

EMC Test Report

Project Number: 4104971**Report Number: 4104971EMC01****Revision Level: 0****Client: Tier One, Inc.****Equipment Under Test: GEN4 Glock Sensor****Model Number: BA10232****FCC ID: 2AJ3810232****IC ID: 22055-10232****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: 05 March 2017****Test Result: Compliant**

Tested by:



Jeremy O. Pickens, Senior EMC Engineer

Reviewed by:



David Schramm, EMC/RF/SAR/HAC Manager**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.

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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	NA(1)

(1) Not Applicable: The device was powered from internal battery with no facility for connection to the AC mains.

1.1 Modifications Required for Compliance

The target power was reduced from 4dBm to 0dBm to meet the radiated spurious emissions requirements.

2 General Information

2.1 Client Information

Name: Tier One, Inc.
Address: 1111 Alderman Drive
City, State, Zip, Country: Alpharetta, GA 30005, 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: GEN4 Glock Sensor
Model Number: BA10232
Serial Number: Not labeled

Frequency Range: 2402-2480MHz
Data Modes: Bluetooth Low Energy
Antenna: PCB Trace Antenna (~-8dB)

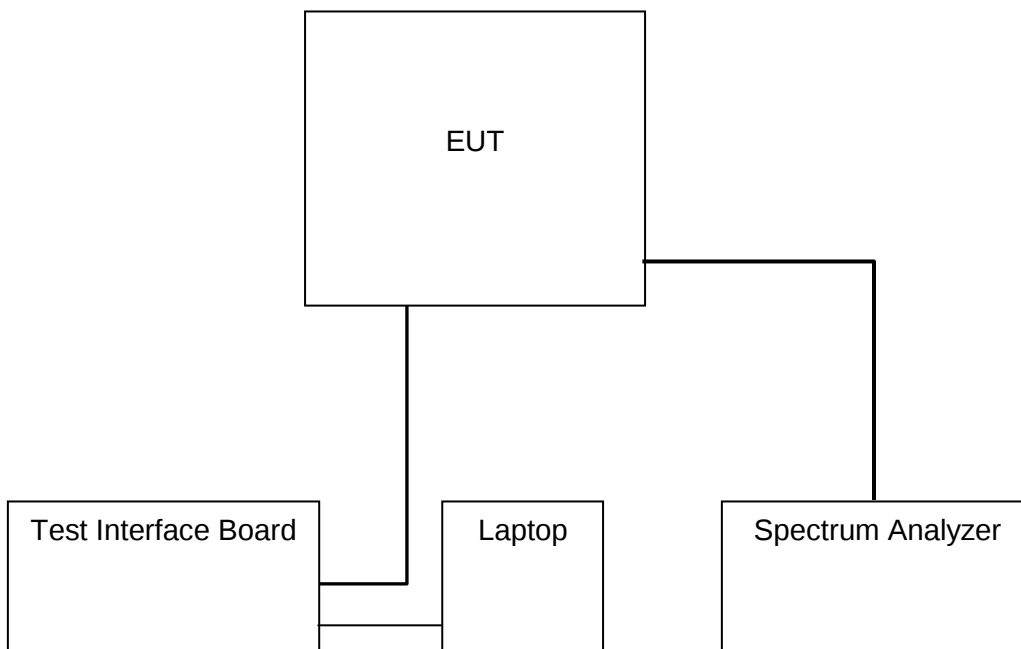
Rated Voltage: 3Vdc Internal Battery
Test Voltage: 3Vdc Internal Battery

Sample Received Date: 15 February 2017
Dates of testing: 24 February – 02 March 2017

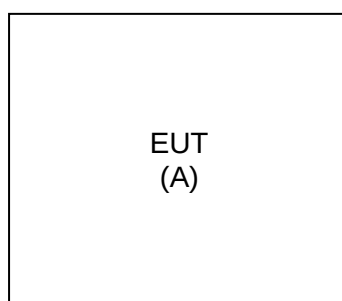
2.3 Operating Modes and Conditions

Continuous traffic was generated using test commands. Where the duty cycle measured below 99% and an RMS detector was employed, corrections of $10 \cdot \log(1/D)$ 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	Tier One, Inc.	GEN4 Glock Sensor	BA10232	Not labeled

