RF Test Report

Project Number: **4451806**

Report Number: **4451806EMC02** **Revision Level:** **0**

Client: **3Si Security Systems Inc.**

Equipment Under Test: **Wireless Tracking Device**

Model Number: **AT170503US**

FCC ID: **Q6KAT170503A**

IC ID: **5043A-AT170503A**

Applicable Standards: **FCC Part 15 Subpart C, § 15.247**
RSS-247, Issue 2
ANSI C63.10: 2013
RSS-GEN, Issue 5

Report issued on: **13 May 2019**

Test Result: **Compliant**

Tested by: _____
Shawn McGuinness, EMC Engineering Leader

Reviewed by: _____
Martin Taylor, RF/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.

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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	NIS(2)
Transmitter Output Power	15.247(b)(3)	RSS-247 S5.4 (4)	NIS(2)
Power Spectral Density	15.247(e)	RSS-247 S5.2 (2)	NIS(2)
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
Antenna Requirement	15.203	RSS-GEN S8.3	Compliant (1)
AC Powerline Conducted Emission	15.107, 15.207	RSS-GEN S8.8	NIS(2)

(1) The device utilizes a PCB trace antenna.
(2) Not in the Scope of this evaluation. Per class 2 permissive change, only RSE and Band edge measurements taken.

1.1 *Modifications Required for Compliance*

None

2 General Information

2.1 *Client Information*

Name:	3Si Security Systems Inc.
Address:	101 Lindenwood Drive Suite 200
City, State, Zip, Country:	Malvern, PA 19355 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

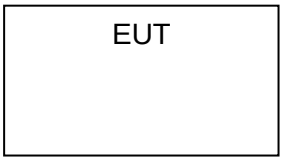
2.3 *General Information of EUT*

Type of Product:	Wireless Tracking Device
Model Number:	AT170503US
FCC ID:	Q6KAT170503A
IC:	5043A-AT170503A
IMEI:	352753092914371
FW Ver:	13.1.36072
Frequency Range:	2402-2480 MHz
Channels:	40
Data Modes:	Bluetooth Low Energy
Antenna:	Trace Antenna
Rated Voltage:	3.7Vdc Battery/DC In
Tested Voltage:	3.7Vdc DC In
AC Power In:	120VAC/60Hz, 1.2A
Sample Received Date:	29 April 2019
Dates of testing:	29 April to 1 May 2019

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 15.247 Meas Guidance v05r02.

2.5 *EUT Connection Block Diagram*



2.6 *System Configurations*

Device reference	Manufacturer	Description	Model Number	Prototype ID
A	3Si Security	Wireless Tracking Device	AT170503US	PROTO-1U

2.7 *Cable List*

Cable reference	Port Name	Start	End	Cable Length (m)	Ferrite installed?	Shielded?
None						

3 Field Strength of Spurious Radiation

3.1 *Test Result*

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

3.2 *Test Method*

Radiated spurious emissions measurements were recorded with the device configured to transmit at the lowest, middle, and highest channels. The frequency range investigated was up through the 10th harmonic of the fundamental transmit frequency. The methods defined in ANSI C63.10: 2013 were used.

For measurements below 1GHz, the device was manipulated through three orthogonal axes. Above 1GHz, the alternative method in Clause 6.6.5 was used.

Test distance:

9k to 30 MHz – Near field prescan to determine if there were any emissions.
30 MHz to 1 GHz - The EUT to measurement antenna distance was 10 meters
1 to 18 GHz - The EUT to measurement antenna distance was 3 meters
18 to 40 GHz - The EUT to measurement antenna distance was 1 meters

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 within the restricted bands of operation defined in FCC §15.205.
(2) Quasi-peak limit
(3) Average limit

3.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 23.3 °C
Relative Humidity: 52.7 %

3.4 *Test Equipment*

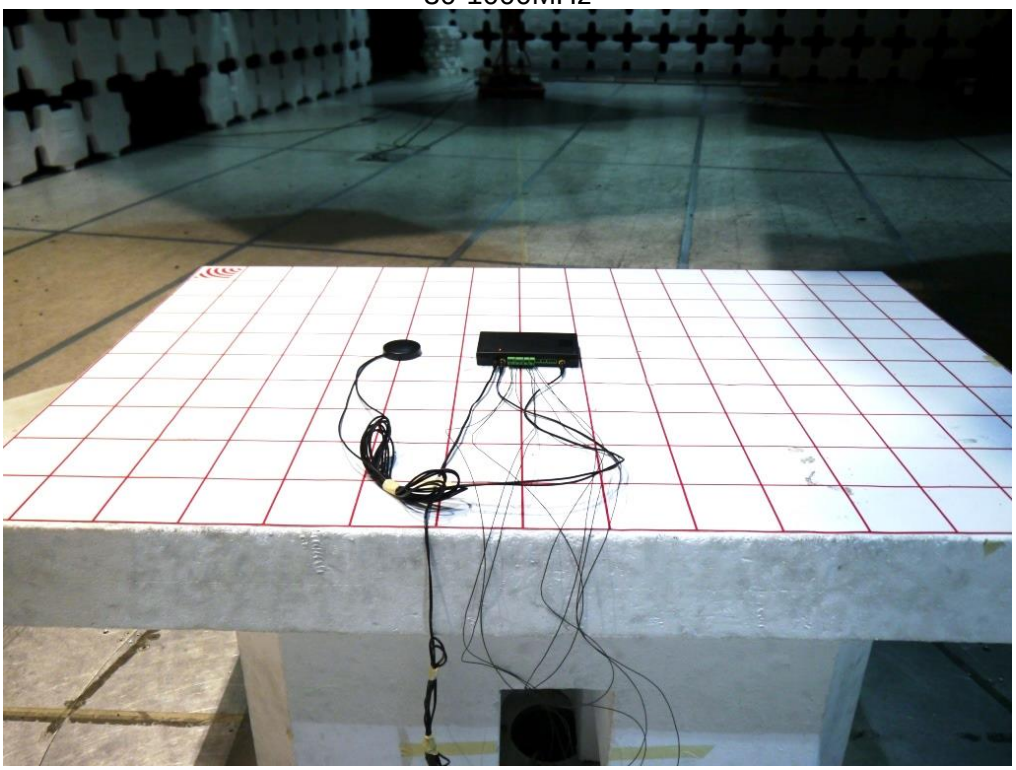
Test End Date: 1-May-2019 Tester: SKM

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019
ANTENNA, BILOG	JB6	SUNOL	B079689	30-Oct-2019
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	10-Aug-2020
ANTENNA, DRG HORN (SMALL)	3116B	ETS LINDGREN	B079697	30-Mar-2020
RF CABLE	SF106	HUBER & SUHNER	B079712	24-Jul-2019
RF CABLE	SF106	HUBER & SUHNER	B079713	24-Jul-2019
RF CABLE	SF106	HUBER & SUHNER	B079659	23-Jul-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	24-Jan-2020
FILTER, HIGH PASS (>2800MHZ)	HPM50111	MICRO-TRONICS	B085747	26-Jul-2019
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	27-Jul-2019
RF CABLE	SF102	HUBER & SUHNER	B079822	25-Jul-2019
RF CABLE	SF102	HUBER & SUHNER	B079824	25-Jul-2019

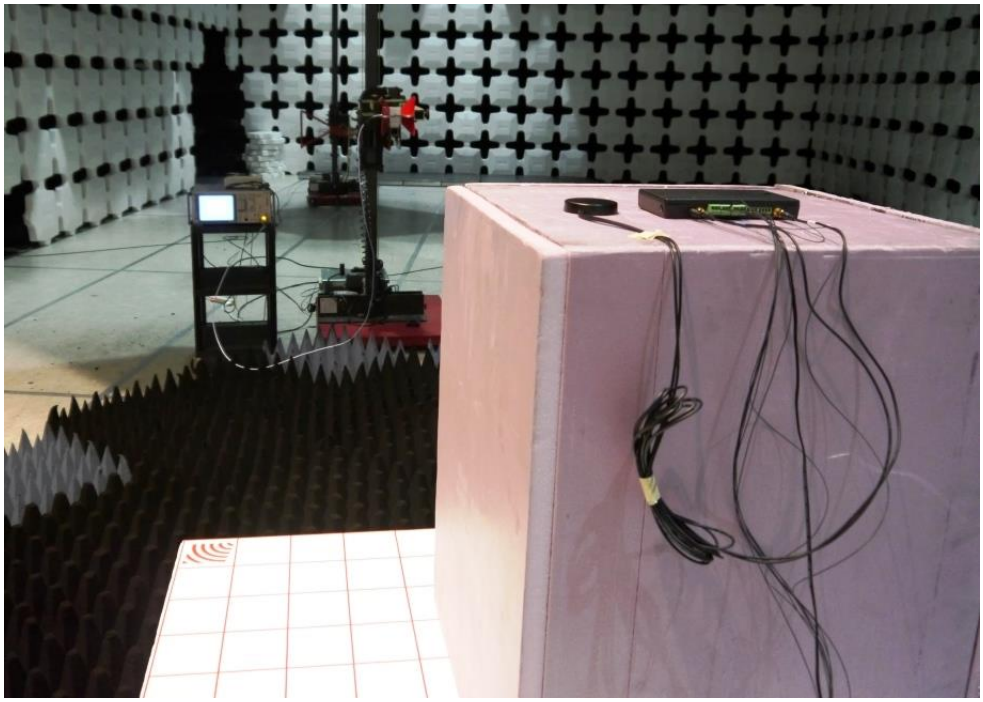
Note: The equipment calibration period is 1 year.

