Vertical
803.210	17.0	8.2	1.0	316.0	3.0	0.0	Vert	QP	0.0	25.2	46.0	-20.8	EUT Horizontal
803.168	17.0	8.2	1.6	190.0	3.0	0.0	Horz	QP	0.0	25.2	46.0	-20.8	EUT Vertical
803.092	17.0	8.2	1.0	250.0	3.0	0.0	Horz	QP	0.0	25.2	46.0	-20.8	EUT on Side
802.875	17.0	8.2	1.8	117.0	3.0	0.0	Vert	QP	0.0	25.2	46.0	-20.8	EUT on Side
802.753	17.0	8.2	1.0	240.0	3.0	0.0	Horz	QP	0.0	25.2	46.0	-20.8	EUT Horizontal
1606.027	30.4	-5.6	1.2	360.0	3.0	0.0	Vert	AV	0.0	24.8	54.0	-29.2	EUT Vertical
1606.023	30.2	-5.6	1.2	21.0	3.0	0.0	Horz	AV	0.0	24.6	54.0	-29.4	EUT Vertical
1204,460	30.3	-7.2	1.2	88.0	3.0	0.0	Vert	AV	0.0	23.1	54.0	-30.9	EUT Vertical
1204.503	30.2	-7.2	1.2	213.0	3.0	0.0	Horz	AV	0.0	23.0	54.0	-31.0	EUT Vertical
1605.991	40.9	-5.6	1.2	360.0	3.0	0.0	Vert	PK	0.0	35.3	74.0	-38.7	EUT Vertical
1606.036	40.8	-5.6	1.2	21.0	3.0	0.0	Horz	PK	0.0	35.2	74.0	-38.8	EUT Vertical
1204.463	41.2	-7.2	1.2	88.0	3.0	0.0	Vert	PK	0.0	34.0	74.0	-40.0	EUT Vertical
1204.550	41.2	-7.2	1.2	213.0	3.0	0.0	Horz	PK	0.0	34.0	74.0	-40.0	EUT Vertical



