

# EMC Test Report

**Project Number:** 4032308**Report Number:** 4032308EMC03**Revision Level:** 0**Client:** Eaton Cooper Lighting**Equipment Under Test:** Wireless Area Controller**Model:** WAC-POE**FCC ID:** 2AKCY2CL69WAC**IC ID:** 4706A-2CL69WAC**Applicable Standards:** FCC Part 15 Subpart C, § 15.247

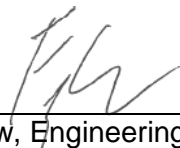
RSS-247, Issue 1, May 2015

ANSI C63.10: 2013


RSS-GEN, Issue 4, November 2014

**Report issued on:** 30 September 2016**Test Result:** Compliant

Tested by:

  
Fendy Liauw, Engineering Technician

Reviewed by:

  
Jeremy Pickens, Senior EMC Engineer**Remarks:**

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or Testing done by SGS International Electrical Approvals in connection with distribution or use of the product described in this report must be approved by SGS international Electrical Approvals in writing.

## Table of Contents

<b>1</b>	<b>SUMMARY OF TEST RESULTS .....</b>	<b>4</b>
1.1	MODIFICATIONS REQUIRED FOR COMPLIANCE .....	4
<b>2</b>	<b>GENERAL INFORMATION.....</b>	<b>5</b>
2.1	CLIENT INFORMATION .....	5
2.1	TEST LABORATORY .....	5
2.2	GENERAL INFORMATION OF EUT .....	5
2.3	OPERATING MODES AND CONDITIONS .....	5
2.4	EUT CONNECTION BLOCK DIAGRAM – CONDUCTED MEASUREMENTS.....	6
2.5	EUT CONNECTION BLOCK DIAGRAM – RADIATED MEASUREMENTS .....	7
2.6	SYSTEM CONFIGURATIONS .....	7
<b>3</b>	<b>BANDWIDTH .....</b>	<b>8</b>
3.1	TEST RESULT.....	8
3.2	TEST METHOD.....	8
3.3	TEST SITE .....	8
3.4	TEST EQUIPMENT .....	8
3.5	TEST DATA.....	8
<b>4</b>	<b>OUTPUT POWER .....</b>	<b>10</b>
4.1	TEST RESULT.....	10
4.2	TEST METHOD.....	10
4.3	TEST SITE .....	10
4.4	TEST EQUIPMENT .....	10
4.5	TEST DATA.....	11
<b>5</b>	<b>POWER SPECTRAL DENSITY .....</b>	<b>12</b>
5.1	TEST RESULT.....	12
5.2	TEST METHOD.....	12
5.3	TEST SITE .....	12
5.4	TEST EQUIPMENT .....	12
5.5	TEST DATA.....	12
<b>6</b>	<b>CONDUCTED SPURIOUS EMISSIONS .....</b>	<b>14</b>
6.1	TEST RESULT.....	14
6.2	TEST METHOD.....	14
6.3	TEST SITE .....	14
6.4	TEST EQUIPMENT .....	14
6.5	TEST DATA – DTS BANDEDGE .....	15
6.6	TEST DATA – CONDUCTED SPURIOUS EMISSIONS .....	16
<b>7</b>	<b>FIELD STRENGTH OF SPURIOUS RADIATION.....</b>	<b>17</b>
7.1	TEST RESULT.....	17
7.2	TEST METHOD.....	17
7.3	TEST SITE .....	17
7.4	TEST EQUIPMENT .....	18
7.5	TEST DATA – PEAK PLOTS.....	19
<b>8</b>	<b>RADIATED EMISSIONS AT BAND EDGE / RESTRICTED BAND .....</b>	<b>31</b>
8.1	TEST RESULT.....	31
8.2	TEST METHOD.....	31
8.3	TEST SITE .....	31
8.4	TEST EQUIPMENT .....	31
8.5	TEST DATA – RESTRICTED BAND EDGE .....	32



9 REVISION HISTORY ..... 33

## 1 Summary of Test Results

Test Description	Test Specification		Test Result
Bandwidth	15.247(d)	RSS-247 S5.2 (1) RSS-GEN S6.6	Compliant
Transmitter Output Power	15.247(b)(3)	RSS-247 S5.4 (4)	Compliant
Power Spectral Density	15.247(e)	RSS-247 S5.2 (2)	Compliant
Conducted Spurious Emissions / Band edge	15.247(d)	RSS-247 S5.5	Compliant
Radiated Spurious Emissions / Restricted Bands	15.35(b), 15.209	RSS-GEN S6.13 RSS-GEN S8.10	Compliant
AC Powerline Conducted Emission	15.107, 15.207	RSS-GEN S8.8	N/A(1)

1) Not Applicable – The device is powered from 48Vdc via Power over Ethernet.

### 1.1 Modifications Required for Compliance

None

## 2 General Information

### 2.1 Client Information

Name: Eaton Cooper Lighting  
Address: 1121 Highway 74 South  
City, State, Zip, Country: Peachtree City, GA 30269, USA

### 2.1 Test Laboratory

Name: SGS North America, Inc.  
Address: 620 Old Peachtree Road NW, Suite 100  
City, State, Zip, Country: Suwanee, GA 30024, USA

Accrediting Body: A2LA  
Type of lab: Testing Laboratory  
Certificate Number: 3212.01

### 2.2 General Information of EUT

Type of Product: Wireless Area Controller  
Model Number: WAC-POE  
Serial Number: F40420116290008 (Conducted)  
F40420116290032 (Radiated)

Frequency Range: 2402-2480MHz  
Data Modes: Bluetooth Low Energy  
Antenna: 1.5dBi Chip Antenna

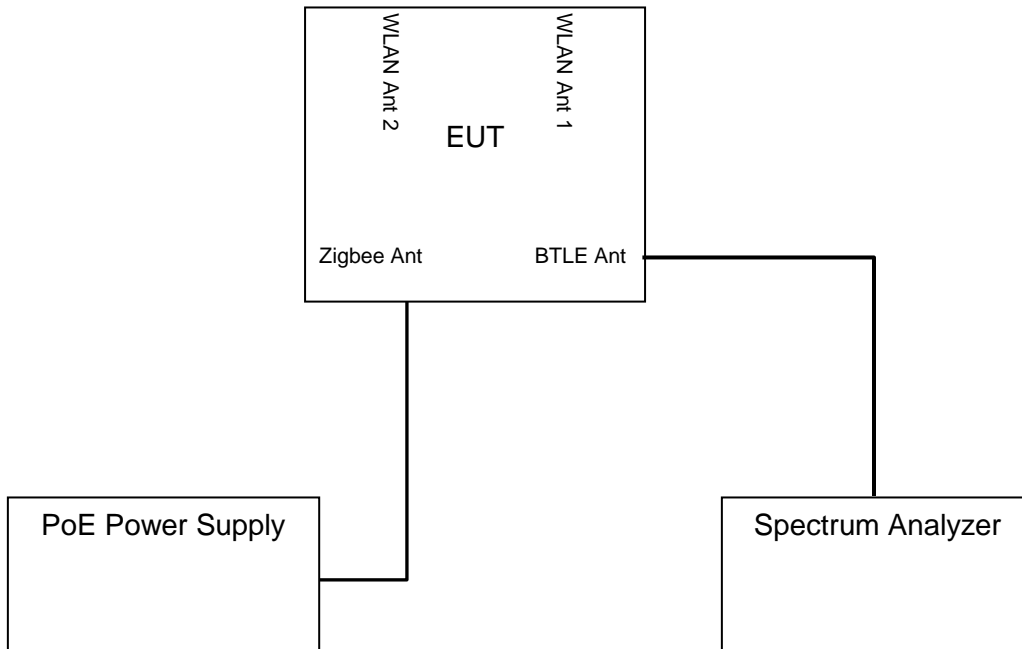
Rated Voltage: 48Vdc (PoE)  
Test Voltage: 48Vdc

Sample Received Date: 25 August 2016  
Dates of testing: 25 August – 27 September 2016

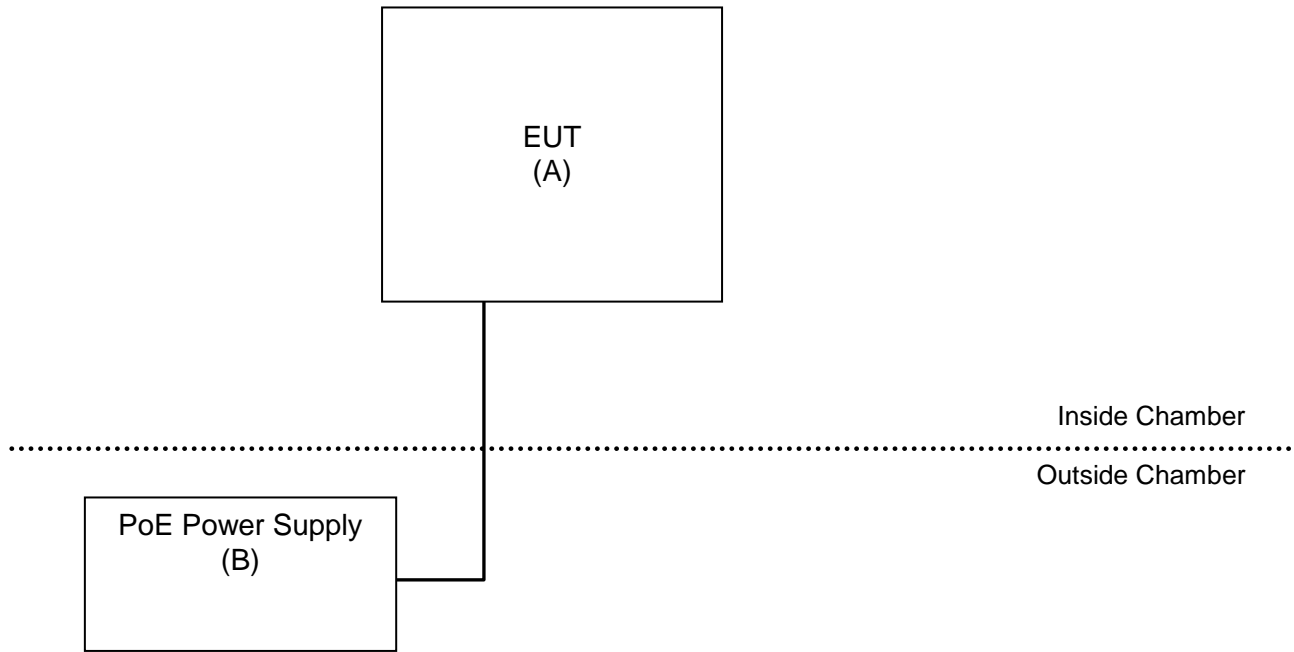
### 2.3 Operating Modes and Conditions

Continuous traffic was generated using test commands. Where the duty cycle measured below 99% and an RMS detector was employed, corrections of  $10 \cdot \text{LOG}(1/D)$  were applied according to KDB publication 558074 D01 DTS Meas Guidance v03r05.

## 2.4 EUT Connection Block Diagram – Conducted Measurements



## 2.5 EUT Connection Block Diagram – Radiated Measurements



## 2.6 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Eaton Cooper Lighting	Wireless Area Controller	WAC-POE	F40420116290008 (Conducted) F40420116290032 (Radiated)
B	Microsemi Corp	PoE Supply	PD-9001GR/AC	C13526561000001961

### 3 Bandwidth

#### 3.1 Test Result

Test Description	Test Specification		Test Result
6 dB bandwidth / 99% OBW	15.247(d)	RSS-247 S5.2 (1) RSS-GEN S6.6	Compliant

#### 3.2 Test Method

The procedures from ANSI C63.10: 2013 clause 11.8 and 558074 D01 DTS Meas Guidance v03r05 were used to determine the 6 dB bandwidth and 99% OBW.

