

NORTHWEST EMC

Esterline (Advanced Input Devices)

Medigenic K080/K081 Wireless Keyboard

FCC 15.247:2015

Report # ESTE0018.1



NVLAP Lab Code: 200630-0

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. This Report may only be duplicated in its entirety

CERTIFICATE OF TEST

Last Date of Test: February 04, 2015
Esterline (Advanced Input Devices)
Model: Medigenic K080/K081 Wireless Keyboard

Radio Equipment Testing

Standards

Specification	Method
FCC 15.247:2014	ANSI C63.10:2009
	DA 00-705:2000

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	AC Powerline Conducted Emissions	No	N/A	Not required for a battery powered device.
6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
6.7	Spurious Conducted Emissions	Yes	Pass	
6.9.1	Occupied Bandwidth	Yes	Pass	
6.10.1	Output Power	Yes	Pass	
6.11.2	Power Spectral Density	Yes	Pass	
7.5	Duty Cycle	Yes	N/A	Characterization of radio operation.
7.7.2	Channel Spacing	Yes	Pass	
7.7.3	Number of Hopping Frequencies	Yes	N/A	No limit for a Hybrid radio. Required for Dwell Time measurement.
7.7.4	Dwell Time	Yes	Pass	
7.7.9	Band Edge Compliance	Yes	Pass	

Deviations From Test Standards

None

Approved By:



Kyle Holgate, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test.

REVISION HISTORY

Revision Number		Description	Date	Page Number
00		None		

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

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

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

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

European Union

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

SCOPE

For details on the Scopes of our Accreditations, please visit:

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

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

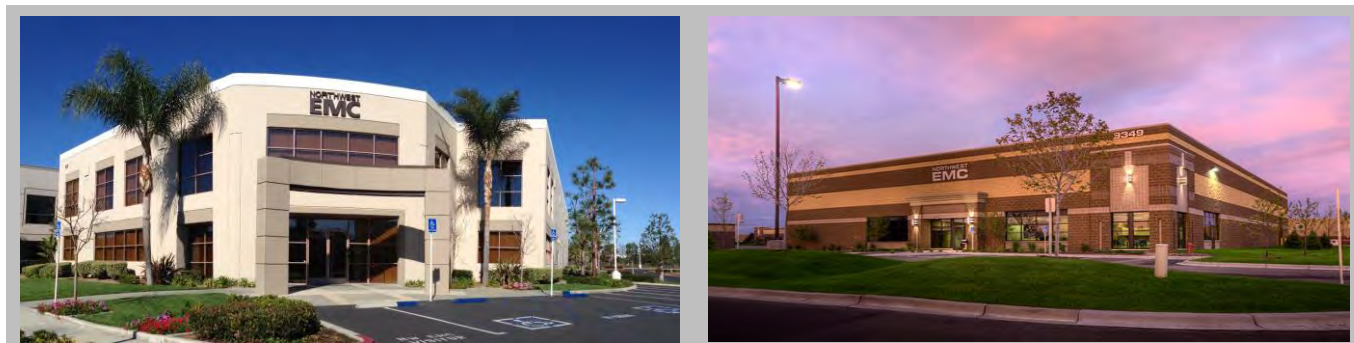
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. Measurement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

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

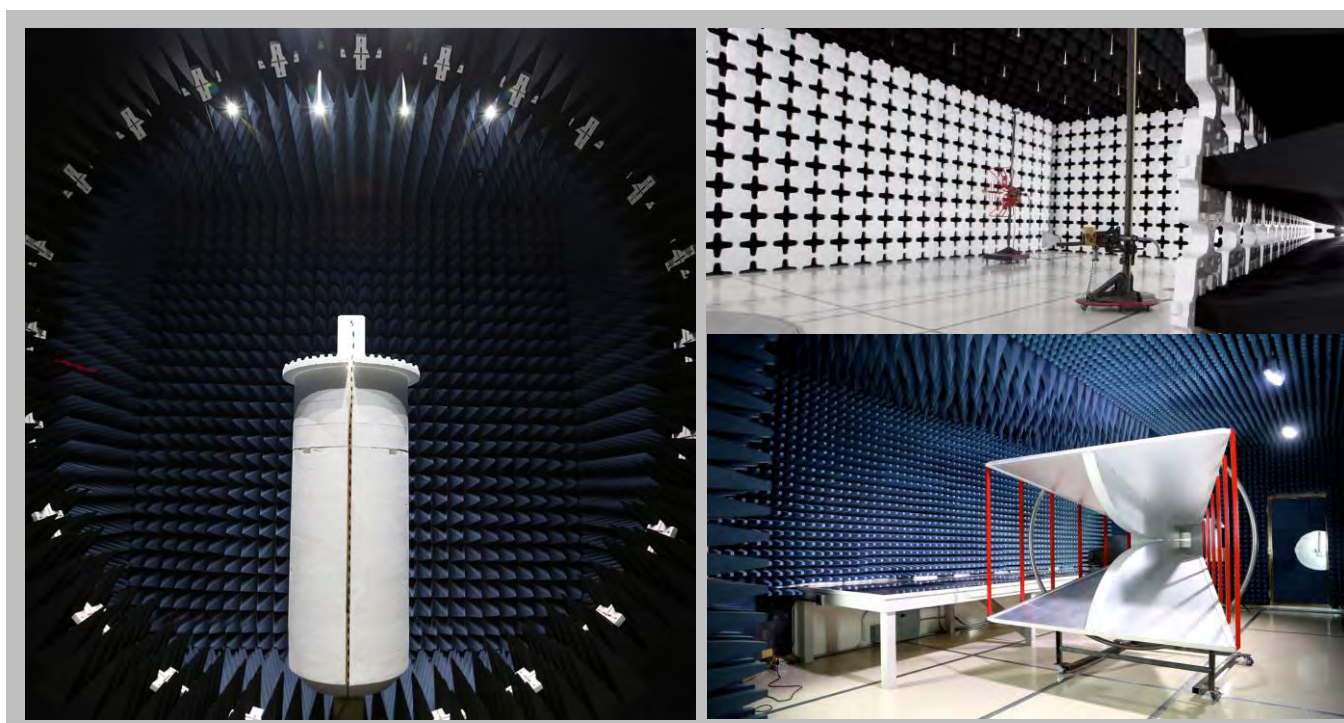
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%
Field Strength (dB)	5.2 dB	-5.2 dB
AC Powerline Conducted Emissions (dB)	2.9 dB	-2.9 dB

FACILITIES



California Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Minnesota Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	New York Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 685-0796	Oregon Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Texas Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Washington Labs NC01-05 19201 120 th Ave NE Bothell, WA 9801 (425)984-6600
NVLAP					
NVLAP Lab Code: 200676-0	NVLAP Lab Code: 200881-0	NVLAP Lab Code: 200761-0	NVLAP Lab Code: 200630-0	NVLAP Lab Code:201049-0	NVLAP Lab Code: 200629-0
Industry Canada					
2834B-1, 2834B-3	2834E-1	N/A	2834D-1, 2834D-2	2834G-1	2834F-1
BSMI					
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R
VCCI					
A-0029	A-0109	N/A	A-0108	A-0201	A-0110
Recognized Phase I CAB for ACMA, BSMI, IDA, KCC/RRR, MIC, MOC, NCC, OFTA					
US0158	US0175	N/A	US0017	US0191	US0157



PRODUCT DESCRIPTION

Client and Equipment Under Test (EUT) Information

Company Name:	Esterline (Advanced Input Devices)
Address:	600 W. Wilbur Avenue
City, State, Zip:	Coeur d'Alene, ID 83815
Test Requested By:	Wayne Hash
Model:	Medigenic K080/K081 Wireless Keyboard
First Date of Test:	February 02, 2015
Last Date of Test:	February 04, 2015
Receipt Date of Samples:	February 02, 2015
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
Wireless Keyboard
Testing Objective:
To demonstrate compliance of the 5 channel hybrid radio to FCC 15.247 requirements in the 2.4 GHz band as set forth in KDB 453039.

CONFIGURATIONS

Configuration ESTE0018- 1

Software/Firmware Running during test	
Description	Version
Firmware ID Keyboard (79 Channel)	9602-00996-001

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Keyboard	Esterline (Advanced Input Devices)	9375-00773-002	P00007

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	.9m	No	Power Supply	Wireless Keyboard
AC Power Cable	No	.7m	No	Power Supply	AC mains

Note: In normal operation the EUT is battery powered.

Configuration ESTE0018- 2

Software/Firmware Running during test	
Description	Version
Firmware ID Keyboard (5 Channel)	9602-00972-001

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Keyboard (5 Channel)	Esterline (Advanced Input Devices)	9375-00773-002	P00007

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	.9m	No	Power Supply	Wireless Keyboard
AC Power Cable	No	.7m	No	Power Supply	AC mains

Note: In normal operation the EUT is battery powered.

CONFIGURATIONS

Configuration ESTE0018- 5

Software/Firmware Running during test	
Description	Version
Firmware ID Keyboard (79 Channel)	9602-00996-001
Firmware ID Keyboard (5 Channel)	9602-00972-001

EUT			
Description	Manufacturer	Model/Part Number	Serial Number
Wireless Keyboard	Esterline (Advanced Input Devices)	9375-00773-002	P00007
Wireless Keyboard (5 Channel)	Esterline (Advanced Input Devices)	9375-00773-002	00007

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	.9m	No	Power Supply	Wireless Keyboard
AC Power Cable	No	.7m	No	Power Supply	AC mains

MODIFICATIONS

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	2/02/2015	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.
2	2/02/2015	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.
3	2/02/2015	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.
4	2/02/2015	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.
5	2/02/2015	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.
6	2/03/2015	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.
7	2/04/2015	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.
8	2/04/2015	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.
9	2/04/2015	Power Spectral Density	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

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

GFSK, Power Level 2

CHANNEL OF OPERATION

Ch.0, 2402MHz

Ch. 39, 2441MHz

Ch. 78, 2480MHz

POWER SETTINGS INVESTIGATED

3.3 VDC

CONFIGURATIONS INVESTIGATED

ESTE0018 - 1

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	26.5 GHz
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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
Spectrum Analyzer	Agilent	E4446A	AAQ	1/21/2014	12 mo
HP Filter	Micro-Tronics	HPM50111	HFO	7/6/2013	24 mo
LP Filter	Micro-Tronics	LPM50004	LFD	6/18/2014	12 mo
Attenuator - 20dB, HF (1000MHz - 18000MHz)	Coaxicom	3910-20	AXZ	6/19/2014	12 mo
Cable	ESM Cable Corp.	KMKM-72	EVY	11/9/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AVU	11/9/2014	12 mo
Antenna, Horn	ETS Lindgren	3160-09	AIV	NCR	0 mo
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVD	2/18/2014	12 mo
Antenna, Horn	ETS	3160-08	AHV	NCR	0 mo
EV01 Cables	N/A	Standard Gain Horns Cables	EVF	2/18/2014	12 mo
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVC	2/18/2014	12 mo
Antenna, Horn	ETS	3160-07	AHU	NCR	0 mo
EV01 Cables	N/A	Double Ridge Horn Cables	EVB	8/26/2014	12 mo
Antenna, Horn	ETS	3115	AIZ	1/24/2014	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	AOL	2/18/2014	12 mo
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	PAG	8/26/2014	12 mo
EV01 Cables	N/A	Bilog Cables	EVA	2/18/2014	12 mo
Antenna, Biconilog	EMCO	3141	AXE	8/29/2014	24 mo

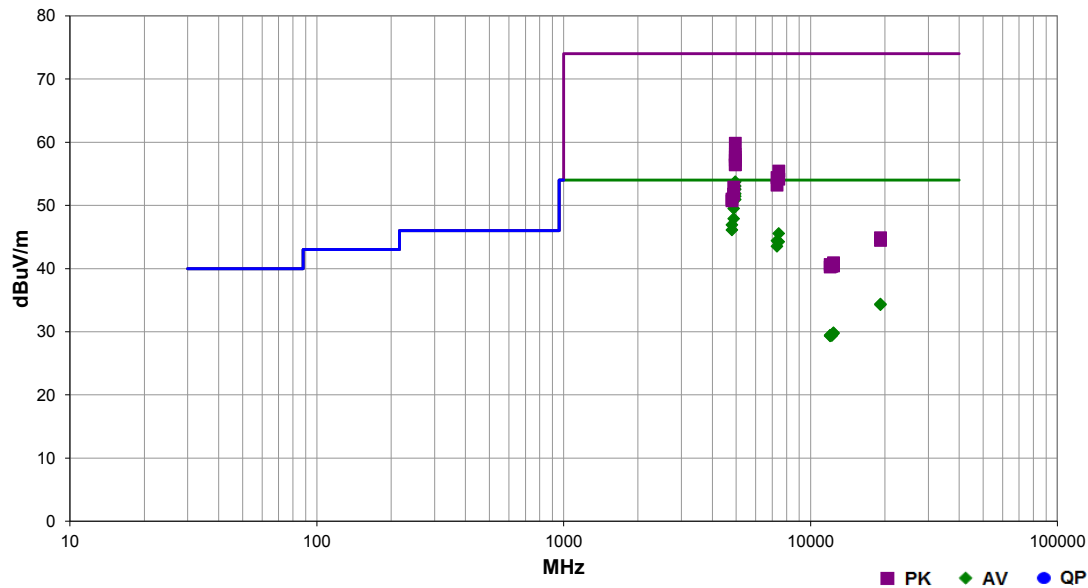
TEST DESCRIPTION

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

Work Order:	ESTE0018	Date:	02/03/15		
Project:	None	Temperature:	22.3 °C		
Job Site:	EV01	Humidity:	39% RH		
Serial Number:	P00001	Barometric Pres.:	1017.3 mbar	Tested by:	Brandon Hobbs
EUT:	Medigenic K080/K081 Wireless Keyboard				
Configuration:	1				
Customer:	Esterline (Advanced Input Devices)				
Attendees:	Wayne Hash				
EUT Power:	3.3 VDC				
Operating Mode:	Continuous Tx GFSK				
Deviations:	None				
Comments:	Please reference the EUT data comments for EUT orientation, frequency, power level and channel.				


