EMC Test Report

Project Number: 4274013
Report Number: 4274013EMC02 **Revision Level:** 0

Client: Integrated M2M Technologies LLC

Equipment Under Test: iLocate GPS AutoTracker
Model: AT850218

FCC ID: 2AO7F2733AT

Applicable Standards: FCC Part 15 Subpart C, § 15.247
ANSI C63.10: 2013

Report issued on: 17 April 2018
Test Result: Compliant

Tested by: Martin Taylor, Project Engineer

Reviewed by: David Schramm, Operations 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.

Table of Contents

1 Summary of Test Results

Test Description	Test Specification	Test Result
Bandwidth	15.247(d)	Compliant
Transmitter Output Power	15.247(b)(3)	Compliant
Power Spectral Density	15.247(e)	Compliant
Conducted Spurious Emissions / Band Edge	15.247(d)	Compliant
Radiated Spurious Emissions / Restricted Bands	15.35(b),15.209	Compliant
Antenna Requirement	15.203	Compliant (1)
AC Powerline Conducted Emissions, Class A	15.107, 15.207	N/A (2)

(1) The device uses an internal PCB trace antenna. It is not replaceable by the end user.
(2) Not Applicable. The EUT does not connect to the AC mains.

1.1 *Modifications Required for Compliance*

None

2 General Information

2.1 *Client Information*

Name:	Integrated M2M Technologies LLC
Address:	3773 Howard Hughes Pwky, Suite 500S
City, State, Zip, Country:	Las Vegas, NV 89169, USA

2.2 *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

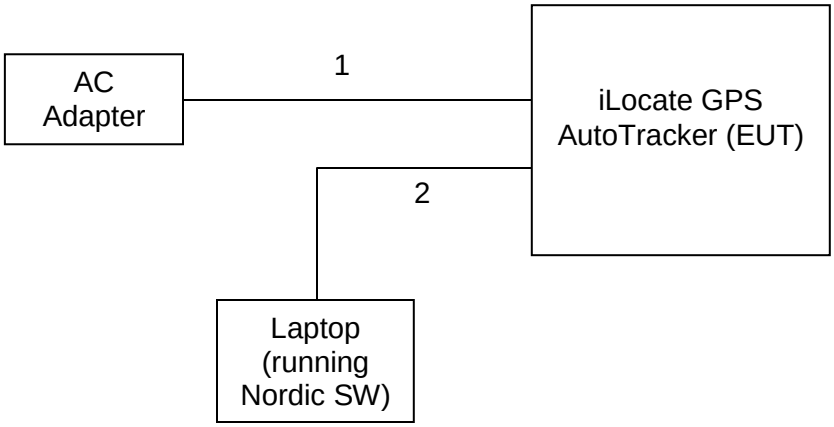
2.3 *General Information of EUT*

Type of Product:	iLocate GPS AutoTracker
Model Number:	AT850218
Serial Number:	Not labeled
FCC ID:	2AO7F2733AT
Frequency Range:	2402 – 2480 MHz
Data Modes:	Bluetooth Low Energy
Antenna:	PCB Trace Antenna (1.2dB)
Rated Voltage:	8 – 20 Vdc
Test Voltage:	12 Vdc
Sample Received Date:	19 March 2018
Dates of testing:	05-16 April 2018

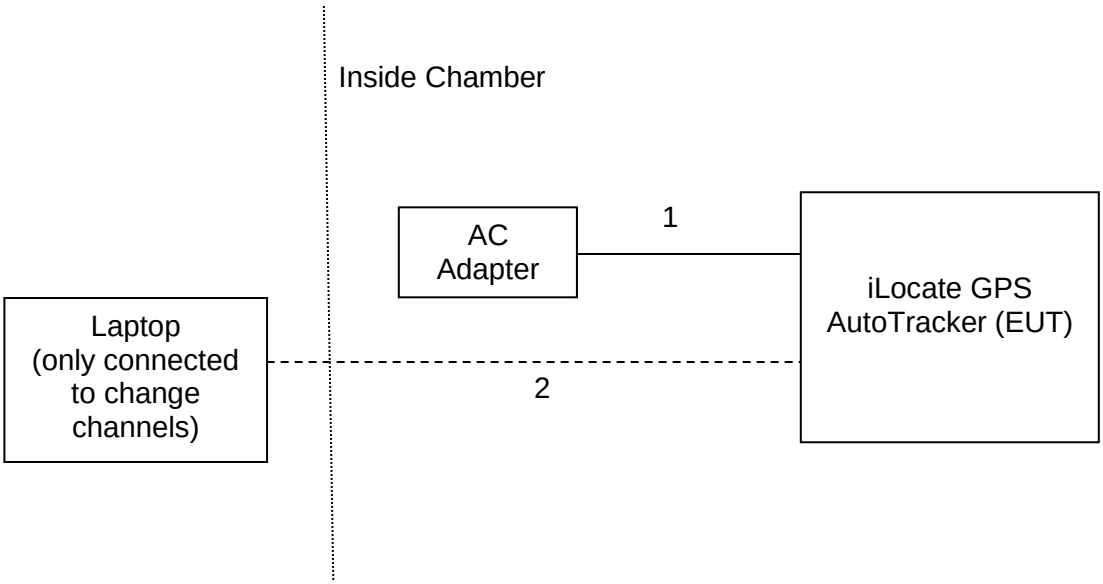
2.4 *Operating Modes and Conditions*

Continuous traffic was generated using test commands. Where the duty cycle measured below 99% and an RMS detector was employed, corrections of 10*LOG(1/D) were applied according to KDB publication 558074 D01 DTS Meas Guidance v04.

2.5 *EUT Connection Block Diagram – Conducted Measurements*



2.6 *EUT Connection Block Diagram – Radiated Measurements*



2.7 *System Configurations*

Manufacturer	Description	Model Number	Serial Number
Integrated M2M Technologies LLC	iLocate GPS AutoTracker	AT850218	Not labeled
V-Infinity	AC Adapter	EPS120050	Not labeled

2.8 *Cable List*

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
1	DC Power	AC Adapter	DC Power Jack (EUT)	1.8	No	No
2	Serial	Laptop USB Port	Serial Port Header (EUT)	1.8	No	No

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 v04 were used to determine the 6 dB bandwidth and 99% OBW.

3.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature:	24.6 °C
Relative Humidity:	26.8 %
Atmospheric Pressure:	98.1 kPa

3.4 *Test Equipment*

Test End Date: 5-Apr-2018 Tester: MT

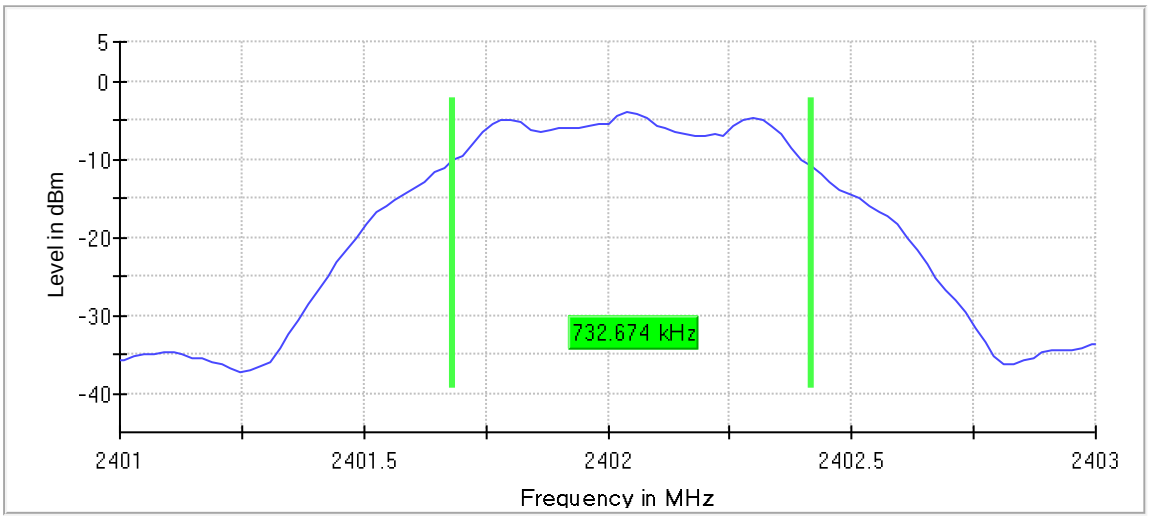
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
OPEN SWITCH AND CONTROL UNIT	OSP 120	ROHDE & SCHWARZ	S/N: 101182	CNR
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095591	28-Jul-2018
RF CABLE	141	HUBER & SUHNER	B095587	26-Jul-2018

