


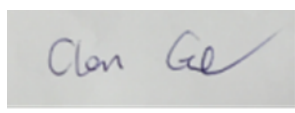
# RF TEST REPORT



**Report No.:** FCC\_IC\_RF\_SL16120201-HID-035\_BLE  
**Supersede Report No.:** None

Applicant	:	HID Global Corporation
Product Name	:	Smart Card Reader with 125kHz LF, 13.56MHz HF, and 2.4GHz BLE
Model No.	:	OMNIKEY 5427 G2
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	:	JQ6-OK5427G2
IC ID	:	2236B-OK5427G2
Dates of test	:	02/27/2017 – 03/30/2017
Issue Date	:	05/10/2017
Test Result	:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Equipment complied with the specification <input checked="" type="checkbox"/>		
Equipment did not comply with the specification <input type="checkbox"/>		

This Test Report is Issued Under the Authority of:

	
<b>Pooja Pandya</b>	<b>Chen Ge</b>
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

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## 1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_IC_RF_SL16120201-HID-035_BLE	None	Original	05/10/2017

## 2 Executive Summary

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

Company: HID Global Corporation  
Product: Smart Card Reader with 125kHz LF, 13.56MHz HF, and 2.4GHz BLE  
Model: OMNIKEY 5427 G2

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

## 3 Customer information

Applicant Name	:	HID Global Corporation
Applicant Address	:	611 Center Ridge Drive, Austin, TX 78753
Manufacturer Name	:	HID Global Corporation
Manufacturer Address	:	6533 Flying Cloud Drive. Eden Prairie, MN 55344

## 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	Smart Card Reader with 125kHz LF, 13.56MHz HF, and 2.4GHz BLE
Model No.	OMNIKEY 5427 G2
Trade Name	HID Global Corporation
Serial No.	N/A
Input Power	5VDC
Power Adapter Manu/Model	N/A
Power Adapter SN	N/A
Hardware version	N/A
Software version	N/A
Date of EUT received	27/02/2017
Equipment Class/ Category	Class B / 125kHz, 13.56MHz RFID SRD / 2.4GHz BLE
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	PIFA Antenna
Antenna Gain	3.86 dBi (BTLE)
Antenna Connector Type	Reverse SMA U.FL connector

Type	Channel No.	Frequency (MHz)	Power Setting(dBm)
Bluetooth(BLE) 2402-2480MHz	0	2402	4
	19	2440	4
	39	2480	4

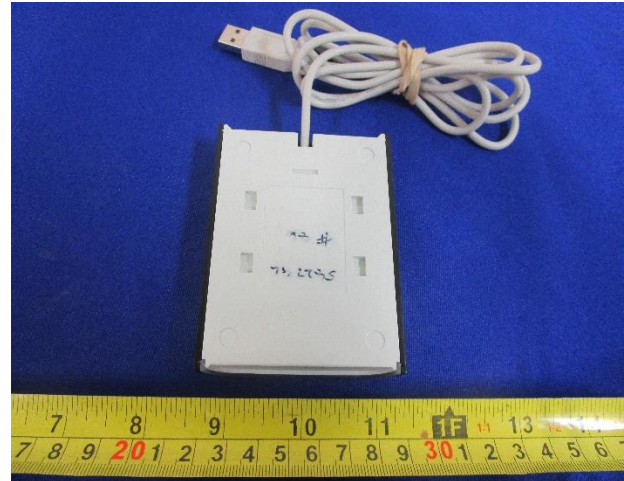
### 6.3 EUT test modes/configuration Description

Mode	Note
Bluetooth	BLE (GFSK)

