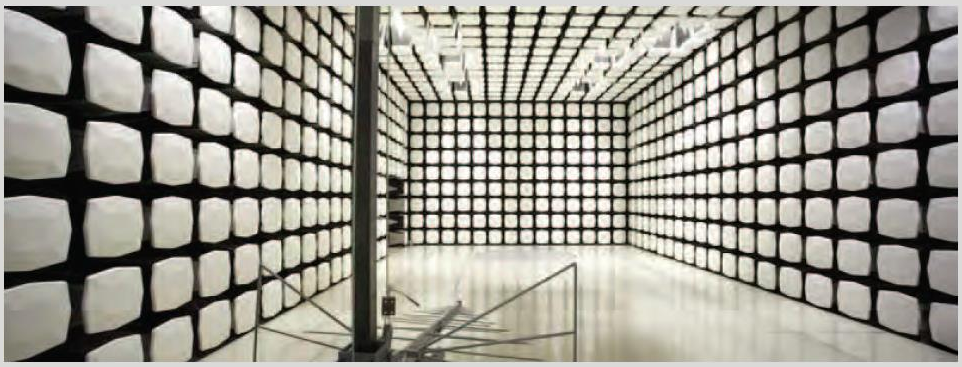
EBR Systems, Inc.

IPG Model 4100 (ICTx)

FCC 95I:2017

MedRadio

Report # EBRS0020



NVLAP Lab Code: 200676-0

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CERTIFICATE OF TEST

Last Date of Test: May 5, 2017
EBR Systems, Inc.
Model: IPG Model 4100 (ICTx)

Radio Equipment Testing

Standards

Specification	Method
FCC 95I:2017	ANSI/TIA/EIA-603-D-2010
	FCC 95.633(e)(3)
	FCC 95.635(d)(4-5)

Results

Method Clause	Test Description	Applied	Results	Comments
FCC 95.633(e)(3)	Emission Bandwidth	Yes	Pass	
FCC 95.635(d)(4-5)	Emission Mask	Yes	Pass	
TIA-603 2.2.1	Output Power	Yes	Pass	
TIA-603 2.2.2	Frequency Stability	Yes	Pass	
TIA-603 2.2.12	Spurious Radiated Emissions	Yes	Pass	
TIA-603 2.2.13	Spurious Conducted Emissions	Yes	Pass	
TIA-603 2.2.17.2	Radiated Power (EIRP)	Yes	Pass	

Deviations From Test Standards

None

Approved By:

Victor Ratinoff, Operations Manager

Product compliance is the responsibility of the client; therefore, the tests and equipment modes of operation represented in this report were agreed upon by the client, prior to testing. The results of this test pertain only to the sample(s) tested. The specific description is noted in each of the individual sections of the test report supporting this certificate of test. This report reflects only those tests from the referenced standards shown in the certificate of test. It does not include inspection or verification of labels, identification, marking or user information.

REVISION HISTORY

Revision Number	Description	Date	Page Number
00	None		

ACCREDITATIONS AND AUTHORIZATIONS

2017.5.15

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 Element to certify transmitters to FCC and IC specifications.

NVLAP - Each laboratory is accredited by NVLAP to ISO 17025

Canada

ISED - Recognized by Innovation, Science and Economic Development Canada as a Certification Body (CB). Certification chambers and Open Area Test Sites are filed with ISED.

European Union

European Commission – Validated by the European Commission as a Notified Body under the R&TTE Directive. Within Element, we have a EU Notified Body validated for the EMCD and RED Directives.

Australia/New Zealand

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

Korea

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

Japan

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

Taiwan

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

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

Singapore

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

Israel

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

Hong Kong

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

Vietnam

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

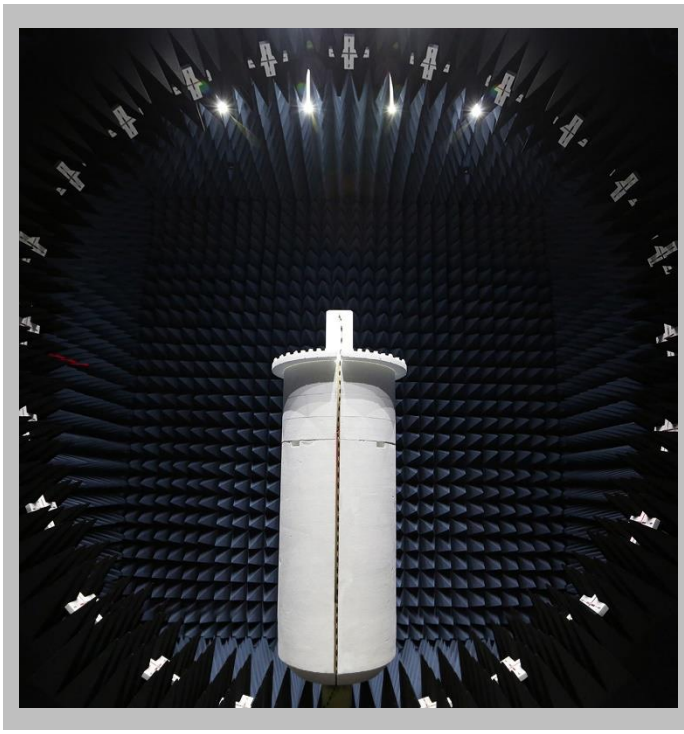
SCOPE

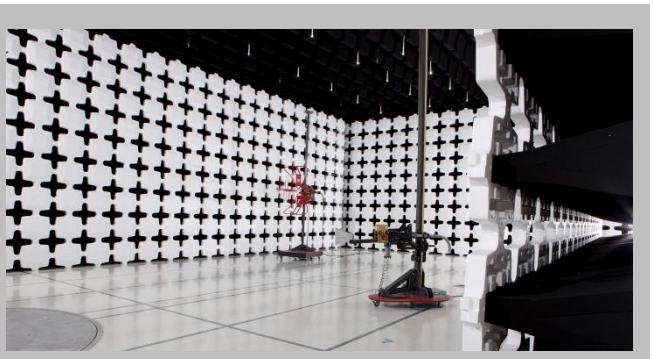
For details on the Scopes of our Accreditations, please visit:
http://portlandcustomer.element.com/ts/scope/scope.htm
http://gsi.nist.gov/global/docs/cabs/designations.html

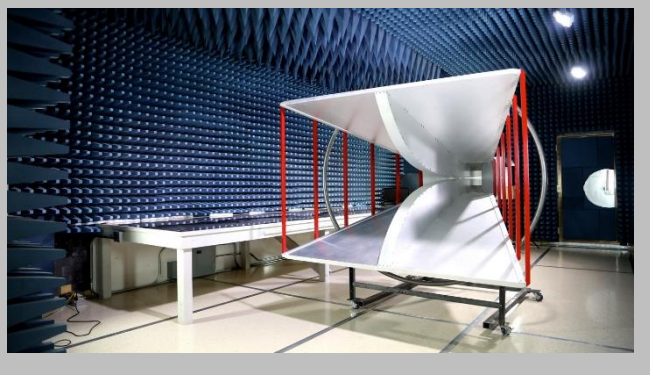
FACILITIES

2017.3.2

California	Minnesota	New York	Oregon	Texas	Washington
Labs OC01-13 41 Tesla Irvine, CA 92618 (949) 861-8918	Labs MN01-08, MN10 9349 W Broadway Ave. Brooklyn Park, MN 55445 (612)-638-5136	Labs NY01-04 4939 Jordan Rd. Elbridge, NY 13060 (315) 554-8214	Labs EV01-12 22975 NW Evergreen Pkwy Hillsboro, OR 97124 (503) 844-4066	Labs TX01-09 3801 E Plano Pkwy Plano, TX 75074 (469) 304-5255	Labs NC01-05 19201 120th Ave NE Bothell, WA 98011 (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
Innovation, Science and Economic Development 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/RRA, MIC, MOC, NCC, OFCA					
US0158	US0175	N/A	US0017	US0191	US0157







MEASUREMENT UNCERTAINTY

TMU.2015.07.10

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.

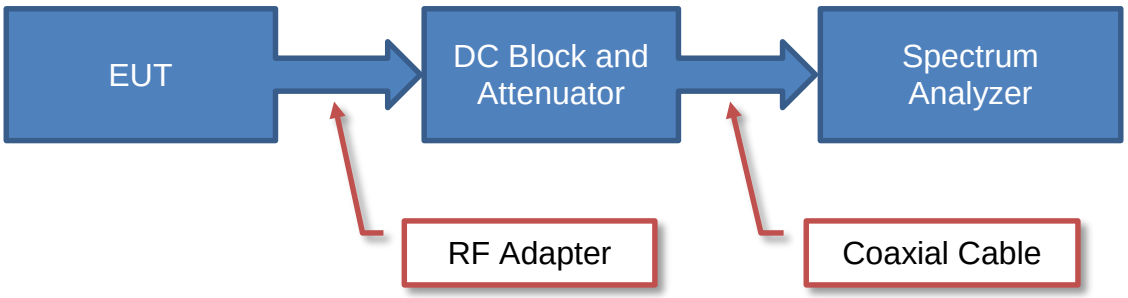
A measurement uncertainty estimation has been performed for each test per our internal quality document QM205.4.6. The estimation is used to compare the measured result with its "true" or theoretically correct value. The expanded measurement uncertainty (K=2) can be found included as part of the applicable test description page. 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.

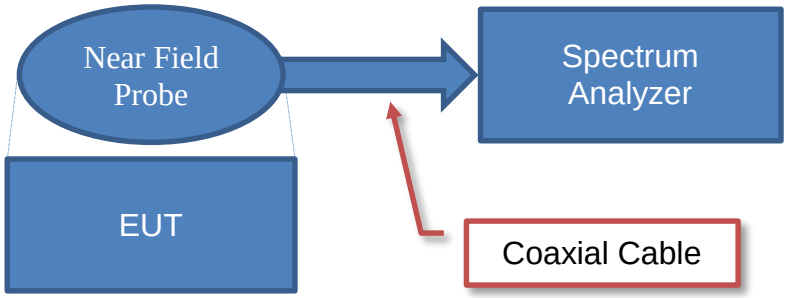
Test	+ MU	- MU
Frequency Accuracy (Hz)	0.0007%	-0.0007%
Amplitude Accuracy (dB)	1.2 dB	-1.2 dB
Conducted Power (dB)	0.3 dB	-0.3 dB
Radiated Power via Substitution (dB)	0.7 dB	-0.7 dB
Temperature (degrees C)	0.7°C	-0.7°C
Humidity (% RH)	2.5% RH	-2.5% RH
Voltage (AC)	1.0%	-1.0%
Voltage (DC)	0.7%	-0.7%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

