QiG Group

IPG, Models 2408 and 2412

FCC 95I:2013

Report #: QIGG0006

Report Prepared By Northwest EMC Inc.

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

California – Minnesota – Oregon – New York – Washington

CERTIFICATE OF TEST

WTD 12.5.23

Last Date of Test: October 8, 2013
QiG Group
Model: IPG Model 2408 and Model 2412

Emissions

Test Description	Specification	Test Method	Pass/Fail
Radiated Power (EIRP)	FCC 95I:2013, FCC 2.1046:2013	ANSI/TIA/EIA-603-C:2004	Pass
Spurious Radiated Emissions	FCC 95I:2013, FCC 2.1053:2013	ANSI/TIA/EIA-603-C:2004	Pass
Receiver Spurious Emissions	FCC 15.109:2013	ANSI C63.4:2009	Pass
Emission Bandwidth	FCC 95I:2013, FCC 2.1049:2013	ANSI/TIA/EIA-603-C:2004	Pass
Emission Mask	FCC 95I:2013, FCC 2.1049:2013	ANSI/TIA/EIA-603-C:2004	Pass
Frequency Stability	FCC 95I:2013, FCC 2.1055:2013	ANSI/TIA/EIA-603-C:2004	Pass

Deviations From Test Standards

None

Approved By:

Tim O'Shea, Lab Manager

NVLAP Lab Code: 200881-0

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

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

REVISION HISTORY

REV 2012.08.02

Revision Number	Description	Date	Page Number
00	None		

Barometric Pressure

The recorded barometric pressure has been normalized to sea level.

REV 2012.05.24

ACCREDITATIONS AND AUTHORIZATIONS

United States

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

A2LA - Accredited by A2LA to ISO / IEC Guide 65 as a product certifier. This allows Northwest EMC to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

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

European Union

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

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Hong Kong

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

Vietnam

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

Russia

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

SCOPE

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

MEASUREMENT UNCERTAINTY

Measurement Uncertainty

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

A measurement uncertainty estimation has been performed for each test per our internal quality document WP 342. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) for each test is listed below. Our measurement data meets or exceeds the measurement uncertainty requirements of the applicable specification; therefore, the test data can be compared directly to the specification limit to determine compliance. The calculations for estimating measurement uncertainty are based upon ETSI TR 100 028 (or CISPR 16-4-1 as applicable), and are available upon request.

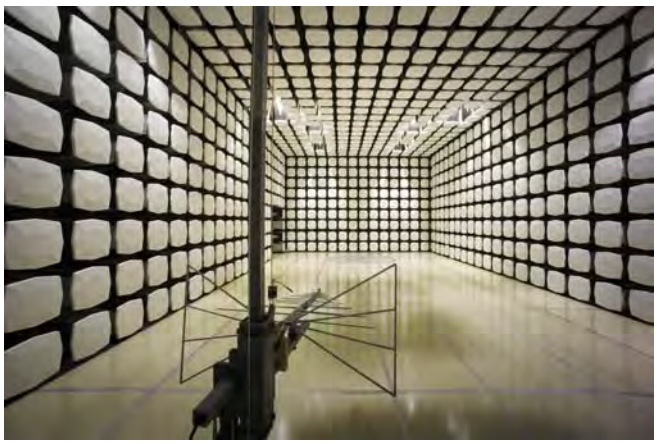
The following table represents the Measurement Uncertainty (MU) budgets for each of the tests that may be contained in this report.

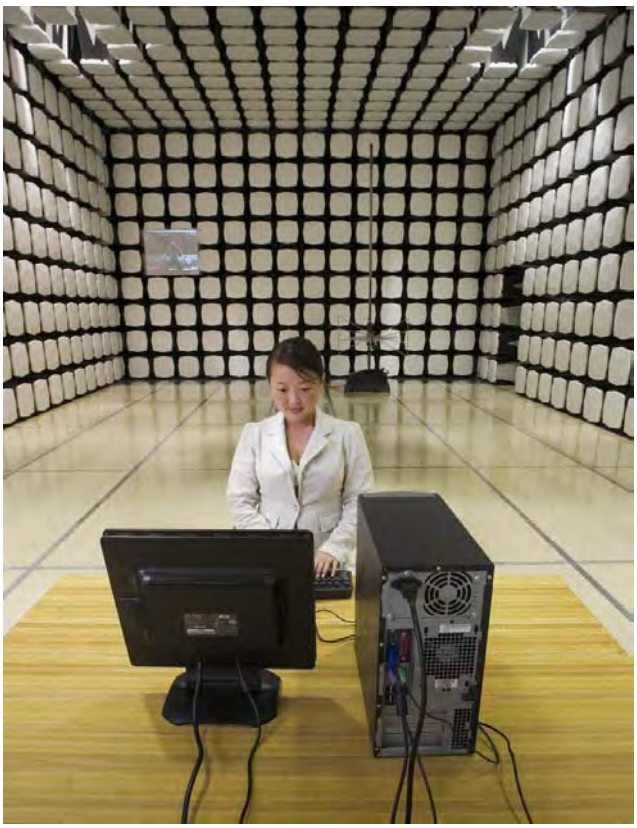
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.12	-0.01
Amplitude Accuracy (dB)	0.49	-0.49
Conducted Power (dB)	0.41	-0.41
Radiated Power via Substitution (dB)	0.69	-0.68
Temperature (degrees C)	0.81	-0.81
Humidity (% RH)	2.89	-2.89
Field Strength (dB)	3.80	-3.80
AC Powerline Conducted Emissions (dB)	2.94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

FACILITIES

REV 2013.06.28

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





PRODUCT DESCRIPTION

WTD 12.5.23

IPG Client and Equipment Under Test (EUT) Information

Company Name:	QiG Group
Address:	10675 Naples Street NE
City, State, Zip:	Blaine, MN 55449
Test Requested By:	Lisa Jorgenson
Model:	IPG Model 2408 and Model 2412
First Date of Test:	September 25, 2013
Last Date of Test:	October 8, 2013
Receipt Date of Samples:	September 25, 2013
Equipment Design Stage:	Production
Equipment Condition:	No Damage

Information Provided by the Party Requesting the Test

Functional Description of the EUT (Equipment Under Test):

The equipment under test is an Implantable Pulse Generator (IPG) with a MICS transceiver and a 2.4 GHz wake up receiver. The Model 2408 is a 3 lead system and Model 2412 is a 2 lead system.

Testing Objective:

To demonstrate compliance of the MICS transceiver for FCC Authorization to FCC Part 95.

CONFIGURATIONS

Configuration QIGG0006- 1

Software/Firmware Running during test	
Description	**Version**
Firmware	R1.00.0004

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
IPG	QiG Group	2412	254977805

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
12 Polar Lead x2	No	90cm	No	IPG	Tissue Simulant
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Configuration QIGG0006- 2

Software/Firmware Running during test	
Description	**Version**
Firmware	R1.00.0004

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
IPG	QiG Group	2408	254979304

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
8 Polar Lead x3	No	90cm	No	IPG	Tissue Simulant
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

MODIFICATIONS

WTD 12.5.23

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	9/25/2013	Radiated Power (EIRP)	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	10/3/2013	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.
3	10/4/2013	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.
4	10/8/2013	Emission 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.
5	10/8/2013	Emission Mask	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	10/8/2013	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

Radiated Power (EIRP)

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

MODES OF OPERATION

Transmitting CW at Low, Mid, High channel: 402.15, 403.35, 404.85 MHz (see comments)

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

QIGG0006 - 1

QIGG0006 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	402 MHz	Stop Frequency	405 MHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Pre-Amplifier	Miteq	AM-1616-1000	PAD	5/20/2013	12 mo
Antenna, Bilog	Teseq	CBL 6141B	AYD	12/17/2012	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	5/20/2013	12 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2013	24 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

Per 95.627(g)(3), the maximum radiated field strength for a MICS transmitter is 25uW EIRP. The Field Strength of the Fundamental data was converted to EIRP with the formula based upon the Friis transmission equation with 6 dB removed due to reflections from the ground plane: EIRP = ((E/2)*d)^2/30 where E is V/m and d = distance = 3m, and EIRP = W.

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

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

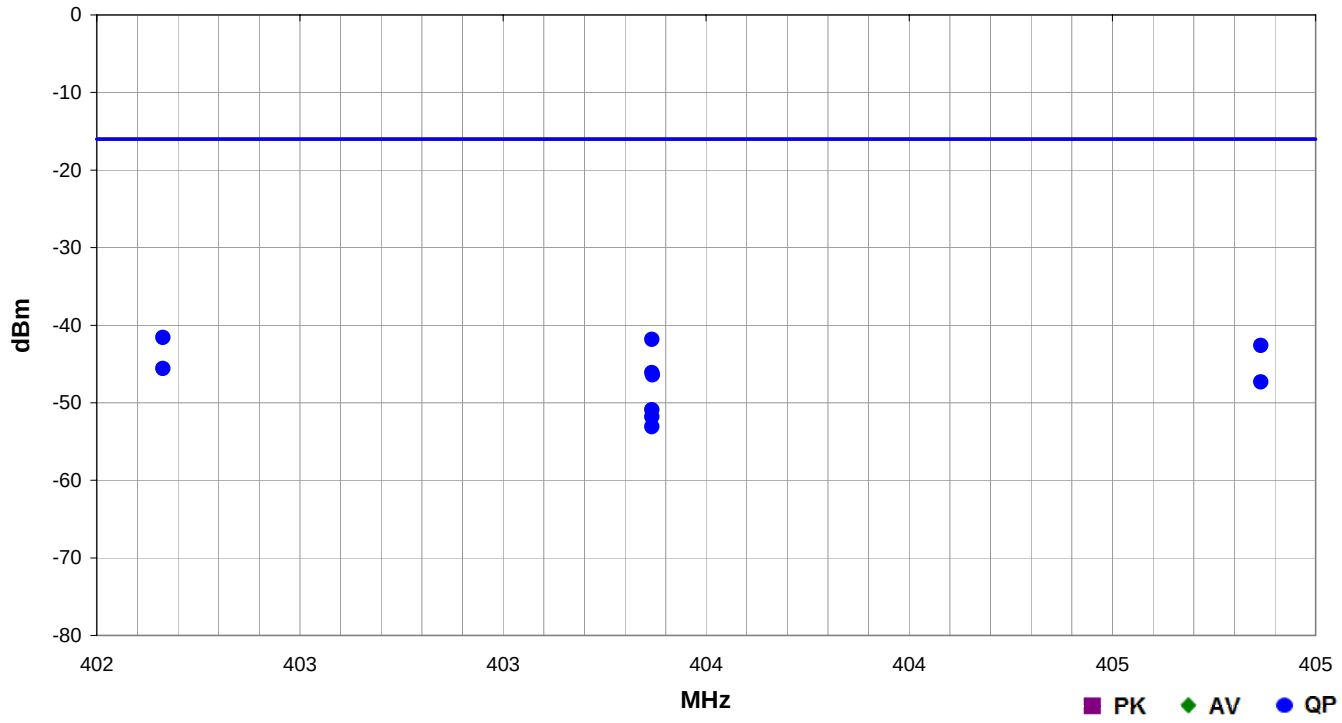
The EUT was configured to transmit in a fixture that simulates the human torso. The dimensions of the test fixture and the characteristics of the tissue substitute material met the requirements 95.627(i) and FCC KDB 617965. The height of the transmitter was 1.5-meter above the reference ground plane.

Radiated Power (EIRP)

Work Order:	QIGG0006	**Date:**	09/25/13	Trevor Buls	
Project:	None	**Temperature:**	22.8 °C		
Job Site:	MN04	**Humidity:**	48.5% RH		
Serial Number:	254977805	**Barometric Pres.:**	1014.8 mbar	**Tested by:**	Trevor Buls
EUT:	IPG				
Configuration:	1				
Customer:	QiG Group				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Transmitting CW at Low, Mid, High channel: 402.15, 403.35, 404.85 MHz (see comments)				
Deviations:	None				
Comments:	QiG Group test plan section: V.1.7.				

Test Specifications	**Test Method**
FCC 95I:2013	ANSI/TIA/EIA-603-C:2004

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



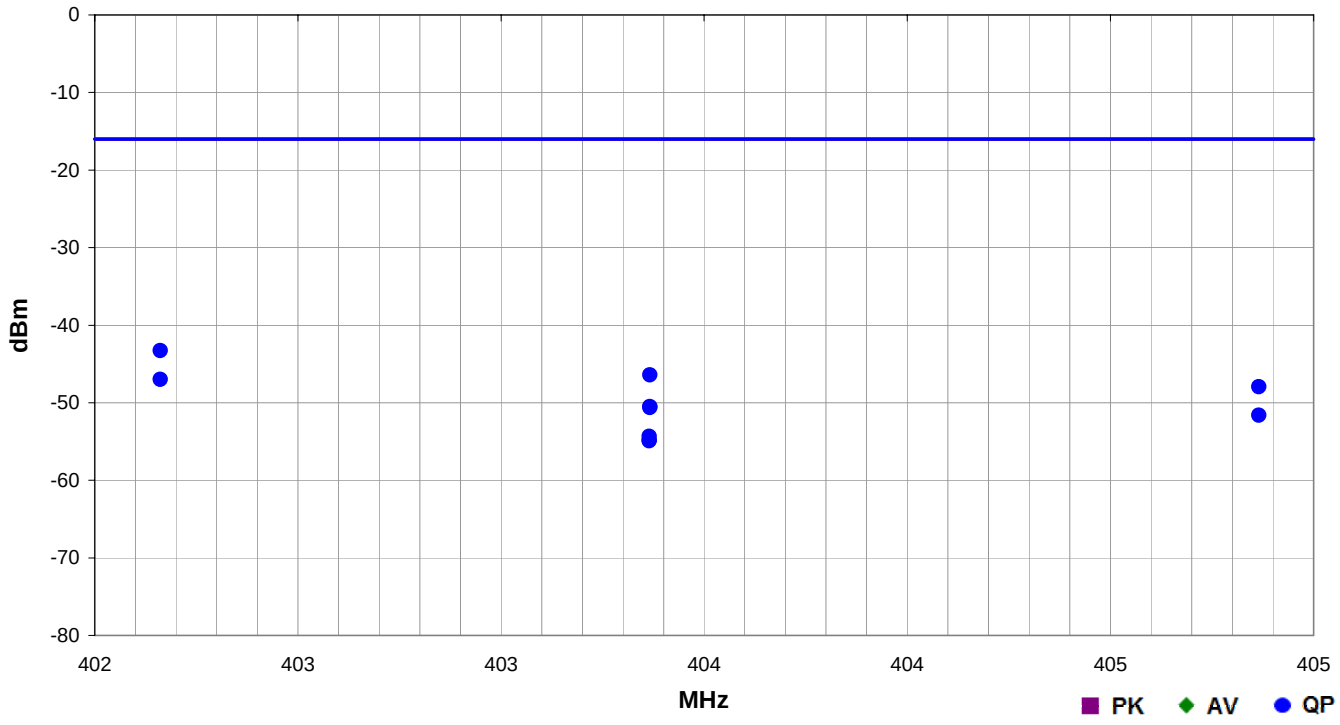
	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	402.163	1.6	358.0	Vert	QP	6.93E-08	-41.6	-16.0	-25.6	EUT Vertical, Low Channel
	403.367	1.6	0.0	Vert	QP	6.58E-08	-41.8	-16.0	-25.8	EUT Vertical, Mid Channel
	404.865	1.6	352.0	Vert	QP	5.47E-08	-42.6	-16.0	-26.6	EUT Vertical, High Channel
	402.163	1.1	255.0	Horz	QP	2.76E-08	-45.6	-16.0	-29.6	EUT Vertical, Low Channel
	403.367	1.1	263.0	Horz	QP	2.45E-08	-46.1	-16.0	-30.1	EUT Vertical, Mid Channel
	403.368	1.2	35.0	Horz	QP	2.28E-08	-46.4	-16.0	-30.4	EUT on Side, Mid Channel
	404.865	1.1	257.0	Horz	QP	1.85E-08	-47.3	-16.0	-31.3	EUT Vertical, High Channel
	403.367	1.6	330.0	Vert	QP	8.10E-09	-50.9	-16.0	-34.9	EUT on Side, Mid Channel
	403.367	1.6	18.0	Vert	QP	6.58E-09	-51.8	-16.0	-35.8	EUT Horizontal, Mid Channel
	403.367	1.2	294.0	Horz	QP	4.88E-09	-53.1	-16.0	-37.1	EUT Horizontal, Mid Channel

Radiated Power (EIRP)

Work Order:	QIGG0006	**Date:**	09/25/13	Trevor Buls	
Project:	None	**Temperature:**	22.8 °C		
Job Site:	MN04	**Humidity:**	48.5% RH		
Serial Number:	254979304	**Barometric Pres.:**	1014.8 mbar	**Tested by:**	Trevor Buls
EUT:	IPG				
Configuration:	2				
Customer:	QiG Group				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Transmitting CW at Low, Mid, High channel: 402.15, 403.35, 404.85 MHz (see comments)				
Deviations:	None				
Comments:	QiG Group test plan section: V.1.7.				