#### 3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.5 °C

Relative Humidity: 51.4 %

#### 3.4 Test Equipment

Test Date: 28-Sep-2016

Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095593	27-Jul-2017
RF CABLE	1134	GORE	B094785	26-Jul-2017

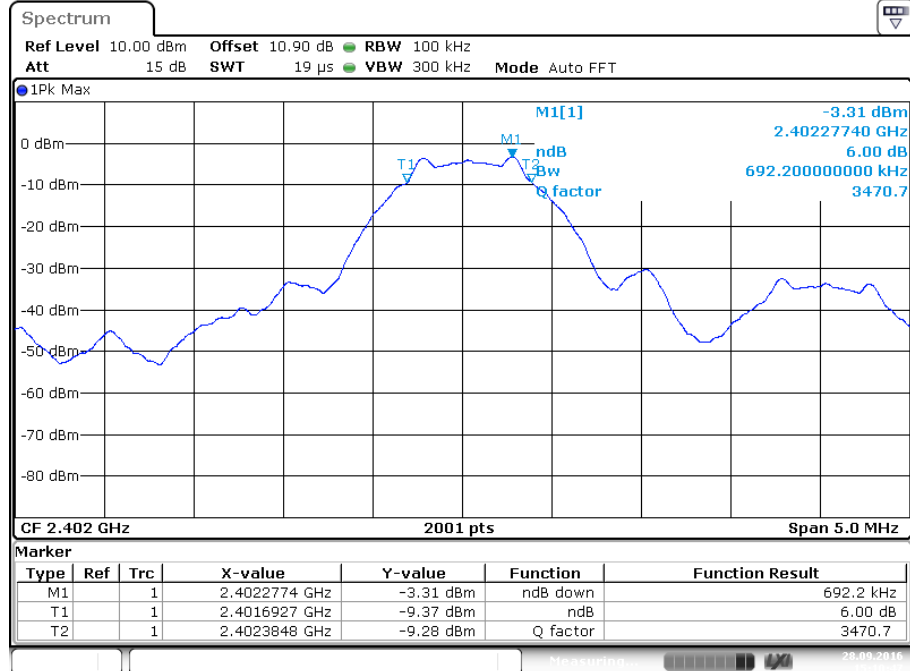
Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

#### 3.5 Test Data

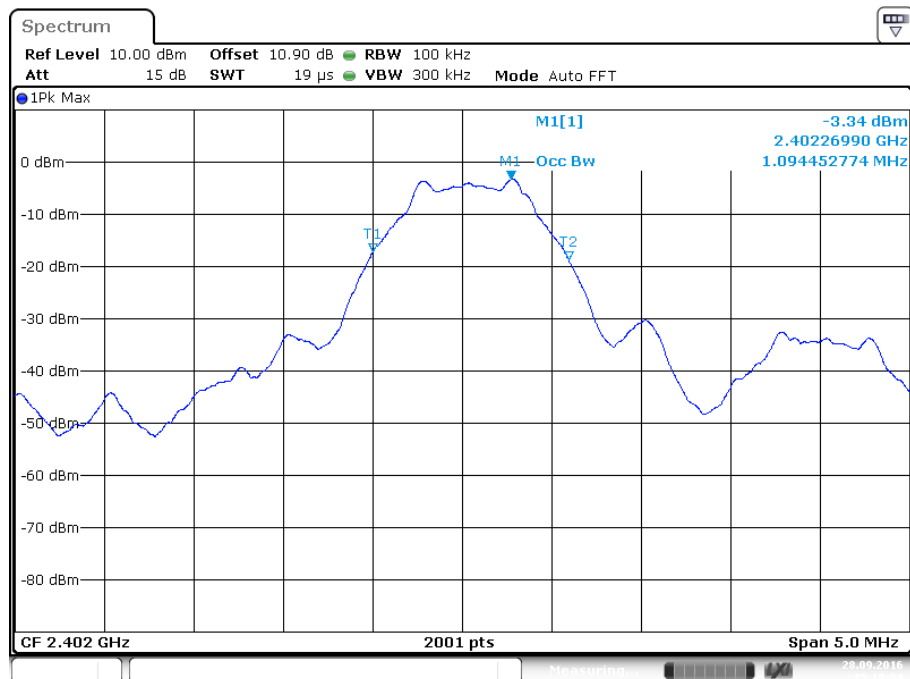
Protocol	Channel	6dB Bandwidth (MHz)	Occupied Bandwidth (99%) (MHz)
BLE	0	0.692	1.094
BLE	19	0.726	1.102
BLE	39	0.741	1.104



## Sample Plots



Date: 28.SEP.2016 15:10:47



Date: 28.SEP.2016 15:10:04

## 4 Output Power

### 4.1 Test Result

Test Description	Test Specification		Test Result
Peak Output Power	15.247(b) (3)	RSS-247 S5.4 (4)	Compliant

### 4.2 Test Method

Fundamental peak power measurements were recorded using the procedures from ANSI C63.10: 2013 clause 11.9 and KDB 558074 D01 Measurement Guidance v03r05.

#### Limit

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. For using antennas with greater than 6dBi of gain, the limit is reduced in dB by the amount the gain exceeds 6dBi (e.g. for a 7.4dBi antenna, the limit is reduced from 30dBm to 28.6dBm)

### 4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

#### Environmental Conditions

Temperature: 22.3 °C

Relative Humidity: 47.9 %

### 4.4 Test Equipment

Test Date: 25-Aug-2016

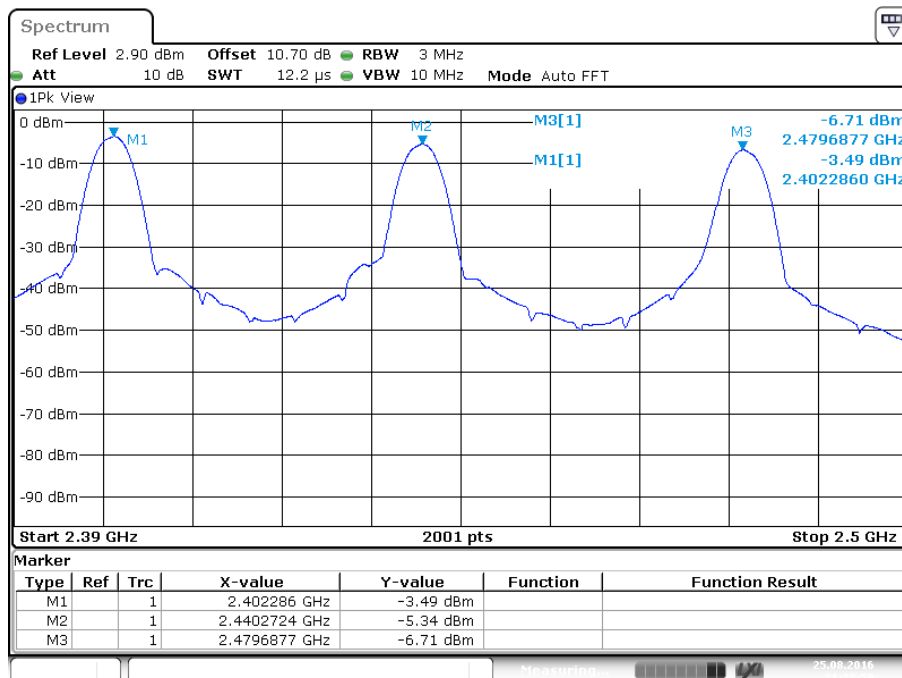
Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095593	27-Jul-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

## 4.5 Test Data

Protocol	Channel	Peak Power (dBm)	Limit (dBm)	Margin (dB)
BLE	0	-3.5	30	-33.5
BLE	19	-5.3	30	-35.3
BLE	39	-6.7	30	-36.7



Date: 25 AUG 2016 21:38:59

## 5 Power Spectral Density

### 5.1 Test Result

Test Description	Test Specification		Test Result
Power Spectral Density	15.247(e)	RSS-247 S5.2 (2)	Compliant

### 5.2 Test Method

Power spectral density measurements were recorded using the procedures from ANSI C63.10: 2013 clause 11.10 and KDB 558074 D01 Measurement Guidance v03r05. The lowest data rate for each modulation was determined to be the worst-case.

#### Limit

The limit is 8 dBm.

### 5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

#### Environmental Conditions

Temperature: 22.3 °C

Relative Humidity: 47.9 %

### 5.4 Test Equipment

Test Date: 30-Aug-2016

Tester: JC

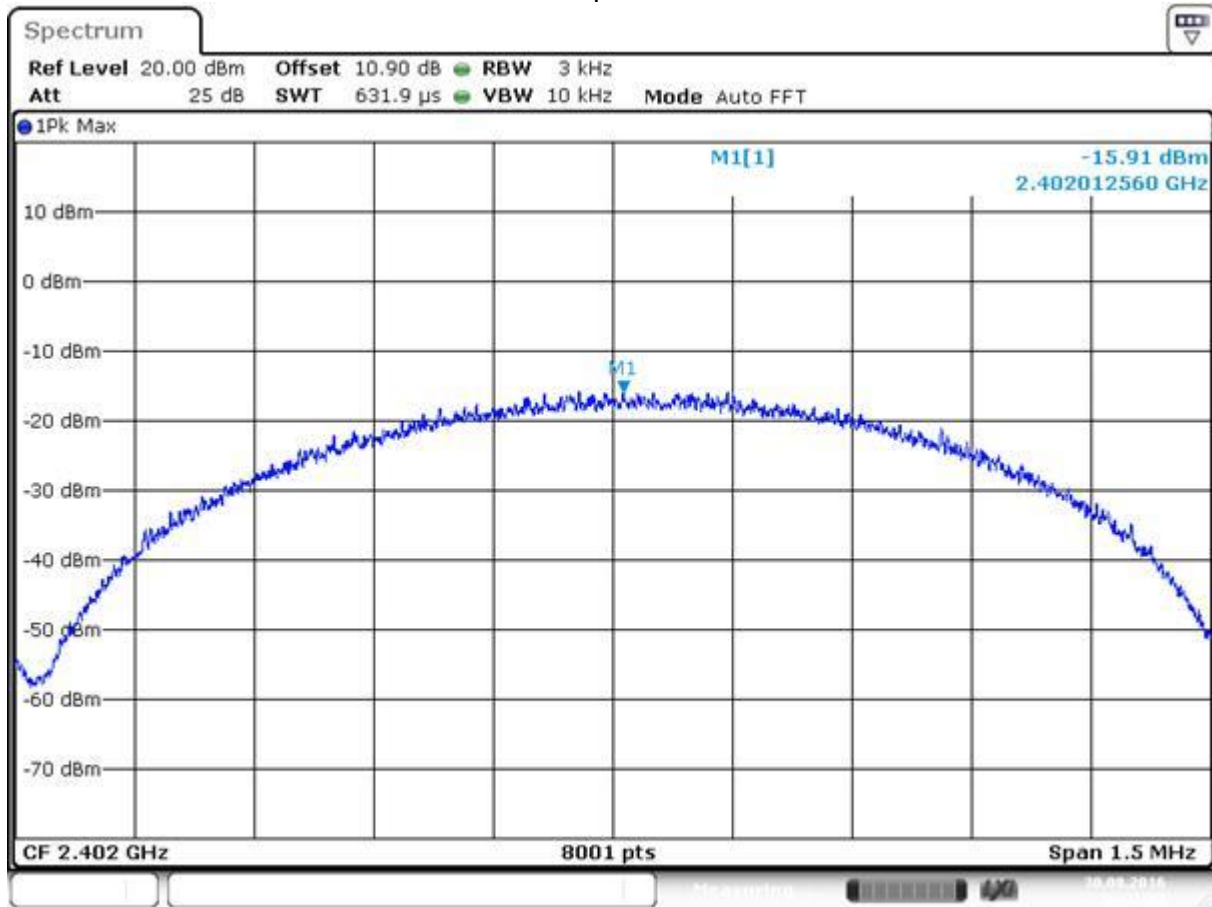
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV40	ROHDE & SCHWARZ	S/N: 101401	19-Aug-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095593	27-Jul-2017
RF CABLE	1134	GORE	B094785	26-Jul-2017

Note: The equipment calibration period is 1 year.