Test Setup Block Diagrams

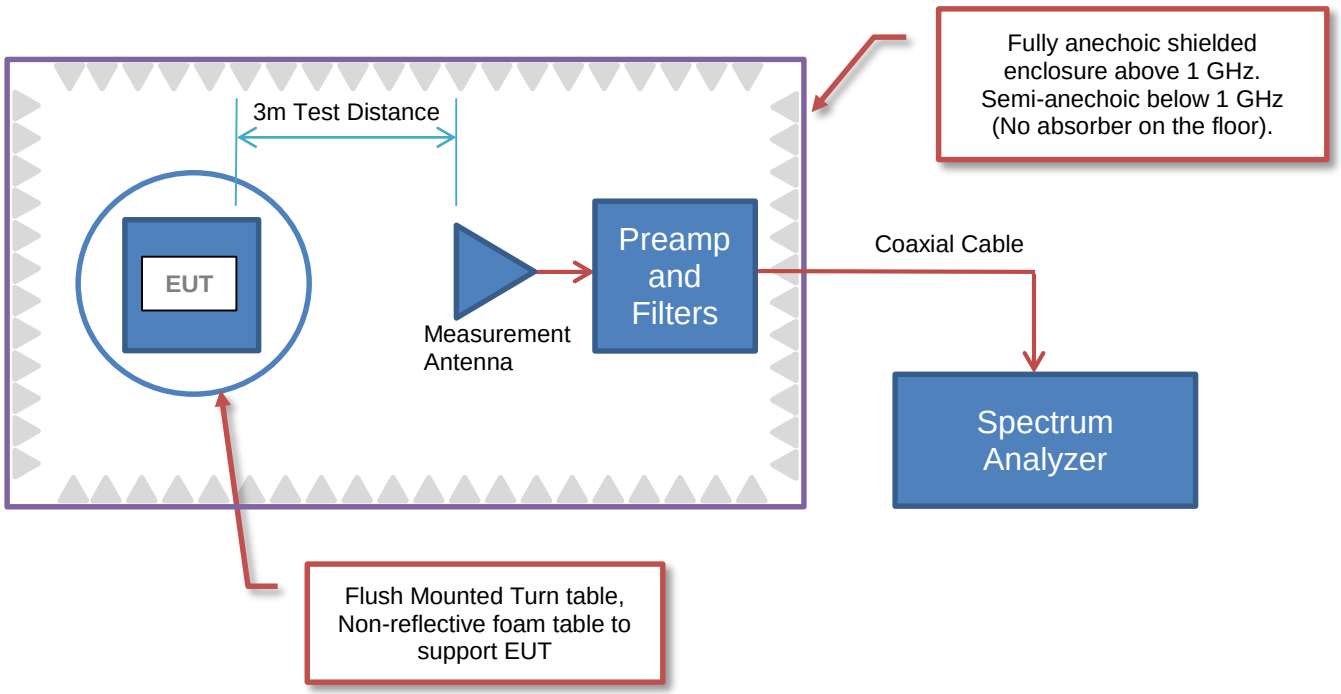
Antenna Port Conducted Measurements



Near Field Test Fixture Measurements



Spurious Radiated Emissions



PRODUCT DESCRIPTION

2017-1-25

Client and Equipment Under Test (EUT) Information

Company Name:	EBR Systems, Inc.
Address:	480 Oakmead Parkway
City, State, Zip:	Sunnyvale, CA 94085
Test Requested By:	Tom Holly
Model:	IPG Model 4100 (ICTx)
First Date of Test:	April 20, 2017
Last Date of Test:	May 5, 2017
Receipt Date of Samples:	April 20, 2017
Equipment Design Stage:	Production
Equipment Condition:	No Damage
Purchase Authorization:	Verified

Information Provided by the Party Requesting the Test

Functional Description of the EUT:
The IPG Model 4100 (ICTx) is a Class III medical device. Specifically it is an implantable ultrasound transmitter, which is part of a cardiac pacing system for treatment of heart failure. It senses using electrodes on the enclosure, and then when it is time to pace the heart it issues ultrasound transmissions to a small separate component of our system (the receiver electrode) which is embedded into the heart muscle, and which puts out the pacing stimulation signal to the tissue. The IPG Model 4100 (ICTx) has a cable which connects to a separate battery module. The IPG Model 4100 (ICTx) communicates to a Programmer using the MICS radio band.

Testing Objective:
Seeking FCC authorization for the MedRadio transmitter to FCC Part 95I.

CONFIGURATIONS

2017-1-25

Configuration EBRS0020- 1

Software/Firmware Running during test	
Description	**Version**
ICTx Firmware	22988

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
IPG (ICTx) Direct Connect	EBR Systems, Inc.	4100	4021186115

Peripherals in test setup boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Adapter Board	EBR Systems, Inc.	2015 Rev 1	3
Base Station Module	EBR Systems, Inc.	BSM100 Rev E	0462
Base Station Module Antenna	Generic	None	None

Remote Equipment Outside of Test Setup Boundary			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Laptop	Dell	PP19S	CN-0P374N-12961-07M-0051-AOO
Laptop Power Supply (Wall Wart)	Dell	WA-30B19U	PK10000H6A0-A01-10AQ-03722
DC Power Supply	TekPower	TP6005E	187890

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
AC Cable	No	1.8m	No	AC Mains	DC Power Supply
DC Cable	No	5.0m	No	Adapter Board	DC Power Supply
Ribbon Cable	No	0.25m	No	Adapter Board	IPG (ICTx) Direct Connect
DC Cable (Wall Wart)	No	2.0m	No	AC Mains	Laptop
USB Cable	No	2.5m	No	Base Station Module	Laptop
DC Cable	No	0.25m	No	IPG (ICTx) Sealed	IPG Battery

CONFIGURATIONS

Configuration EBRS0020- 4

Software/Firmware Running during test	
Description	**Version**
ICTx Firmware	23125

EUT			
Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
IPG (ICTx) Sealed	EBR Systems, Inc.	4100	T0102F
IPG Battery	EBR Systems, Inc.	3000	T00317

Cables					
Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC Cable	No	0.25m	No	IPG (ICTx) Sealed	IPG Battery

MODIFICATIONS

2017-1-25

Equipment Modifications

Item	Date	Test	Modification	Note	Disposition of EUT
1	4/20/2017	Spurious Conducted Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
2	5/5/2017	Emission Bandwidth	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
3	5/5/2017	Emission Mask	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
4	5/5/2017	Output Power	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
5	5/5/2017	Frequency Stability	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
6	5/5/2017	Spurious Radiated Emissions	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	EUT remained at Element following the test.
7	5/5/2017	Radiated Power (EIRP)	Tested as delivered to Test Station.	No EMI suppression devices were added or modified during this test.	Scheduled testing was completed.

EMISSIONS BANDWIDTH

XMit 2017.02.08

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.	Cal. Due
Meter - Multimeter	Fluke	79 III	MMD	2/11/2016	2/11/2019
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	1/5/2017	1/5/2018
Block - DC	Fairview Microwave	SD3379	AMV	1/11/2017	1/11/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/2/2016	11/2/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. 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.

EMISSIONS BANDWIDTH

TbtTx 2017.01.27 XMit 2017.02.08

EUT:	**IPG Model 4100 (ICTx)**			**Work Order:**	**EBRS0020**
Serial Number:	**T0102F**			**Date:**	**05/05/17**
Customer:	**EBR Systems, Inc.**			**Temperature:**	**21.9 °C**
Attendees:	**None**			**Humidity:**	**49.3% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Mark Baytan**	**Power:**	**Battery**	**Job Site:**	**OC12**

TEST SPECIFICATIONS	**Test Method**
FCC 95I:2017	FCC 95.633(e)(3)

COMMENTS

Connected to Battery Model 3000, SN T00317. Reference level offset (DC Block + 20dB Attenuator + Direct Connect Cable) = 21.3 dB

DEVIATIONS FROM TEST STANDARD

None

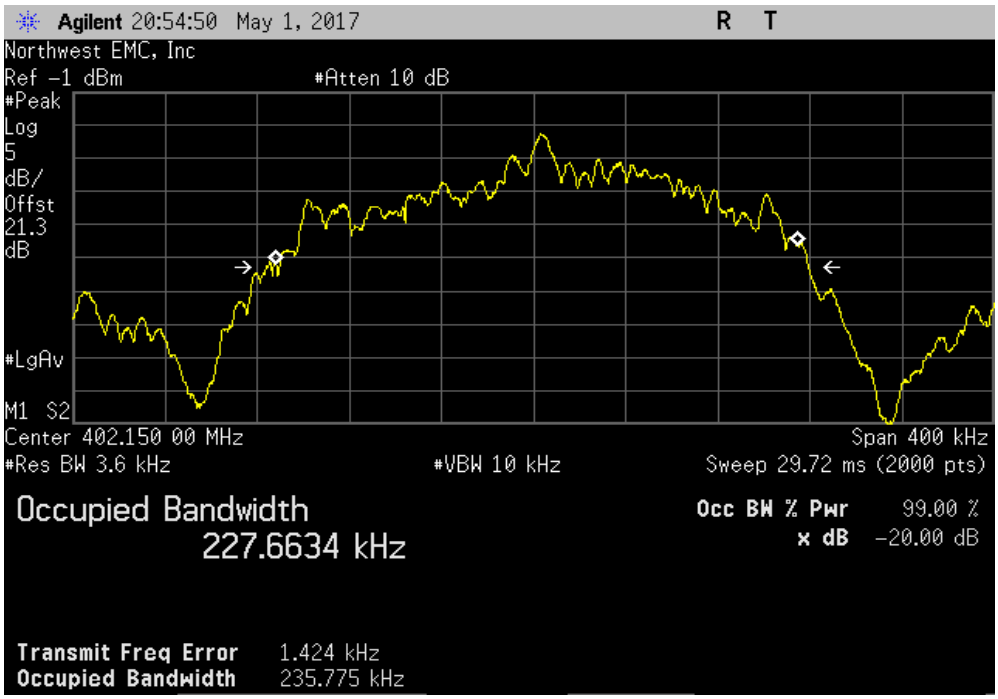
Configuration #	**1**	*Signature*

	Value (kHz)	**Limit (≤) kHz**	**Result**
Low Channel 0, 402.15 MHz	235.775	300	Pass
Mid Channel 4, 403.35 MHz	225.593	300	Pass
High Channel 9, 404.85 MHz	236.440	300	Pass

EMISSIONS BANDWIDTH

TbtTx 2017.01.27 XMit 2017.02.08

Low Channel 0, 402.15 MHz						
				Value (kHz)	Limit (≤) kHz	Result
				235.775	300	Pass



Mid Channel 4, 403.35 MHz						
				Value (kHz)	Limit (≤) kHz	Result
				225.593	300	Pass

EMISSIONS BANDWIDTH

High Channel 9, 404.85 MHz						
				Value (kHz)	Limit (≤) kHz	Result
				236.440	300	Pass

EMISSIONS MASK

XMit 2017.02.08

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.	Cal. Due
Meter - Multimeter	Fluke	79 III	MMD	2/11/2016	2/11/2019
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	1/5/2017	1/5/2018
Block - DC	Fairview Microwave	SD3379	AMV	1/11/2017	1/11/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/2/2016	11/2/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. 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

TbtTx 2017.01.27 XMit 2017.02.08

EUT:	**IPG Model 4100 (ICTx)**			**Work Order:**	**EBRS0020**
Serial Number:	**T0102F**			**Date:**	**05/05/17**
Customer:	**EBR Systems, Inc.**			**Temperature:**	**21.9 °C**
Attendees:	**None**			**Humidity:**	**49.3% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Mark Baytan**	**Power:**	**Battery**	**Job Site:**	**OC12**

TEST SPECIFICATIONS	**Test Method**
FCC 95I:2017	FCC 95.635(d)(4-5)

COMMENTS

Connected to Battery Model 3000, SN T00317. Reference level offset (DC Block + 20dB Attenuator + Direct Connect Cable) = 21.3 dB

