

**Electric Imp, Inc.** IMP004M FCC 15.207:2017 FCC 15.247:2017 **Bluetooth Radio** 

Report # ELIM0013.2





NVLAP Lab Code: 200676-0

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# **CERTIFICATE OF TEST**



### Last Date of Test: June 6, 2017 Electric Imp, Inc. Model: IMP004M

# **Radio Equipment Testing**

Standards	
Specification	Method
FCC 15.207:2017	ANSI C63 10:2013
FCC 15.247:2017	ANOI 005.10.2015

Results

Method Clause	Test Description	Applied	Results	Comments
6.2	Powerline Conducted Emissions	Yes	Pass	
11.12.1, 11.13.2, 6.5, 6.6	Spurious Radiated Emissions	Yes	Pass	
11.6	Duty Cycle	Yes	Pass	
11.8.2	Occupied Bandwidth	Yes	Pass	
11.9.1.1	Output Power	Yes	Pass	
11.10.2	Power Spectral Density	Yes	Pass	
11.11	Band Edge Compliance	Yes	Pass	
11.11	Spurious Conducted Emissions	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



### **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: <u>http://portlandcustomer.element.com/ts/scope/scope.htm</u> <u>http://gsi.nist.gov/global/docs/cabs/designations.html</u>

# **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 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

# FACILITIES





California	Minnesota	New York	Oregon	Texas	Washington		
Labs OC01-13	Labs MN01-08, MN10	Labs NY01-04	Labs NY01-04 Labs EV01-12		Labs NC01-05		
41 Tesla	9349 W Broadway Ave.	4939 Jordan Rd.	22975 NW Evergreen Pkwy	3801 E Plano Pkwy	19201 120 <sup>th</sup> Ave NE		
Irvine, CA 92618	Brooklyn Park, MN 55445	Elbridge, NY 13060	Hillsboro, OR 97124	Plano, TX 75074	Bothell, WA 98011		
(949) 861-8918	(612)-638-5136	(315) 554-8214	(503) 844-4066	(469) 304-5255	(425)984-6600		
		NV	'LAP				
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		
		BS	MI				
SL2-IN-E-1154R	SL2-IN-E-1152R	N/A	SL2-IN-E-1017	SL2-IN-E-1158R	SL2-IN-E-1153R		
		VC	CI				
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		



# **Test Setup Block Diagrams**





# **PRODUCT DESCRIPTION**



### **Client and Equipment Under Test (EUT) Information**

Company Name:	Electric Imp, Inc.
Address:	5150 El Camino Real, Ste C-31
City, State, Zip:	Los Altos, CA 94022
Test Requested By:	Hugo Fiennes
Model:	IMP004M
First Date of Test:	May 25, 2017
Last Date of Test:	June 6, 2017
Receipt Date of Samples:	May 23, 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:

802.11bgn SISO radio WiFi module with added Bluetooth radio, with embedded OS that works with the Electric Imp cloud to allow internet connectivity for devices that use this WiFi/BT module.

### **Testing Objective:**

To demonstrate compliance of the Bluetooth radio under FCC 15.247 requirements.





### Configuration ELIM0013-1

EUT						
Description	Manufacturer	Model/Part Number	Serial Number			
WiFi Radio Module	Murata	IMP004M	IMP0107			

Peripherals in test setup boundary						
Description Manufacturer Model/Part Number Serial Number						
Host Laptop	HP	15-ba009dx	CND71420K3			
Laptop Power Supply	HP	HSTNN-DA40	1WFTLD0CAR63O5H			

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	2.0m	No	USB Extension	WiFi Radio Module
AC Cable	No	1.1m	No	AC Mains	Laptop Power Supply
DC Cable	No	2.0m	No	Host Laptop	Laptop Power Supply

### Configuration ELIM0013-2

EUT						
Description	Manufacturer	Model/Part Number	Serial Number			
WiFi Radio Module	Murata	IMP004M	IMP0107			

Peripherals in test setup boundary						
Description Manufacturer Model/Part Number Serial Number						
Host Laptop	HP	15-ba009dx	CND71420K3			
Laptop Power Supply	HP	HSTNN-DA40	1WFTLD0CAR63O5H			

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
USB Cable	Yes	2.0m	No	USB Extension	WiFi Radio Module
AC Cable	No	1.1m	No	AC Mains	Laptop Power Supply
DC Cable	No	2.0m	No	Host Laptop	Laptop Power Supply
USB Extension Cable	No	2.0m	No	Host Laptop	USB Cable





### Configuration ELIM0013-3

EUT								
Description	Manufacturer	Model/Part Number	Serial Number					
WiFi Radio Module	Murata	IMP004M	IMP0107					

Peripherals in test setup boundary									
Description	Manufacturer	Model/Part Number	Serial Number						
Host Laptop	HP	15-ba009dx	CND71420K3						
Laptop Power Supply	HP	HSTNN-DA40	1WFTLD0CAR63O5H						
DC Power Supply	HQ Power	PS3003U	DK10103872						

Cables										
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2					
USB Cable	Yes	2.0m	No	USB Extension	WiFi Radio Module					
AC Cable	No	1.1m	No	AC Mains	Laptop Power Supply					
DC Cable	No	2.0m	No	Host Laptop	Laptop Power Supply					
AC Cable	No	1.8m	No	AC Mains	DC Power Supply					
DC Cables	No	1.0m	No	WiFi Radio Module	DC Power Supply					

# **MODIFICATIONS**



### **Equipment Modifications**

Item	Date	Test	Modification	Note	Disposition of EUT
		Spurious	Tested as	No EMI suppression	EUT remained at
1	5/25/2017	Radiated	delivered to	devices were added or	Element following the
		Emissions	Test Station.	modified during this test.	test.
			Tested as	No EMI suppression	EUT remained at
2	5/31/2017	Output Power	delivered to	devices were added or	Element following the
			Test Station.	modified during this test.	test.
		Spurious	Tested as	No EMI suppression	EUT remained at
3	5/31/2017	Conducted	delivered to	devices were added or	Element following the
		Emissions	Test Station.	modified during this test.	test.
		Band Edge	Tested as	No EMI suppression	EUT remained at
4	5/31/2017	Compliance	delivered to	devices were added or	Element following the
		Compliance	Test Station.	modified during this test.	test.
			Tested as	No EMI suppression	EUT remained at
5	5/31/2017	Duty Cycle	delivered to	devices were added or	Element following the
			Test Station.	modified during this test.	test.
		Occupied	Tested as	No EMI suppression	EUT remained at
6	5/31/2017	Bandwidth	delivered to	devices were added or	Element following the
		Danuwiutin	Test Station.	modified during this test.	test.
		Power	Tested as	No EMI suppression	EUT remained at
7	5/31/2017	Spectral	delivered to	devices were added or	Element following the
		Density	Test Station.	modified during this test.	test.
		Powerline	Tested as	No EMI suppression	Schodulod testing
8	6/6/2017	Conducted	delivered to	devices were added or	was completed
		Emissions	Test Station.	modified during this test.	was completed.

# **POWERLINE CONDUCTED EMISSIONS**



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

#### MODES OF OPERATION

Transmitting Bluetooth LE at Mid Ch 20-2442MHz

#### POWER SETTINGS INVESTIGATED

3.3VDC

#### **CONFIGURATIONS INVESTIGATED**

ELIM0013 - 3

#### SAMPLE CALCULATIONS

Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator

#### TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Interval
Cable - Conducted Cable Assembly	Element	OCP, HFP, AWC	OCPA	3/28/2017	12 mo
LISN	Solar Electronics	9252-50-24-BNC	LIB	1/25/2017	12 mo
LISN	Solar Electronics	9252-50-24-BNC	LIA	2/17/2017	12 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAQ	4/25/2017	12 mo

#### MEASUREMENT BANDWIDTHS

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

Measurements were made using the bandwidths and detectors specified. No video filter was used.

