

EMC Test Report

Project Number: 4323973

Report Number: 4323973EMC01

Revision Level: 3

Client: MICHELIN NORTH AMERICA (US) INC.

Equipment Under Test: MICHELIN TRACK CONNECT

Model: MTC-V1

FCC ID: FI5-EX2-01

Applicable Standards: ANSI C63.10: 2013

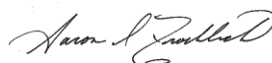
FCC Part 15 Subpart C, § 15.247

RSS-247, Issue 2 / RSS-GEN Issue 5

Report issued on: 6 May 2019

Test Result: Compliant

Tested by:

A handwritten signature in black ink, appearing to read 'Aaron Froehlich'.

Aaron Froehlich, EMC Test Engineer

Reviewed by:

A handwritten signature in blue ink, appearing to read 'David Schramm'.

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.

This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Table of Contents

1	SUMMARY OF TEST RESULTS	4
1.1	MODIFICATIONS REQUIRED FOR COMPLIANCE	4
2	GENERAL INFORMATION	5
2.1	CLIENT INFORMATION	5
2.2	TEST LABORATORY	5
2.3	GENERAL INFORMATION OF EUT	5
2.4	OPERATING MODES AND CONDITIONS	5
2.5	EUT CONNECTION BLOCK DIAGRAM – CONDUCTED MEASUREMENTS	6
2.6	EUT CONNECTION BLOCK DIAGRAM – RADIATED MEASUREMENTS	6
2.7	SYSTEM CONFIGURATIONS	7
3	BANDWIDTH	8
3.1	TEST RESULT	8
3.2	TEST METHOD	8
3.3	TEST SITE	8
3.4	TEST EQUIPMENT	8
3.5	TEST DATA	9
4	PEAK OUTPUT POWER	11
4.1	TEST RESULT	11
4.2	TEST METHOD	11
4.3	TEST SITE	11
4.4	TEST EQUIPMENT	11
4.5	TEST DATA	12
5	POWER SPECTRAL DENSITY	13
5.1	TEST RESULT	13
5.2	TEST METHOD	13
5.3	TEST SITE	13
5.4	TEST EQUIPMENT	13
5.5	TEST DATA	14
6	CONDUCTED SPURIOUS EMISSIONS / BAND EDGE	15
6.1	TEST RESULT	15
6.2	TEST METHOD	15
6.3	TEST SITE	15
6.4	TEST EQUIPMENT	15
6.5	TEST DATA – DTS BAND EDGE	16
6.6	TEST DATA – CONDUCTED SPURIOUS EMISSIONS	17
7	FIELD STRENGTH OF SPURIOUS RADIATION	19
7.1	TEST RESULT	19
7.2	TEST METHOD	19
7.3	TEST SITE	19
7.4	TEST EQUIPMENT	20
7.5	TEST DATA	21
8	EMISSIONS IN RESTRICTED FREQUENCY BANDS	29
8.1	TEST RESULT	29
8.2	TEST METHOD	29
8.3	TEST SITE	29
8.4	TEST EQUIPMENT	29
8.5	TEST DATA – RESTRICTED BAND EDGE	30



9	REVISION HISTORY	31
----------	-------------------------------	-----------

1 Summary of Test Results

Test Description	Test Specification		Test Result
Bandwidth	15.247(d)	RSS-247 S5.2 (1) RSS-GEN S6.7	Compliant
Peak 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
Field Strength of Spurious Radiation	15.247(d), 15.209	RSS-247 S5.5	Compliant
Emissions in Restricted Frequency Bands	15.205, 15.209	RSS-GEN S8.9, S8.10	Compliant
Antenna Requirement	15.203	RSS-GEN S6.8	Compliant ²
AC Powerline Conducted Emissions	15.107, 15.207	RSS-GEN S8.8	N/A ¹

Notes:

1. DUT is DC powered.
2. Antenna is integral PCB Trace

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: MICHELIN NORTH AMERICA (US) INC.
Address: One Parkway South
City, State, Zip, Country: Greenville, SC 29615 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

Product Marketing Name (PMN): MICHELIN TRACK CONNECT
Model Number (HVIN): MTC-V1
Firmware Version ID (FVIN): V2.0
Serial Number: 20180308.0245

Frequency Range: 2402 – 2480 MHz
Data Modes: Bluetooth Low Energy – GFSK
Antenna: Internal PCB Trace, -2dBi

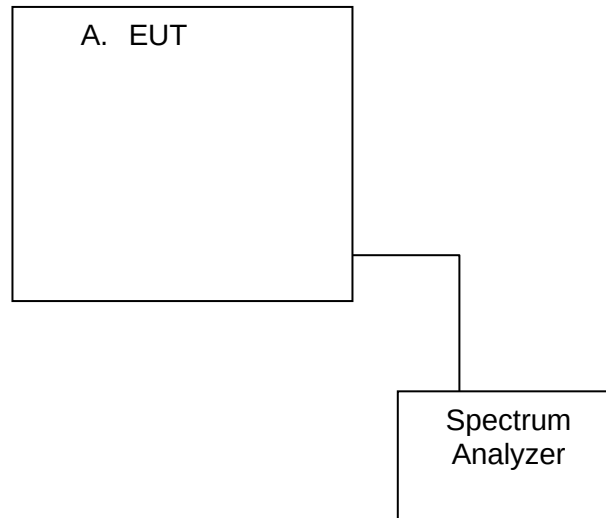
Rated Voltage: 5 V_{DC}
Test Voltage: 5 V_{DC}

Sample Received Date: 6/6/2018
Dates of testing: 8/2/2018-8/28/2018

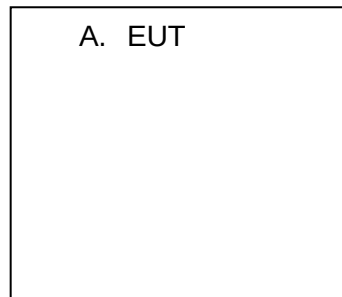
2.4 Operating Modes and Conditions

The EUT was programmed by the manufacturer to transmit on low, mid and high channels in all necessary modulation and modes of operation.

2.5 *EUT Connection Block Diagram – Conducted Measurements*



2.6 *EUT Connection Block Diagram – Radiated Measurements*



Inside Chamber

.....
Outside Chamber

2.7 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Michelin	EUT	MTC-V1	20180308.0245

3 Bandwidth

3.1 Test Result

Test Description	Test Specification		Test Result
Bandwidth	15.247(d)	RSS-247 S5.2 (1) RSS-GEN S6.7	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.

3.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.9 °C

Relative Humidity: 50.1 %

Atmospheric Pressure: 98.0 kPa

3.4 Test Equipment

Test End Date: 7-Aug-2018

Tester: ASF

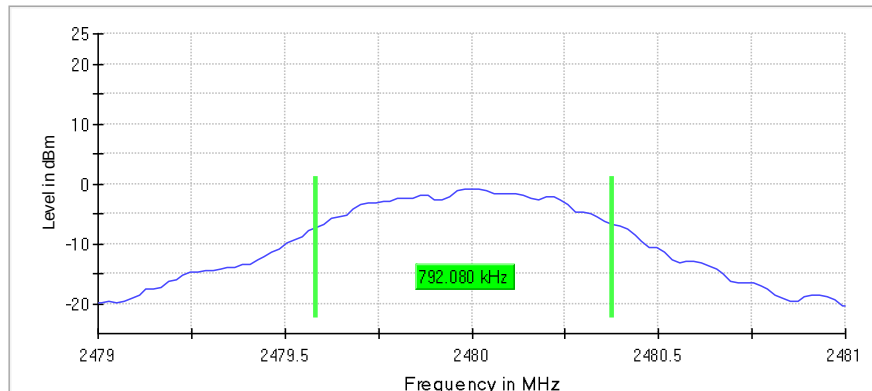
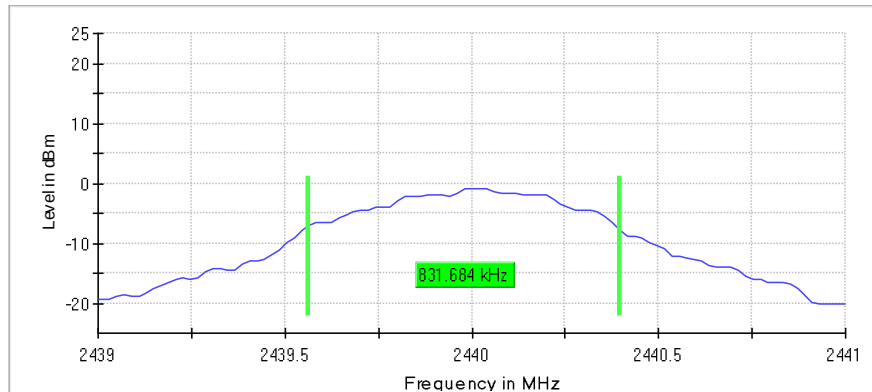
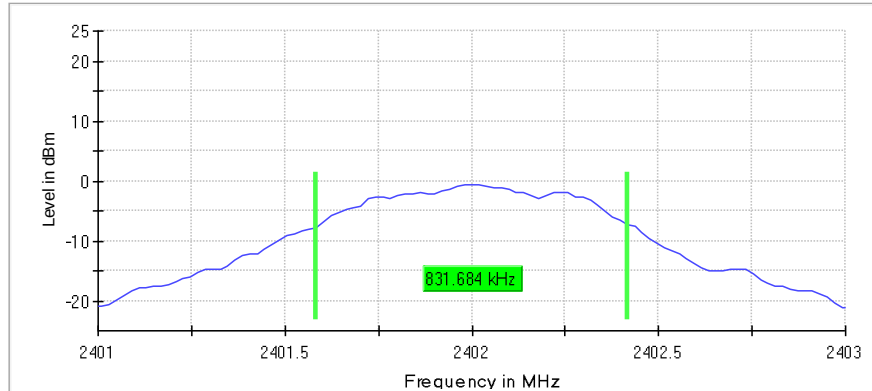
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095592	25-Jul-2019
RF CABLE	141	HUBER & SUHNER	B095587	25-Jul-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019

