Medtronic Inc.

CTM2
Model 8880T2

EMC Test Report

Report No. MDTR0042.7

Report Prepared By

NORTHWEST EMC

www.nwemc.com
1-888-EMI-CERT

NORTHWEST EMC

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Last Date of Test: December 21, 2011

Medtronic Inc.

Model: 8880T2

Emissions			
Test Description	**Specification**	**Test Method**	**Pass/Fail**
Channel Spacing	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Channel Spacing	RSS-210:2010	RSS-Gen:2010	**Pass**
Time of Occupancy (Dwell Time)	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Time of Occupancy (Dwell Time)	RSS-210:2010	RSS-Gen:2010	**Pass**
Number of Hopping Frequencies	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Number of Hopping Frequencies	RSS-210:2010	RSS-Gen:2010	**Pass**
Occupied Bandwidth	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Occupied Bandwidth	RSS-210:2010	RSS-Gen:2010	**Pass**
Output Power	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Output Power	RSS-210:2010	RSS-Gen:2010	**Pass**
Band Edge Compliance	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Band Edge Compliance	RSS-210:2010	RSS-Gen:2010	**Pass**
Band Edge - Hopping Mode	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Band Edge - Hopping Mode	RSS-210:2010	RSS-Gen:2010	**Pass**
Spurious Conducted Emissions	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Spurious Conducted Emissions	RSS-210:2010	RSS-Gen:2010	**Pass**
Power Spectral Density	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Power Spectral Density	RSS-210:2010	RSS-Gen:2010	**Pass**
Duty Cycle	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Duty Cycle	RSS-210:2010	RSS-Gen:2010	**Pass**
Spurious Radiated Emissions	FCC 15.247:2011	ANSI C63.10:2009	**Pass**
Spurious Radiated Emissions	RSS-210:2010	RSS-Gen:2010	**Pass**
Receiver Spurious Emissions	FCC 15.109:2011 Class B	ANSI C63.4:2003	**Pass**
Receiver Spurious Emissions	RSS-Gen:2010	RSS-Gen:2010	**Pass**

Modifications made to the product
See the Modifications section of this report

Test Facility

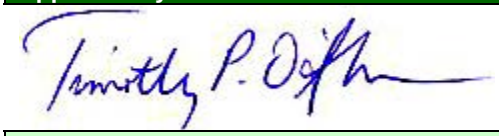
The measurement facility used to collect the data is located at:

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 (Site filing #2834E-1). filed with and accepted by the FCC (Federal Communications Commission) and Industry Canada

Approved By:



Tim O'Shea, Operations Manager

NVLAP Lab Code: 200881-0

This report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government of the United States of America.
Product compliance is the responsibility of the client, therefore the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

Accreditations and Authorizations

FCC

Accredited by NVLAP for performance of FCC radio, digital, and ISM device testing. Our Open Area Test Sites, certification chambers, and conducted measurement facilities have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

NVLAP

Northwest EMC, Inc. is accredited under the National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with the requirements of ISO/IEC 17025 for Testing Laboratories. NVLAP is administered by the National Institute of Standards and Technology (NIST), an agency of the U.S. Commerce Department. The NVLAP accreditation encompasses Electromagnetic Compatibility Testing in accordance with the European Union EMC Directive 2004/108/EC, and ANSI C63.4. Additionally, Northwest EMC is accredited by NVLAP to perform radio testing in accordance with the European Union R&TTE Directive 1999/5/EEC, the requirements of FCC, and the RSS radio standards for Industry Canada.

Industry Canada

Accredited by NVLAP for performance of Industry Canada RSS and ICES testing. Our Open Area Test Sites and certification chambers comply with RSS-Gen, Issue 2 and have been filed with Industry Canada and accepted. Northwest EMC has been accredited by ANSI to ISO / IEC Guide 65 as a product certifier. We have been designated by NIST and recognized by Industry Canada as a Certification Body (CB) per the APEC Mutual Recognition Arrangement (MRA). This allows Northwest EMC to certify transmitters to Industry Canada technical requirements. (*Site Filing Numbers - Hillsboro: 2834D-1, 2834D-2, Sultan: 2834C-1, Irvine: 2834B-1, 2834B-2, 2834B-3, Brooklyn Park: 2834E-1)*

CAB

Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement.

Australia/New Zealand

The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body (NVLAP).

Accreditations and Authorizations

VCCI

Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. *(Registration Numbers. - Hillsboro: C-1071, R-1025, G-84, C-2687, T-1658, and R-2318, Irvine: R-1943, G-85, C-2766, T-1659, and G-548, Sultan: R-871, G-83, C-3265, and T-1511, Brooklyn Park: R-3125, G-86, G-141, C-3464, and T-1634).*

BSMI

Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement (US0017).

GOST

Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

KCC

Northwest EMC, Inc is a CAB designated by MRA partners and recognized by Korea. (*Assigned Lab Numbers: Hillsboro: US0017, Irvine: US0158, Sultan: US0157, Brooklyn Park: US0175)*

VIETNAM

Vietnam MIC has approved Northwest EMC as an accredited test lab. Per Decision No. 194/QD-QLCL (dated December 15, 2009), Northwest EMC test reports can be used for Vietnam approval submissions.

SCOPE

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

Northwest EMC Locations

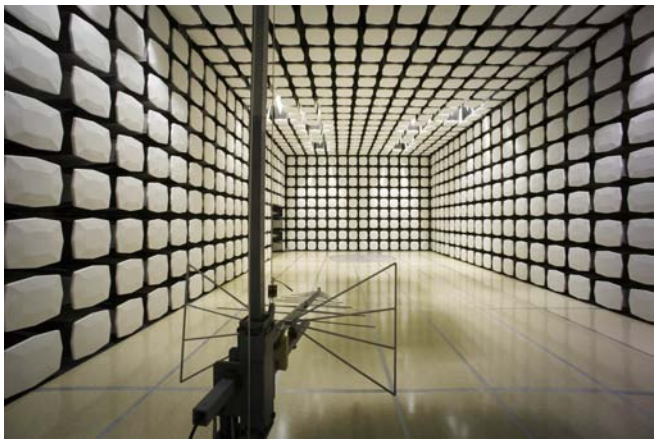
Oregon
Labs EV01-EV12
22975 NW Evergreen Pkwy
Suite 400
Hillsboro, OR 97124
(503) 844-4066

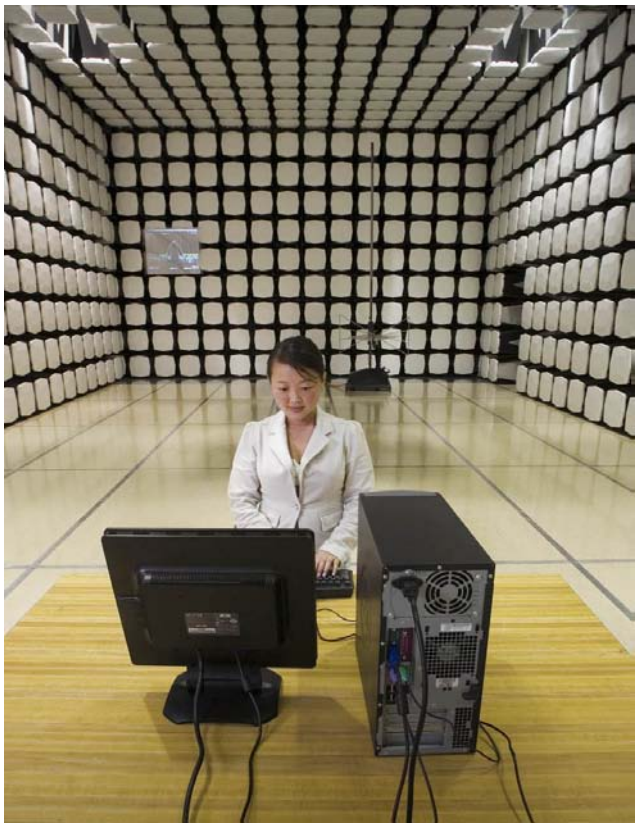
California
Labs OC01-OC13
41 Tesla
Irvine, CA 92618
(949) 861-8918

Minnesota
Labs MN01-MN08
9349 W Broadway Ave.
Brooklyn Park,
MN 55445
(763) 425-2281

Washington
Labs SU01-SU07
14128 339th Ave. SE
Sultan, WA 98294
(360) 793-8675

New York
Labs WA01-WA04
4939 Jordan Rd.
Elbridge, NY 13060
(315) 685-0796





Party Requesting the Test

Company Name:	Medtronic Inc.
Address:	7000 Central Avenue NE
City, State, Zip:	Minneapolis, MN 55432
Test Requested By:	Paul Wood
Model:	8880T2
First Date of Test:	December 12, 2011
Last Date of Test:	December 21, 2011
Receipt Date of Samples:	December 12, 2011
Equipment Design Stage:	Production equivalent
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):

The Clinician Telemetry Module (CTM2) provides a communication link from the Clinician Programmer (CP) to an Implanted Medical Device (IMD). The CTM2 provides a single telemetry module solution for use with the following telemetry types: TEL-M (Medical Implant Communications Service MICS Telemetry) connection to the Intellis IMD, TEL A/N (Proximal wakeup) connection to Intellis IMD and communication with the SM3 pump, Bluetooth connection to CP, and/or USB connection to CP. The CTM2 is a Battery operated device that will be used in a hospital environment by medical professionals.

Testing Objective:

To demonstrate compliance to FCC and IC requirements for the Bluetooth transmitter

CONFIGURATION 2 MDTR0042

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
CTM2	Medtronic Inc.	8880T2	NKW001518N

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
USB System Cable, M943457A002 Rev. D	Yes	1.8m	Yes	CTM2	NGCP
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

CONFIGURATION 4 MDTR0042

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
CTM2	Medtronic Inc.	8880T2	NKW001457N

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Dell	Latitude D610	12068016661
Power Brick (Laptop)	Dell	LA90PS0-00	CN-0DF266-71615-7BE-1D3E

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Power	No	1.8m	No	AC Mains	Power Brick (Laptop)
DC Power	No	1.8m	Yes	Power Brick (Laptop)	Laptop
xTM FTDI Cable, M947422A22 Rev. A	Yes	2.3m	No	Laptop	CTM2
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Equipment modifications					
Item	Date	Test	Modification	Note	Disposition of EUT
1	12/12/2011	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
2	12/16/2011	Receiver Spurious Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
3	12/19/2011	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
4	12/19/2011	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
5	12/19/2011	Occupied Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
6	12/19/2011	Band Edge Compliance	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
7	12/19/2011	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
8	12/19/2011	Duty Cycle	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
9	12/21/2011	Channel Spacing	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
10	12/21/2011	Time of Occupancy (Dwell Time)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
11	12/21/2011	Number of Hopping Frequencies	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Northwest EMC following the test.
12	12/21/2011	Band Edge - Hopping Mode	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

BLUETOOTH APPROVALS

FCC Procedure Received from Joe Dichoso on 2-15-02

The following exhibit indicates the FCC Spread Spectrum requirements in Section 15.247 for devices meeting the Bluetooth Specifications in the 2.4 GHz band as of February 2001 operating in the USA. The purpose of this exhibit is to help expedite the approval process for Bluetooth devices. This exhibit provides items that vary for each device and also provides a list of items that are common to Bluetooth devices that explains the remaining requirements. The list of common items can be submitted for each application for equipment authorization. This exhibit only specifies requirements in Section 15.247, requirements in other rule Sections for intentional radiators such as in Section 15.203 or 15.207 must be also be addressed. A Bluetooth device is a FHSS transmitter in the data mode and applies as a Hybrid spread spectrum device in the acquisition mode.

For each individual device, the following items, 1-7 will vary from one device to another and must be submitted.

1) The occupied bandwidth in Section 15.247(a)(1)(ii).
2) Conducted output power specified in Section 15.247(b)(1).
3) EIRP limit in Section 15.247(b)(3).
4) RF safety requirement in Section 15.247(b)(4)
5) Spurious emission limits in Section 15.247(c).
6) Processing gain and requirements for Hybrids in Section 15.247(f) in the acquisition mode.
7) Power spectral density requirement in Section 15.247(f) in the acquisition mode.

For all devices, the following items, 1-12, are common to all Bluetooth devices and will not vary from one device to another. This list can be copied into the filing.

1 Output power and channel separation of a Bluetooth device in the different operating modes:

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device don't influence the output power and the channel spacing. There is only one transmitter which is driven by identical input parameters concerning these two parameters.
Only a different hopping sequence will be used. For this reason, the RF parameters in one op-mode is sufficient.

2 Frequency range of a Bluetooth device:

The maximum frequency of the device is: **2402 – 2480 M**Hz.
This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for devices which will be operated in the USA. Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification must **not be** supported by the device.

3 Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:

Bluetooth units which want to communicate with other units must be organized in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from it's BD address which is unique for every Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

4 Example of a hopping sequence in data mode:

Example of a 79 hopping sequence in data mode:
40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67,
56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59,
72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75,
09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06,
01, 51, 03, 55, 05, 04

5 Equally average use of frequencies in data mode and short transmissions:

The generation of the hopping sequence in connection mode depends essentially on two input values:
1. LAP/UAP of the master of the connection
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS. The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronization with other units, only the offsets are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 µs. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.
Regarding short transmissions, the Bluetooth system has the following behavior:
The first connection between the two devices is established, a hopping sequence is generated. For transmitting the wanted data, the complete hopping sequence is not used and the connection ends. The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 µs). The hopping sequence will always differ from the first one.

6 Receiver input bandwidth, synchronization and repeated single or multiple packets:

The input bandwidth of the receiver is 1 MHz.
In every connection, one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single or multi-slot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing is according to the packet type of the connection. Also, the slave of the connection uses these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence

7 Dwell time in data mode

The dwell time of 0.3797s within a 30 second period in data mode is independent from the packet type (packet length). The calculation for a 30 second period is a follows:
Dwell time = time slot length * hop rate / number of hopping channels *30s
Example for a DH1 packet (with a maximum length of one time slot)
Dwell time = 625 µs * 1600 1/s / 79 * 30s = 0.3797s (in a 30s period)

For multi-slot packet the hopping is reduced according to the length of the packet.
Example for a DH5 packet (with a maximum length of five time slots)
Dwell time = 5 * 625 µs * 1600 * 1/5 *1/s / 79 * 30s = 0.3797s (in a 30s period)
This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for all Bluetooth devices. Therefore, all Bluetooth devices **comply** with the FCC dwell time requirement in the data mode.
This was checked during the Bluetooth Qualification tests.
The Dwell time in hybrid mode is approximately 2.6 mS (in a 12.8s period)

8 Channel Separation in hybrid mode

The nominal channel spacing of the Bluetooth system is 1Mhz independent of the operating mode.
The maximum “initial carrier frequency tolerance” which is allowed for Bluetooth is fcenter = 75 kHz.
This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/07-E) for three frequencies (2402, 2441, 2480 MHz).

9 Derivation and examples for a hopping sequence in hybrid mode

For the generation of the inquiry and page hop sequences the same procedures as described for the data mode are used (see item 5), but this time with different input vectors:
**For the inquiry hop sequence, a predefined fixed address is always used. This results in the same 32 frequencies used by all devices doing an inquiry but every time with a different start frequency and phase in this sequence.
**For the page hop sequence, the device address of the paged unit is used as the input vector. This results in the use of a subset of 32 frequencies which is specific for that initial state of the connection establishment between the two units. A page to different devices would result in a different subset of 32 frequencies.
So it is ensured that also in hybrid mode, the frequency is used equally on average.
Example of a hopping sequence in inquiry mode:
48, 50, 09, 13, 52, 54,41, 45, 56, 58, 11, 15, 60, 62, 43, 47, 00, 02, 64, 68, 04, 06, 17, 21, 08, 10, 66, 70, 12, 14, 19, 23
Example of a hopping sequence in paging mode:
08, 57, 68, 70, 51, 02, 42, 40, 04, 61, 44, 46, 63, 14, 50, 48, 16, 65, 52, 54, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

10 Receiver input bandwidth and synchronization in hybrid mode:

The receiver input bandwidth is the same as in the data mode (1 MHz). When two Bluetooth devices establish contact for the first time, one device sends an inquiry access code and the other device is scanning for this inquiry access code. If two devices have been connected previously and want to start a new transmission, a similar procedure takes place. The only difference is, instead of the inquiry access code, a special access code, derived from the BD_ADDRESS of the paged device will be, will be sent by the master of this connection. Due to the fact that both units have been connected before (in the inquiry procedure) the paging unit has timing and frequency information about the page scan of the paged unit. For this reason the time to establish the connection is reduced.

11 Spread rate / data rate of the direct sequence signal

The Spread rate / Data rate in inquiry and paging mode can be defined via the access code. The access code is the only criterion for the system to check if there is a valid transmission or not. If you regard the presence of a valid access code as one bit of information, and compare it with the length of the access code of 68 bits, the Spread rate / Data rate will be 68/1.

12 Spurious emission in hybrid mode

The Dwell in hybrid mode is shorter than in data mode. For this reason the spurious emissions average level in data mode is worst case. The spurious emissions peak level is the same for both modes.

Channel Spacing

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
Multimeter	Fluke	114	MMU	7/8/2011	24
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	6/2/2011	12
40 GHz DC block	Fairview Microwave	SD3379	AMI	10/12/2011	12
Spectrum Analyzer	Agilent	E4440A	AAX	5/23/2011	12

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) (Frequency Accuracy: +0.12/- 0.01) 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 16-4-1 as applicable), and are available upon request.

TEST DESCRIPTION

The channel carrier frequencies in the 2400-2483.5MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Or, if the output power is less than 125 mW, the channel separation can be 25 kHz or 2/3 of the 20dB bandwidth. The EUT was operated in pseudorandom hopping mode. The spectrum was scanned across two adjacent peaks. The separation between the peaks of these channels was measured.

NORTHWEST EMC

Channel Spacing

XMit 2011.10.26

EUT:	CTM2			Work Order:	MDTR0042
Serial Number:	NKW001457N			Date:	12/21/11
Customer:	Medtronic Inc.			Temperature:	24.48°C
Attendees:	None			Humidity:	15%
Project:	None			Barometric Pres.:	1005.4
Tested by:	Trevor Buls	Power:	2.75VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

COMMENTS

MDTR0012 Test Plan Configuration 7. Payload Size = 528, Frequency Hopping Mode.

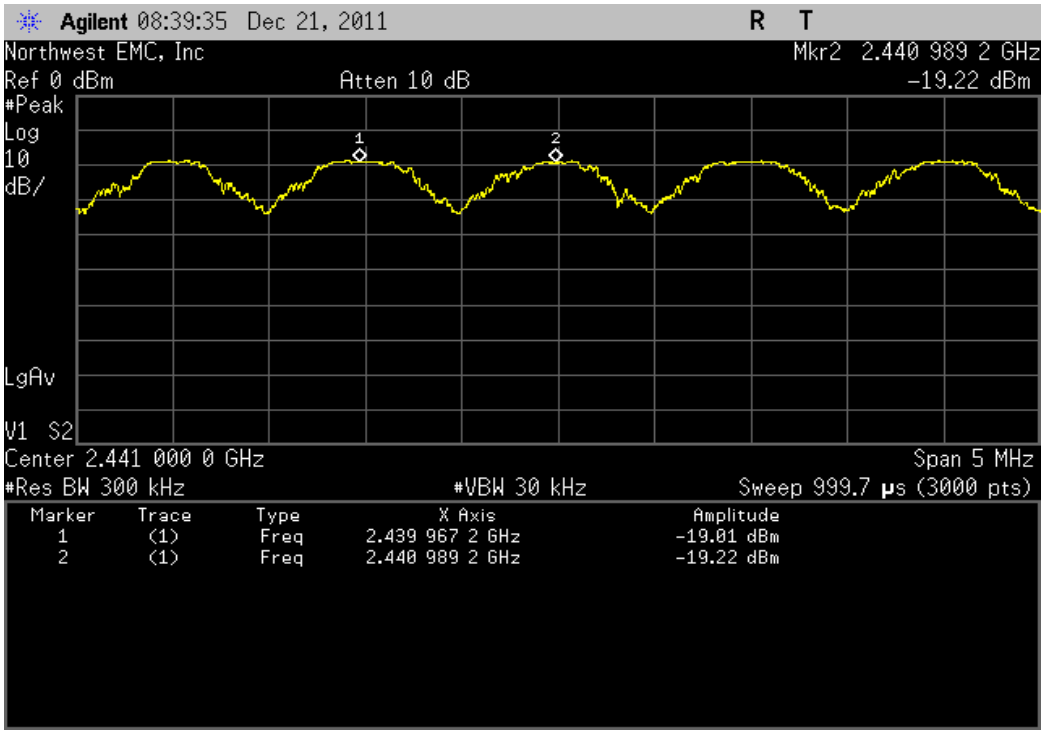
DEVIATIONS FROM TEST STANDARD

None

Configuration #	4	Signature	Trevor Buls

	Value	Limit	Result
Channel Spacing	1.0 MHz	1.0 MHz	Pass

Channel Spacing						
				Value	**Limit**	**Result**
				1.0 MHz	1.0 MHz	Pass



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TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Attenuator, 20 dB, 'SMA'	SM Electronics	SA6-20	REO	7/1/2011	12
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	6/29/2011	24
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	7/1/2011	12
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	10/18/2011	12
Spectrum Analyzer	Agilent	E4446A	AAT	3/2/2012	12

MEASUREMENT UNCERTAINTY

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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) (Frequency Accuracy: +0.12/- 0.01) 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 16-4-1 as applicable), and are available upon request.

TEST DESCRIPTION

The average dwell time per hopping channel was measured at one hopping channel in the middle of the authorized band. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The hopping function of the EUT was enabled.

NORTHWEST
EMC

Dwell Time

XMit 2011.10.26
PsaTx 2012.04.10

EUT:	CTM2			**Work Order:**	MDTR0042
Serial Number:	NKW001518N			**Date:**	04/10/12
Customer:	Medtronic Inc.			**Temperature:**	24.02°C
Attendees:	None			**Humidity:**	14%
Project:	None			**Barometric Pres.:**	1024.7
Tested by:	Trevor Buls	**Power:**	2.75VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2012	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

COMMENTS

MDTR0012 Test Plan Configuration 7. Payload Size = 339: DH5, 679: 2DH5, 986: 3DH5. Limit is based on a time domain of 0.4 Seconds * Number of Hopping Channels (79) = 31.6 sec. Scale factor is based on 12.64 sec window * 2.5 = 31.6 sec.

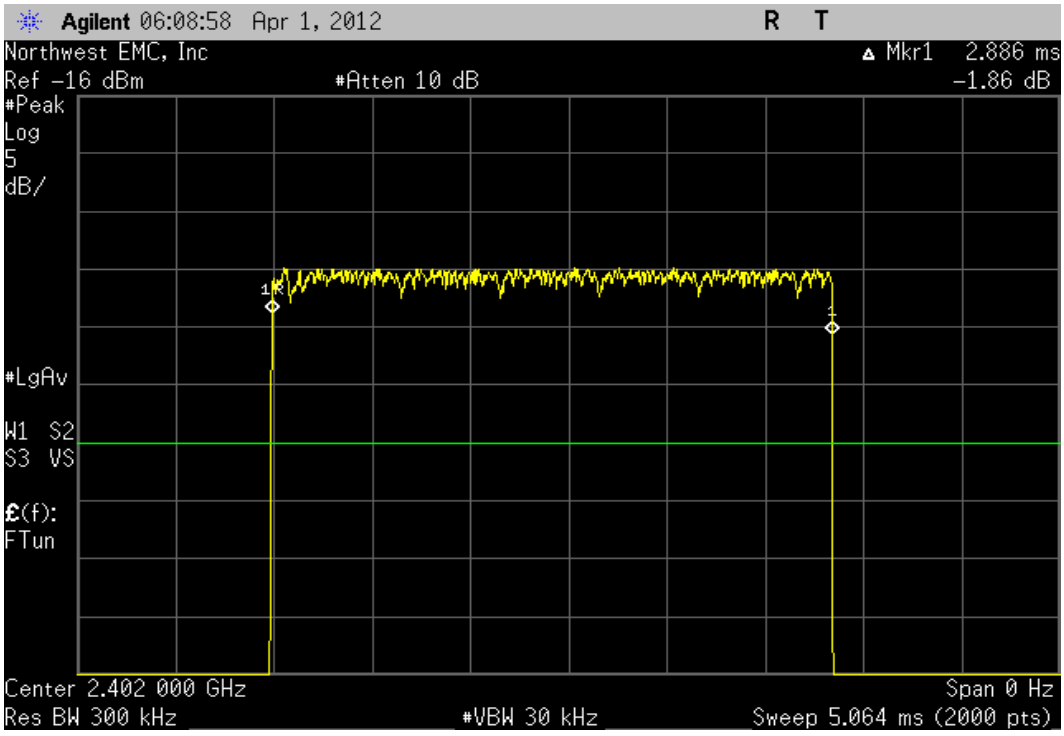
DEVIATIONS FROM TEST STANDARD

None

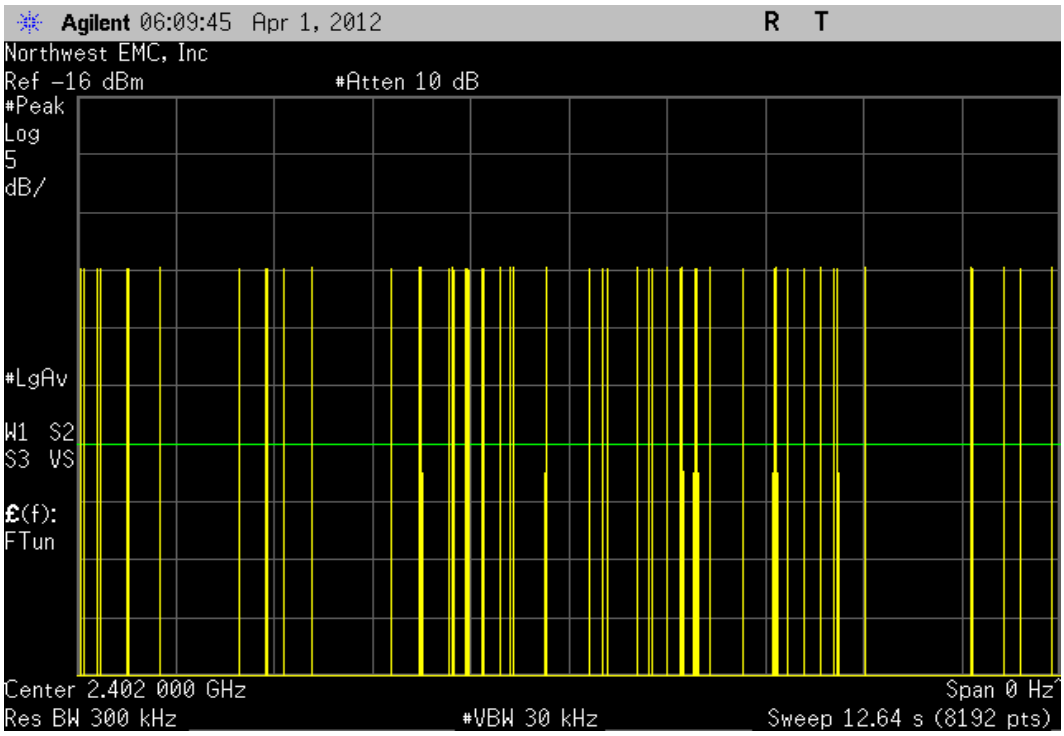
Configuration #	2	*Signature* Trevor Buls

		Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
DH5, GFSK								
	Low Channel	2.886	1	N/A	N/A	2.886	400	Pass
	Low Channel	2.886	47	135.642	2.5	339.105	400	Pass
	Mid Channel	2.889	1	N/A	N/A	2.889	400	Pass
	Mid Channel	2.889	47	135.783	2.5	339.4575	400	Pass
	High Channel	2.889	1	N/A	N/A	2.889	400	Pass
	High Channel	2.889	47	135.783	2.5	339.4575	400	Pass
2DH5, 4-DQPSK								
	Low Channel	2.892	1	N/A	N/A	2.892	400	Pass
	Low Channel	2.892	49	141.708	2.5	354.27	400	Pass
	Mid Channel	2.892	1	N/A	N/A	2.892	400	Pass
	Mid Channel	2.892	51	147.492	2.5	368.73	400	Pass
	High Channel	2.895	1	N/A	N/A	2.895	400	Pass
	High Channel	2.895	54	156.33	2.5	390.825	400	Pass
3DH5, 8-DPSK								
	Low Channel	2.803	1	N/A	N/A	2.803	400	Pass
	Low Channel	2.803	47	131.741	2.5	329.3525	400	Pass
	Mid Channel	2.801	1	N/A	N/A	2.801	400	Pass
	Mid Channel	2.801	51	142.851	2.5	357.1275	400	Pass
	High Channel	2.804	1	N/A	N/A	2.804	400	Pass
	High Channel	2.804	47	131.788	2.5	329.47	400	Pass

DH5, GFSK, Low Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.886	1	N/A	N/A	2.886	400	Pass

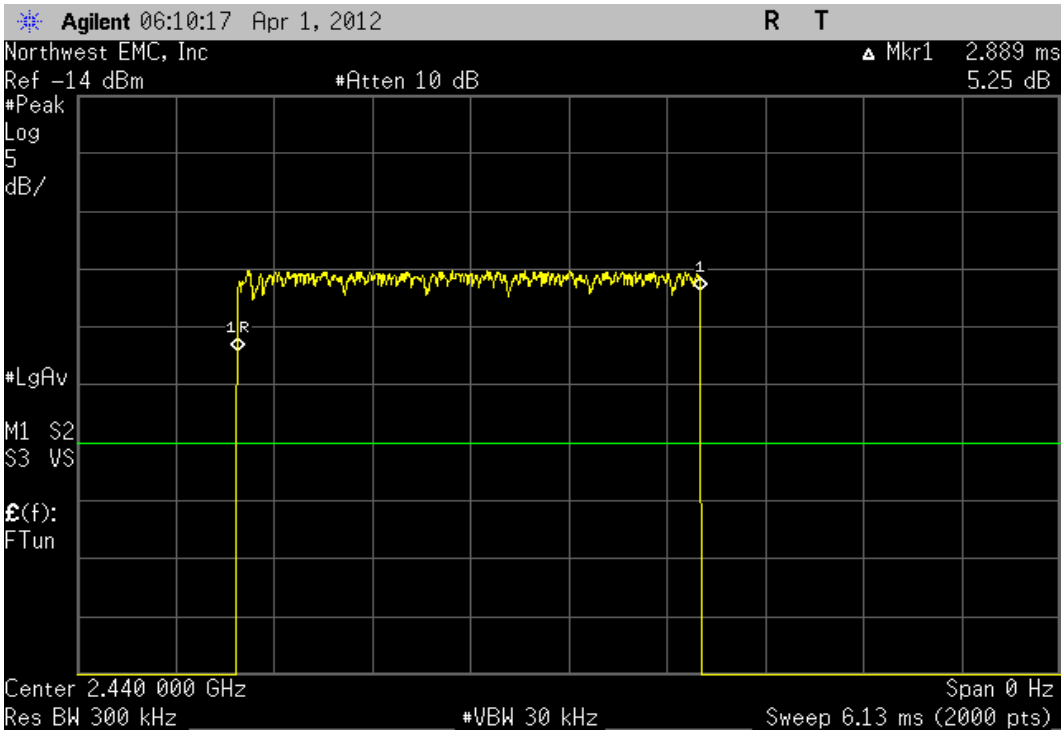


DH5, GFSK, Low Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.886	47	135.642	2.5	339.105	400	Pass



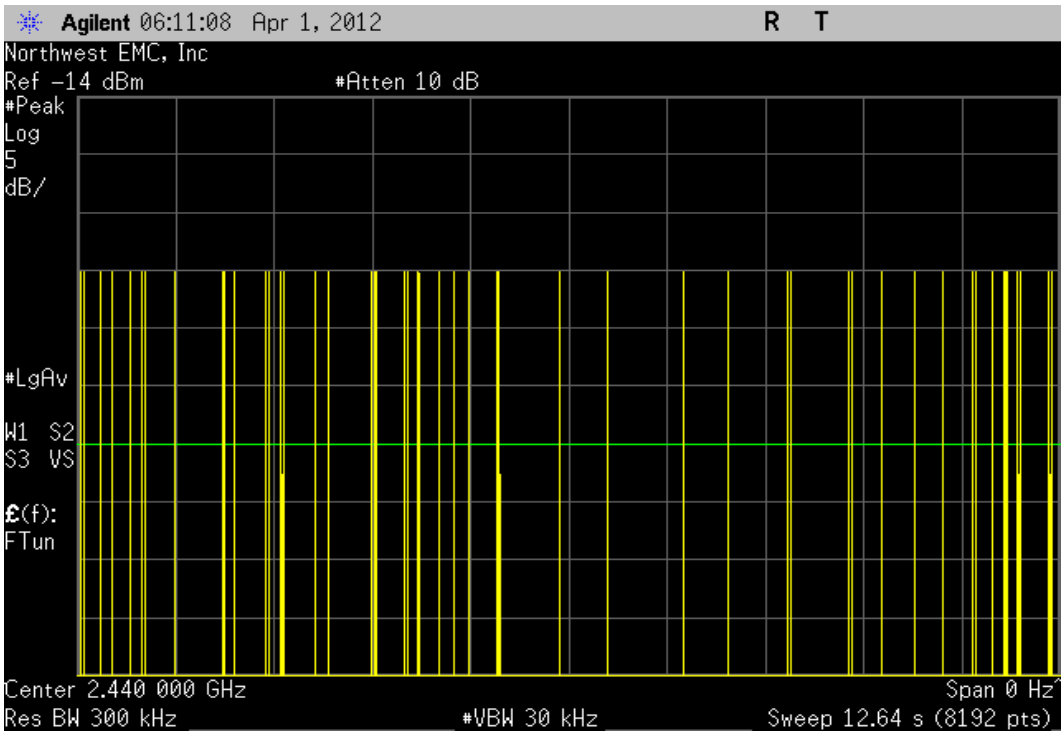
DH5, GFSK, Mid Channel

Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.889	1	N/A	N/A	2.889	400	Pass



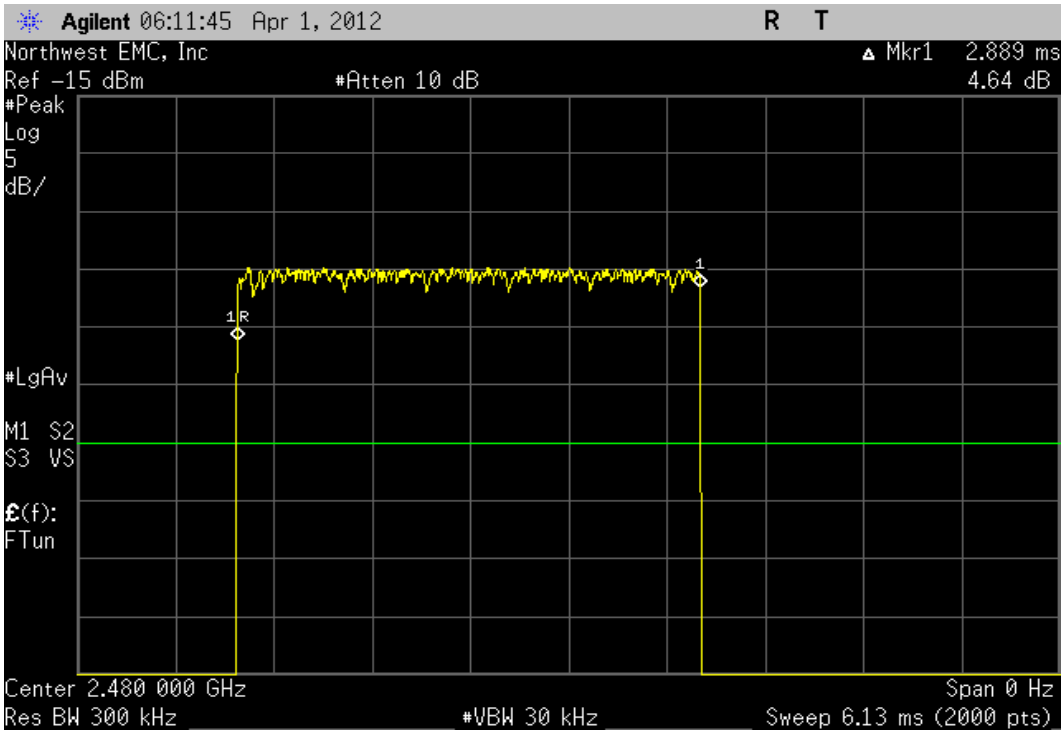
DH5, GFSK, Mid Channel

Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.889	47	135.783	2.5	339.4575	400	Pass