Test Specifications	**Test Method**
FCC 95I:2013	ANSI/TIA/EIA-603-C:2004

Run #	2	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**Results**	Pass



	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	EIRP (Watts)	EIRP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	402.162	1.6	352.0	Vert	QP	4.69E-08	-43.3	-16.0	-27.3	EUT Vertical, Low Ch
	403.367	1.6	348.0	Vert	QP	2.28E-08	-46.4	-16.0	-30.4	EUT Vertical, Mid Ch
	402.162	1.1	262.0	Horz	QP	2.00E-08	-47.0	-16.0	-31.0	EUT Vertical, Low Ch
	404.865	1.6	0.0	Vert	QP	1.61E-08	-47.9	-16.0	-31.9	EUT Vertical, High Ch
	403.367	1.1	257.0	Horz	QP	8.88E-09	-50.5	-16.0	-34.5	EUT Vertical, Mid Ch
	403.367	1.2	45.0	Horz	QP	8.68E-09	-50.6	-16.0	-34.6	EUT on Side, Mid Ch
	404.865	1.1	261.0	Horz	QP	6.88E-09	-51.6	-16.0	-35.6	EUT Vertical, High Ch
	403.365	1.6	345.0	Vert	QP	3.70E-09	-54.3	-16.0	-38.3	EUT Horizontal, Mid Ch
	403.365	1.6	310.0	Vert	QP	3.30E-09	-54.8	-16.0	-38.8	EUT on Side, Mid Ch
	403.365	1.2	280.0	Horz	QP	3.22E-09	-54.9	-16.0	-38.9	EUT Horizontal, Mid Ch

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 modulated, Low, Mid, High Ch at 402.15, 403.35, 404.85 MHz (see comments)

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

QIGG0006 - 1

QIGG0006 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	5 GHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	5/20/2013	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	8/12/2013	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	6/29/2011	36 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAD	5/20/2013	12 mo
Antenna, Bilog	Teseq	CBL 6141B	AYD	12/17/2012	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	5/20/2013	12 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2013	24 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

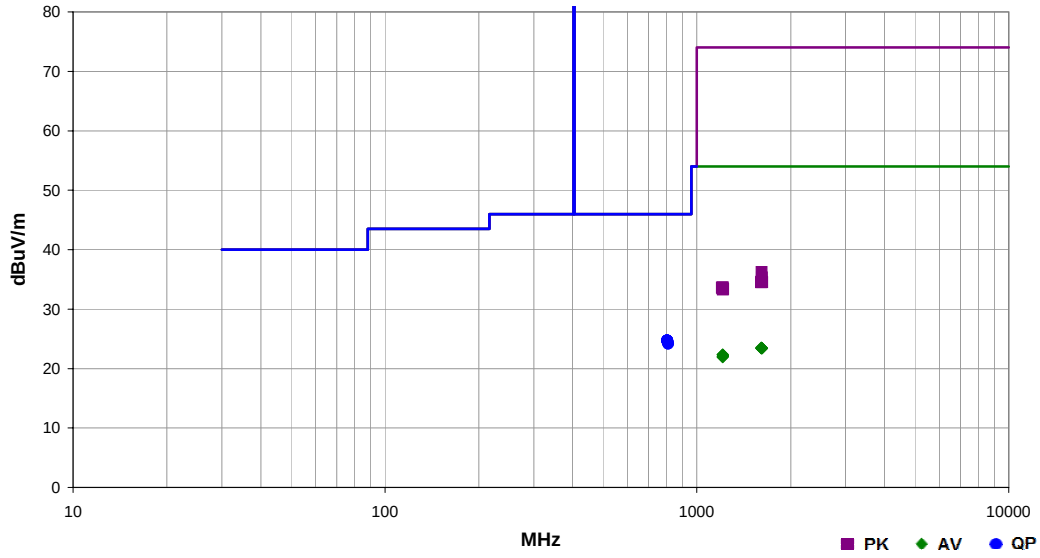
The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.10:2009). A preamp was used for this test in order to provide sufficient measurement sensitivity.

Spurious Radiated Emissions

Work Order:	QIGG0006	**Date:**	10/03/13		
Project:	None	**Temperature:**	23 °C		
Job Site:	MN05	**Humidity:**	44.5% RH		
Serial Number:	254977805	**Barometric Pres.:**	1011.5 mbar	**Tested by:**	Trevor Buls
EUT:	IPG				
Configuration:	1				
Customer:	QiG Group				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Transmitting modulated, Low, Mid, High Ch at 402.15, 403.35, 404.85 MHz (see comments)				
Deviations:	None				
Comments:	QiG Group test plan section V.1.7				

Test Specifications	**Test Method**
FCC 95I:2013	ANSI/TIA/EIA-603-C:2004

Run #	14	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**Results**	Pass



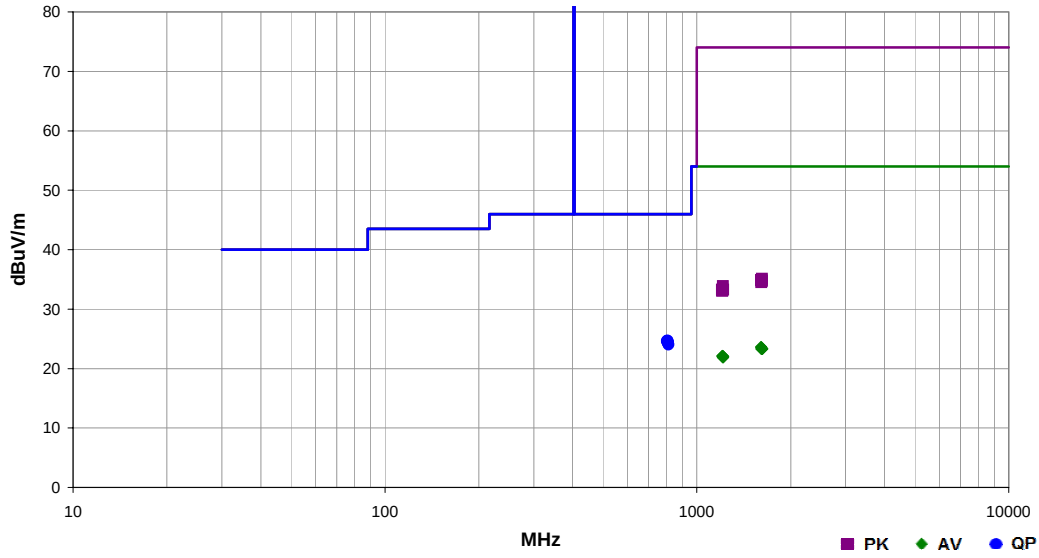
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
804.300	16.5	8.2	3.2	93.0	3.0	0.0	Horz	QP	0.0	24.7	46.0	-21.3	EUT Vertical, Low Ch
804.300	16.5	8.2	1.9	49.0	3.0	0.0	Vert	QP	0.0	24.7	46.0	-21.3	EUT Vertical, Low Ch
804.300	16.5	8.2	1.0	143.0	3.0	0.0	Horz	QP	0.0	24.7	46.0	-21.3	EUT on Side, Low Ch
804.300	16.5	8.2	1.0	294.0	3.0	0.0	Vert	QP	0.0	24.7	46.0	-21.3	EUT on Side, Low Ch
804.300	16.5	8.2	3.9	86.0	3.0	0.0	Horz	QP	0.0	24.7	46.0	-21.3	EUT Horizontal, Low Ch
804.300	16.5	8.2	1.0	213.0	3.0	0.0	Vert	QP	0.0	24.7	46.0	-21.3	EUT Horizontal, Low Ch
806.700	16.5	8.0	1.0	191.0	3.0	0.0	Horz	QP	0.0	24.5	46.0	-21.5	EUT Vertical, Mid Ch
806.700	16.5	8.0	1.3	321.0	3.0	0.0	Vert	QP	0.0	24.5	46.0	-21.5	EUT Vertical, Mid Ch
809.700	16.5	7.7	1.0	145.0	3.0	0.0	Horz	QP	0.0	24.2	46.0	-21.8	EUT Vertical, High Ch
809.700	16.5	7.7	3.5	156.0	3.0	0.0	Vert	QP	0.0	24.2	46.0	-21.8	EUT Vertical, High Ch
1610.908	28.5	-5.0	2.3	187.0	3.0	0.0	Horz	AV	0.0	23.5	54.0	-30.5	EUT Vertical, Mid Ch
1619.750	28.4	-5.0	1.0	293.0	3.0	0.0	Vert	AV	0.0	23.4	54.0	-30.6	EUT Vertical, High Ch
1618.033	28.4	-5.0	2.1	32.0	3.0	0.0	Horz	AV	0.0	23.4	54.0	-30.6	EUT Vertical, High Ch
1611.617	28.4	-5.0	1.8	248.0	3.0	0.0	Vert	AV	0.0	23.4	54.0	-30.6	EUT Vertical, Mid Ch
1610.633	28.4	-5.0	3.6	262.0	3.0	0.0	Vert	AV	0.0	23.4	54.0	-30.6	EUT Vertical, Low Ch
1609.008	28.4	-5.0	1.0	344.0	3.0	0.0	Horz	AV	0.0	23.4	54.0	-30.6	EUT Vertical, Low Ch
1210.967	29.0	-6.6	1.9	198.0	3.0	0.0	Vert	AV	0.0	22.4	54.0	-31.6	EUT Vertical, Mid Ch
1210.075	29.0	-6.7	1.0	27.0	3.0	0.0	Horz	AV	0.0	22.3	54.0	-31.7	EUT Vertical, Mid Ch
1212.500	28.8	-6.6	3.1	328.0	3.0	0.0	Vert	AV	0.0	22.2	54.0	-31.8	EUT Vertical, High Ch
1214.167	28.7	-6.6	3.4	213.0	3.0	0.0	Horz	AV	0.0	22.1	54.0	-31.9	EUT Vertical, High Ch
1208.583	28.7	-6.7	1.0	287.0	3.0	0.0	Vert	AV	0.0	22.0	54.0	-32.0	EUT Vertical, Low Ch
1208.958	28.6	-6.7	3.0	168.0	3.0	0.0	Horz	AV	0.0	21.9	54.0	-32.1	EUT Vertical, Low Ch
1615.842	41.2	-5.0	2.3	187.0	3.0	0.0	Horz	PK	0.0	36.2	74.0	-37.8	EUT Vertical, Mid Ch
1617.250	40.3	-5.0	1.0	293.0	3.0	0.0	Vert	PK	0.0	35.3	74.0	-38.7	EUT Vertical, High Ch
1613.083	39.6	-5.0	1.8	248.0	3.0	0.0	Vert	PK	0.0	34.6	74.0	-39.4	EUT Vertical, Mid Ch
1621.642	39.5	-5.0	2.1	32.0	3.0	0.0	Horz	PK	0.0	34.5	74.0	-39.5	EUT Vertical, High Ch
1610.808	39.5	-5.0	3.6	262.0	3.0	0.0	Vert	PK	0.0	34.5	74.0	-39.5	EUT Vertical, Low Ch
1607.508	39.5	-5.0	1.0	344.0	3.0	0.0	Horz	PK	0.0	34.5	74.0	-39.5	EUT Vertical, Low Ch
1211.700	40.3	-6.6	1.0	27.0	3.0	0.0	Horz	PK	0.0	33.7	74.0	-40.3	EUT Vertical, Mid Ch
1204.992	40.3	-6.7	1.0	287.0	3.0	0.0	Vert	PK	0.0	33.6	74.0	-40.4	EUT Vertical, Low Ch
1204.717	40.3	-6.7	3.0	168.0	3.0	0.0	Horz	PK	0.0	33.6	74.0	-40.4	EUT Vertical, Low Ch
1210.058	40.1	-6.7	1.9	198.0	3.0	0.0	Vert	PK	0.0	33.4	74.0	-40.6	EUT Vertical, Mid Ch
1215.975	40.0	-6.6	3.1	328.0	3.0	0.0	Vert	PK	0.0	33.4	74.0	-40.6	EUT Vertical, High Ch
1213.558	39.9	-6.6	3.4	213.0	3.0	0.0	Horz	PK	0.0	33.3	74.0	-40.7	EUT Vertical, High Ch

Spurious Radiated Emissions

Work Order:	QIGG0006	**Date:**	10/03/13		
Project:	None	**Temperature:**	23 °C		
Job Site:	MN05	**Humidity:**	44.5% RH		
Serial Number:	254979304	**Barometric Pres.:**	1011.5 mbar	**Tested by:**	Trevor Buls
EUT:	IPG				
Configuration:	2				
Customer:	QiG Group				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Transmitting modulated, Low, Mid, High Ch at 402.15, 403.35, 404.85 MHz (see comments)				
Deviations:	None				
Comments:	QiG Group test plan section V.1.7				

Test Specifications	**Test Method**
FCC 95I:2013	ANSI/TIA/EIA-603-C:2004

Run #	26	**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
805.197	16.5	8.2	1.1	108.0	3.0	0.0	Horz	QP	0.0	24.7	46.0	-21.3	EUT Vertical, Low Ch
804.998	16.4	8.2	1.1	352.0	3.0	0.0	Horz	QP	0.0	24.6	46.0	-21.4	EUT Horizontal, Low Ch
803.623	16.4	8.2	1.0	84.0	3.0	0.0	Vert	QP	0.0	24.6	46.0	-21.4	EUT on Side, Low Ch
802.968	16.4	8.2	1.0	274.0	3.0	0.0	Vert	QP	0.0	24.6	46.0	-21.4	EUT Horizontal, Low Ch
805.810	16.4	8.1	1.0	316.0	3.0	0.0	Vert	QP	0.0	24.5	46.0	-21.5	EUT Vertical, Low Ch
805.823	16.4	8.1	1.0	51.0	3.0	0.0	Horz	QP	0.0	24.5	46.0	-21.5	EUT on Side, Low Ch
806.347	16.4	8.1	2.8	30.0	3.0	0.0	Horz	QP	0.0	24.5	46.0	-21.5	EUT Vertical, Mid Ch
807.315	16.5	7.9	3.0	51.0	3.0	0.0	Vert	QP	0.0	24.4	46.0	-21.6	EUT Vertical, Mid Ch
808.813	16.4	7.8	3.5	45.0	3.0	0.0	Horz	QP	0.0	24.2	46.0	-21.8	EUT Vertical, High Ch
810.817	16.4	7.6	1.4	340.0	3.0	0.0	Vert	QP	0.0	24.0	46.0	-22.0	EUT Vertical, High Ch
1608.025	28.6	-5.0	1.0	184.0	3.0	0.0	Vert	AV	0.0	23.6	54.0	-30.4	EUT Vertical, Low Ch
1609.400	28.5	-5.0	1.0	188.0	3.0	0.0	Horz	AV	0.0	23.5	54.0	-30.5	EUT Vertical, Low Ch
1621.833	28.3	-5.0	1.0	32.0	3.0	0.0	Horz	AV	0.0	23.3	54.0	-30.7	EUT Vertical, High Ch
1617.058	28.3	-5.0	1.0	293.0	3.0	0.0	Vert	AV	0.0	23.3	54.0	-30.7	EUT Vertical, High Ch
1612.792	28.3	-5.0	3.9	81.0	3.0	0.0	Horz	AV	0.0	23.3	54.0	-30.7	EUT Vertical, Mid Ch
1611.825	28.3	-5.0	1.0	4.0	3.0	0.0	Vert	AV	0.0	23.3	54.0	-30.7	EUT Vertical, Mid Ch
1208.783	28.8	-6.7	3.5	248.0	3.0	0.0	Horz	AV	0.0	22.1	54.0	-31.9	EUT Vertical, Low Ch
1208.175	28.8	-6.7	3.1	114.0	3.0	0.0	Vert	AV	0.0	22.1	54.0	-31.9	EUT Vertical, Low Ch
1211.242	28.7	-6.6	1.0	131.0	3.0	0.0	Vert	AV	0.0	22.1	54.0	-31.9	EUT Vertical, Mid Ch
1214.258	28.6	-6.6	1.0	196.0	3.0	0.0	Horz	AV	0.0	22.0	54.0	-32.0	EUT Vertical, High Ch
1211.275	28.6	-6.6	1.0	247.0	3.0	0.0	Horz	AV	0.0	22.0	54.0	-32.0	EUT Vertical, Mid Ch
1212.442	28.5	-6.6	2.2	199.0	3.0	0.0	Vert	AV	0.0	21.9	54.0	-32.1	EUT Vertical, High Ch
1618.267	40.1	-5.0	1.0	293.0	3.0	0.0	Vert	PK	0.0	35.1	74.0	-38.9	EUT Vertical, High Ch
1607.433	39.9	-5.0	1.0	188.0	3.0	0.0	Horz	PK	0.0	34.9	74.0	-39.1	EUT Vertical, Low Ch
1615.442	39.8	-5.0	3.9	81.0	3.0	0.0	Horz	PK	0.0	34.8	74.0	-39.2	EUT Vertical, Mid Ch
1609.858	39.8	-5.0	1.0	184.0	3.0	0.0	Vert	PK	0.0	34.8	74.0	-39.2	EUT Vertical, Low Ch
1617.575	39.7	-5.0	1.0	32.0	3.0	0.0	Horz	PK	0.0	34.7	74.0	-39.3	EUT Vertical, High Ch
1611.050	39.5	-5.0	1.0	4.0	3.0	0.0	Vert	PK	0.0	34.5	74.0	-39.5	EUT Vertical, Mid Ch
1212.892	40.5	-6.6	1.0	196.0	3.0	0.0	Horz	PK	0.0	33.9	74.0	-40.1	EUT Vertical, High Ch
1204.467	40.0	-6.7	3.1	114.0	3.0	0.0	Vert	PK	0.0	33.3	74.0	-40.7	EUT Vertical, Low Ch
1215.817	39.9	-6.6	2.2	199.0	3.0	0.0	Vert	PK	0.0	33.3	74.0	-40.7	EUT Vertical, High Ch
1208.275	39.8	-6.7	1.0	131.0	3.0	0.0	Vert	PK	0.0	33.1	74.0	-40.9	EUT Vertical, Mid Ch
1207.808	39.8	-6.7	1.0	247.0	3.0	0.0	Horz	PK	0.0	33.1	74.0	-40.9	EUT Vertical, Mid Ch
1206.725	39.8	-6.7	3.5	248.0	3.0	0.0	Horz	PK	0.0	33.1	74.0	-40.9	EUT Vertical, Low Ch

