

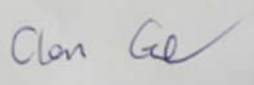
RF TEST REPORT



Report No.: FCC IC_RF_SL15122401-BTF-003_BLE_Rev1.0
Supersede Report No.: None

Applicant	:	Butterfleye, Inc.
Product Name	:	Butterfleye Smart Camera
Model No.	:	BFLY1
Test Standard	:	47 CFR 15.247 RSS 247 Iss.1 : May 2015
Test Method	:	ANSI C63.10: 2013 RSS Gen Iss 4: Nov 2014 558074 D01 DTS Meas Guidance v03r04
FCC ID	:	2AG9N-BFLY1
IC ID	:	21091-BFLY1
Dates of test	:	01/07/2016 - 01/14/2016
Issue Date	:	01/21/2016
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification [X]		
Equipment did not comply with the specification []		

This Test Report is Issued Under the Authority of:

	
Rachana Khanduri	Chen Ge
Test Engineer	Engineer Reviewer

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA



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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/RRR, 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 Product Certifications

Country	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

CONTENTS

1	REPORT REVISION HISTORY	4
2	EXECUTIVE SUMMARY	4
3	CUSTOMER INFORMATION	4
4	TEST SITE INFORMATION	4
5	MODIFICATION	4
6	EUT INFORMATION	5
6.1	EUT Description	5
6.2	Spec for BT Radio	5
6.3	EUT test modes/configuration Description	5
6.4	EUT Photos – External	6
6.5	EUT Photos (Internal)	7
6.6	EUT Test Setup Photos	8
7	SUPPORTING EQUIPMENT/SOFTWARE AND CABLING DESCRIPTION	9
7.1	Supporting Equipment	9
7.2	Cabling Description	9
7.3	Test Software Description	9
8	TEST SUMMARY	10
9	MEASUREMENT UNCERTAINTY	11
10	MEASUREMENTS, EXAMINATION AND DERIVED RESULTS	12
10.1	Conducted Emissions	12
10.2	Output Power (Bluetooth LE)	15
10.3	Band Edge (Bluetooth LE)	17
10.4	6dB Bandwidth (Bluetooth LE)	19
10.5	99% Occupied Bandwidth (Bluetooth LE)	22
10.6	Peak Spectral Density (Bluetooth LE)	25
10.7	Transmitter Radiated Spurious Emissions Below 1GHz	28
10.8	Transmitter Radiated Spurious Emissions > 1GHz & Restricted band	30
	ANNEX A. TEST INSTRUMENT	33
	ANNEX B. SIEMIC ACCREDITATION	34

1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC IC_RF_SL15122401-BTF-003_BLE	None	Original	01/21/2016
FCC IC_RF_SL15122401-BTF-003_BLE_Rev1.0	Rev1.0	Updated Antenna Gain	02/10/2016

2 Executive Summary

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

Company: Butterfleye, Inc.
Product: Butterfleye Smart Camera
Model: BFLY1

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	:	Butterfleye, Inc.
Applicant Address	:	2191-B, South El Camino Real, San Mateo, CA 94403, USA
Manufacturer Name	:	Appro Photoelectron, Inc.
Manufacturer Address	:	3F, No.23 Siyuan Rd., Xinzhuang Dist., New Taipei, 24251 Taiwan, (R.O.C)

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	:	Butterfleye Smart Camera
Model No.	:	BFLY1
Trade Name	:	Butterfleye
Serial No.	:	N/A
Host Model No.	:	N/A
Input Power	:	100-240V, 50/60Hz
Power Adapter Manu/Model	:	N/A
Power Adapter SN	:	N/A
Product Hardware version	:	DVT4
Product Software version	:	0.4.14
Radio Hardware version	:	DVT4
Radio Software version	:	0.4.14
Date of EUT received	:	01/07/2016
Equipment Class/ Category	:	DTS
Port/Connectors	:	USB

6.2 Spec for BT Radio

Radio Type	Bluetooth
Operating Frequency	2402MHz-2480MHz
Modulation	GFSK (LE)
Channel Spacing	2MHz (LE)
Antenna Type	Dipole
Antenna Gain	2.5 dBi (BTLE)
Antenna Connector Type	U.FL connector

Type	Channel No.	Frequency (MHz)	Power Setting
Bluetooth(BLE) 2402-2480MHz	0	2402	Default
	19	2440	Default
	39	2480	Default

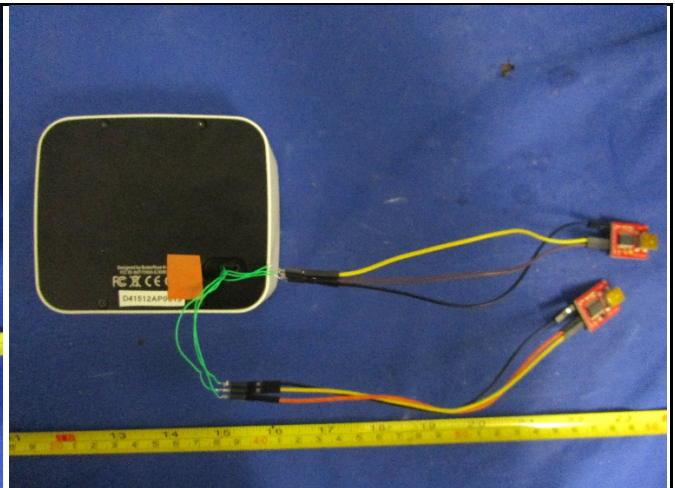
6.3 EUT test modes/configuration Description

Mode	Note
Bluetooth	BLE (GFSK)

