TEST REPORT

Report Number: 103506678MPK-002
Project Number: G103506678
September 18, 2018

Testing performed on
CONEKT
Models: CSR-35P & CSR-35L
FCC ID: T8I-CONEKT
IC: 6504A-CONEKT
to

FCC Part 15 Subpart C (15.247)
Industry Canada RSS-247 Issue 2
FCC Part 15, Subpart B
Industry Canada ICES-003

For

Farpointe Data, Inc.

Test Performed by:	Test Authorized by:
Intertek	Farpointe Data, Inc.
1365 Adams Court	232 Santa Ana Ct.
Menlo Park, CA 94025 USA	Sunnyvale, CA 94085 USA

Prepared by: _____ **Date:** September 18, 2018
Anderson Soungpanya

Reviewed by: _____ **Date:** September 18, 2018
Krishna K Vemuri

Report No. 103506678MPK-002

Equipment Under Test:	CONEKT
Model Number:	CSR-35P & CSR-35L
Applicant:	Farpointe Data, Inc.
Contact:	Kirk Bierach
Address:	Farpointe Data, Inc. 232 Santa Ana Ct. Sunnyvale, CA 94085
Country	USA
Tel. Number:	(408) 731-8700
Email:	Kirkb@farpointedata.com
Applicable Regulation:	FCC Part 15 Subpart C (15.247) Industry Canada RSS-247 Issue 2 FCC Part 15, Subpart B Industry Canada ICES-003 Issue 6
Date of Test:	May 21 – September 11, 2018

We attest to the accuracy of this report:

Anderson Soungpanya
Project Engineer

Krishna K Vemuri
Engineering Team Lead

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1.0 Summary of Tests

Test	Reference FCC	Reference Industry Canada	Result
RF Output Power	15.247(b)(3)	RSS-247, 5.4.4	Complies
6 dB Bandwidth	15.247(a)(2)	RSS-247, 5.2.1	Complies
Power Density	15.247(e)	RSS-247, 5.2.2	Complies
Out of Band Antenna Conducted Emission	15.247(d)	RSS-247, 5.5	Complies
Transmitter Radiated Emissions	15.247(d), 15.209, 15.205	RSS-247, 5.5	Complies
AC Line Conducted Emission	15.207	RSS-GEN	Complies
Antenna Requirement	15.203	RSS-GEN	Complies (Internal Antenna)
Radiated Emission	15.109	RSS-GEN	Complies
AC Line Conducted Emission	15.107	RSS-GEN	Complies

2.0 General Information

2.1 Product Description

Farpointe Data, Inc. supplied the following description of the EUT:

The product covered by this report is a combination Smart Card Reader and BLE Mobile Access Credential Reader (hereafter referred to a “Reader”) device. The Reader is epoxy sealed, suitable for outdoor use and provided with an approved UL Style 2576, 9-conductor, 26-AWG, shielded cable for connection to a Door Access Control Unit.

The Reader is a key component of a physical security access control system, a Reader is based on dual use operating at 13.56Mhz to read RFID technology, and 2.45GHz to read a BLE enabled smartphone. In operation the Reader is capable of reading data stored on smartcard credentials via radio frequency without physical contact, also read data stored on the BLE enabled smartphone with a specialized application program and then passing the data obtained to the physical access control system. Access control systems typically manage and record the movement of individuals through a protected area, such as a locked door.

The model variants for short range or long range BLE credential reading are designated by a P or L in the model name. The read range determination is based upon the Receive Signal Strength Indicator (RSSI) for the device.

Controller Devices:
The reader contains a Host microcontroller, a STM32L100RBT6A that performs control functions to enable or disable the radio controller, performs Host I/O interfacing, and provides for overall reader control.

The radio controller, SM-6350, from Legic, performs the radio baseband functions. Either radio may be turned on or off under processor control. RF signals are generated within the chip, and passed through filter and matching circuits to the etched antennas on the PCB.

Antennas:
The reader has two antennas which are etched onto the PCB. The first is for RFID applications at 13.56MHz, and is composed of a inductive coupling loop antenna. The second is an elliptically polarized dipole antenna for 2.45GHz communications.

For more information, refer to the following product specification, declared by the manufacturer.

Information about the 2.4 GHz radio is presented below:

Applicant	Farpointe Data, Inc.
Model No.	CSR-35P & CSR-35L
FCC Identifier	T8I-CONEKT
IC Identifier	6504A-CONEKT
Type of transmission	Digital Transmission System (DTS)
Rated RF Output	1.77 dBm
Antenna(s) & Gain	Internal Antenna, Gain: 2.1 dBi
Frequency Range	2402 – 2480 MHz
Type of modulation/data rate	GFSK / 1mbps
Number of Channel(s)	40, Channel 0-39
Applicant Name & Address	Farpointe Data, Inc. 232 Santa Ana Ct. Sunnyvale, CA 94085 USA

EUT receive date: May 21, 2018

EUT receive condition: The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.

Test start date: May 21, 2018

Test completion date: September 11, 2018

The test results in this report pertain only to the item tested.

2.2 Related Submittal(s) Grants

None.

2.3 Test Facility

The test site used to collect the radiated data is site 1 (10-m semi-anechoic chamber). This test facility and site measurement data have been fully placed on file with the FCC, IC and A2LA accredited.

2.4 Test Methodology

Antenna conducted measurements were performed according to the FCC documents "Guidance for Performing Compliance Measurement on Digital Transmission Systems (DTS) Operating under §15.247" (KDB 558074 D01 DTS Meas Guidance v05), RSS-247 Issue 2, ANSI C63.10: 2013 and RSS-GEN Issue 4.

Radiated emissions and AC mains conducted emissions measurements were performed according to the procedures in ANSI C63.10: 2013 & ANSI C63.4-2014. Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Data Sheet" of this report.

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	1 GHz – 2.5 GHz	> 2.5 GHz
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-

Measurement	Expanded Uncertainty (k=2)			
	0.15 MHz – 30MHz	30 – 200 MHz	200 MHz – 1 GHz	1 GHz – 18 GHz
Radiated emissions	-	4.7	4.6	5.1 dB
AC mains conducted emissions	2.1 dB	-	-	-

3.0 System Test Configuration

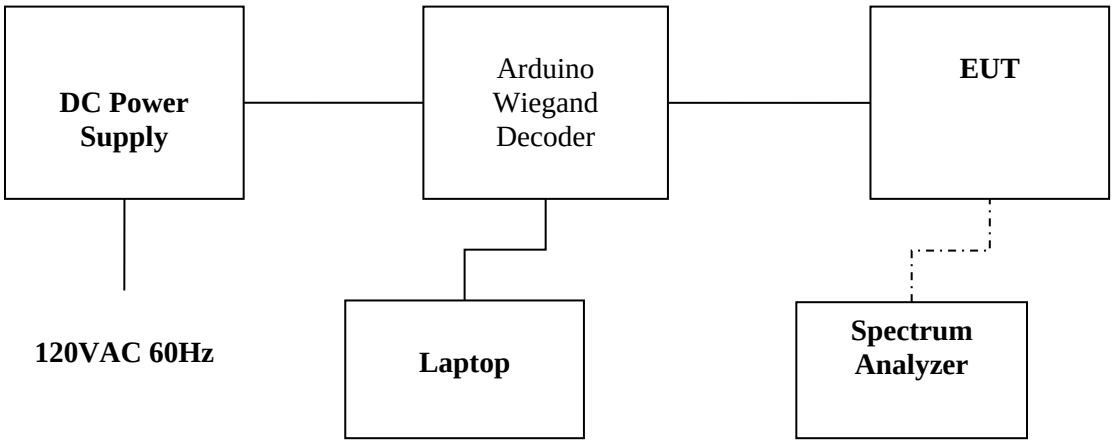
3.1 Support Equipment

Support Equipment			
Type	Model #	Quantity	S/N
DC Power Supply	Extech	1	D30030012
Laptop	Dell Laptop	1	N/A
Arduino Wiegand Decoder	Not Listed	1	MPK1707241613-007

3.2 Block Diagram of Test Setup

Equipment Under Test			
Type	Model #	Quantity	S/N
CONEKT	CSR-35P & CSR-35L	1	0818035

Antenna was removed and co-axial connector with a cable was installed for Conducted Measurements.



S = Shielded **U** = Unshielded	**F** = With Ferrite **m** = Length in Meters

3.3 Justification

For radiated emission measurements the EUT is placed on a non-conductive table.

CSR-35L and CSR-35P models are electrically identical. Testing was completed on the CSR-35L.

The difference: P is for Presentation mode. L is for long range.

L version is more active to look for BLE credentials.

P version waits for a wakeup signal from the 13.56MHz NFC circuit before sending a BLE poll to communicate with phone.

All RF signals are of same type and power level.

Only difference is logic of message sequencing.

Unit can be ordered pre-configured in either setting.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was provided by Farpointe Data, Inc.

3.5 Mode of Operation during Test

Mode of operation during the tests was setup using a laptop which allows controlling the radio by test software. During the transmitter tests, the transmitter was setup to transmit maximum communication and RF power levels.

EUT was placed into transmit mode at the lowest (2402MHz) middle (2440MHz), and highest (2480MHz) channels

3.5 Modifications Required for Compliance

No modifications were made by the manufacturer or Intertek to the EUT in order to bring the EUT into compliance.

3.6 Additions, Deviations and Exclusions from Standards

No additions, deviations or exclusions from the standard were made.

4.0 Measurement Results

4.1 6-dB Bandwidth and 99% Occupied Bandwidth
FCC Rule: 15.247(a)(2); RSS-247 A8.2 and RSS-GEN;

4.1.1 Requirement

The minimum 6-dB bandwidth shall be at least 500 kHz

4.1.2 Procedure

A spectrum analyzer was connected to the antenna port of the transmitter.

For FCC 6dB Channel Bandwidth the Procedure described in the FCC Publication 558074 D01 DTS Meas Guidance v05 was used to determine the DTS occupied bandwidth. Section 11.8.1 Option 1 of ANSI 63.10 was used.

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

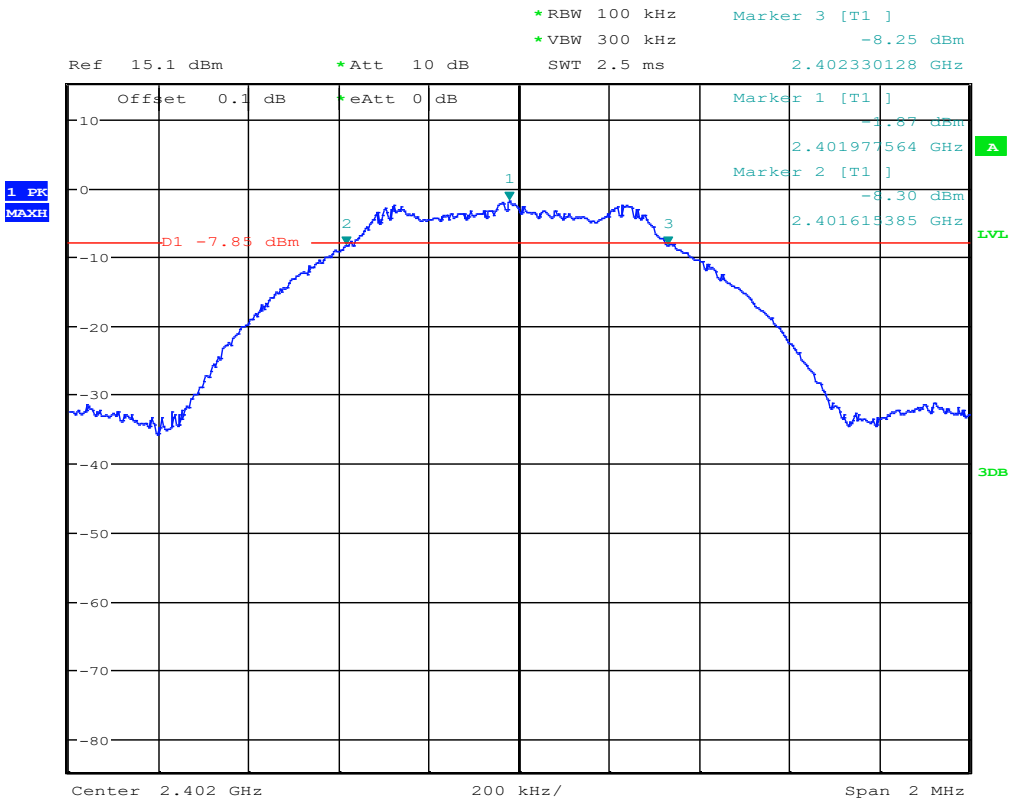
For 99% power bandwidth measurement, the bandwidth was determined by using the built-in 99% occupied bandwidth function of the spectrum analyzer. The resolution bandwidth is set to 1% of the selected span as is without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

4.1.3 Test Result

Frequency (MHz)	6-dB bandwidth FCC 15.247 & RSS-GEN, kHz	Occupied bandwidth, RSS-GEN, MHz	Plot
2402	714.743	--	1.1
	--	1.069	1.4
2440	705.128	--	1.2
	--	1.054	1.5
2480	714.743	--	1.3
	--	1.737	1.6

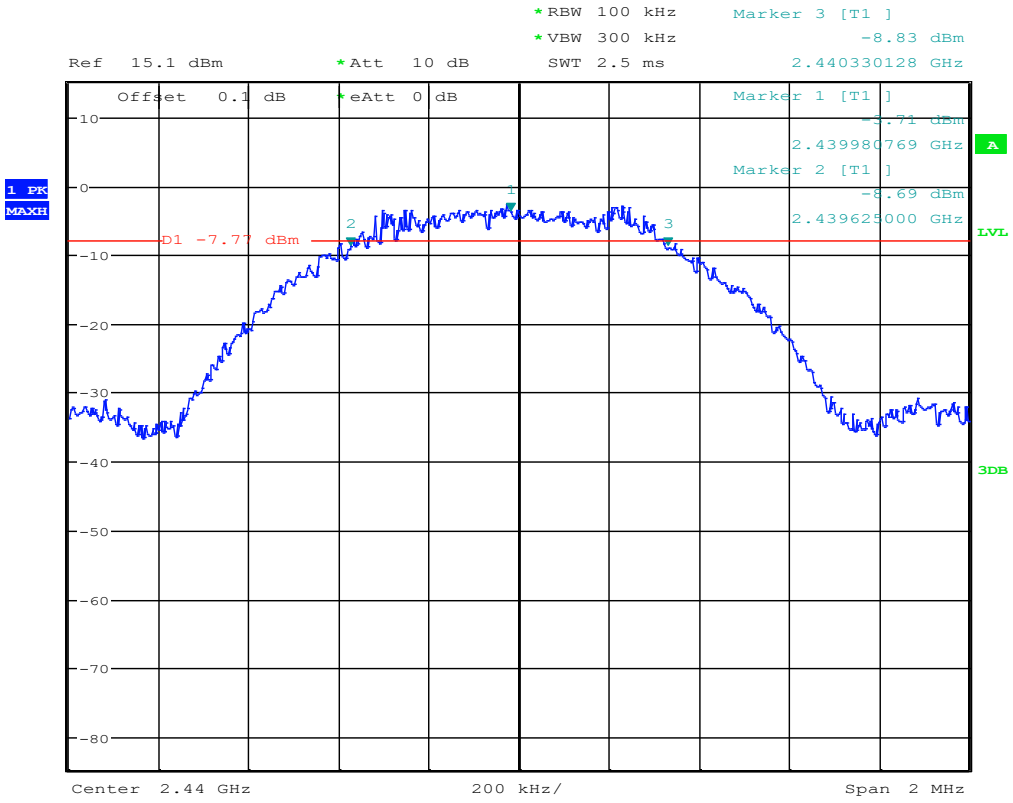
Date of Test:	September 11, 2018
Results	**Complies**