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

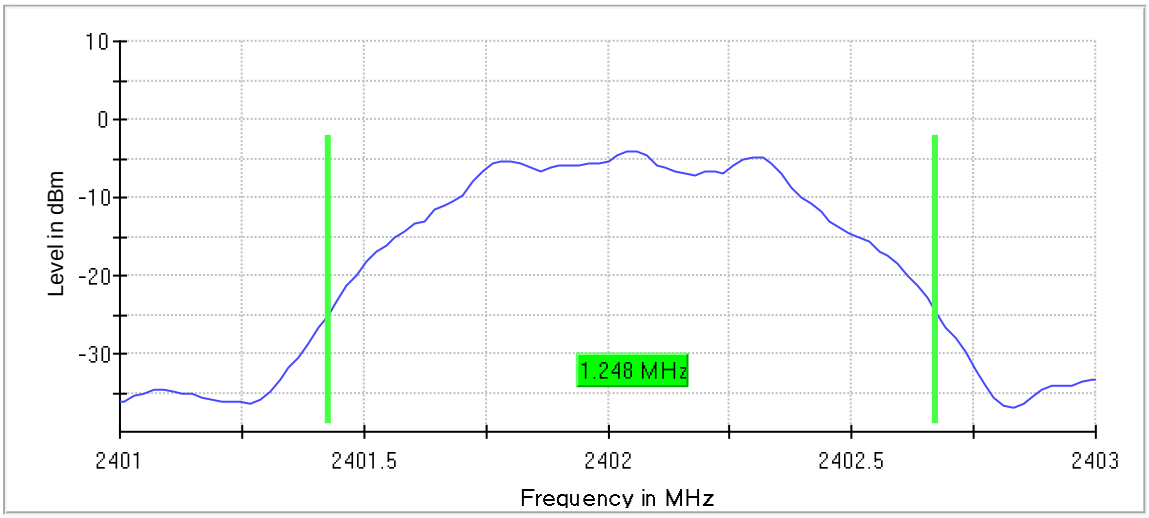
3.5 *Test Data*

Protocol	Channel	6dB Bandwidth (MHz)	Occupied Bandwidth (99%) (MHz)
BLE	0	0.733	1.248
BLE	19	0.733	1.248
BLE	39	0.713	1.248

6dB Bandwidth



99% Occupied Bandwidth



Plots at the low channel are representative of the mid and high channels.

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 Meas Guidance v04.

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:	24.6 °C
Relative Humidity:	26.8 %
Atmospheric Pressure:	98.1 kPa

4.4 *Test Equipment*

Test End Date: 5-Apr-2018 Tester: MT

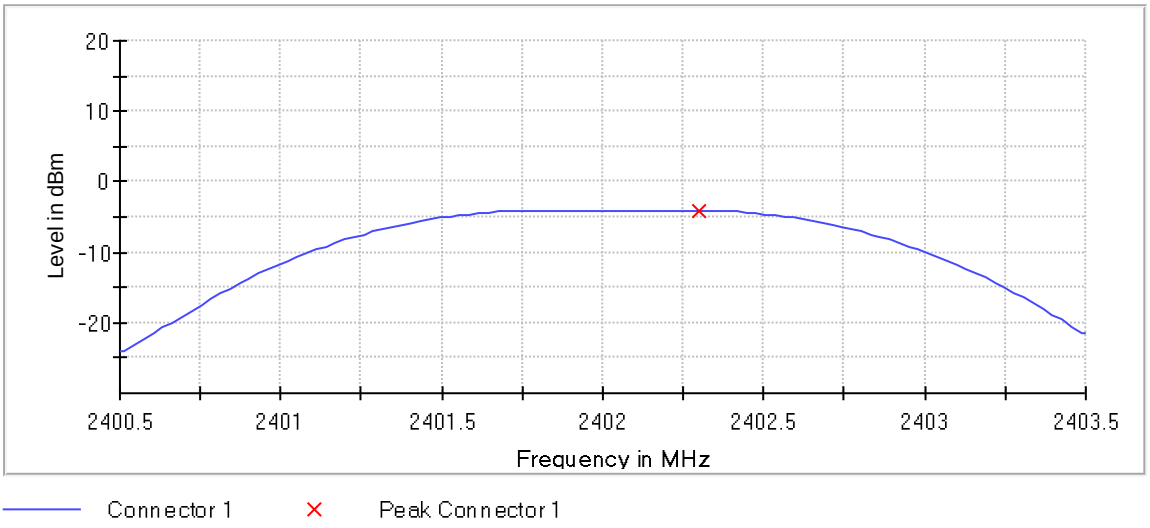
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
OPEN SWITCH AND CONTROL UNIT	OSP 120	ROHDE & SCHWARZ	S/N: 101182	CNR
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095591	28-Jul-2018
RF CABLE	141	HUBER & SUHNER	B095587	26-Jul-2018

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	-3.6	30	-34.1
BLE	19	-3.8	30	-34.3
BLE	39	-4.2	30	-34.7

Sample Plot:



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 Meas Guidance v04.

Limit
The limit is 8 dBm / 3 kHz.

5.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature:	24.6 °C
Relative Humidity:	26.8 %
Atmospheric Pressure:	98.1 kPa

5.4 *Test Equipment*

Test End Date: 5-Apr-2018 Tester: MT

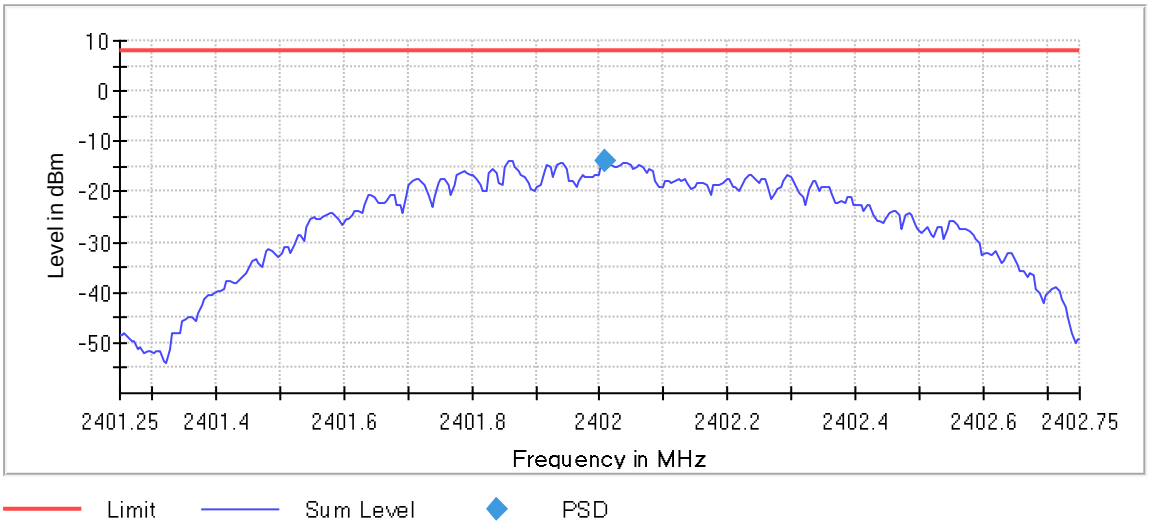
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
OPEN SWITCH AND CONTROL UNIT	OSP 120	ROHDE & SCHWARZ	S/N: 101182	CNR
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095591	28-Jul-2018
RF CABLE	141	HUBER & SUHNER	B095587	26-Jul-2018

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/3kHz)	Limit (dBm/3kHz)	Margin (dB)
BLE	0	-13.77	8	-21.77
BLE	19	-14.10	8	-22.10
BLE	39	-14.39	8	-22.39

Sample Plot:



6 Conducted Spurious Emissions / Band Edge

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 Meas Guidance v04.

