

RF TEST REPORT

Report: FCC_IC_RF_SL15080501-ZBR-027

Supersedes: N/A

Applicant: Zebra Technologies Corporation

Product name: Bluetooth Low Energy Module

Model: ZBRBLE

Test standard: FCC 15.209; 15.247(d); IC RSS 247

Test method: ANSI C63.10 – 2013, 558074 D01 DTS Meas Guidance V03r03

FCC ID: I28MD-ZBRBLE

IC ID: 37981B-ZBRBLE

Date of test: 10/8/2015

Issue date: 10/15/2015

Test result: PASS

Equipment complied with the specifications:

Equipment did not comply with the specifications:

This test report is issued under the authority of:

Gary Chou

Full Name: Gary Chou

Title: Test Engineer

Full Name: Nima Molaei

Title: Engineer Reviewer

N. Molaei G.

This test report may be reproduced in full only.

Test result presented in this test report is applicable to the tested sample only.

ISSUED BY:

SIEMIC Laboratories

775 Montague Expressway, Milpitas, CA 95035 USA



Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for conformity assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC, NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC, RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

Accreditations for conformity assessment

Country/Region	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

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1. Report revision history

2. Executive summary

The purpose of this test program was to demonstrate compliance of following product:

Company: Zebra Technologies Corporation

Product: Bluetooth Low Energy Module

Model: ZBRBLE

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3. Customer information

Applicant name: Zebra Technologies Corporation

Applicant address: 333 Corporate Woods Parkway, Vernon Hills Illinois 60061

Manufacturer name: Zebra Technologies Corporation

Manufacturer address: 333 Corporate Woods Parkway, Vernon Hills Illinois 60061

4. Test site information

Lab performing tests: SIEMIC Laboratories

Lab address: 775 Montague Expressway, Milpitas, CA 95035

FCC test site no.: 881796

IC test site no.: 4842D-2

VCCI test site no.: A0133

5. Modification

Index	Item	Description	Note

6. EUT Information

6.1. EUT Description

Product Name	Bluetooth Low Energy Module
Model No.	ZBRBLE
Trade Name	ZEBRA
Serial No.	GCO000699
Host Model No.	N/A
Input Power	3.3V DC
Power Adapter Manu/Model	N/A
Power Adapter SN	N/A
Date of EUT received	10/02/2015
Equipment Class/ Category	DTS
Port/Connectors	N/A
Product Hardware Version	N/A
Product Software Version	V77.19.xxx
Radio Hardware Version	Rev E
Radio Software Version	Version 4

6.2. Radio description

Radio Type	Bluetooth (Ver4.0+EDR)
Operating Frequency	2402MHz-2480MHz
Modulation	DSSS
Channel Spacing	2MHz
Antenna Type	Chip Antenna
Antenna Gain	1dBi
Antenna Connector Type	N/A

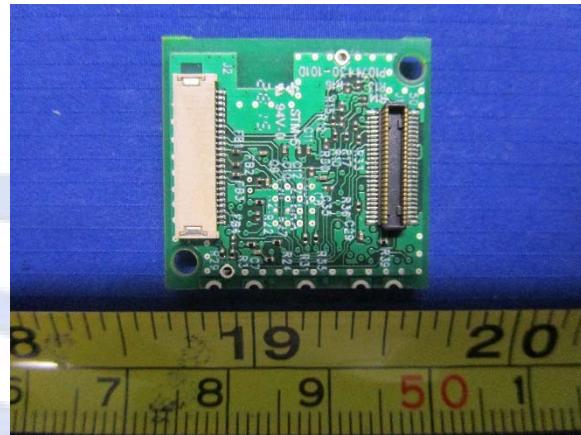
6.3. EUT Power level setting

Mode	Frequency (MHz)	Power setting
BLE	2402	Default
BLE	2440	Default
BLE	2480	Default