DEVIATIONS FROM TEST STANDARD

None

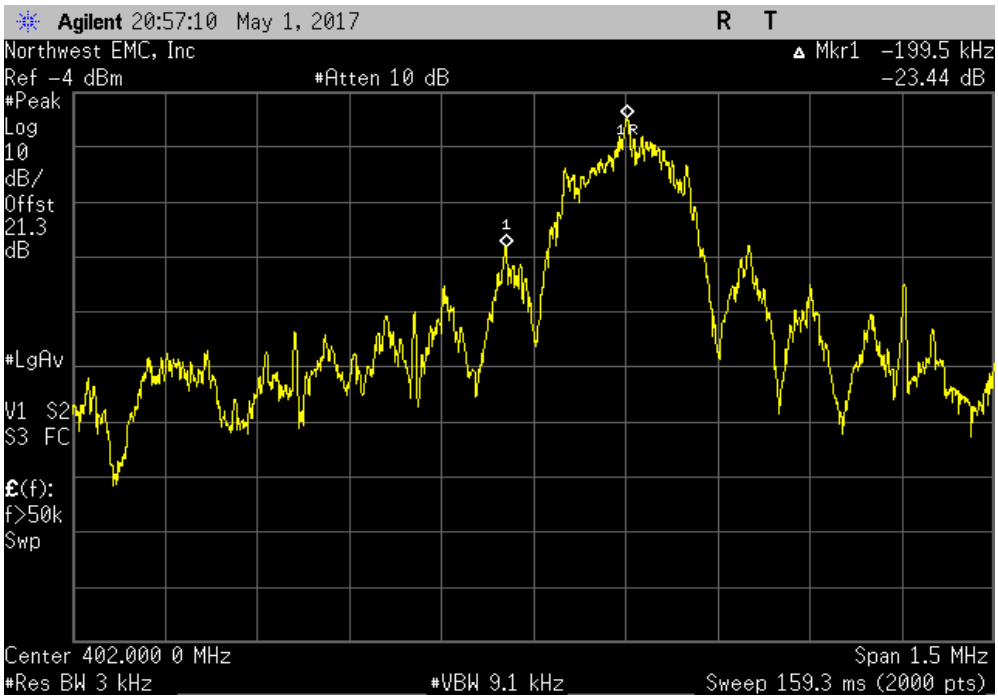
Configuration #	**1**	*Signature*

	Value (dBc)	**Limit ≤ (dBc)**	**Result**
Low Channel 0, 402.15 MHz	-23.44	-20	Pass
High Channel 9, 404.85 MHz	-23.85	-20	Pass

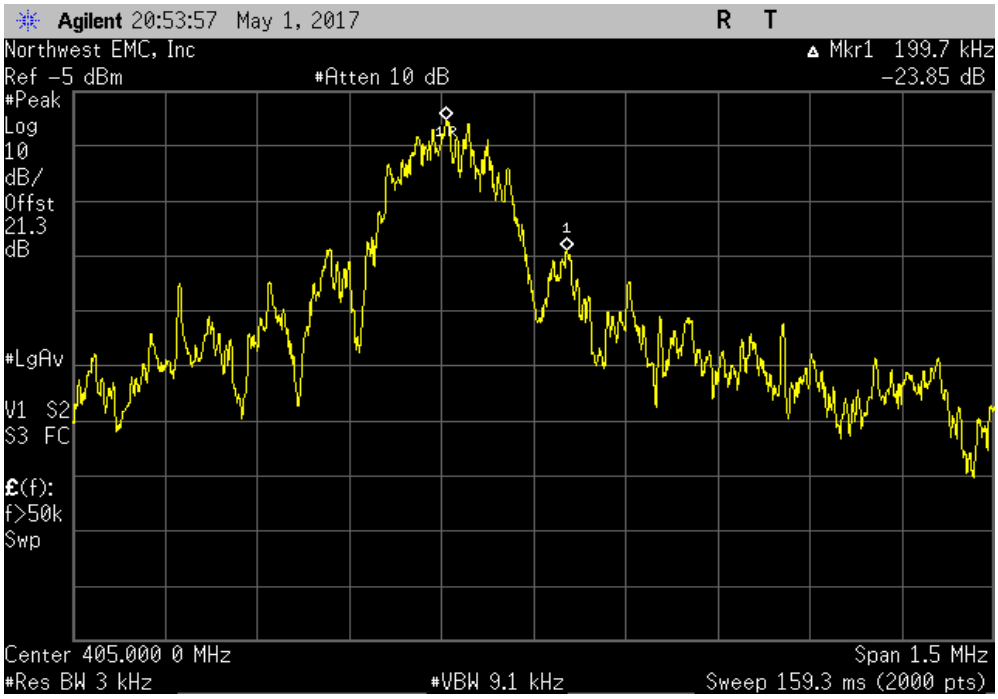
EMISSIONS MASK

TbtTx 2017.01.27 XMit 2017.02.08

Low Channel 0, 402.15 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-23.44	-20	Pass



High Channel 9, 404.85 MHz						
				Value (dBc)	Limit ≤ (dBc)	Result
				-23.85	-20	Pass



OUTPUT POWER

XMit 2017.02.08

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TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Meter - Multimeter	Fluke	79 III	MMD	2/11/2016	2/11/2019
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	1/5/2017	1/5/2018
Block - DC	Fairview Microwave	SD3379	AMV	1/11/2017	1/11/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/2/2016	11/2/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. Per FCC Part 2.1046, RSS-GEN, the output power shall be measured at the RF terminal. The peak output power was measured with the EUT configured in the modes listed in the datasheet. The EUT was transmitting at its maximum data rate.

FCC Part 95 and RSS-243 have no conducted output power limit. It is a requirement to characterize this information and that data is contained within this datasheet.

OUTPUT POWER

TbtTx 2017.01.27 XMit 2017.02.08

EUT:	**IPG Model 4100 (ICTx)**			**Work Order:**	**EBRS0020**
Serial Number:	**T0102F**			**Date:**	**05/05/17**
Customer:	**EBR Systems, Inc.**			**Temperature:**	**21.9 °C**
Attendees:	**None**			**Humidity:**	**49.3% RH**
Project:	**None**			**Barometric Pres.:**	**1015 mbar**
Tested by:	**Mark Baytan**	**Power:**	**Battery**	**Job Site:**	**OC12**

TEST SPECIFICATIONS	**Test Method**
FCC 95I:2017	ANSI/TIA/EIA-603-D-2010

COMMENTS

Connected to Battery Model 3000, SN T00317. Reference level offset (DC Block + 20dB Attenuator + Direct Connect Cable) = 21.3 dB

DEVIATIONS FROM TEST STANDARD

None

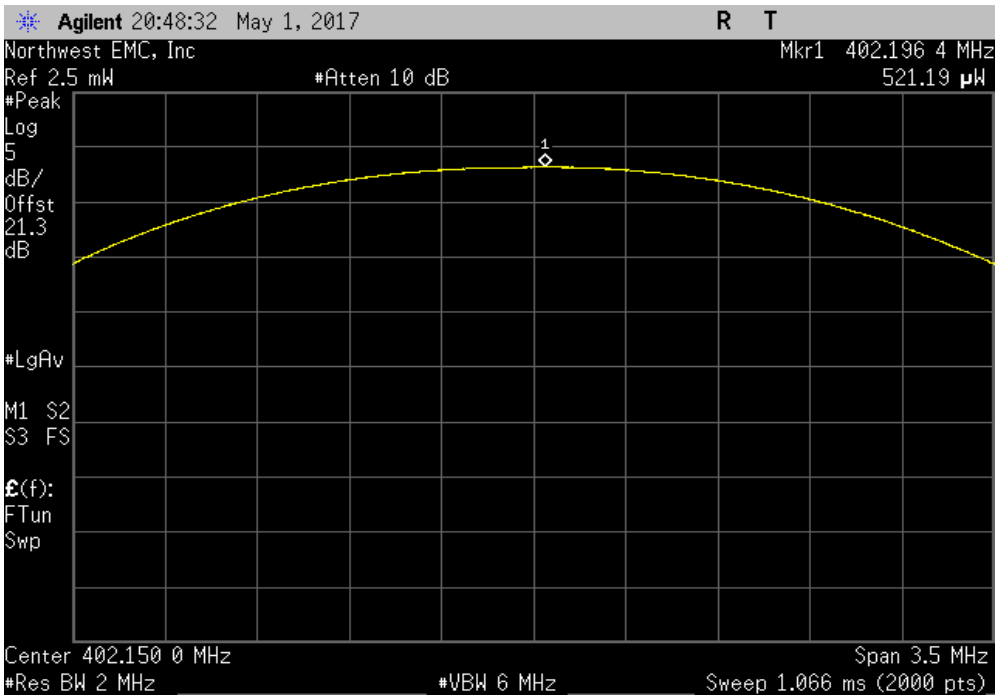
Configuration #	**1**	*Signature*

	Value (uW)	**Limit**	**Result**
Low Channel 0, 402.15 MHz	521.195	N/A	N/A
Mid Channel 4, 403.35 MHz	526.866	N/A	N/A
High Channel 9, 404.85 MHz	447.507	N/A	N/A

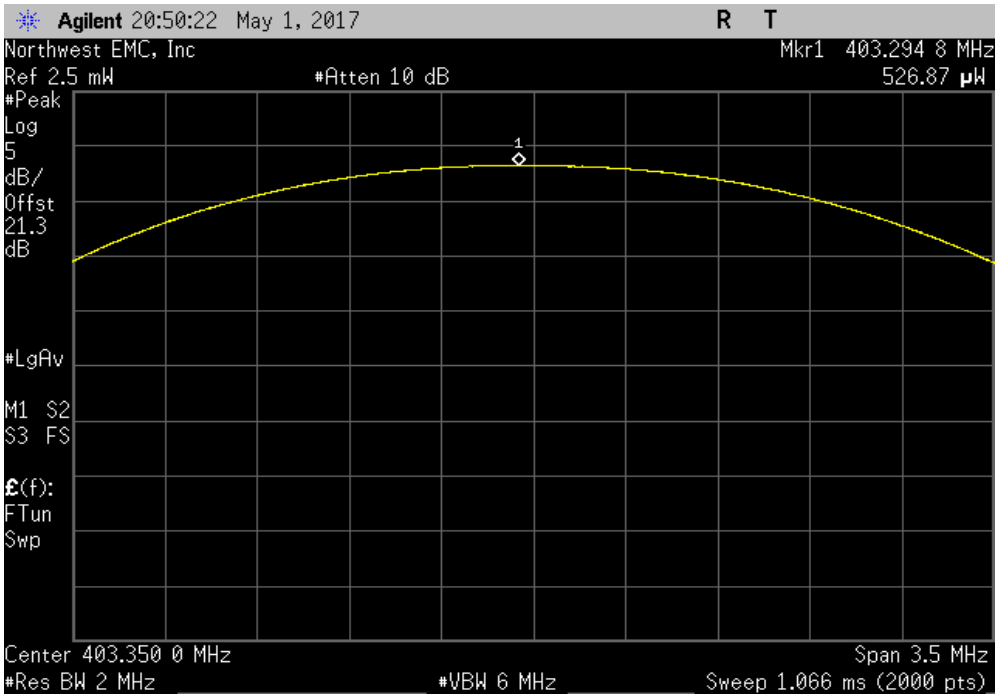
OUTPUT POWER

TbtTx 2017.01.27 XMit 2017.02.08

Low Channel 0, 402.15 MHz						
				Value (uW)	Limit	Result
				521.195	N/A	N/A



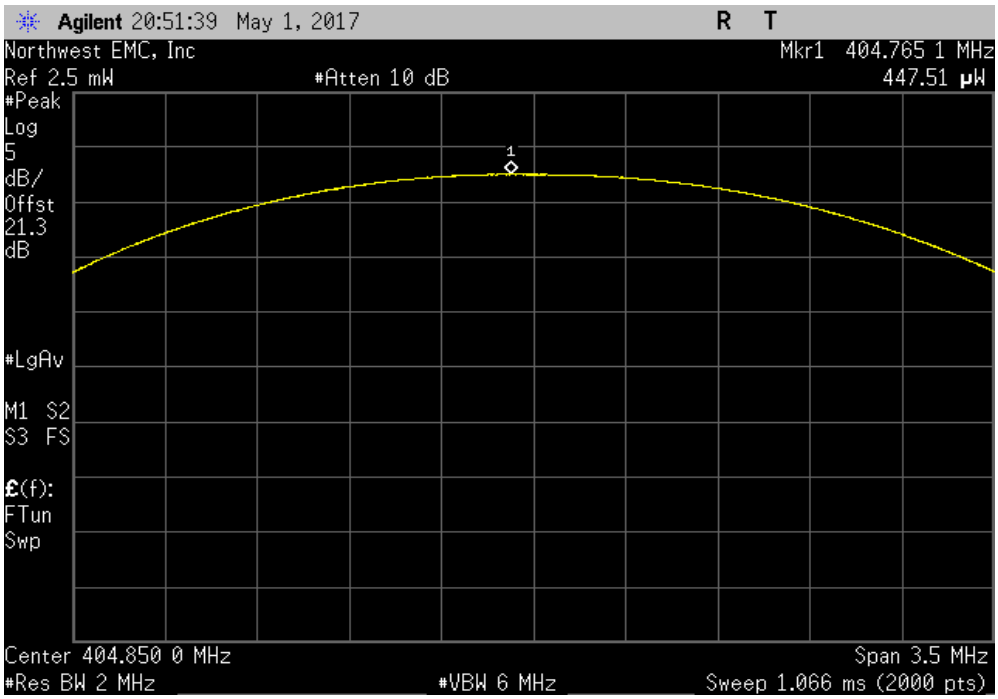
Mid Channel 4, 403.35 MHz						
				Value (uW)	Limit	Result
				526.866	N/A	N/A