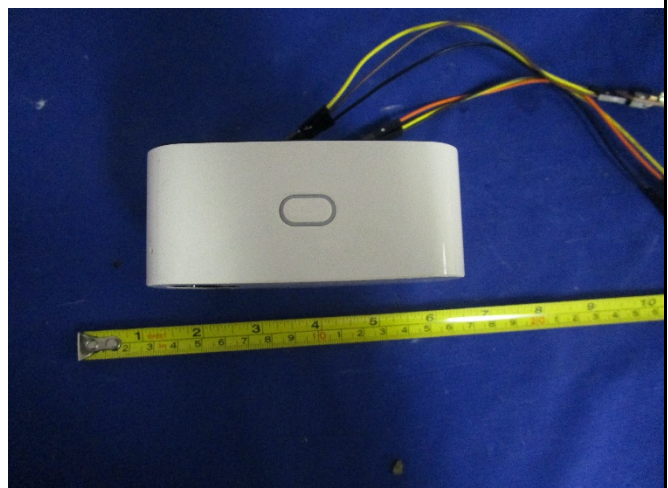
6.4 EUT Photos – External



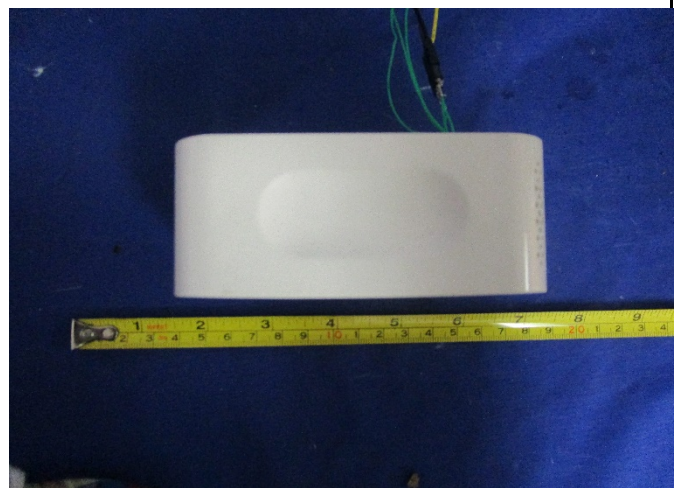
EUT - Front View



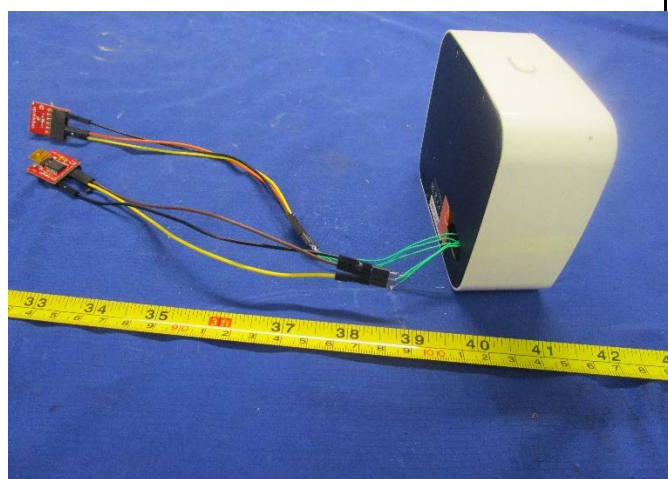
EUT – Rear View



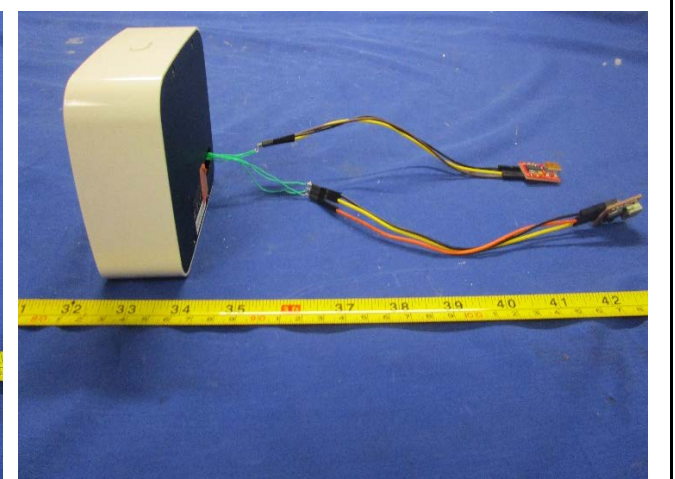
EUT - Top View



EUT – Bottom View

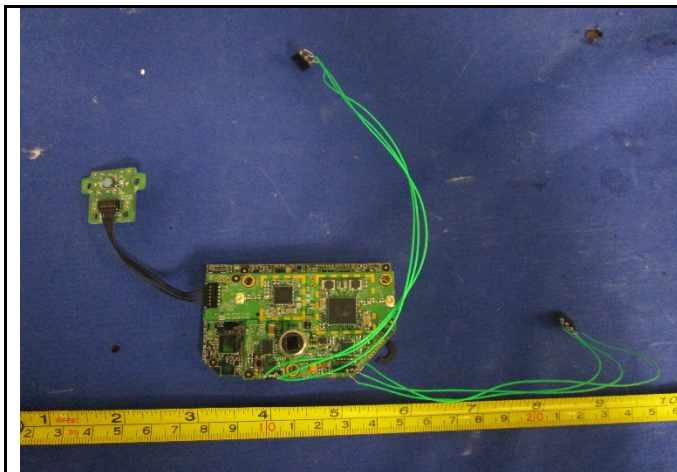


EUT – Left Side View

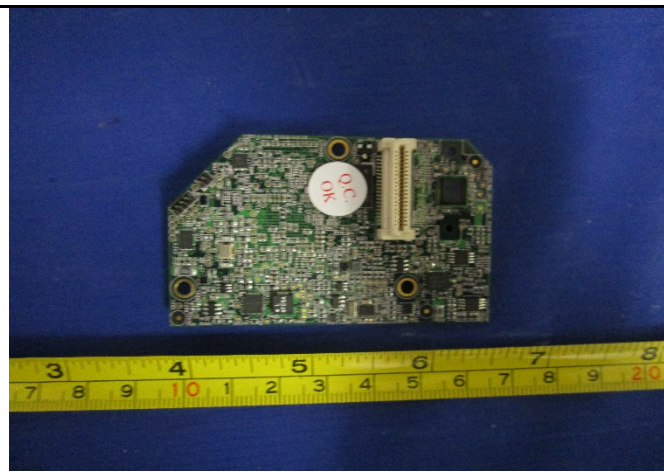


EUT – Right Side View

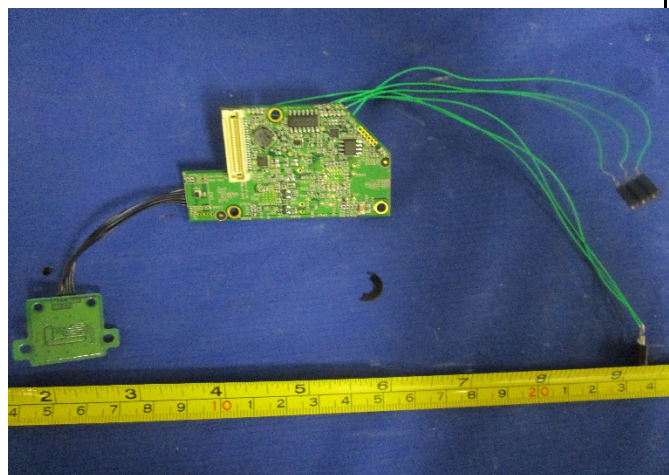
6.5 EUT Photos (Internal)