### 5.5 Test Data

Protocol	Channel	Peak PSD (dBm)	Limit (dBm)	Margin (dB)
BLE	0	-15.91	8	-23.9
BLE	19	-17.06	8	-25.1
BLE	39	-19.06	8	-27.1

## Sample Plot



Date: 30 AUG 2016 16:41:03

## 6 Conducted Spurious Emissions

### 6.1 Test Result

Test Description	Test Specification		Test Result
Conducted Spurious Emissions	15.247(d)	RSS-247 S5.5	Compliant

### 6.2 Test Method

Spurious emissions in non-restricted frequency bands were recorded using the methods defined in ANSI C63.10: 2013 clause 11.11 and KDB 558074 D01 Measurement Guidance v03r05.

Lowest, middle, and highest channels were investigated.

Because the maximum conducted peak output power was used to determine compliance with the output power limits, the limit in any 100 kHz band outside of the authorized band is 20 dB below the maximum in-band peak level.

### 6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.3 °C

Relative Humidity: 47.9 %

### 6.4 Test Equipment

Test Date: 30-Aug-2016

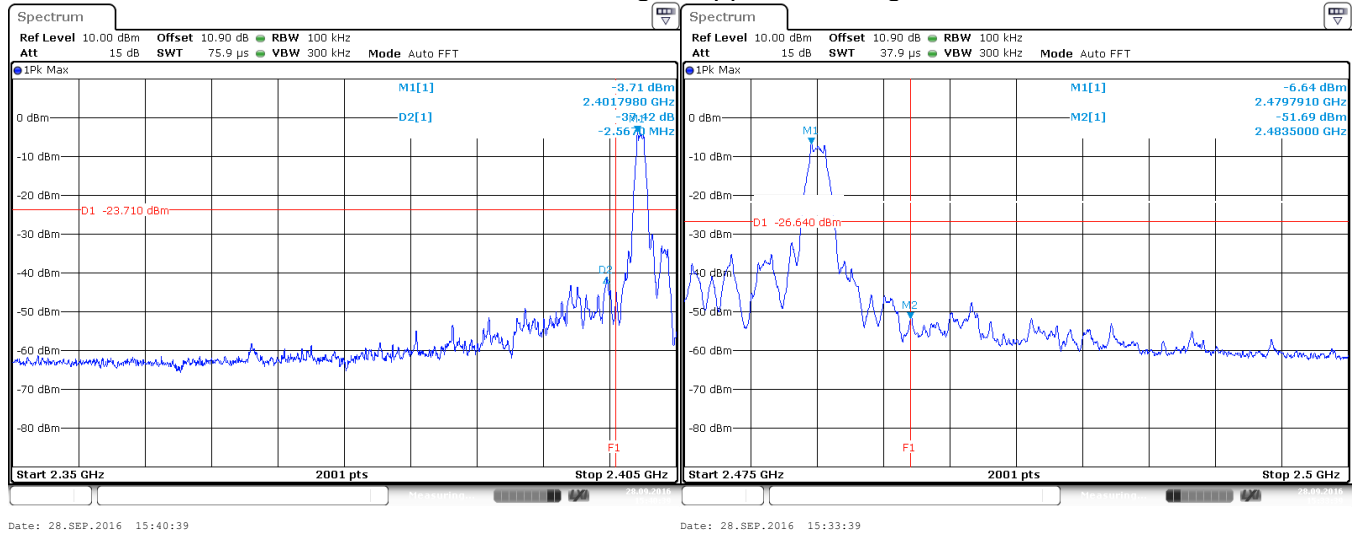
Tester: JC

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV40	ROHDE & SCHWARZ	S/N: 101401	19-Aug-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095593	27-Jul-2017
RF CABLE	1134	GORE	B094785	26-Jul-2017

Note: The equipment calibration period is 1 year.

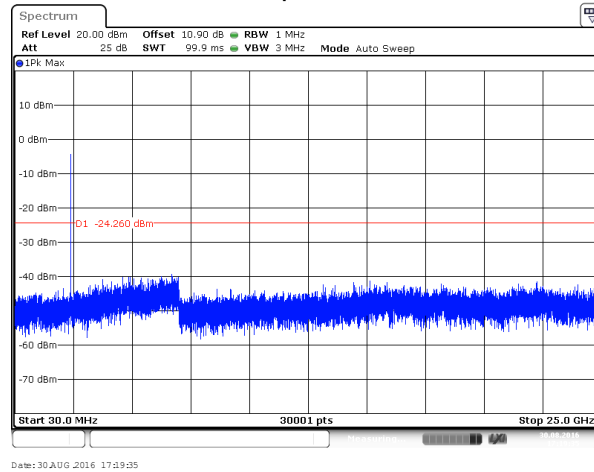
## 6.5 Test Data – DTS Bandedge

BLE  
Lower band edge / Upper band edge

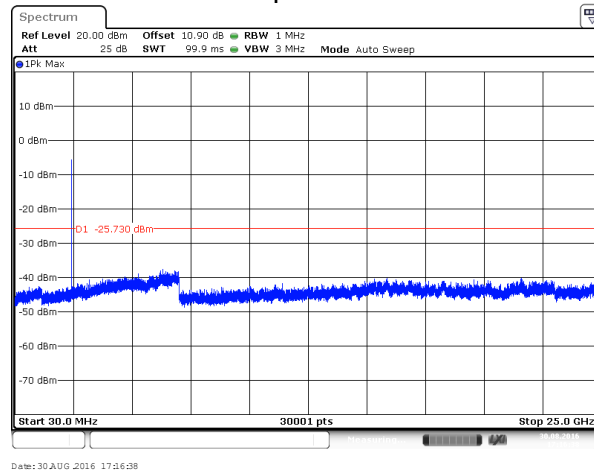


## 6.6 Test Data – Conducted Spurious Emissions

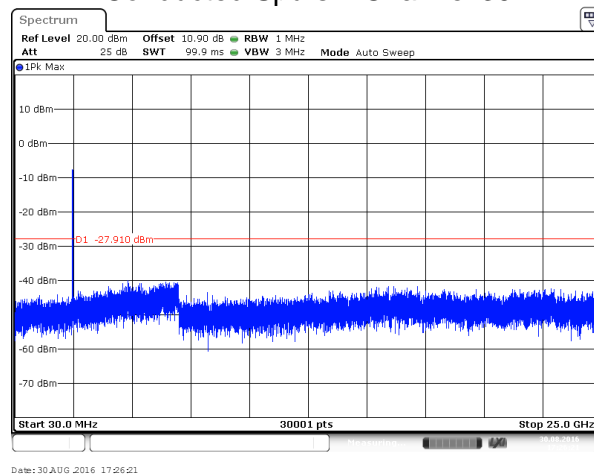
### Conducted Spurs – Channel 0



### Conducted Spurs – Channel 19



### Conducted Spurs – Channel 39





## 7 Field Strength of Spurious Radiation

### 7.1 Test Result

Test Description	Test Specification		Test Result
Spurious Emissions	15.247 (d) and 15.209	RSS-247 S5.5	Compliant

### 7.2 Test Method

The measurement methods defined in ANSI C63.4: 2014 were used.

Lowest, middle, and highest channels were investigated.

Test distance:

9k to 30 MHz – Near field prescan to determine if there were any emissions.

30 to 1000 MHz - The EUT to measurement antenna distance was 3 meters

1 to 18 GHz - The EUT to measurement antenna distance was 3 meters

18 to 26 GHz - The EUT to measurement antenna distance was 1 meter

Limits within restricted bands of operation:

Frequency	Limits <sup>(1)</sup>		Peak Limits dBuV/m
	Microvolts/m	dBuV/m	
30 - 88 MHz	100	40 <sup>(2)</sup>	--
88 - 216 MHz	150	43.5 <sup>(2)</sup>	--
216 - 960 MHz	200	46 <sup>(2)</sup>	--
960 - 1000 MHz	500	54 <sup>(2)</sup>	--
1 - 40 GHz	500	54 <sup>(3)</sup>	74

(1) These limits are applicable to emissions outside of the intentional transmit frequency band.

(2) Quasi-peak limit

(3) Average limit

### 7.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.4 °C

Relative Humidity: 49.5 %

## 7.4 Test Equipment

Test Date: 7-Sep-2016

Tester: JOP

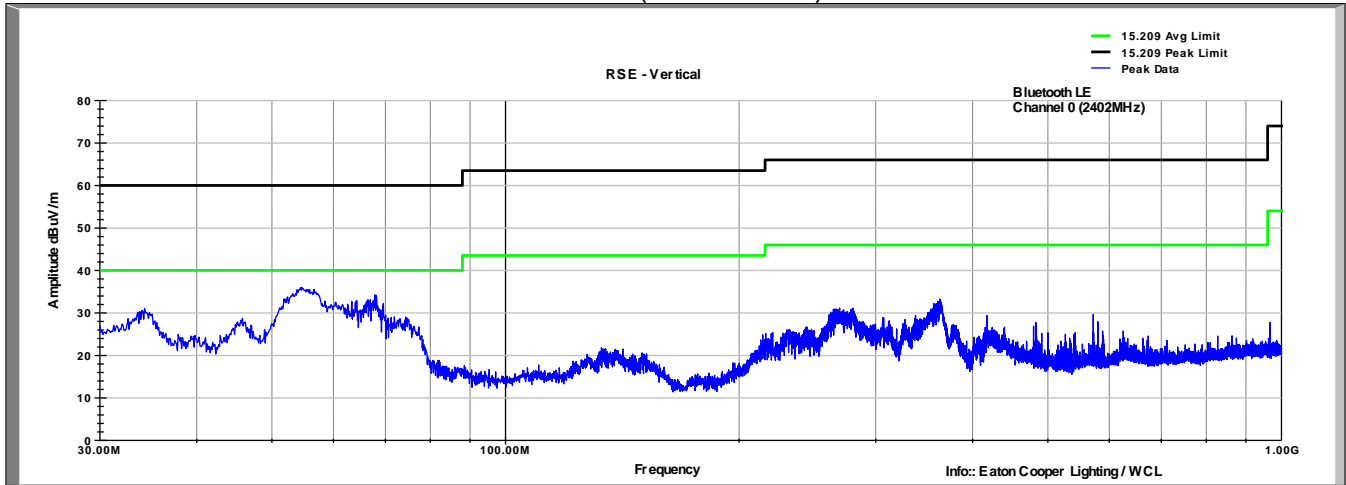
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
ANTENNA, BILOG	CBL 6143A	TESEQ	B085931	1-Dec-2016
RF CABLE	SF106	HUBER & SUHNER	B079712	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079713	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079716	27-Jul-2017
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2017
RF CABLE	SF102	HUBER & SUHNER	B079824	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B085892	27-Jul-2017
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	4-Aug-2017
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	16-Feb-2017
DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2017
HORN(SMALL)	LB-180400-20-C-KF	A-INFO	15007	29-Mar-2017
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	29-Jul-2017

Note: The equipment calibration period is 1 year.