OUTPUT POWER

TbtTx 2017.01.27 XMit 2017.02.08

High Channel 9, 404.85 MHz						
				Value (uW)	Limit	Result
				447.507	N/A	N/A



FREQUENCY STABILITY

XMit 2017.02.08

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.	Cal. Due
Thermometer	Omega Engineering, Inc.	HH311	DUC	10/3/2014	10/3/2017
Chamber - Temperature/Humidity	Cincinnati Sub Zero (CSZ)	ZPHS-32-3.5-SCT/AC	TBE	NCR	NCR
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	1/5/2017	1/5/2018
Block - DC	Fairview Microwave	SD3379	AMV	1/11/2017	1/11/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/2/2016	11/2/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT 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.

Variation of Supply Voltage
The primary supply voltage was varied from 85% to 115% of the nominal voltage. A DC lab supply was used to vary the supply voltage.

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).

FREQUENCY STABILITY

TbtTx 2017.01.27 XMit 2017.02.08

EUT:	IPG Model 4100 (ICTx)			**Work Order:**	EBRS0020
Serial Number:	T0102F			**Date:**	05/05/17
Customer:	EBR Systems, Inc.			**Temperature:**	21.9 °C
Attendees:	None			**Humidity:**	49.3% RH
Project:	None			**Barometric Pres.:**	1015 mbar
Tested by:	Mark Baytan	**Power:**	Battery	**Job Site:**	OC12

TEST SPECIFICATIONS	Test Method
FCC 95I:2017	ANSI/TIA/EIA-603-D-2010

COMMENTS

Connected to Battery Model 3000, SN T00317. Reference level offset (DC Block + 20dB Attenuator + Direct Connect Cable) = 21.3 dB

DEVIATIONS FROM TEST STANDARD

None

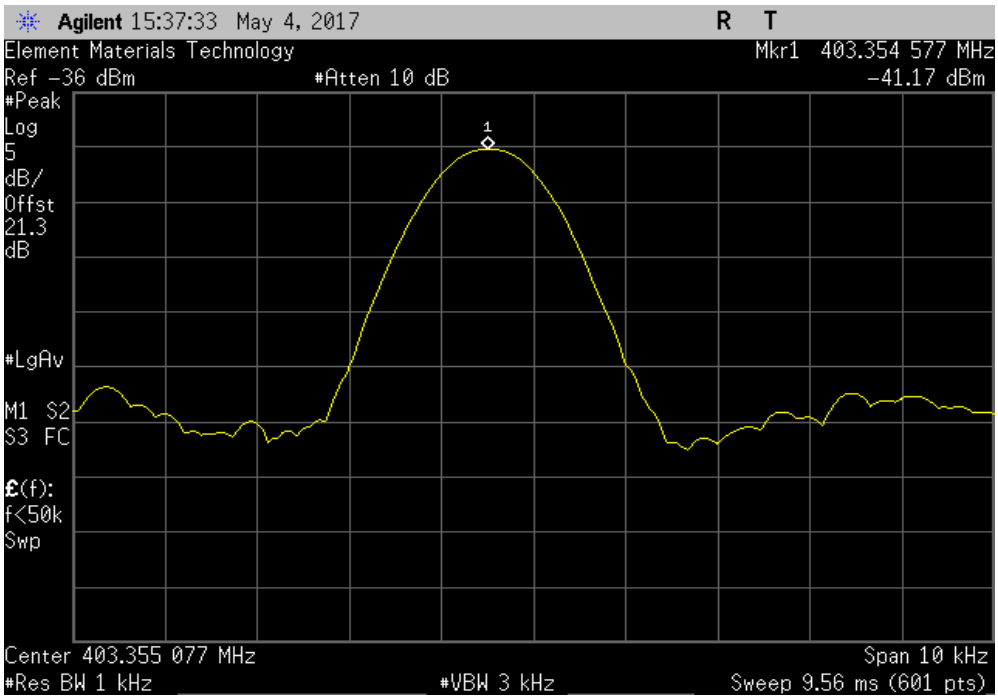
Configuration #	1	Signature

	Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
Normal Voltage					
Mid Channel, 403.35 MHz	403.354577	403.35	11.4	100	Pass
Extreme Voltage +15%					
Mid Channel, 403.35 MHz	403.354545	403.35	11.3	100	Pass
Extreme Voltage -15%					
Mid Channel, 403.35 MHz	403.354511	403.35	11.2	100	Pass
Extreme Temperature +45°C					
Mid Channel, 403.35 MHz	403.348899	403.35	2.7	100	Pass
Extreme Temperature +35°C					
Mid Channel, 403.35 MHz	403.351371	403.35	3.4	100	Pass
Extreme Temperature +25°C					
Mid Channel, 403.35 MHz	403.354644	403.35	11.5	100	Pass

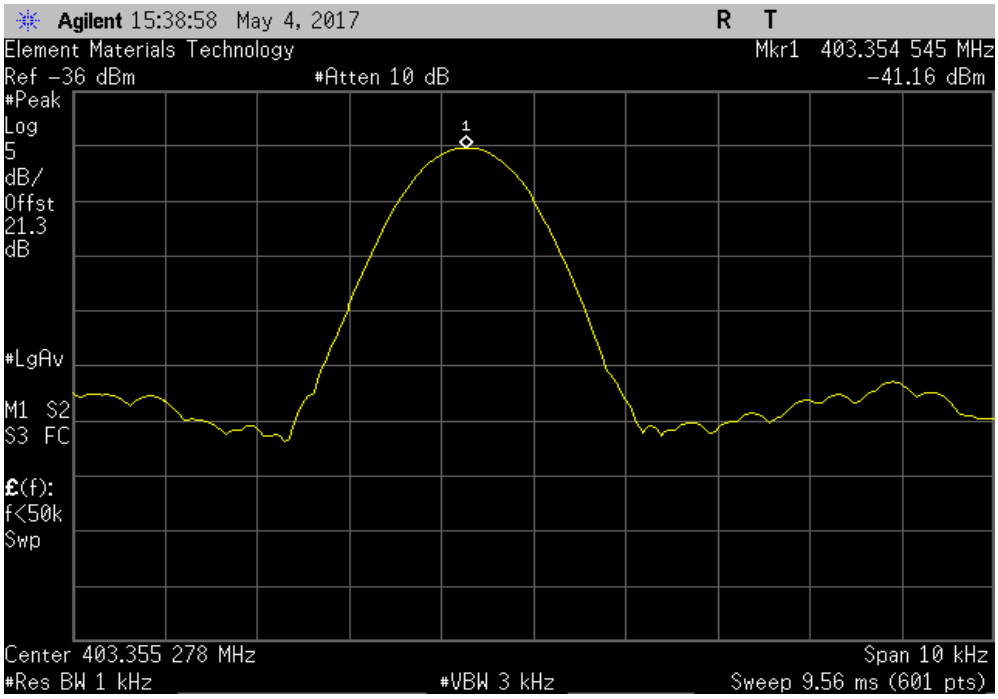
FREQUENCY STABILITY

TbtTx 2017.01.27 XMit 2017.02.08

Normal Voltage, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
		403.354577	403.35	11.4	100	Pass



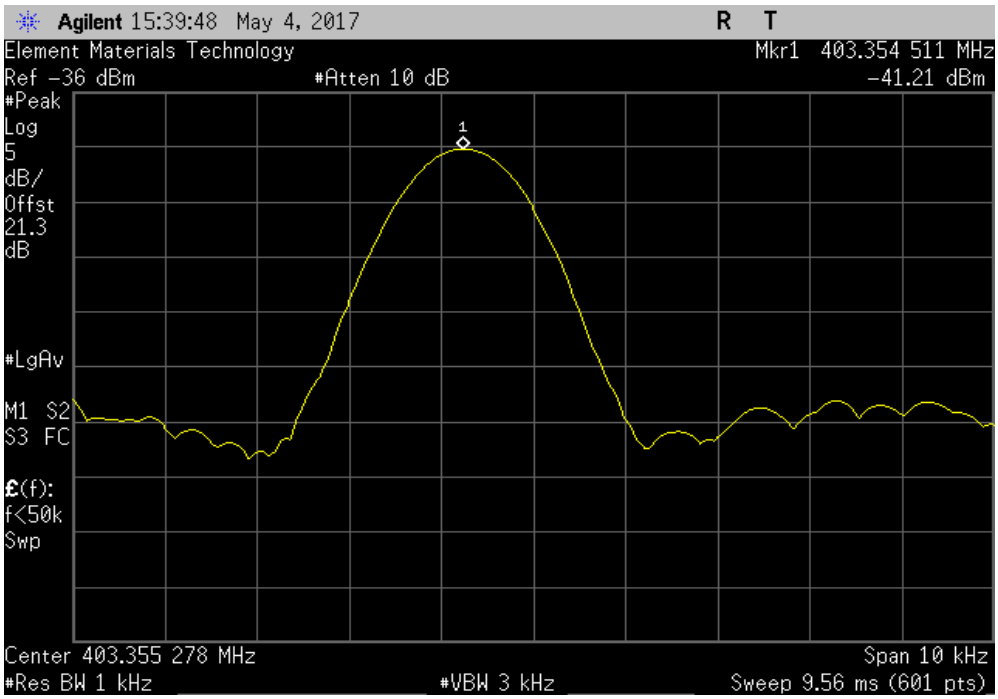
Extreme Voltage +15%, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
		403.354545	403.35	11.3	100	Pass



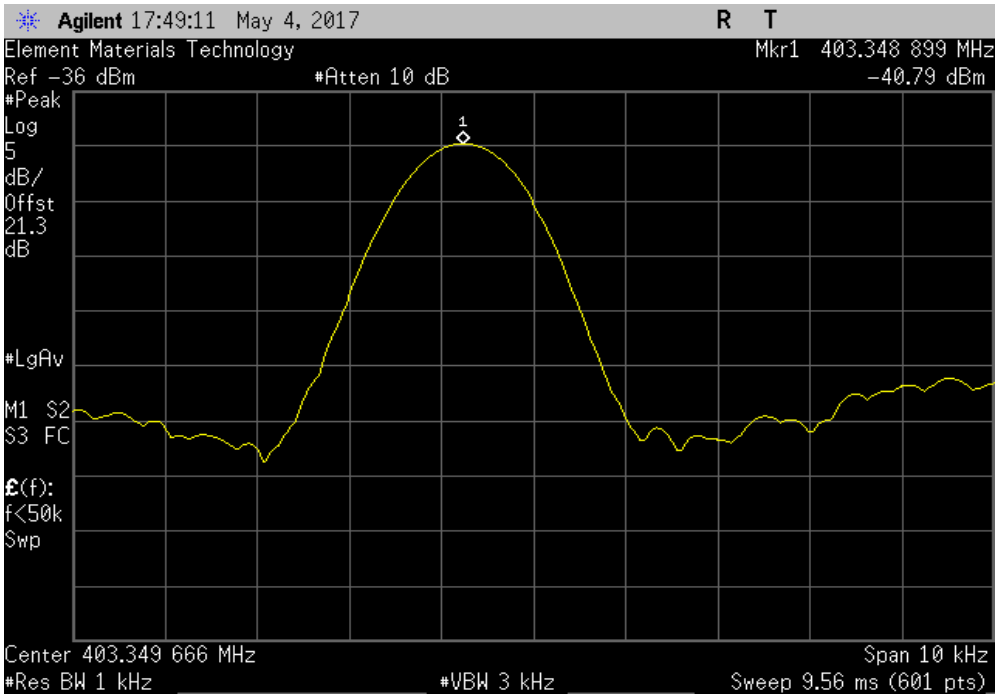
FREQUENCY STABILITY

TbtTx 2017.01.27 XMit 2017.02.08

Extreme Voltage -15%, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
		403.354511	403.35	11.2	100	Pass