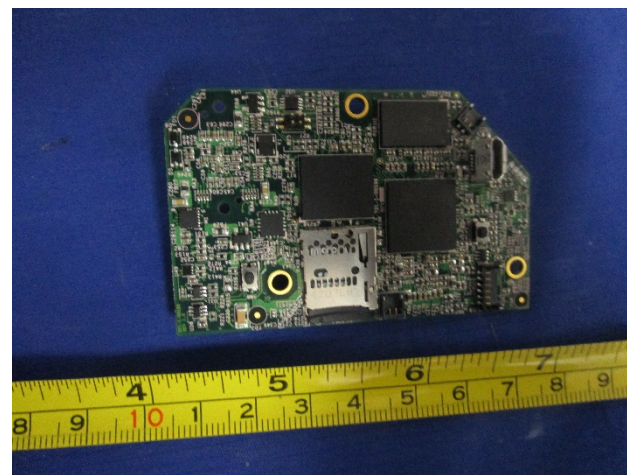
Cover off View 1



Cover off View 2



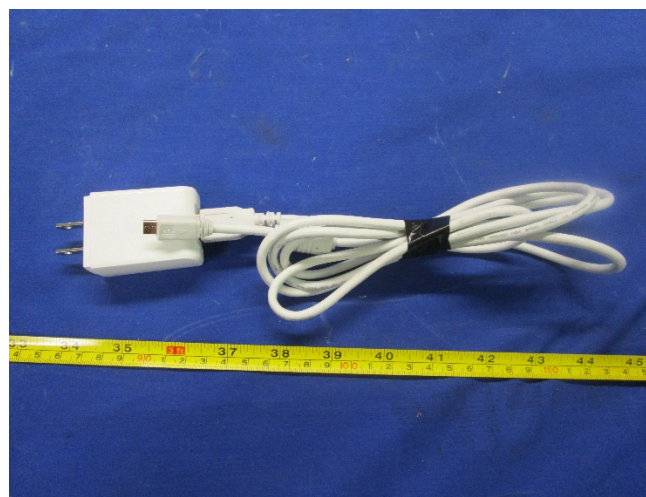
PCBA 1 Top View



PCBA 1 RearView



Support Equipment Power Supply Top View



Support Equipment Power Supply Bottom View

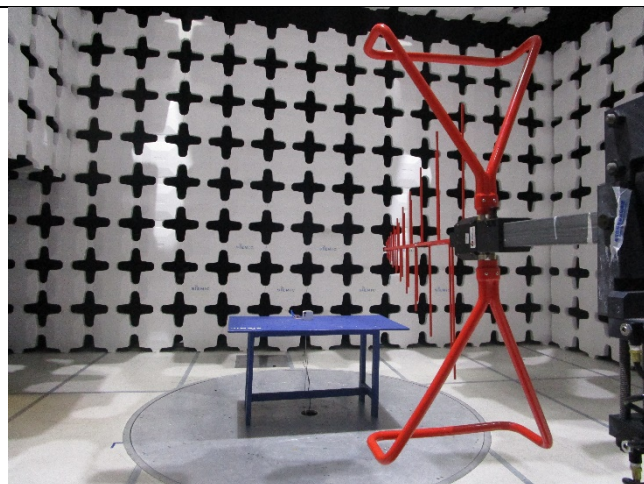
6.6 EUT Test Setup Photos



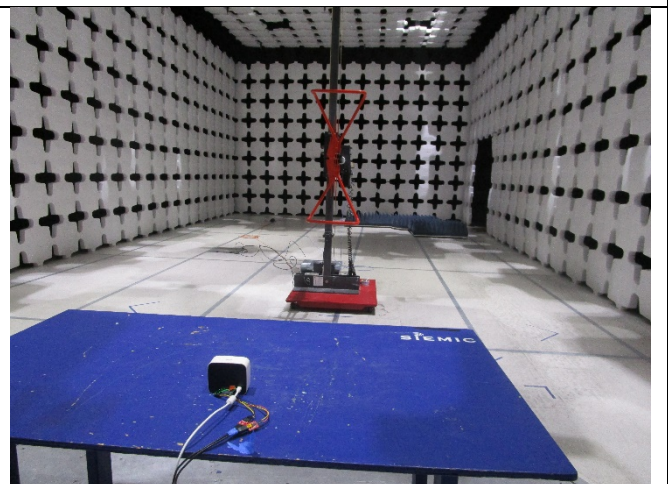
AC Line Conducted Emissions – Front View



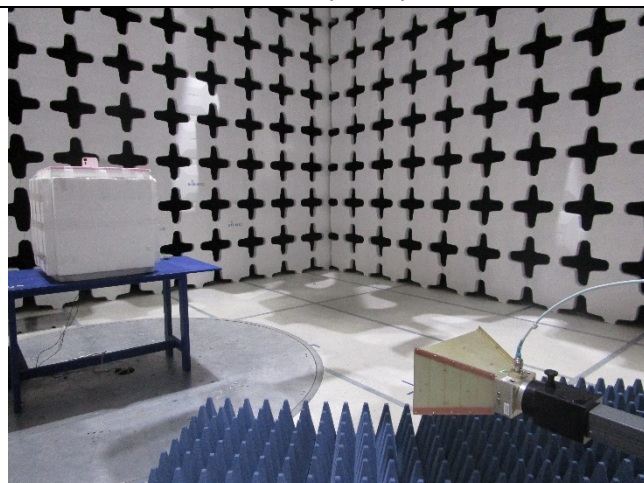
AC Line Conducted Emissions – Rear View



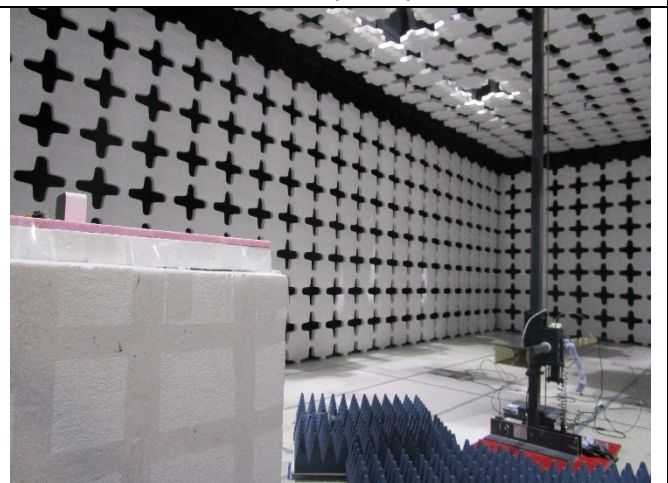
Radiated Emissions (<1GHz) – Front View



Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (>1GHz) – Front View



Radiated Emissions (>1GHz) – Rear View

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	Latitude 3550	N/A	Dell	-

7.2 Cabling Description

Name	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 Testing	Tera Term.Ink	Set the EUT to transmit continuously in diferent 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	☒ Pass
	IC	RSS Gen 8.10	IC	558074 D01 DTS Meas Guidance v03r04	☐ N/A
AC Conducted Emissions	FCC	15.207(a)	FCC	ANSI C63.10:2013	☒ Pass
	IC	RSS Gen 8.8	IC	RSS Gen Issue 4: 2014	☐ N/A

DTS band Requirement

Test Item	Test standard		Test Method/Procedure		Pass / Fail
99% Occupied Bandwidth	-	-	-	-	☒ Pass
	IC	RSS Gen 6.6	IC	RSS Gen Issue 4: 2014 -	☐ N/A
6dB Bandwidth	FCC	15.247(a)(2)	FCC	558074 D01 DTS Meas Guidance v03r04	☒ Pass
	IC	RSS247 (5.2.1)	IC		☐ N/A
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	ANSI C63.10:2013	☒ Pass
	IC	RSS247 (5.5)	IC	558074 D01 DTS Meas Guidance v03r04	☐ N/A
Output Power	FCC	15.247(b)	FCC	558074 D01 DTS Meas Guidance v03r04	☒ Pass
	IC	RSS247 (5.4.4)	IC		☐ N/A
Receiver Spurious Emissions	IC	RSS Gen (4.8)	IC	RSS Gen Issue 4: 2014	☐ Pass ☒ N/A
Antenna Gain > 6 dBi	FCC	15.247(e)	FCC	-	☐ Pass
	IC	-	IC	-	☒ N/A
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v03r04	☒ Pass
	IC	RSS247 (5.2.2)	IC		☐ N/A
RF Exposure requirement	FCC	15.247(i)	FCC	-	☐ Pass
	IC	RSS Gen(5.5)	IC	RSS Gen Issue 4: 2014	☒ N/A
Remark	- All measurement uncertainties do not take into consideration for all presented test results. - 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

