

EMC Test Report

Project Number: 4227659

Report Number: 4227659EMC02

Revision Level: 0

Client: Technicolor Connected Home USA LLC

Equipment Under Test: Channel Master Android TV

Model: CM-7600

FCC ID: G95-CM-7600

IC ID: 431C-DWT765CHA

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

RSS-247, Issue 2

RSS-GEN Issue 4

Report issued on: 20 December 2017

Test Result: Compliant

Tested by:



Jeremy Pickens, Senior EMC 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.

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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.....	8
4	OUTPUT POWER	10
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
5	POWER SPECTRAL DENSITY	12
5.1	TEST RESULT.....	12
5.2	TEST METHOD.....	12
5.3	TEST SITE	12
5.4	TEST EQUIPMENT	12
5.5	TEST DATA.....	13
6	CONDUCTED SPURIOUS EMISSIONS / BAND EDGE.....	14
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 BAND EDGE.....	15
6.6	TEST DATA – CONDUCTED SPURIOUS EMISSIONS	16
7	FIELD STRENGTH OF SPURIOUS RADIATION.....	18
7.1	TEST RESULT.....	18
7.2	TEST METHOD.....	18
7.3	TEST SITE	18
7.4	TEST EQUIPMENT	19
7.5	TEST DATA – PEAK PLOTS.....	20
7.6	TEST DATA – TABULAR DATA.....	30
8	RADIATED EMISSIONS AT BAND EDGE / RESTRICTED BAND	31
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 CONDUCTED EMISSIONS 33

9.1 TEST RESULT..... 33

9.2 TEST METHOD..... 33

9.3 TEST SITE 33

9.4 TEST EQUIPMENT 33

9.5 TEST DATA..... 34

10 REVISION HISTORY 36

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
Antenna Requirement	15.203	RSS-GEN S8.3	Compliant (1)
AC Powerline Conducted Emissions	15.107, 15.207	RSS-GEN S8.8	Compliant

1) Internal PCB trace antenna

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: Technicolor Connected Home USA LLC
Address: 5030 Sugarloaf Parkway Building 6
City, State, Zip, Country: Lawrenceville, GA 30044, 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: Channel Master Android TV
Model Number: CM-7600
Serial Number: 211930007386700018

Frequency Range: 2402-2480MHz
Data Modes: Bluetooth Low Energy
Antenna: Internal PCB Trace
 #1 3.5 dBi Max Gain
 #2 2.4 dBi Max Gain (BLE uses this antenna only)

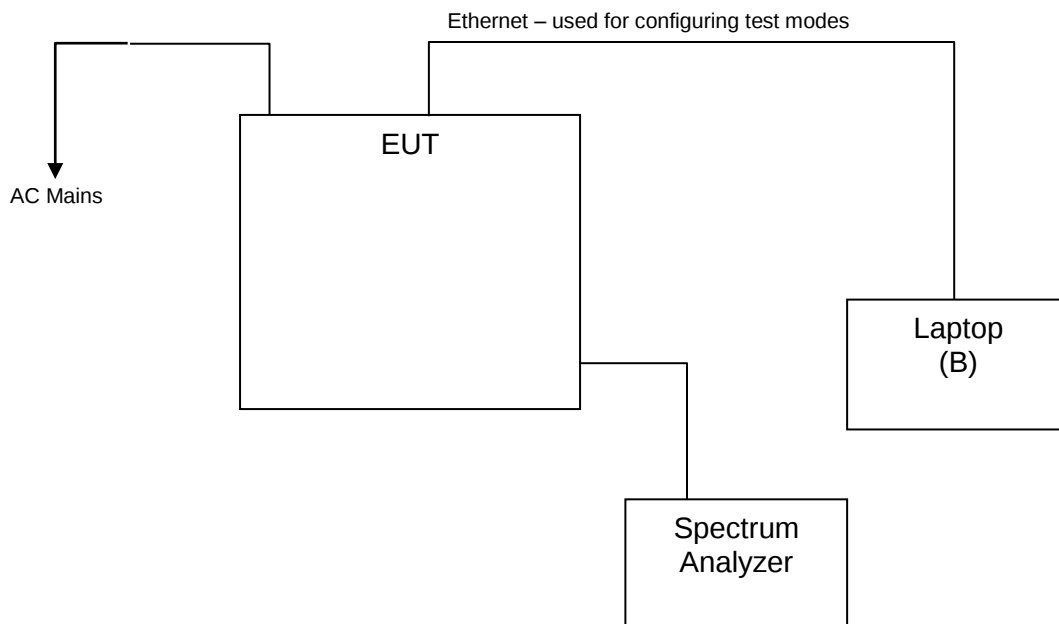
Rated Voltage: 12Vdc (Supplied via 100-120Vac, 60Hz AC Adapter)
Test Voltage: 12Vdc, (120Vac, 60Hz)

Sample Received Date: 30 October 2017
Dates of testing: 13 November - 08 December 2017

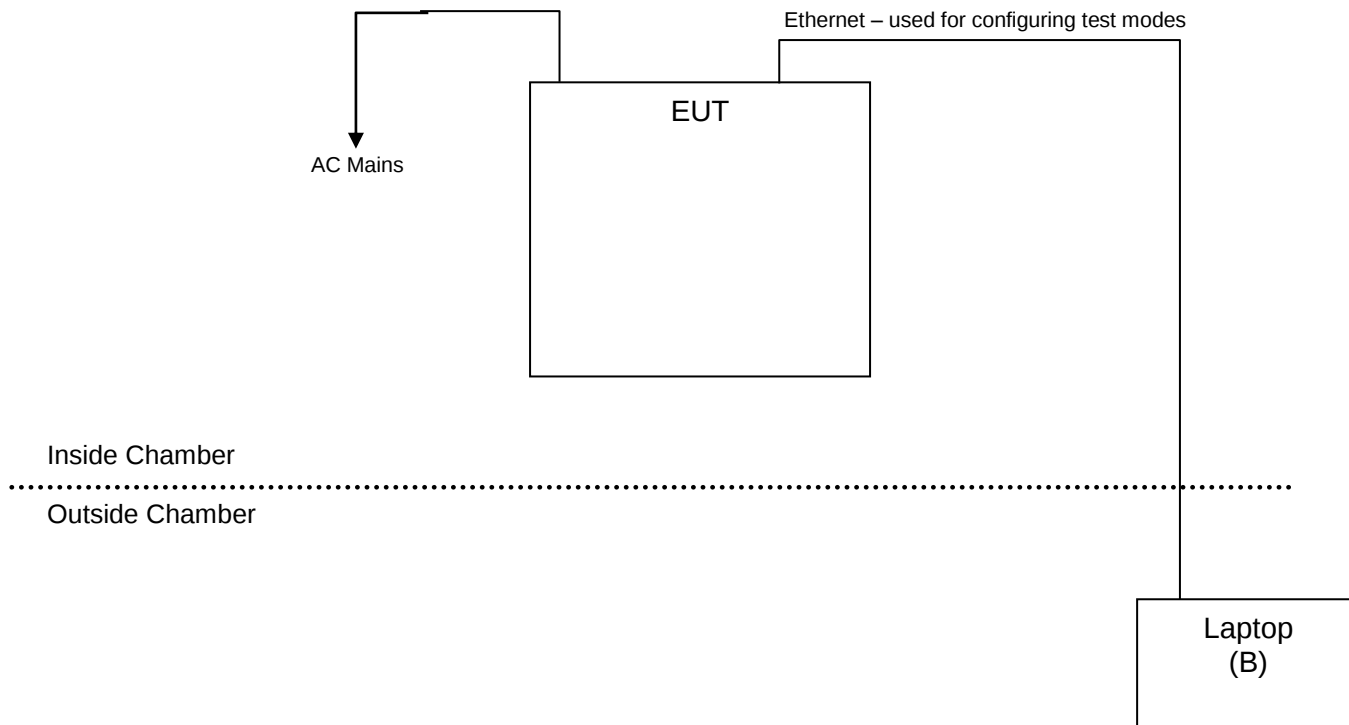
2.4 Operating Modes and Conditions

Continuous traffic was generated using test commands. Where the duty cycle measured below 99% and an RMS detector was employed, corrections of $10 \cdot \log(1/D)$ 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

Device reference	Manufacturer	Description	Model Number	Serial Number
A	Technicolor	Channel Master Android TV	CM-7600	211930007386700018
B	Lenovo	ThinkPad Laptop	T400	276731U

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: 22.8 °C
 Relative Humidity: 38.5 %

3.4 Test Equipment

Test End Date: 13-Nov-2017

Tester: JOP

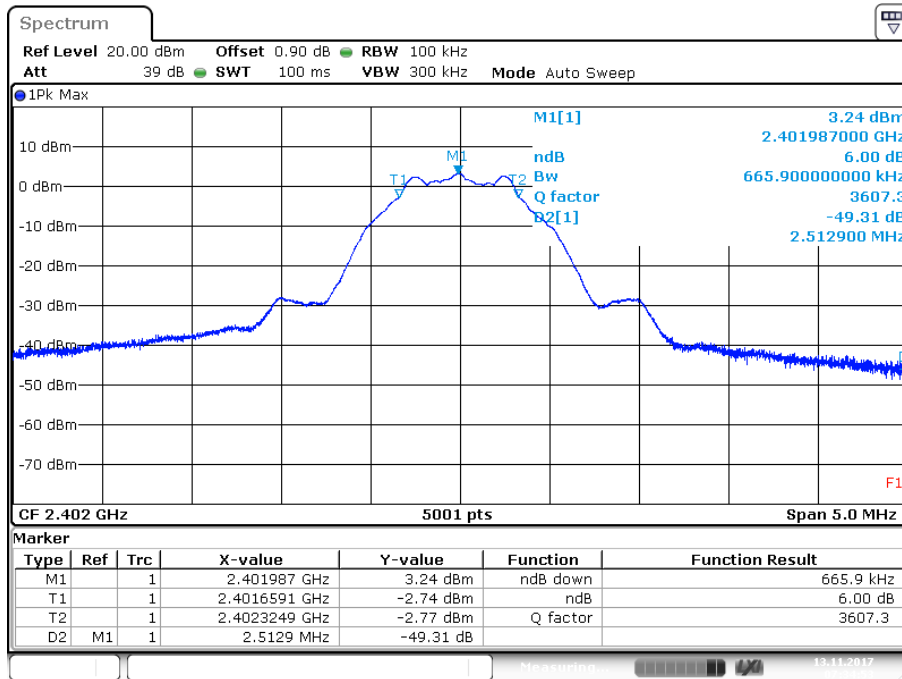
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SPCTRUM ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	26-Jul-2018

Note: The equipment calibration period is 1 year.