	Work	Order:	MDT	1\0220		Date:	06/06/13			
	F	Project:	N	one	Te	mperature:	22.5 °C	- fe	- 1.6	her
	Jo	ob Site:		N05		Humidity:	47% RH	0		
5	Serial N	lumber:		00209S	Barom	etric Pres.:	1015.3 mbar	Teste	ed by: Johnny Cande	las
		EUT:	Reveal LIN	1Q						
(	Configu	uration:	1							
	Cus	stomer:	Medtronic	Inc.						
	Atte	endees:	Nick Blake	)						
	EUT	Power:	Battery							
Op	perating	g Mode:	Transmittir	ng, 401.5 Mł	Hz ± 0.14 N	MHz				
	Dev	iations:	None							
	Com	nments:	None							
	Specific						Test N			
;C 9	951:2013	3					ANSI/1	TIA/EIA-603-C:2004		
	un #	6	Test D	vistance (m)	3	Antenna He	eight(s)	1-4m	Results	Pass
	un #	6	Test D	vistance (m)	3	Antenna He	eight(s)	1-4m	Results	Pass
		6	Test D	vistance (m)	3	Antenna He	eight(s)	1-4m	Results	Pass
	70	6	Test D	vistance (m)	3	Antenna He	eight(s)	1-4m	Results	Pass
	80	6	Test D	vistance (m)	3	Antenna He	eight(s)	1-4m	Results	Pass
	70	6	Test D	Pistance (m)	3	Antenna He	eight(s)	1-4m	Results	Pass
	80 70 60 50	6	Test D	Pistance (m)	3	Antenna He	eight(s)	1-4m	Results	Pass
	80 70 60	6	Test D	vistance (m)	3	Antenna He	aight(s)	1-4m	Results       Image: state	Pass
	80 70 60 50	6	Test D	vistance (m)	3	Antenna He	eight(s)		Results       Image: Strategy of the st	Pass
	80 70 60 50 40	6	Test D	Pistance (m)	3	Antenna He	eight(s)			Pass
	80       70       60       50       40       30       20	6	Test D	Pistance (m)	3	Antenna He	aight(s)			Pass
	80	6	Test D	Pistance (m)	3	Antenna He	aight(s)			Pass
5	80       70       60       50       40       30       20	6	Test D	Pistance (m)	3	Antenna He	2ight(s)			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
803.147	17.1	8.2	3.3	187.0	3.0	0.0	Vert	QP	0.0	25.3	46.0	-20.7	EUT on Side
802.988	17.0	8.2	2.5	180.0	3.0	0.0	Vert	QP	0.0	25.2	46.0	-20.8	EUT Vertical
802.840	17.0	8.2	1.0	18.0	3.0	0.0	Horz	QP	0.0	25.2	46.0	-20.8	EUT Horizontal
802.863	17.0	8.2	1.0	164.0	3.0	0.0	Vert	QP	0.0	25.2	46.0	-20.8	EUT Horizontal
802.748	17.0	8.2	2.5	246.0	3.0	0.0	Horz	QP	0.0	25.2	46.0	-20.8	EUT on Side
802.756	17.0	8.2	1.0	295.0	3.0	0.0	Horz	QP	0.0	25.2	46.0	-20.8	EUT Vertical
1605.950	30.7	-5.6	1.2	13.0	3.0	0.0	Horz	AV	0.0	25.1	54.0	-28.9	EUT Vertical
1605.999	30.2	-5.6	1.2	144.0	3.0	0.0	Vert	AV	0.0	24.6	54.0	-29.4	EUT Vertical
1204.502	30.1	-7.2	1.2	188.0	3.0	0.0	Horz	AV	0.0	22.9	54.0	-31.1	EUT Vertical
1204.543	30.0	-7.2	1.2	87.0	3.0	0.0	Vert	AV	0.0	22.8	54.0	-31.2	EUT Vertical
1606.040	41.5	-5.6	1.2	144.0	3.0	0.0	Vert	PK	0.0	35.9	74.0	-38.1	EUT Vertical
1606.033	41.5	-5.6	1.2	13.0	3.0	0.0	Horz	PK	0.0	35.9	74.0	-38.1	EUT Vertical
1204.451	41.5	-7.2	1.2	188.0	3.0	0.0	Horz	PK	0.0	34.3	74.0	-39.7	EUT Vertical
1204.518	41.0	-7.2	1.2	87.0	3.0	0.0	Vert	PK	0.0	33.8	74.0	-40.2	EUT Vertical



## **Emission Bandwidth**

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
Near Field Probe Set	ETS	7405	IPO	NCR	0
Spectrum Analyzer	Agilent	E4440A	AAX	5/15/2012	24

### **TEST DESCRIPTION**

Per 47 CFR 95.633(e)(3), the emission bandwidth was determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 20 dB down relative to the maximum level of the modulated carrier. A spectrum analyzer using a peak detector with no video filtering was used with a resolution bandwidth equal to approximately 1.0 percent of the emission bandwidth of the EUT.



## **Emission Bandwidth**

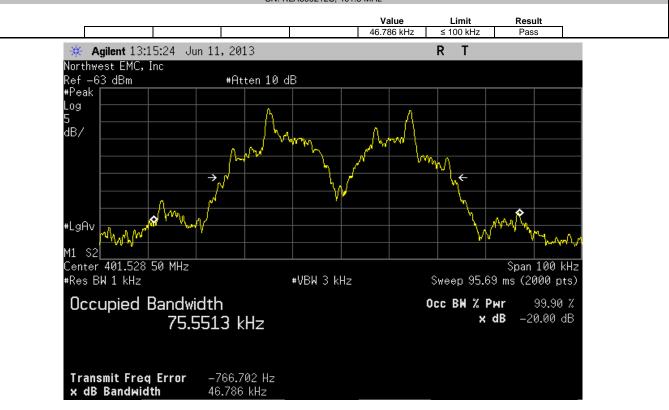
		HIRKKKMM		
	Reveal LINQ		Work Order: MDTR0228	
Serial Number:	RLA600209S, RLA6002123	S, RLA600216S		Date: 06/11/13
Customer:	Medtronic Inc.			Temperature: 23.2°C
Attendees:	Nick Blake			Humidity: 56%
Project:				Barometric Pres.: 1010.8
	Trevor Buls		Power: Battery	Job Site: MN08
TEST SPECIFICATI	ONS		Test Method	
FCC 95I:2013			ANSI/TIA/EIA-603-C-2004	
COMMENTS				
None				
DEVIATIONS FROM	I TEST STANDARD			
None				
Configuration #	1,2,3	Signature	Trevor Buls	