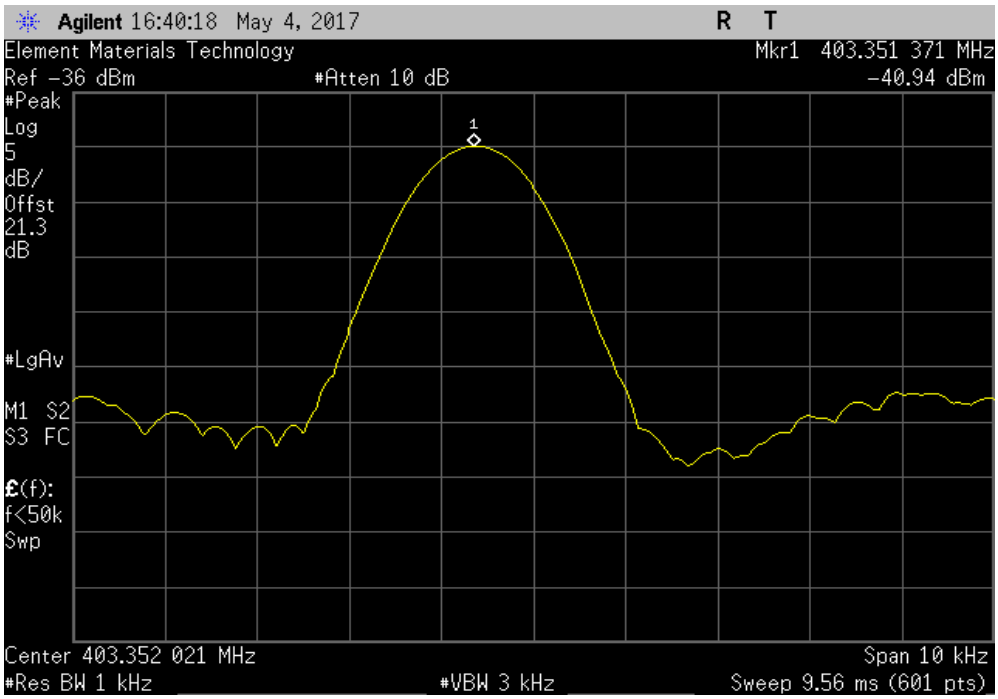
Extreme Temperature +45°C, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
		403.348899	403.35	2.7	100	Pass



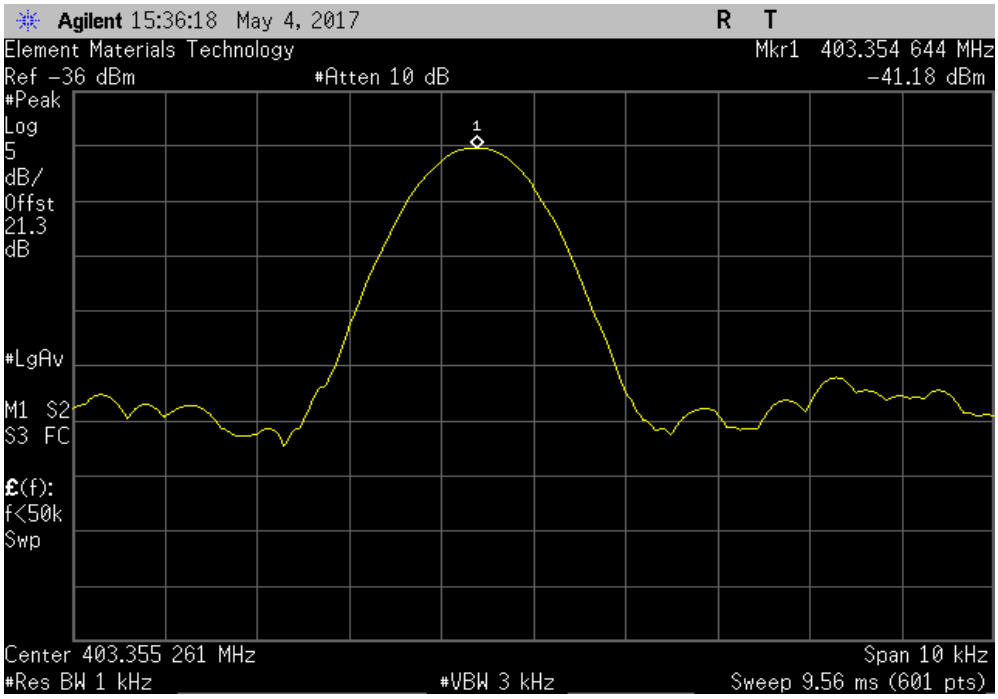
FREQUENCY STABILITY

TbtTx 2017.01.27 XMit 2017.02.08

Extreme Temperature +35°C, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
		403.351371	403.35	3.4	100	Pass



Extreme Temperature +25°C, Mid Channel, 403.35 MHz						
		Measured Value (MHz)	Assigned Value (MHz)	Error (ppm)	Limit (ppm)	Results
		403.354644	403.35	11.5	100	Pass



SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2017.01.26

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.	Cal. Due
Meter - Power	Hewlett Packard	E4418A	SPA	1/26/2017	1/26/2018
Power Sensor	Agilent	E4412A	SQE	1/26/2017	1/26/2018
Antenna - Dipole	EMCO	3121C-DB1,DB2,DB3,DB4	ADC	NCR	NCR
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	4/16/2018
Cable	Northwest EMC	1-8GHz RE Cables	OCJ	8/4/2016	8/4/2017
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	8/9/2016	8/9/2017
Antenna - Biconilog	EMCO	3142	AXB	11/6/2015	11/6/2017
Amplifier - Pre-Amplifier	Miteq	AM-1402	AOZ	8/10/2016	8/10/2017
Amplifier - Pre-Amplifier	Miteq	AMF-4D-010120-30-10P-1	AOP	8/4/2016	8/4/2017
Antenna - Double Ridge	EMCO	3115	AHB	3/21/2016	3/21/2018
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	1/28/2017	1/28/2018

TEST DESCRIPTION

The measurement was made in a radiated configuration of the fundamental with the carrier fully maximized for its highest radiated power. The EUT was operated in three orthogonal axis in transmit mode. The EUT was transmitting with a CW signal. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the measurement antenna height (1-4 meters) and polarization. The amplitude and frequency of the highest emissions were noted. The EUT was then replaced with a ½ wave dipole that was successively tuned to each of the highest emissions. A signal generator was connected to the dipole antenna and its output was adjusted to match the level previously noted for each frequency. The output of the signal generator was recorded, and by factoring in the cable loss to the dipole antenna and its gain (dBi); the effective radiated power for the fundamental emission was determined.

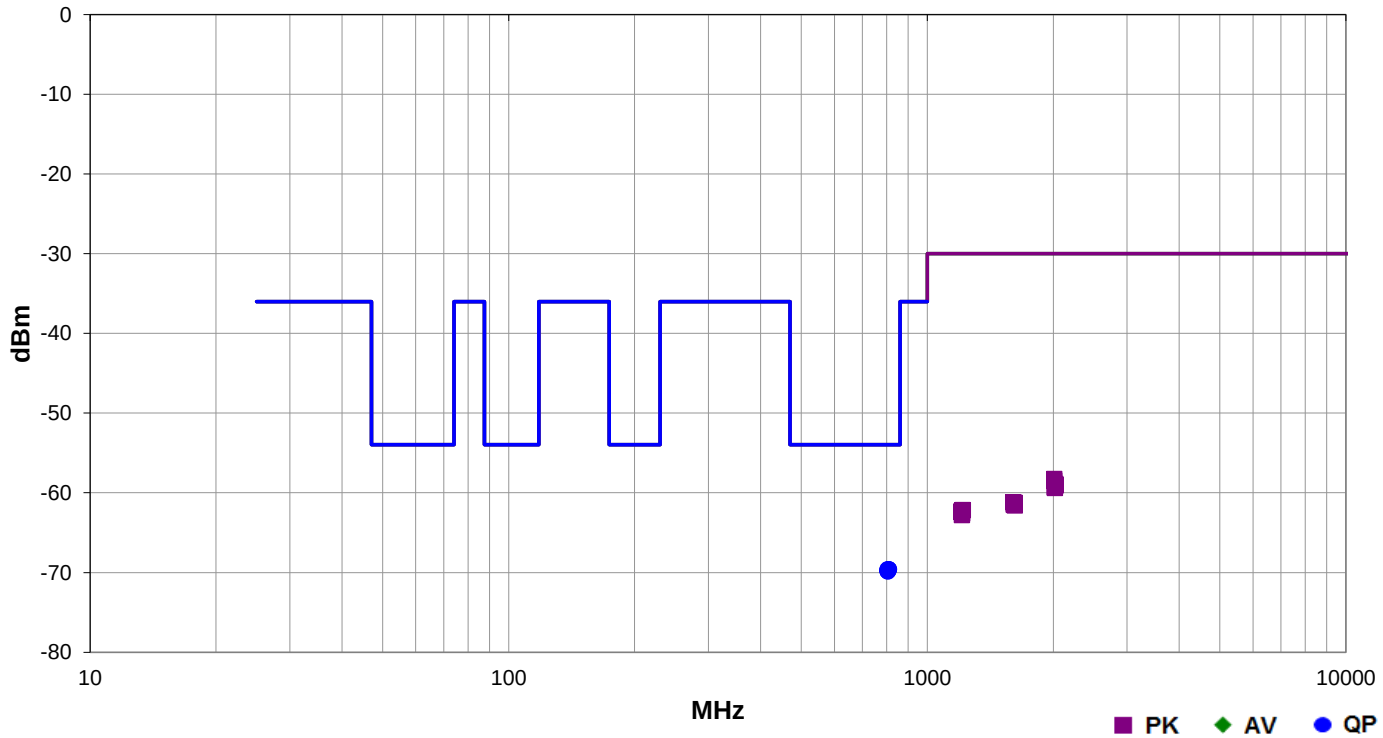
SPURIOUS RADIATED EMISSIONS

PSA-ESCI 2017.01.26

Work Order:	EBRS0020	**Date:**	05/05/17		
Project:	None	**Temperature:**	23.1 °C		
Job Site:	OC10	**Humidity:**	47% RH		
Serial Number:	T0102F	**Barometric Pres.:**	1013 mbar	**Tested by:**	Mark Baytan
EUT:	IPG Model 4100 (ICTx)				
Configuration:	4				
Customer:	EBR Systems, Inc.				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Transmitting MICS: Low Channel 0 (402.15 MHz), Mid Channel 4 (403.35 MHz), High Channel 9 (404.85 MHz)				
Deviations:	None				
Comments:	Connected to Battery Model 3000, SN T00317				