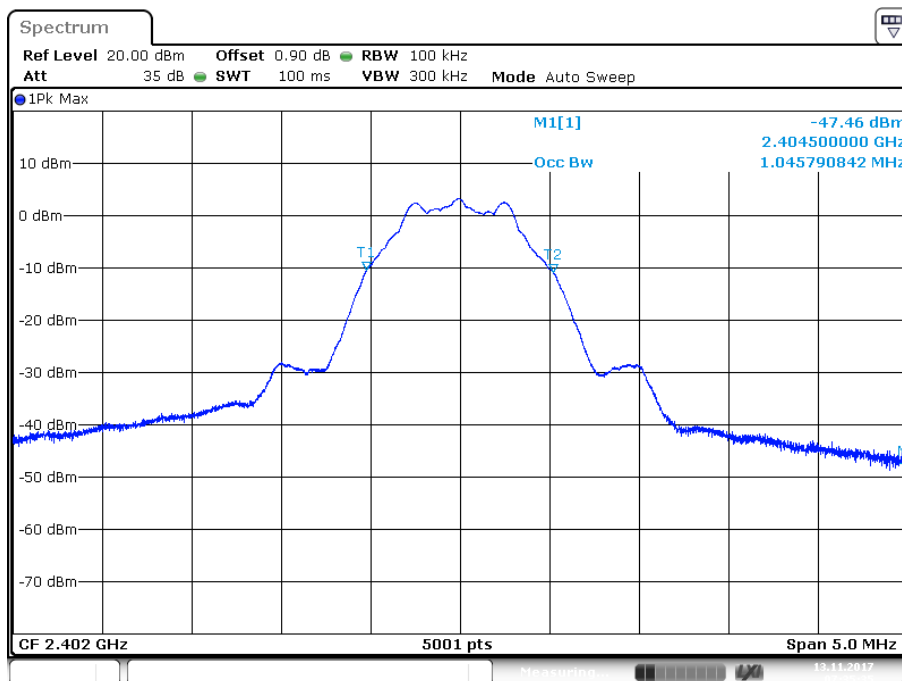
3.5 Test Data

Protocol	Channel	6dB Bandwidth (MHz)	Occupied Bandwidth (99%) (MHz)
BLE	0	0.666	1.046
BLE	19	0.665	1.041
BLE	39	0.666	1.042

Sample Plots:



Date: 13 NOV 2017 07:34:53



Date: 13 NOV 2017 07:35:36

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 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: 22.8 °C
 Relative Humidity: 38.5 %

4.4 Test Equipment

Test End Date: 13-Nov-2017

Tester: JOP

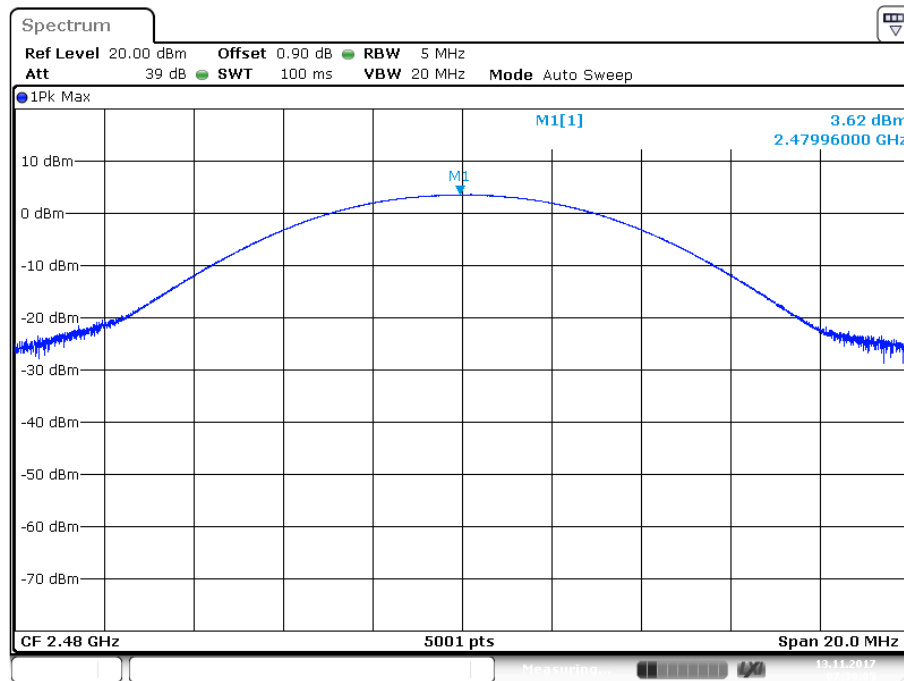
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SPCTRUM ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	26-Jul-2018

Note: The equipment calibration period is 1 year.

4.5 Test Data

Protocol	Channel	Peak Power (dBm)	Limit (dBm)	Margin (dB)
BLE	0	3.63	30	-26.37
BLE	19	3.72	30	-26.28
BLE	39	3.62	30	-26.38

Sample Plot:



Date: 13 NOV 2017 07:39:06

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: 22.8 °C
 Relative Humidity: 38.5 %

5.4 Test Equipment

Test End Date: 13-Nov-2017

Tester: JOP

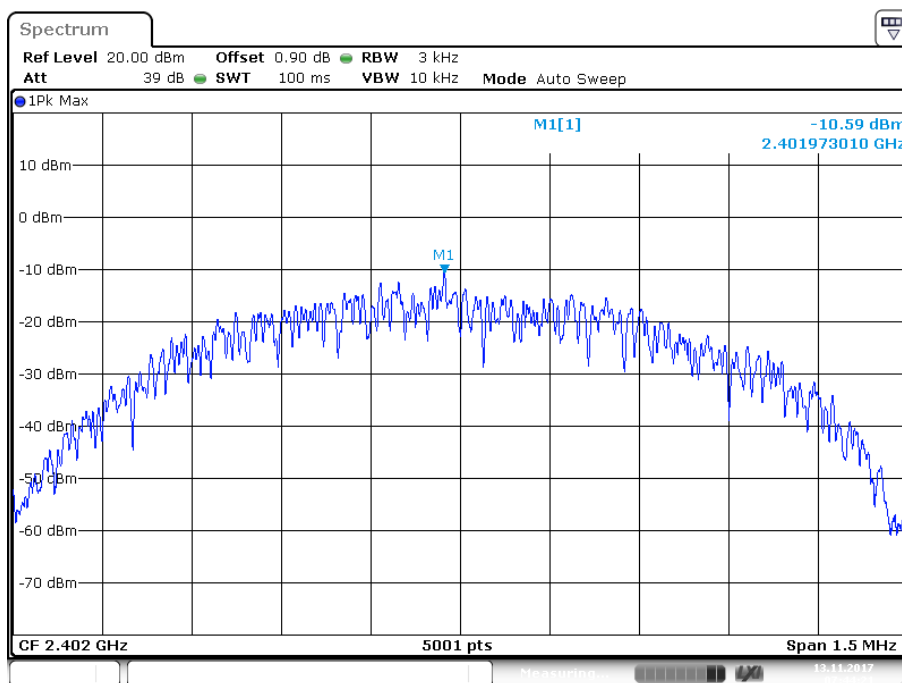
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SPCTRUM ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	26-Jul-2018

Note: The equipment calibration period is 1 year.

5.5 Test Data

Protocol	Channel	Peak PSD (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
BLE	0	-10.59	8	-18.59
BLE	19	-10.58	8	-18.58
BLE	39	-10.81	8	-18.81

Sample Plot:



Date: 13 NOV 2017 07:44:21

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: 22.8 °C
 Relative Humidity: 38.5 %

6.4 Test Equipment

Test End Date: 13-Nov-2017

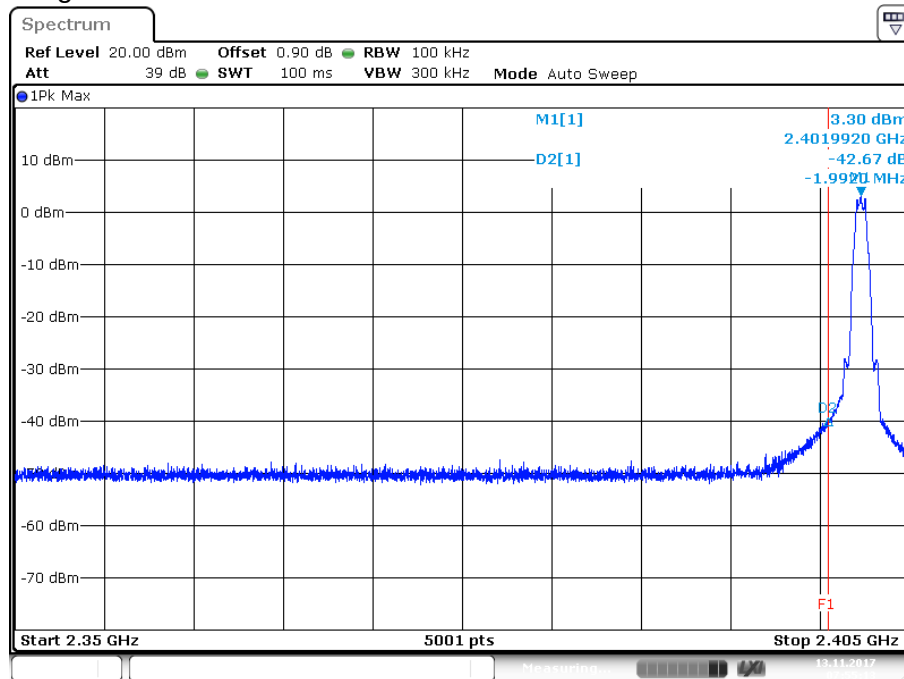
Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SPCTRUM ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	26-Jul-2018

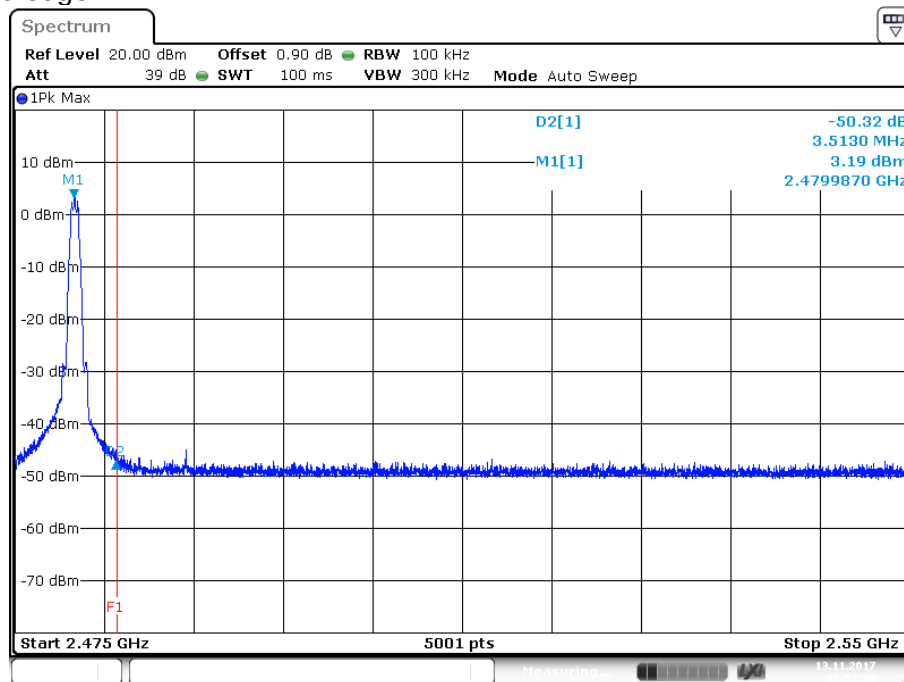
Note: The equipment calibration period is 1 year.