**6.4 EUT Photos – External**



**EUT Top Side View**



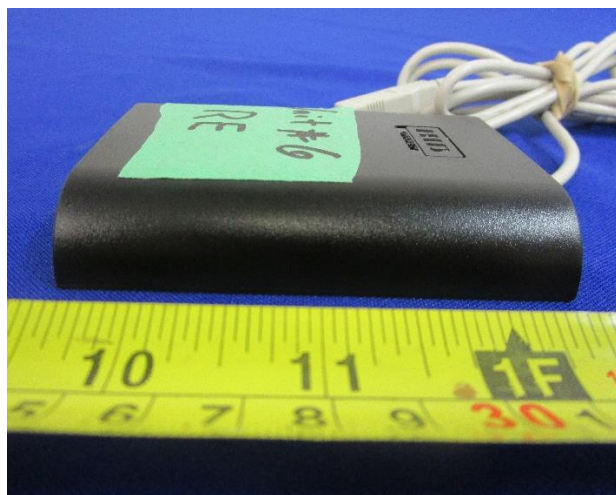
**EUT Bottom Side View**



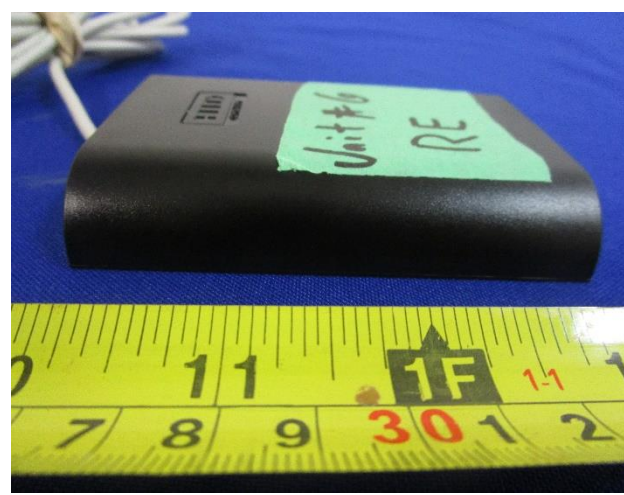
**EUT Front Side View**



**EUT Rear Side View**



**EUT Left Side View**

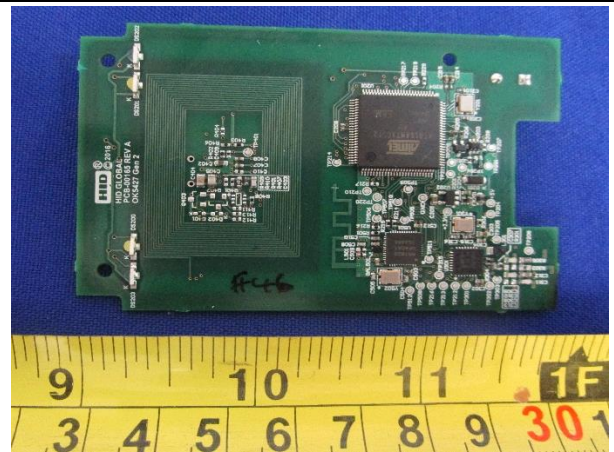


**EUT Right Side View**

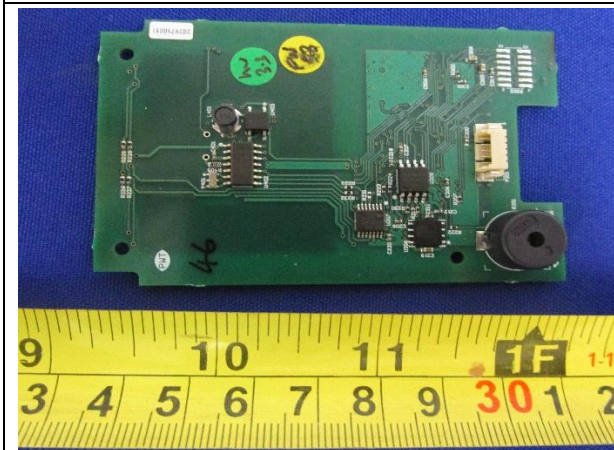
**6.5 EUT Photos (Internal)**



**EUT Open Case View**



**EUT Main PCB - Top View**



**EUT Main PCB - Bottom View**



**EUT Main PCB - Label View**



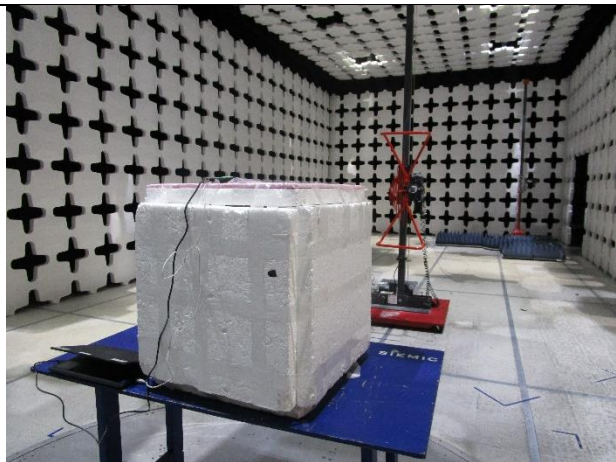
**6.6 EUT Test Setup Photos**



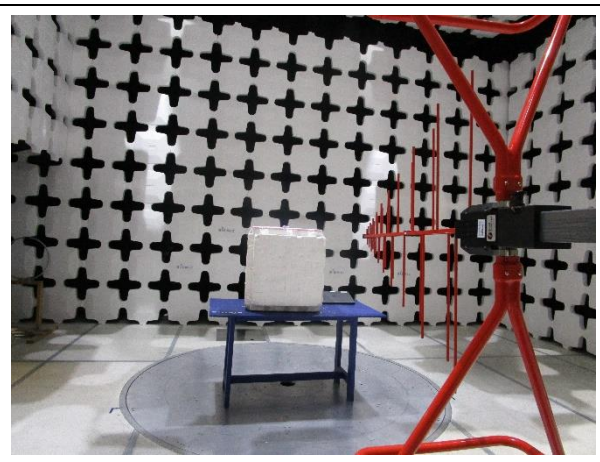
**AC Line Conducted Emissions – Front View**



**AC Line Conducted Emissions – Rear View**



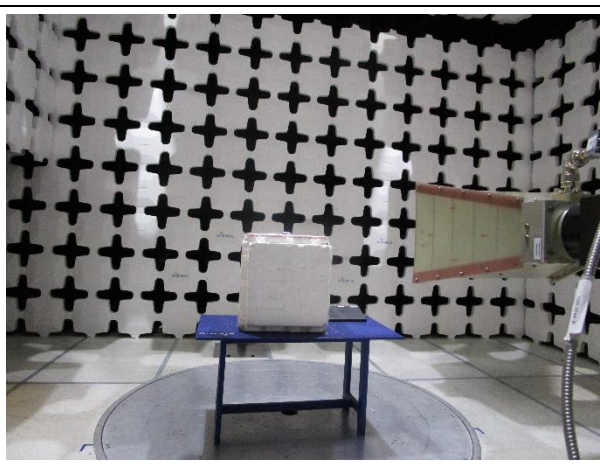
**Radiated Emissions (<1GHz) – Front View**



**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	Inspiron 15	9555XB2	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	USB	EUT	USB	Laptop	USB	1	-

### 7.3 Test Software Description

Test Item	Software	Description
RF Testing	Putty	Set the EUT to transmit continuously in diferent test mode

## 8 DTS band Requirement

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Restricted Band of Operation	FCC	15.205	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v03r04	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 8.10	IC		<input type="checkbox"/> N/A
AC Conducted Emissions	FCC	15.207(a)	FCC	ANSI C63.10:2013	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 8.8	IC	RSS Gen Issue 4: 2014	<input type="checkbox"/> N/A

Test Item	Test standard		Test Method/Procedure		Pass / Fail
99% Occupied Bandwidth	-	-	-	-	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 6.6	IC	RSS Gen Issue 4: 2014 -	<input type="checkbox"/> N/A
6dB Bandwidth	FCC	15.247(a)(2)	FCC	558074 D01 DTS Meas Guidance v03r04	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.2.1)	IC		<input type="checkbox"/> N/A
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v03r04	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.5)	IC		<input type="checkbox"/> N/A
Output Power	FCC	15.247(b)	FCC	558074 D01 DTS Meas Guidance v03r04	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.4.4)	IC		<input type="checkbox"/> N/A
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
	IC	-	IC	-	<input checked="" type="checkbox"/> N/A
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v03r04	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.2.2)	IC		<input type="checkbox"/> N/A
RF Exposure requirement	FCC	15.247(i)	FCC	-	<input type="checkbox"/> Pass
	IC	RSS Gen(5.5)	IC	RSS Gen Issue 4: 2014	<input checked="" type="checkbox"/> N/A
Remark	<ol style="list-style-type: none"> <li>All measurement uncertainties do not take into consideration for all presented test results.</li> <li>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.</li> <li>The device is operating at near 98% duty cycle.</li> </ol>				

## 9 Measurement Uncertainty

### 9.1 Conducted Emissions

The test is to measure the conducted emissions to the mains port of the EUT.  
Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the LISN
- Uncertainty of cables
- Uncertainty due to the mismatches
- Etc, see the below table for details

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
LISN Insertion Loss	0.40	Normal	2	1	0.20
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch LISN - Receiver	0.25	U-Shape	1.414	1	0.1768033
LISN Impedance	2.5	Triangular	2.449	1	1.0208248
Combined Standard Uncertainty					1.928133
<b>Expanded Uncertainty (K=2)</b>					<b>3.856266</b>

The total derived measurement uncertainty is +/- 3.86 dB.

### 9.2 Radiated Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.  
Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
Antenna Factor	0.65	Normal	2	1	0.325
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
NSA Calibration	4.0	U-Shape	1.414	1	2.8288543
Combined Standard Uncertainty					3.0059131
<b>Expanded Uncertainty (K=2)</b>					<b>6.0118262</b>

The total derived measurement uncertainty is +/- 6.00 dB.