Test Specifications	**Test Method**
FCC 95I:2017	ANSI/TIA/EIA-603-D-2010

Run #	8	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**Results**	Pass



	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	ERP (Watts)	ERP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	804.150	1.0	350.0	Horz	QP	1.10E-10	-69.6	-54.0	-15.6	Low Ch 0, EUT Vert
	809.657	1.0	240.0	Horz	QP	1.10E-10	-69.6	-54.0	-15.6	High Ch 9, EUT Vert
	809.985	1.0	48.0	Vert	QP	1.10E-10	-69.6	-54.0	-15.6	High Ch 9, EUT Horz
	804.153	1.0	230.0	Vert	QP	1.08E-10	-69.7	-54.0	-15.7	Low Ch 0, EUT Horz
	806.592	1.0	202.0	Vert	QP	1.08E-10	-69.7	-54.0	-15.7	Mid Ch 4, EUT Horz

	Freq (MHz)	Antenna Height (meters)	Azimuth (degrees)	Polarity/ Transducer Type	Detector	ERP (Watts)	ERP (dBm)	Spec. Limit (dBm)	Compared to Spec. (dB)	Comments
	804.522	1.0	272.0	Horz	QP	1.05E-10	-69.8	-54.0	-15.8	Low Ch 0, EUT Horz
	804.298	2.1	176.0	Horz	QP	1.05E-10	-69.8	-54.0	-15.8	Low Ch 0, EUT on Side
	804.052	1.0	182.0	Vert	QP	1.05E-10	-69.8	-54.0	-15.8	Low Ch 0, EUT on Side
	806.480	1.0	247.0	Horz	QP	1.05E-10	-69.8	-54.0	-15.8	Mid Ch 4, EUT Vert
	804.518	1.0	59.0	Vert	QP	1.03E-10	-69.9	-54.0	-15.9	Low Ch 0, EUT Vert
	2011.170	1.1	186.0	Horz	PK	1.49E-09	-58.3	-30.0	-28.3	Low Ch 0, EUT Vert
	2010.240	1.0	17.0	Vert	PK	1.42E-09	-58.5	-30.0	-28.5	Low Ch 0, EUT Horz
	2023.125	1.0	313.0	Vert	PK	1.29E-09	-58.9	-30.0	-28.9	High Ch 9, EUT Horz
	2024.450	4.0	118.0	Horz	PK	1.24E-09	-59.1	-30.0	-29.1	High Ch 9, EUT Vert
	2015.450	1.0	0.0	Vert	PK	1.18E-09	-59.3	-30.0	-29.3	Mid Ch 4, EUT Horz
	2017.520	1.0	22.0	Horz	PK	1.15E-09	-59.4	-30.0	-29.4	Mid Ch 4, EUT Vert
	1607.455	1.0	313.0	Vert	PK	7.62E-10	-61.2	-30.0	-31.2	Low Ch 0, EUT Horz
	1617.915	1.0	183.0	Horz	PK	7.45E-10	-61.3	-30.0	-31.3	High Ch 9, EUT Vert
	1613.490	2.9	1.0	Horz	PK	7.28E-10	-61.4	-30.0	-31.4	Mid Ch 4, EUT Vert
	1613.290	1.0	241.0	Vert	PK	7.28E-10	-61.4	-30.0	-31.4	Mid Ch 4, EUT Horz
	1609.540	1.0	329.0	Horz	PK	7.11E-10	-61.5	-30.0	-31.5	Low Ch 0, EUT Vert
	1618.675	1.0	176.0	Vert	PK	6.95E-10	-61.6	-30.0	-31.6	High Ch 9, EUT Horz
	1213.305	1.0	166.0	Horz	PK	6.05E-10	-62.2	-30.0	-32.2	High Ch 9, EUT Vert
	1215.475	2.0	174.0	Vert	PK	6.05E-10	-62.2	-30.0	-32.2	High Ch 9, EUT Horz
	1205.370	1.0	262.0	Horz	PK	5.78E-10	-62.4	-30.0	-32.4	Low Ch 0, EUT Vert
	1205.440	2.5	108.0	Vert	PK	5.78E-10	-62.4	-30.0	-32.4	Low Ch 0, EUT Horz
	1211.390	1.0	127.0	Horz	PK	5.52E-10	-62.6	-30.0	-32.6	Mid Ch 4, EUT Vert
	1210.660	1.0	335.0	Vert	PK	5.27E-10	-62.8	-30.0	-32.8	Mid Ch 4, EUT Horz

SPURIOUS CONDUCTED EMISSIONS

XMit 2017.02.08

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.	Cal. Due
Meter - Multimeter	Fluke	79 III	MMD	2/11/2016	2/11/2019
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
Attenuator	Fairview Microwave	SA18H-20	TKR	1/5/2017	1/5/2018
Block - DC	Fairview Microwave	SD3379	AMV	1/11/2017	1/11/2018
Analyzer - Spectrum Analyzer	Agilent	E4440A	AFA	11/2/2016	11/2/2017

TEST DESCRIPTION

The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. Per FCC Part 2.1051, RSS-GEN, the spurious emissions shall be measured at the RF terminal. The peak spurious emissions were measured with the EUT configured to the modes listed in the datasheet. The EUT was transmitting at its maximum data rate.

FCC Part 95 and RSS-243 have no conducted spurious emissions limit. It is a requirement to characterize this information and that data is contained within this datasheet.

SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.01.27 XMit 2017.02.08

EUT:	**IPG Model 4100 (ICTx)**			**Work Order:**	**EBRS0020**
Serial Number:	**None**			**Date:**	**04/20/17**
Customer:	**EBR Systems, Inc.**			**Temperature:**	**22.3 °C**
Attendees:	**None**			**Humidity:**	**48.1% RH**
Project:	**None**			**Barometric Pres.:**	**1020 mbar**
Tested by:	**Johnny Candelas**	**Power:**	**2.8 VDC**	**Job Site:**	**OC03**

TEST SPECIFICATIONS	**Test Method**
FCC 95I:2017	ANSI/TIA/EIA-603-D-2010

COMMENTS

DC Block + 20dB Attenuator + Coax Cable = 21.33dB Total Offset

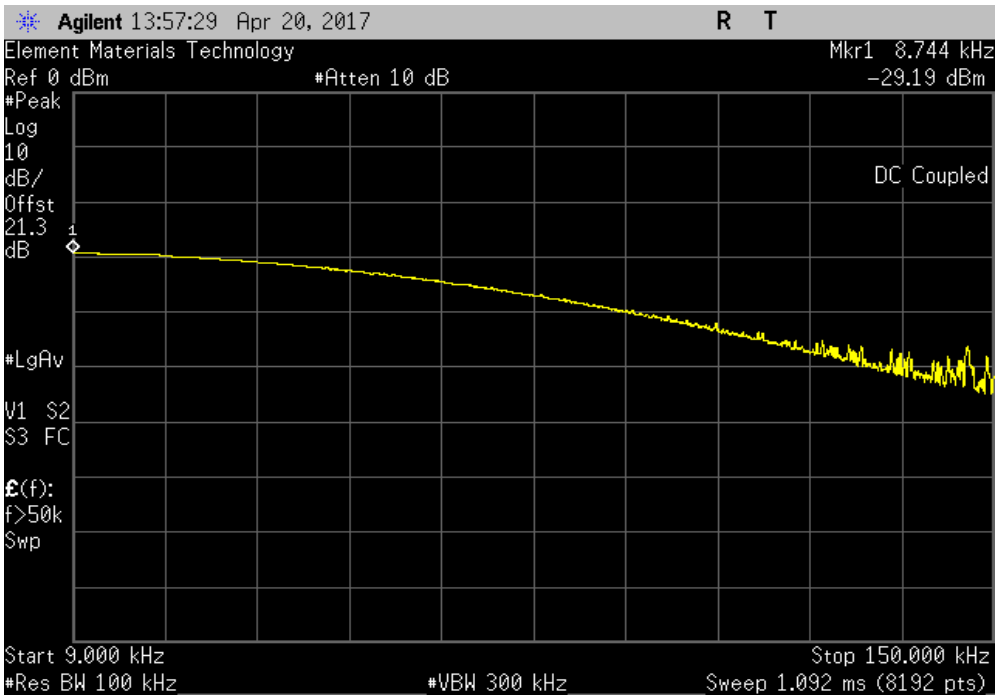
DEVIATIONS FROM TEST STANDARD

None

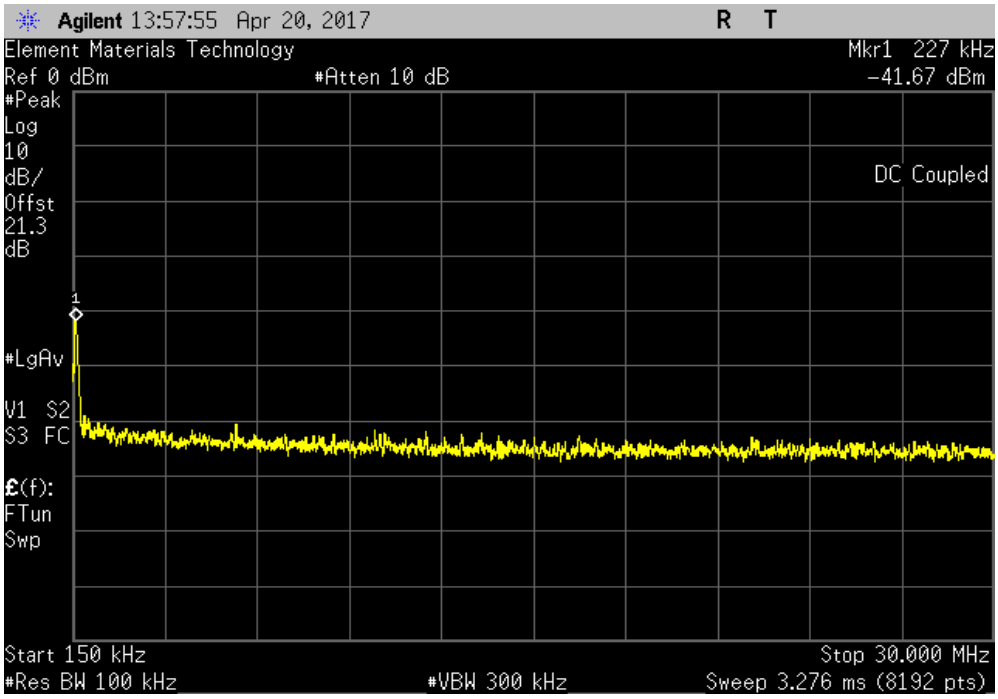
Configuration #	**1**	*Signature*

	Frequency Range	Max Value (dBc)	Limit A (dBc)	Result
Low Channel 0, 402.15 MHz	9 kHz - 150 kHz	-29.19		N/A
Low Channel 0, 402.15 MHz	150 kHz - 30 MHz	-12.65		N/A
Low Channel 0, 402.15 MHz	30 MHz - 5 GHz	25.1		N/A
Mid Channel 4, 403.35 MHz	9 kHz - 150 kHz	-28.98		N/A
Mid Channel 4, 403.35 MHz	150 kHz - 30 MHz	-15.77		N/A
Mid Channel 4, 403.35 MHz	30 MHz - 5 GHz	24.23		N/A
High Channel 9, 404.85 MHz	9 kHz - 150 kHz	-28.91		N/A
High Channel 9, 404.85 MHz	150 kHz - 30 MHz	-12.69		N/A
High Channel 9, 404.85 MHz	30 MHz - 5 GHz	-19.14		N/A