#### MEASUREMENT UNCERTAINTY

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

#### **TEST DESCRIPTION**

The EUT will be powered either directly or indirectly from the AC power line. Therefore, conducted emissions measurements were made on the AC input of the EUT, or on the AC input of the device used to power the EUT.

The EUT was transmitting at its maximum data rate. For each mode, the spectrum was scanned from 150 kHz to 30 MHz. Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Per the standard, an insulating material was also added to ground plane between the EUT's power and remote *I/O* cables. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 500hm measuring port is terminated by a 500hm EMI meter or a 500hm resistive load. All 500hm measuring ports of the LISN are terminated by 500hm. The test data represents the configuration / operating mode/ model that produced the highest emission levels as compared to the specification limit.

# **POWERLINE CONDUCTED EMISSIONS**



								EmiR5 2017.01.25	PSA-ESCI 201	7.01.26
Wo	rk Order:	ELIM0013	Date:	06/06	5/17		11			
	Project:	None	Temperature:	22.6	°C		4-A		1	
	Job Site:	OC06	Humidity:	48.3%	RH					
Serial	Number:	IMP0107	Barometric Pres.:	1015 ו	nbar	1	Tested by:	Mark Baytan		
	EUT:	IMP004M	· · · · · · · · · · · · · · · · · · ·							
Confi	guration:	3								
С	ustomer:	Electric Imp, Inc.								
At	ttendees:	None								
EU	T Power:	3.3VDC								
Operati	ng Mode:	Transmitting Bluetoot	h LE at Mid Ch 20-2442I	MHz						
De	viations:	None								
Co	omments:	Board powered throug	gh external DC power su	ipply.						
Test Specif	ications				Fest Metho	bd				
FCC 15 207	2:2017				NSI C63.1	10:2013				
Dup #	4	Lino	Noutral	Evt Att	nuction	0		Populto	Booo	
	Quasi F	Peak Data - vs - Quas	i Peak Limit		A	verage Da	ta - vs - Av	erage Limit		
100				100						
90				90						
30				30						
80				80						
_										
70				70						
60				60						
2	🚽     T			2						
				<b>n</b> 50				J	•	
۲ 40				40						
-	. hh h									
30				30		•				

20 10

0

100.0

Quasi Peak Data - vs - Quasi Peak Limit										
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)					
0.170	33.2	20.2	53.4	65.0	-11.6					
0.151	34.1	20.2	54.3	65.9	-11.6					
0.201	28.7	20.1	48.8	63.6	-14.8					
0.221	22.2	20.1	42.3	62.8	-20.5					
0.528	11.7	20.0	31.7	56.0	-24.3					
0.398	12.3	20.0	32.3	57.9	-25.6					

1.0

MHz

10.0

Average Data - vs - Average Limit									
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)				
0.528	4.0	20.0	24.0	46.0	-22.0				
0.398	4.8	20.0	24.8	47.9	-23.1				
0.221	6.1	20.1	26.2	52.8	-26.6				
0.201	6.7	20.1	26.8	53.6	-26.8				
0.170	7.2	20.2	27.4	55.0	-27.6				
0.151	7.5	20.2	27.7	55.9	-28.2				

MHz

10.0

1.0

20

10

0 ⊢ 0.1

100.0

# **POWERLINE CONDUCTED EMISSIONS**



					EmiR5 2017.01.25	PSA-ESCI 2017.01.26					
Work Orde	r: ELIM0013	Date:	06/06/17	11							
Projec	t: None	Temperature:	22.6 °C	-4	K D	1					
Job Site	e: OC06	Humidity:	48.3% RH	- 7.00							
Serial Numbe	r: IMP0107	Barometric Pres.:	1015 mbar	Tested b	y: Mark Baytan						
EUT	IMP004M										
Configuration	<b>1:</b> 3										
Custome	r: Electric Imp, Inc.										
Attendees	s: None										
EUT Powe	r: 3.3VDC										
Operating Mode	Transmitting Bluetoot	smitting Bluetooth LE at Mid Ch 20-2442MHz									
Deviations	s: None	e									
Comment	Board powered throug	h external DC power su	pply.								
<b>Test Specifications</b>	5		Test Meth	od							
FCC 15.207:2017			ANSI C63.	10:2013							
Run # 5	Line:	High Line	Ext. Attenuation:	0	Results	Pass					
Quasi	Peak Data - vs - Quas	i Peak Limit	<b>A</b> 100	Verage Data - vs -	Average Limit						
90			90								
80			80								





Quasi Peak Data - vs - Quasi Peak Limit									
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)				
0.158	34.2	20.2	54.4	65.5	-11.1				
0.209	25.4	20.1	45.5	63.3	-17.8				
0.301	14.5	20.1	34.6	60.2	-25.6				
0.963	10.2	20.0	30.2	56.0	-25.8				
1.055	10.0	20.0	30.0	56.0	-26.0				
2.010	8.8	20.1	28.9	56.0	-27.1				

Average Data - vs - Average Limit								
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Adjusted (dBuV)	Spec. Limit (dBuV)	Compared to Spec. (dB)			
0.963	2.5	20.0	22.5	46.0	-23.5			
1.055	2.4	20.0	22.4	46.0	-23.6			
2.010	1.2	20.1	21.3	46.0	-24.7			
0.301	5.4	20.1	25.5	50.2	-24.7			
0.209	6.3	20.1	26.4	53.3	-26.9			
0.158	7.3	20.2	27.5	55.5	-28.0			
	Freq (MHz) 0.963 1.055 2.010 0.301 0.209 0.158	Freq (MHz)         Amplitude (dBuV)           0.963         2.5           1.055         2.4           2.010         1.2           0.301         5.4           0.209         6.3           0.158         7.3	Freq (MHz)         Amplitude (dBuV)         Factor (dB)           0.963         2.5         20.0           1.055         2.4         20.0           2.010         1.2         20.1           0.301         5.4         20.1           0.209         6.3         20.1	Freq (MHz)         Amplitude (dBuV)         Factor (dB)         Adjusted (dBuV)           0.963         2.5         20.0         22.5           1.055         2.4         20.0         22.4           2.010         1.2         20.1         21.3           0.301         5.4         20.1         25.5           0.209         6.3         20.1         26.4           0.158         7.3         20.2         27.5	Freq (MHz)         Amplitude (dBuV)         Factor (dB)         Adjusted (dBuV)         Spec. Limit (dBuV)           0.963         2.5         20.0         22.5         46.0           1.055         2.4         20.0         22.4         46.0           2.010         1.2         20.1         21.3         46.0           0.301         5.4         20.1         25.5         50.2           0.209         6.3         20.1         26.4         53.3           0.158         7.3         20.2         27.5         55.5			