Plot 1. 1



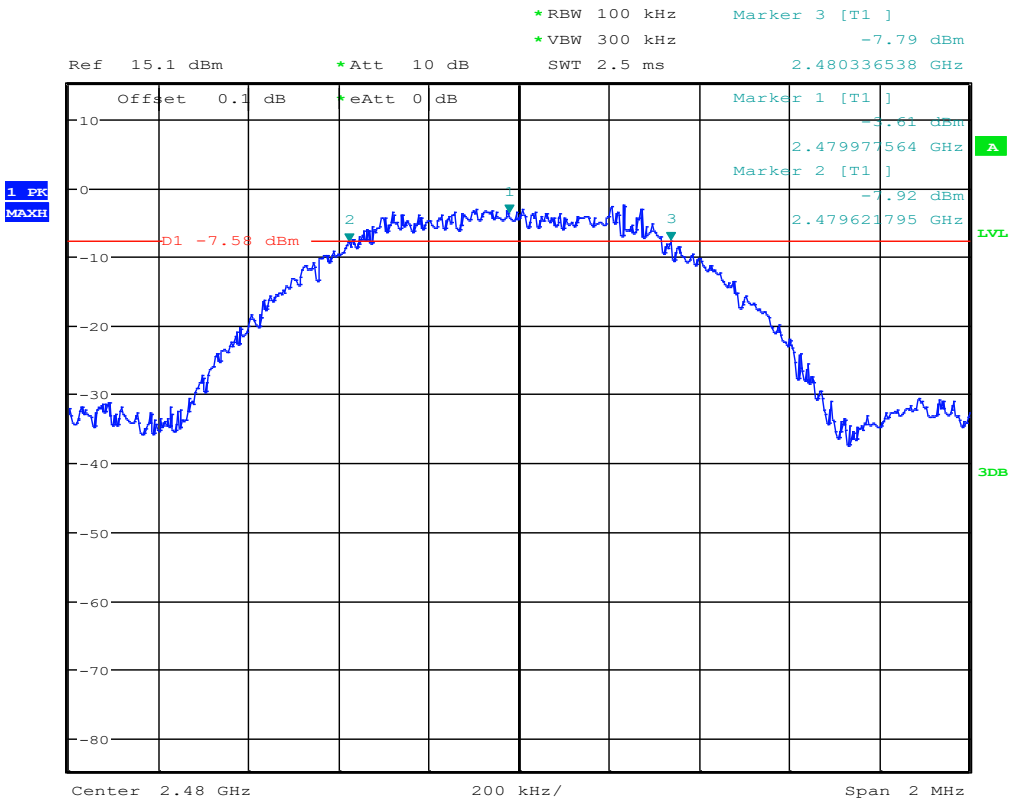
Date: 11.SEP.2018 11:18:32

Plot 1. 2



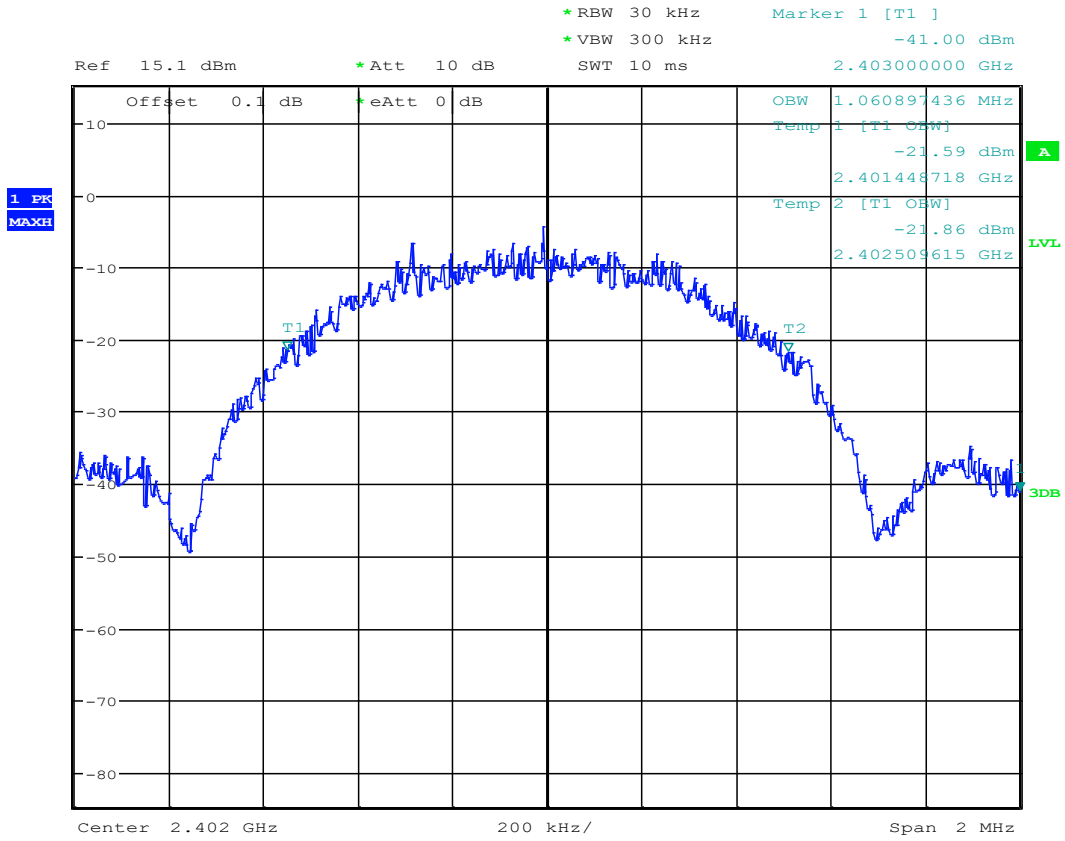
Date: 11.SEP.2018 11:23:11

Plot 1. 3



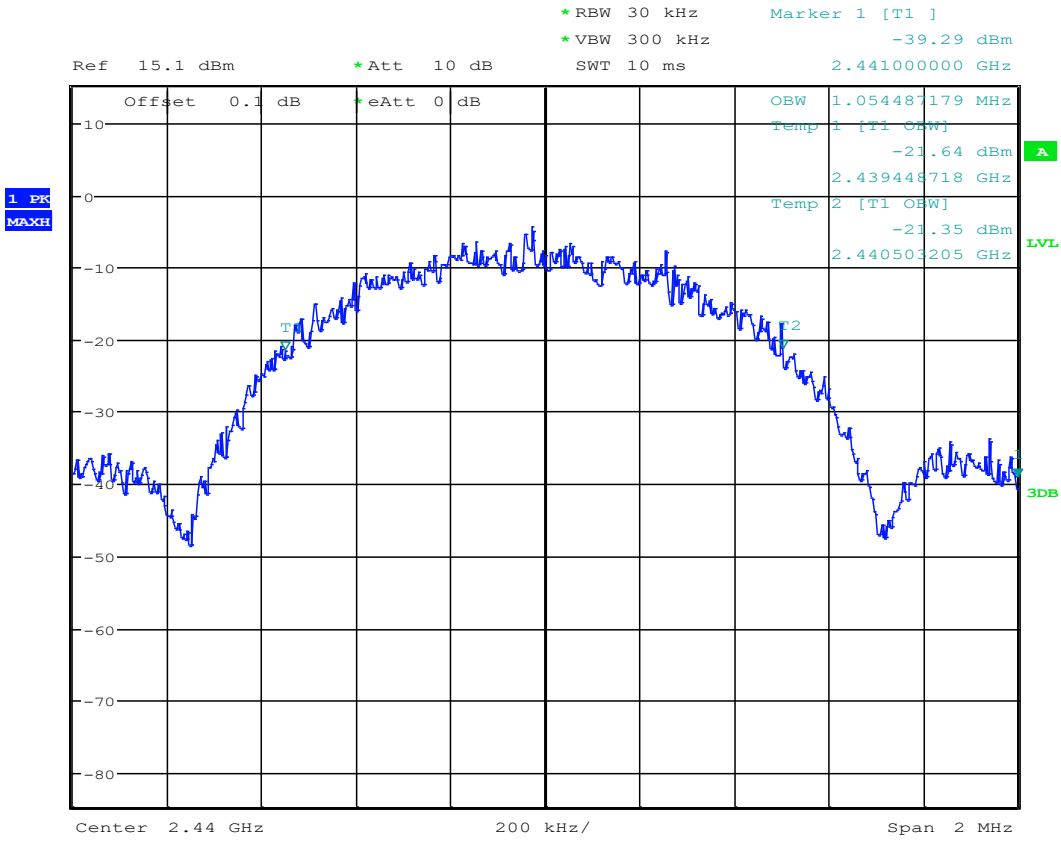
Date: 11.SEP.2018 11:25:58

Plot 1. 4



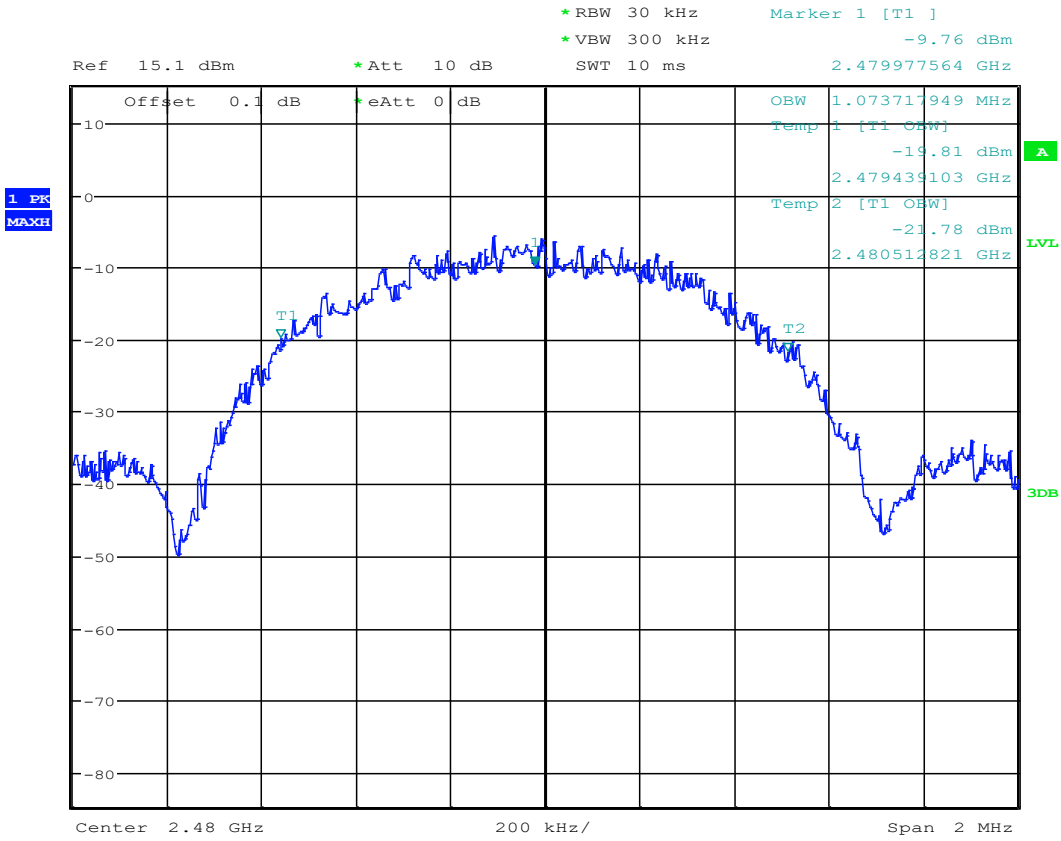
Date: 11.SEP.2018 11:34:26

Plot 1.5



Date: 11.SEP.2018 11:33:18

Plot 1.6



Date: 11.SEP.2018 11:31:24

4.2 Maximum Peak Conducted Output Power at Antenna Terminals
FCC Rule: 15.247(b)(3); RSS-247 A8.4;

4.2.1 Requirement

For antennas with gains of 6 dBi or less, maximum allowed transmitter output is 1 watt or 30 dBm.
For antennas with gains greater than 6 dBi, transmitter output level must be decreased appropriately, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.2.2 Procedure

The procedure described in FCC Publication 558074 D01 DTS Meas Guidance v05 was used. Specifically, section 11.9.1.1 RBW ≥ DTS Bandwidth of ANSI 63.10 was utilized as the spectrum analyzer's resolution bandwidth was greater than the DTS bandwidth.

1. Set the RBW ≥ DTS Bandwidth
2. Set the VBW ≥ 3 x RBW
3. Set the span ≥ 3 x RBW
4. Detector = Peak
5. Sweep time = Auto couple
6. Trace mode = Max Hold
7. Allow trace to fully stabilize
8. Use peak marker function to determine the peak amplitude level.

A spectrum analyzer was connected to the antenna port of the transmitter.

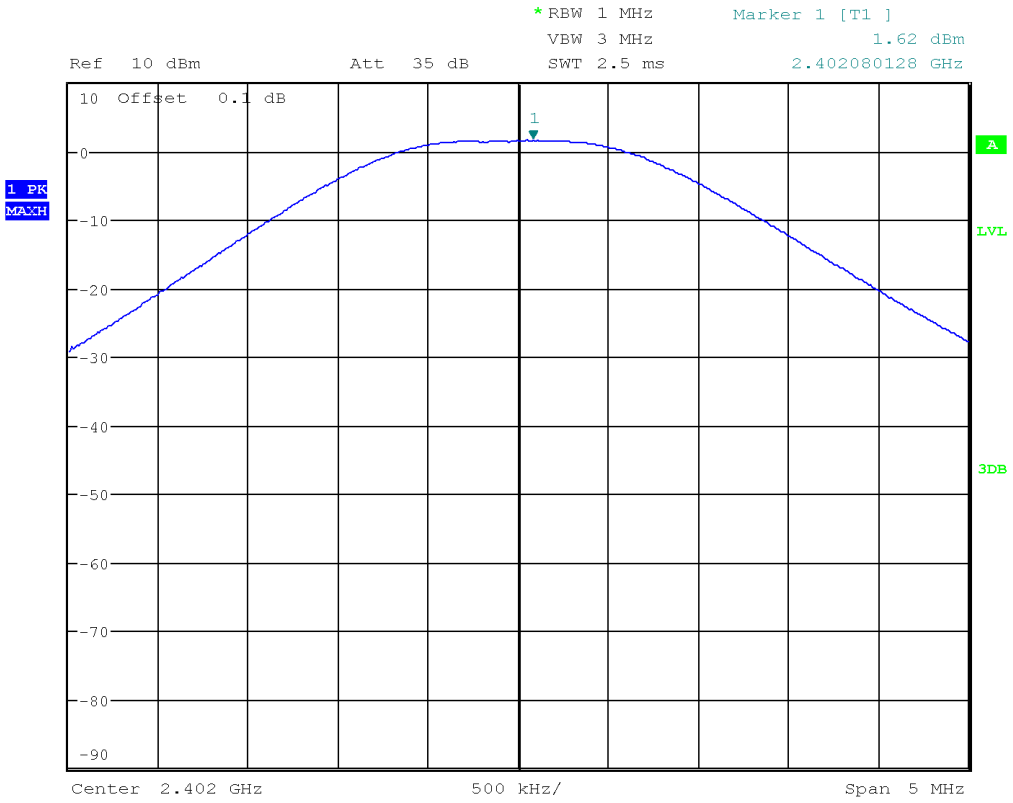
4.2.3 Test Result

Refer to the following plots 2.1 – 2.3 for the test details.

Frequency, MHz	Conducted Power (peak), dBm	Conducted Power (peak), mW	Plot
2402	1.62	1.456	2.1
2440	1.63	1456	2.2
2480	1.77	1.507	2.3

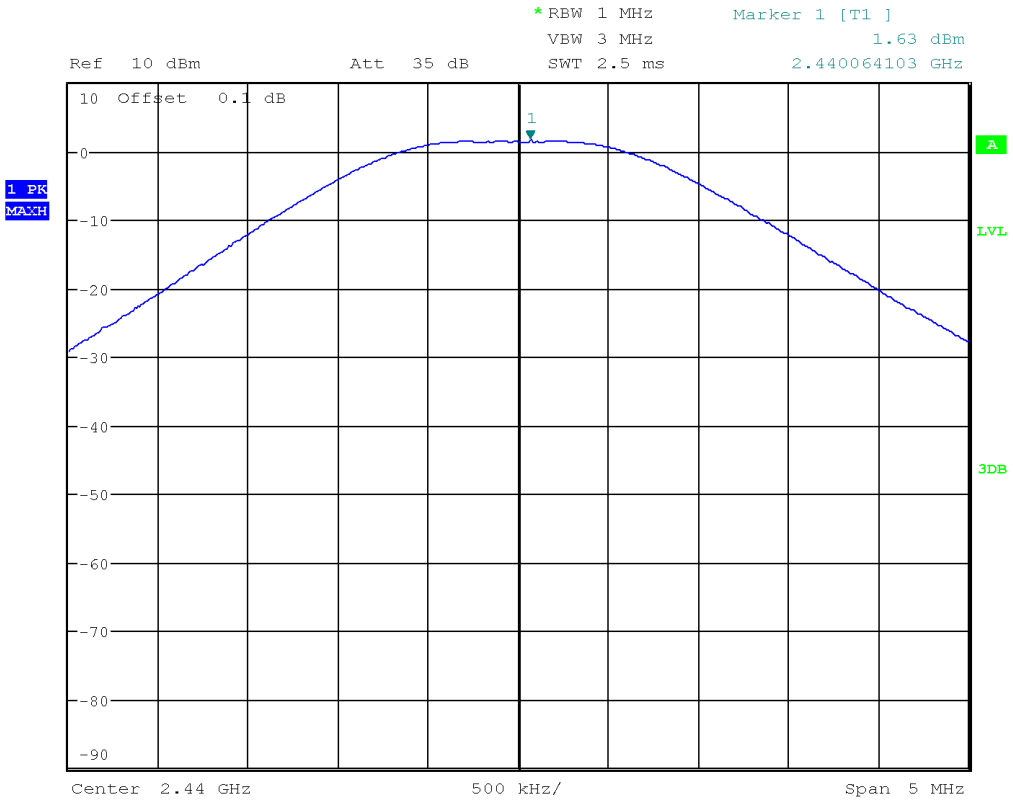
Date of Test:	May 21, 2018
Results	**Complies**

Plot 2. 1



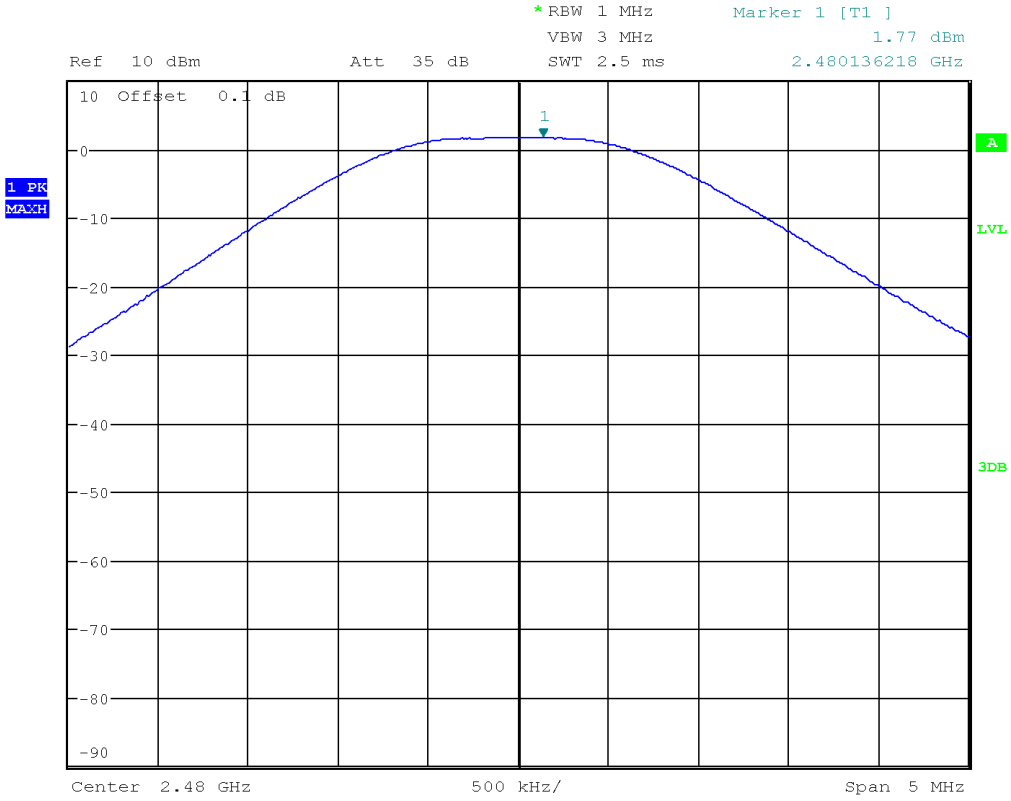
Date: 21.MAY.2018 13:28:57

Plot 2. 2



Date: 21.MAY.2018 13:27:49

Plot 2. 3



Date: 21.MAY.2018 13:26:07

4.3 Maximum Power Spectral Density
FCC: 15.247 (e); RSS-247, 5.2.2;

4.3.1 Requirement

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna should not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

4.3.2 Procedure

A spectrum analyzer was connected to the antenna port of the transmitter.

