

EMC Test Report

Project Number: 2199**Report Number: 2199EMC01****Revision Level: 0****Client: ARRIS Group, Inc.****Equipment Under Test: Battery Backup****Model: XBB1-A****FCC ID: UIDXBB1****Applicable Standards: FCC Part 15 Subpart C, § 15.247****ANSI C63.10: 2013****Report issued on: 15 August 2016****Test Result: Compliant**

Tested by:



Fabian Nica, Senior Engineering Technician

Reviewed by:



Jeremy Pickens, Senior 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)	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
AC Powerline Conducted Emission	15.107, 15.207	Compliant

1.1 Modifications Required for Compliance

None

2 General Information

2.1 Client Information

Name: ARRIS Group, Inc.
Address: 3871 Lakefield Drive, Suite 300
City, State, Zip, Country: Suwanee, GA 30024, 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: Battery Backup
Model Number: XBB1-A
Serial Number: G76BWXX222200055 (Conducted)
G76BWXX222200084 (Radiated)

FCC ID: UIDXBB1

Frequency Range: 2405-2480MHz
Modulation: 802.15.4
Antenna: PCB – Inverted F

Rated Voltage: 12 Vdc
Test Voltage: 12Vdc

Sample Received Date: 08 August 2016
Dates of testing: 10 - 16 August 2016

2.3 Operating Modes and Conditions

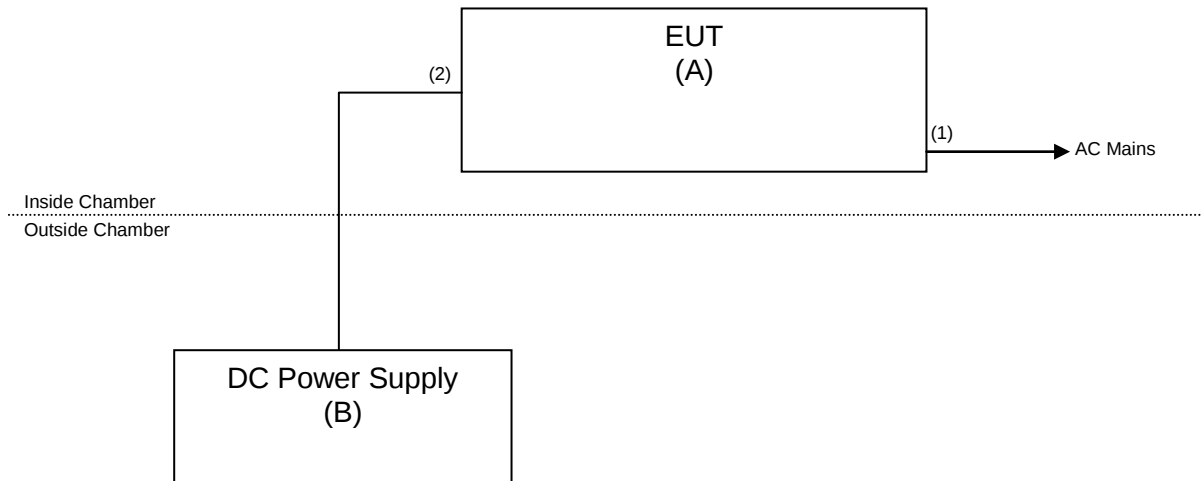
Continuous traffic was generated using test commands. The device was programmed to transmit at 100% duty cycle at low, middle, and high channels.

Channel 11, 2405MHz

Channel 18, 2440MHz

Channel 26, 2480MHz

2.4 EUT Connection Block Diagram



2.5 System Configurations

Device reference	Manufacturer	Description	Model Number	Serial Number
A	ARRIS Group, Inc	Battery Backup	XBB1-A	G76BWX222200055 (Conducted) G76BWX222200084 (Radiated)
B	Extech	DC Power Supply	382280	12010471

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: 23.0 °C

Relative Humidity: 42.2 %

3.4 Test Equipment

Test Date: 12-Aug-2016

Tester: JOP

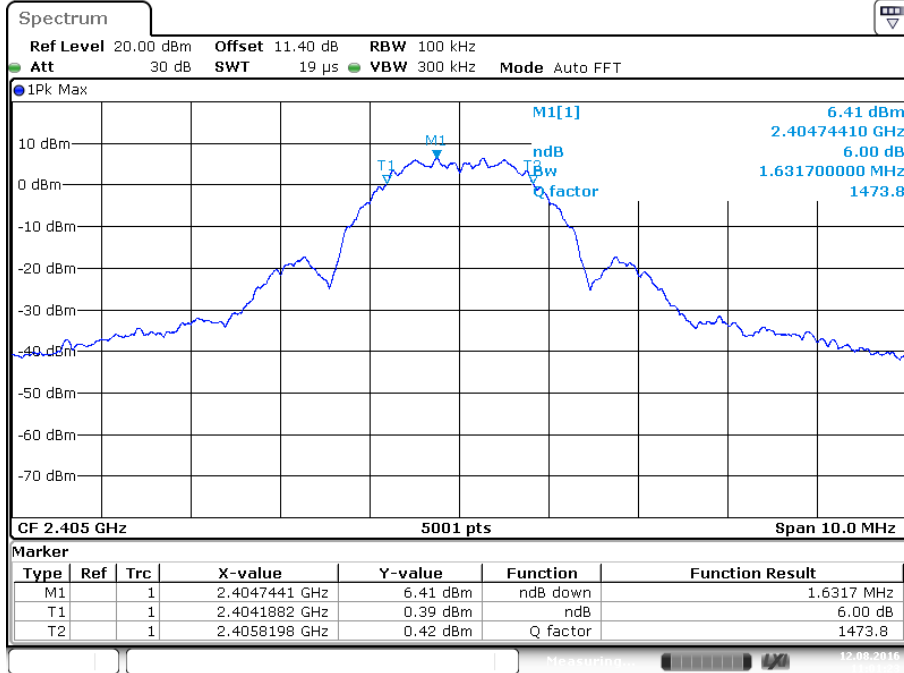
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095593	27-Jul-2017

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

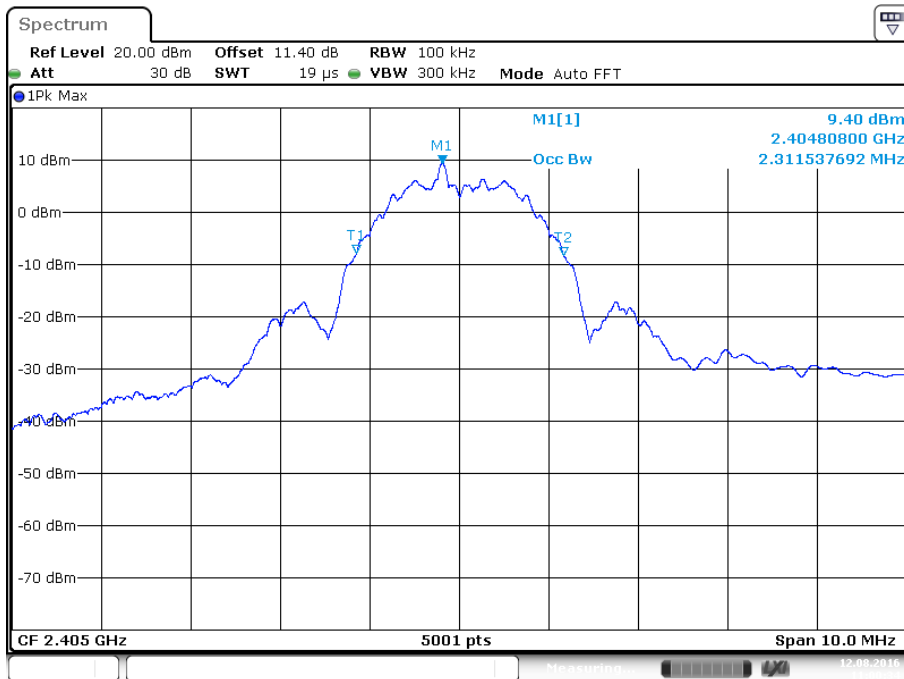
3.5 Test Data

Channel	6dB Bandwidth (MHz)	Occupied Bandwidth (99%) (MHz)
11	1.632	2.312
18	1.646	2.296
26	1.638	2.298

Sample Plots



Date: 12.AUG.2016 11:01:24



Date: 12.AUG.2016 11:00:34

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 power measurements were recorded using the peak power 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

4.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.0 °C
Relative Humidity: 42.2 %