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: 21.7 °C

Relative Humidity: 49.5 %

3.4 Test Equipment

Test Date: 24-Feb-2017

Tester: JOP

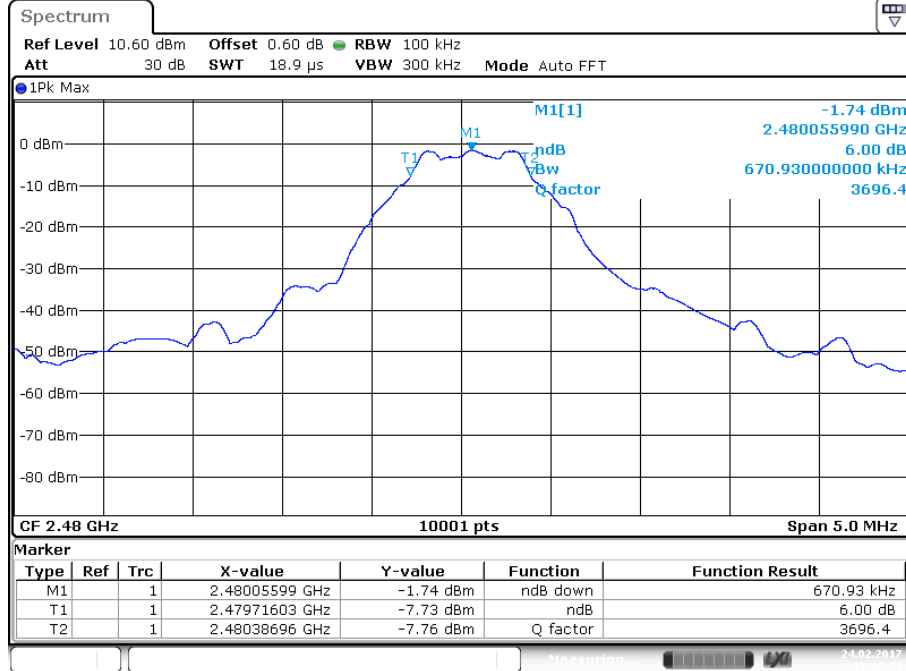
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095587	26-Jul-2017

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

3.5 Test Data

Protocol	Channel	6dB Bandwidth (MHz)	Occupied Bandwidth (99%) (MHz)
BLE	0	0.641	1.042
BLE	19	0.643	1.047
BLE	39	0.671	1.039

Sample Plots



Date: 24.FEB.2017 12:06:42



Date: 24.FEB.2017 12:05:39

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: 21.7 °C
Relative Humidity: 49.5 %

4.4 Test Equipment

Test Date: 24-Feb-2017

Tester: JOP

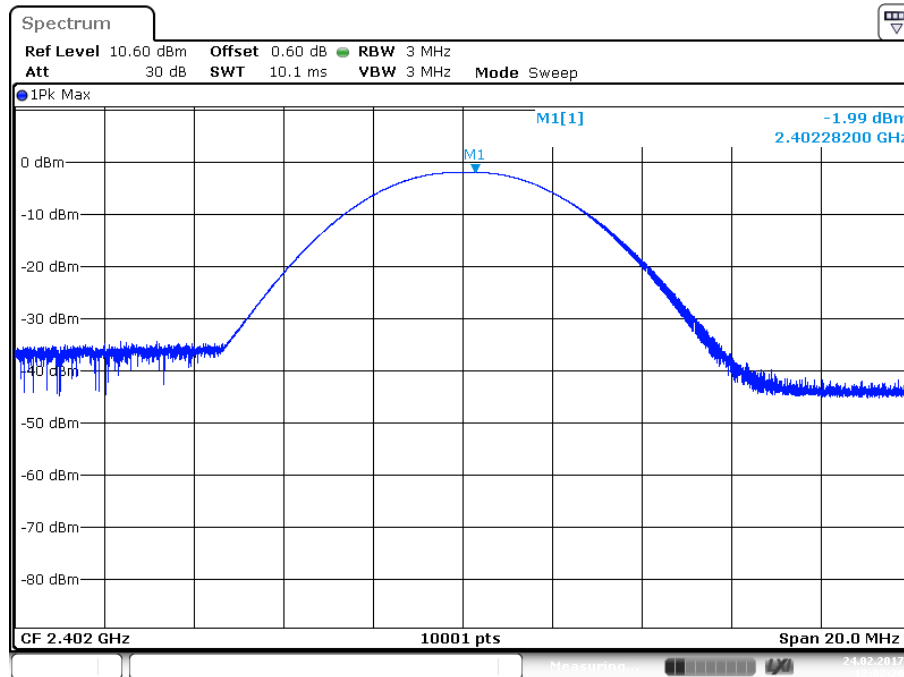
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095587	26-Jul-2017

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

4.5 Test Data

Protocol	Channel	Peak Power (dBm)	Limit (dBm)	Margin (dB)
BLE	0	-2.0	30	-32.0
BLE	19	-2.2	30	-32.2
BLE	39	-1.7	30	-31.7

Sample Plot:



Date: 24.FEB.2017 12:02:29

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.