	Value	Limit	Result
SN: RLA600209S			
401.5 MHz	46.914 kHz	≤ 100 kHz	Pass
SN: RLA600212S			
401.5 MHz	46.786 kHz	≤ 100 kHz	Pass
SN: RLA600216S			
401.5 MHz	46.663 kHz	≤ 100 kHz	Pass

-

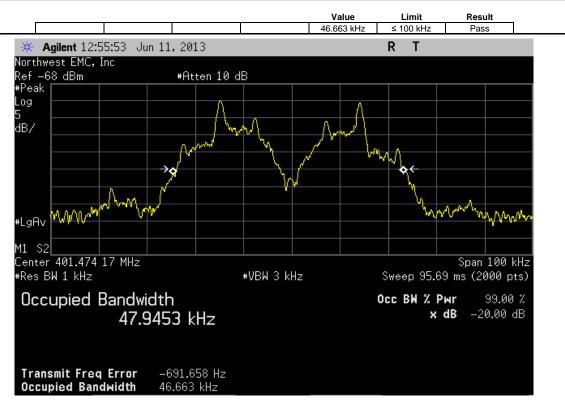








SN: RLA600216S, 401.5 MHz





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
Near Field Probe Set	ETS	7405	IPO	NCR	0
Spectrum Analyzer	Agilent	E4440A	AAX	5/15/2012	24

## **TEST DESCRIPTION**

Per 47 CFR 95.635(d)(4) the emission mask was measured. Emissions more than 50 kHz away from the center frequency must be attenuated below the transmitter output power by at least 20 dB. This was evaluated by the Occupied Bandwidth measurement according to 47 CFR 95.633(e)(1). In addition, emissions 100 kHz or less above and below the MEDS band (401-402 MHz) must be attenuated below the maximum permitted output power by at least 20 dB.

A spectrum analyzer was used to measure the emission mask. A spectrum analyzer using a peak detector with no video filtering was used with a resolution bandwidth equal to approximately 1.0 percent of the emission bandwidth of the EUT. However, various plots were made using different frequency spans and resolution bandwidths in an attempt to not only satisfy the measurement criteria, but to also show that all emissions outside of the occupied band are greatly attenuated.



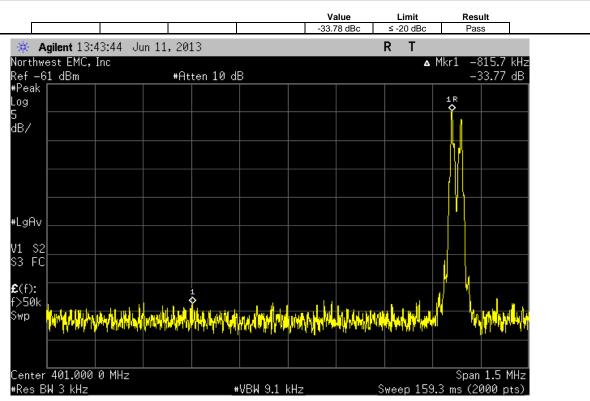


	Reveal LINQ					Work Order:	MDTR0228	
Serial Number	RLA600209S, RLA600212	S, RLA600216S					06/11/13	
	: Medtronic Inc.					Temperature:		
	Nick Blake					Humidity:		
Project					B	arometric Pres.:		
	: Trevor Buls			Battery		Job Site:	MN08	
TEST SPECIFICAT	TIONS			Test Method				
FCC 95I:2013				ANSI/TIA/EIA-603-C-2004				
COMMENTS								
None								
	M TEST STANDARD							
None								
Configuration #	1,2,3		Trevor	Bulb				
oomigaration #	.,_,0	Signature	Inevor	, o mas				
						Value	Limit	Result
SN: RLA600209S						value	Linin	Result
SN. KLA0002093	401.5 MHz							
	Low Band Ed	ge				-33.78 dBc	≤ -20 dBc	Pass
	High Band Ed	ige				-33.25 dBc	≤ -20 dBc	Pass
SN: RLA600212S								
	401.5 MHz							
	Low Band Ed	ge				-31.72 dBc	≤ -20 dBc	Pass
	High Band Ed	lge				-31.12 dBc	≤ -20 dBc	Pass
SN: RLA600216S								
	401.5 MHz							
	Low Band Ed					-27.34 dBc	≤ -20 dBc	Pass
	High Band Ed	dge				-27.54 dBc	≤ -20 dBc	Pass