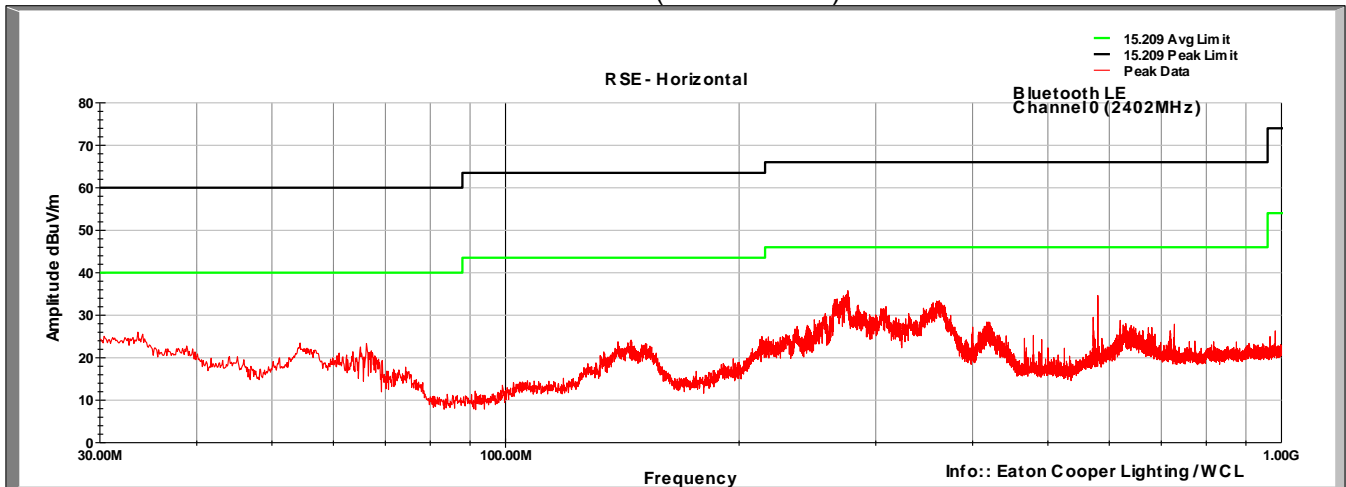
## 7.5 Test Data – Peak Plots

No emissions detected below 30MHz

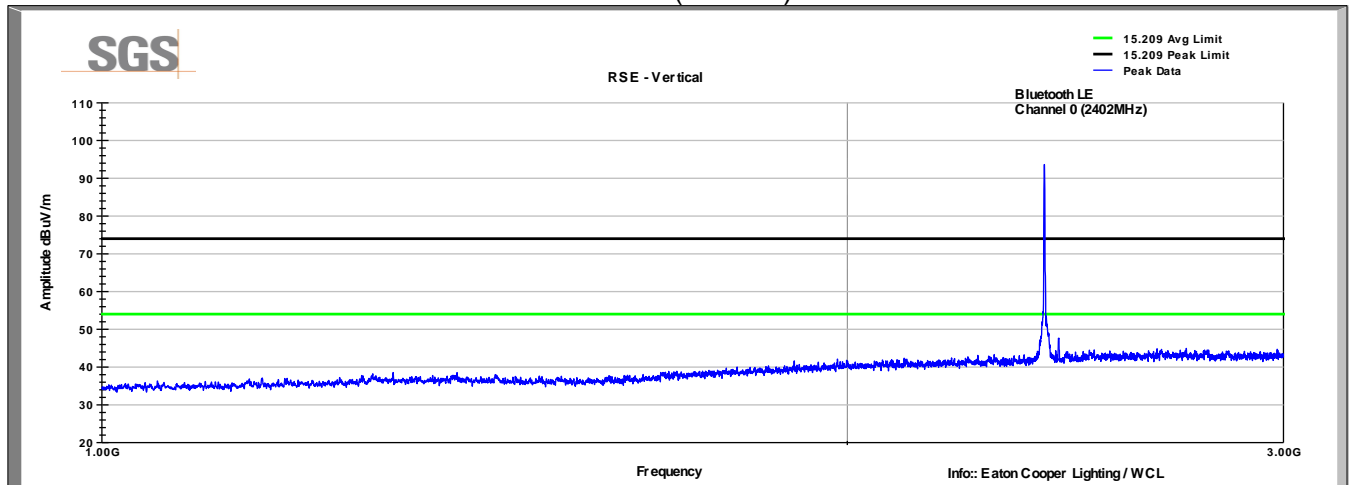
BLE Channel 0  
Vertical (30-1000MHz)



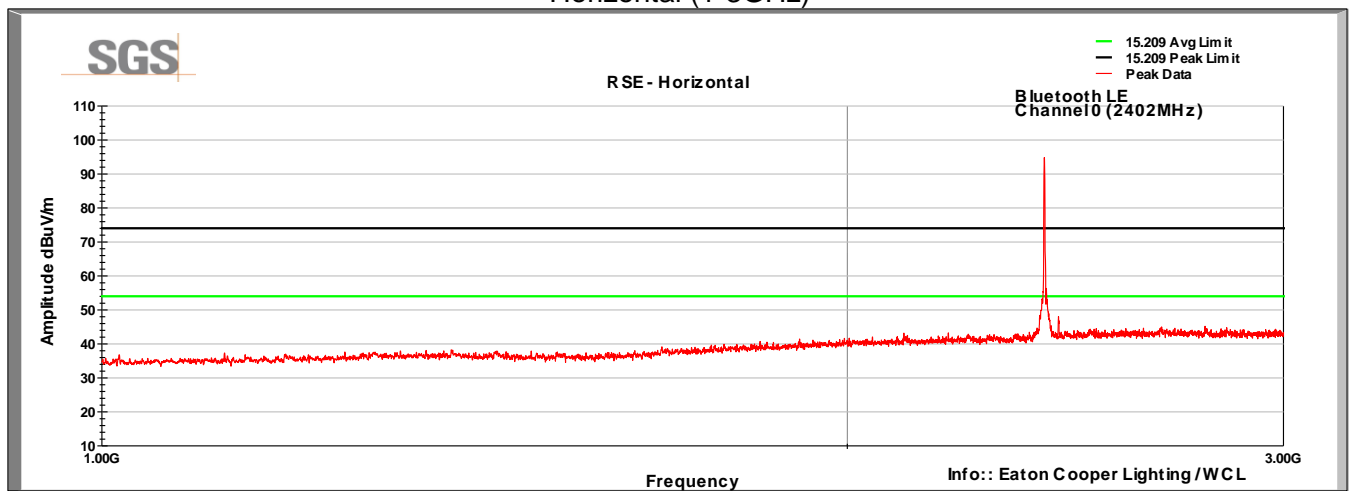
BLE Channel 0  
Horizontal (30-1000MHz)



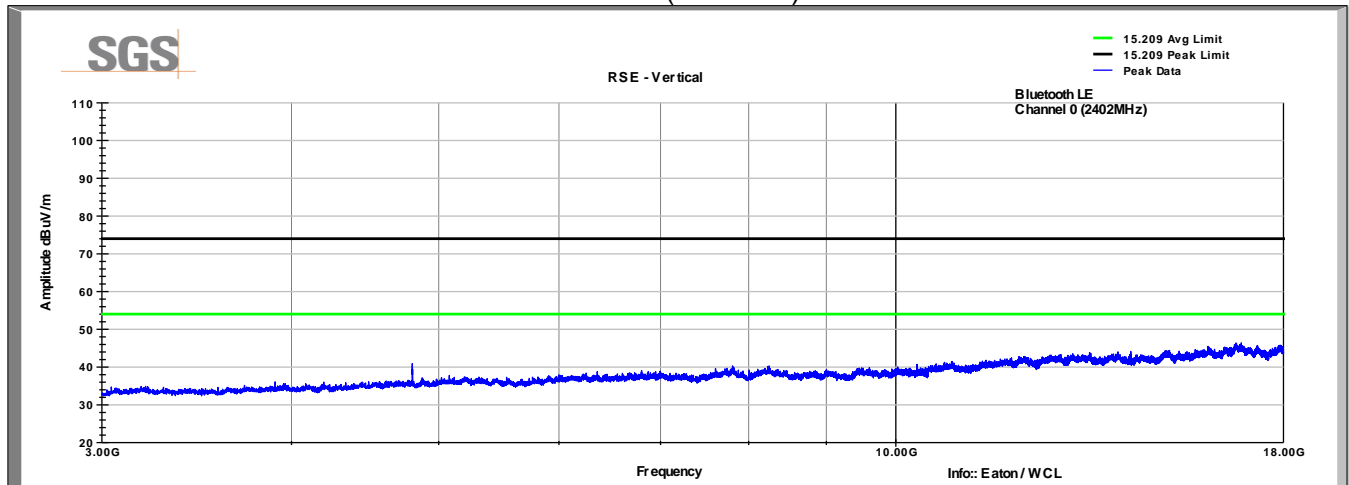
### BLE Channel 0 Vertical (1-3GHz)



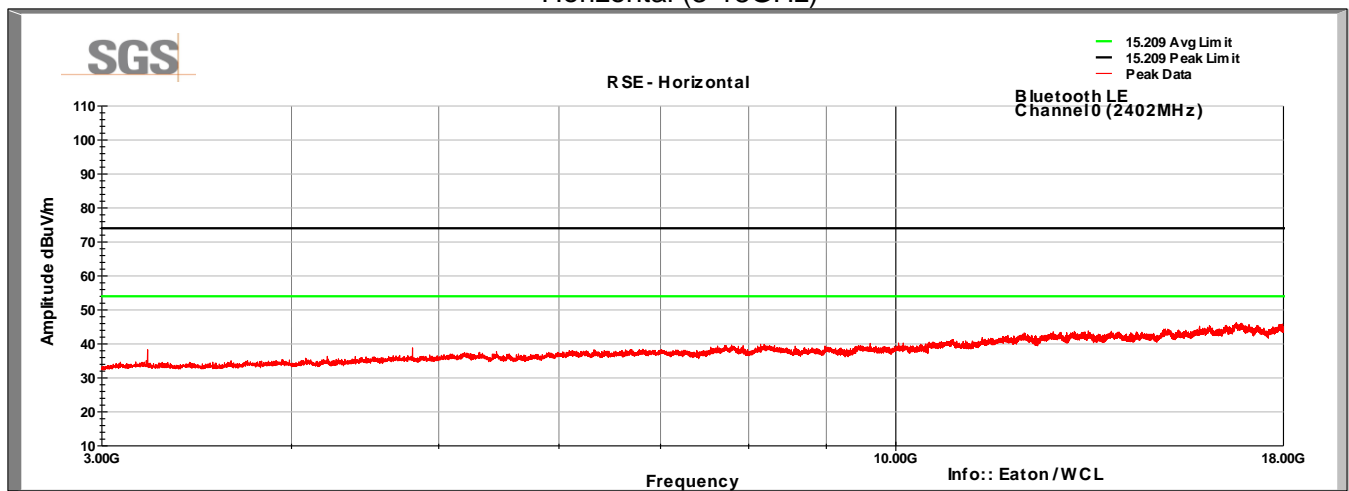
### BLE Channel 0 Horizontal (1-3GHz)