Limit

The limit is 8 dBm.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 21.7 °C

Relative Humidity: 49.5 %

5.4 Test Equipment

Test Date: 24-Feb-2017

Tester: JOP

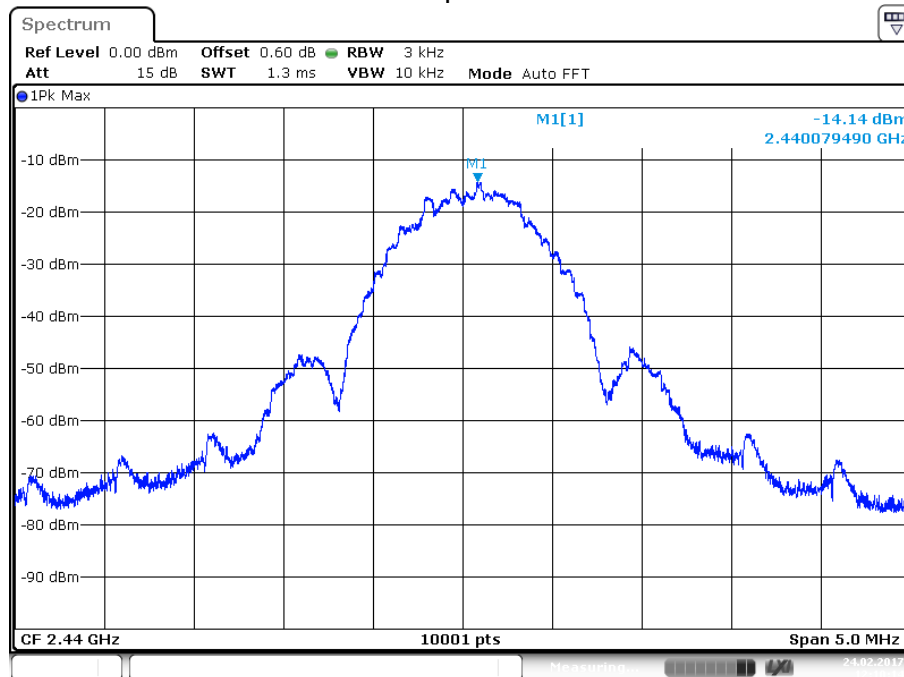
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095587	26-Jul-2017

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

5.5 Test Data

Protocol	Channel	Peak PSD (dBm)	Limit (dBm)	Margin (dB)
BLE	0	-14.65	8	-22.7
BLE	19	-14.14	8	-22.1
BLE	39	-12.93	8	-20.9

Sample Plot



Date: 24.FEB.2017 12:10:15

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: 21.7 °C

Relative Humidity: 49.5 %

6.4 Test Equipment

Test Date: 24-Feb-2017

Tester: JOP

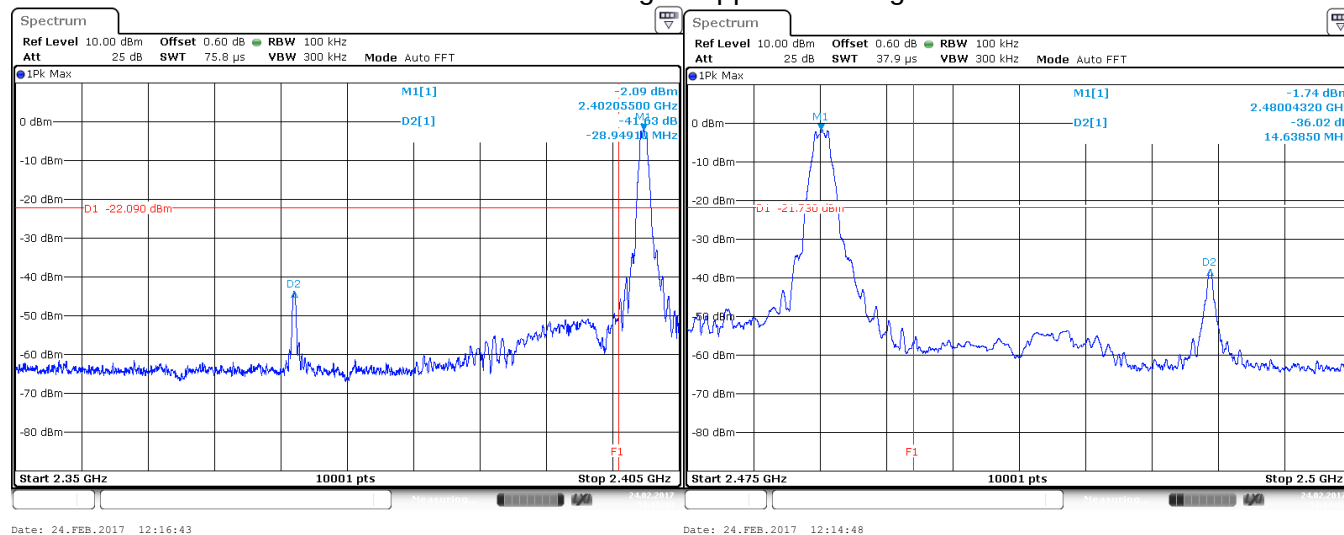
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095587	26-Jul-2017