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, Low, Mid, High Ch at 402.15, 403.35, 404.85 MHz (see comments)

POWER SETTINGS INVESTIGATED

Battery

CONFIGURATIONS INVESTIGATED

QIGG0006 - 1

QIGG0006 - 2

FREQUENCY RANGE INVESTIGATED

Start Frequency	30 MHz	Stop Frequency	5 GHz

SAMPLE CALCULATIONS

Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVX	5/20/2013	12 mo
MN05 Cables	ESM Cable Corp.	Double Ridge Guide Horn Cables	MNI	8/12/2013	12 mo
Antenna, Horn (DRG)	ETS Lindgren	3115	AIP	6/29/2011	36 mo
Pre-Amplifier	Miteq	AM-1616-1000	PAD	5/20/2013	12 mo
Antenna, Bilog	Teseq	CBL 6141B	AYD	12/17/2012	12 mo
MN05 Cables	ESM Cable Corp.	Bilog Cables	MNH	5/20/2013	12 mo
Spectrum Analyzer	Agilent	N9010A	AFI	1/27/2013	24 mo

MEASUREMENT BANDWIDTHS

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

TEST DESCRIPTION

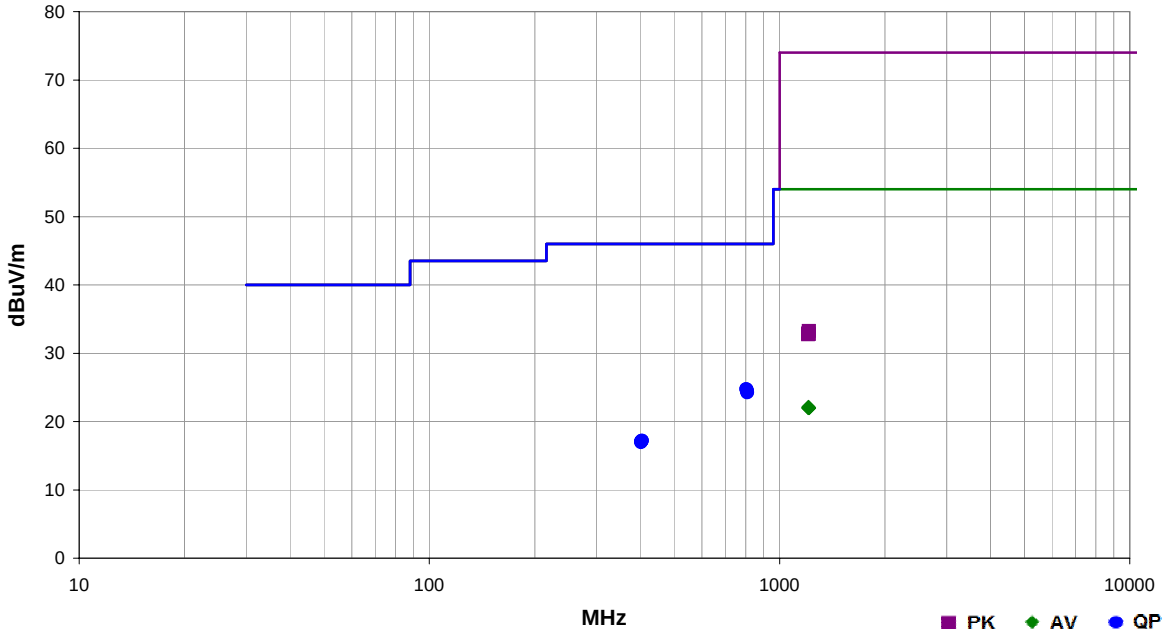
The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band receive frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. 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). A preamp was used for this test in order to provide sufficient measurement sensitivity.

RECEIVER SPURIOUS EMISSIONS

Work Order:	QIGG0006	**Date:**	10/03/13	Trevor Buls	
Project:	None	**Temperature:**	23 °C		
Job Site:	MN05	**Humidity:**	44.5% RH		
Serial Number:	254977805	**Barometric Pres.:**	1011.5 mbar	**Tested by:**	Trevor Buls
EUT:	IPG				
Configuration:	1				
Customer:	QiG Group				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Receive Mode, Low, Mid, High Ch at 402.15, 403.35, 404.85 MHz (see comments)				
Deviations:	None				
Comments:	QiG Group test plan section V.1.6				

Test Specifications	**Test Method**
FCC 15.109:2013	ANSI C63.4:2009

Run #	16	**Test Distance (m)**	3	**Antenna Height(s)**	1-4m	**Results**	Pass



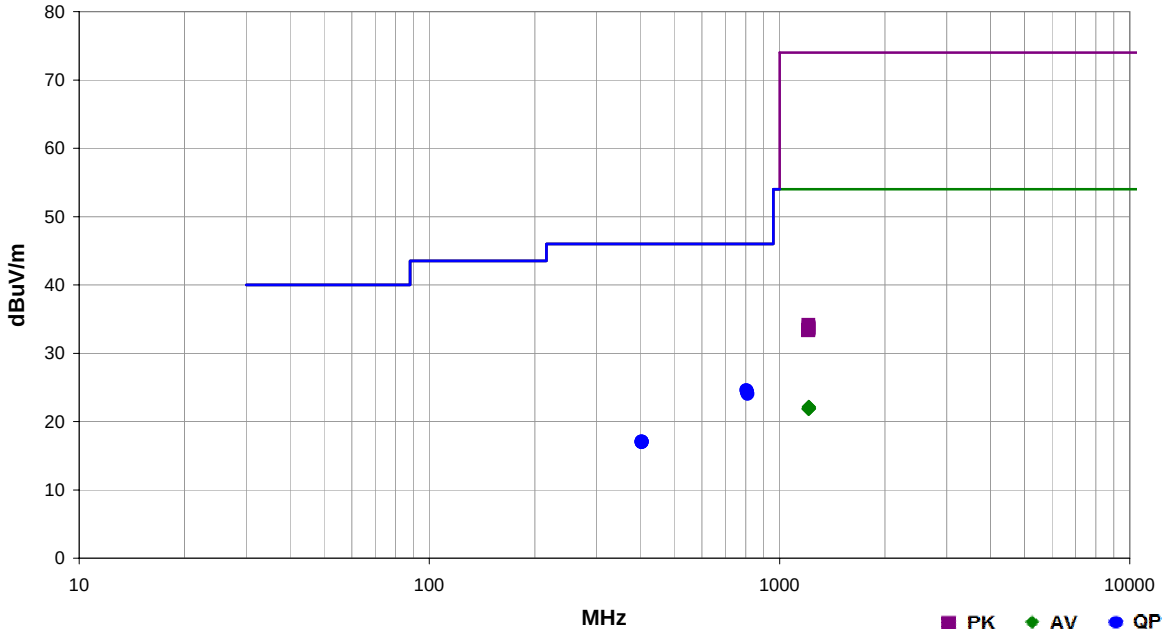
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
809.700	16.6	7.7	1.3	268.0	3.0	0.0	Horz	QP	0.0	24.3	46.0	-21.7	EUT Vertical, High Ch
809.700	16.6	7.7	1.0	79.0	3.0	0.0	Vert	QP	0.0	24.3	46.0	-21.7	EUT Vertical, High Ch
404.850	16.5	0.7	1.0	37.0	3.0	0.0	Horz	QP	0.0	17.2	46.0	-28.8	EUT Vertical, High Ch
404.850	16.5	0.7	1.0	340.0	3.0	0.0	Vert	QP	0.0	17.2	46.0	-28.8	EUT Vertical, High Ch
806.700	16.6	8.0	1.0	351.0	3.0	0.0	Vert	QP	0.0	24.6	46.0	-21.4	EUT Vertical, Mid Ch
806.700	16.5	8.0	1.0	12.0	3.0	0.0	Horz	QP	0.0	24.5	46.0	-21.5	EUT Vertical, Mid Ch
403.350	16.5	0.6	2.3	352.0	3.0	0.0	Horz	QP	0.0	17.1	46.0	-28.9	EUT Vertical, Mid Ch
403.350	16.5	0.6	2.9	49.0	3.0	0.0	Vert	QP	0.0	17.1	46.0	-28.9	EUT Vertical, Mid Ch
804.300	16.5	8.2	1.6	94.0	3.0	0.0	Horz	QP	0.0	24.7	46.0	-21.3	EUT Vertical, Low Ch
804.300	16.5	8.2	1.0	122.0	3.0	0.0	Vert	QP	0.0	24.7	46.0	-21.3	EUT Vertical, Low Ch
402.150	16.5	0.5	1.0	172.0	3.0	0.0	Vert	QP	0.0	17.0	46.0	-29.0	EUT Vertical, Low Ch
402.150	16.4	0.5	1.0	257.0	3.0	0.0	Horz	QP	0.0	16.9	46.0	-29.1	EUT Vertical, Low Ch
1214.467	28.6	-6.6	1.0	298.0	3.0	0.0	Horz	AV	0.0	22.0	54.0	-32.0	EUT Vertical, High Ch
1213.033	28.6	-6.6	1.0	186.0	3.0	0.0	Vert	AV	0.0	22.0	54.0	-32.0	EUT Vertical, High Ch
1213.408	39.9	-6.6	1.0	298.0	3.0	0.0	Horz	PK	0.0	33.3	74.0	-40.7	EUT Vertical, High Ch
1214.225	39.4	-6.6	1.0	186.0	3.0	0.0	Vert	PK	0.0	32.8	74.0	-41.2	EUT Vertical, High Ch
1208.600	28.7	-6.7	1.0	201.0	3.0	0.0	Horz	AV	0.0	22.0	54.0	-32.0	EUT Vertical, Mid Ch
1210.583	28.6	-6.7	1.0	78.0	3.0	0.0	Vert	AV	0.0	21.9	54.0	-32.1	EUT Vertical, Mid Ch
1210.692	39.9	-6.7	1.0	78.0	3.0	0.0	Vert	PK	0.0	33.2	74.0	-40.8	EUT Vertical, Mid Ch
1209.583	39.6	-6.7	1.0	201.0	3.0	0.0	Horz	PK	0.0	32.9	74.0	-41.1	EUT Vertical, Mid Ch

RECEIVER SPURIOUS EMISSIONS

Work Order:	QIGG0006	**Date:**	10/04/13	Trevor Buls	
Project:	None	**Temperature:**	22.2 °C		
Job Site:	MN05	**Humidity:**	49.6% RH		
Serial Number:	254979304	**Barometric Pres.:**	1014.8 mbar	**Tested by:**	Trevor Buls
EUT:	IPG				
Configuration:	2				
Customer:	QiG Group				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Receive Mode, Low, Mid, High Ch at 402.15, 403.35, 404.85 MHz (see comments)				
Deviations:	None				
Comments:	QiG Group test plan section V.1.6				

Test Specifications	**Test Method**
FCC 15.109:2013	ANSI C63.4:2009

Run #	30	**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
804.862	16.4	8.2	1.6	127.0	3.0	0.0	Vert	QP	0.0	24.6	46.0	-21.4	EUT Vertical, Low Ch
805.712	16.4	8.1	3.8	76.0	3.0	0.0	Horz	QP	0.0	24.5	46.0	-21.5	EUT Vertical, Low Ch
806.687	16.4	8.0	2.0	115.0	3.0	0.0	Vert	QP	0.0	24.4	46.0	-21.6	EUT Vertical, Mid Ch
807.658	16.4	7.9	3.9	241.0	3.0	0.0	Horz	QP	0.0	24.3	46.0	-21.7	EUT Vertical, Mid Ch
808.423	16.4	7.8	2.2	0.0	3.0	0.0	Horz	QP	0.0	24.2	46.0	-21.8	EUT Vertical, High Ch
810.177	16.4	7.6	1.0	120.0	3.0	0.0	Vert	QP	0.0	24.0	46.0	-22.0	EUT Vertical, High Ch
404.467	16.4	0.7	3.5	306.0	3.0	0.0	Horz	QP	0.0	17.1	46.0	-28.9	EUT Vertical, Mid Ch
403.782	16.4	0.6	1.0	128.0	3.0	0.0	Vert	QP	0.0	17.0	46.0	-29.0	EUT Vertical, Low Ch
403.723	16.4	0.6	1.0	218.0	3.0	0.0	Horz	QP	0.0	17.0	46.0	-29.0	EUT Vertical, Low Ch
404.895	16.3	0.7	2.4	106.0	3.0	0.0	Horz	QP	0.0	17.0	46.0	-29.0	EUT Vertical, High Ch
402.932	16.4	0.6	1.0	322.0	3.0	0.0	Vert	QP	0.0	17.0	46.0	-29.0	EUT Vertical, Mid Ch
404.070	16.3	0.7	2.5	147.0	3.0	0.0	Vert	QP	0.0	17.0	46.0	-29.0	EUT Vertical, High Ch
1210.925	28.8	-6.6	1.0	75.0	3.0	0.0	Vert	AV	0.0	22.2	54.0	-31.8	EUT Vertical, Mid Ch
1210.642	28.8	-6.7	1.0	64.0	3.0	0.0	Horz	AV	0.0	22.1	54.0	-31.9	EUT Vertical, Mid Ch
1213.608	28.6	-6.6	1.0	249.0	3.0	0.0	Vert	AV	0.0	22.0	54.0	-32.0	EUT Vertical, High Ch
1208.375	28.6	-6.7	1.0	118.0	3.0	0.0	Horz	AV	0.0	21.9	54.0	-32.1	EUT Vertical, Low Ch
1213.383	28.5	-6.6	4.0	113.0	3.0	0.0	Horz	AV	0.0	21.9	54.0	-32.1	EUT Vertical, High Ch
1208.558	28.5	-6.7	1.0	191.0	3.0	0.0	Vert	AV	0.0	21.8	54.0	-32.2	EUT Vertical, Low Ch
1210.125	40.8	-6.7	1.0	64.0	3.0	0.0	Horz	PK	0.0	34.1	74.0	-39.9	EUT Vertical, Mid Ch
1212.208	40.4	-6.6	4.0	113.0	3.0	0.0	Horz	PK	0.0	33.8	74.0	-40.2	EUT Vertical, High Ch

Emission Bandwidth

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Near Field Probe Set	ETS	7405	IPO	NCR	0
Spectrum Analyzer	Agilent	E4440A	AAX	5/15/2012	24

TEST DESCRIPTION

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

Emission Bandwidth

EUT:	IPG			**Work Order:**	QIGG0006
Serial Number:	254979304, 254977805			**Date:**	10/08/13
Customer:	QiG Group			**Temperature:**	22.9°C
Attendees:	None			**Humidity:**	41%
Project:	None			**Barometric Pres.:**	1013.5
Tested by:	Trevor Buls	**Power:**	Battery	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 95I:2013	ANSI/TIA/EIA-603-C-2004