6.4. EUT Photos | External



EUT Top View



EUT Bottom View

6.5. EUT Photos | Internal



Crystal

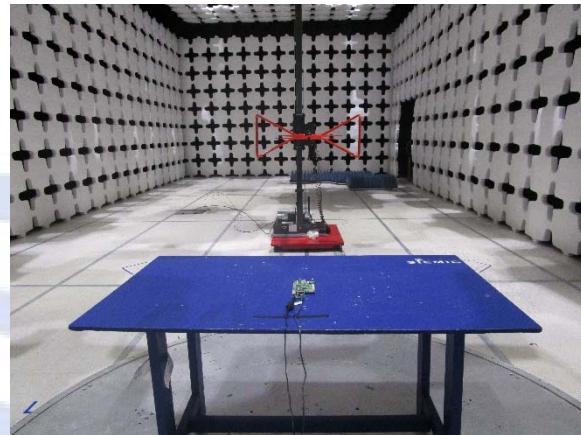


Main Chip

6.6. EUT Photos | Test setup



Radiated Emission Test setup (<1GHz) – Front View



Radiated Emission Test setup (<1GHz) – Rear View



Radiated Emission Test setup (>1GHz) – Front View

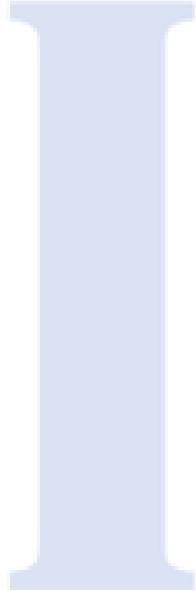


Radiated Emission Test setup (>1GHz) – Rear View

7. Supporting equipment / Software / Cabling information

7.1. Support equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	P05F Latitude E5510	N/A	Dell	-
2	Fixture Board	N/A	N/A	Zebra	-



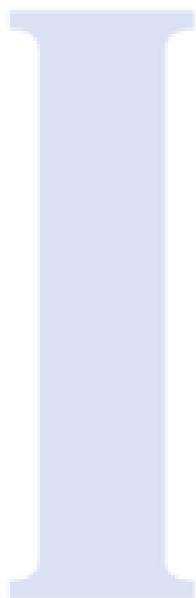
7.2. Cabling description

Item	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
USB	EUT	I/O Port	Laptop	USB	1	Unshielded	-



7.3. Test software description

Test Item	Software	Description
RF TEST Item	Splat V0.7	Set the EUT to transmit continuously in different test mode



8. Test summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Restricted Band of Operation	FCC	15.205	FCC	ANSI C63.10:2013	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 8.10	IC	558074 D01 DTS Meas Guidance v03r03	<input type="checkbox"/> N/A
AC Conducted Emissions	FCC	15.207(a)	FCC	ANSI C63.10:2013	<input type="checkbox"/> Pass
	IC	RSS Gen 8.8	IC	RSS Gen Issue 4: 2014	<input checked="" type="checkbox"/> N/A

DTS band Requirement

Test Item		Test standard		Test Method/Procedure	Pass / Fail
99% Occupied Bandwidth	IC	RSS Gen 6.6	IC	RSS Gen Issue 4: 2014	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
6dB Bandwidth	FCC	15.247(a)(2)	FCC	558074 D01 DTS Meas Guidance v03r03	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
	IC	RSS247 (5.2.1)	IC		
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v03r03	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
	IC	RSS247 (5.5)	IC		
Output Power	FCC	15.247(b)	FCC	558074 D01 DTS Meas Guidance v03r03	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
	IC	RSS247 (5.4.4)	IC		
Receiver Spurious Emissions	IC	RSS Gen (4.8)	IC	RSS Gen Issue 4: 2014	<input type="checkbox"/> Pass <input checked="" type="checkbox"/> N/A
Antenna Gain > 6 dBi	FCC	15.247(e)	FCC	-	<input type="checkbox"/> Pass <input checked="" type="checkbox"/> N/A
	IC	-	IC	-	<input checked="" type="checkbox"/> N/A
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v03r03	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A
	IC	RSS247 (5.2.2)	IC		
RF Exposure requirement	FCC	15.247(i)	FCC	-	<input type="checkbox"/> Pass <input checked="" type="checkbox"/> N/A
	IC	RSS Gen(5.5)	IC	RSS Gen Issue 4: 2014	<input type="checkbox"/> Pass <input checked="" type="checkbox"/> N/A
Remark	1. All measurement uncertainties do not take into consideration for all presented test results. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.				