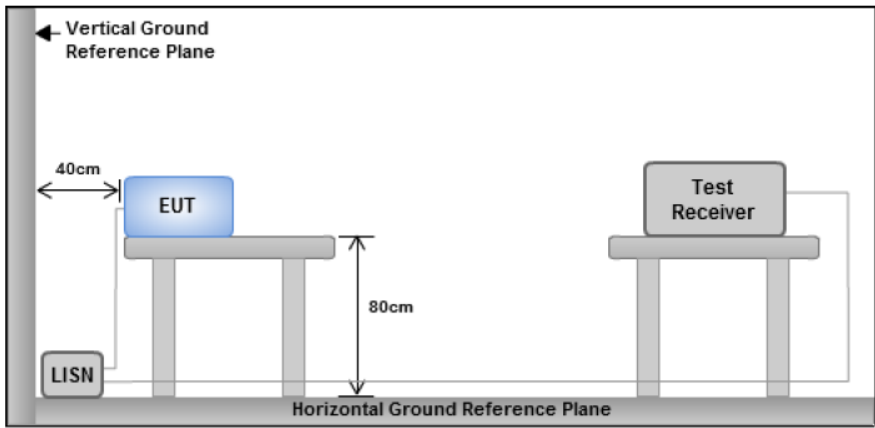
Emissions			
Test Item	Frequency Range	Description	Uncertainty
Band Edge and Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Band Edge and Radiated Spurious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

Conducted Emission Limit

Frequency ranges (MHz)	Limit (dBuV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

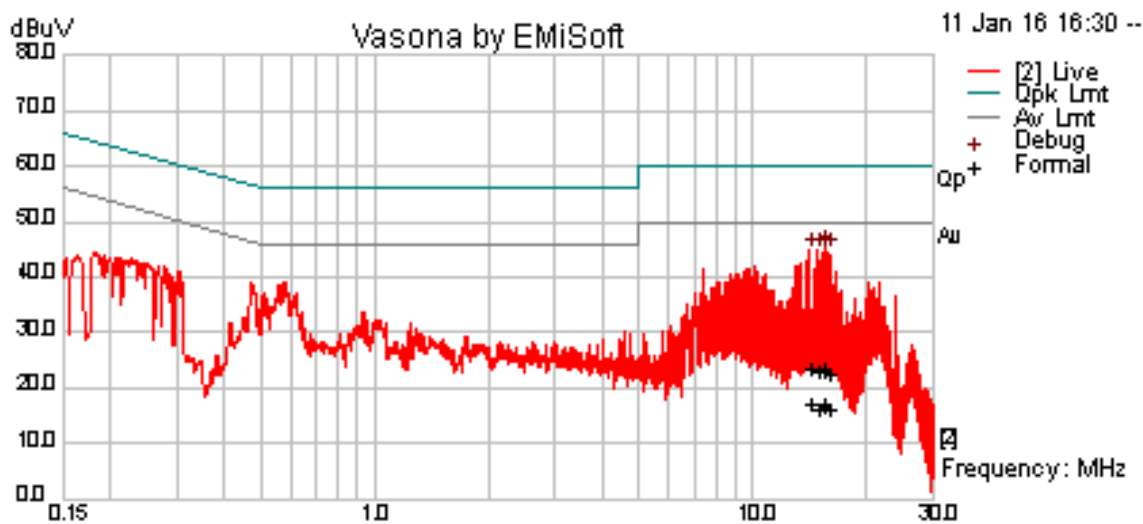
Spec	Item	Requirement	Applicable
47CFR§15.207	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	☒
Test Setup	 Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes		
Procedure	- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B. - The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains. - The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. - All other supporting equipment was powered separately from another main supply.		
Remark	EUT tested with AC 120V 60Hz		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Rachana Khanduri			
Test Date:	01/11/2016			
Remarks	AC Line @ Line			



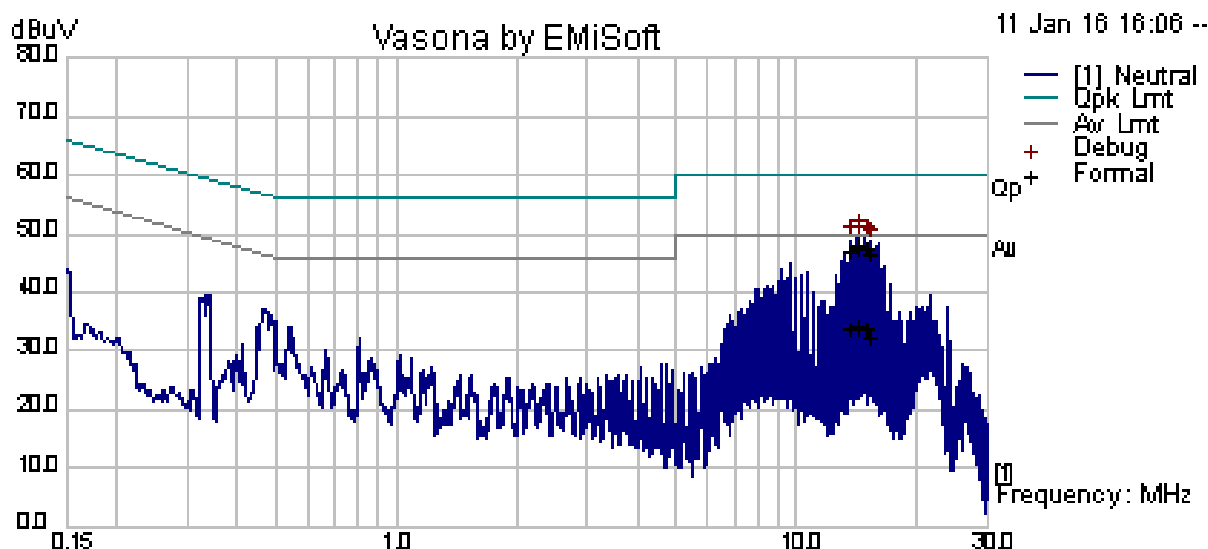
Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
15.48	12.41	10.06	0.61	23.08	Quasi Peak	Live	60.00	-36.92	Pass
14.19	12.81	10.06	0.59	23.46	Quasi Peak	Live	60.00	-36.54	Pass
14.88	12.64	10.06	0.60	23.30	Quasi Peak	Live	60.00	-36.70	Pass
15.88	11.72	10.06	0.62	22.40	Quasi Peak	Live	60.00	-37.60	Pass
14.15	12.96	10.06	0.59	23.61	Quasi Peak	Live	60.00	-36.39	Pass
15.54	12.98	10.06	0.61	23.65	Quasi Peak	Live	60.00	-36.35	Pass
15.48	6.31	10.06	0.61	16.98	Average	Live	50.00	-33.02	Pass
14.19	6.54	10.06	0.59	17.20	Average	Live	50.00	-32.80	Pass
14.88	5.77	10.06	0.60	16.43	Average	Live	50.00	-33.57	Pass
15.88	5.58	10.06	0.62	16.25	Average	Live	50.00	-33.75	Pass
14.15	6.35	10.06	0.59	17.00	Average	Live	50.00	-33.00	Pass
15.54	6.22	10.06	0.61	16.89	Average	Live	50.00	-33.11	Pass

Note: The results above show only the worst case.

