TEST REPORT

Report Number: 103495071MPK-006
Project Number: G103495071
May 14, 2018

Testing performed on the
LF80C ZeniD RFID Reader
Part Numbers: TLG-E2B-1O00-S0-00EB & TLG-I2-1O00-S0-00EB
FCC ID: N5GLF80BC1

to

FCC Part 15 Subpart C (15.209)
FCC Part 15 Subpart C (15.207)
RSS-210 Issue 9

for

Brooks Automation

Test Performed by:	Test Authorized by:
Intertek	Brooks Automation
1365 Adams Court	46702 Bayside Pkwy
Menlo Park, CA 94025 USA	Fremont, CA 94538, USA

Prepared by: Aaron Chang **Date:** May 14, 2018

Reviewed by: Krishna K Vemuri **Date:** May 14, 2018

VERIFICATION OF COMPLIANCE
Report No. 103495071MPK-006

Verification is hereby issued to the named APPLICANT and is VALID ONLY for the equipment identified hereon for use under the rules and regulations listed below.

Equipment Under Test:	LF80C ZeniD RFID Reader
Trade Name:	Brooks Automation
Part Numbers:	TLG-E2B-1O00-S0-00EB & TLG-I2-1O00-S0-00EB
Applicant: **Contact**:	Brooks Automation Michael Krolak
Address:	Brooks Automation 46702 Bayside Pkwy Fremont, CA 94538
Country	USA
Tel. number:	(510)-661-5090
email:	Michael.krolak@brooks.com
Applicable Regulation:	FCC Part 15, Subpart C (15.209) FCC Part 15, Subpart C (15.207) RSS-210 Issue 9
Date of Test:	April 16 – 27, 2018

We attest to the accuracy of this report:

Aaron Chang
Project Engineer

Krishna K Vemuri
Engineering Team Lead

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Test	Reference FCC	Reference IC	Result
Transmitter Radiated Emissions	15.209	RSS 210 (4.3)	Complies
AC Line Conducted Emission (Transmitting mode)	15.207	RSS GEN	Complies
Radiated Emission from Digital Part and Receiver	15.109	ICES 003	Complies*
AC Line Conducted Emission	15.107	ICES 003	Complies*
Antenna Requirement	15.203	RSS GEN	Complies (The EUT uses unique antenna connector)
Occupied Bandwidth	15.215(c)	RSS GEN	Complies

*See report 103495071MPK-008 for data.

1.0 Job Description

The Equipment under Test (EUT): The EUT is a Radio Frequency ID (RFID) reader. It transmits energy and signals trough an inductive coupling antenna. There is a small ID/Data storage transponder which is initially energized by the antenna transmission, and then the transponder can respond with an identification data response. The reader can also write data to the transponder. This product is used in the Semiconductor industry to read the IDs of containers of Silicon wafers. The reader is installed inside a semiconductor processing tool. The transponder is located in the Silicon wafer container (FOUP).

1.1 Client Information

The EUT has been tested at the request of:

Company:	Brooks Automation 46702 Bayside Pkwy Fremont, CA 94538, USA
Name of contact:	Michael Krolak
Telephone:	(510)-661-5090
Email:	Michael.krolak@brooks.com

1.2 Test Plan Reference

Tests were performed to the following standards:

- FCC Part 15, Subpart C (15.209)
- FCC Part 15, Subpart C (15.207)
- RSS-210 Issue 9

1.3 Description of Equipment Under Test (EUT)

Description	LF80C ZeniD RFID Reader
Part Nos.	TLG-E2B-1O00-S0-00EB & TLG-I2-1O00-S0-00EB
FCC Identifier	N5GLF80BC1
Operating Frequency	134.5 kHz
Number of Channels	1
Type of Modulation	CW
Antenna Type	External Antenna

EUT receive date: April 16, 2018

EUT receive condition: The EUT was received in good condition with no apparent damage.

Test start date: April 16, 2018

Test completion date: April 27, 2018

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

1.4 Equipment Under Test

Ref No.	Description	Model Number	Serial Number
1	LF80	TLG-I2-1O00-S0-00EB	1804FRE10940 (RS232)
2	LF80	TLG-E2B-1O00-S0-00EB	1804FRE10943 (Ethernet)
3	Micro Antenna	ANT-1M10	N/A
4	Mini Antenna	ANT-2LK15	N/A
5	Rod Antenna	ANT-1S10	N/A
6	Frame Antenna	ANT-1R10	N/A

Support Equipment

Ref No.	Description	Model Number/Part Number	Serial Number
7	Laptop	Latitude E6420	B78C4R1
8	AC/DC Adapter	DRS-24V30W1A	S124030AZW15171661
9	AC/DC Supply	EP-3003	00468
10	Transponder	266391	Not Labeled

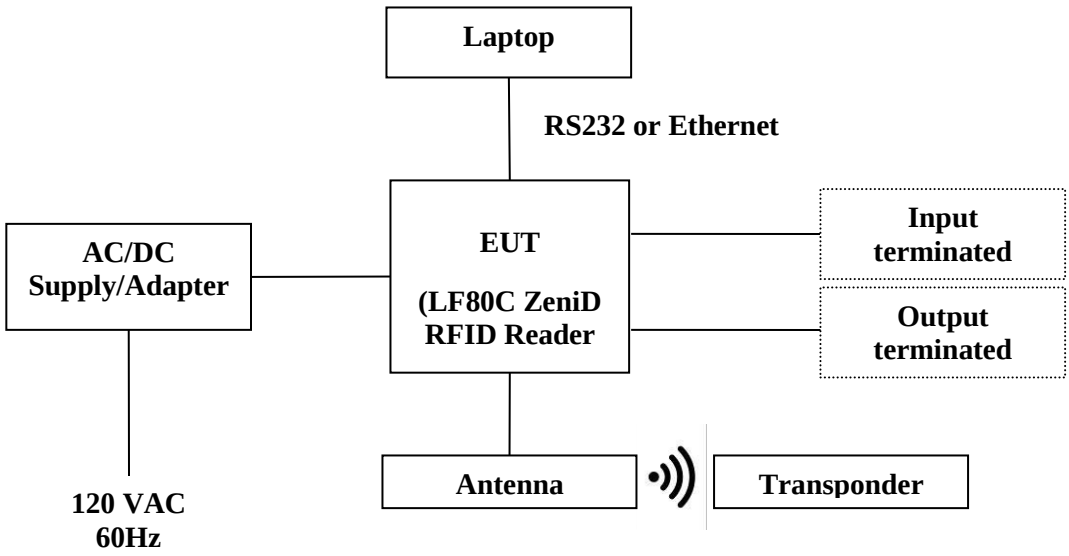
Cables Used

Ref No.	Description	Cable Length (m)/ Type	From	To
11	Input port	1.0, S	EUT	Termination
12	Output port	1.0, S	EUT	Termination
13	RS232 Serial Cable	2.5, U	EUT	Laptop
14	Ethernet Cable	3.1, U	EUT	Laptop

1.5 Block Diagram of Test Setup

The diagrams showed below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.

RS232 Configuration or Ethernet Configuration:



S = Shielded **U** = Unshielded	**m** = Length in Meters

1.6 Justification

The EUT was configured for testing in a table-top configuration, as specified by Brooks Automation. The highest clock frequency used in the EUT was 40 MHz. Radiated Emissions was tested up to 1GHz for FCC Part 15 Subpart B. Radiated emissions investigation was done with EUT antenna orientations in Vertical and Horizontal polarizations. The worst-case data was found with EUT antenna orientation in Horizontal polarization.

1.7 Mode(s) of Operation

EUT was continuously transmitting during the tests.

RS232 configuration: The laptop communicated with the EUT via serial connection.

Ethernet configuration: The laptop communicated with the EUT via RJ45.

1.8 Modifications Required for Compliance

No modifications were made during compliance testing in order to bring the product into compliance.

2.0 Test Environment for Emissions Testing

2.1 Test Facility

The test facility is located at 1365 Adams Court, Menlo Park, California. The test site is a 10-meter semi-anechoic chamber. The site meets the characteristics of CISPR 16-1 and ANSI C63.4:2014. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

The A2LA certificate number for this site is 1755-01.
The Industry Canada (IC) Site Number is 2042L-1.

2.2 Test Equipment

Table 2-1 contains a list of the test equipment used during the testing.

Table 2-1 List of Test Equipment

Equipment	Manufacturer	Model/Type	Asset #	Cal Int	Cal Due
LISN	FCC	FCC-LISN-50-50-M-H	ITS 00552	12	11/14/18
Spectrum Analyzer	Rohde & Schwarz	FSU	ITS 00913	12	01/24/19
EMI Receiver	Rohde & Schwarz	ESR	ITS 01607	12	10/09/18
Passive Loop Antenna	EMCO	6512	ITS 01598	12	10/10/18
BI-Log Antenna	ARA	LPB-2513	ITS 00355	12	02/21/19
Pre-Amplifier	Sonoma Instrument	310N	ITS 01493	12	10/20/18
EMI Receiver	Rohde and Schwarz	ESU	ITS 00961	12	07/10/18

2.3 Example Field Strength Calculation

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

FS = RA + AF + CF – PA + DCF

Where FS = Field Strength in dB (μV/m)
RA = Receiver Amplitude (including preamplifier) in dB (μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB (1/m)
PA= Preamplifier Factor in dB
DCF = Distance Correction Factor dB (for measurements made at X meters when compared to Y meter limits, 40log(X/Y) for below 30MHz and 20log(X/Y) for above 30MHz)

Assume a receiver reading of 52.0 dB (μV) is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted and the Distance Correction Factor of 10.5 dB is added, giving field strength of 42.5 dB (μV/m).

RA = 52.0 dB (μV)
AF = 7.4 dB (1/m)
CF = 1.6 dB
PA = 29.0 dB
DCF = 10.5 dB
FS = RF + AF + CF – PA + DCF
FS = 52.0 + 7.4 + 1.6 – 29.0 + 10.5
FS = 42.5 dB (μV/m)

2.4 Measurement Uncertainty

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes.

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 Emissions Test Results

3.1 Transmitter Radiated Emissions

FCC: 15.209
IC: RSS-GEN

3.1.1 Test Limits

Limits for Electromagnetic Radiated Disturbance, FCC Section 15.209(b)& RSS-GEN

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

In addition, the level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.

3.1.2 Test Procedure

Radiated emission measurements were performed from 9 kHz to 30 MHz with the Spectrum Analyzer Resolution Bandwidth 200 Hz. In the frequency range from 9 kHz to 30 MHz the Quasi-peak value of the Field Strength (FS) is measured. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

The EUT is placed on a plastic table that is 80 cm in height on top of a turntable. 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 emission measurements were performed from 9 kHz to 1 GHz.
Analyzer resolution was:
9 kHz or greater for frequencies below 30 MHz
100 kHz or greater for frequencies 30 MHz to 1000 MHz

Below 30 MHz
Radiated emissions are taken at 3 meter for frequencies below 30MHz. An inverse proportionality factor of 40 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

Above 30 MHz
During the test the EUT is rotated and the measuring 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 10 meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent 30 meter reading using inverse scaling with distance.

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Equipment was setup as “Transmission Mode.” See section 1.5 for setup details.

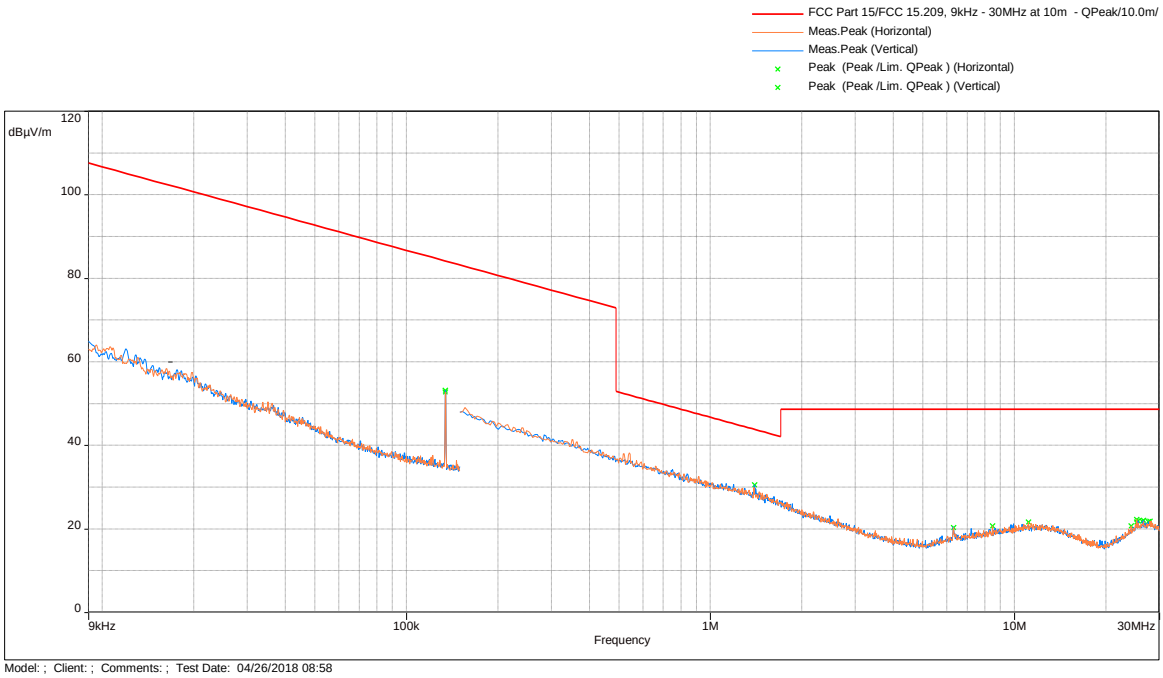
Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.10: 2013.