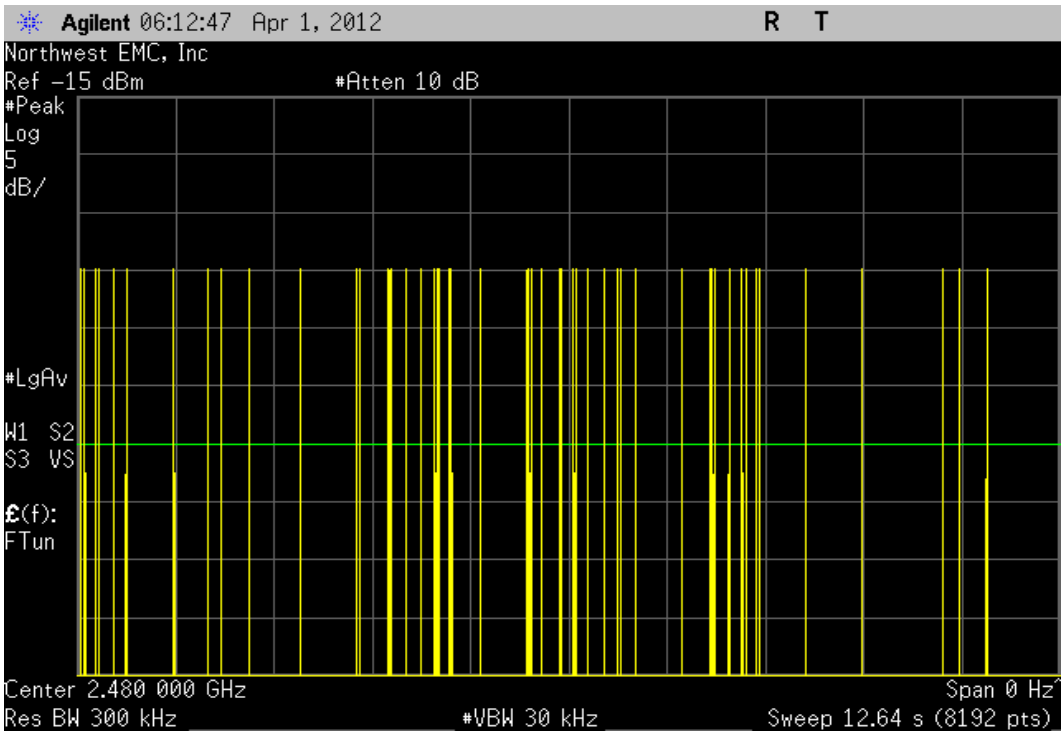
DH5, GFSK, High Channel

Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.889	1	N/A	N/A	2.889	400	Pass

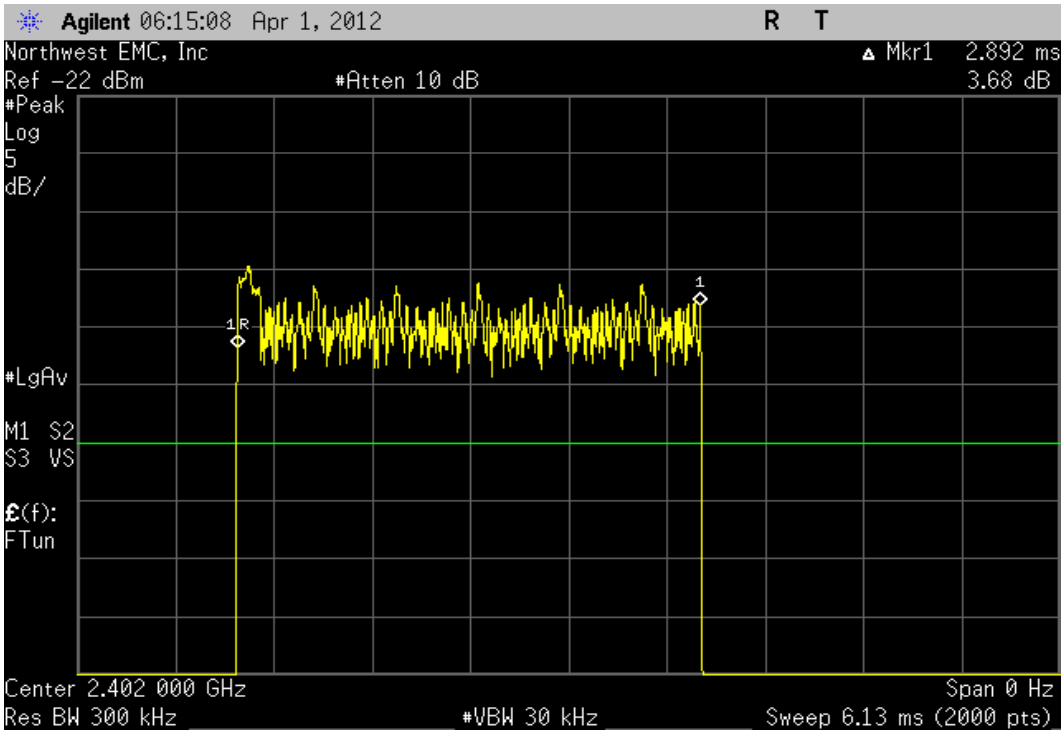


DH5, GFSK, High Channel

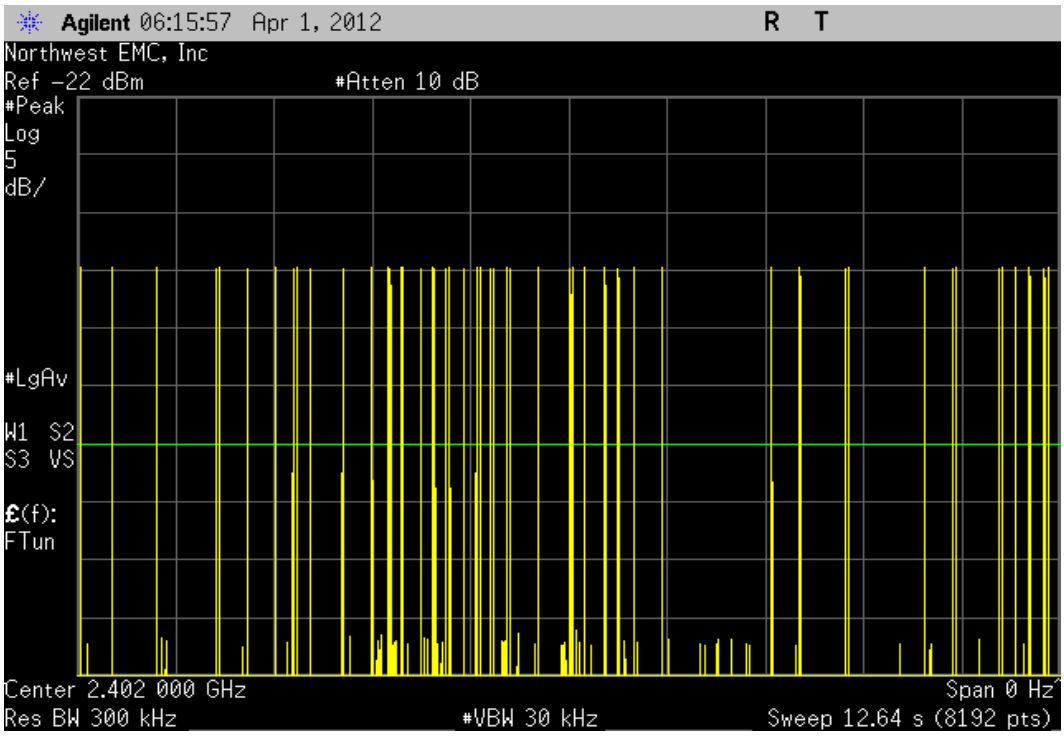
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.889	47	135.783	2.5	339.4575	400	Pass



2DH5, 4-DQPSK, Low Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.892	1	N/A	N/A	2.892	400	Pass

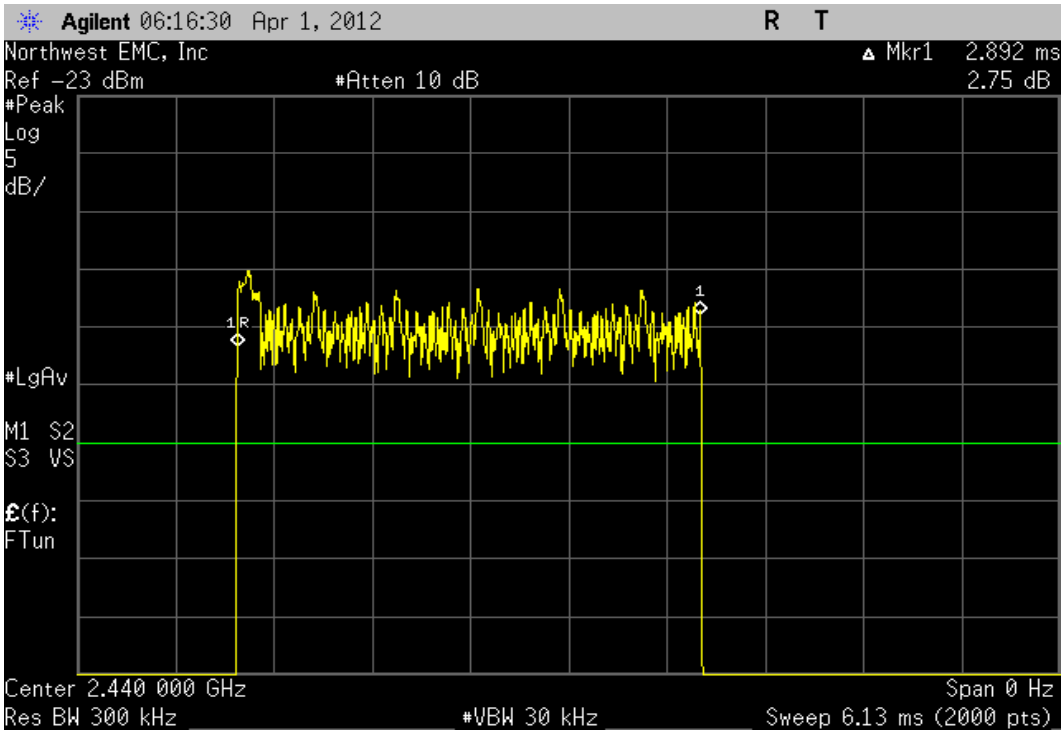


2DH5, 4-DQPSK, Low Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.892	49	141.708	2.5	354.27	400	Pass



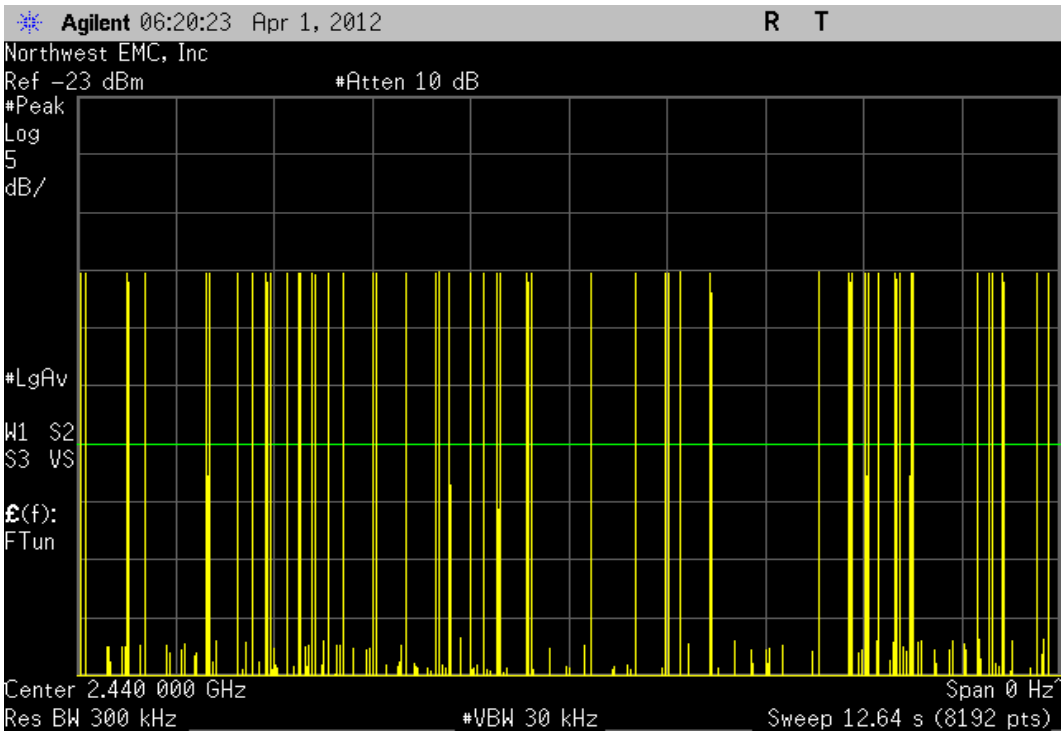
2DH5, 4-DQPSK, Mid Channel

Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.892	1	N/A	N/A	2.892	400	Pass

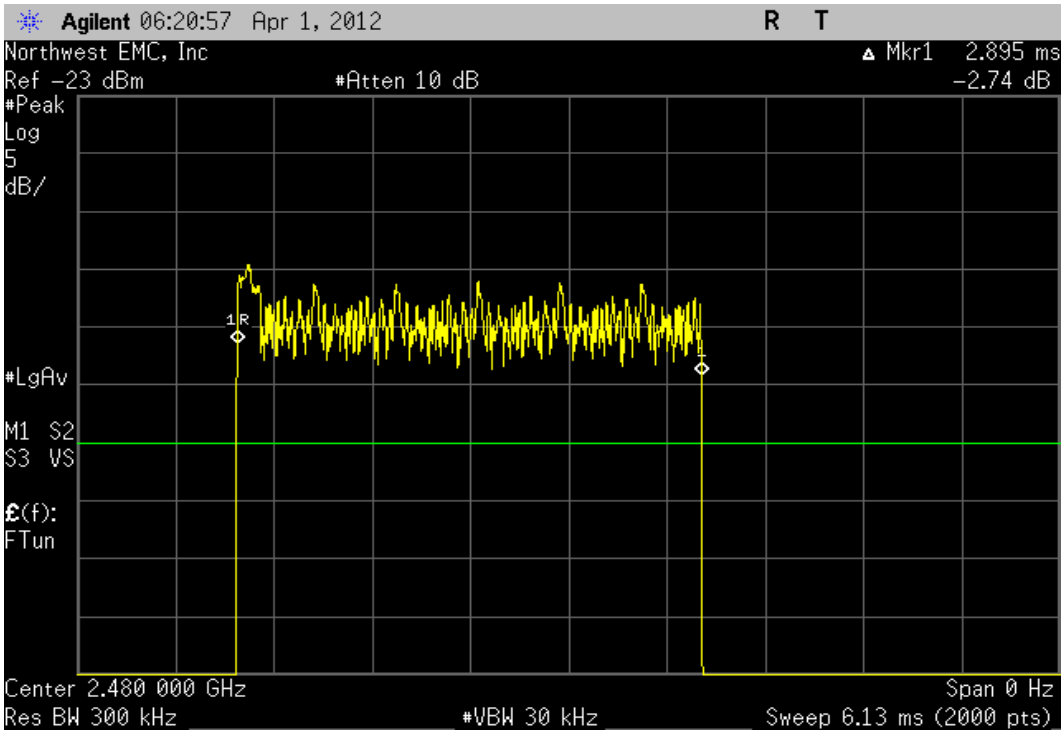


2DH5, 4-DQPSK, Mid Channel

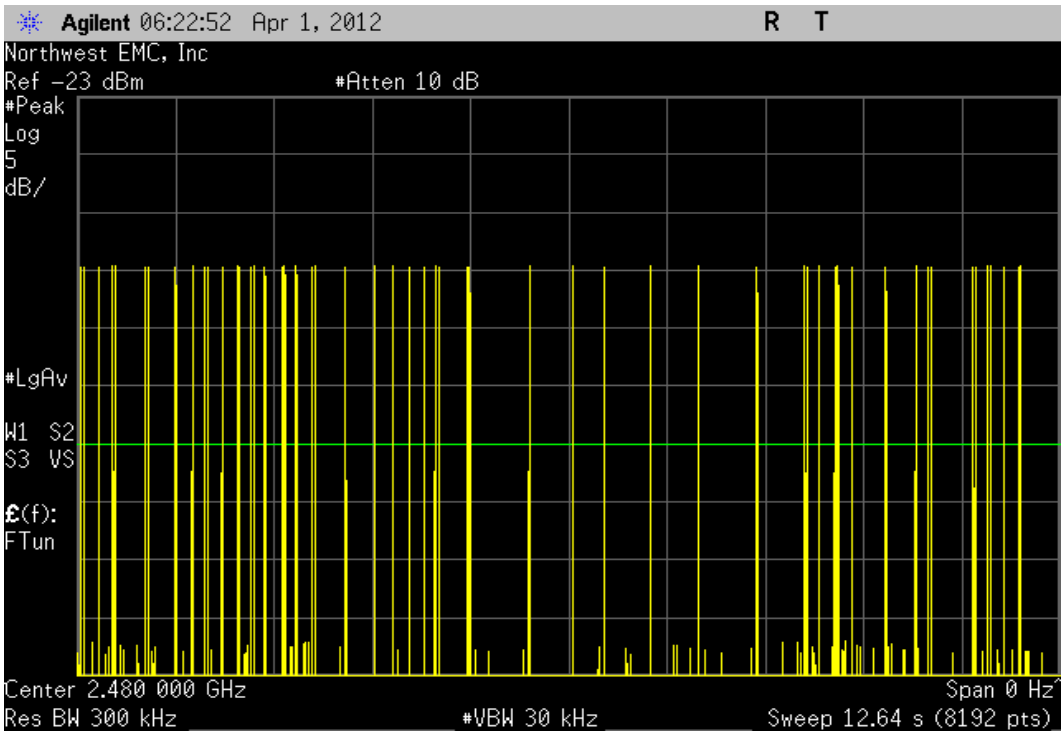
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.892	51	147.492	2.5	368.73	400	Pass



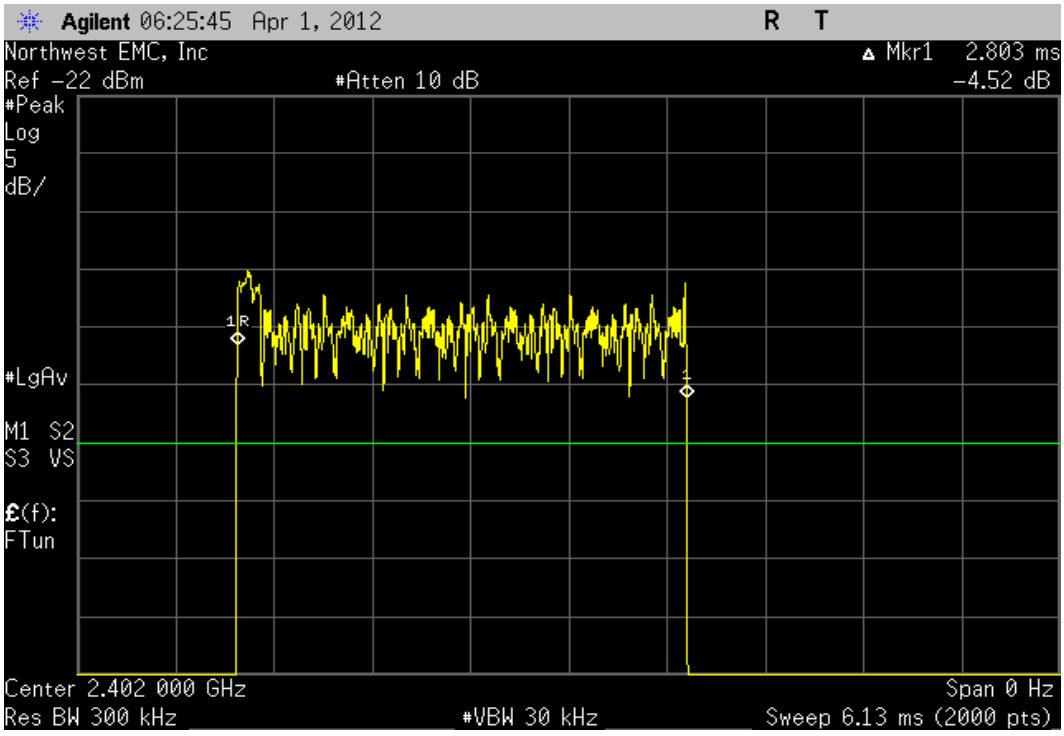
2DH5, 4-DQPSK, High Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.895	1	N/A	N/A	2.895	400	Pass



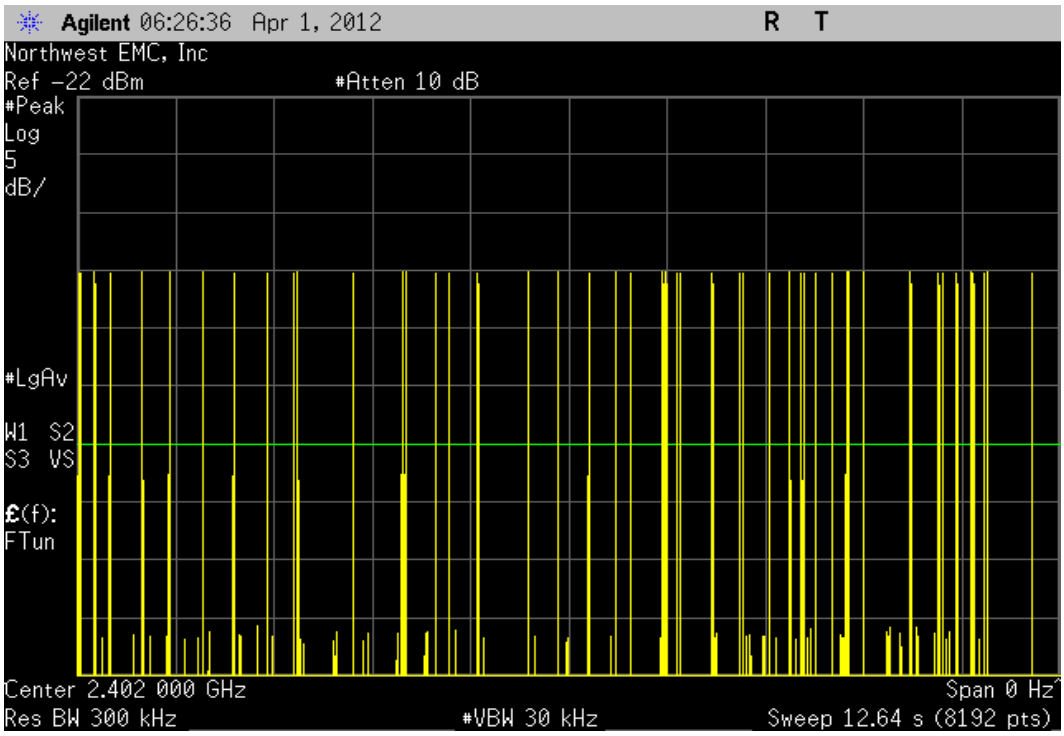
2DH5, 4-DQPSK, High Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.895	54	156.33	2.5	390.825	400	Pass



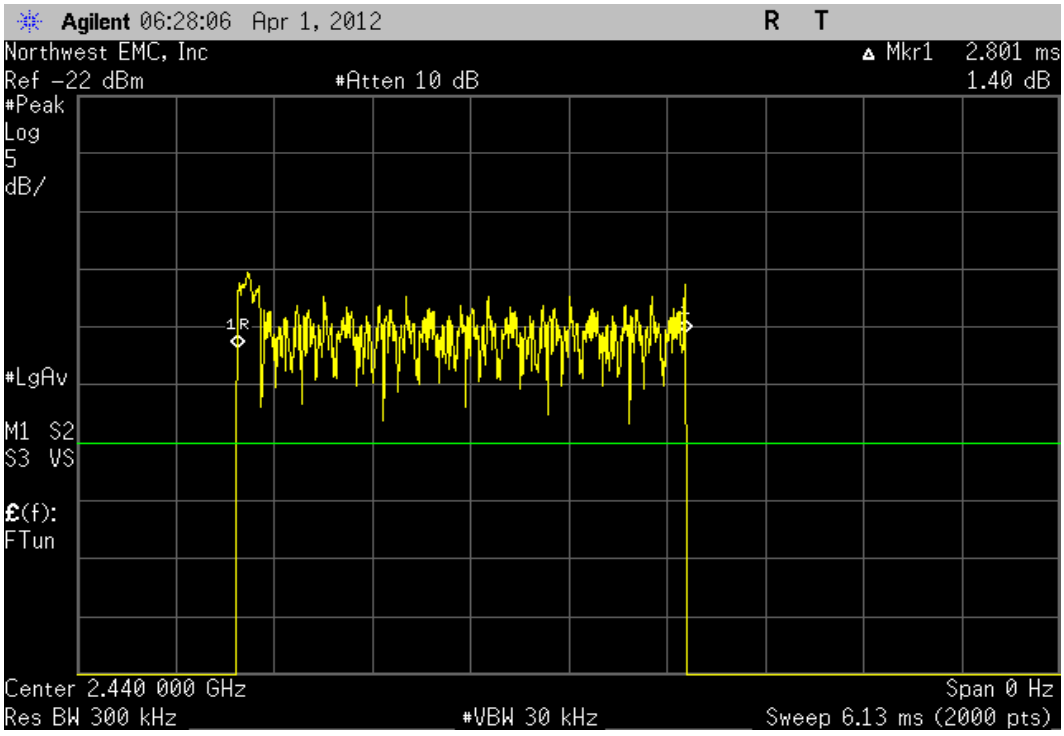
3DH5, 8-DPSK, Low Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.803	1	N/A	N/A	2.803	400	Pass



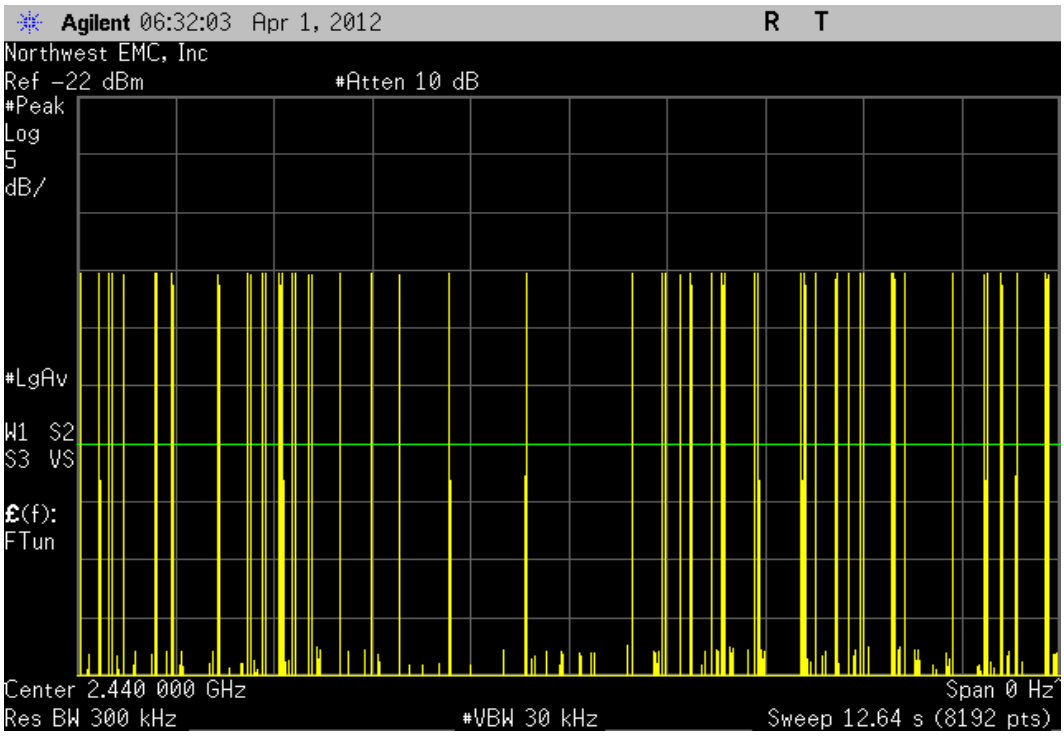
3DH5, 8-DPSK, Low Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.803	47	131.741	2.5	329.3525	400	Pass



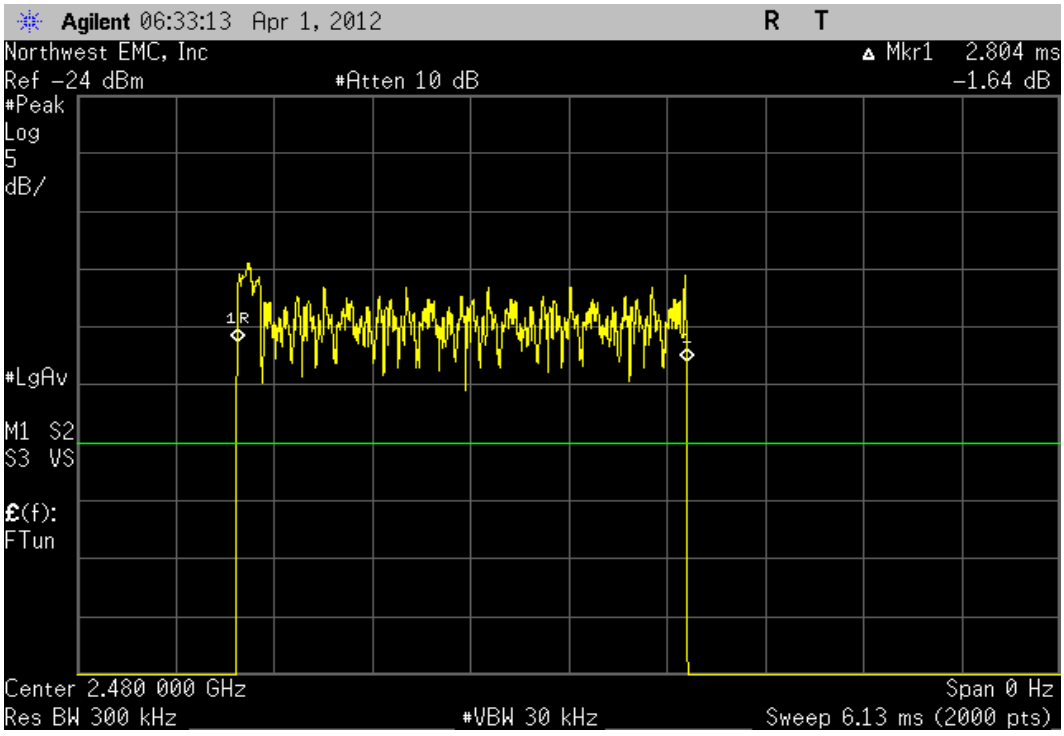
3DH5, 8-DPSK, Mid Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.801	1	N/A	N/A	2.801	400	Pass



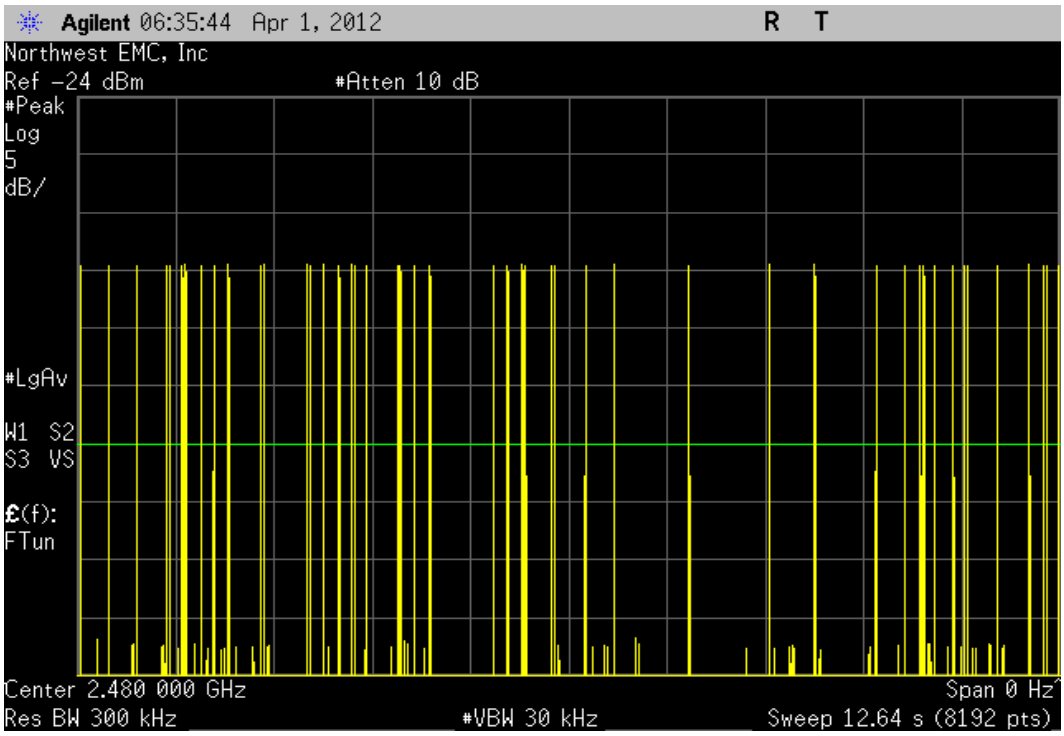
3DH5, 8-DPSK, Mid Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.801	51	142.851	2.5	357.1275	400	Pass



3DH5, 8-DPSK, High Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.804	1	N/A	N/A	2.804	400	Pass



3DH5, 8-DPSK, High Channel						
Pulse Width (mS)	Number of Pulses	Worst Case High Time (mS)	Scale Factor	On Time (mS) During 31.6 S	Limit (mS)	Result
2.804	47	131.788	2.5	329.47	400	Pass



Dwell Time

Number of Hopping Frequencies

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
Multimeter	Fluke	114	MMU	7/8/2011	24
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	6/2/2011	12
40 GHz DC block	Fairview Microwave	SD3379	AMI	10/12/2011	12
Spectrum Analyzer	Agilent	E4440A	AAX	5/23/2011	12

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) (Frequency Accuracy: +0.12/- 0.01) 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 16-4-1 as applicable), and are available upon request.

TEST DESCRIPTION

The number of hopping frequencies was measured across the authorized band. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The hopping function of the EUT was enabled.

NORTHWEST EMC

Number of Hopping Frequencies

XMit 2011.10.26

EUT:	CTM2			Work Order:	MDTR0042
Serial Number:	NKW001457N			Date:	12/21/11
Customer:	Medtronic Inc.			Temperature:	24.48°C
Attendees:	None			Humidity:	15%
Project:	None			Barometric Pres.:	1005.4
Tested by:	Trevor Buls	Power:	2.75VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

COMMENTS

MDTR0012 Test Plan Configuration 7. Payload Size = 528, Frequency Hopping Mode.