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Rachana Khanduri			
Test Date:	01/11/2016			
Remarks	AC Line @ Neutral			



Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
14.32	37.37	10.06	0.59	48.02	Quasi Peak	Neutral	60.00	-11.98	Pass
14.24	37.09	10.06	0.59	47.74	Quasi Peak	Neutral	60.00	-12.26	Pass
14.88	36.75	10.06	0.60	47.41	Quasi Peak	Neutral	60.00	-12.60	Pass
14.20	36.90	10.06	0.59	47.55	Quasi Peak	Neutral	60.00	-12.45	Pass
13.64	36.21	10.06	0.59	46.85	Quasi Peak	Neutral	60.00	-13.15	Pass
15.32	35.91	10.06	0.61	46.58	Quasi Peak	Neutral	60.00	-13.42	Pass
14.32	23.91	10.06	0.59	34.56	Average	Neutral	50	-15.44	Pass
14.24	23.66	10.06	0.59	34.31	Average	Neutral	50	-15.69	Pass
14.88	23.04	10.06	0.6	33.7	Average	Neutral	50	-16.3	Pass
14.20	23.39	10.06	0.59	34.04	Average	Neutral	50	-15.96	Pass
13.64	23.33	10.06	0.59	33.98	Average	Neutral	50	-16.03	Pass
15.32	21.65	10.06	0.61	32.31	Average	Neutral	50	-17.69	Pass

Note: The results above show only the worst case.

10.2 Output Power (Bluetooth LE)

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247 (5.4.2)	a)	FHSS in 2400-2483.5MHz with ≥ 75 channels: ≤ 1 Watt	☐
	b)	FHSS in 5725-5850MHz: ≤ 1 Watt	☐
	c)	For all other FHSS in the 2400-2483.5MHz band: ≤ 0.125 Watt.	☐
	d)	FHSS in 902-928MHz with ≥ 50 channels: ≤ 1 Watt	☐
	e)	FHSS in 902-928MHz with ≥ 25 & < 50 channels: ≤ 0.25 Watt	☐
	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤ 1 Watt	☒
Test Setup	 Power Meter		
Test Procedure	558074 D01 DTS Meas Guidance v03r04, 9.2.3.1 Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required. - Connect EUT's RF output power to power meter - Set EUT to be continuous transmission mode - Measurement the average output power using power meter and record the result - Repeat above steps for different test channel and other modulation type.		
Test Date	01/11/2016	Environmental condition	Temperature 23°C Relative Humidity 44% Atmospheric Pressure 1021mbar
Remark	-		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

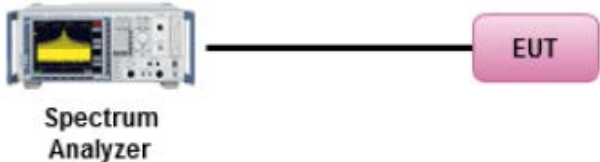
Test Plot ☐ Yes (See below) ☒ N/A

Output Power measurement result (Bluetooth)

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)	Limit (dBm)	Result
Output power	Bluetooth LE	2402	Low	0.335	30	Pass
Output power	Bluetooth LE	2440	Mid	-0.061	30	Pass
Output power	Bluetooth LE	2480	High	-0.899	30	Pass

10.3 Band Edge (Bluetooth LE)

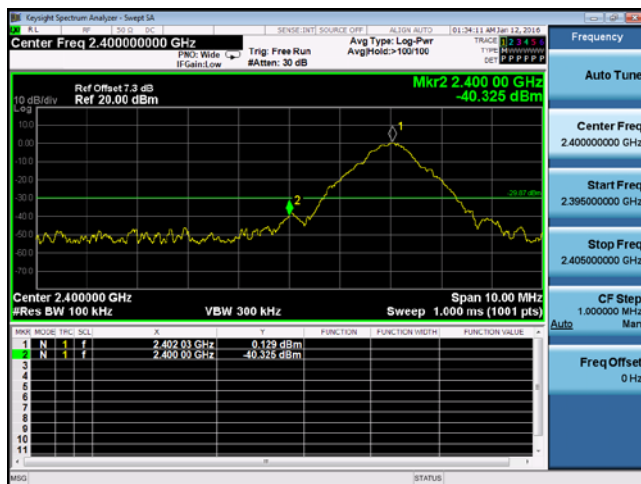
Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247(5.5)	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 ☐ 20 dB down ☒ 30 dB down	☒
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v03r04 <u>Band Edge measurement procedure</u> 1. Set the EUT to maximum power setting and enable the EUT transmit continuously. 2. 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 Peak conducted output power procedure is used. 3. Change modulation and channel bandwidth then repeat step 1 to 2. 4. Measured and record the results in the test report.		
Test Date	01/11/2016	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	-		
Result	☒ Pass ☐ Fail		

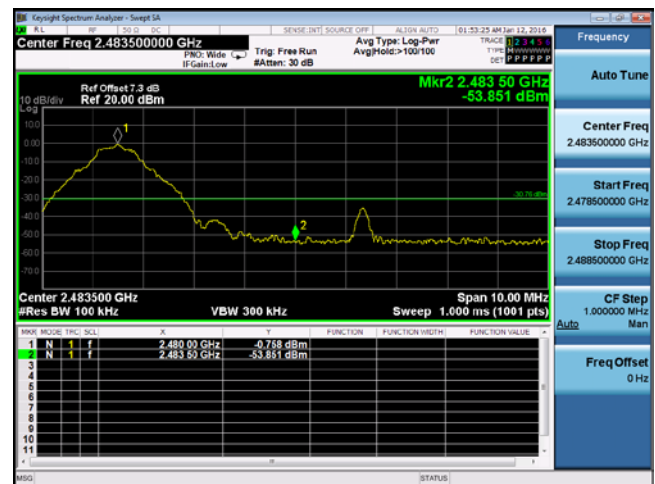
Test Data ☐ Yes ☒ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Band Edge Test Plots (Bluetooth LE)



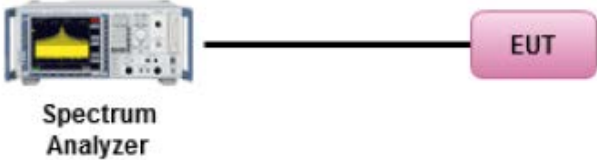
Band Edge-LE Low



Band Edge-LE High

10.4 6dB Bandwidth (Bluetooth LE)

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247 (5.2.1)	a)(2)	6dB BW≥500KHz;	☒
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v03r04, 8.1 DTS bandwidth <u>6dB Emission bandwidth measurement procedure</u> - 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.		
Test Date	01/11/2016	Environmental condition	Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A		
Result	☒ Pass ☐ Fail		