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	Band Edge	Conducted Spurious Emissions
Temperature:	24.6 °C	25.1 °C
Relative Humidity:	26.8 %	35.3 %
Atmospheric Pressure:	98.1 kPa	97.9 kPa

6.4 *Test Equipment*

Band Edge:

Test End Date: 5-Apr-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
OPEN SWITCH AND CONTROL UNIT	OSP 120	ROHDE & SCHWARZ	S/N: 101182	CNR
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095591	28-Jul-2018
RF CABLE	141	HUBER & SUHNER	B095587	26-Jul-2018

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

Conducted Spurious Emissions:

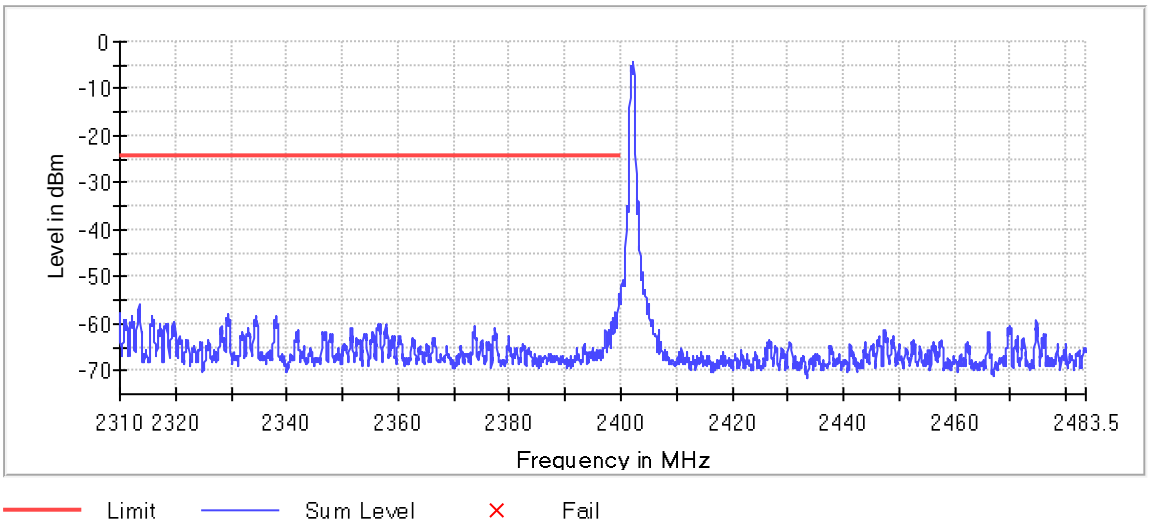
Test End Date: 13-Apr-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 1608522I	24-Jul-2018

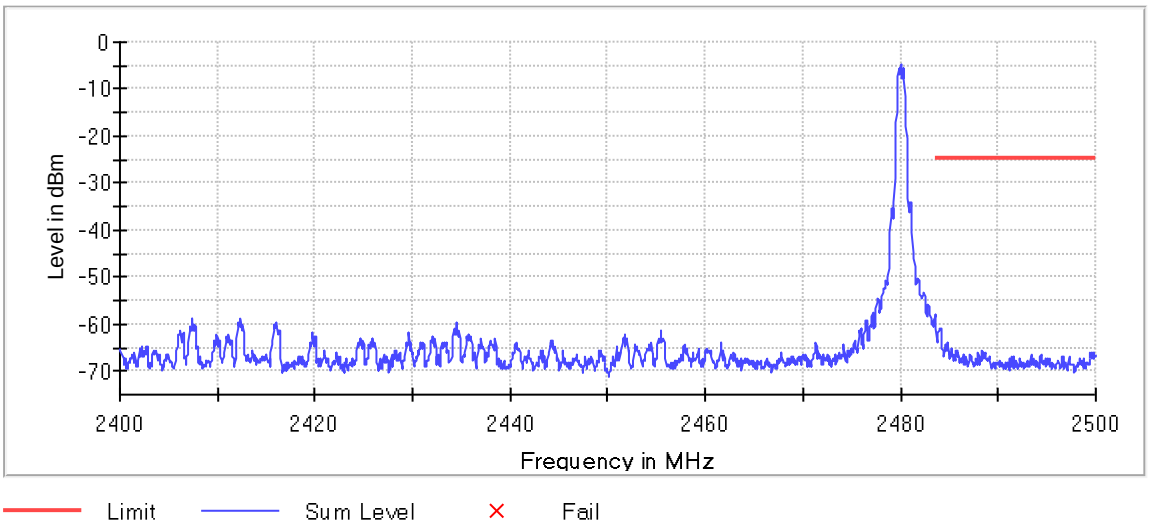
Note: The equipment calibration period is 1 year.

6.5 *Test Data – DTS Band Edge*

BLE - Lower band edge:

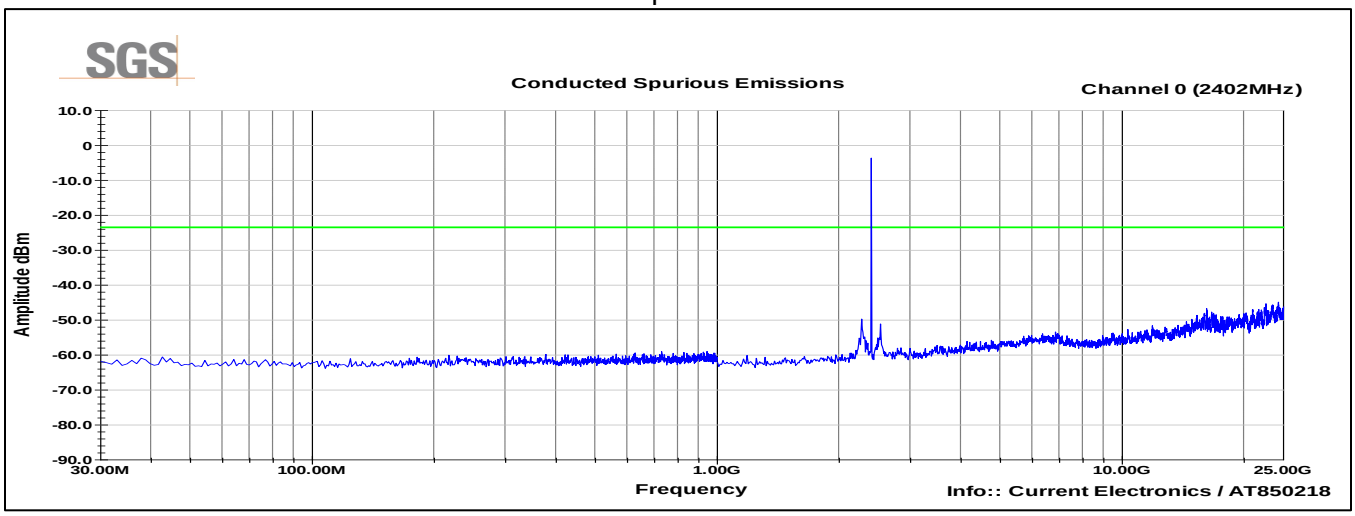


BLE - Upper band edge:

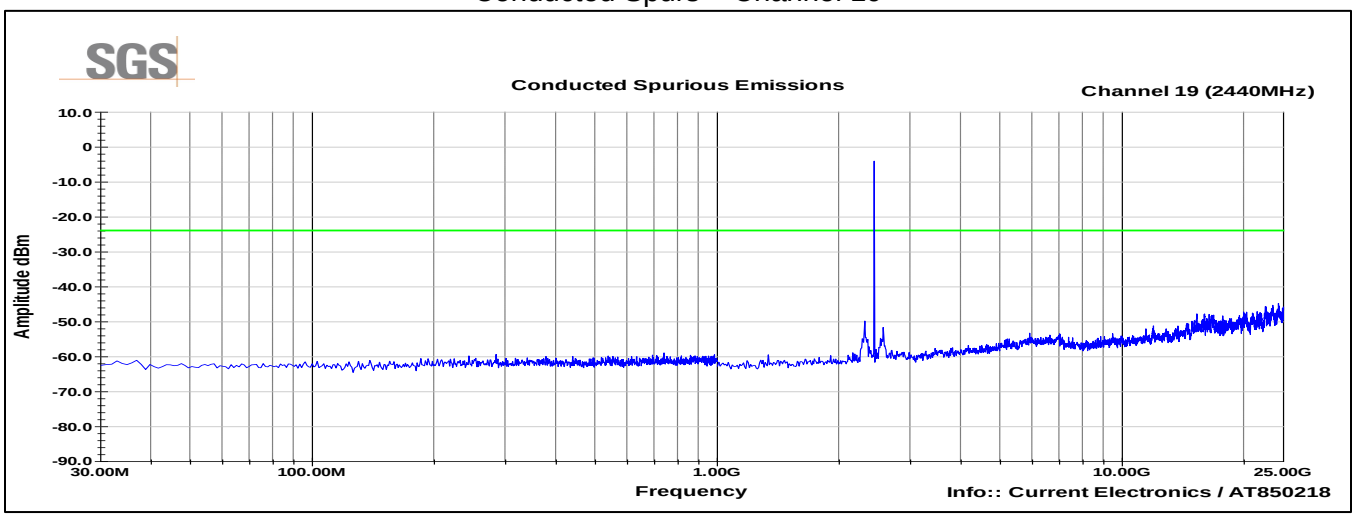


6.6 *Test Data – Conducted Spurious Emissions*

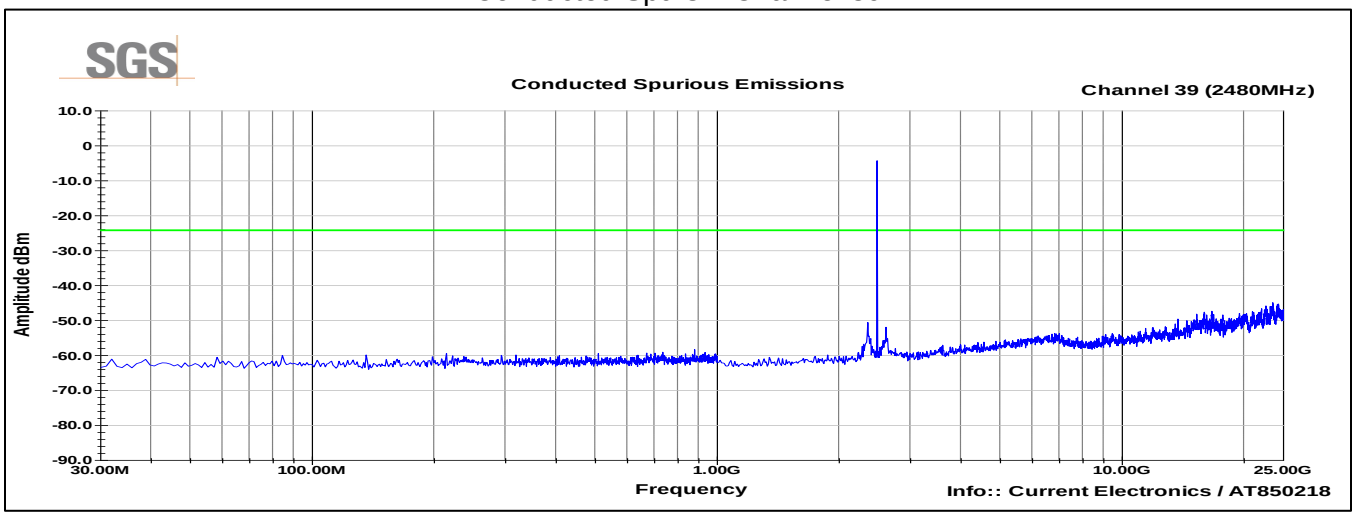
Conducted Spurs – Channel 0



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 and KDB 558074 D01 Meas Guidance v04 were used.

Lowest, middle, and highest channels were investigated – the device was commanded to continuously transmit on 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 1.5 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*

3m Absorber Lined Shielded Enclosure (ALSE), Suwanee, GA

Environmental Conditions	30MHz to 1GHz	1 to 18GHz	18 to 26GHz
Temperature:	24.9 °C	23.4 – 24.2 °C	24.9 °C
Relative Humidity:	35.9 %	25.8 – 31.3 %	26.8 %
Atmospheric Pressure:	97.8 kPa	98.2 – 98.4 kPa	98.2 kPa

7.4 *Test Equipment*

30MHz to 1GHz

Test End Date: 13-Apr-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079689	16-Oct-2018
RF CABLE	SF106	HUBER & SUHNER	B079712	24-Jul-2018
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	24-Jul-2018
RF CABLE	UC-N-MM-275	MAURY MICROWAVE	17015	25-Jul-2018
RF CABLE	104PE	HUBER & SUHNER	B079793	24-Jul-2018
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	6-Mar-2019
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	25-Jul-2018

Note: The equipment calibration period is 1 year.

1 to 18GHz

Test End Date: 11-Apr-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2018
RF CABLE	SF106	HUBER & SUHNER	B079712	24-Jul-2018
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2018
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	28-Jul-2018
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	25-Apr-2018

Note: The equipment calibration period is 1 year.

18 to 26GHz

Test End Date: 11-Apr-2018 Tester: MT

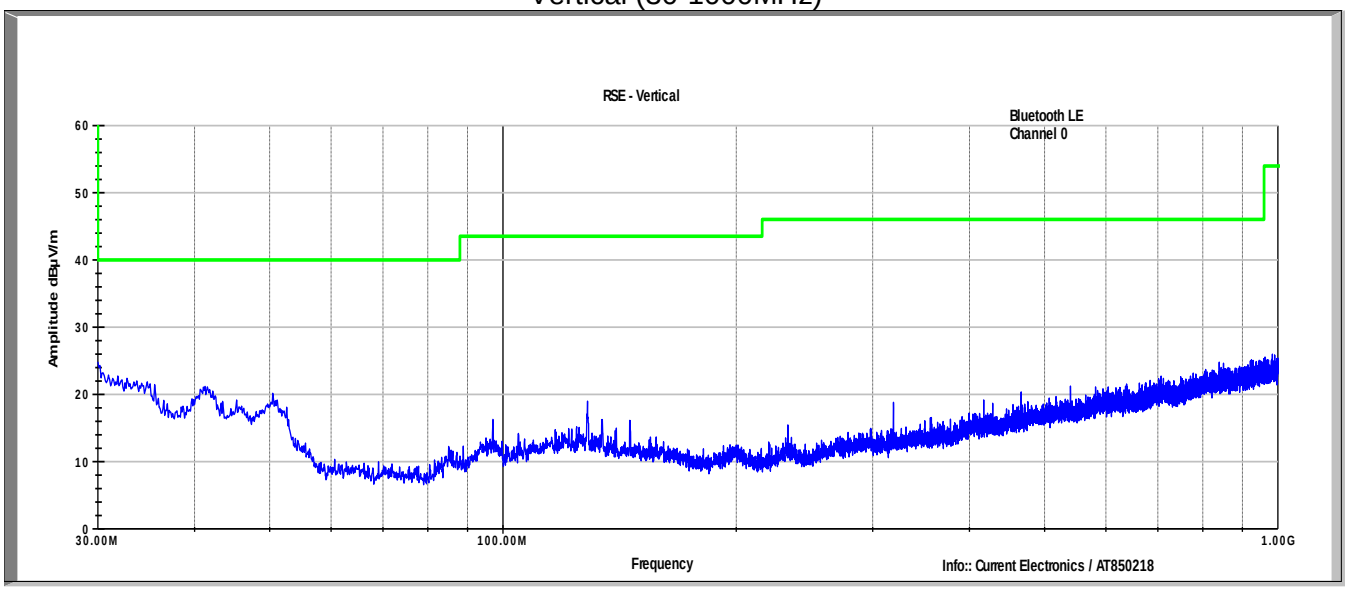
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, DRG HORN (SMALL)	3116B	ETS LINDGREN	B079695	27-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	26-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079824	26-Jul-2018
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	28-Jul-2018
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	25-Apr-2018

Note: The equipment calibration period is 1 year.