3.1 *Test Setup Photographs*

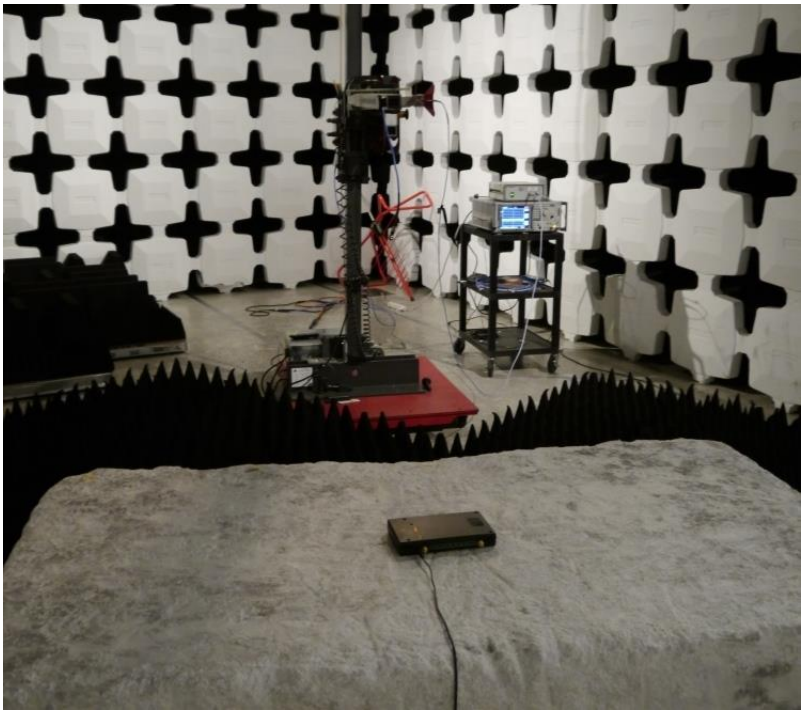
30-1000MHz



1-18GHz



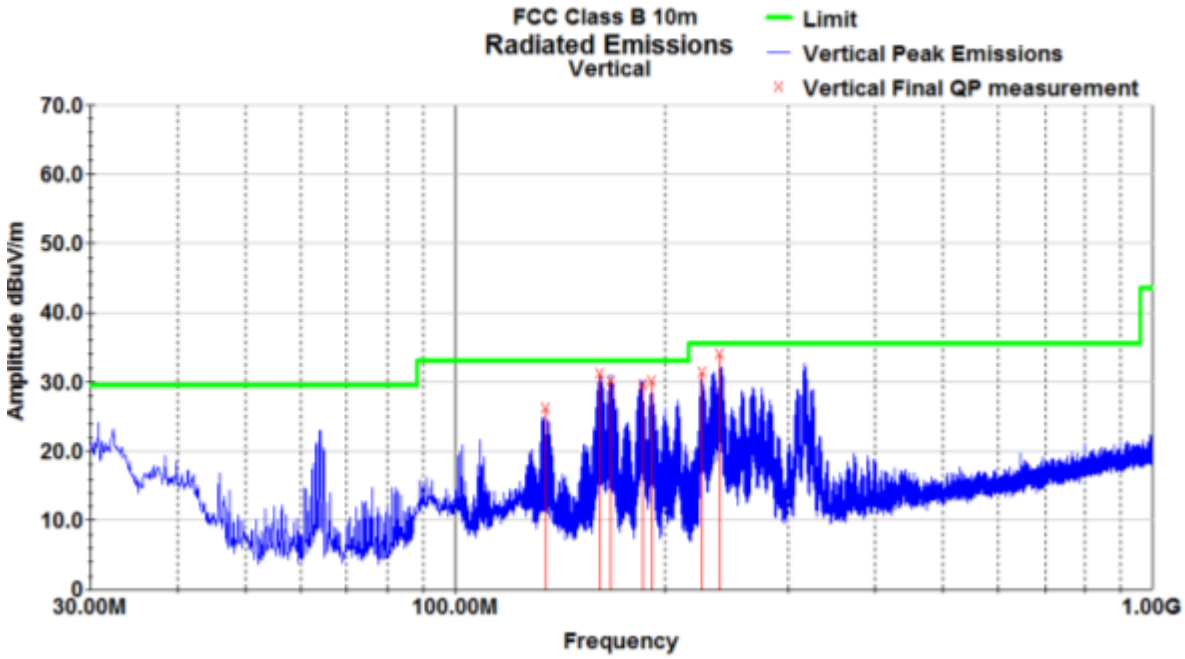
18 -26Ghz



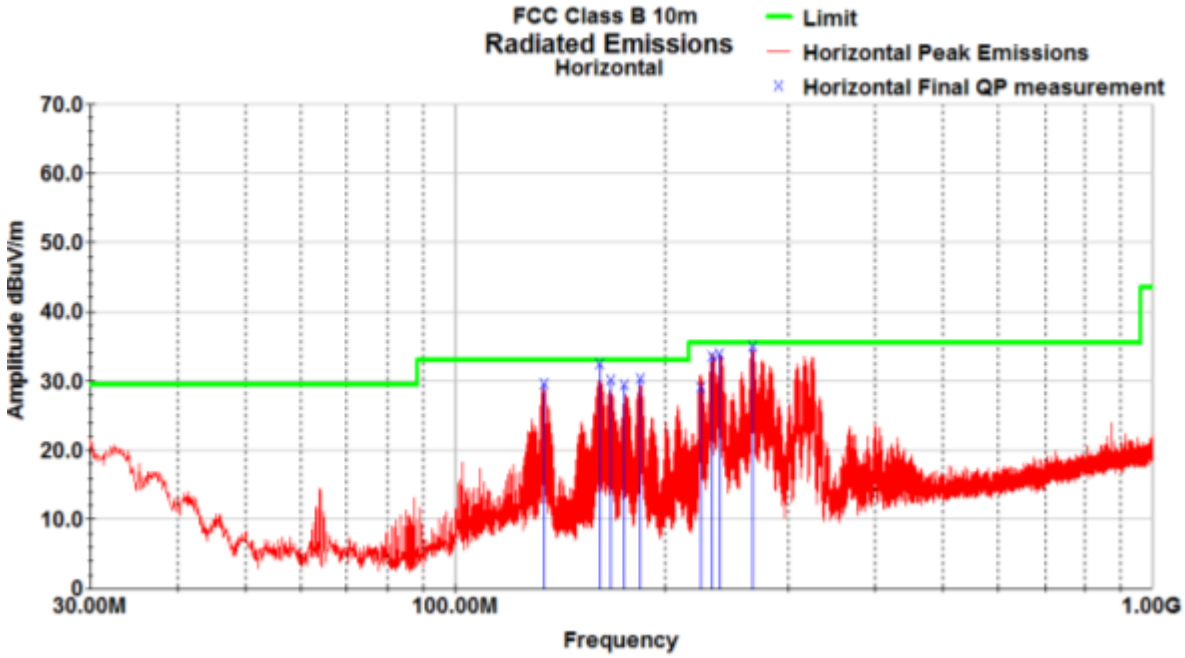
3.2 *Test Data – Peak Plots*

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

BLE Vertical (30-1000MHz)

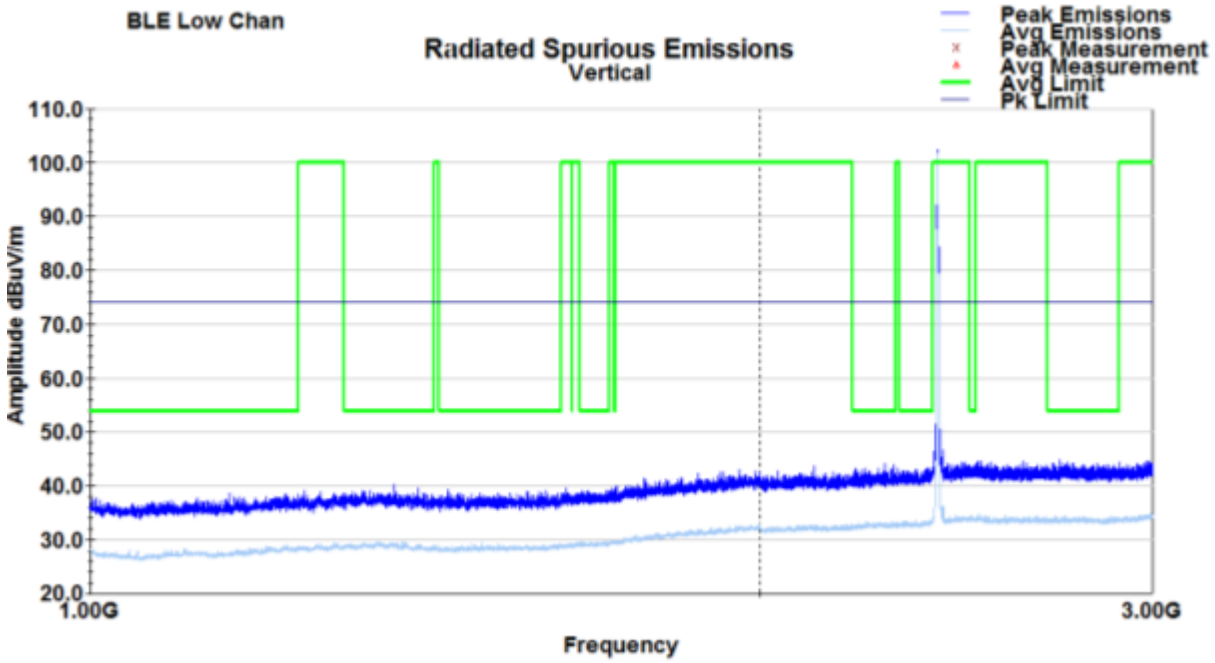


BLE Horizontal (30-000MHz)