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

6.5 Test Data – DTS Bandedge

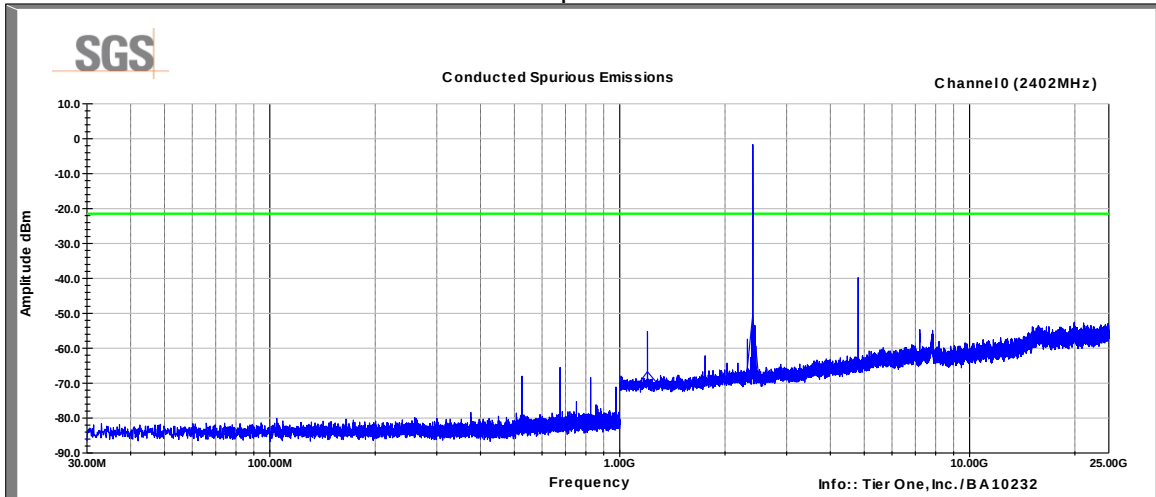
BLE

Lower band edge / Upper band edge

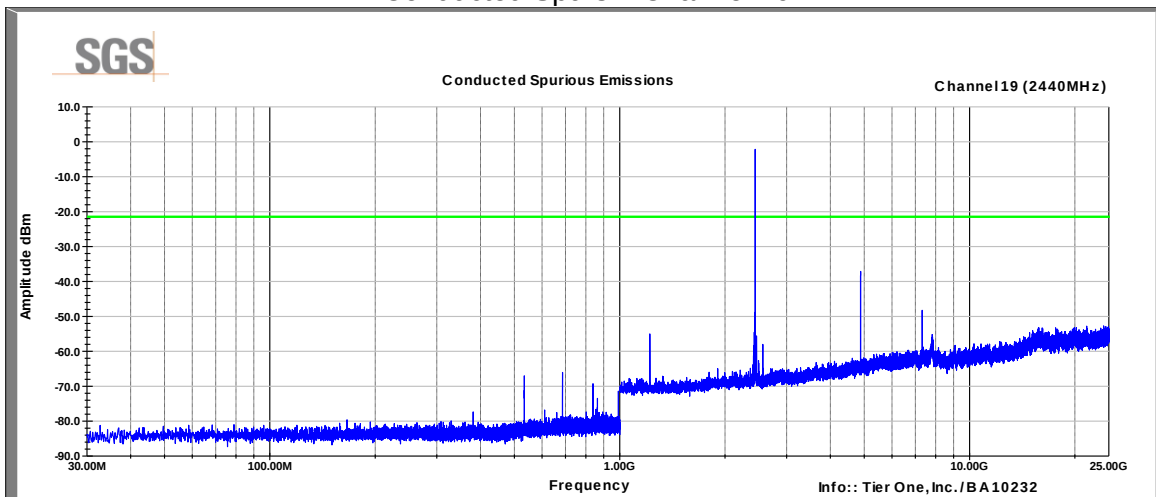


6.6 Test Data – Conducted Spurious Emissions

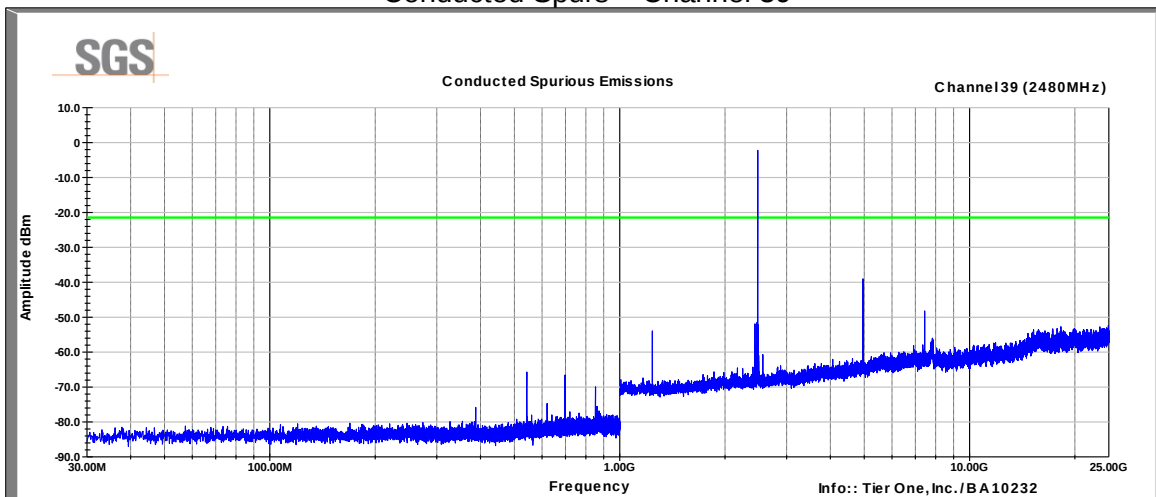
Conducted Spurs – Channel 0



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 C63.10: 2013 were used.

Lowest, middle, and highest channels were investigated – the device was configured to continuously transmit and step among channels 0, 19, and 39.

