FCC 47 CFR PART 15 SUBPART C
ISED CANADA RSS-210 ISSUE 9

CERTIFICATION TEST REPORT

FOR

RFID MODULE

MODEL NUMBER: R8XXEA

REPORT NUMBER: R11870434-E1

FCC ID: M9MR8XXEA
IC: 6571A-R8XXEA

ISSUE DATE: 2017-12-07

Prepared for
RF IDEAS, INC.
4020 WINNETKA AVENUE
ROLLING MEADOWS, IL, 60008-1374, USA

Prepared by
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NVLAP TESTING

NVLAP LAB CODE 200246-0

Revision History

Ver.	Issue Date	Revisions	Revised By
1	2017-12-07	Initial Issue	Brian T. Kiewra
2	2017-12-15	Corrected 30m calculated PK power in Section 5.3. Revised I/O Cables table in Section 5.8. Revised titles for radiated setups in Section 10	Brian T. Kiewra

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: RF Ideas, Inc.
4020 Winnetka Avenue
Rolling Meadows, IL, 60008-1374, USA

EUT DESCRIPTION: RFID MODULE

MODEL: R8XXEA

SERIAL NUMBER: OEM-805X2AXU-HPM270: USB84200003
OEM-805X2AXU-HPN 840: GGSPD019242004

DATE TESTED: 2017-10-20 to 2017-11-03, 2017-12-05

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Pass
ISED RSS-210 Issue 9	Pass
ISED RSS-GEN Issue 4	Pass

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL LLC based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL LLC and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL LLC will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Approved & Released
For UL LLC By:

Jeffrey Moser
Operations Leader
UL – Consumer Technology Division

Prepared By:

Brian T. Kiewra
Project Engineer
UL – Consumer Technology Division

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 4, and RSS-210 Issue 9.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Dr., Research Triangle Park, NC 27709, USA and 2800 Perimeter Park Dr., Suite B, Morrisville, NC 27560, USA.

12 Laboratory Dr., RTP, NC 27709
☐ Chamber A
☐ Chamber C

2800 Suite B Perimeter Park Dr., Morrisville, NC 27560
☐ Chamber NORTH
☒ Chamber SOUTH

The onsite chambers are covered under Industry Canada company address code 2180C with site numbers 2180C -1 through 2180C-4, respectively.

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0. The full scope of accreditation can be viewed at http://www.nist.gov/nvlap/.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY	Required by standard
Occupied Channel Bandwidth	2.00%	±5 %
RF output power, conducted	1.3 dB	±1,5 dB
Power Spectral Density, conducted	2.47 dB	±3 dB
Unwanted Emissions, conducted	2.94 dB	±3 dB
All emissions, radiated	5.36 dB	±6 dB
Temperature	2.26 °C	±3 °C
Supply voltages	2.40%	±3 %
Time	3.39%	±5 %

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a RFID Module intended for laptop integration.

5.2. MANUFACTURER'S DESCRIPTION OF MODEL DIFFERENCES

Model number R9XXEA covers manufacturer part numbers OEM-805X2AXU-HPM270 (clamshell antenna) and OEM-805X2AXU-HPN840 (open face antenna). The only difference between the two part numbers is the antenna. Both were tested in this report.

5.3. MAXIMUM OUTPUT POWER

The testing was performed at 3 meter. The HPM270 PK transmitter maximum E-field reading at 30m is 28.31 dBuV/m corrected from 3m reading of 68.31 dBuV/m. The HPN840 PK transmitter maximum E-field reading at 30m is 27.19 dBuV/m, which has been corrected from the 3m reading of 67.19dBuV/m.

5.4. DESCRIPTION OF AVAILABLE ANTENNAS

The OEM-80X2AXU-HPM270 utilizes one integral loop coil antenna with an area of 0.0013 m^2.
The OEM-805X2AXU-HPN840 utilizes one integral loop coil antenna with an area of 0.0012 m^2.

5.5. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was IBC170903UPX700.H, rev. FCC.
The test utility software used during testing was 20171012, DLL rev. 7.2.28.

5.6. WORST-CASE CONFIGURATION AND MODE

The both EUT models were investigated in three orthogonal orientations, X,Y, and Z-axes. It was determined that Y axis was worst-case orientation for OEM-805X2AXU-HPM270 and Z axis was worst-case orientation for OEM-805X2AXU-HPN840.

5.7. MODIFICATIONS

No modifications were made during testing.