DEVIATIONS FROM TEST STANDARD

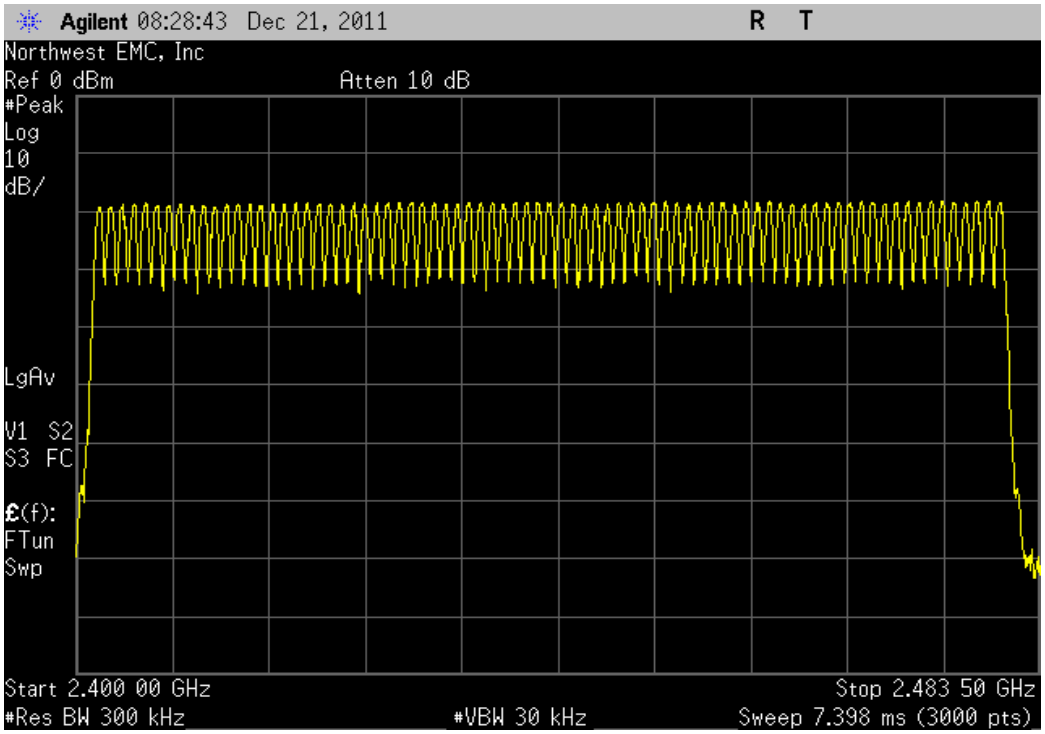
None

Configuration #	4	Signature	Trevor Buls

	Value	Limit	Result
Number of Hopping Frequencies	79	≥ 15	Pass

Number of Hopping Frequencies

Number of Hopping Frequencies						
				Value	Limit	Result
				79	≥ 15	Pass



Occupied 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
Signal Generator	Agilent	N5183A	TIA	1/18/2011	12
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0
Multimeter	Fluke	114	MMU	7/8/2011	24
Spectrum Analyzer	Agilent	E4440A	AAX	5/23/2011	12
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	6/2/2011	12
40 GHz DC block	Fairview Microwave	SD3379	AMI	10/12/2011	12

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) (Frequency Accuracy: +0.12/- 0.01) 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 16-4-1 as applicable), and are available upon request.

TEST DESCRIPTION

The 20 dB occupied bandwidth was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting in a no hop mode at its maximum data rate for each of the three different modulations available.

NORTHWEST EMC

Occupied Bandwidth

XMit 2011.10.26
PsaTx 2011.12.16

EUT:	CTM2			**Work Order:**	MDTR0042
Serial Number:	NKW001457N			**Date:**	12/19/11
Customer:	Medtronic Inc.			**Temperature:**	24.40C°C
Attendees:	None			**Humidity:**	20%
Project:	None			**Barometric Pres.:**	1017.8
Tested by:	Bryan Weller	**Power:**	2.75VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

COMMENTS

MDTR0012 Test Plan Configuration 7.

DEVIATIONS FROM TEST STANDARD

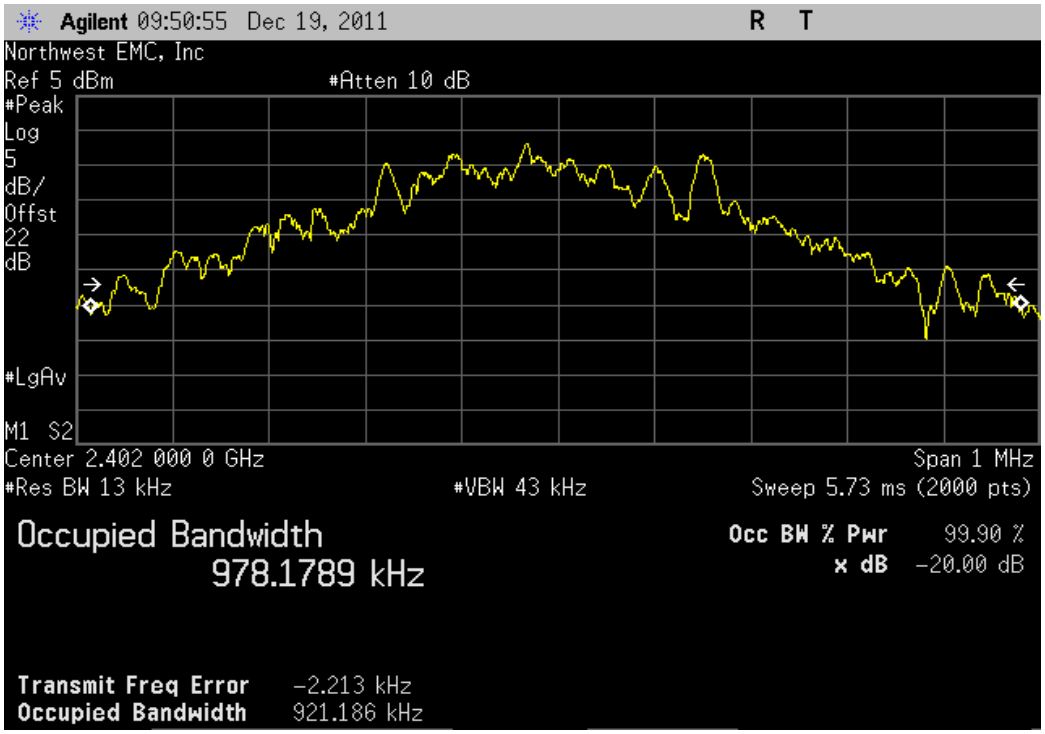
None

Configuration #	4	Signature	Trevor Bulls

		Value	Limit	Result
DH5, GFSK				
	Low Channel	921.186 kHz	< 1.5 MHz	Pass
	Mid Channel	918.162 kHz	< 1.5 MHz	Pass
	High Channel	899.579 kHz	< 1.5 MHz	Pass
2DH5, 4-DQPSK				
	Low Channel	1.31 MHz	< 1.5 MHz	Pass
	Mid Channel	1.32 MHz	< 1.5 MHz	Pass
	High Channel	1.309 MHz	< 1.5 MHz	Pass
3DH5, 8-DPSK				
	Low Channel	1.199 MHz	< 1.5 MHz	Pass
	Mid Channel	1.202 MHz	< 1.5 MHz	Pass
	High Channel	1.2 MHz	< 1.5 MHz	Pass

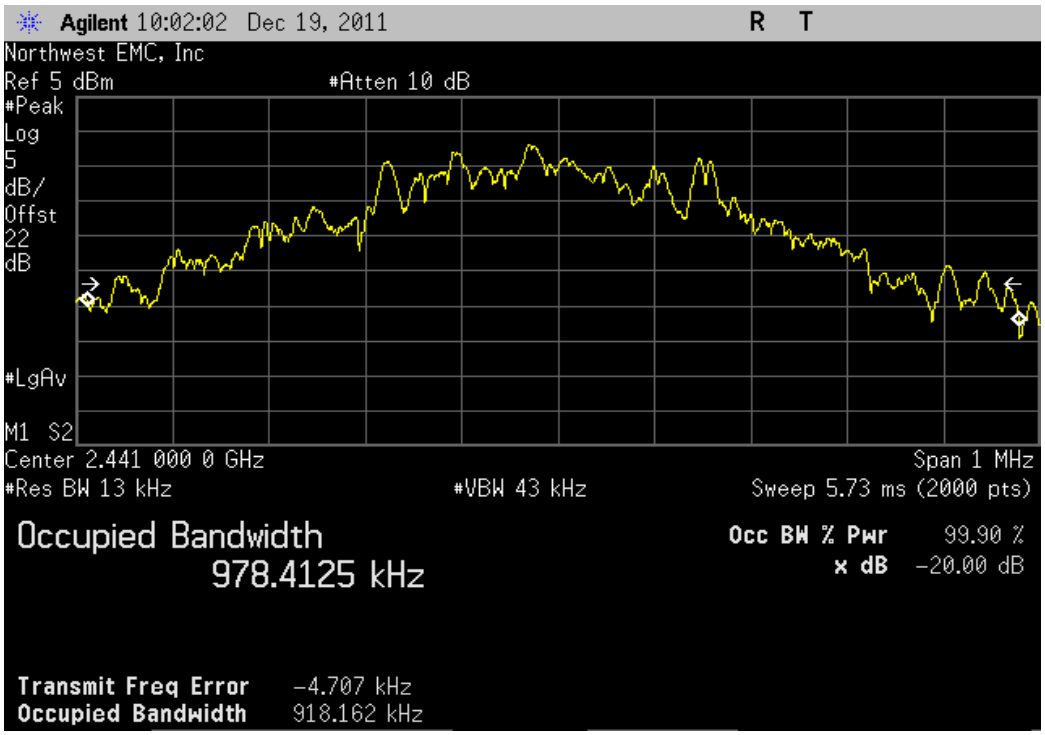
DH5, GFSK, Low Channel

				Value	Limit	Result
				921.186 kHz	< 1.5 MHz	Pass



DH5, GFSK, Mid Channel

				Value	Limit	Result
				918.162 kHz	< 1.5 MHz	Pass



DH5, GFSK, High Channel

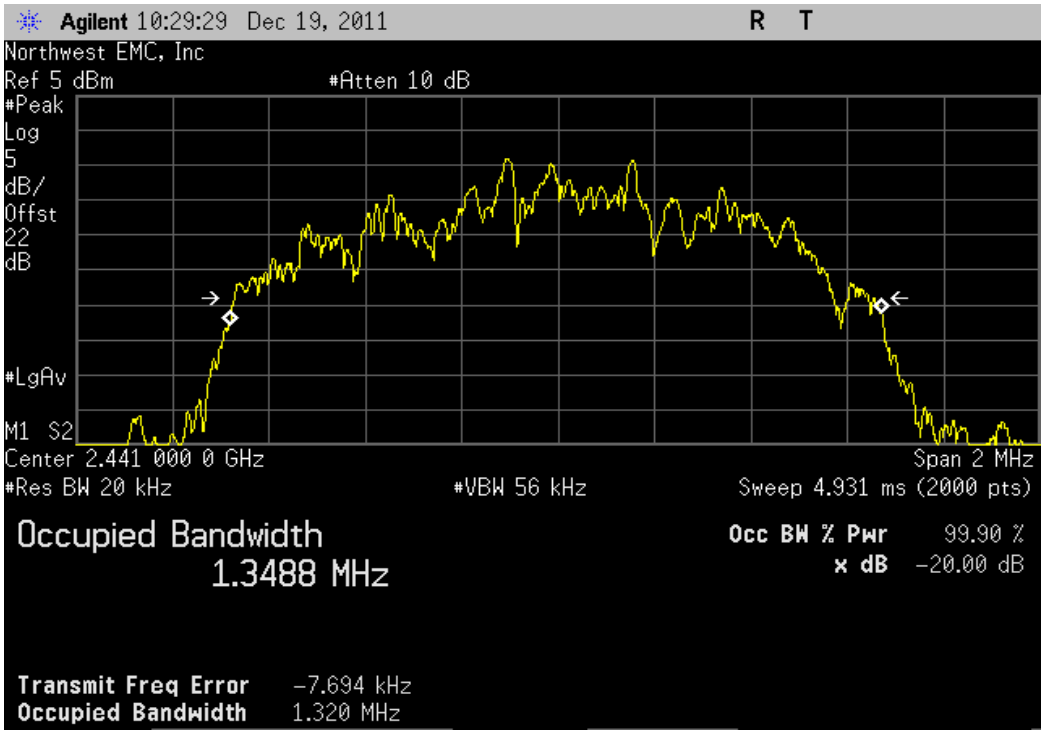
				Value	Limit	Result
				899.579 kHz	< 1.5 MHz	Pass

2DH5, 4-DQPSK, Low Channel

				Value	Limit	Result
				1.31 MHz	< 1.5 MHz	Pass

2DH5, 4-DQPSK, Mid Channel

				Value	Limit	Result
				1.32 MHz	< 1.5 MHz	Pass



2DH5, 4-DQPSK, High Channel

				Value	Limit	Result
				1.309 MHz	< 1.5 MHz	Pass

3DH5, 8-DPSK, Low Channel

				Value	Limit	Result
				1.199 MHz	< 1.5 MHz	Pass

3DH5, 8-DPSK, Mid Channel

				Value	Limit	Result
				1.202 MHz	< 1.5 MHz	Pass

3DH5, 8-DPSK, High Channel

				Value	Limit	Result
				1.2 MHz	< 1.5 MHz	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
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0
Signal Generator	Agilent	N5183A	TIA	1/18/2011	12
Multimeter	Fluke	114	MMU	7/8/2011	24
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	6/2/2011	12
Spectrum Analyzer	Agilent	E4440A	AAX	5/23/2011	12
40 GHz DC block	Fairview Microwave	SD3379	AMI	10/12/2011	12

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) (Conducted Power: +/- 0.41) 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 16-4-1 as applicable), and are available upon request.

TEST DESCRIPTION

The peak output power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. . The EUT was transmitting in a no hop mode at its maximum data rate for each of the three different modulations available.

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

NORTHWEST EMC

Output Power

XMit 2011.10.26
PsaTx 2011.12.16

EUT:	CTM2			Work Order:	MDTR0042
Serial Number:	NKW001457N			Date:	12/19/11
Customer:	Medtronic Inc.			Temperature:	24.40C°C
Attendees:	None			Humidity:	20%
Project:	None			Barometric Pres.:	1017.8
Tested by:	Bryan Weller	Power:	2.75VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

COMMENTS

MDTR0012 Test Plan Configuration 7.

DEVIATIONS FROM TEST STANDARD

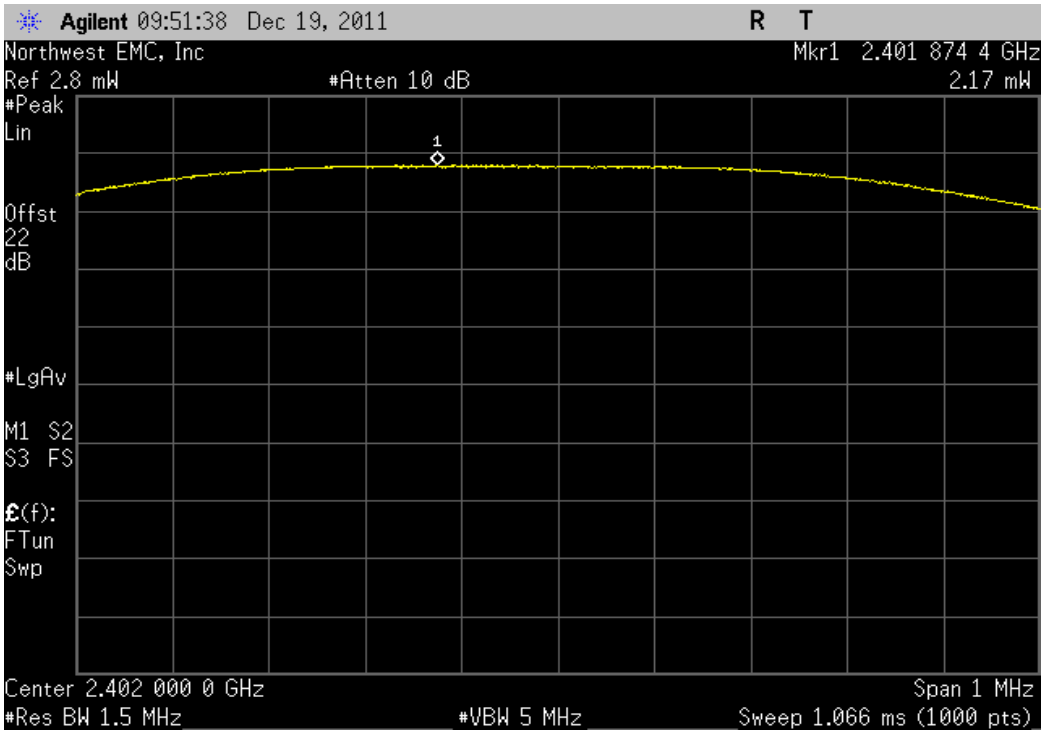
None

Configuration #	4	Signature	Trevor Bulls

		Value	Limit	Result
DH5, GFSK				
	Low Channel	2.168 mW	< 125 mW	Pass
	Mid Channel	2.367 mW	< 125 mW	Pass
	High Channel	2.445 mW	< 125 mW	Pass
2DH5, 4-DQPSK				
	Low Channel	1.576 mW	< 125 mW	Pass
	Mid Channel	1.647 mW	< 125 mW	Pass
	High Channel	1.639 mW	< 125 mW	Pass
3DH5, 8-DPSK				
	Low Channel	1.693 mW	< 125 mW	Pass
	Mid Channel	1.784 mW	< 125 mW	Pass
	High Channel	1.782 mW	< 125 mW	Pass

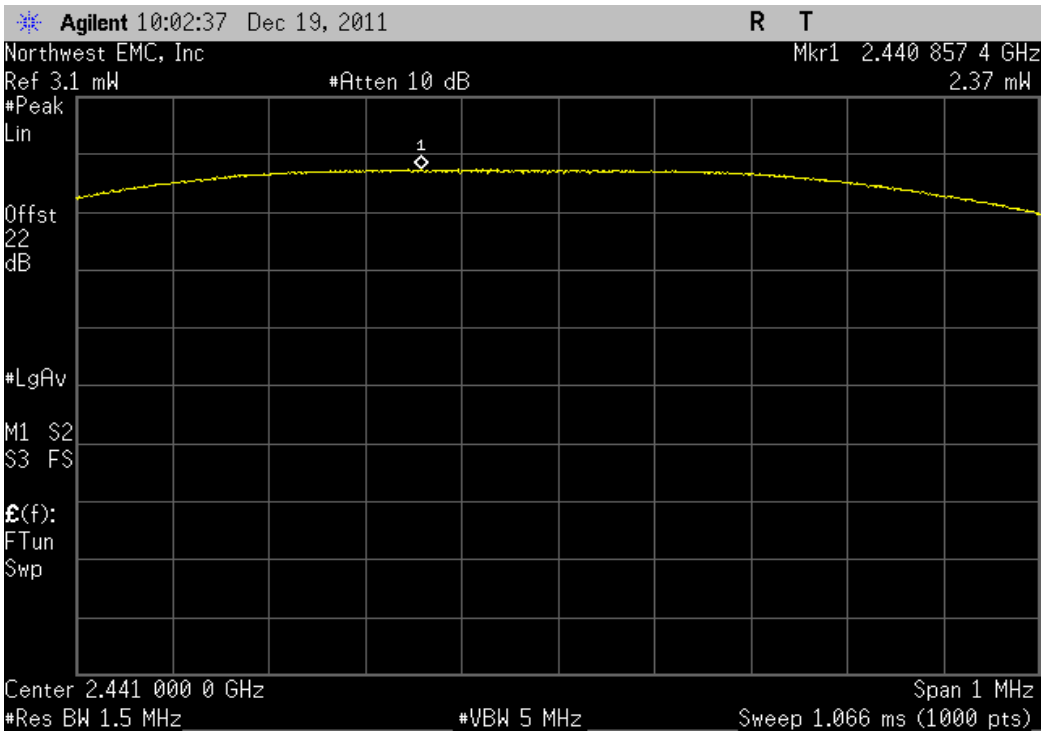
DH5, GFSK, Low Channel

				Value	Limit	Result
				2.168 mW	< 125 mW	Pass



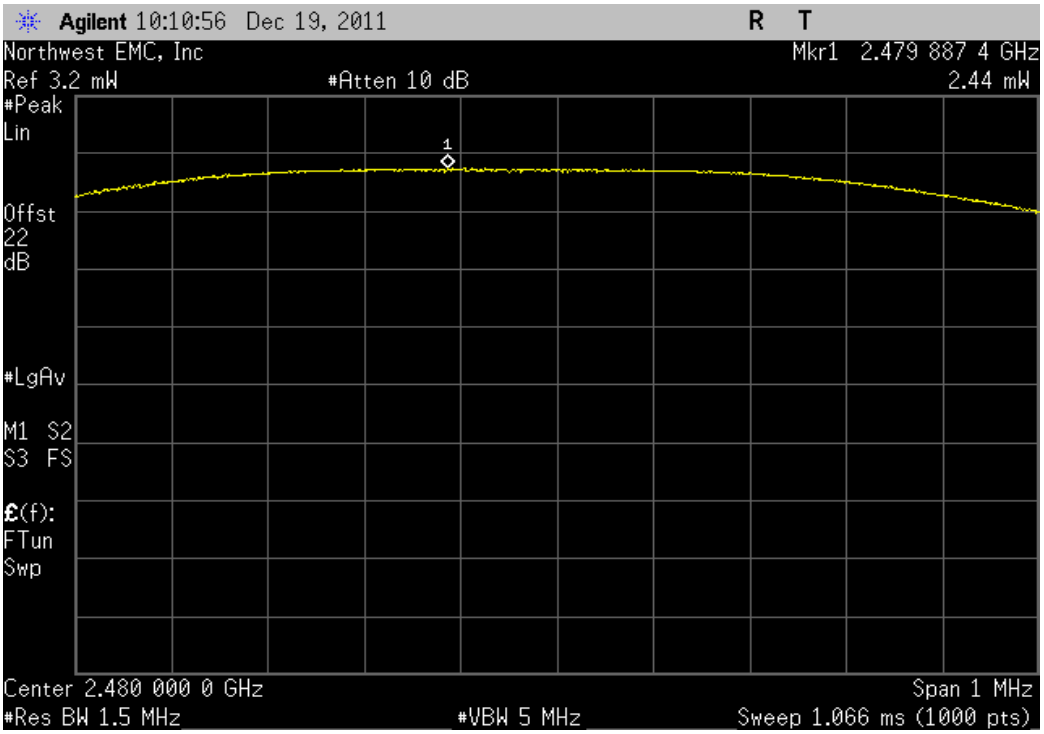
DH5, GFSK, Mid Channel

				Value	Limit	Result
				2.367 mW	< 125 mW	Pass



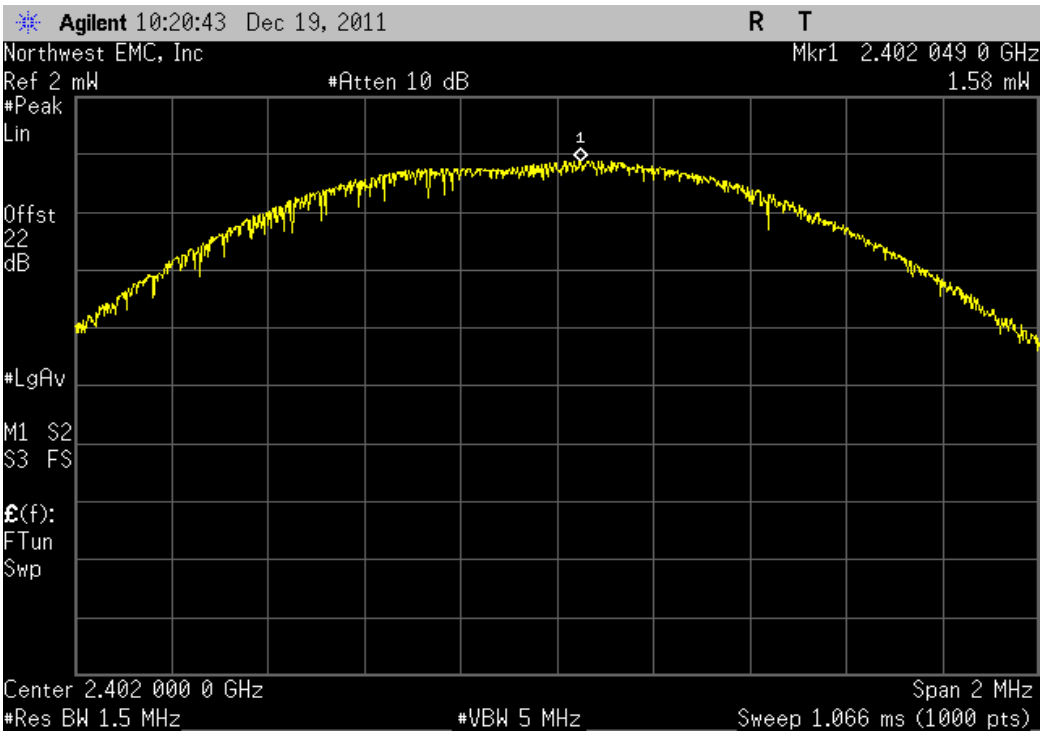
DH5, GFSK, High Channel

				Value	Limit	Result
				2.445 mW	< 125 mW	Pass



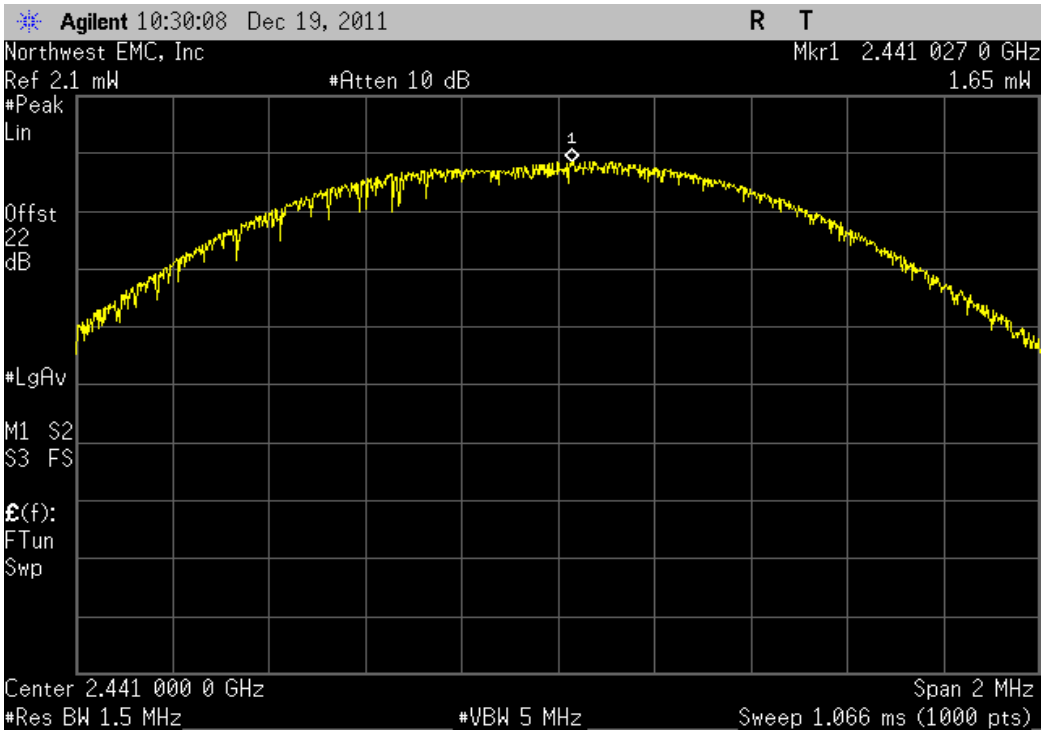
2DH5, 4-DQPSK, Low Channel

				Value	Limit	Result
				1.576 mW	< 125 mW	Pass



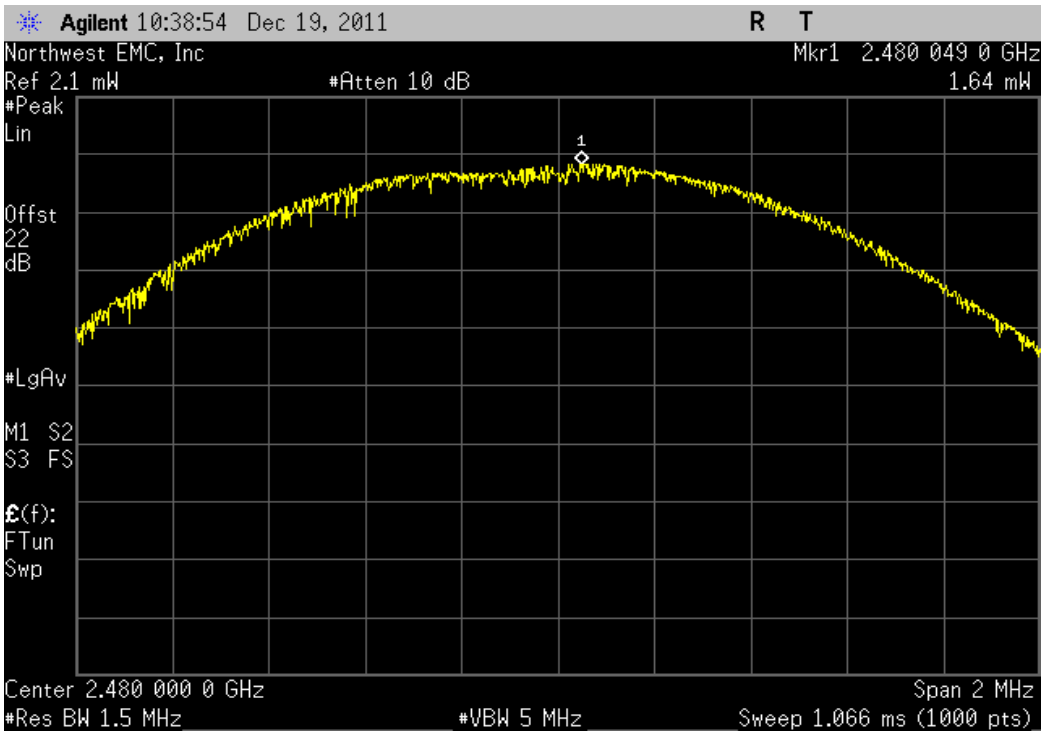
2DH5, 4-DQPSK, Mid Channel

				Value	Limit	Result
				1.647 mW	< 125 mW	Pass



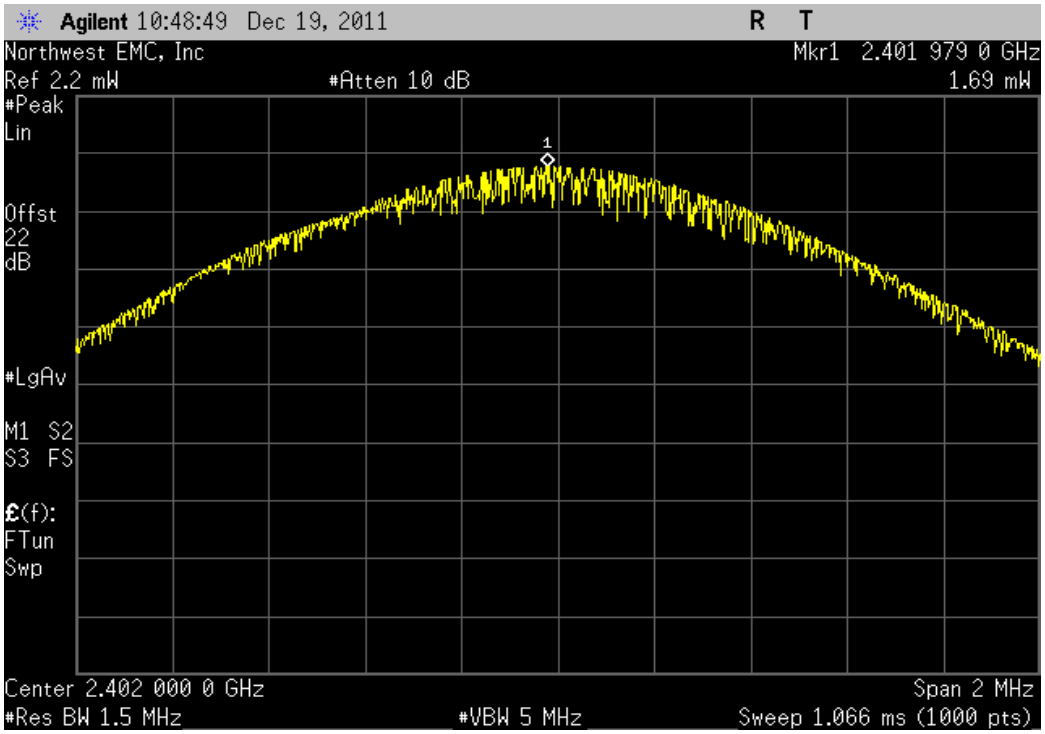
2DH5, 4-DQPSK, High Channel

				Value	Limit	Result
				1.639 mW	< 125 mW	Pass



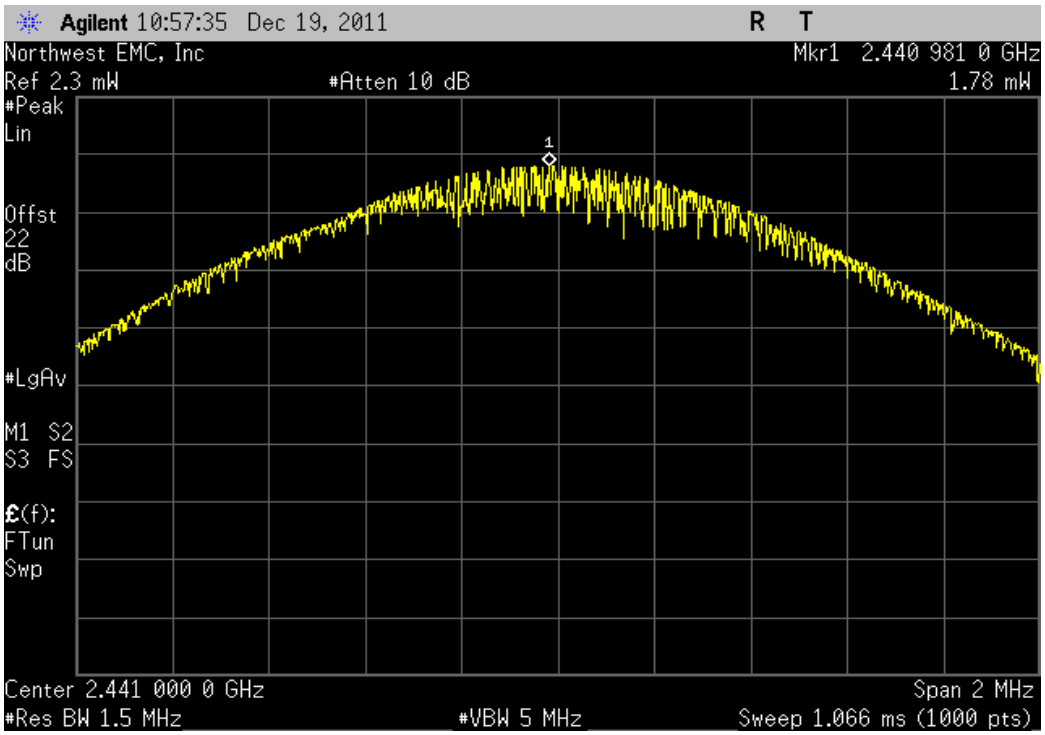
3DH5, 8-DPSK, Low Channel

				Value	Limit	Result
				1.693 mW	< 125 mW	Pass



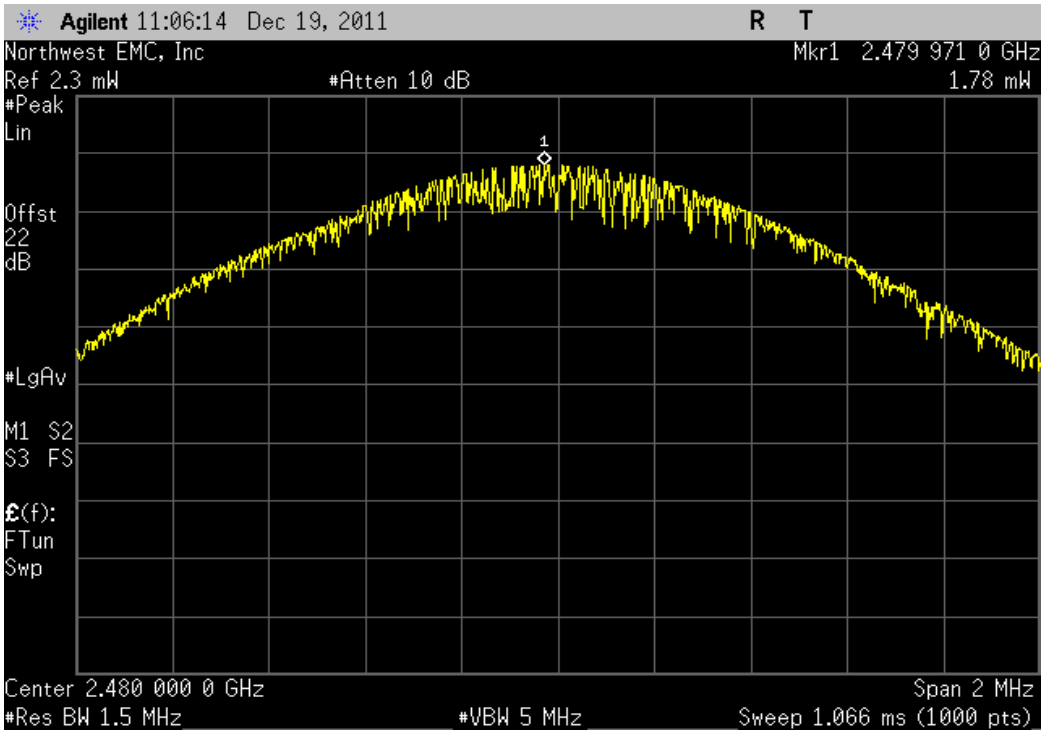
3DH5, 8-DPSK, Mid Channel

				Value	Limit	Result
				1.784 mW	< 125 mW	Pass



3DH5, 8-DPSK, High Channel

				Value	Limit	Result
				1.782 mW	< 125 mW	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
40 GHz DC block	Fairview Microwave	SD3379	AMI	10/12/2011	12
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0
Signal Generator	Agilent	N5183A	TIA	1/18/2011	12
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	6/2/2011	12
Multimeter	Fluke	114	MMU	7/8/2011	24
Spectrum Analyzer	Agilent	E4440A	AAX	5/23/2011	12

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) (Amplitude Accuracy: +/- 0.49) 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 16-4-1 as applicable), and are available upon request.