Tested By:	Aaron Chang
Test Date:	April 26, 2018

3.1.3 Test Results (RS232 configuration)

The EUT met the radiated disturbance requirements of FCC 15.209 for an Intentional Radiator.

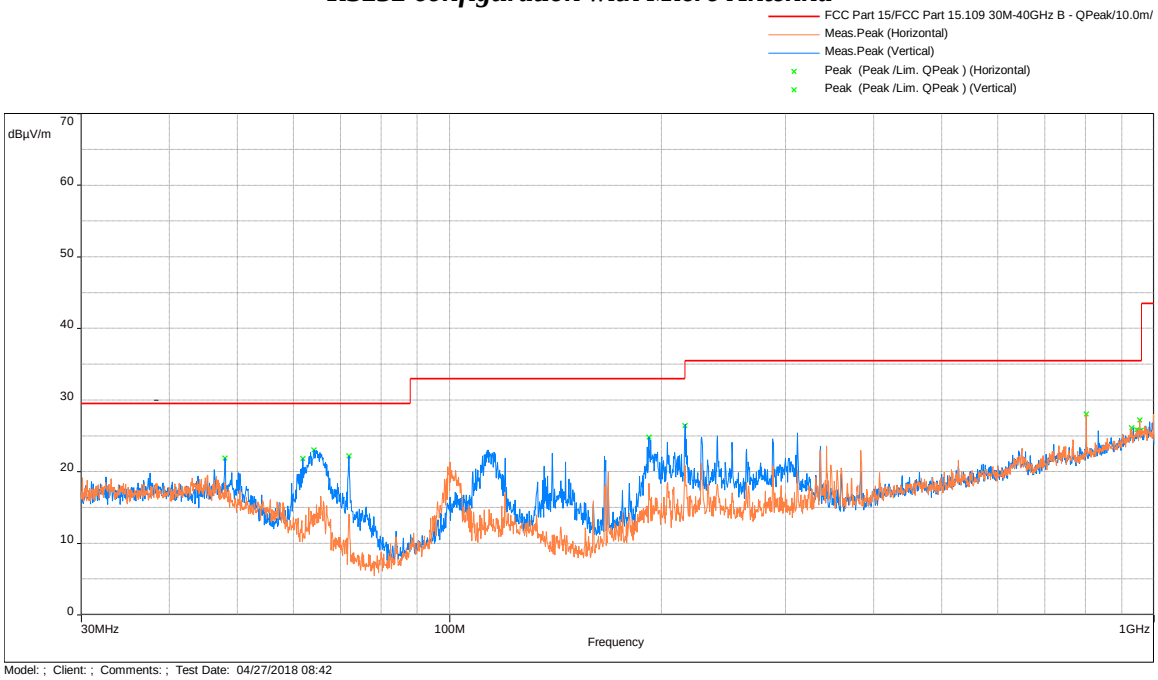
9kHz to 30MHz Radiated Disturbance, FCC 15.209
RS232 configuration with Micro Antenna



Frequency	QP Level @10m	Limit @10m	Margin	Raw Value @10m	Correction Factor
kHz	dBuV/m	dBuV/m	dB	dBuV	dB
134.5	53.1	84.1	-30.9	21.7	31.4

Note: Measurements made with antenna axis in Parallel and Perpendicular. The worst case data is reported.

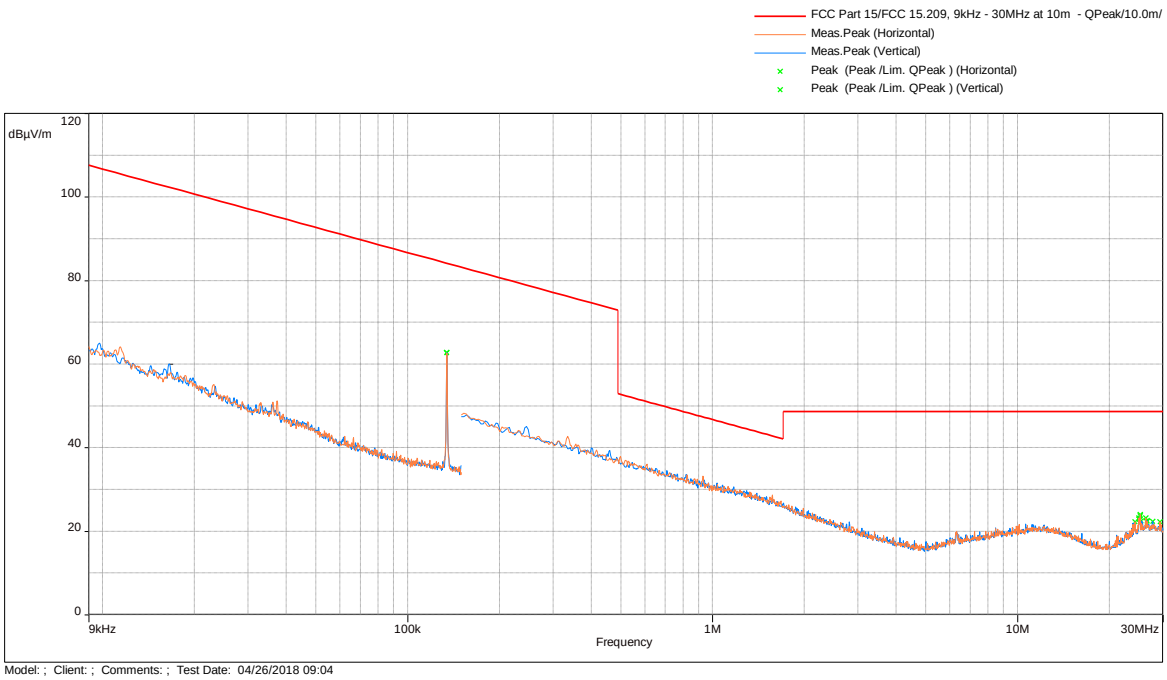
30MHz to 1GHz Radiated Disturbance, FCC 15.209
RS232 configuration with Micro Antenna



Frequency	QP	Limit	Margin	Height	Angle	Comment	Correction	Raw
MHz	dBµV/m	dBµV/m	dB	m	°		dB	dBµV/m
64.241	23.01	29.5	-6.49	2.5	238.25	Vertical	-18.37	41.38

Result:	**Complies** by 6.49 dB

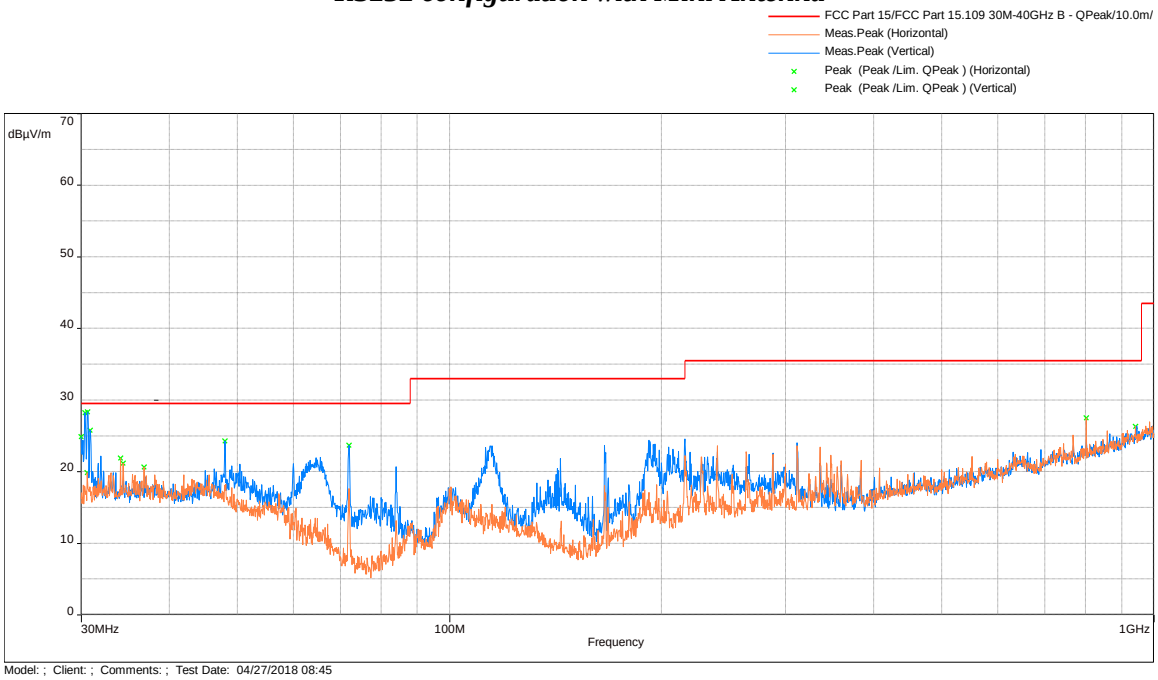
9kHz to 30MHz Radiated Disturbance, FCC 15.209
RS232 configuration with Mini Antenna



Frequency	QP Level @10m	Limit @10m	Margin	Raw Value @10m	Correction Factor
kHz	dBuV/m	dBuV/m	dB	dBuV	dB
134.5	62.8	84.1	-21.3	31.4	31.4

Note: Measurements made with antenna axis in Parallel and Perpendicular. The worst case data is reported.

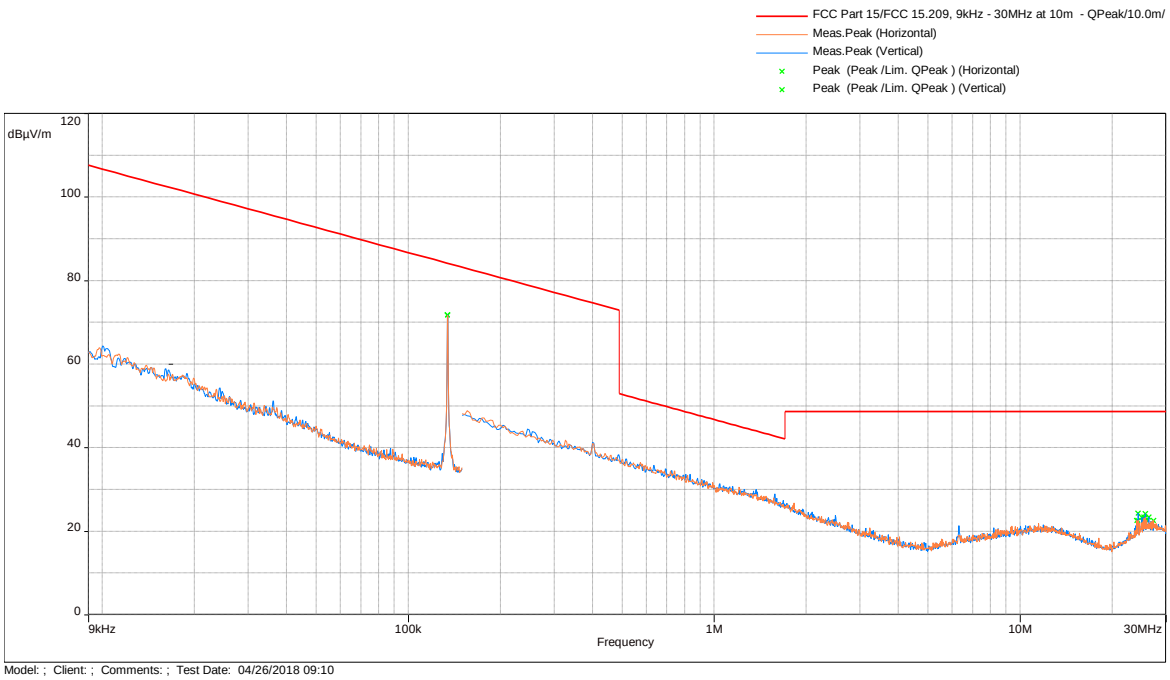
30MHz to 1GHz Radiated Disturbance, FCC 15.209
RS232 configuration with Mini Antenna



Frequency	QP	Limit	Margin	Height	Angle	Comment	Correction	Raw
MHz	dBµV/m	dBµV/m	dB	m	°		dB	dBµV/m
30.64667	28.34	29.5	-1.16	2.49	142.25	Vertical	-9.48	37.82