4.4 Test Equipment

Test Date: 12-Aug-2016

Tester: JOP

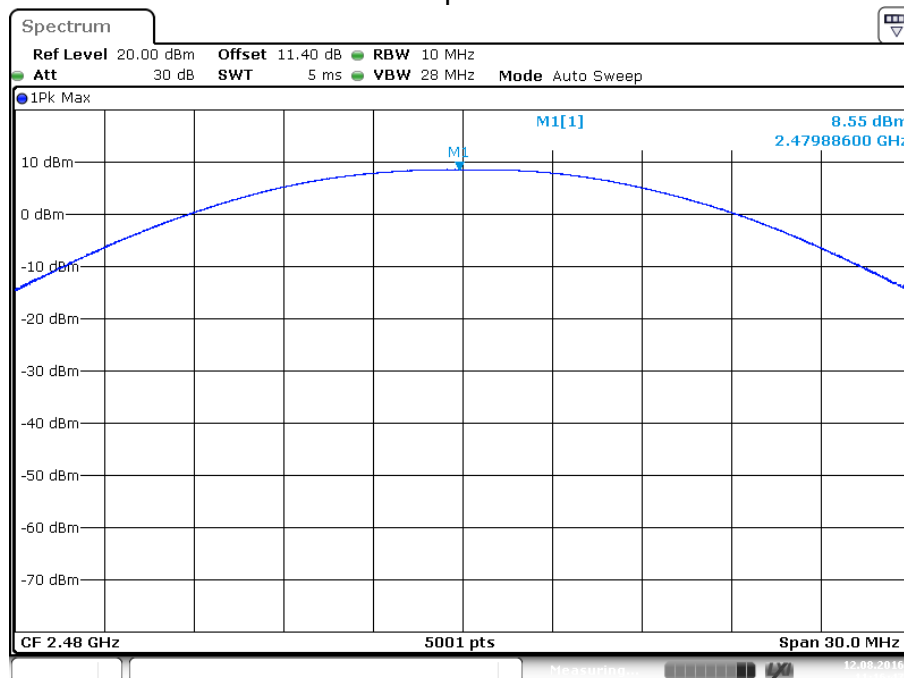
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095593	27-Jul-2017

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

4.5 Test Data

Channel	Frequency (MHz)	Peak Power (dBm)	Limit (30dBm)	Margin (dB)
11	2405	9.97	30	-20.03
18	2440	9.33	30	-20.67
26	2480	-3.56	30	-33.56

Sample Plot



- After initial measurements, the output power was reduced at channel 26 to meet the FCC band edge requirements. The final measured power does not match the 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

Fundamental power spectral density measurements were recorded using the peak PSD 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: 23.0 °C

Relative Humidity: 42.2 %

5.4 Test Equipment

Test Date: 12-Aug-2016

Tester: JOP

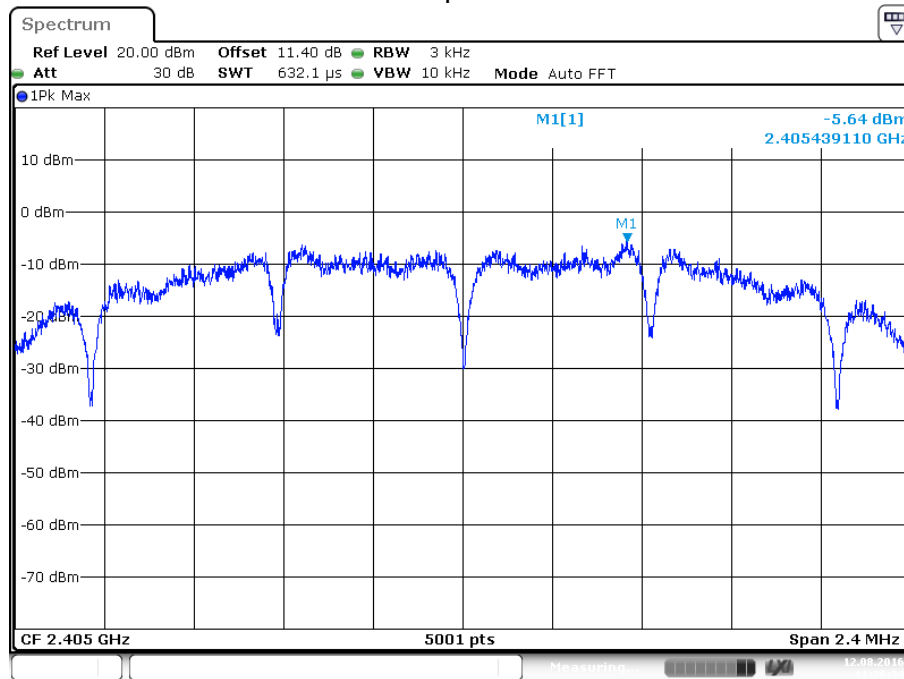
Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095593	27-Jul-2017

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

5.5 Test Data

Channel	Frequency (MHz)	Peak PSD (dBm)	Limit (30dBm)	Margin (dB)
11	2405	-5.64	8	-13.64
18	2440	-6.2	8	-14.2
26	2480	-6.94	8	-14.94

Sample Plot



Date: 12.AUG.2016 11:26:34

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 is 20 dB below the maximum in-band peak PSD level in 100 kHz.

6.3 Test Site

SGS EMC Laboratory, Suwanee, GA

Environmental Conditions

Temperature: 23.0 °C

Relative Humidity: 42.2 %

6.4 Test Equipment

Test Date: 12-Aug-2016

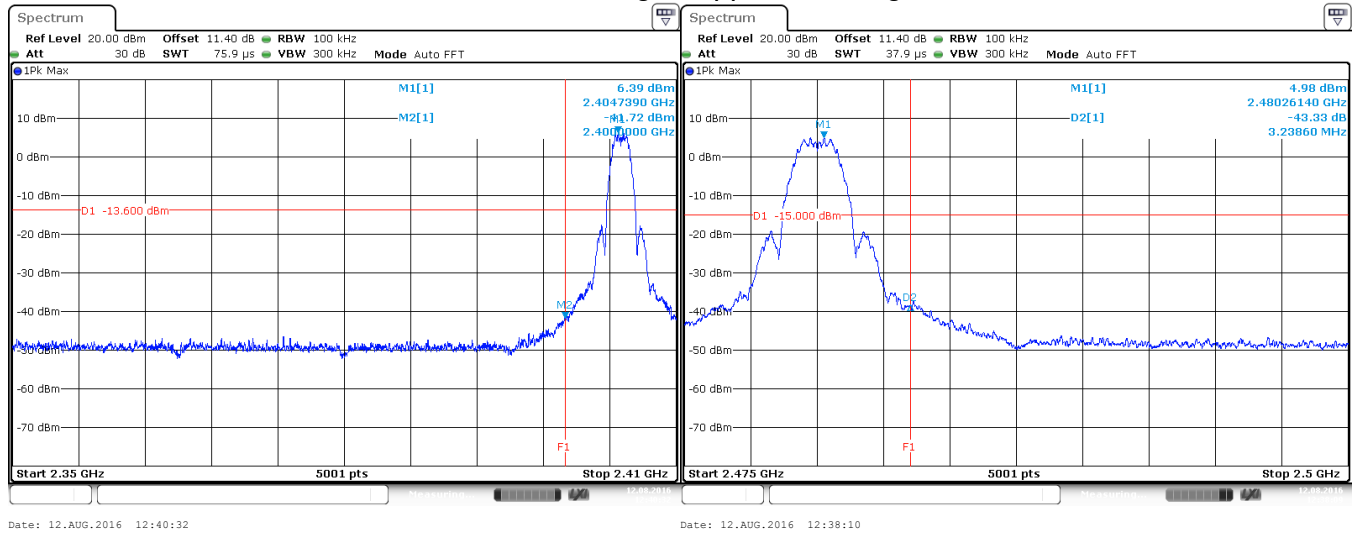
Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
SIGNAL ANALYZER	FSV30	ROHDE & SCHWARZ	B085749	8-Oct-2017
RF CABLE	141	HUBER & SUHNER	B095585	26-Jul-2017
ATTENUATOR, 10DB	10DB	ROHDE & SCHWARZ	B095593	27-Jul-2017