6.5 Test Data – DTS Band Edge

BLE - Lower band edge:

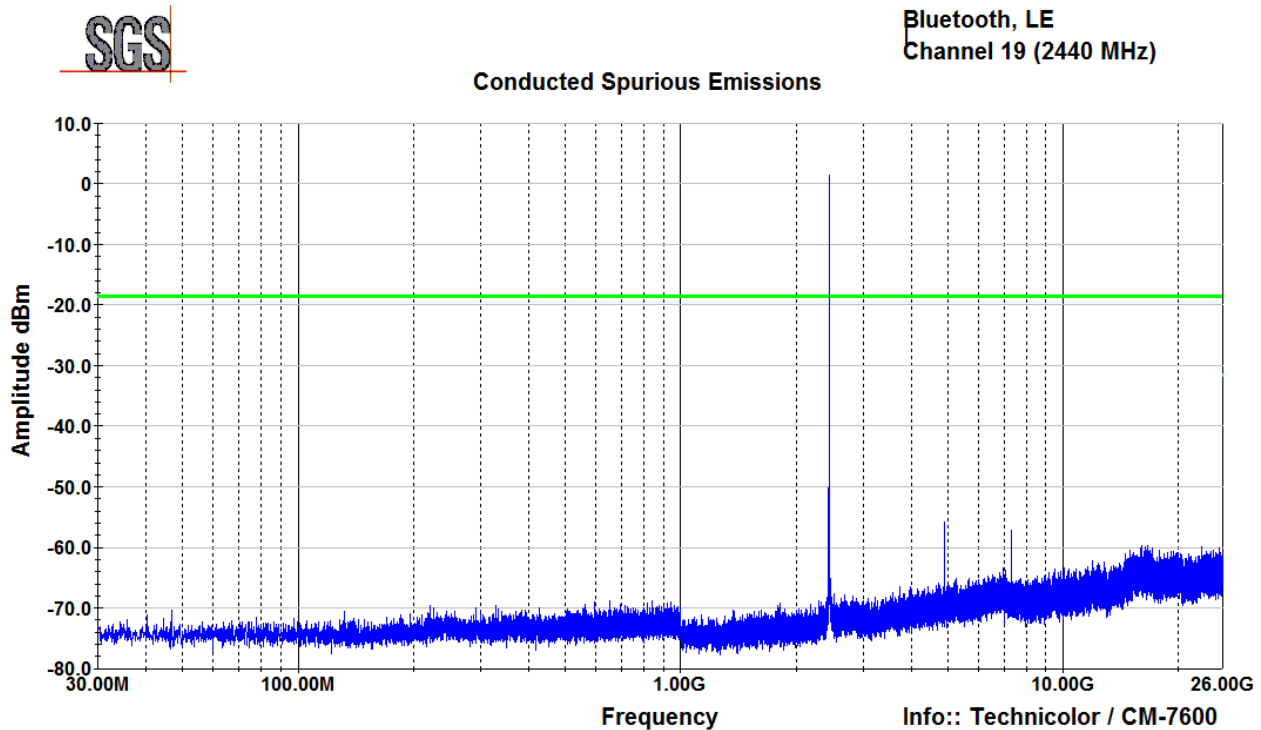
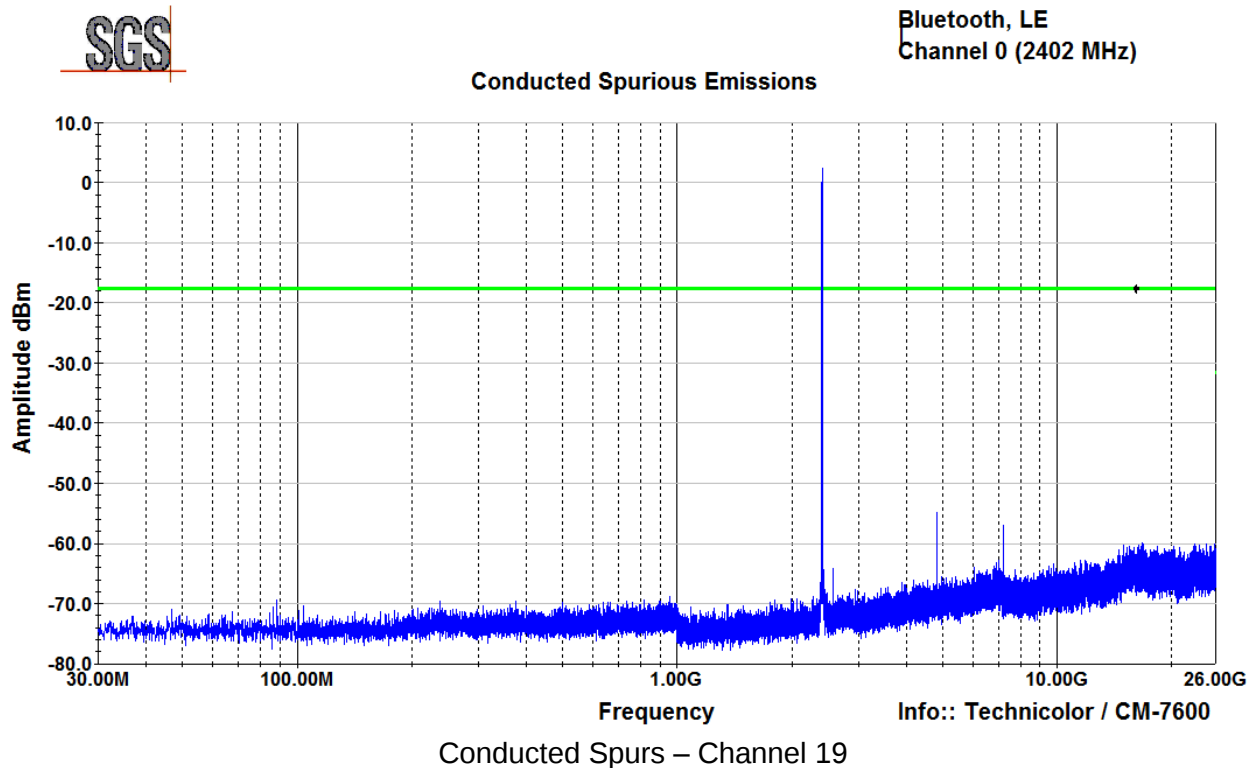


BLE - Upper band edge:

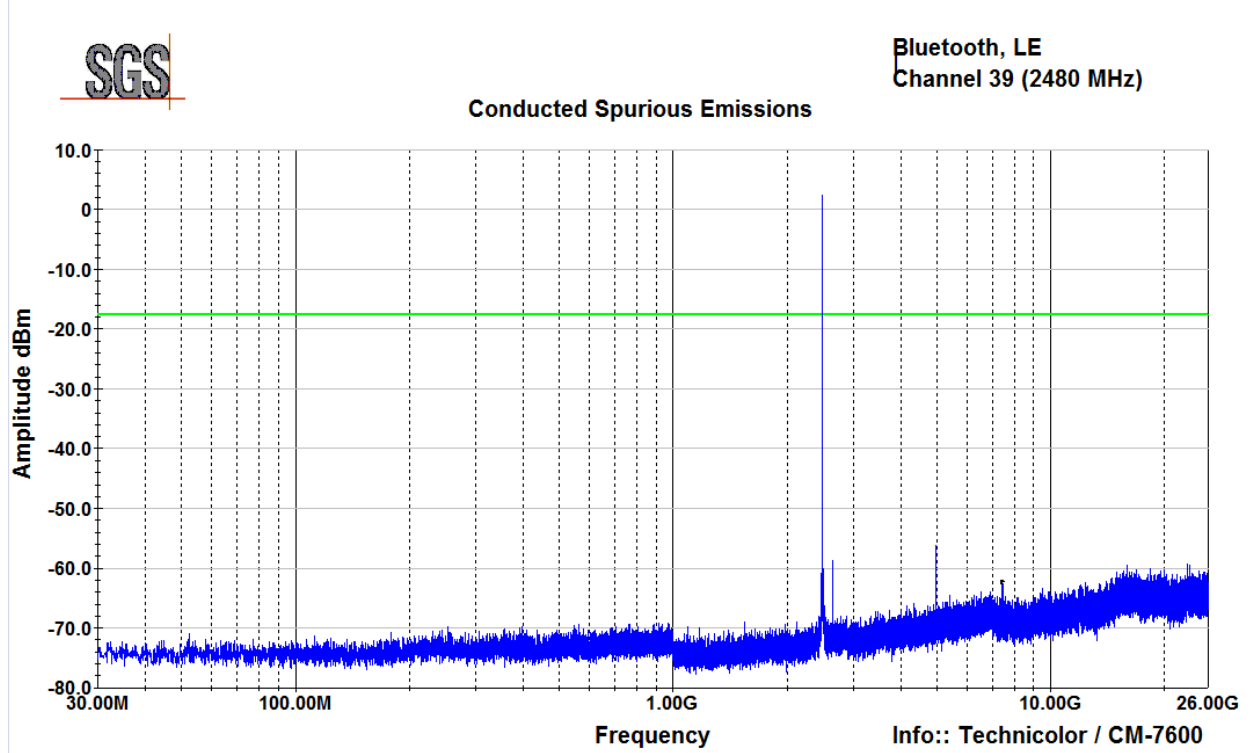


6.6 Test Data – Conducted Spurious Emissions

Conducted Spurs – Channel 0



Conducted Spurs – Channel 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 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 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: 23.5 °C
 Relative Humidity: 31.2 %
 Atmospheric Pressure: 97.9 kPa

7.4 Test Equipment

Test End Date: 7-Dec-2017

Tester: JOP/AF

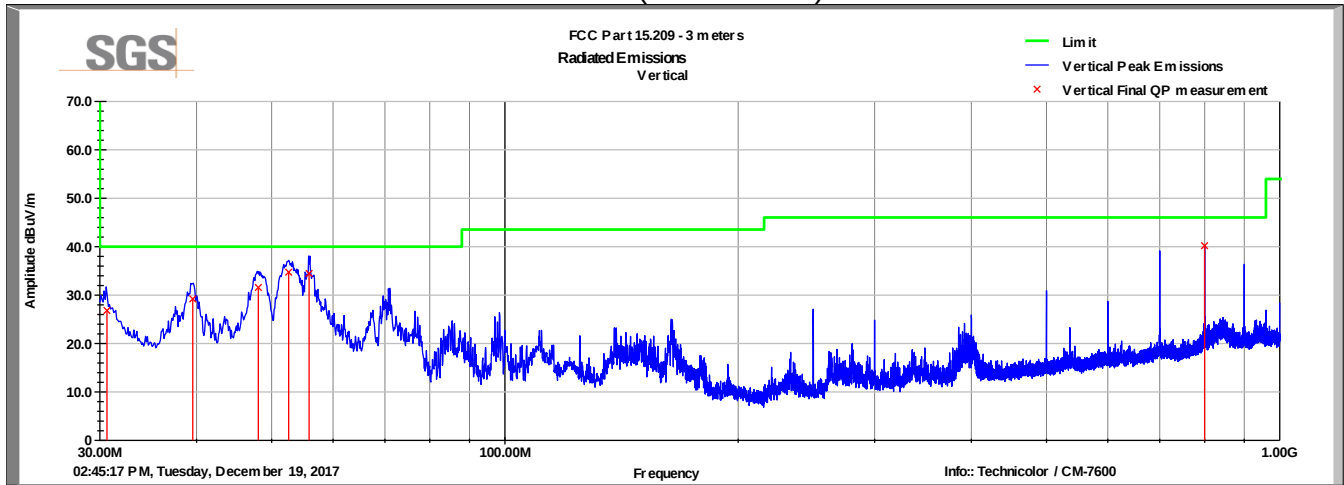
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	25-Jul-2018
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	25-Apr-2018
ANTENNA, BILOG	JB6	SUNOL	B079689	16-Oct-2018
RF CABLE	SF106	HUBER & SUHNER	B079712	24-Jul-2018
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	24-Jul-2018
RF CABLE	UC-N-MM-78	MAURY MICROWAVE	17017	25-Jul-2018
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	24-Jul-2018
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	B094463	22-Feb-2018
ANTENNA, DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2018
RF CABLE	104PE	HUBER & SUHNER	B079793	24-Jul-2018
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	28-Jul-2018
FILTER, HIGH PASS (>2800MHZ)	HPM50111	MICRO-TRONICS	B085747	27-Jul-2018
HORN(SMALL)	LB-180400-20-C-KF	A-INFO	15007	21-Mar-2018
RF CABLE	SF102	HUBER & SUHNER	B079822	27-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079824	26-Jul-2018
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	28-Jul-2018
ANTENNA, LOOP, ACTIVE	6502	ETS LINDGREN	B085752	22-Aug-2018

Note: The equipment calibration period is 1 year.