Note: The equipment calibration period is 1 year.

3.5 Test Data

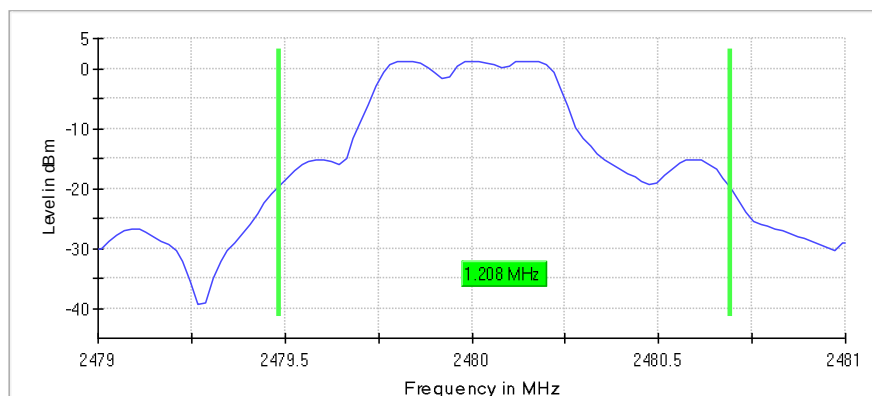
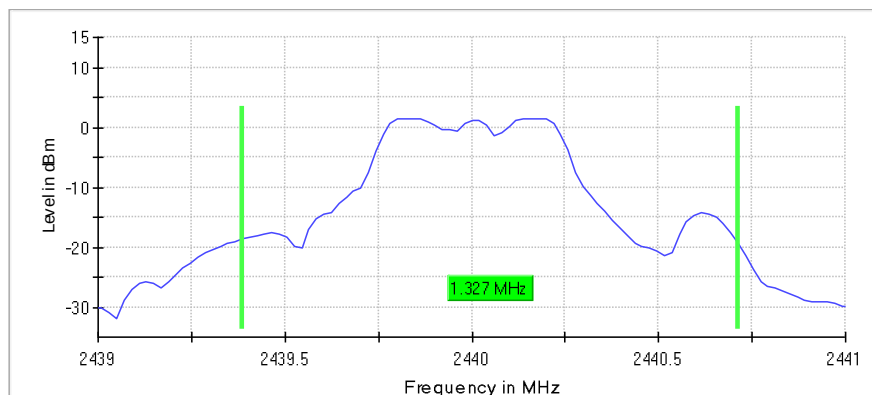
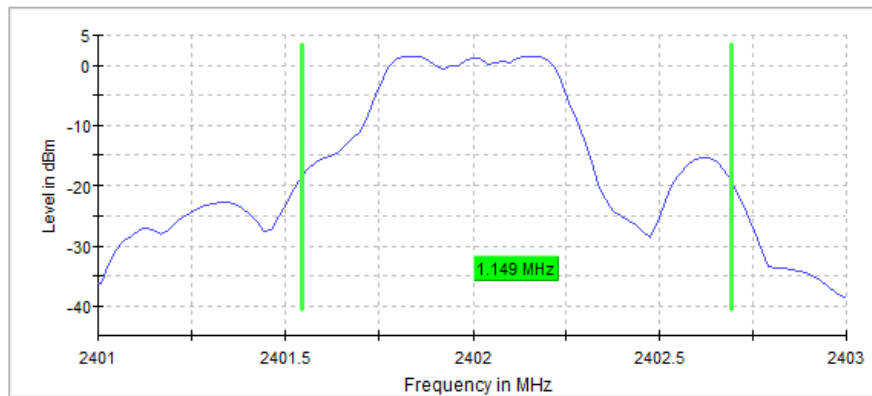
3.5.1 6 dB BW

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2402.000000	0.831684	0.500000	2401.584158	2402.415842	-0.7	PASS
2440.000000	0.831684	0.500000	2439.564356	2440.396040	-0.8	PASS
2480.000000	0.792080	0.500000	2479.584158	2480.376238	-0.9	PASS



3.5.2 99% OBW

DUT Frequency (MHz)	Bandwidth (MHz)	Limit Min (MHz)	Limit Max (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2402	1.148515	---	---	2401.5446	2402.6931	1.4	PASS
2440	1.326732	---	---	2439.3861	2440.7129	1.5	PASS
2480	1.20792	---	---	2479.4851	2480.6931	1.2	PASS



4 Peak 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 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: 23.9 °C
Relative Humidity: 50.1 %
Atmospheric Pressure: 98.0 kPa

4.4 Test Equipment

Test End Date: 7-Aug-2018

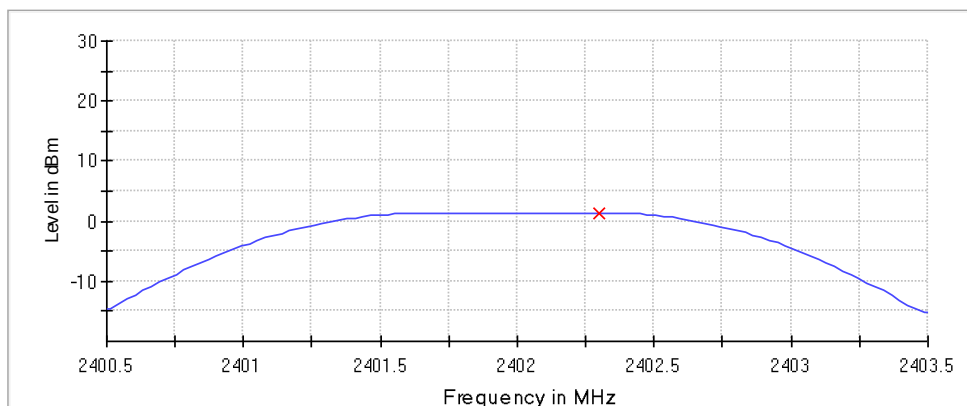
Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095592	25-Jul-2019
RF CABLE	141	HUBER & SUHNER	B095587	25-Jul-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019

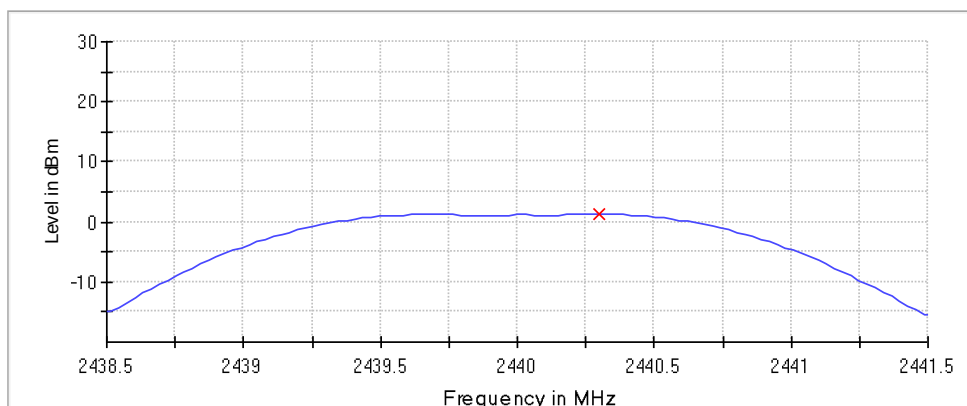
Note: The equipment calibration period is 1 year.