Result: **Complies** by 1.16 dB

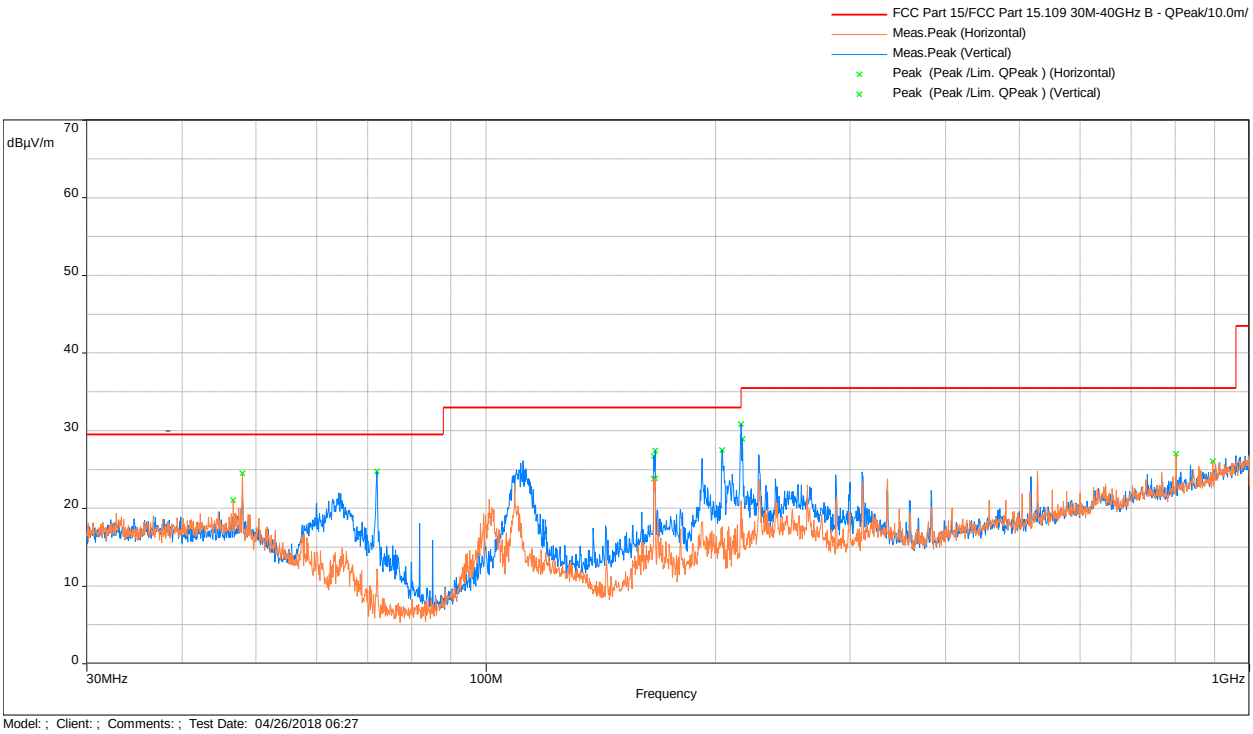
9kHz to 30MHz Radiated Disturbance, FCC 15.209
RS232 configuration with Rod Antenna



Frequency	QP Level @10m	Limit @10m	Margin	Raw Value @10m	Correction Factor
kHz	dBuV/m	dBuV/m	dB	dBuV	dB
134.5	71.7	84.1	-12.42	40.3	31.4

Note: Measurements made with antenna axis in Parallel and Perpendicular. The worst case data is reported.

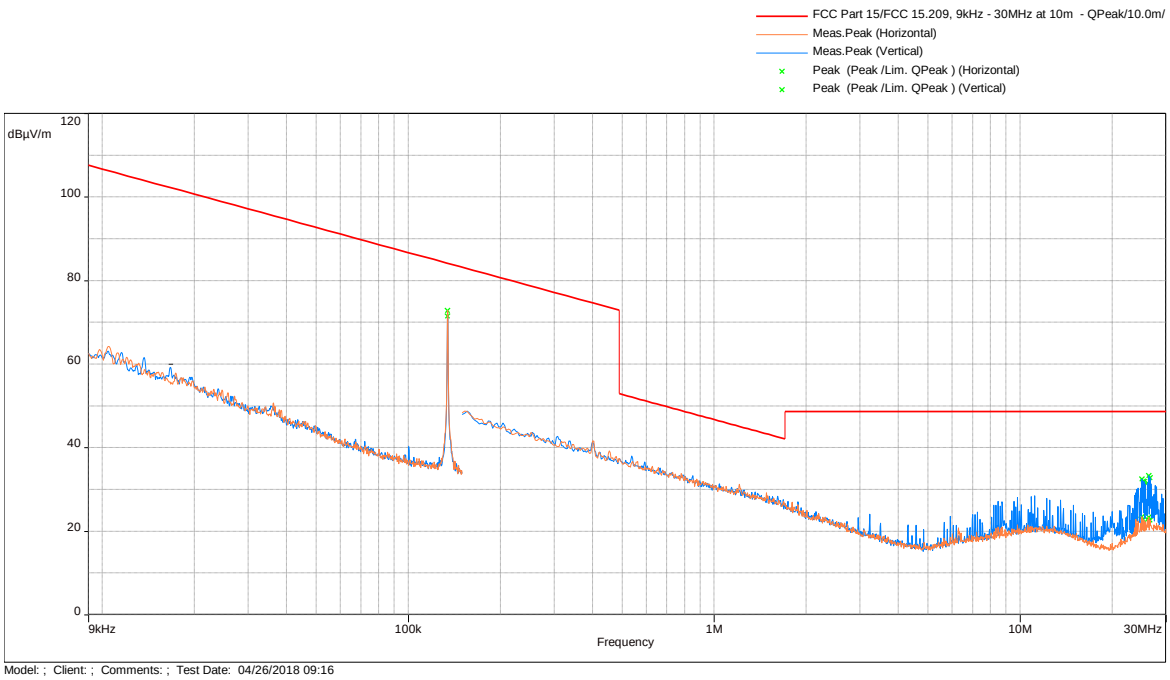
30MHz to 1GHz Radiated Disturbance, FCC 15.209
RS232 configuration with Rod Antenna



Frequency	QP	Limit	Margin	Height	Angle	Comment	Correction	Raw
MHz	dBµV/m	dBµV/m	dB	m	°		dB	dBµV/m
215.9167	30.84	33	-2.16	1.02	200.5	Vertical	-15.01	45.85

Result: **Complies** by 2.16 dB

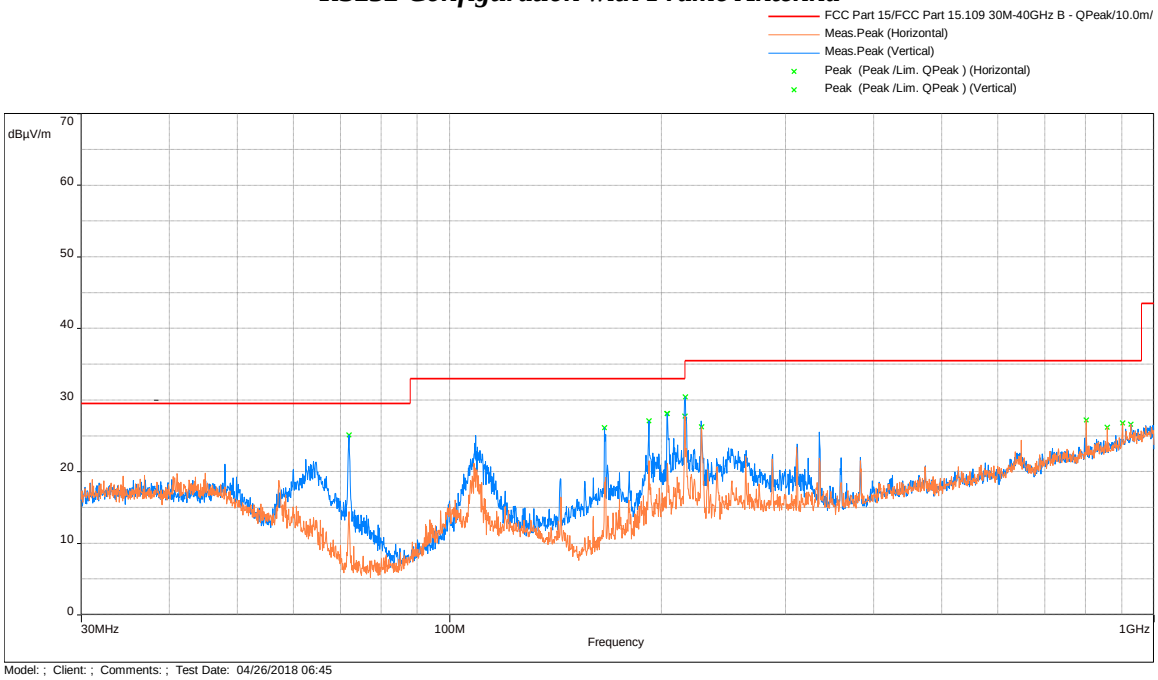
9kHz to 30MHz Radiated Disturbance, FCC 15.209
RS232 Configuration with Frame Antenna



Frequency	QP Level @10m	Limit @10m	Margin	Raw Value @10m	Correction Factor
kHz	dBuV/m	dBuV/m	dB	dBuV	dB
134.5	72.8	84.12	-11.3	41.4	31.4

Note: Measurements made with antenna axis in Parallel and Perpendicular. The worst case data is reported.

30MHz to 1GHz Radiated Disturbance, FCC 15.209
RS232 Configuration with Frame Antenna



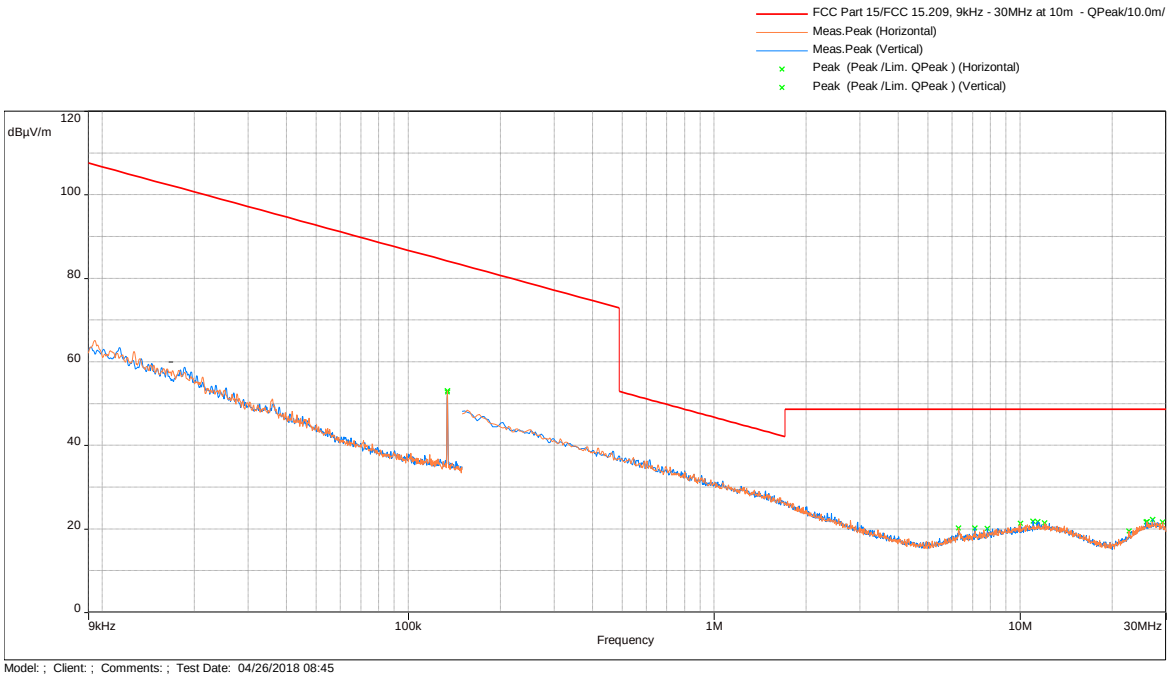
Frequency	QP	Limit	Margin	Height	Angle	Comment	Correction	Raw
MHz	dBµV/m	dBµV/m	dB	m	°		dB	dBµV/m
72.001	25.07	29.5	-4.43	0.99	163.5	Vertical	-20.01	45.08

Result:	**Complies** by 4.43 dB

3.1.3 Test Results (Ethernet configuration)

The EUT met the radiated disturbance requirements of FCC 15.209 for an Intentional Radiator.