9. Measurement uncertainty

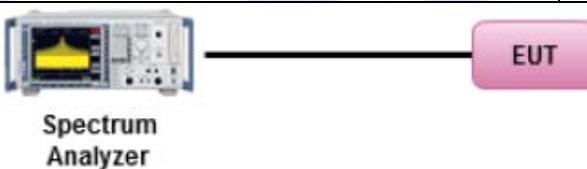
Emissions			
Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious Emissions	1GHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+4.3dB/-4.1dB



10. Measurements, Examination and Derived results

10.1. 6dB Bandwidth and 99% Occupied Bandwidth

Requirement(s):

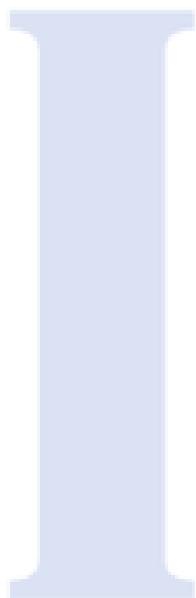
Spec	Item	Requirement	Applicable
§FCC-15.247	a)(2)	6dB BW≥500KHz;	
§RSS-247	5.2(1)	6dB BW≥500KHz;	
§RSS-Gen	6.6	99% OBW For FCC reference only; Required by IC	
Test Setup			
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r03, 8.1 DTS bandwidth</p> <p><u>6dB Emission bandwidth measurement procedure:</u></p> <ul style="list-style-type: none"> - Set RBW = 100 kHz. - Set the video bandwidth (VBW) $\geq 3 \times$ RBW. - Detector = Peak. - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize. - Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. <p><u>99% Occupied bandwidth measurement procedure</u></p> <ul style="list-style-type: none"> - Allow the trace to stabilize. - Use the spectrum analyzer built-in measurement function to determine the 99% OBW. <ul style="list-style-type: none"> o Set RBW = close to 1% of the selected span as is o Set VBW = $3 \times$ RBW o Detector = Peak o Trace mode = max hold o Sweep = auto couple - Capture the plot. - Repeat above steps for different test channel and other modulation type. 		
Test Date	10/8/2015	Environmental condition	Temperature: 25
			Relative Humidity: 40%
			Atmospheric: 1010PA
Remark	N/A		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
6 dB DTS Bandwidth	100KHz	3 x RBW	>EBW	PK	Auto	Max hold	-
99% OBW	1% of selected span	3 x RBW	>EBW	PK	Auto	Max hold	-

Test Data Yes (See below) N/A

Test Plot Yes (See below) N/A



6dB Bandwidth

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit	Result
6dB BW	BLE	2402	Low	0.678	≥ 0.5	Pass
6dB BW	BLE	2440	Mid	0.69	≥ 0.5	Pass
6dB BW	BLE	2480	High	0.682	≥ 0.5	Pass

99% Occupied Bandwidth

Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% OBW	BLE	2402	Low	1.0884
99% OBW	BLE	2440	Mid	1.0859
99% OBW	BLE	2480	High	1.0841

6dB Bandwidth AND 99% Occupied Bandwidth test plots



2402 Bandwidth

2440 Bandwidth



2480 Bandwidth

10.2. Output power

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 § RSS-247	a)	FHSS in 2400-2483.5MHz with \geq 75 channels: \leq 1 Watt	<input type="checkbox"/>
	b)	FHSS in 5725-5850MHz: \leq 1 Watt	<input type="checkbox"/>
	c)	For all other FHSS in the 2400-2483.5MHz band: \leq 0.125 Watt.	<input type="checkbox"/>
	d)	FHSS in 902-928MHz with \geq 50 channels: \leq 1 Watt	<input type="checkbox"/>
	e)	FHSS in 902-928MHz with \geq 25 & $<$ 50 channels: \leq 0.25 Watt	<input type="checkbox"/>
	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: \leq 1 Watt	<input checked="" type="checkbox"/>
Test Setup			
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r03, 9.2.3.1</p> <p><u>Measurement using a Power Meter (PM)</u></p> <p>a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.</p> <ol style="list-style-type: none"> 1) The EUT is configured to transmit continuously, or to transmit with a constant duty factor. 2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level. 3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five. <p>b) If the transmitter does not transmit continuously, measure the duty cycle (x) of the transmitter output signal as described in Section 6.0.</p> <p>c) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.</p> <p>d) Adjust the measurement in dBm by adding $10\log(1/x)$, where x is the duty cycle to the measurement result.</p>		
Test Date	10/8/2015	Environmental condition	Temperature: 25 Relative Humidity: 40% Atmospheric: 1010PA
Remark	N/A		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes N/A