4.5 Test Data

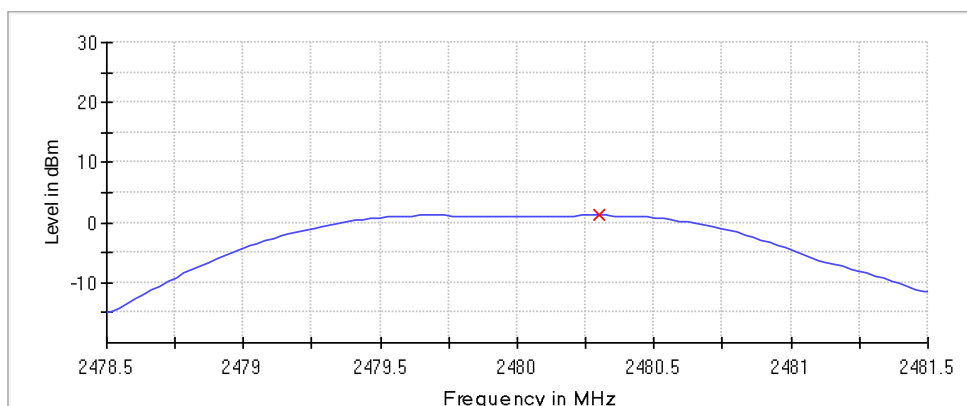
DUT Frequency (MHz)	Peak Power (dBm)	Limit Max (dBm)	Result
2402.000000	1.4	30.0	PASS
2440.000000	1.3	30.0	PASS
2480.000000	1.2	30.0	PASS



— Connector 1 × Peak Connector 1



— Connector 1 × Peak Connector 1



— Connector 1 × Peak Connector 1

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 v04.

Limit

The limit is 8 dBm.

5.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.9 °C
Relative Humidity: 50.1 %
Atmospheric Pressure: 98.0 kPa

5.4 Test Equipment

Test End Date: 7-Aug-2018

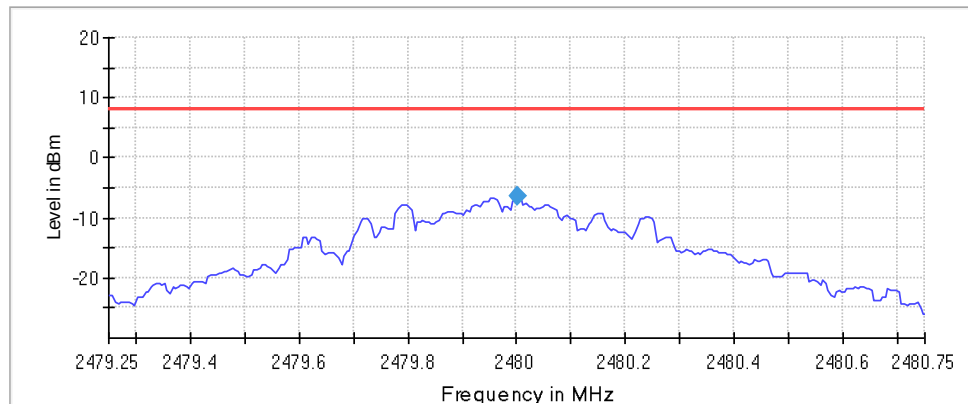
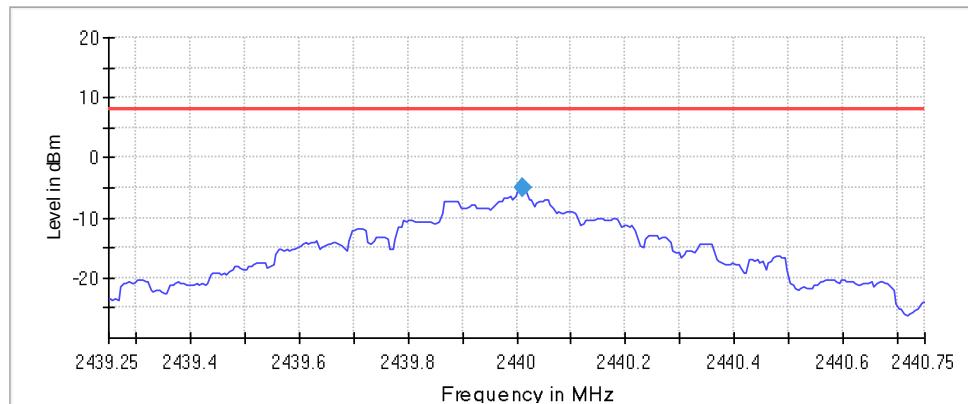
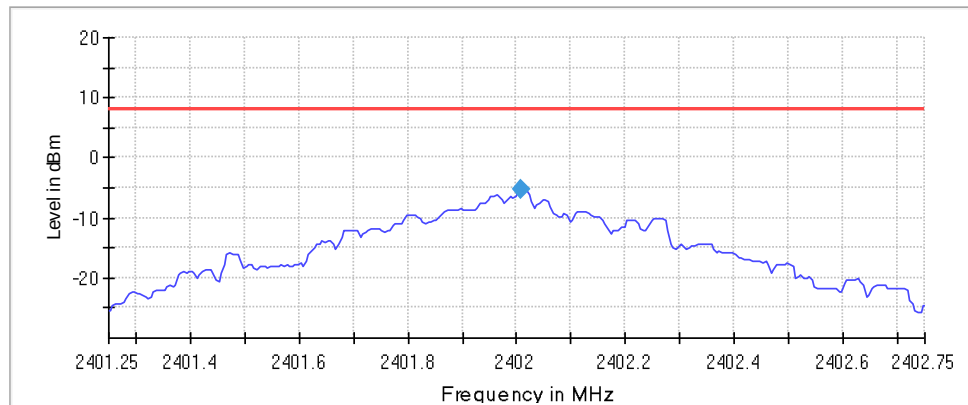
Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095592	25-Jul-2019
RF CABLE	141	HUBER & SUHNER	B095587	25-Jul-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019

Note: The equipment calibration period is 1 year.

5.5 Test Data

DUT Frequency (MHz)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2402.000000	2402.007500	-5.145	8.0	PASS
2440.000000	2440.012500	-5.065	8.0	PASS
2480.000000	2480.002500	-6.377	8.0	PASS



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 Measurement 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

Temperature: 23.1 °C

Relative Humidity: 49.1 %

Atmospheric Pressure: 98.2 kPa

6.4 Test Equipment

Test End Date: 23-Aug-2018

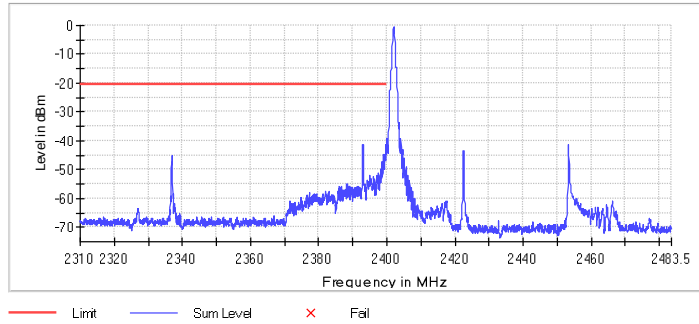
Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095592	25-Jul-2019
RF CABLE	141	HUBER & SUHNER	B095587	25-Jul-2019
SIGNAL ANALYZER (TS8997)	FSV30	ROHDE & SCHWARZ	B085749	1-Nov-2019
RF SWITCH (TS8997)	OSP	ROHDE & SCHWARZ	15039	15-Dec-2019
RF CABLE	SF102	HUBER & SUHNER	B079824	25-Jul-2019
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019

Note: The equipment calibration period is 1 year.