Test Specifications	FCC 15.247:2014	Test Method	ANSI C63.10:2009
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Run #	18	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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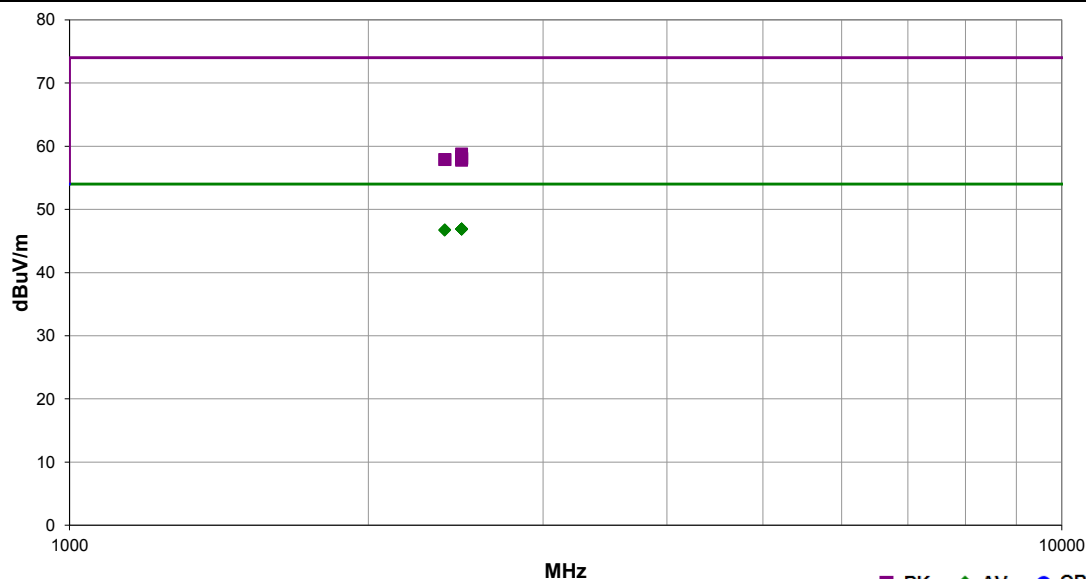
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
4960.295	47.4	6.3	1.0	356.0	3.0	0.0	Horz	AV	0.0	53.7	54.0	-0.3	High Ch.78 2480MHz, Pwr 1, EUT Horz
4960.235	46.7	6.3	2.0	181.0	3.0	0.0	Vert	AV	0.0	53.0	54.0	-1.0	High Ch.78 2480MHz, Pwr 1, EUT Horz
4960.205	46.2	6.3	1.5	232.0	3.0	0.0	Horz	AV	0.0	52.5	54.0	-1.5	High Ch.78 2480MHz, Pwr 1, EUT On Side
4960.320	45.5	6.3	1.0	360.0	3.0	0.0	Vert	AV	0.0	51.8	54.0	-2.2	High Ch.78 2480MHz, Pwr 1, EUT On Side
4960.255	45.1	6.3	1.0	80.0	3.0	0.0	Horz	AV	0.0	51.4	54.0	-2.6	High Ch.78 2480MHz, Pwr 1, EUT Vert
4960.250	44.6	6.3	1.5	107.0	3.0	0.0	Vert	AV	0.0	50.9	54.0	-3.1	High Ch.78 2480MHz, Pwr 2, EUT Vert
4882.005	43.5	6.0	1.0	0.0	3.0	0.0	Horz	AV	0.0	49.5	54.0	-4.5	Mid Ch.39 2441MHz, Pwr 2, EUT Horz
4882.055	41.9	6.0	1.0	276.0	3.0	0.0	Vert	AV	0.0	47.9	54.0	-6.1	Mid Ch.39 2441MHz, Pwr 2, EUT Vert
4804.067	41.2	5.7	1.0	287.0	3.0	0.0	Vert	AV	0.0	46.9	54.0	-7.1	Low Ch.0 2402MHz, Pwr 2, EUT Vert
4804.042	40.4	5.7	1.0	109.0	3.0	0.0	Horz	AV	0.0	46.1	54.0	-7.9	Low Ch.0 2402MHz, Pwr 2, EUT Horz
7440.708	30.8	14.7	2.1	255.0	3.0	0.0	Vert	AV	0.0	45.5	54.0	-8.5	High Ch.78 2480MHz, Pwr 2, EUT Vert
7323.095	30.3	14.1	1.0	25.0	3.0	0.0	Vert	AV	0.0	44.4	54.0	-9.6	Mid Ch.39 2441MHz, Pwr 2, EUT Vert
7440.125	29.5	14.7	1.0	59.0	3.0	0.0	Horz	AV	0.0	44.2	54.0	-9.8	High Ch.78 2480MHz, Pwr 2, EUT Horz
7322.865	29.4	14.1	1.0	61.0	3.0	0.0	Horz	AV	0.0	43.5	54.0	-10.5	Mid Ch.39 2441MHz, Pwr 2, EUT Horz
4959.550	53.5	6.3	1.5	107.0	3.0	0.0	Vert	PK	0.0	59.8	74.0	-14.2	High Ch.78 2480MHz, Pwr 1, EUT Vert
4960.745	51.7	6.3	1.0	356.0	3.0	0.0	Horz	PK	0.0	58.0	74.0	-16.0	High Ch.78 2480MHz, Pwr 1, EUT Horz
4959.455	51.4	6.3	2.0	181.0	3.0	0.0	Vert	PK	0.0	57.7	74.0	-16.3	High Ch.78 2480MHz, Pwr 1, EUT Horz
4959.370	50.8	6.3	1.5	232.0	3.0	0.0	Horz	PK	0.0	57.1	74.0	-16.9	High Ch.78 2480MHz, Pwr 1, EUT On Side
4959.430	50.1	6.3	1.0	360.0	3.0	0.0	Vert	PK	0.0	56.4	74.0	-17.6	High Ch.78 2480MHz, Pwr 1, EUT On Side
4959.440	50.1	6.3	1.0	80.0	3.0	0.0	Horz	PK	0.0	56.4	74.0	-17.6	High Ch.78 2480MHz, Pwr 1, EUT Vert
7439.442	40.7	14.7	2.1	255.0	3.0	0.0	Vert	PK	0.0	55.4	74.0	-18.6	High Ch.78 2480MHz, Pwr 2, EUT Vert
7322.545	40.3	14.1	1.0	25.0	3.0	0.0	Vert	PK	0.0	54.4	74.0	-19.6	Mid Ch.39 2441MHz, Pwr 2, EUT Vert
19217.010	35.0	-0.6	1.2	35.0	3.0	0.0	Horz	AV	0.0	34.4	54.0	-19.6	Low Ch.0 2402MHz, Pwr 2, EUT Horz
19216.960	34.9	-0.6	1.2	273.0	3.0	0.0	Vert	AV	0.0	34.3	54.0	-19.7	Low Ch.0 2402MHz, Pwr 2, EUT Vert
7439.475	39.4	14.7	1.0	59.0	3.0	0.0	Horz	PK	0.0	54.1	74.0	-19.9	High Ch.78 2480MHz, Pwr 2, EUT Horz
7322.750	39.1	14.1	1.0	61.0	3.0	0.0	Horz	PK	0.0	53.2	74.0	-20.8	Mid Ch.39 2441MHz, Pwr 2, EUT Horz
4882.100	46.9	6.0	1.0	0.0	3.0	0.0	Horz	PK	0.0	52.9	74.0	-21.1	Mid Ch.39 2441MHz, Pwr 2, EUT Horz
4881.985	45.8	6.0	1.0	276.0	3.0	0.0	Vert	PK	0.0	51.8	74.0	-22.2	Mid Ch.39 2441MHz, Pwr 2, EUT Vert
4804.017	45.3	5.7	1.0	287.0	3.0	0.0	Vert	PK	0.0	51.0	74.0	-23.0	Low Ch.0 2402MHz, Pwr 2, EUT Vert
4804.200	45.0	5.7	1.0	109.0	3.0	0.0	Horz	PK	0.0	50.7	74.0	-23.3	Low Ch.0 2402MHz, Pwr 2, EUT Horz

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
12397.900	30.5	-0.7	4.0	112.0	3.0	0.0	Vert	AV	0.0	29.8	54.0	-24.2	High Ch.78 2478MHz, Pwr 2, EUT Vert
12397.610	30.4	-0.7	2.8	67.0	3.0	0.0	Horz	AV	0.0	29.7	54.0	-24.3	High Ch.78 2478MHz, Pwr 2, EUT Horz
12203.060	30.1	-0.6	2.5	0.0	3.0	0.0	Horz	AV	0.0	29.5	54.0	-24.5	Mid Ch.39 2441MHz, Pwr 2, EUT Horz
12007.780	31.8	-2.4	1.0	57.0	3.0	0.0	Horz	AV	0.0	29.4	54.0	-24.6	Low Ch.0 2402MHz, Pwr 2, EUT Horz
12205.110	30.0	-0.6	1.0	122.0	3.0	0.0	Vert	AV	0.0	29.4	54.0	-24.6	Mid Ch.39 2441MHz, Pwr 2, EUT Vert
12007.710	31.7	-2.4	1.0	0.0	3.0	0.0	Vert	AV	0.0	29.3	54.0	-24.7	Low Ch.0 2402MHz, Pwr 2, EUT Vert
19217.600	45.5	-0.6	1.2	35.0	3.0	0.0	Horz	PK	0.0	44.9	74.0	-29.1	Low Ch.0 2402MHz, Pwr 2, EUT Horz
19215.190	45.1	-0.6	1.2	273.0	3.0	0.0	Vert	PK	0.0	44.5	74.0	-29.5	Low Ch.0 2402MHz, Pwr 2, EUT Vert
12397.970	41.6	-0.7	4.0	112.0	3.0	0.0	Vert	PK	0.0	40.9	74.0	-33.1	High Ch.78 2478MHz, Pwr 2, EUT Vert
12009.180	43.0	-2.3	1.0	0.0	3.0	0.0	Vert	PK	0.0	40.7	74.0	-33.3	Low Ch.0 2402MHz, Pwr 2, EUT Vert
12204.870	41.1	-0.6	2.5	0.0	3.0	0.0	Horz	PK	0.0	40.5	74.0	-33.5	Mid Ch.39 2441MHz, Pwr 2, EUT Horz
12397.510	41.1	-0.7	2.8	67.0	3.0	0.0	Horz	PK	0.0	40.4	74.0	-33.6	High Ch.78 2478MHz, Pwr 2, EUT Horz
12202.590	41.0	-0.6	1.0	122.0	3.0	0.0	Vert	PK	0.0	40.4	74.0	-33.6	Mid Ch.39 2441MHz, Pwr 2, EUT Vert
12008.220	42.6	-2.4	1.0	57.0	3.0	0.0	Horz	PK	0.0	40.2	74.0	-33.8	Low Ch.0 2402MHz, Pwr 2, EUT Horz

Work Order:	ESTE0018	Date:	02/03/15	
Project:	None	Temperature:	22.3 °C	
Job Site:	EV01	Humidity:	39% RH	
Serial Number:	P00001	Barometric Pres.:	1017.3 mbar	
EUT:	Medigenic K080/K081 Wireless Keyboard			
Configuration:	1			
Customer:	Esterline (Advanced Input Devices)			
Attendees:	Wayne Hash			
EUT Power:	3.3 VDC			
Operating Mode:	Continuous Tx GFSK			
Deviations:	None			
Comments:	Please reference the EUT data comments for EUT orientation, frequency and channel.			