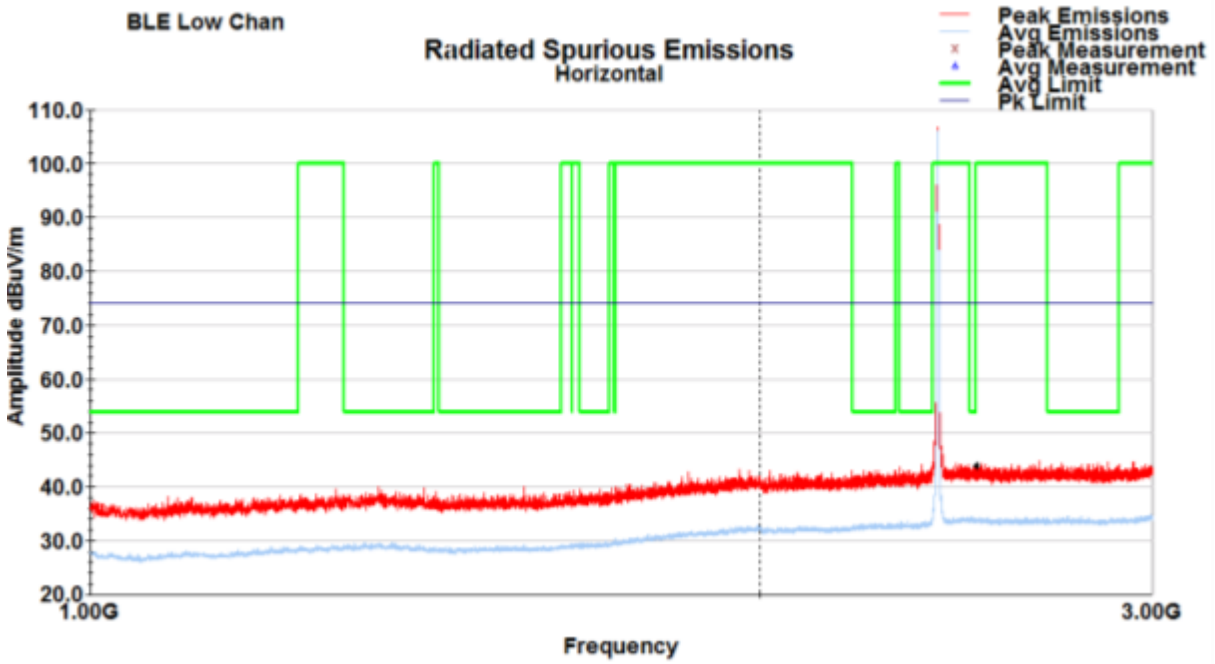


There was no discernible difference in the emissions profile below 1GHz when changing between BLE channels.

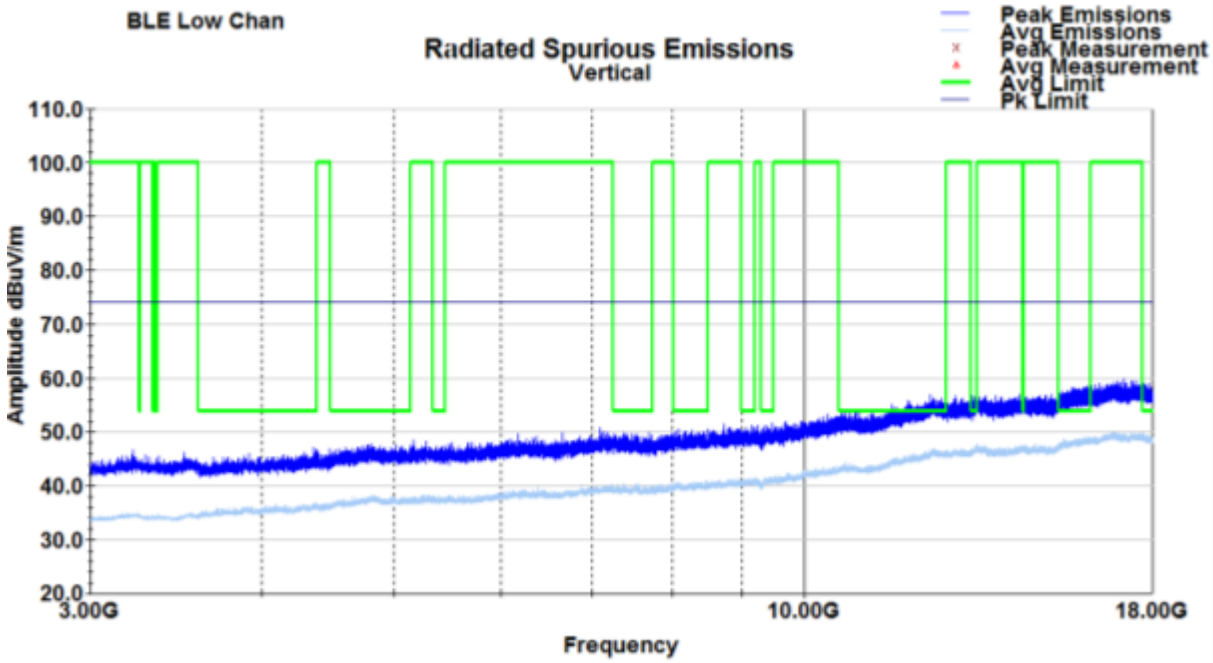
Vertical (1-3GHz)



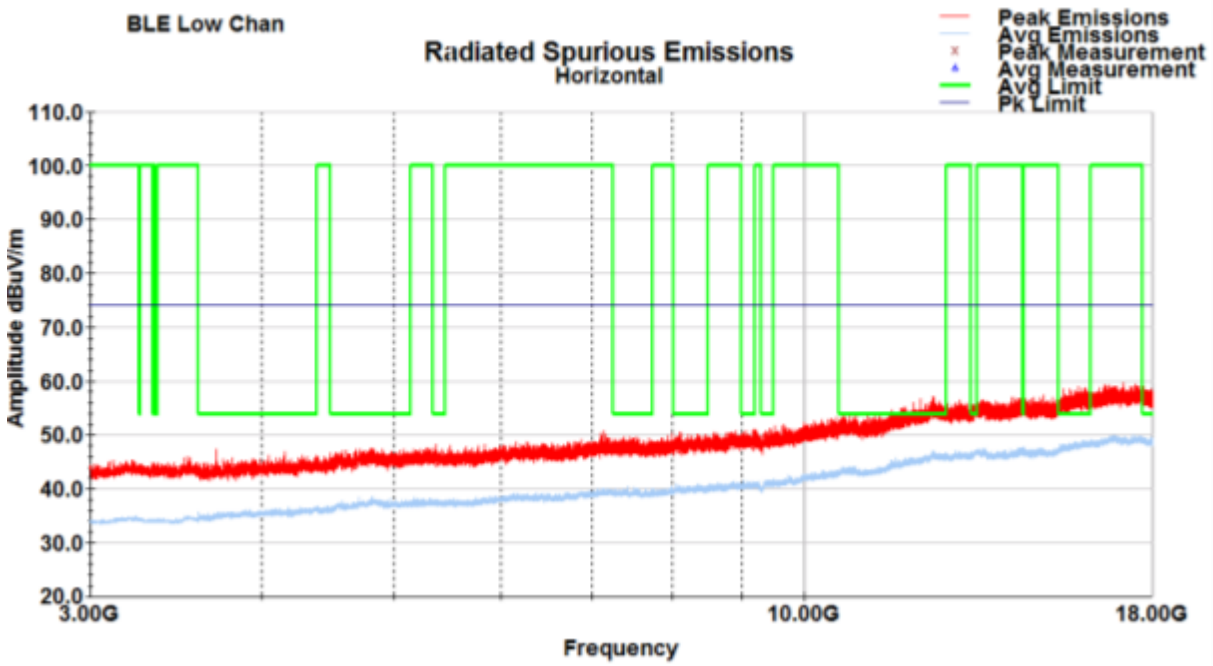
Horizontal (1-3GHz)