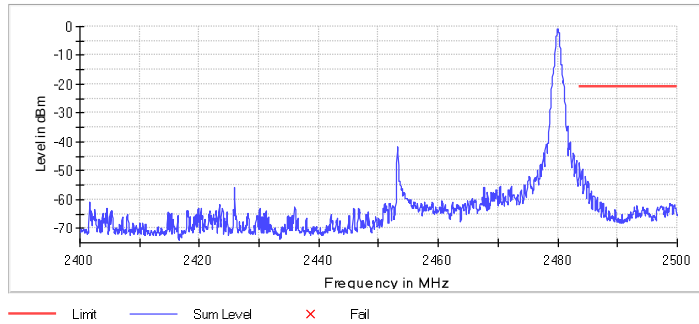
6.5 Test Data – DTS Band Edge

BLE - Lower band edge:



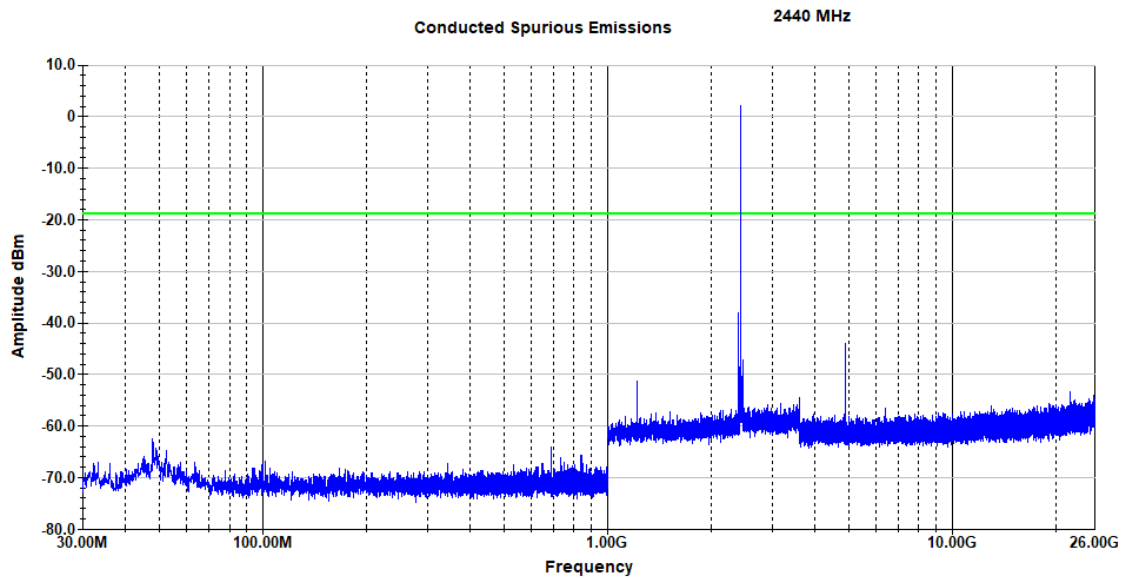
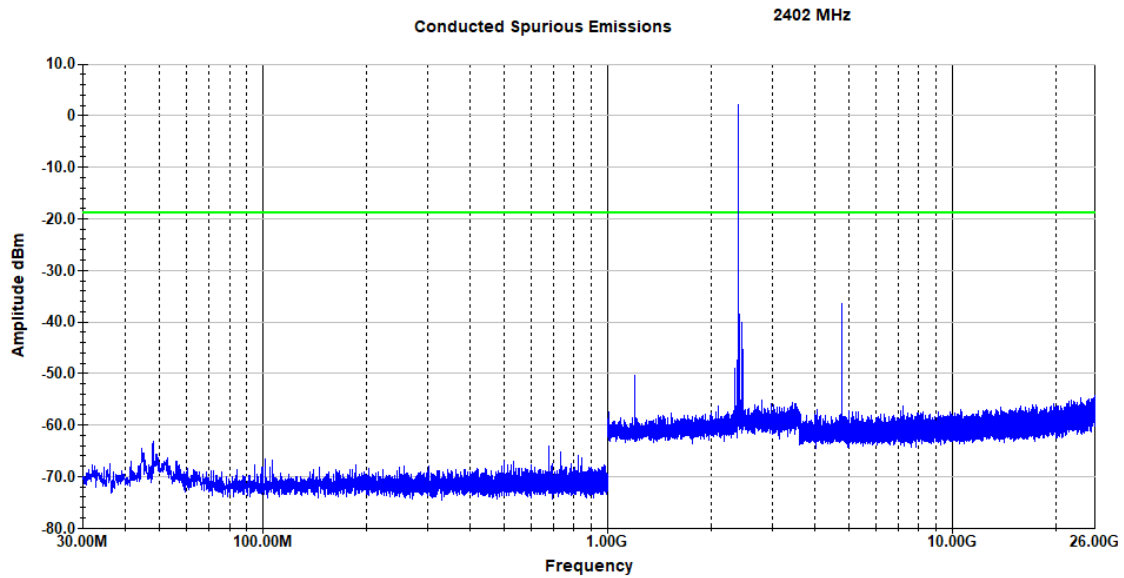
Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.975000	-39.3	18.8	-20.6	PASS
2399.925000	-40.0	19.4	-20.6	PASS
2392.975000	-41.3	20.7	-20.6	PASS
2399.875000	-41.5	20.9	-20.6	PASS
2399.625000	-41.5	21.0	-20.6	PASS
2399.575000	-41.5	21.0	-20.6	PASS
2392.925000	-41.5	21.0	-20.6	PASS
2393.025000	-41.9	21.3	-20.6	PASS
2399.525000	-42.6	22.0	-20.6	PASS
2399.675000	-42.8	22.2	-20.6	PASS
2399.825000	-43.5	23.0	-20.6	PASS
2392.875000	-43.8	23.2	-20.6	PASS
2399.075000	-44.7	24.1	-20.6	PASS
2393.075000	-44.7	24.2	-20.6	PASS
2399.125000	-44.7	24.2	-20.6	PASS

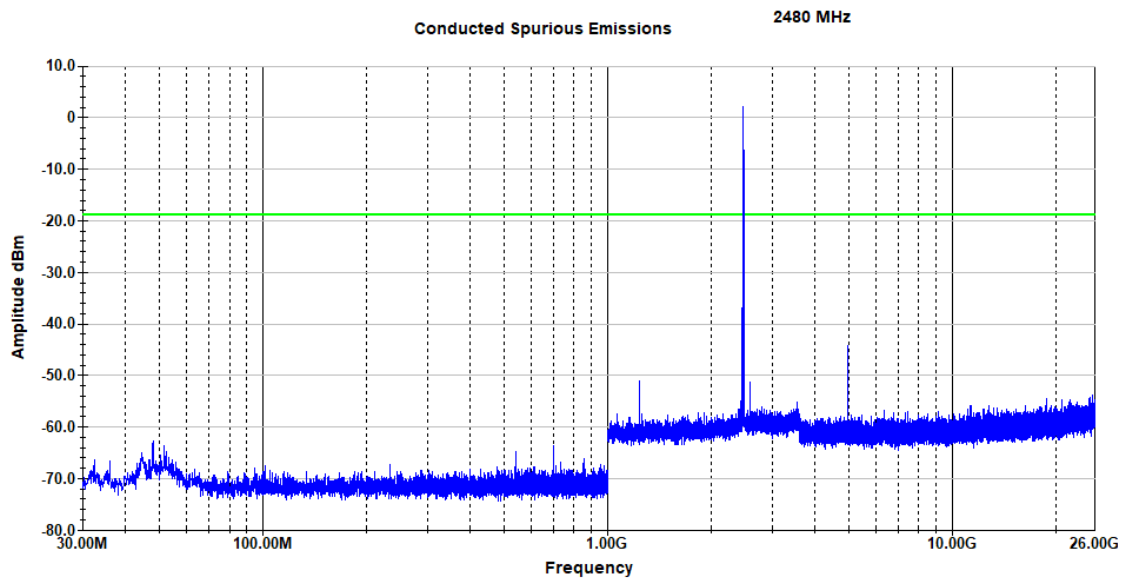
BLE - Upper band edge:



Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2483.625000	-47.3	26.4	-21.0	PASS
2483.575000	-47.9	26.9	-21.0	PASS
2483.675000	-47.9	27.0	-21.0	PASS
2483.525000	-48.7	27.8	-21.0	PASS
2484.125000	-49.6	28.6	-21.0	PASS
2484.175000	-50.1	29.2	-21.0	PASS
2484.075000	-50.3	29.3	-21.0	PASS
2484.025000	-51.3	30.3	-21.0	PASS
2483.725000	-51.7	30.8	-21.0	PASS
2483.975000	-51.9	30.9	-21.0	PASS
2484.625000	-52.1	31.1	-21.0	PASS
2484.675000	-52.5	31.5	-21.0	PASS
2484.575000	-52.5	31.6	-21.0	PASS
2483.925000	-52.8	31.8	-21.0	PASS
2483.875000	-53.3	32.3	-21.0	PASS

6.6 Test Data – Conducted Spurious Emissions





7 Field Strength of Spurious Radiation

7.1 Test Result

Test Description	Test Specification		Test Result
Radiated 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. Compliance has been demonstrated by performing radiated cabinet emissions with the antenna port terminated at 50 Ω and performing antenna port conducted emissions.

Lowest, middle, and highest channels were investigated – the device was commanded to continuously transmit on channels low, middle, and high channels.