TEST DESCRIPTION

The requirements of FCC 15.247(d) for emissions at least 20dB below the carrier in any 100kHz bandwidth outside the allowable band was measured with the EUT set to low and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The channels closest to the band edges were selected. The spectrum was scanned across each band edge from 10 MHz below the band edge to 10 MHz above the band edge.

The EUT was transmitting at its maximum data rate using all three types of modulations available in Bluetooth EDR.

NORTHWEST EMC

Band Edge Compliance

XMit 2011.10.26
PsaTx 2011.12.16

EUT:	CTM2			Work Order:	MDTR0042
Serial Number:	NKW001457N			Date:	12/19/11
Customer:	Medtronic Inc.			Temperature:	24.40C°C
Attendees:	None			Humidity:	20%
Project:	None			Barometric Pres.:	1017.8
Tested by:	Bryan Weller	Power:	2.75VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen :2010

COMMENTS

MDTR0012 Test Plan Configuration 7.

DEVIATIONS FROM TEST STANDARD

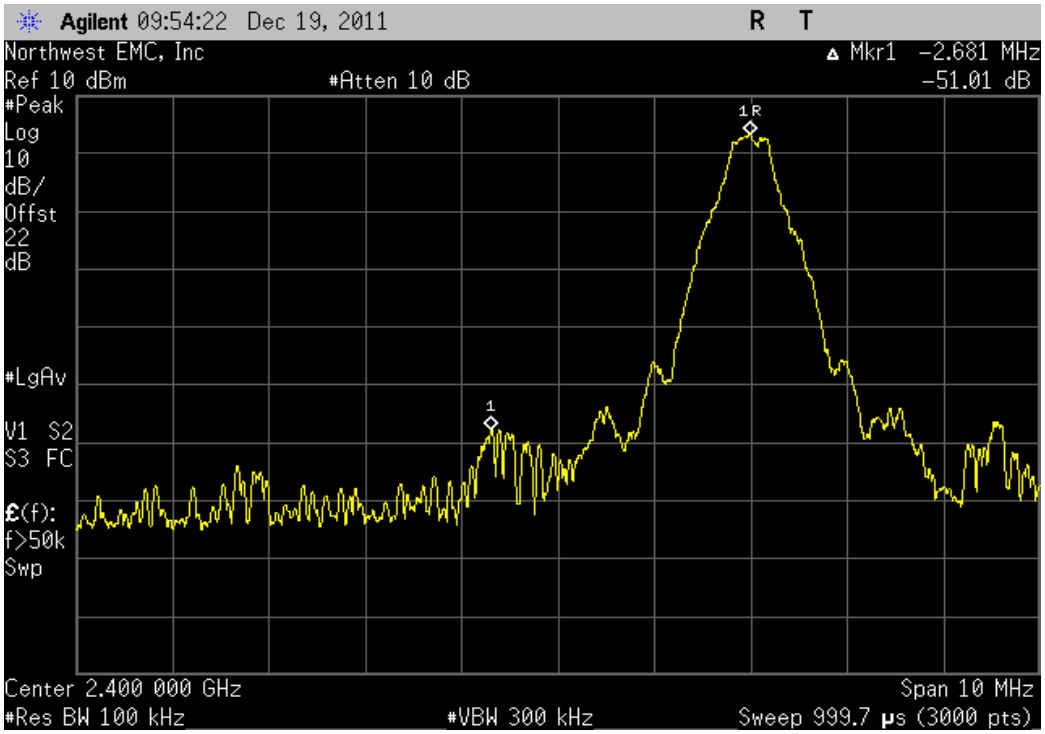
None

Configuration #	4	Signature	Trevor Bulls

		Value	Limit	Result
DH5, GFSK				
	Low Channel	-51.01 dBc	≤ -20 dBc	Pass
	High Channel	-57.51 dBc	≤ -20 dBc	Pass
2DH5, 4-DQPSK				
	Low Channel	-50.27 dBc	≤ -20 dBc	Pass
	High Channel	-57.28 dBc	≤ -20 dBc	Pass
3DH5, 8-DPSK				
	Low Channel	-50.59 dBc	≤ -20 dBc	Pass
	High Channel	-56.12 dBc	≤ -20 dBc	Pass

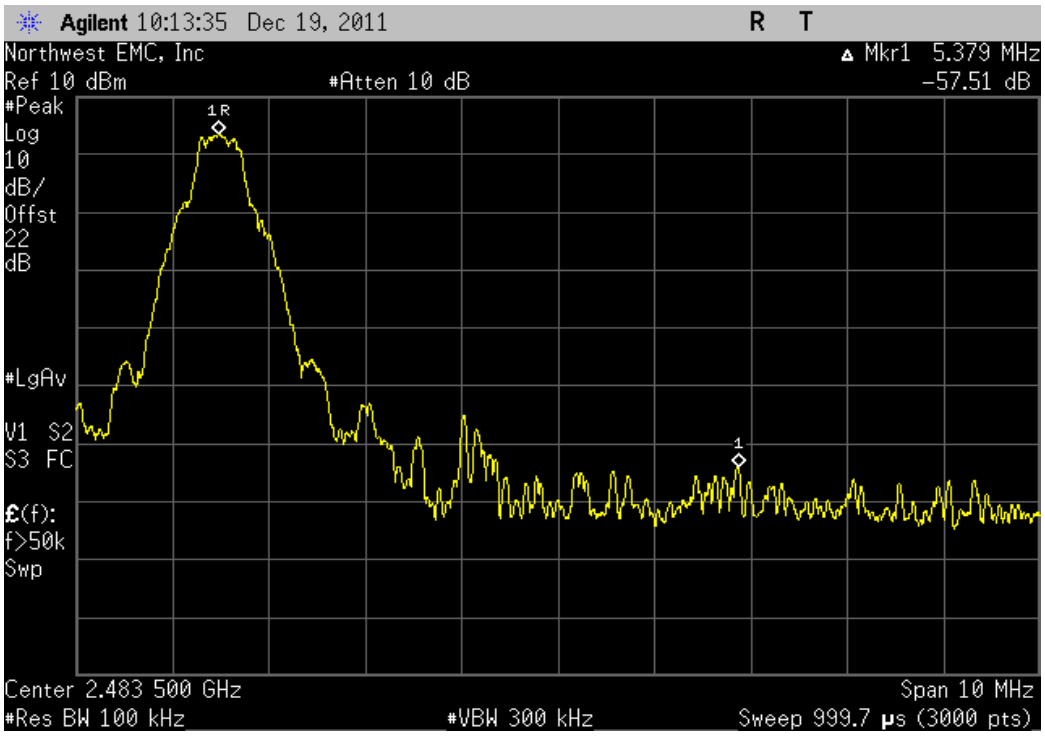
DH5, GFSK, Low Channel

				Value	Limit	Result
				-51.01 dBc	≤ -20 dBc	Pass



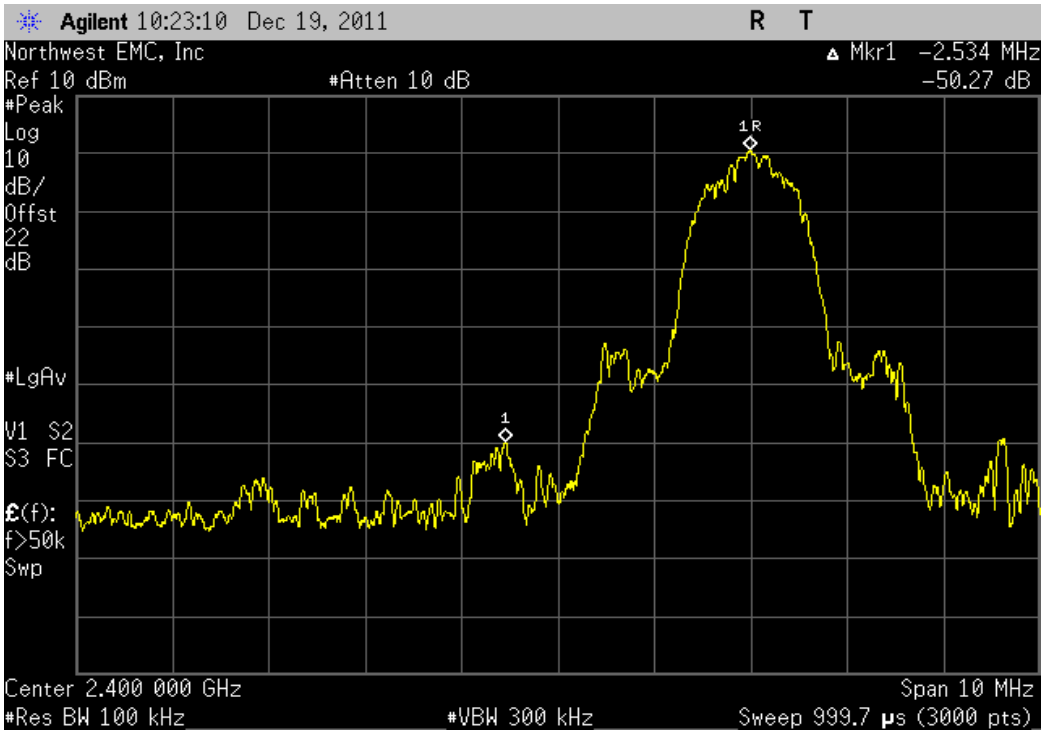
DH5, GFSK, High Channel

				Value	Limit	Result
				-57.51 dBc	≤ -20 dBc	Pass



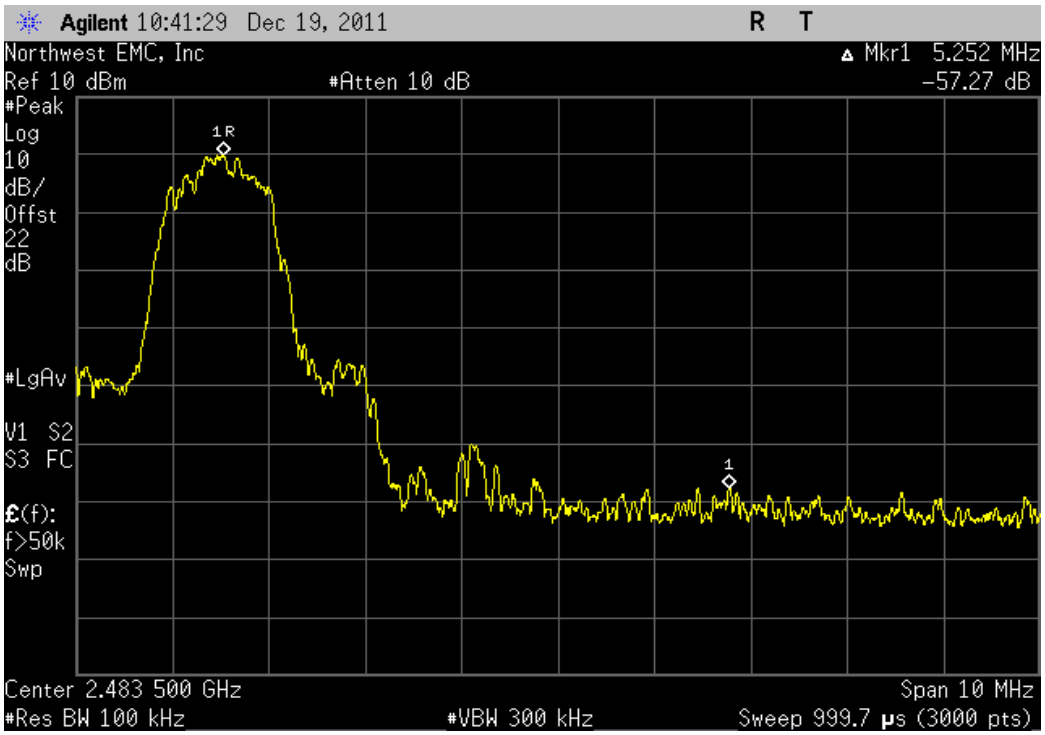
2DH5, 4-DQPSK, Low Channel

				Value	Limit	Result
				-50.27 dBc	≤ -20 dBc	Pass



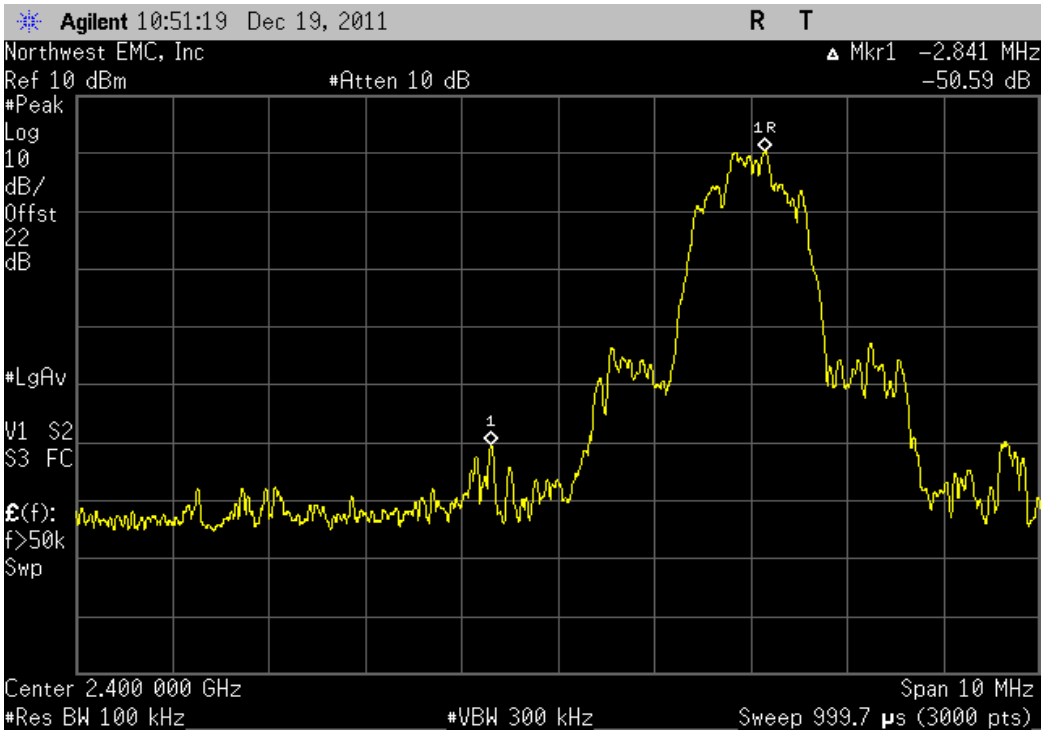
2DH5, 4-DQPSK, High Channel

				Value	Limit	Result
				-57.28 dBc	≤ -20 dBc	Pass



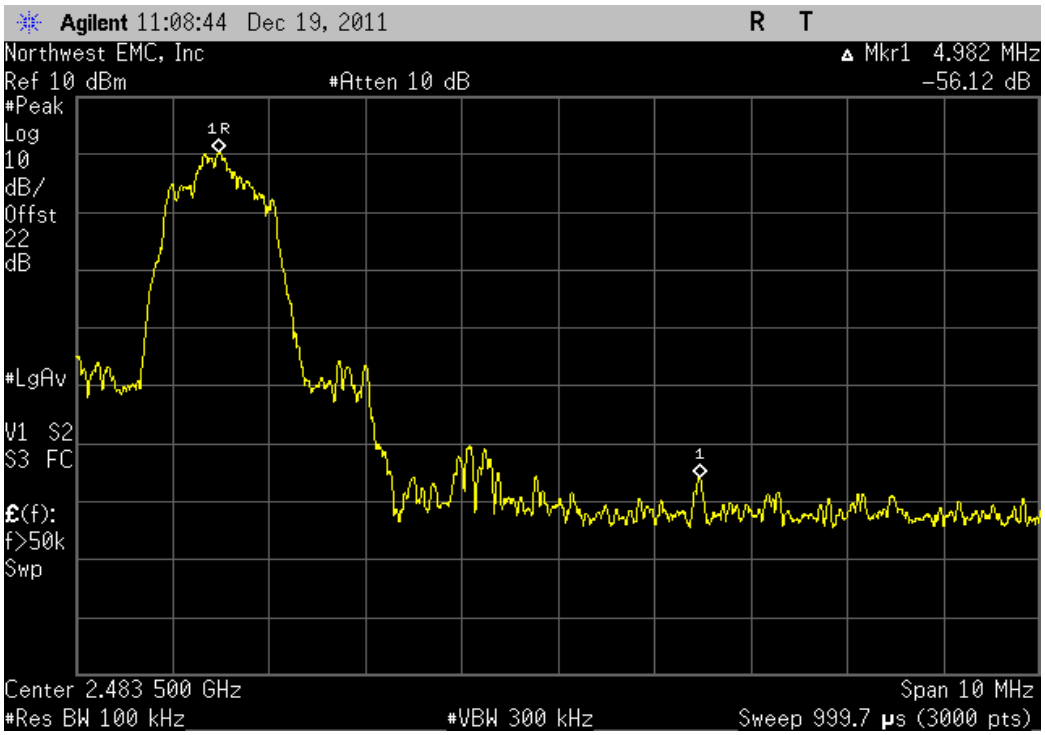
3DH5, 8-DPSK, Low Channel

				Value	Limit	Result
				-50.59 dBc	≤ -20 dBc	Pass



3DH5, 8-DPSK, High Channel

				Value	Limit	Result
				-56.12 dBc	≤ -20 dBc	Pass



Band Edge - Hopping Mode

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
40 GHz DC block	Fairview Microwave	SD3379	AMI	10/12/2011	12
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	6/2/2011	12
Multimeter	Fluke	114	MMU	7/8/2011	24
Spectrum Analyzer	Agilent	E4440A	AAX	5/23/2011	12

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) (Amplitude Accuracy: +/- 0.49) 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 16-4-1 as applicable), and are available upon request.

TEST DESCRIPTION

The requirements of FCC 15.247(d) for emissions at least 20dB below the carrier in any 100kHz bandwidth outside the allowable band was measured with the EUT set to low and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The channels closest to the band edges were selected. The spectrum was scanned across each band edge from 10 MHz below the band edge to 10 MHz above the band edge.

The EUT was transmitting at its maximum data rate using all three types of modulations available in Bluetooth EDR.

NORTHWEST EMC

Band Edge - Hopping Mode

XMit 2011.10.26
PsaTx 2011.12.16

EUT:	CTM2			Work Order:	MDTR0042
Serial Number:	NKW001457N			Date:	12/21/11
Customer:	Medtronic Inc.			Temperature:	24.48°C
Attendees:	None			Humidity:	15%
Project:	None			Barometric Pres.:	1005.4
Tested by:	Trevor Buls	Power:	2.75VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

COMMENTS

MDTR0012 Test Plan Configuration 7. Payload Size = 528, Frequency Hopping Mode.

DEVIATIONS FROM TEST STANDARD

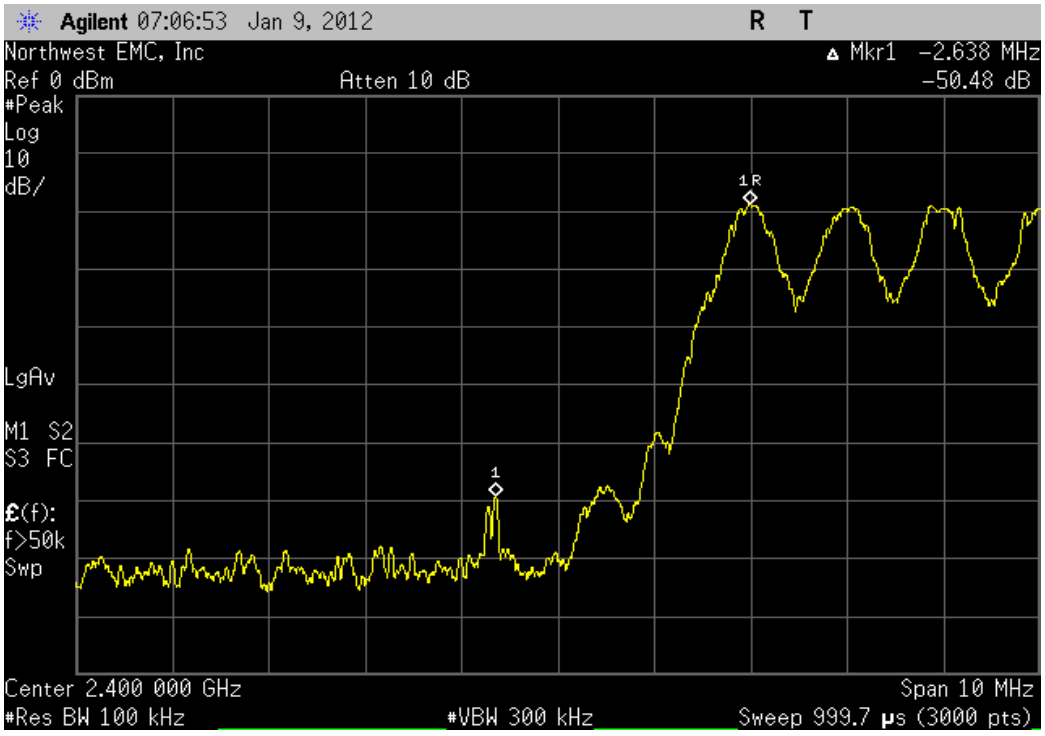
None

Configuration #	4	Signature	Trevor Buls

		Value	Limit	Result
DH5, GFSK				
	Low Channel	-50.48 dBc	≤ -20 dBc	Pass
	High Channel	-58.57 dBc	≤ -20 dBc	Pass
2DH5, 4-DQPSK				
	Low Channel	-54.72 dBc	≤ -20 dBc	Pass
	High Channel	-51.70 dBc	≤ -20 dBc	Pass
3DH5, 8-DPSK				
	Low Channel	-54.36 dBc	≤ -20 dBc	Pass
	High Channel	-54.55 dBc	≤ -20 dBc	Pass

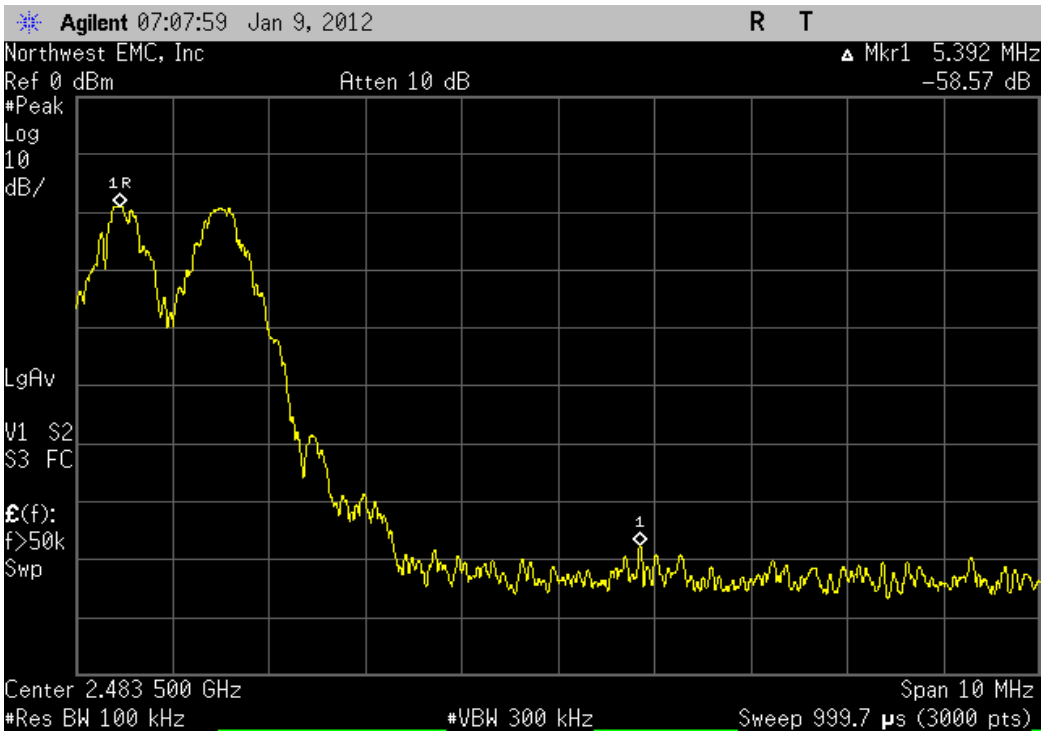
DH5, GFSK, Low Channel

				Value	Limit	Result
				-50.48 dBc	≤ -20 dBc	Pass



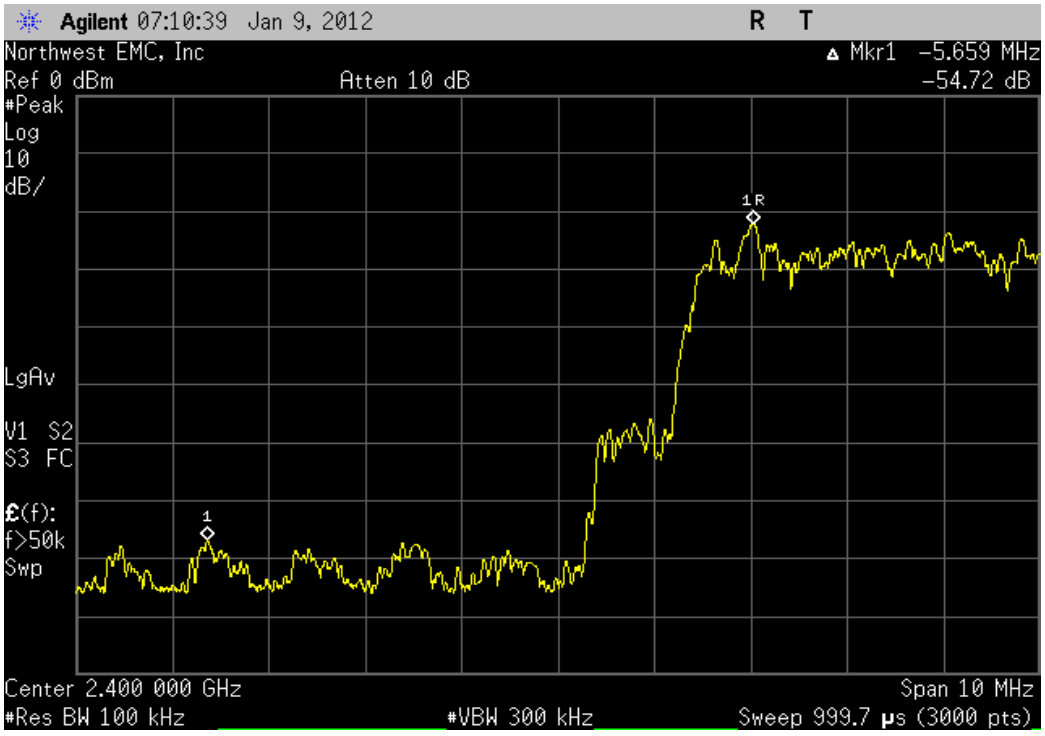
DH5, GFSK, High Channel

				Value	Limit	Result
				-58.57 dBc	≤ -20 dBc	Pass



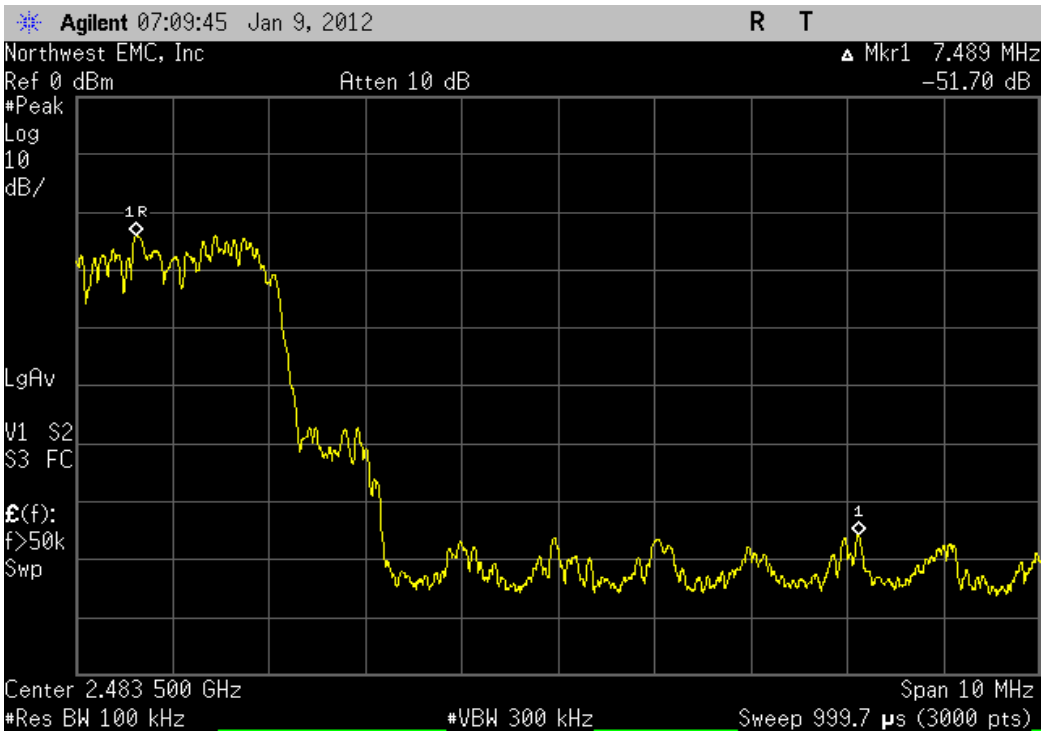
2DH5, 4-DQPSK, Low Channel

				Value	Limit	Result
				-54.72 dBc	≤ -20 dBc	Pass



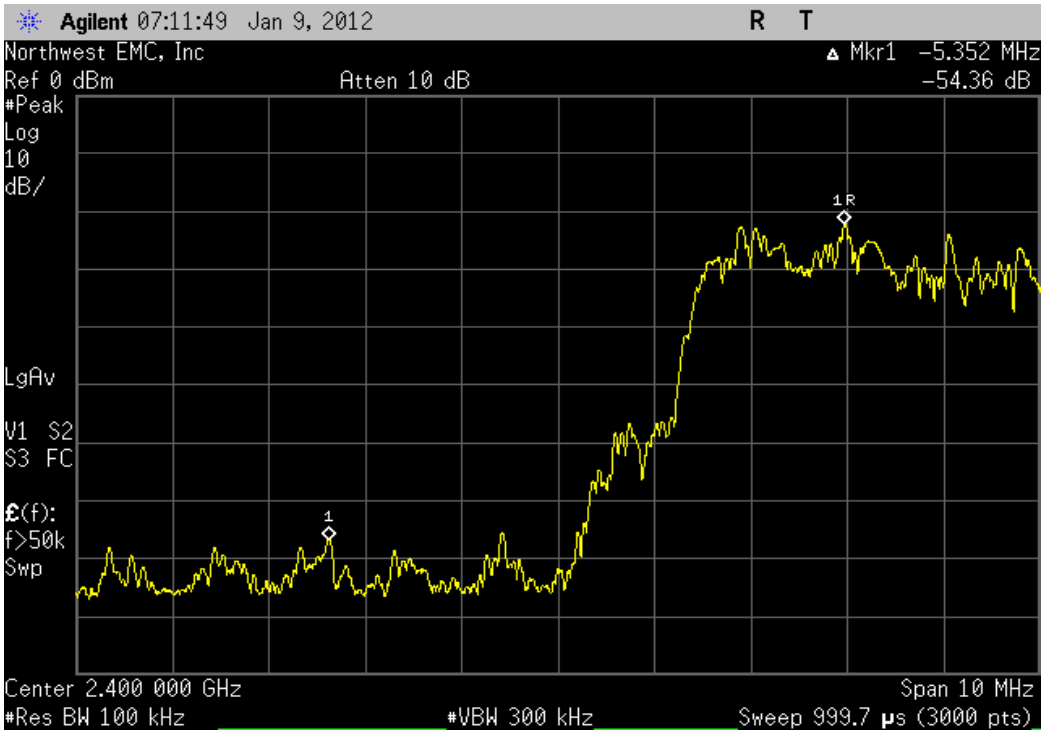
2DH5, 4-DQPSK, High Channel

				Value	Limit	Result
				-51.70 dBc	≤ -20 dBc	Pass



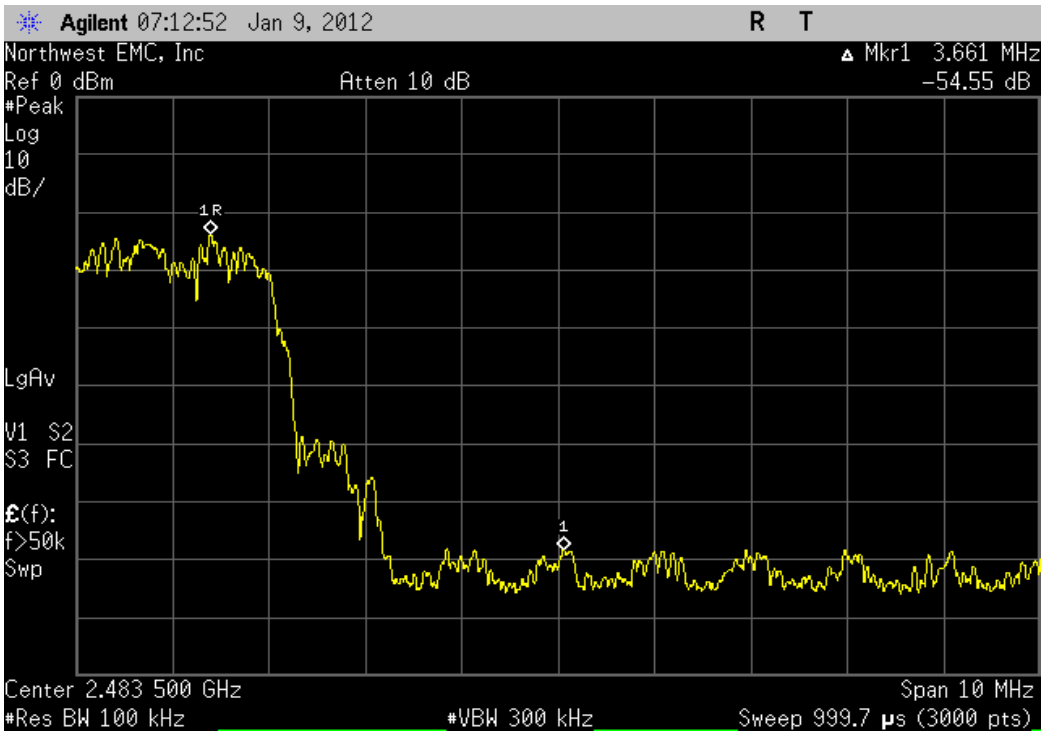
3DH5, 8-DPSK, Low Channel

				Value	Limit	Result
				-54.36 dBc	≤ -20 dBc	Pass



3DH5, 8-DPSK, High Channel

				Value	Limit	Result
				-54.55 dBc	≤ -20 dBc	Pass



Spurious Conducted 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.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Signal Generator	Agilent	N5183A	TIA	1/18/2011	12
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0
40 GHz DC block	Fairview Microwave	SD3379	AMI	10/12/2011	12
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	6/2/2011	12
Spectrum Analyzer	Agilent	E4440A	AAX	5/23/2011	12
Multimeter	Fluke	114	MMU	7/8/2011	24

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) (Amplitude Accuracy: +/- 0.49) 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 16-4-1 as applicable), and are available upon request.