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	HP	Elite X2	5CG545482O	NA
Power Supply	KTC	HU10674-13017	WDUVA0CPP9H1G1	NA

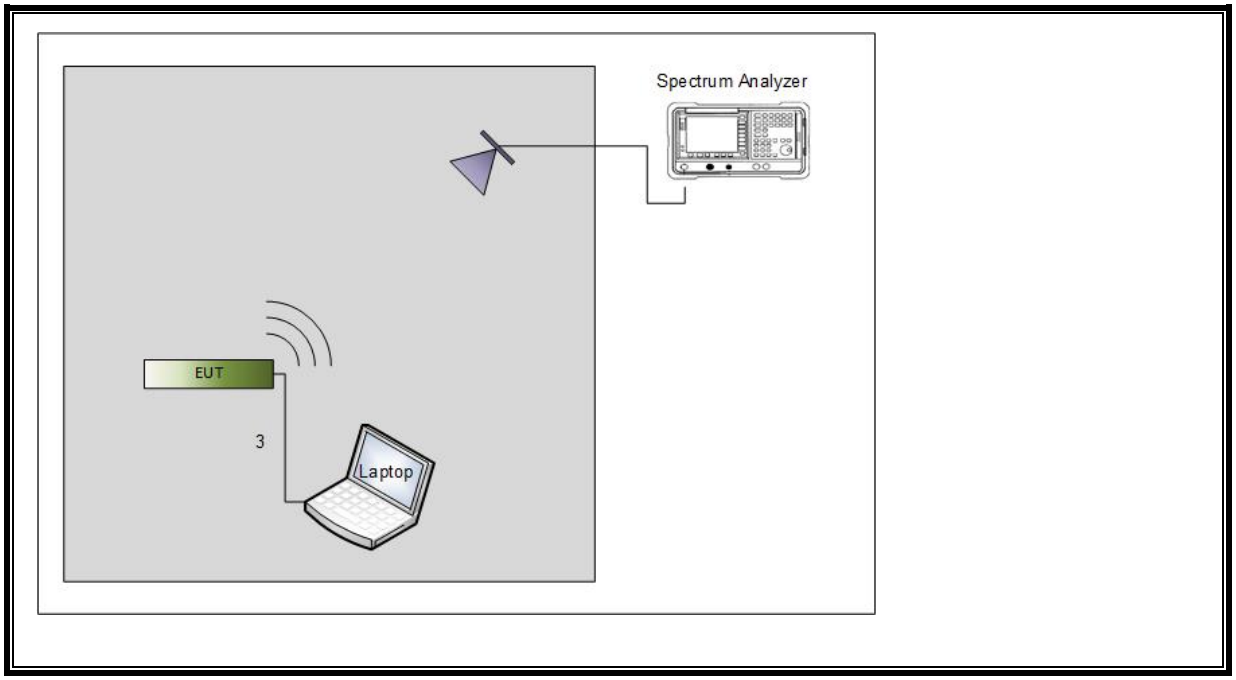
I/O CABLES

I/O Cable List						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
3	Ribbon	1	USB	Ribbon	<3m	Connects to laptop

TEST SETUP

The EUT is connected to a host laptop computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment Used - Line-Conducted Emissions – Voltage

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Equipment – Ground Plane E					
85496	EMI Test Receiver 9kHz-3.6GHz	Rohde & Schwarz	ESR3	2017-08-22	2018-08-22
ATA509	Coaxial cable, 20 ft., BNC -male to BNC-male	UL	RG-223	2017-08-23	2018-08-23
HI0085	Temp/Humid/Pressure Meter	Extech	SD700	2017-02-27	2018-02-27
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Transient Limiter					
ATA508	Transient Limiter, 0.009 to 100 MHz	Electro-Metrics	EM 7600	2017-08-23	2018-08-23
LISN (FCC & CISPR testing)					
LISN004	LISN, 50-ohm/50-uH, 2-conductor, 50A	Fischer Custom Com.	FCC-LISN-50-50-2-02-550V	2017-08-22	2018-08-22

Test Equipment Used – OBW Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
Conducted Room 2					
T177	Spectrum Analyzer	Agilent Technologies	E4446A	2017-03-30	2018-03-30
1100502	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2017-06-06	2018-06-06
139843	Temp/Humid/Pressure Meter	Control Co./Fisher	14-650-118	2016-12-23	2018-12-23
MM0167	Multi-meter	Agilent	U1232A	2017-10-21	2018-10-30
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA

Test Equipment Used - Radiated Disturbance Emissions Test Equipment (Morrisville - South Chamber)

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
0.009-30MHz (Loop Ant.)					
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2016-12-28	2017-12-31
30-1000 MHz					
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2017-06-15	2018-06-15
Gain-Loss Chains					
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2017-09-15	2018-09-15
S-SAC02	Gain-loss string: 30-1000MHz	Various	Various	2017-06-11	2018-06-11
Receiver & Software					
SA0025	Spectrum Analyzer	Agilent	N9030A	2017-04-10	2018-04-10
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
Additional Equipment used					
s/n 161024887	Environmental Meter	Fisher Scientific	15-077-963	2016-12-23	2018-12-23