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 3 meters

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: 23.4 °C
Relative Humidity: 55.9 %
Atmospheric Pressure: 97.9 kPa

7.4 Test Equipment

Test End Date: 2-Aug-2018

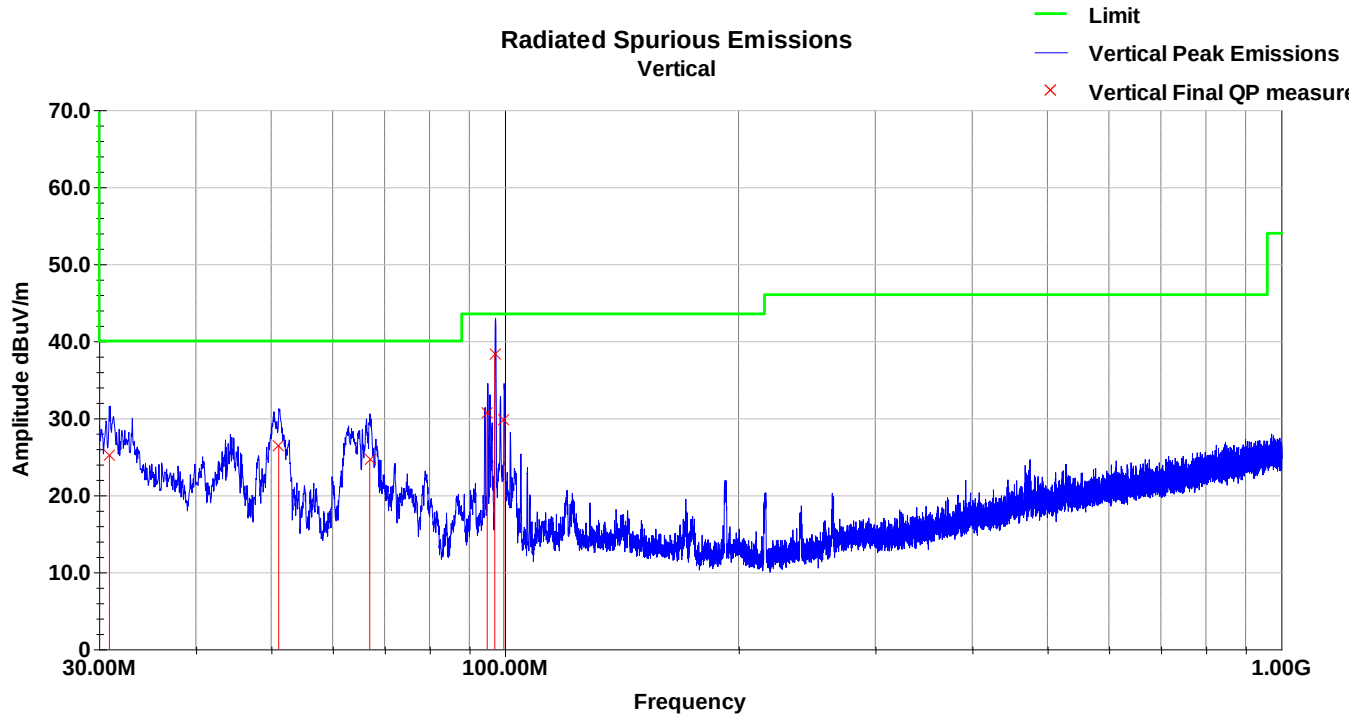
Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
ANTENNA, BILOG	JB6	SUNOL	B079689	16-Oct-2018
RF CABLE	NMS-290-236.2-NMS	FLORIDA RF LABS	B095020	23-Jul-2019
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	24-Jul-2019
RF CABLE	UC-N-MM-78	MAURY MICROWAVE	17016	23-Jul-2019
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	6-Mar-2019
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2019
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019

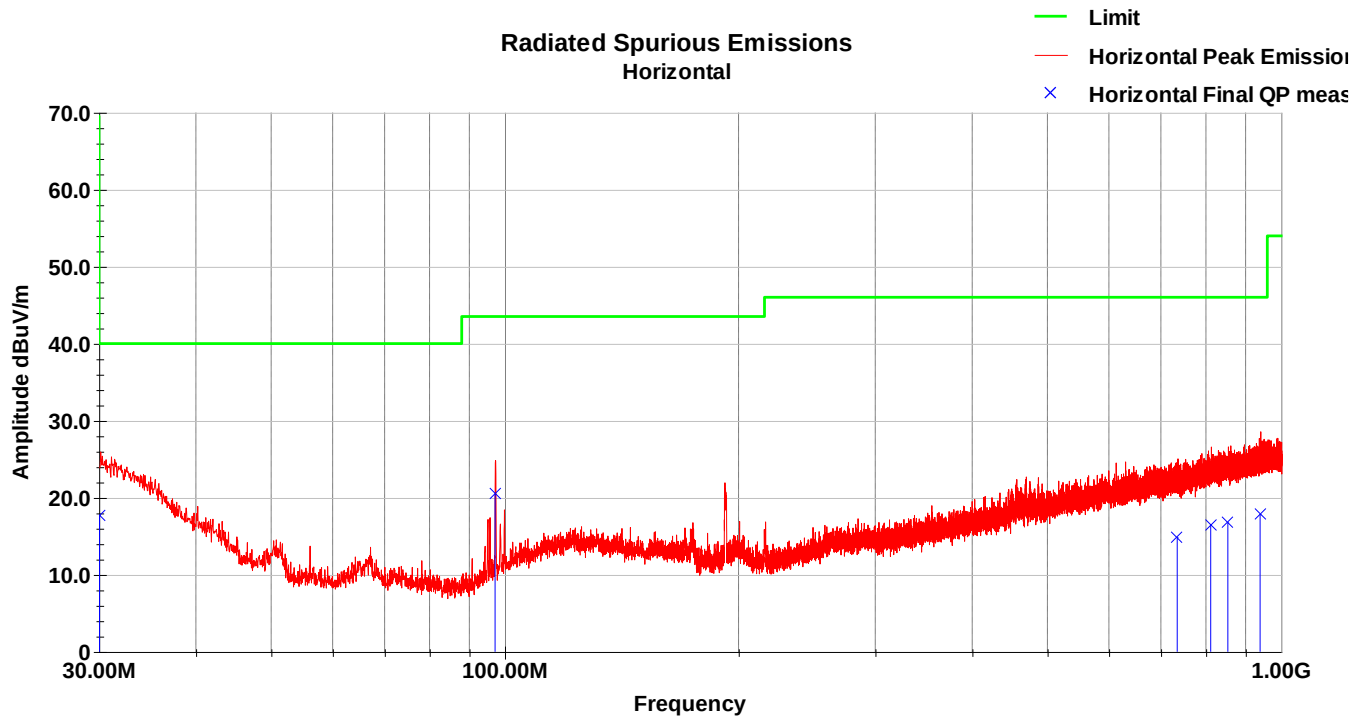
Note: The equipment calibration period is 1 year.

7.5 Test Data

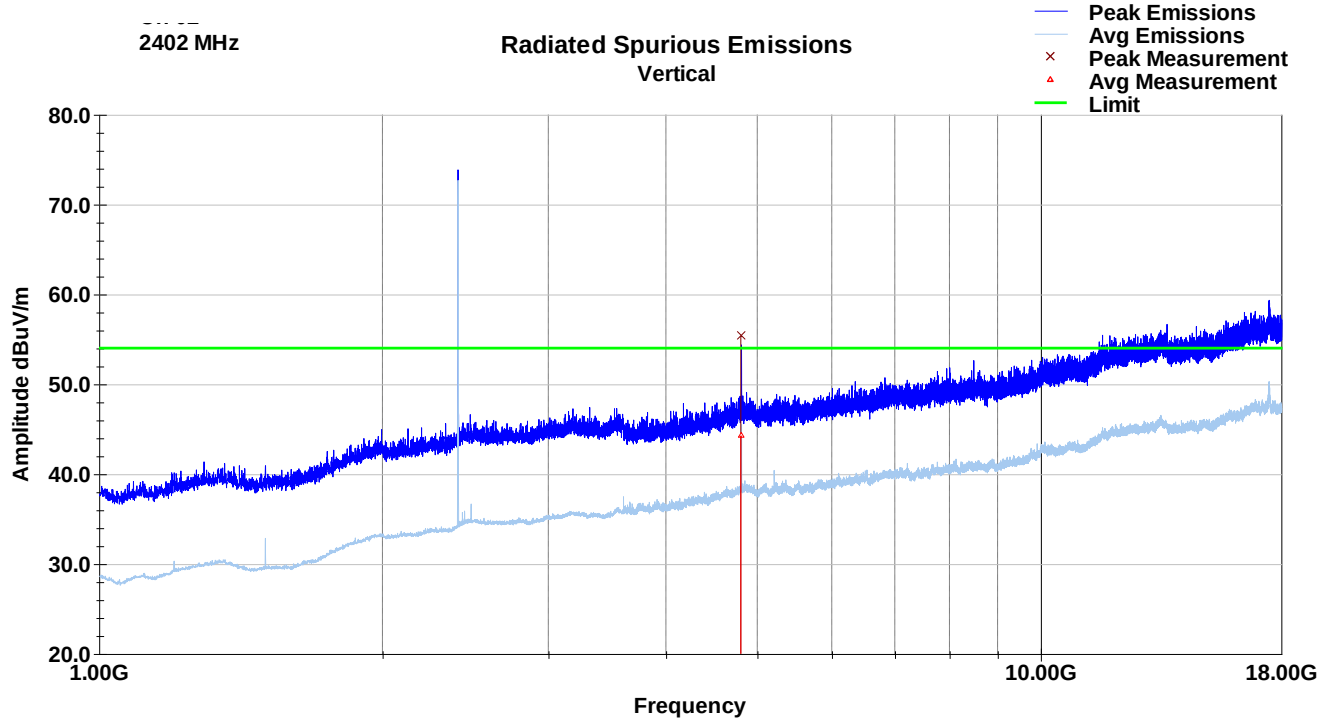
No emissions were detected in the range 9kHz to 30MHz.
There was no significant difference in emissions per channel below 1 GHz.