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

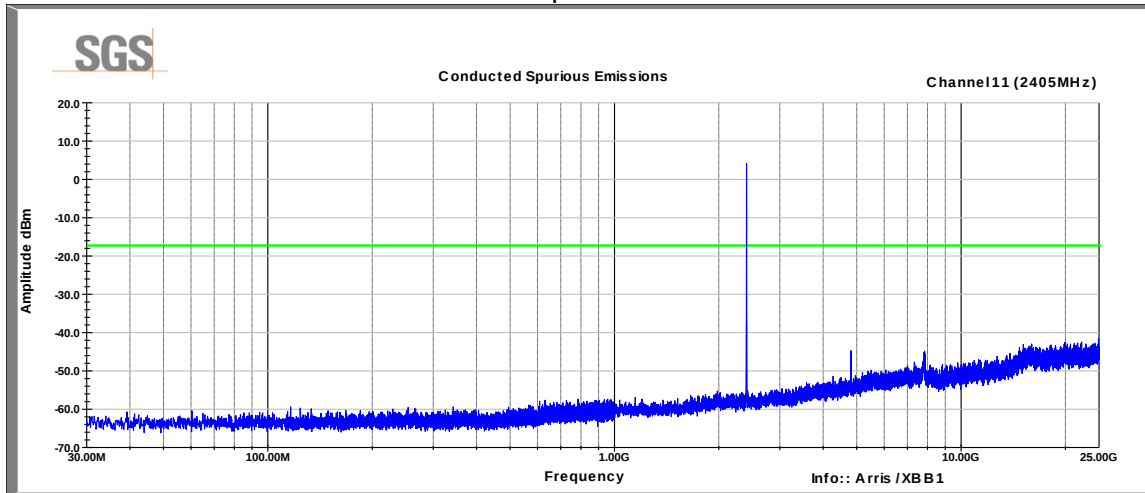
6.5 Test Data – DTS Bandedge

Lower band edge / Upper band edge

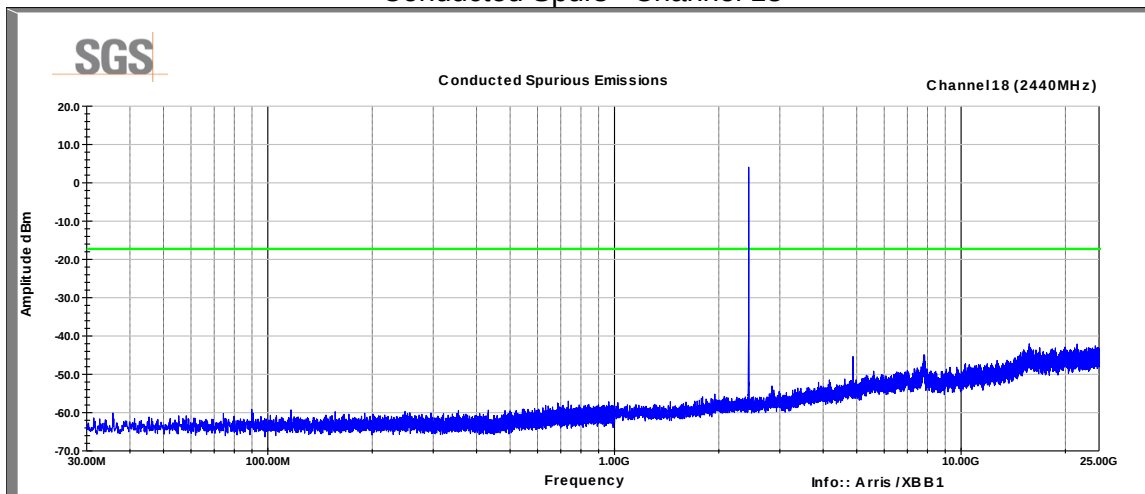


6.6 Test Data – Conducted Spurious Emissions

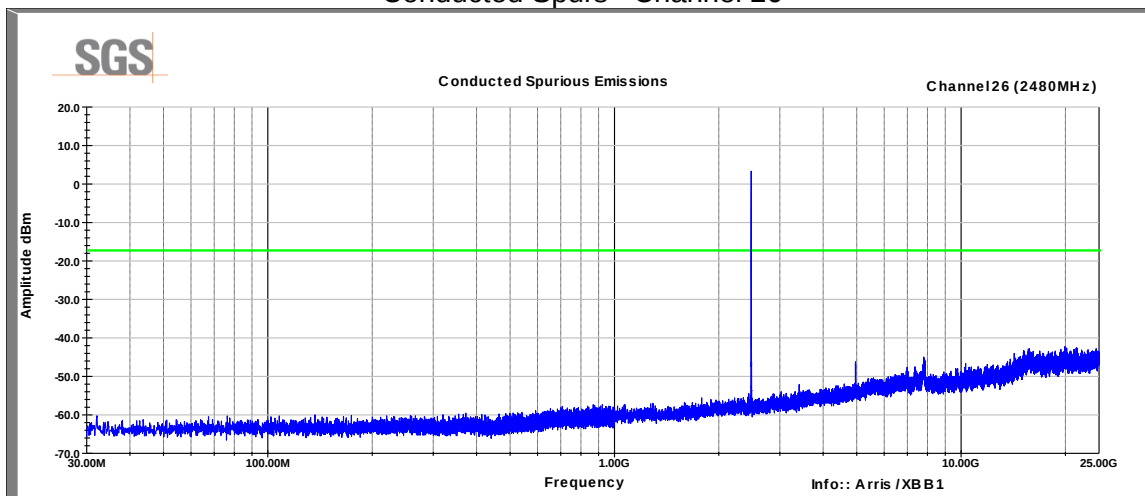
Conducted Spurs –Channel 11



Conducted Spurs –Channel 18



Conducted Spurs –Channel 26



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

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.

Test distance:

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 (limit adjusted according to 20*LOG(D1/D2))

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: 49.2 %

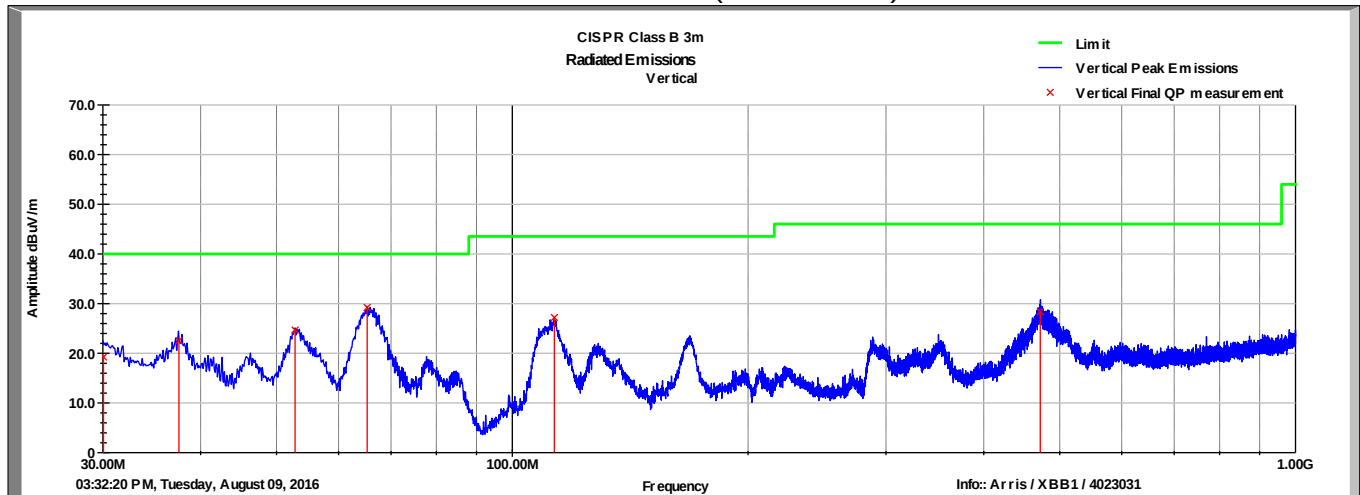
7.4 Test Equipment

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
Test Equipment for Measurements < 1GHz (Test Date: 8/09/2016)				
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
ANTENNA, BILOG	JB6	SUNOL	B079689	8-Sep-2017
RF CABLE	NFS-290-78.7-NFS	FLORIDA RF LABS	B095019	28-Jul-2017
RF CABLE	NMS-290-236.2-NMS	FLORIDA RF LABS	B095020	29-Jul-2017
RF CABLE	CBL-25FT-NMNM	MINI-CIRCUITS	B094941	25-Jul-2017
RF CABLE	104PE	HUBER & SUHNER	B079793	27-Jul-2017
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	29-Jul-2017
Test Equipment for Measurements > 1GHz (Test Date: 8/11/2016)				
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
DRG HORN (MEDIUM)	3117	ETS LINDGREN	B079691	27-Jul-2017
RF CABLE	NMS-290-236.2-NMS	FLORIDA RF LABS	B095020	29-Jul-2017
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	4-Aug-2017
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	29-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	B079823	27-Jul-2017
LOW NOISE AMPLIFIER	NSP1840-HG	MITEQ	B087572	29-Jul-2017

Note: The equipment calibration period is 1 year.