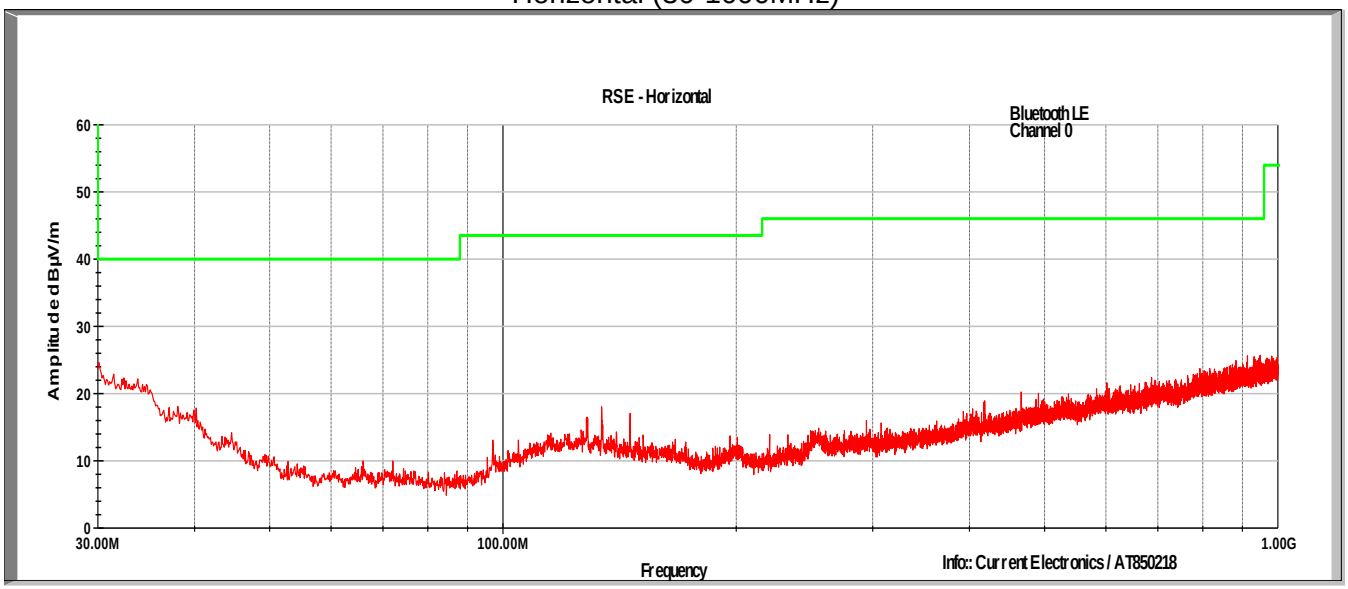
7.5 *Test Data – Peak Plots*

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

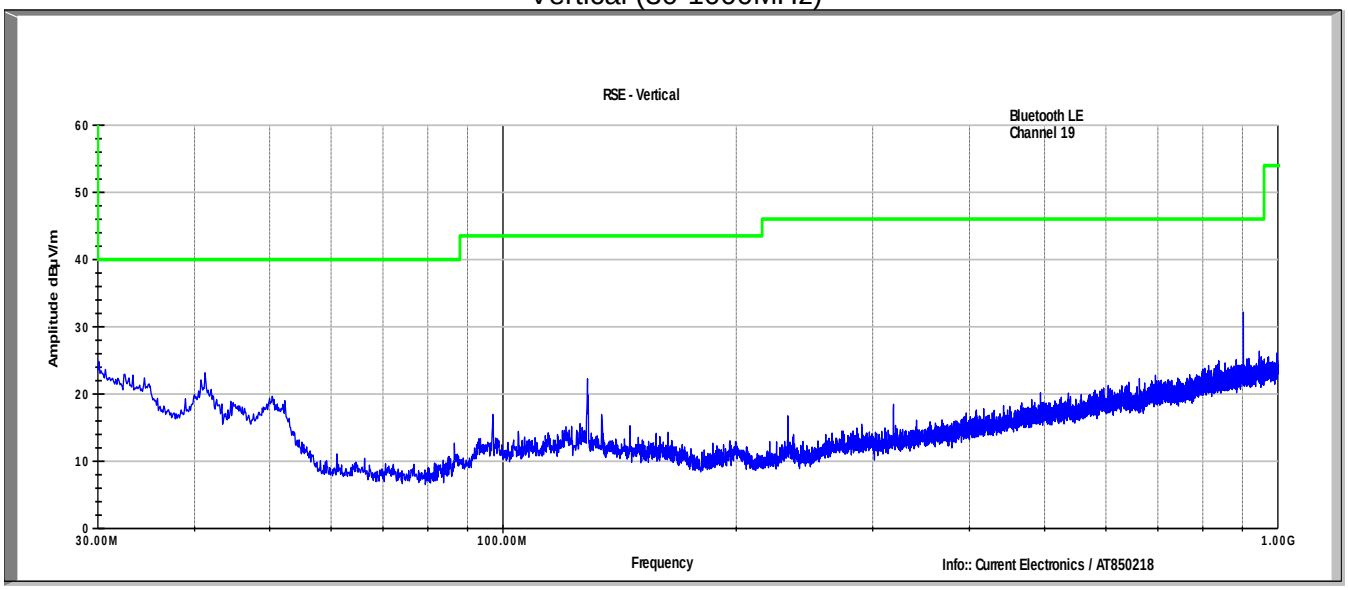
BLE Channel 0
Vertical (30-1000MHz)



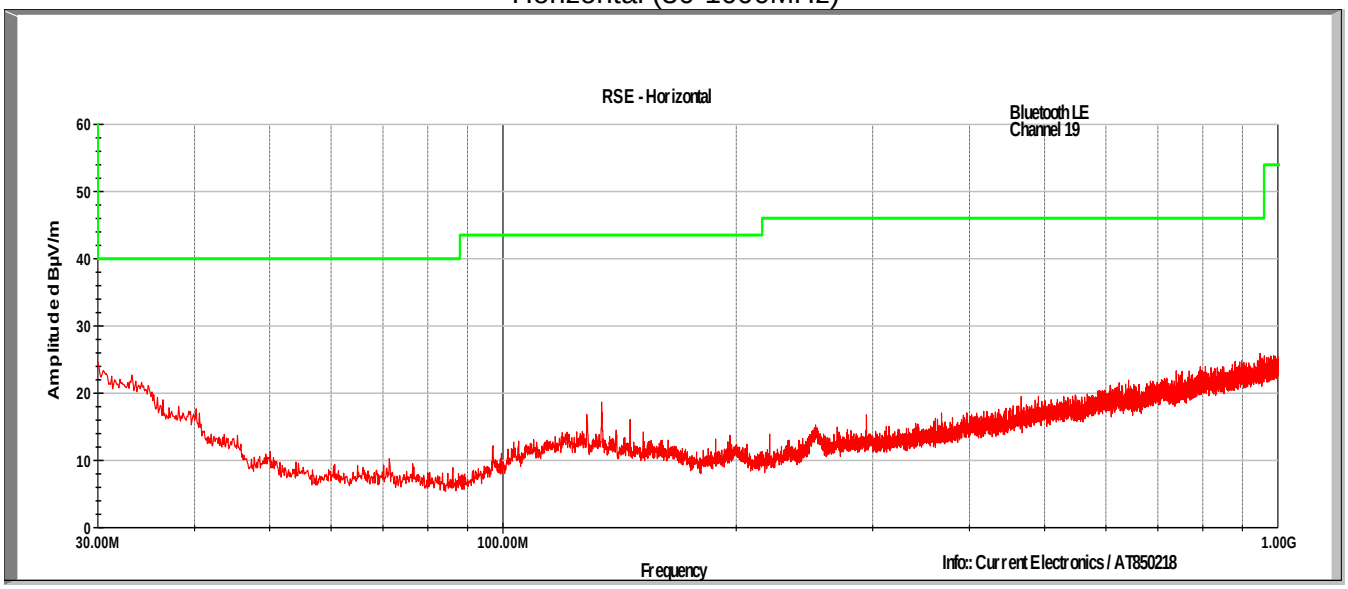
BLE Channel 0
Horizontal (30-1000MHz)



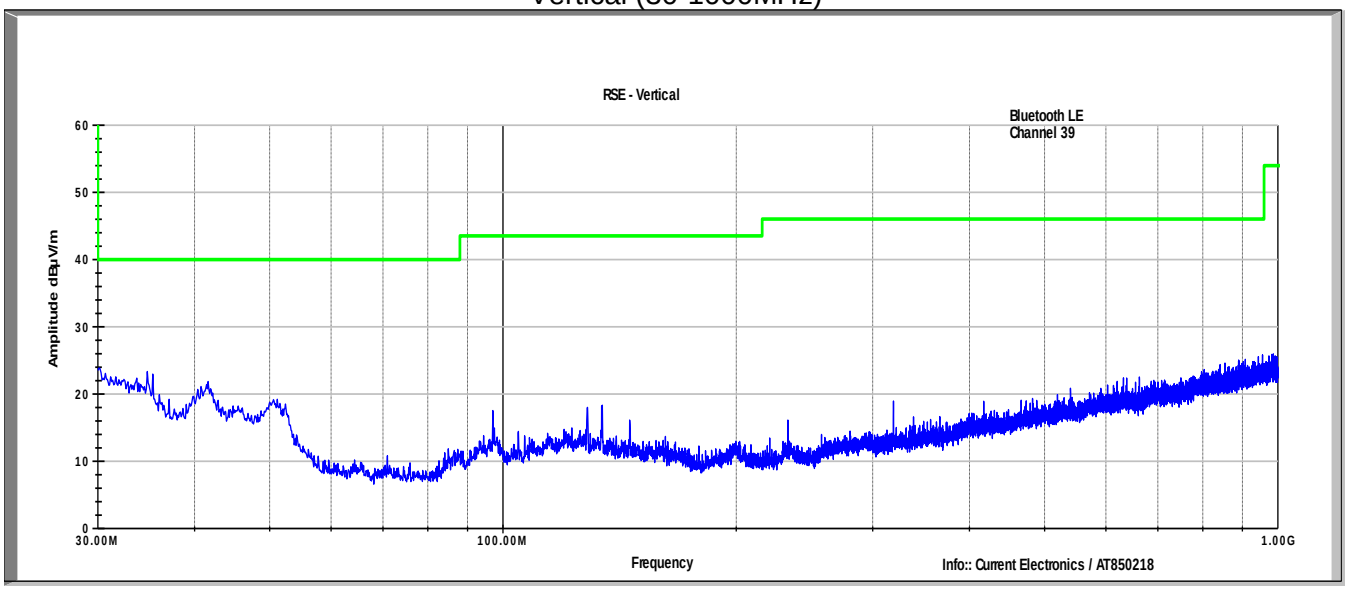
BLE Channel 19
Vertical (30-1000MHz)