Test Specifications	Test Method
FCC 15.247:2014	ANSI C63.10:2009

Run #	20	Test Distance (m)	3	Antenna Height(s)	1 to 4(m)	Results	Pass
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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
2484.877	31.3	-4.4	1.0	97.0	3.0	20.0	Vert	AV	0.0	46.9	54.0	-7.1	High Ch.78 2478MHz, Pwr 2, EUT On Side
2484.667	31.3	-4.4	1.0	16.0	3.0	20.0	Horz	AV	0.0	46.9	54.0	-7.1	High Ch.78 2478MHz, Pwr 2, EUT Vert
2484.390	31.3	-4.4	1.0	140.0	3.0	20.0	Vert	AV	0.0	46.9	54.0	-7.1	High Ch.78 2478MHz, Pwr 2, EUT Vert
2484.457	31.3	-4.4	1.0	0.0	3.0	20.0	Horz	AV	0.0	46.9	54.0	-7.1	High Ch.78 2478MHz, Pwr 2, EUT Horz
2484.290	31.3	-4.4	1.0	327.0	3.0	20.0	Vert	AV	0.0	46.9	54.0	-7.1	High Ch.78 2478MHz, Pwr 2, EUT Horz
2483.573	31.3	-4.4	1.0	85.0	3.0	20.0	Horz	AV	0.0	46.9	54.0	-7.1	High Ch.78 2478MHz, Pwr 2, EUT On Side
2389.537	31.4	-4.6	1.0	5.0	3.0	20.0	Vert	AV	0.0	46.8	54.0	-7.2	Low Ch.0 2402MHz, Pwr 2, EUT On Side
2388.230	31.3	-4.6	1.0	314.0	3.0	20.0	Horz	AV	0.0	46.7	54.0	-7.3	Low Ch.0 2402MHz, Pwr 2, EUT Vert
2484.357	43.2	-4.4	1.0	16.0	3.0	20.0	Horz	PK	0.0	58.8	74.0	-15.2	High Ch.78 2478MHz, Pwr 2, EUT Vert
2483.960	42.8	-4.4	1.0	0.0	3.0	20.0	Horz	PK	0.0	58.4	74.0	-15.6	High Ch.78 2478MHz, Pwr 2, EUT Horz
2485.113	42.5	-4.4	1.0	140.0	3.0	20.0	Vert	PK	0.0	58.1	74.0	-15.9	High Ch.78 2478MHz, Pwr 2, EUT Vert
2484.127	42.5	-4.4	1.0	85.0	3.0	20.0	Horz	PK	0.0	58.1	74.0	-15.9	High Ch.78 2478MHz, Pwr 2, EUT On Side
2483.983	42.4	-4.4	1.0	97.0	3.0	20.0	Vert	PK	0.0	58.0	74.0	-16.0	High Ch.78 2478MHz, Pwr 2, EUT On Side
2388.943	42.5	-4.6	1.0	5.0	3.0	20.0	Vert	PK	0.0	57.9	74.0	-16.1	Low Ch.0 2402MHz, Pwr 2, EUT On Side
2389.207	42.5	-4.6	1.0	314.0	3.0	20.0	Horz	PK	0.0	57.9	74.0	-16.1	Low Ch.0 2402MHz, Pwr 2, EUT Vert
2483.843	42.2	-4.4	1.0	327.0	3.0	20.0	Vert	PK	0.0	57.8	74.0	-16.2	High Ch.78 2478MHz, Pwr 2, EUT Horz

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 (mo)
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	24
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	1/7/2015	12
RF Vector Signal Generator (FOR REFERENCE ONLY)	Agilent	V2920A	TIH	NCR	0
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40 GHz DC Block	Fairview Microwave	SD3379	AMK	12/11/2014	12

TEST DESCRIPTION

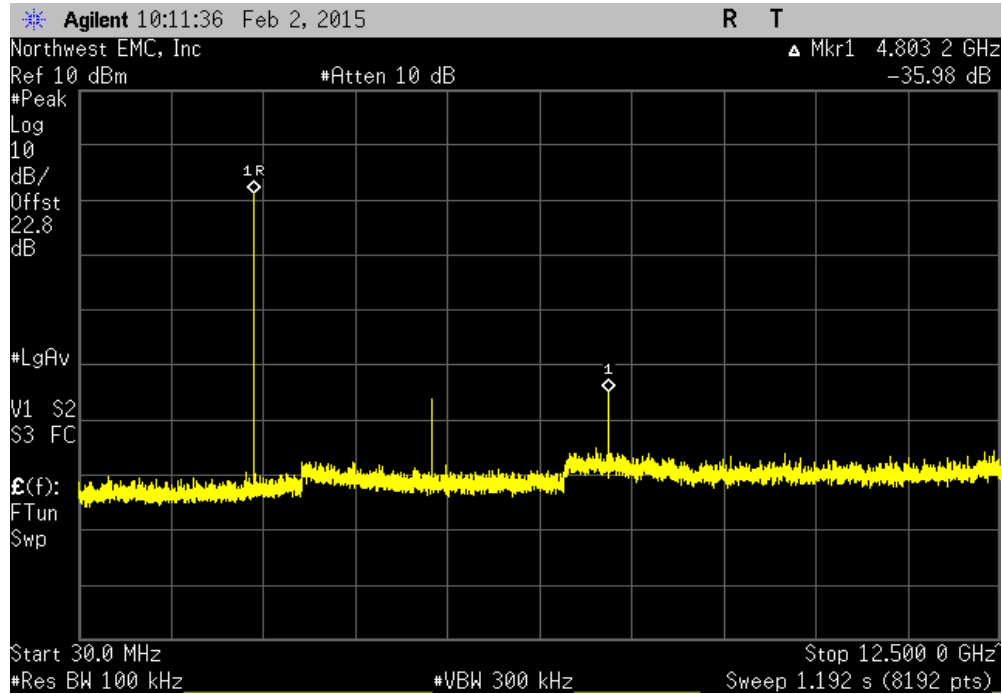
The spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting using the modulation listed in the datasheet in a no-hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.

SPURIOUS CONDUCTED EMISSIONS

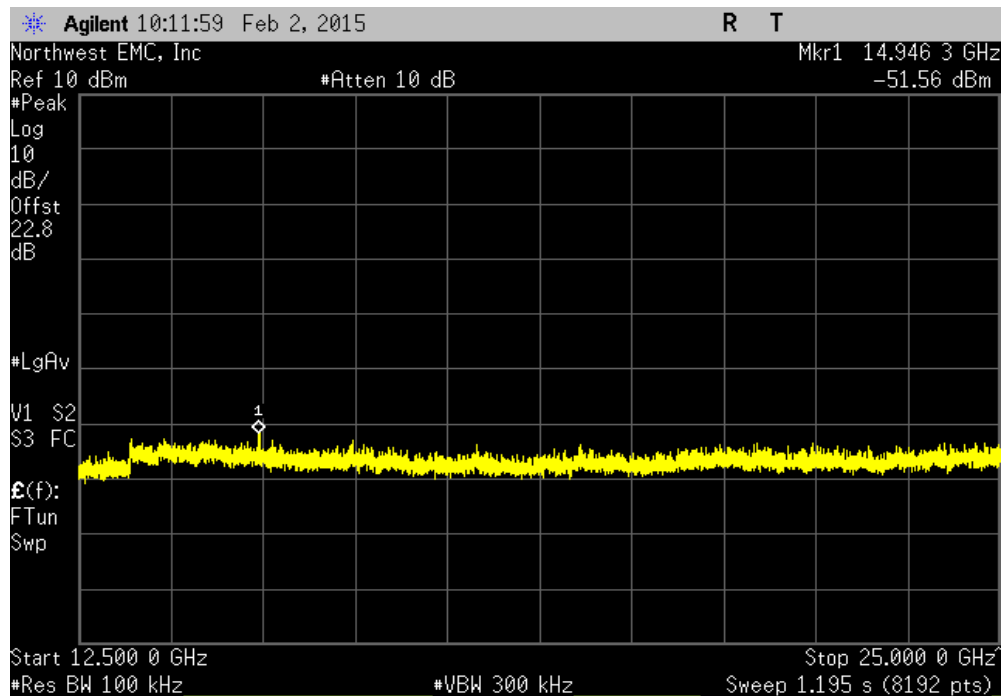
EUT: Medigenic K080/K081 Wireless Keyboard		Work Order: ESTE0018	
Serial Number: P00001		Date: 02/02/15	
Customer: Esterline (Advanced Input Devices)		Temperature: 23.2°C	
Attendees: Wayne Hash		Humidity: 42%	
Project: None		Barometric Pres.: 1015.2	
Tested by: Brandon Hobbs		Power: 3.3 VDC	
Job Site: EV06			
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
All cable losses were accounted for. The EUT was operating at 100% duty cycle. The EUT power level was set to 2 while under test.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Frequency Range	Value (dBc)
			Limit ≤ (dBc)
			Result
Hopping Mode, OFF			
GFSK			
	Low Channel, 2402 MHz	30 MHz - 12.5 GHz	-35.99
	Low Channel, 2402 MHz	12.5 GHz - 25 GHz	-42.82
	Mid Channel, 2441 MHz	30 MHz - 12.5 GHz	-36.06
	Mid Channel, 2441 MHz	12.5 GHz - 25 GHz	-43.88
	High Channel, 2480 MHz	30 MHz - 12.5 GHz	-34.74
	High Channel, 2480 MHz	12.5 GHz - 25 GHz	-43.42
			Pass
			Pass
			Pass
			Pass
			Pass
			Pass

SPURIOUS CONDUCTED EMISSIONS

Hopping Mode, OFF, DH5, GFSK, Low Channel, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-35.99	-20	Pass	

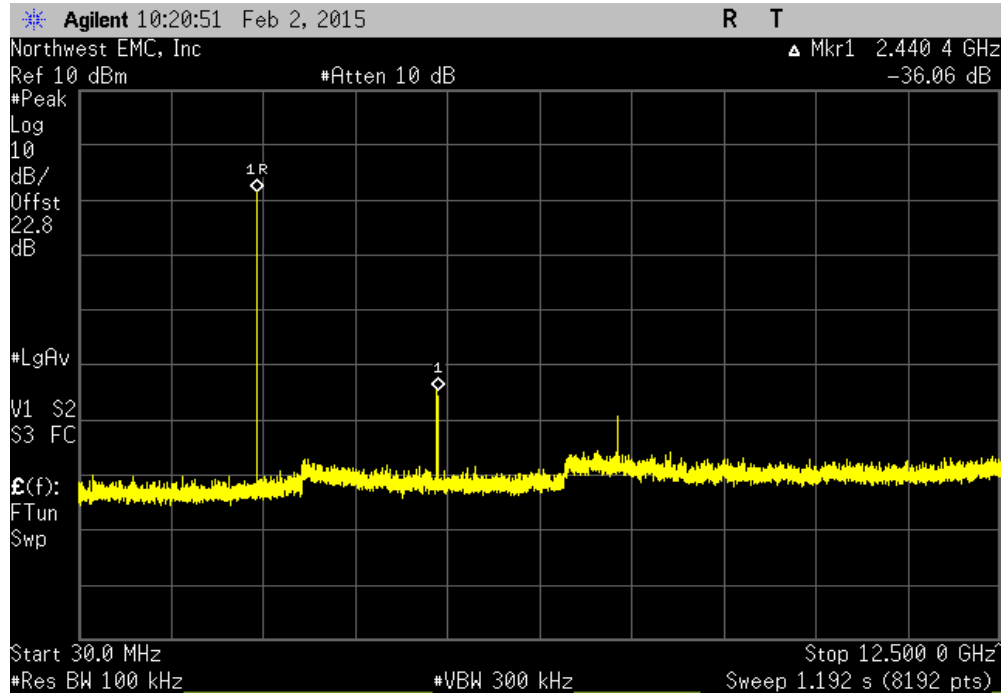


Hopping Mode, OFF, DH5, GFSK, Low Channel, 2402 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-42.82	-20	Pass	