7.5 Peak Plots

Low Channel (Channel 11, 2405MHz)
Peak Plot Vertical (30-1000MHz)

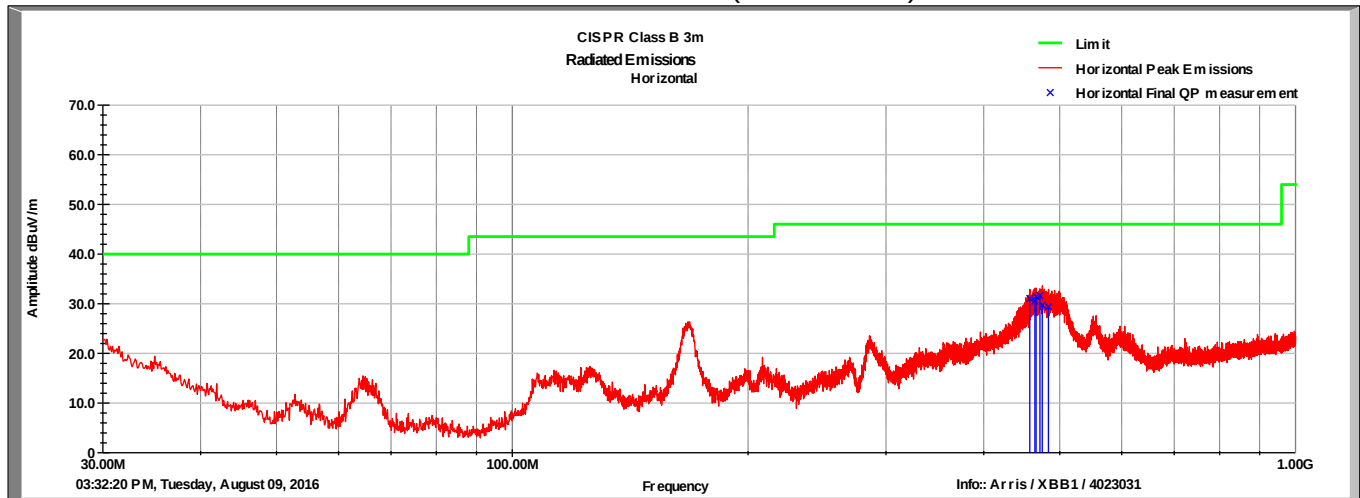


Low Channel (Channel 11, 2405MHz)
Tabular Data (30-1000MHz)

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)
30.06	27.5	V	240.0	196.0	22.2	0.7	31.1	19.2	40.0	-20.8
37.53	37.1	V	270.0	100.0	16.3	0.7	31.7	22.5	40.0	-17.5
52.80	48.5	V	38.0	100.0	8.0	0.9	32.8	24.7	40.0	-15.3
65.26	53.5	V	66.0	120.0	8.0	1.0	33.3	29.2	40.0	-10.8
113.18	46.3	V	106.0	110.0	13.3	1.4	33.8	27.2	43.5	-16.3
472.33	40.9	V	31.0	137.0	18.0	3.0	33.6	28.4	46.0	-17.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

Note: There was no change in the emission profile below 1GHz when switching among Channels 11, 18, and 26.

Low Channel (Channel 11, 2405MHz) Peak Plot Horizontal (30-1000MHz)

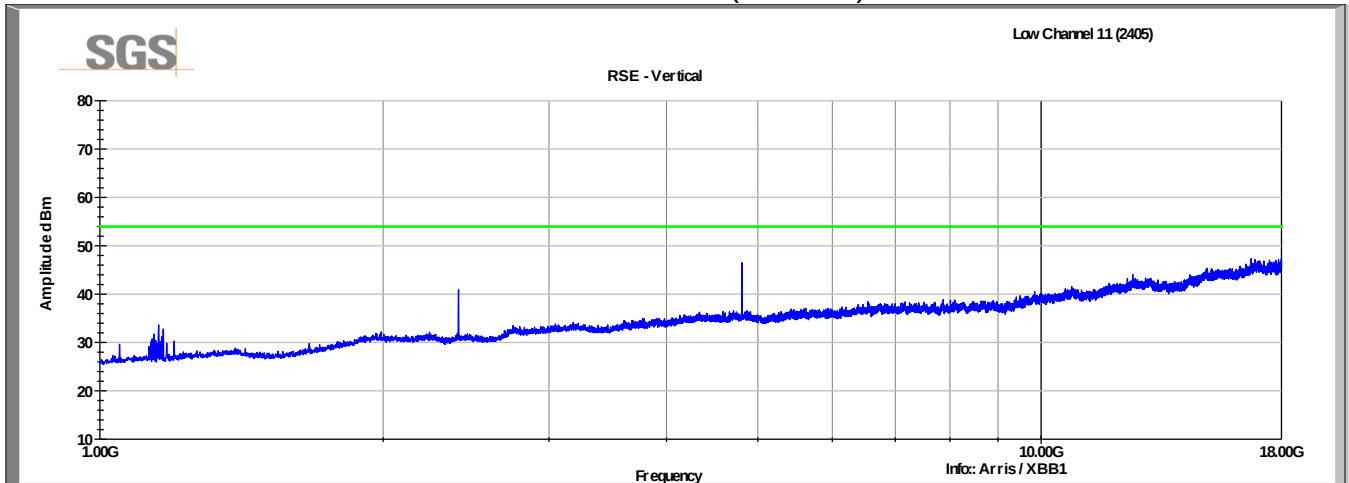


Low Channel (Channel 11, 2405MHz) Tabular Data (30-1000MHz)

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)
457.86	44.1	H	328.0	224.0	17.7	2.9	33.6	31.0	46.0	-15.0
464.81	43.2	H	338.0	184.0	18.0	2.9	33.6	30.5	46.0	-15.5
466.36	44.1	H	314.0	205.0	18.0	3.0	33.6	31.4	46.0	-14.6
471.72	44.2	H	328.0	185.0	18.0	3.0	33.6	31.6	46.0	-14.4
475.08	42.2	H	9.0	186.0	18.1	3.0	33.6	29.7	46.0	-16.3
483.75	41.9	H	330.0	213.0	18.1	3.0	33.6	29.4	46.0	-16.6
QP Value = Level + AF + CL - Amp										
Margin = QP Value - Limit										

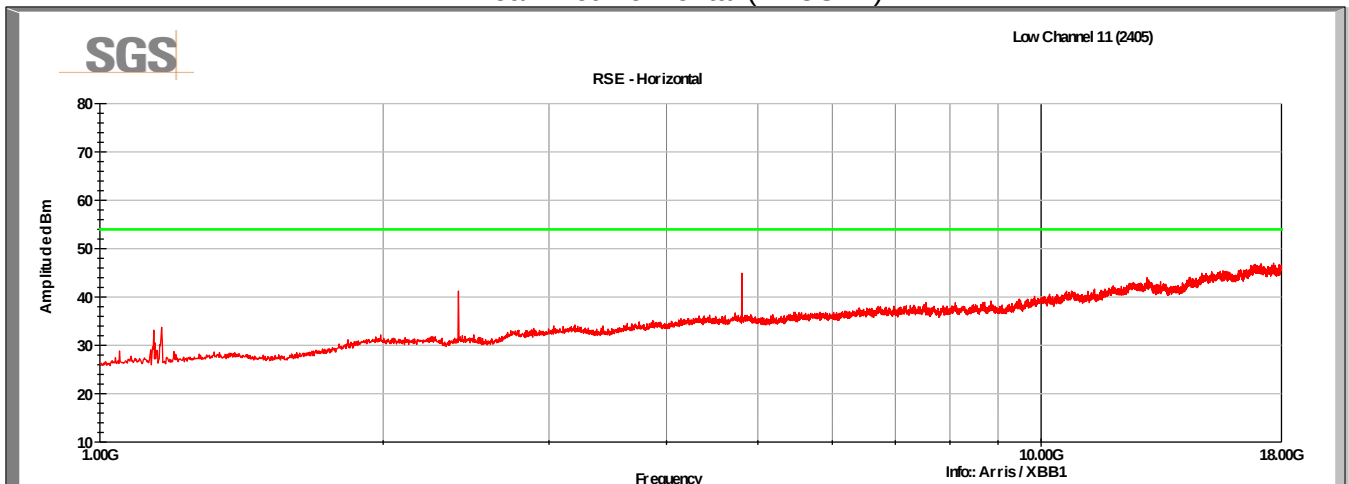
Note: There was no change in the emission profile below 1GHz when switching among Channels 11, 18, and 26.