# 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 BLE at Low Ch 0-2402MHz, Mid Ch 19-2440MHz, H	High Ch 39-2480M	Hz
POWER SETTINGS INVESTIGATED		
3.3VDC regulated down from USB 5V		
CONFIGURATIONS INVESTIGATED		
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FREQUENCY RANGE INVESTIGATED		
Start Frequency 30 MHz	Stop Frequency	26500 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
Cable	ESM Cable Corp.	8-18GHz cables	OCY	5/15/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	JSDWK42-18004000-60-5P	PAN	1/4/2017	12 mo
Cable	ESM Cable Corp.	1-8GHz cables	OCX	5/15/2017	12 mo
Cable	D-Coax	None	OC4	1/4/2017	12 mo
Antenna - Double Ridge	A.H. Systems, Inc.	SAS-574	AXV	5/3/2016	24 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AVP	8/15/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AVL	10/17/2016	12 mo
Amplifier - Pre-Amplifier	Miteq	AMF-3D-00100800-32-13P	AVJ	8/15/2016	12 mo
Antenna - Double Ridge	ETS Lindgren	3115	AIR	6/23/2016	24 mo
Antenna - Standard Gain	ETS Lindgren	3160-07	AHX	NCR	0 mo
Antenna - Standard Gain	EMCO	3160-08	AHK	NCR	0 mo
Cable	ESM Cable Corp.	30-1GHz cables	OCW	5/15/2017	12 mo
Amplifier - Pre-Amplifier	Miteq	AM-1616-1000	PAD	8/15/2016	12 mo
Analyzer - Spectrum Analyzer	Agilent	E4446A	AAY	10/25/2016	12 mo

#### TEST DESCRIPTION

The highest gain antenna of each type to be used with the EUT was tested. The EUT was configured for the required transmit frequencies and the modes as showed in the data sheets.

For each configuration, the spectrum was scanned throughout the specified range as part of the exploratory investigation of the emissions. These "pre-scans" are not included in the report. Final measurements on individual emissions were then made and included in this test report.

The individual emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and EUT antenna in three orthogonal axis if required, and adjusting the measurement antenna height and polarization (per ANSI C63.10). A preamp and high pass filter (and notch filter) were used for this test in order to provide sufficient measurement sensitivity.

Measurements were made with the required detectors and annotated on the data for each individual point using the following annotation:

QP = Quasi-Peak Detector PK = Peak Detector AV = RMS Detector

Measurements were made to satisfy the specific requirements of the test specification for out of band emissions as well as the restricted band requirements.

If there are no detectable emissions above the noise floor, the data included may show noise floor measurements for reference only.

Measurements at the edges of the allowable band may be presented in an alternative method as provided for in the ANSI C63.10 Marker-Delta method. This method involves performing an in-band fundamental measurement followed by a screen capture of the fundamental and out-of-band emission using reduced measurement instrumentation bandwidths. The amplitude delta measured on this screen capture is applied to the fundamental emission value to show the out-of-band emission level as applied to the limit.

# SPURIOUS RADIATED EMISSIONS



Wo	ork Order:	ELIM00 <sup>2</sup>	13		Date:	05/25/17		Nal	
	Project	None		Tem	perature:	22.4 °C	~	and day	
	Job Site:	OC07			Humidity:	44.3% RH			
Serial	I Number:	IMP010	7	Baromet	tric Pres.:	1014 mbar	Test	ted by: Mike Tran	
	EUT	IMP004M							
Confi	iguration	1							
C	Customer	Electric Imp, I	nc.						
A	ttendees	Jonathan Dillo	n						
EL	JT Power:	3.3VDC regula	ated dow	vn from USE	3 5V				
Operati	ing Mode	Transmitting E	3LE at Lo	ow Ch 0-240	02MHz, Mid (	Ch 19-2440MHz	z, High Ch 39-2480N	ИНz	
D	eviations	None							
Co	omments	TX Power valu	ue = 5.						
st Speci	ifications					Test I	Method		
C 15.24	7:2017					ANSI	C63.10:2013		
<b>Run #</b>	29	Test Dista	nce (m)	3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
<b>Run #</b>	29	Test Dista	nce (m)	3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
<b>Run #</b> 80 70	29	Test Dista	nce (m)	3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
<b>Run #</b> 80 70 60	29	Test Dista	nce (m)	3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
Run # 80 70 60	29	Test Dista	nce (m)	3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
Run # 80 70 60 50	29	Test Dista		3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
Run # 80 70 60 50 50 40	29	Test Dista		3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
Run # 80 70 60 50 50 40	29	Test Dista		3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
Run # 80 70 60 50 50 40 30	29	Test Dista		3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
Run # 80 70 60 50 50 40 30 20	29	Test Dista		3	Antenna H		1 to 4(m)	Results	Pass
Run # 80 70 60 50 50 30 20 10	29	Test Dista		3	Antenna H		1 to 4(m)	Results	Pass
Run # 80 70 60 50 50 30 20 10	29			3	Antenna H	leight(s)	1 to 4(m)	Results	Pass
Run #           80           70           60           50           50           20           10           0	29	Test Dista		3	Antenna H		1 to 4(m)	Results       Image: state	Pass

EUT (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
7439.495	36.1	12.0	2.4	259.0	3.0	0.0	Vert	AV	0.0	48.1	54.0	-5.9	EUT Ver, High Ch
7439.500	35.3	12.0	1.0	276.0	3.0	0.0	Horz	AV	0.0	47.3	54.0	-6.7	EUT Hor, High Ch
7439.610	34.5	12.0	1.1	76.0	3.0	0.0	Horz	AV	0.0	46.5	54.0	-7.5	EUT Ver, High Ch
7439.305	33.3	12.0	1.0	164.0	3.0	0.0	Vert	AV	0.0	45.3	54.0	-8.7	EUT Hor, High Ch
7319.475	33.3	10.8	2.6	286.0	3.0	0.0	Horz	AV	0.0	44.1	54.0	-9.9	EUT Hor, Mid Ch
7438.685	31.8	12.0	3.3	169.0	3.0	0.0	Horz	AV	0.0	43.8	54.0	-10.2	EUT on Side, High Ch
7438.920	31.7	12.0	1.0	8.0	3.0	0.0	Vert	AV	0.0	43.7	54.0	-10.3	EUT on Side, High Ch
7319.595	32.5	10.8	1.0	330.0	3.0	0.0	Vert	AV	0.0	43.3	54.0	-10.7	EUT Ver, Mid Ch
4879.790	34.1	3.9	2.4	203.0	3.0	0.0	Vert	AV	0.0	38.0	54.0	-16.0	EUT Ver, Mid Ch
7440.830	45.9	12.0	2.4	259.0	3.0	0.0	Vert	PK	0.0	57.9	74.0	-16.1	EUT Ver, High Ch
4803.705	34.2	3.6	1.0	329.0	3.0	0.0	Horz	AV	0.0	37.8	54.0	-16.2	EUT Hor, Low Ch
7439.395	45.2	12.0	1.0	276.0	3.0	0.0	Horz	PK	0.0	57.2	74.0	-16.8	EUT Hor, High Ch
4880.000	33.1	3.9	1.0	325.0	3.0	0.0	Horz	AV	0.0	37.0	54.0	-17.0	EUT Hor, Mid Ch
7439.640	44.9	12.0	1.1	76.0	3.0	0.0	Horz	PK	0.0	56.9	74.0	-17.1	EUT Ver, High Ch
7440.525	43.7	12.0	1.0	164.0	3.0	0.0	Vert	PK	0.0	55.7	74.0	-18.3	EUT Hor, High Ch
4803.870	31.9	3.6	1.5	164.0	3.0	0.0	Vert	AV	0.0	35.5	54.0	-18.5	EUT Ver, Low Ch
4958.880	31.0	4.4	1.0	158.0	3.0	0.0	Horz	AV	0.0	35.4	54.0	-18.6	EUT Hor, High Ch
4958.855	30.9	4.4	1.6	17.0	3.0	0.0	Vert	AV	0.0	35.3	54.0	-18.7	EUT Ver, High Ch