COMMENTS

QiG Group test plan section V.1.7

DEVIATIONS FROM TEST STANDARD

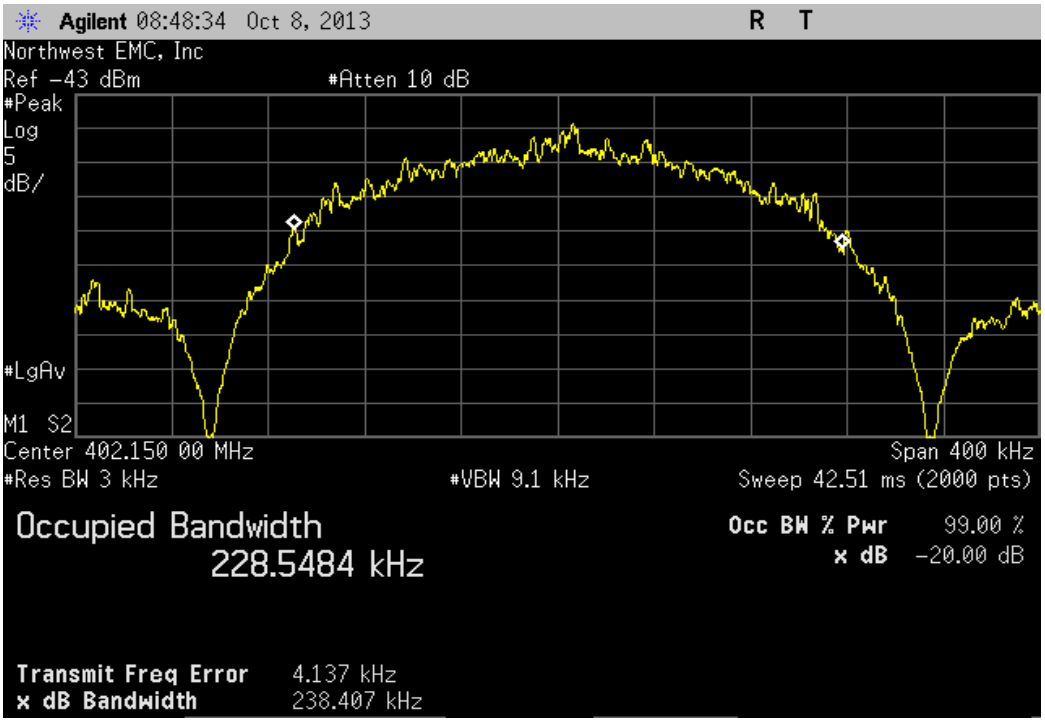
None

Configuration #	1,2	Signature	Trevor Buls

		Value	Limit	Result
SN: 254977805				
	Low Channel, 402.15 MHz	238.407 kHz	≤ 300 kHz	Pass
	Mid Channel, 403.35 MHz	241.999 kHz	≤ 300 kHz	Pass
	High Channel, 404.85 MHz	244.685 kHz	≤ 300 kHz	Pass
SN: 254979304				
	Low Channel, 402.15 MHz	240.415 kHz	≤ 300 kHz	Pass
	Mid Channel, 403.35 MHz	254.041 kHz	≤ 300 kHz	Pass
	High Channel, 404.85 MHz	243.479 kHz	≤ 300 kHz	Pass

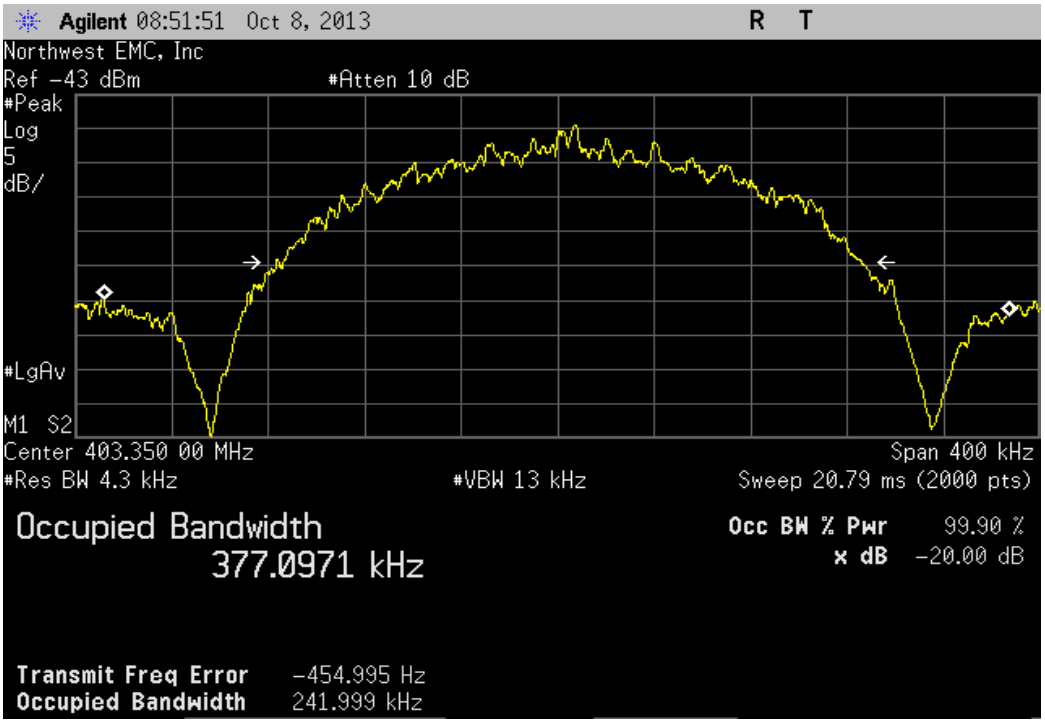
SN: 254977805, Low Channel, 402.15 MHz

				Value	Limit	Result
				238.407 kHz	≤ 300 kHz	Pass



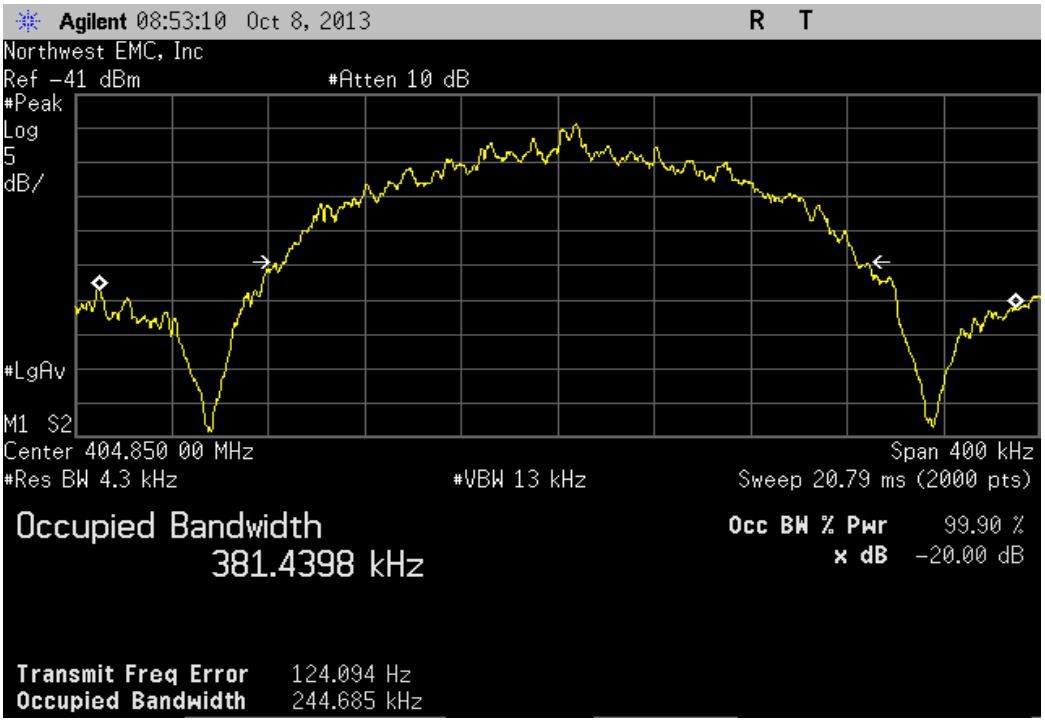
SN: 254977805, Mid Channel, 403.35 MHz

				Value	Limit	Result
				241.999 kHz	≤ 300 kHz	Pass



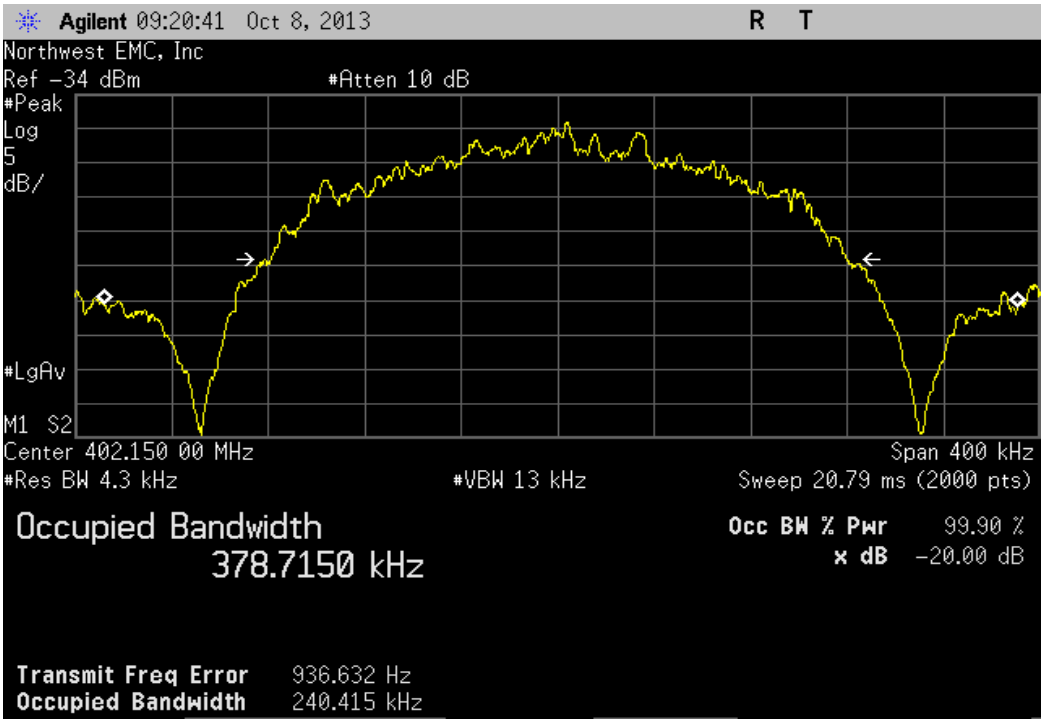
SN: 254977805, High Channel, 404.85 MHz

				Value	Limit	Result
				244.685 kHz	≤ 300 kHz	Pass



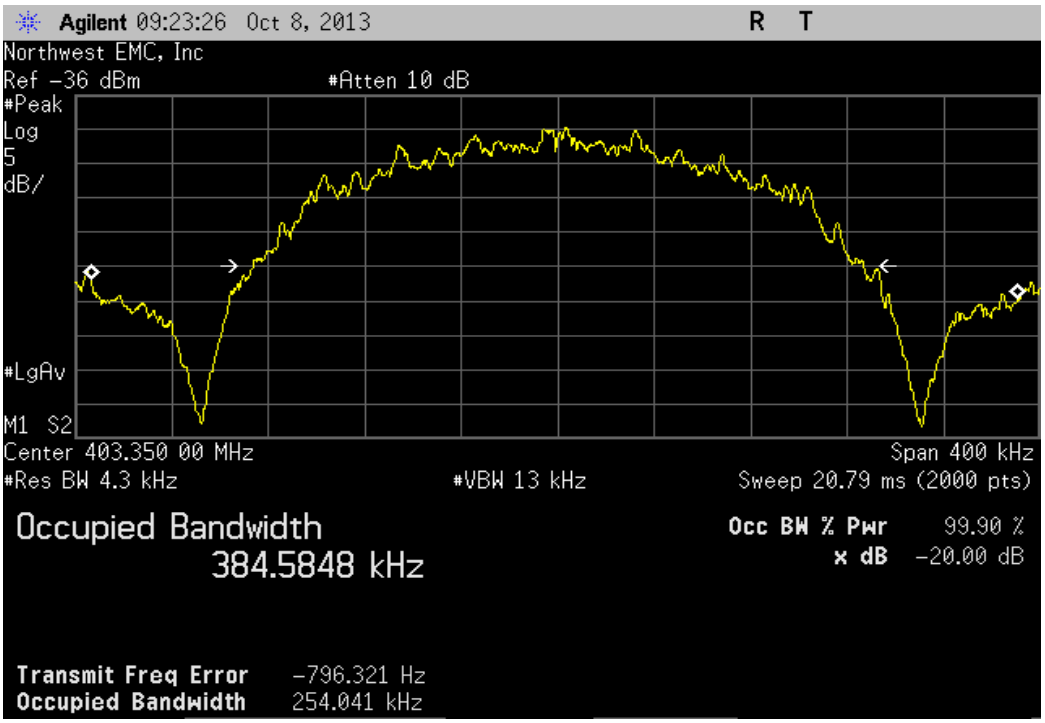
SN: 254979304, Low Channel, 402.15 MHz

				Value	Limit	Result
				240.415 kHz	≤ 300 kHz	Pass



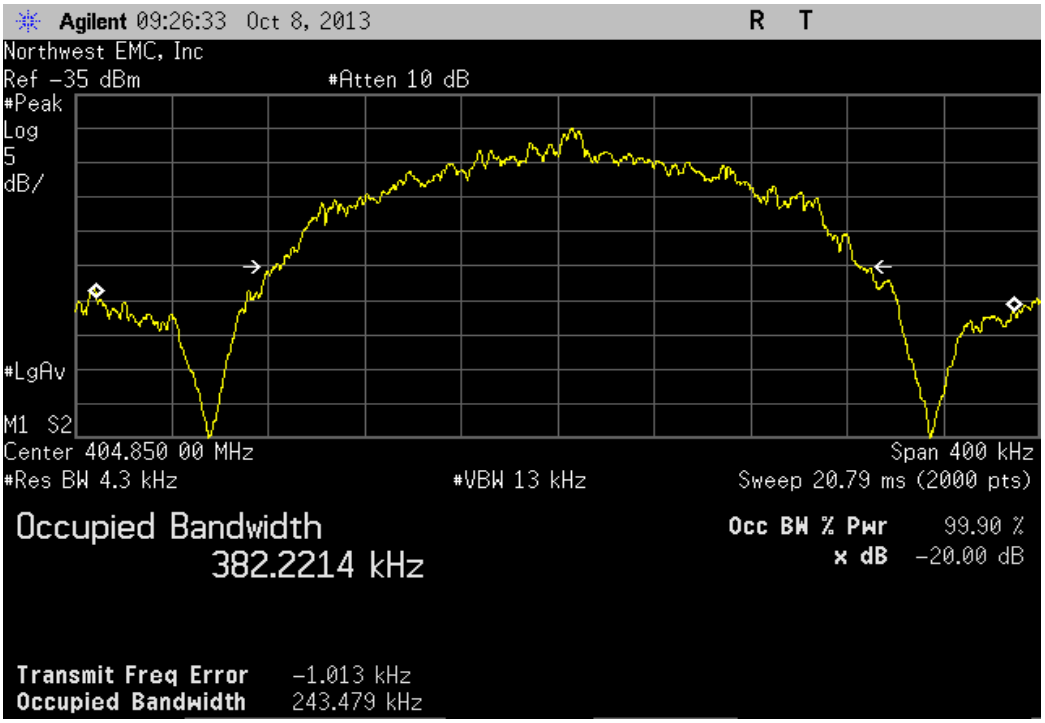
SN: 254979304, Mid Channel, 403.35 MHz

				Value	Limit	Result
				254.041 kHz	≤ 300 kHz	Pass



SN: 254979304, High Channel, 404.85 MHz

				Value	Limit	Result
				243.479 kHz	≤ 300 kHz	Pass



Emissions Mask

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

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Near Field Probe Set	ETS	7405	IPO	NCR	0
Spectrum Analyzer	Agilent	E4440A	AAX	5/15/2012	24

TEST DESCRIPTION

Per 47 CFR 95.635(d)(4) the emission mask was measured. Emissions more than 150 kHz away from the center frequency must be attenuated below the transmitter output power by at least 20 dB. This was evaluated by the Occupied Bandwidth measurement according to 47 CFR 95.633(e)(1). In addition, emissions 250 kHz or less above and below the MICS band (402-405 MHz) must be attenuated below the maximum permitted output power by at least 20 dB.