7.5 Test Data – Peak Plots

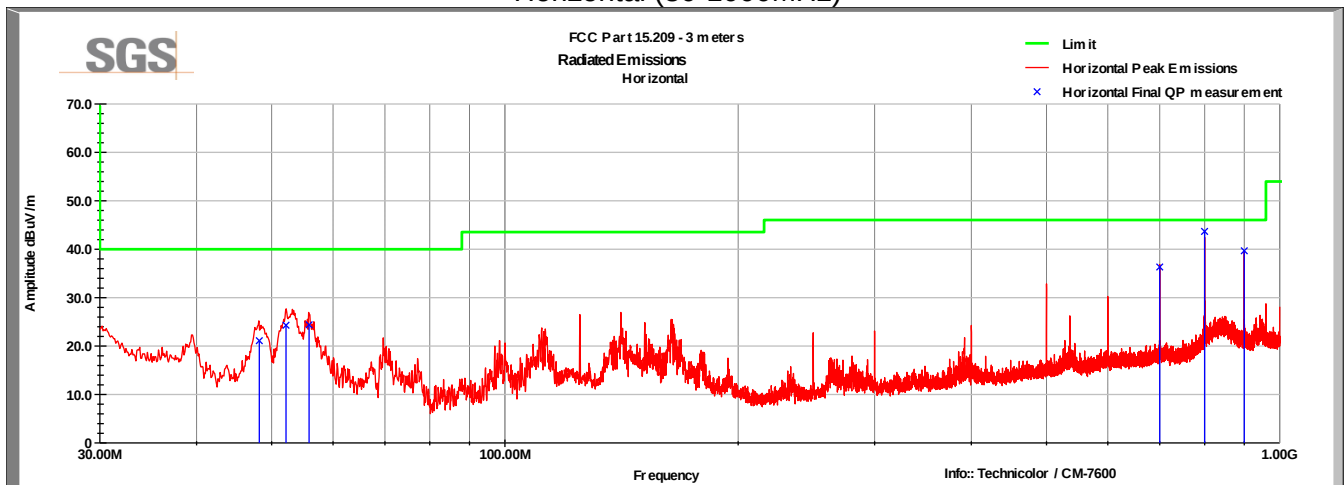
No emissions were detected in the range 9kHz to 30MHz.

BLE Channel 0
 Vertical (30-1000MHz)



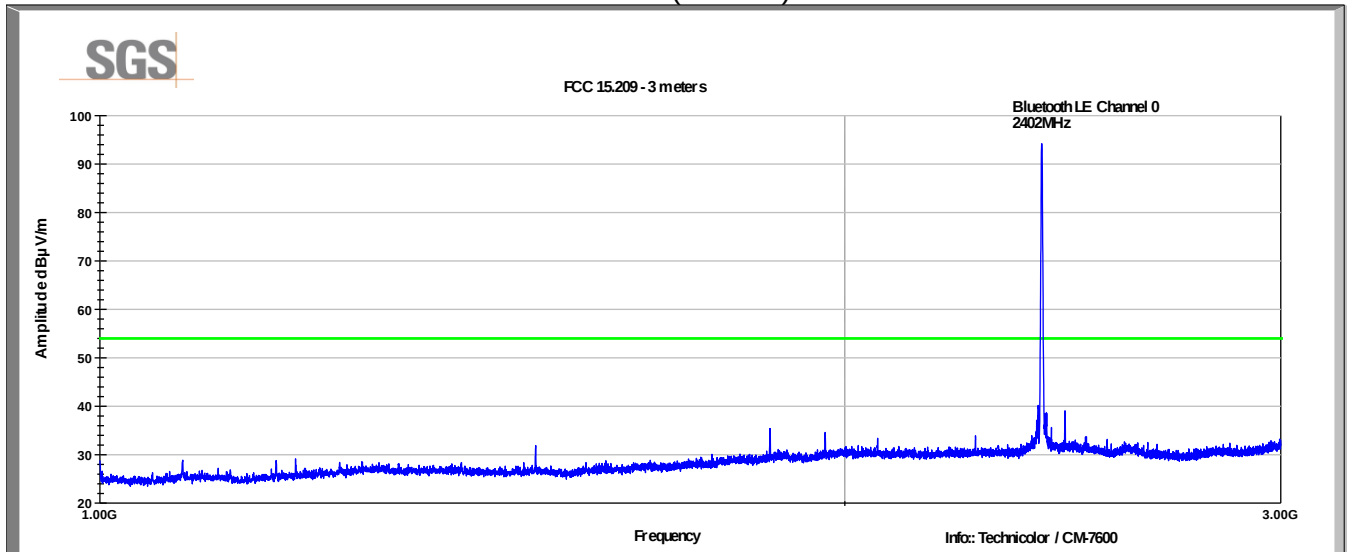
Below 1GHz, there was no discernible difference among the different transmit channels.

BLE Channel 0
 Horizontal (30-1000MHz)

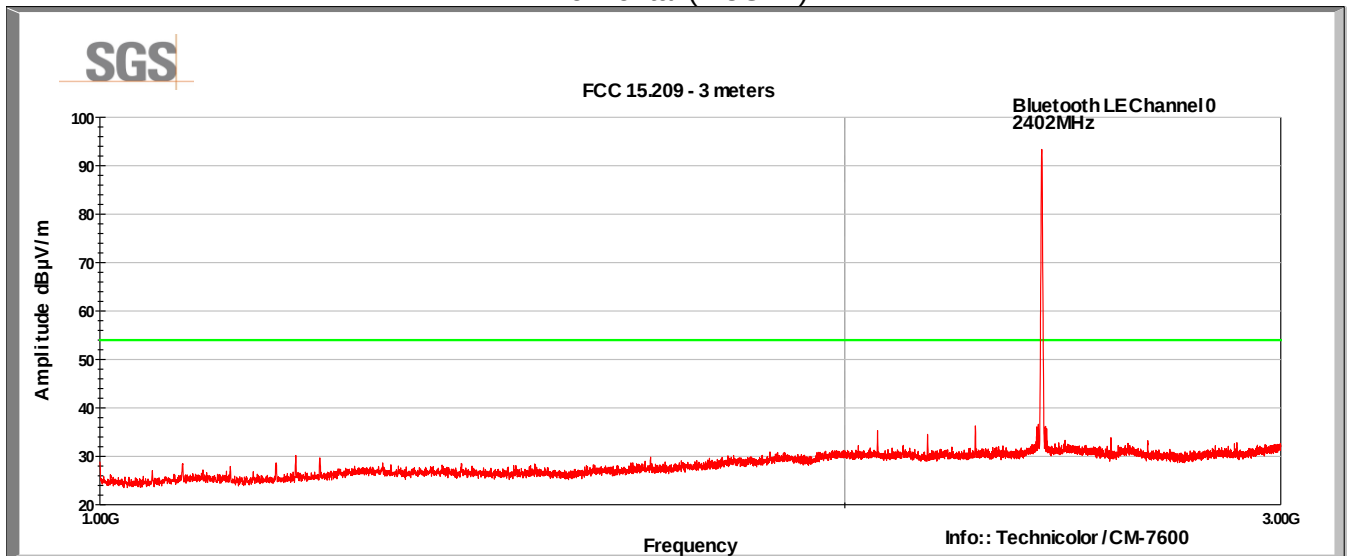


Below 1GHz, there was no discernible difference among the different transmit channels.

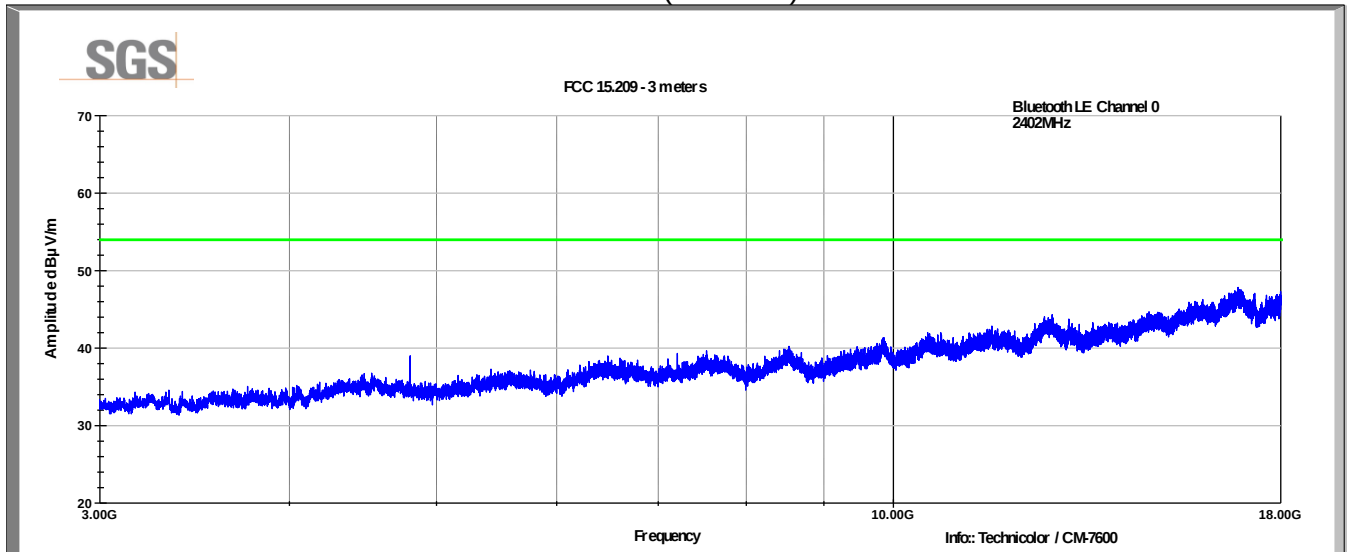
BLE Channel 0
Vertical (1-3GHz)



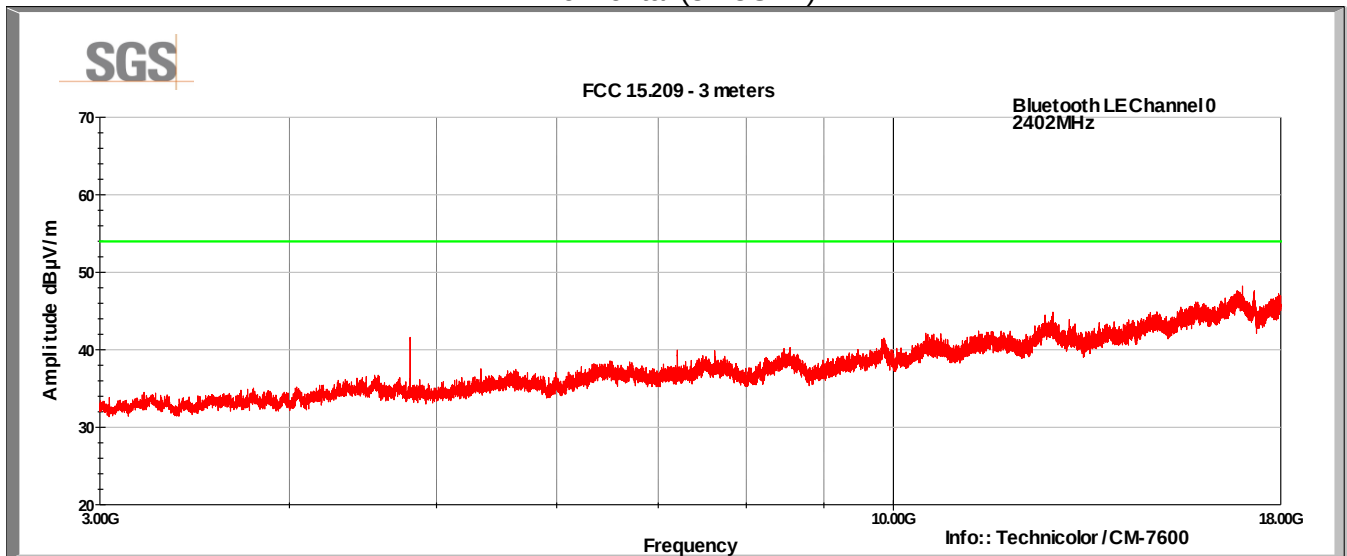
BLE Channel 0
Horizontal (1-3GHz)