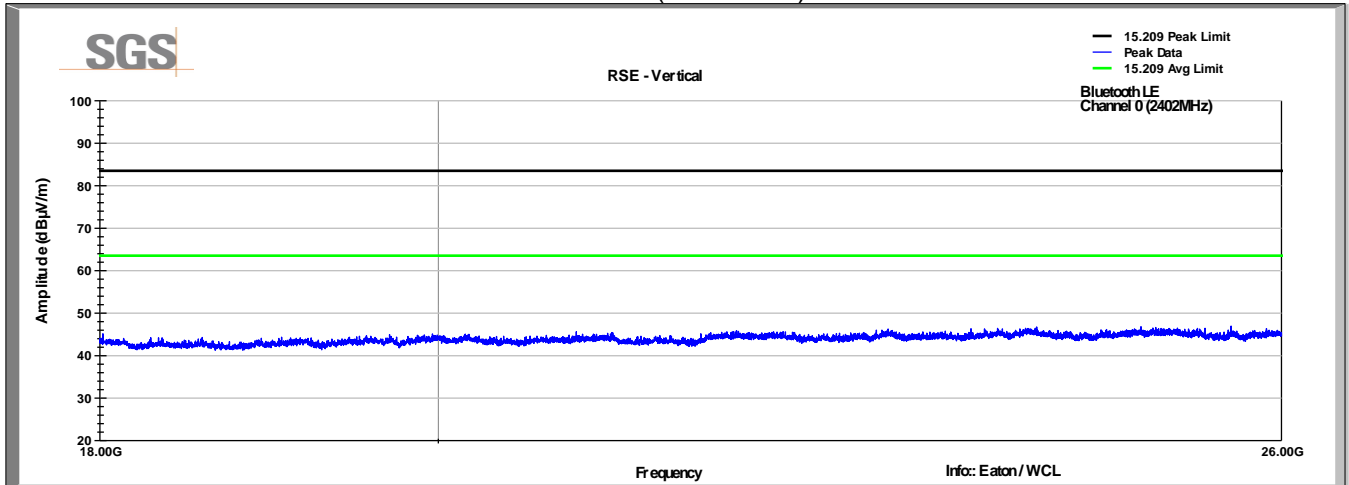
### BLE Channel 0 Vertical (3-18GHz)



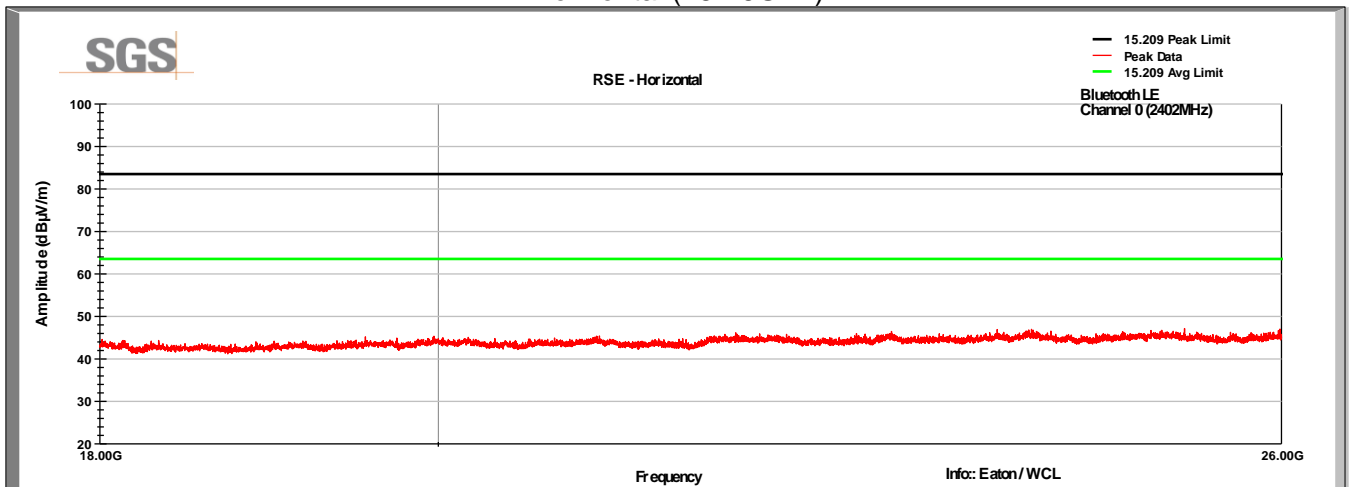
### BLE Channel 0 Horizontal (3-18GHz)



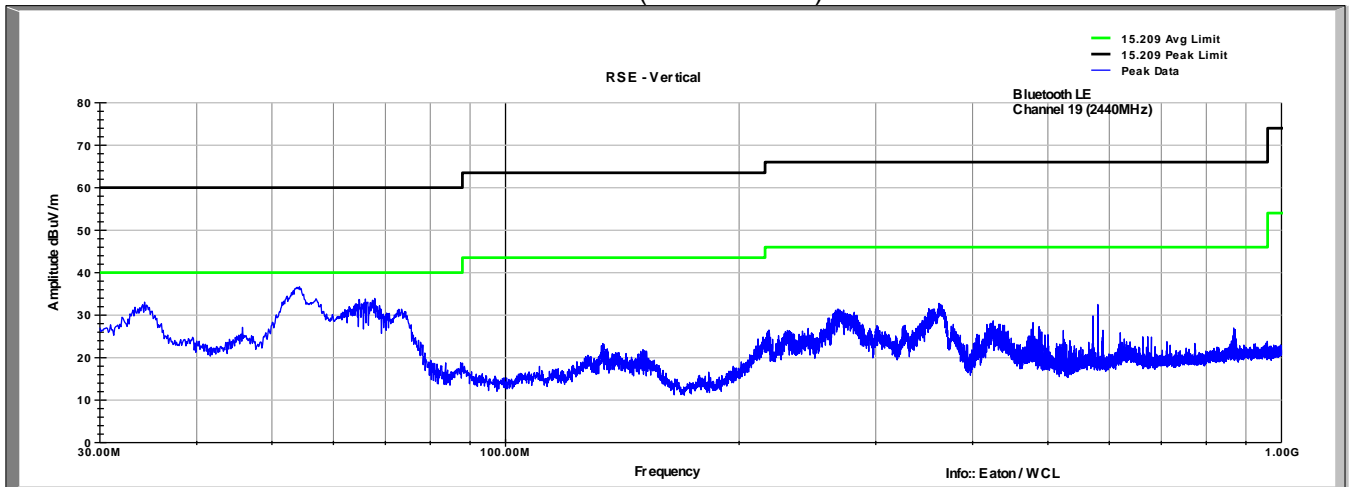
BLE Channel 0  
Vertical (18-26GHz)



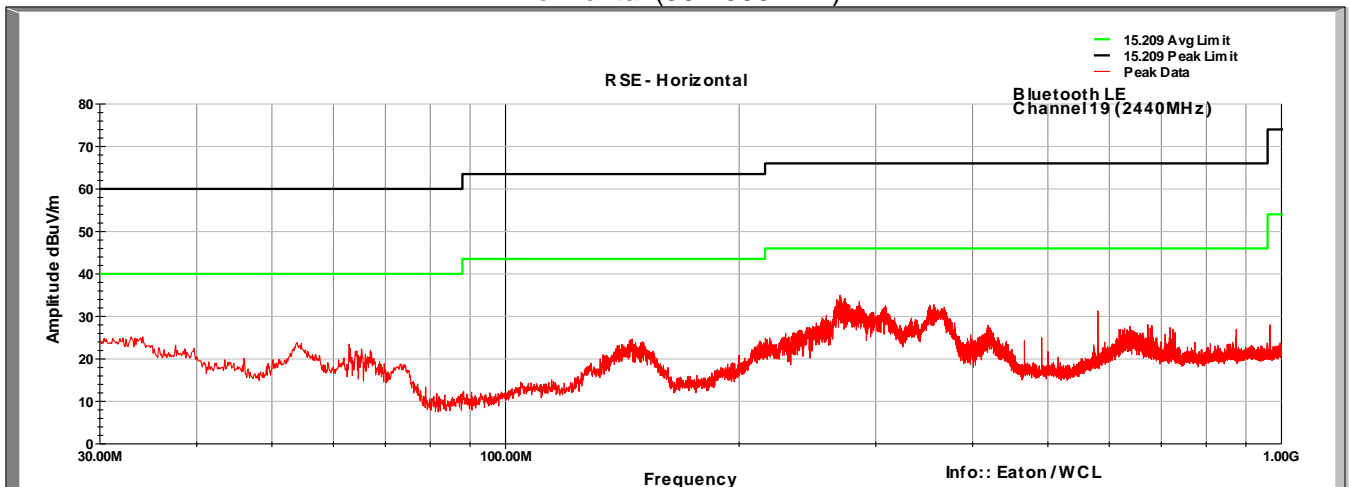
BLE Channel 0  
Horizontal (18-26GHz)



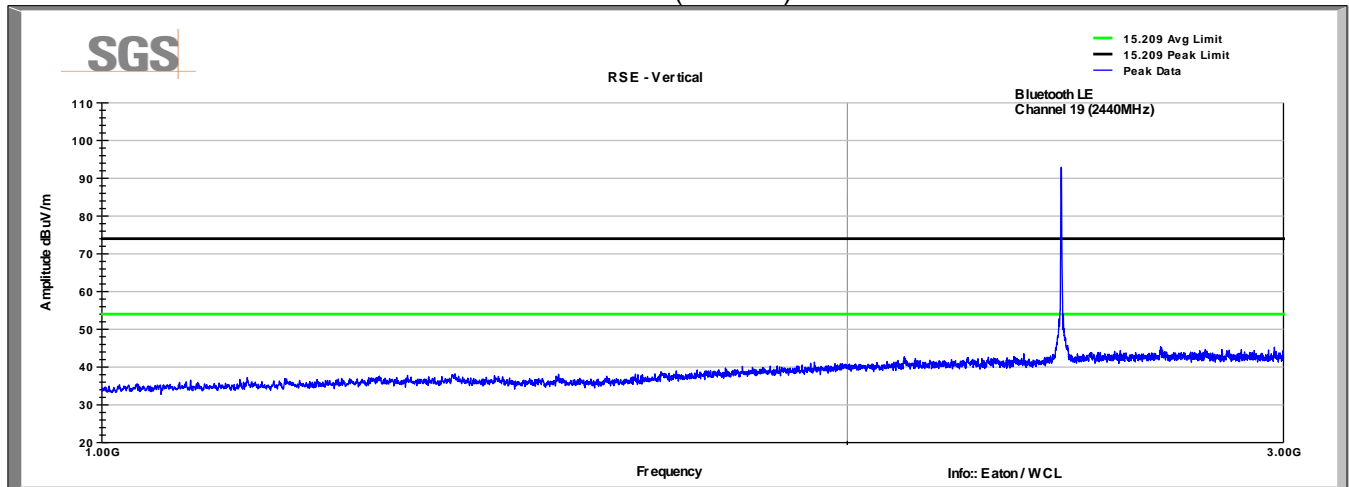
### BLE Channel 19 Vertical (30-1000MHz)