The procedure described in FCC Publication 558074 D01 DTS Meas Guidance v05, specifically section 11.10.2 Method PKPSD (peak PSD) of ANSI 63.10.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the *DTS bandwidth*.
3. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

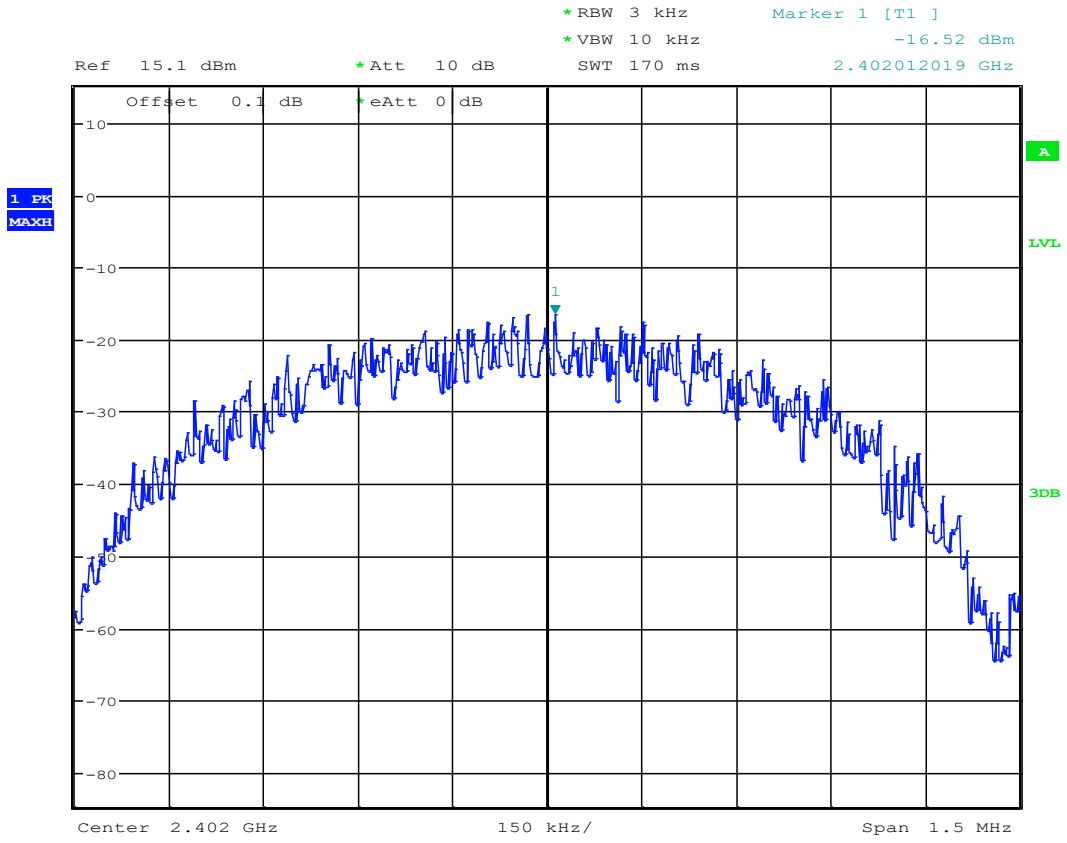
4.3.3 Test Result

Refer to the following plots for the test result

Frequency, MHz	Maximum Power Spectral Density, dBm	Maximum Power Spectral Density Limit, dBm	Margin, dB	Plot
2402	-16.52	8.0	-24.52	3.1
2440	-14.95	8.0	-22.95	3.2
2480	-14.94	8.0	-22.94	3.3

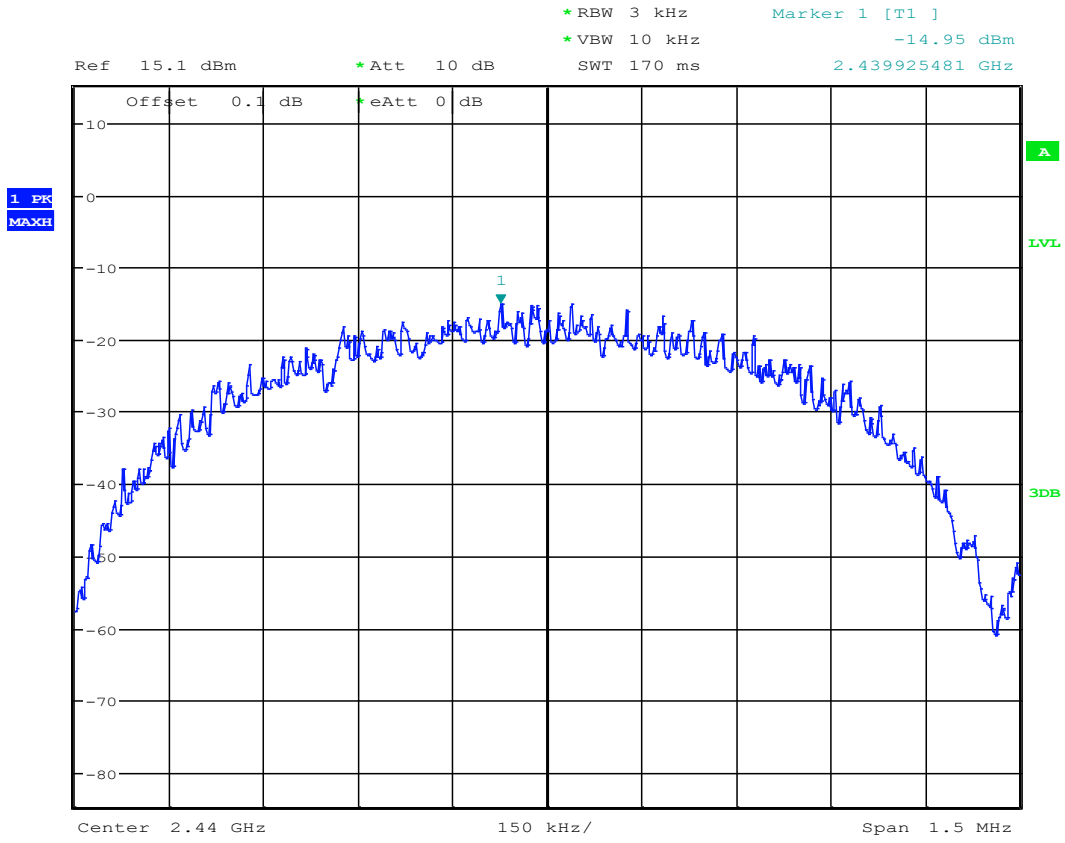
Date of Test:	September 11, 2018
Results	**Complies**

Plot 3. 1



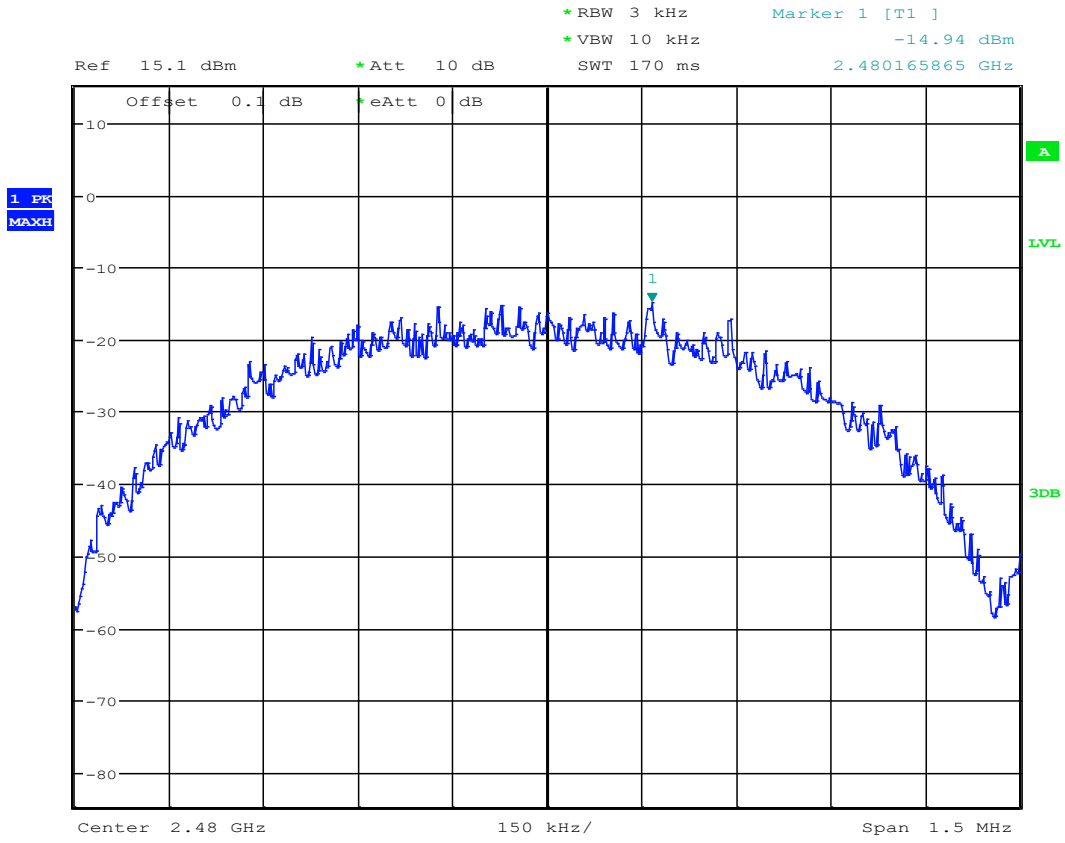
Date: 11.SEP.2018 11:39:49

Plot 3. 2



Date: 11.SEP.2018 11:44:51

Plot 3. 3


*RBW 3 kHz
*VBW 10 kHz
SWT 170 ms
Marker 1 [T1]
-14.94 dBm
2.480165865 GHz
Ref 15.1 dBm
*Att 10 dB
Offset 0.1 dB
*eAtt 0 dB
1 PK
MAXH
A
LVL
3DB
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.48 GHz
150 kHz/
Span 1.5 MHz
Date: 11.SEP.2018 11:43:38

4.4 Out of Band Antenna Conducted Emission
FCC: 15.247(d); RSS-247, 5.5;

4.4.1 Requirement

In any 100 kHz bandwidth outside the EUT pass-band, the RF power shall be below the maximum in-band 100 kHz emissions by at least 20 dB (if peak power of in-band emission is measured) or 30 dB (if average power of in-band emission is measured).

In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a)

4.4.2 Procedure

The procedure described in FCC Publication 558074 D01 DTS Meas Guidance v05, specifically section 11.11 DTS Emissions in non-restricted frequency bands of ANSI 63.10.

A spectrum analyzer was connected to the antenna port of the transmitter.

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 3 x RBW.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

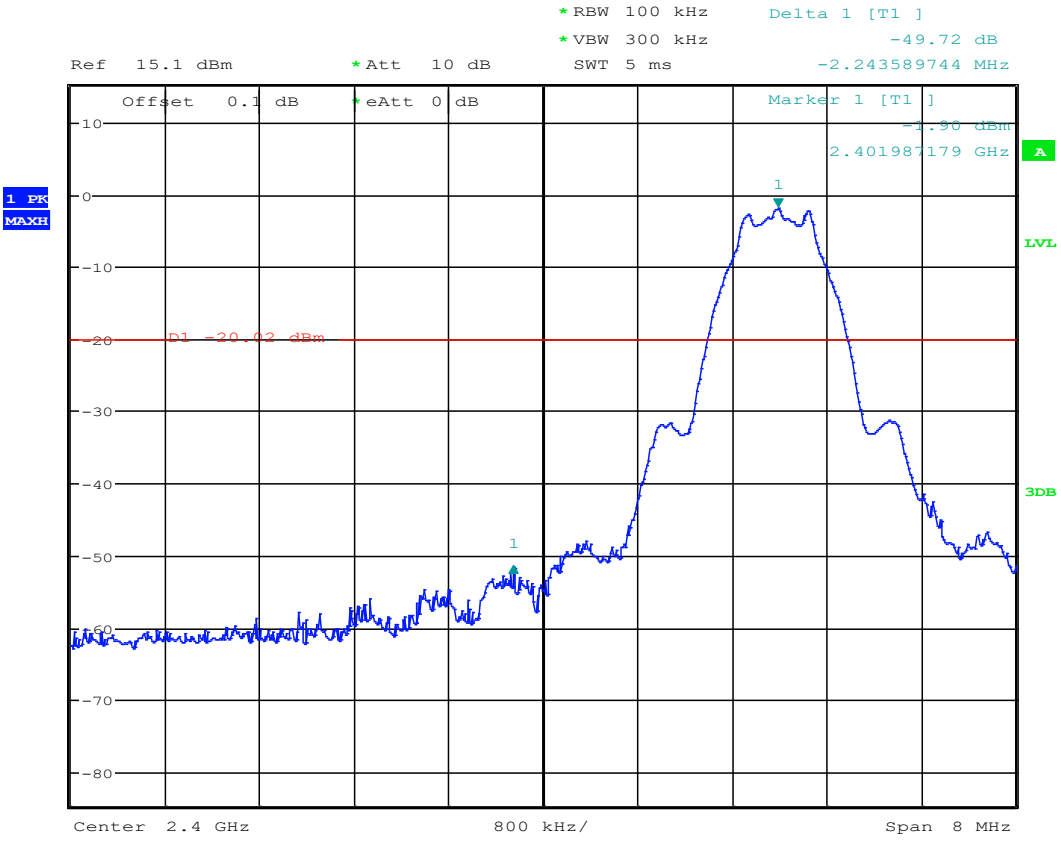
The unwanted emissions were measured from 30 MHz to 25 GHz. Plots below are corrected for cable loss and then compared to the limits.

4.4.3 Test Result

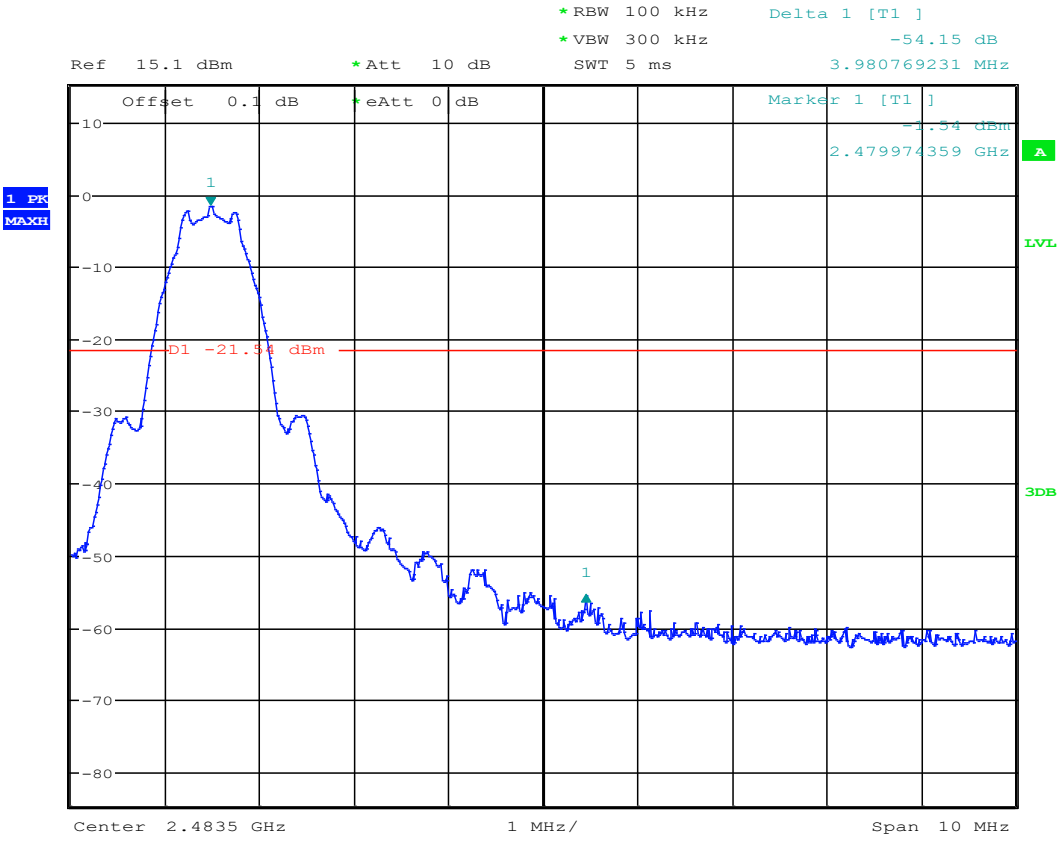
Refer to the following plots 4.1 – 4.5 for unwanted conducted emissions. The plot shows -20dB attenuation limit line.

Date of Test:	September 11, 2018
Results	**Complies**

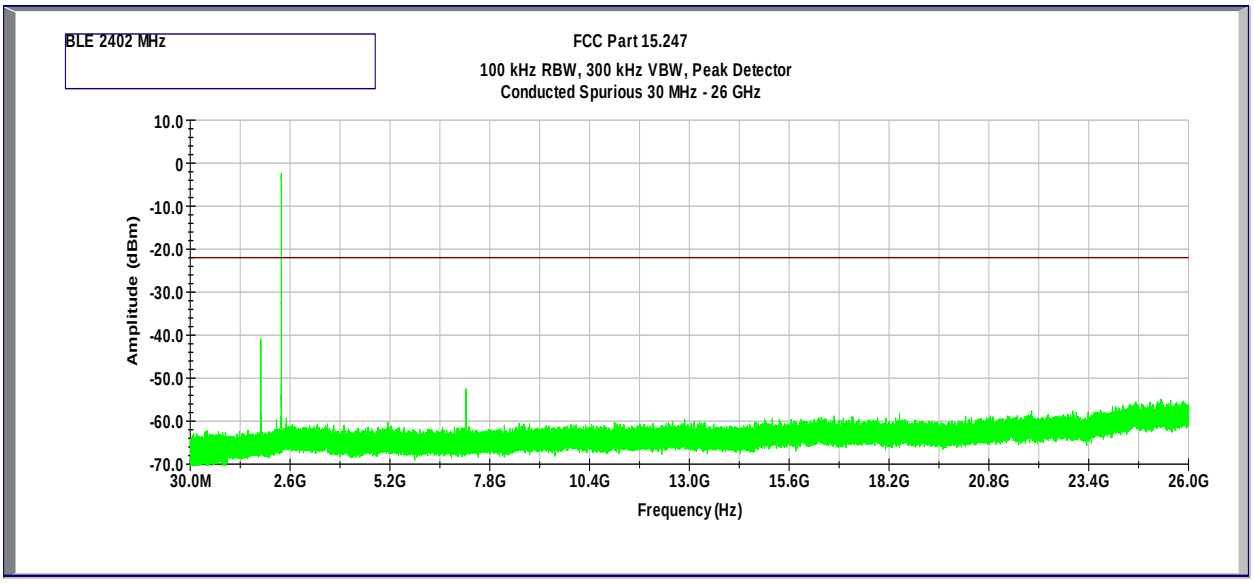
Tx @ Low Channel, 2400 MHz Band Edge
Plot 4.1



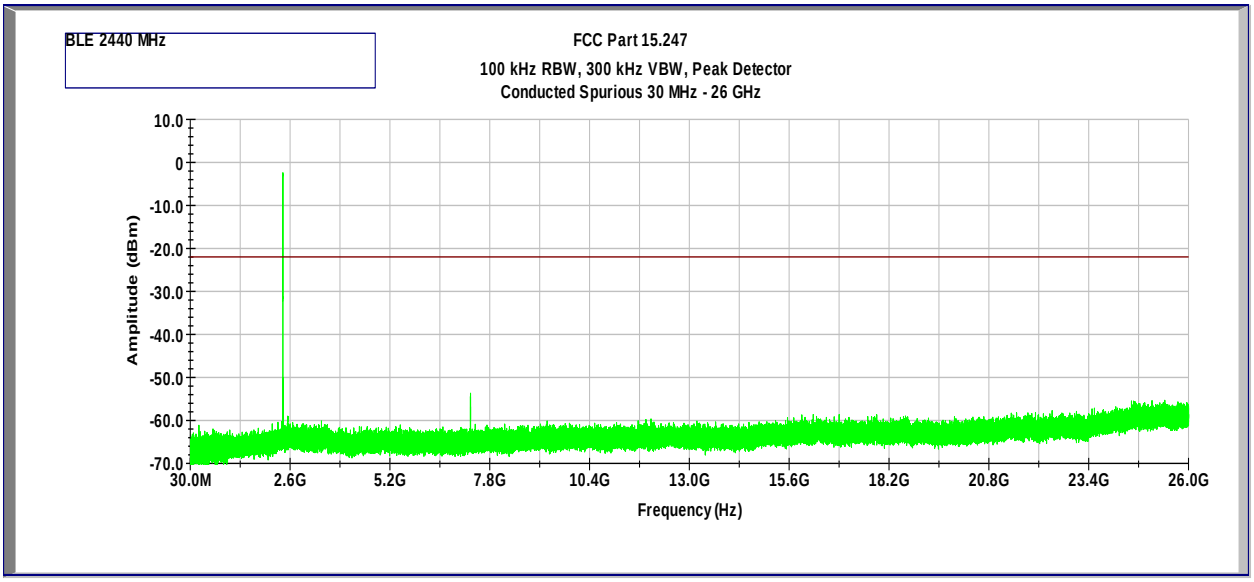
Tx @ Low Channel, 2483.5 MHz Band Edge
Plot 4.2