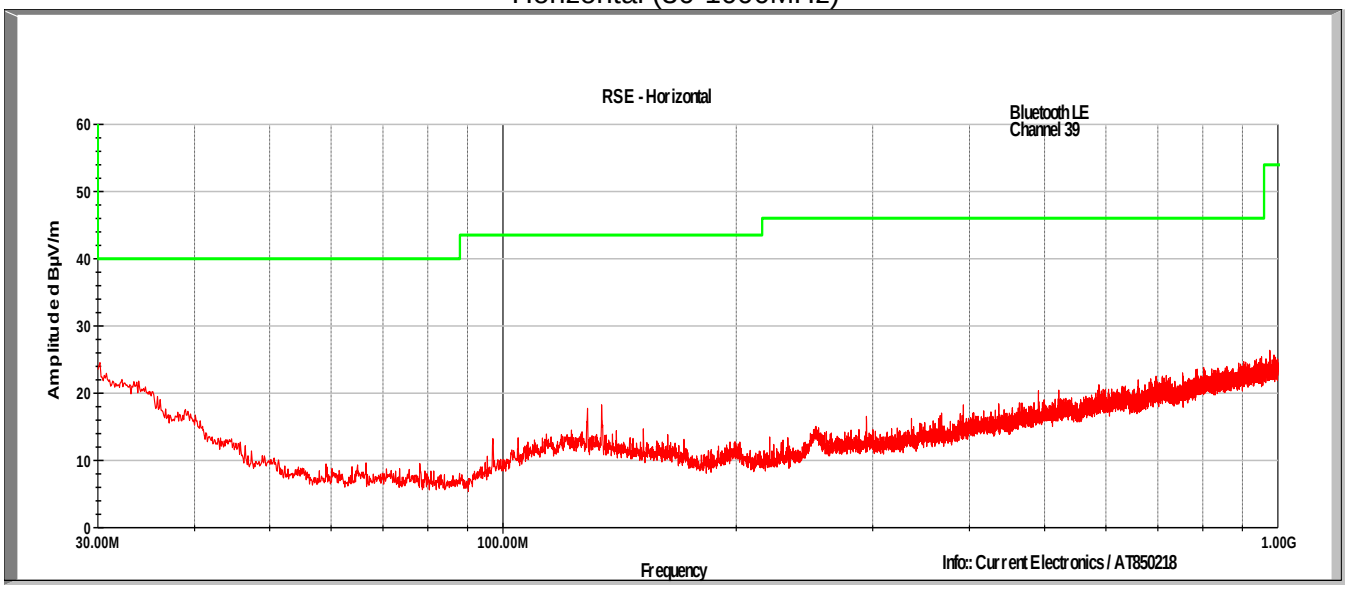
BLE Channel 19
Horizontal (30-1000MHz)



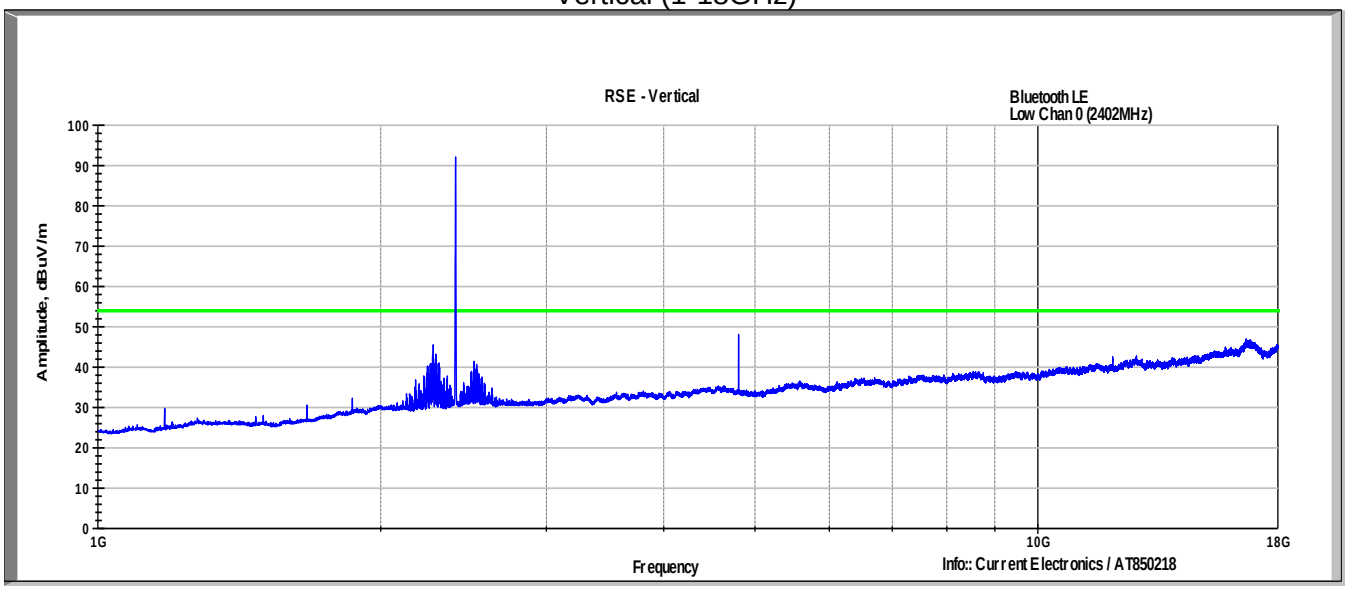
BLE Channel 39
Vertical (30-1000MHz)



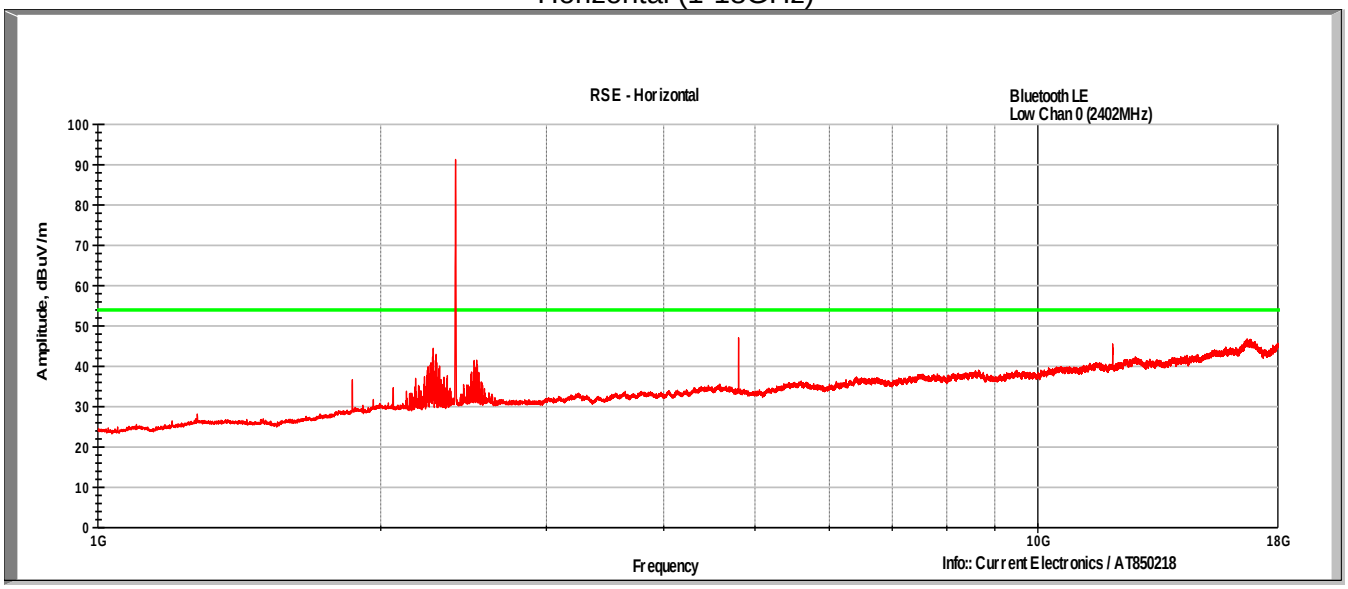
BLE Channel 39
Horizontal (30-1000MHz)