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 its maximum data rate in a no hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency.

NORTHWEST EMC

Spurious Conducted Emissions

XMit 2011.10.26
PsaTx 2011.12.16

EUT:	CTM2			**Work Order:**	MDTR0042
Serial Number:	NKW001457N			**Date:**	12/19/11
Customer:	Medtronic Inc.			**Temperature:**	24.40C°C
Attendees:	None			**Humidity:**	20%
Project:	None			**Barometric Pres.:**	1017.8
Tested by:	Bryan Weller	**Power:**	2.75VDC	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

COMMENTS

MDTR0012 Test Plan Configuration 7.

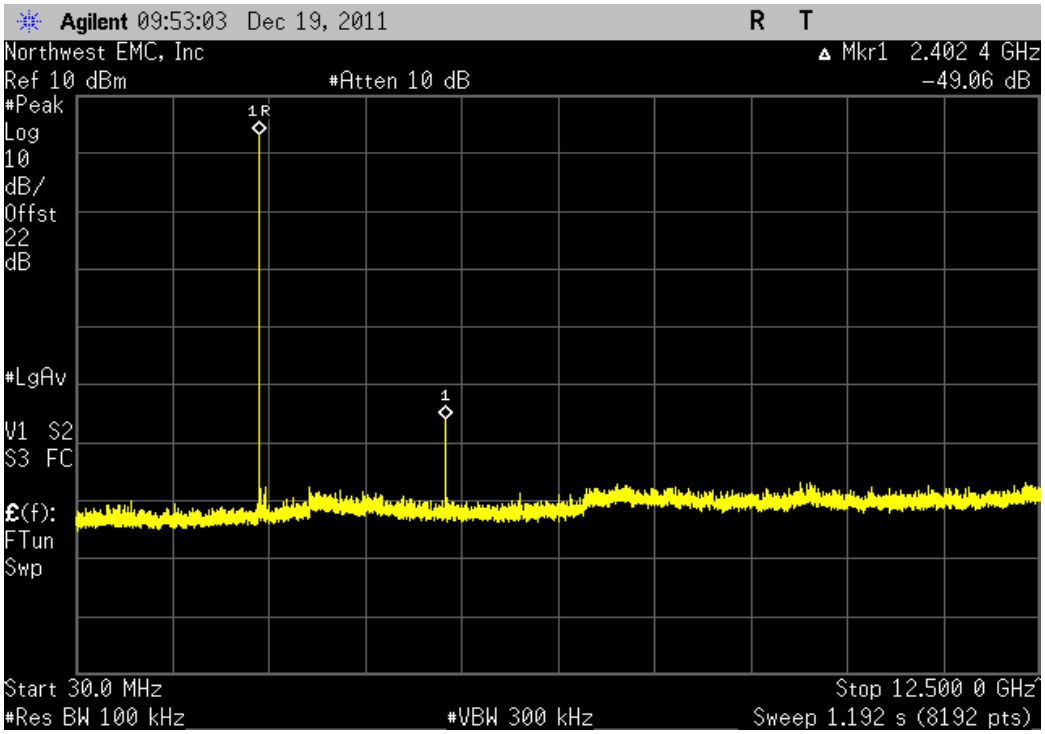
DEVIATIONS FROM TEST STANDARD

None

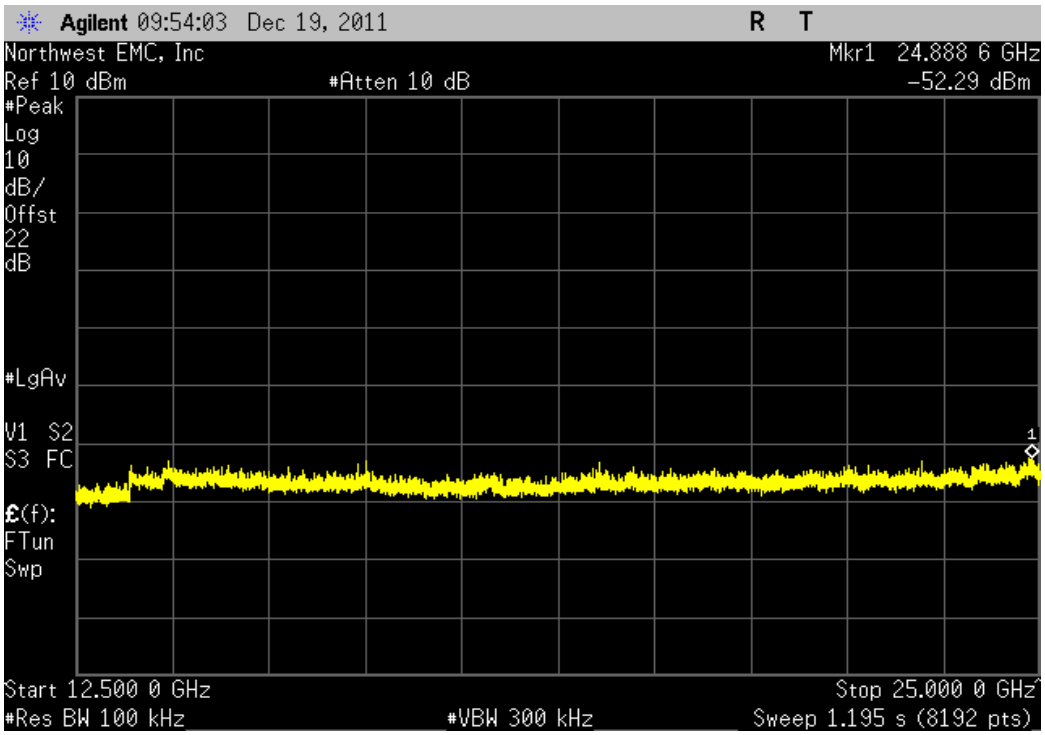
Configuration #	4	Signature	Trevor Buls

		Frequency Range	Value	Limit	Result
DH5, GFSK					
	Low Channel	30 MHz - 12.5 GHz	-49.06 dBc	≤ -20 dBc	Pass
	Low Channel	12.5 GHz - 25 GHz	-55.4 dBc	≤ -20 dBc	Pass
	Mid Channel	30 MHz - 12.5 GHz	-46.92 dBc	≤ -20 dBc	Pass
	Mid Channel	12.5 GHz - 25 GHz	-55.03 dBc	≤ -20 dBc	Pass
	High Channel	30 MHz - 12.5 GHz	-46.43 dBc	≤ -20 dBc	Pass
	High Channel	12.5 GHz - 25 GHz	-55.43 dBc	≤ -20 dBc	Pass
2DH5, 4-DQPSK					
	Low Channel	30 MHz - 12.5 GHz	-47.27 dBc	≤ -20 dBc	Pass
	Low Channel	12.5 GHz - 25 GHz	-50.65 dBc	≤ -20 dBc	Pass
	Mid Channel	30 MHz - 12.5 GHz	-49.62 dBc	≤ -20 dBc	Pass
	Mid Channel	12.5 GHz - 25 GHz	-52.52 dBc	≤ -20 dBc	Pass
	High Channel	30 MHz - 12.5 GHz	-56.58 dBc	≤ -20 dBc	Pass
	High Channel	12.5 GHz - 25 GHz	-52.58 dBc	≤ -20 dBc	Pass
3DH5, 8-DPSK					
	Low Channel	30 MHz - 12.5 GHz	-42.33 dBc	≤ -20 dBc	Pass
	Low Channel	12.5 GHz - 25 GHz	-46.05 dBc	≤ -20 dBc	Pass
	Mid Channel	30 MHz - 12.5 GHz	-50.7 dBc	≤ -20 dBc	Pass
	Mid Channel	12.5 GHz - 25 GHz	-52.21 dBc	≤ -20 dBc	Pass
	High Channel	30 MHz - 12.5 GHz	-51.35 dBc	≤ -20 dBc	Pass
	High Channel	12.5 GHz - 25 GHz	-51.9 dBc	≤ -20 dBc	Pass

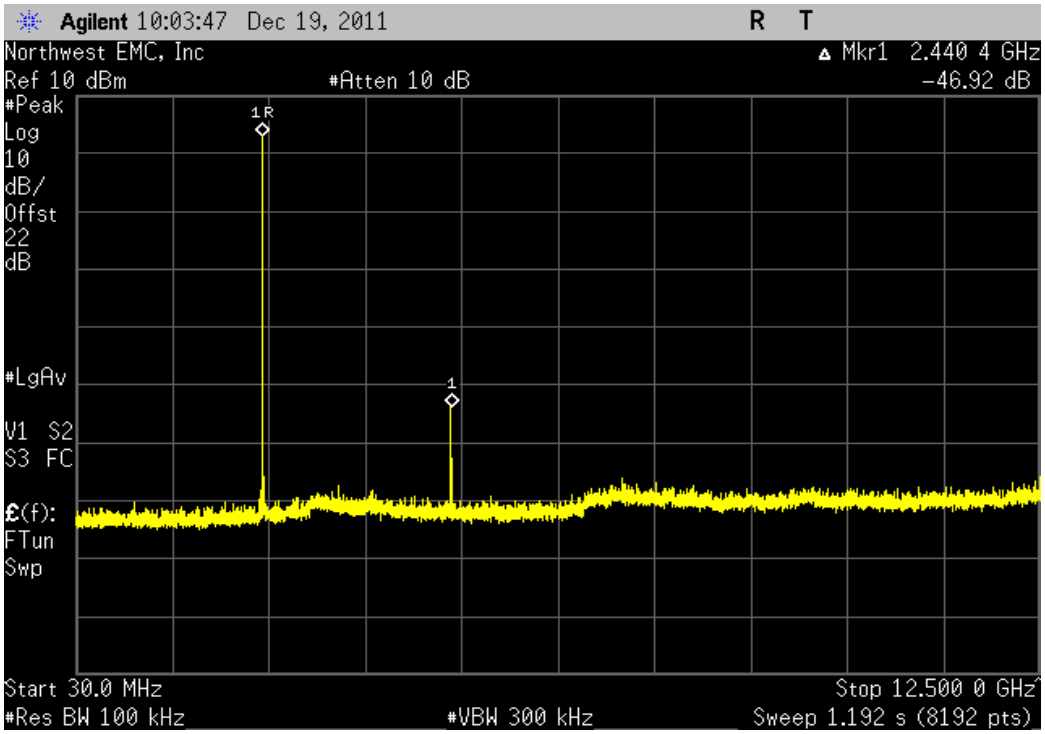
DH5, GFSK, Low Channel				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-49.06 dBc	≤ -20 dBc	Pass



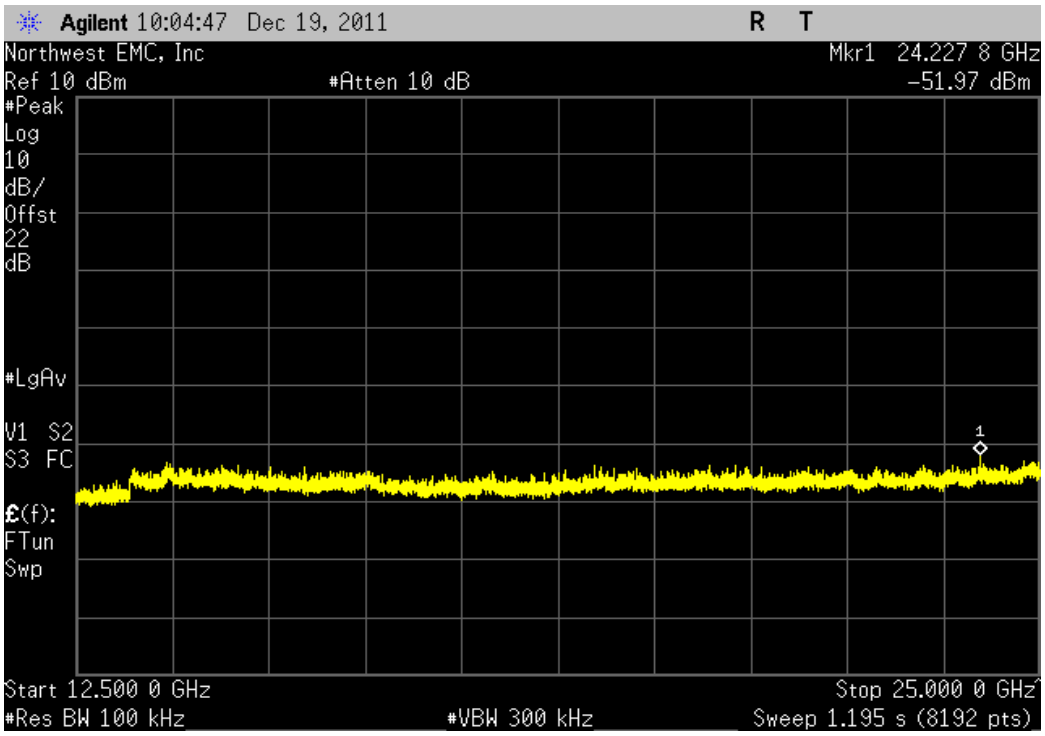
DH5, GFSK, Low Channel				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-55.4 dBc	≤ -20 dBc	Pass



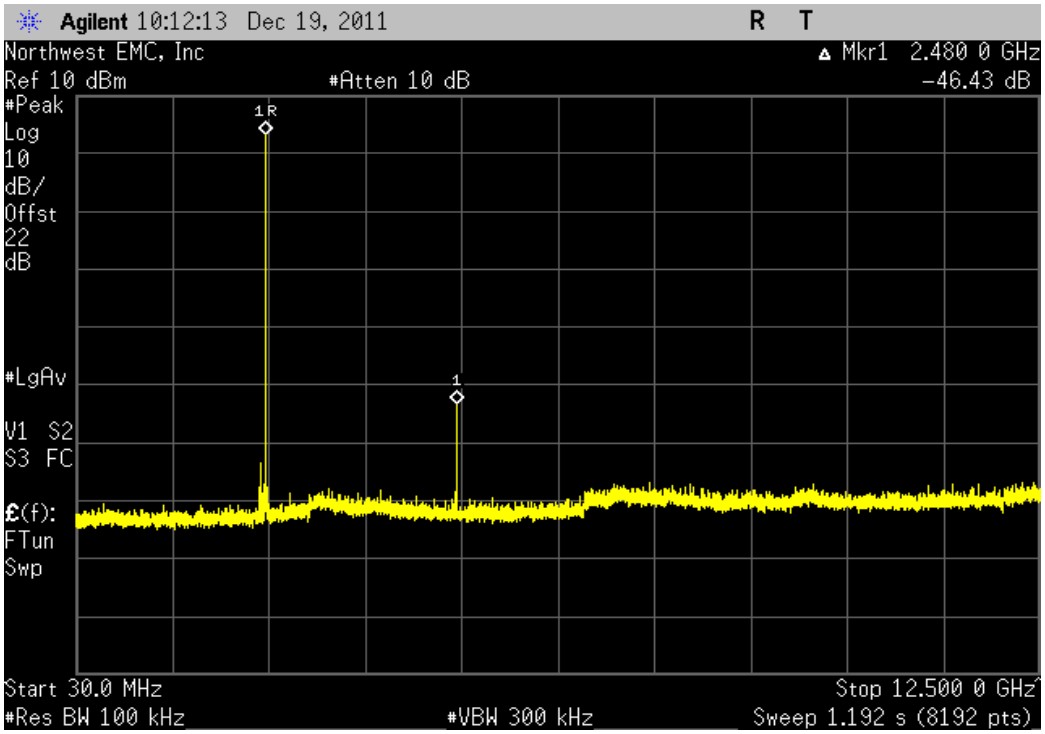
DH5, GFSK, Mid Channel				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-46.92 dBc	≤ -20 dBc	Pass



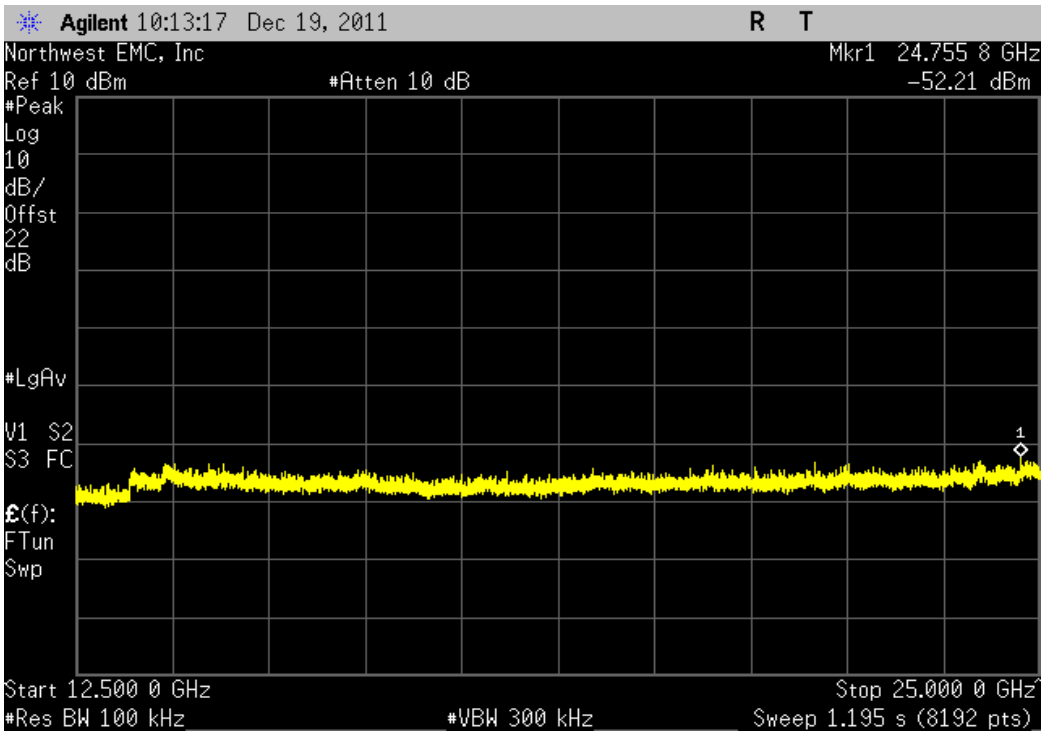
DH5, GFSK, Mid Channel				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-55.03 dBc	≤ -20 dBc	Pass



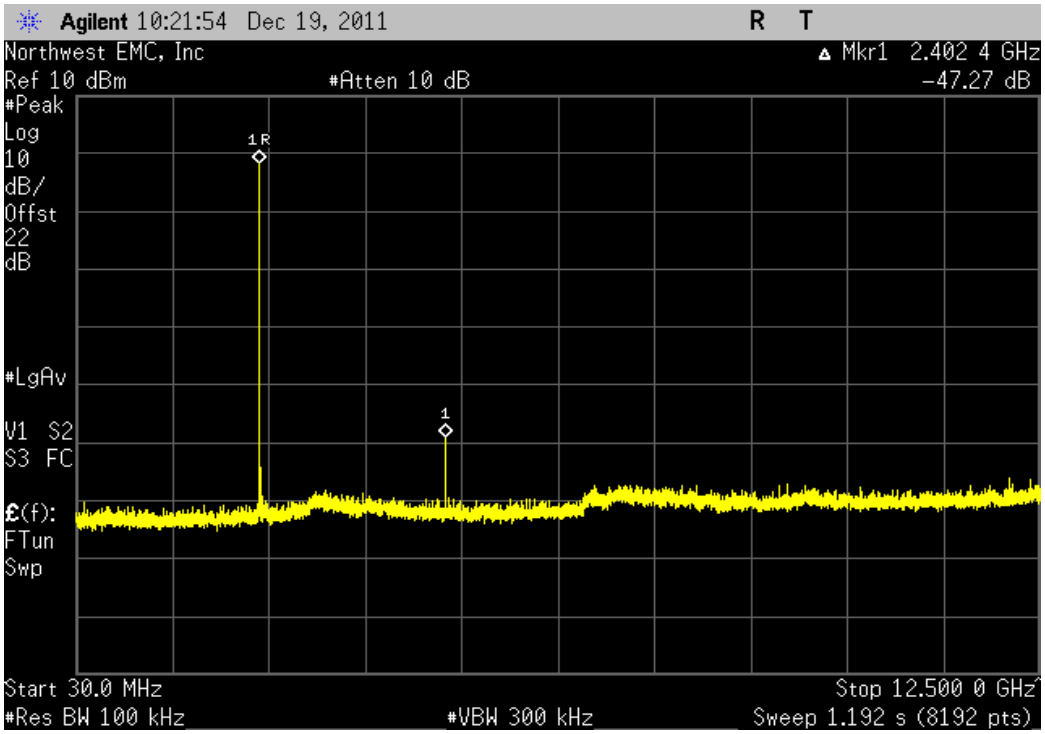
DH5, GFSK, High Channel				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-46.43 dBc	≤ -20 dBc	Pass



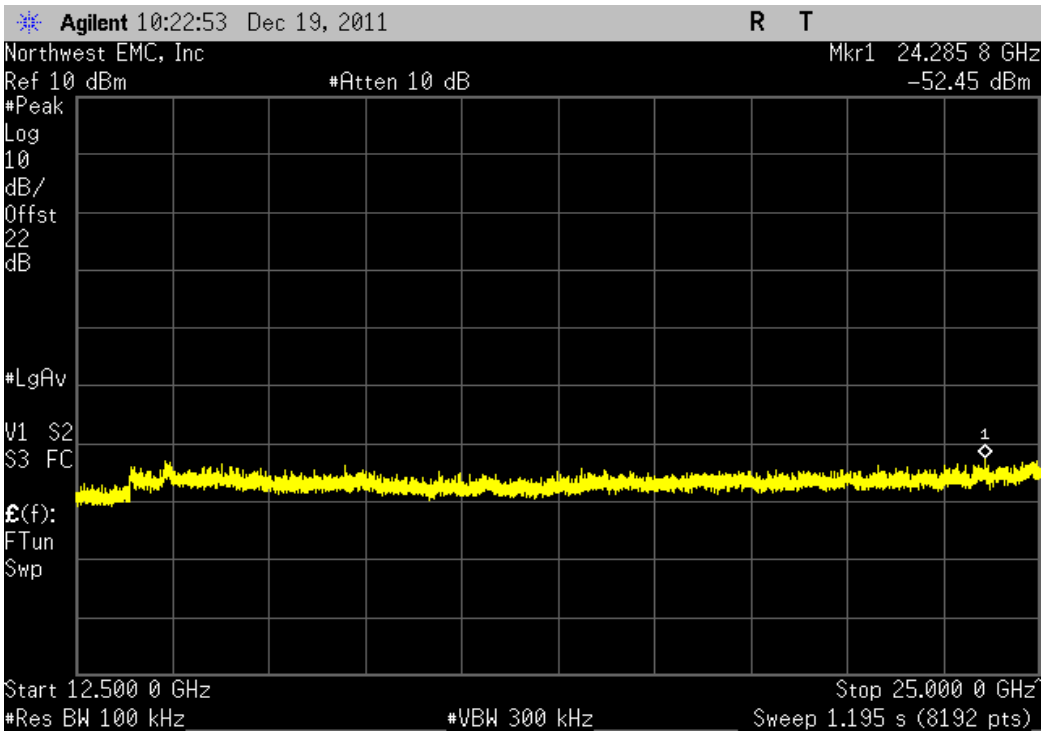
DH5, GFSK, High Channel				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-55.43 dBc	≤ -20 dBc	Pass



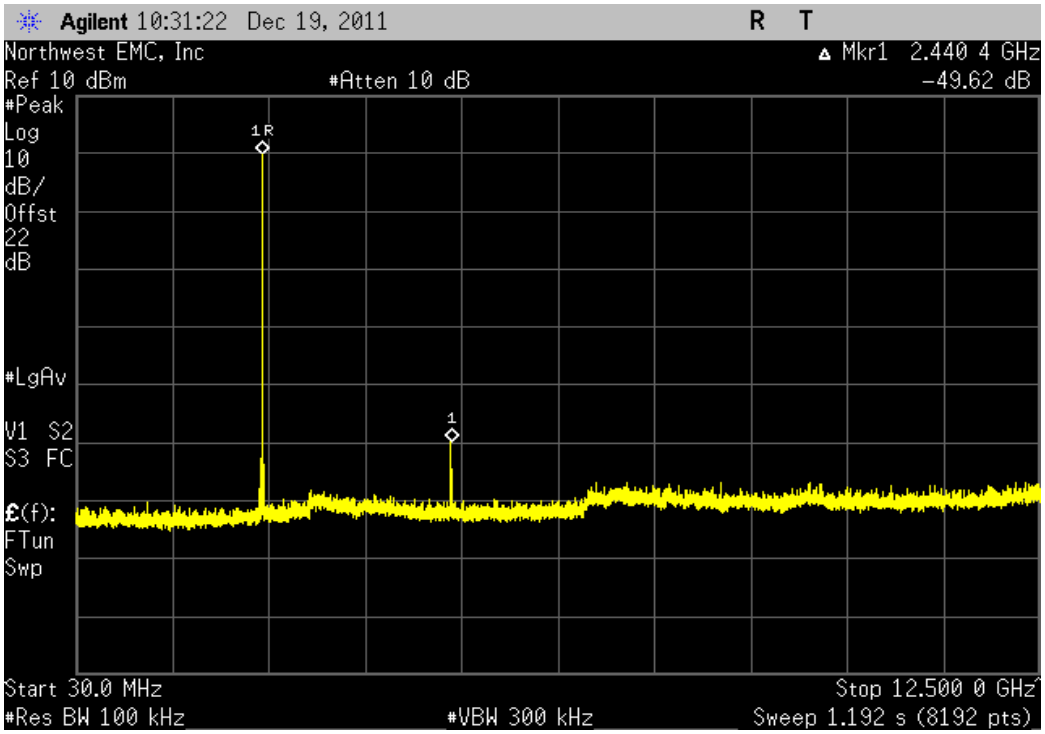
2DH5, 4-DQPSK, Low Channel				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-47.27 dBc	≤ -20 dBc	Pass



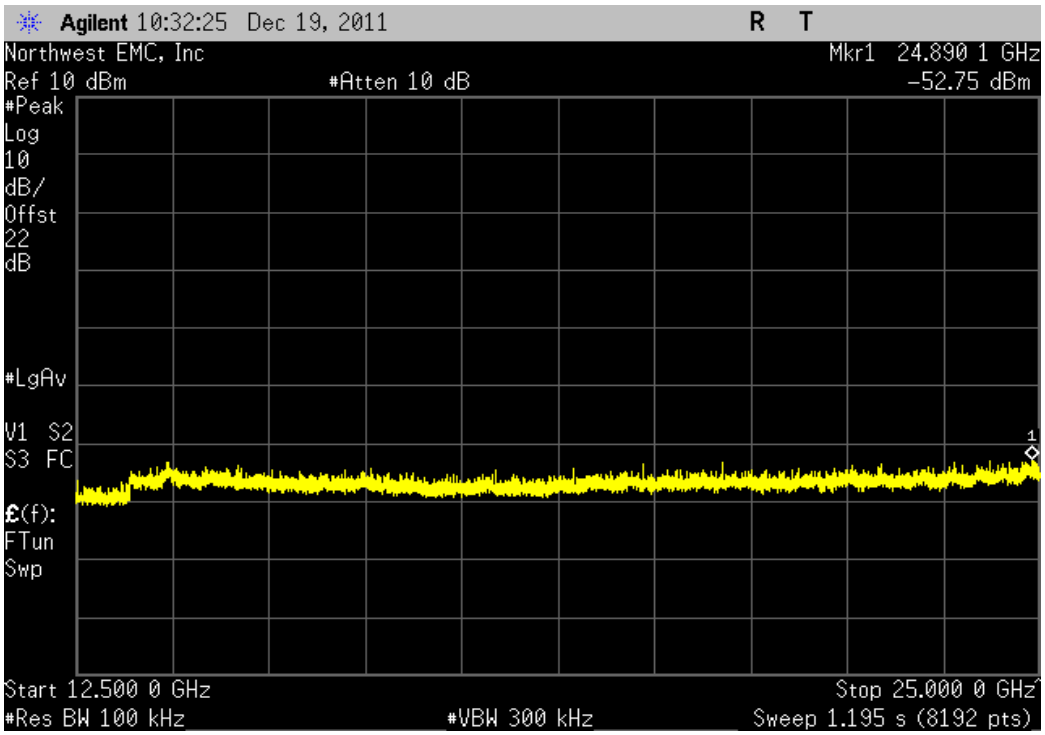
2DH5, 4-DQPSK, Low Channel				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-50.65 dBc	≤ -20 dBc	Pass



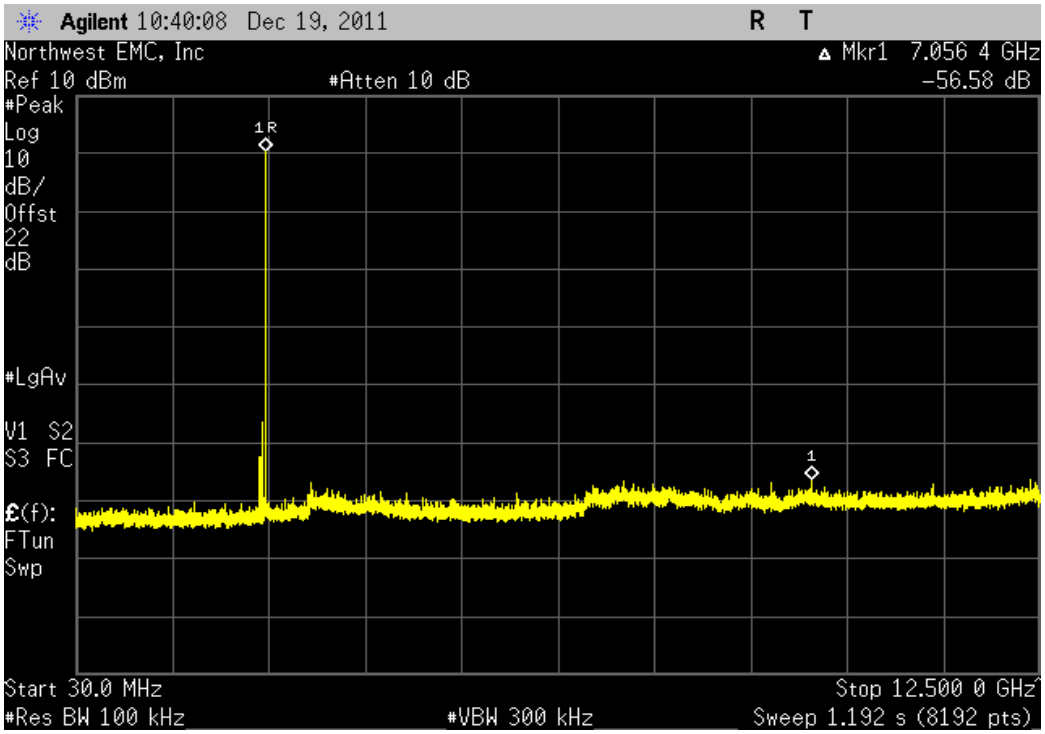
2DH5, 4-DQPSK, Mid Channel				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-49.62 dBc	≤ -20 dBc	Pass



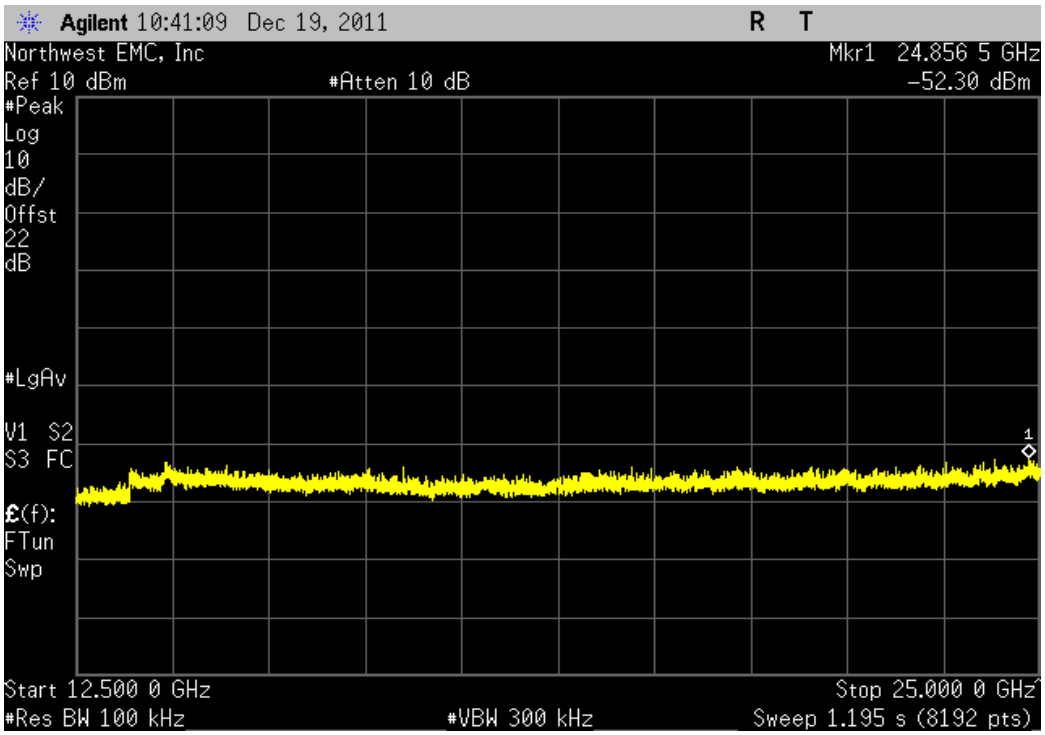
2DH5, 4-DQPSK, Mid Channel				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-52.52 dBc	≤ -20 dBc	Pass