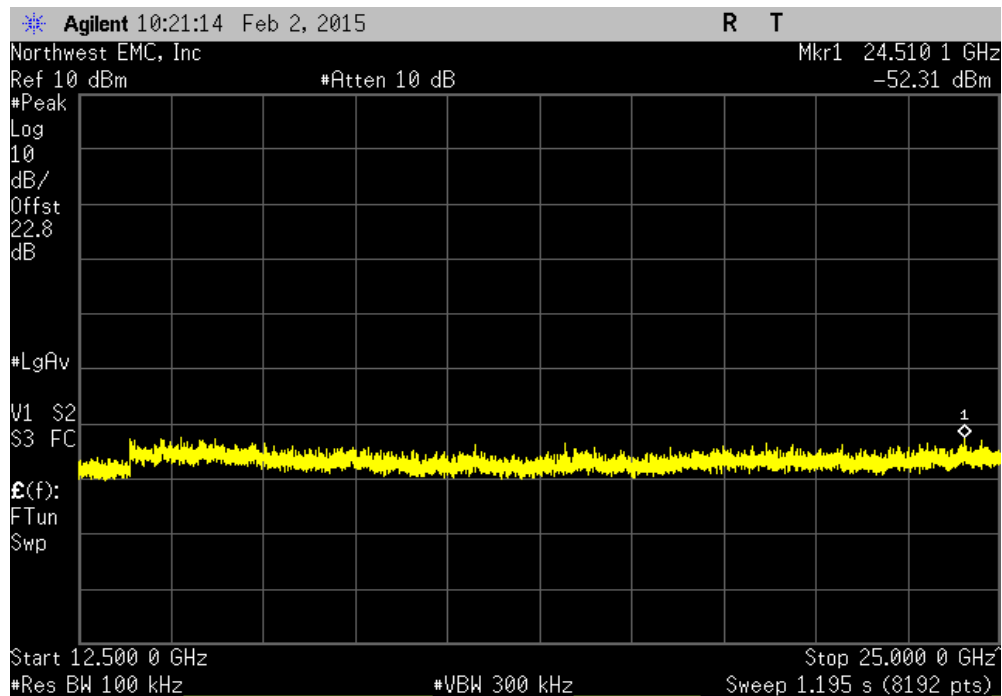


SPURIOUS CONDUCTED EMISSIONS

Hopping Mode, OFF, DH5, GFSK, Mid Channel, 2441 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-36.06	-20	Pass	

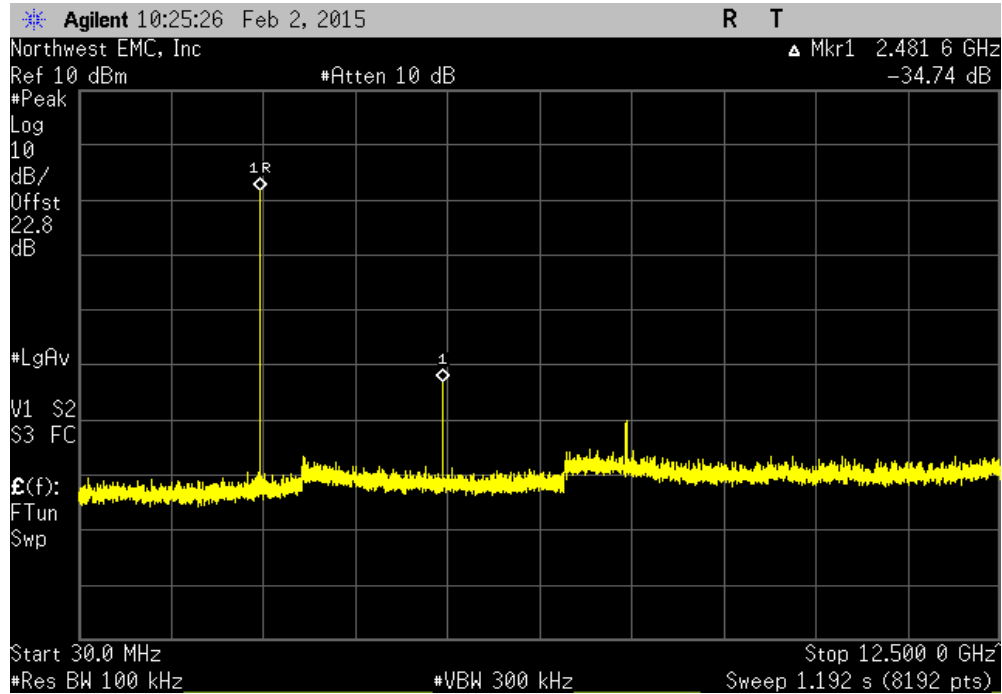


Hopping Mode, OFF, DH5, GFSK, Mid Channel, 2441 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-43.88	-20	Pass	

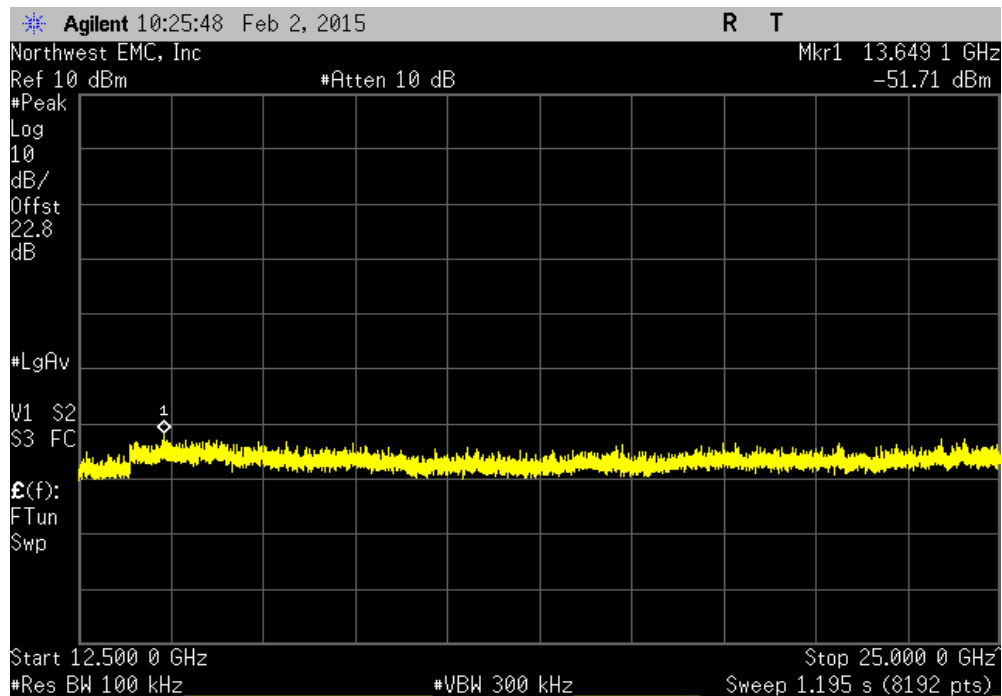


SPURIOUS CONDUCTED EMISSIONS

Hopping Mode, OFF, DH5, GFSK, High Channel, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
30 MHz - 12.5 GHz	-34.74	-20	Pass	



Hopping Mode, OFF, DH5, GFSK, High Channel, 2480 MHz				
Frequency Range	Value (dBc)	Limit ≤ (dBc)	Result	
12.5 GHz - 25 GHz	-43.42	-20	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 (mo)
Spectrum Analyzer	Keysight	N9010A	AFM	7/14/2014	24
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	1/7/2015	12
RF Vector Signal Generator (FOR REFERENCE ONLY)	Agilent	V2920A	TIH	NCR	0
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40 GHz DC Block	Fairview Microwave	SD3379	AMK	12/11/2014	12

TEST DESCRIPTION

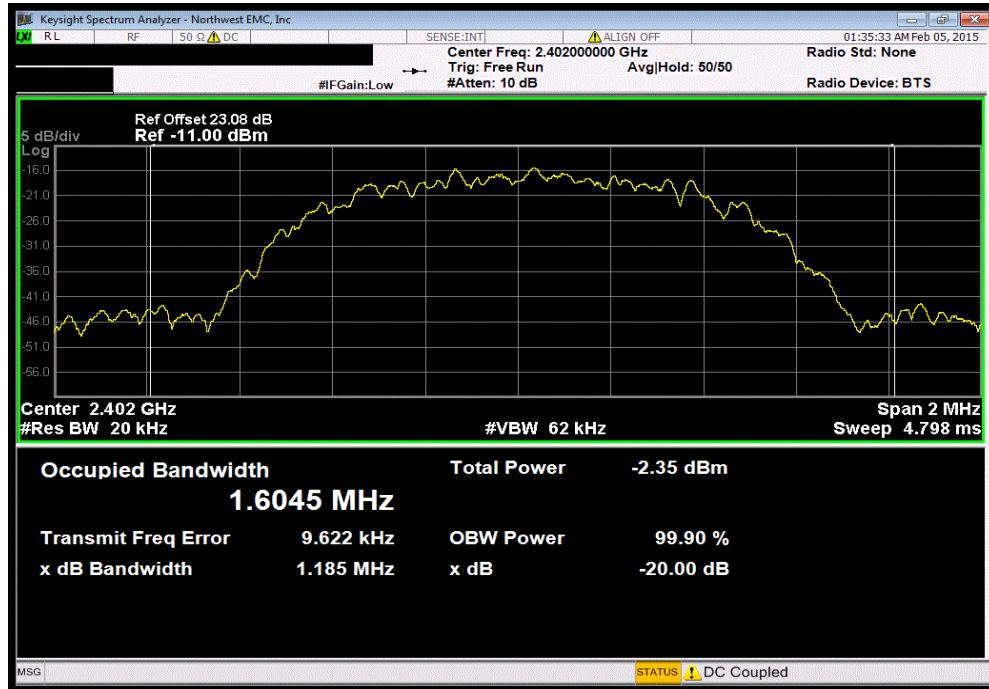
The occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting using the modulation listed in the datasheet in a no-hop mode.

OCCUPIED BANDWIDTH

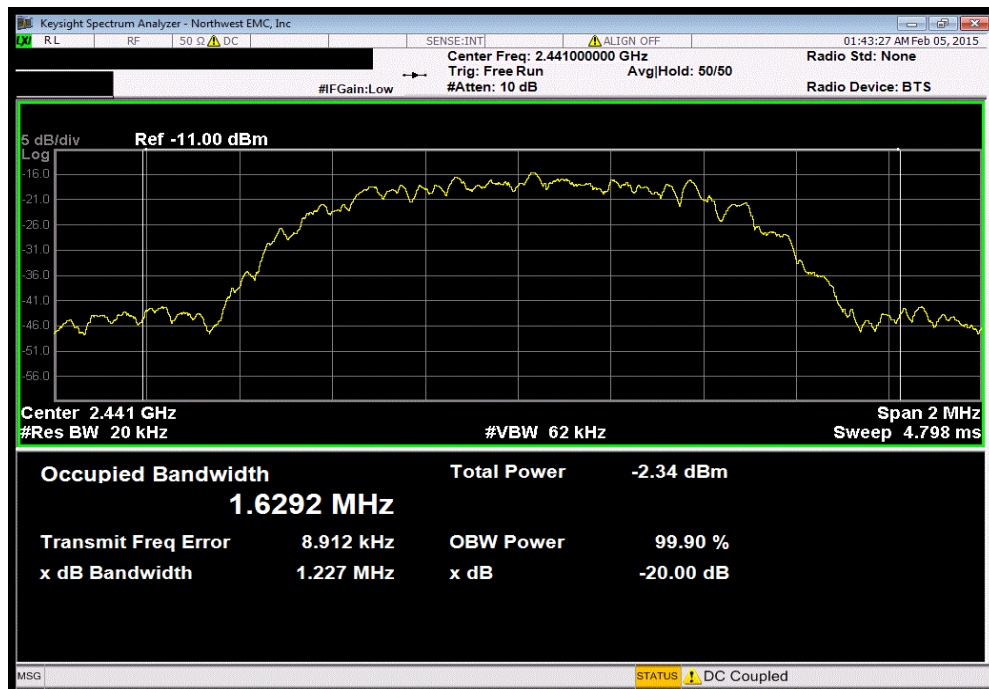
EUT: Medigenic K080/K081 Wireless Keyboard		Work Order: ESTE0018	
Serial Number: P00001		Date: 02/04/15	
Customer: Esterline (Advanced Input Devices)		Temperature: 23.2°C	
Attendees: Wayne Hash		Humidity: 42%	
Project: None		Barometric Pres.: 1015.2	
Tested by: Brandon Hobbs	Power: 3.3 VDC	Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2013	
COMMENTS			
All cable losses were accounted for. The EUT was operating at 100% duty cycle. The EUT power level was set to 2 while under test.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (>)
Hopping Mode, OFF			Result
GFSK			
Low Channel, 2402 MHz		1.185 MHz	500 kHz
Mid Channel, 2441 MHz		1.227 MHz	500 kHz
High Channel, 2480 MHz		1.202 MHz	500 kHz
			Pass
			Pass
			Pass

OCCUPIED BANDWIDTH

Hopping Mode, OFF, DH5, GFSK, Low Channel, 2402 MHz						
				Value	Limit (>)	Result
				1.185 MHz	500 kHz	Pass