Low Channel (Channel 11, 2405MHz)
Peak Plot Vertical (1-18GHz)



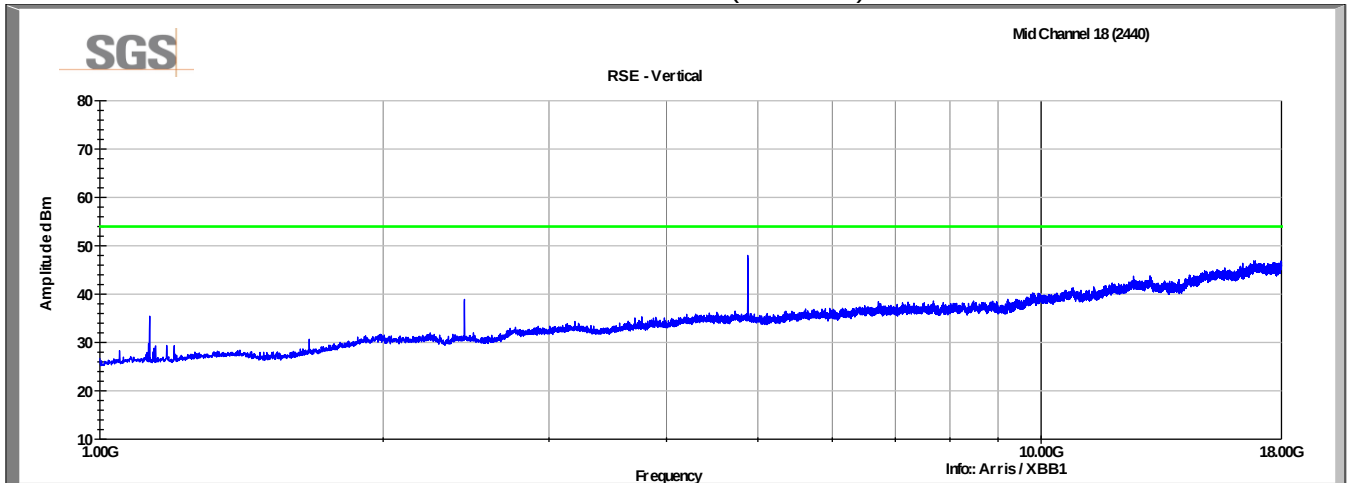
Peak @ 4810MHz, 46.5dBμV

Low Channel (Channel 11, 2405MHz)
Peak Plot Horizontal (1-18GHz)



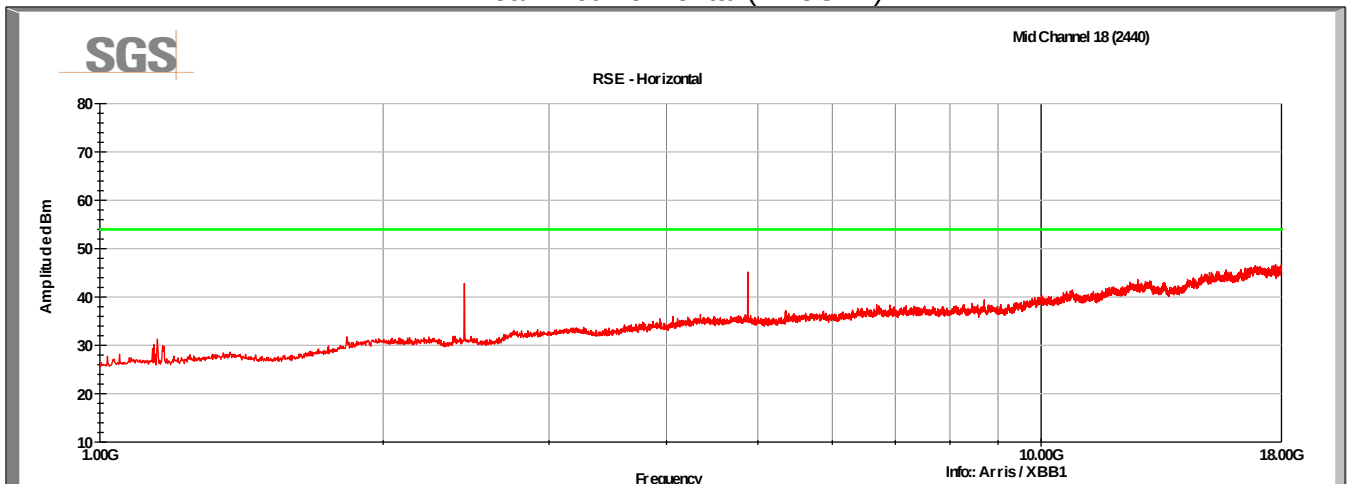
Peak @ 4810MHz, 44.9dBμV

Mid Channel (Channel 18, 2440MHz)
Peak Plot Vertical (1-18GHz)



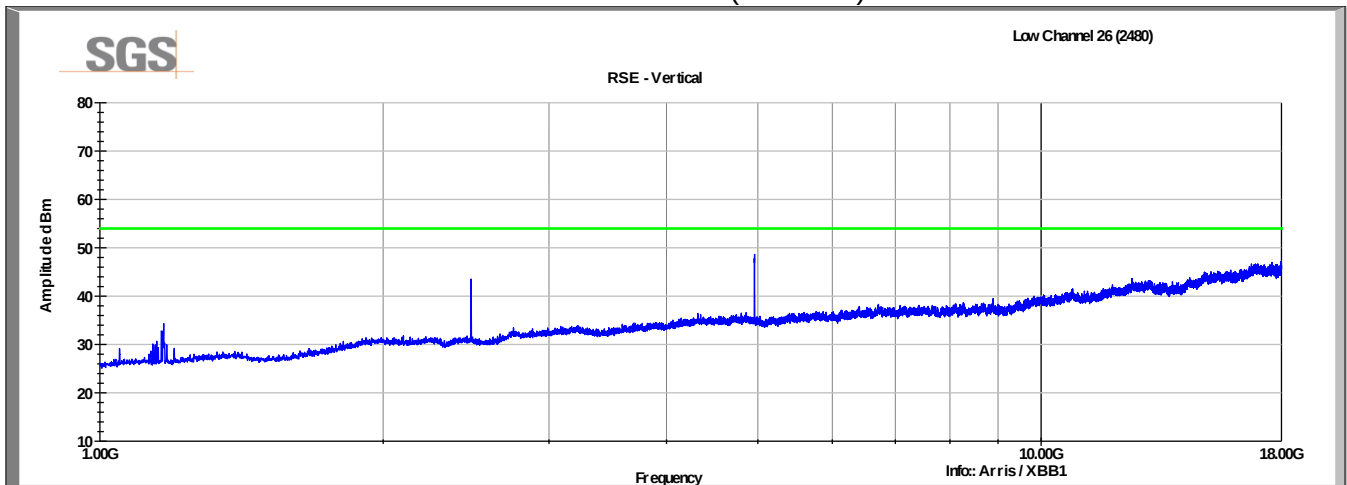
Peak @ 4880MHz, 48.0dBμV

Mid Channel (Channel 18, 2440MHz)
Peak Plot Horizontal (1-18GHz)



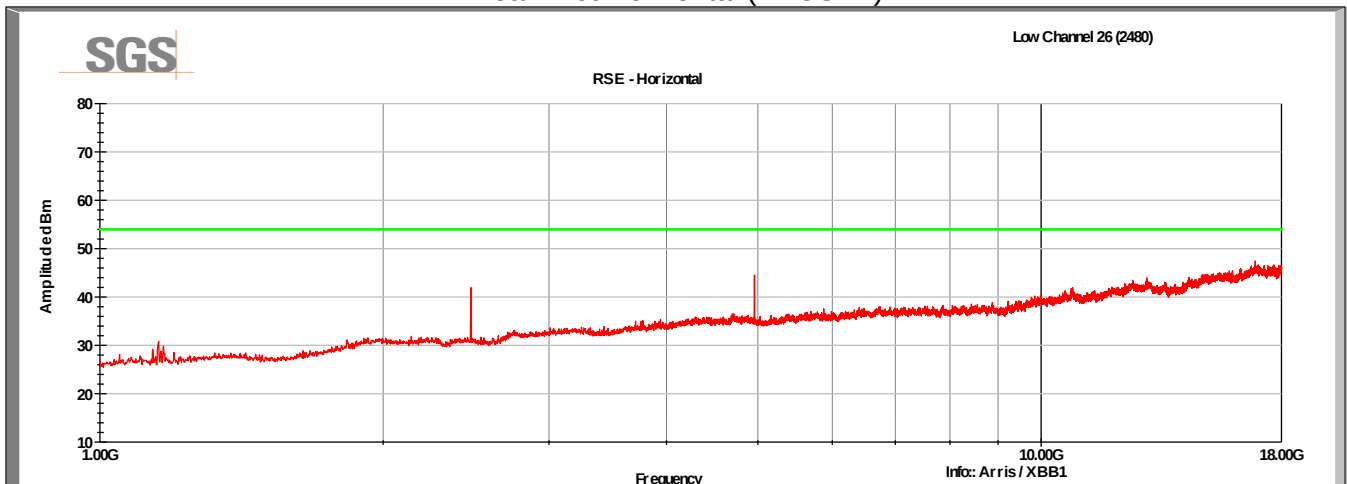
Peak @ 4880MHz, 45.2dBμV

High Channel (Channel 26, 2480MHz)
Peak Plot Vertical (1-18GHz)