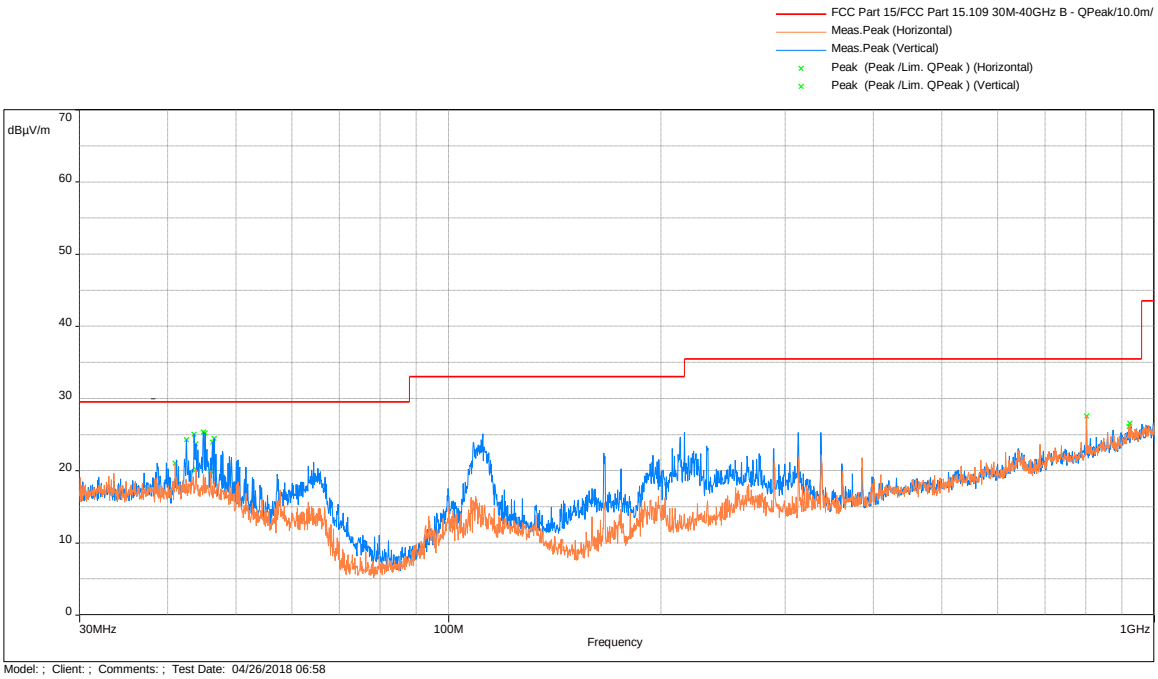
9kHz to 30MHz Radiated Disturbance, FCC 15.209
Ethernet Configuration with Micro Antenna



Frequency	QP Level @10m	Limit @10m	Margin	Raw Value @10m	Correction Factor
kHz	dBuV/m	dBuV/m	dB	dBuV	dB
134.5	53	84.1	-31.1	21.6	31.4

Note: Measurements made with antenna axis in Parallel and Perpendicular. The worst case data is reported.

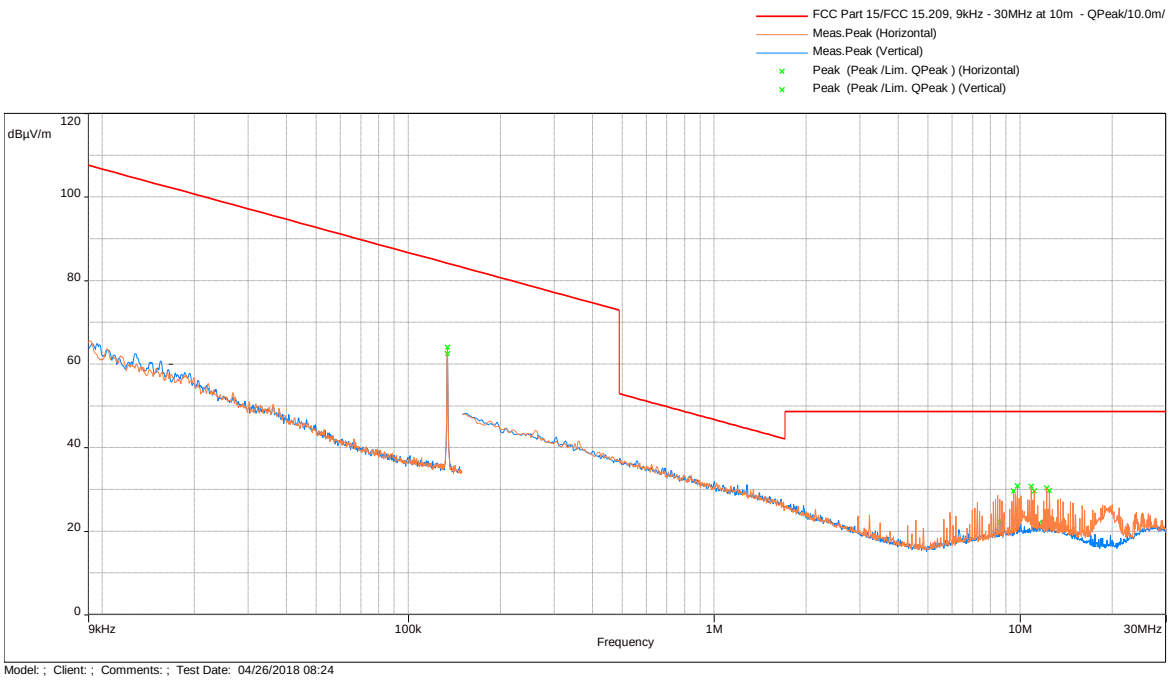
30MHz to 1GHz Radiated Disturbance, FCC 15.209
Ethernet configuration with Micro Antenna



Frequency	QP	Limit	Margin	Height	Angle	Comment	Correction	Raw
MHz	dBµV/m	dBµV/m	dB	m	°		dB	dBµV/m
44.938	25.3	29.5	-4.2	4	277	Vertical	-9.82	35.12

Result: **Complies** by 4.2 dB

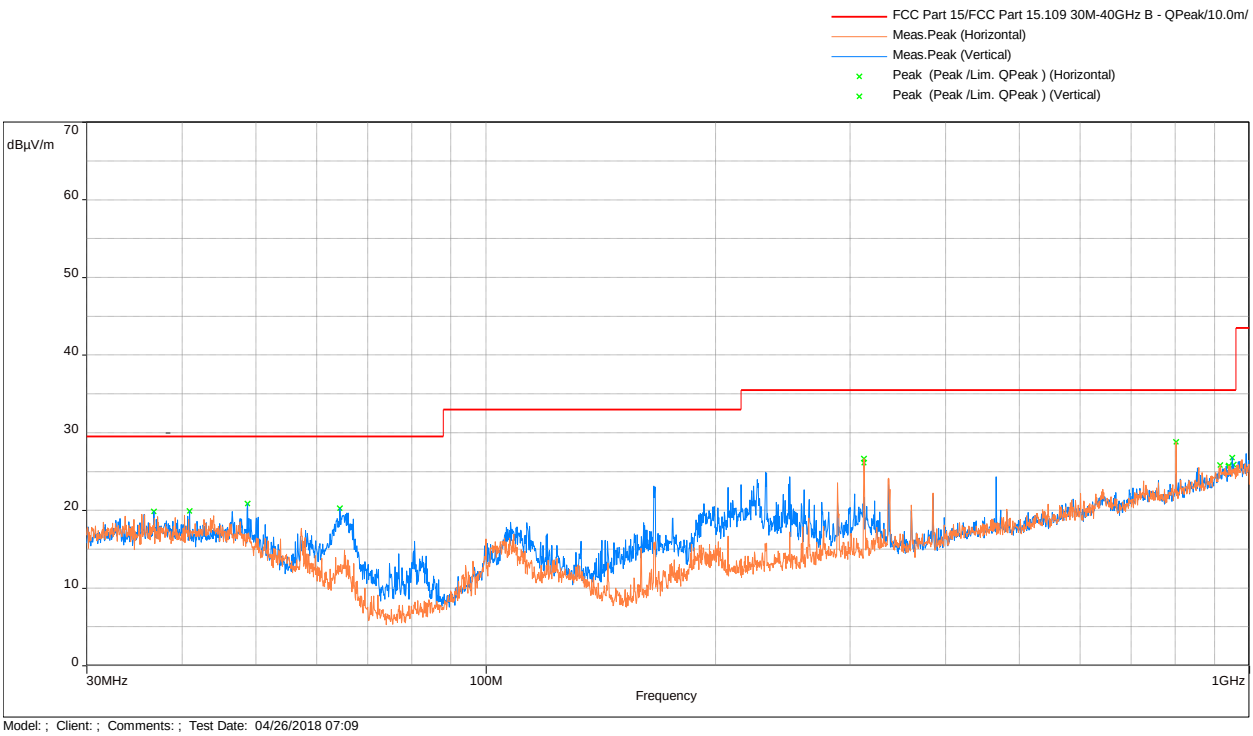
9kHz to 30MHz Radiated Disturbance, FCC 15.209
Ethernet Configuration with Mini Antenna



Frequency	QP Level @10m	Limit @10m	Margin	Raw Value @10m	Correction Factor
kHz	dBuV/m	dBuV/m	dB	dBuV	dB
134.5	64	84.1	-20.1	32.6	31.4

Note: Measurements made with antenna axis in Parallel and Perpendicular. The worst case data is reported.

30MHz to 1GHz Radiated Disturbance, FCC 15.209
Ethernet Configuration with Mini Antenna

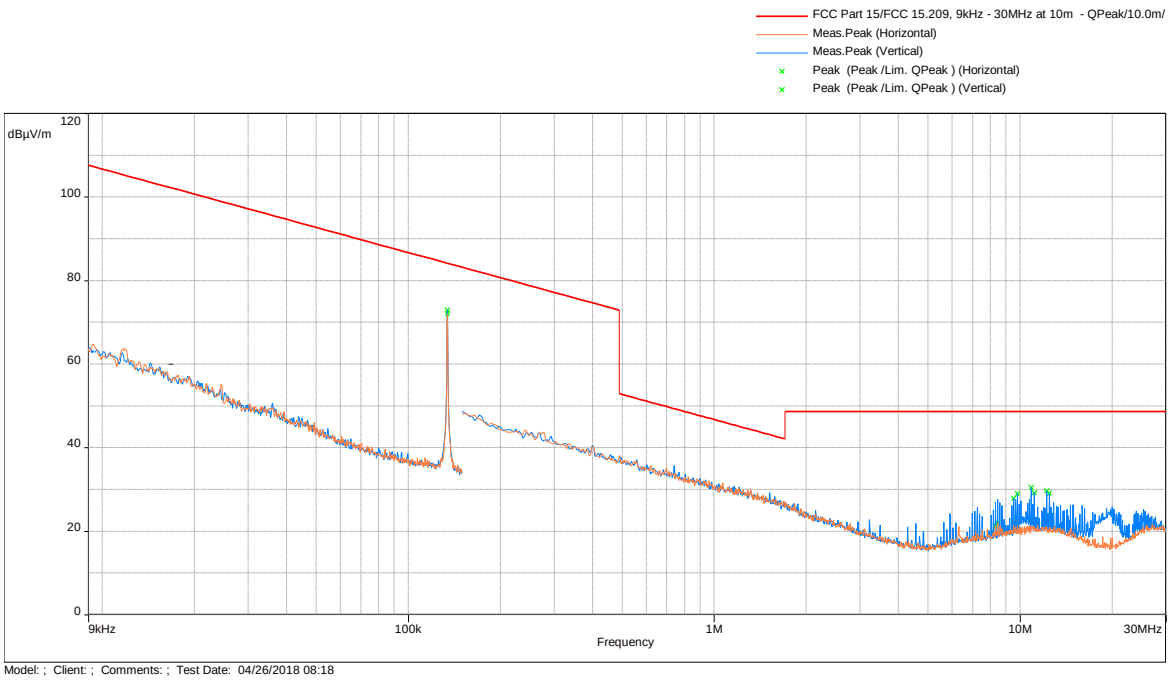


Model: ; Client: ; Comments: ; Test Date: 04/26/2018 07:09

Frequency	QP	Limit	Margin	Height	Angle	Comment	Correction	Raw
MHz	dBµV/m	dBµV/m	dB	m	°		dB	dBµV/m
48.721	20.88	29.5	-8.62	4	266.5	Vertical	-10.39	31.27