BLE Channel 0
Vertical (3-18GHz)

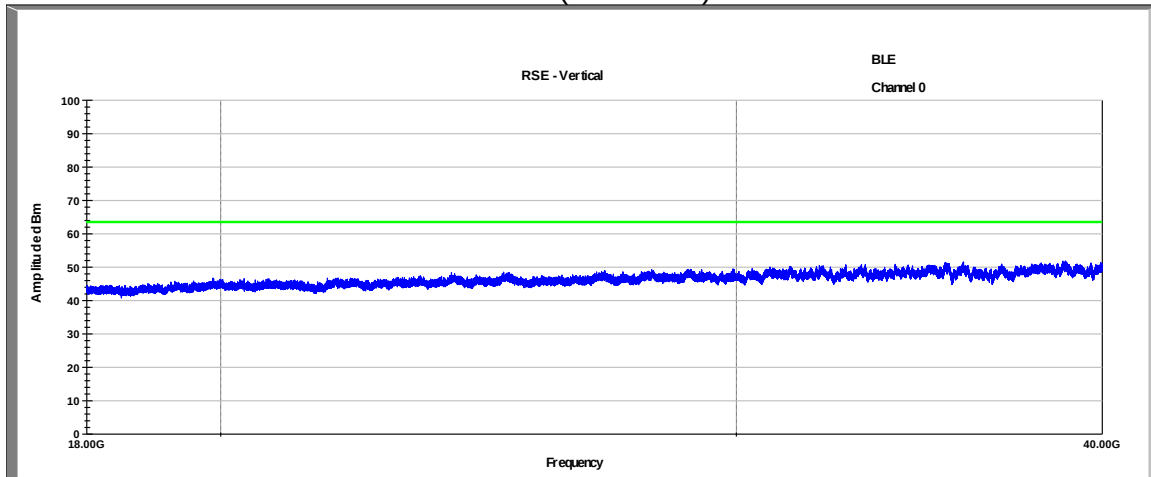


BLE Channel 0
Horizontal (3-18GHz)

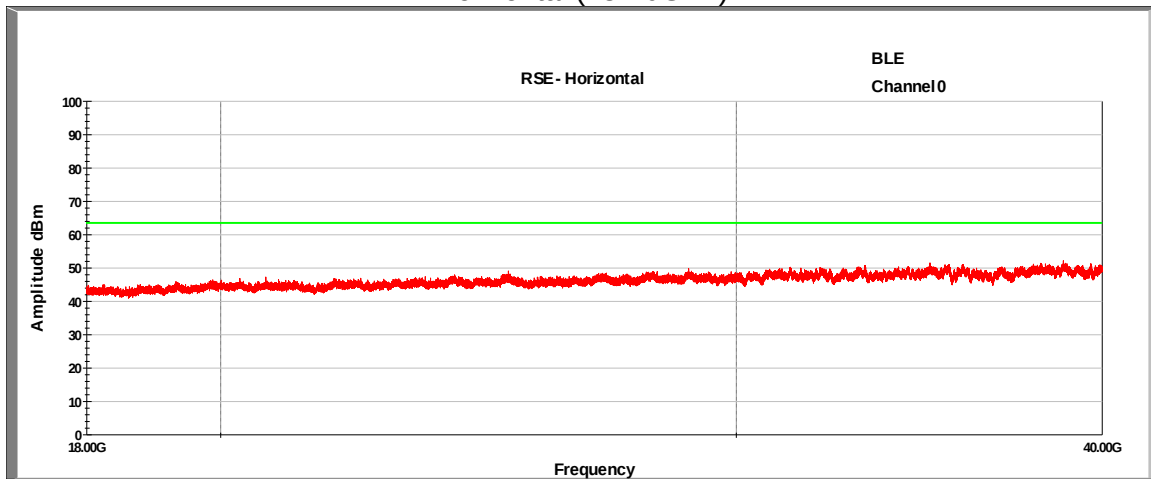


Worst-case spur: 41.6dBµV/m (Peak) @ 4804MHz (12.4dB Margin)

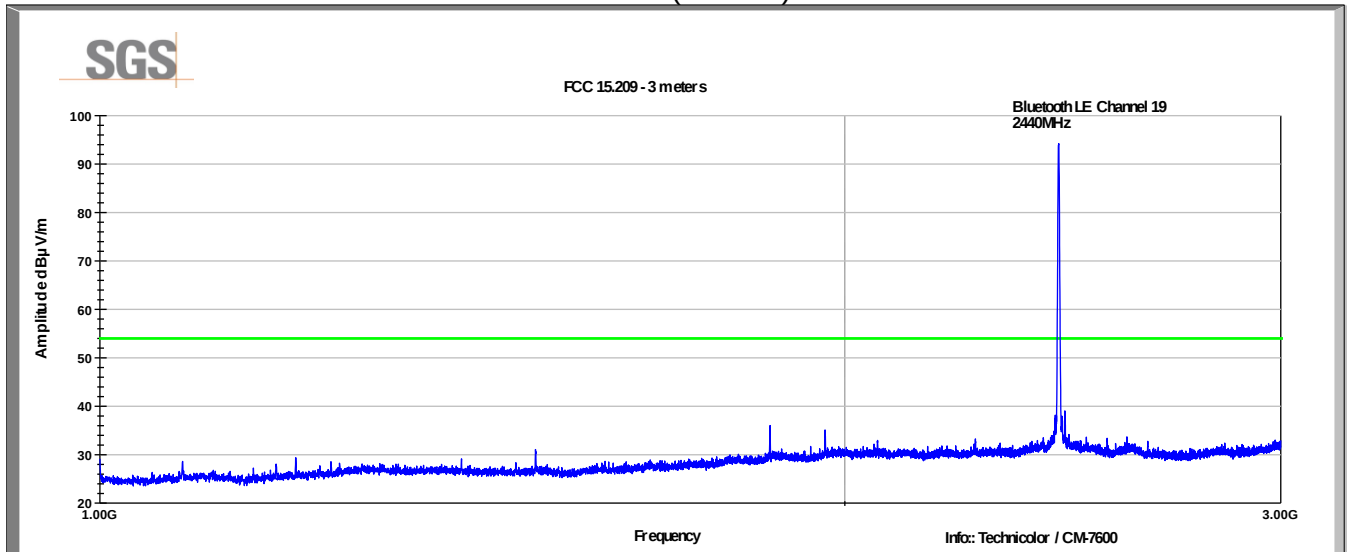
BLE Channel 0
 Vertical (18-40GHz)



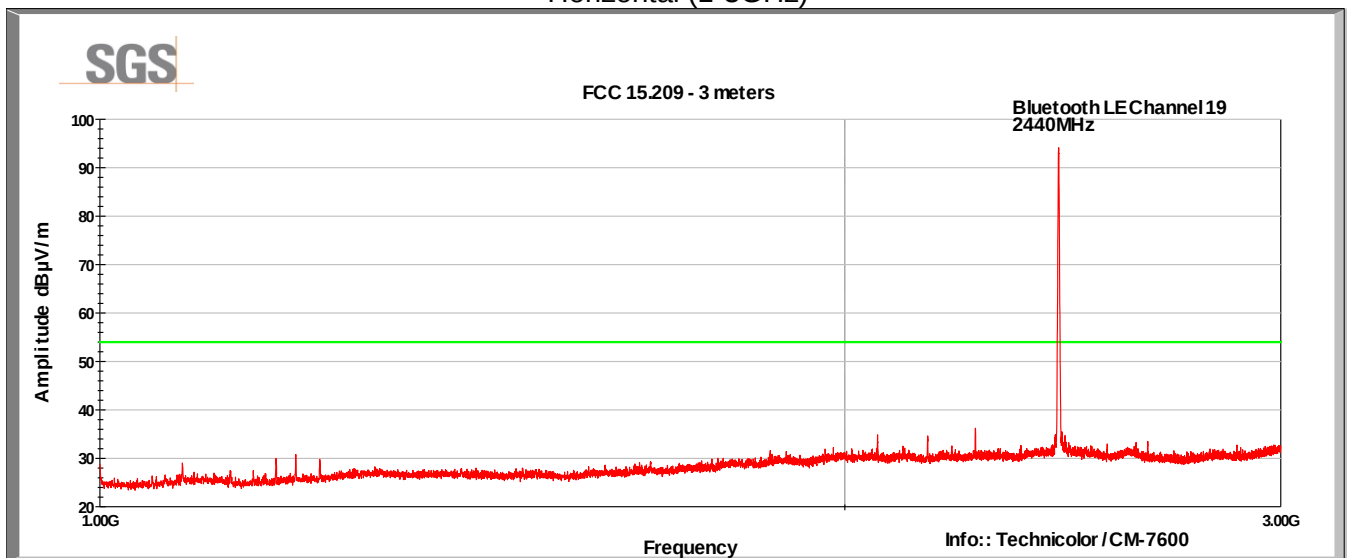
BLE Channel 0
 Horizontal (18-40GHz)



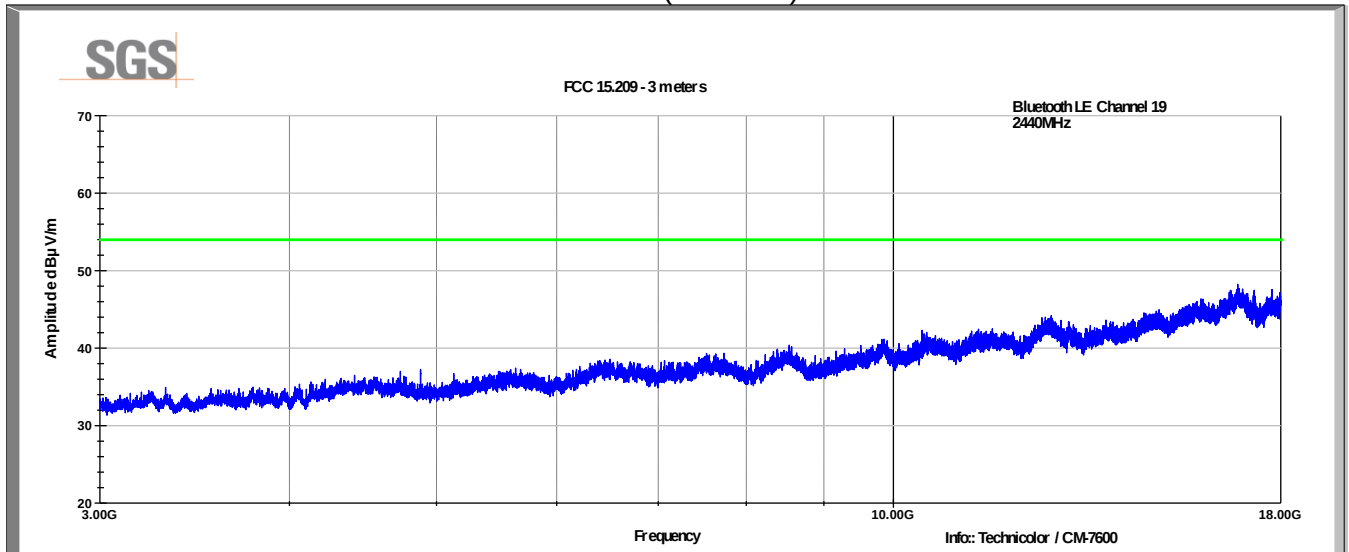
BLE Channel 19
Vertical (1-3GHz)