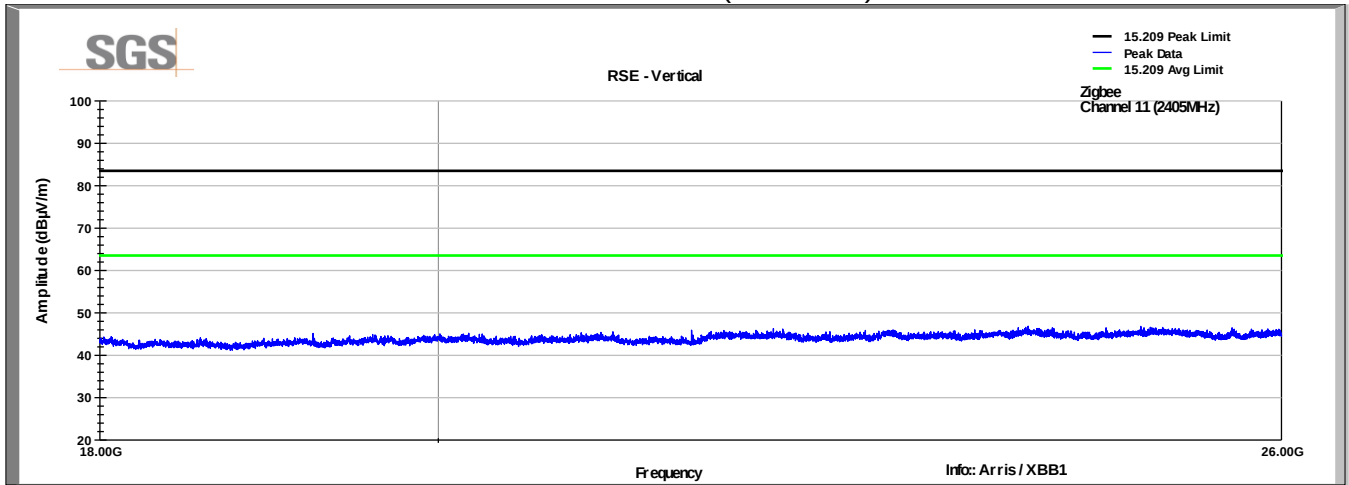
Peak @ 4960MHz, 48.6dBμV

High Channel (Channel 18, 2440MHz)
Peak Plot Horizontal (1-18GHz)

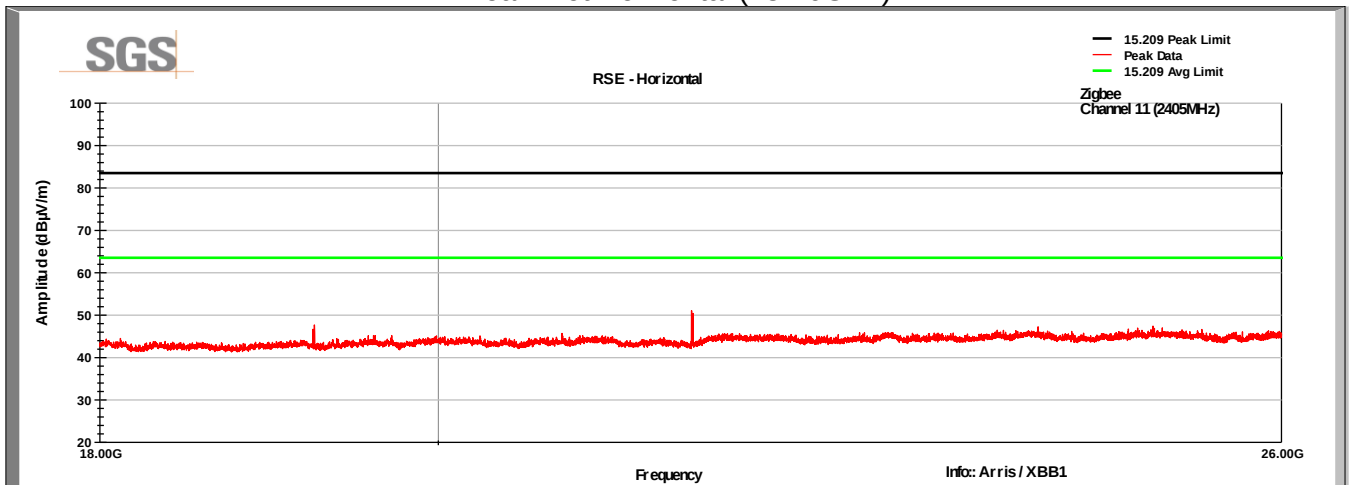


Peak @ 4960MHz, 44.3dBμV

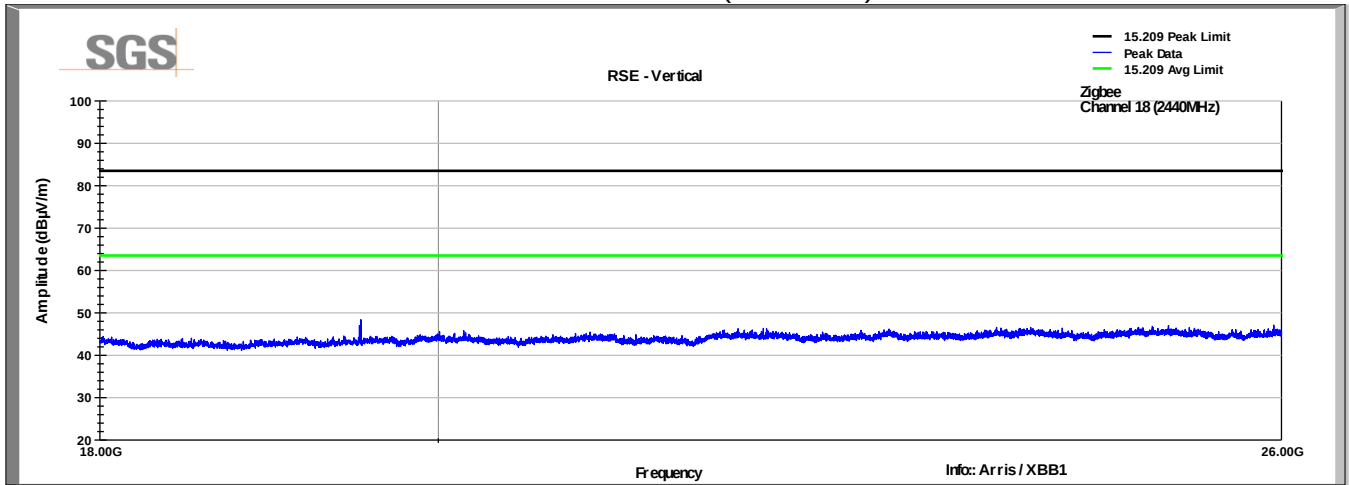
Low Channel (Channel 11, 2405MHz)
Peak Plot Vertical (18-26GHz)



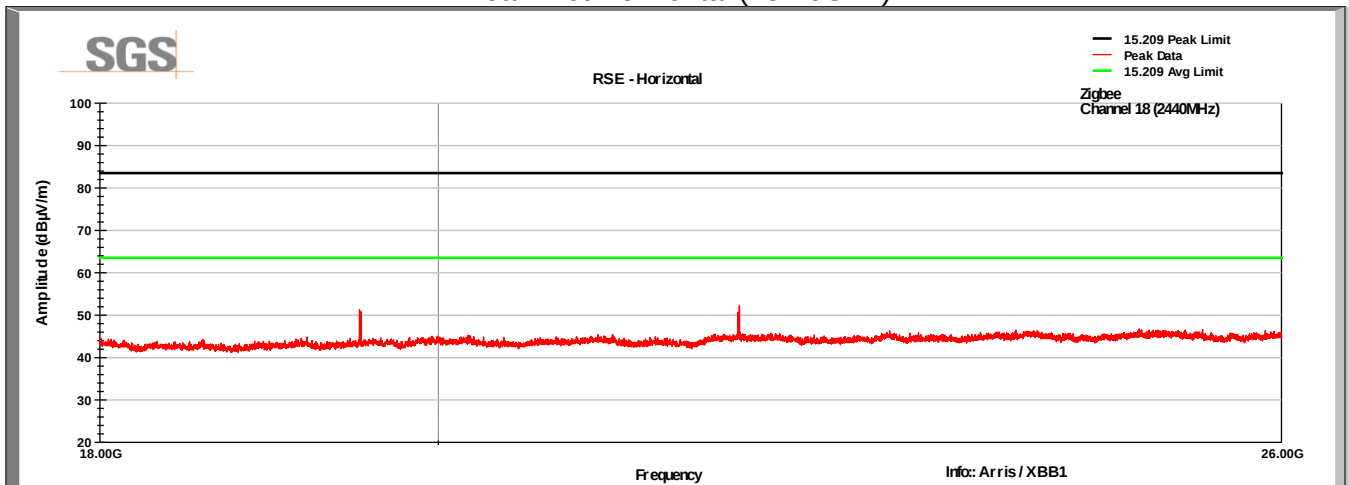
Low Channel (Channel 11, 2405MHz)
Peak Plot Horizontal (18-26GHz)