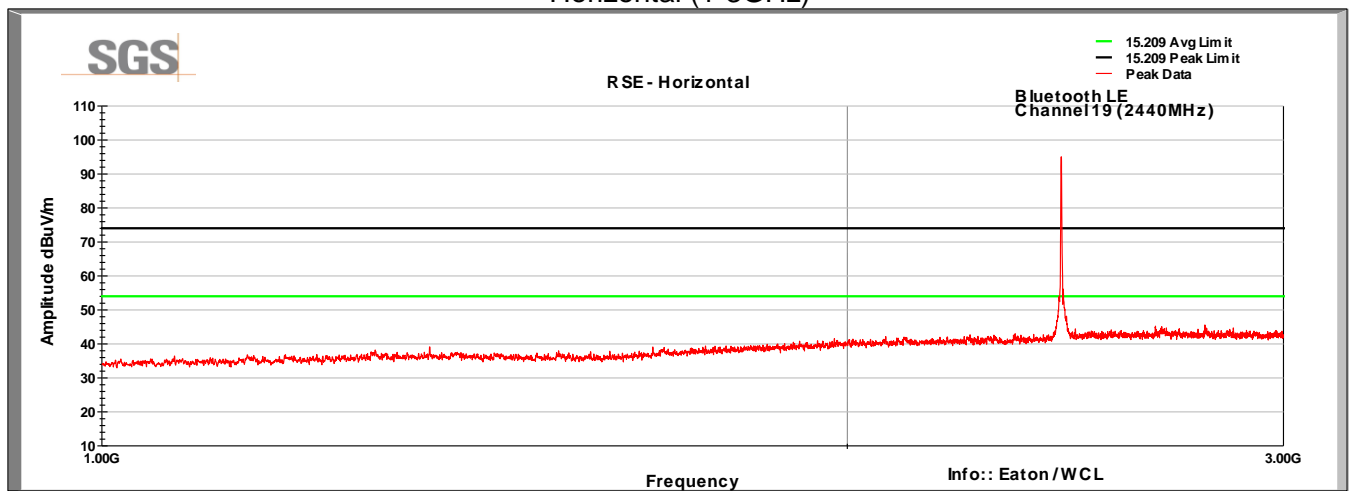
### BLE Channel 19 Horizontal (30-1000MHz)



### BLE Channel 19 Vertical (1-3GHz)

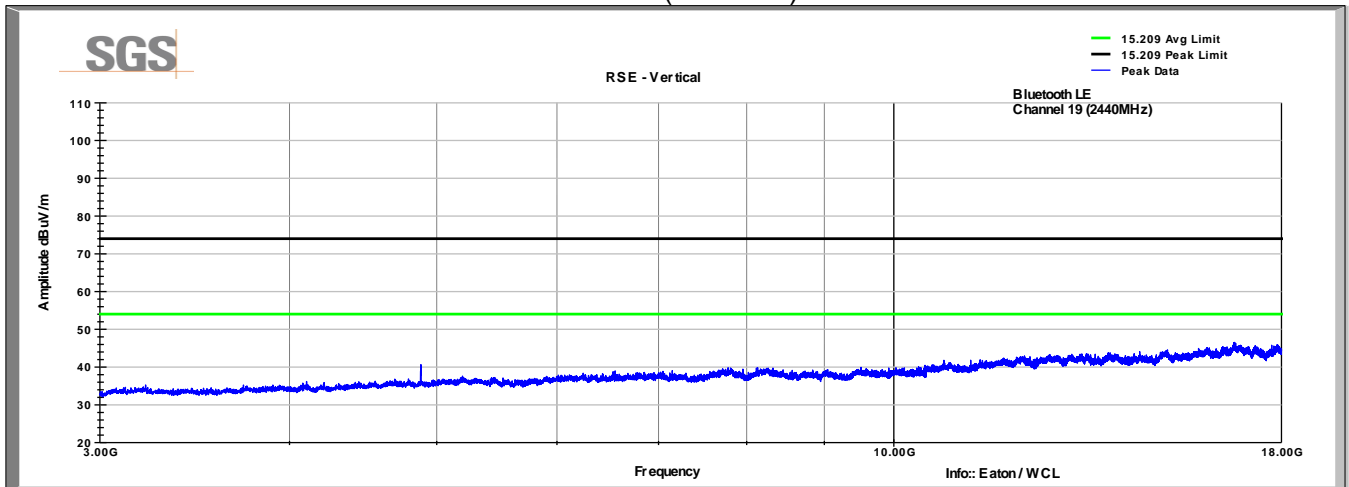


### BLE Channel 19 Horizontal (1-3GHz)

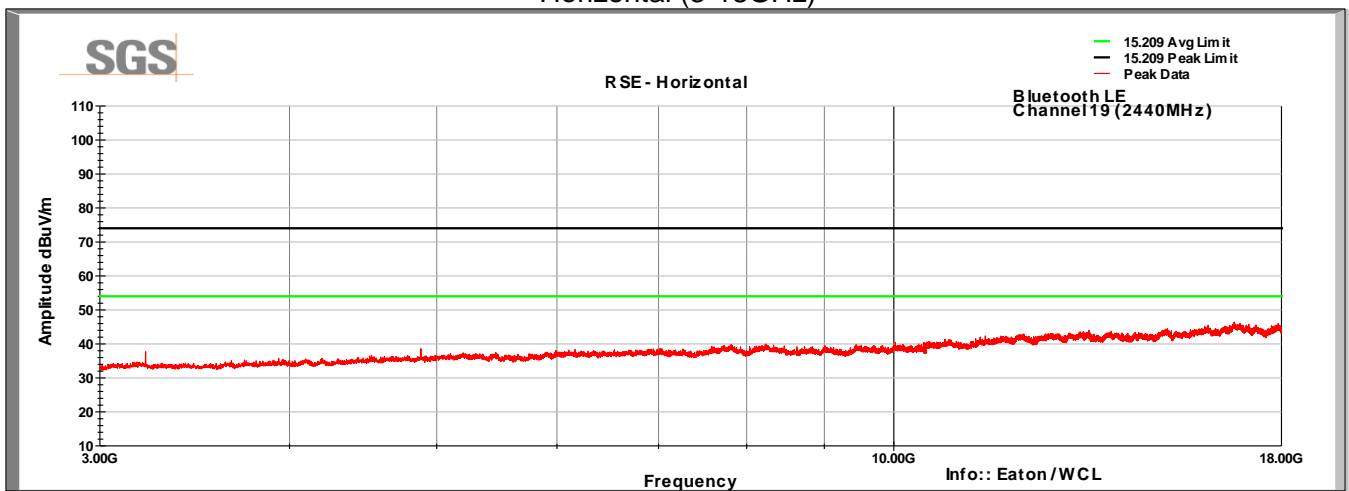




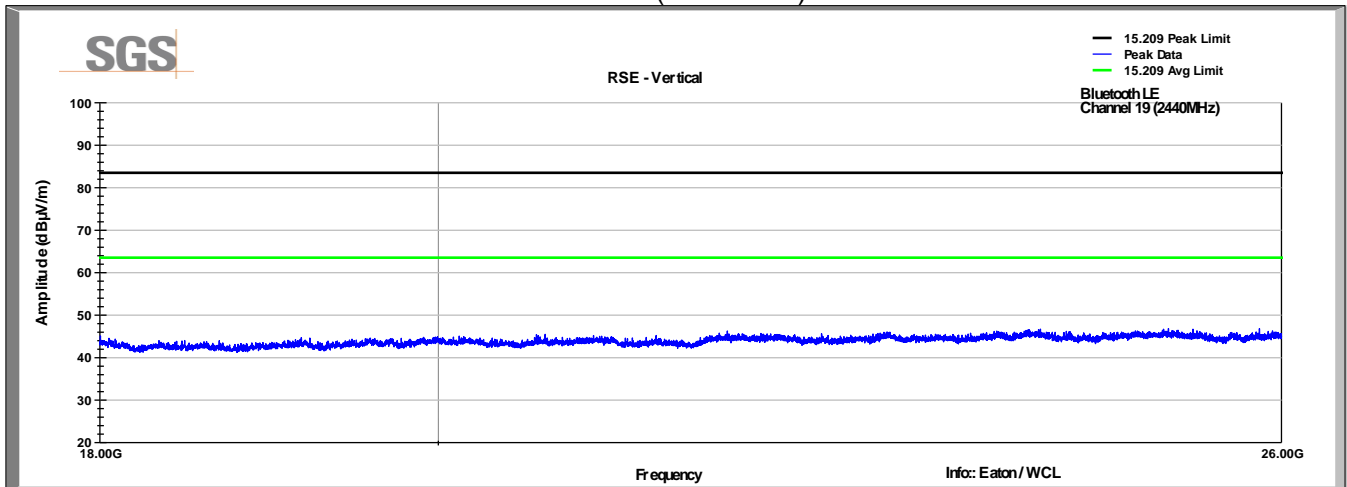
### BLE Channel 19 Vertical (3-18GHz)



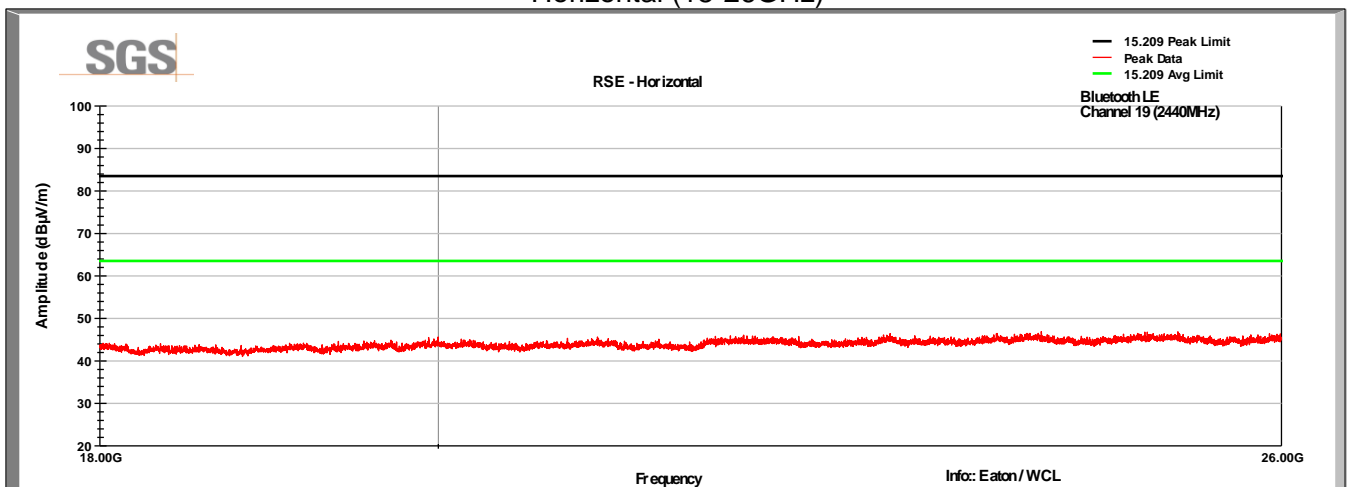
### BLE Channel 19 Horizontal (3-18GHz)