### 9.3 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.0692840
Cable Insertion Loss	0.21	Normal	2	1	0.1050000
Filter Insertion Loss	0.25	Normal	2	1	0.1250000
Antenna Factor	0.65	Normal	2	1	0.3250000
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.8660508
PRF Response	1.5	Rectangular	1.732	1	0.8660508
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
VSWR Calibration	2.0	U-Shape	1.414	1	1.4144272
Combined Standard Uncertainty					4.2363
<b>Expanded Uncertainty (K=2)</b>					<b>8.4726</b>

The total derived measurement uncertainty is +/- 8.47 dB.

### 9.4 RF conducted measurement

The test is to measure the RF output power from the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the Reference Level Uncertainty
- Uncertainty of variable attenuators
- Uncertainty of cables
- Uncertainty due to the mismatches

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Reference Level	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Attenuator	0.25	Normal	2	1	0.125
Mismatch	0.25	U-Shape	1.414	1	0.1768033
Combined Standard Uncertainty					0.476087
<b>Expanded Uncertainty (K=2)</b>					<b>0.952174</b>

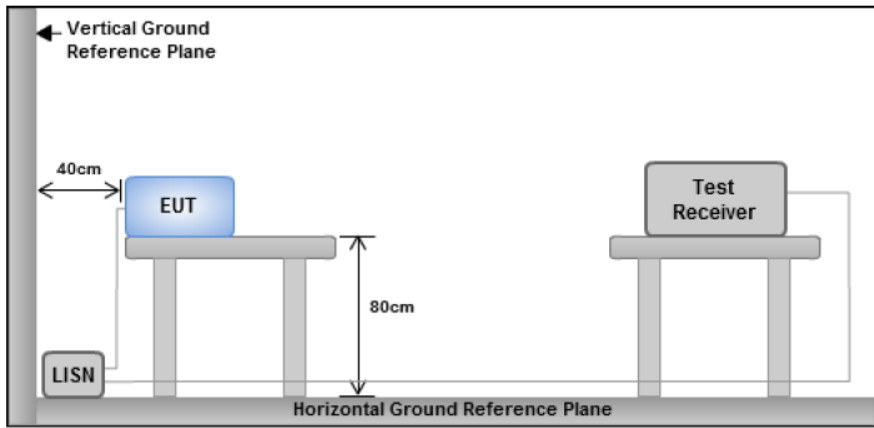
The total derived measurement uncertainty is +/- 0.95 dB.

## 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 $\mu$ H/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;"> <b>Note: 1. Support units were connected to second LISN.</b>  <b>2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes</b> </p>		
Procedure	<ul style="list-style-type: none"> <li>- 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.</li> <li>- The power supply for the EUT was fed through a 50<math>\Omega</math>/50<math>\mu</math>H EUT LISN, connected to filtered mains.</li> <li>- The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.</li> <li>- All other supporting equipment was powered separately from another main supply.</li> </ul>		
Remark	EUT tested with AC 120VAC 60Hz		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

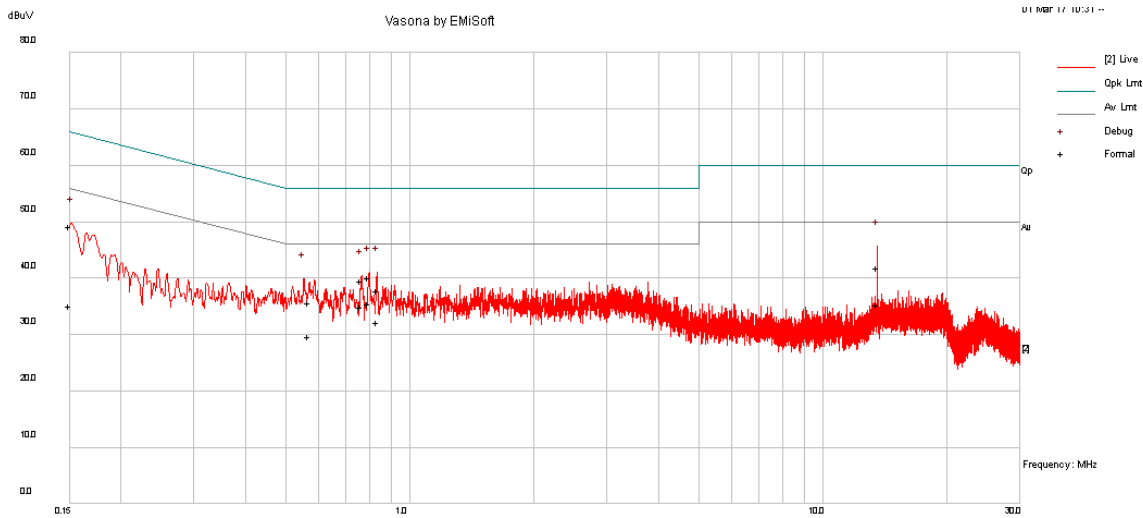
Test Data     Yes                       N/A

Test Plot     Yes (See below)             N/A

Test was done by Pooja Pandya at Conducted Emission Test Site.

### Conducted Emission Test Results

Test specification:	Conducted Emissions			Result:	<input checked="" type="checkbox"/> Pass  <input type="checkbox"/> Fail
Environmental Conditions:	Temp(°C):	21			
	Humidity (%):	42			
	Atmospheric(mbar):	1021			
Mains Power:	120Vac, 60Hz				
Tested by:	Pooja Pandya				
Test Date:	02/28/2017				
Remarks	AC Line @ Line				