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

Emissions Mask

EUT:	IPG			**Work Order:**	QIGG0006
Serial Number:	254979304, 254977805			**Date:**	10/08/13
Customer:	QiG Group			**Temperature:**	22.9°C
Attendees:	None			**Humidity:**	41%
Project:	None			**Barometric Pres.:**	1013.5
Tested by:	Trevor Buls	**Power:**	Battery	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 95I:2013	ANSI/TIA/EIA-603-C-2004

COMMENTS

QiG Group test plan section V.1.7

DEVIATIONS FROM TEST STANDARD

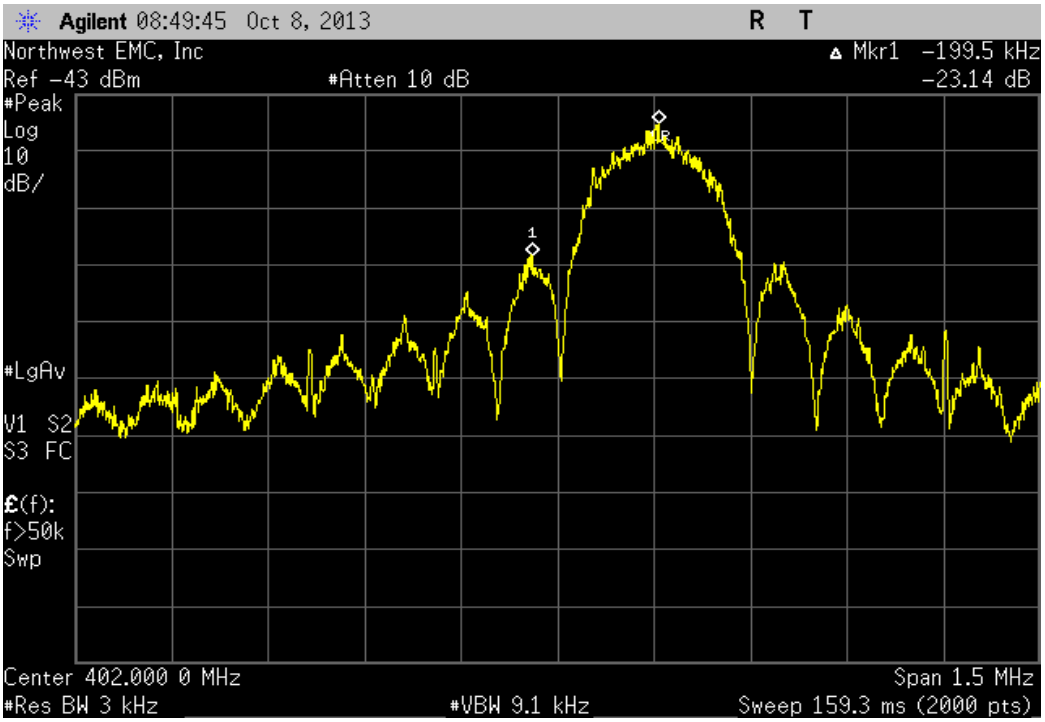
None

Configuration #	1,2	Signature	Trevor Buls

		Value	Limit	Result
SN: 254977805				
	Low Channel, 402.15 MHz	-23.14 dBc	≤ -20 dBc	Pass
	High Channel, 404.85 MHz	-23.28 dBc	≤ -20 dBc	Pass
SN: 254979304				
	Low Channel, 402.15 MHz	-23.58 dBc	≤ -20 dBc	Pass
	High Channel, 404.85 MHz	-23.04 dBc	≤ -20 dBc	Pass

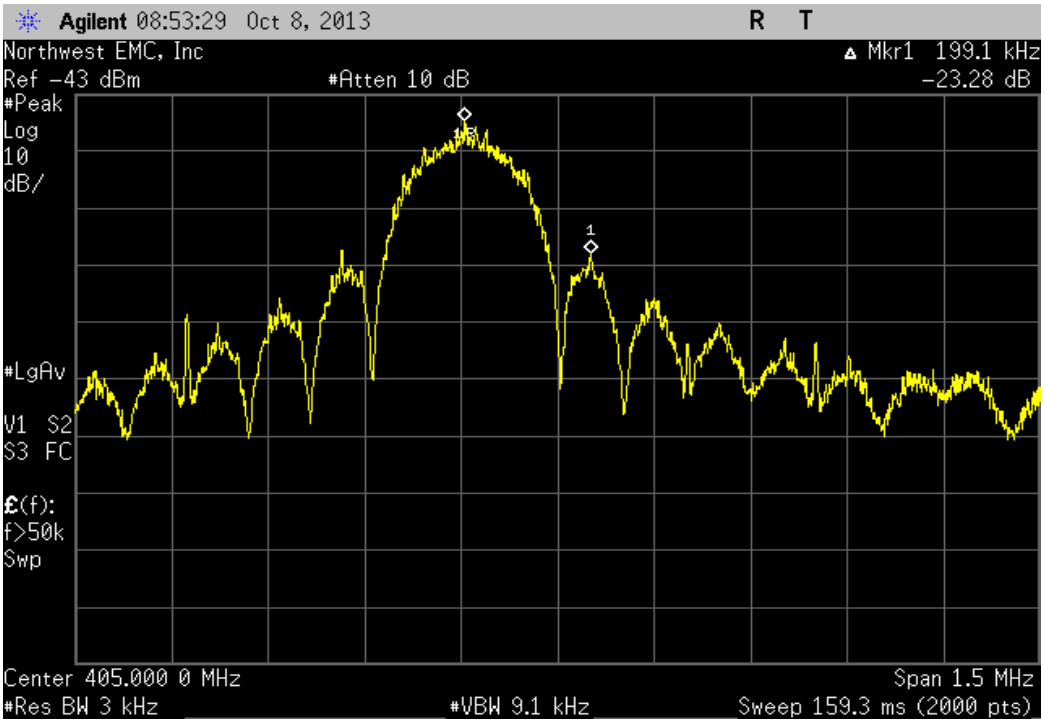
SN: 254977805, Low Channel, 402.15 MHz

				Value	Limit	Result
				-23.14 dBc	≤ -20 dBc	Pass



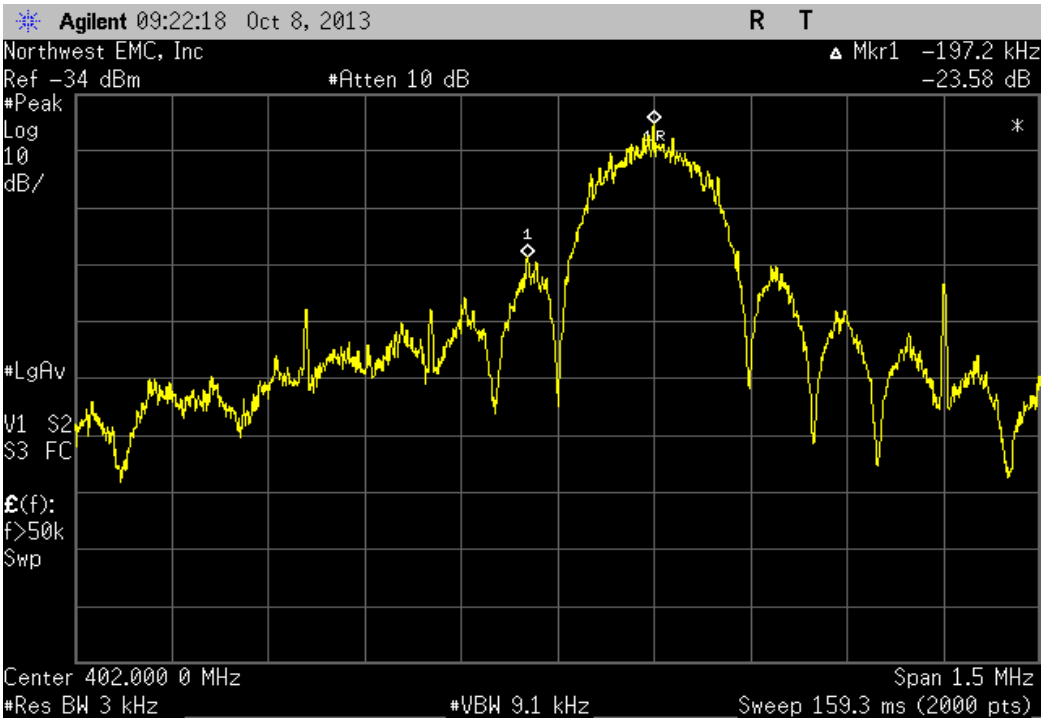
SN: 254977805, High Channel, 404.85 MHz

				Value	Limit	Result
				-23.28 dBc	≤ -20 dBc	Pass



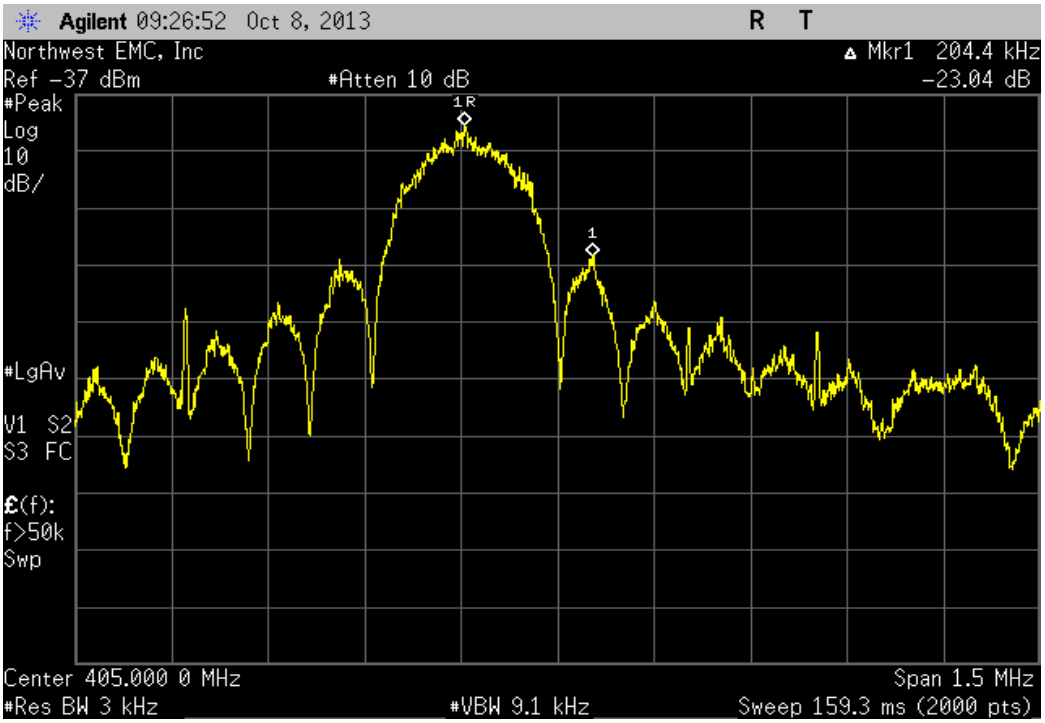
SN: 254979304, Low Channel, 402.15 MHz

				Value	Limit	Result
				-23.58 dBc	≤ -20 dBc	Pass



SN: 254979304, High Channel, 404.85 MHz

				Value	Limit	Result
				-23.04 dBc	≤ -20 dBc	Pass



Frequency Stability

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

TEST EQUIPMENT

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

TEST DESCRIPTION

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

Variation of Voltage
The variation of voltage was not tested because the manufacturer stated, "The internal voltage supplied to the radio is maintained at a constant 2.5 volts over the Battery Voltage (VBAT) operating range of 4.1 - 2.7 Volts . In normal operation, the system goes into automatic shutdown when the VBAT supply voltage is less than 2.7 volts."

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

Frequency Stability

EUT:	IPG			**Work Order:**	QIGG0006
Serial Number:	254979304, 254977805			**Date:**	10/08/13
Customer:	QiG Group			**Temperature:**	22.9°C
Attendees:	None			**Humidity:**	41%
Project:	None			**Barometric Pres.:**	1009.5
Tested by:	Johnathan Lee	**Power:**	Battery	**Job Site:**	MN08

TEST SPECIFICATIONS	Test Method
FCC 95I:2013	ANSI/TIA/EIA-603-C-2004

COMMENTS

QiG Group test plan section V.1.7

DEVIATIONS FROM TEST STANDARD

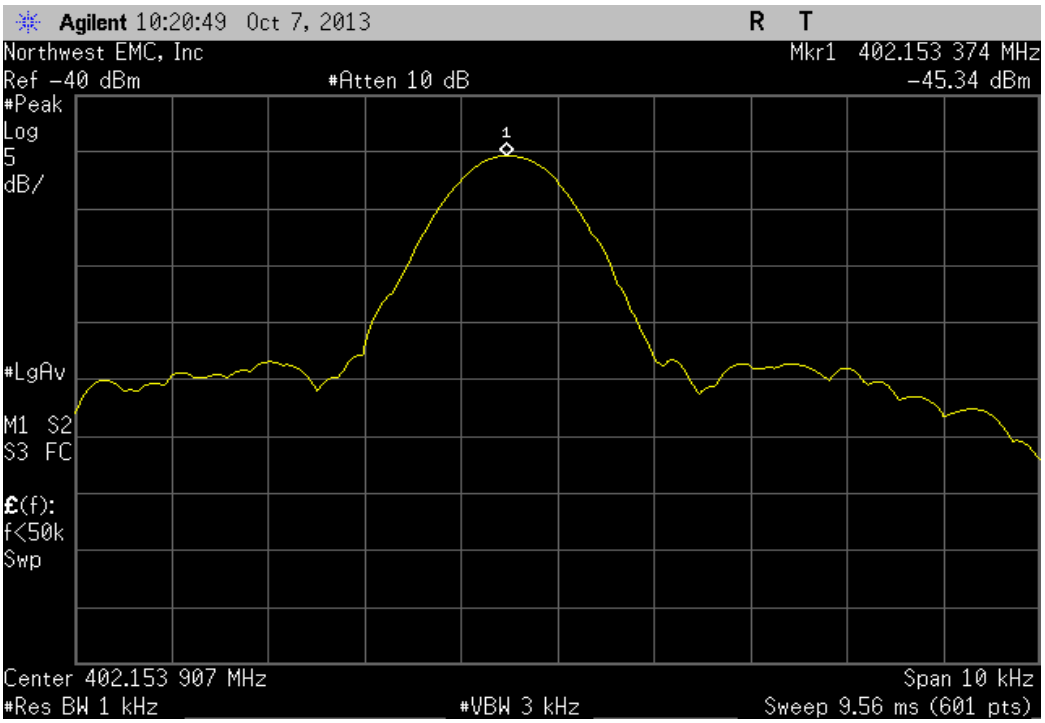
None

Configuration #	1, 2	Signature

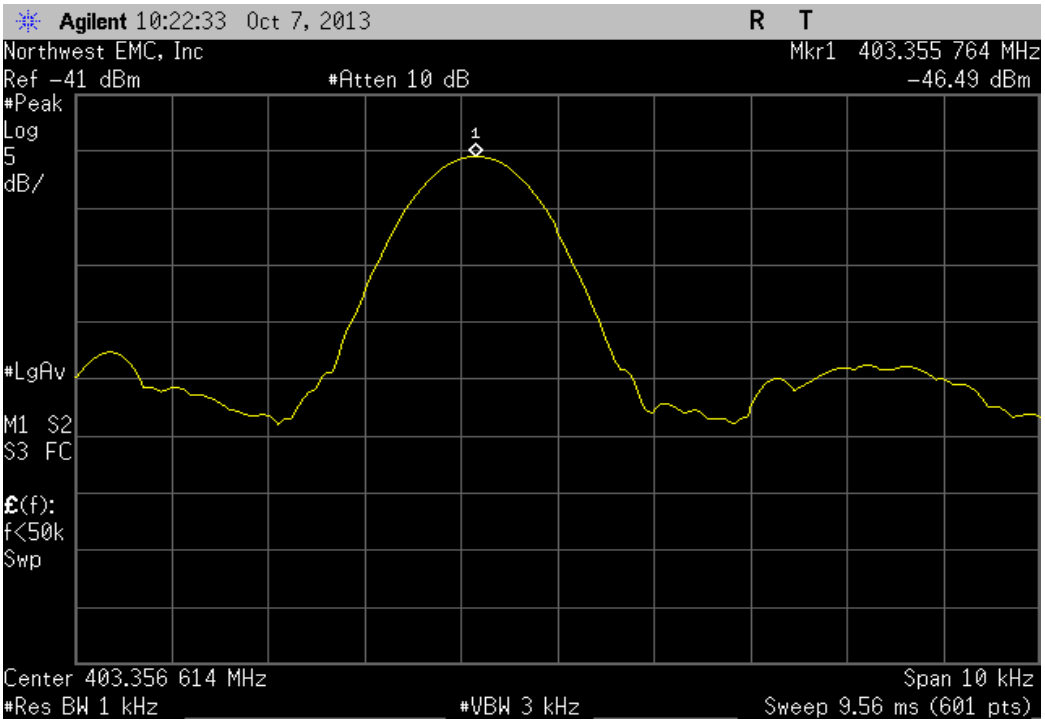
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
S/N 254977805						
	Extreme Temperature 25°C					
	Low Channel, 402.15 MHz	402.153374	402.15	8.4	100	Pass
	Mid Channel, 403.35 MHz	403.355764	403.35	14.3	100	Pass
	High Channel, 404.85 MHz	404.853093	404.85	7.6	100	Pass
	Extreme Temperature 35°C					
	Low Channel, 402.15 MHz	402.15234	402.15	5.8	100	Pass
	Mid Channel, 403.35 MHz	403.35234	403.35	5.8	100	Pass
	High Channel, 404.85 MHz	404.85483	404.85	11.9	100	Pass
	Extreme Temperature 45°C					
	Low Channel, 402.15 MHz	402.152706	402.15	6.7	100	Pass
	Mid Channel, 403.35 MHz	403.352673	403.35	6.6	100	Pass
	High Channel, 404.85 MHz	404.853078	404.85	7.6	100	Pass
S/N 254979304						
	Extreme Temperature 25°C					
	Low Channel, 402.15 MHz	402.149485	402.15	1.3	100	Pass
	Mid Channel, 403.35 MHz	403.352909	403.35	7.2	100	Pass
	High Channel, 404.85 MHz	404.851791	404.85	4.4	100	Pass
	Extreme Temperature 35°C					
	Low Channel, 402.15 MHz	402.15259	402.15	6.4	100	Pass
	Mid Channel, 403.35 MHz	403.350103	403.35	0.3	100	Pass
	High Channel, 404.85 MHz	404.854112	404.85	10.2	100	Pass
	Extreme Temperature 45°C					
	Low Channel, 402.15 MHz	402.149368	402.15	1.6	100	Pass
	Mid Channel, 403.35 MHz	403.349302	403.35	1.7	100	Pass
	High Channel, 404.85 MHz	404.854078	404.85	10.1	100	Pass