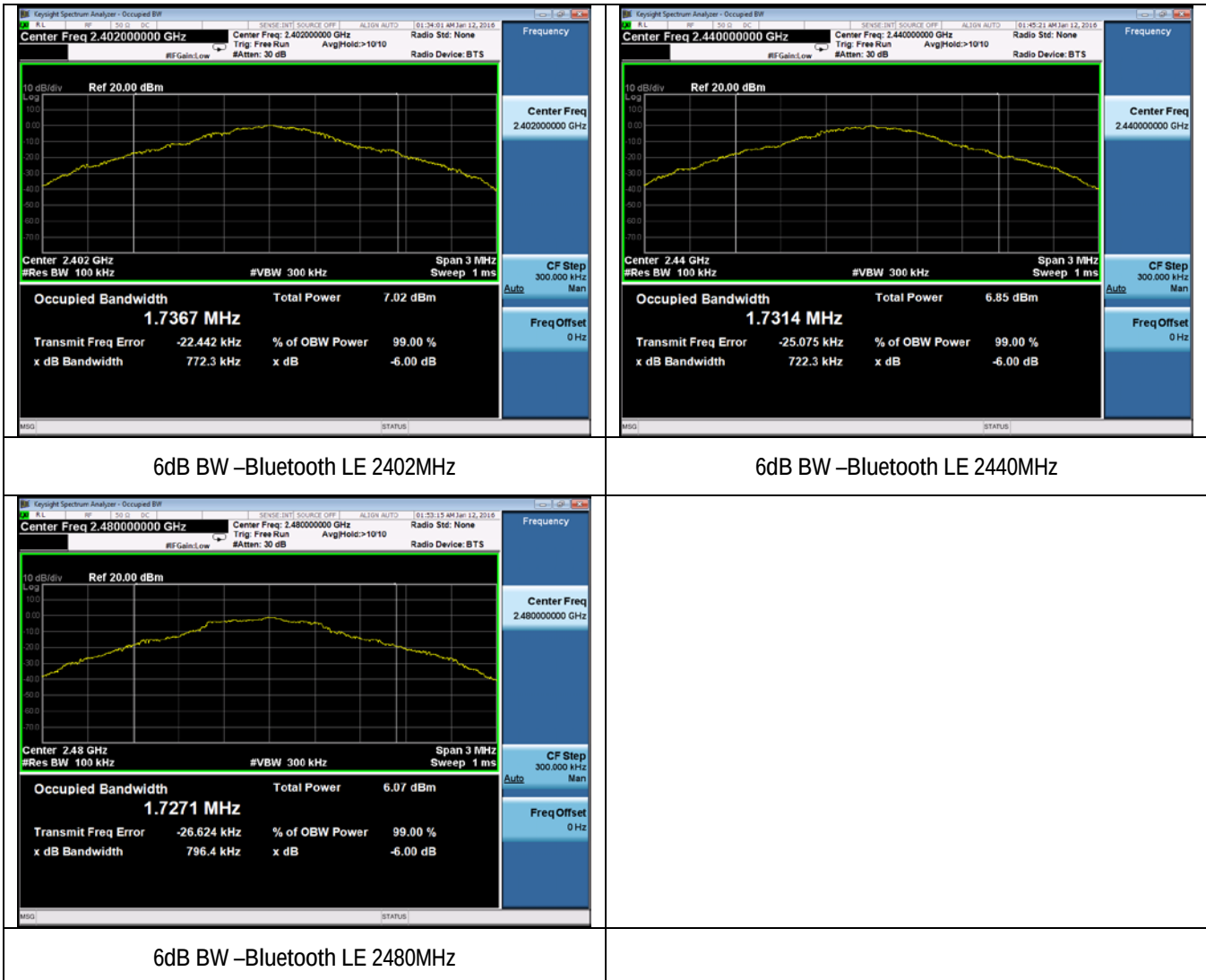
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes ☐ N/A

6dB Bandwidth measurement result for 2.4GHz

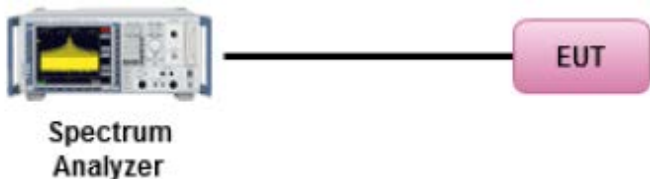
Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit (MHz)	Result
6dB BW	BT-LE	2402	Low	0.722	≥0.5	Pass
6dB BW	BT-LE	2440	Mid	0.722	≥0.5	Pass
6dB BW	BT-LE	2480	High	0.796	≥0.5	Pass

Test Plots



10.5 99% Occupied Bandwidth (Bluetooth LE)

Requirement(s):

Spec	Requirement	Applicable									
RSS Gen 4.6.1	The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual. The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth	☒									
Test Setup											
Procedure	- EUT was set for low , mid, high channel with modulated mode and highest RF output power. - The spectrum analyzer was connected to the antenna terminal.										
Test Date	01/11/2016	<table border="1"> <tr> <td>Environmental condition</td> <td>Temperature</td> <td>23oC</td> </tr> <tr> <td></td> <td>Relative Humidity</td> <td>47%</td> </tr> <tr> <td></td> <td>Atmospheric Pressure</td> <td>1019mbar</td> </tr> </table>	Environmental condition	Temperature	23oC		Relative Humidity	47%		Atmospheric Pressure	1019mbar
Environmental condition	Temperature	23oC									
	Relative Humidity	47%									
	Atmospheric Pressure	1019mbar									
Remark	-										
Result	☒ Pass ☐ Fail										

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

99% Bandwidth measurement result for Bluetooth LE

Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% OBW	BT-LE	2402	Low	1.7367
99% OBW	BT-LE	2440	Mid	1.7314
99% OBW	BT-LE	2480	High	1.7271

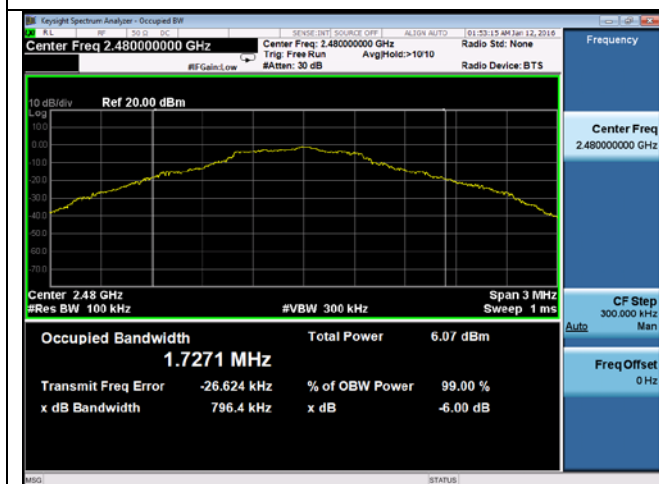
99dB Bandwidth Test Plot (Bluetooth LE)



99% BW –Bluetooth LE 2402MHz



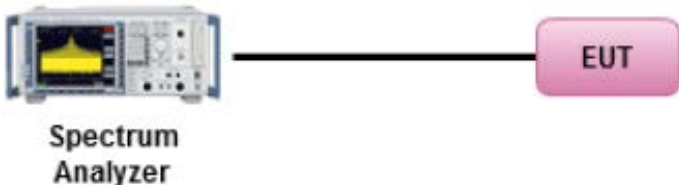
99% BW –Bluetooth LE 2440MHz



99% BW –Bluetooth LE 2480MHz

10.6 Peak Spectral Density (Bluetooth LE)

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(e)	e)	DSSS: $\leq 8\text{dBm}/3\text{KHz}$	☒
RSS247 (5.2.2)	f)	DSSS in hybrid sys with FH turned off: $\leq 8\text{dBm}/3\text{KHz}$	☐
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v03r04, 10.2 Method PKPSD (peak PSD) <u>Peak spectral density measurement procedure</u> - Set analyzer center frequency to DTS channel center frequency. - Set the span to 1.5 times the DTS bandwidth. - Set the RBW to: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$. - Set the VBW $\geq 3 \times \text{RBW}$. - Detector = Peak - Sweep time = auto couple. - Trace mode = Trace Max Hold over 100 traces - Allow trace to fully stabilize. - Use the peak marker function to determine the maximum amplitude level within the RBW. - If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.		
Test Date	01/11/2016	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	-		
Result	☒ Pass ☐ Fail		