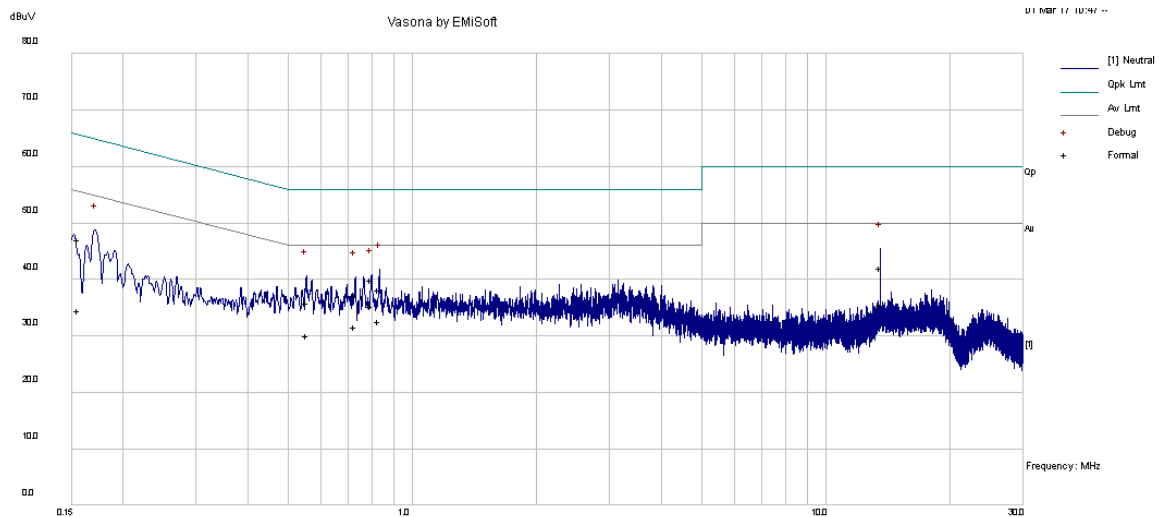
Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
13.55	31.38	10.06	0.55	41.98	Quasi Peak	Live	60.00	-18.02	Pass
0.83	27.28	10.01	0.54	37.84	Quasi Peak	Live	56.00	-18.16	Pass
0.79	29.53	10.01	0.55	40.09	Quasi Peak	Live	56.00	-15.91	Pass
0.76	29.01	10.01	0.55	39.57	Quasi Peak	Live	56.00	-16.43	Pass
0.56	25.10	10.01	0.60	35.71	Quasi Peak	Live	56.00	-20.29	Pass
0.15	37.54	10.00	1.74	49.29	Quasi Peak	Live	66.00	-16.71	Pass
13.55	24.64	10.06	0.55	35.24	Average	Live	50.00	-14.76	Pass
0.83	21.66	10.01	0.54	32.22	Average	Live	46.00	-13.78	Pass
0.79	24.98	10.01	0.55	35.55	Average	Live	46.00	-10.45	Pass
0.76	24.33	10.01	0.55	34.90	Average	Live	46.00	-11.10	Pass
0.56	19.04	10.01	0.60	29.65	Average	Live	46.00	-16.35	Pass
0.15	23.40	10.00	1.74	35.14	Average	Live	56.00	-20.86	Pass

Note: The results above show only the worst case.

### Conducted Emission Test Results

Test specification:	Conducted Emissions			Result:	<input checked="" type="checkbox"/> Pass  <input type="checkbox"/> Fail
Environmental Conditions:	Temp(°C):	21			
	Humidity (%):	42			
	Atmospheric(mbar):	1021			
Mains Power:	120Vac, 60Hz				
Tested by:	Pooja Pandya				
Test Date:	02/28/2017				
Remarks	AC Line @ Neutral				



Neutral Plot at 120Vac, 60Hz

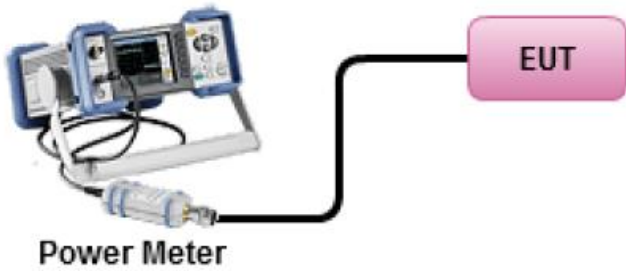
Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.83	27.72	10.01	0.54	38.28	Quasi Peak	Neutral	56.00	-17.72	Pass
13.55	31.56	10.06	0.55	42.17	Quasi Peak	Neutral	56.00	-17.83	Pass
0.79	29.34	10.01	0.55	39.90	Quasi Peak	Neutral	56.00	-16.10	Pass
0.55	25.37	10.01	0.61	35.98	Quasi Peak	Neutral	56.00	-20.02	Pass
0.72	26.68	10.01	0.56	37.25	Quasi Peak	Neutral	56.00	-18.75	Pass
0.15	35.44	10.00	1.66	47.10	Quasi Peak	Neutral	65.66	-18.56	Pass
0.83	21.97	10.01	0.54	32.53	Average	Neutral	46.00	-13.47	Pass
13.55	24.88	10.06	0.55	35.49	Average	Neutral	50.00	-14.51	Pass
0.79	24.78	10.01	0.55	35.35	Average	Neutral	46.00	-10.65	Pass
0.55	19.49	10.01	0.61	30.11	Average	Neutral	46.00	-15.89	Pass
0.72	21.03	10.01	0.56	31.60	Average	Neutral	46.00	-14.40	Pass
0.15	22.80	10.00	1.66	34.46	Average	Neutral	55.66	-21.20	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 $\geq 75$ 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	 <p style="text-align: center;"><b>Power Meter</b></p>		
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r04, 9.2.3.1</p> <p>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.</p> <ul style="list-style-type: none"> <li>- Connect EUT's RF output power to power meter</li> <li>- Set EUT to be continuous transmission mode</li> <li>- Measurement the average output power using power meter and record the result</li> <li>- Repeat above steps for different test channel and other modulation type.</li> </ul>		
Test Date	02/28/2017	Environmental condition	Temperature 23°C Relative Humidity 44% Atmospheric Pressure 1021mbar
Remark	-		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data     Yes                                       N/A

Test Plot     Yes (See below)                                       N/A

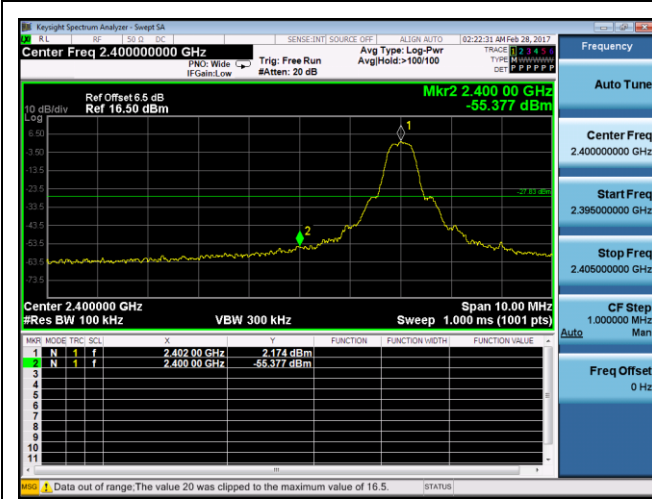
**Test was done by Pooja Pandya at RF Test Site.**

**Output Power measurement result (Bluetooth)**

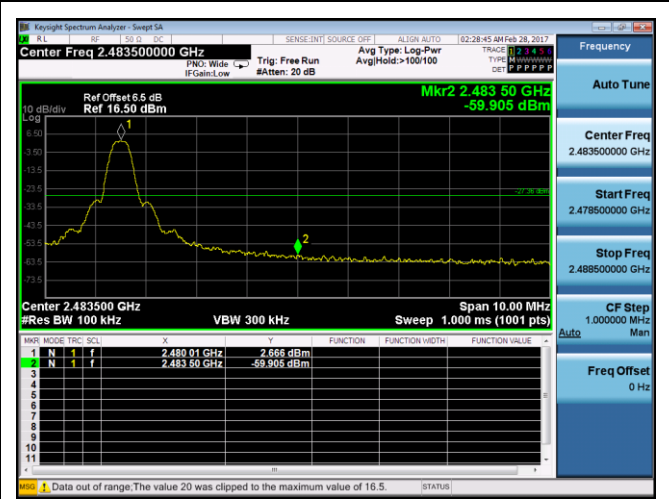
Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)	Limit (dBm)	Result
Output power	Bluetooth LE	2402	Low	1.94	30	Pass
		2440	Mid	2.35	30	Pass
		2480	High	2.47	30	Pass