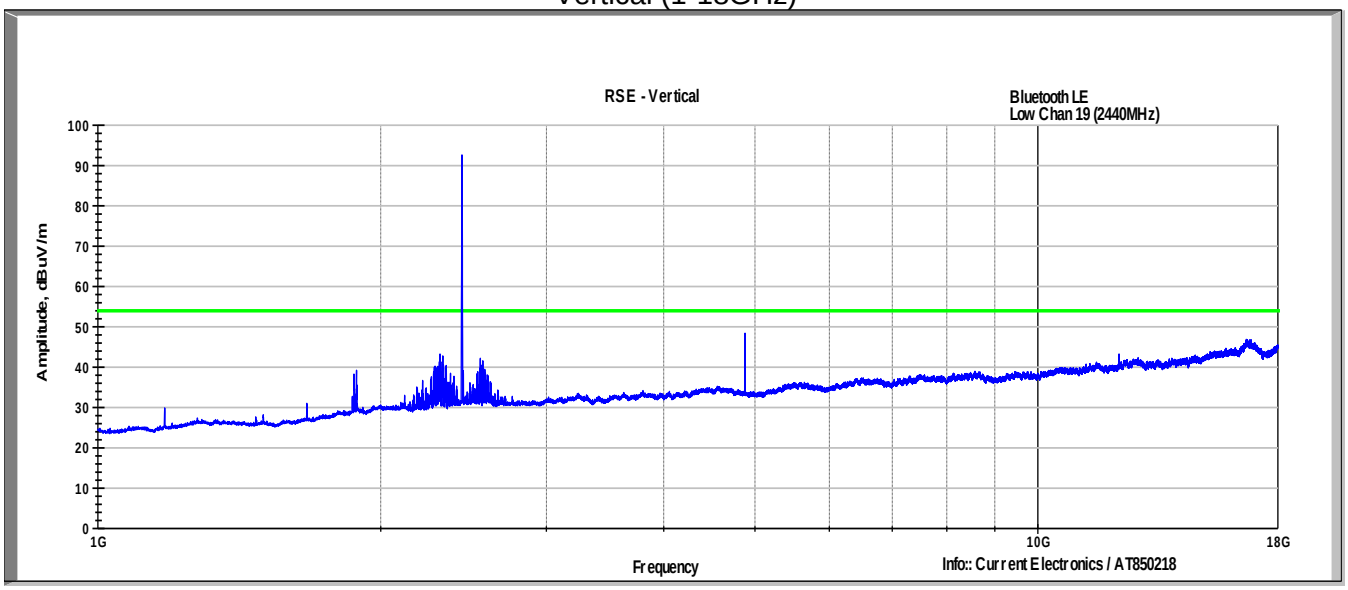
BLE Channel 0
Vertical (1-18GHz)



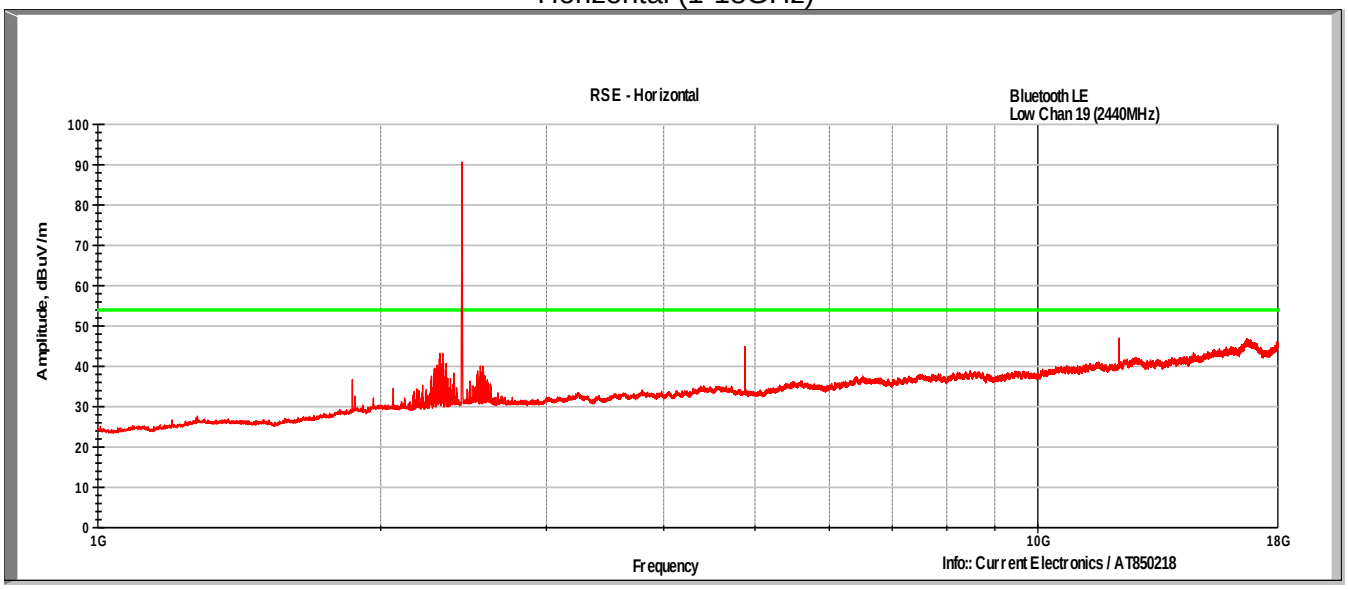
BLE Channel 0
Horizontal (1-18GHz)



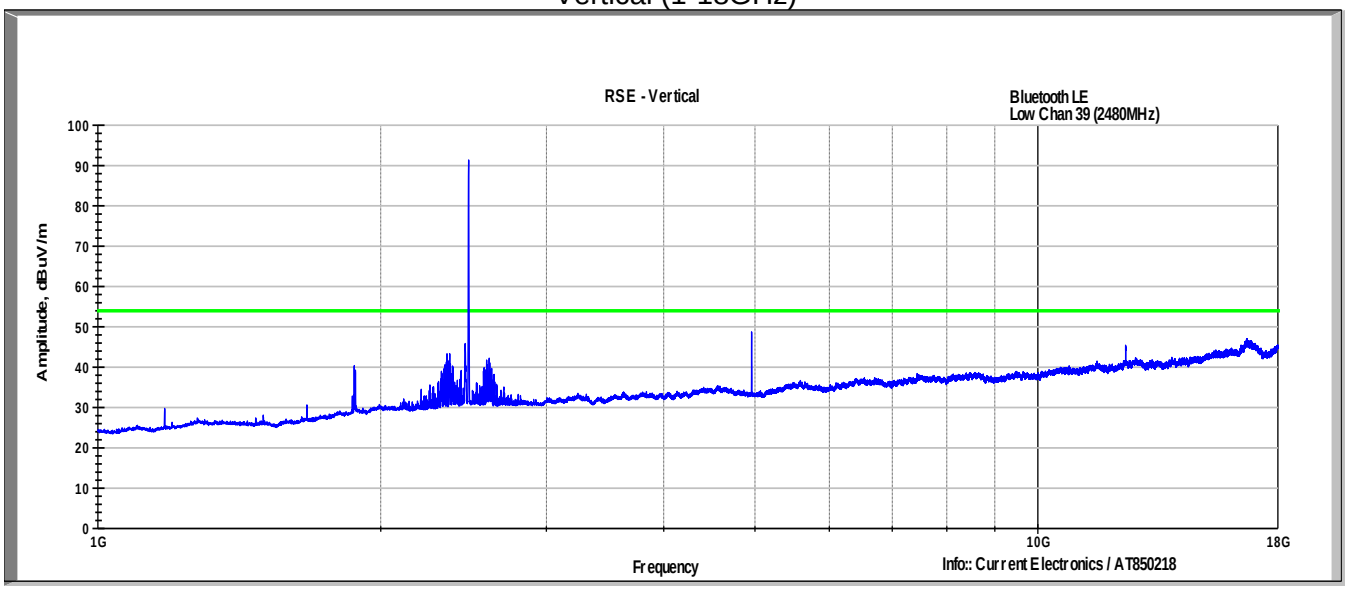
BLE Channel 19
Vertical (1-18GHz)