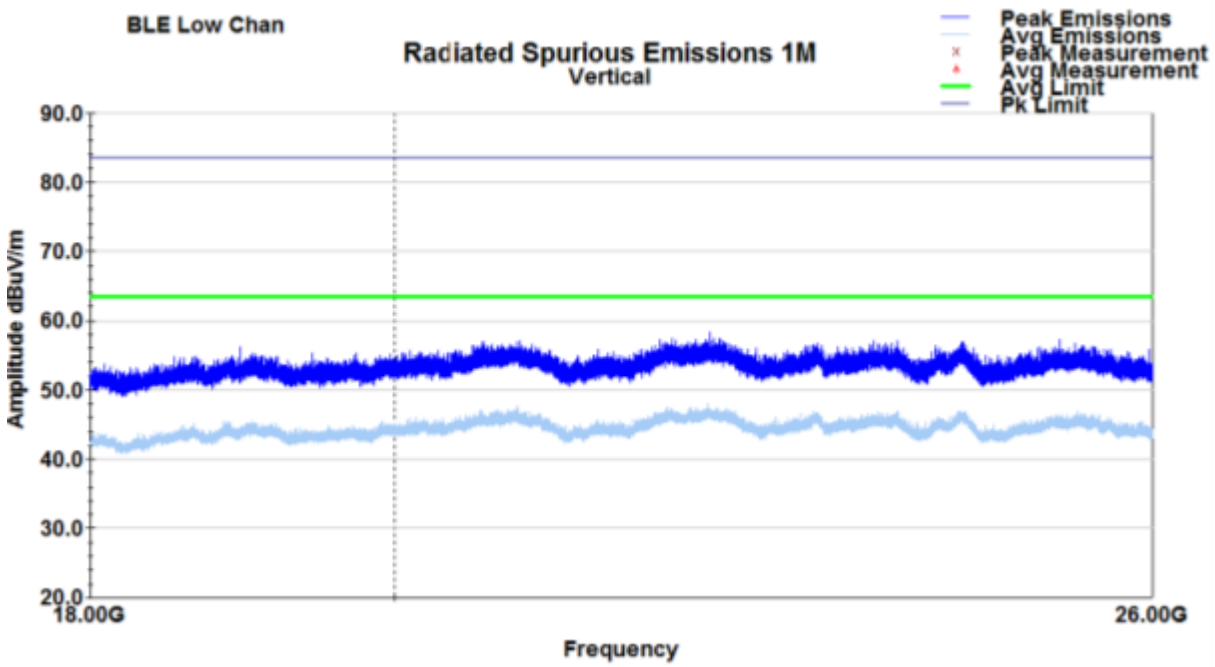
Vertical (3-18GHz)



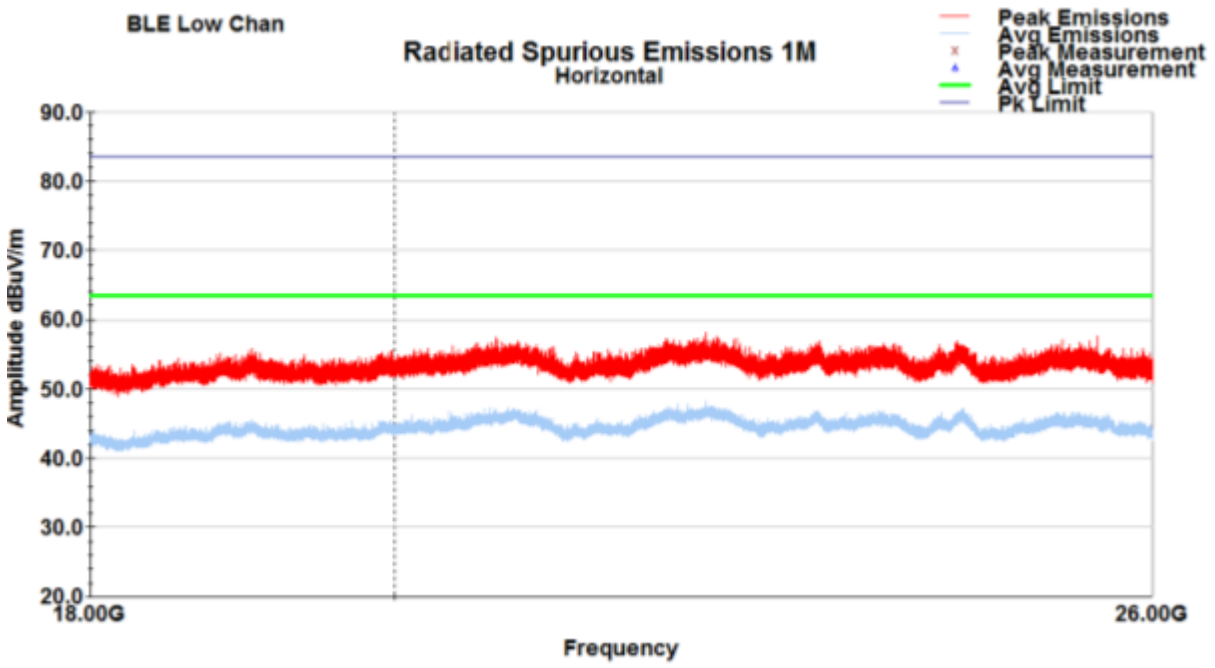
Horizontal (3-18GHz)



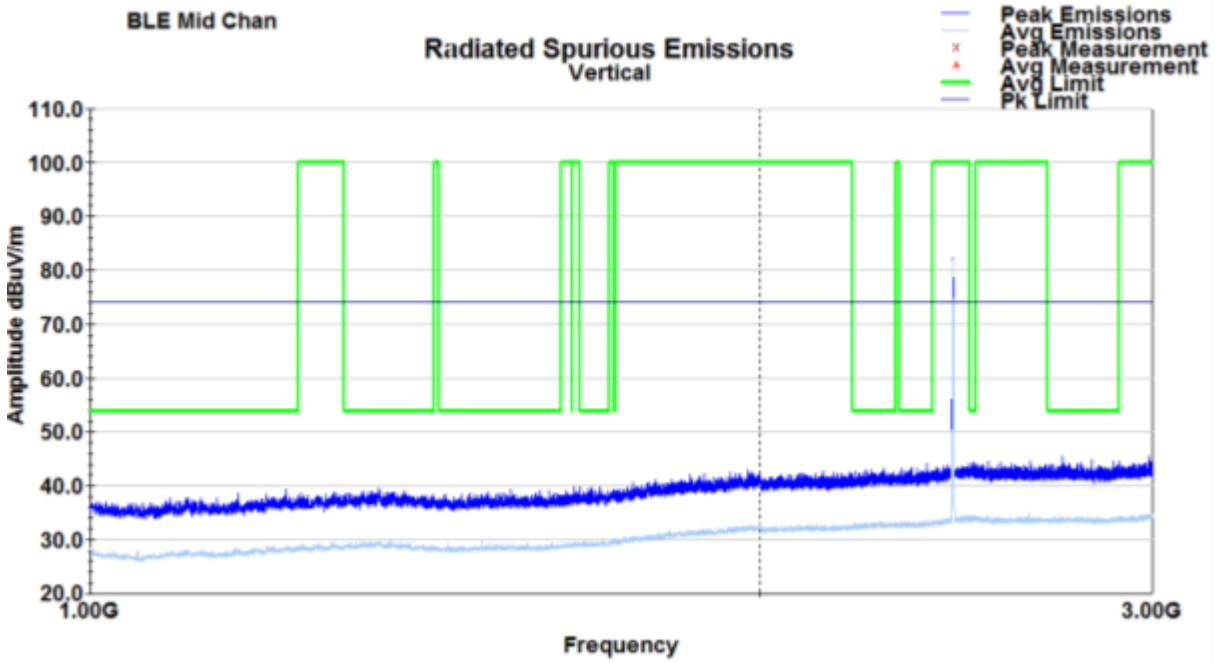
Vertical (18-26GHz)



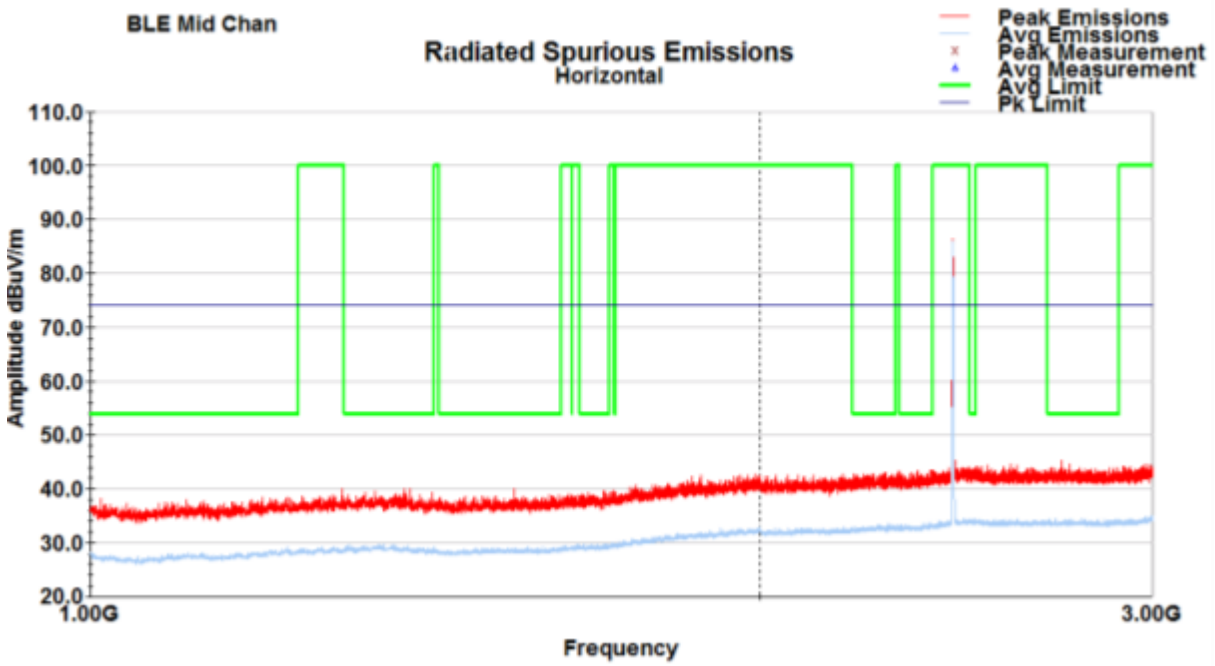
Horizontal (18-26GHz)