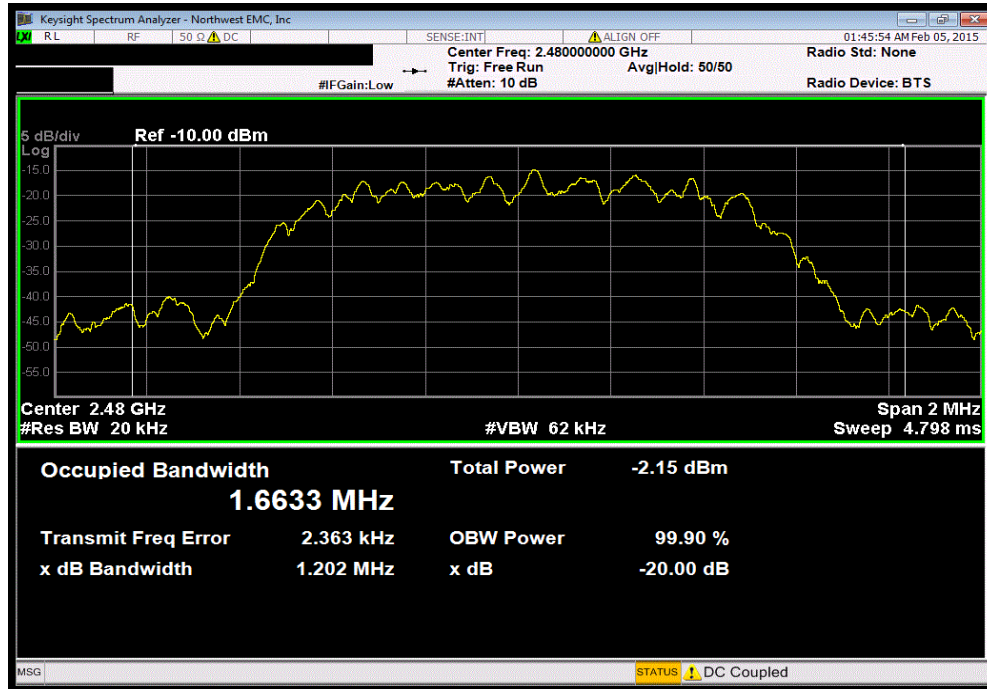


Hopping Mode, OFF, DH5, GFSK, Mid Channel, 2441 MHz						
				Value	Limit (>)	Result
				1.227 MHz	500 kHz	Pass



OCCUPIED BANDWIDTH

Hopping Mode, OFF, DH5, GFSK, High Channel, 2480 MHz						
Value				Limit	Result	
				(>)		
1.202 MHz				500 kHz	Pass	



OUTPUT POWER

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

TEST EQUIPMENT


Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	1/7/2015	12
RF Vector Signal Generator (FOR REFERENCE ONLY)	Agilent	V2920A	TIH	NCR	0
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
40 GHz DC Block	Fairview Microwave	SD3379	AMK	12/11/2014	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
Spectrum Analyzer	Keysight	N9010A	AFM	7/14/2014	24

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 the data rate(s) listed in the datasheet.

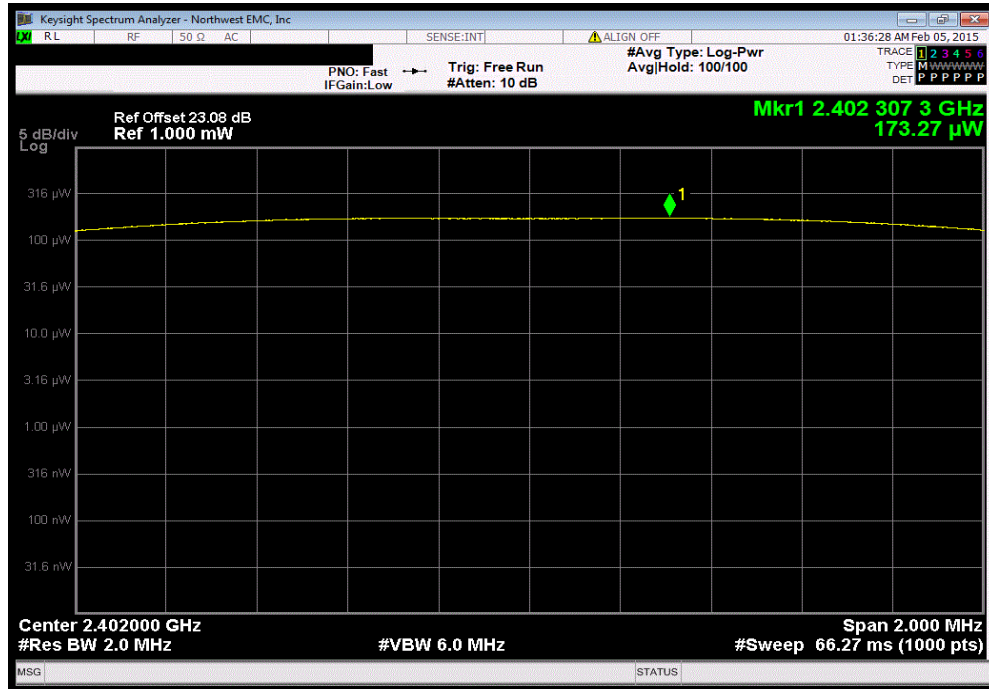
De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +27dBm.

OUTPUT POWER

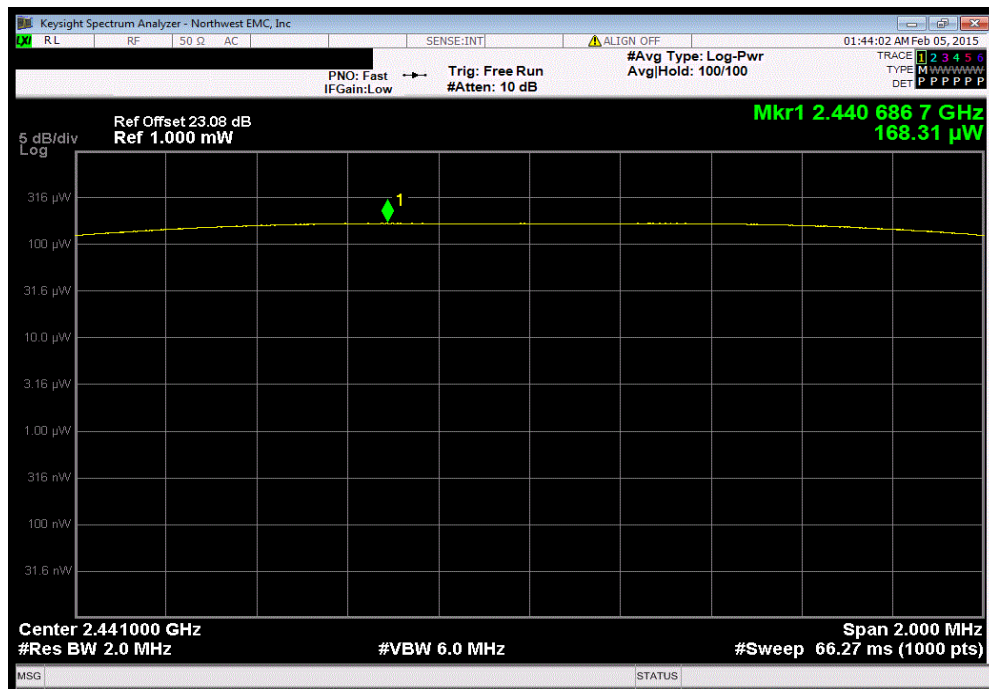
EUT: Medigenic K080/K081 Wireless Keyboard		Work Order: ESTE0018	
Serial Number: P00001		Date: 02/04/15	
Customer: Esterline (Advanced Input Devices)		Temperature: 23.2°C	
Attendees: Wayne Hash		Humidity: 42%	
Project: None		Barometric Pres.: 1015.2	
Tested by: Brandon Hobbs		Power: 3.3 VDC	Job Site: EV06
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2013	
COMMENTS			
All cable losses were accounted for. The EUT was operating at 100% duty cycle. The EUT power level was set to 2 while under test.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value	Limit (<) Result
Hopping Mode, OFF			
DH5, GFSK			
Low Channel, 2402 MHz		173.27 uW	125 mW Pass
Mid Channel, 2441 MHz		168.31 uW	125 mW Pass
High Channel, 2480 MHz		179.86 uW	125 mW Pass

OUTPUT POWER

Hopping Mode, OFF, DH5, GFSK, Low Channel, 2402 MHz						
				Value	Limit (<)	Result
				173.27 uW	125 mW	Pass

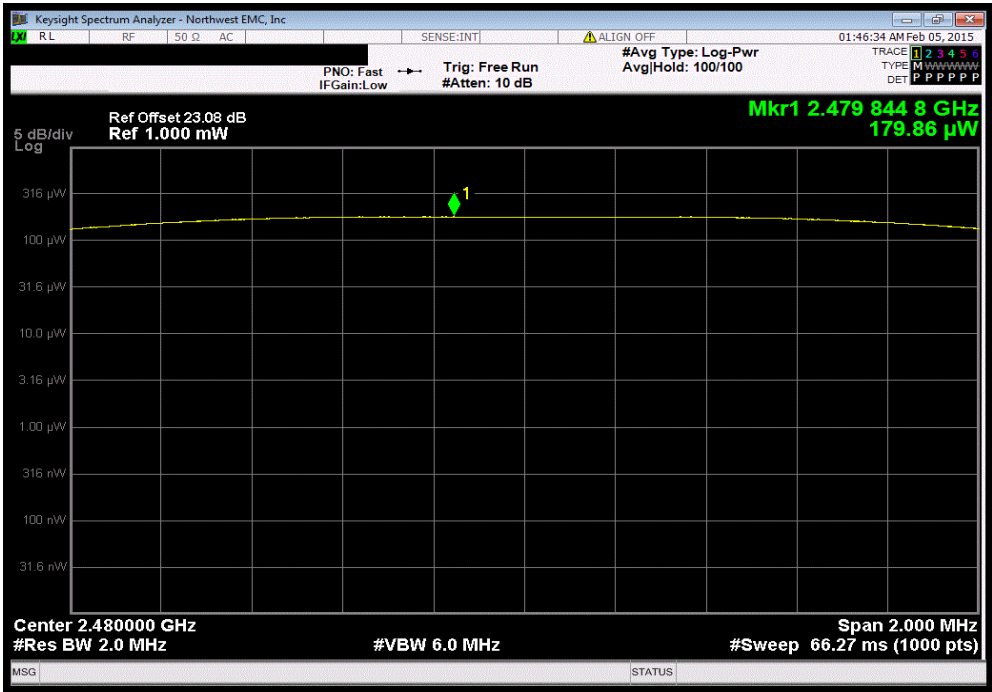


Hopping Mode, OFF, DH5, GFSK, Mid Channel, 2441 MHz						
				Value	Limit (<)	Result
				168.31 uW	125 mW	Pass



OUTPUT POWER

Hopping Mode, OFF, DH5, GFSK, High Channel, 2480 MHz						
Value				Limit	Result	
				(<)		
179.86 μ W				125 mW	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 (mo)
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	1/7/2015	12
RF Vector Signal Generator (FOR REFERENCE ONLY)	Agilent	V2920A	TIH	NCR	0
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40 GHz DC Block	Fairview Microwave	SD3379	AMK	12/11/2014	12
Spectrum Analyzer	Keysight	N9010A	AFM	7/14/2014	24

TEST DESCRIPTION

The maximum power spectral density measurements were measured with the EUT set to the required transmit frequencies in each band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at the lowest, middle, and maximum data rate for each modulation type available.