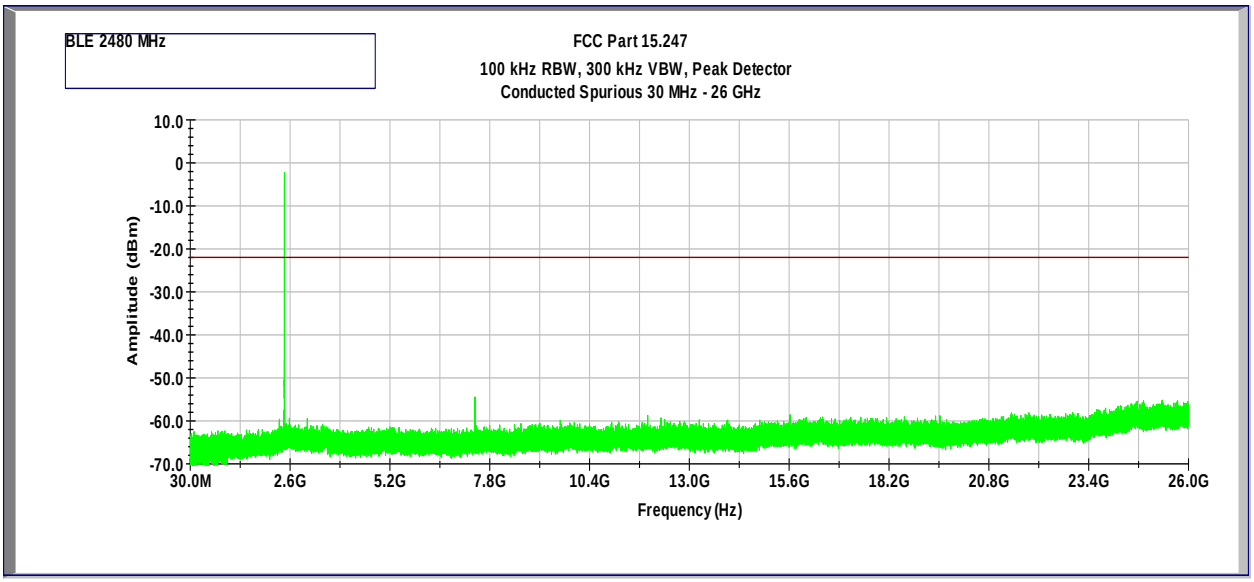
Tx @ Low Channel, 2402 MHz
30MHz -26GHz Conducted Spurious
Plot 4.3



Tx @ Mid Channel, 2440 MHz
30MHz -26GHz Conducted Spurious
Plot 4.4



Tx @ High Channel, 2480 MHz
30MHz -26GHz Conducted Spurious
Plot 4.5



4.5 Transmitter Radiated Emissions
FCC Rules: 15.247(d), 15.209, 15.205; RSS-247;

4.5.1 Requirement

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

For out of band radiated emissions (except for frequencies in restricted bands), in any 100 kHz bandwidths outside the EUT pass-band, the RF power shall be at least 20dB (peak) or 30 dB (average) below that of the maximum in-band 100 kHz emissions.

4.5.2 Procedure

Radiated emission measurements were performed from 30 MHz to 25 GHz according to the procedure described in ANSI C63.10: 2013. Spectrum Analyzer Resolution Bandwidth is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz for frequencies above 1000 MHz. Above 1000 MHz Peak and Average measurements were performed.

The EUT is placed on a plastic turntable that is 80 cm in height for below 1000MHz and 1.5m in height for above 1GHz. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at 3 meters for frequencies above 1 GHz and at 10 meters for frequencies below 1 GHz.

Measurements made from 1 GHz to 18GHz had a 2.4-2.5GHz notch filter in place. A preamp was used from 30MHz to 26GHz.

All measurements were made with a Peak Detector and compared to QP limits for 30MHz – 1GHz and Average limits for 1GHz – 26GHz.

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels).

4.5.3 Field Strength Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF – AG; if measurement is performed at a distance other than specified in the rule, a Distance Correction Factor (DCF) shall be added.

Where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV); AF = Antenna Factor in dB(1/m)
CF = Cable Attenuation Factor in dB; AG = Amplifier Gain in dB

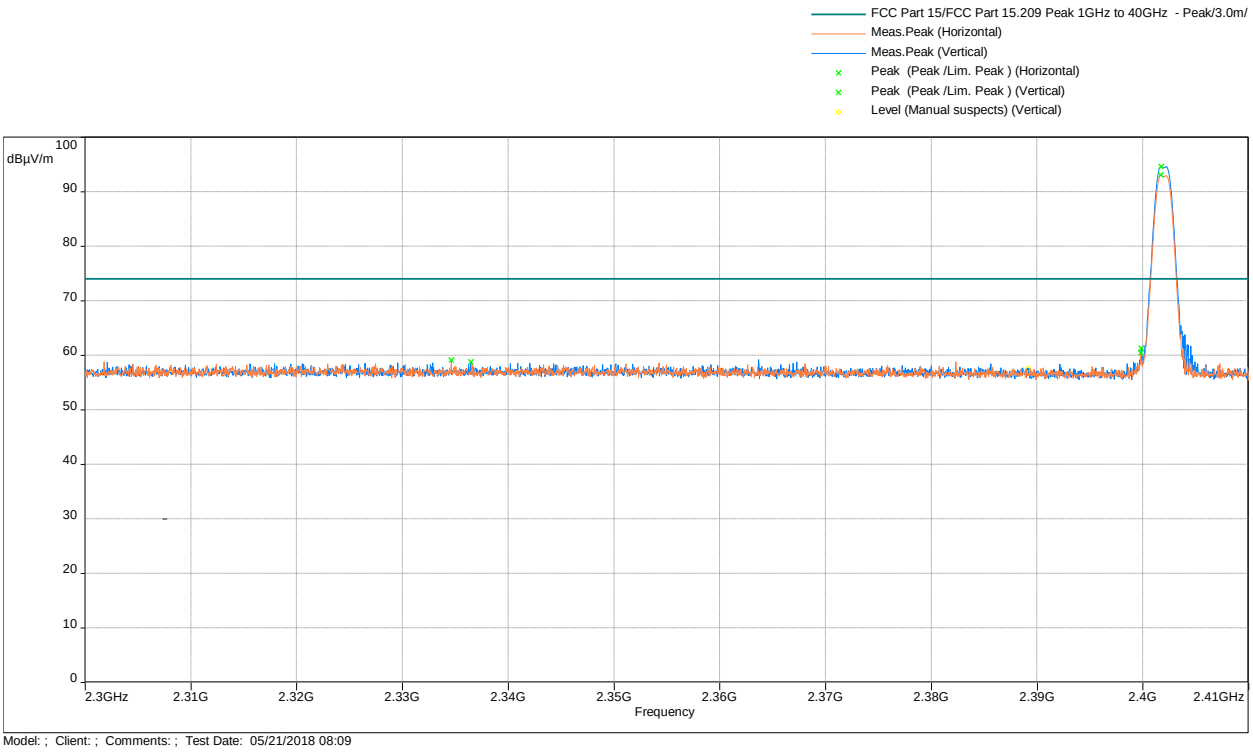
Assume a receiver reading of 52.0 dB(μV) is obtained. The antennas factor of 7.4 dB(1/m) and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving field strength of 32 dB(μV/m). This value in dB(μV/m) was converted to its corresponding level in μV/m.
RA = 52.0 dB(μV)
AF = 7.4 dB(1/m)
CF = 1.6 dB
AG = 29.0 dB
FS = 52.0+7.4+1.6-29.0 = 32 dB(μV/m).
Level in μV/m = Common Antilogarithm [(32 dBμV/m)/20] = 39.8 μV/m.

4.5.4 Test Results

Date of Test:	May 21, 2018
Results	**Complies**

Test Results: 15.209/15.205 Restricted Band Emissions

Out-of-Band Radiated spurious emissions at the Band-edge @3m distance
2310–2390 MHz, Peak Scan with Peak Limit

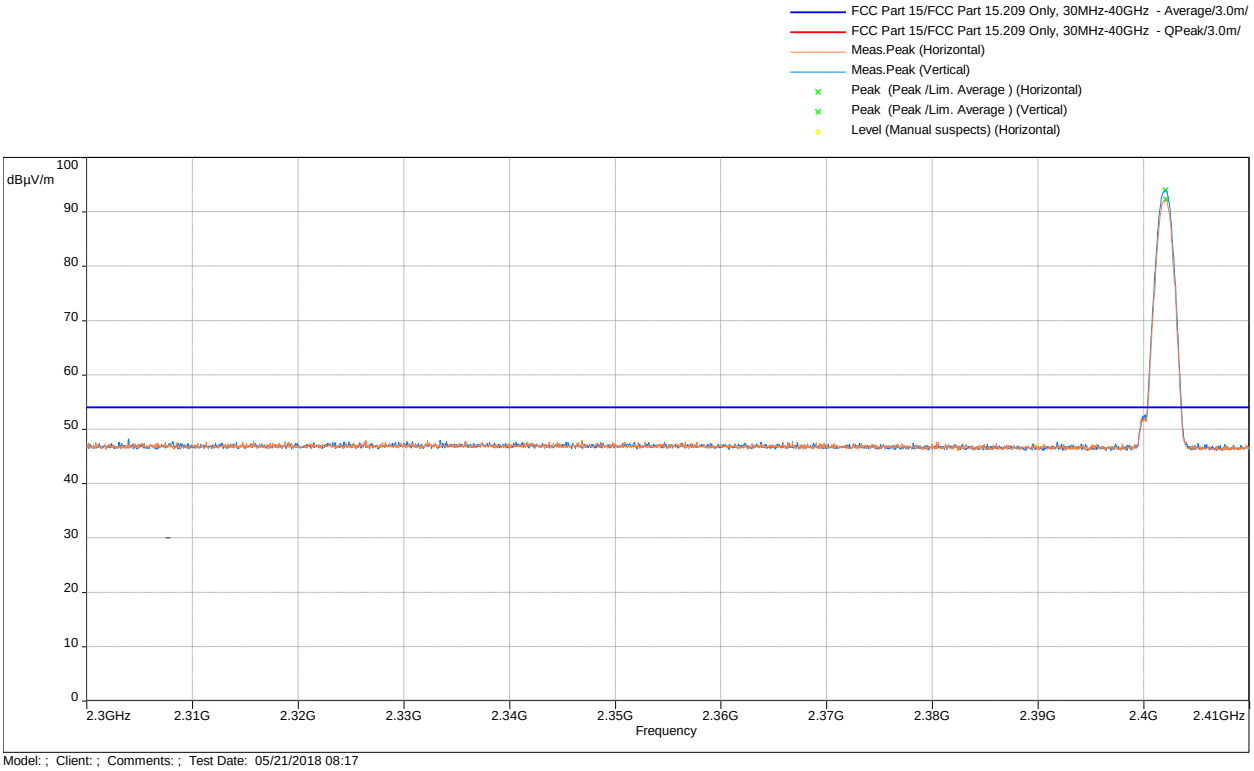


Model: ; Client: ; Comments: ; Test Date: 05/21/2018 08:09

Frequency	Corrected Amplitude	Limit	Margin	Detector	Polarity	Results
GHz	dBµV/m	dBµV/m	dB			
2.390	57.58	74	-16.42	Peak	Vertical	Pass

4.5.4 Test Results (Continued)

Out-of-Band Radiated spurious emissions at the Band-edge @3m distance
2310–2390 MHz, Avg Scan with Avg Limit

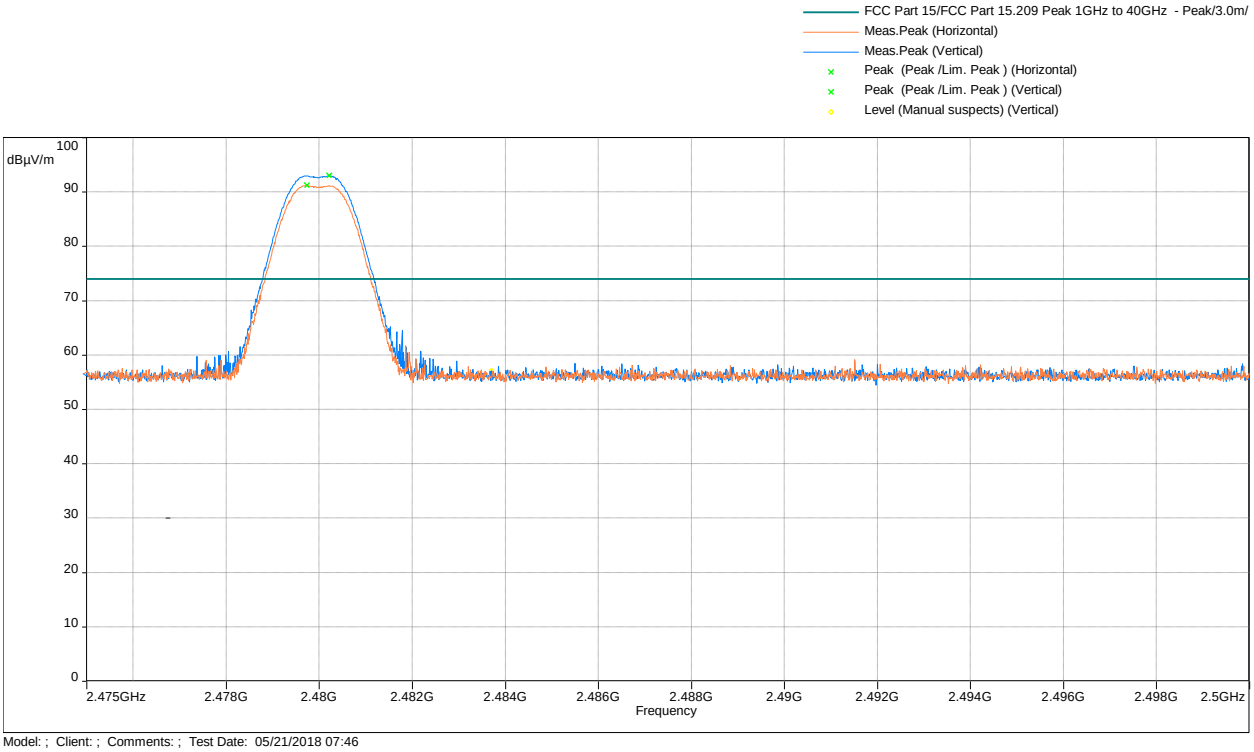


Model: ; Client: ; Comments: ; Test Date: 05/21/2018 08:17

Frequency	Corrected Amplitude	Limit	Margin	Detector	Polarity	Results
GHz	dBµV/m	dBµV/m	dB			
2.390	46.97	54	-7.03	Avg	Vertical	Pass

4.5.4 Test Results (Continued)

Out-of-Band Radiated spurious emissions at the Band-edge, @3m distance
2483.5–2500 MHz, Peak Scan with Peak Limit

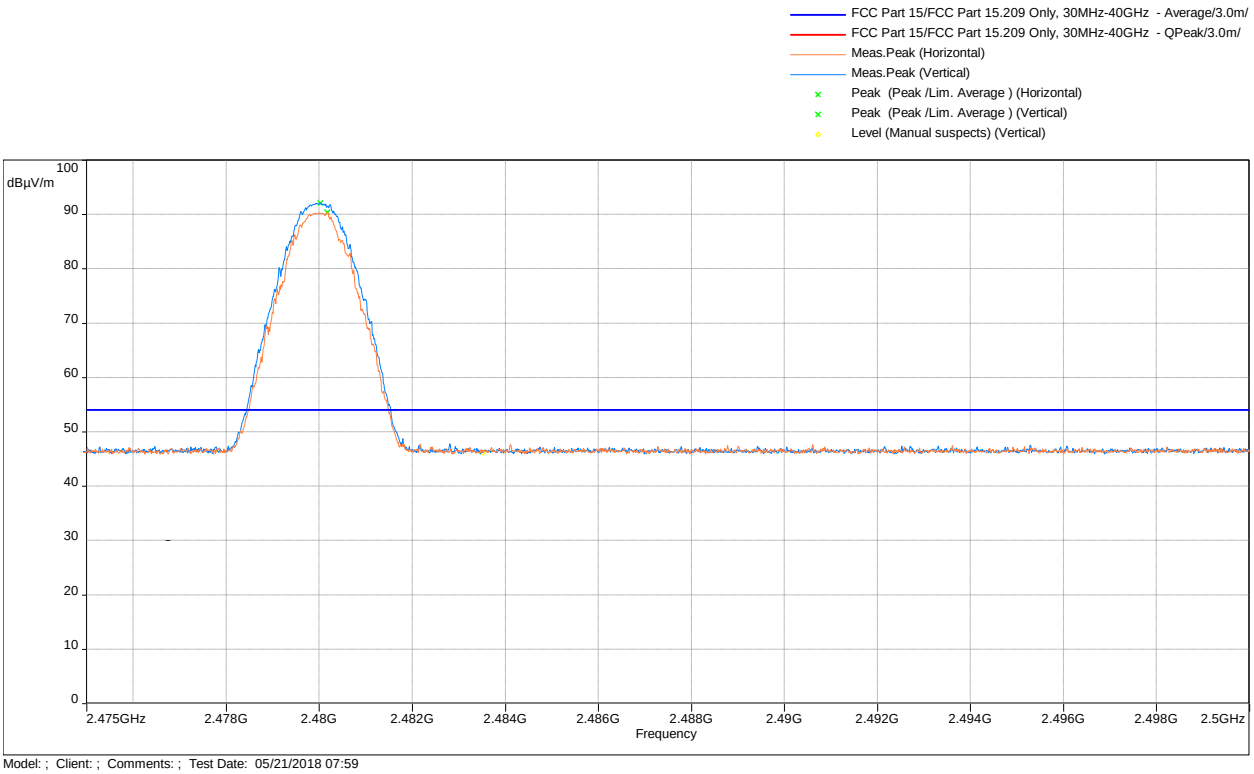


Model: ; Client: ; Comments: ; Test Date: 05/21/2018 07:46

Frequency	Corrected Amplitude	Limit	Margin	Detector	Polarity	Results
GHz	dBµV/m	dBµV/m	dB			
2.4835	57.10	74	-16.90	Peak	Vertical	Pass

4.5.4 Test Results (Continued)

Out-of-Band Radiated spurious emissions at the Band-edge, @3m distance
2483.5–2500 MHz, Avg Scan with Average Limit