Frequency Stability

S/N 254977805 , Extreme Temperature 25°C, Low Channel, 402.15 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		402.153374	402.15	8.4	100	Pass

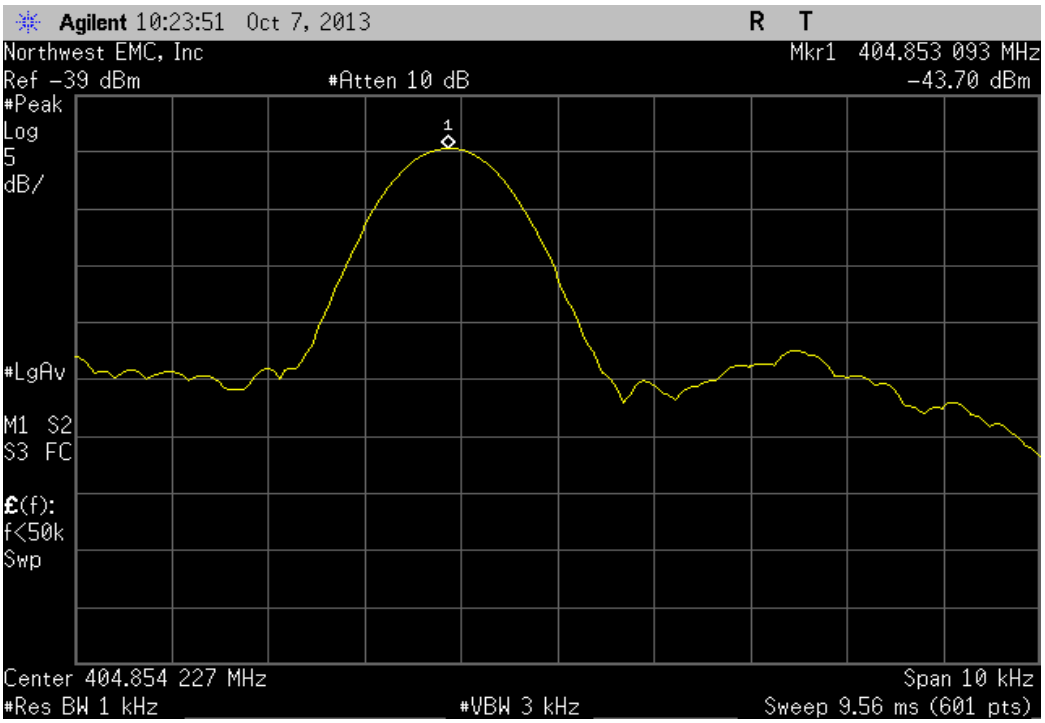


S/N 254977805 , Extreme Temperature 25°C, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		403.355764	403.35	14.3	100	Pass

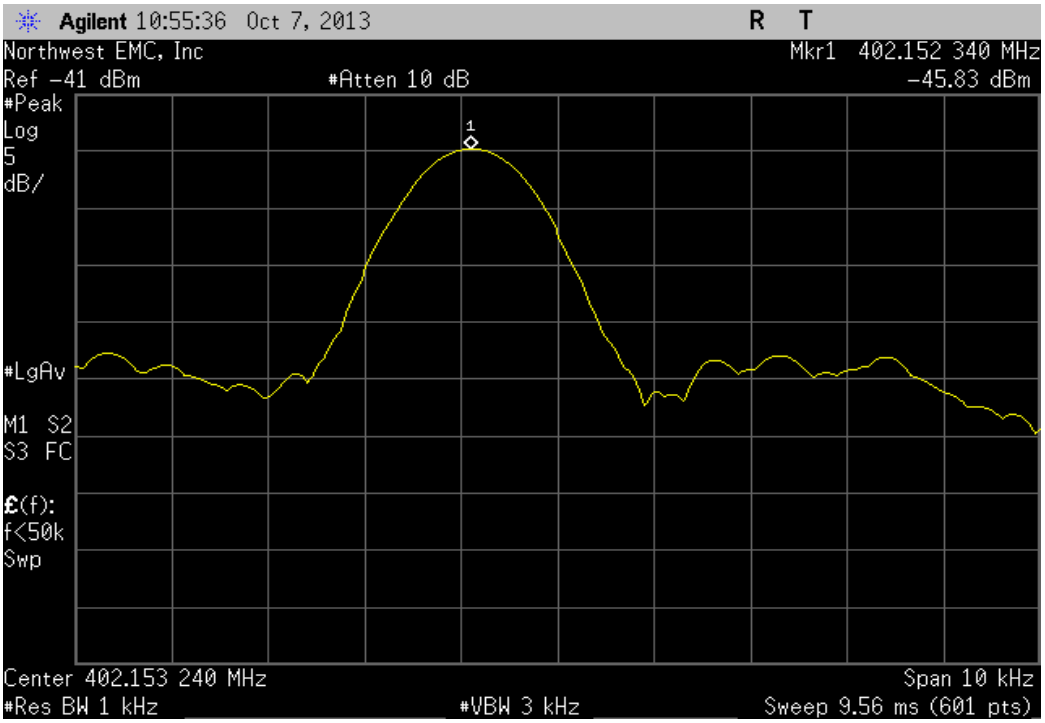


Frequency Stability

S/N 254977805 , Extreme Temperature 25°C, High Channel, 404.85 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		404.853093	404.85	7.6	100	Pass

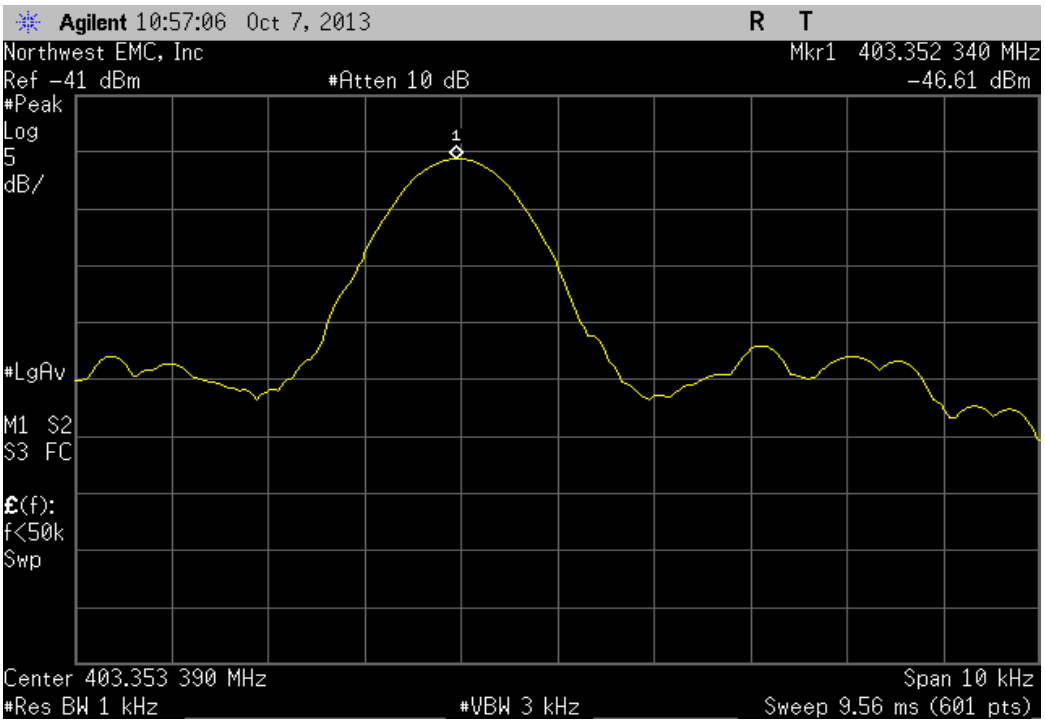


S/N 254977805 , Extreme Temperature 35°C, Low Channel, 402.15 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		402.15234	402.15	5.8	100	Pass

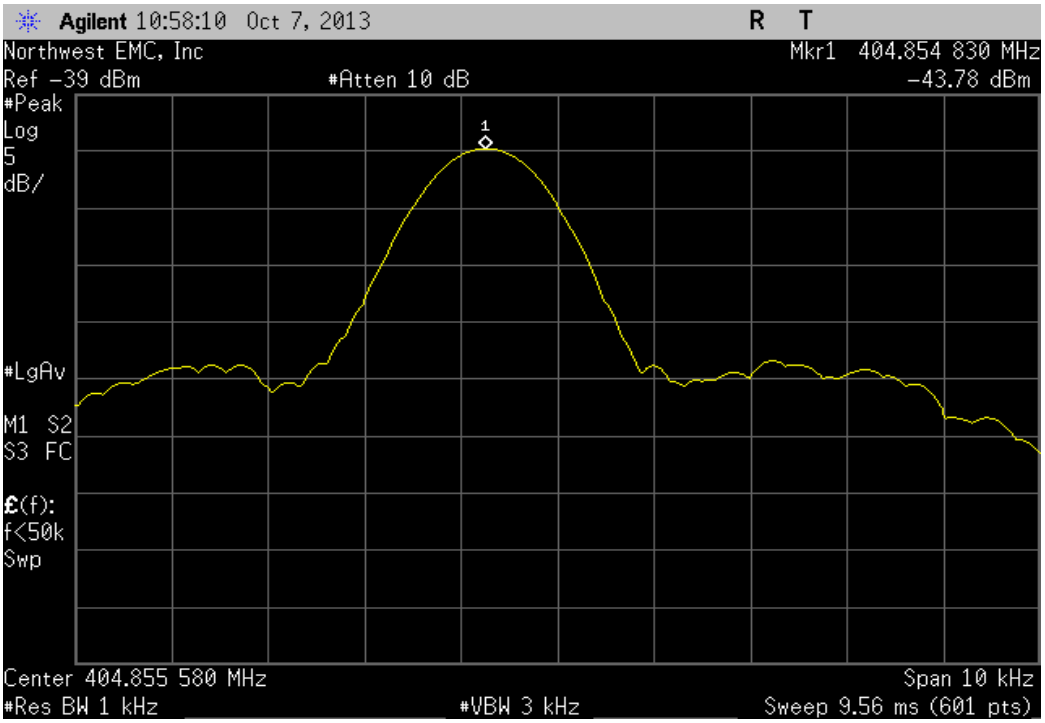


Frequency Stability

S/N 254977805 , Extreme Temperature 35°C, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		403.35234	403.35	5.8	100	Pass

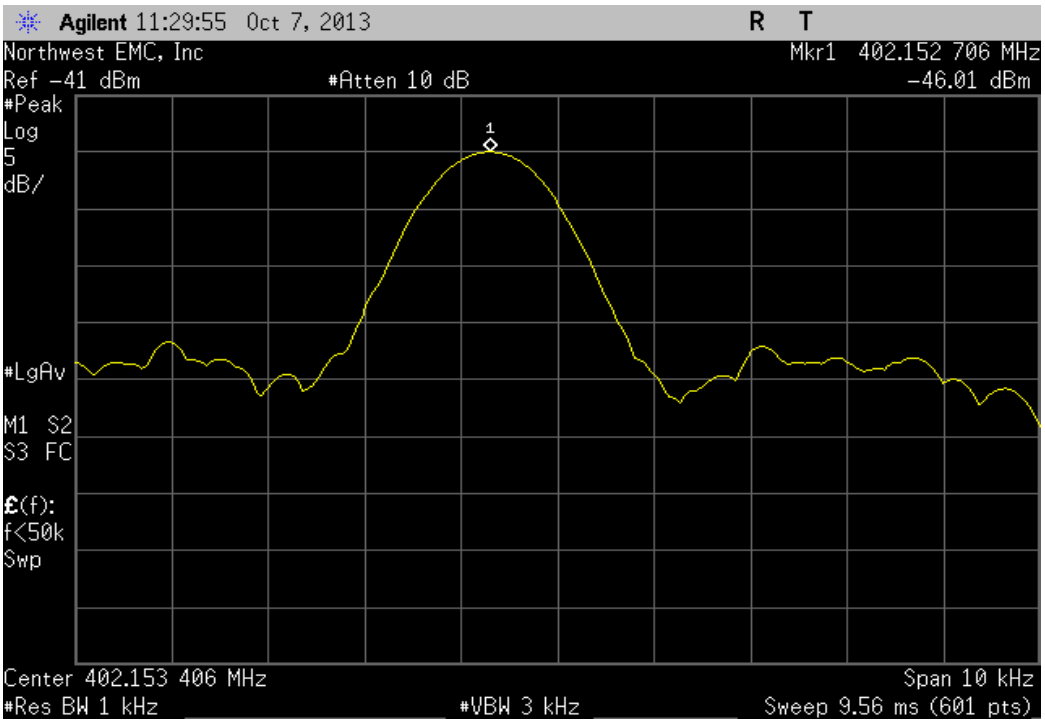


S/N 254977805 , Extreme Temperature 35°C, High Channel, 404.85 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		404.85483	404.85	11.9	100	Pass

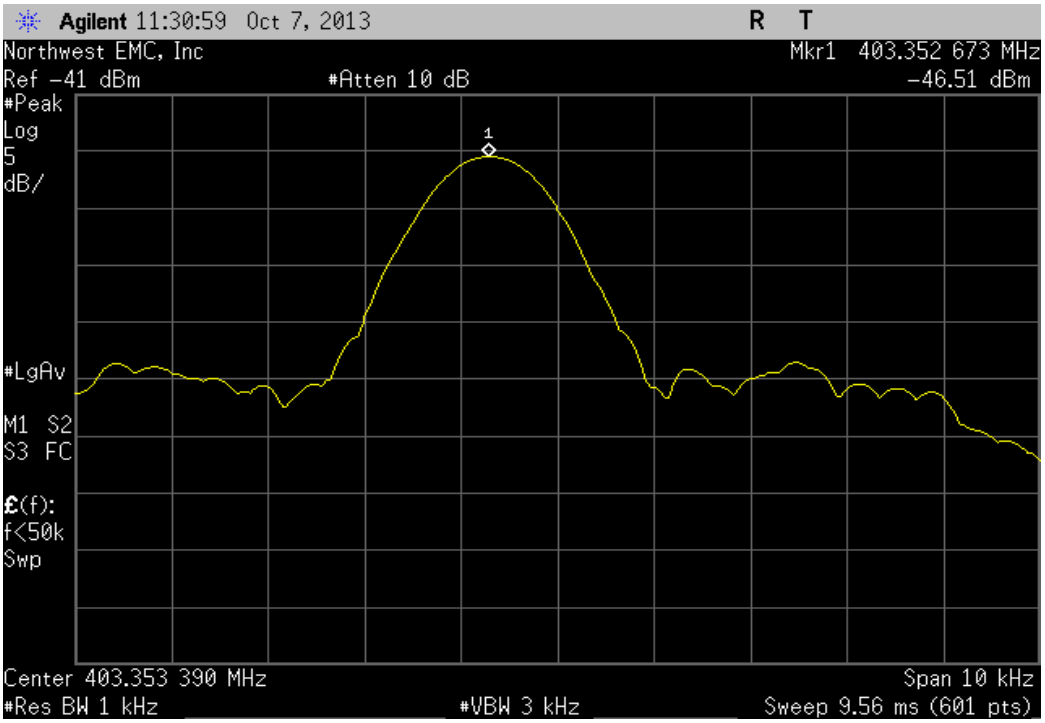


Frequency Stability

S/N 254977805 , Extreme Temperature 45°C, Low Channel, 402.15 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		402.152706	402.15	6.7	100	Pass