## **Emissions Mask**

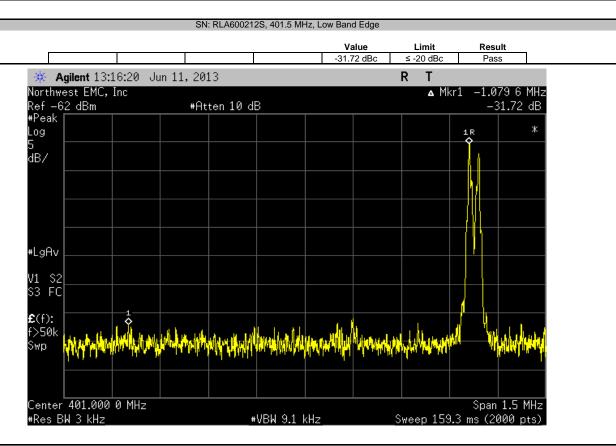




	SN: RLA60020	09S, 401.5 MHz, Hi	gh Band Edge		
		1 1	Value	Limit	Result
			-33.25 dBc	≤ -20 dBc	Pass
<b>Agilent</b> 13:44:03	Jun 11, 2013			RT	
Northwest EMC, Inc Ref —60 dBm	#Atten 10 d	dB		∆ Mkri	. 1.179 7 MHz -33.25 dB
#Peak Log	1R				*
5 dB/	¥				
#LgAv					
V1 52					
S3 FC					
£(f): f>50k					1 ♦
Swp Mytryddyn yw W	Vinter And Philippe And	Nethersteinnerstei	villinely 41/14	Manghantan	And the particular for the start
Center 402.000 0 MHz #Res BW 3 kHz		#VBW 9.1 kHz_	S	weep 159.3 i	Span 1.5 MHz ms (2000 pts)_