➤RBW = 100 kHz

➤VBW = 300 kHz


➤Detector = Peak (to match method used for power measurement)

➤Trace = Max hold

The observed power level is then scaled to an equivalent value in 3 kHz by adding a Bandwidth Correction Factor (BWCF) where:

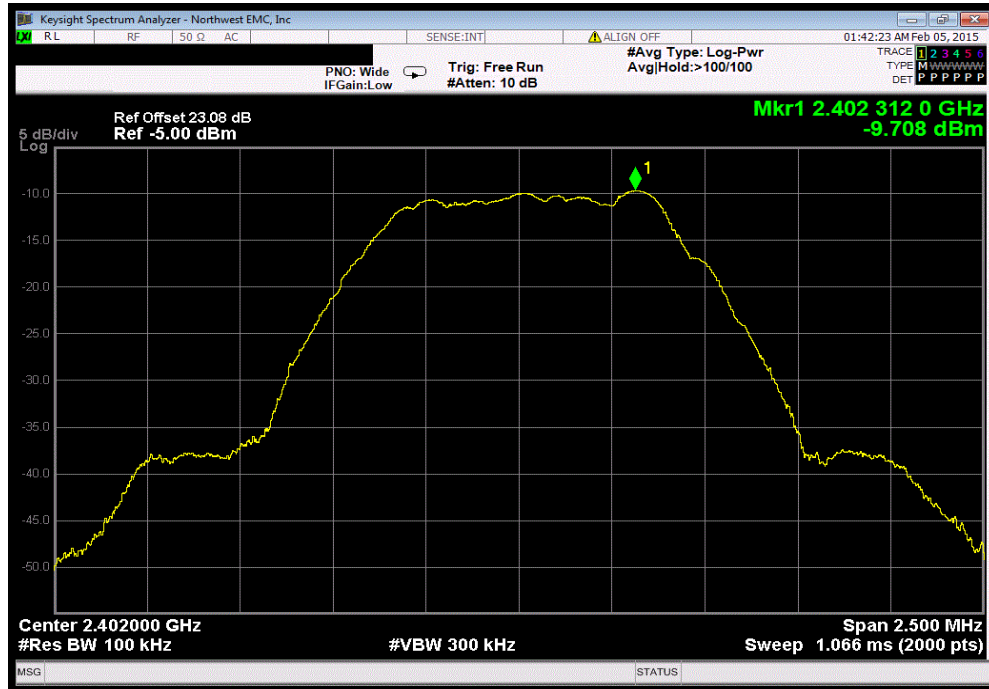
$$BWCF = 10 \cdot \log(3 \text{ kHz} / 100 \text{ kHz}) = -15.2 \text{ dB}$$

POWER SPECTRAL DENSITY

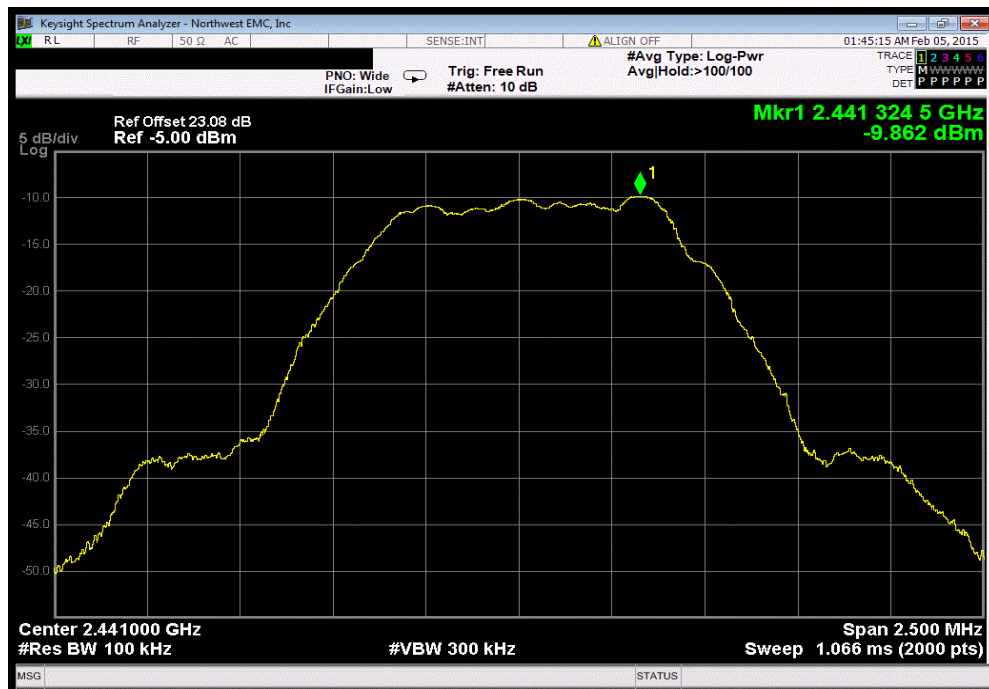
EUT: Medigenic K080/K081 Wireless Keyboard		Work Order: ESTE0018	
Serial Number: P00001		Date: 02/04/15	
Customer: Esterline (Advanced Input Devices)		Temperature: 23.2°C	
Attendees: Wayne Hash		Humidity: 42%	
Project: None		Barometric Pres.: 1015.2	
Tested by: Brandon Hobbs	Power: 3.3 VDC	Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2013	
COMMENTS			
All cable losses were accounted for. The EUT was operating at 100% duty cycle. The EUT power level was set to 2 while under test.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	1	Signature 	
		Value dBm/100kHz	dBm/100kHz To dBm/3kHz
		Value dBm/3kHz	Limit dBm/3kHz
			Results
Hopping Mode, OFF			
DH5, GFSK			
	Low Channel, 2402 MHz	-9.708	-15.2
	Mid Channel, 2441 MHz	-9.862	-15.2
	High Channel, 2480 MHz	-9.533	-15.2
		-24.908	8
		-25.062	8
		-24.733	8
			Pass
			Pass
			Pass

POWER SPECTRAL DENSITY

Hopping Mode, OFF, DH5, GFSK, Low Channel, 2402 MHz						
	Value	dBm/100kHz	Value	Limit	Results	
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
	-9.708	-15.2	-24.908	8	Pass	

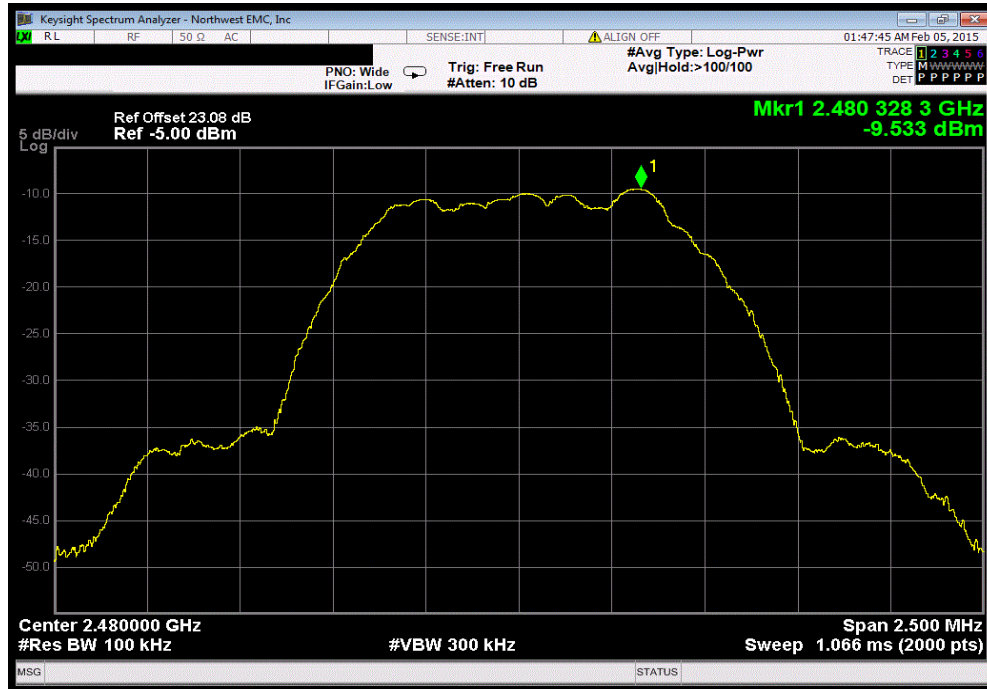


Hopping Mode, OFF, DH5, GFSK, Mid Channel, 2441 MHz						
	Value	dBm/100kHz	Value	Limit	Results	
	dBm/100kHz	To dBm/3kHz	dBm/3kHz	dBm/3kHz		
	-9.862	-15.2	-25.062	8	Pass	



POWER SPECTRAL DENSITY

Hopping Mode, OFF, DH5, GFSK, High Channel, 2480 MHz						
	Value	dBm/100kHz	Value	Limit	Results	
		dBm/100kHz	To dBm/3kHz	dBm/3kHz		
		-9.533	-15.2	-24.733	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 DESCRIPTION

The Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum. A direct connection was made between the RF output of the EUT and a spectrum analyzer. Attenuation and a DC block were used

The test software provided for operation in a fixed, single channel mode allows the EUT to operate continuously at 100% Duty Cycle.

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 (mo)
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
RF Vector Signal Generator (FOR REFERENCE ONLY)	Agilent	V2920A	TIH	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	1/7/2015	12
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40 GHz DC Block	Fairview Microwave	SD3379	AMK	12/11/2014	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	24

TEST DESCRIPTION

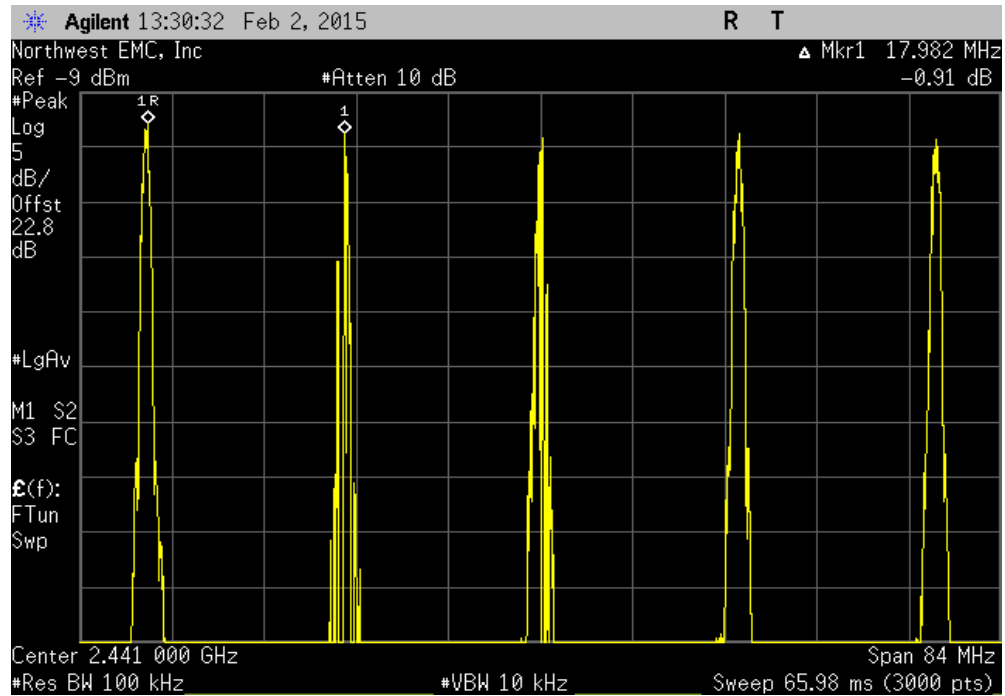
The channel carrier frequencies in the 2400-2483.5MHz band must be separated by 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Or, if the output power is less than 125 mW, the channel separation can be 25 kHz or 2/3 of the 20dB bandwidth. The EUT was operated in pseudorandom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

CHANNEL SPACING

EUT: Medigenic K080/K081 Wireless Keyboard		Work Order: ESTE0018	
Serial Number: 00007		Date: 02/02/15	
Customer: Esterline (Advanced Input Devices)		Temperature: 23.2°C	
Attendees: Wayne Hash		Humidity: 42%	
Project: None		Barometric Pres.: 1015.2	
Tested by: Brandon Hobbs		Power: 3.3 VDC	Job Site: EV06
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
All cable losses were accounted for. The EUT was operating on 5 channels while under test. The EUT power level was set to 2 will under test.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Value	Limit (≥) Results
Hopping Mode, ON			
GFSK			
Mid Channel, 2441 MHz		18.0 MHz	1 MHz Pass

CHANNEL SPACING

Hopping Mode, ON, DH5, GFSK, Mid Channel, 2441 MHz						
				Value	Limit (≥)	Results
				18.0 MHz	1 MHz	Pass



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 (mo)
40 GHz DC Block	Fairview Microwave	SD3379	AMK	12/11/2014	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	1/7/2015	12
RF Vector Signal Generator (FOR REFERENCE ONLY)	Agilent	V2920A	TIH	NCR	0
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	24

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.

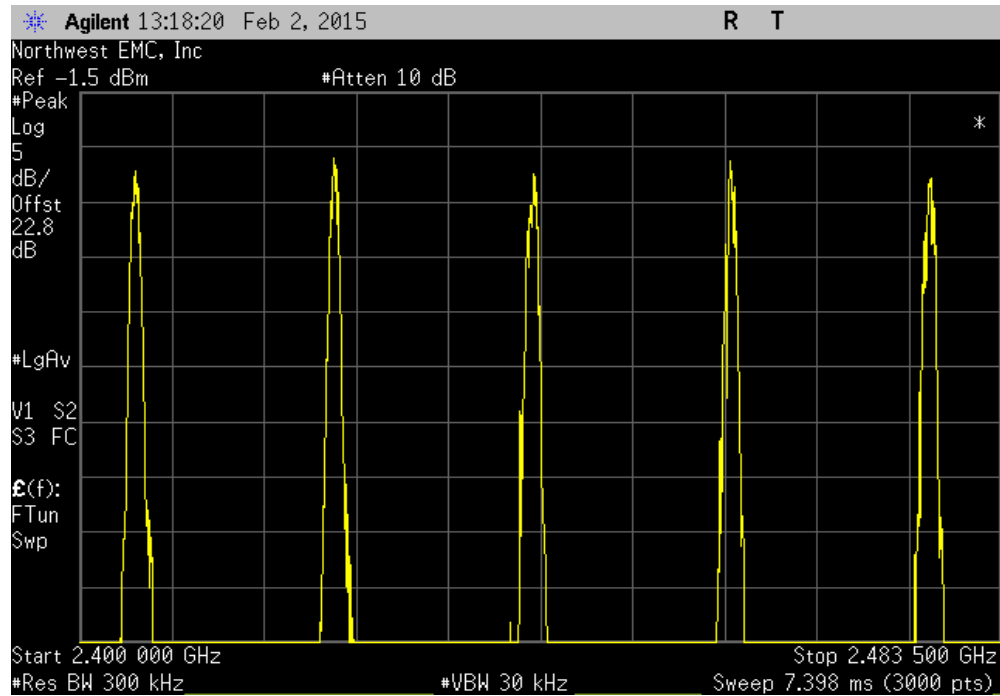
For Hybrid systems there is no minimum or maximum number of channels specified. The number of channels is measured to characterize the system and for dwell time calculations contained elsewhere in the report.