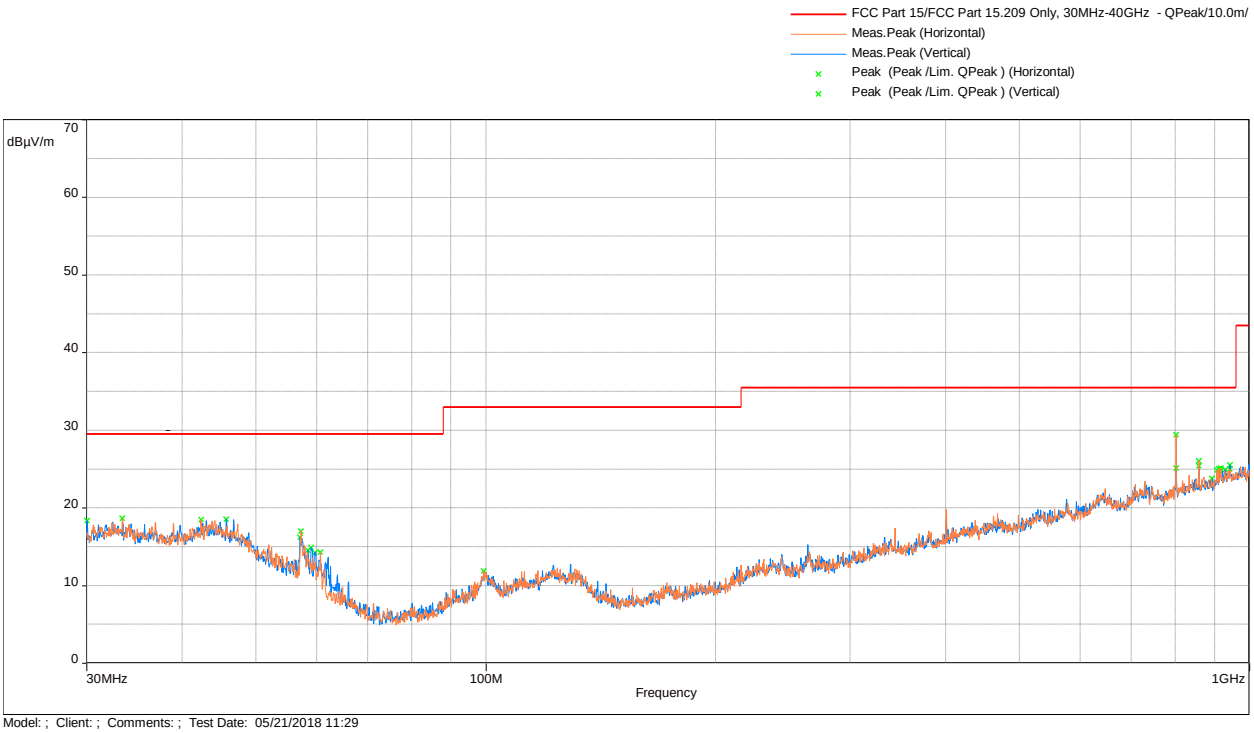


Frequency	Corrected Amplitude	Limit	Margin	Detector	Polarity	Results
GHz	dBµV/m	dBµV/m	dB			
2.4835	46.2	54	-7.80	Avg	Vertical	Pass

4.5.4 Test Results (Continued)

Test Results: 15.209 Radiated Spurious Emissions Low Channel, Tx at 2402MHz

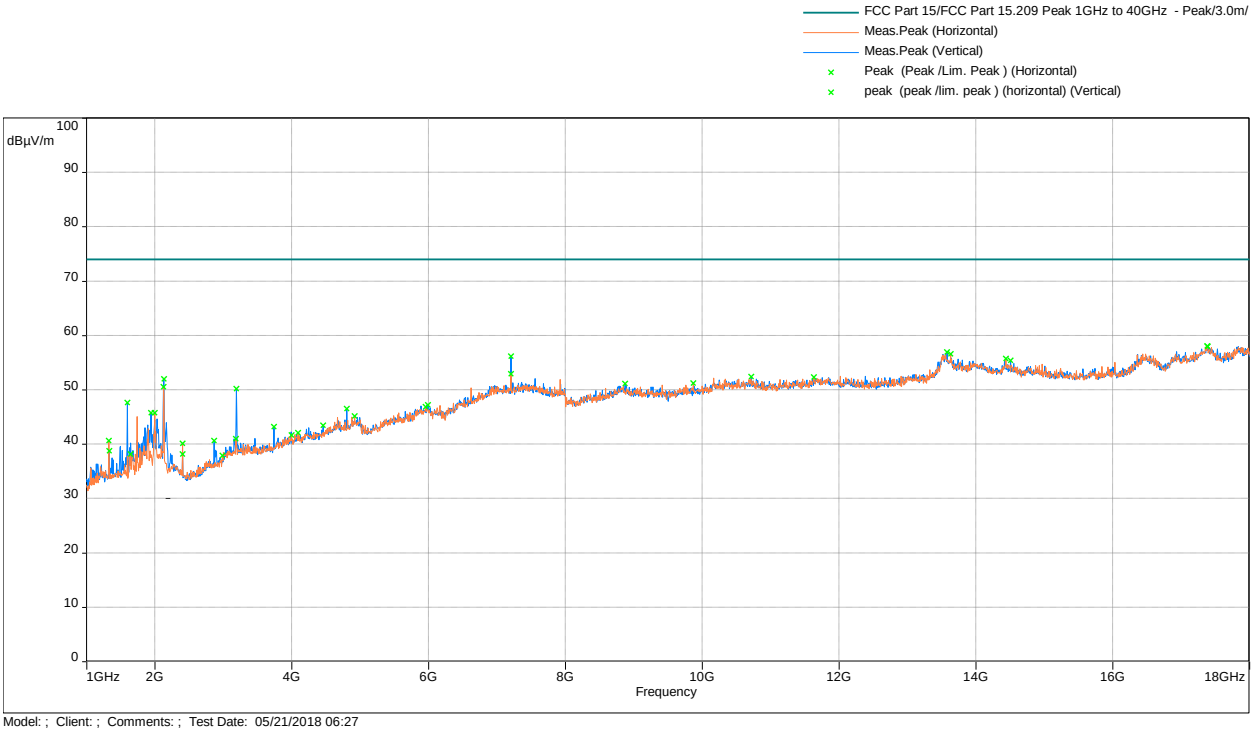
Radiated Spurious Emissions 30 MHz - 1000 MHz



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 11:29

4.5.4 Test Results (Continued)

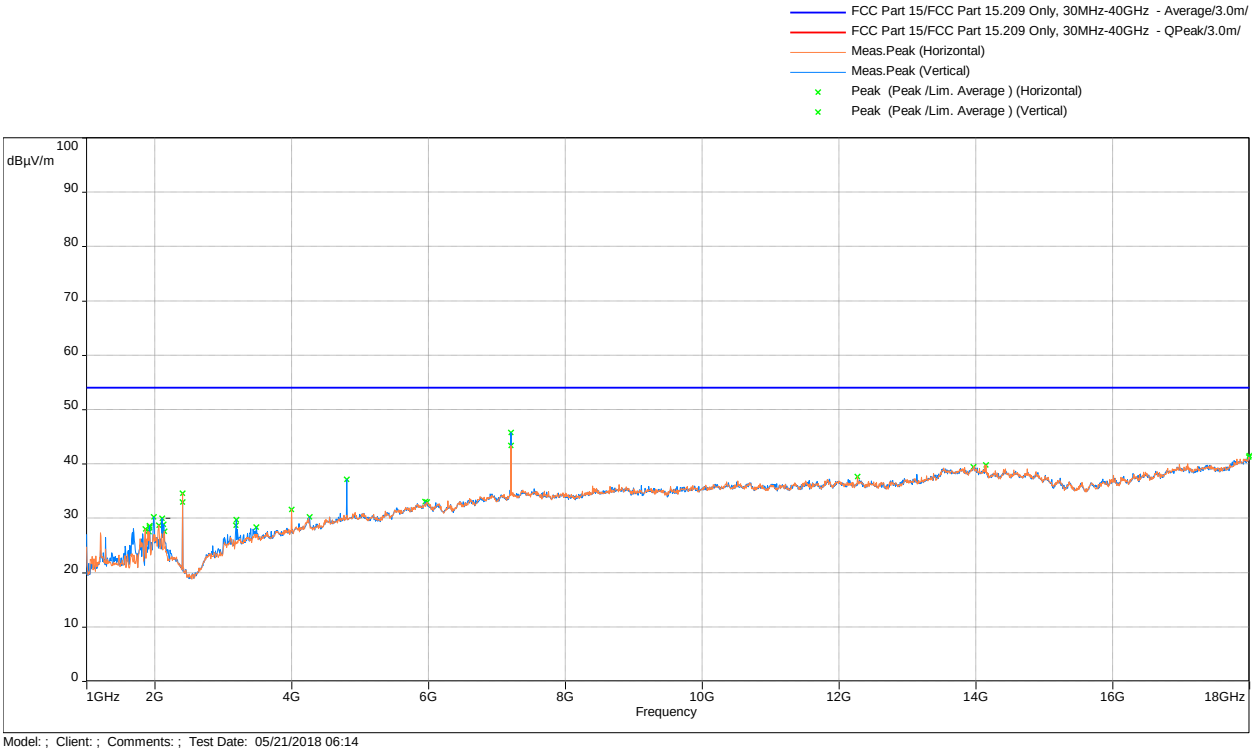
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 06:27

4.5.4 Test Results (Continued)

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



Frequency (MHz)	Average @3m (dBµV/m)	Limit @3m (dBµV/m)	Margin (dB)	Angle (°)	Height (m)	Polarity	Correction (dB)
7206.7	45.73	54	-8.27	349	2.49	Vertical	11.94

Note: Correction = AF + CF - Preamp

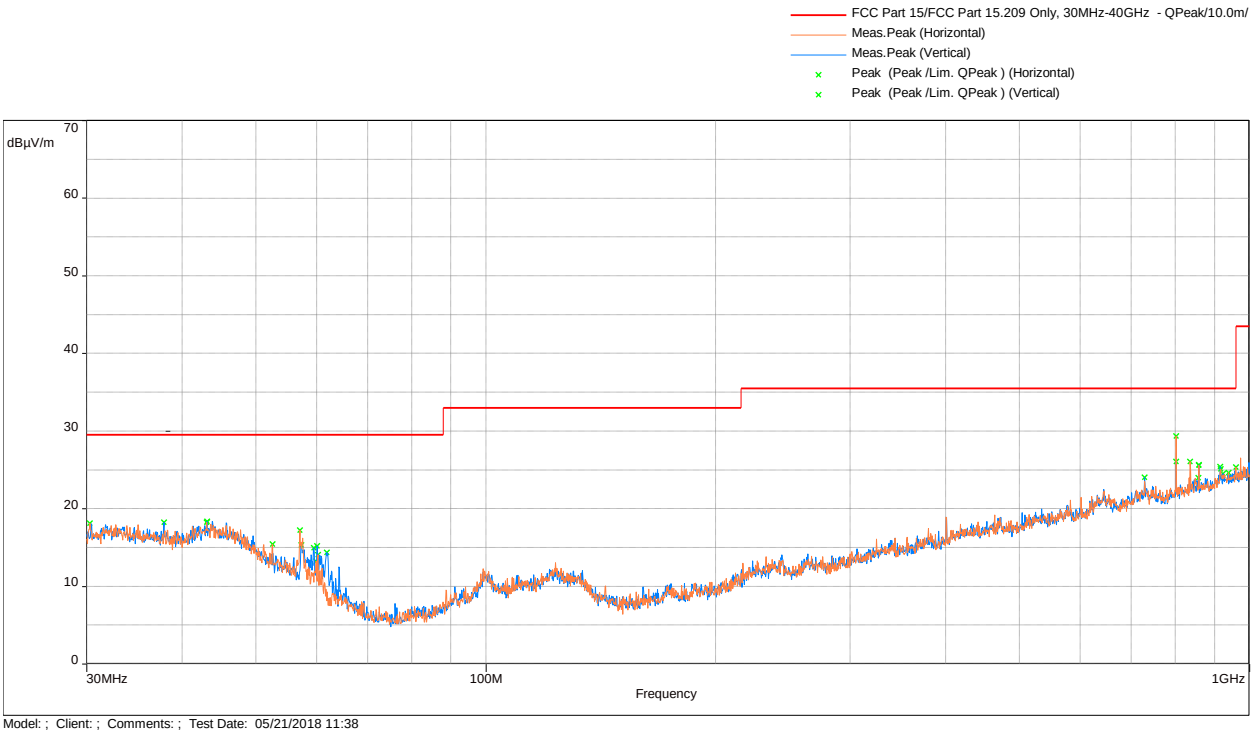
Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

Results	**Complies**

4.5.4 Test Results (Continued)

Test Results: 15.209 Radiated Spurious Emissions Mid Channel, Tx at 2440MHz

Radiated Spurious Emissions 30 MHz - 1000 MHz

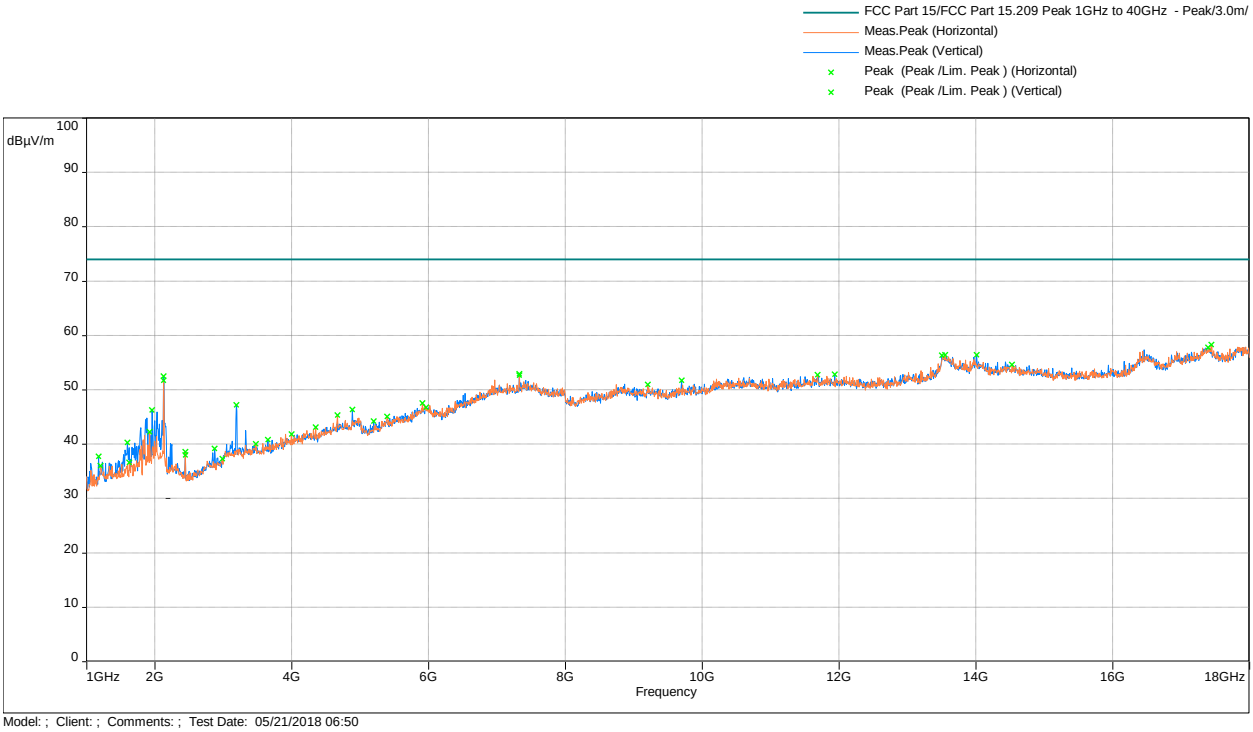


Frequency	Peak@10m	Limit @10m	Margin	Azimuth	Height	Polarity	Raw @10m	Correction
MHz	dB(uV/m)	dB(uV/m)	dB	deg	cm		dB(uV/m)	dB
947.523	32.69	35.5	-2.81	83	1	Horizontal	27.7	5.03

Note: Correction = AF + CF - Preamp
Note: FS = RA + Correction

4.5.4 Test Results (Continued)

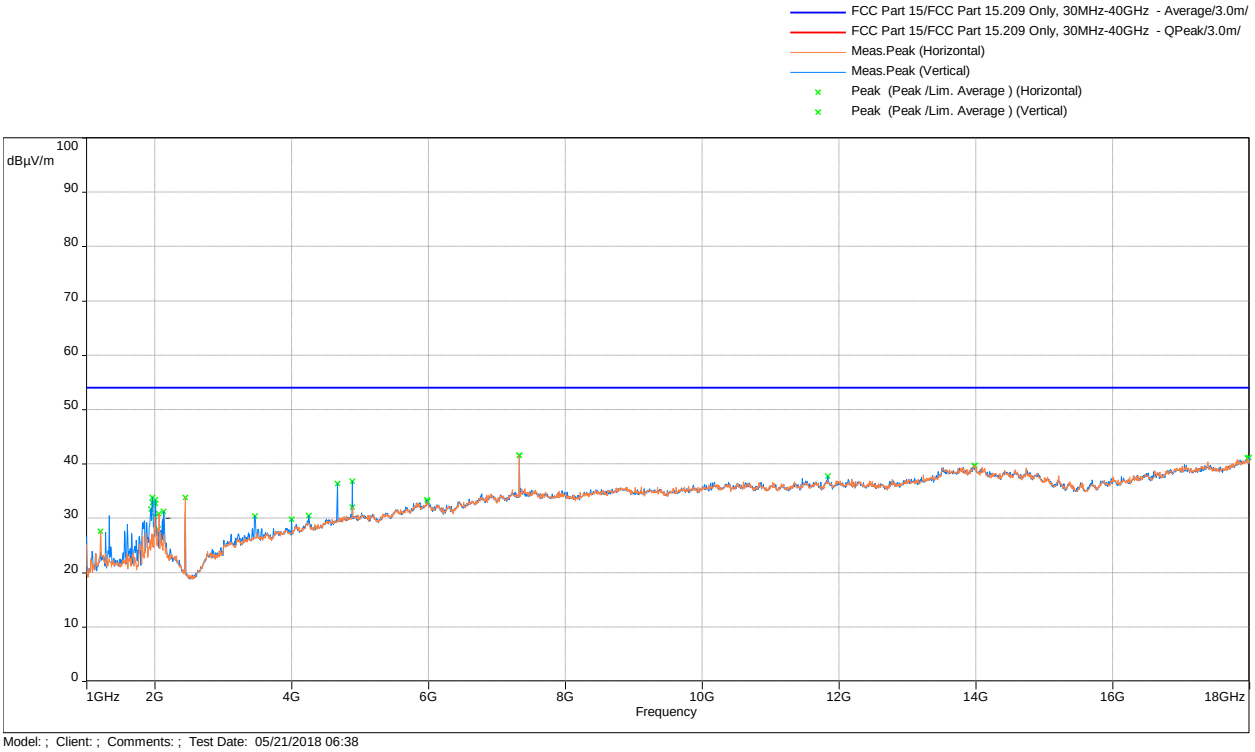
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 06:50

4.5.4 Test Results (Continued)

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 06:38

Frequency (MHz)	Average@3m (dBµV/m)	Limit@3m (dBµV/m)	Margin (dB)	Angle (°)	Height (m)	Polarity	Correction (dB)
7320.0	41.55	54	-12.45	279	2.09	Vertical	12.33