Result: **Complies** by 8.62 dB

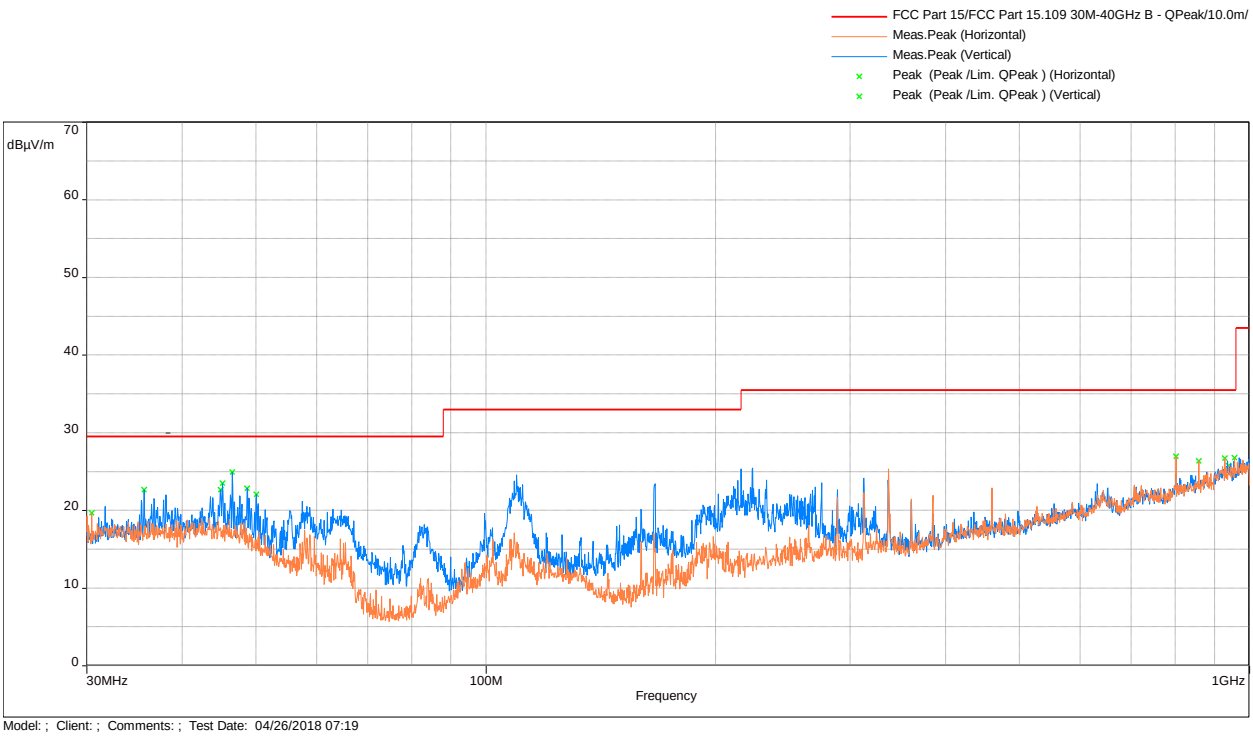
9kHz to 30MHz Radiated Disturbance, FCC 15.209
Ethernet Configuration with Rod Antenna



Frequency	QP Level @10m	Limit @10m	Margin	Raw Value @10m	Correction Factor
kHz	dBuV/m	dBuV/m	dB	dBuV	dB
134.5	72.9	84.1	-11.2	41.5	31.4

Note: Measurements made with antenna axis in Parallel and Perpendicular. The worst case data is reported.

30MHz to 1GHz Radiated Disturbance, FCC 15.209
Ethernet Configuration with Rod Antenna

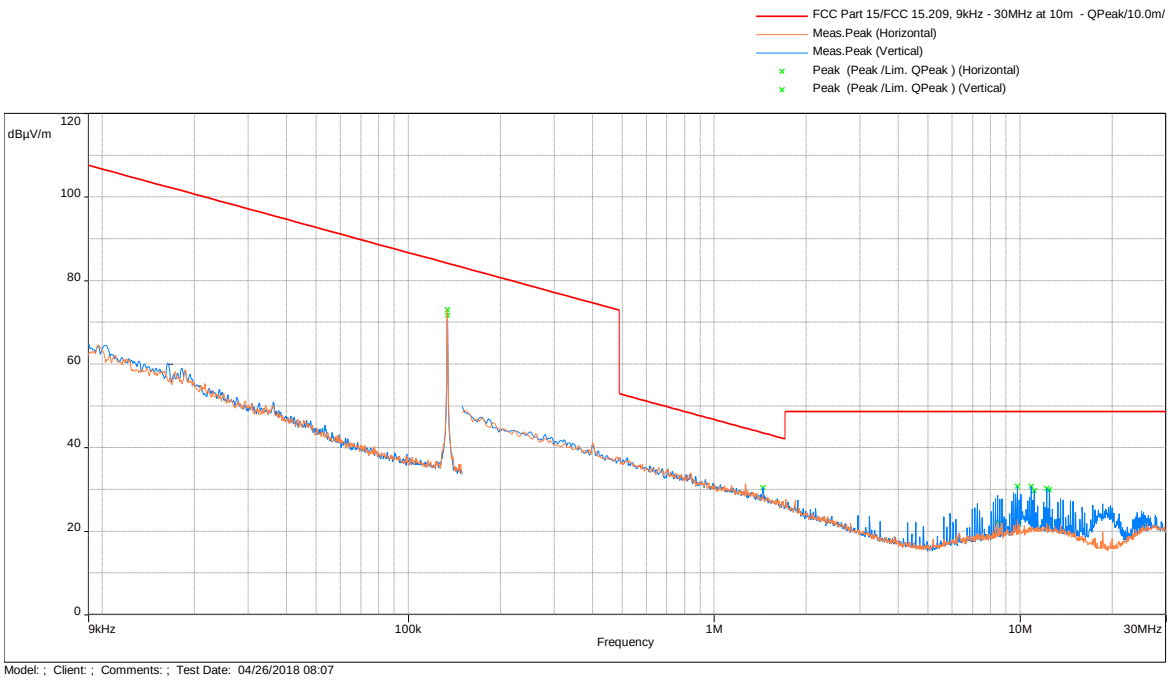


Model: ; Client: ; Comments: ; Test Date: 04/26/2018 07:19

Frequency	QP	Limit	Margin	Height	Angle	Comment	Correction	Raw
MHz	dBµV/m	dBµV/m	dB	m	°		dB	dBµV/m
46.554	24.91	29.5	-4.59	4	217.75	Vertical	-9.88	34.79

Result: **Complies** by 4.59 dB

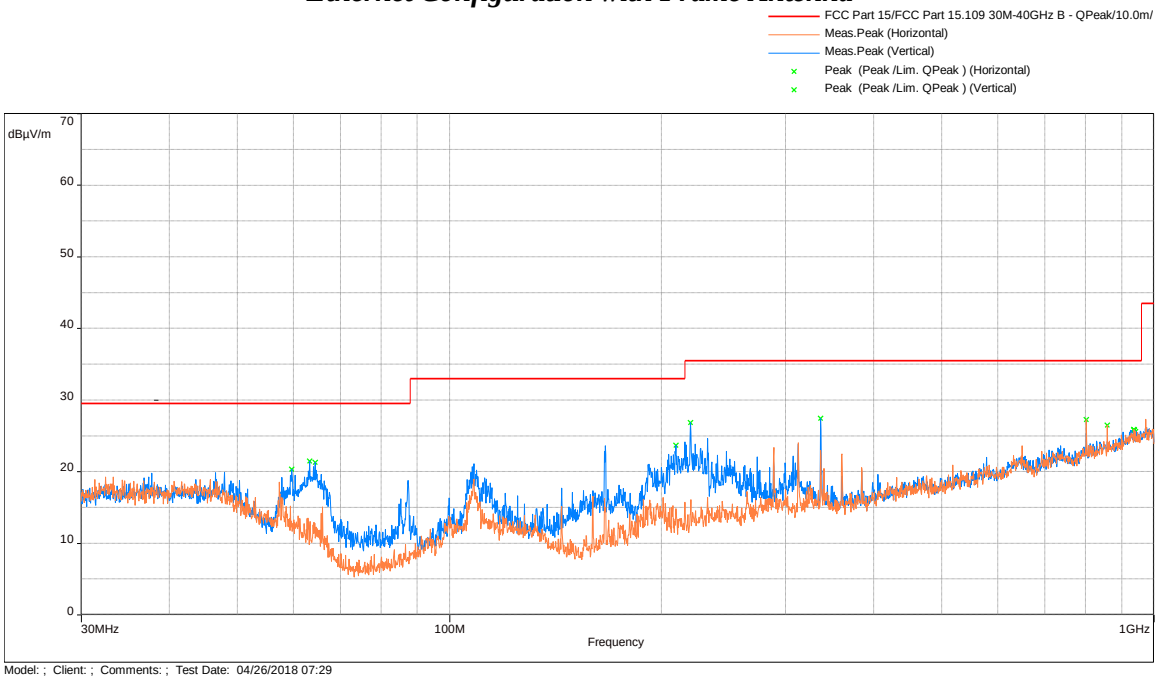
9kHz to 30MHz Radiated Disturbance, FCC 15.209
Ethernet Configuration with Frame Antenna



Frequency	QP Level @10m	Limit @10m	Margin	Raw Value @10m	Correction Factor
kHz	dBuV/m	dBuV/m	dB	dBuV	dB
134.5	73	84.1	-11.1	41.6	31.4

Note: Measurements made with antenna axis in Parallel and Perpendicular. The worst case data is reported.

30MHz to 1GHz Radiated Disturbance, FCC 15.209
Ethernet Configuration with Frame Antenna

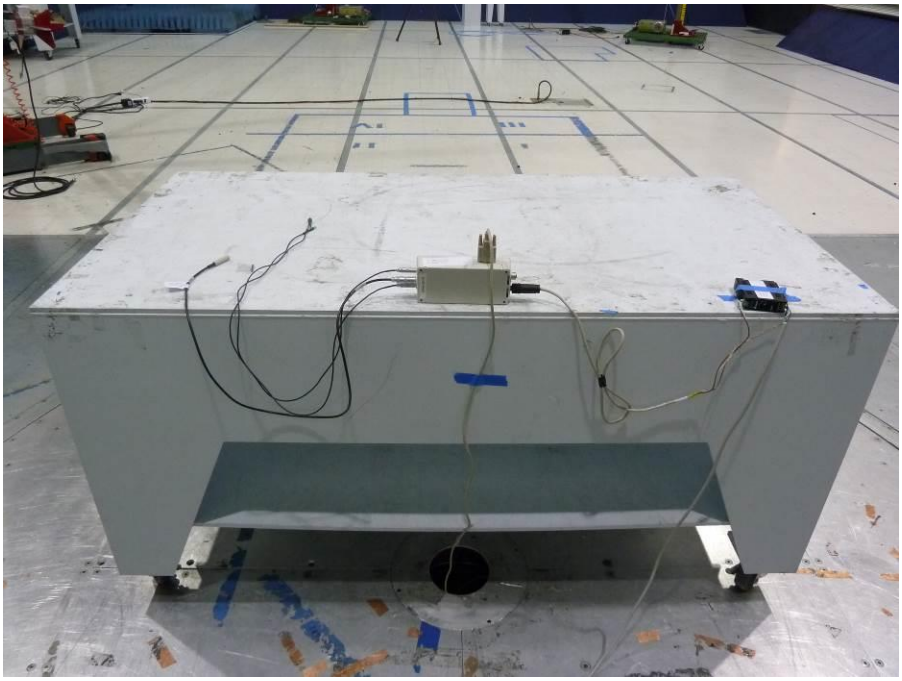


Frequency	QP	Limit	Margin	Height	Angle	Comment	Correction	Raw
MHz	dBµV/m	dBµV/m	dB	m	°		dB	dBµV/m
63.335	21.48	29.5	-8.02	2.5	264.5	Vertical	-18	39.48

Result: **Complies** by 8.02 dB

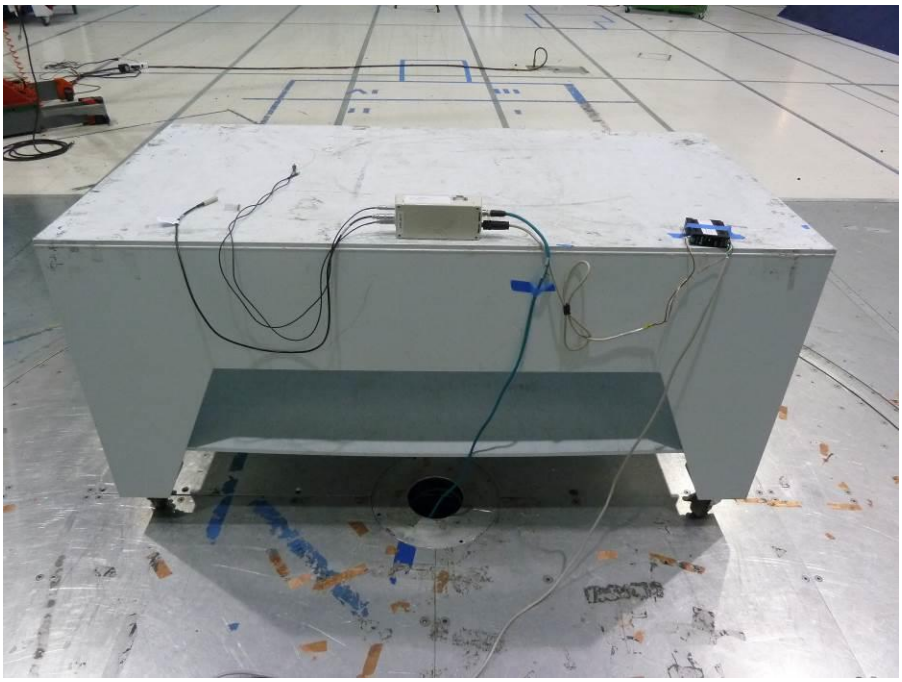
3.1.4 Test Configuration Photographs

The following photographs show the testing configurations used.