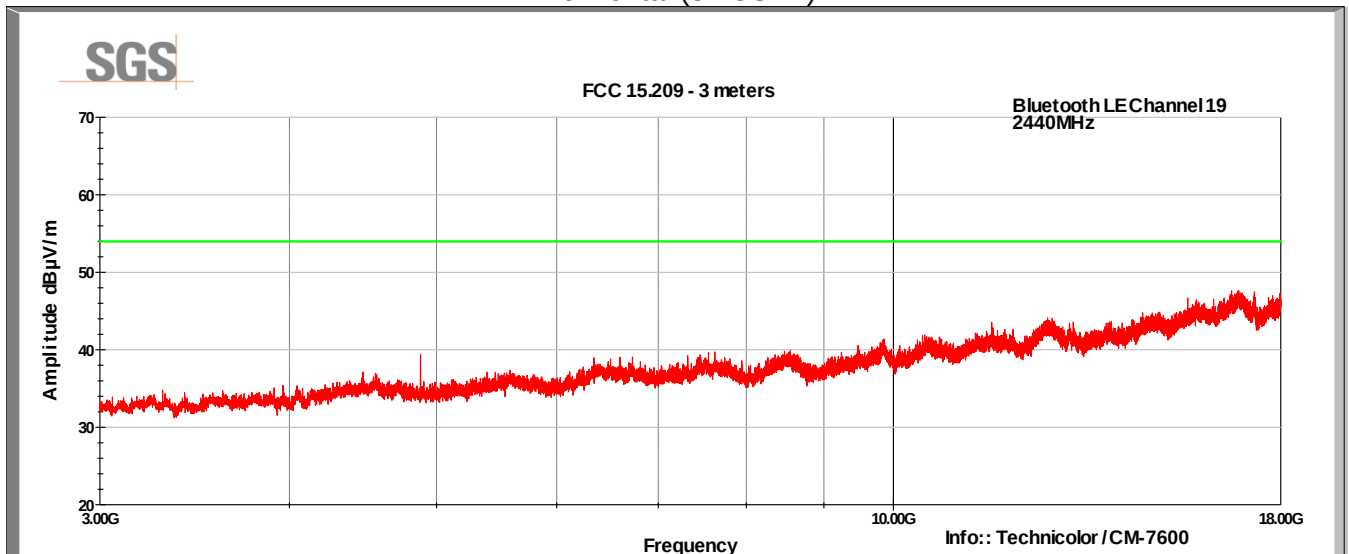
BLE Channel 19
Horizontal (1-3GHz)



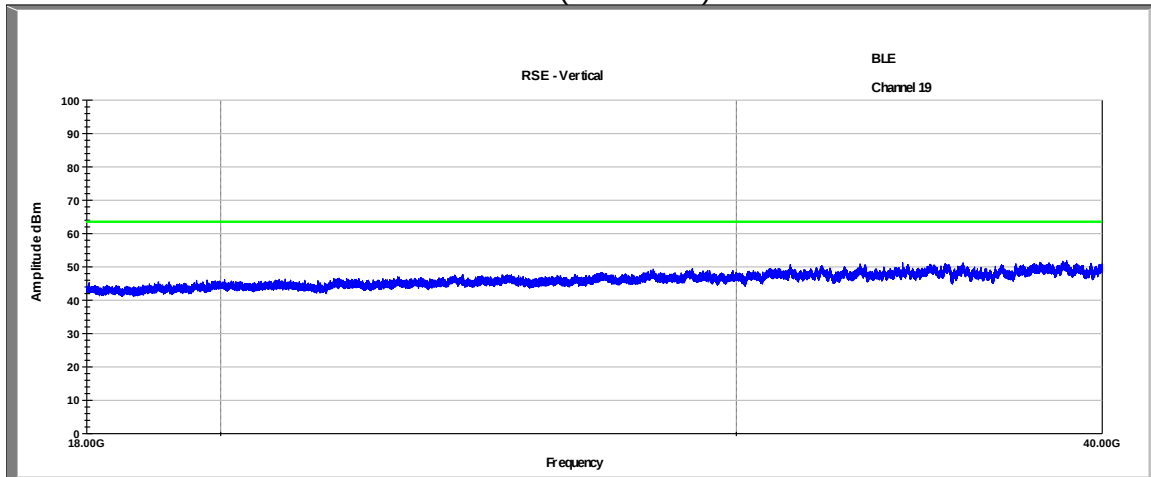
BLE Channel 19
 Vertical (3-18GHz)



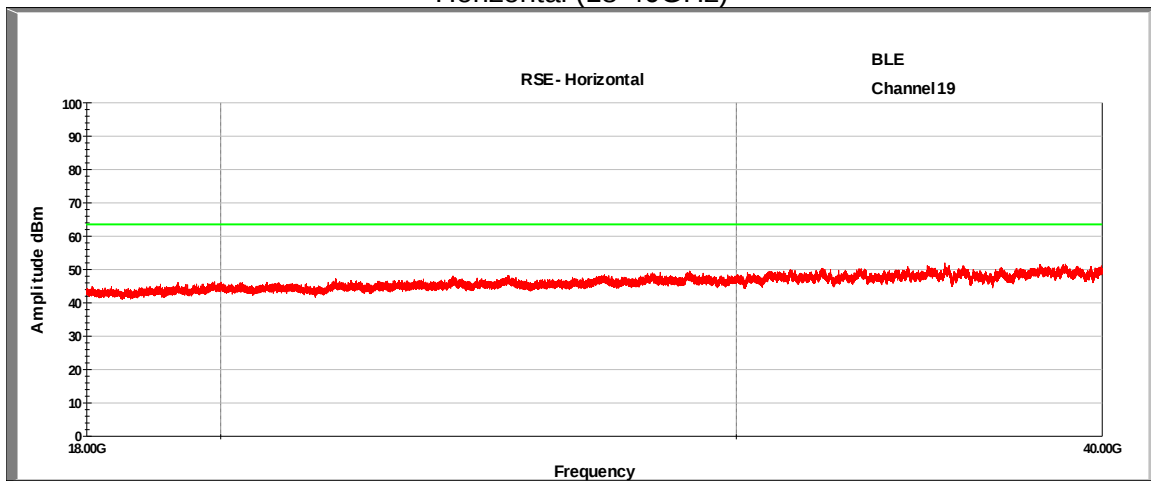
BLE Channel 19
 Horizontal (3-18GHz)



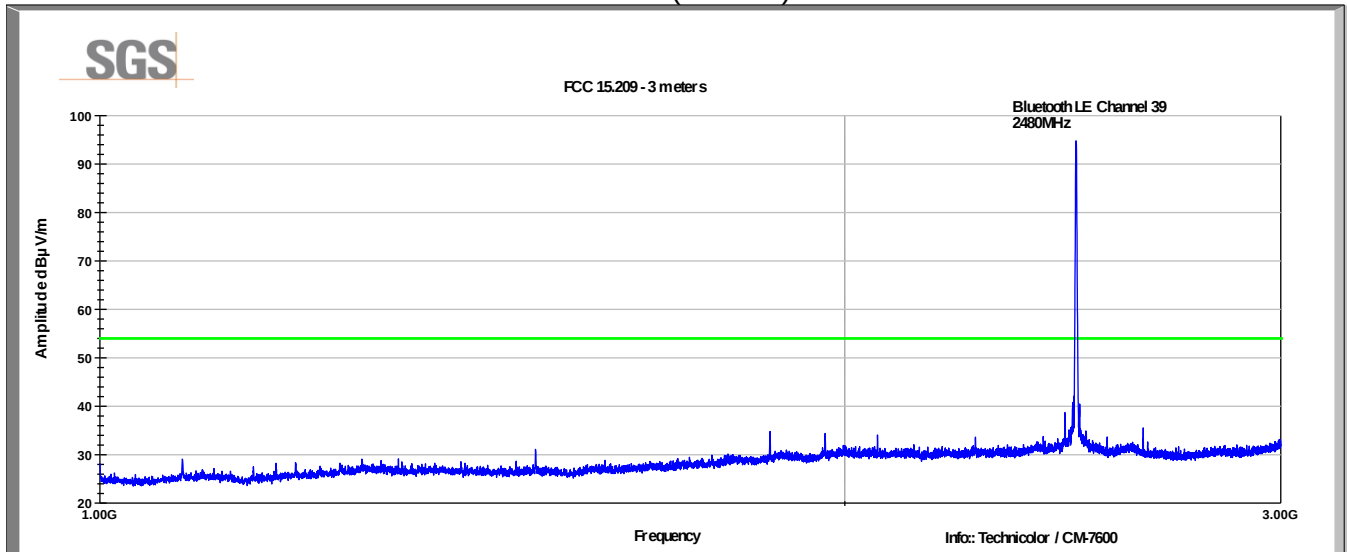
BLE Channel 19
 Vertical (18-40GHz)



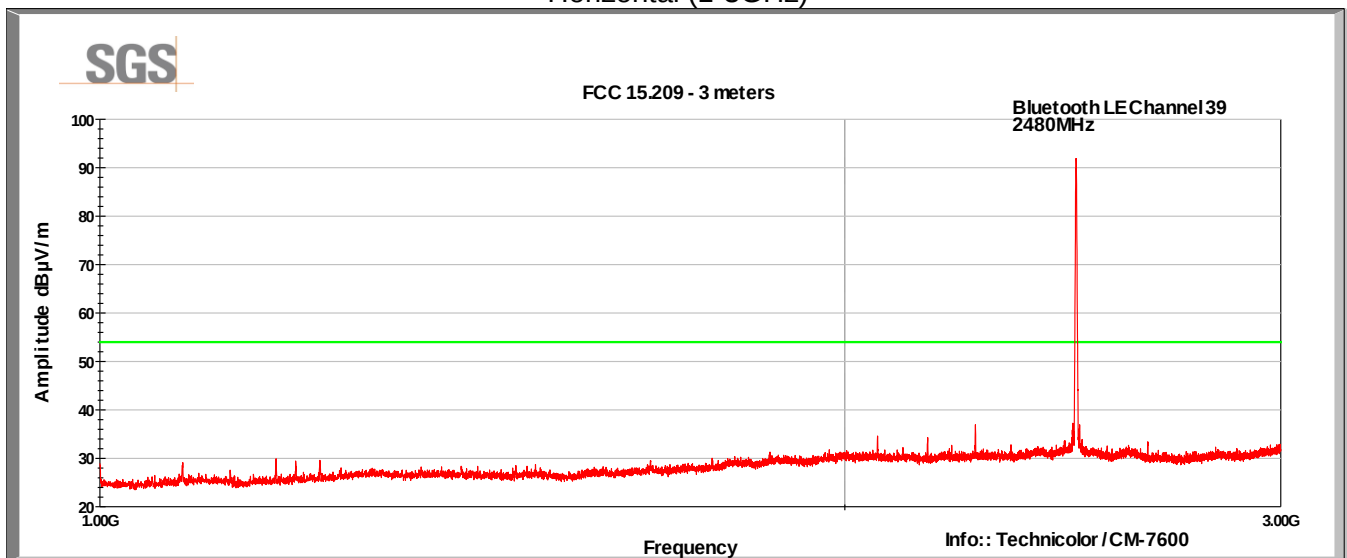
BLE Channel 19
 Horizontal (18-40GHz)