Note: Correction = AF + CF - Preamp

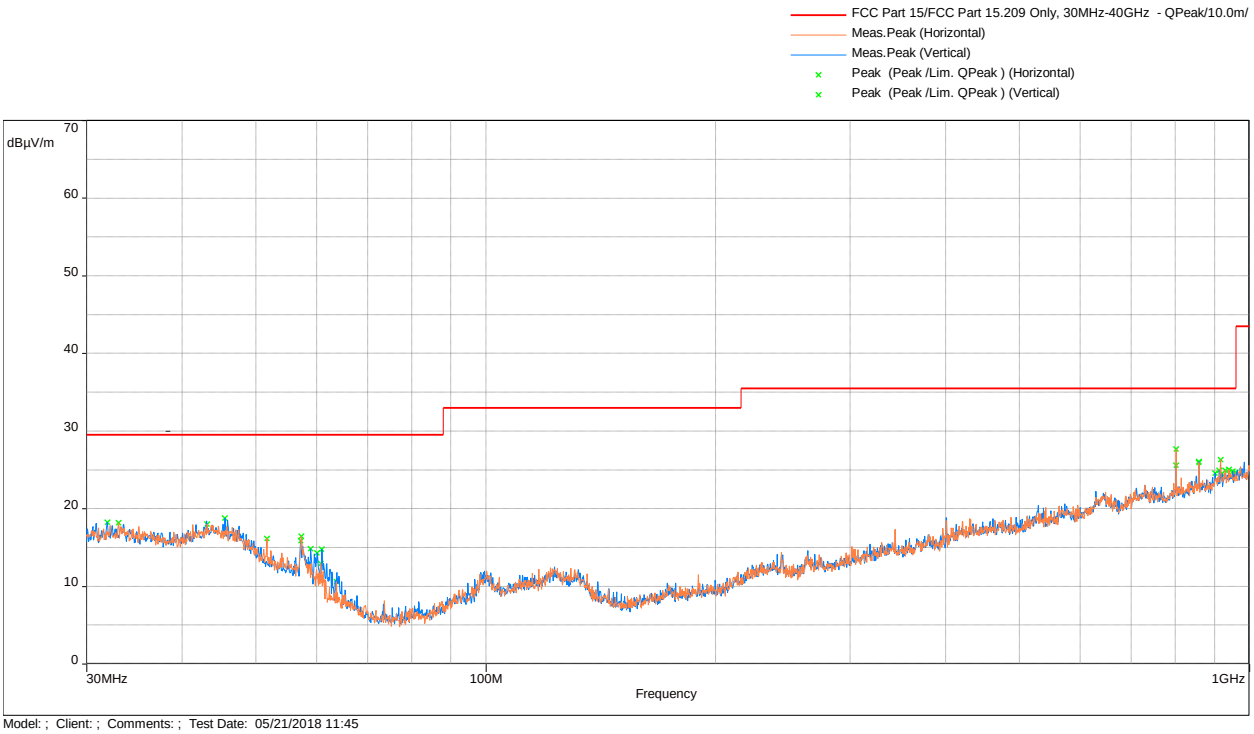
Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

Results	**Complies**

4.5.4 Test Results (Continued)

Test Results: 15.209 Radiated Spurious Emissions High Channel, Tx at 2480MHz

Radiated Spurious Emissions 30 MHz - 1000 MHz

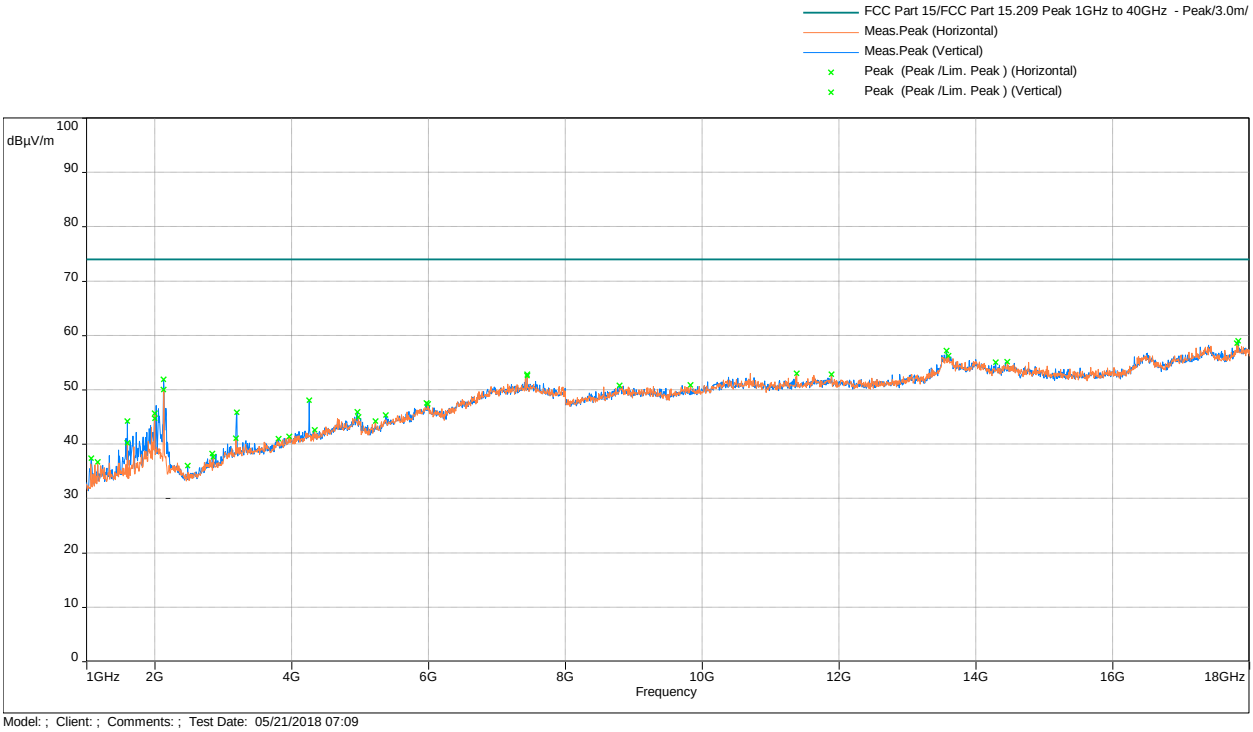


Frequency	Peak@10m	Limit@10m	Margin	Azimuth	Height	Polarity	Raw@10m	Correction
MHz	dB(uV/m)	dB(uV/m)	dB	deg	cm		dB(uV/m)	dB
957.611	33.37	35.5	-2.13	45	1.0	Horizontal	28.6	4.8

Note: Correction = AF + CF - Preamp
Note: FS = RA + Correction

4.5.4 Test Results (Continued)

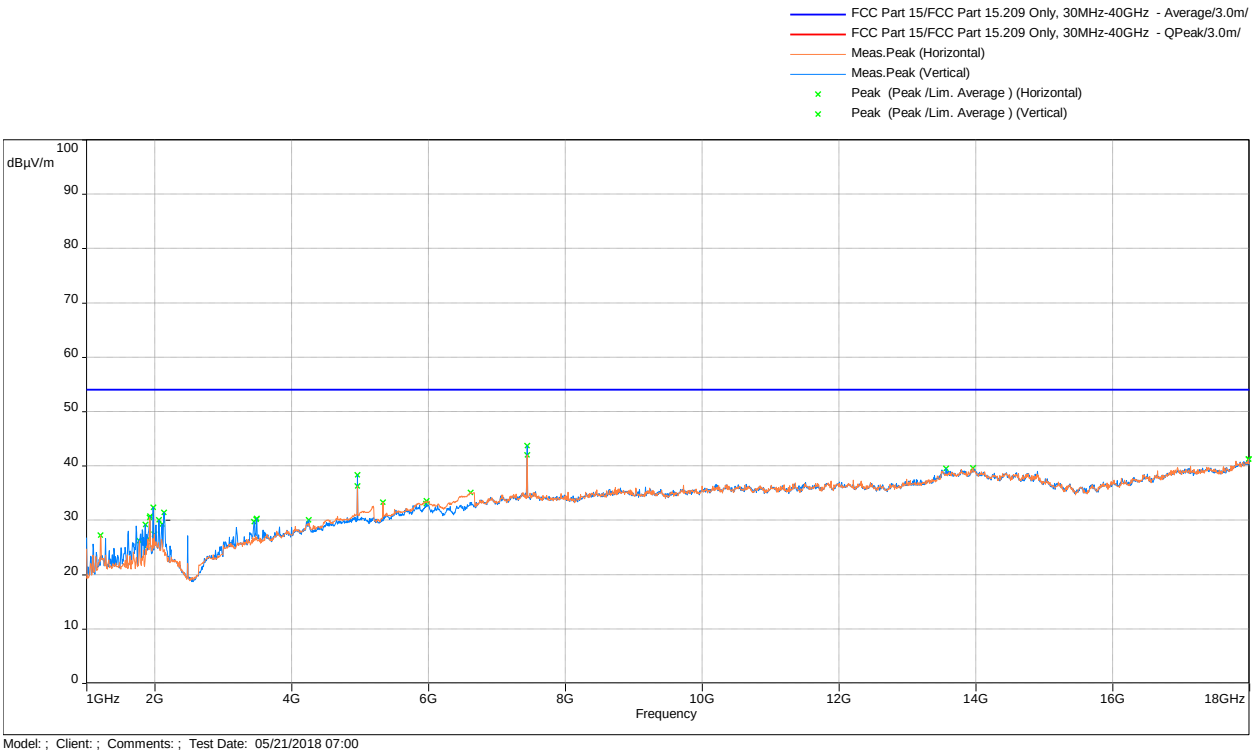
Radiated Spurious Emissions 1000 - 18000 MHz, Peak Scan vs Peak Limit



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 07:09

4.5.4 Test Results (Continued)

Radiated Spurious Emissions 1000 - 18000 MHz, Avg Scan vs Avg Limit



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 07:00

Frequency (MHz)	Average@3m (dBµV/m)	Limit@3m (dBµV/m)	Margin (dB)	Angle (°)	Height (m)	Polarity	Correction (dB)
7440.733	43.66	54	-10.34	15	2.01	Vertical	12.36

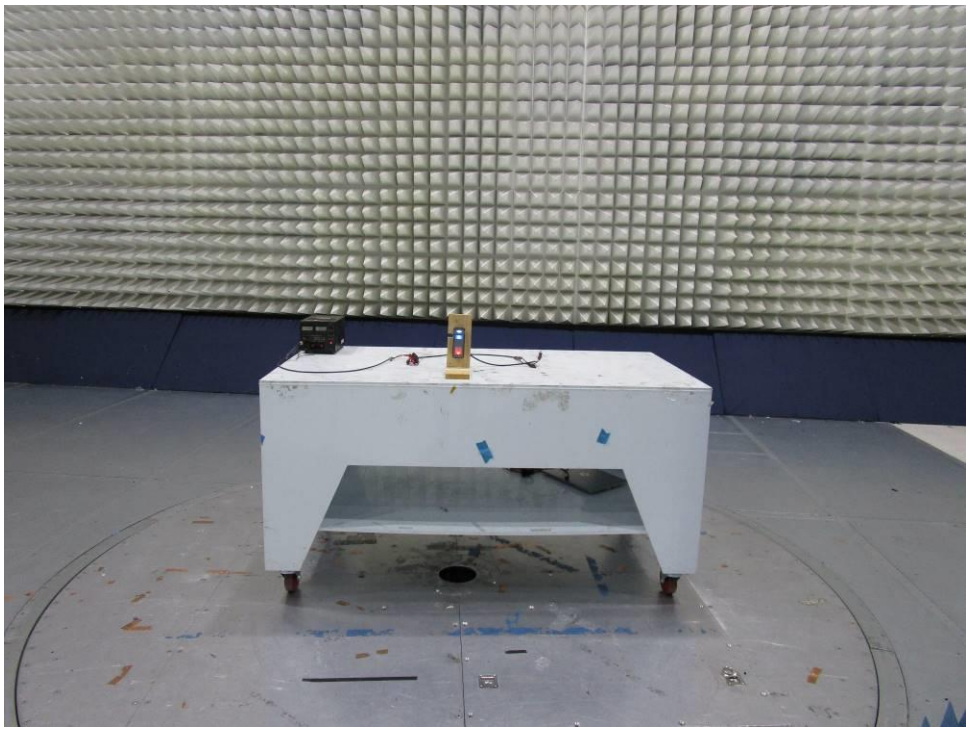
Note: Correction = AF + CF - Preamp

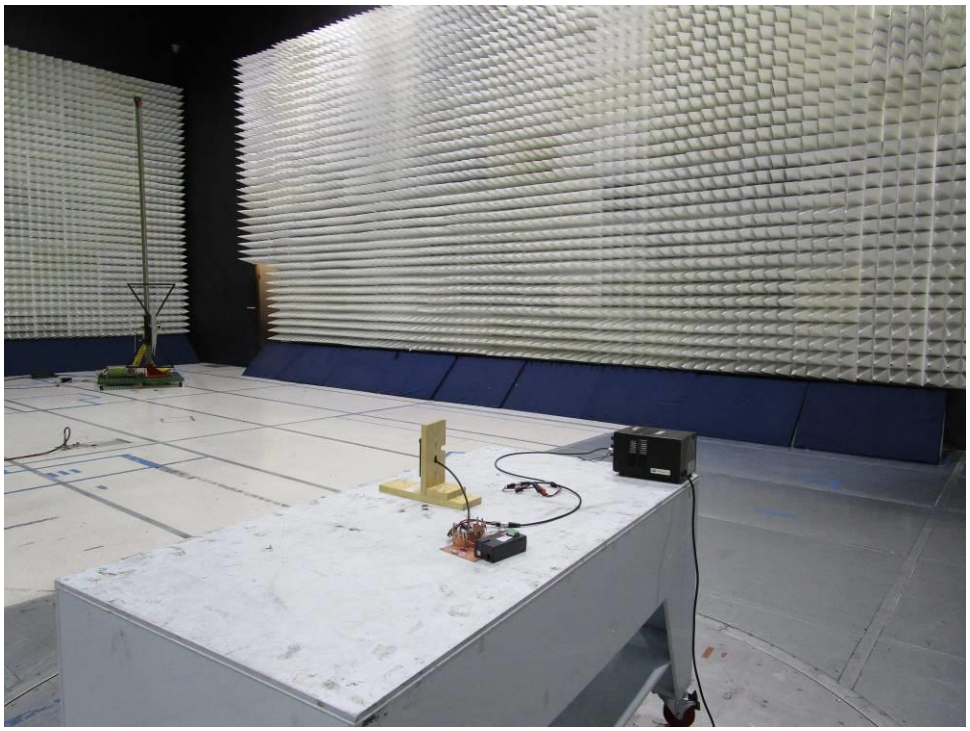
Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz

Results	**Complies**

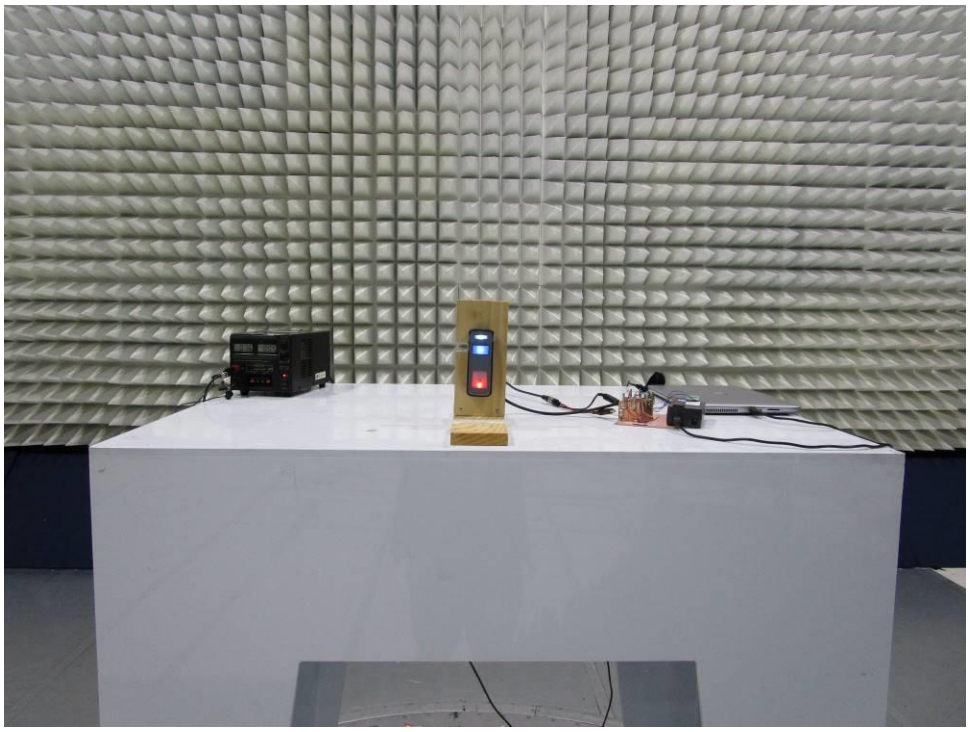
4.5.5 Test setup photographs

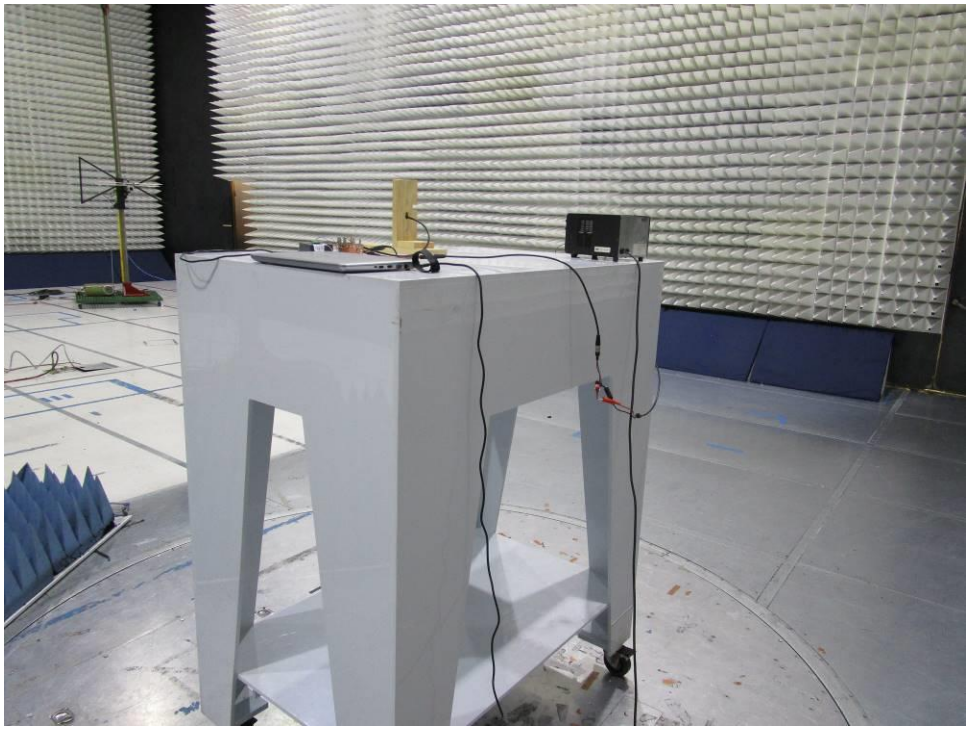
The following photographs show the testing configurations used.





4.5.5 Test Setup Photographs (Continued)





4.6 Radiated Emissions

FCC Ref: 15.109, ICES 003

4.6.1 Requirement

Limits for Electromagnetic Radiated Emissions FCC Section 15.109(b), ICES 003*, RSS GEN

Frequency (MHz)	**Class A at 10m dB(μV/m)**	**Class B at 3m dB(μV/m)**
30-88	39	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

4.6.2 Procedures

Measurements are conducted with a quasi-peak detector instrument in the frequency range of 30 MHz to 1000 MHz and with the average detector instrument in the frequency range above 1000 MHz. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for a larger EUT.