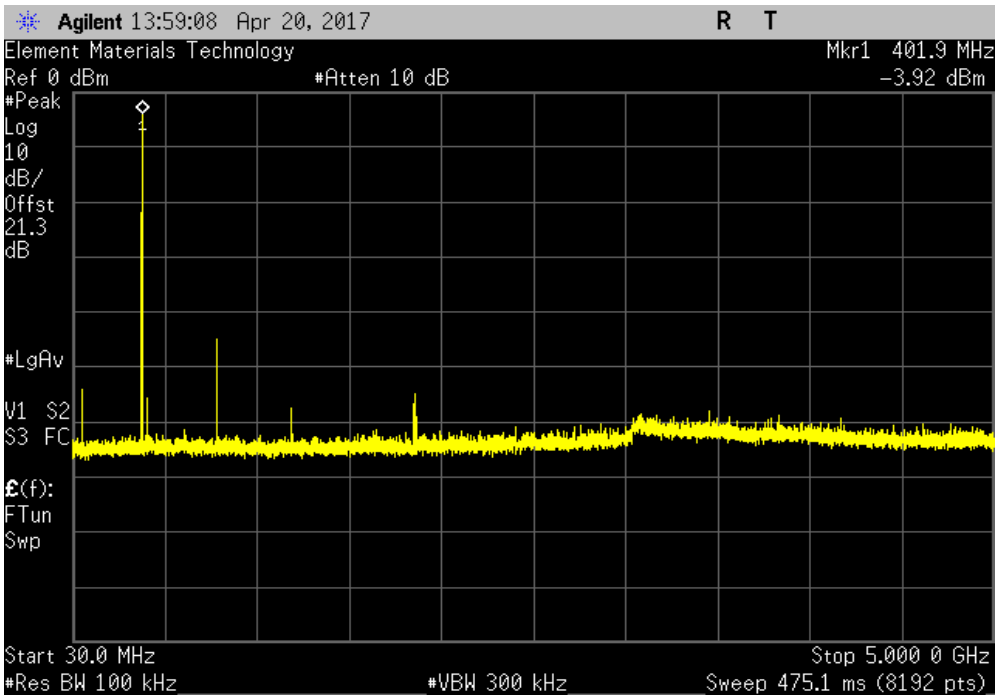
Low Channel 0, 402.15 MHz					
Frequency Range			Max Value (dBc)	Limit A (dBc)	Result
	9 kHz - 150 kHz		-29.19		N/A



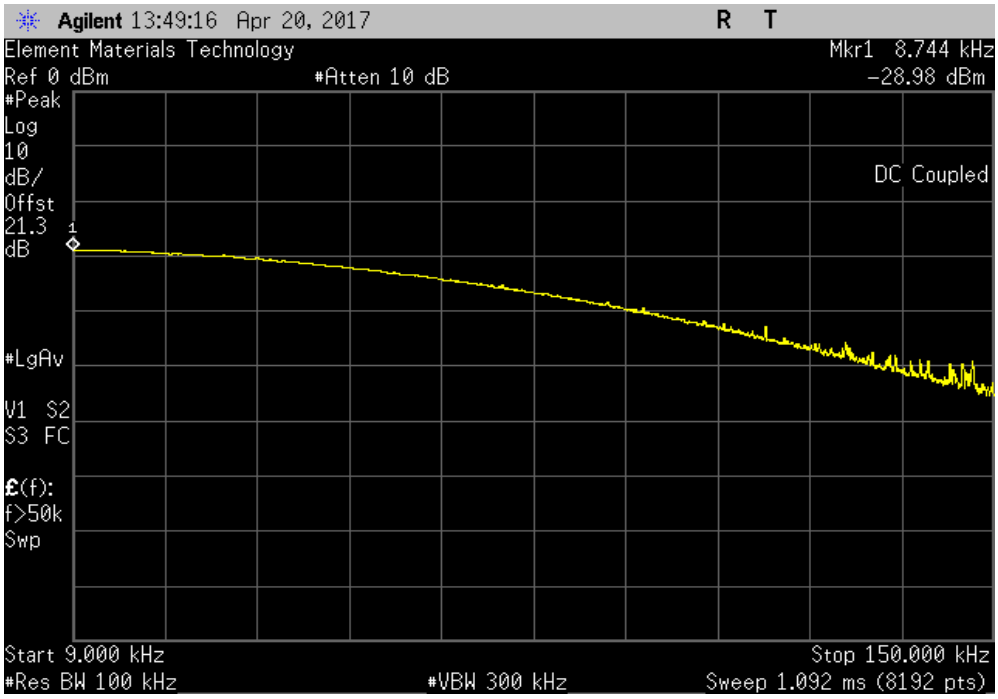
Low Channel 0, 402.15 MHz					
Frequency Range			Max Value (dBc)	Limit A (dBc)	Result
150 kHz - 30 MHz			-12.65		N/A



Low Channel 0, 402.15 MHz						
	Frequency Range			Max Value (dBc)	Limit A (dBc)	Result
	30 MHz - 5 GHz			25.1		N/A



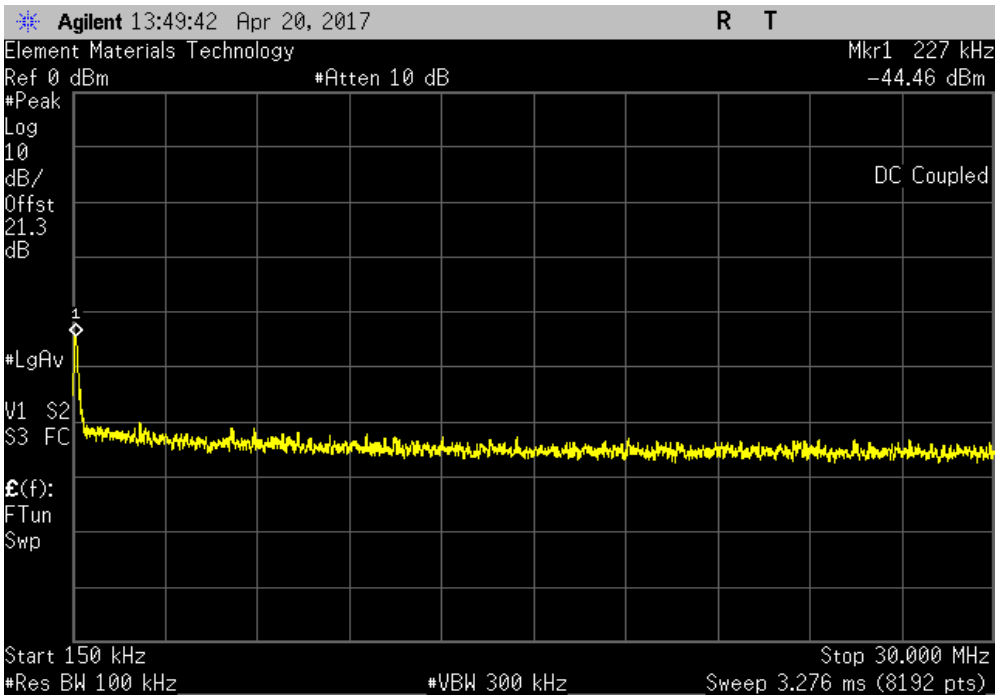
Mid Channel 4, 403.35 MHz						
	Frequency Range			Max Value (dBc)	Limit A (dBc)	Result
	9 kHz - 150 kHz			-28.98		N/A



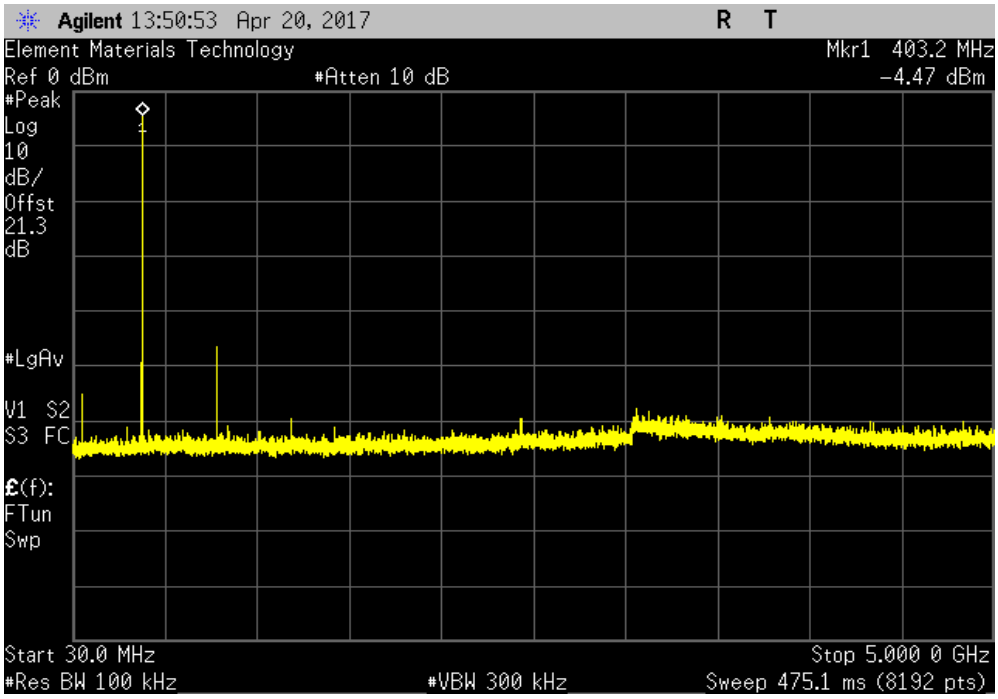
SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.01.27 XMit 2017.02.08

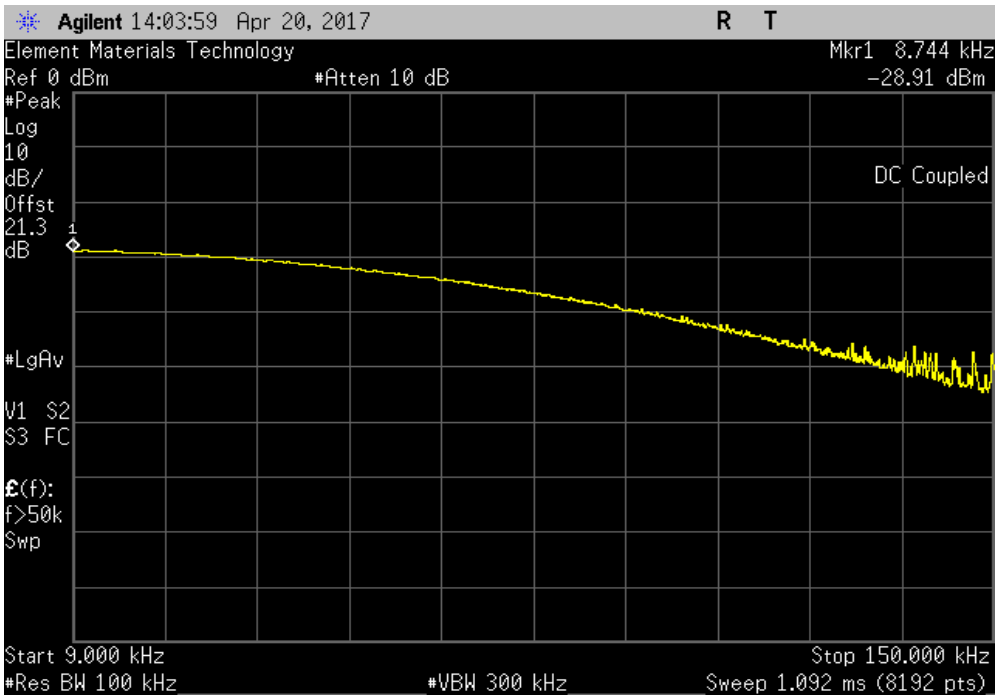
Mid Channel 4, 403.35 MHz				
Frequency Range		Max Value (dBc)	Limit A (dBc)	Result
150 kHz - 30 MHz		-15.77		N/A