EUT (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
7438.965	43.1	12.0	3.3	169.0	3.0	0.0	Horz	PK	0.0	55.1	74.0	-18.9	EUT on Side, High Ch
7441.500	42.5	12.0	1.0	8.0	3.0	0.0	Vert	PK	0.0	54.5	74.0	-19.5	EUT on Side, High Ch
7320.295	43.7	10.8	1.0	330.0	3.0	0.0	Vert	PK	0.0	54.5	74.0	-19.5	EUT Ver, Mid Ch
19216.120	45.2	-10.8	1.0	186.0	3.0	0.0	Horz	AV	0.0	34.4	54.0	-19.6	EUT Hor, Low Ch
7319.755	43.5	10.8	2.6	286.0	3.0	0.0	Horz	PK	0.0	54.3	74.0	-19.7	EUT Hor, Mid Ch
19216.580	45.1	-10.8	1.0	113.0	3.0	0.0	Vert	AV	0.0	34.3	54.0	-19.7	EUT Vert, Low Ch
12397.540	33.3	-2.4	1.0	231.0	3.0	0.0	Vert	AV	0.0	30.9	54.0	-23.1	EUT Vert, High Ch
12397.630	32.1	-2.4	1.3	321.0	3.0	0.0	Horz	AV	0.0	29.7	54.0	-24.3	EUT Hor, High Ch
12200.880	33.0	-3.9	3.9	305.0	3.0	0.0	Horz	AV	0.0	29.1	54.0	-24.9	EUT Hor, Mid Ch
12201.350	32.9	-3.9	1.8	5.0	3.0	0.0	Vert	AV	0.0	29.0	54.0	-25.0	EUT Ver, Mid Ch
12011.500	34.0	-5.2	3.1	121.0	3.0	0.0	Vert	AV	0.0	28.8	54.0	-25.2	EUT Ver, Low Ch
12011.140	33.9	-5.2	1.3	277.0	3.0	0.0	Horz	AV	0.0	28.7	54.0	-25.3	EUT Horz, Low Ch
4879.515	44.3	3.9	2.4	203.0	3.0	0.0	Vert	PK	0.0	48.2	74.0	-25.8	EUT Ver, Mid Ch
4804.285	44.1	3.6	1.0	329.0	3.0	0.0	Horz	PK	0.0	47.7	74.0	-26.3	EUT Hor, Low Ch
4880.675	43.7	3.9	1.0	325.0	3.0	0.0	Horz	PK	0.0	47.6	74.0	-26.4	EUT Hor, Mid Ch
4804.475	42.6	3.6	1.5	164.0	3.0	0.0	Vert	PK	0.0	46.2	74.0	-27.8	EUT Ver, Low Ch
4959.870	41.7	4.4	1.0	158.0	3.0	0.0	Horz	PK	0.0	46.1	74.0	-27.9	EUT Hor, High Ch
4959.850	41.6	4.4	1.6	17.0	3.0	0.0	Vert	PK	0.0	46.0	74.0	-28.0	EUT Ver, High Ch
19215.390	56.2	-10.8	1.0	113.0	3.0	0.0	Vert	PK	0.0	45.4	74.0	-28.6	EUT Vert, Low Ch
19215.140	56.0	-10.8	1.0	186.0	3.0	0.0	Horz	PK	0.0	45.2	74.0	-28.8	EUT Hor, Low Ch
12398.570	44.2	-2.4	1.0	231.0	3.0	0.0	Vert	PK	0.0	41.8	74.0	-32.2	EUT Vert, High Ch
12011.110	46.3	-5.2	3.1	121.0	3.0	0.0	Vert	PK	0.0	41.1	74.0	-32.9	EUT Ver, Low Ch
12397.980	43.0	-2.4	1.3	321.0	3.0	0.0	Horz	PK	0.0	40.6	74.0	-33.4	EUT Hor, High Ch
12199.130	44.2	-3.9	3.9	305.0	3.0	0.0	Horz	PK	0.0	40.3	74.0	-33.7	EUT Hor, Mid Ch
12200.610	43.7	-3.9	1.8	5.0	3.0	0.0	Vert	PK	0.0	39.8	74.0	-34.2	EUT Ver, Mid Ch
12007.550	44.6	-5.2	13	277.0	3.0	0.0	Horz	PK	0.0	39.4	74 0	-34.6	EUT Horz, Low Ch

# SPURIOUS RADIATED EMISSIONS



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	JC Tiol N	DD Site:			/	-	Bar		Hum	alty	-	44	3%	RH	_			Test			lika	Tron			
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Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Antenna Height (meters)	Azimuth (degrees)	Test Distance (meters)	External Attenuation (dB)	Polarity/ Transducer Type	Detector	Distance Adjustment (dB)	Adjusted (dBuV/m)	Spec. Limit (dBuV/m)	Compared to Spec. (dB)	Comments
2483.967	32.7	-4.5	1.0	345.0	3.0	20.0	Vert	AV	0.0	48.2	54.0	-5.8	EUT Vert, High Ch
2388.703	32.9	-4.9	1.0	279.0	3.0	20.0	Horz	AV	0.0	48.0	54.0	-6.0	EUT Hor, Low Ch
2387.833	32.9	-4.9	1.8	177.0	3.0	20.0	Vert	AV	0.0	48.0	54.0	-6.0	EUT Vert, Low Ch
2484.107	32.5	-4.5	1.0	196.0	3.0	20.0	Vert	AV	0.0	48.0	54.0	-6.0	EUT on Side, High Ch
2483.600	32.5	-4.5	1.2	85.0	3.0	20.0	Horz	AV	0.0	48.0	54.0	-6.0	EUT Hor, High Ch
2484.670	32.4	-4.5	1.0	359.0	3.0	20.0	Horz	AV	0.0	47.9	54.0	-6.1	EUT Vert, High Ch
2483.860	32.4	-4.5	2.6	124.0	3.0	20.0	Vert	AV	0.0	47.9	54.0	-6.1	EUT Hor, High Ch
2484.703	32.4	-4.5	1.0	7.0	3.0	20.0	Horz	AV	0.0	47.9	54.0	-6.1	EUT on Side, High Ch
2390.125	44.6	-4.9	1.8	177.0	3.0	20.0	Vert	PK	0.0	59.7	74.0	-14.3	EUT Vert, Low Ch
2388.240	44.3	-4.9	1.0	279.0	3.0	20.0	Horz	PK	0.0	59.4	74.0	-14.6	EUT Hor, Low Ch
2485.037	43.8	-4.5	2.6	124.0	3.0	20.0	Vert	PK	0.0	59.3	74.0	-14.7	EUT Hor, High Ch
2485.070	43.6	-4.5	1.0	196.0	3.0	20.0	Vert	PK	0.0	59.1	74.0	-14.9	EUT on Side, High Ch
2483.983	43.5	-4.5	1.0	345.0	3.0	20.0	Vert	PK	0.0	59.0	74.0	-15.0	EUT Vert, High Ch
2483.773	43.4	-4.5	1.2	85.0	3.0	20.0	Horz	PK	0.0	58.9	74.0	-15.1	EUT Hor, High Ch
2484.367	43.1	-4.5	1.0	359.0	3.0	20.0	Horz	PK	0.0	58.6	74.0	-15.4	EUT Vert, High Ch
2484.700	43.0	-4.5	1.0	7.0	3.0	20.0	Horz	PK	0.0	58.5	74.0	-15.5	EUT on Side, High Ch



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
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Attenuator	Fairview Microwave	SA18E-20	TKS	3/6/2017	3/6/2018
Block - DC	Aeroflex	INMET 8535	AMO	3/27/2017	3/27/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
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 Duty Cycle (x) of the single channel operation of the radio as controlled by the provided test software was measured for each of the EUT operating modes.