### Band Edge Test Plots (Bluetooth LE)



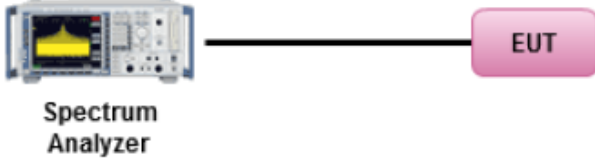
Band Edge-LE Low



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;	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;"><b>Spectrum Analyzer</b> ————— <b>EUT</b></p>		
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r04, 8.1 DTS bandwidth</p> <p><u>6dB Emission bandwidth measurement procedure</u></p> <ul style="list-style-type: none"> <li>- Set RBW = 100 kHz.</li> <li>- Set the video bandwidth (VBW) ≥ 3 x RBW.</li> <li>- Detector = Peak.</li> <li>- Trace mode = max hold.</li> <li>- Sweep = auto couple.</li> <li>- Allow the trace to stabilize.</li> <li>- 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.</li> </ul>		
Test Date	03/16/2017	Environmental condition	Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

**Test Data**     Yes       N/A

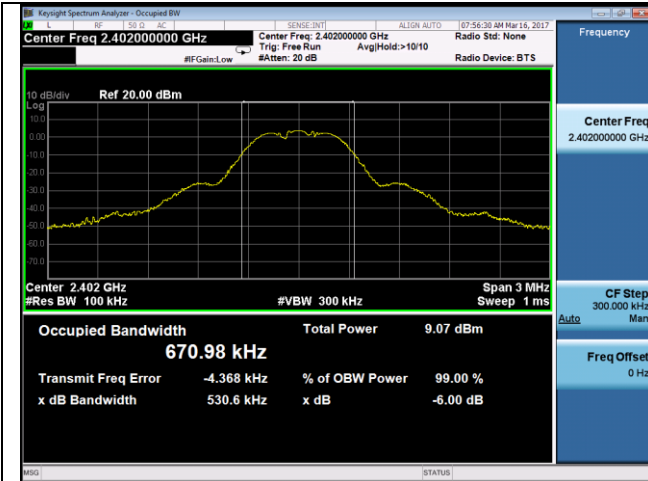
**Test Plot**     Yes       N/A

**Test was done by Pooja Pandya at RF Test Site.**

**6dB Bandwidth measurement result for 2.4GHz**

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit (MHz)	Result
6dB BW	BT-LE	2402	Low	0.530	≥0.5	Pass
		2440	Mid	0.544	≥0.5	Pass
		2480	High	0.549	≥0.5	Pass

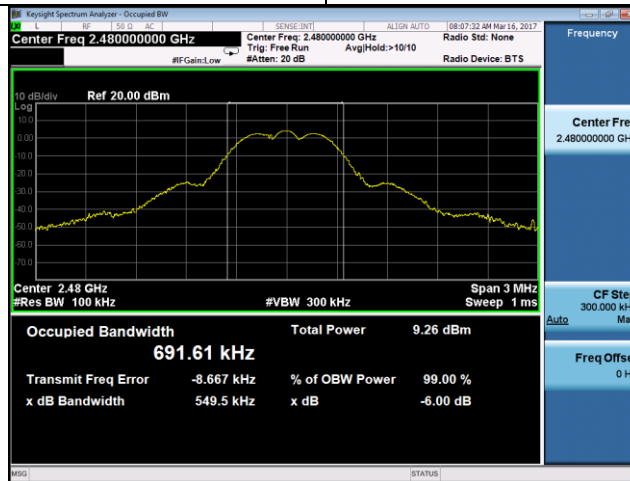
**Test Plots**



**6dB BW -Bluetooth LE 2402MHz**



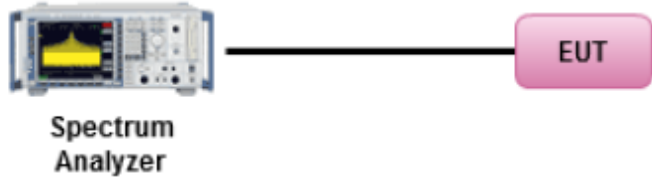
**6dB BW -Bluetooth LE 2440MHz**



**6dB BW -Bluetooth LE 2480MHz**

### 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	<input checked="" type="checkbox"/>									
Test Setup	 <p style="text-align: center;">Spectrum Analyzer ————— EUT</p>										
Procedure	<ol style="list-style-type: none"> <li>EUT was set for low , mid, high channel with modulated mode and highest RF output power.</li> <li>The spectrum analyzer was connected to the antenna terminal.</li> </ol>										
Test Date	03/16/2017	<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	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail										

**Test Data**     Yes (See below)       N/A

**Test Plot**     Yes (See below)       N/A

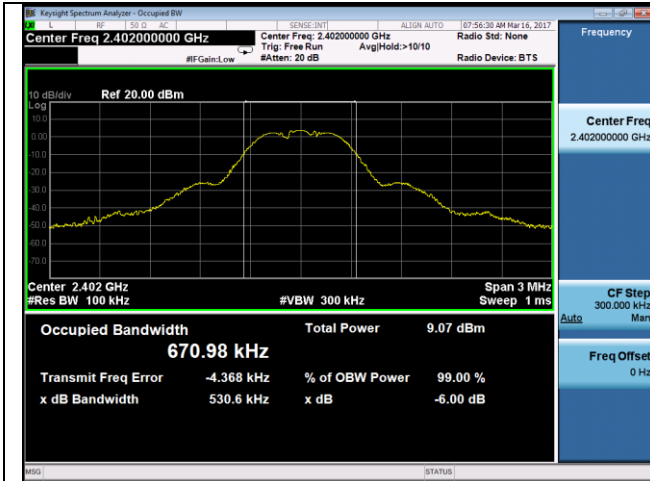
**Test was done by Pooja Pandya at RF Test Site.**



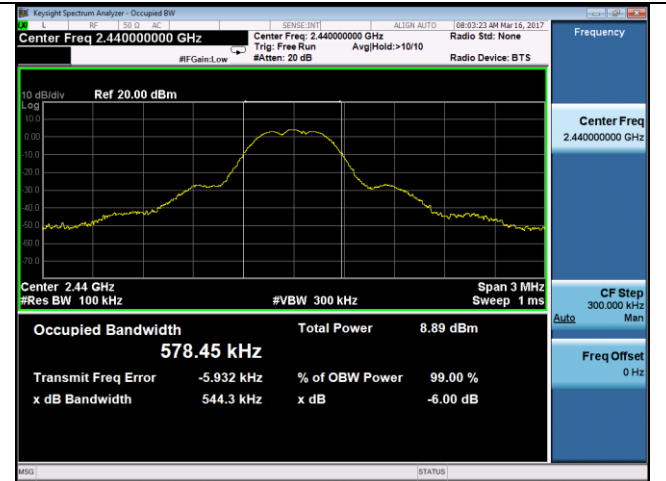
**99% Bandwidth measurement result for Bluetooth LE**

Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% BW	BT-LE	2402	Low	0.670
		2440	Mid	0.578
		2480	High	0.691

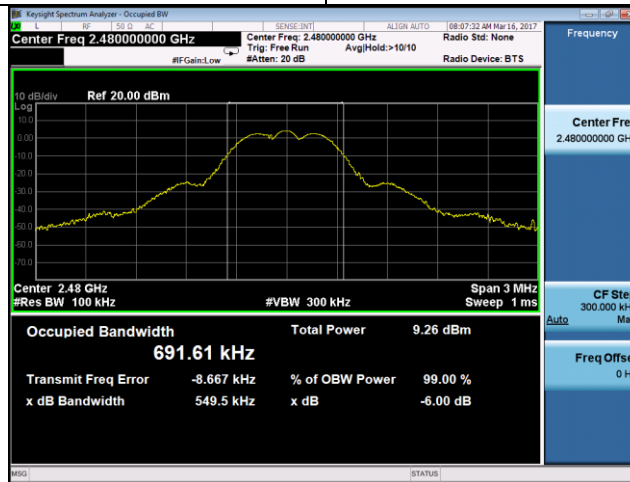
### 99%dB Bandwidth Test Plot (Bluetooth LE)



99% BW –Bluetooth LE 2402MHz



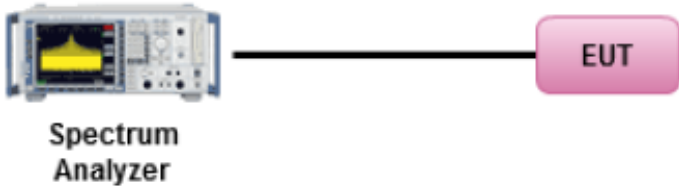
99% BW –Bluetooth LE 2440MHz



99% BW –Bluetooth LE 2480MHz

## 10.6 Peak Spectral Density (Bluetooth LE)

### Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(e) RSS247 (5.2.2)	e)	DSSS: $\leq 8\text{dBm}/3\text{KHz}$	<input checked="" type="checkbox"/>
	f)	DSSS in hybrid sys with FH turned off: $\leq 8\text{dBm}/3\text{KHz}$	<input type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer      EUT</p>		
Test Procedure	<p>558074 D01 DTS Meas Guidance v03r04, 10.2 Method PKPSD (peak PSD)</p> <p><u>Peak spectral density measurement procedure</u></p> <ul style="list-style-type: none"> <li>- Set analyzer center frequency to DTS channel center frequency.</li> <li>- Set the span to 1.5 times the DTS bandwidth.</li> <li>- Set the RBW to: <math>3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}</math>.</li> <li>- Set the VBW <math>\geq 3 \times \text{RBW}</math>.</li> <li>- Detector = Peak</li> <li>- Sweep time = auto couple.</li> <li>- Trace mode = Trace Max Hold over 100 traces</li> <li>- Allow trace to fully stabilize.</li> <li>- Use the peak marker function to determine the maximum amplitude level within the RBW.</li> <li>- If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.</li> </ul>		
Test Date	03/30/2017	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	-		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data     Yes                       N/A

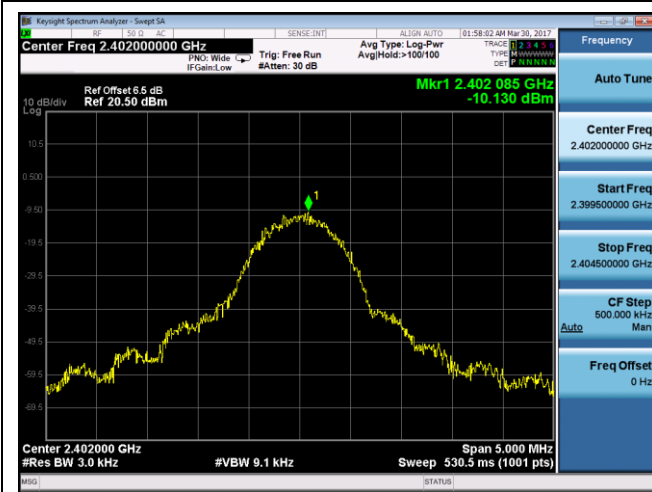
Test Plot     Yes (See below)       N/A

Test was done by Pooja Pandya at RF Test Site.

**PSD measurement result (Bluetooth LE)**

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
PSD	Bluetooth LE	2402	Low	-10.13	≤8	Pass
		2440	Mid	-8.84	≤8	Pass
		2480	High	-10.64	≤8	Pass

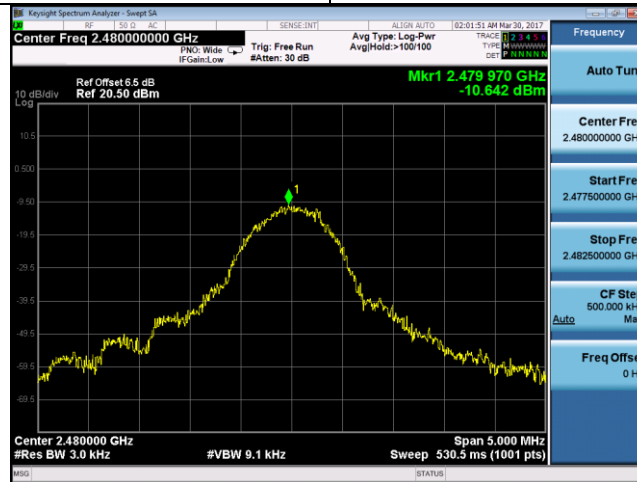
### Test Plots (Bluetooth LE)