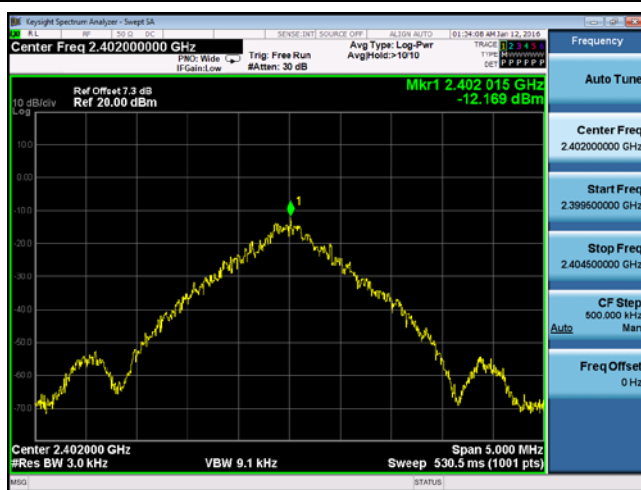
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

PSD measurement result (Bluetooth LE)

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
PSD	Bluetooth LE	2402	Low	-12.169	≤8	Pass
PSD	Bluetooth LE	2440	Mid	-13.148	≤8	Pass
PSD	Bluetooth LE	2480	High	-14.369	≤8	Pass

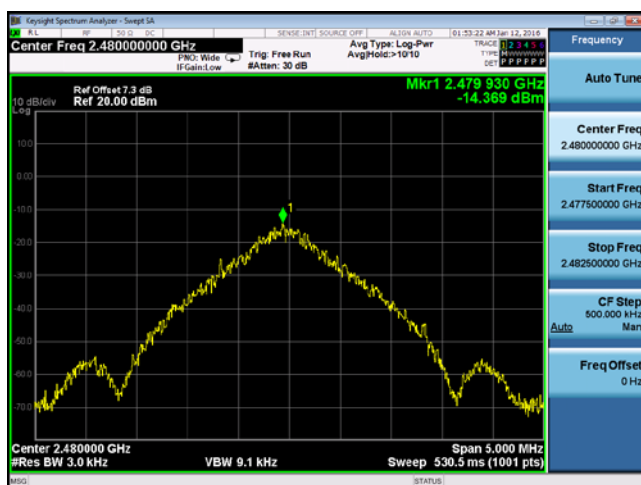
Test Plots (Bluetooth LE)



PSD -Bluetooth LE Low



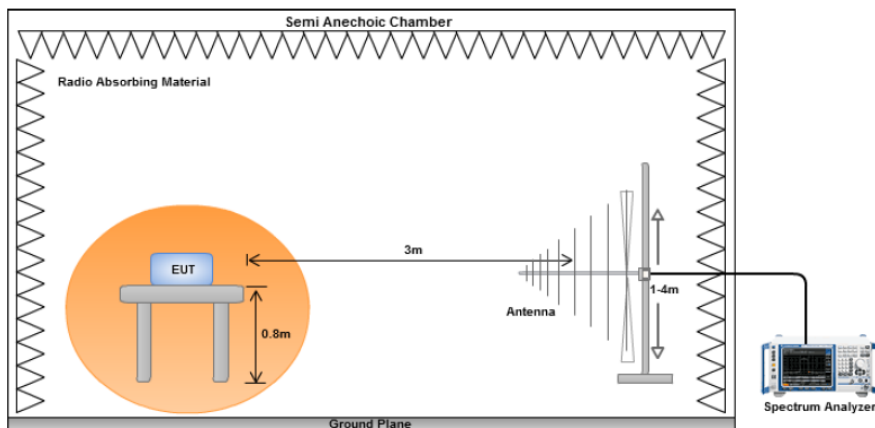
PSD -Bluetooth LE Mid



PSD -Bluetooth LE High

10.7 Transmitter Radiated Spurious Emissions Below 1GHz

Requirement(s):

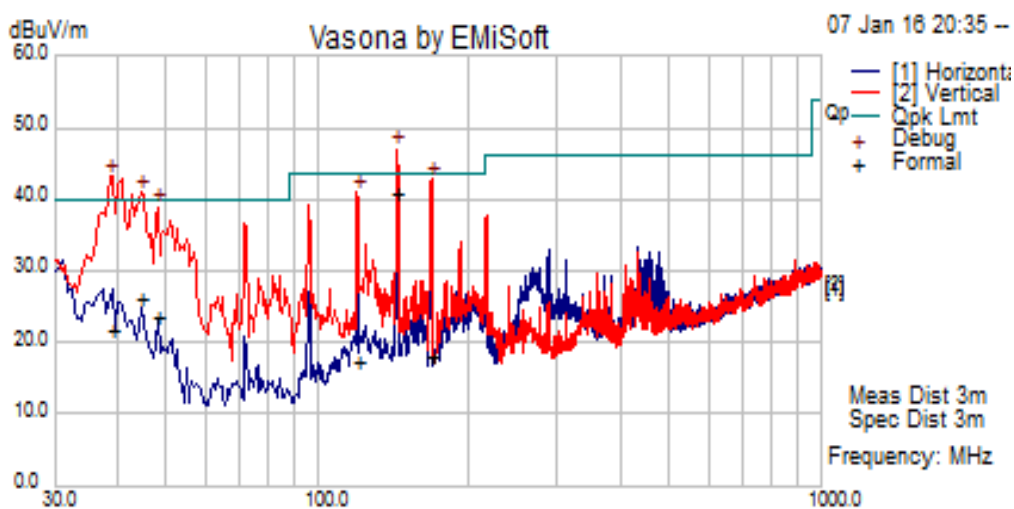
Spec	Item	Requirement	Applicable							
47CFR§15.247(d), RSS247(5.5)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges	☒							
		<table><tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr><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></table>		Frequency range (MHz)	Field Strength (uV/m)	30 – 88	100	88 – 216	150	216 960
Frequency range (MHz)	Field Strength (uV/m)									
30 – 88	100									
88 – 216	150									
216 960	200									
Above 960	500									
Test Setup										
Procedure	1. 2. 3. 4. The EUT was switched on and allowed to warm up to its normal operating condition. 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: a. b. c. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. The EUT was then rotated to the direction that gave the maximum emission. Finally, the antenna height was adjusted to the height that gave the maximum emission. A Quasi-peak measurement was then made for that frequency point. 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	☒ Pass ☐ Fail									

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Radiated Emission Test Results

Test specification		Below 1GHz			Result		
Environmental Conditions:	Temp (°C):	25.7					
	Humidity (%)	29					
	Atmospheric (mPa):						
Mains Power:	110VAC, 60Hz						
Tested by:	Rachana Khanduri						
Test Date:	01/07/2016						
Remarks:	Bluetooth LE 2440MHz						