Test Plot Yes (See below) N/A

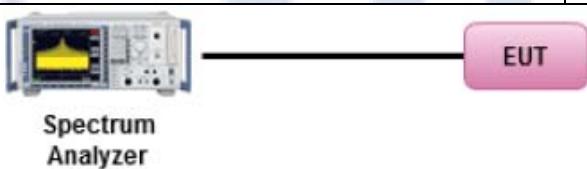
Output power measurement result

Test mode	Freq (MHz)	CH	Conducted Power	Limit (dBm)	Result
BLE	2402	Low	-1.85	30	Pass
BLE	2440	Mid	-2.81	30	Pass
BLE	2480	High	-3.88	30	Pass



10.3. Band edge

Requirement(s):

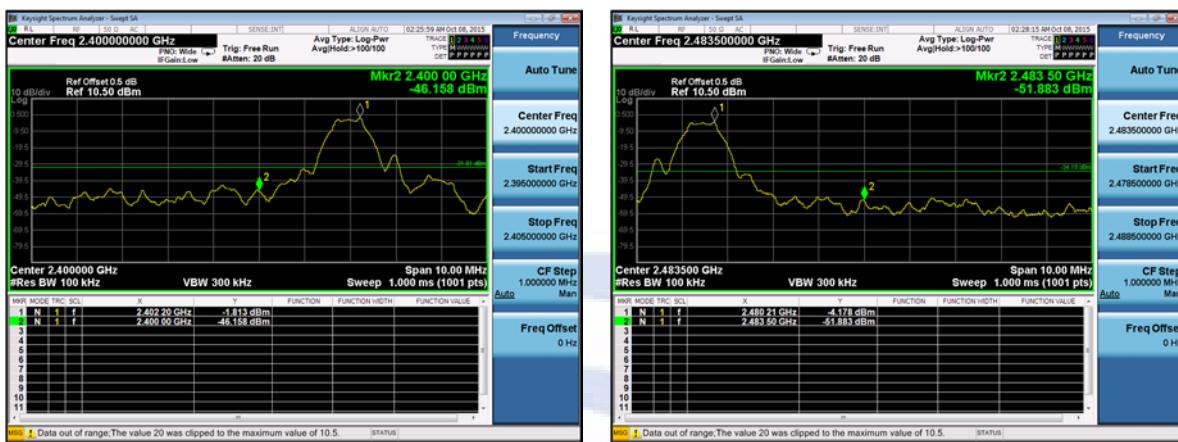
Spec	Item	Requirement		Applicable		
§ 15.247 § RSS-247	d)	For non-restricted band, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209 (a) is not required <input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down		<input checked="" type="checkbox"/>		
Test Setup						
Test Procedure	558074 D01 DTS Meas Guidance v03r03 <u>Band Edge measurement procedure</u> <ul style="list-style-type: none"> - Set the EUT to maximum power setting and enable the EUT transmit continuously. - Band edge emissions must be at least 30 dB down from the highest emission level within the authorized band as a measured. The attenuation shall be 30 dB instead of 20 dB when RMS conducted output power procedure is used. - Change modulation and channel bandwidth then repeat step 1 to 2. - Measured and record the results in the test report. 					
Test Date	10/8/2015	Environmental condition	Temperature: 25			
			Relative Humidity: 40%			
			Atmospheric Pressure: 1010mba			
Remark	N/A					
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail					

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
Band Edge	100KHz	$\geq 3 \times$ RBW	135 MHz	RMS	Auto	Trace average	-

Test Data Yes N/A

Test Plot Yes (See below) N/A

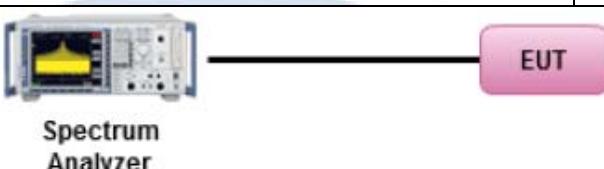


2402MHz Band Edge

2480MHz Band Edge

10.4. Peak spectral density

Requirement(s):