PSD -Bluetooth LE Low



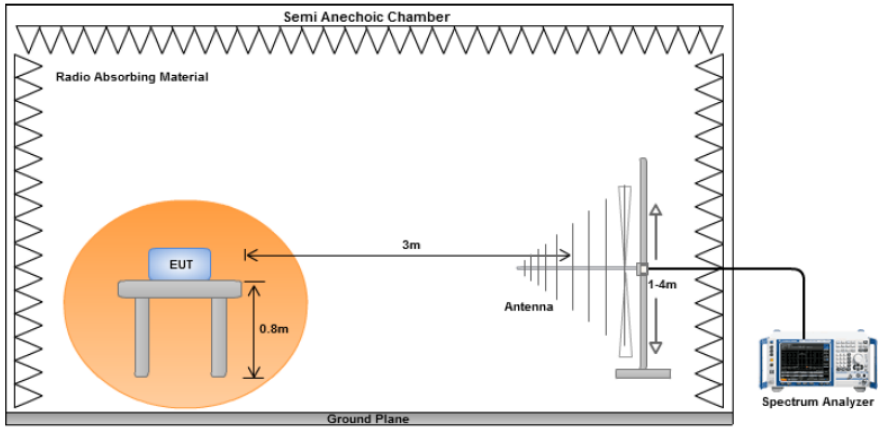
PSD -Bluetooth LE Mid



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)	<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	☒
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"> <li>The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>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"> <li>Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>The EUT was then rotated to the direction that gave the maximum emission.</li> <li>Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> <li>A Quasi-peak measurement was then made for that frequency point.</li> <li>Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol>											
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											

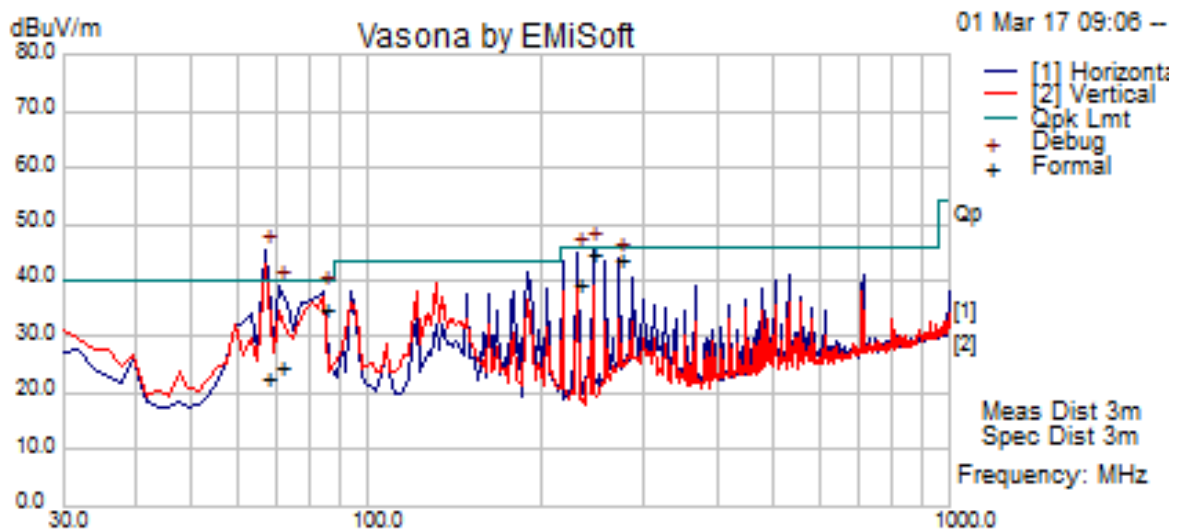
**Test Data**    ☒ Yes (See below)      ☐ N/A

**Test Plot**    ☒ Yes (See below)      ☐ N/A

**Test was done by Pooja Pandya at 10m Chamber.**

### 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:	Pooja Pandya			
Test Date:	03/01/2017			
Remarks:	Bluetooth LE 2440MHz			



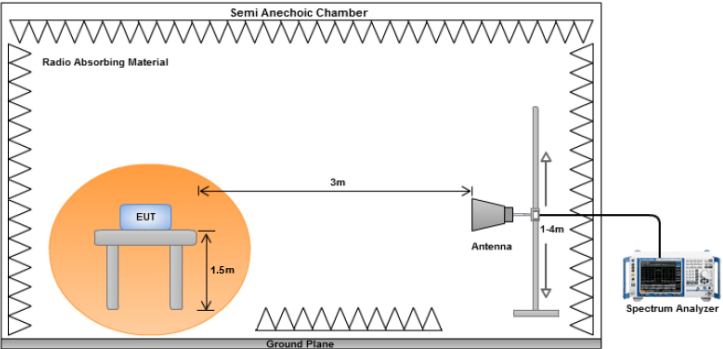
#### Quasi Max Measurement

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
67.10	49.75	1.46	-28.46	22.75	Quasi Max	H	329	156	40	-17.25	Pass
244.07	66.15	2.78	-24.54	44.40	Quasi Max	H	129	49	46	-1.60	Pass
70.85	51.26	1.48	-28.17	24.57	Quasi Max	H	252	179	40	-15.43	Pass
230.47	61.73	2.63	-25.12	39.24	Quasi Max	H	135	41	46	-6.76	Pass
84.18	61.87	1.55	-28.46	34.96	Quasi Max	H	242	23	40	-5.04	Pass
271.20	63.98	2.81	-23.32	43.47	Quasi Max	H	108	39	46	-2.53	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  <input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down	<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"> <li>1. The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>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"> <li>a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>b. The EUT was then rotated to the direction that gave the maximum emission.</li> <li>c. Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> <li>3. An average measurement was then made for that frequency point.</li> <li>4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol>		
Remark	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 (See below)     N/A

**Test Plot**     Yes (See below)     N/A

**Test was done by Pooja Pandya at 3m Chamber.**



## 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
17890.69	37.49	9.13	8.52	55.13	Peak Max	V	170	37	74	-18.87	Pass
7204.24	47.97	5.87	-0.03	53.81	Peak Max	H	119	301	74	-20.19	Pass
1198.28	50.43	2.40	-16.1	36.73	Peak Max	V	158	105	74	-37.27	Pass
17890.69	25.7	9.13	8.52	43.34	Average Max	V	170	37	54	-10.66	Pass
7204.24	42.66	5.87	-0.03	48.50	Average Max	H	119	301	54	-5.50	Pass
1198.28	34.16	2.40	-16.1	20.46	Average Max	V	158	105	54	-33.54	Pass