NUMBER OF HOPPING FREQUENCIES

EUT: Medigenic K080/K081 Wireless Keyboard		Work Order: ESTE0018	
Serial Number: 00007		Date: 02/02/15	
Customer: Esterline (Advanced Input Devices)		Temperature: 23.2°C	
Attendees: Wayne Hash		Humidity: 42%	
Project: None		Barometric Pres.: 1015.2	
Tested by: Brandon Hobbs	Power: 3.3 VDC	Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
All cable losses were accounted for. The EUT was operating while in hopping mode. The EUT power level was set to 2 while under test.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Number of Channels	Limit
Hopping Mode, ON			Results
GFSK		5	N/A
Mid Channel, 2441 MHz			N/A

NUMBER OF HOPPING FREQUENCIES

Hopping Mode, ON, DH5, GFSK, Mid Channel, 2441 MHz						
				Number of Channels	Limit	Results
				5	N/A	N/A



DWELL TIME

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	1/7/2015	12
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
RF Vector Signal Generator (FOR REFERENCE ONLY)	Agilent	V2920A	TIH	NCR	0
Power Meter	Gigatronics	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronics	80701A	SPL	5/28/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
40 GHz DC Block	Fairview Microwave	SD3379	AMK	12/11/2014	12
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	24

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.


The dwell time limit is based on the Number of Hopping Channels * 400 mS. This would be 5 Channels * 400mS = 2 Sec.

On Time During 2 Sec = Pulse Width * Average Number of Pulses * Scale Factor

➤Average Number of Pulses is based on 4 samples.

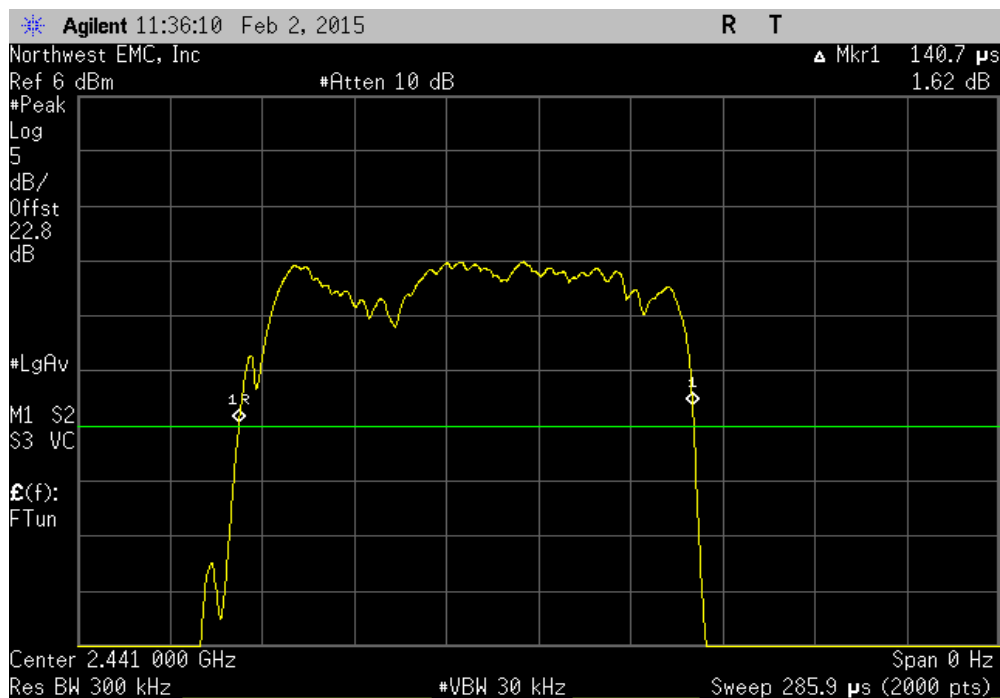
➤Scale Factor = 2 Sec / Screen Capture Sweep Time = 2 Sec / .4 Sec = 5

DWELL TIME

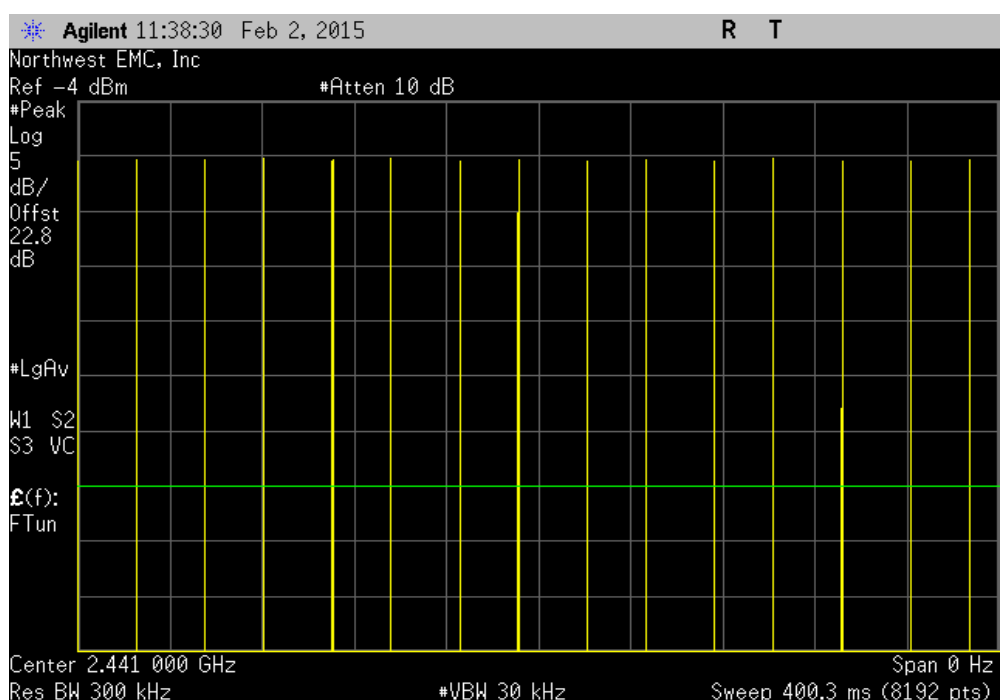
EUT: Medigenic K080/K081 Wireless Keyboard		Work Order: ESTE0018	
Serial Number: 00007		Date: 02/02/15	
Customer: Esterline (Advanced Input Devices)		Temperature: 23.2°C	
Attendees: Wayne Hash		Humidity: 42%	
Project: None		Barometric Pres.: 1015.2	
Tested by: Brandon Hobbs	Power: 3.3 VDC	Job Site: EV06	
TEST SPECIFICATIONS			
FCC 15.247:2015		Test Method	
		ANSI C63.10:2009	
COMMENTS			
All cable losses were accounted for. The EUT was operating on 5 channels while under test. The EUT power level was set to 2 while under test.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	2	Signature 	
		Pulse Width (ms)	Number of Pulses
		Average No. of Pulses	Scale Factor
		On Time (ms) During 2 s	Limit (ms)
			Results
Hopping Mode, ON			
GFSK			
	Mid Channel, 2441 MHz	0.141	N/A
	Mid Channel, 2441 MHz	N/A	17
	Mid Channel, 2441 MHz	N/A	14
	Mid Channel, 2441 MHz	N/A	16
	Mid Channel, 2441 MHz	N/A	15
	Mid Channel, 2441 MHz	0.141	N/A
			15.5
			5
			10.9
			400
			Pass

DWELL TIME

Hopping Mode, ON, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 2 s	Limit (ms)	Results
0.141	N/A	N/A	N/A	N/A	N/A	N/A

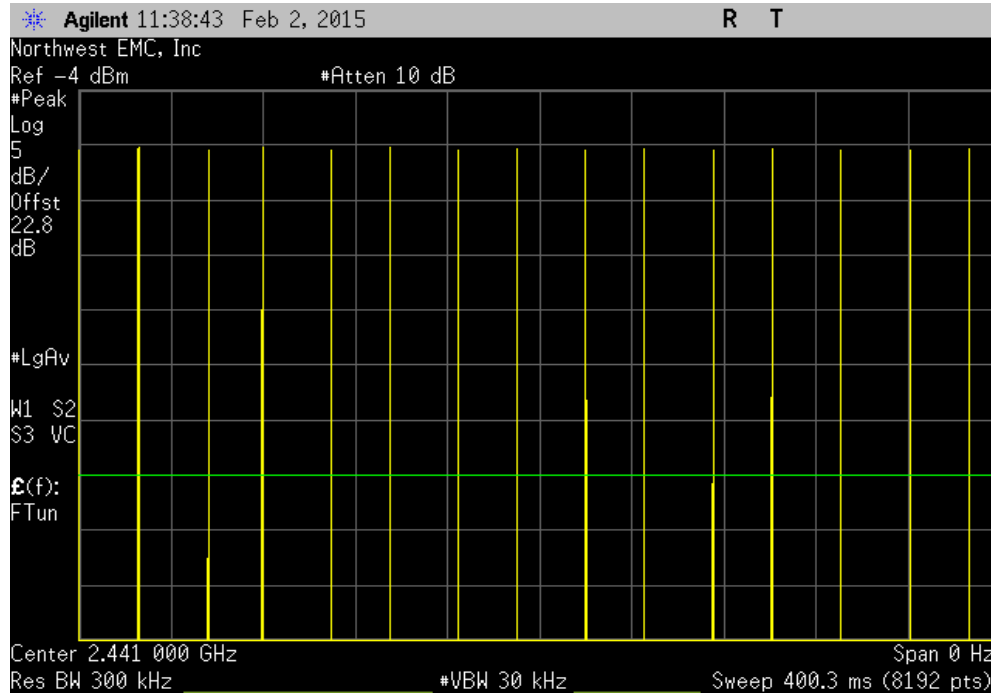


Hopping Mode, ON, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 2 s	Limit (ms)	Results
N/A	17	N/A	N/A	N/A	N/A	N/A

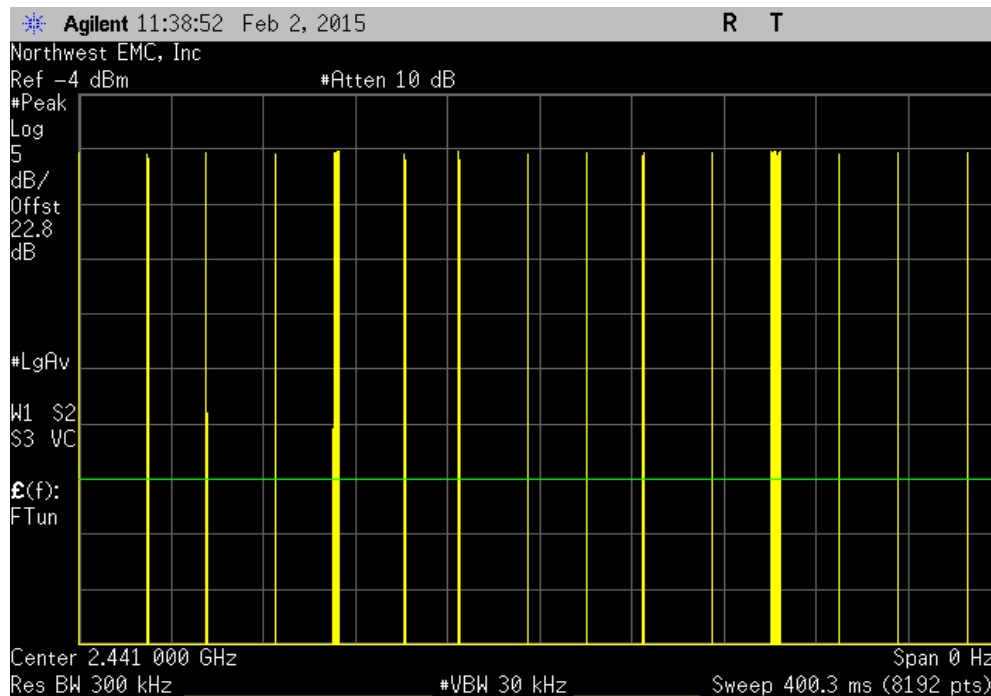


DWELL TIME

Hopping Mode, ON, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 2 s	Limit (ms)	Results
N/A	14	N/A	N/A	N/A	N/A	N/A