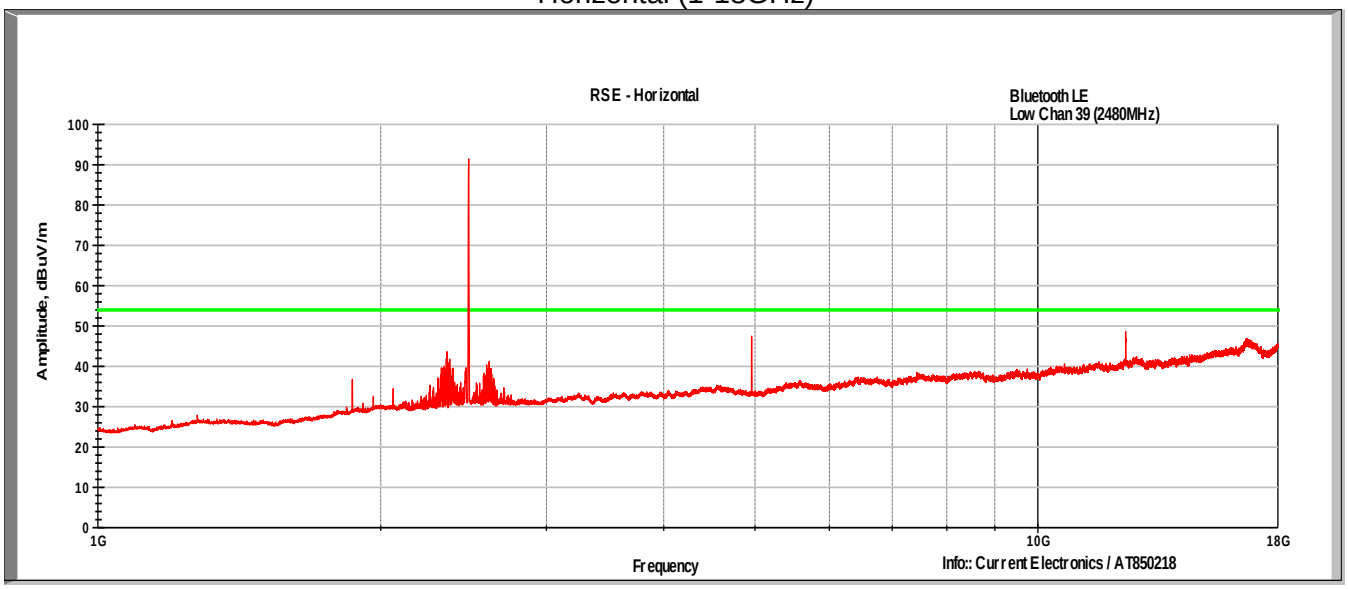
BLE Channel 19
Horizontal (1-18GHz)



BLE Channel 39
Vertical (1-18GHz)



BLE Channel 39
Horizontal (1-18GHz)



Manual scans were performed in the 18 to 26 GHz frequency range and no emissions were detected.

7.6 *Test Data – Tabular Data*

Frequency MHz	Raw Meas (dBuV/m)	Polarity (V/H)	Correction (dB)	Corr Value dBuV/m	Limit (dBuV/m)	Margin (dB)
Channel 0 (2402MHz)						
4804.0	48.1	V	0.00	48.10	54.0	-5.90
4804.0	47.0	H	0.00	47.00	54.0	-7.00
Channel 19 (2440MHz)						
4880.0	48.3	V	0.00	48.30	54.0	-5.70
12200.0	46.9	H	0.00	46.90	54.0	-7.10
Channel 39 (2480MHz)						
4960.0	48.7	V	0.00	48.70	54.0	-5.30
12400.0	48.5	H	0.00	48.50	54.0	-5.50

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 for each modulation. Measurements were made using the conducted methods defined in Section 12 of FCC publication KDB 558074 D01 DTS Meas Guidance v04.

Offset Calculations:
Offset calculations so that conducted measurements on the spectrum analyzer in dBµV represent field strength measurements in dBµV/m.

Offset = -20Log(D) + 104.8 - 107 + CL + DC + AG
$Offset_{3m}$ = -11.7 + CL + DC + AG

D = 3m	Distance
CL = 0.5 dB	Cable Loss
DC = 1.89 dB (64.76%)	Duty Cycle Correction Factor
AG = 2 dB*	Antenna Gain

Offset = -7.35 dB

* The actual antenna gain was calculated to be 1.2dBi. 2 dB correction is the minimum allowed by the test method.

8.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature:	22.3 °C
Relative Humidity:	29.4 %
Atmospheric Pressure:	97.6 kPa

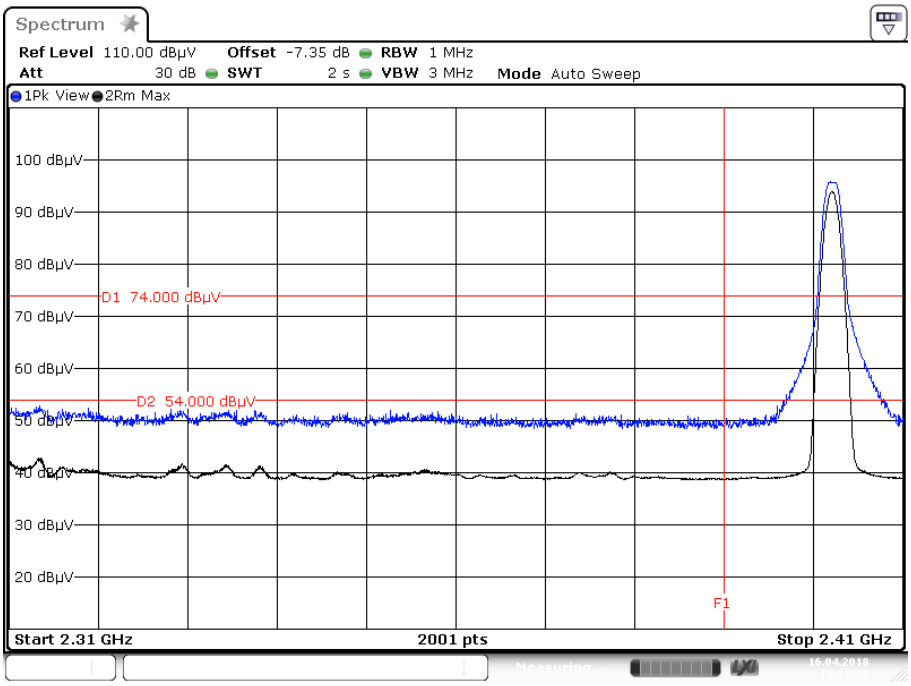
8.4 *Test Equipment*

Test End Date: 16-Apr-2018 Tester: MT

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 1608522I	24-Jul-2018

Note: The equipment calibration period is 1 year.

8.5 *Test Data – Restricted Band Edge*



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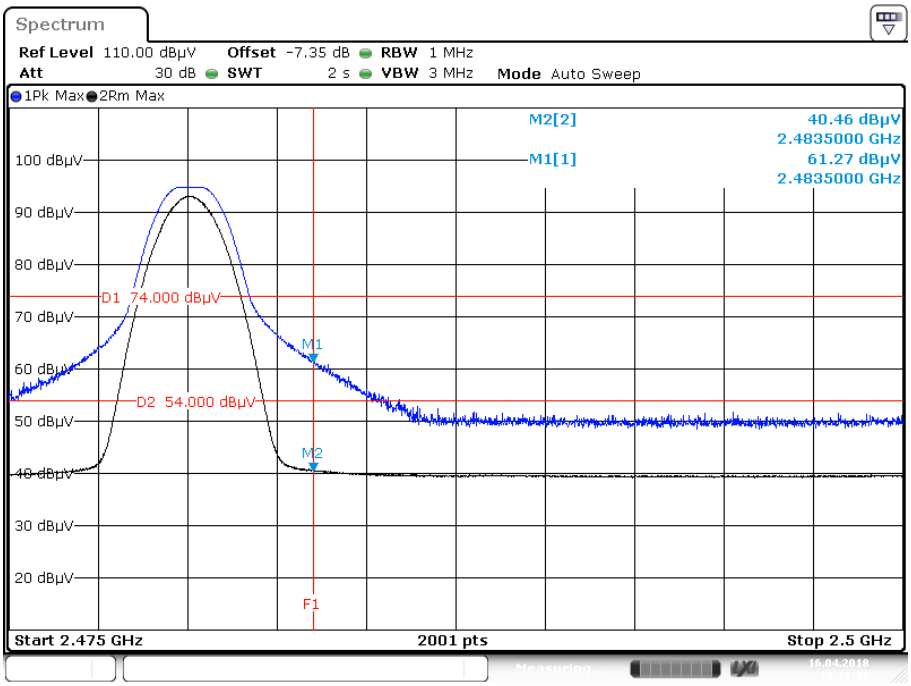

Date: 16.APR.2018 18:23:39

9 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	17 April 2018