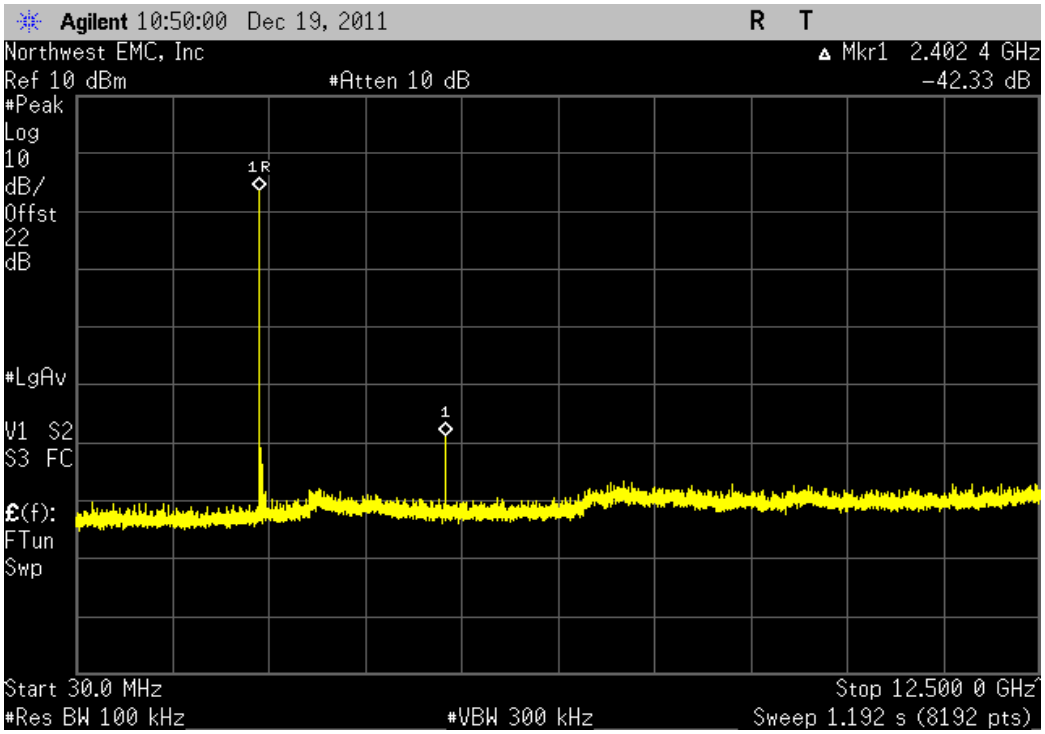
2DH5, 4-DQPSK, High Channel				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-56.58 dBc	≤ -20 dBc	Pass



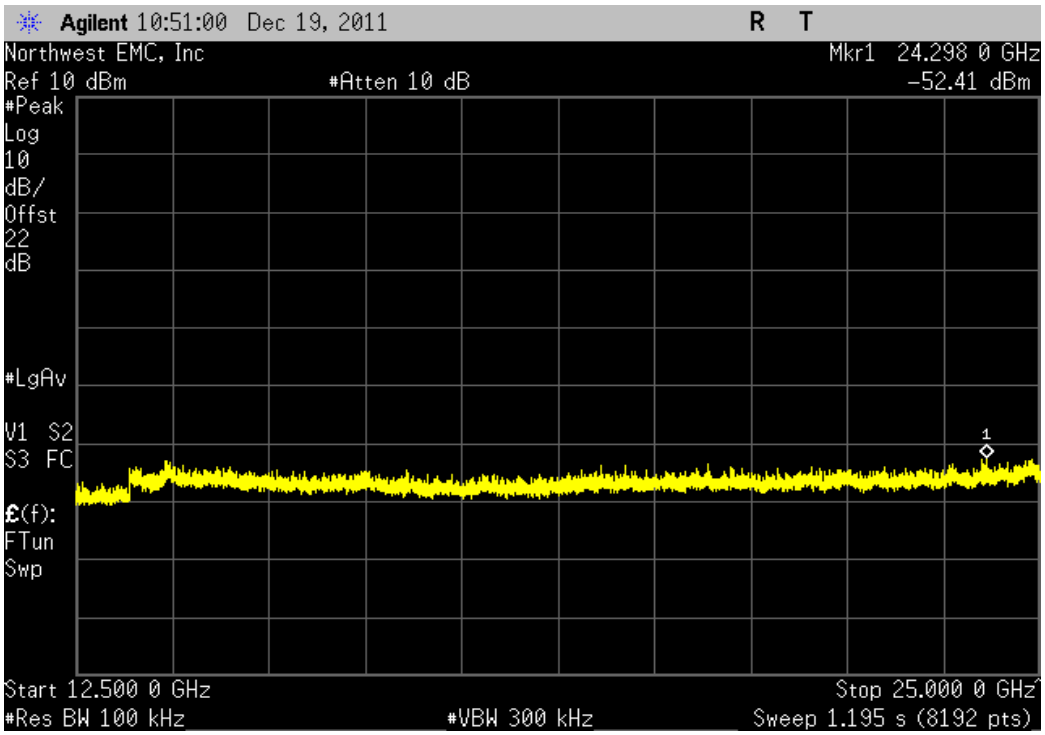
2DH5, 4-DQPSK, High Channel				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-52.58 dBc	≤ -20 dBc	Pass



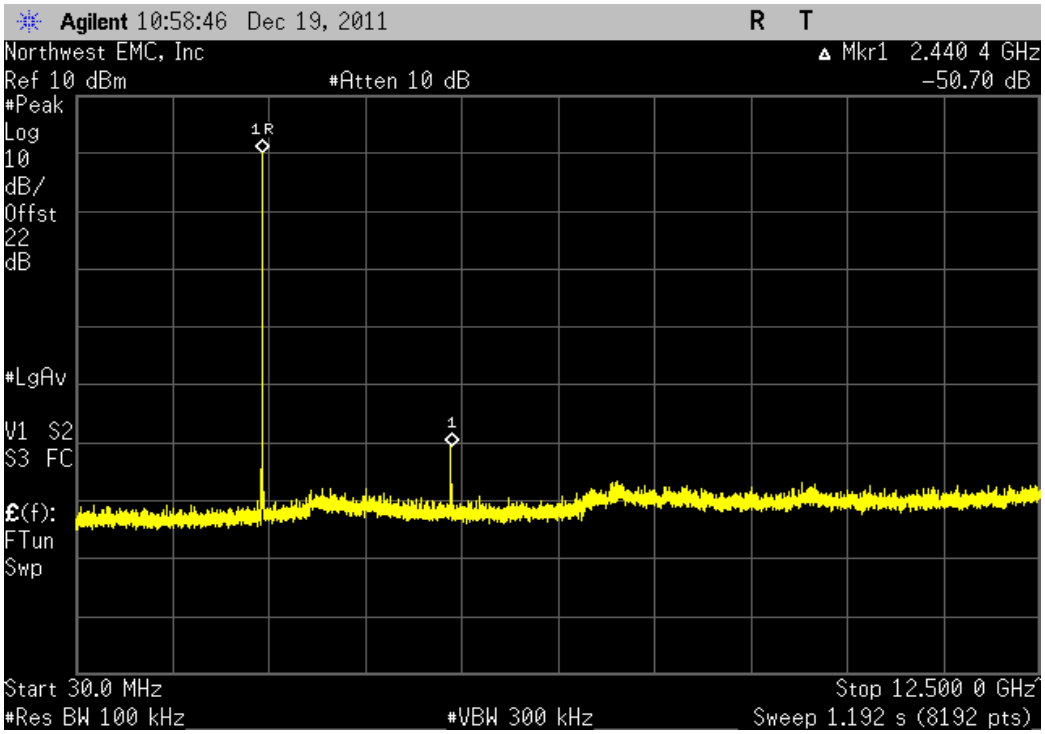
3DH5, 8-DPSK, Low Channel				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-42.33 dBc	≤ -20 dBc	Pass



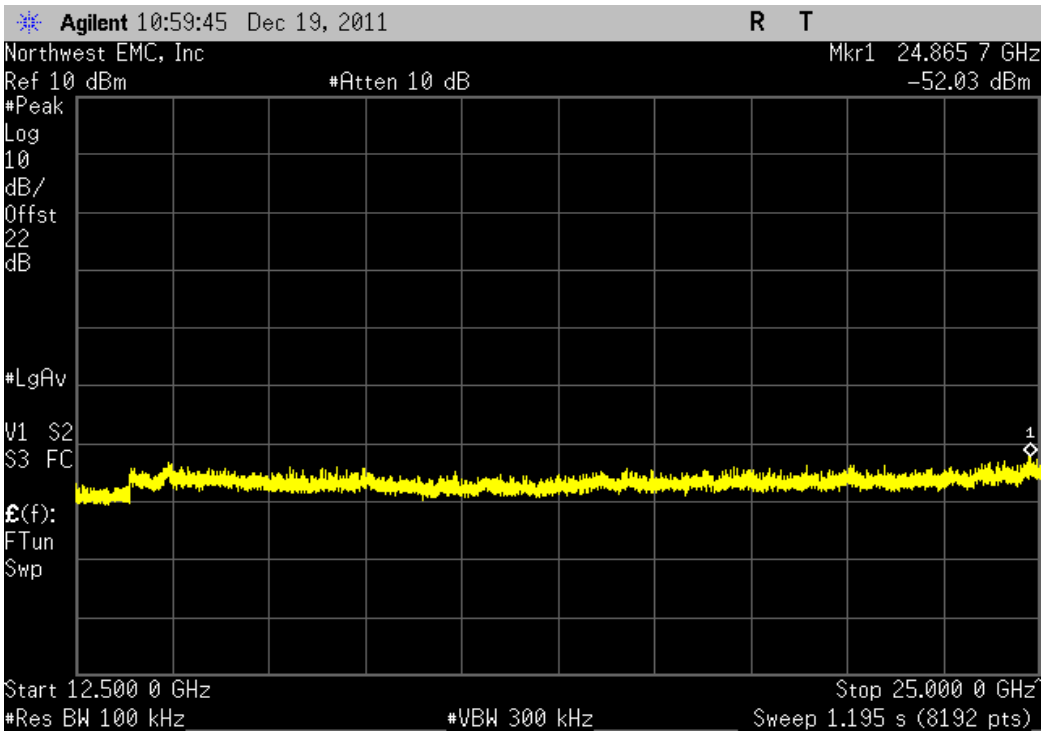
3DH5, 8-DPSK, Low Channel				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-46.05 dBc	≤ -20 dBc	Pass



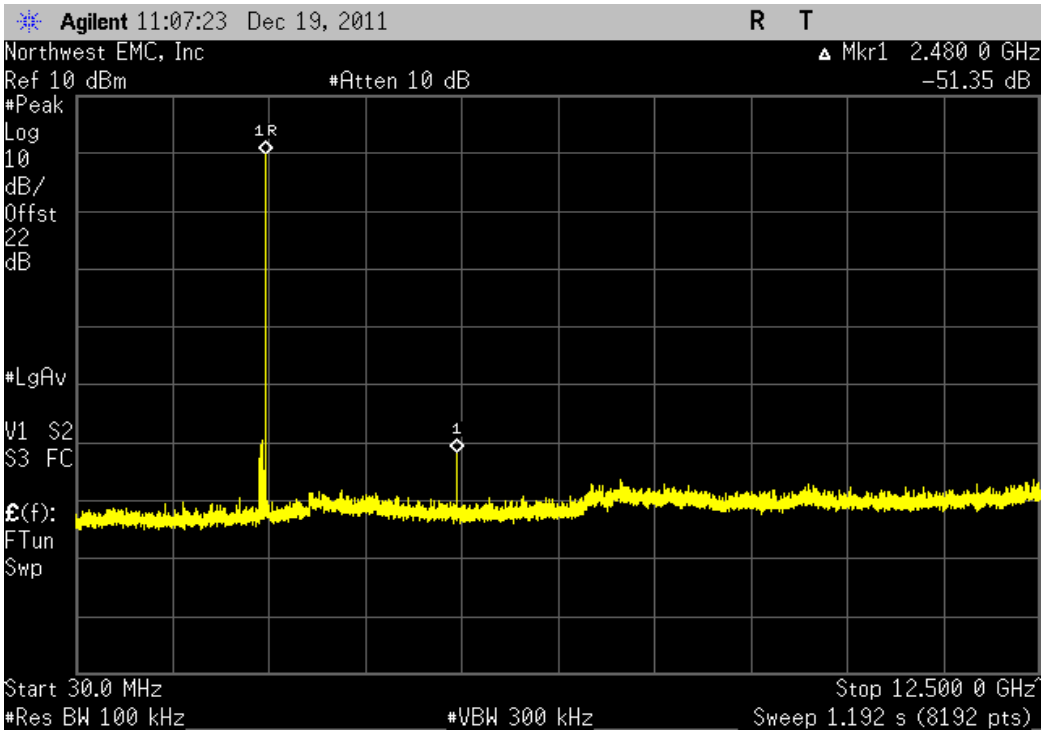
3DH5, 8-DPSK, Mid Channel				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-50.7 dBc	≤ -20 dBc	Pass



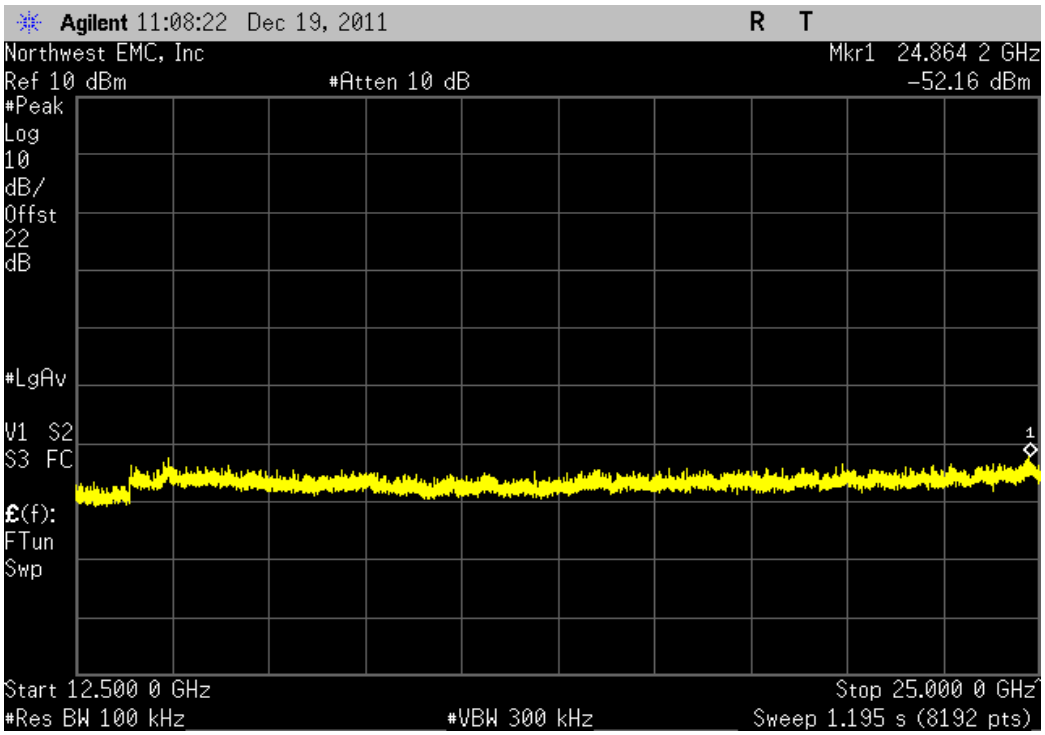
3DH5, 8-DPSK, Mid Channel				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-52.21 dBc	≤ -20 dBc	Pass



3DH5, 8-DPSK, High Channel				
Frequency Range		**Value**	**Limit**	**Result**
30 MHz - 12.5 GHz		-51.35 dBc	≤ -20 dBc	Pass



3DH5, 8-DPSK, High Channel				
Frequency Range		**Value**	**Limit**	**Result**
12.5 GHz - 25 GHz		-51.9 dBc	≤ -20 dBc	Pass



Power Spectral Density

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
Spectrum Analyzer	Agilent	E4440A	AAX	5/23/2011	12
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0
Signal Generator	Agilent	N5183A	TIA	1/18/2011	12
40 GHz DC block	Fairview Microwave	SD3379	AMI	10/12/2011	12
Multimeter	Fluke	114	MMU	7/8/2011	24
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	6/2/2011	12

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) (Conducted Power: +/- 0.41) 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 16-4-1 as applicable), and are available upon request.

TEST DESCRIPTION

The power spectral density measurements were measured with the EUT set to low, mid, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate for each modulation type available. ANSI C63.10:2009, Section 6.11.2.3 was followed. The spectrum analyzer was set as follows:

The emission peak was located and zoomed in on within the passband.

a) RBW = 3 kHz

b) VBW = 10 kHz

c) Span = 300 kHz

d) Sweep time = 100s

e) Trace set to MAX

f) The 1 hz Marker Noise function on the analyzer was used. The data was corrected to 3 kHz by adding 34.8 dB to the reading.

NORTHWEST EMC

Power Spectral Density

XMit 2011.10.26
PsaTx 2011.12.16

EUT:	CTM2			Work Order:	MDTR0042
Serial Number:	NKW001457N			Date:	12/19/11
Customer:	Medtronic Inc.			Temperature:	24.40C°C
Attendees:	None			Humidity:	20%
Project:	None			Barometric Pres.:	1017.8
Tested by:	Bryan Weller	Power:	2.75VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

COMMENTS

MDTR0012 Test Plan Configuration 7.

DEVIATIONS FROM TEST STANDARD

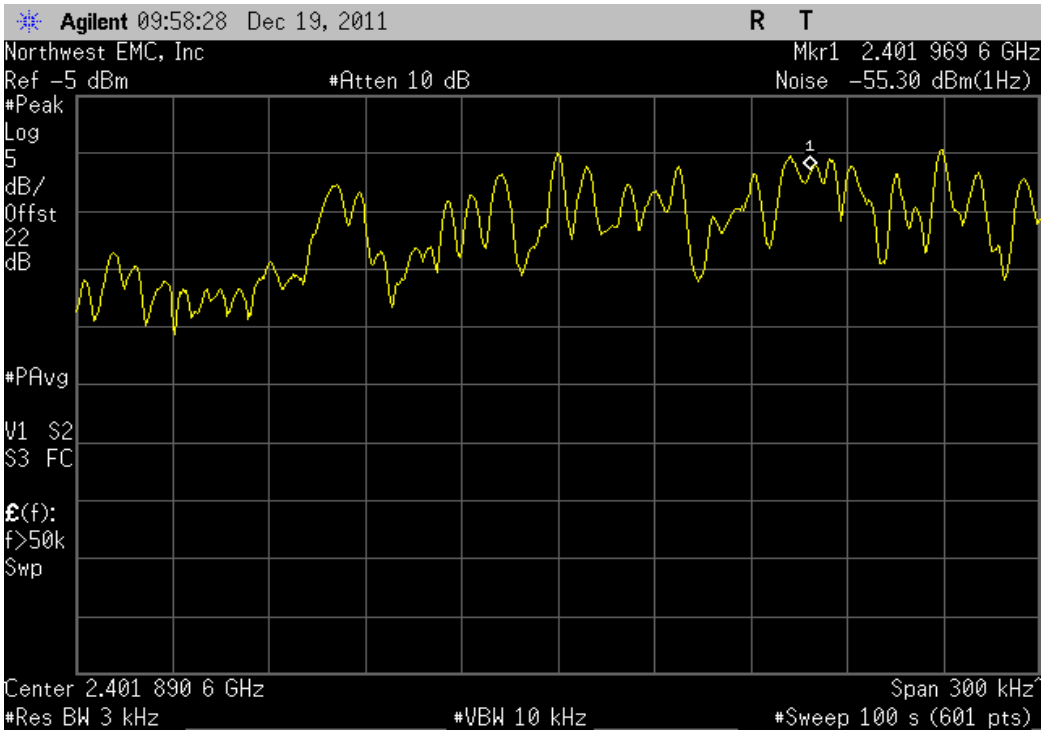
None

Configuration #	4	Signature	Trevor Bulls

		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
DH5, GFSK						
	Low Channel	-55.299	34.8	-20.499	8	Pass
	Mid Channel	-54.904	34.8	-20.104	8	Pass
	High Channel	-54.819	34.8	-20.019	8	Pass
2DH5, 4-DQPSK						
	Low Channel	-60.543	34.8	-25.743	8	Pass
	Mid Channel	-60.568	34.8	-25.768	8	Pass
	High Channel	-60.724	34.8	-25.924	8	Pass
3DH5, 8-DPSK						
	Low Channel	-60.948	34.8	-26.148	8	Pass
	Mid Channel	-60.847	34.8	-26.047	8	Pass
	High Channel	-61.038	34.8	-26.238	8	Pass

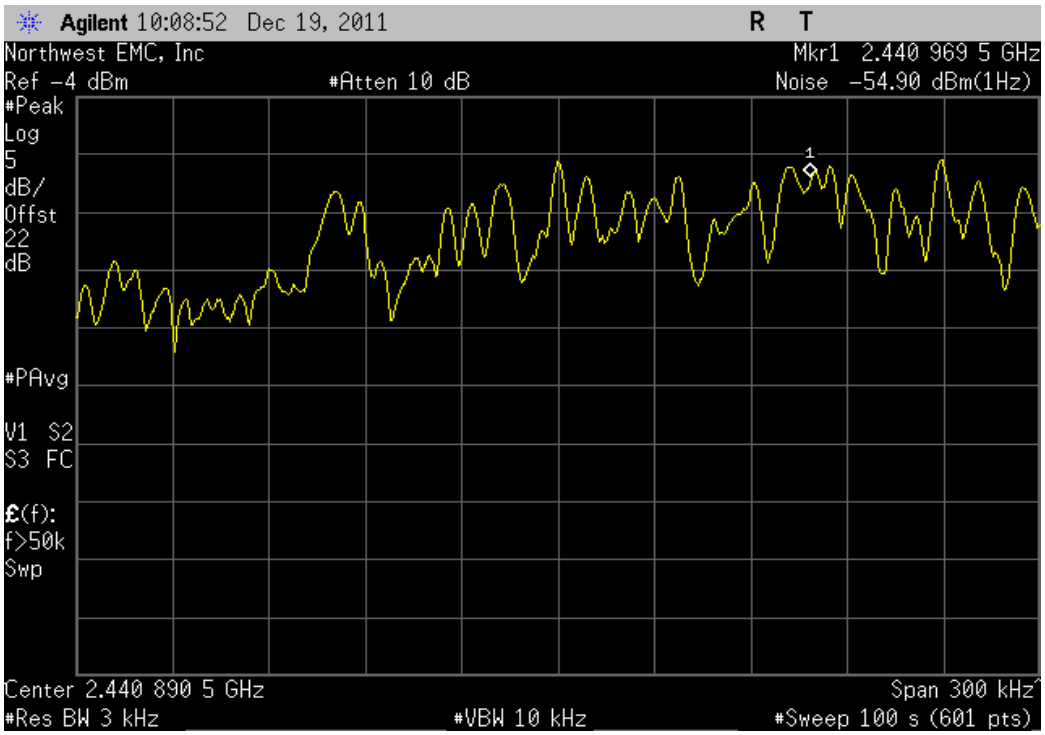
DH5, GFSK, Low Channel

		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-55.299	34.8	-20.499	8	Pass

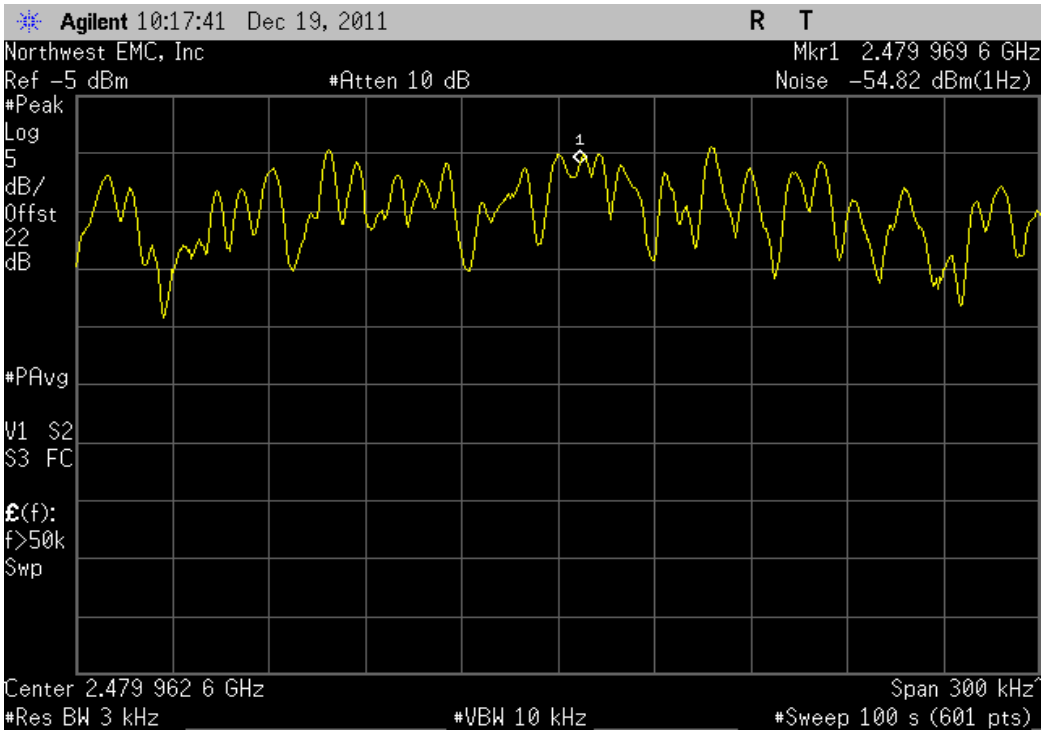


DH5, GFSK, Mid Channel

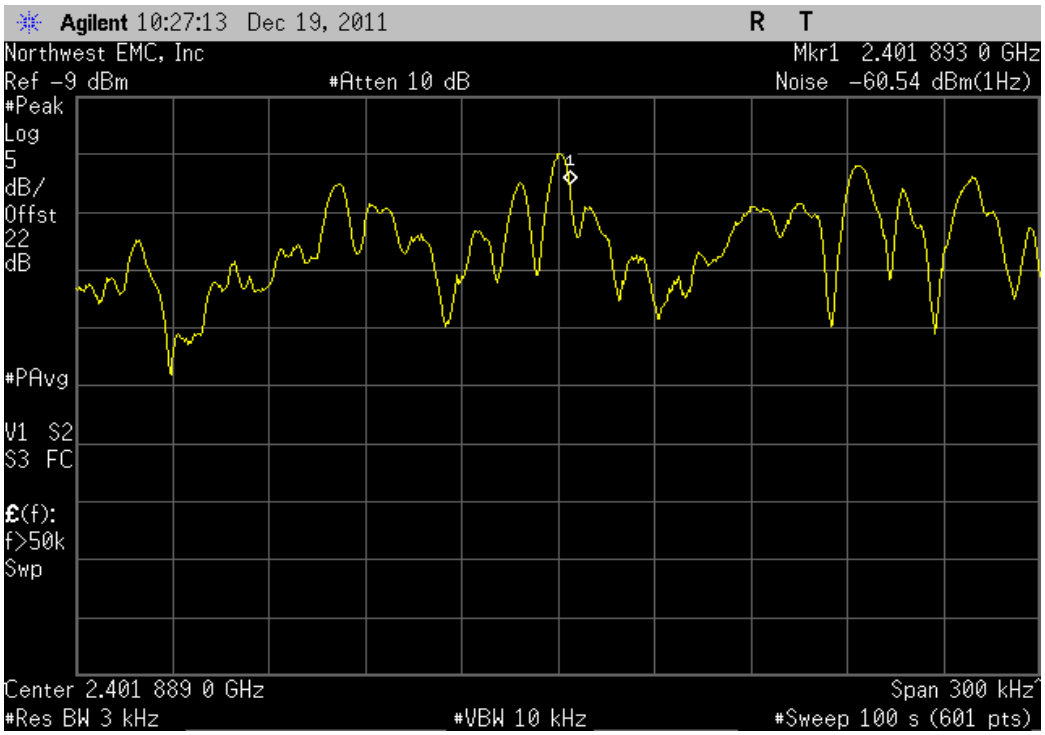
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-54.904	34.8	-20.104	8	Pass



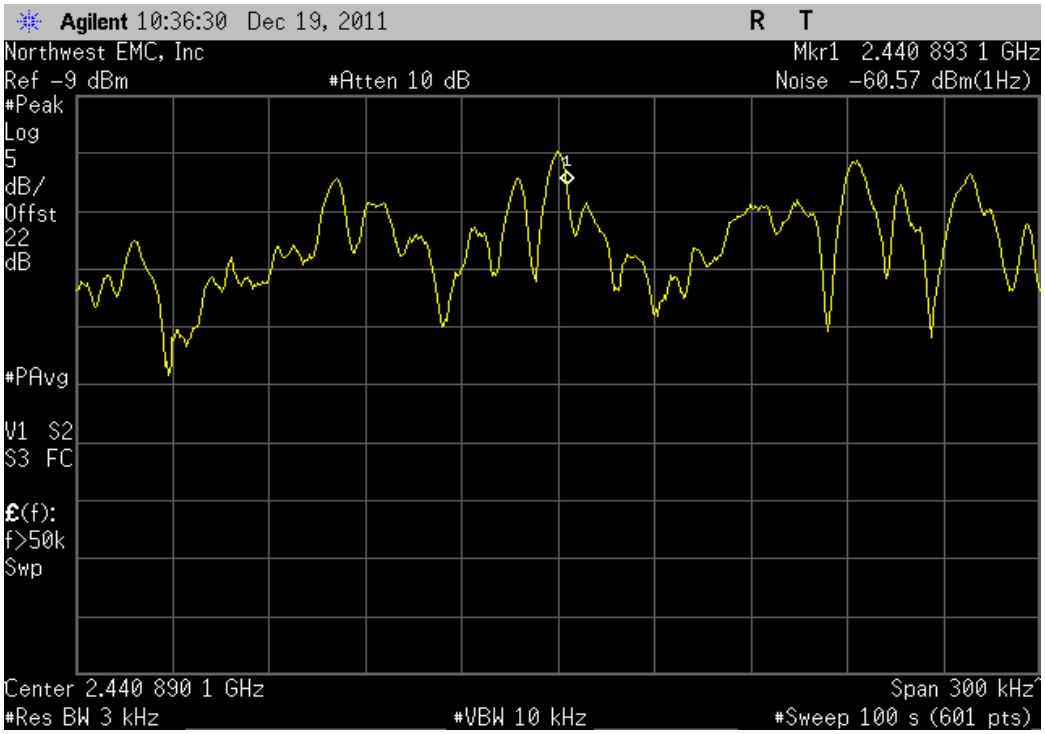
DH5, GFSK, High Channel						
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-54.819	34.8	-20.019	8	Pass



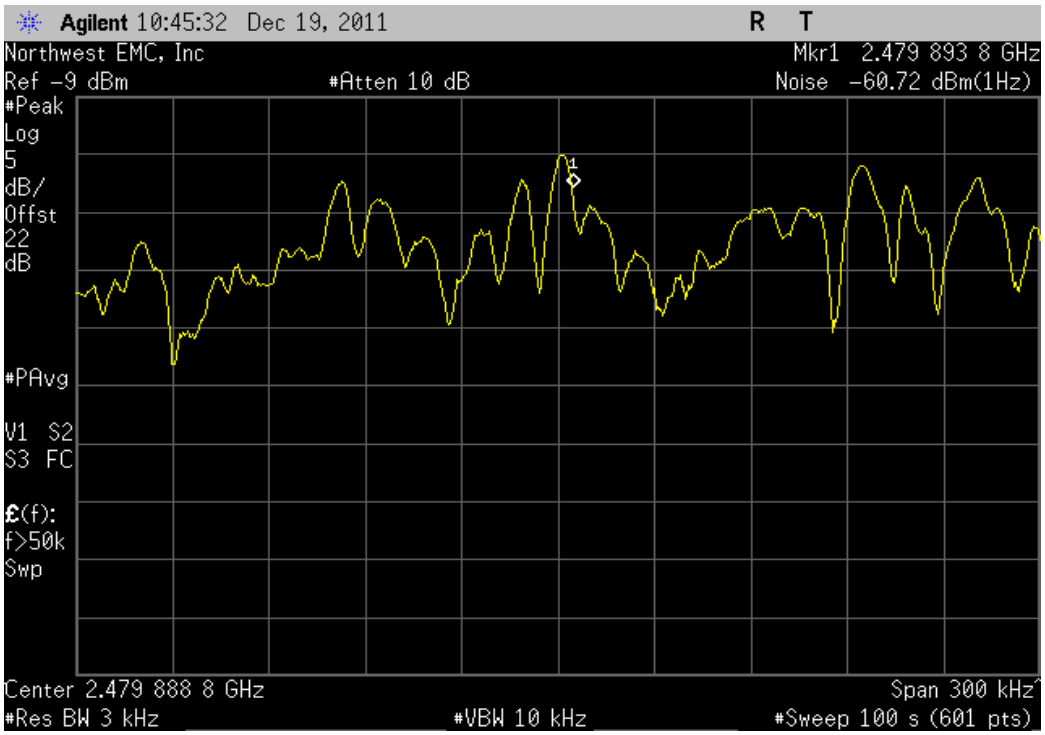
2DH5, 4-DQPSK, Low Channel						
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-60.543	34.8	-25.743	8	Pass



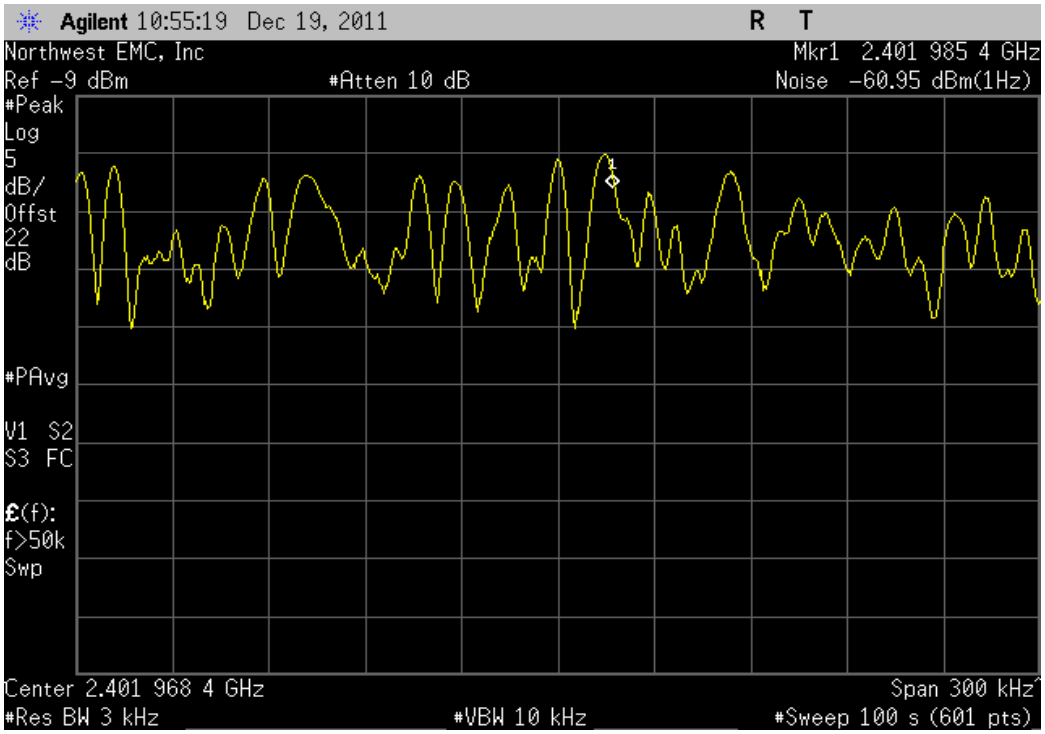
2DH5, 4-DQPSK, Mid Channel						
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-60.568	34.8	-25.768	8	Pass