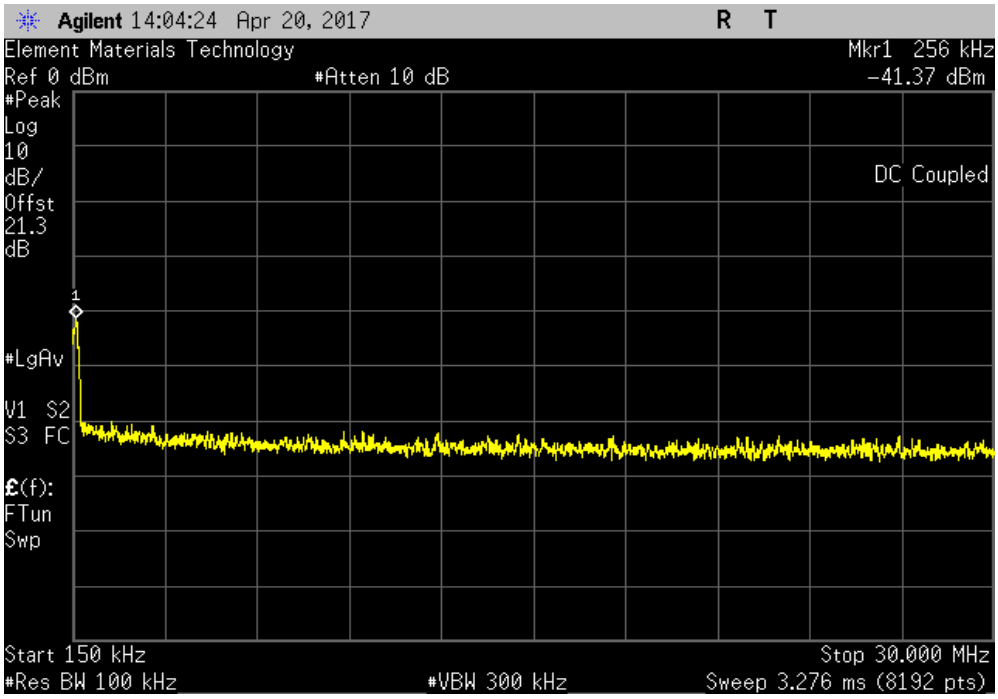
Mid Channel 4, 403.35 MHz				
Frequency Range		Max Value (dBc)	Limit A (dBc)	Result
30 MHz - 5 GHz		24.23		N/A



High Channel 9, 404.85 MHz					
Frequency Range			Max Value (dBc)	Limit A (dBc)	Result
	9 kHz - 150 kHz		-28.91		N/A



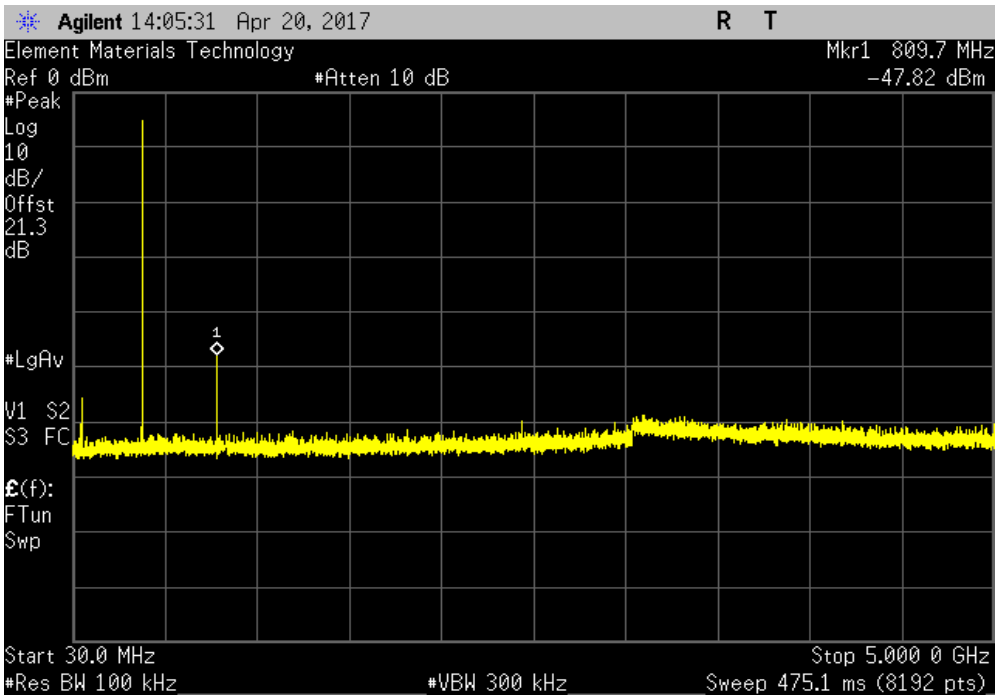
High Channel 9, 404.85 MHz				
Frequency Range		Max Value (dBc)	Limit A (dBc)	Result
150 kHz - 30 MHz		-12.69		N/A



SPURIOUS CONDUCTED EMISSIONS

TbtTx 2017.01.27 XMit 2017.02.08

High Channel 9, 404.85 MHz						
	Frequency Range			Max Value (dBc)	Limit A (dBc)	Result
	30 MHz - 5 GHz			-19.14		N/A



RADIATED POWER (EIRP)

XMit 2017.02.08

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.	Cal. Due
Meter - Power	Hewlett Packard	E4418A	SPA	1/26/2017	1/26/2018
Power Sensor	Agilent	E4412A	SQE	1/26/2017	1/26/2018
Antenna - Dipole	EMCO	3121C-DB1,DB2,DB3,DB4	ADC	NCR	NCR
Generator - Signal	Keysight	N5182B	TFX	4/16/2015	4/16/2018
Cable	Northwest EMC	10kHz-1GHz RE Cables	OCH	8/9/2016	8/9/2017
Antenna - Biconilog	EMCO	3142	AXB	11/6/2015	11/6/2017
Analyzer - Spectrum Analyzer	Agilent	N9010A	AFJ	1/28/2017	1/28/2018

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.

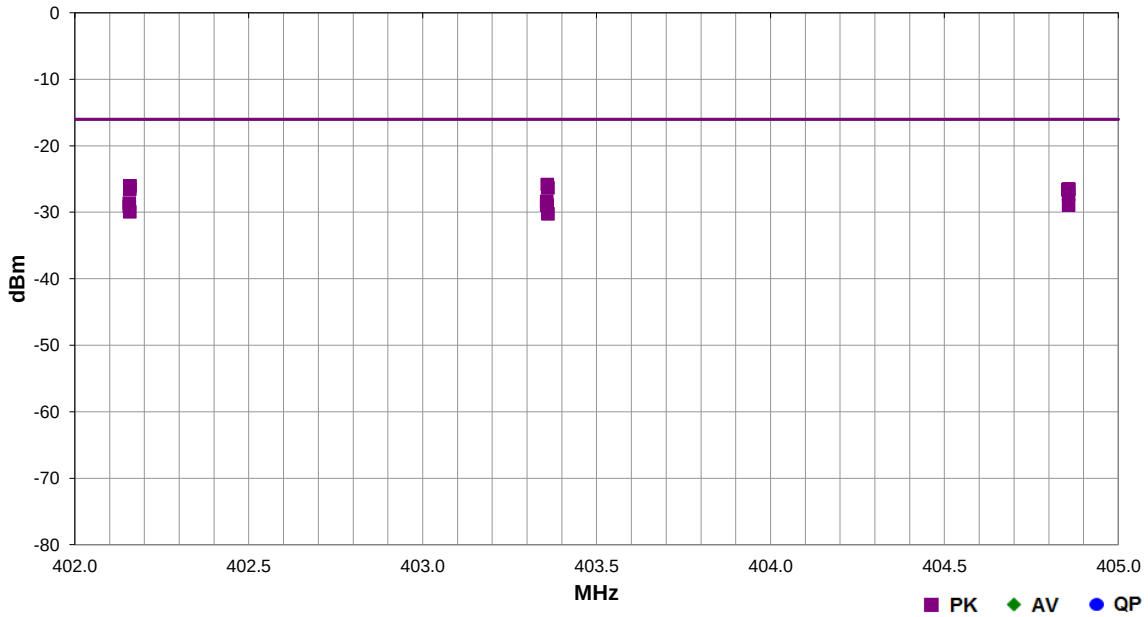
RADIATED POWER (EIRP)

EmiR5 2017.01.25 PSA-ESCI 2017.01.26

Work Order:	EBRS0020	**Date:**	05/05/17		
Project:	None	**Temperature:**	23.1 °C		
Job Site:	OC10	**Humidity:**	47% RH		
Serial Number:	T0102F	**Barometric Pres.:**	1013 mbar	**Tested by:**	Mark Baytan
EUT:	IPG Model 4100 (ICTx)				
Configuration:	4				
Customer:	EBR Systems, Inc.				
Attendees:	None				
EUT Power:	Battery				
Operating Mode:	Transmitting MICS: Low Channel 0 (402.15 MHz), Mid Channel 4 (403.35 MHz), High Channel 9 (404.85 MHz)				
Deviations:	None				
Comments:	Connected to Battery Model 3000, SN T00317				

Test Specifications	**Test Method**
FCC 95I:2017	ANSI/TIA/EIA-603-D-2010

Run #	5	**Test Distance (m)**	3	**Antenna Height(s)**	1 to 4(m)	**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
	403.358	1.0	182.0	Horz	PK	2.61E-06	-25.8	-16.0	-9.8	Mid Ch 4, EUT Horz
	402.158	1.0	178.0	Horz	PK	2.50E-06	-26.0	-16.0	-10.0	Low Ch 0, EUT on Side
	402.158	1.0	182.0	Horz	PK	2.50E-06	-26.0	-16.0	-10.0	Low Ch 0, EUT Horz
	403.360	1.0	285.0	Vert	PK	2.33E-06	-26.3	-16.0	-10.3	Mid Ch 4, EUT Vert
	402.158	1.0	287.0	Vert	PK	2.22E-06	-26.5	-16.0	-10.5	Low Ch 0, EUT Vert
	404.857	1.9	31.0	Horz	PK	2.22E-06	-26.5	-16.0	-10.5	High Ch 9, EUT Vert
	404.857	1.0	153.0	Vert	PK	2.22E-06	-26.5	-16.0	-10.5	High Ch 9, EUT Vert
	404.857	1.0	179.0	Horz	PK	2.22E-06	-26.5	-16.0	-10.5	High Ch 9, EUT Horz
	404.855	1.6	22.0	Horz	PK	2.17E-06	-26.6	-16.0	-10.6	High Ch 9, EUT on Side
	404.857	1.0	0.0	Vert	PK	1.85E-06	-27.3	-16.0	-11.3	High Ch 9, EUT on Side
	403.357	1.4	76.0	Vert	PK	1.47E-06	-28.3	-16.0	-12.3	Mid Ch 4, EUT Horz
	402.157	1.5	75.0	Vert	PK	1.37E-06	-28.6	-16.0	-12.6	Low Ch 0, EUT Horz
	403.357	1.3	59.0	Horz	PK	1.28E-06	-28.9	-16.0	-12.9	Mid Ch 4, EUT on Side
	403.358	1.3	59.0	Vert	PK	1.28E-06	-28.9	-16.0	-12.9	Mid Ch 4, EUT on Side
	404.857	1.4	66.0	Vert	PK	1.28E-06	-28.9	-16.0	-12.9	High Ch 9, EUT Horz
	402.157	1.4	68.0	Vert	PK	1.22E-06	-29.1	-16.0	-13.1	Low Ch 0, EUT on Side
	402.158	1.0	173.0	Horz	PK	1.02E-06	-29.9	-16.0	-13.9	Low Ch 0, EUT Vert
	403.360	1.0	176.0	Horz	PK	9.49E-07	-30.2	-16.0	-14.2	Mid Ch 4, EUT Vert