Spec	Item	Requirement	Applicable	
§ 15.247	e)	DSSS: $\leq 8\text{dBm}/3\text{KHz}$	<input checked="" type="checkbox"/>	
§ RSS-247	f)	DSSS in hybrid sys with FH turned off: $\leq 8\text{dBm}/3\text{KHz}$	<input type="checkbox"/>	
Test Setup				
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r03, 10.2 Method PEAK PSD-1</p> <p><u>Peak spectral density measurement procedure</u></p> <ul style="list-style-type: none"> - a) Set analyzer center frequency to DTS channel center frequency. - b) Set the span to 1.5 times the DTS bandwidth. - c) Set the RBW to: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$. - d) Set the VBW $\geq 3 \times \text{RBW}$. - e) Detector = peak. - f) Sweep time = auto couple. - g) Trace mode = max hold. - h) Allow trace to fully stabilize. - i) Use the peak marker function to determine the maximum amplitude level within the RBW. - j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat. 			
Test Date	10/8/2015	Environmental condition	Temperature:	25
			Relative Humidity:	40
			Atmospheric Pressure:	1010 Pa
Remark	N/A			
Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
PSD	3KHz	$\geq 3 \times \text{RBW}$	1.5x DTS BW	PEAK	Auto	Trace POS Peak	-

Test Data Yes N/A

Test Plot Yes (See below) N/A

PSD measurement results

Test mode	Freq (MHz)	CH	Conducted Power (dBm/3KHz)	Limit (dBm/3KHz)	Result
BLE	2402	Low	-14.441	8	Pass
BLE	2440	Mid	-15.942	8	Pass
BLE	2480	High	-15.773	8	Pass



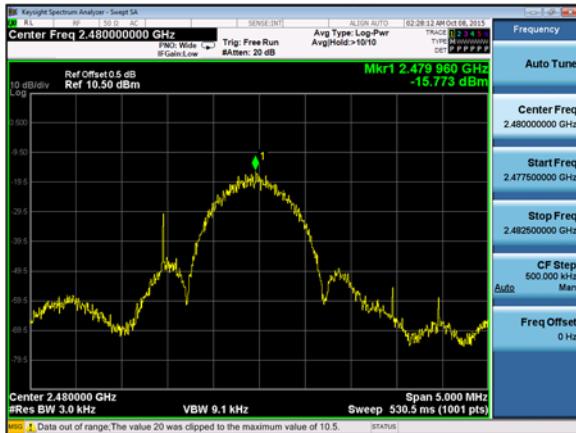
Test plots



2402MHz PSD



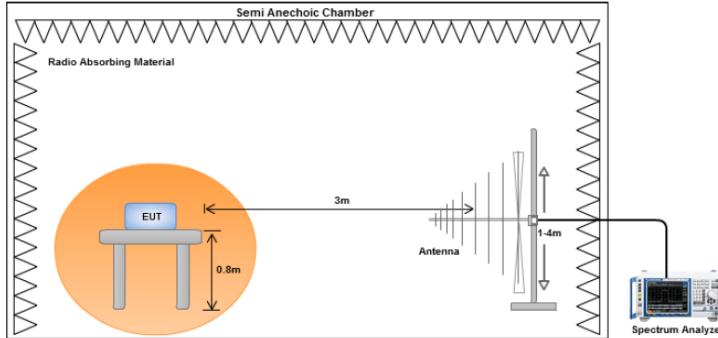
2440MHz PSD



2480MHz PSD

10.5. Radiated spurious emissions in restricted band

Requirement(s):

Spec	Item	Requirement	Applicable	
47CFR§15.247(d), § RSS-247	a)	<p>For non-restricted band, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required</p> <p><input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down</p>	<input type="checkbox"/>	
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	<input checked="" type="checkbox"/>	
Test Setup				
Test Procedure	<ol style="list-style-type: none"> 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. An average measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured. 			
Test Date	02/24/2015	Environmental condition	Temperature: 25	
			Relative Humidity: 40	
			Atmospheric Pressure: 1010 PA	
Remark	The EUT was scanned up to 25GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case. Radiated measurement was measured with antenna port terminated, there isn't outstanding emission found at the edge of restricted frequency, within x dB margin			
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail			

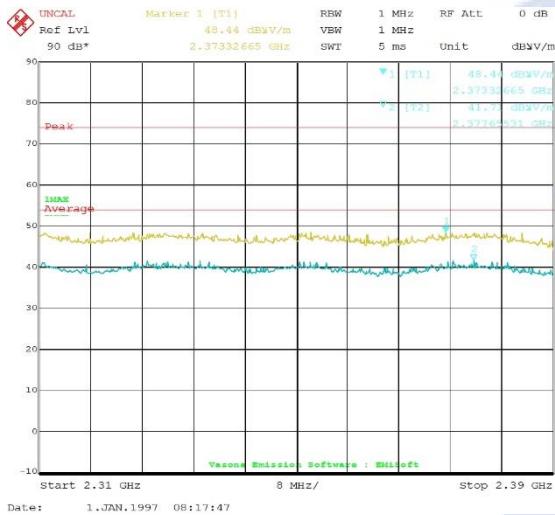
Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
Radiated Spurious Emission	1MHz	3MHz	1GHz - 25 GHz	Peak	Auto	Max hold	PK Measurement
Radiated Spurious Emission	1MHz	10Hz	1GHz - 25 GHz	Peak	Auto	Max hold	Ave Measurement