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 ⁽¹⁾		Peak Limits dBuV/m
	Microvolts/m	dBuV/m	
30 - 88 MHz	100	40 ⁽²⁾	--
88 - 216 MHz	150	43.5 ⁽²⁾	--
216 - 960 MHz	200	46 ⁽²⁾	--
960 - 1000 MHz	500	54 ⁽²⁾	--
1 - 40 GHz	500	54 ⁽³⁾	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: 24.1 °C

Relative Humidity: 19.4 %

7.4 Test Equipment

Test End Date: 2-Mar-2017

Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
ANTENNA, BILOG	JB6	SUNOL	B079690	10-Nov-2017
RF CABLE	SF106	HUBER & SUHNER	B079716	27-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079713	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	15003	29-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079712	27-Jul-2017
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2017
HORN(SMALL)	LB-180400-20-C-KF	A-INFO	15007	29-Mar-2017
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2017
RF CABLE	SF102	HUBER & SUHNER	B079824	27-Jul-2017
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	29-Jul-2017

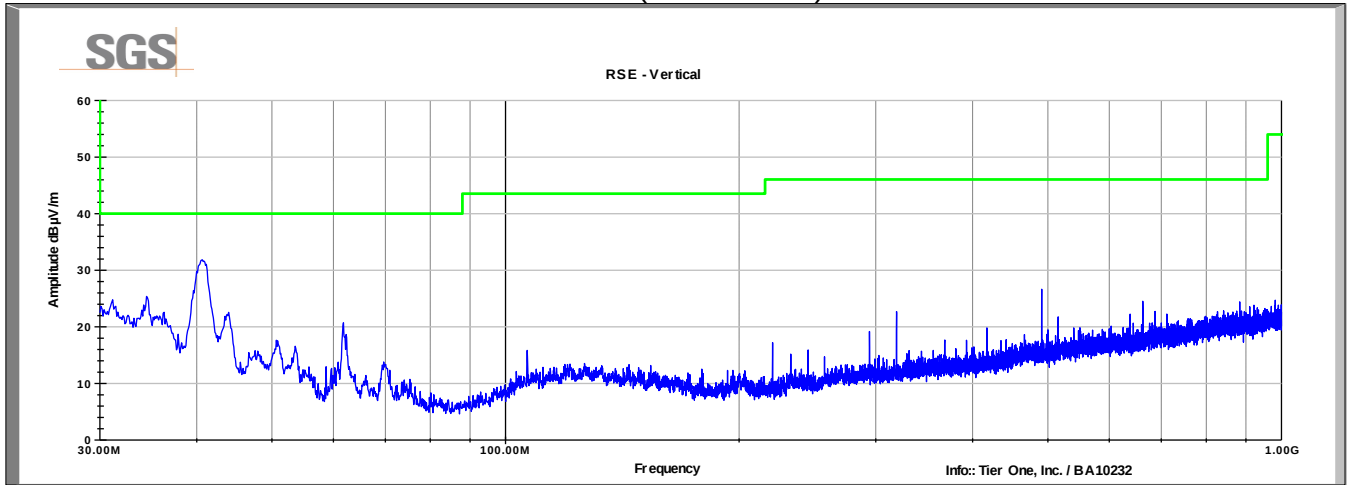
Note: The equipment calibration period is 1 year.

7.5 Test Data – Peak Plots

No emissions were detected in the range 9kHz to 30MHz.

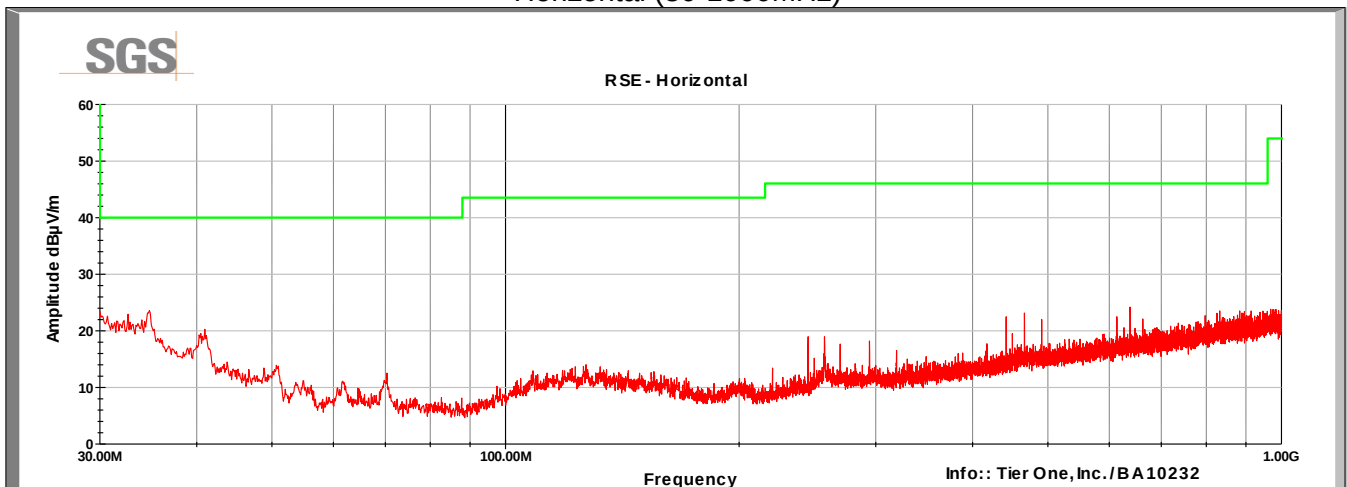
BLE Channels 0, 19, 39

Vertical (30-1000MHz)