There is no compliance requirement to be met by this test, so therefore no Pass / Fail criteria.

The measurements were made using a zero span on the spectrum analyzer to see the pulses in the time domain. The transmit power was set to its default maximum.

The duty cycle was calculated by dividing the transmission pulse duration (T) by the total period of a single on and total off time.

If the transmit duty cycle < 98 percent, burst gating may have been used during some of the other tests in this report to only take the measurement during the burst duration.



								TbtTx 2017.01.27	XMit 2017.02.08
EUT:	IMP004M						Work Order:	ELIM0013	
Serial Number:	IMP0107						Date:	05/31/17	
Customer:	Electric Imp, Inc.						Temperature:	21.3 °C	
Attendees:	Jonathan Dillon						Humidity:	49% RH	
Project:	None						Barometric Pres.:	1014 mbar	
Tested by:	Mike Tran		Power: 3.	3VDC regulated of	down from USB 5\	/	Job Site:	OC13	
TEST SPECIFICAT	IONS		Te	est Method					
FCC 15.247:2017			A	NSI C63.10:2013					
COMMENTS									
Total Offset 22.92d	B (20dB pad + DC Block +	coax cable + client provided patch ca	able) at 2.4GHz						
DEVIATIONS FROM	I TEST STANDARD								
None									
			1 and						
Configuration #	2		Non au	(					
		Signature							
						Number of	Value	Limit	
				Pulse Width	Period	Pulses	(%)	(%)	Results
BLE/GFSK Low Cha	annel, 2402 MHz			363.809 us	621.626 us	1	58.5	N/A	N/A
BLE/GFSK Low Cha	annel, 2402 MHz			N/A	N/A	6	N/A	N/A	N/A
BLE/GFSK Mid Cha	nnel, 2442 MHz			363.765 us	621.87 us	1	58.5	N/A	N/A
BLE/GFSK Mid Cha	nnel, 2442 MHz			N/A	N/A	5	N/A	N/A	N/A
BLE/GFSK High Cha	annel, 2480 MHz			364.309 us	626.021 us	1	58.2	N/A	N/A
BLE/GFSK High Cha	annel, 2480 MHz			N/A	N/A	5	N/A	N/A	N/A



Paise within         Penda         Paises         (%)         (%)         Results           363.809 us         621.626 us         1         58.5         N/A         N/A           Agilent 15:15:04         May 23, 2017         R         T           ement Materials Technology         #Atten 10 dB         6.48 dBm           eff 12 dBm         #Atten 10 dB         6.48 dBm           Peak         1         2         3           99         1         2         3           99         1         2         3           99         1         2         3           99         1         2         3           99         1         2         3           99         1         2         3           99         1         2         3           99         1         2         3           99         1         1         1         1           99         1         1         1         1           99         1         1         1         1           99         1         1         1         1           99         1		Dulas Width	Dariad	Dulana	(0/)	(0/)	Beaulto
Agilent 15:15:04 May 23, 2017       R T         ement Materials Technology       Mkr3 1.021 ms         ef 12 dBm       #Atten 10 dB         eak       1         1       2         8/       1         9/       1         8/       1         1       2         1       2         1       2         1       2         1       2         1       2         1       2         1       1         1       1         1       1         1       1         1       1         1       1         1       1         1       1         1       1         1       1         1       1         1       1         1       1         2       1         3       1         3       1         1       1         1       1         1       1         1       1         1       1         2 <td< th=""><th></th><th></th><th>Feriou</th><th>Fuises</th><th>(%)</th><th>(%)</th><th>NIA</th></td<>			Feriou	Fuises	(%)	(%)	NIA
Agilent 15:15:04 May 23, 2017         R T           ement Materials Technology         Mkr3 1.021 ms           ef 12 dBm         #Atten 10 dB         6.48 dBm           Peak         1         2         0           Peak         1         2         0         0           B3/         1         2         0         0         0           B3/         1         2         0         0         0         0           B3/         1         2         0         0         0         0         0           B3/         1         0         <		303.009 US	021.020 US	I	56.5	IN/A	IN/A
Agilent 15:15:04 May 23, 2017         R T           ement Materials Technology         Mkr3 1.021 ms           af 12 dBm         #Atten 10 dB         6.48 dBm           Peak         1         2         3           org         1         2         3							
ement Materials Technology       Mkr3 1.021 ms         a=f 12 dBm       #Atten 10 dB       6.48 dBm         Peak       1       2       3         pg       1       2       3         B/       1       2       3         Ifst       1       1       1         2.9       1       1       1         B/       1       1       1         Ifst       1       1       1         2.9       1       1       1         gRv       1       1       1         growth       1	🔆 Agilent 15:	15:04 May 23	,2017			RT	
ef 12 dBm #Atten 10 dB 6.48 dBm Peak pg 3/ ffst 2.9 3 a a a a b a c a c a b a a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a	lement Materia	s Technology					Mkr3 1.021 ms
99     1     2     3       99     1     2     3       3/     1     2     3       1     2     3       93     1     2       3/     1     2       1     2     3       93     1     1       93     1     1       94     1     1       95     1     1       97     1     1       98     1     1       99     1     1       99     1     1       90     1     1       91     1     1       92     1     1       93     1     1       94     1     1       95     BW 30 Hz     Sweep 2 ms (8192 pts)       Marker     Trace     Type       1     10     Time       1     10     Time       1     10     Time       1     10     Time       1     10     1       1     10     1       1     10     1       1     10     1       1     10     1       1     10     1 <td>ef 12 dBm</td> <td></td> <td>#Atten 10 d</td> <td>R</td> <td></td> <td></td> <td>6.48 dBm</td>	ef 12 dBm		#Atten 10 d	R			6.48 dBm
Out     Image: Construction of the system       09     Image: Construction of the system       3/     Image: Construction of the system       Iffst     Image: Construction of the system       2.9     Image: Construction of the system       3     Image: Construction of the system       3     (1)       Time     1.821 ms	Peak I	4	2				0.40 0.00
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57     1     1     1     1     1       2.9     1     1     1     1     1       2.9     1     1     1     1     1       .gAv     1     1     1     1     1   <		<u>                                      </u>		<u>├</u>			
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3     3     4 </td <td>2.9</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	2.9						
.gAv	IB L					_	
L S2 enter 2.402 000 GHz s5 BW 3 MHz Marker Trace Type X Axis Amplitude 1 (1) Time 399.3 μs 2 (1) Time 763.1 μs 3 (1) Time 1.021 ms 6.48 dBm							
_gAv _sGAv L \$2 enter 2.402 000 GHz =s BW 3 MHz Marker Trace Type X Axis Amplitude 1 (1) Time 399.3 μs 2 (1) Time 763.1 μs 3 (1) Time 763.1 μs 5.48 dBm 							
_gAv							
Image: Second system     Second system       Second system     Span 0 Hz       Second system     Span 0 Hz       Second system     Sweep 2 ms (8192 pts)       Marker     Trace     Type       1     (1)     Time       2     (1)     Time       3     (1)     Time       3     (1)     Time       3     (1)							
I S2     Span 0 Hz       enter 2.402 000 GHz     Span 0 Hz       es BW 3 MHz     #VBW 30 kHz     Sweep 2 ms (8192 pts)       Marker     Trace     Type     X Axis       1     (1)     Time     399.3 µs     6.72 dBm       2     (1)     Time     763.1 µs     5.90 dBm       3     (1)     Time     1.021 ms     6.48 dBm	LgHv						
L S2 enter 2.402 000 GHz es BW 3 MHz Marker Trace Type X Axis Amplitude 1 (1) Time 399.3 μs 6.72 dBm 2 (1) Time 763.1 μs 6.90 dBm 3 (1) Time 1.021 ms 6.48 dBm							
enter 2.402 000 GHz es BW 3 MHz #VBW 30 kHz Sweep 2 ms (8192 pts) Marker Trace Type X Axis Amplitude 1 (1) Time 399.3 µs 6.72 dBm 2 (1) Time 763.1 µs 6.98 dBm 3 (1) Time 1.021 ms 6.48 dBm	1 S2						
es BW 3 MHz         #VBW 30 kHz         Sweep 2 ms (8192 pts)           Marker         Trace         Type         X Axis         Amplitude           1         (1)         Time         399.3 μs         6.72 dBm           2         (1)         Time         763.1 μs         6.98 dBm           3         (1)         Time         1.021 ms         6.48 dBm	enter 2.402 0	00 GHz					Span 0 Hz
Marker         Trace         Type         X Axis         Amplitude           1         (1)         Time         399.3 μs         6.72 dBm           2         (1)         Time         763.1 μs         6.90 dBm           3         (1)         Time         1.021 ms         6.48 dBm	es RW 3 MHz			∎VRW 30 kH≂		Sween	2 ms (8192 nts)
1     (1)     Time     399.3 µs     6.72 dBm       2     (1)     Time     763.1 µs     6.90 dBm       3     (1)     Time     1.021 ms     6.48 dBm	Markor Tra		X	Avic	- Ampl	litudo	<u>e mo (oroc p</u> (0)
2 (1) Time 763.1 µs 6.90 dBm 3 (1) Time 1.021 ms 6.48 dBm	1 <u>(1</u>	) Time	30	19.3 us	6.7	2 dBm	
3 (1) Time 1.021 ms 6.48 dBm	2 (1	) Time	76	3 <b>.</b> 1 ця	6.9	9 dBm	
	3 (1	) Time	1.	021 ms	6.4	8 dBm	