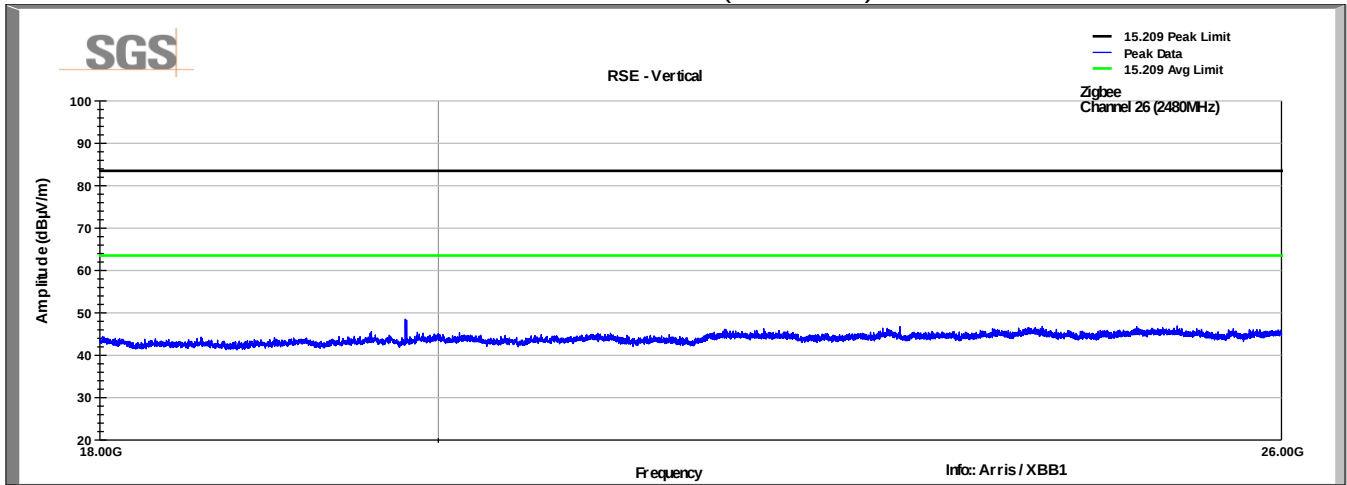
Mid Channel (Channel 18, 2440MHz)
Peak Plot Vertical (18-26GHz)



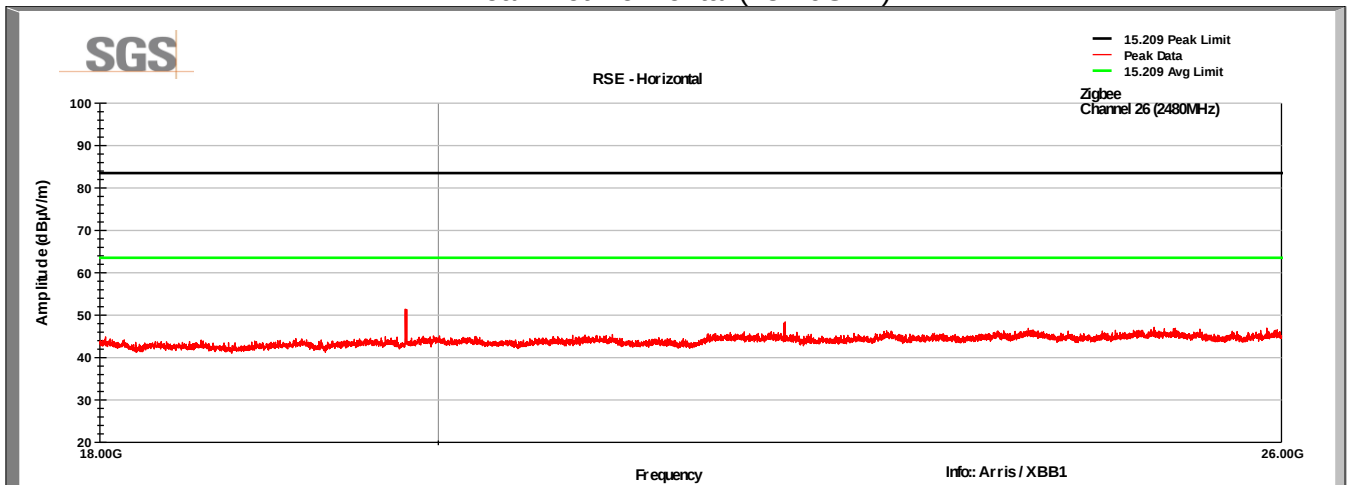
Mid Channel (Channel 18, 2440MHz)
Peak Plot Horizontal (18-26GHz)



High Channel (Channel 26, 2480MHz) Peak Plot Vertical (18-26GHz)



High Channel (Channel 26, 2480MHz) Peak Plot Horizontal (18-26GHz)



8 Radiated Emissions at Band Edge / Restricted Band

8.1 Test Result

Test Description	Test Specification	Test Result
Field strength of spurious radiation	15.247 (d) and 15.209	Compliant

8.2 Test Method

Peak and average field strength measurements were performed at the restricted band edges of 2390MHz and 2483.5MHz. Initial measurements were recorded with the maximum target power (8dBm). Reductions were applied where necessary to achieve compliance. Measurements were made using the radiated methods defined in FCC KDB publication 558074 D01 DTS Meas Guidance v03r05.

8.3 Test Site

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

Environmental Conditions

Temperature: 23.5 °C

Relative Humidity: 49.2 %

8.4 Test Equipment

Test Date: 11-Aug-2016

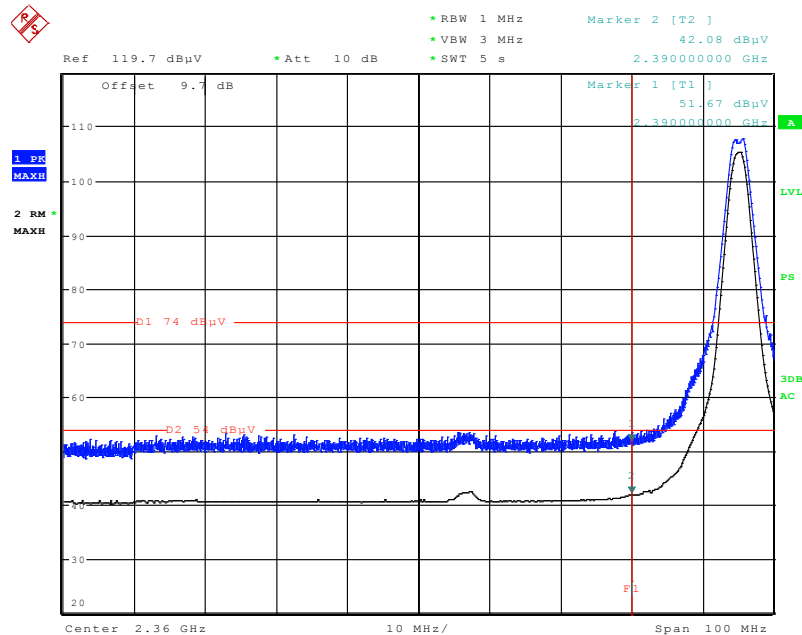
Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
DRG HORN (MEDIUM)	3117	ETS Lindgren	B079691	27-Jul-2017
RF CABLE	NMS-290-236.2-NMS	FLORIDA RF LABS	B095020	29-Jul-2017
RF CABLE	SUCOFLEX 100	HUBER & SUHNER	B108523	4-Aug-2017
LOW NOISE AMPLIFIER	TS-PR18	ROHDE & SCHWARZ	15003	29-Jul-2017

Note: The equipment calibration period is 1 year.

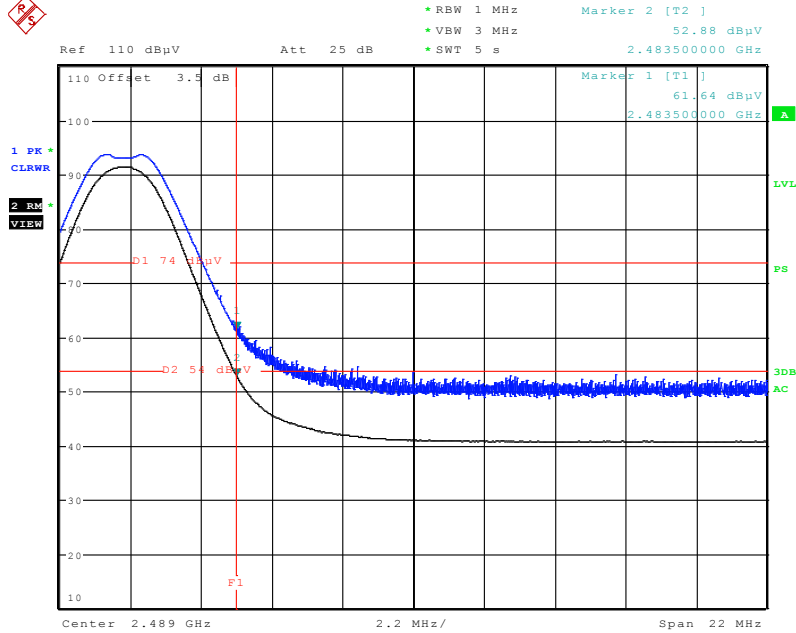
8.5 Test Data

Channel 11 – 8dBm



Channel	Frequency (MHz)	Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measuremnt Detector
11	2390	51.7	74	-22.3	Peak
11	2390	42.1	54	-11.9	RMS