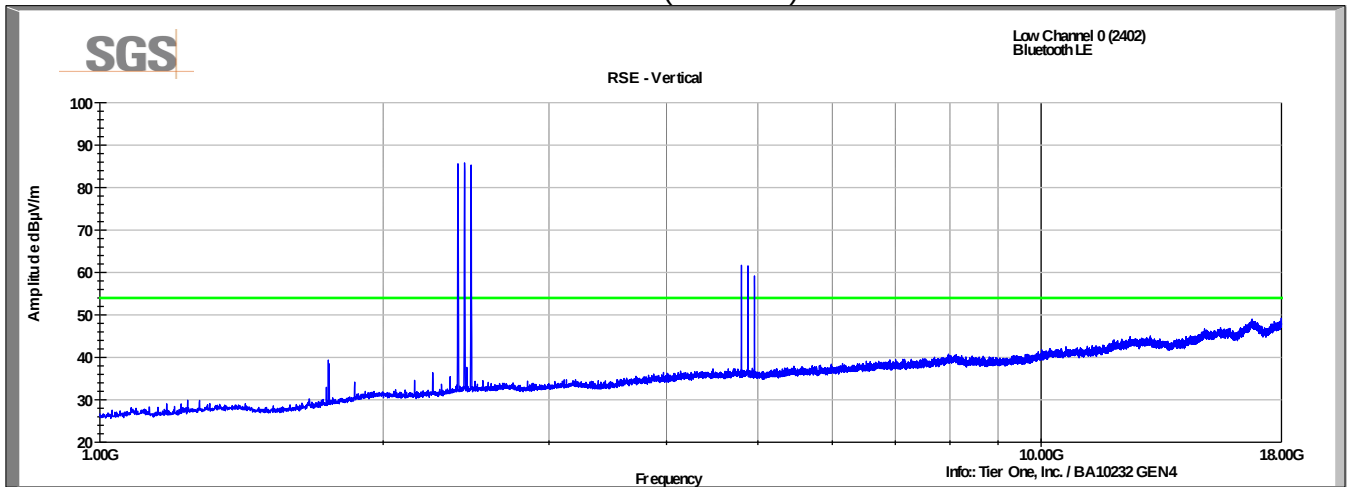


BLE Channels 0, 19, 39

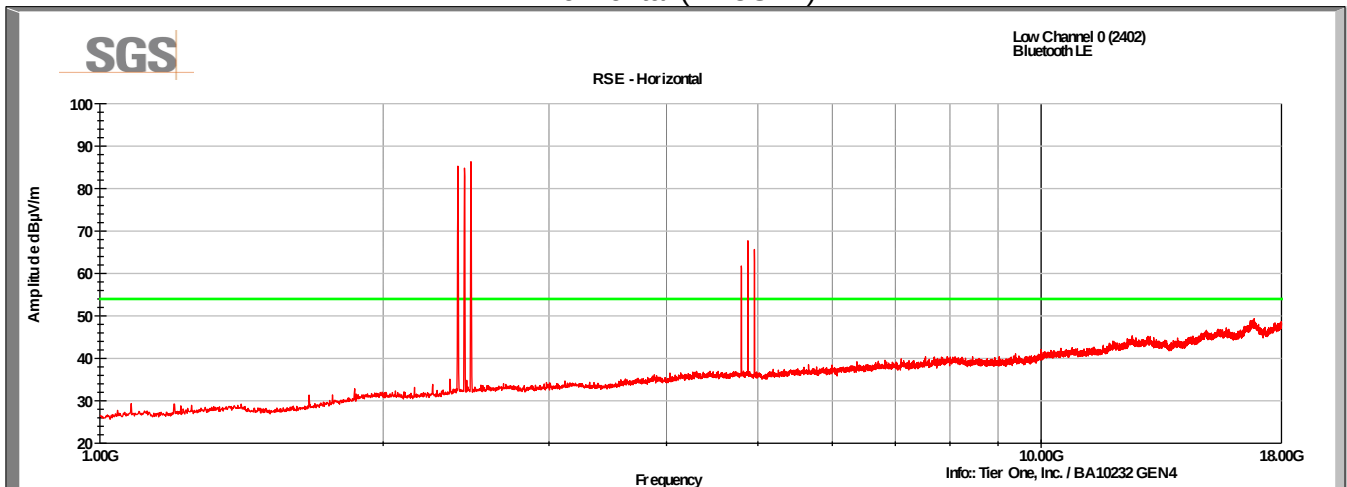
Horizontal (30-1000MHz)