BLE/GFSK Low Channel, 2402 MHz									
			Number of	Value	Limit				
	Pulse Width	Period	Pulses	(%)	(%)	Results			
	N/A	N/A	6	N/A	N/A	N/A			





	Pul	lso Width	Period	Number of	Value (%)	Limit (%)	Results
	36	3 765 us	621 87 us	1	58.5	N/A	N/A
	00	0.100 00	021.07 00	·	00.0	14/1	10/7
🔆 Agilen	t 15:29:24	May 23	, 2017			RT	
Element Ma	terials Teo	chnology					Mkr2 763.3 µ
Ref 13 dBr	n		#Atten 10 c	IB			7.59 dBm
#Peak		1	2	3			
Log 🗕			¢	- ŏ		_	
5 <sup>°</sup>		1	1			l l	
229							<u> </u>
-E.V							
						_	
ŧLgAv ├──				jj			
						_	
J1 S2							
Center 2.4	40 000 GH	z					Span 0 Hz
Res BW 3 N	1Hz			#VBW 30 kHz		Sween	2 ms (8192 pts)
Marker	Trace	Tyne	Х	Axis	Ĥmn	litude	
1	(1)	Time	3	99.5 µs	7.4	l6 dBm	
2	(1)	Time	7	63 <b>.</b> 3 µs	7.5	9 dBm	
3	(1)	Time	1	.021 ms	7.2	!5 dBm	

BLE/GFSK Mid Channel, 2442 MHz								
				Number of	Value	Limit		
		Pulse Width	Period	Pulses	(%)	(%)	Results	_
		N/A	N/A	5	N/A	N/A	N/A	





	Pulse Width	Period	Pulses	(%)	(%)	Results
	364.309 us	626.021 us	1	58.2	N/A	N/A
			•			•
🔆 Agilent 15:3	5:21 May 23	, 2017			RT	
lement Materials	Technology					Mkr2 763.3 🗩
ef 13 dBm		#Atten 10 d	B			7.55 dBm
Peak 👘 👘	1	2	3			
ng	\$		Š.		_	
ř III	f	- I - 1				
R/						
			<u> </u>			
2.0 P						
LaAv 🗕 🕂	<mark>/  </mark>				_	
Ŭ						
1 \$2						
- ∨⊏  antor 2/180/00	0 GHZ		<u> </u>			Span 0 Hz
	0 0112				Succes	2 ma (0102 mta)
			#VDW Э0 КНZ		oweep	Z ms (0192 pts)
Marker Irac	e lype Tino	Х	HXIS 200	Hmp 74	litude 1 dPm	
2 (1)	Time	76	299 ha	7.4	5 dBm	
3 (1)	Time	1.	025 ms	7.4	7 dBm	

BLE/GFSK High Channel, 2480 MHz								
				Number of	Value	Limit		
		Pulse Width	Period	Pulses	(%)	(%)	Results	
		N/A	N/A	5	N/A	N/A	N/A	





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
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Attenuator	Fairview Microwave	SA18E-20	TKS	3/6/2017	3/6/2018
Block - DC	Aeroflex	INMET 8535	AMO	3/27/2017	3/27/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
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 20 dB occupied bandwidth was measured with the EUT set to low, medium and high transmit frequencies in the band. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode.



					TbtTx 2017.01.27	XMit 2017.02.08			
EUT:	IMP004M			Work Order:	ELIM0013				
Serial Number:	IMP0107			Date:	05/31/17				
Customer:	Electric Imp, Inc.	Temperature:	21.3 °C						
Attendees:	Jonathan Dillon	onathan Dillon							
Project:	None			Barometric Pres.:	1014 mbar				
Tested by:	Mike Tran	Power:	3.3VDC regulated down from USB 5V	Job Site:	OC13				
TEST SPECIFICATI	ONS		Test Method						
FCC 15.247:2017			ANSI C63.10:2013						
COMMENTS									
Total Offset 22.92d	B (20dB pad + DC Block + coax cable + client provided patch o	able) at 2.4GHz							
DEVIATIONS FROM	I IEST STANDARD								
None									
Configuration #	2 Signature	And U	ing						
					Limit				
				Value	(≥)	Result			
BLE/GFSK Low Cha	nnel, 2402 MHz			676.758 kHz	500 kHz	Pass			
BLE/GFSK Mid Char	nnel, 2442 MHz			683.423 kHz	500 kHz	Pass			
BLE/GFSK High Cha	annel, 2480 MHz			654.945 kHz	500 kHz	Pass			

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TbtTx 2017.01.27









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
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Attenuator	Fairview Microwave	SA18E-20	TKS	3/6/2017	3/6/2018
Block - DC	Aeroflex	INMET 8535	AMO	3/27/2017	3/27/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
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 transmit frequency was set to the required channels in each band. The transmit power was set to its default maximum.

Prior to measuring peak transmit power the DTS bandwidth (B) was measured.

The method found in ANSI C63.10:2013 Section 11.9.1.1 was used because the RBW on the analyzer was greater than the DTS Bandwidth of the radio.

De Facto EIRP Limit: The EUT meets the de facto EIRP limit of +36 dBm.