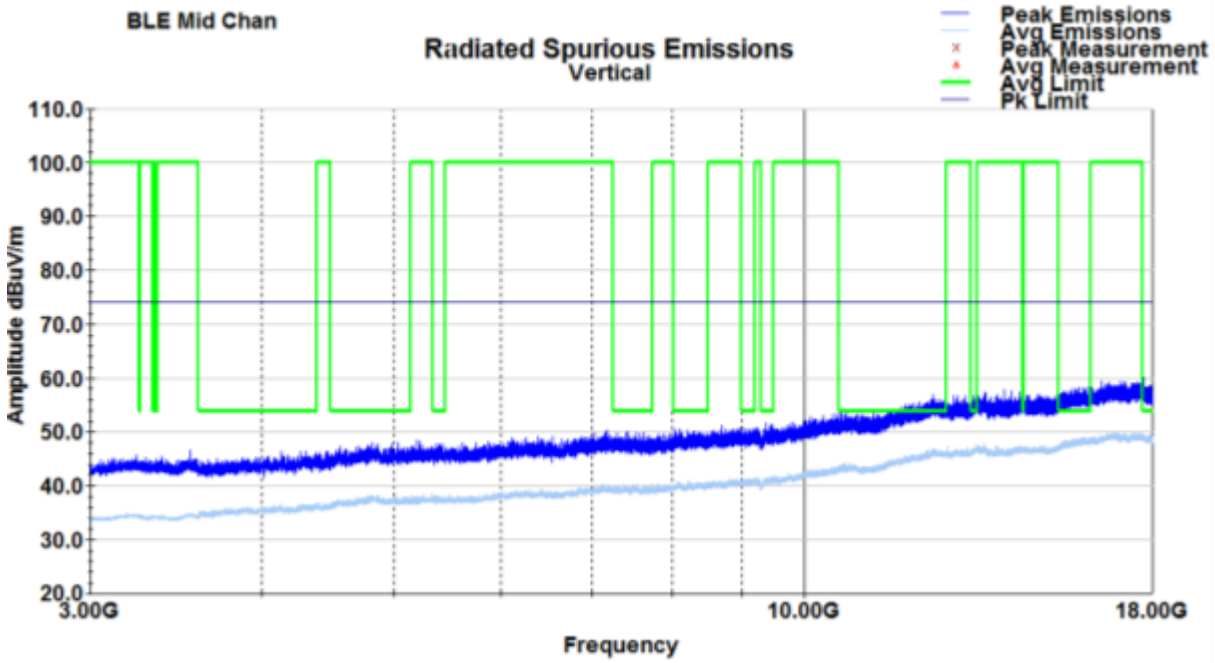
Vertical (1-3GHz)



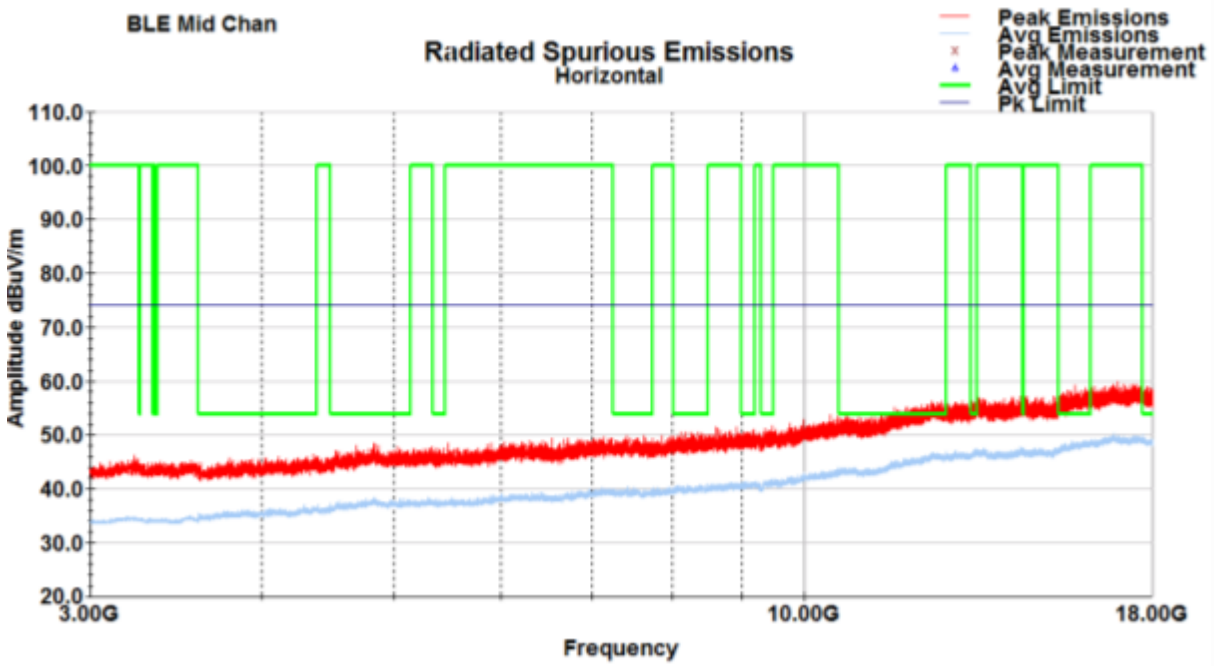
Horizontal (1-3GHz)



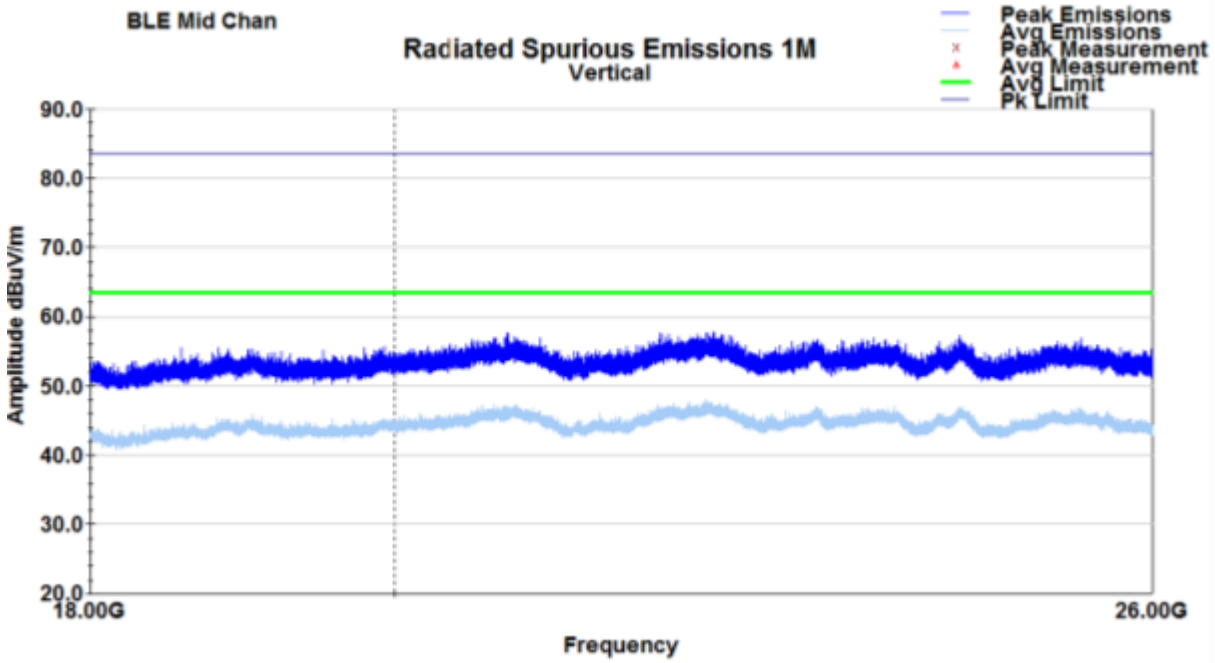
Vertical (3-18GHz)