Channel 26 - -4dBm (Reduced for compliance)



Channel	Frequency (MHz)	Reading (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Measuremnt Detector
26	2483.5	61.6	74	-12.4	Peak
26	2483.5	52.9	54	-1.1	RMS

9 Conducted Emissions

9.1 Test Result

Test Description	Basic Standards	Test Result
Conducted Emissions Class B	FCC Part 15, Subpart B ICES-003	Compliant

9.2 Test Method

With the receiver resolution bandwidth was set to 9 kHz the initial preliminary 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 B Limits (dBuV)
0.15 to 0.5 MHz	Avg 56 to 46 QP 66 to 56
0.5 to 5 MHz	Avg 46 Pk 56
5 to 30 MHz	Avg 50 Pk 60

9.3 Test Site

SGS EMC Laboratory, Suwanee, GA
Environmental Conditions

Temperature: 23.0 °C
Relative Humidity: 48.5 %

9.4 Test Equipment

Test Date: 16-Aug-2016

Tester: JOP

Equipment	Model	Manufacturer	Asset Number	Cal Due Date
EMI TEST RECEIVER	ESU40	ROHDE & SCHWARZ	B079629	20-Jun-2017
LINE IMPEDANCE STABILIZATION NETWORK	NNB 51	TESEQ	B087573	12-Nov-2016
RF CABLE	SF106	HUBER & SUHNER	B085887	26-Jul-2017

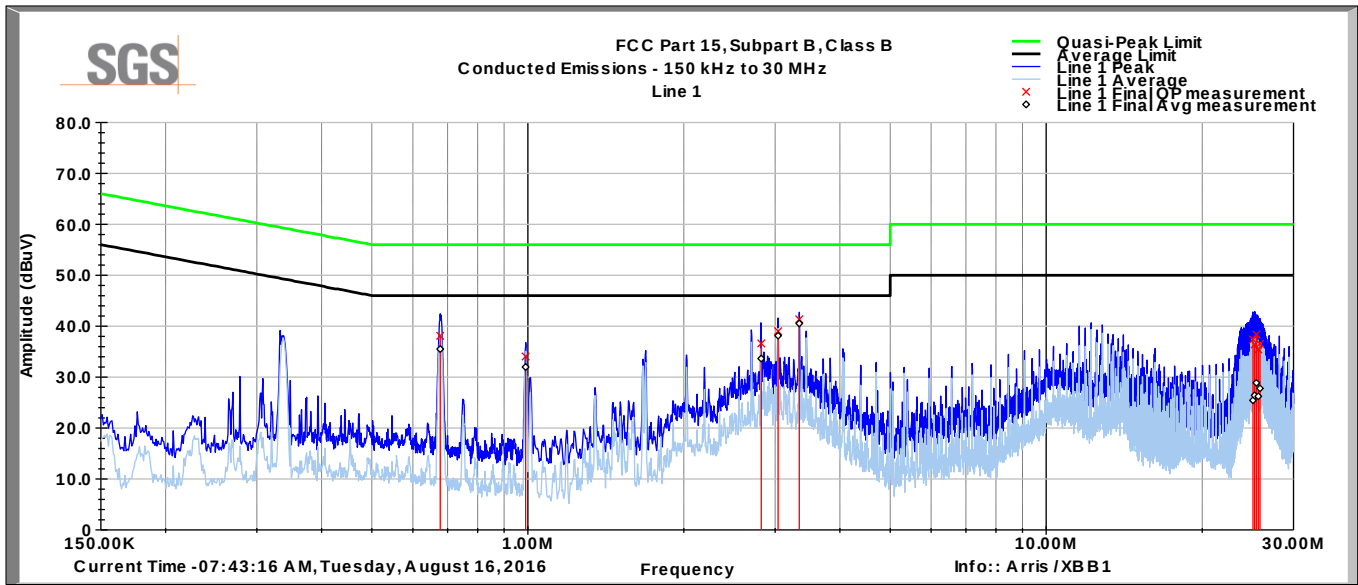
Note: The equipment calibration period is 1 year.

Software:

“Conducted Emissions” TILE! profile dated December 2015

9.5 Test Data

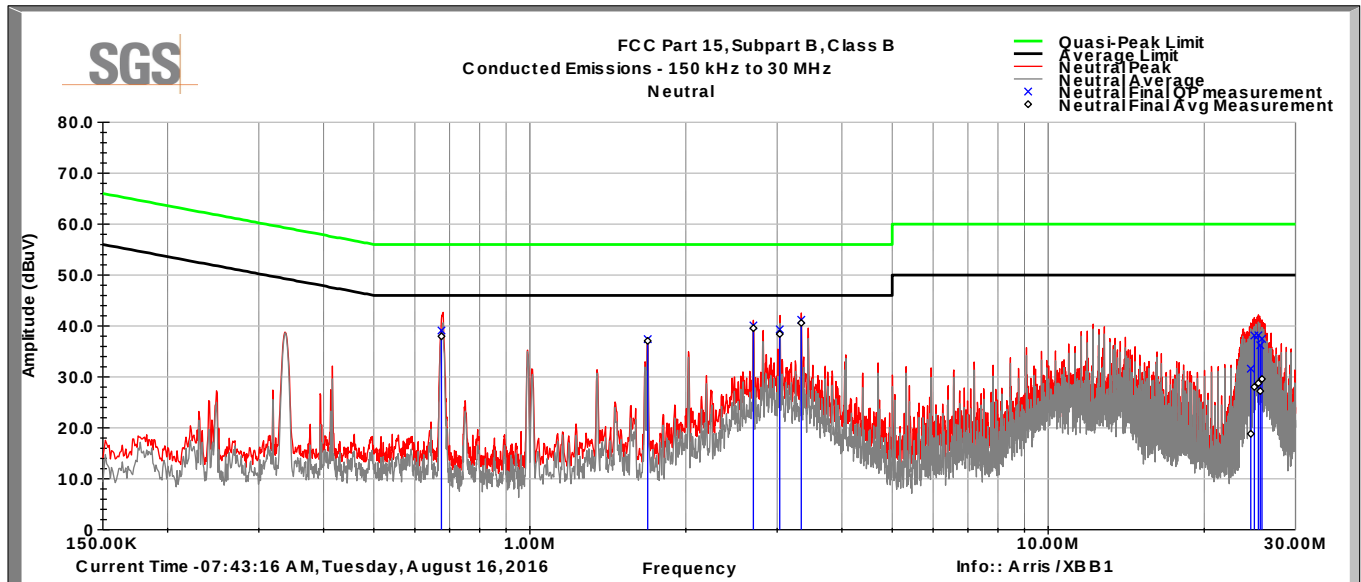
Line 1 Conducted Plot



Line 1 Conducted Emissions

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.677	38.1	56.0	-17.9	35.5	46.0	-10.5
0.990	34.0	56.0	-22.0	32.0	46.0	-14.0
2.820	36.6	56.0	-19.4	33.6	46.0	-12.4
3.039	39.0	56.0	-17.0	38.1	46.0	-7.9
3.340	41.3	56.0	-14.7	40.5	46.0	-5.5
25.058	37.4	60.0	-22.6	25.4	50.0	-24.6
25.244	36.4	60.0	-23.6	26.4	50.0	-23.6
25.449	38.4	60.0	-21.6	28.9	50.0	-21.1
25.659	35.4	60.0	-24.6	26.2	50.0	-23.8
25.845	36.5	60.0	-23.5	27.8	50.0	-22.2

Neutral Conducted Plot



Neutral Conducted Emissions

Frequency MHz	QP Value dBuV	QP Limit dBuV	QP Margin dB	Avg Value dBuV	Avg Limit dBuV	Avg Margin dB
0.675	39.1	56.0	-16.9	38.0	46.0	-8.0
1.688	37.4	56.0	-18.6	37.1	46.0	-8.9
2.700	40.1	56.0	-15.9	39.6	46.0	-6.4
3.035	39.3	56.0	-16.7	38.4	46.0	-7.6
3.340	41.2	56.0	-14.8	40.6	46.0	-5.4
24.599	31.6	60.0	-28.4	18.8	50.0	-31.2
24.990	38.1	60.0	-21.9	28.0	50.0	-22.0
25.449	38.2	60.0	-21.8	28.8	50.0	-21.2
25.658	36.2	60.0	-23.8	27.2	50.0	-22.8
25.849	37.5	60.0	-22.5	29.6	50.0	-20.4

10 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	15 August 2016