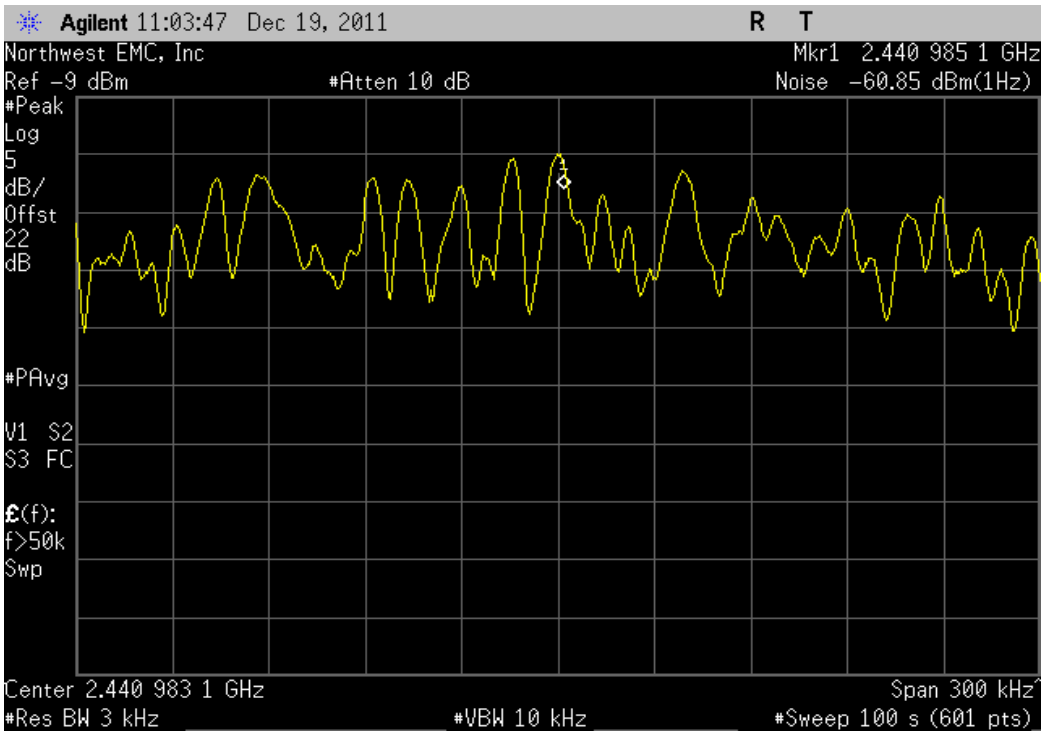
2DH5, 4-DQPSK, High Channel						
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-60.724	34.8	-25.924	8	Pass



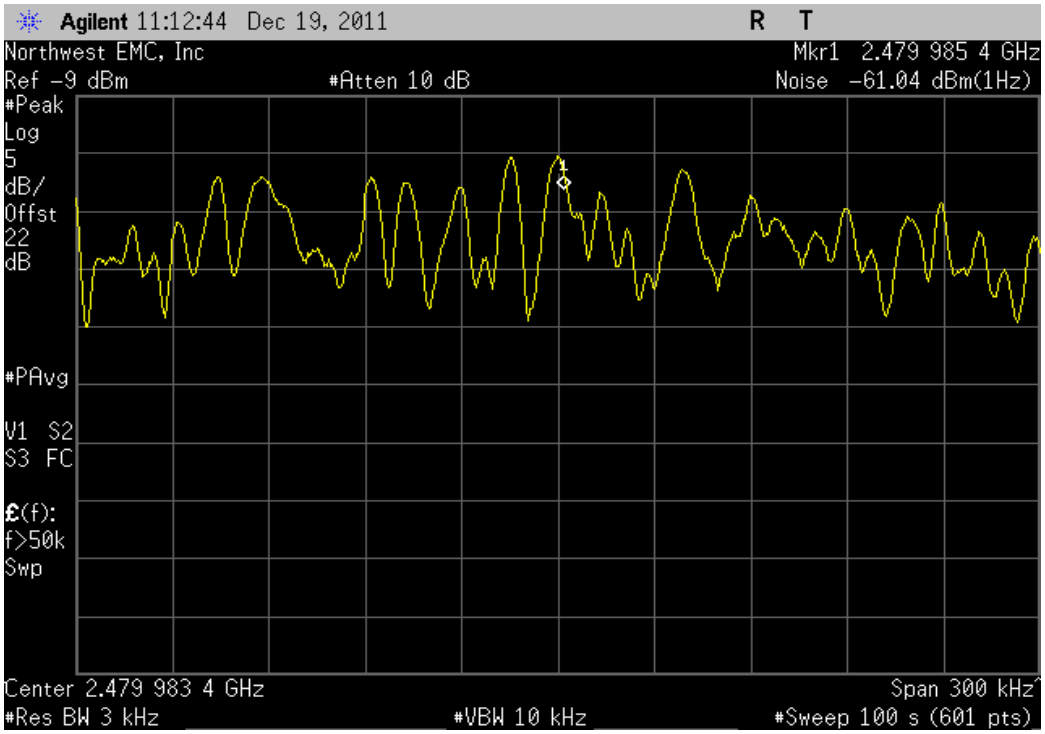
3DH5, 8-DPSK, Low Channel						
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-60.948	34.8	-26.148	8	Pass



3DH5, 8-DPSK, Mid Channel						
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-60.847	34.8	-26.047	8	Pass



3DH5, 8-DPSK, High Channel						
		Value (dBm / Hz)	(dBm / Hz) To (dBm / 3 kHz)	Value (dBm / 3 kHz)	Limit (dBm / 3 kHz)	Result
		-61.038	34.8	-26.238	8	Pass



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
Multimeter	Fluke	114	MMU	7/8/2011	24
DC Power Supply	EZ Digital Co	GP-4303D	TPY	NCR	0
Signal Generator	Agilent	N5183A	TIA	1/18/2011	12
Attenuator - 20db, 'SMA'	SM Electronics	SA26B-20	RFW	6/2/2011	12
40 GHz DC block	Fairview Microwave	SD3379	AMI	10/12/2011	12
Spectrum Analyzer	Agilent	E4440A	AAX	5/23/2011	12

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) (Frequency Accuracy: +0.12/- 0.01) 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 16-4-1 as applicable), and are available upon request.

TEST DESCRIPTION

For software controlled or pre-programmed devices, the manufacturer shall declare the duty cycle class or classes for the equipment under test. For manually operated or event dependant devices, with or without software controlled functions, the manufacturer shall declare whether the device once triggered, follows a pre-programmed cycle, or whether the transmission is constant until the trigger is released or manually reset. The manufacturer shall also give a description of the application for the device and include a typical usage pattern. The typical usage pattern as declared by the manufacturer shall be used to determine the duty cycle and hence the duty class.

Where an acknowledgement is required, the additional transmitter on-time shall be included and declared by the manufacturer.

NORTHWEST EMC

Duty Cycle

XMit 2011.10.26
PsaTx 2011.12.16

EUT:	CTM2			Work Order:	MDTR0042
Serial Number:	NKW001457N			Date:	12/19/11
Customer:	Medtronic Inc.			Temperature:	24.40C°C
Attendees:	None			Humidity:	20%
Project:	None			Barometric Pres.:	1017.8
Tested by:	Bryan Weller	Power:	2.75VDC	Job Site:	MN08

TEST SPECIFICATIONS	Test Method
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

COMMENTS

MDTR0012 Test Plan Configuration 7.

DEVIATIONS FROM TEST STANDARD

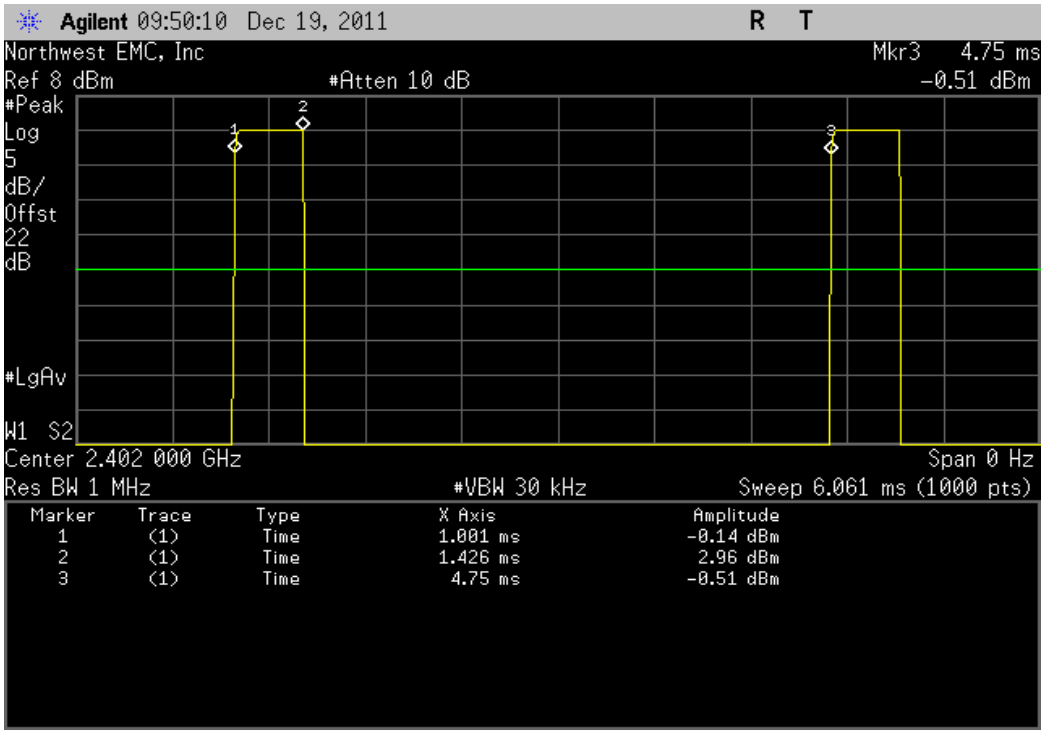
None

Configuration #	4	Signature	Trevor Bulls

		Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
DH5, GFSK							
	Low Channel	424.7 uS	3.749 mS	1	11%	N/A	N/A
	Low Channel			5		N/A	N/A
	Mid Channel	430.7 uS	3.749 mS	1	12%	N/A	N/A
	Mid Channel			5		N/A	N/A
	High Channel	430.8 uS	3.755 mS	1	12%	N/A	N/A
	High Channel			5		N/A	N/A
2DH5, 4-DQPSK							
	Low Channel	297.3 uS	3.749 mS	1	8%	N/A	N/A
	Low Channel			5		N/A	N/A
	Mid Channel	303.3 uS	3.749 mS	1	8%	N/A	N/A
	Mid Channel			5		N/A	N/A
	High Channel	303.3 uS	3.749 mS	1	8%	N/A	N/A
	High Channel			5		N/A	N/A
3DH5, 8-DPSK							
	Low Channel	248.733 uS	3.749 mS	1	7%	N/A	N/A
	Low Channel			5		N/A	N/A
	Mid Channel	248.7 uS	3.749 mS	1	7%	N/A	N/A
	Mid Channel			5		N/A	N/A
	High Channel	253.4 uS	3.754 mS	1	7%	N/A	N/A
	High Channel			5		N/A	N/A

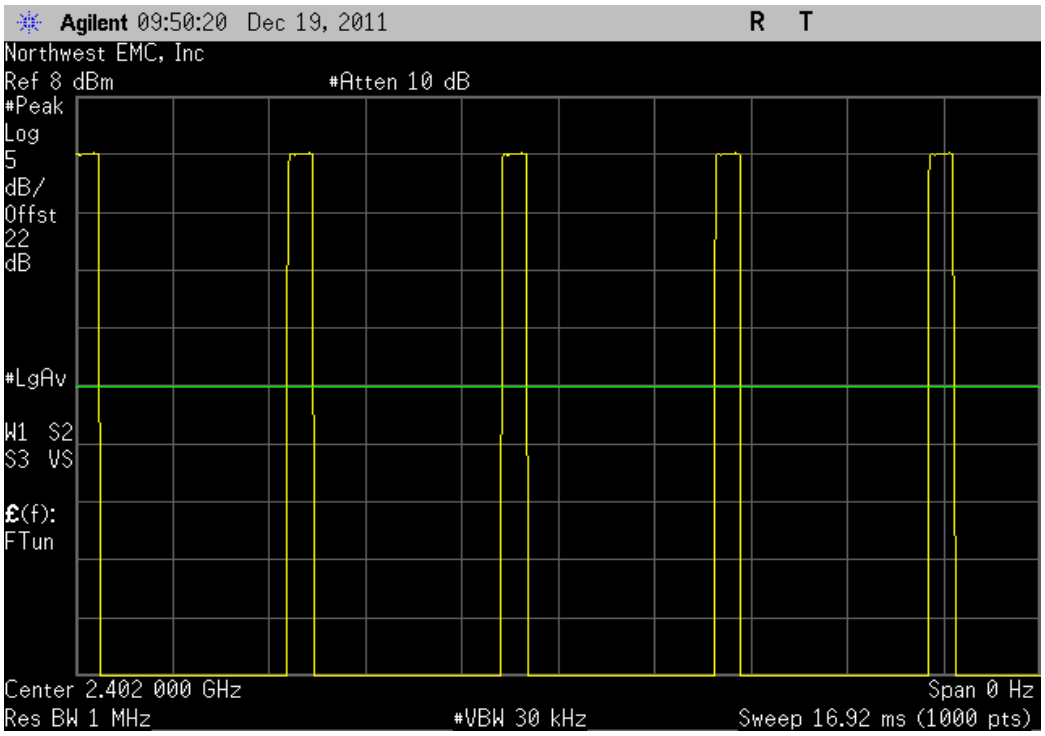
DH5, GFSK, Low Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
424.7 uS	3.749 mS	1	11%	N/A	N/A



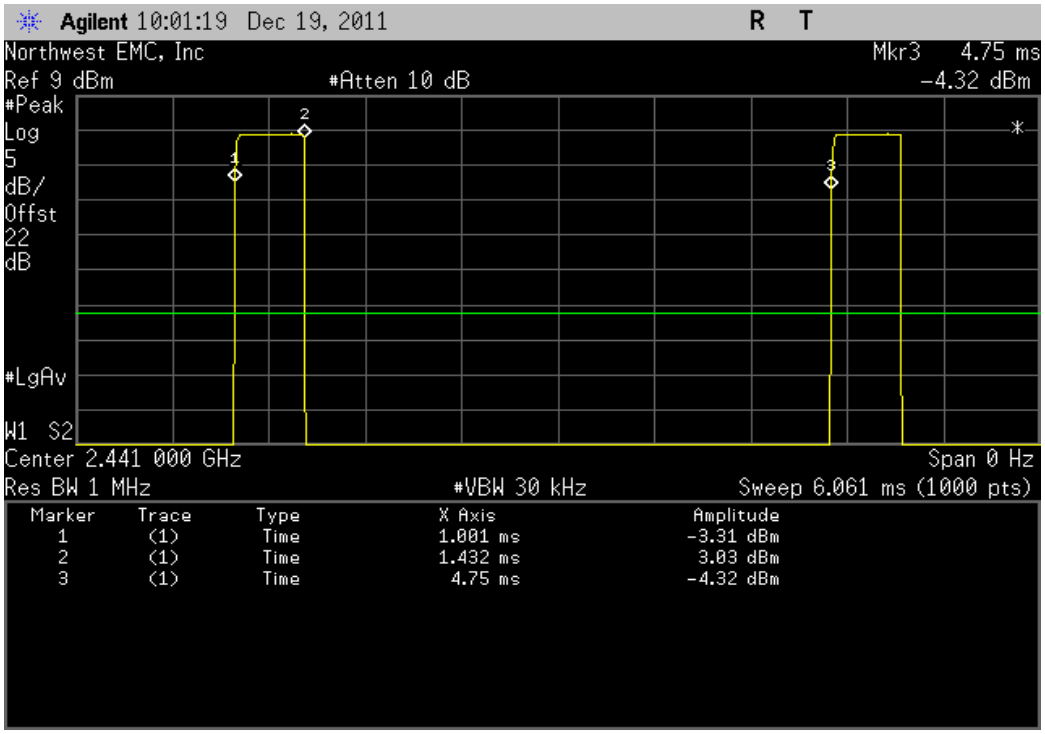
DH5, GFSK, Low Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
		5		N/A	N/A



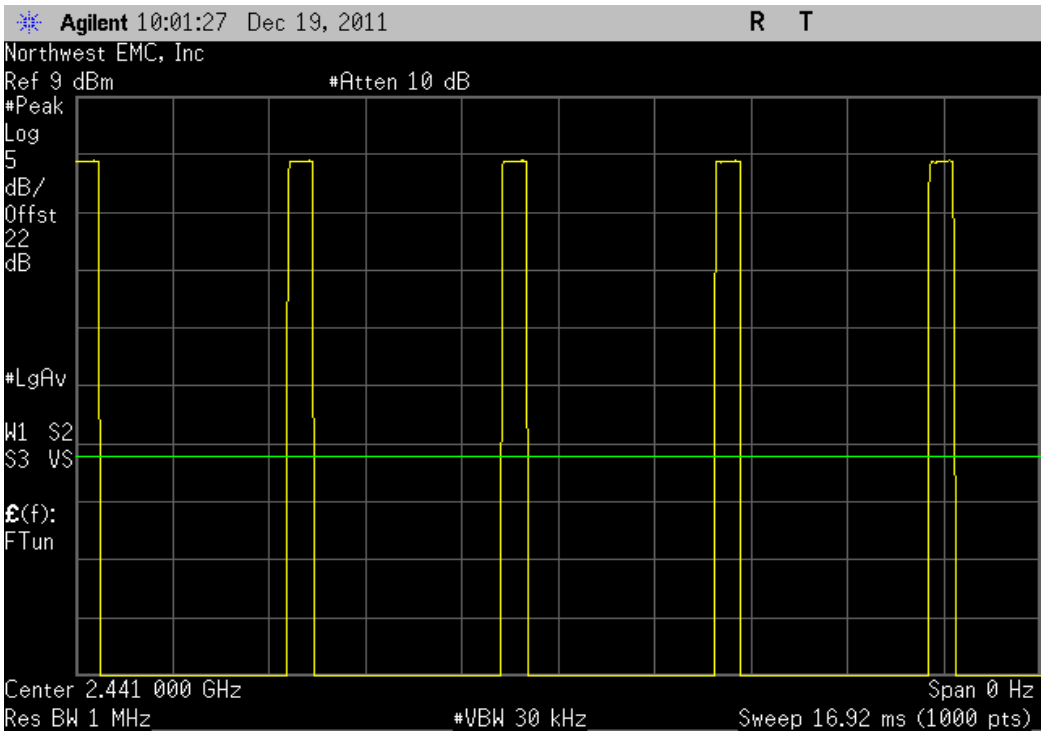
DH5, GFSK, Mid Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
430.7 uS	3.749 mS	1	12%	N/A	N/A



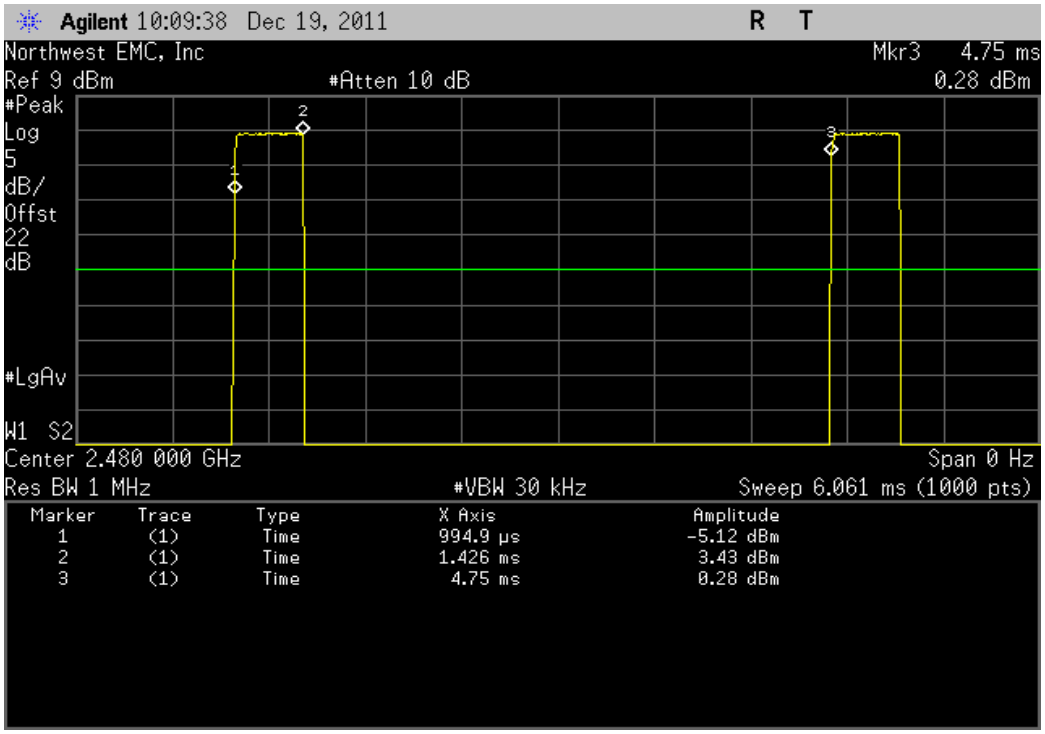
DH5, GFSK, Mid Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
		5		N/A	N/A



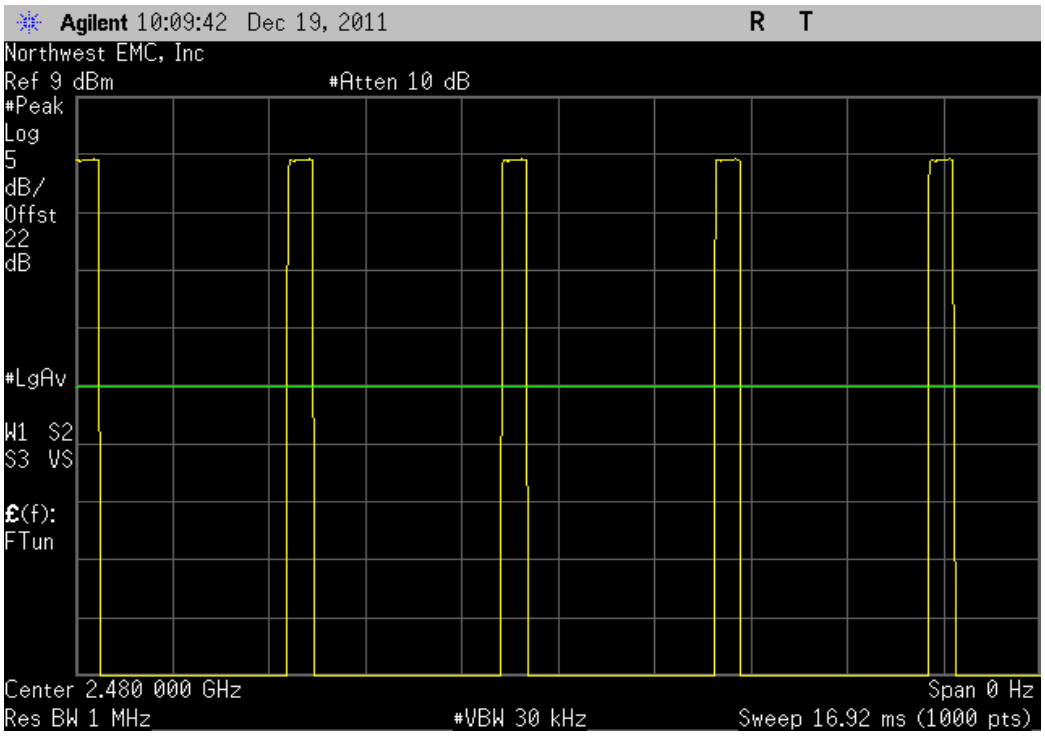
DH5, GFSK, High Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
430.8 uS	3.755 mS	1	12%	N/A	N/A



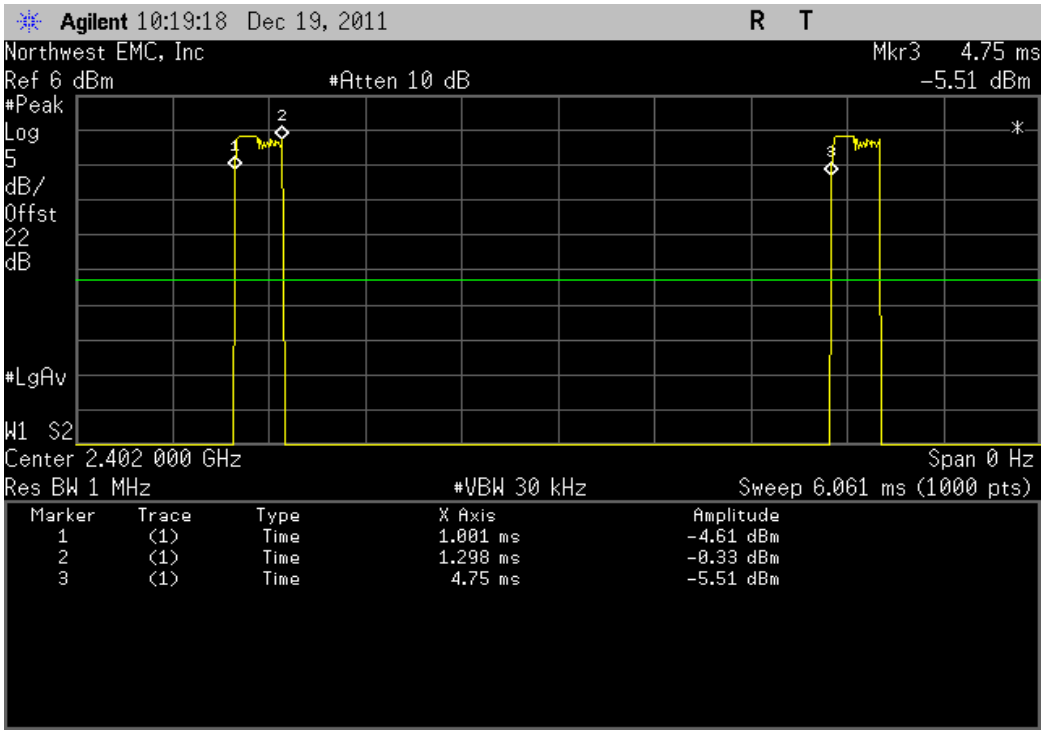
DH5, GFSK, High Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
		5		N/A	N/A



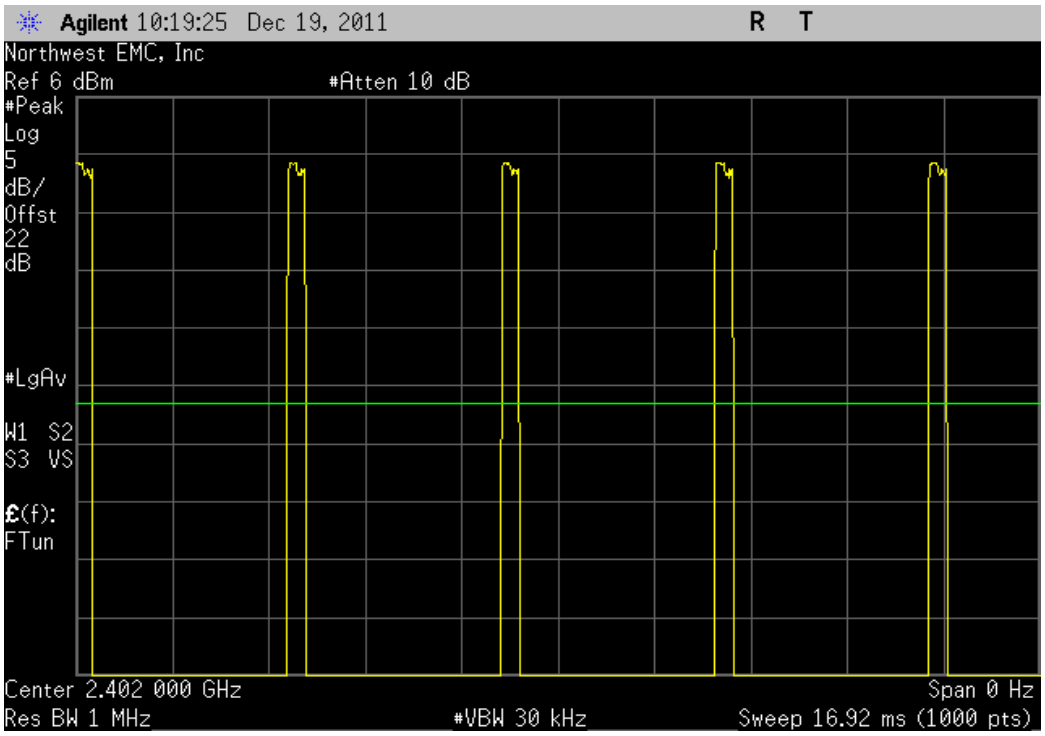
2DH5, 4-DQPSK, Low Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
297.3 uS	3.749 mS	1	8%	N/A	N/A



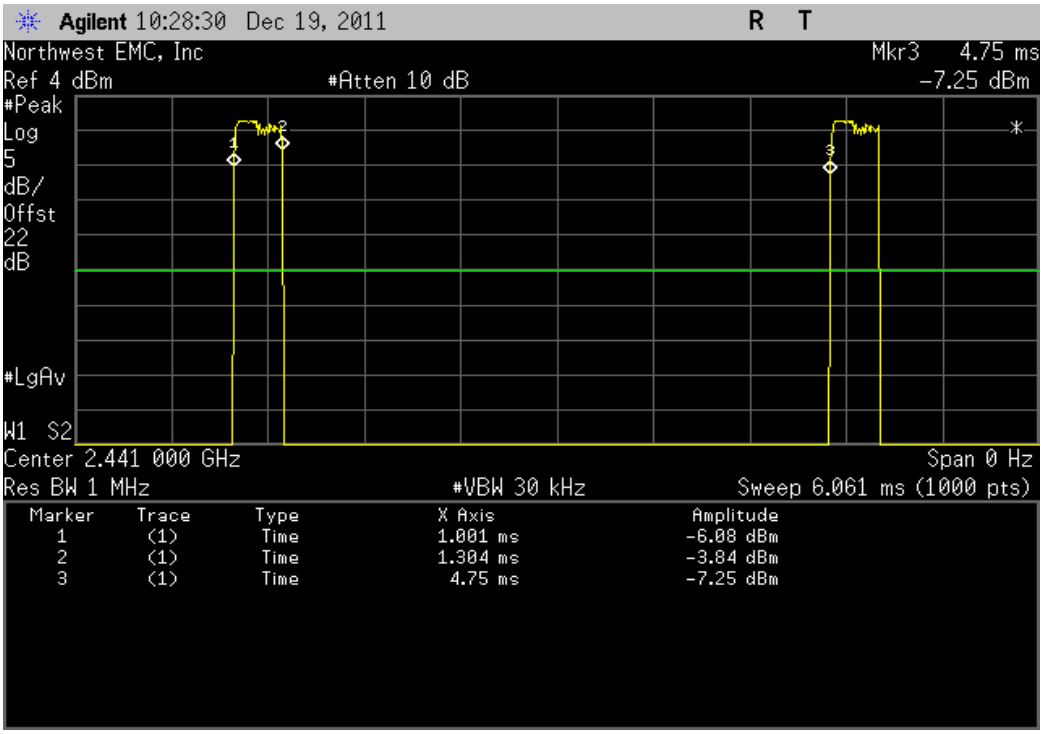
2DH5, 4-DQPSK, Low Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
		5		N/A	N/A



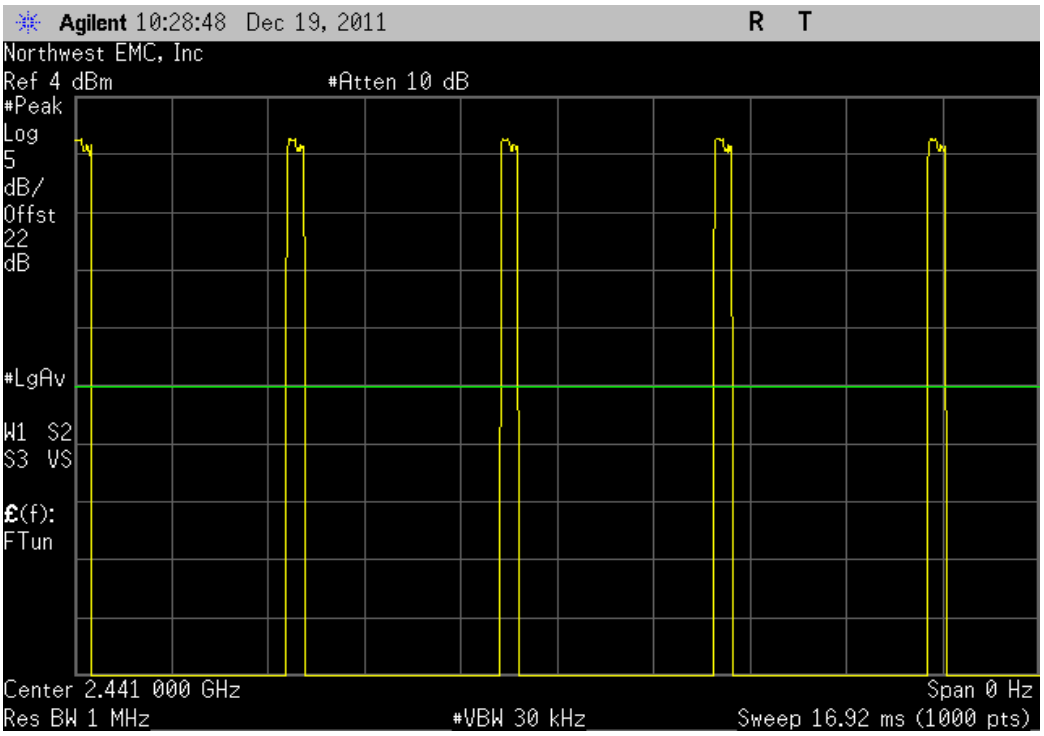
2DH5, 4-DQPSK, Mid Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
303.3 uS	3.749 mS	1	8%	N/A	N/A