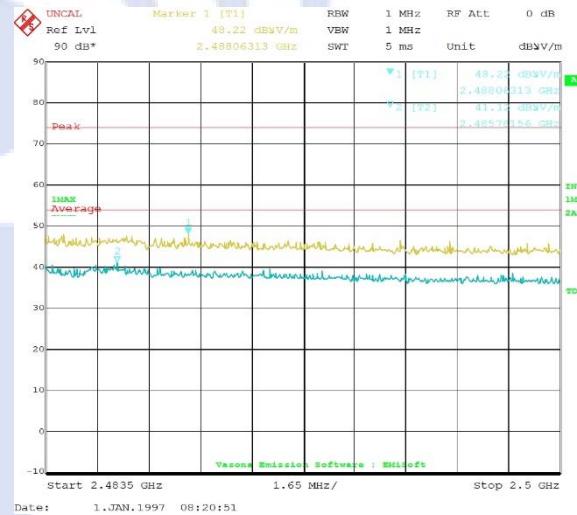
 Test Data Yes N/A

 Test Plot Yes (See below) N/A

Restricted band measurement plots



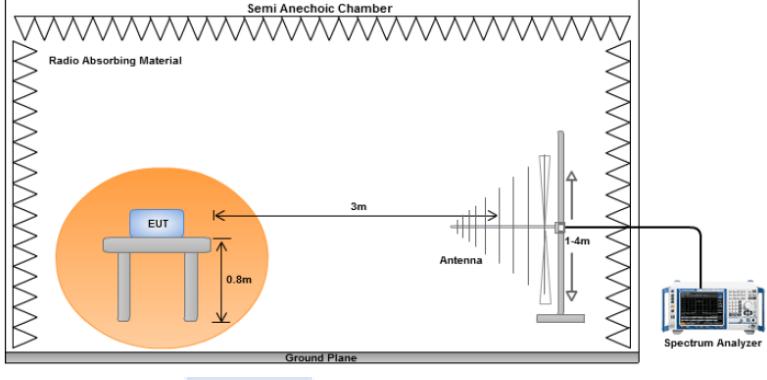
TX MODE 2402 MHz



TX MODE 2480 MHz

10.6. Radiated spurious emissions below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable										
47CFR§15.247(d) § RSS-247	a)	<p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</p> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr> </thead> <tbody> <tr> <td>30 – 88</td><td>100</td></tr> <tr> <td>88 – 216</td><td>150</td></tr> <tr> <td>216 – 960</td><td>200</td></tr> <tr> <td>Above 960</td><td>500</td></tr> </tbody> </table>	Frequency range (MHz)	Field Strength (uV/m)	30 – 88	100	88 – 216	150	216 – 960	200	Above 960	500	<input checked="" type="checkbox"/>
Frequency range (MHz)	Field Strength (uV/m)												
30 – 88	100												
88 – 216	150												
216 – 960	200												
Above 960	500												
Test Setup													
Procedure		<ol style="list-style-type: none"> 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. A Quasi-peak measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured. 											
Remark		The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.											
Result		<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail											