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)
30.95	35.4	V	52.0	116.0	21.0	0.4	31.7	25.2	40.0	-14.8
51.13	50.4	V	218.0	120.0	8.4	0.5	32.9	26.4	40.0	-13.6
66.99	49.2	V	325.0	119.0	8.0	0.6	33.3	24.6	40.0	-15.4
94.92	54.6	V	269.0	155.0	9.0	0.7	33.6	30.7	43.5	-12.8
97.06	61.6	V	190.0	118.0	9.7	0.8	33.7	38.3	43.5	-5.2
99.72	52.3	V	5.0	133.0	10.4	0.8	33.7	29.8	43.5	-13.8
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

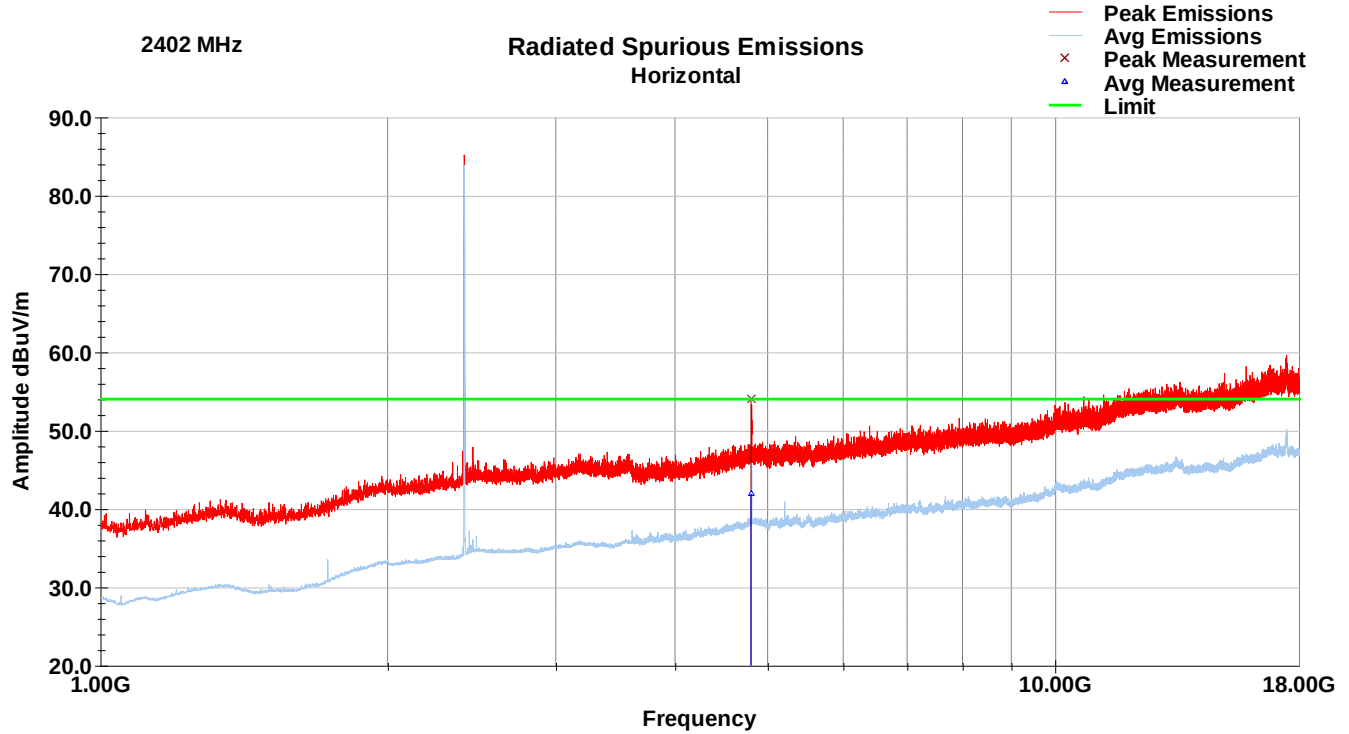


Frequency MHz	Raw QP (dBuV)	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	QP Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)
30.05	27.2	H	32.0	248.0	21.8	0.4	31.6	17.7	40.0	-22.3
97.16	43.7	H	84.0	156.0	9.7	0.8	33.7	20.5	43.5	-23.0
734.88	25.0	H	361.0	141.0	21.1	2.1	33.3	14.9	46.0	-31.1
811.51	25.1	H	95.0	206.0	22.5	2.2	33.3	16.5	46.0	-29.5
853.76	25.1	H	249.0	210.0	22.7	2.3	33.3	16.8	46.0	-29.2
939.40	25.1	H	174.0	141.0	23.6	2.4	33.2	17.9	46.0	-28.1
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



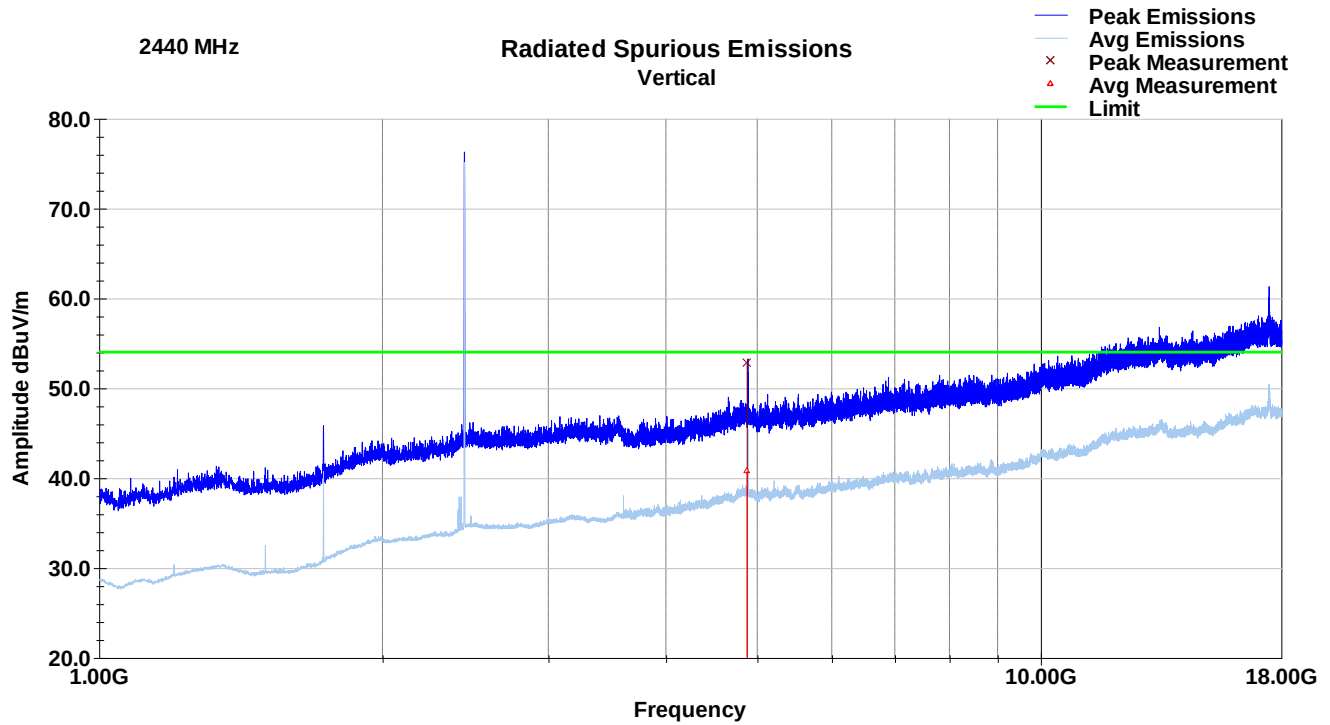
Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4804.12	51.2	V	49.0	250.0	34.7	3.0	33.5	55.4	74.0	-18.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit (dBuV/m)	Margin (dB)
4804.12	40.1	V	49.0	250.0	34.7	3.0	33.5	44.3	54.0	-9.7
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