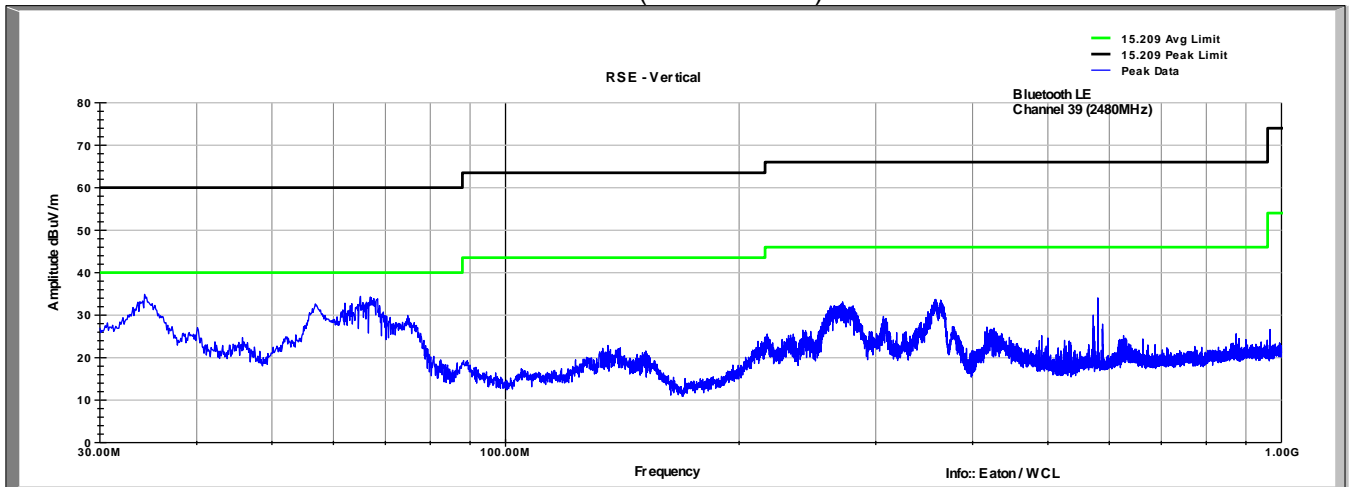
### BLE Channel 19 Vertical (18-26GHz)



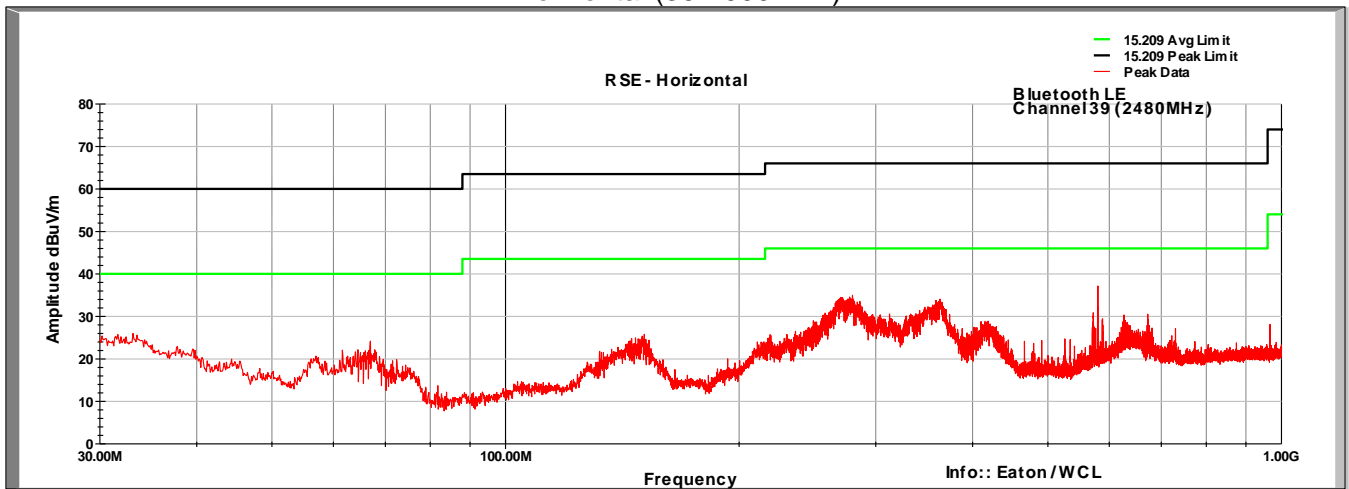
### BLE Channel 19 Horizontal (18-26GHz)



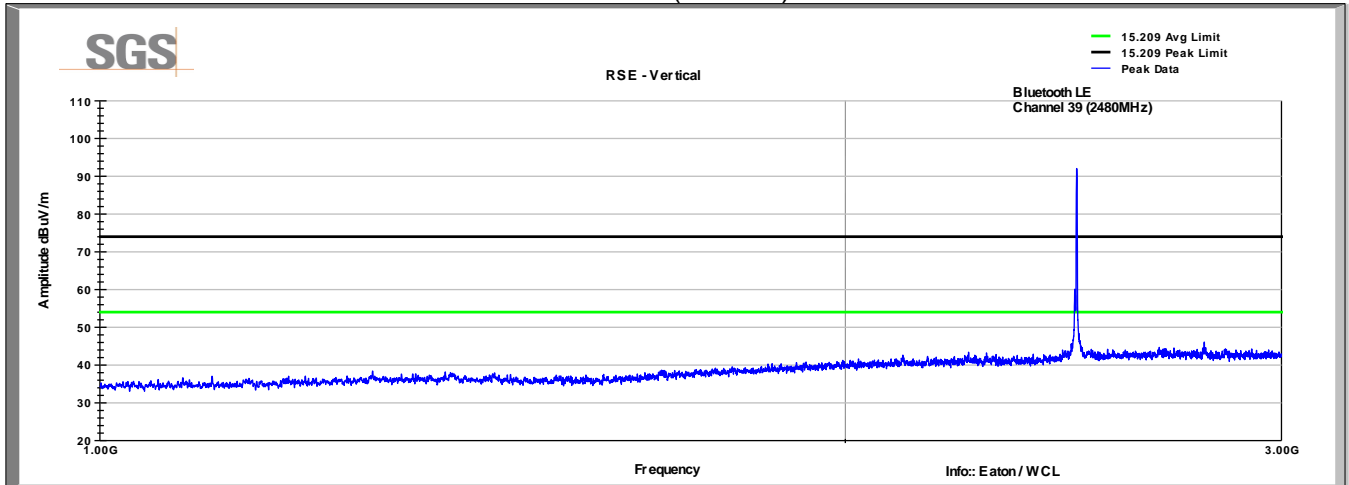
### BLE Channel 39 Vertical (30-1000MHz)



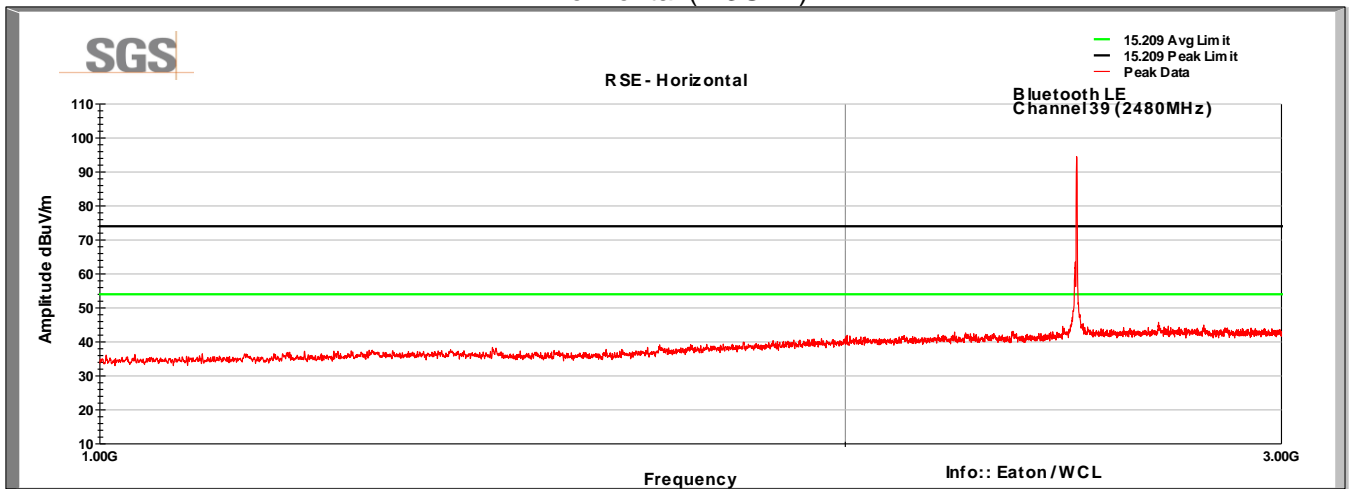
### BLE Channel 39 Horizontal (30-1000MHz)



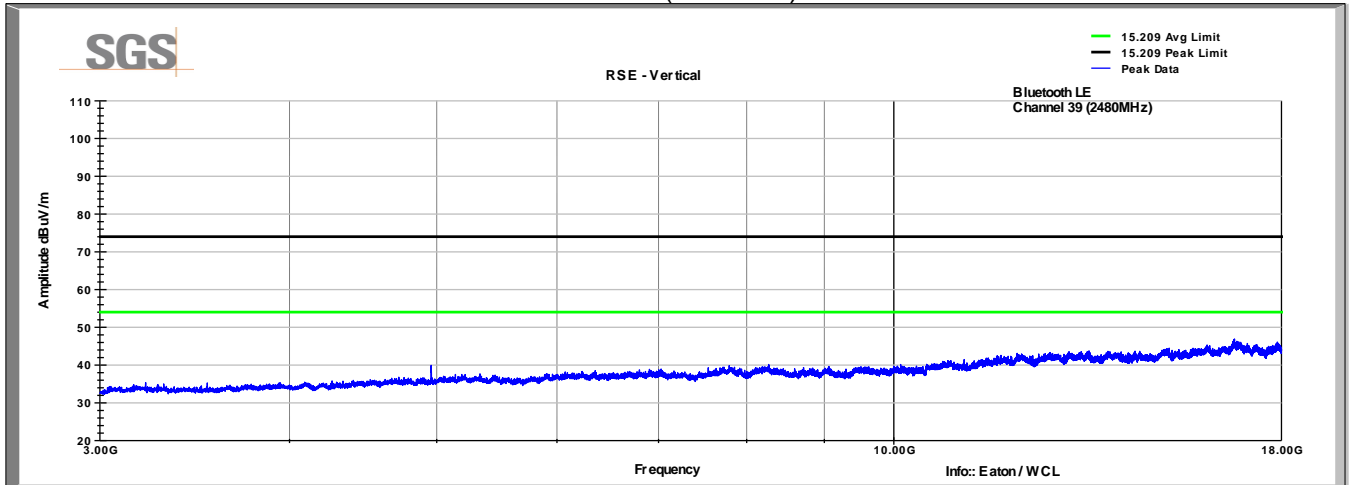
### BLE Channel 39 Vertical (1-3GHz)