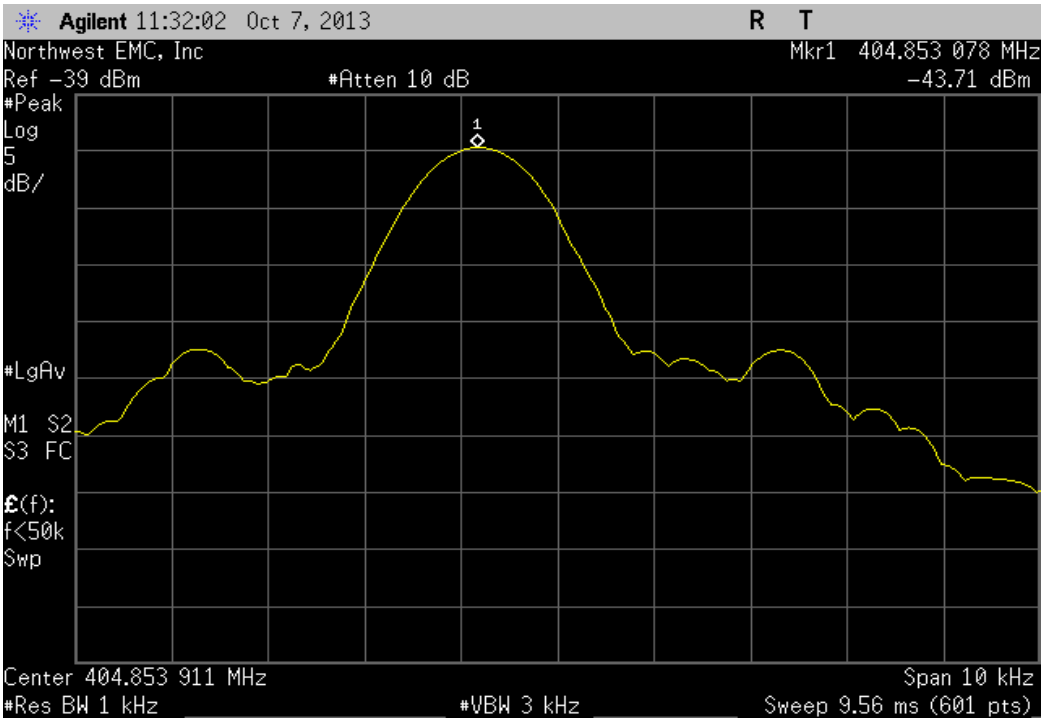


S/N 254977805 , Extreme Temperature 45°C, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		403.352673	403.35	6.6	100	Pass

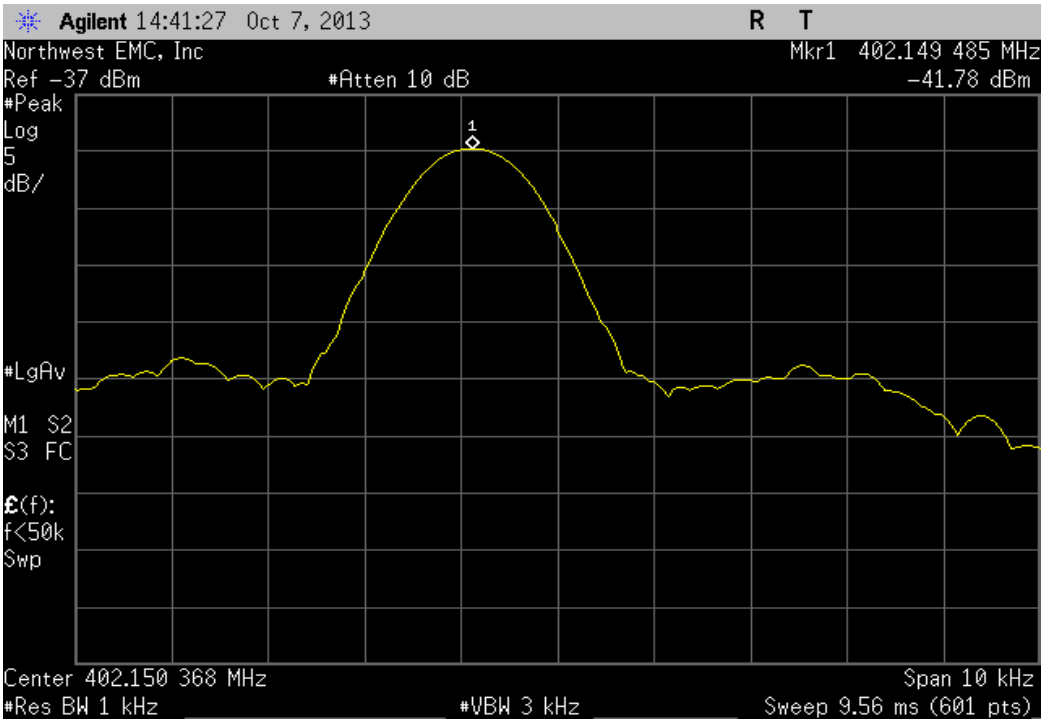


Frequency Stability

S/N 254977805 , Extreme Temperature 45°C, High Channel, 404.85 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		404.853078	404.85	7.6	100	Pass

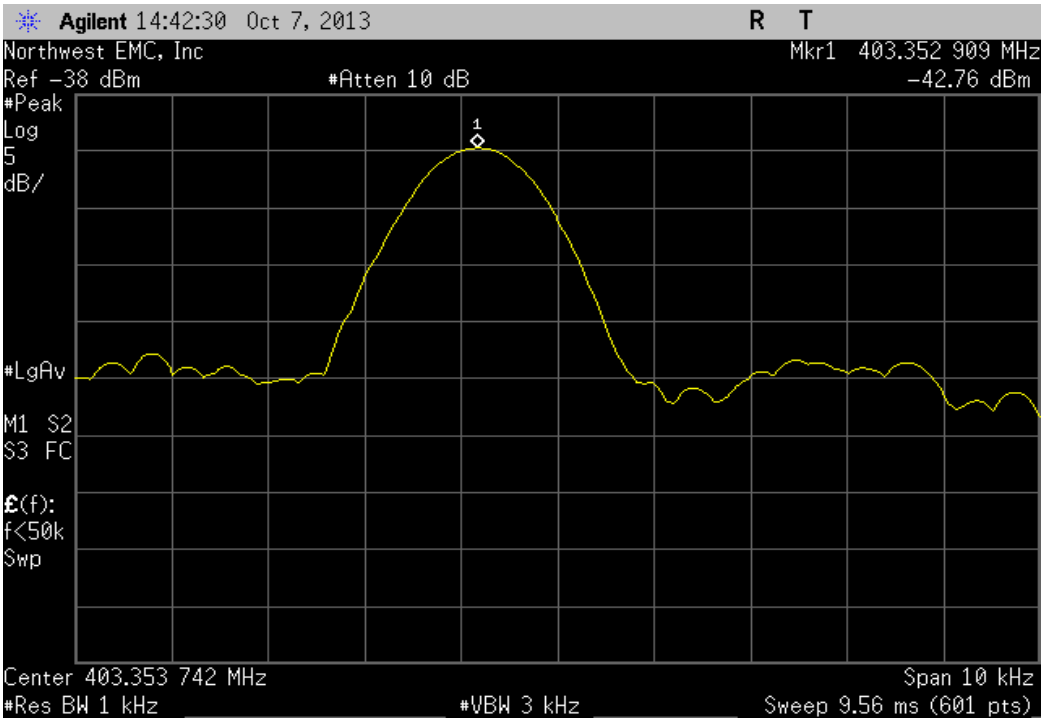


S/N 254979304 , Extreme Temperature 25°C, Low Channel, 402.15 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		402.149485	402.15	1.3	100	Pass

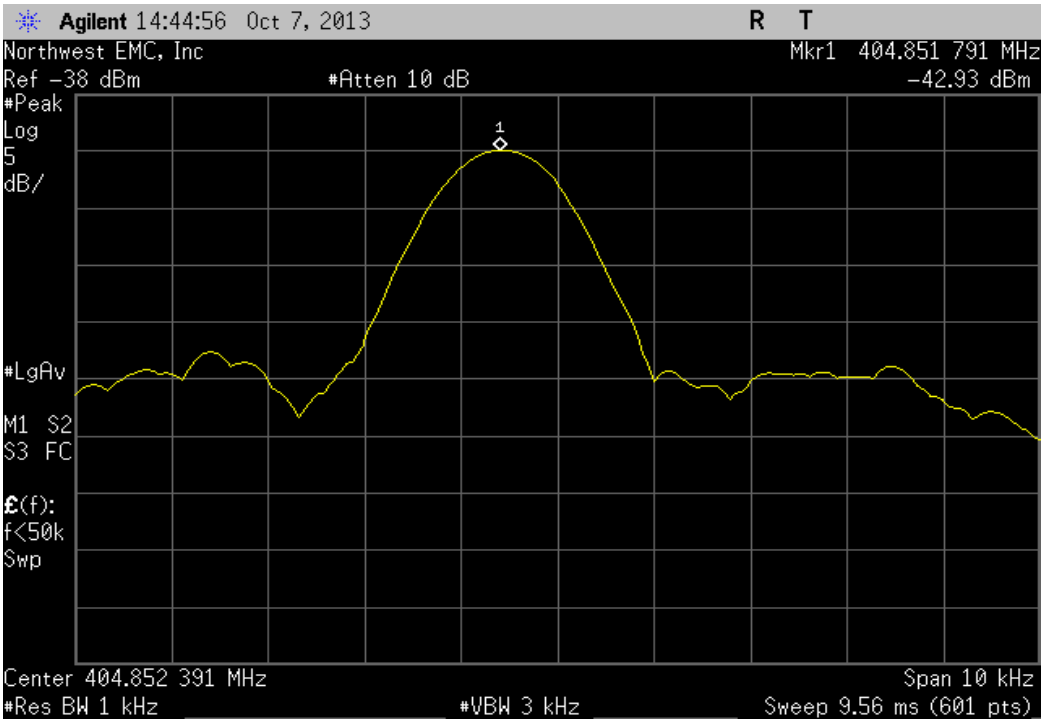


Frequency Stability

S/N 254979304 , Extreme Temperature 25°C, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		403.352909	403.35	7.2	100	Pass

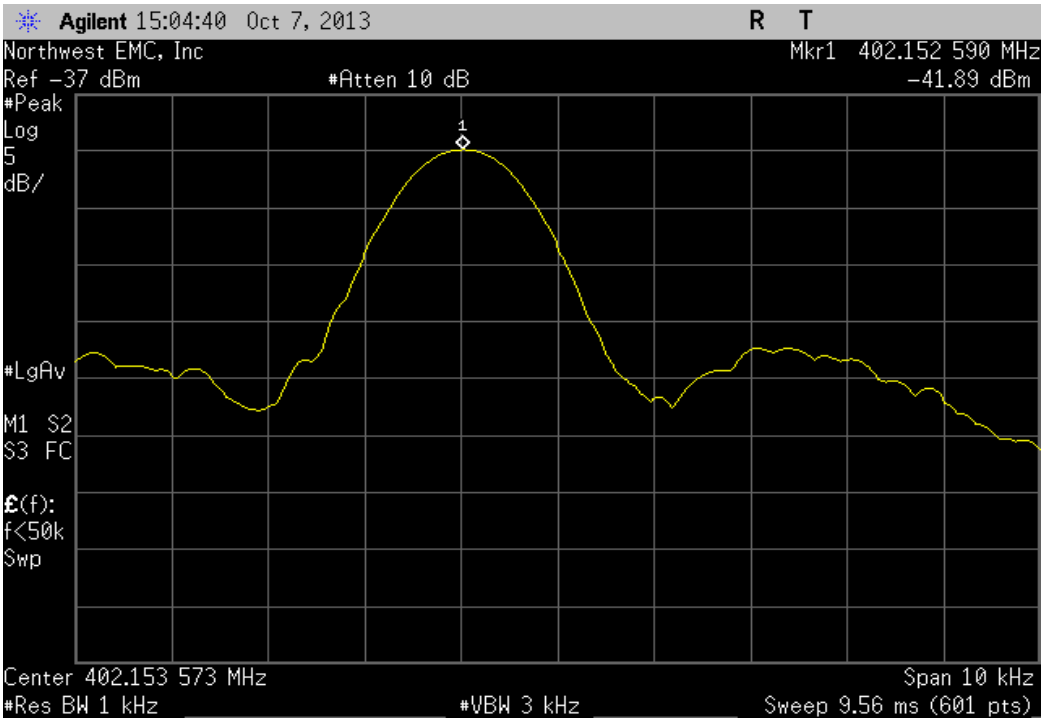


S/N 254979304 , Extreme Temperature 25°C, High Channel, 404.85 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		404.851791	404.85	4.4	100	Pass

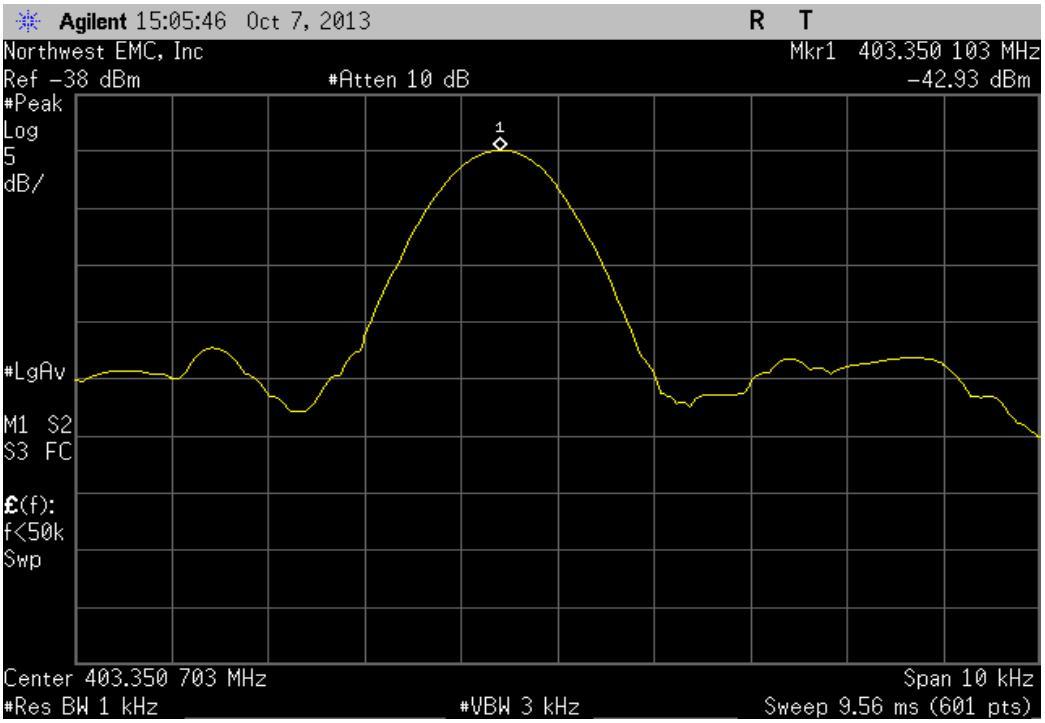


Frequency Stability

S/N 254979304 , Extreme Temperature 35°C, Low Channel, 402.15 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		402.15259	402.15	6.4	100	Pass