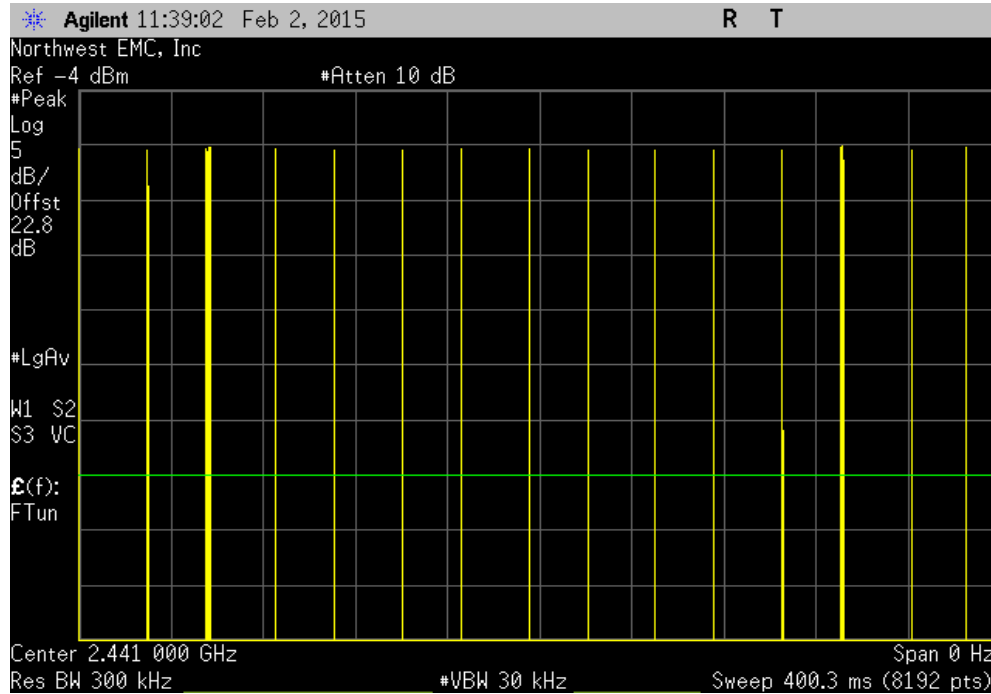


Hopping Mode, ON, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 2 s	Limit (ms)	Results
N/A	16	N/A	N/A	N/A	N/A	N/A



DWELL TIME

Hopping Mode, ON, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 2 s	Limit (ms)	Results
N/A	15	N/A	N/A	N/A	N/A	N/A



Hopping Mode, ON, DH5, GFSK, Mid Channel, 2441 MHz						
Pulse Width (ms)	Number of Pulses	Average No. of Pulses	Scale Factor	On Time (ms) During 2 s	Limit (ms)	Results
0.141	N/A	15.5	5	10.93	400	Pass

Calculation Only

No Screen Capture Required

BAND EDGE COMPLIANCE

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

TEST EQUIPMENT


Description	Manufacturer	Model	ID	Last Cal.	Interval (mo)
DC Power Supply	Topward	TPS-2000	TPD	NCR	0
Multimeter	Tektronix	DMM912	MMH	2/5/2013	36
RF Vector Signal Generator (FOR REFERENCE ONLY)	Agilent	V2920A	TIH	NCR	0
Attenuator, 6dB	S.M. Electronics	18N-06	AWN	1/7/2015	12
Power Meter	Gigatronix	8651A	SPM	9/17/2014	12
Power Sensor	Gigatronix	80701A	SPL	5/28/2014	12
EV06 Direct Connect Cable	ESM Cable Corp.	TT	ECA	NCR	0
Attenuator 20 dB, SMA M/F 26GHz	S.M. Electronics	SA26B-20	AUY	7/30/2014	12
40 GHz DC Block	Fairview Microwave	SD3379	AMK	12/11/2014	12
Spectrum Analyzer	Agilent	E4440A	AFD	7/14/2014	24

TEST DESCRIPTION

The spurious RF conducted emissions at the edges of the authorized band were 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 EUT was transmitting using the modulation listed in the datasheet in both hopping and non hopping modes. The channels closest to the band edges were selected.

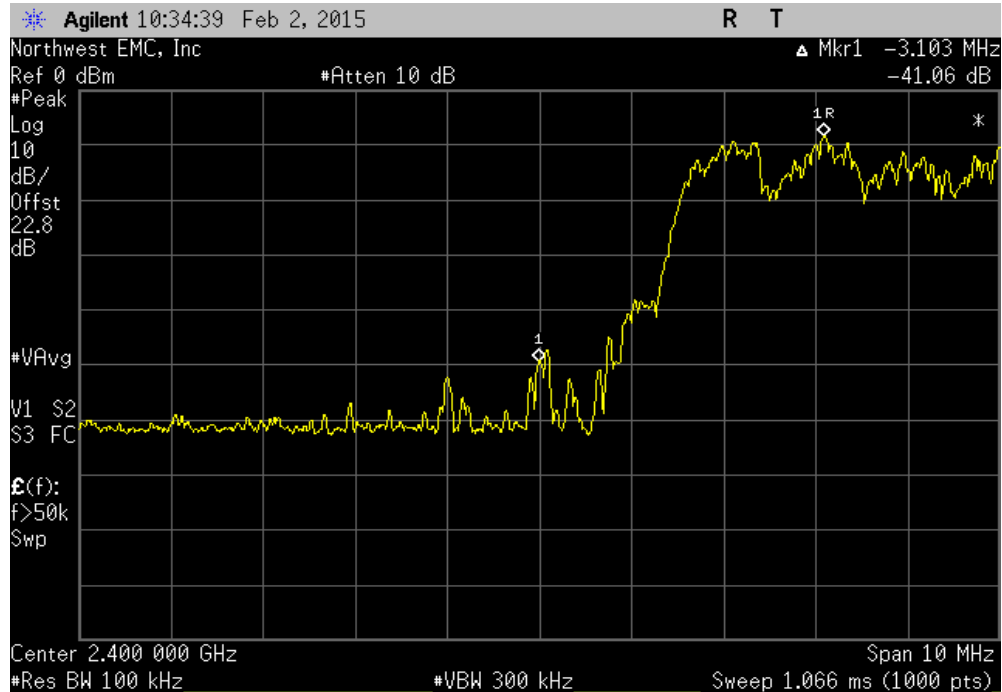
The spectrum was scanned below the lower band edge and above the higher band edge.

BAND EDGE COMPLIANCE

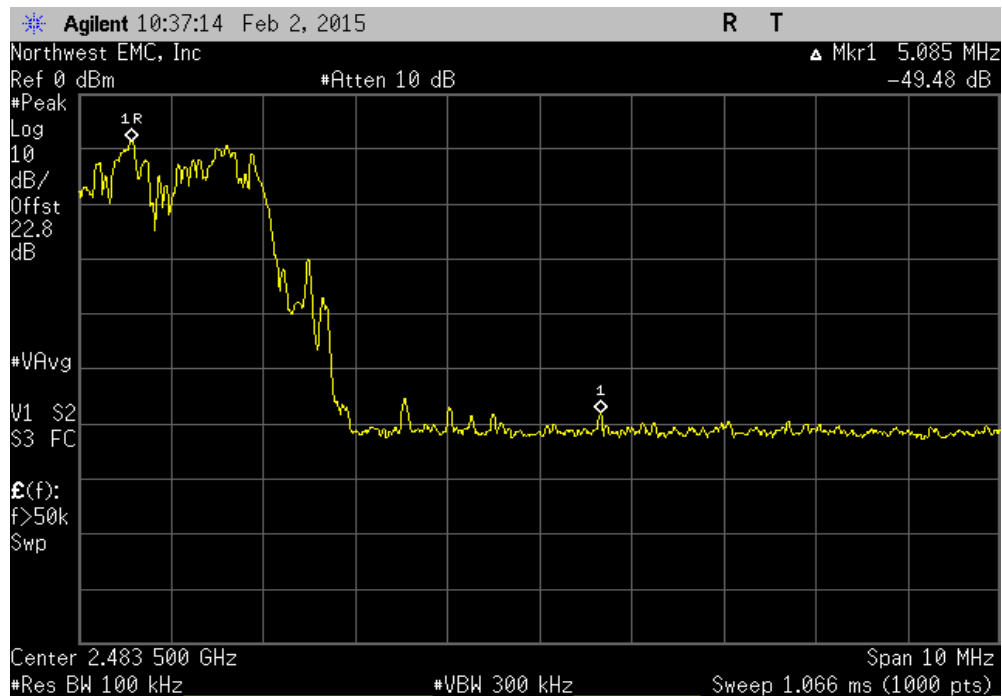
EUT: Medigenic K080/K081 Wireless Keyboard		Work Order: ESTE0018	
Serial Number: 00007, P00001		Date: 02/02/15	
Customer: Esterline (Advanced Input Devices)		Temperature: 23.2°C	
Attendees: Wayne Hash		Humidity: 42%	
Project: None		Barometric Pres.: 1015.2	
Tested by: Brandon Hobbs	Power: 3.3 VDC	Job Site: EV06	
TEST SPECIFICATIONS		Test Method	
FCC 15.247:2015		ANSI C63.10:2009	
COMMENTS			
All cable losses were accounted for. The EUT was operating at 100% duty cycle. Power level was set to 2 while under test.			
DEVIATIONS FROM TEST STANDARD			
None			
Configuration #	5	Signature 	
		Value (dBc)	Limit ≤ (dBc) Result
Hopping Mode, ON			
GFSK			
Low Channel, 2402 MHz		-41.06	-20 Pass
High Channel, 2480 MHz		-49.48	-20 Pass
Hopping Mode, OFF			
GFSK			
Low Channel, 2402 MHz		-49.82	-20 Pass
High Channel, 2480 MHz		-51.62	-20 Pass

BAND EDGE COMPLIANCE

Hopping Mode, ON, DH5, GFSK, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-41.06	-20	Pass

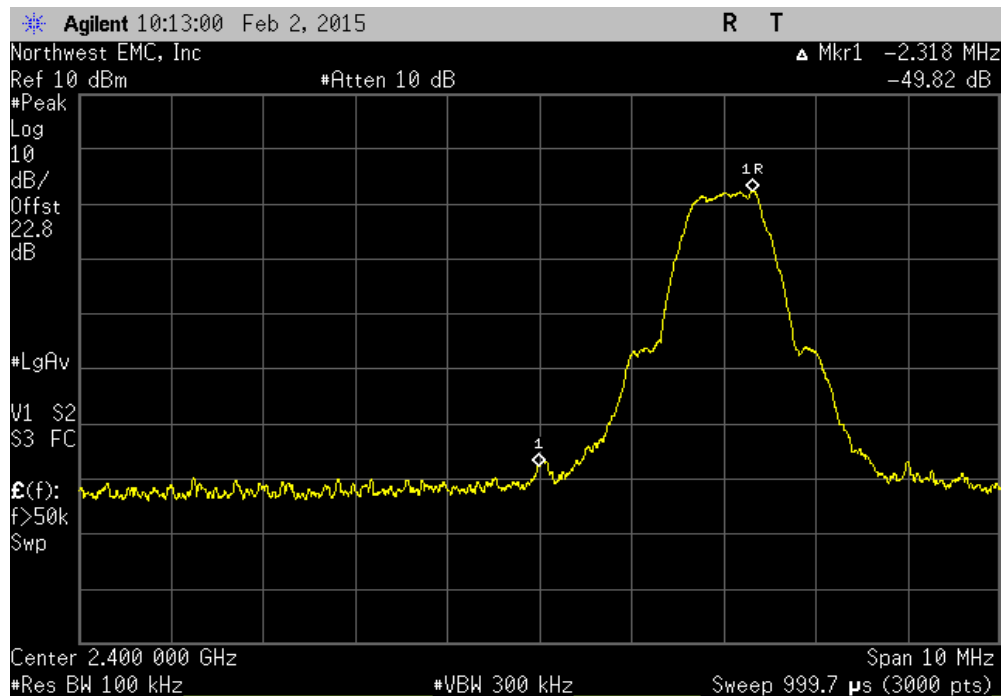


Hopping Mode, ON, DH5, GFSK, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-49.48	-20	Pass



BAND EDGE COMPLIANCE

Hopping Mode, OFF, DH5, GFSK, Low Channel, 2402 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-49.82	-20	Pass



Hopping Mode, OFF, DH5, GFSK, High Channel, 2480 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-51.62	-20	Pass