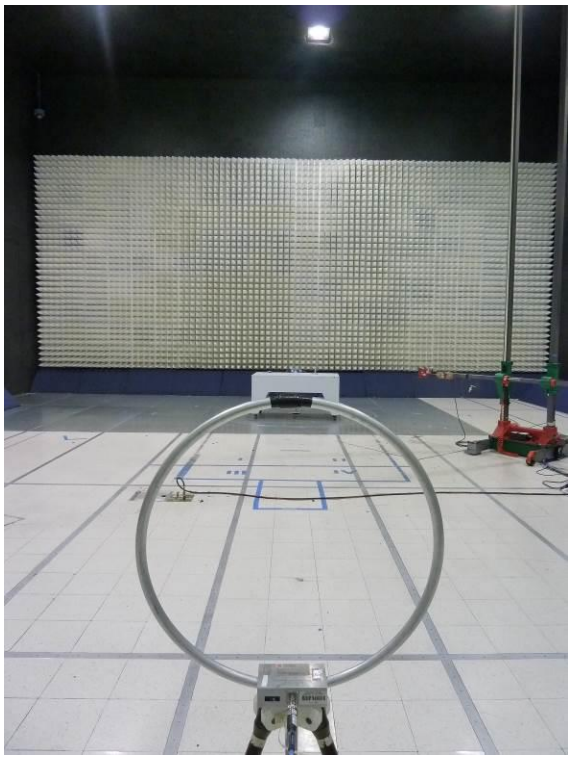
Electromagnetic Radiated Disturbance Setup Photograph

3.1.4 Test Configuration Photograph (Continued)



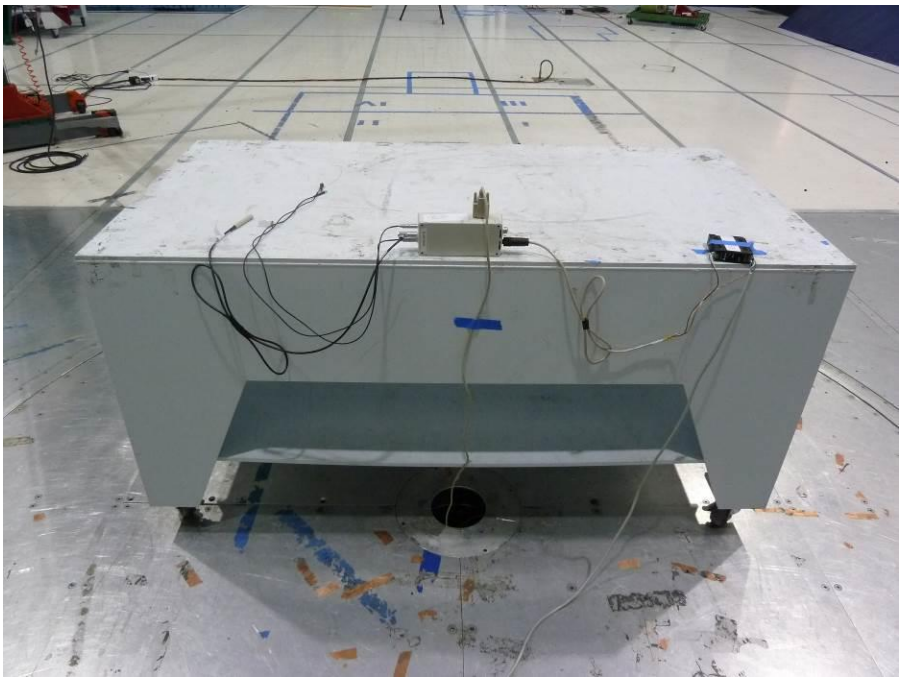
Electromagnetic Radiated Disturbance Setup Photograph

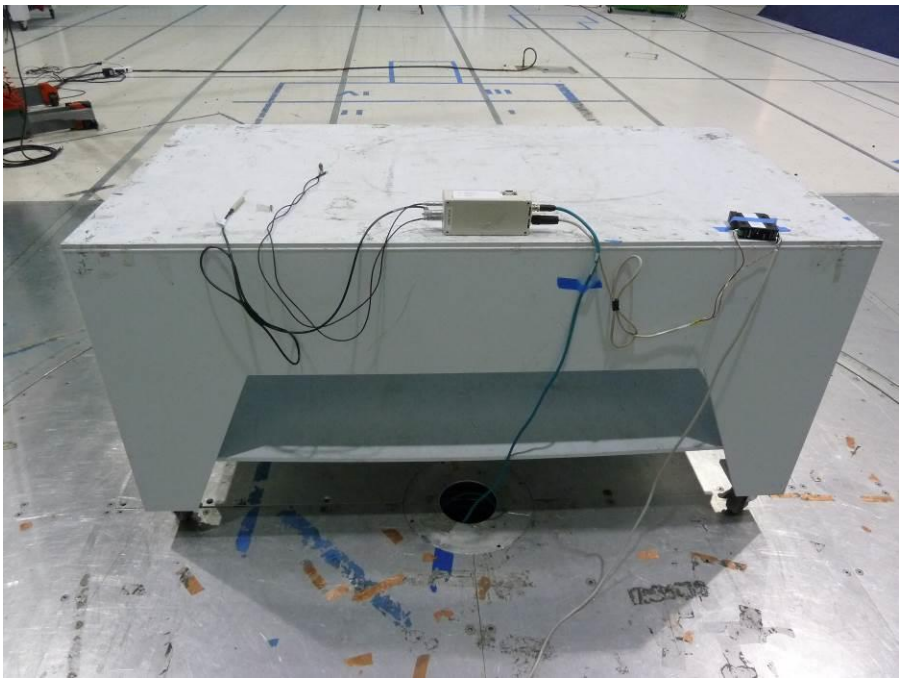
3.1.4 Test Configuration Photograph (Continued)



Electromagnetic Radiated Disturbance Setup Photograph

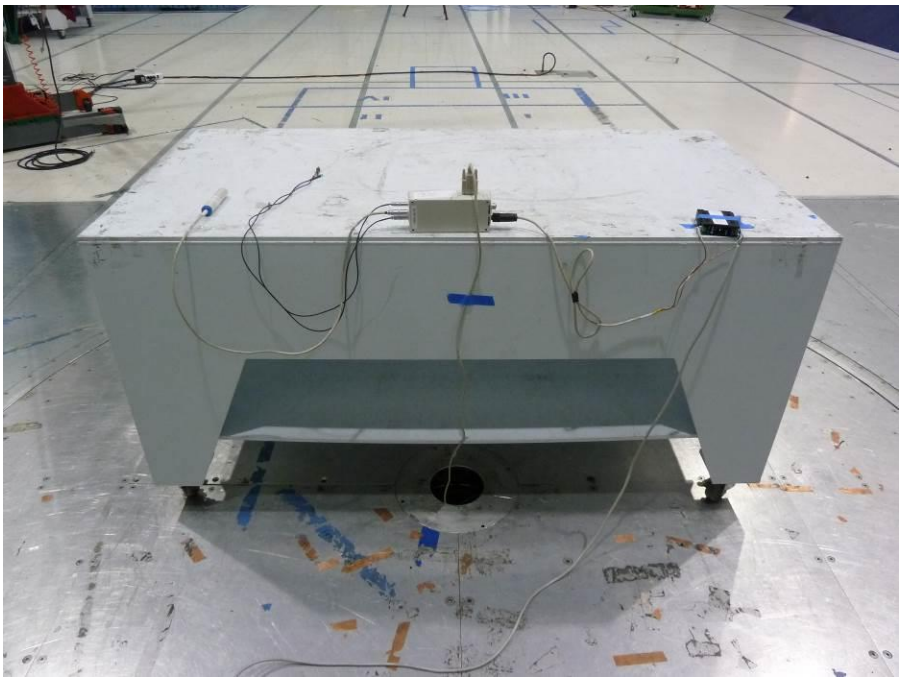
3.1.4 Test Configuration Photograph (Continued)

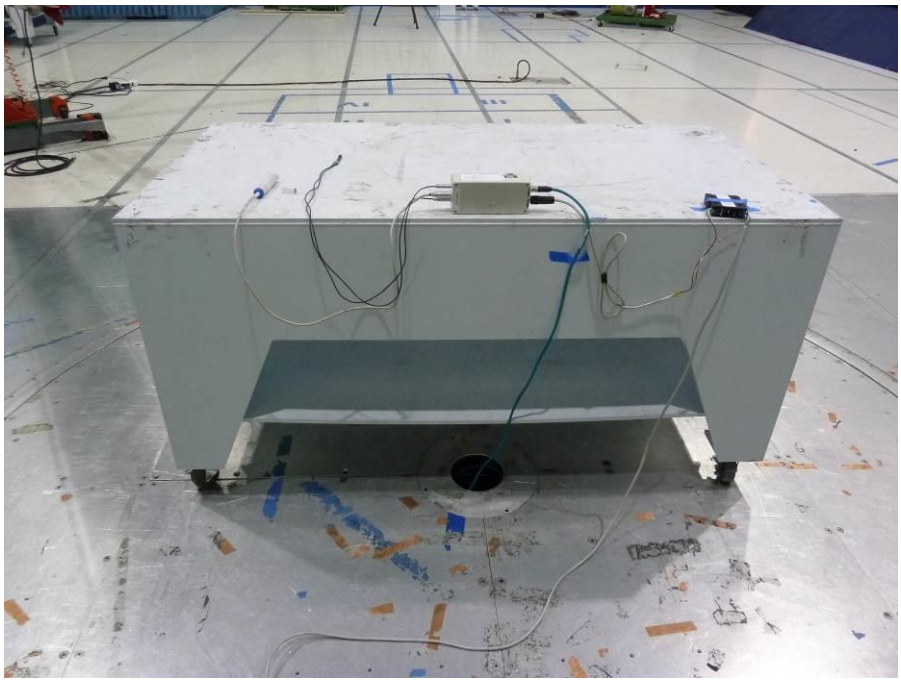




Electromagnetic Radiated Disturbance Setup Photograph

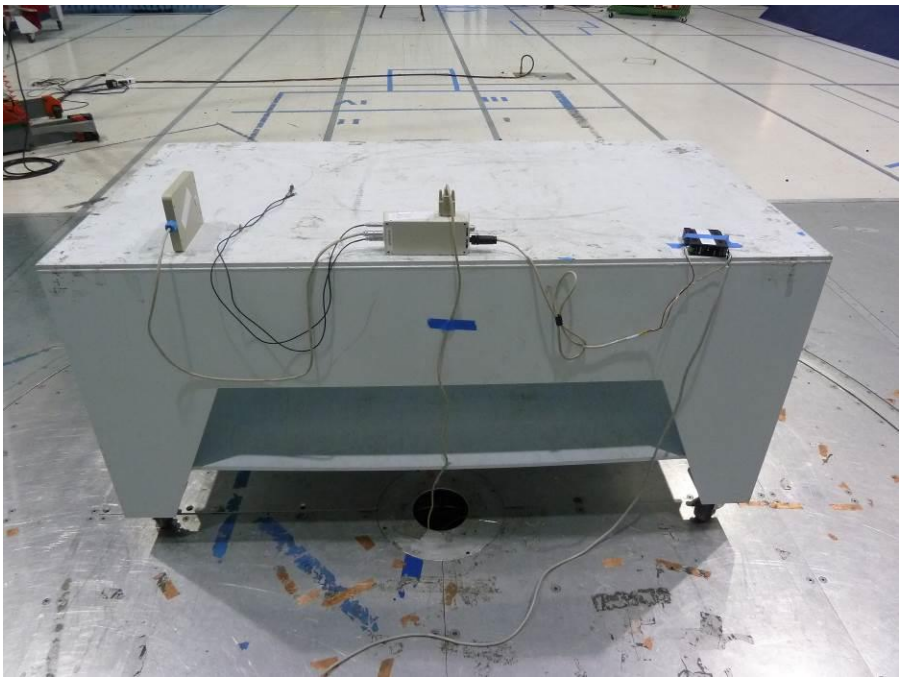
3.1.4 Test Configuration Photograph (Continued)

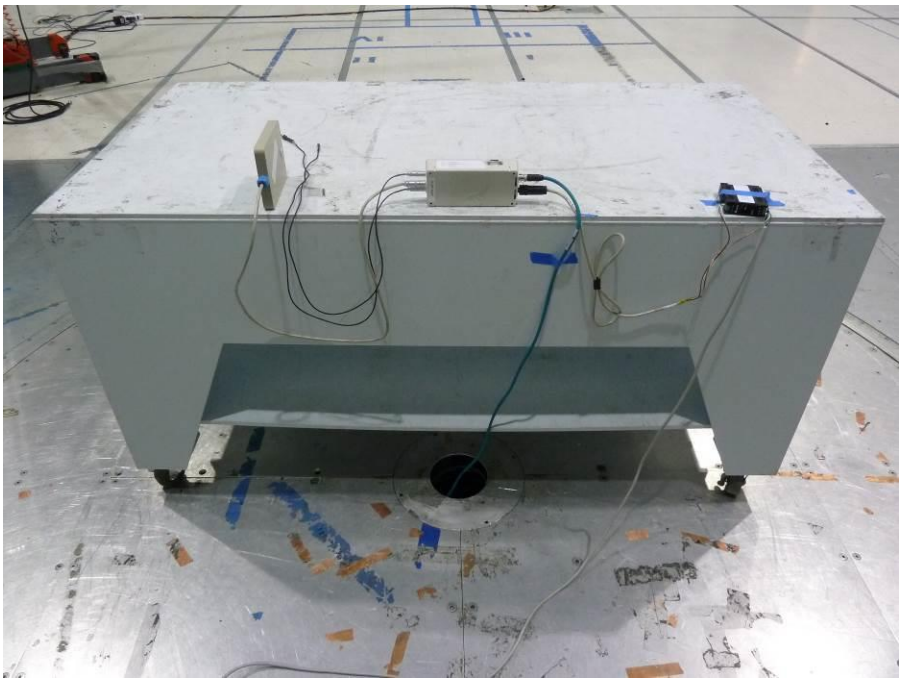




Electromagnetic Radiated Disturbance Setup Photograph

3.1.4 Test Configuration Photograph (Continued)





Electromagnetic Radiated Disturbance Setup Photograph

3.2 AC Mains Line-Conducted Disturbance

FCC: 15.207
IC: ICES-003

3.2.1 Test Limits

Limits for Electromagnetic Conducted Disturbance, FCC Section 15.207

Frequency Band MHz	**Class B Limit dB (μV)**	
	Quasi-Peak	**Average**
0.15-0.50	66 to 56 Decreases linearly with the logarithm of the frequency	56 to 46 Decreases linearly with the logarithm of the frequency
0.50-5.00	56	46
5.00-30.00	60	50

Note: At the transition frequency the lower limit applies.