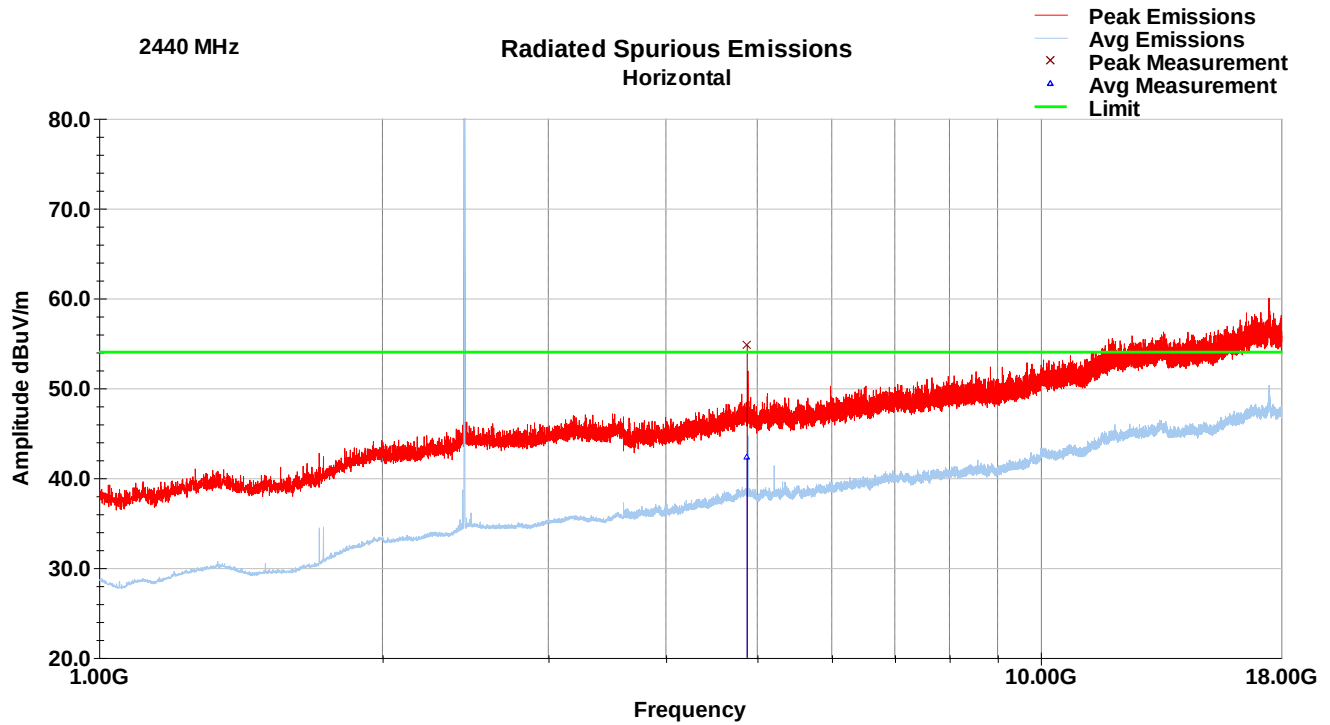
Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4804.00	49.9	H	250.0	209.0	34.7	3.0	33.5	54.1	74.0	-19.9
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit (dBuV/m)	Margin (dB)
4804.00	37.7	H	250.0	209.0	34.7	3.0	33.5	41.9	54.0	-12.1
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



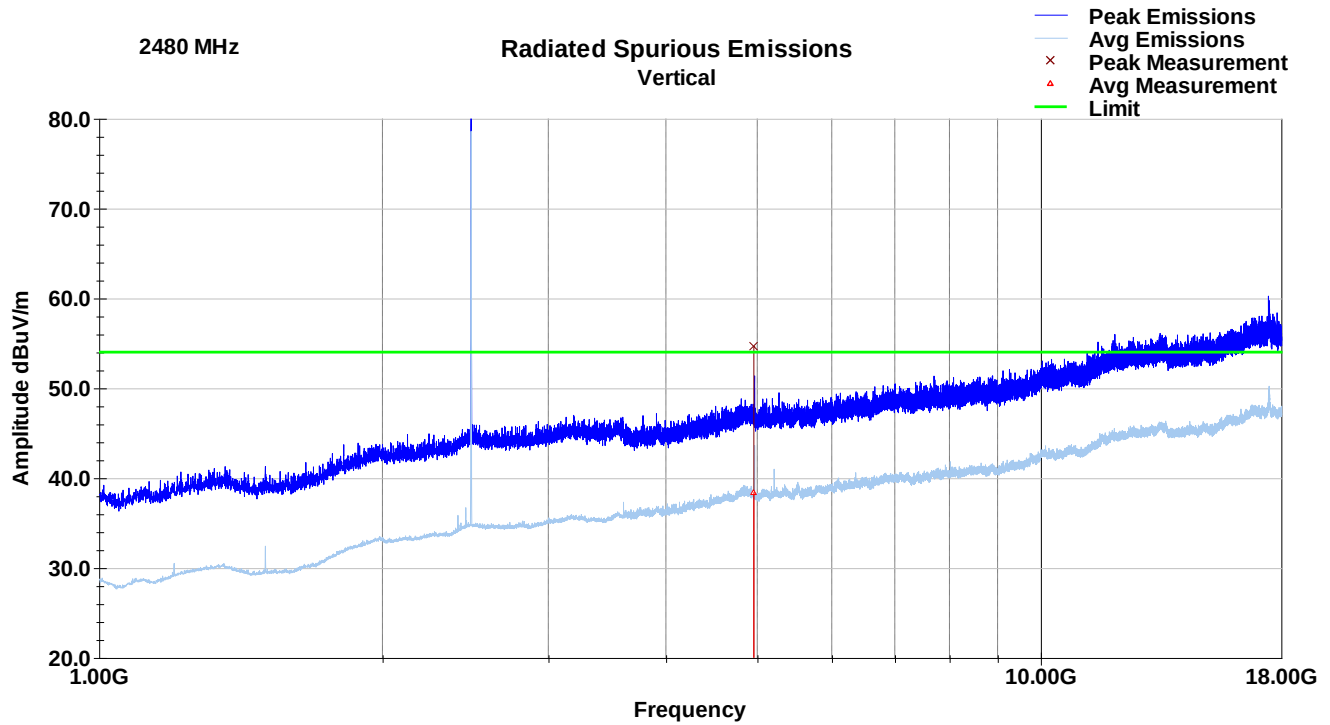
Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4879.92	48.6	V	277.0	182.0	34.5	3.2	33.5	52.8	74.0	-21.2
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit (dBuV/m)	Margin (dB)
4879.92	36.5	V	277.0	182.0	34.5	3.2	33.5	40.8	54.0	-13.2
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



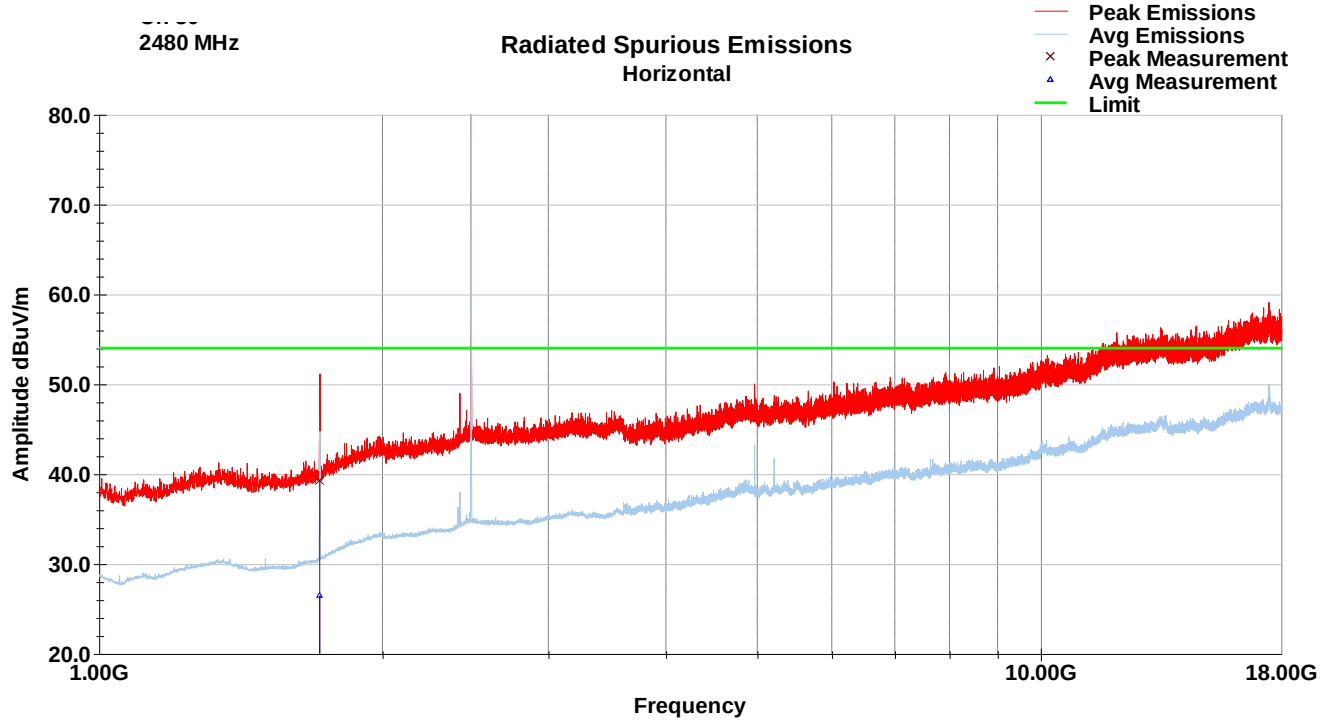
Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4879.71	50.5	H	44.0	210.0	34.5	3.2	33.5	54.8	74.0	-19.2
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit (dBuV/m)	Margin (dB)
4879.71	38.1	H	44.0	210.0	34.5	3.2	33.5	42.3	54.0	-11.7
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
4958.83	50.7	V	22.0	202.0	34.4	3.0	33.4	54.7	74.0	-19.3
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Avg dBuV/m	Limit (dBuV/m)	Margin (dB)
4958.83	34.4	V	22.0	202.0	34.4	3.0	33.4	38.4	54.0	-15.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										