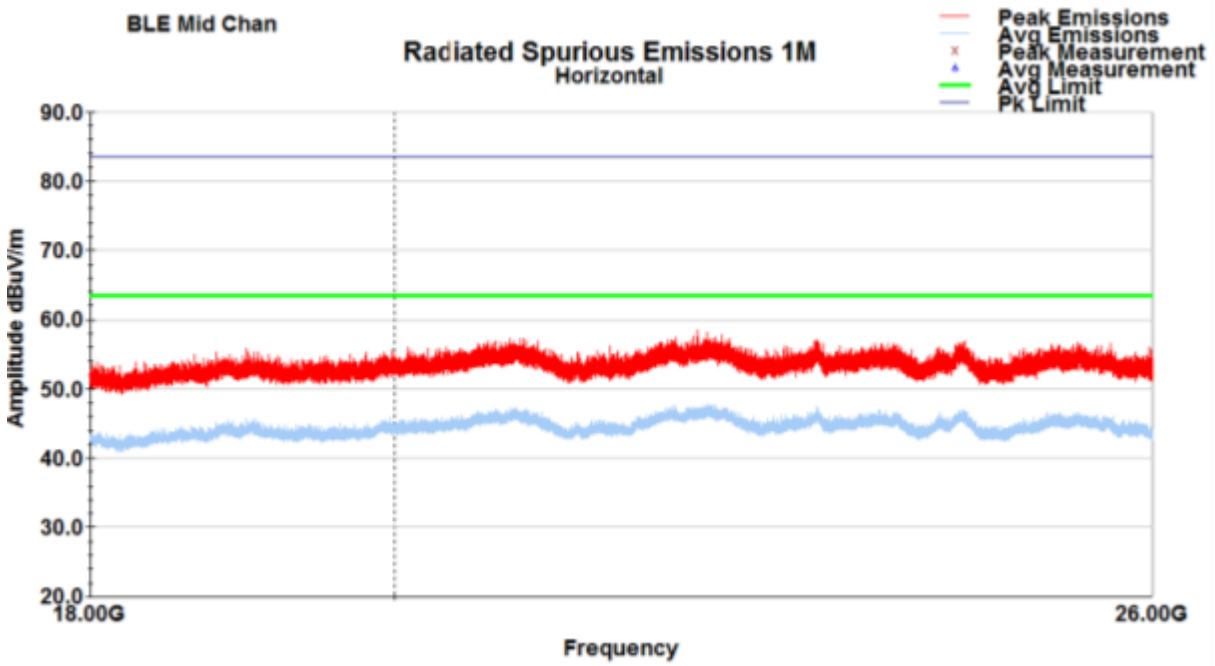
Horizontal (3-18GHz)



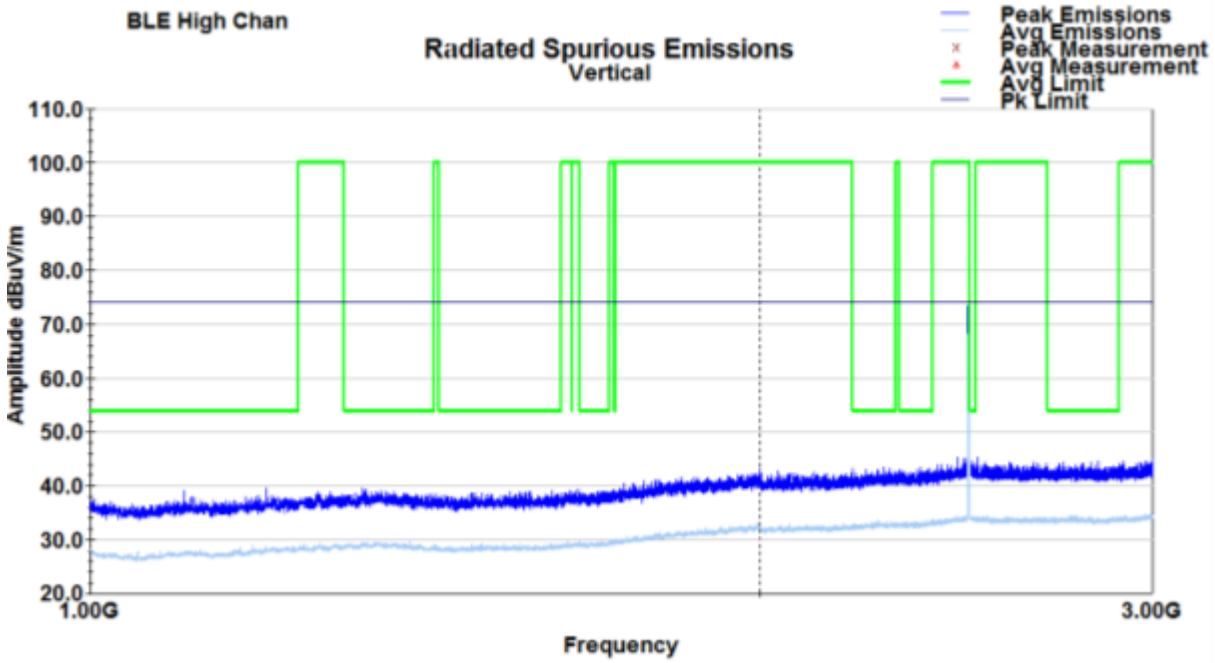
Vertical (18-26GHz)



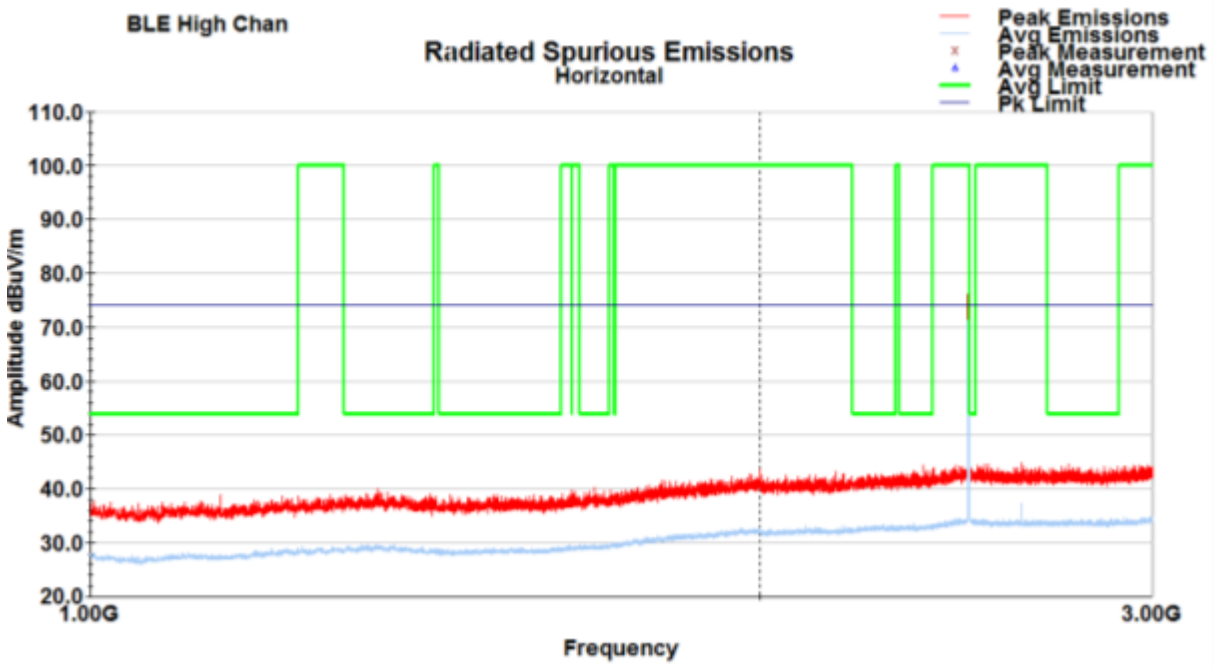
Horizontal (18-26GHz)



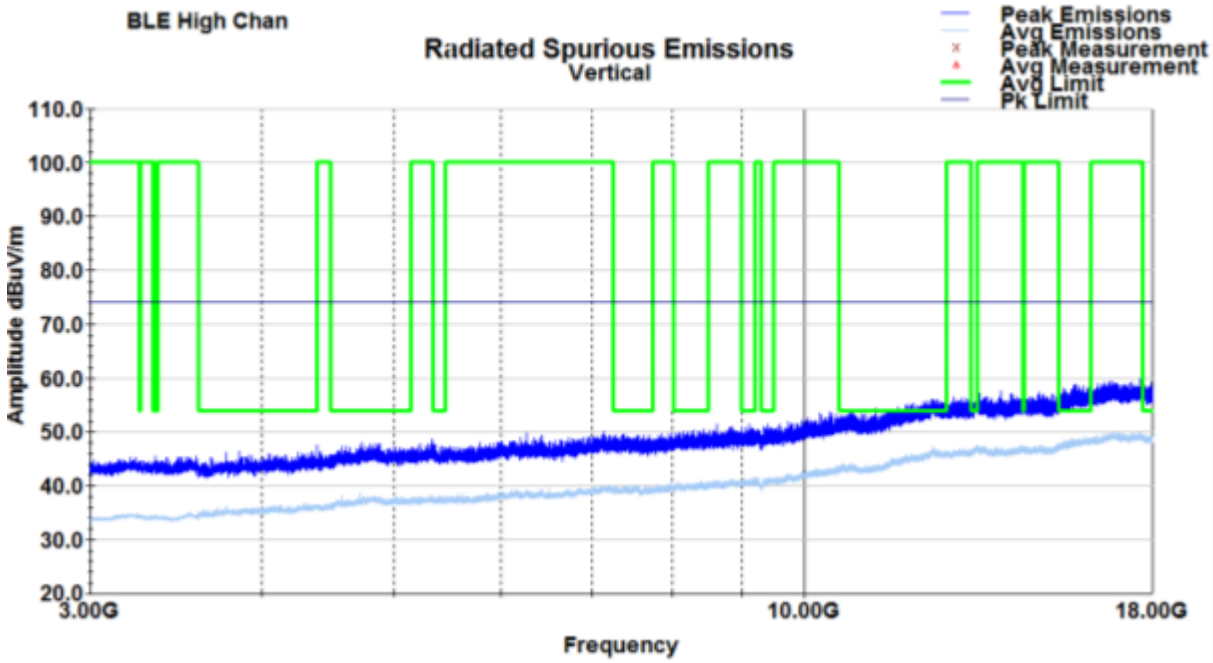
Vertical (1-3GHz)