3.2.2 Test 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.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of 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.

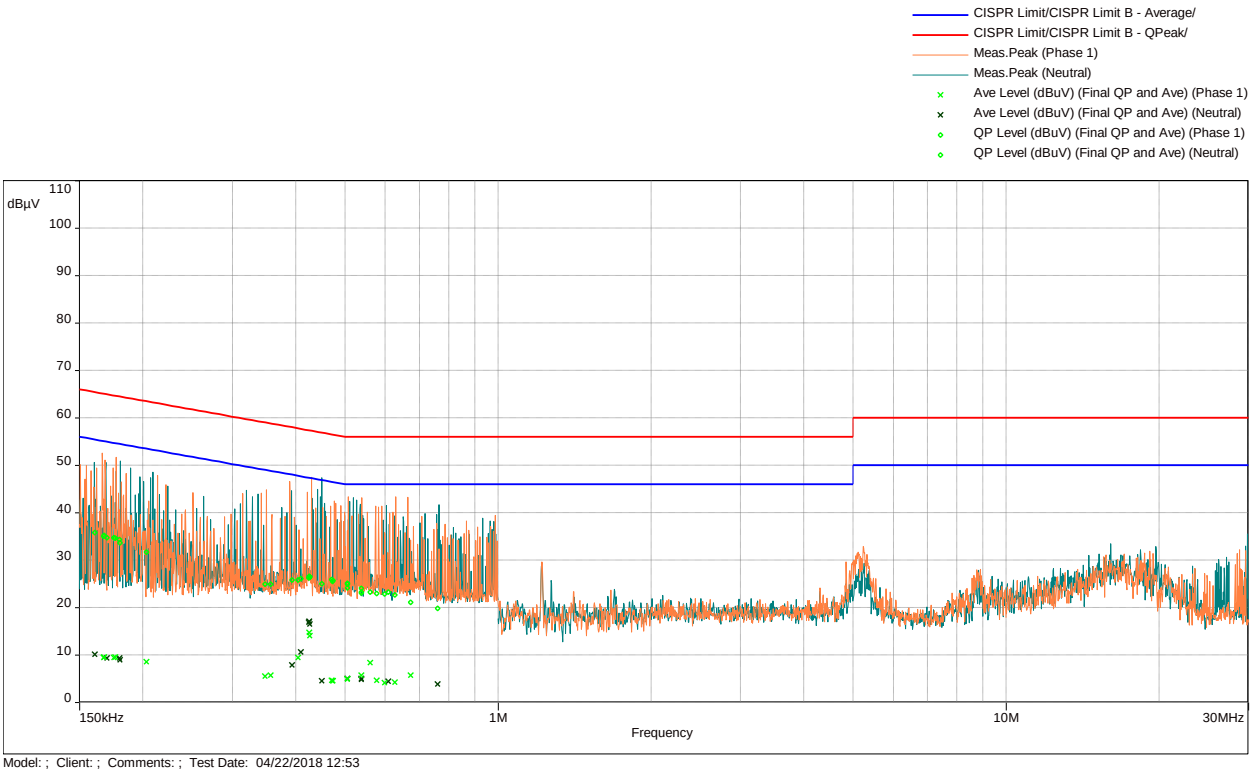
Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.10: 2013.

Date of Test:	April 22, 2018
Results	**Complies**

3.2.3 Test Results

The EUT met the conducted disturbance requirement of FCC and ICES 003 for a Class B device.

FCC and ICES 003 Conducted Disturbance at AC Mains of DC power supply, FCC 15.207
RS232 Configuration



Model: ; Client: ; Comments: ; Test Date: 04/22/2018 12:53

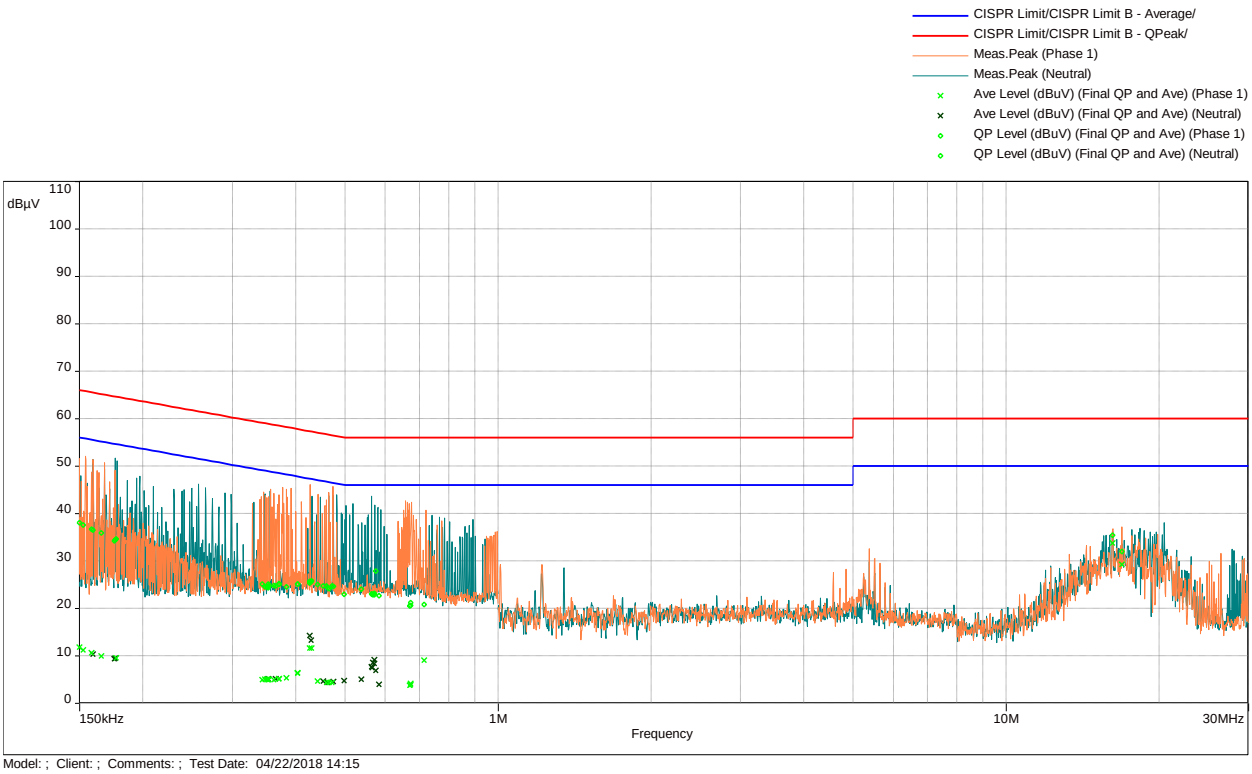
Freq.	Ave Level	QP Level	Ave Limit	QP Limit	Ave Margin	QP Margin	Line	Correction
MHz	dBµV	dBµV	dBµV	dBµV	dB	dB		dB
0.161	10.13	35.84	55.42	65.42	-45.29	-29.58	Neutral	11.52
0.168	9.49	35.16	55.08	65.08	-45.59	-29.92	Phase 1	11.52
0.175	9.46	34.7	54.7	64.7	-45.24	-30	Phase 1	11.52
0.167	9.4	35.05	55.09	65.09	-45.69	-30.03	Phase 1	11.52
0.177	9.53	34.6	54.64	64.64	-45.11	-30.05	Phase 1	11.52
0.180	9.29	34.35	54.49	64.49	-45.2	-30.14	Neutral	11.53
0.170	9.34	34.76	54.97	64.97	-45.63	-30.21	Neutral	11.52
0.470	4.65	25.84	46.51	56.51	-41.86	-30.67	Phase 1	11.59
0.473	4.55	25.73	46.46	56.46	-41.91	-30.73	Phase 1	11.59
0.425	17.05	26.54	47.35	57.35	-30.3	-30.81	Neutral	11.58

Freq.	Ave Level	QP Level	Ave Limit	QP Limit	Ave Margin	QP Margin	Line	Correction
0.426	16.48	26.48	47.33	57.33	-30.85	-30.85	Neutral	11.58
0.180	8.98	33.61	54.48	64.48	-45.5	-30.87	Neutral	11.53
0.505	4.89	25.09	46	56	-41.11	-30.91	Phase 1	11.59
0.472	4.56	25.52	46.48	56.48	-41.91	-30.95	Phase 1	11.59
0.426	14.04	26.35	47.33	57.33	-33.29	-30.98	Phase 1	11.58
0.425	16.87	26.28	47.36	57.36	-30.49	-31.08	Neutral	11.58
0.505	4.96	24.91	46	56	-41.04	-31.09	Phase 1	11.59
0.425	14.68	26.25	47.35	57.35	-32.68	-31.1	Phase 1	11.58
0.409	10.62	26.06	47.67	57.67	-37.05	-31.61	Neutral	11.58
0.203	8.55	31.68	53.48	63.48	-44.93	-31.8	Phase 1	11.55
0.505	5.05	24.16	46	56	-40.95	-31.84	Neutral	11.59
0.450	4.55	25.02	46.88	56.88	-42.33	-31.86	Neutral	11.59
0.538	5.67	24.02	46	56	-40.33	-31.98	Phase 1	11.59
0.404	9.43	25.75	47.77	57.77	-38.35	-32.02	Phase 1	11.58
0.393	7.82	25.82	48.01	58.01	-40.18	-32.18	Neutral	11.58
0.609	4.38	23.29	46	56	-41.62	-32.71	Neutral	11.59
0.561	8.35	23.2	46	56	-37.65	-32.8	Phase 1	11.59
0.538	4.97	23.2	46	56	-41.03	-32.8	Neutral	11.59
0.538	4.77	23.09	46	56	-41.23	-32.91	Neutral	11.59
0.578	4.64	22.98	46	56	-41.36	-33.02	Phase 1	11.59
0.598	4.12	22.83	46	56	-41.88	-33.17	Phase 1	11.59
0.626	4.2	22.62	46	56	-41.8	-33.38	Phase 1	11.59
0.357	5.72	24.93	48.8	58.8	-43.08	-33.87	Phase 1	11.59
0.348	5.46	24.88	49.01	59.01	-43.56	-34.13	Phase 1	11.59
0.673	5.69	21.05	46	56	-40.31	-34.95	Phase 1	11.6
0.761	3.79	19.82	46	56	-42.21	-36.18	Neutral	11.62

Results	**Complies** by 29.58 dB

3.2.3 Test Results (Continued)

FCC and ICES 003 Conducted Disturbance at AC Mains of DC power supply, 15.207
Ethernet Configuration