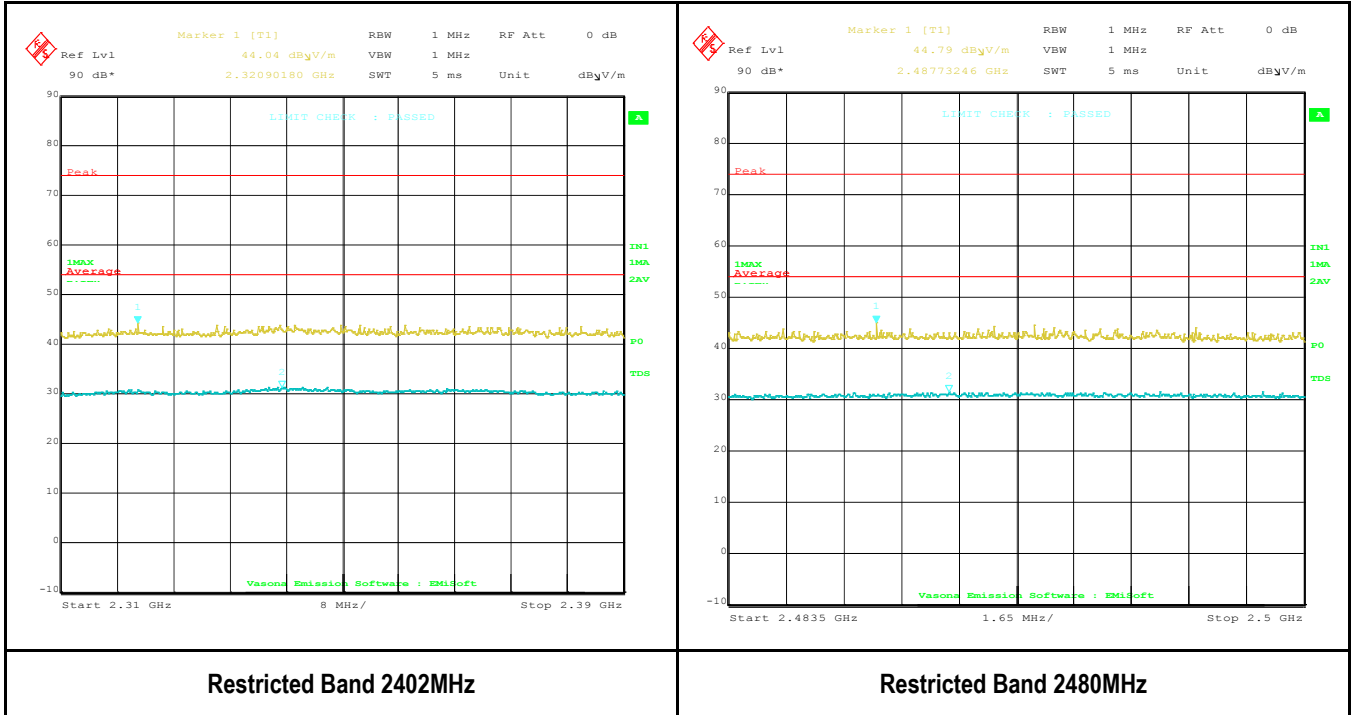
### BLE – 2440MHz

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
17341.82	38.70	9	7.33	55.04	Peak Max	H	105	219	74	-18.96	Pass
7321.48	47.49	5.92	0.02	53.43	Peak Max	H	100	261	74	-20.57	Pass
1196.63	58.12	2.40	-16.1	44.41	Peak Max	H	99	55	74	-29.59	Pass
17341.82	26.24	9.00	7.33	42.58	Average Max	H	105	219	54	-11.42	Pass
7321.48	43.25	5.92	0.02	49.19	Average Max	H	100	261	54	-4.81	Pass
1196.63	34.78	2.40	-16.1	21.08	Average Max	H	99	55	54	-32.92	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
17925.25	38.79	9.13	8.48	56.41	Peak Max	V	118	132	74	-17.59	Pass
7539.14	39.87	5.98	0.11	45.96	Peak Max	V	364	10	74	-28.04	Pass
1552.53	58.03	2.76	-15.03	45.76	Peak Max	V	122	148	74	-28.24	Pass
17925.25	26.78	9.13	8.48	44.40	Average Max	V	118	132	54	-9.61	Pass
7539.14	27.89	5.98	0.11	33.98	Average Max	H	227	243	54	-20.02	Pass
1552.53	40.51	2.76	-15.03	28.25	Average Max	V	122	148	54	-25.75	Pass

### Restricted Band Test plot



















## Annex A. TEST INSTRUMENT








Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
<b>Conducted Emissions</b>						
EMI Test Receiver (9kHz - 6GHz)	ESL6	100178	08/17/2016	1 Year	08/17/2017	<input checked="" type="checkbox"/>
LISN (9kHz - 30MHz)	MN2050B	1018	08/16/2016	1 Year	08/16/2017	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>						
EMI Test Receiver	ESIB 40	100179	06/08/2016	1 Year	06/08/2017	<input checked="" type="checkbox"/>
Keysight EXA 44 GHz Spectrum Analyzer	N9010A	MY51440112	08/02/2016	1 Year	08/02/2017	<input checked="" type="checkbox"/>
Antenna - Biconlog (30MHz - 2GHz)	JB1	A030702	01/13/2017	1 Year	01/13/2018	<input checked="" type="checkbox"/>
Horn Antenna (1GHz~26GHz)	3115	10SL0059	08/11/2016	1 Year	08/11/2017	<input checked="" type="checkbox"/>
Pre-Amplifier (1 - 40GHz)	J532-00104000-58-5P	1960351	05/10/2016	1 Year	05/10/2017	<input checked="" type="checkbox"/>
RF Pre-Amplifier (9kHz - 6.5GHz)	LPA-6-30	11140711	02/09/2017	1 Year	02/09/2018	<input checked="" type="checkbox"/>
3 Meters SAC	3M	N/A	06/09/2016	1 Year	06/09/2017	<input type="checkbox"/>
10 Meters SAC	10M	N/A	07/06/2016	1 Year	07/06/2017	<input checked="" type="checkbox"/>
<b>RF Conducted Measurement</b>						
Spectrum Analyzer	N9010A	10SL0219	11/16/2016	1 Year	11/16/2017	<input checked="" type="checkbox"/>

### Test Software Version

Test Item	Vendor	Software	Version
Radiated Emission	EMISoft	EMISoft Vasona	V5.0

## 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		<a href="#">A1</a> , <a href="#">A2</a> , <a href="#">A3</a> , <a href="#">A4</a> , <a href="#">B1</a> , <a href="#">B2</a> , <a href="#">B3</a> , <a href="#">B4</a> , 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		<b>Radio &amp; Telecommunications Terminal Equipment:</b> EN45001 – EN ISO/IEC 17025
		<b>Electromagnetic Compatibility:</b> EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)	 	<a href="#">Phase I</a> , <a href="#">Phase II</a>
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
Hong Kong OFCA		<b>(Phase II)</b> OFCA Foreign Certification Body for Radio and Telecom
		<b>(Phase I)</b> Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		<b>Radio:</b> Scope A – All Radio Standard Specification in Category I
		<b>Telecom:</b> CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		<p><b>Radio:</b> A1. Terminal equipment for purpose of calling</p> <p><b>Telecom:</b> B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law</p>
Korea CAB Accreditation		<p><b>EMI:</b> KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI</p> <p><b>EMS:</b> 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</p>
		<p><b>Radio:</b> 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</p> <p><b>Telecom:</b> 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</p>
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		<p>R-3083: Radiation 3 meter site</p> <p>C-3421: Main Ports Conducted Interference Measurement</p> <p>T-1597: Telecommunication Ports Conducted Interference Measurement</p>
Australia CAB Recognition		<p><b>EMC:</b> AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4</p>
		<p><b>Radio communications:</b> 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</p> <p><b>Telecommunications:</b> 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</p>
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