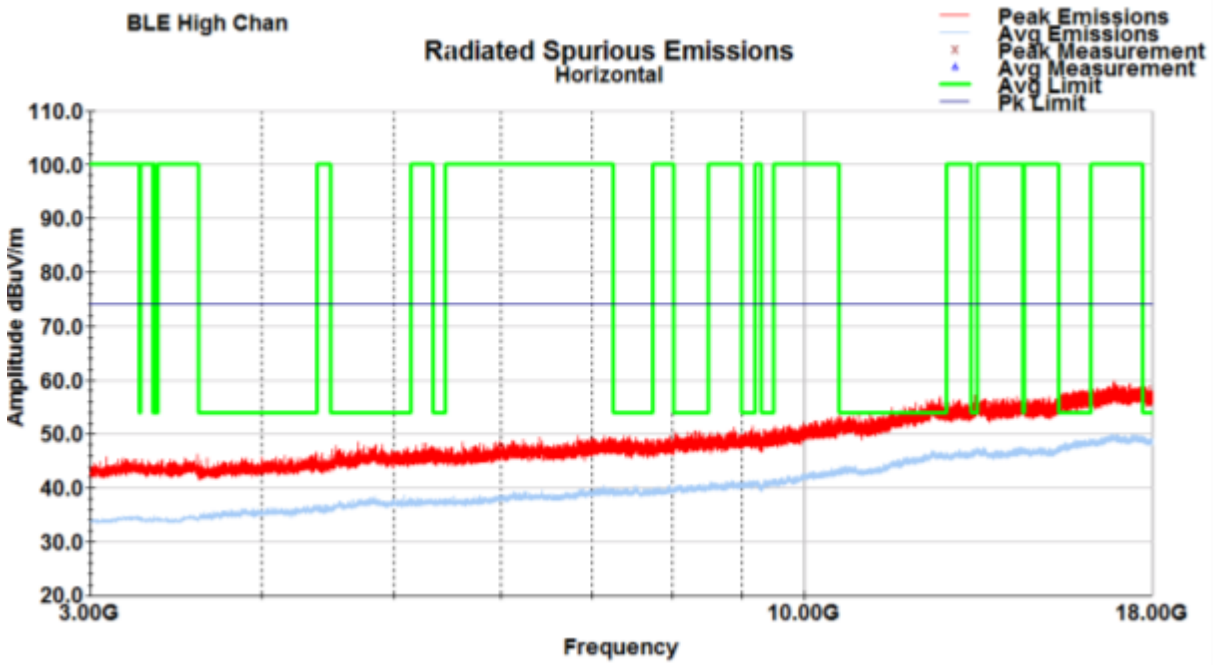
Horizontal (1-3GHz)



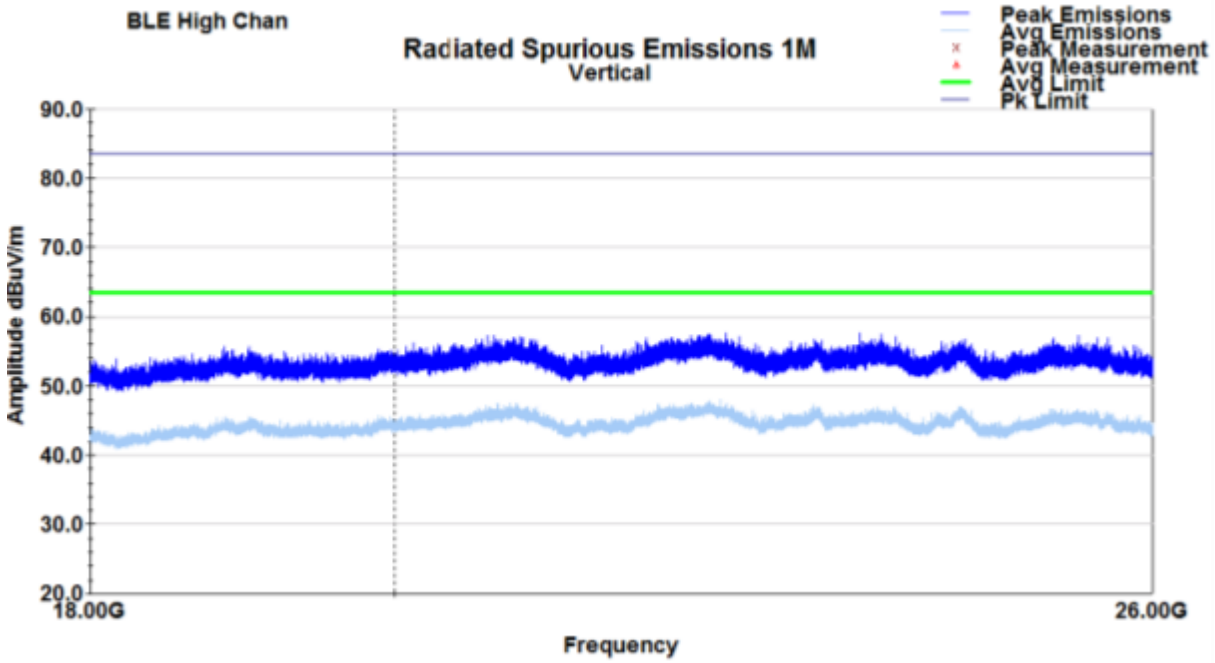
Vertical (3-18GHz)



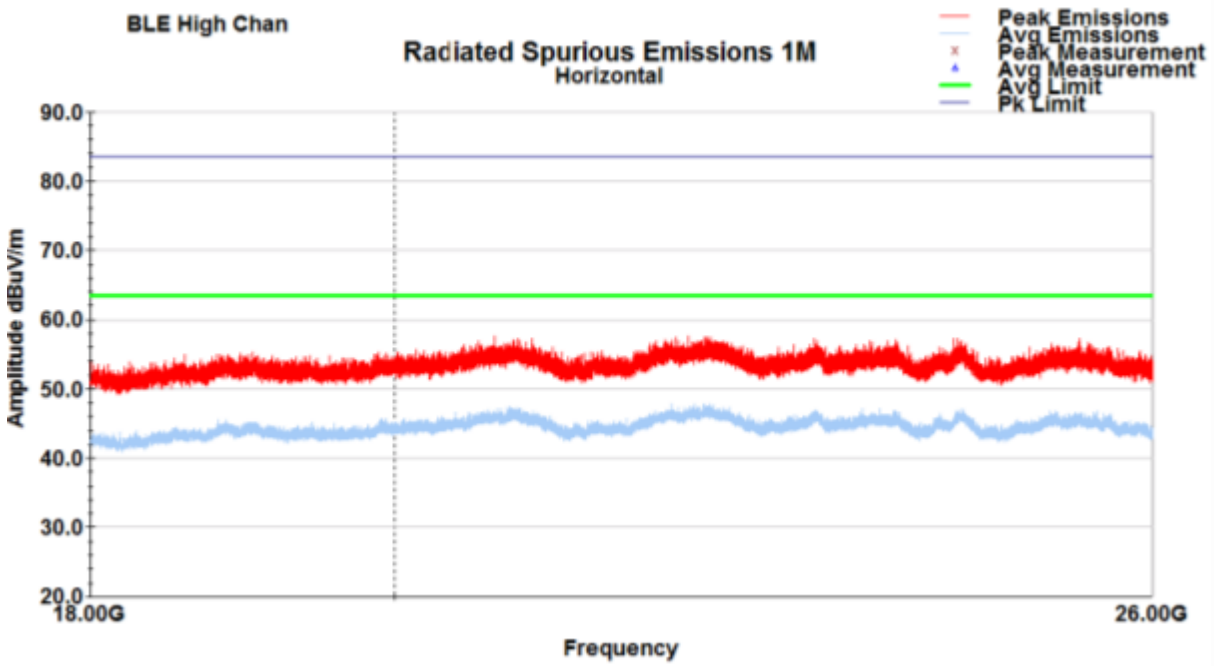
Horizontal (3-18GHz)



Vertical (18-26GHz)



Horizontal (18-26GHz)



3.3 *Test Data – Tabular Data*

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
134.86	46.2	V	152.0	100.0	13.3	1.5	34.7	26.3	33.0	-6.7
161.24	51.8	V	265.0	119.0	12.5	1.6	34.7	31.2	33.0	-1.8
167.28	51.2	V	276.0	201.0	12.1	1.7	34.7	30.2	33.0	-2.8
186.07	51.8	V	127.0	116.0	10.8	1.8	34.7	29.6	33.0	-3.4
191.37	52.0	V	97.0	129.0	11.0	1.8	34.7	30.1	33.0	-2.9
226.00	53.0	V	271.0	102.0	11.2	2.0	34.8	31.5	35.5	-4.0
239.58	55.0	V	97.0	102.0	11.8	2.0	34.8	34.1	35.5	-1.4
QP Value = Level + AF + CL - Amp										

Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
134.08	49.5	H	100.0	362.0	13.4	1.5	34.7	29.7	33.0	-3.3
161.24	53.0	H	115.0	395.0	12.5	1.6	34.7	32.4	33.0	-0.6
167.28	51.1	H	118.0	399.0	12.1	1.7	34.7	30.1	33.0	-2.9
174.78	51.3	H	102.0	399.0	11.2	1.7	34.7	29.5	33.0	-3.5
184.58	52.5	H	276.0	394.0	10.8	1.8	34.7	30.3	33.0	-2.7
225.26	50.7	H	3.0	361.0	11.1	2.0	34.8	29.1	35.5	-6.4
233.57	54.6	H	293.0	369.0	11.6	2.0	34.8	33.4	35.5	-2.1
239.58	54.8	H	105.0	399.0	11.8	2.0	34.8	33.8	35.5	-1.7
266.68	54.2	H	235.0	389.0	13.3	2.1	34.7	34.9	35.5	-0.6

Margin = QP Value - Limit

Note: There was no discernible difference in the measurement data below 1GHz when transmitting at different channels. QP measurements were only recorded with the device transmitting on Channel 1.