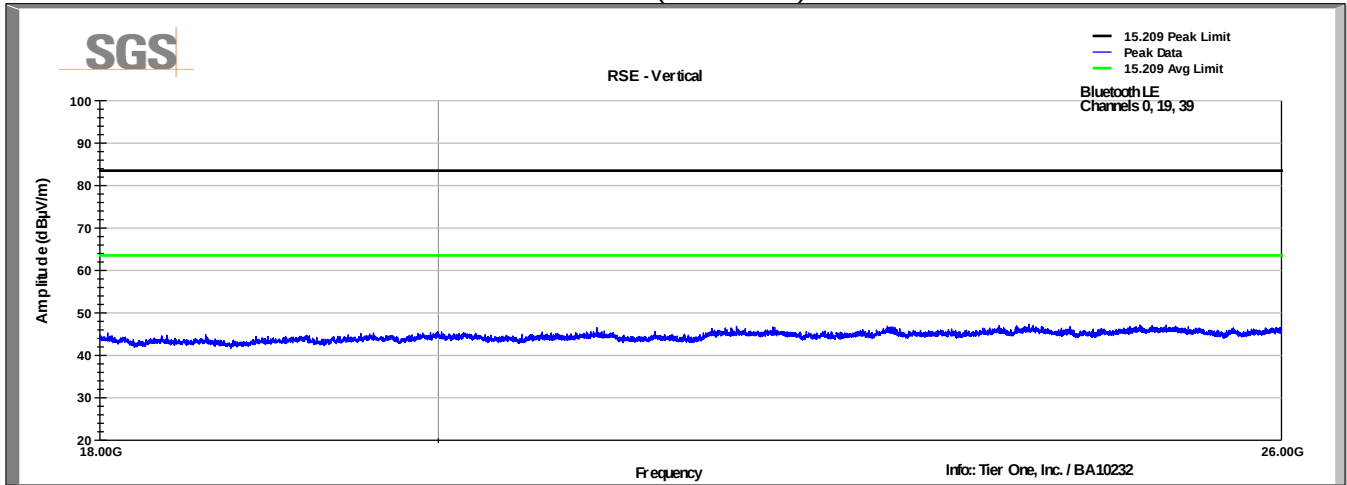
BLE Channels 0, 19, 39
Vertical (1-18GHz)



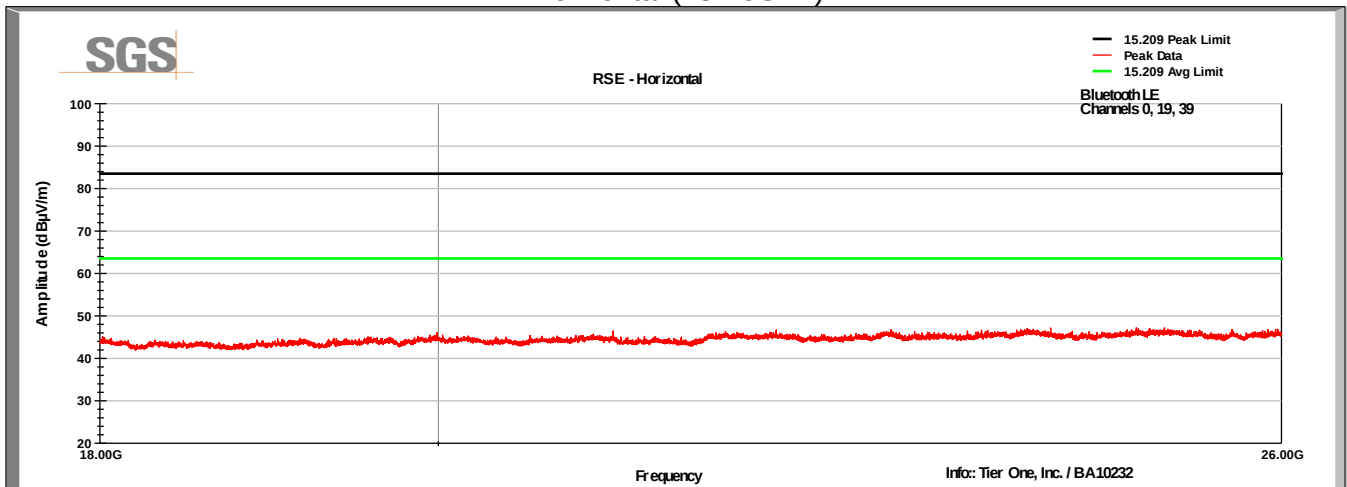
BLE Channels 0, 19, 39
Horizontal (1-18GHz)



BLE Channels 0, 19, 39
Vertical (18-26GHz)



BLE Channels 0, 19, 39
Horizontal (18-26GHz)