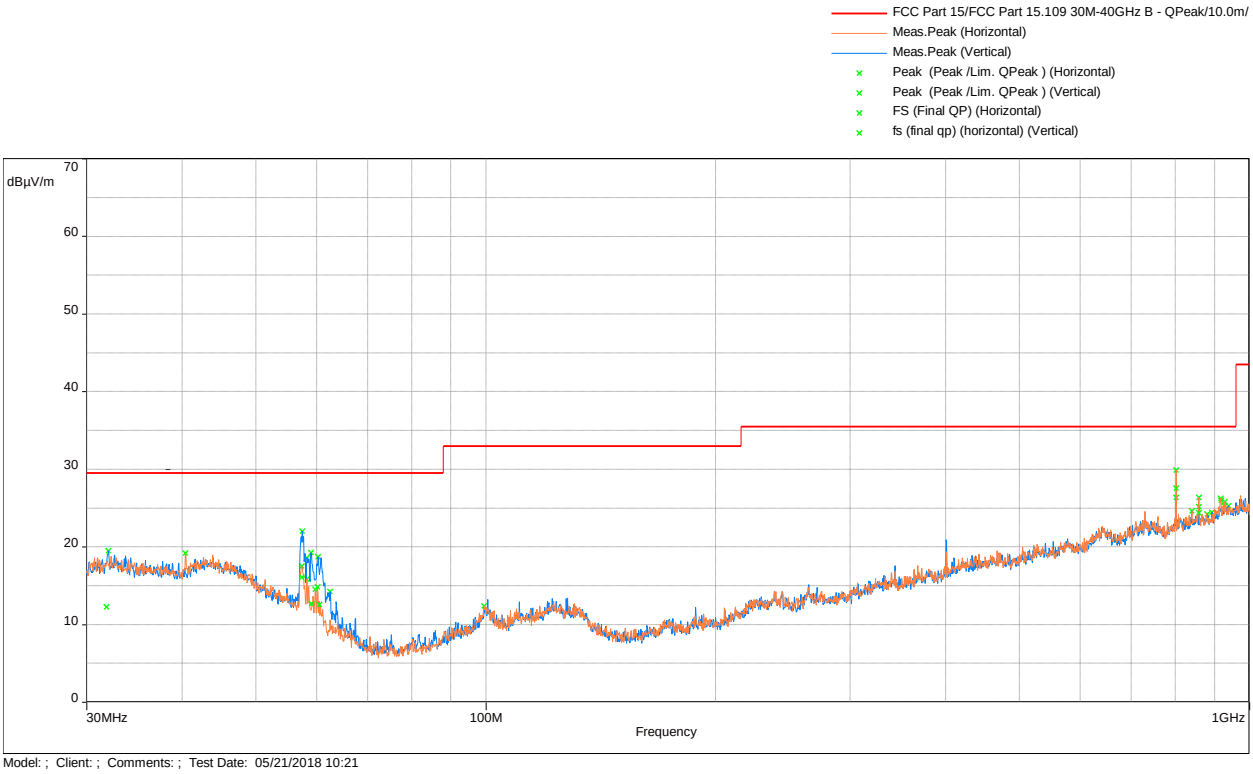
Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.

4.6.3 Test Results

Date of Test:	May 28, 2018
Results	**Complies**

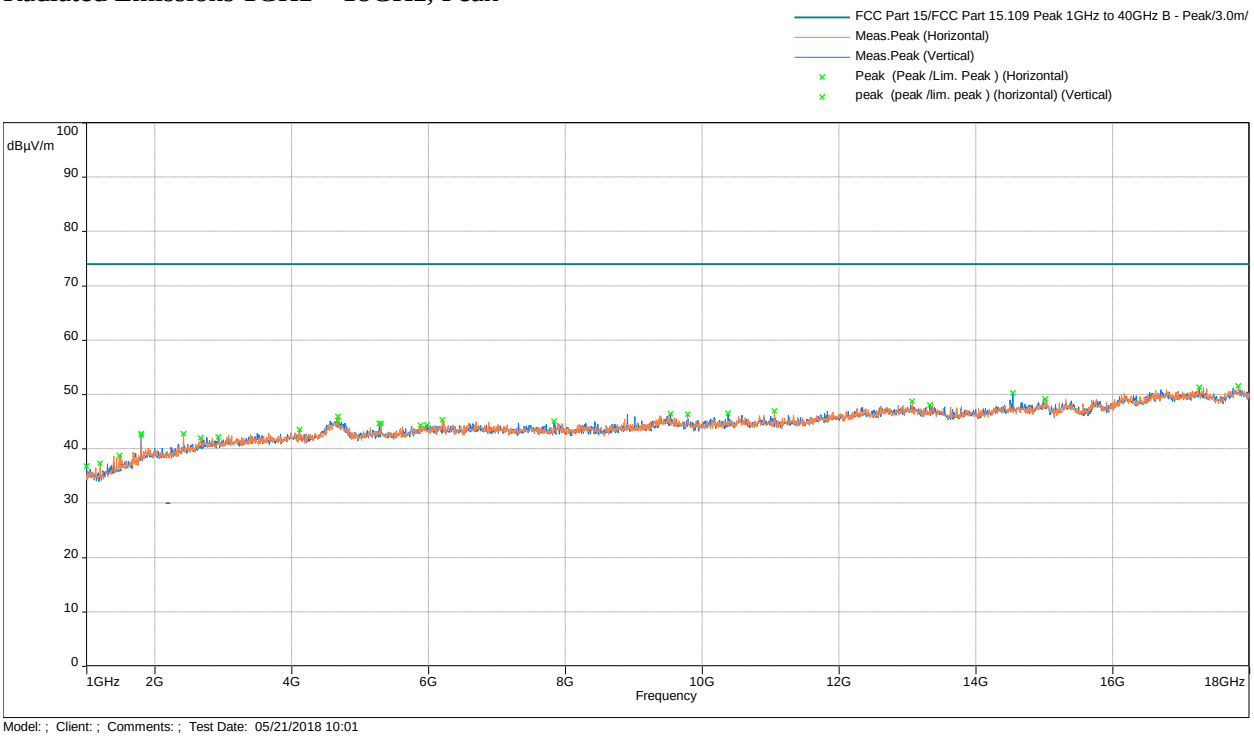
Test Results: Radiated Emissions 30 MHz – 1000 MHz



Frequency	Quasi Pk FS	Limit@10m	Margin	Azimuth	Height	Polarity	Raw@10m	Correction
MHz	dB(uV/m)	dB(uV/m)	dB	deg	cm		dB(uV/m)	dB
31.882	12.24	29.5	-17.26	231.5	3.52	Vertical	21.65	-9.4
57.3809	16.08	29.5	-13.42	51.25	3.8	Vertical	31.52	-15.4
59.156	12.67	29.5	-16.83	42	3.92	Vertical	28.61	-15.99
60.559	12.55	29.5	-16.95	100.75	1	Vertical	28.91	-16.49
801.841	27.52	35.5	-7.98	294.5	1.28	Horizontal	31.01	-3.49
859.083	24.37	35.5	-11.13	55.75	1.07	Horizontal	26.95	-2.58

4.6.3 Test Results (Continued)

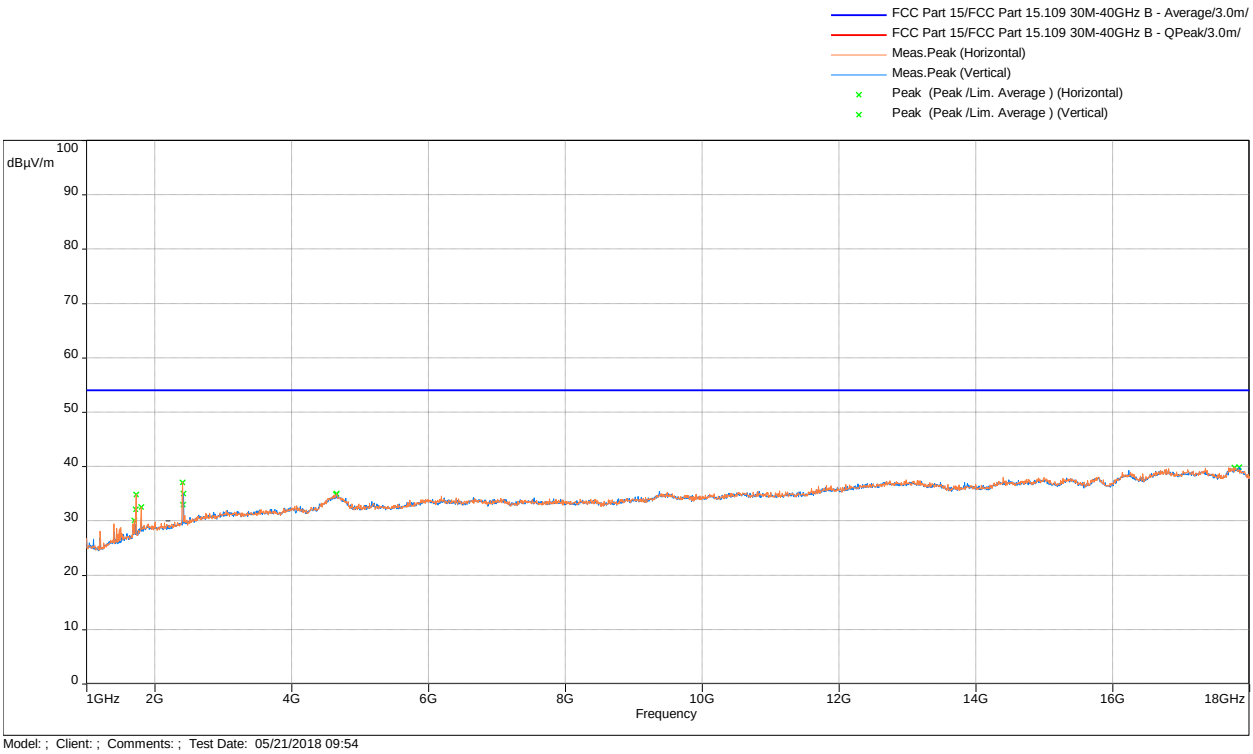
Radiated Emissions 1GHz – 18GHz, Peak



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 10:01

4.6.3 Test Results (Continued)

Radiated Emissions 1GHz – 18GHz, Average

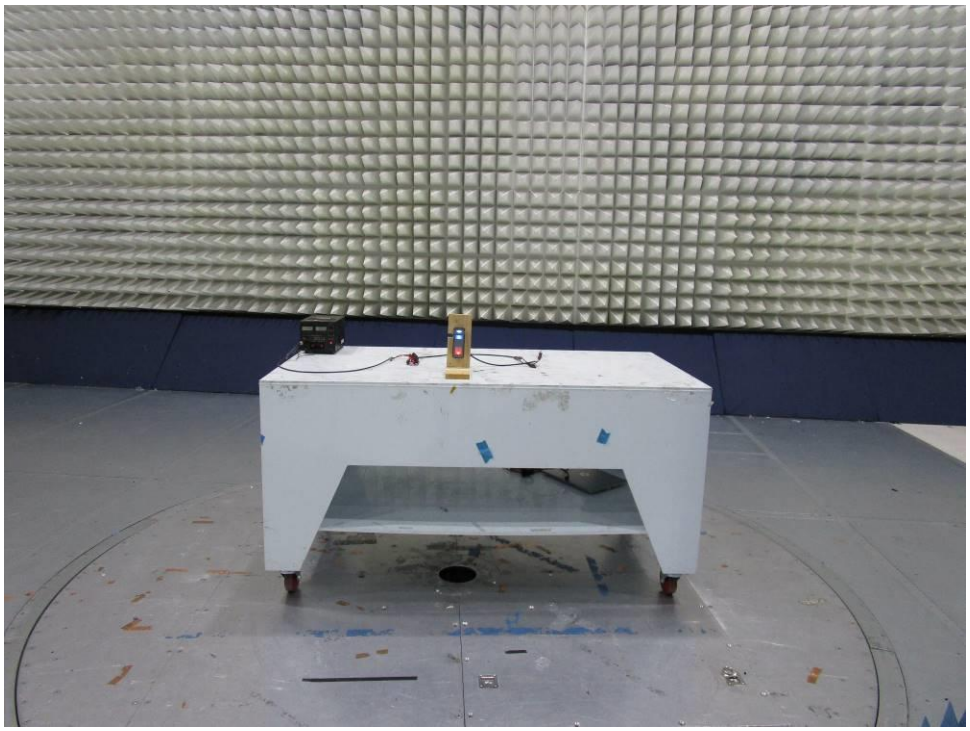


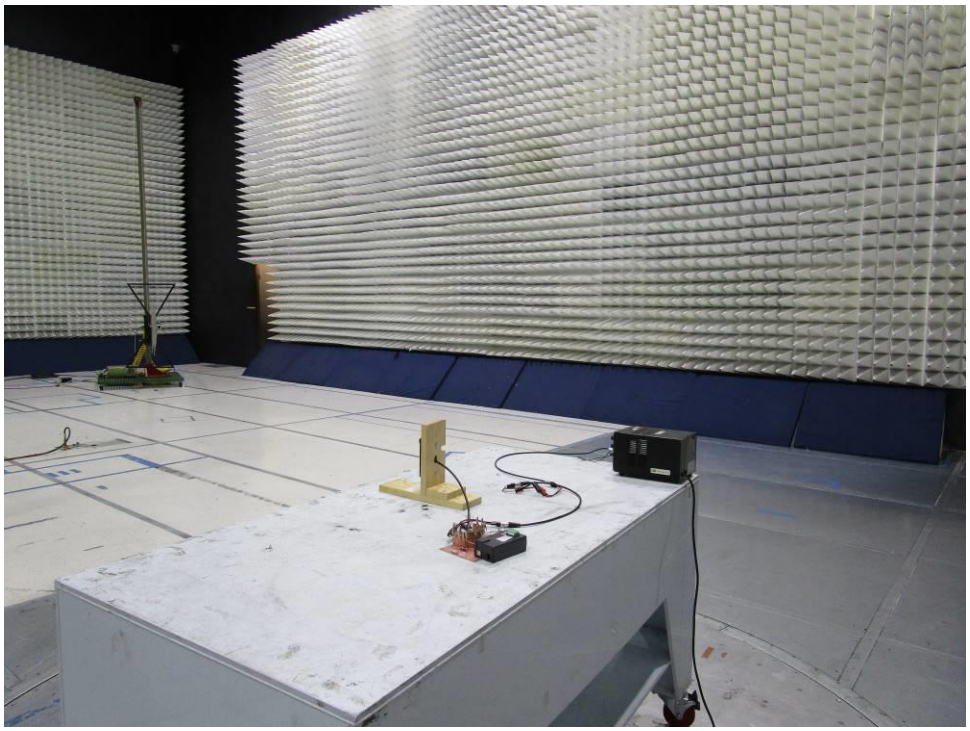
Note: Radiated emission measurements were performed up to 25GHz. No Emissions were identified when scanned from 18-25 GHz.

Result:	**Complies** by 7.98 dB

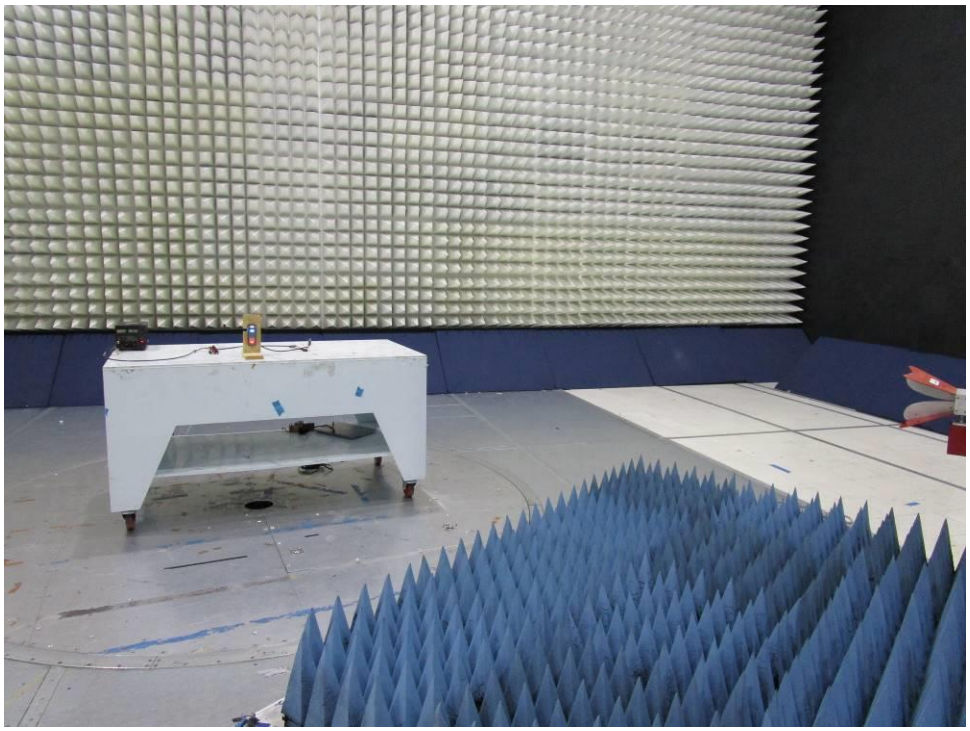
4.6.4 Test Configuration Photographs

The following photographs show the testing configurations used.





4.6.4 Test Configuration Photographs (Continued)



4.7 AC Line Conducted Emission
FCC: 15.207, 15.107; RSS-GEN;

4.4.1 Requirement

Frequency Band MHz	Class B Limit dB(μV)		Class A Limit dB(μV)	
	Quasi-Peak	Average	Quasi-Peak	Average
0.15-0.50	66 to 56 *	56 to 46 *	79	66
0.50-5.00	56	46	73	60
5.00-30.00	60	50	73	60

*Note: *Decreases linearly with the logarithm of the frequency. At the transition frequency the lower limit applies.*

4.7.2 Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

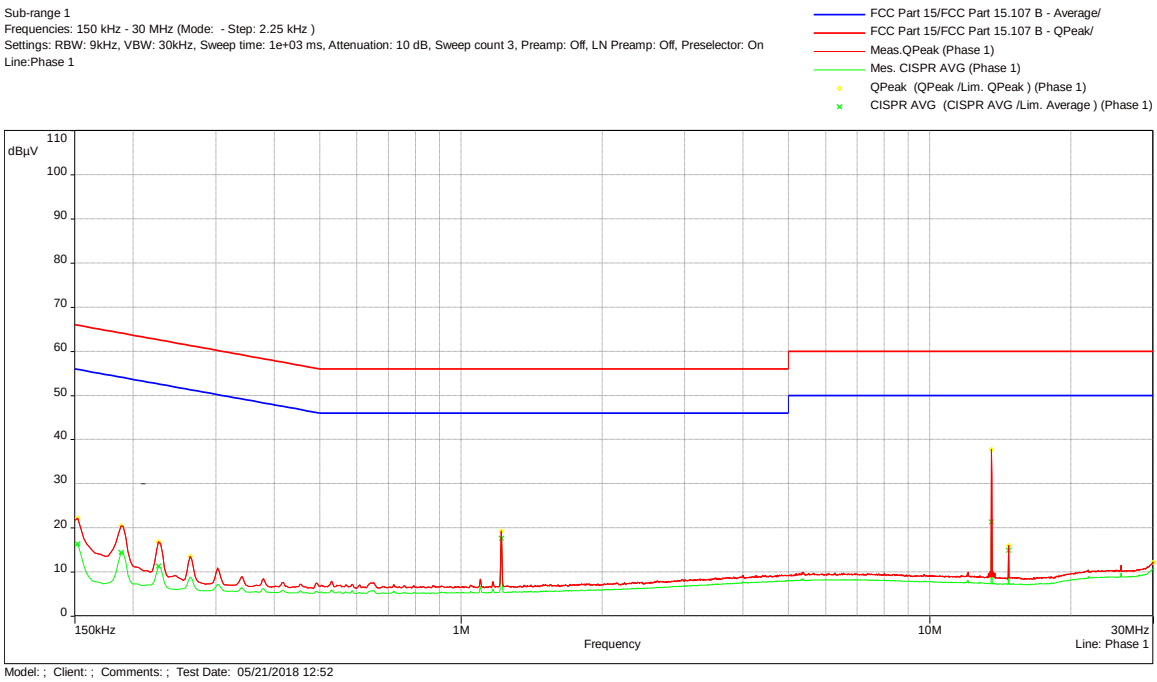
Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4: 2014 & ANSI C63.10-2013.