4 Radiated Emissions at Band Edge / Restricted Band

4.1 *Test Result*

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

4.2 *Test Method*

Field strength measurements were performed at the restricted band edges of 2390MHz and 2483.5MHz using the radiated methods defined in Section 8.6 of FCC publication 558074 D01 15.247 Meas Guidance v05r02.

4.3 *Test Site*

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions
Temperature: 24.8 °C
Relative Humidity: 44.6 %

4.4 *Test Equipment*

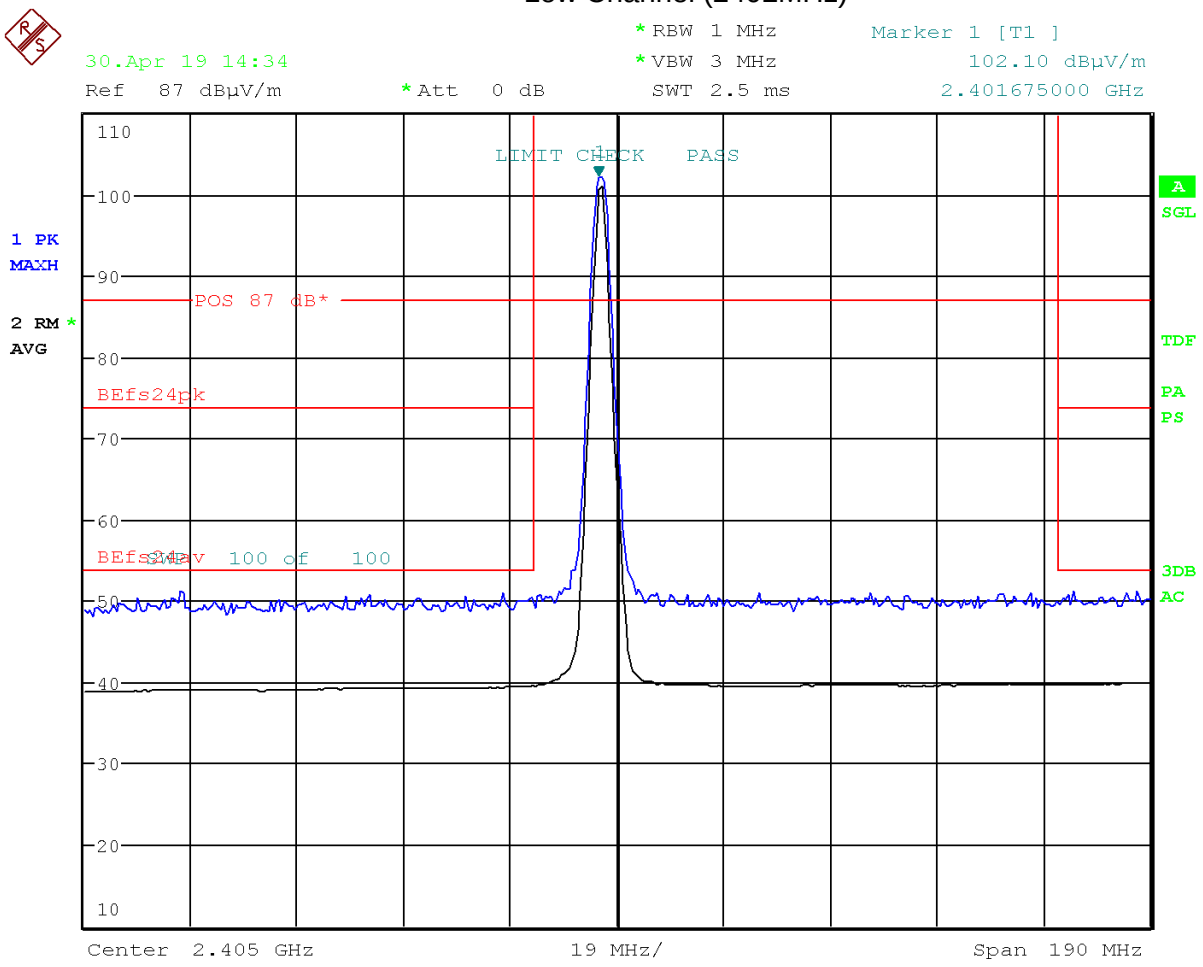
Test End Date: 1-May-2019 Tester: SKM

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	24-Jul-2019
RF CABLE	NMS-290-236.2-NMS	FLORIDA RF LABS	B095020	23-Jul-2019
RF CABLE	SF106	HUBER & SUHNER	B079659	23-Jul-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	24-Jan-2020

Note: The equipment calibration period is 1 year

Test Data – Restricted Band Edge

Low Channel (2402MHz)



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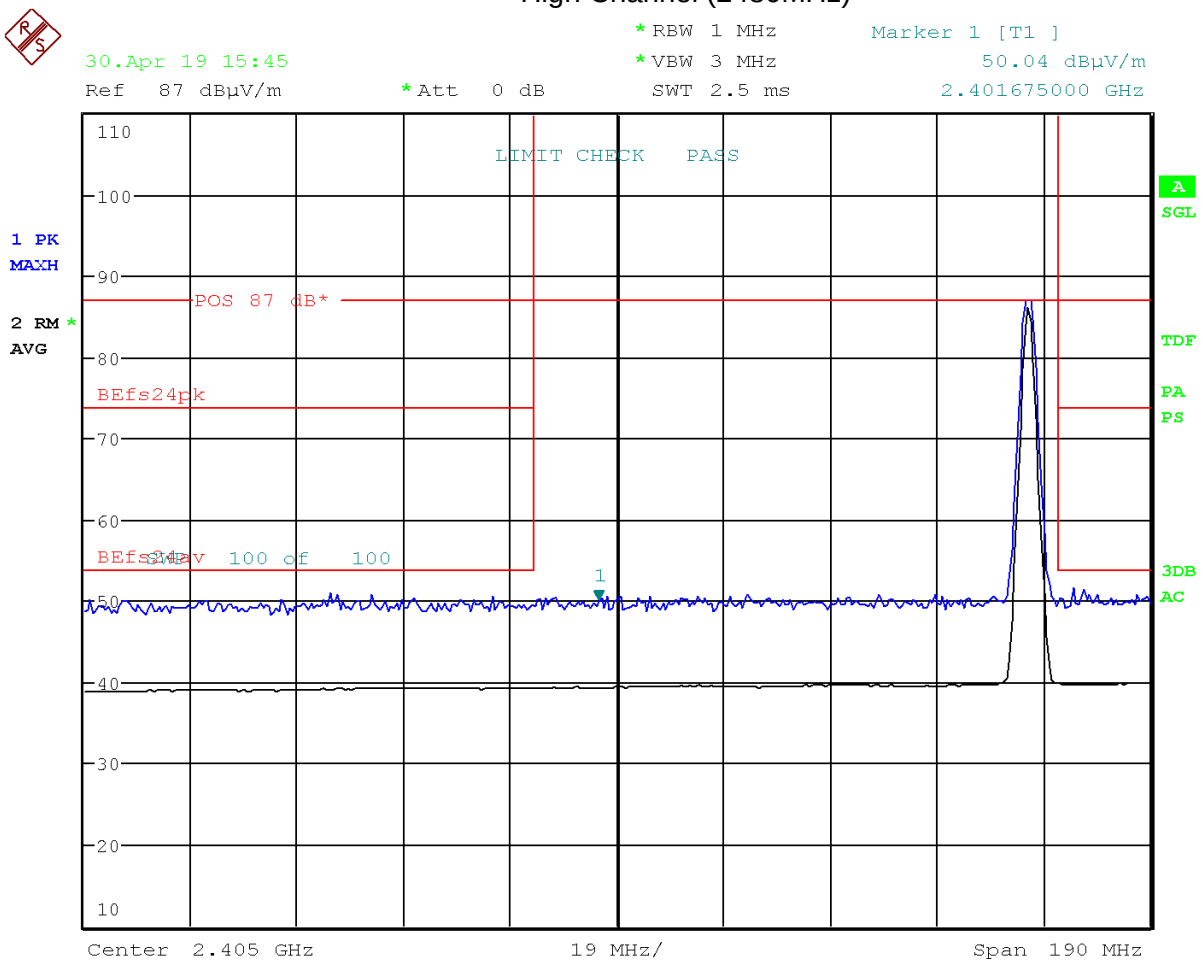
High Channel (2480MHz)



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5 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	13 May 2019