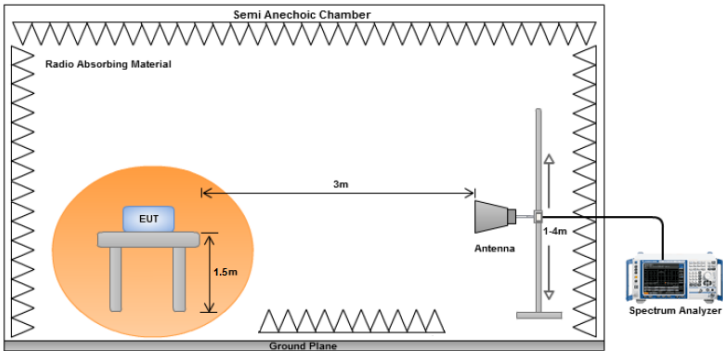
Quasi Max Measurement

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
143.69	64.31	1.96	-25.5	40.76	Quasi Max	V	130	83	43.52	-2.76	Pass
38.93	42.46	0.9	-21.83	21.54	Quasi Max	V	106	241	40	-18.46	Pass
44.54	50.93	1.03	-25.74	26.22	Quasi Max	V	139	88	40	-13.78	Pass
168.14	43.09	2.15	-27.03	18.2	Quasi Max	V	116	275	43.52	-25.32	Pass
48.18	50.64	1.05	-28.02	23.67	Quasi Max	V	152	70	40	-16.33	Pass
119.90	40.07	1.8	-24.66	17.21	Quasi Max	V	111	210	43.52	-26.31	Pass

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

10.8 Transmitter Radiated Spurious Emissions > 1GHz & Restricted band

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS247(5.5)	a)	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 ☐ 20 dB down ☒ 30 dB down	☒
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	☒
Test Setup			
Procedure	- The EUT was switched on and allowed to warm up to its normal operating condition. - 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: - Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. - The EUT was then rotated to the direction that gave the maximum emission. - Finally, the antenna height was adjusted to the height that gave the maximum emission. - An average measurement was then made for that frequency point. - 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 26GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Radiated Emission Test Results

BLE – 2402MHz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
4164.45	37.79	8.91	11.51	58.21	Peak Max	V	136	101	74	-15.79	Pass
17733.34	34.70	16.39	10.64	61.73	Peak Max	V	115	155	74	-12.27	Pass
6154.15	36.27	10.67	10.70	57.64	Peak Max	H	156	312	74	-16.36	Pass
4164.45	25.72	8.91	11.51	46.15	Average Max	V	136	101	54	-7.85	Pass
17733.34	22.82	16.39	10.64	49.85	Average Max	V	115	155	54	-4.15	Pass
6154.15	24.66	10.67	10.70	46.03	Average Max	H	156	312	54	-7.97	Pass

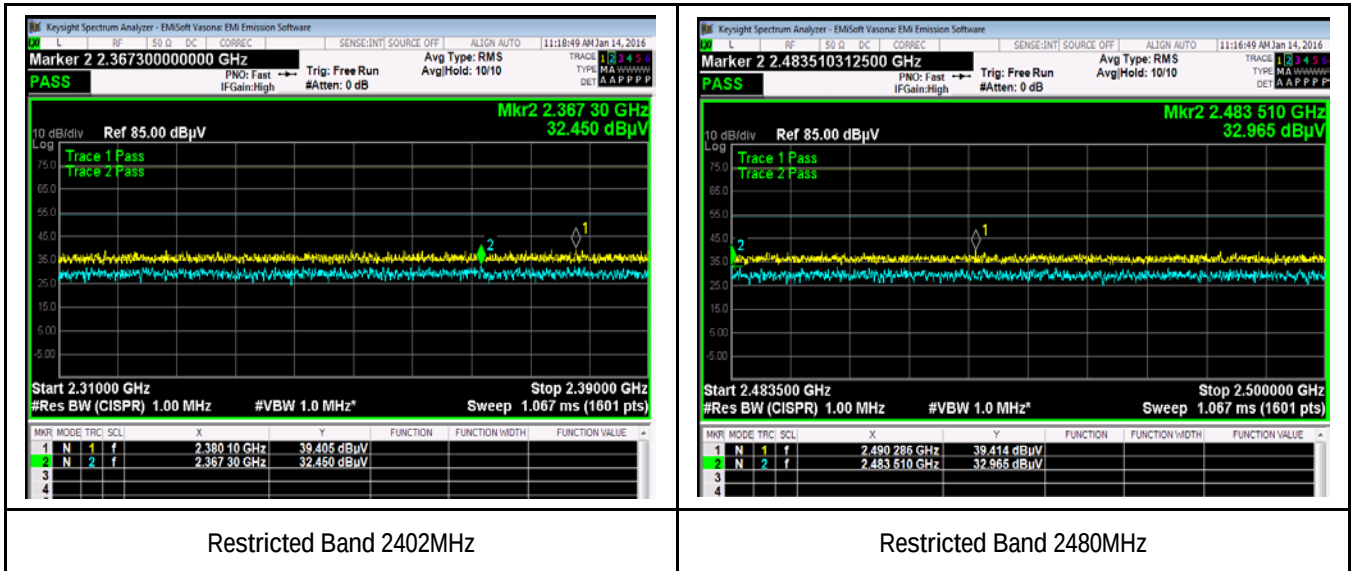
BLE – 2440MHz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
4167.59	36.95	8.92	11.5	57.37	Peak Max	H	109	105	74	-16.63	Pass
17351.02	34.34	16.77	9.95	61.06	Peak Max	V	251	105	74	-12.94	Pass
6143.60	36.07	10.66	10.72	57.45	Peak Max	V	191	80	74	-16.55	Pass
4167.59	25.70	8.92	11.5	46.11	Average Max	H	109	105	54	-7.89	Pass
17351.02	22.96	16.77	9.95	49.68	Average Max	V	251	105	54	-4.32	Pass
6143.60	24.63	10.66	10.72	46.01	Average Max	V	191	80	54	-7.99	Pass

BLE – 2480MHz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
6142.68	37.16	10.66	10.72	58.54	Peak Max	V	167	76	74	-15.46	Pass
4146.51	37.63	8.87	11.59	58.08	Peak Max	H	139	80	74	-15.92	Pass
17766.14	34.39	16.33	10.67	61.39	Peak Max	H	220	286	74	-12.61	Pass
6142.68	24.61	10.66	10.72	45.99	Average Max	V	167	76	54	-8.01	Pass
4146.51	25.66	8.87	11.59	46.12	Average Max	H	139	80	54	-7.89	Pass
17766.14	22.96	16.33	10.67	49.97	Average Max	H	220	286	54	-4.04	Pass

Restricted Band Test plot



Annex A. TEST INSTRUMENT

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	☒
CHASE LISN	MN2050B	1018	08/07/2015	1 Year	08/07/2016	☒
Radiated Emissions						
R & S Receiver	ESL6	100178	05/27/2015	1 Year	05/27/2016	☒
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☒
ETS-Lingren Loop Antenna	6512	00049120	05/12/2015	1 Year	05/12/2016	☐
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2015	1 Year	08/12/2016	☒
Horn Antenna (1-26.5GHz)	3115	10SL0059	08/11/2015	1 Year	08/11/2016	☒
Horn Antenna (18-40 GHz)	AH-840	101013	08/11/2015	1 Year	08/11/2016	☒
3 Meters SAC	3M	N/A	08/08/2015	1 Year	08/08/2016	☒
10 Meters SAC	10M	N/A	09/05/2015	1 Year	09/05/2016	☒
RF Conducted Measurement						
Spectrum Analyzer	N9010A	10SL0219	08/20/2015	1 Year	08/20/2016	☒
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☒
Test Equity Environment Chamber	1007H	61201	07/31/2015	1 Year	07/31/2016	☒
USB RF Power Sensor	7002-006	10SL0190	09/03/2015	1 Year	09/03/2016	☒

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 CB(Certification Body)	 	Phase I , Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
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 EMS 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