7.6 Test Data – Tabular Data

Frequency MHz	Raw Meas (dBuV)	Polarity (V/H)	Correction (dB/m)	Corr Value dBuV/m	Limit (dBuV/m)	Margin (dB)	Detector
Channel 0 (2402MHz)							
4804.00	50.0	V	3.0	53.0	74.0	-21.0	Peak
4804.00	48.0	V	3.0	51.0	54.0	-3.0	Average
4804.00	50.2	H	3.0	53.2	74.0	-20.8	Peak
4804.00	48.2	H	3.0	51.2	54.0	-2.8	Average
Channel 19 (2440MHz)							
4880.00	46.7	V	2.9	49.6	74.0	-24.4	Peak
4880.00	44.7	V	2.9	47.6	54.0	-6.4	Average
4880.00	52.9	H	2.9	55.8	74.0	-18.2	Peak
4880.00	50.9	H	2.9	53.8	54.0	-0.2	Average
Channel 39 (2480MHz)							
4960.00	44.4	V	2.9	47.3	74.0	-26.7	Peak
4960.00	42.4	V	2.9	45.3	54.0	-8.7	Average
4960.00	50.9	H	2.9	53.8	74.0	-20.2	Peak
4960.00	48.9	H	2.9	51.8	54.0	-2.2	Average

Note: For compliance, the target power was reduced from 4dBm to 0dBm.

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

Field strength measurements were performed at the restricted band edges of 2390MHz and 2483.5MHz using the radiated methods defined in Section 12 of FCC publication D01 DTS Meas Guidance v03r05.

Offset Calculations:

AF= 32.2 Antenna Factor
 CL = 2.0 dB Cable Loss
 PA= 33.9 Pre-Amplifier Gain
 DC = 0.2 dB (96.5%) Duty Cycle Correction Factor

Offset = 0.5 dB

8.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 24.4 °C
 Relative Humidity: 49.5 %

8.4 Test Equipment

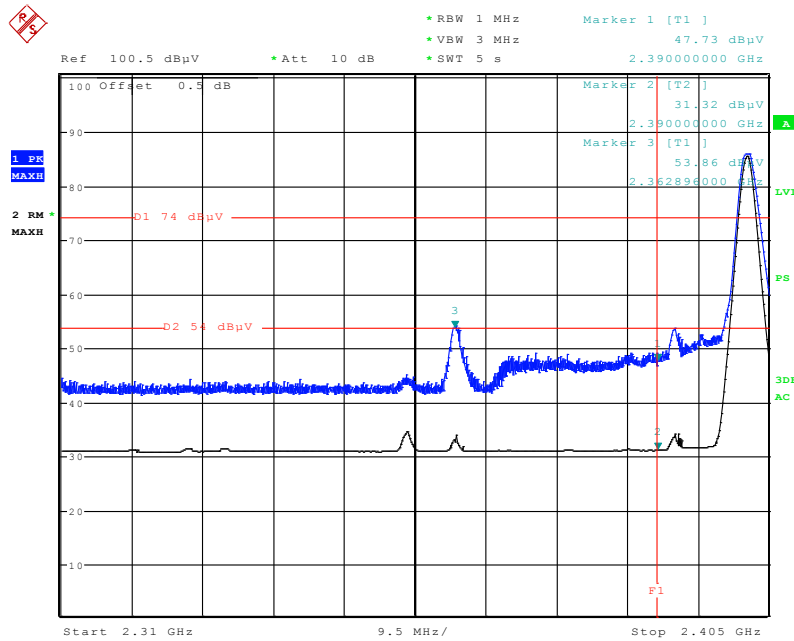
Test End Date: 24-Feb-2017

Tester: JOP

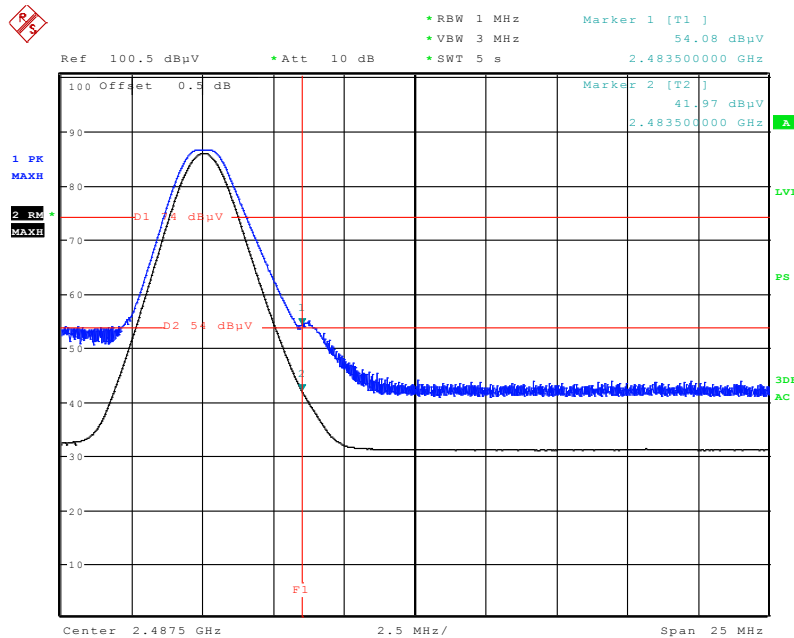
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	4-Aug-2017
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	29-Jul-2017
RF CABLE	SF106	HUBER & SUHNER	B079712	27-Jul-2017
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2017

Note: The equipment calibration period is 1 year.

8.5 Test Data – Restricted Band Edge



Date: 24.FEB.2017 09:05:25



Date: 24.FEB.2017 08:32:00

9 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	05 March 2017