Frequency MHz	Raw Pk dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Final Pk dBuV/m	Limit dBuV/m	Margin dB
1715.72	42.2	H	299.0	193.0	28.9	1.5	33.3	39.3	74.0	-34.7
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Frequency MHz	Raw Avg dBuV	Polarity (V/H)	Azimuth (degrees)	Height (cm)	AF (dB/m)	Loss (dB)	Amp (dB)	Avg Value dBuV/m	Limit (dBuV/m)	Margin (dB)
1715.72	29.4	H	299.0	193.0	28.9	1.5	33.3	26.5	54.0	-27.5
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

8 Emissions in Restricted Frequency Bands

8.1 Test Result

Test Description	Test Specification		Test Result
Restricted Band 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 ANSI C63.10, Section 11.12.2.

Offset Calculations:

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

$$\text{Offset} = -20\log(D) + 104.8 - 107 + \text{CL} + \text{DC} + \text{AG}$$

$$\text{Offset}_{3m} = -11.7 + \text{CL} + \text{DC} + \text{AG}$$

D = 3m	Distance
CL = 0.4 dB	Cable Loss
DC = 0.3 dB	Duty Cycle Correction Factor
AG = 2.0 dB	Antenna Gain

$$\text{Offset} = -9.0 \text{ dB}$$

8.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature:	23.3°C
Relative Humidity:	47.9%

8.4 Test Equipment

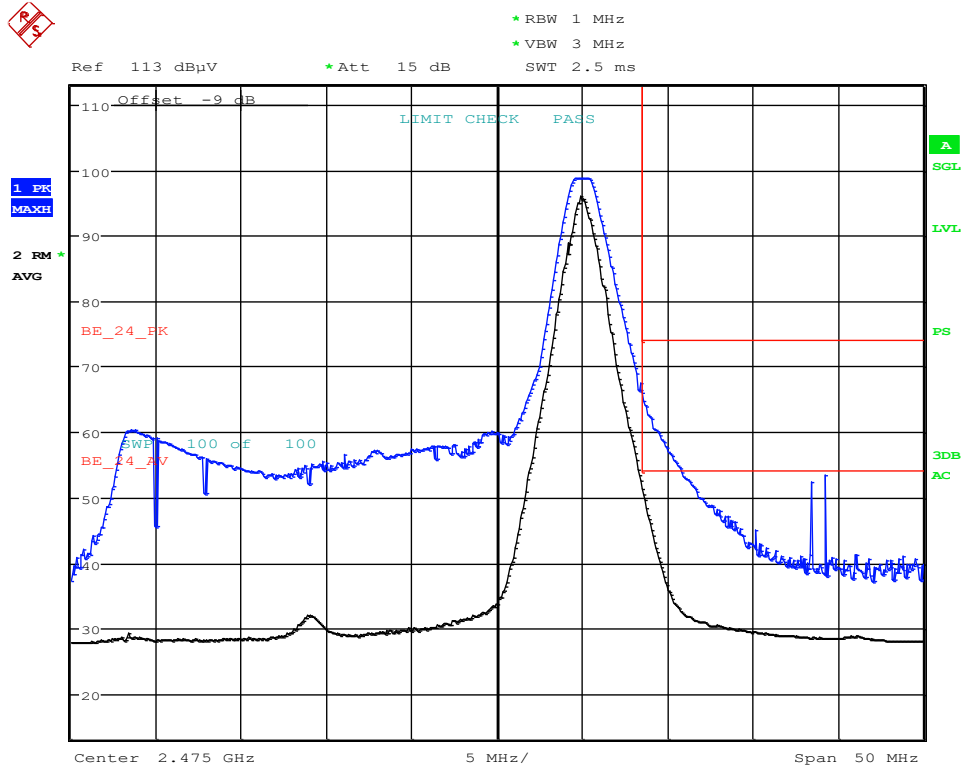
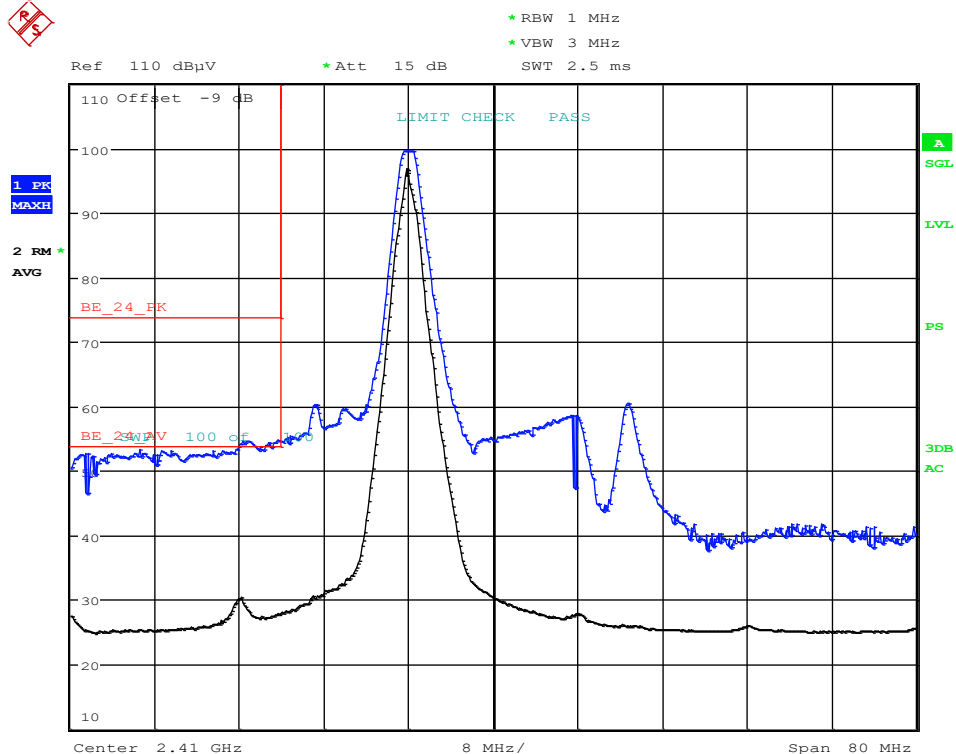
Test End Date: 28-Aug-2018

Tester: ASF

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
RF CABLE	SF102	HUBER & SUHNER	B079823	25-Jul-2019
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	2-Jul-2019

Note: The equipment calibration period is 1 year.

8.5 Test Data – Restricted Band Edge



9 Revision History

Revision Level	Description of changes	Revision Date
DRAFT	--	
0	Initial release	11 October 2018
1	Cover Page & Section 2 – Updated client info to match TCB/FCC filing requirements. Section 7 – Proprietary channel identifiers removed from plots. Cover Page – IC ID removed.	22 April 2019
2	Section 6.6 – Removed channel identifiers. Section 3 – Added 99% OBW data.	6 May 2019
3	Section 6.6 – Removed channel identifiers Test Summation – Updated RSS Gen References Section 3 – Updated RSS Gen Reference	15 May 2019