					TbtTx 2017.01.27	XMit 2017.02.08	
EUT:	IMP004M			Work Order:	ELIM0013		
Serial Number:	IMP0107			Date:	05/31/17		
Customer:	Electric Imp, Inc.		Temperature:	21.3 °C			
Attendees:	Jonathan Dillon		Humidity:	49% RH			
Project:	None		Barometric Pres.:	Barometric Pres.: 1014 mbar			
Tested by:	Mike Tran		Power: 3.3VDC regulated down from USB 5	5V Job Site:	OC13		
TEST SPECIFICAT	IONS		Test Method				
FCC 15.247:2017			ANSI C63.10:2013				
COMMENTS							
Total Offset 22.92d	B (20dB pad + DC Block + co	oax cable + client provided patch c	able) at 2.4GHz				
DEVIATIONS FROM	M TEST STANDARD						
None							
Configuration #	2	Signature	Ano duy				
					Limit		
				Value	(<)	Result	
BLE/GFSK Low Cha	annel, 2402 MHz			5.189 mW	1 W	Pass	
BLE/GFSK Mid Cha	nnel, 2440 MHz			6.121 mW	1 W	Pass	
BLE/GFSK High Ch	annel, 2480 MHz			6.256 mW	1 W	Pass	



TbtTx 2017.01.27 XMit 2017.02.08 BLE/GFSK Low Channel, 2402 MHz Limit **(<)** 1 W Value Result 5.189 mW Pass 🔆 Agilent 15:16:29 May 23, 2017 R T Element Materials Technology Mkr1 2.401 785 GHz Ref 20 mW #Peak #Atten 10 dB 5.19 mW Log 1 0 5 J dB/ Offst 22.9 dB #LgAv M1 S2 S3 FS £(f): FTun Swp Center 2.402 000 GHz #Res BW 2 MHz Span 3.5 MHz #Sweep 3.263 ms (1000 pts) ₩VBW 6 MHz BLE/GFSK Mid Channel, 2440 MHz Limit Value **(<)** 1 W Result 6.121 mW Pass Agilent 15:30:46 May 23, 2017 \*\* R T Element Materials Technology Mkr1 2.439 995 GHz Ref 25 mW #Peak #Atten 10 dB 6.12 mW Log 5 dB/ 0ffst 22.9 dB #LgAv M1 S2 S3 FS £(f): FTun Swp







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
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Attenuator	Fairview Microwave	SA18E-20	TKS	3/6/2017	3/6/2018
Block - DC	Aeroflex	INMET 8535	AMO	3/27/2017	3/27/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
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 maximum power spectral density measurements was measured using the channels and modes as called out on the following data sheets.

Per the procedure outlined in ANSI C63.10 the peak power spectral density was measured in a 3 kHz RBW.



					TbtTx 2017.01.27	XMit 2017.02.08				
EUT:	IMP004M			Work Order:	ELIM0013					
Serial Number:	IMP0107			Date:	05/31/17					
Customer:	Electric Imp, Inc.			Temperature:	21.3 °C					
Attendees:	Jonathan Dillon			Humidity:	49% RH					
Project:	None			Barometric Pres.:	1014 mbar					
Tested by:	Mike Tran		Power: 3.3VDC regulated down from USB 5V	Job Site:	OC13					
TEST SPECIFICAT	IONS		Test Method							
FCC 15.247:2017			ANSI C63.10:2013							
COMMENTS										
DEVIATIONS FROM	Total Offset 22.92dB (20dB pad + DC Block + coax cable + client provided patch cable) at 2.4GHz									
None										
Configuration #	2	Signature	And duy							
				Value dBm/3kHz	Limit < dBm/3kHz	Results				
BLE/GFSK Low Cha	annel, 2402 MHz			-6.909	8	Pass				
BLE/GFSK Mid Cha	nnel, 2440 MHz			-6.105	8	Pass				
BLE/GFSK High Cha	annel, 2480 MHz			-7.698	8	Pass				

Report No. ELIM0013.2



TbtTx 2017.01.27 XMit 2017.02.08 BLE/GFSK Low Channel, 2402 MHz Value Limit dBm/3kHz < dBm/3kHz Results -6.909 8 Pass R 🔆 Agilent 15:27:15 May 23, 2017 Т Element Materials Technology Mkr1 2.401 986 0 GHz Ref -2 dBm #Peak #Atten 10 dB -6.91 dBm Log Ó 5 J dB/ Offst 22.9 dB #LgAv V1 S2 S3 FC £(f): f>50k Swp Center 2.402 000 0 GHz #Res BW 3 kHz Span 10 MHz #VBW 9.1 kHz Sweep 1.062 s (8192 pts) BLE/GFSK Mid Channel, 2440 MHz Value Limit Results dBm/3kHz < dBm/3kHz -6.105 8 Pass







# **BAND EDGE COMPLIANCE**



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
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Attenuator	Fairview Microwave	SA18E-20	TKS	3/6/2017	3/6/2018
Block - DC	Aeroflex	INMET 8535	AMO	3/27/2017	3/27/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
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 spurious RF conducted emissions at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no hop mode. The channels closest to the band edges were selected.

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

# BAND EDGE COMPLIANCE



						TbtTx 2017.01.27	XMit 2017.02.08			
EUT:	IMP004M				Work Order:	ELIM0013				
Serial Number:	IMP0107				Date:	05/31/17				
Customer:	Electric Imp, Inc.				Temperature:	21.3 °C				
Attendees:	Jonathan Dillon				Humidity:	49% RH				
Project:	None				Barometric Pres.:	1014 mbar				
Tested by:	Mike Tran		Power:	3.3VDC regulated down from USB 5V	Job Site:	OC13				
TEST SPECIFICATI	ONS			Test Method						
FCC 15.247:2017				ANSI C63.10:2013						
COMMENTS	COMMENTS									
Total Offset 22.92d	Total Offset 22.92dB (20dB pad + DC Block + coax cable + client provided patch cable) at 2.4GHz									
DEVIATIONS FROM	I TEST STANDARD									
None										
Configuration #	2	Signature	And H	ing						
					Value	Limit				
					(dBc)	≤ (dBc)	Result			
BLE/GFSK Low Cha	nnel, 2402 MHz				-59.13	-20	Pass			
BLE/GFSK High Cha	annel, 2480 MHz				-62.79	-20	Pass			

### **BAND EDGE COMPLIANCE**



TbtTx 2017.01.27 BLE/GFSK Low Channel, 2402 MHz Value Limit (dBc) ≤ (dBc) Result 59.13 20 Pass R T Agilent 15:26:37 May 23, 2017 \*\* Element Materials Technology ▲ Mkr1 -2.064 MHz Ref 10 dBm #Peak #Atten 10 dB -59.13 dB 8 Log 10 dB/ Offst 22.9 dB #LgAv V1 S2 S3 FC Ś - Unit Marin Norm **£**(f): f>50k STV Var www. Swp Center 2.400 000 GHz Span 10 MHz #Res BW 100 kHz #VBW 300 kHz Sweep 999.7 µs (3000 pts) BLE/GFSK High Channel, 2480 MHz Limit Value Result (dBc) ≤ (dBc) -62.79 -20 Pass Agilent 15:39:38 May 23, 2017 \*\* R T Element Materials Technology ▲ Mkr1 3.835 MHz Ref 10 dBm #Peak #Atten 10 dB -62.79 dB  $\sim \lambda_{e}$ Log 10 dB/ 0ffst 22.9 dB #LgAv V1 S2 S3 FC www.www. \$ Mu MWW **£**(f): f>50k 1/mar Swp

#VBW 300 kHz

Center 2.483 500 GHz

#Res BW 100 kHz

Span 10 MHz

Sweep 999.7 µs (3000 pts)



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
Generator - Signal	Agilent	E8257D	TGU	2/5/2015	2/5/2018
Attenuator	Fairview Microwave	SA18E-20	TKS	3/6/2017	3/6/2018
Block - DC	Aeroflex	INMET 8535	AMO	3/27/2017	3/27/2018
Cable	Fairview Microwave	SCA1814-0101-120	OCZ	NCR	NCR
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 spurious RF conducted emissions were measured with the EUT set to low, medium and high transmit frequencies. The EUT was transmitting at the data rate(s) listed in the datasheet in a no-hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency range.