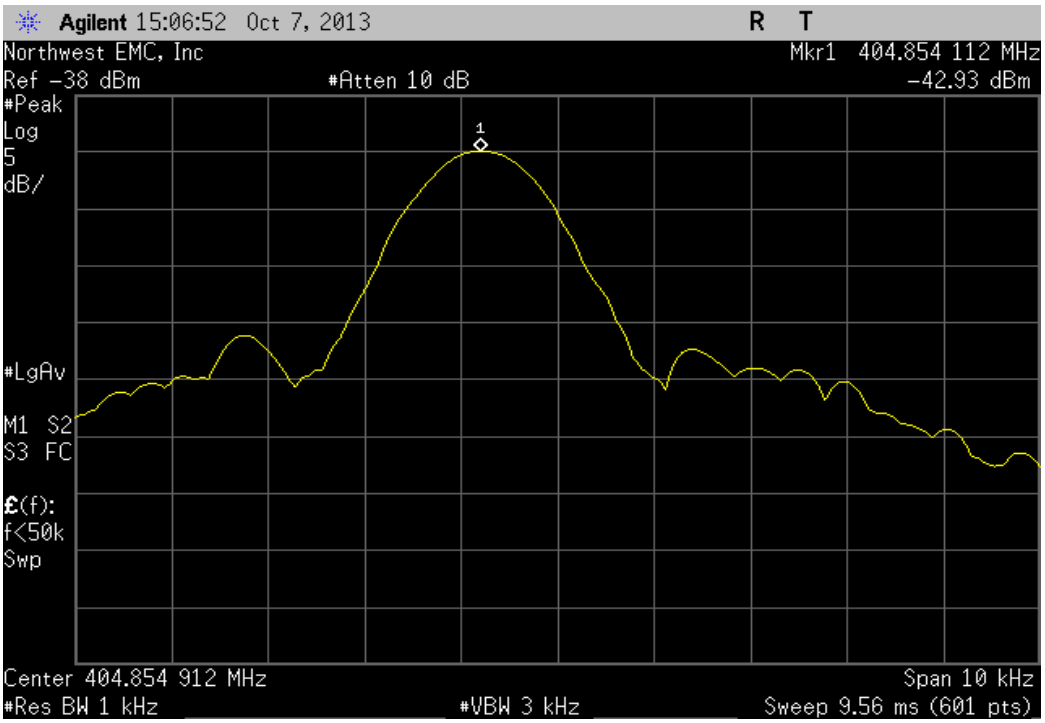


S/N 254979304 , Extreme Temperature 35°C, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		403.350103	403.35	0.3	100	Pass

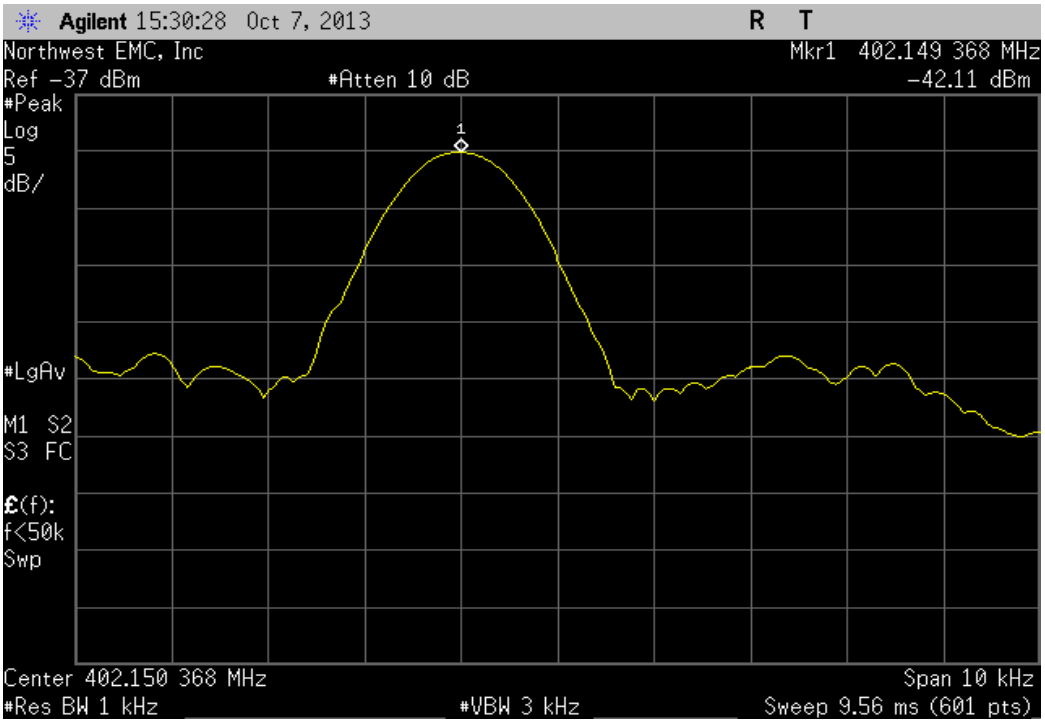


Frequency Stability

S/N 254979304 , Extreme Temperature 35°C, High Channel, 404.85 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		404.854112	404.85	10.2	100	Pass

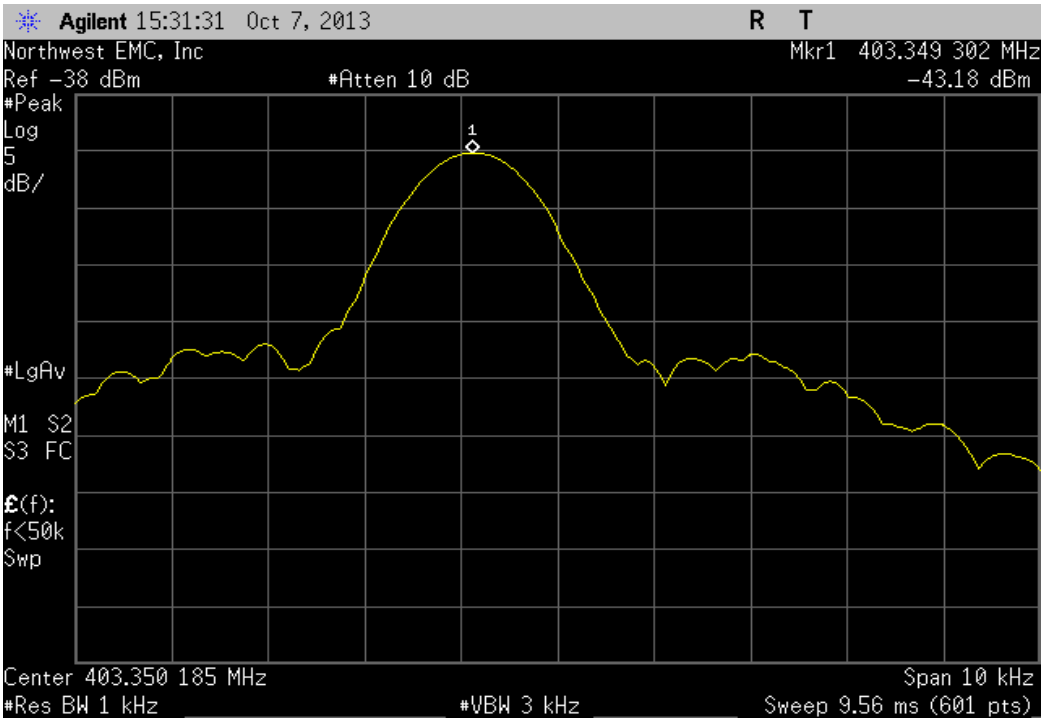


S/N 254979304 , Extreme Temperature 45°C, Low Channel, 402.15 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		402.149368	402.15	1.6	100	Pass

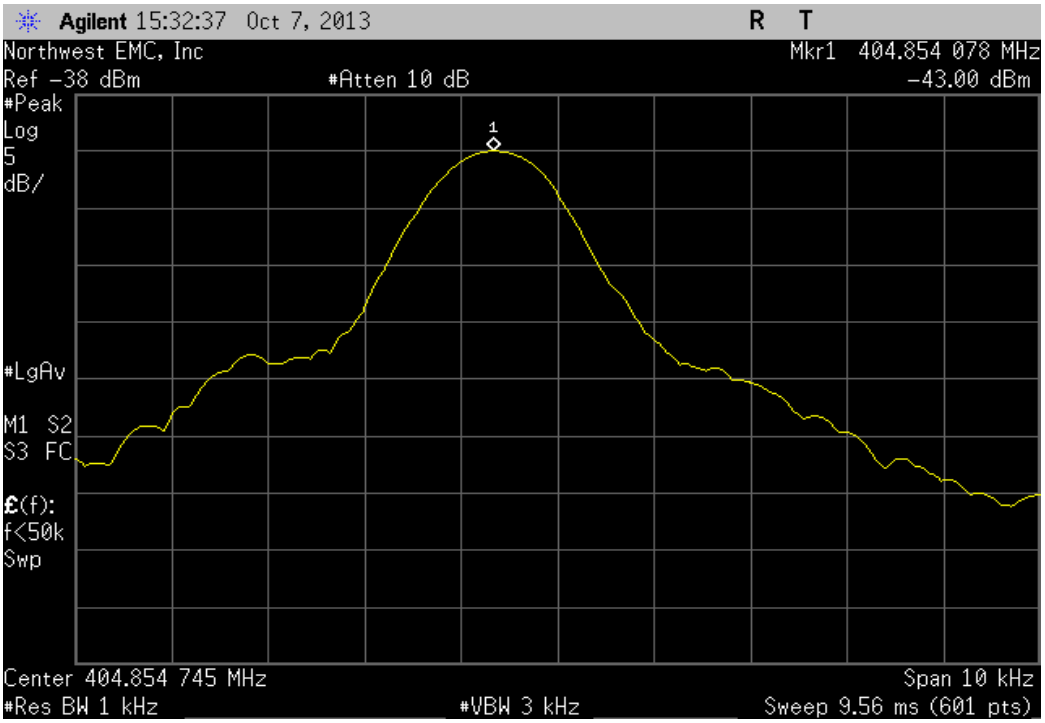


Frequency Stability

S/N 254979304 , Extreme Temperature 45°C, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		403.349302	403.35	1.7	100	Pass



S/N 254979304 , Extreme Temperature 45°C, High Channel, 404.85 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Result
		404.854078	404.85	10.1	100	Pass



Appendix

Customer Provided Information

1. Purpose

This document is intended to describe the RF Test Method and Transmitter Power Output Performance Test Results (typ.) for the Implantable Pulse Generator (Model 2408 and 2412).

2. Sample Preparation

2.1. PCB Modification

The transmitter output power of the IPG may be measured directly by attaching a 50 ohm (semi-rigid) coax cable with an RF connector to the 50 Ohms I/O point as shown in Figure 1. The coax cable ground shield shall be soldered to the IPG assembly PCB using the rectangular ground pad located in the antenna connection area. The coax cable center conductor shall be soldered to the output of the (C24) chip capacitor.

2.2. IPG Modification

In order to be able to attach a coax cable to the IPG assembly PCB, the IPG assembly must be modified such that a small portion of the enclosure is removed (i.e. window) to expose the PCB and enable attachment of the coax cable to the antenna to PCB connection area as described above.

> Note: Attachment of a coax cable to the IPG assembly must be done very carefully using adequate fixture apparatus to allow for proper soldering to the PCB and without causing undue stress by the coax cable on the PCB solder connection points (I.e. PCB pad area damage may easily occur).

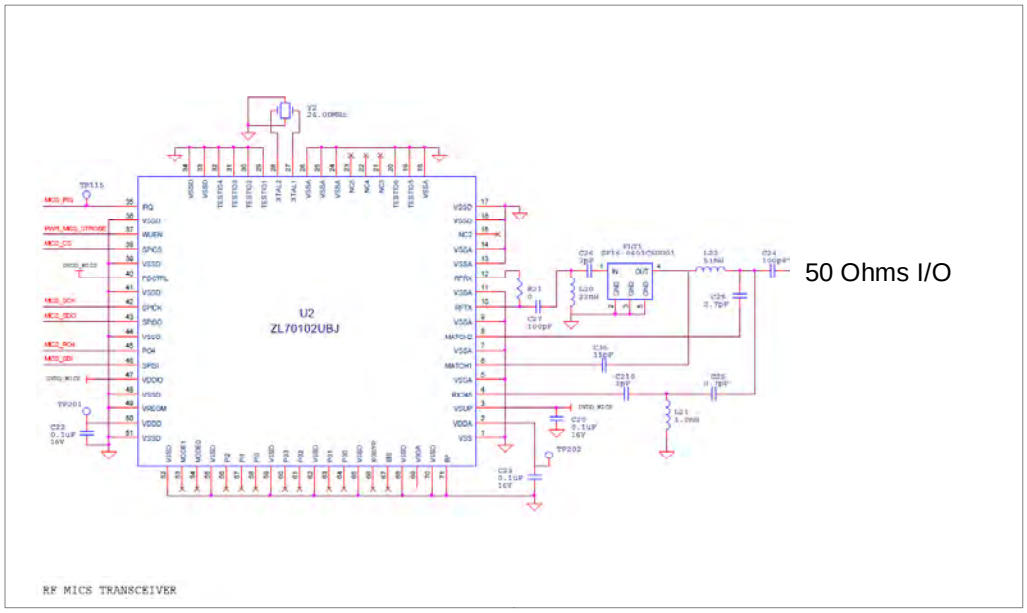


Figure 1 – sample preparation

3. RF Test Method

With the coax cable / RF connector attached to the IPG assembly PCB and having a 50 ohm load present to measure output power (such as a spectrum analyzer or power meter), first RUN the MICS Antenna Tuning algorithm (xCT) to set the RF output power to the peak RF strength.

4. Transmitter Power Output Test Results

The IPG transmitter power output data sheet specifications indicate that the value is dependent on the (VSUP) IC voltage supply conditions. The Maximum Transmit Power output specification (400 MHz Transmitter) as shown on the data sheet (ZL70102 2010, V1) at IMP-3.0 volts (maximum output power register code) is -3.5 dBm typical. Since the IPG voltage supply to VSUP is 2.5 volts, measured (conducted) typical power output data is shown for low (channel 0), medium (channel 5), and high (channel 9) are shown in Figure 2 and Table 1.

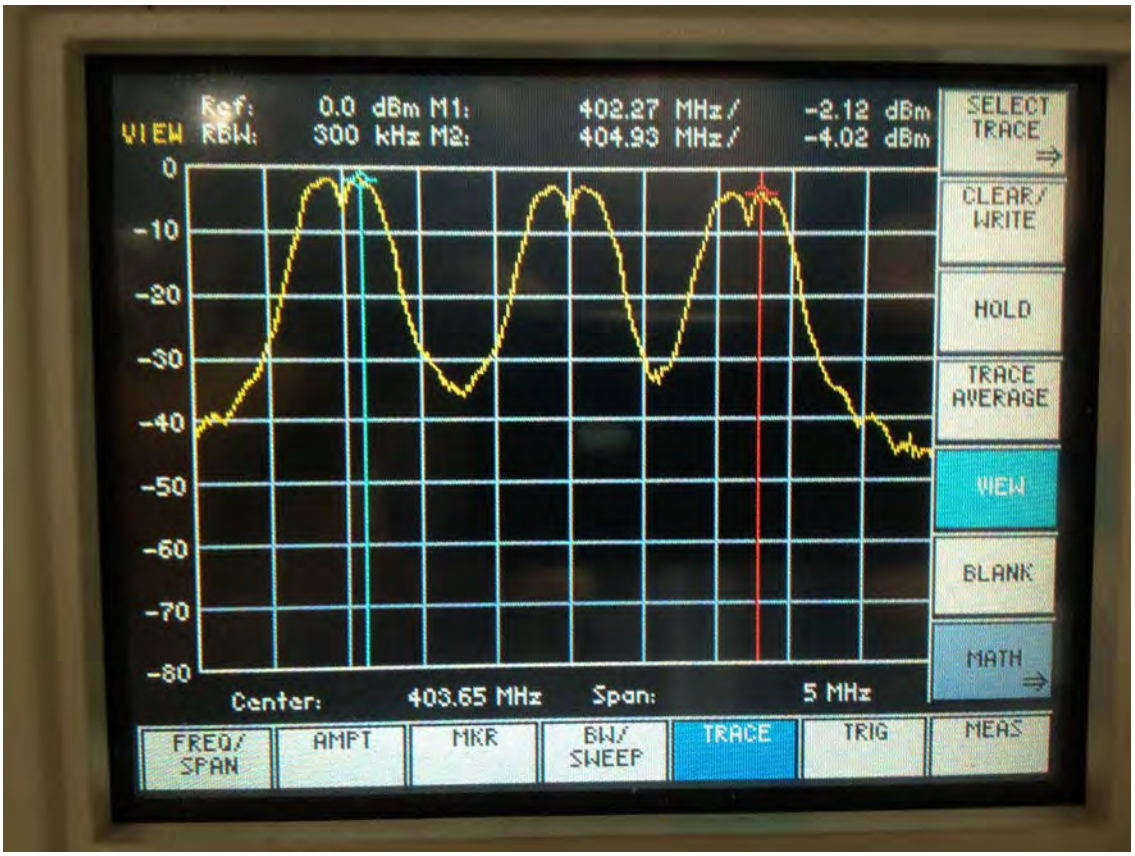


Figure 2– 400 MHz IPG Transmitter Output Power Performance Test Results (Low, Medium, High Freq.)

	Channel 0	Channel 5	Channel 9
Frequency (MHz)	402.15	403.65	404.85
Power Output (dBm)	-2.12	-3.1	-4.02

Table 1

5. Revision History

Revision Level	Revision Description	ECN No#	Effective Date
1.1	Initial Release	2042	11/08/13