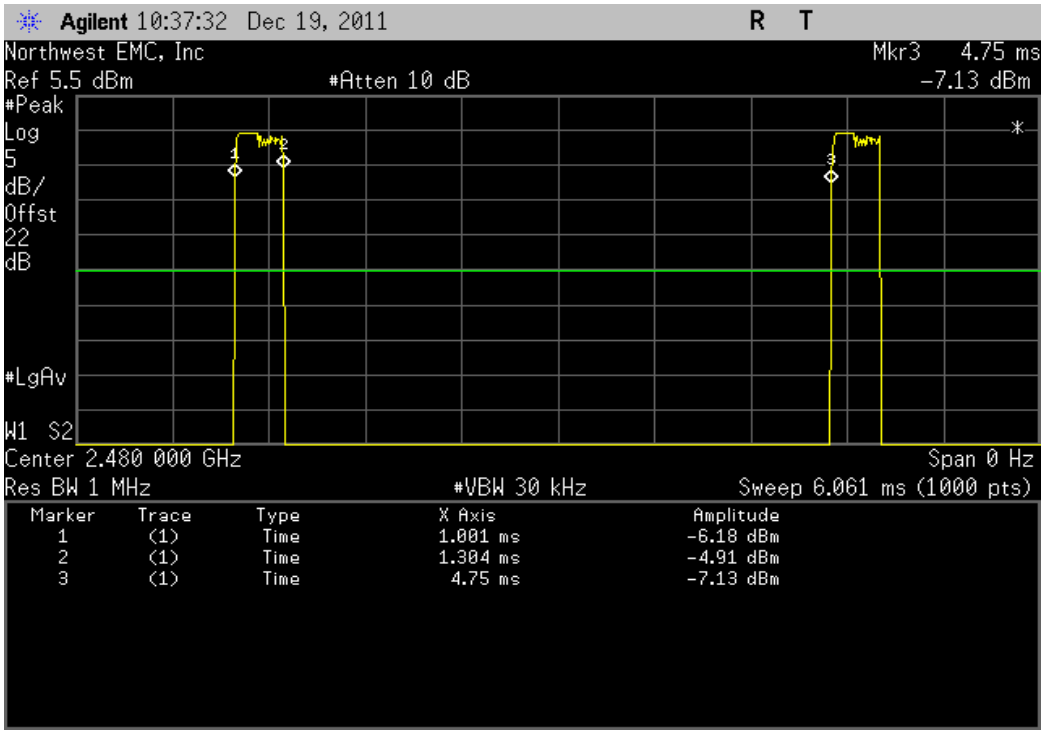
2DH5, 4-DQPSK, Mid Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
		5		N/A	N/A



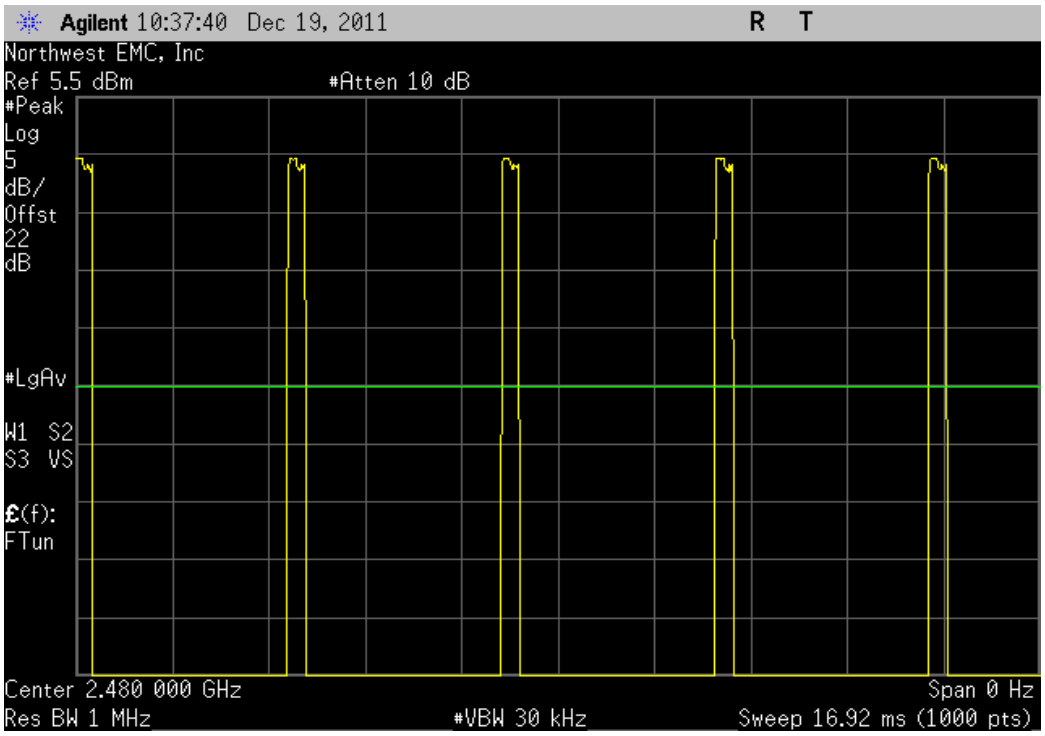
2DH5, 4-DQPSK, High Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
303.3 uS	3.749 mS	1	8%	N/A	N/A

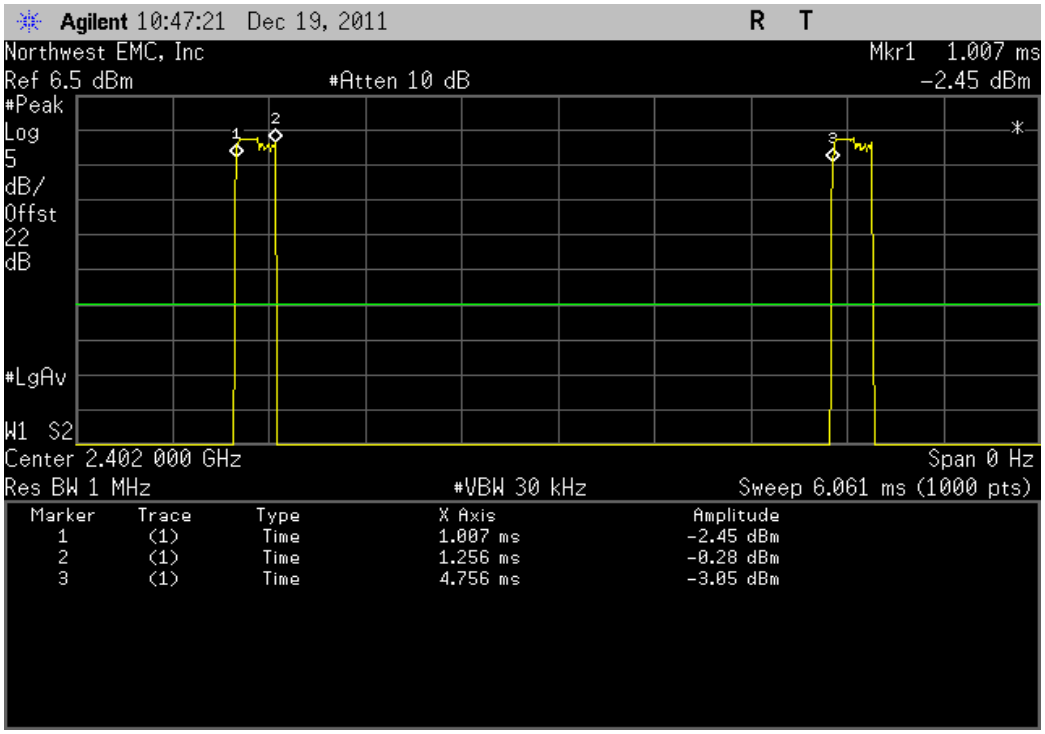


2DH5, 4-DQPSK, High Channel

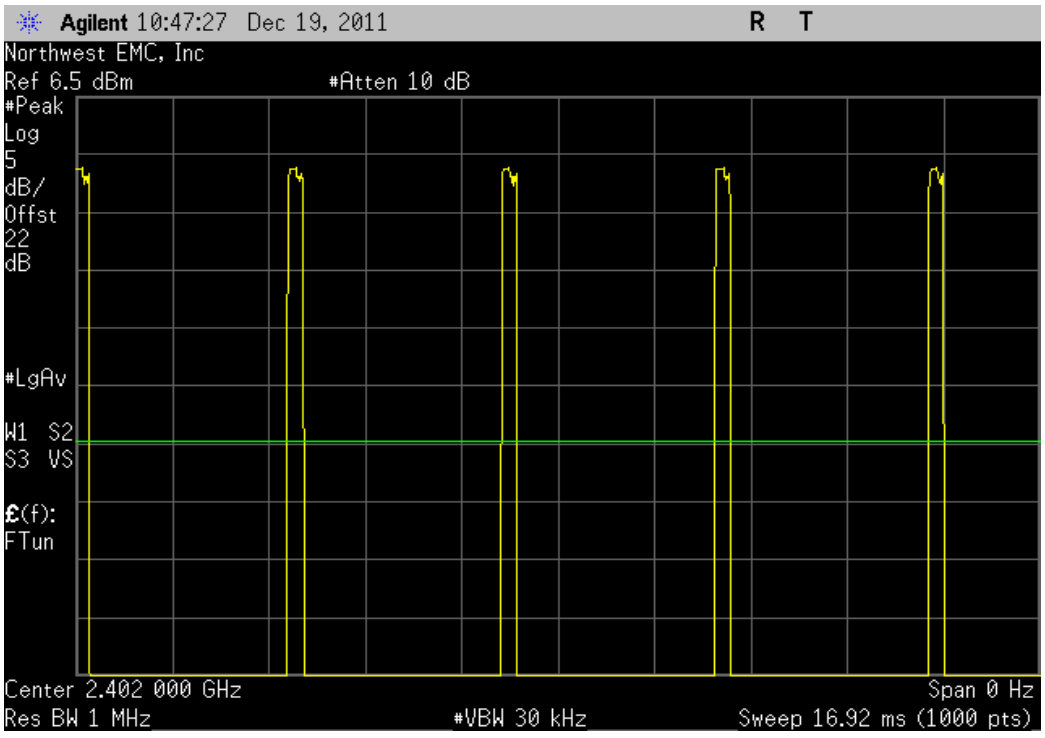
Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
		5		N/A	N/A



3DH5, 8-DPSK, Low Channel						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	248.733 uS	3.749 mS	1	7%	N/A	N/A

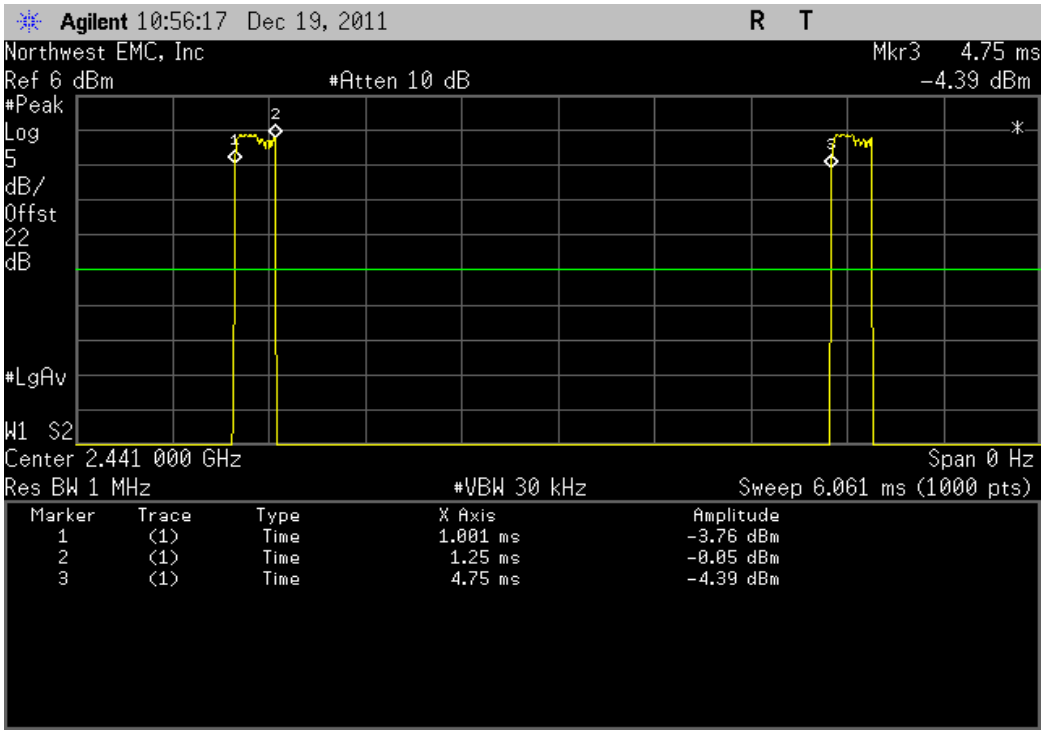


3DH5, 8-DPSK, Low Channel						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
			5		N/A	N/A



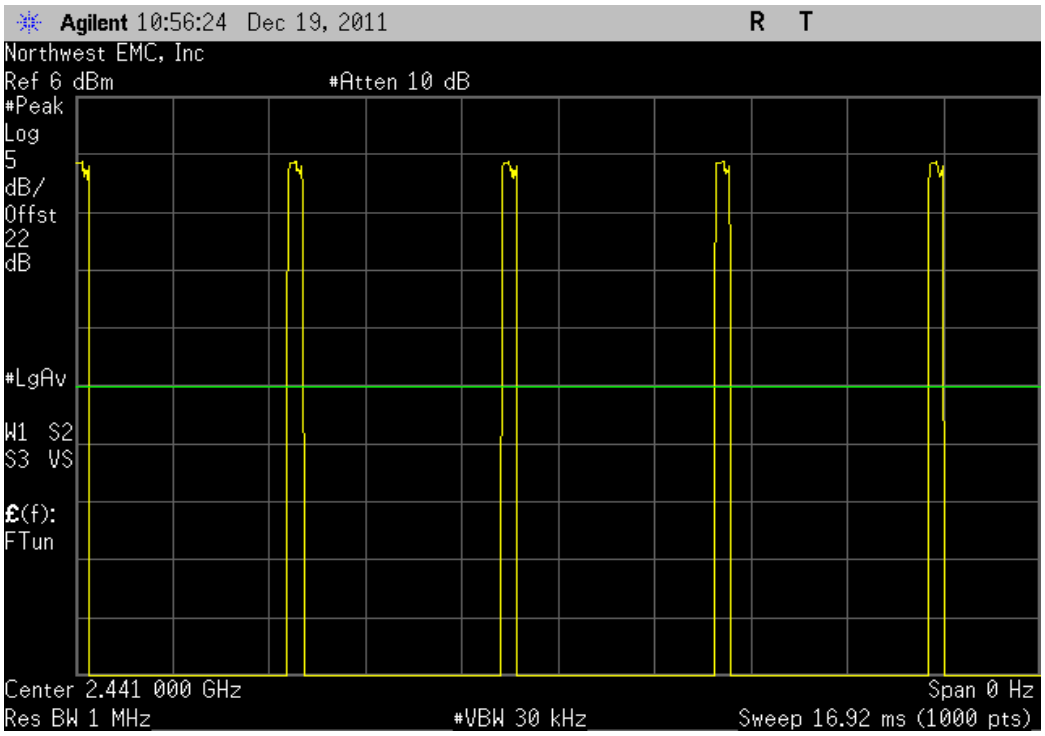
3DH5, 8-DPSK, Mid Channel

Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
248.7 uS	3.749 mS	1	7%	N/A	N/A

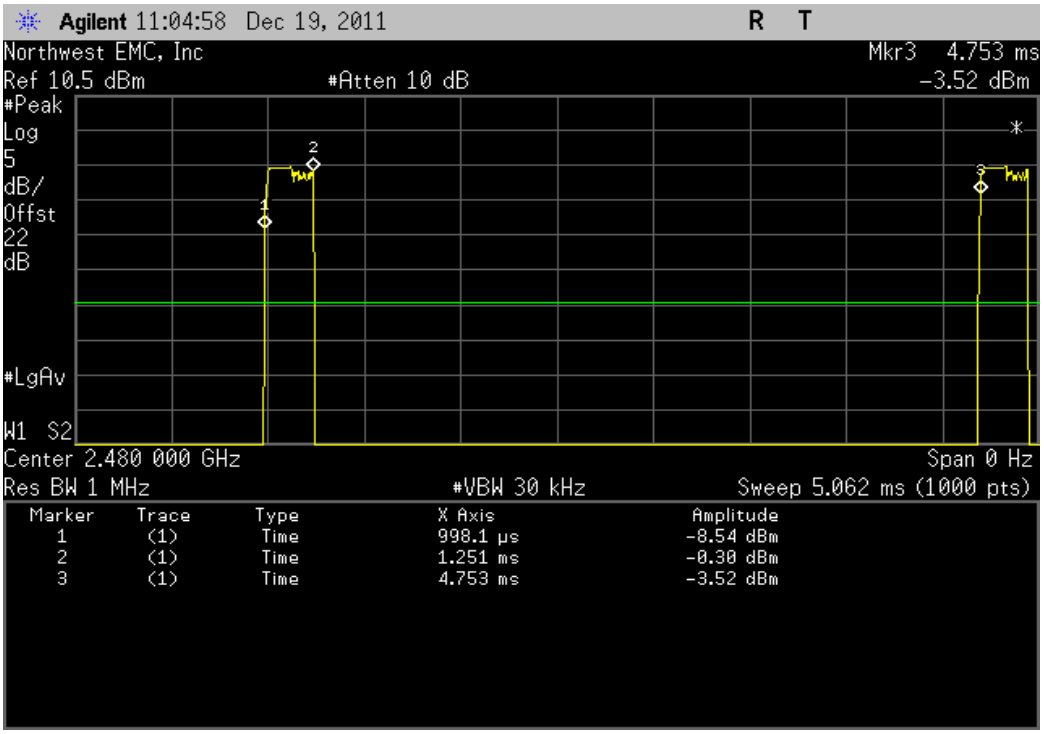


3DH5, 8-DPSK, Mid Channel

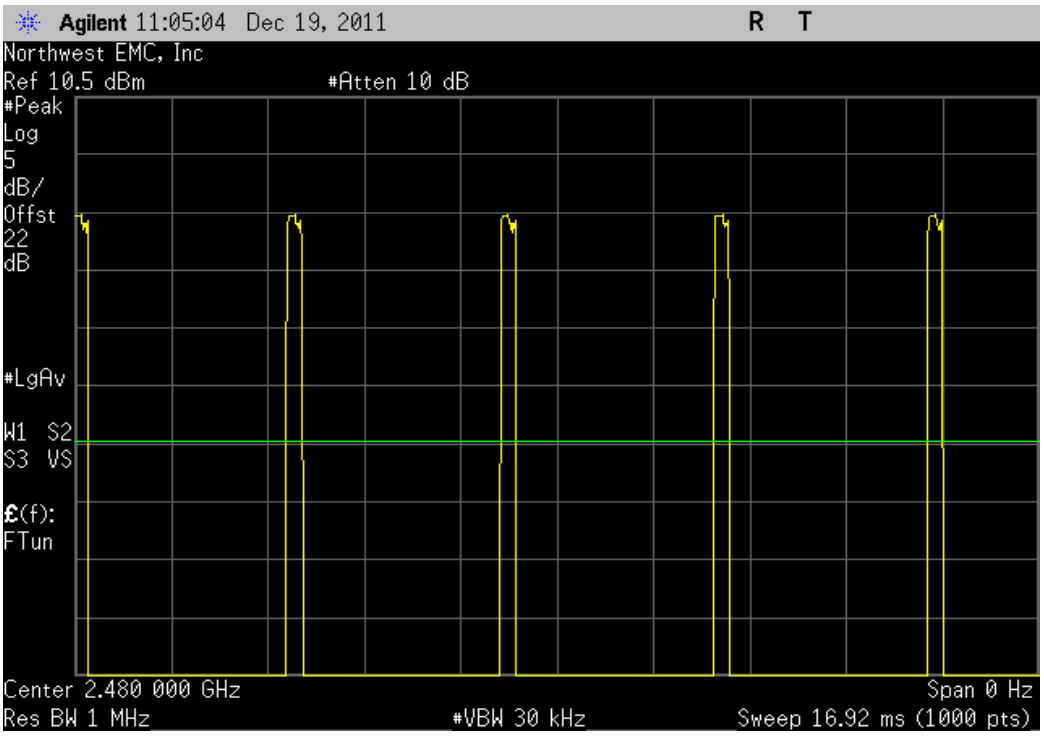
Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
		5		N/A	N/A



3DH5, 8-DPSK, High Channel						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
	253.4 uS	3.754 mS	1	7%	N/A	N/A



3DH5, 8-DPSK, High Channel						
	Pulse Width	Period	Number of Pulses	Value (%)	Limit	Result
			5		N/A	N/A



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 Bluetooth Ch 0: 2402 MHz, 39: 2441 MHz, 78: 2480 MHz at DH5, 2DH5, 3DH5 (See Comments)

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

MDTR0042: CTM2 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	25 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
Low Pass Filter	Micro-Tronics	LPM50004	HGK	7/9/2010	24 mo
High Pass Filter	Micro-Tronics	HPM50111	HGQ	7/9/2010	24 mo
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	4/15/2011	12 mo
MN05 Cables	N/A	18-26GHz Standard Gain Horn Cable	EVD	4/15/2011	12 mo
Antenna, Horn	ETS	3160-09	AHG	NCR	0 mo
Attenuator, 20 dB, 'SMA'	SM Electronics	SA6-20	REO	7/1/2011	12 mo
Antenna, Horn	ETS	3160-07	AXP	NCR	0 mo
Antenna, Horn	ETS Lindgren	3160-08	AIQ	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	7/1/2011	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	10/18/2011	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	6/29/2011	24 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	7/1/2011	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	AVY	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	2/2/2011	12 mo
Antenna, Biconilog	ETS Lindgren	3142D	AXN	12/30/2009	24 mo
Spectrum Analyzer	Agilent	E4446A	AAT	2/15/2011	12 mo

MEASUREMENT BANDWIDTHS

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

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainy 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 for radiated emissions measurements is less than +/- 4dB, and for conducted emissions measurements is less than +/-2.7dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specificiation limit to determine compliance. The calculations for measurement uncertainty are available upon request.

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, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.10:2009). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

NORTHWEST

EMC

Spurious Radiated Emissions

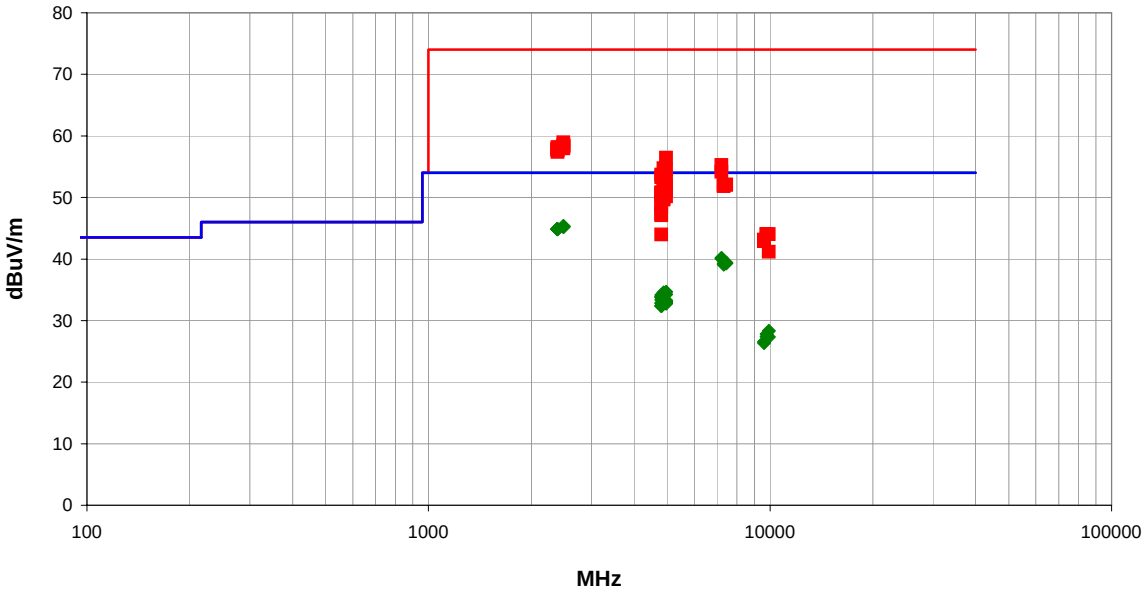
PSA-ESCI 2011.07.26
PSA-ESCI Version 2011.06.23

Work Order:	MDTR0042	**Date:**	12/12/11		
Project:	None	**Temperature:**	24.51 °C		
Job Site:	MN05	**Humidity:**	21.56% RH		
Serial Number:	NKW001518N	**Barometric Pres.:**	1021.7 mbar	**Tested by:**	Trevor Buls

EUT:	CTM2
Configuration:	2
Customer:	Medtronic Inc.
Attendees:	None
EUT Power:	Battery
Operating Mode:	Transmitting Bluetooth Ch 0: 2402 MHz, 39: 2441 MHz, 78: 2480 MHz at DH5, 2DH5, 3DH5 (See Comments)
Deviations:	None
Comments:	MDTR0012 Test Plan Configuration 7.

Test Specifications	**Test Method**
FCC 15.247:2011	ANSI C63.10:2009
RSS-210:2010	RSS-Gen:2010

Run #	6	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2484.442	28.8	-3.5	1.1	51.0	3.0	20.0	Vert	AV	0.0	45.3	54.0	-8.7	Ch 78, 3DH5, EUT Horizontal
2483.925	28.8	-3.5	1.0	181.0	3.0	20.0	Vert	AV	0.0	45.3	54.0	-8.7	Ch 78, 2DH5, EUT Horizontal
2483.500	28.8	-3.5	1.0	83.0	3.0	20.0	Horz	AV	0.0	45.3	54.0	-8.7	Ch 78, 3DH5, EUT Horizontal
2486.117	28.7	-3.5	1.0	349.0	3.0	20.0	Horz	AV	0.0	45.2	54.0	-8.8	Ch 78, DH5, EUT Horizontal
2484.950	28.7	-3.5	1.0	258.0	3.0	20.0	Horz	AV	0.0	45.2	54.0	-8.8	Ch 78, 2DH5, EUT Horizontal
2483.908	28.7	-3.5	3.6	278.0	3.0	20.0	Vert	AV	0.0	45.2	54.0	-8.8	Ch 78, DH5, EUT Horizontal
2385.133	28.6	-3.7	2.2	272.0	3.0	20.0	Vert	AV	0.0	44.9	54.0	-9.1	Ch 0, 3DH5, EUT Horizontal
2385.308	28.6	-3.7	2.9	58.0	3.0	20.0	Vert	AV	0.0	44.9	54.0	-9.1	Ch 0, 2DH5, EUT Horizontal
2385.775	28.6	-3.7	1.0	281.0	3.0	20.0	Horz	AV	0.0	44.9	54.0	-9.1	Ch 0, DH5, EUT Horizontal
2385.808	28.6	-3.7	1.7	80.0	3.0	20.0	Horz	AV	0.0	44.9	54.0	-9.1	Ch 0, 3DH5, EUT Horizontal
2385.925	28.6	-3.7	1.0	257.0	3.0	20.0	Horz	AV	0.0	44.9	54.0	-9.1	Ch 0, 2DH5, EUT Horizontal
2385.950	28.6	-3.7	1.0	314.0	3.0	20.0	Vert	AV	0.0	44.9	54.0	-9.1	Ch 0, DH5, EUT Horizontal
7206.018	28.6	11.6	1.1	238.0	3.0	0.0	Horz	AV	0.0	40.2	54.0	-13.8	Ch 0, DH5, EUT Horizontal
7205.918	28.5	11.6	1.0	211.0	3.0	0.0	Vert	AV	0.0	40.1	54.0	-13.9	Ch 0, DH5, EUT Horizontal
7440.342	26.8	12.6	1.1	223.0	3.0	0.0	Horz	AV	0.0	39.4	54.0	-14.6	Ch 78, DH5, EUT Horizontal
7322.892	27.2	12.1	1.0	26.0	3.0	0.0	Vert	AV	0.0	39.3	54.0	-14.7	Ch 39, DH5, EUT Horizontal
7440.683	26.7	12.6	3.6	303.0	3.0	0.0	Vert	AV	0.0	39.3	54.0	-14.7	Ch 78, DH5, EUT Horizontal
7322.092	27.0	12.1	1.0	265.0	3.0	0.0	Horz	AV	0.0	39.1	54.0	-14.9	Ch 39, DH5, EUT Horizontal
2484.183	42.4	-3.5	1.0	349.0	3.0	20.0	Horz	PK	0.0	58.9	74.0	-15.1	Ch 78, DH5, EUT Horizontal
2487.925	41.9	-3.4	1.0	181.0	3.0	20.0	Vert	PK	0.0	58.5	74.0	-15.5	Ch 78, 2DH5, EUT Horizontal

Receiver Spurious 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

Receive mode BT, DH5, Chan 39: 2441 MHz

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

MDTR0042: CTM2 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	18 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
Antenna, Horn	ETS	3160-07	AXP	NCR	0 mo
Antenna, Horn	ETS Lindgren	3160-08	AIQ	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVW	7/1/2011	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVV	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Standard Gain Horn Cables	MNJ	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	10/18/2011	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	6/29/2011	24 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	7/1/2011	12 mo
Pre-Amplifier	Miteq	AM-1616-1000	AVY	7/1/2011	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	2/2/2011	12 mo
Antenna, Biconilog	ETS Lindgren	3142D	AXN	12/30/2009	24 mo
Spectrum Analyzer	Agilent	E4446A	AAT	2/15/2011	12 mo

MEASUREMENT BANDWIDTHS

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

Measurements were made using the IF bandwidths and detectors specified. No video filter was used, except in the case of the FCC Average Measurements above 1GHz. In that case, a peak detector with a 10Hz video bandwidth was used.

MEASUREMENT UNCERTAINTY

A measurement uncertainy 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 for radiated emissions measurements is less than +/- 4dB, and for conducted emissions measurements is less than +/-2.7dB. Our measurement data meets or exceeds the measurement uncertainty requirements of CISPR 16-4; therefore, the test data can be compared directly to the specificiation limit to determine compliance. The calculations for measurement uncertainty are available upon request.

TEST DESCRIPTION

The EUT was configured for mid channel receive frequency. The spectrum was scanned through out the range specified in RSS-Gen. RSS GEN defines the start frequency for receiver spurious emissions as 30MHz and the stop frequency the 3rd harmonic of the highest tuneable receive frequency. Unwanted emissions were measured to demonstrate compliance. While scanning, emissions from the EUT were maximized by rotating the EUT 360 degrees, measuring the EUT in three orthogonal axis, and adjusting the measurement antenna height and polarization between 1 and 4 meters. A preamp was used for this test in order to provide sufficient measurement sensitivity.

NORTHWEST
EMC

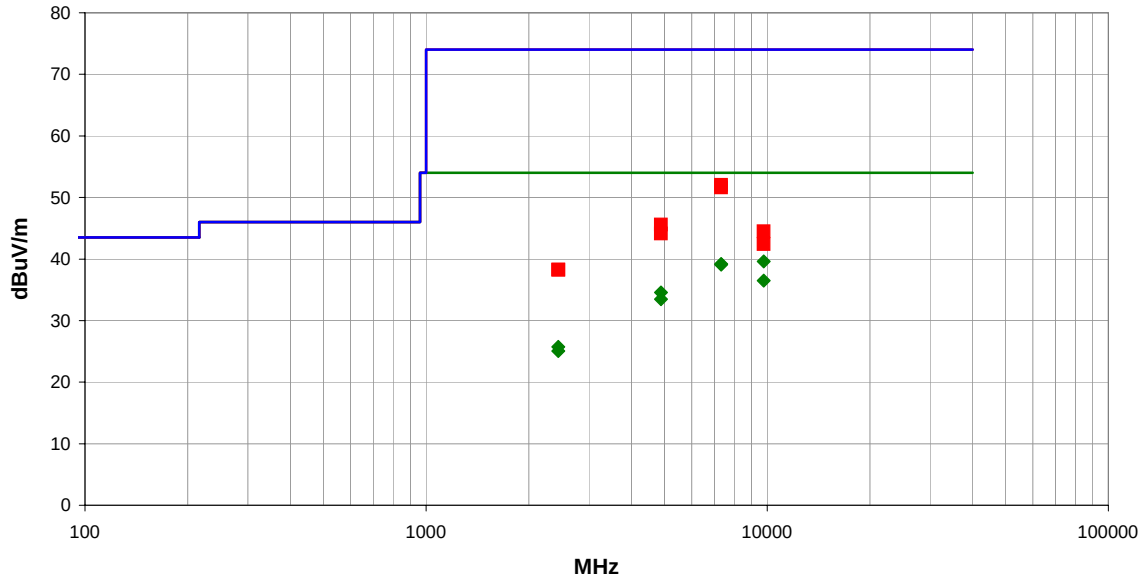
Receiver Spurious Emissions

PSA-ESCI 2011.07.26
PSA-ESCI Version 2011.06.23

Work Order:	MDTR0042	**Date:**	12/16/11	Trevor Buls	
Project:	None	**Temperature:**	24.38 °C		
Job Site:	MN05	**Humidity:**	14.85% RH		
Serial Number:	NKW001518N	**Barometric Pres.:**	1031.2 mbar	**Tested by:**	Trevor Buls
EUT:	CTM2				
Configuration:	2				
Customer:	Medtronic Inc.				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Receive mode BT, DH5, Chan 39: 2441 MHz				
Deviations:	None				
Comments:	MDTR0012 Test Plan Configuration 7. EUT Horizontal				

Test Specifications	**Class B**	**Test Method**
FCC 15.109:2011		ANSI C63.4:2003
RSS-Gen:2010		RSS-Gen:2010

Run #	66	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**Results**	Pass



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)
9760.073	48.8	-9.2	1.2	63.0	3.0	0.0	Vert	AV	0.0	39.6	54.0	-14.4
7321.225	27.1	12.1	3.5	324.0	3.0	0.0	Horz	AV	0.0	39.2	54.0	-14.8
7320.500	27.0	12.1	1.1	132.0	3.0	0.0	Vert	AV	0.0	39.1	54.0	-14.9
9760.073	45.7	-9.2	1.5	65.0	3.0	0.0	Horz	AV	0.0	36.5	54.0	-17.5
4880.025	29.9	4.7	1.0	318.0	3.0	0.0	Horz	AV	0.0	34.6	54.0	-19.4
4880.067	28.8	4.7	1.0	324.0	3.0	0.0	Vert	AV	0.0	33.5	54.0	-20.5
7321.033	39.9	12.1	1.1	132.0	3.0	0.0	Vert	PK	0.0	52.0	74.0	-22.0
7323.067	39.5	12.1	3.5	324.0	3.0	0.0	Horz	PK	0.0	51.6	74.0	-22.4
2439.100	29.4	-3.6	1.0	304.0	3.0	0.0	Horz	AV	0.0	25.8	54.0	-28.2
4882.450	40.9	4.7	1.0	324.0	3.0	0.0	Vert	PK	0.0	45.6	74.0	-28.4
2438.850	28.7	-3.6	1.0	123.0	3.0	0.0	Vert	AV	0.0	25.1	54.0	-28.9
9760.040	53.7	-9.2	1.2	63.0	3.0	0.0	Vert	PK	0.0	44.5	74.0	-29.5
4879.642	39.5	4.7	1.0	318.0	3.0	0.0	Horz	PK	0.0	44.2	74.0	-29.8
9760.193	51.6	-9.2	1.5	65.0	3.0	0.0	Horz	PK	0.0	42.4	74.0	-31.6
2443.400	41.9	-3.6	1.0	304.0	3.0	0.0	Horz	PK	0.0	38.3	74.0	-35.7
2438.842	41.9	-3.6	1.0	123.0	3.0	0.0	Vert	PK	0.0	38.3	74.0	-35.7