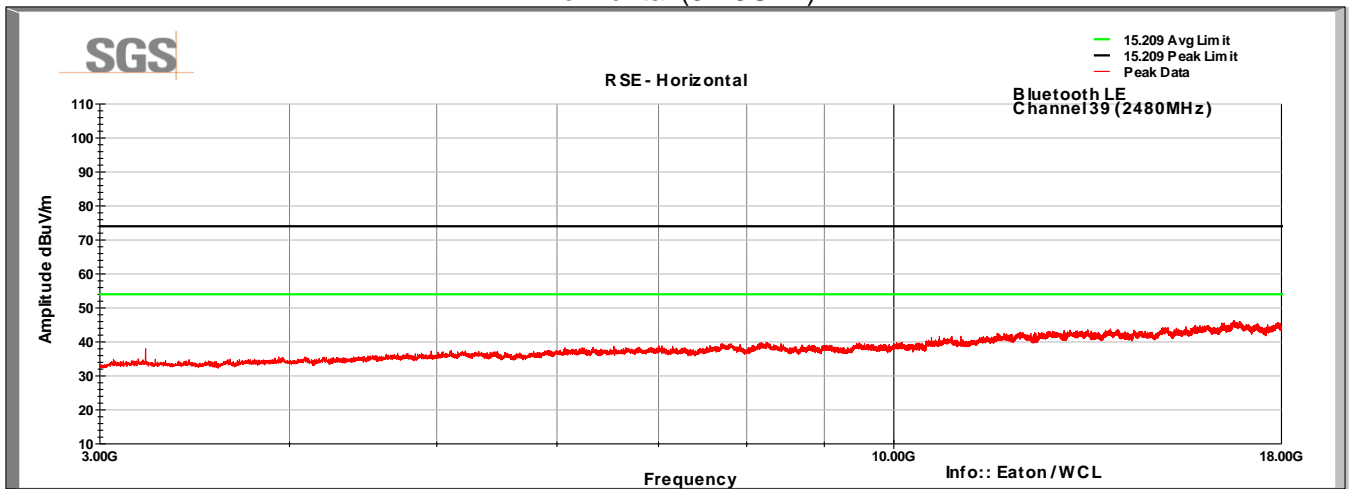
### BLE Channel 39 Horizontal (1-3GHz)



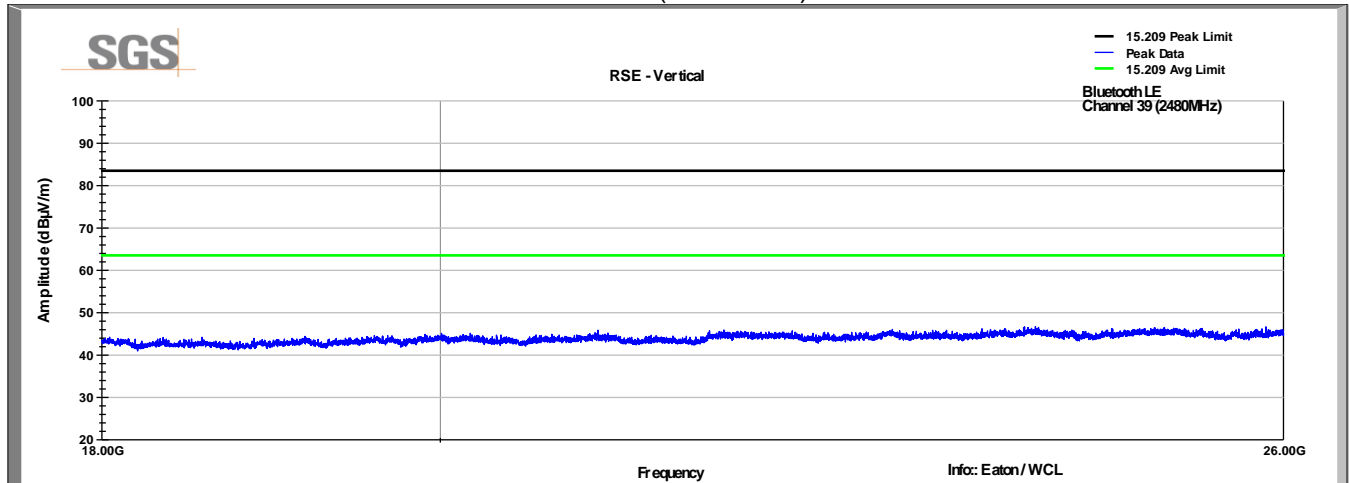
### BLE Channel 39 Vertical (3-18GHz)



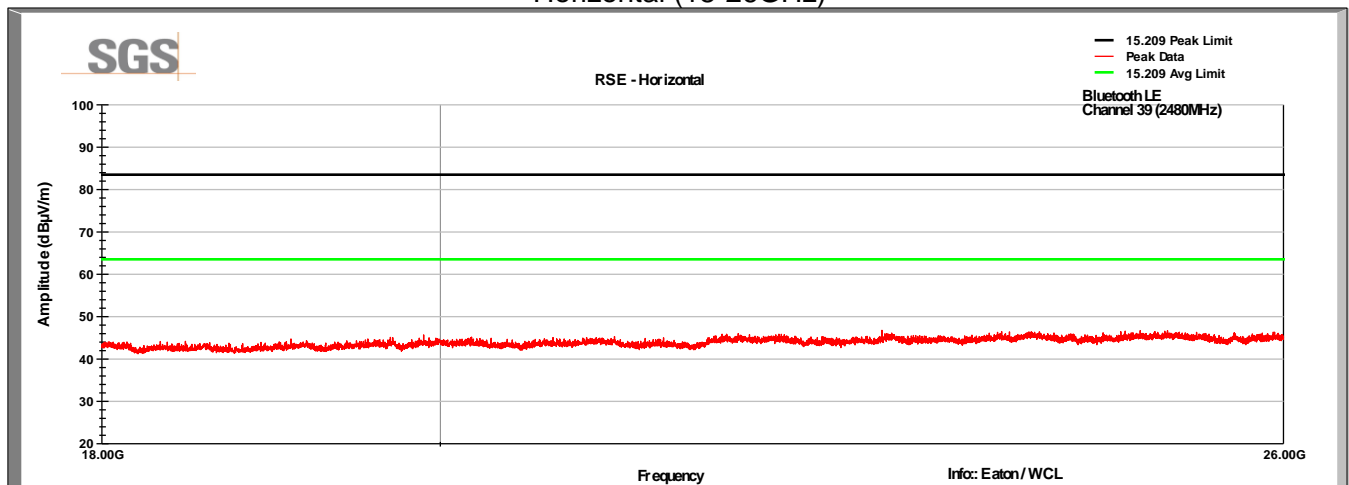
### BLE Channel 39 Horizontal (3-18GHz)



### BLE Channel 39 Vertical (18-26GHz)



### BLE Channel 39 Horizontal (18-26GHz)



## 8 Radiated Emissions at Band Edge / Restricted Band

### 8.1 Test Result

Test Description	Test Specification		Test Result
Spurious Emissions	15.205 / 15.209	RSS-GEN S8.9 / 8.10	Compliant

### 8.2 Test Method

Radiated field strength measurements were performed at the restricted band edges of 2390MHz and 2483.5MHz for each modulation. Measurements were made using the conducted methods defined in Section 12 of FCC publication D01 DTS Meas Guidance v03r05.

### 8.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.4 °C

Relative Humidity: 49.5 %

### 8.4 Test Equipment

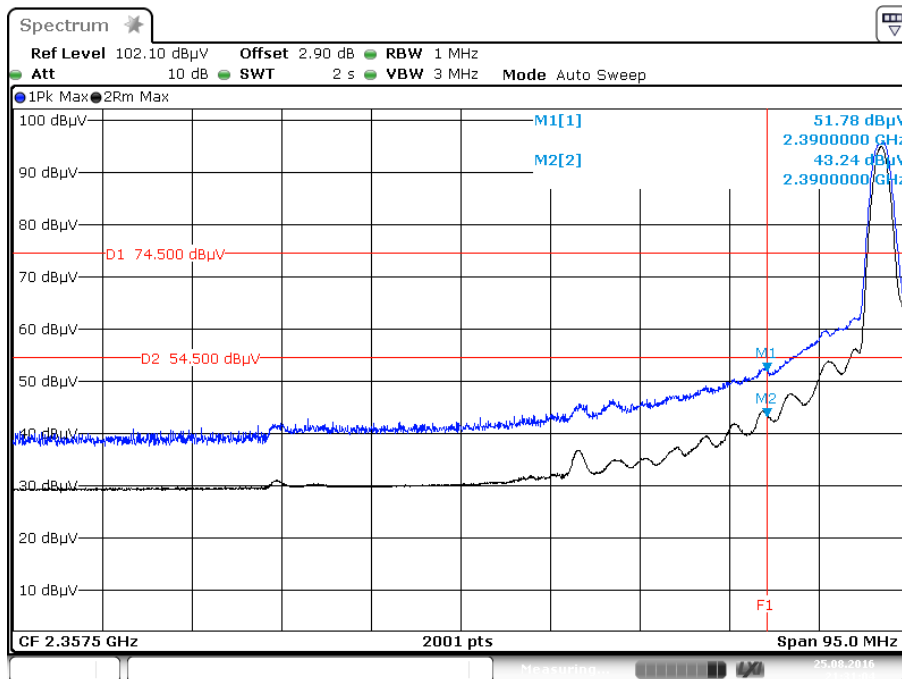
Test Date: 25-Aug-2016

Tester: JOP

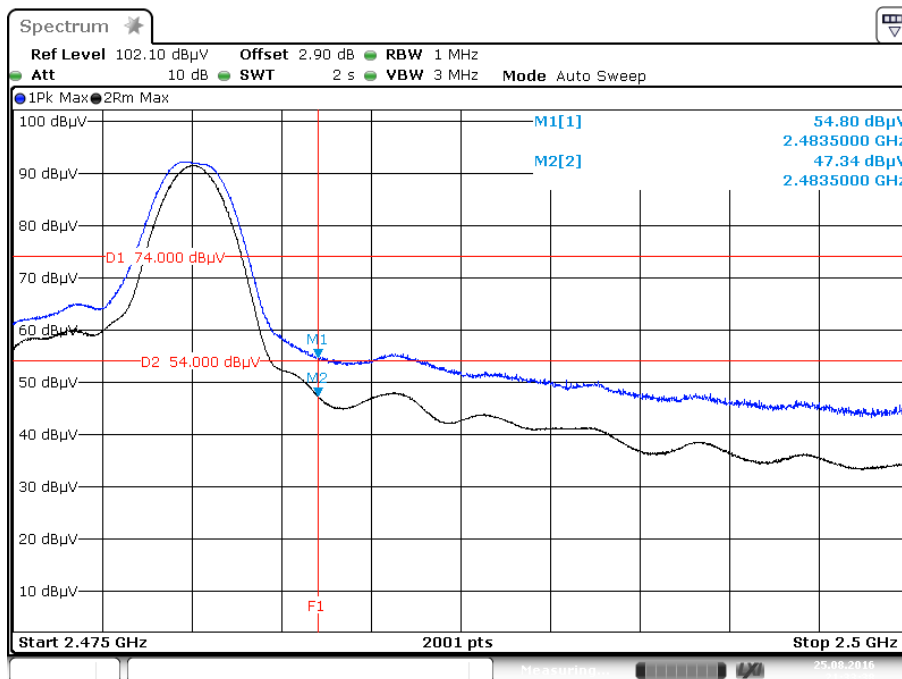
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095593	27-Jul-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017

Note: The equipment calibration period is 1 year except for the FSV30 which is on a 2-year cycle.

## 8.5 Test Data – Restricted Band Edge



Date: 25 AUG 2016 21:31:04



Date: 25 AUG 2016 21:33:38



## 9 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	30 September 2016