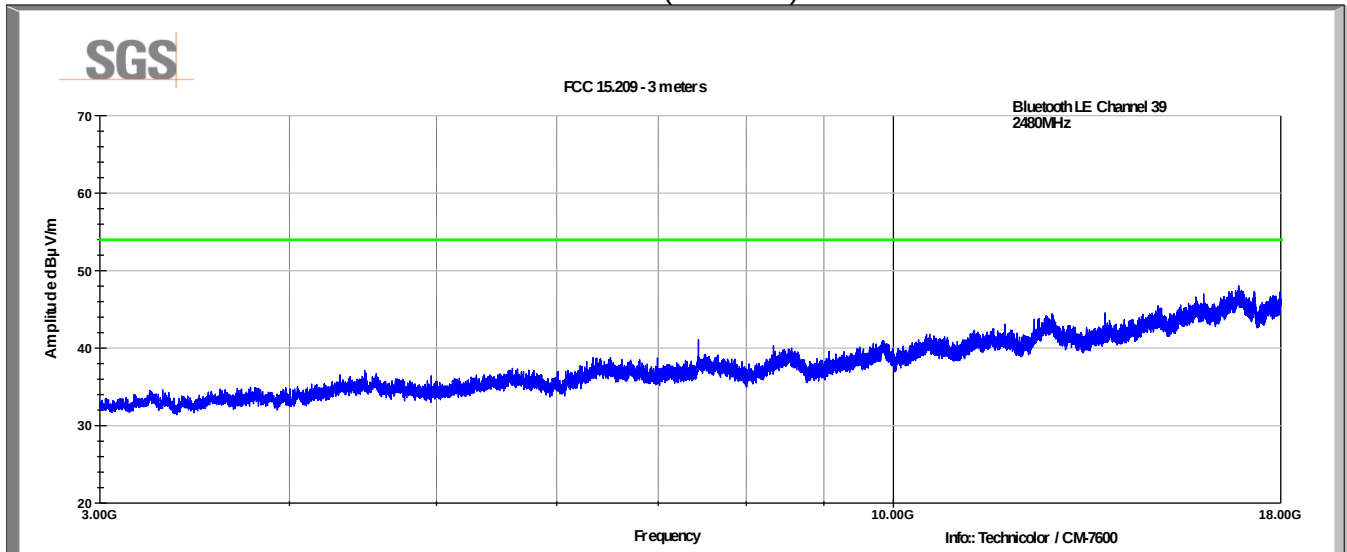
BLE Channel 39
 Vertical (1-3GHz)



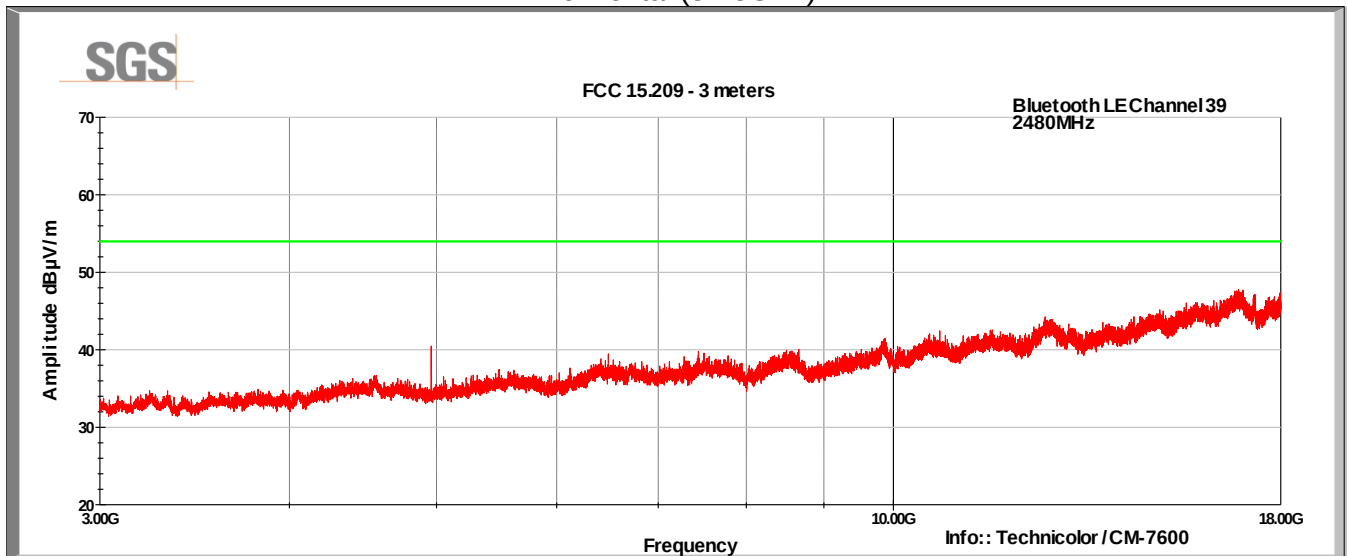
BLE Channel 39
 Horizontal (1-3GHz)



BLE Channel 39
 Vertical (3-18GHz)

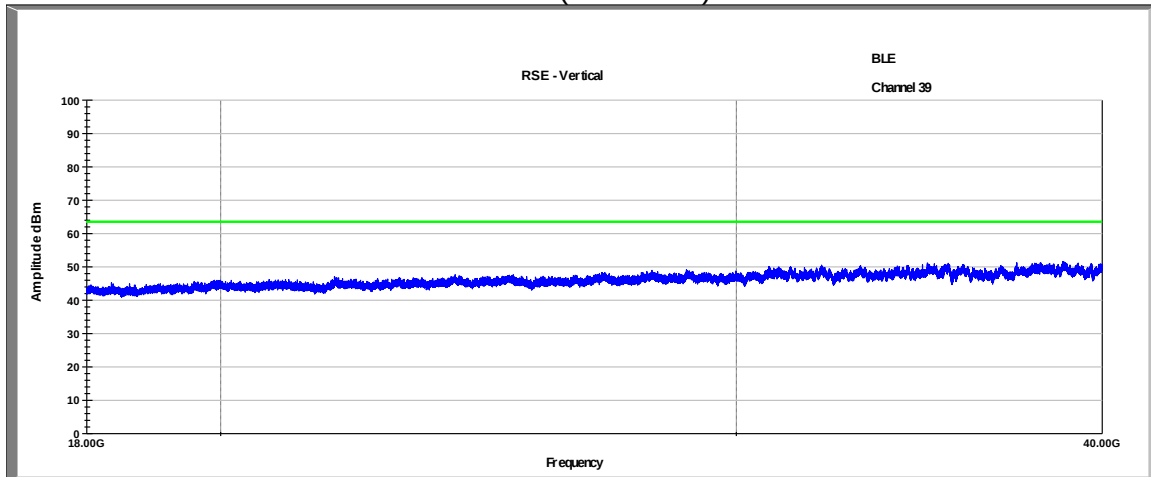


BLE Channel 39
 Horizontal (3-18GHz)

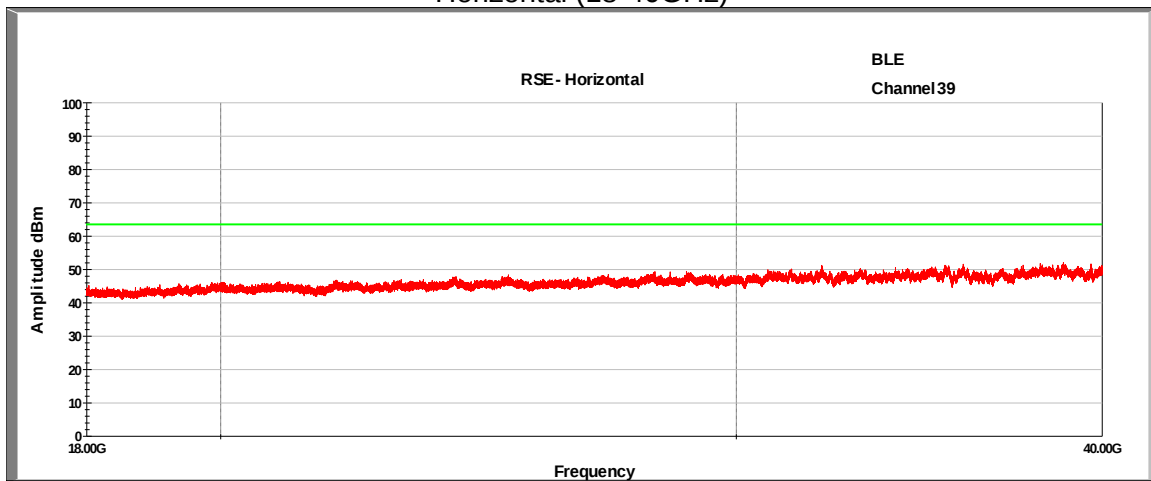


Worst-case spur: 40.5dBµV/m (Peak) @ 4960MHz (13.5dB Margin)

BLE Channel 39
 Vertical (18-40GHz)



BLE Channel 39
 Horizontal (18-40GHz)



7.6 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)
30.64	36.8	V	243.0	175.0	21.3	0.4	31.7	26.8	40.0	-13.2
39.55	46.5	V	29.0	175.0	14.6	0.4	32.3	29.2	40.0	-10.8
48.06	54.4	V	-2.0	175.0	9.4	0.5	32.7	31.6	40.0	-8.4
52.60	59.0	V	300.0	175.0	8.0	0.5	32.9	34.7	40.0	-5.3
55.89	59.2	V	323.0	175.0	7.6	0.5	32.9	34.5	40.0	-5.5
800.00	49.2	V	154.0	175.0	22.1	2.1	33.2	40.2	46.0	-5.8
48.20	44.0	H	255.0	175.0	9.3	0.5	32.7	21.1	40.0	-18.9
52.17	48.4	H	264.0	325.0	8.1	0.5	32.8	24.3	40.0	-15.7
55.89	49.1	H	271.0	325.0	7.6	0.5	32.9	24.4	40.0	-15.6
700.00	46.9	H	206.0	175.0	20.7	1.9	33.2	36.3	46.0	-9.7
800.00	52.7	H	53.0	175.0	22.1	2.1	33.2	43.7	46.0	-2.3
899.99	47.5	H	19.0	175.0	23.2	2.2	33.2	39.7	46.0	-6.4
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

No spurious emissions above 1GHz were within 10dB of the limit.