					10(1x 2017.01.27	AMII 2017.02.06					
EUT:	IMP004M			Work Order:	ELIM0013						
Serial Number:	IMP0107		Date:	Date: 05/31/17							
Customer:	Electric Imp, Inc.		Temperature:	Temperature: 21.3 °C							
Attendees:	Jonathan Dillon		Humidity:	idity: 49% RH							
Project:	None		Barometric Pres.:	ric Pres.: 1014 mbar							
Tested by:	Mike Tran		Job Site:	Job Site: OC13							
TEST SPECIFICAT	TEST SPECIFICATIONS Test Method										
FCC 15.247:2017	ANSI C63.10:2013										
COMMENTS	COMMENTS										
Total Offset 22.92d	IB (20dB pad + DC Block +	coax cable + client provided pate	ch cable) at 2.4GHz								
			,								
DEVIATIONS FROM TEST STANDARD											
None											
None											
None											
None Configuration #	2		And Huy								
None Configuration #	2	Signature	Down dung								
None Configuration #	2	Signature	And lun	Max Value	Limit						
None Configuration #	2	Signature	And Mun Frequency Range	Max Value (dBc)	Limit ≤ (dBc)	Result					
None Configuration # BLE/GFSK Low Cha	2 annel, 2402 MHz	Signature	Frequency Range Fundamental	Max Value (dBc) N/A	Limit ≤ (dBc) N/A	Result N/A					
None Configuration # BLE/GFSK Low Cha BLE/GFSK Low Cha	2 annel, 2402 MHz annel, 2402 MHz	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz	Max Value (dBc) N/A -58.45	Limit ≤ (dBc) N/A -20	Result N/A Pass					
None Configuration # BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Low Cha	2 annel, 2402 MHz annel, 2402 MHz annel, 2402 MHz	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz	Max Value (dBc) N/A -58.45 -58.31	Limit ≤ (dBc) N/A -20 -20	Result N/A Pass Pass					
None Configuration # BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Mid Cha	2 annel, 2402 MHz annel, 2402 MHz annel, 2402 MHz nnel, 2440 MHz	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental	Max Value (dBc) N/A -58.45 -58.31 N/A	Limit ≤ (dBc) N/A -20 -20 N/A	Result N/A Pass Pass N/A					
None Configuration # BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Mid Cha BLE/GFSK Mid Cha	2 annel, 2402 MHz annel, 2402 MHz annel, 2402 MHz annel, 2440 MHz nnnel, 2440 MHz	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz	Max Value (dBc) N/A -58.45 -58.31 N/A -59.67	Limit ≤ (dBc) N/A -20 -20 N/A -20 -20	Result N/A Pass Pass N/A Pass					
None Configuration # BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Mid Cha BLE/GFSK Mid Cha BLE/GFSK Mid Cha	2 annel, 2402 MHz annel, 2402 MHz annel, 2402 MHz annel, 2440 MHz annel, 2440 MHz	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 12.5 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz 12.5 GHz - 25 GHz	Max Value (dBc) N/A -58.45 -58.31 N/A -59.67 -58.98	Limit ≤ (dBc) N/A -20 -20 N/A -20 -20 -20	Result N/A Pass Pass N/A Pass Pass					
None Configuration # BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Mid Cha BLE/GFSK Mid Cha BLE/GFSK Mid Cha BLE/GFSK High Ch	2 annel, 2402 MHz annel, 2402 MHz annel, 2402 MHz innel, 2440 MHz innel, 2440 MHz annel, 2440 MHz annel, 2440 MHz	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental Fundamental	Max Value (dBc) N/A -58.45 -58.31 N/A -59.67 -58.98 N/A	Limit ≤ (dBc) N/A -20 -20 N/A -20 -20 N/A	Result N/A Pass Pass N/A Pass Pass N/A					
None Configuration # BLE/GFSK Low Che BLE/GFSK Low Che BLE/GFSK Mid Cha BLE/GFSK Mid Cha BLE/GFSK Mid Cha BLE/GFSK Mid Cha BLE/GFSK High Ch	2 annel, 2402 MHz annel, 2402 MHz annel, 2402 MHz annel, 2400 MHz annel, 2440 MHz annel, 2440 MHz annel, 2480 MHz	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 25 GHz Fundamental 30 MHz - 12.5 GHz	Max Value (dBc) N/A -58.45 -58.31 N/A -59.67 -58.98 N/A -58.34	Limit ≤ (dBc) N/A -20 -20 N/A -20 -20 N/A -20	Result N/A Pass Pass N/A Pass Pass N/A Pass					
None Configuration # BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Low Cha BLE/GFSK Kid Cha BLE/GFSK Kid Cha BLE/GFSK Kids Cha BLE/GFSK Kids Cha BLE/GFSK Kids Cha	2 annel, 2402 MHz annel, 2402 MHz annel, 2402 MHz annel, 2440 MHz annel, 2440 MHz annel, 2440 MHz annel, 2480 MHz annel, 2480 MHz	Signature	Frequency Range Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 22.5 GHz Fundamental 30 MHz - 12.5 GHz 12.5 GHz - 12.5 GHz 5 GHz - 12.5 GHz 12.5 GHz - 12.5 GHz 12.5 GHz - 25 GHz	Max Value (dBc) N/A -58.45 -58.31 N/A -59.67 -58.98 N/A -58.93 N/A -58.34 -59.32	Limit ≤ (dBc) -20 -20 N/A -20 -20 N/A -20 N/A -20 -20	Result N/A Pass Pass N/A Pass N/A Pass N/A Pass Pass					





BLE/GFSK Mid Channel, 2440 MHz							
Frequency		Max Value	Limit				
Range		(dBc)	≤ (dBc)	Result			
Fundamental		N/A	N/A	N/A			

兼	Agilent 15:	31 <b>:</b> 20 Ma	ay 23, 20	17				RT		
Element Materials Technology Mkr1 2.439 988 18 GHz										
Ref 1	0 dBm		#At	ten 10 dE	3				7	.20 dBm
#Peak					4					
Log					<u> </u>					
10										
Uttot UD/										
22.9										
dB										
#LgA∖	/									
V1 S	2									
53 F	니									
e (1).										
£-(T). f∖50L	,									
1700r Swn	`									
0110										
Start	2 439 500	L OO GHZ						Stop	1 2 440 500	) 00 GHz
#Res	BW 100 kH	7		#	VBW 300	kHz	S	ween 1 û	92 ms (81	92 nts)
dB ¥LgA\ V1 S S3 F £(f): Swp Start #Res	2 C 2.439 500 BW 100 kH	00 GHz			VBW 300	kHz_		Stop weep 1.0	2.440 500 92 ms (8:	) 00 GH: 192 pts)

TbtTx 2017.01.27

XMit 2017.02.08



#VBW 300 kHz

Swp

Start 12.500 0 GHz

#Res BW 100 kHz

Stop 25.000 0 GHz

Sweep 1.195 s (8192 pts)