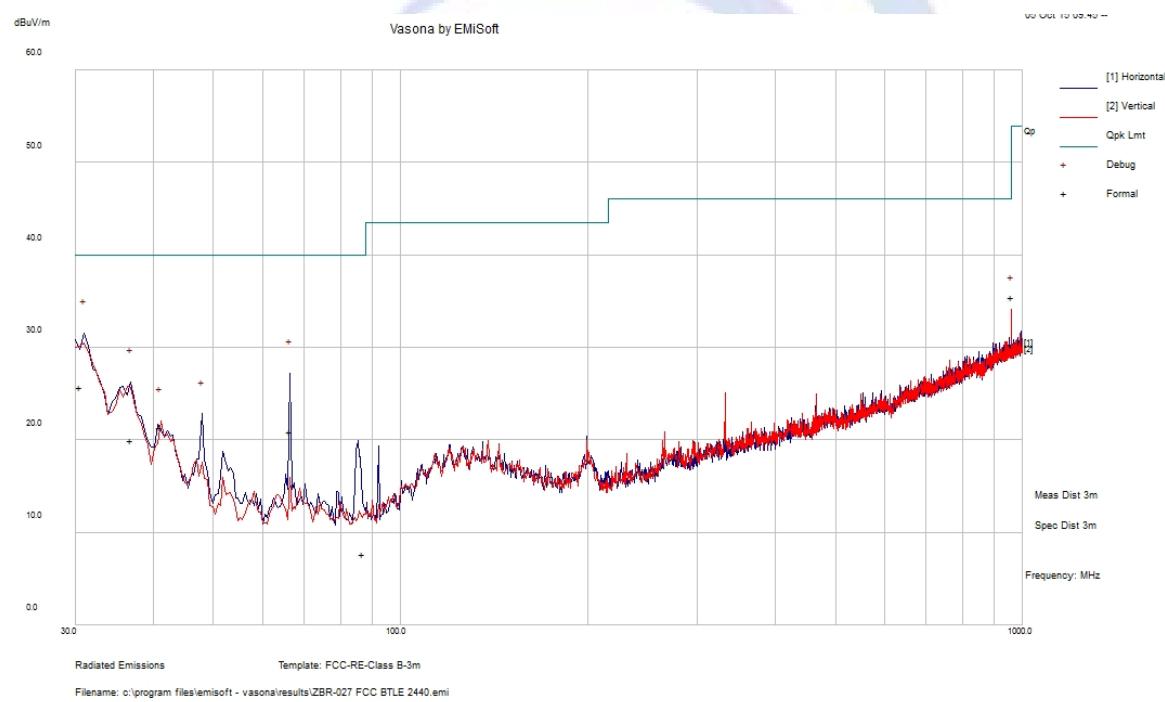
Test Data Yes N/A

Test Plot Yes (See below) N/A



Radiated emission test results (below 1GHz)

Test specification:	Radiated Emissions		
Environmental Conditions:	Temp(°C):	25	Result:
	Humidity (%):	58	
	Atmospheric(mbar):	1010	
Mains Power:	3.3V DC		<input checked="" type="checkbox"/> Pass
Tested by:	Gary Chou		<input type="checkbox"/> Fail
Test Date:	10/8/2015		
Remarks:	TX MODE 2440 MHz		

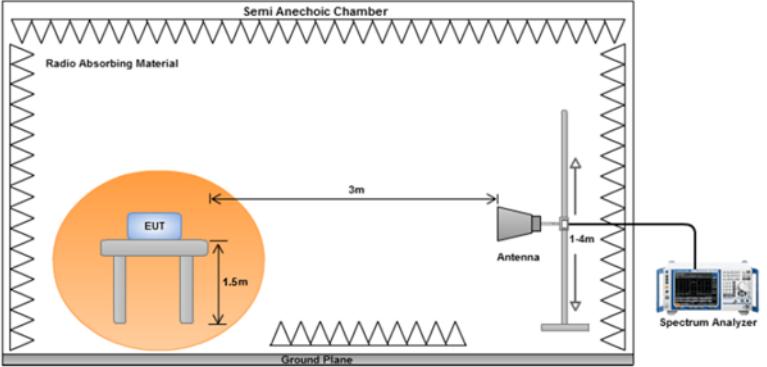


BLE

Frequency	Raw	Cable	AF (dB)	Level	Measurement	Pol	Hgt	Azt	Limit	Margin	Pass
30.47	39.68	0.81	-14.83	25.66	Quasi Max	V	195	250	40	-14.34	Pass
36.86	39.32	0.87	-20.27	19.92	Quasi Max	H	290	233	40	-20.08	Pass
66.49	49.77	1.28	-30.12	20.94	Quasi Max	H	172	19	40	-19.06	Pass
86.89	36.99	1.47	-30.8	7.66	Quasi Max	H	218	134	40	-32.34	Pass
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