Model: ; Client: ; Comments: ; Test Date: 04/22/2018 14:15

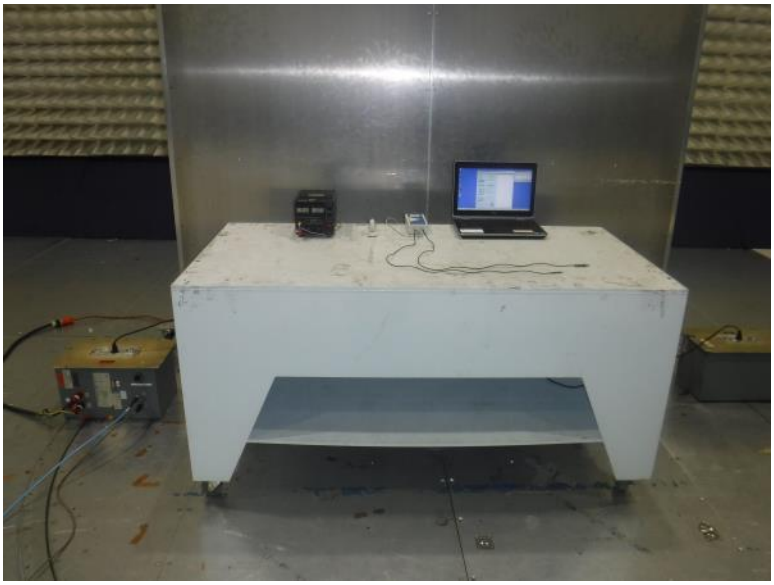
Freq.	Ave Level	QP Level	Ave Limit	QP Limit	Ave Margin	QP Margin	Line	Correction
MHz	dBµV	dBµV	dBµV	dBµV	dB	dB		dB
16.228	33.71	35.36	50	60	-16.29	-24.64	Phase 1	11.93
16.899	29.27	32	50	60	-20.73	-28	Phase 1	11.93
0.426	14.18	25.71	47.33	57.33	-33.15	-31.62	Neutral	11.58
0.429	13.22	25.62	47.28	57.28	-34.06	-31.66	Neutral	11.58
0.429	11.61	25.81	47.27	57.27	-35.66	-31.45	Phase 1	11.58
0.426	11.58	25.26	47.33	57.33	-35.75	-32.07	Phase 1	11.58
0.572	9.16	23.16	46	56	-36.84	-32.84	Neutral	11.59
0.715	9.04	20.82	46	56	-36.96	-35.18	Phase 1	11.61
0.567	8.53	22.85	46	56	-37.47	-33.15	Neutral	11.59
0.571	8.38	22.88	46	56	-37.62	-33.12	Neutral	11.59
0.564	7.7	23.03	46	56	-38.3	-32.97	Neutral	11.59
0.565	7.48	22.99	46	56	-38.52	-33.01	Neutral	11.59

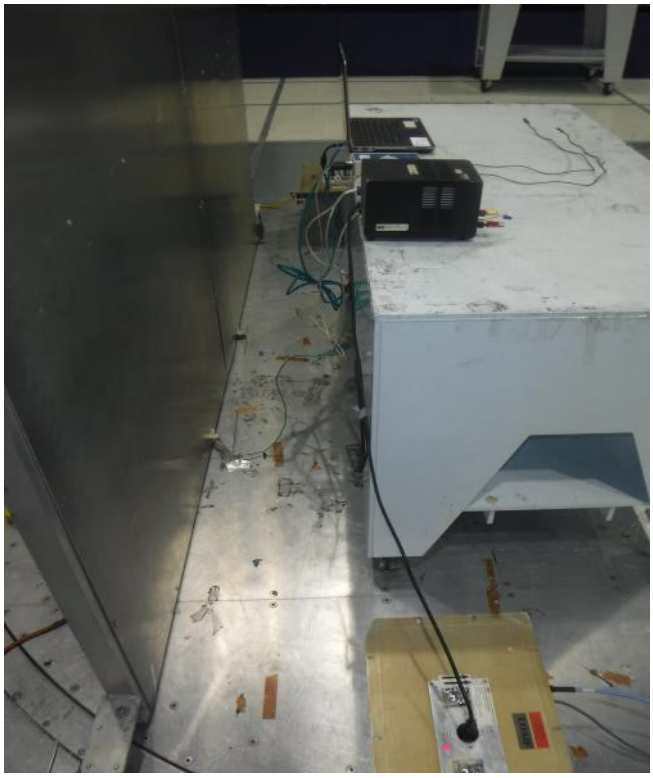
0.574	6.85	27.87	46	56	-39.15	-28.13	Neutral	11.59
0.538	5.02	24.06	46	56	-40.98	-31.94	Neutral	11.59
0.498	4.73	22.93	46.03	56.03	-41.3	-33.1	Neutral	11.59
0.404	6.35	25.08	47.78	57.78	-41.42	-32.7	Phase 1	11.58
0.404	6.25	25.08	47.78	57.78	-41.53	-32.7	Phase 1	11.58
0.673	4.1	20.62	46	56	-41.9	-35.38	Phase 1	11.6
0.474	4.51	24.65	46.44	56.44	-41.93	-31.79	Neutral	11.59
0.583	3.92	22.66	46	56	-42.08	-33.34	Neutral	11.59
0.673	3.82	21.16	46	56	-42.18	-34.84	Phase 1	11.6
0.471	4.3	24.7	46.49	56.49	-42.19	-31.79	Phase 1	11.59
0.453	4.57	24.76	46.82	56.82	-42.24	-32.06	Neutral	11.59
0.670	3.73	20.48	46	56	-42.27	-35.52	Phase 1	11.6
0.463	4.36	24.31	46.64	56.64	-42.28	-32.33	Neutral	11.59
0.465	4.29	24.12	46.6	56.6	-42.32	-32.48	Phase 1	11.59
0.459	4.36	24.68	46.71	56.71	-42.35	-32.03	Phase 1	11.59
0.442	4.63	25.05	47.03	57.03	-42.41	-31.98	Phase 1	11.59
0.384	5.29	24.52	48.2	58.2	-42.91	-33.68	Phase 1	11.58
0.371	5.12	25.25	48.49	58.49	-43.37	-33.24	Phase 1	11.58
0.371	5.08	24.96	48.48	58.48	-43.4	-33.52	Phase 1	11.58
0.365	5.12	24.69	48.61	58.61	-43.48	-33.91	Neutral	11.58
0.362	4.91	24.82	48.68	58.68	-43.77	-33.87	Phase 1	11.58
0.353	5.06	24.33	48.89	58.89	-43.83	-34.56	Neutral	11.59
0.353	5.03	25.1	48.89	58.89	-43.86	-33.79	Phase 1	11.59
0.354	4.93	24.7	48.87	58.87	-43.94	-34.17	Phase 1	11.59
0.351	4.97	24.52	48.94	58.94	-43.97	-34.42	Phase 1	11.59
0.352	4.93	24.61	48.91	58.91	-43.98	-34.3	Phase 1	11.59
0.348	4.97	24.47	49.02	59.02	-44.05	-34.54	Phase 1	11.59
0.344	4.94	25.1	49.11	59.11	-44.17	-34.01	Phase 1	11.59

Results	**Complies** by 16.29 dB

3.2.4 Test Configuration Photographs

The following photographs show the testing configurations used.





AC Mains Line-Conducted Disturbance Setup Photograph

3.3 Occupied Bandwidth

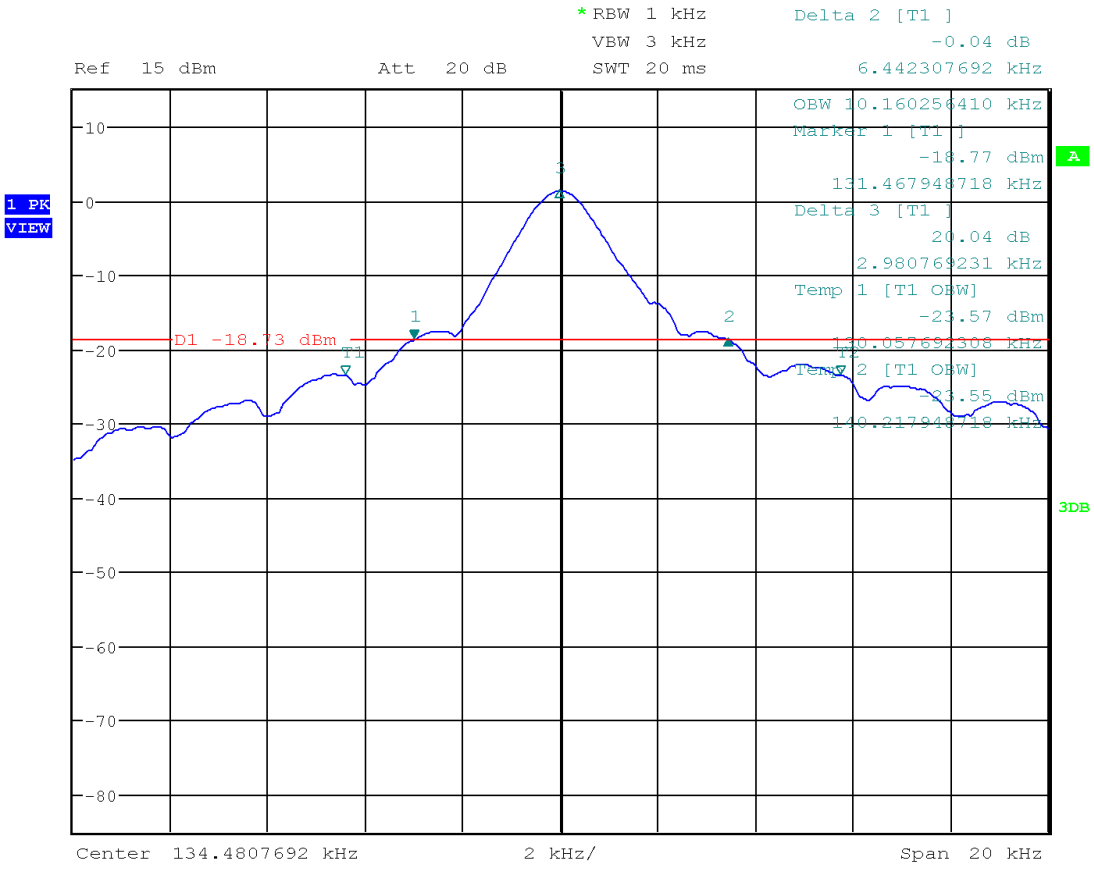
Equipment was setup as "Transmission Mode." See section 1.5 for setup details.

Measurements were made with the loop antenna at 10 cm distance using a Spectrum Analyzer. The spectrum analyzer reading was plotted.

RS232 Configuration

Frequency (kHz)	20-dB bandwidth FCC 15.209 kHz	Occupied bandwidth, RSS-GEN, kHz	Plot
134.5	6.442	--	1
	--	10.160	1

Plot 1, 20dB and 99% Bandwidth



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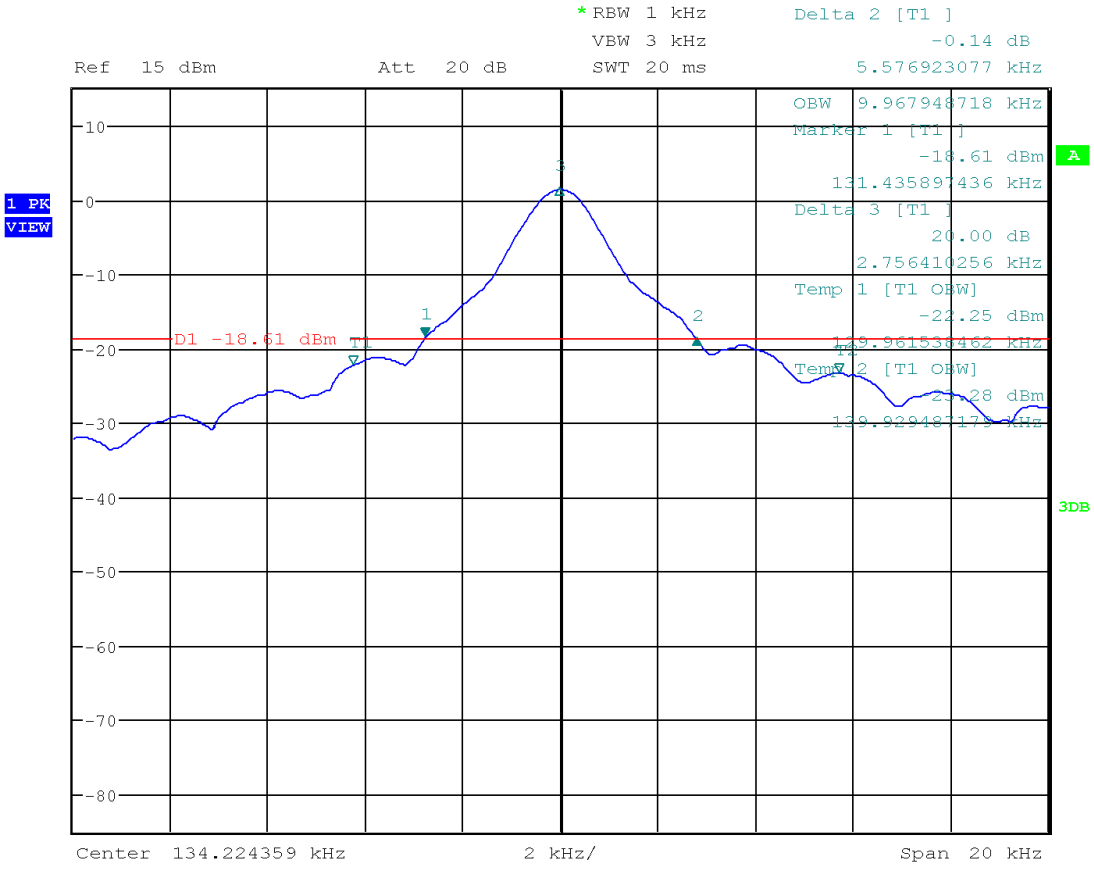
Ethernet Configuration

Frequency (kHz)	20-dB bandwidth FCC 15.209 kHz	Occupied bandwidth, RSS-GEN, kHz	Plot
134.5	5.577	--	2
	--	9.968	2

Plot 2, 20dB and 99% Bandwidth



Date: 27.APR.2018 08:03:56

5.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G103495071	AC	KV	May 14, 2018	Original document