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 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 = 0.9 dB Cable Loss
 DC = 1.9 dB (64.1%) Duty Cycle Correction Factor
 AG = 2.4 dB Antenna Gain

$$\text{Offset} = -6.5 \text{ dB}$$

8.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 22.8 °C
 Relative Humidity: 38.5 %

8.4 Test Equipment

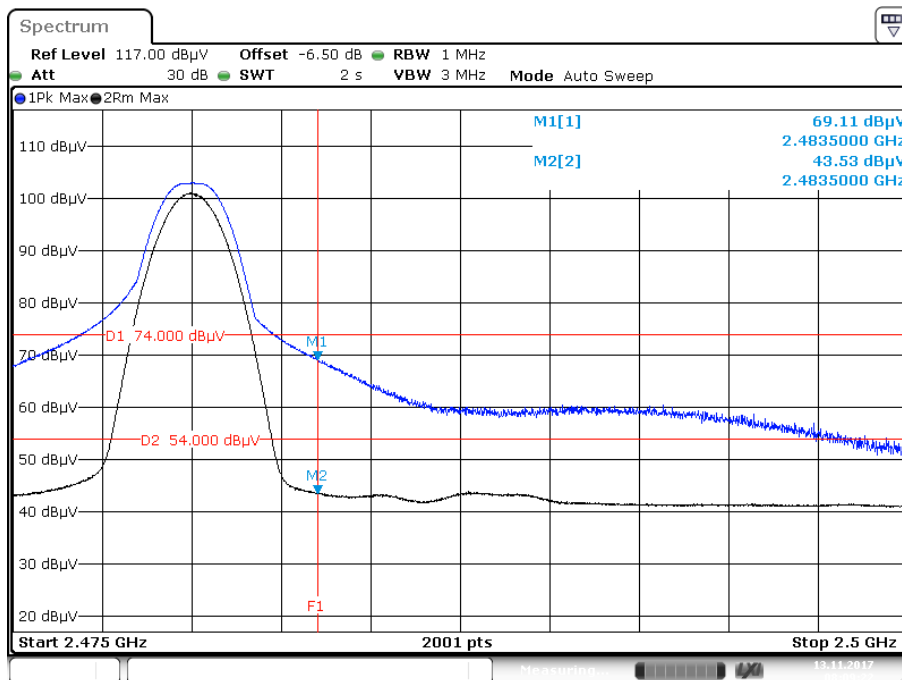
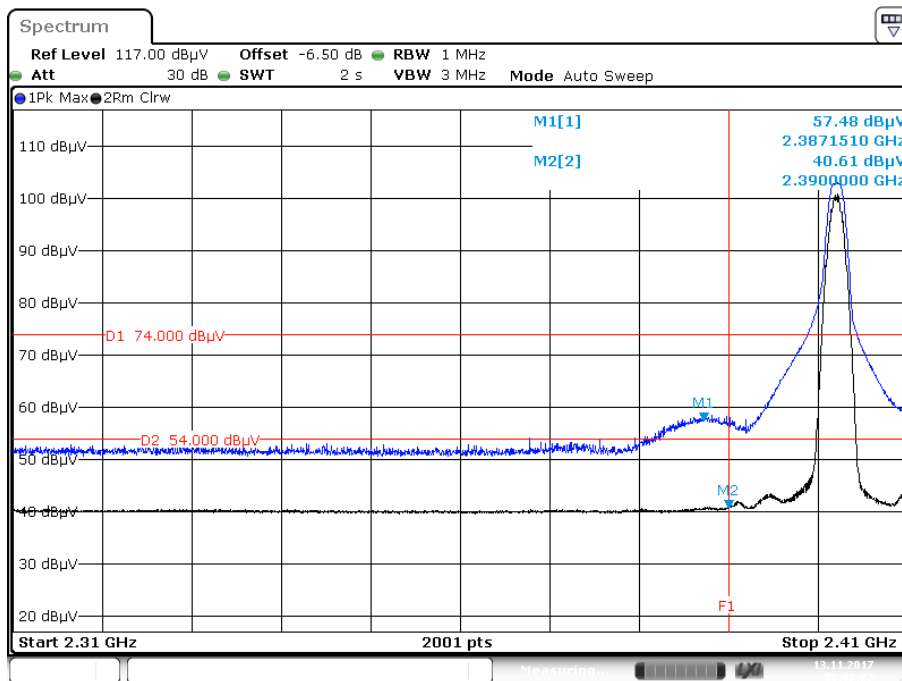
Test End Date: 13-Nov-2017

Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SPCTRUM ANALYZER	FSV30	ROHDE & SCHWARZ	S/N: 103106	24-Jul-2018
RF CABLE	SF102	HUBER & SUHNER	B079823	26-Jul-2018

Note: The equipment calibration period is 1 year.

8.5 Test Data – Restricted Band Edge



9 Conducted Emissions

9.1 Test Result

Test Description	Basic Standards	Test Result
Conducted Emissions, Class B	RSS-GEN, Issue 4 ANSI C63.4:2014	Compliant

9.2 Test Method

With the receivers resolution bandwidth was set to 9 kHz the exploratory scans were performed over the measuring frequency range (0.15MHz to 30MHz) using a max hold mode incorporating a Peak detector and Average detector and using the TILE! software. The final test data was measured using a Quasi-Peak detector and Average detector and compared against the limits indicated in the table below.

Frequency Range	Class A Limits (dBuV)	Class B Limits (dBuV) CISPR
0.15 to 0.5 MHz	Avg 66 QP 79	Avg 56 to 46 QP 66 to 56
0.5 to 5 MHz	Avg 60 QP 73	Avg 46 Pk 56
5 to 30 MHz	Avg 60 QP 73	Avg 50 Pk 60

9.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.8°C
 Relative Humidity: 21.2%

9.4 Test Equipment

Test End Date: 12-Dec-2017

Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU8	ROHDE & SCHWARZ	B085759	25-Jul-2018
LINE IMPEDANCE STABILIZATION NETWORK	NNB 51	TESEQ	B085882	8-Nov-2018
RF CABLE	CBL-25FT-NMNM	MINI-CIRCUITS	B094941	25-Jul-2018

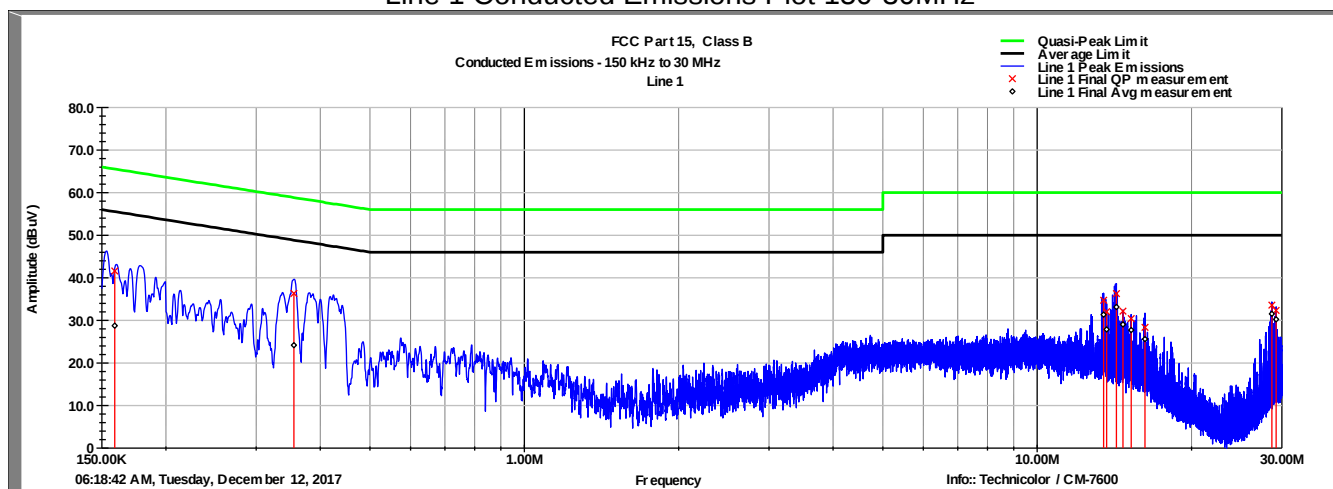
Note: The equipment calibration period is 1 year.

Software:

"Conducted Emissions" TILE! profile dated Dec 2015

9.5 Test Data

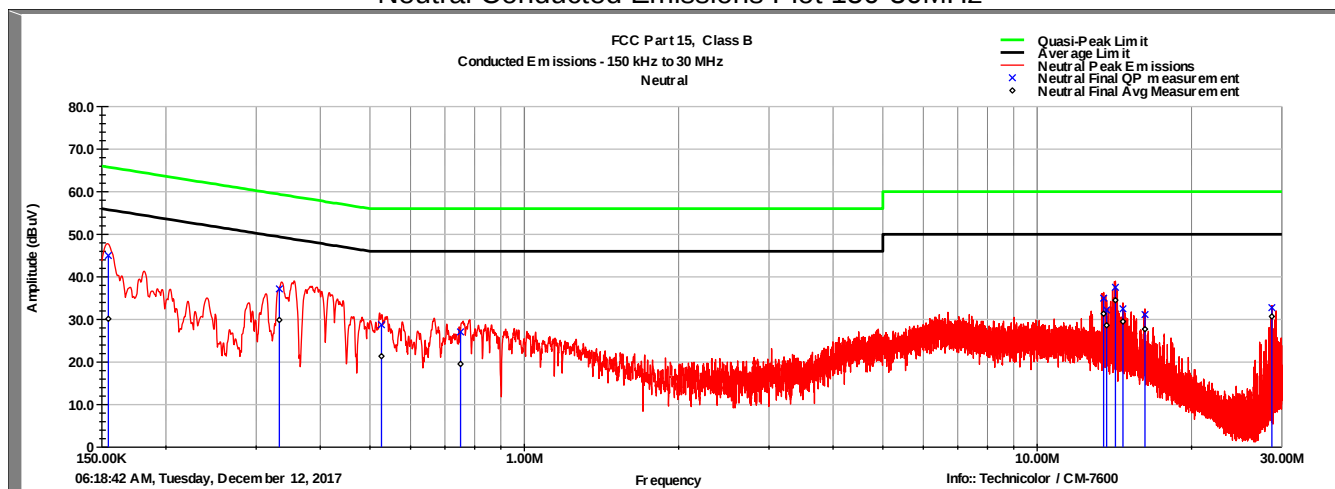
Line 1 Conducted Emissions Plot 150-30MHz



Line 1 Conducted Emissions Data 150-30MHz

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.159	41.6	65.5	-24.0	28.7	55.5	-26.8
0.355	36.3	58.8	-22.5	24.2	48.8	-24.6
13.479	34.7	60.0	-25.3	31.3	50.0	-18.7
13.662	32.0	60.0	-28.0	27.9	50.0	-22.1
14.273	36.3	60.0	-23.7	33.1	50.0	-16.9
14.701	32.2	60.0	-27.8	29.0	50.0	-21.0
15.251	30.4	60.0	-29.6	27.7	50.0	-22.3
16.231	28.3	60.0	-31.7	25.6	50.0	-24.4
28.685	33.6	60.0	-26.4	31.5	50.0	-18.5
29.234	32.3	60.0	-27.7	30.2	50.0	-19.8

Neutral Conducted Emissions Plot 150-30MHz



Neutral Conducted Emissions Data 150-30MHz

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.155	45.0	65.7	-20.7	30.1	55.7	-25.6
0.333	37.2	59.4	-22.2	29.9	49.4	-19.5
0.527	28.7	56.0	-27.3	21.4	46.0	-24.6
0.751	27.1	56.0	-28.9	19.5	46.0	-26.5
13.481	35.0	60.0	-25.0	31.3	50.0	-18.7
13.661	32.2	60.0	-27.8	28.6	50.0	-21.4
14.212	37.6	60.0	-22.4	34.5	50.0	-15.5
14.700	32.5	60.0	-27.5	29.5	50.0	-20.5
16.227	31.1	60.0	-28.9	27.7	50.0	-22.3
28.685	32.8	60.0	-27.2	30.7	50.0	-19.3

10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	11 December 2017