10.7. Radiated spurious emissions between 1GHz-25GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d) § RSS-247	a)	<p>For non-restricted band, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required</p> <p><input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down</p>	<input checked="" type="checkbox"/>
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	<input checked="" type="checkbox"/>
Test Setup			
Procedure	<ol style="list-style-type: none"> 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. A Quasi-peak measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured. 		
Remark	<p>The EUT was scanned up to 25GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.</p>		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
Radiated Spurious Emission	1MHz	3MHz	1GHz - 25 GHz	Peak	Auto	Max hold	PK Measurement
Radiated Spurious Emission	1MHz	10Hz	1GHz - 25 GHz	Peak	Auto	Max hold	Ave Measurement

Test Data Yes N/A

Test Plot Yes (See below) N/A



Radiated emission test results (above 1GHz)
Above 1GHz-25GHz- BLE 2402MHz

Frequency	Raw	Cable	AF (dB)	Level	Measurement	Pol	Hgt	Azt	Limit	Margin	Pass
14526.45	39.13	13.15	8.35	60.62	Peak Max	V	198	209	74	-13.38	Pass
4033.73	36.63	5.86	12.08	54.57	Peak Max	V	191	317	74	-19.43	Pass
14526.45	26.33	13.15	8.35	47.83	Average Max	V	198	209	54	-6.17	Pass
4033.74	22.97	5.86	12.08	40.9	Average Max	V	191	317	54	-13.1	Pass

Above 1GHz-25GHz- BLE 2440MHz

Frequency	Raw	Cable	AF (dB)	Level	Measurement	Pol	Hgt	Azt	Limit	Margin	Pass
4066.10	36.14	5.89	11.94	53.96	Peak Max	V	178	332	74	-20.04	Pass
12107.67	38.08	12.39	8.52	59.00	Peak Max	H	210	267	74	-15	Pass
4066.10	22.92	5.89	11.94	40.74	Average Max	V	178	332	54	-13.26	Pass
12107.67	25.19	12.39	8.52	46.11	Average Max	H	210	267	54	-7.89	Pass

Above 1GHz-25GHz- BLE 2480MHz

Frequency	Raw	Cable	AF (dB)	Level	Measurement	Pol	Hgt	Azt	Limit	Margin	Pass
17999.54	36.89	13	10.91	60.79	Peak Max	V	289	256	74	-13.21	Pass
4067.53	35.75	5.89	11.93	53.56	Peak Max	H	150	258	74	-20.44	Pass
17999.54	23.95	13	10.91	47.86	Average Max	V	289	256	54	-6.14	Pass
4067.53	22.94	5.89	11.93	40.76	Average Max	H	150	258	54	-13.24	Pass

11. Annex A | Test Instruments

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	<input type="checkbox"/>
CHASE LISN	MN2050B	1018	08/07/2015	1 Year	08/07/2016	<input type="checkbox"/>
Radiated Emissions						
R & S Receiver	ESL6	100178	05/27/2015	1 Year	05/27/2016	<input checked="" type="checkbox"/>
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	<input checked="" type="checkbox"/>
ETS-Lingren Loop Antenna	6512	00049120	05/12/2015	1 Year	05/12/2016	<input checked="" type="checkbox"/>
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2015	1 Year	08/12/2016	<input checked="" type="checkbox"/>
3 Meters SAC	3M	N/A	08/08/2015	1 Year	08/08/2016	<input checked="" type="checkbox"/>
10 Meters SAC	10M	N/A	09/05/2015	1 Year	09/05/2016	<input checked="" type="checkbox"/>
RF Conducted Measurement						
Spectrum Analyzer	N9010A	10SL0219	08/20/2015	1 Year	08/20/2016	<input checked="" type="checkbox"/>
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	<input checked="" type="checkbox"/>
Test Equity Environment Chamber	1007H	61201	07/31/2015	1 Year	07/31/2016	<input checked="" type="checkbox"/>
USB RF Power Sensor	7002-006	10SL0190	09/03/2015	1 Year	09/03/2016	<input checked="" type="checkbox"/>

12. Annex B | SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		Radio & Telecommunications Terminal Equipment: EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA		Phase I, Phase II
CB(Certification Body)		
Vietnam MIC		Please see the document for the detailed scope
CAB Accreditation		
Hong Kong OFCA		(Phase II) OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		Radio: Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII
Japan Recognized Certification Body Designation		Radio: A1. Terminal equipment for purpose of calling
		Telecom: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		EMI: KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI
		EMS: KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EM, KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS

		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3 meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measurement
Australia CAB Recognition		EMC: AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radio communications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06, AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016, AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2