## **Emissions Mask**

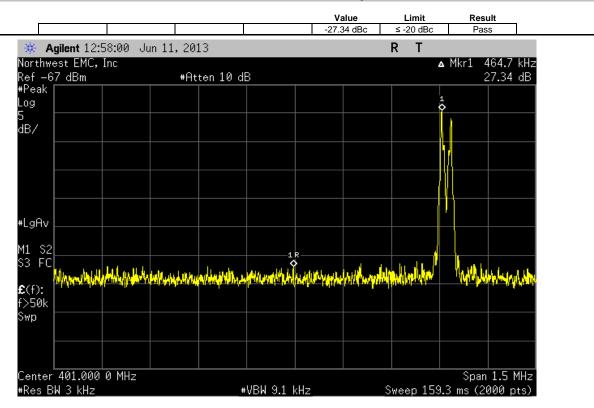


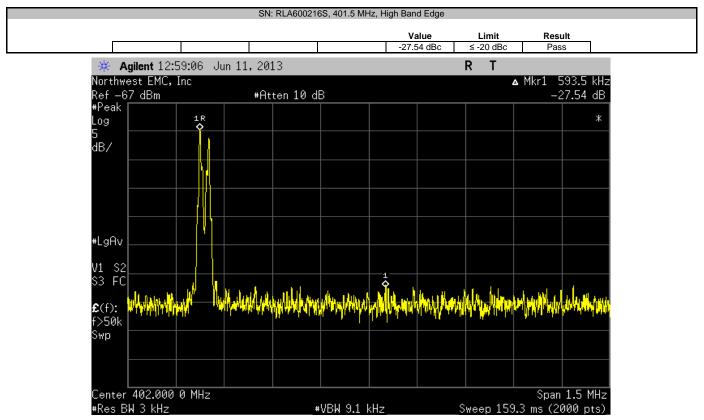
	SN: F	RLA600212S, 401.5 MH	Iz, High Band Edge		
· · · · · · · · · · · · · · · · · · ·		I	Value	Limit	Result
			-31.12 dBc	≤ -20 dBc	Pass
★ Agilent 13:16:4		3		RT	
Northwest EMC, Inc Ref —63 dBm		en 10 dB		<b>∆</b> Mk	r1 797.7 kHz -31.11 dB
#Peak Log	1 R				*
5 dB/					
#LgAv					
V1 S2 S3 FC					
\$3 FC				1	
£(f): f>50k Swp	hu <sup>n</sup> haybauthan	hinderstarte Aller and an	held the alternation of the second		halada ana ana ana ana ana ana ana ana ana
Center 402.000 0 M	/Hz				Span 1.5 MHz
#Res BW 3 kHz		#VBW 9.1	KHz		is (2000 pts)_



## **Emissions Mask**







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
Near Field Probe Set	ETS	7405	IPO	NCR	0
Humidity Temperature Meter	Omega Engineering, Inc.	HH31	DUB	10/25/2011	36
Temp./Humidity Chamber	Cincinnati Sub Zero (CSZ)	ZPH-32-3.5-SCT/AC	TBF	NCR	0
Spectrum Analyzer	Agilent	E4440A	AAX	5/15/2012	24

#### **TEST DESCRIPTION**

## Variation of Supply Voltage

The primary supply voltage was varied over the range specified by the client. Per the client, the device only works over this voltage range; it will shut off if the voltage is outside the specified range.

## Variation of Ambient Temperature

Using a temperature chamber, the transmit frequency was recorded at the extremes of the specified temperature range (+25°, +35°C and +45° C).

The Frequency Stability was measured using a near-field probe and a spectrum analyzer. The spectrum analyzer is configured with a precision frequency reference that exceeds the stability requirement of the transmitter. The EUT was placed inside a temperature / humidity chamber. The near-field probe was placed near the transmitter. A low-loss coaxial cable connected the near-field probe to the spectrum analyzer outside of the chamber.



FUT	Reveal LINQ						Work Order:		
	RLA600209S, RLA600212S, RLA	6002165						06/11/13	
	Medtronic Inc.	0002100					Temperature:		
	Nick Blake						Humidity:		
Project							Barometric Pres.:		
	: Trevor Buls		Power: B	atterv			Job Site:		
TEST SPECIFICAT	TIONS			est Method					
FCC 95I:2013			A	NSI/TIA/EIA-603-C-	2004				
COMMENTS									
None									
-	M TEST STANDARD								
None									
Configuration #	1,2,3		Trevor	0 0 -					
Configuration #	1,2,3	Signature	1100002	Dues					
		Signature	0,0000		Measured	Assigned	Error	Limit	
					Value (MHz)	Value (MHz)	(ppm)	(ppm)	Result
SN: RLA600209S					raido (iiiii2)	raide (initiz)	(PP)	(pp)	nooun
011.112.10002000	Extreme Temperature +45C								
	401.5 MHz				401.523468	401.5	58.4	100	Pass
	Extreme Temperature +35C								
	401.5 MHz				401.525807	401.5	64.3	100	Pass
	Extreme Temperature +25C								
	401.5 MHz				401.524987	401.5	62.2	100	Pass
SN: RLA600212S									
	Extreme Temperature +45C								_
	401.5 MHz				401.523561	401.5	58.7	100	Pass
	Extreme Temperature +35C 401.5 MHz				401.526208	401.5	65.3	100	Pass
	Extreme Temperature +25C				401.520208	401.5	05.5	100	F d55
	401.5 MHz				401.526441	401.5	65.9	100	Pass
SN: RLA600216S	10110 11112					10110	00.0		. 400
	Extreme Temperature +45C								
	401.5 MHz				401.469223	401.5	76.7	100	Pass
	Extreme Temperature +35C								
	401.5 MHz				401.471825	401.5	70.2	100	Pass
	Extreme Temperature +25C								
	401.5 MHz				401.471307	401.5	71.5	100	Pass