4.7.3 Test Result

15.207, 120VAC 60Hz with BLE Transmitter On

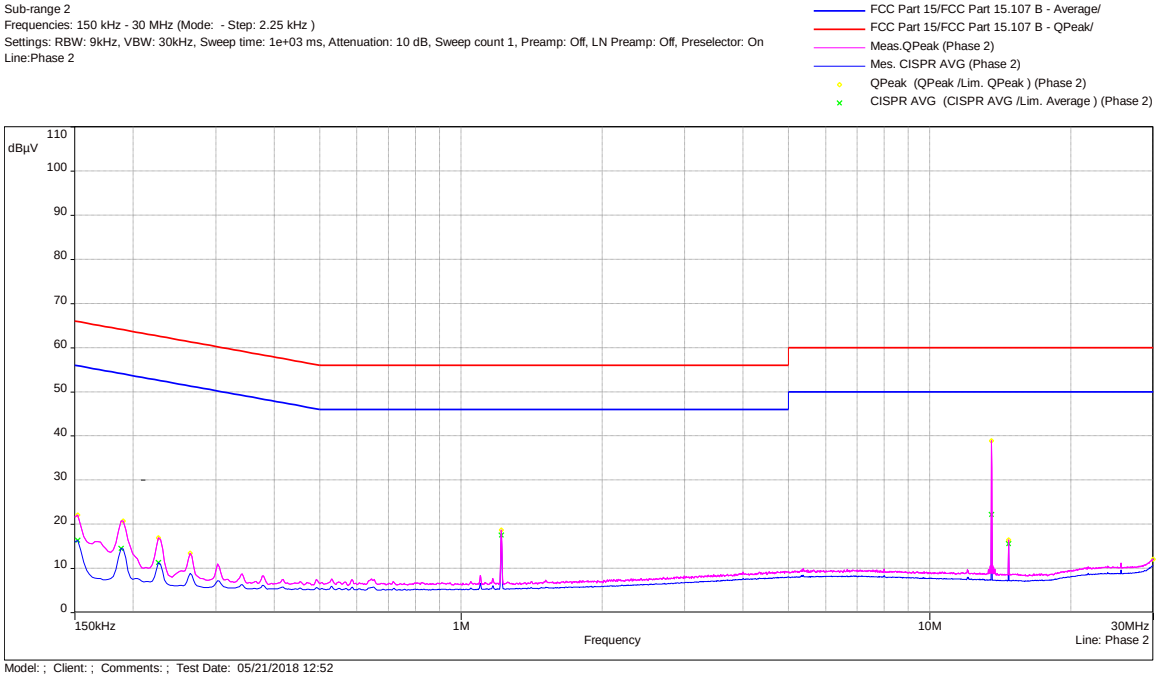
Tested with RFID Antenna removed and terminated

Phase 1



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 12:52

Phase 2



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 12:52

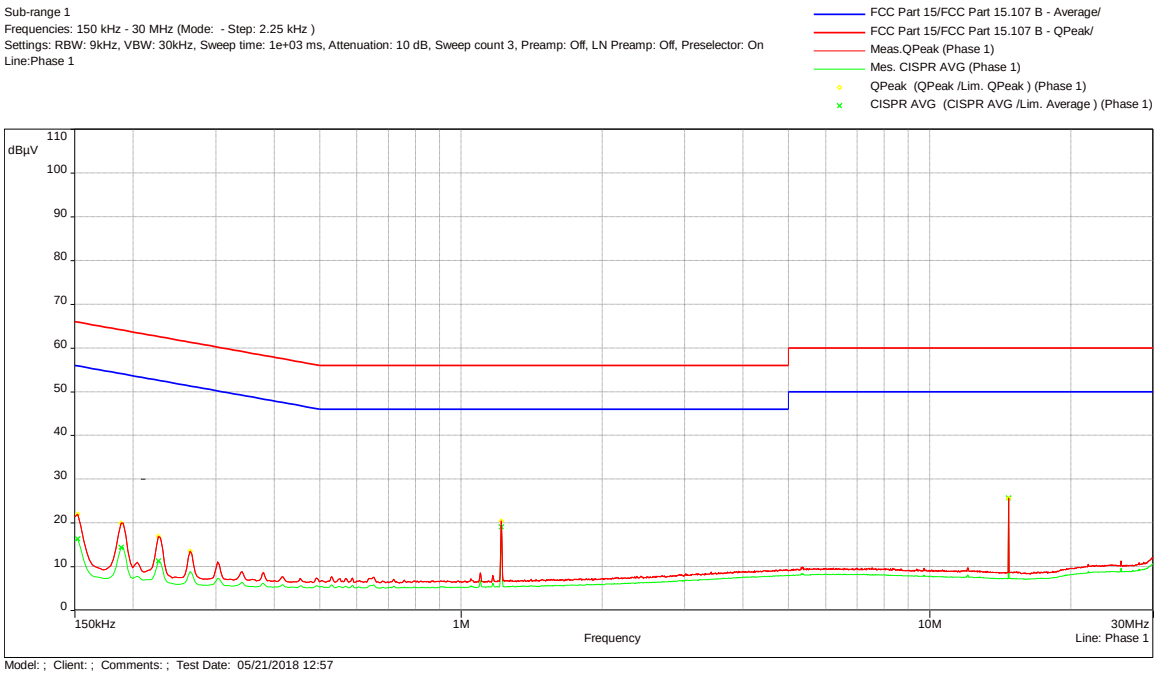
Quasi Peak Table					
Frequency (MHz)	QPeak (dBµV)	Lim. QPeak (dBµV)	QPeak-Lim (dB)	Phase	Correction (dB)
0.152	21.92	65.88	-43.95	Phase 1	11.51
0.152	21.73	65.88	-44.15	Phase 2	11.51
0.188	19.97	64.11	-44.14	Phase 1	11.53
0.191	19.81	64.11	-44.31	Phase 2	11.53
0.227	16.90	62.58	-45.68	Phase 1	11.55
0.227	16.79	62.58	-45.79	Phase 2	11.55
0.265	13.54	61.28	-47.74	Phase 1	11.56
0.265	13.46	61.28	-47.82	Phase 2	11.56
1.221	20.37	56.00	-35.63	Phase 1	11.62
1.221	20.52	56.00	-35.48	Phase 2	11.62
13.560	26.23	60.00	-33.77	Phase 2	11.95
13.560	25.61	60.00	-34.39	Phase 1	11.95
14.746	11.94	60.00	-48.06	Phase 2	12.05
14.746	16.44	60.00	-43.56	Phase 2	11.95
29.974	12.13	60.00	-47.87	Phase 1	12.05
29.983	12.06	60.00	-47.94	Phase 2	12.05

Average Table					
Frequency (MHz)	AVG (dBµV)	Lim. Average (dBµV)	AVG-Lim (dB)	Phase	Correction (dB)
0.152	16.32	55.88	-39.55	Phase 1	11.51
0.152	16.29	55.88	-39.59	Phase 2	11.51
0.188	14.42	54.11	-39.69	Phase 2	11.53
0.188	14.42	54.11	-39.70	Phase 1	11.53
0.227	11.24	52.58	-41.34	Phase 2	11.55
0.227	11.27	52.58	-41.31	Phase 1	11.55
1.221	19.29	46.00	-26.71	Phase 2	11.62
1.221	19.06	46.00	-26.94	Phase 1	11.62
13.560	26.28	50.00	-23.72	Phase 2	11.95
13.560	25.63	50.00	-24.37	Phase 1	11.95
14.746	15.60	50.00	-34.40	Phase 2	11.95
14.746	14.88	50.00	-35.12	Phase 1	11.95

Result **Complies** by 23.72 dB

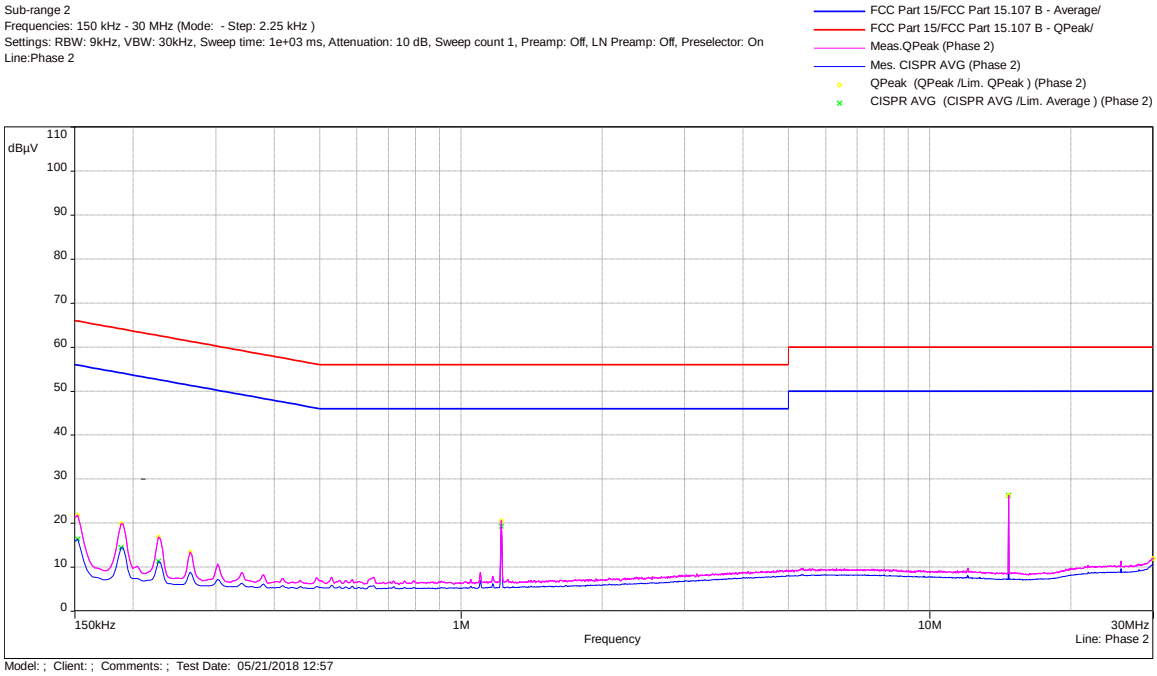
15.107, 120VAC 60Hz with BLE and RFID Transmitter Off

Phase 1



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 12:57

Phase 2



Model: ; Client: ; Comments: ; Test Date: 05/21/2018 12:57

4.7.3 Test Result (Continued)

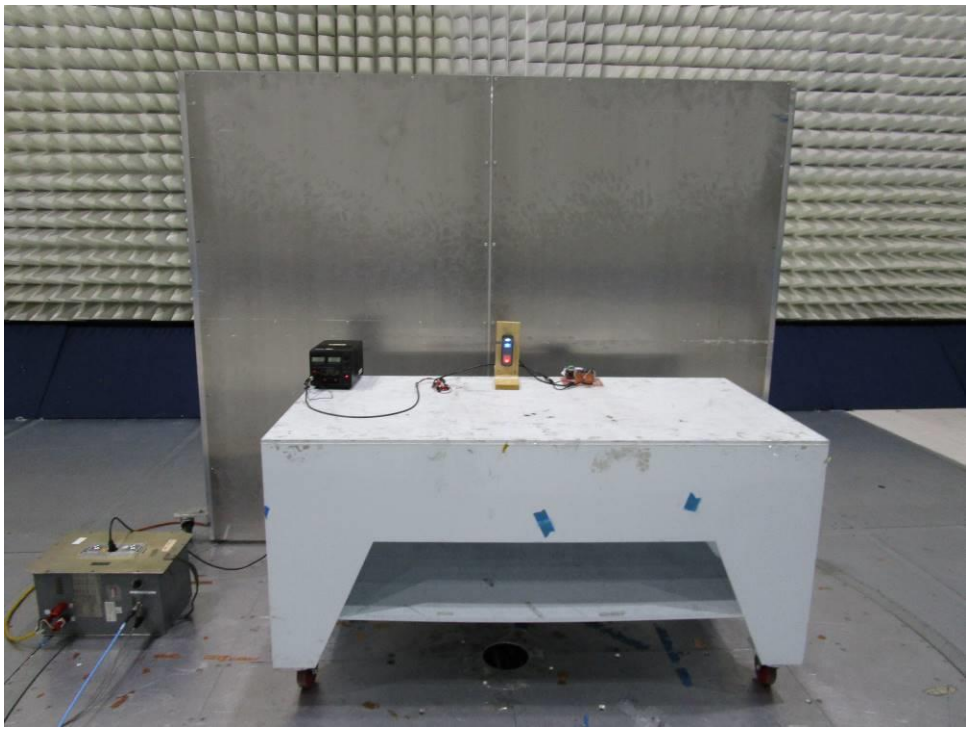
Quasi Peak Table					
Frequency (MHz)	QPeak (dBµV)	Lim. QPeak (dBµV)	QPeak-Lim (dB)	Phase	Correction (dB)
0.152	21.92	65.88	-43.95	Phase 1	11.51
0.152	21.73	65.88	-44.15	Phase 2	11.51
0.188	19.97	64.11	-44.14	Phase 1	11.53
0.188	19.81	64.11	-44.31	Phase 2	11.53
0.227	16.90	62.58	-45.68	Phase 1	11.55
0.227	16.79	62.58	-45.79	Phase 2	11.55
0.265	13.54	61.28	-47.74	Phase 1	11.56
0.265	13.46	61.28	-47.82	Phase 2	11.56
1.221	20.37	56.00	-35.63	Phase 1	11.62
1.221	20.52	56.00	-35.48	Phase 2	11.62
14.746	26.23	60.00	-33.77	Phase 2	11.95
14.746	25.61	60.00	-34.39	Phase 1	11.95
29.985	11.94	60.00	-48.06	Phase 2	12.05

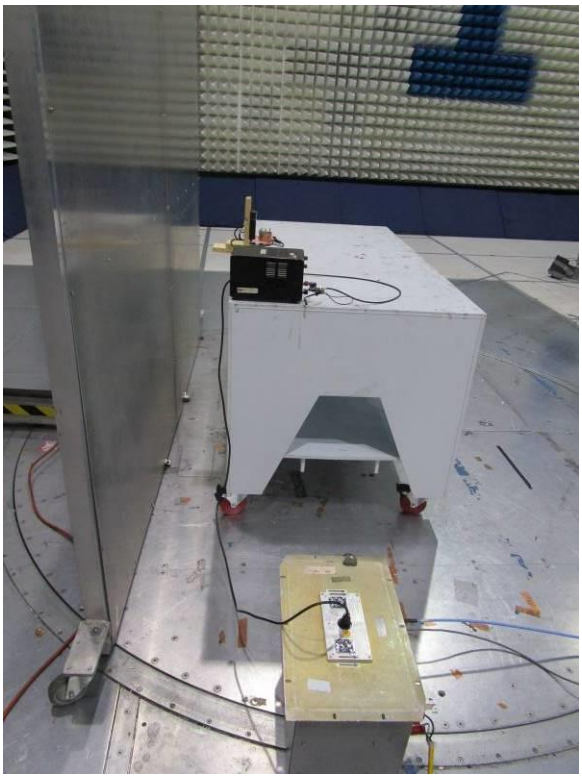
Average Table					
Frequency (MHz)	AVG (dBµV)	Lim. Average (dBµV)	AVG-Lim (dB)	Phase	Correction (dB)
0.152	16.32	55.88	-39.55	Phase 1	11.51
0.152	16.29	55.88	-39.59	Phase 2	11.51
0.188	14.42	54.11	-39.69	Phase 2	11.53
0.188	14.42	54.11	-39.70	Phase 1	11.53
0.227	11.24	52.58	-41.34	Phase 2	11.55
0.227	11.27	52.58	-41.31	Phase 1	11.55
1.221	19.29	46.00	-26.71	Phase 2	11.62
1.221	19.06	46.00	-26.94	Phase 1	11.62
14.746	26.28	50.00	-23.72	Phase 2	11.95
14.746	25.63	50.00	-24.37	Phase 1	11.95

Result **Complies** by 23.72 dB

4.7.4 Test Configuration Photographs

The following photographs show the testing configurations used.





5.0 List of Test Equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Asset No.	Calibration Interval	Cal Due
Pre-Amplifier	Sonoma Instrument	310	ITS 01493	12	10/20/18
EMI Receiver	Rohde and Schwarz	ESR7	ITS 01607	12	10/09/18
BI-Log Antenna	Antenna Research	LPB-2513	ITS 00355	12	02/21/19
LISN	FCC	FCC-LISN-PA-NEMA-5-15	ITS 00552	12	11/14/18
RE Cable	TRU Corporation	TRU CORE 300	ITS 01462	12	08/19/18
RE Cable	TRU Corporation	TRU CORE 300	ITS 01465	12	08/16/19
RE Cable	TRU Corporation	TRU CORE 300	ITS 01470	12	08/16/19
Transient Limiter	COM-POWER	LIT-153A	ITS 01452	12	06/21/19
Spectrum Analyzer	Rohde and Schwarz	FSU	ITS 00913	12	01/24/19
Pyramidal Horn Antenna	EMCO	3160-09	ITS 00571	#	#
Pre-Amplifier (18-40GHz)	Miteq	TTA1840-35-S-M	ITS 01393	12	01/19/19
Pre-Amplifier (1-18GHz)	Miteq	AMF-4D-001180-24-10P	ITS 00526	12	01/19/19
Horn Antenna	ETS-Lindgren	3117	ITS 01325	12	01/25/19
Horn Antenna	ETS-Lindgren	3117-PA	ITS 01636	12	01/11/19
Notch Filter	Micro-Tronics	BRM50702	ITS 01166	12	05/22/19
RE Cable	TRU Corporation	TRU Core 300	ITS 01330	12	11/29/18
RE Cable	Megaphase	EMC1-K1K1-236	ITS 01538	12	06/25/19

No Calibration required

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.16.0.64	Farpointe_G103506678
RS Commander	Rohde Schwarz	1.6.4	Not Applicable (Screen grabber)

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewers Initials	Date	Change
1.0 / G103506678	ML	KV	May 30, 2018	Original document
2.0 / G103506678	AS	KV	September 18, 2018	Added sections 4.1, 4.3 and 4.4.

END OF REPORT