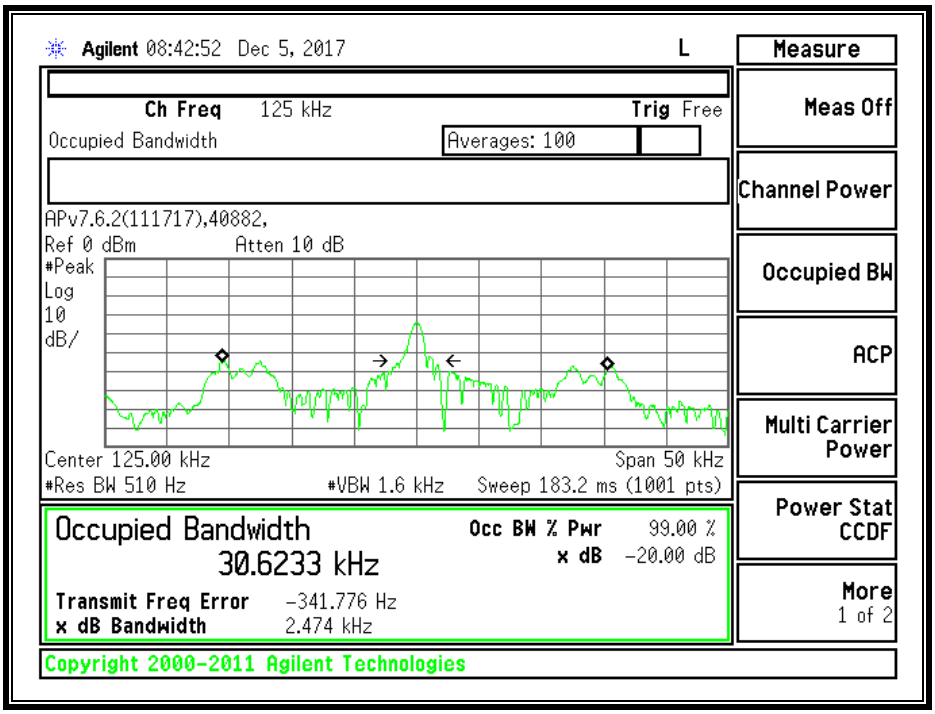
7. OCCUPIED BANDWIDTH

LIMITS

None; for reporting purposes only.
FCC §15.215 (c) and RSS-GEN, ANSI C63.10 Sections 6.9.2 and 6.9.3 were used for the measurement procedure.

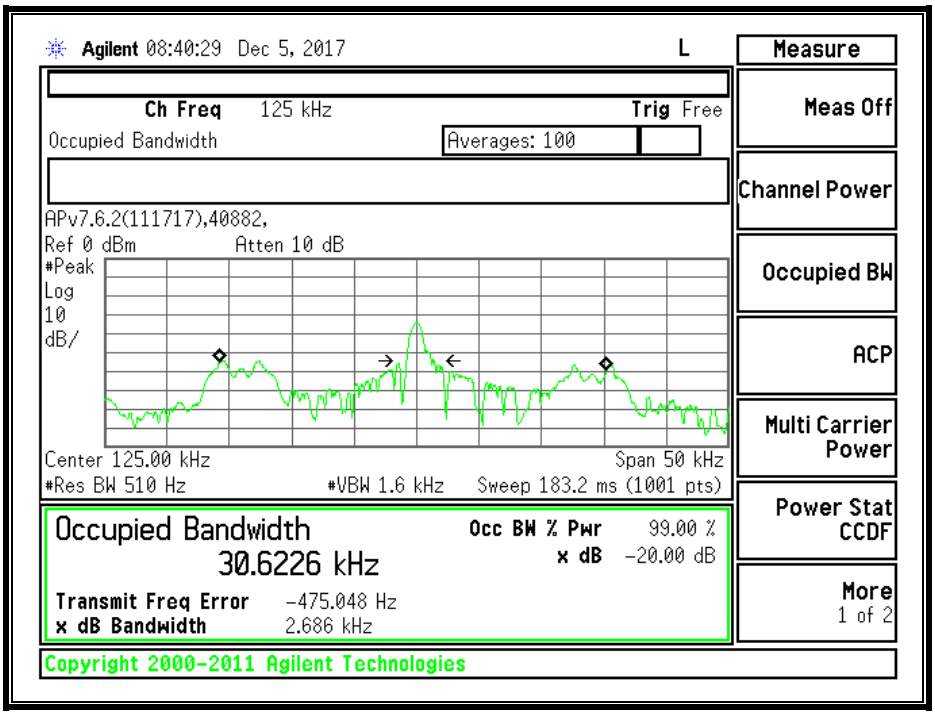
RESULTS – HPM270

	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
N270	0.125	2.474	30.623



RESULTS – HPN840

	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
HPN840	0.125	2.686	30.623



Test Information
Date: 2017-12-05
Project: 11870434
Tested By: Jeffrey Cabrera

8. RADIATED EMISSIONS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.209 (a)
IC RSS-GEN, Section 8.9 (Transmitter)
IC RSS-GEN, Section 7.1.2 (Receiver)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (m)
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 to 216	150	3
216 to 960	200	3
Above 960 MHz	500	3
Note: The lower limit shall apply at the transition frequency.		

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz measurements. The antenna to EUT distance is 3 meters.

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements for the 30-1000 MHz range, 9 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements for the 0.15-30 MHz range and 200 Hz for peak detection measurements or 200 Hz for quasi-peak detection measurements for the 9 to 150 kHz range. Peak detection is used unless otherwise noted as quasi-peak.

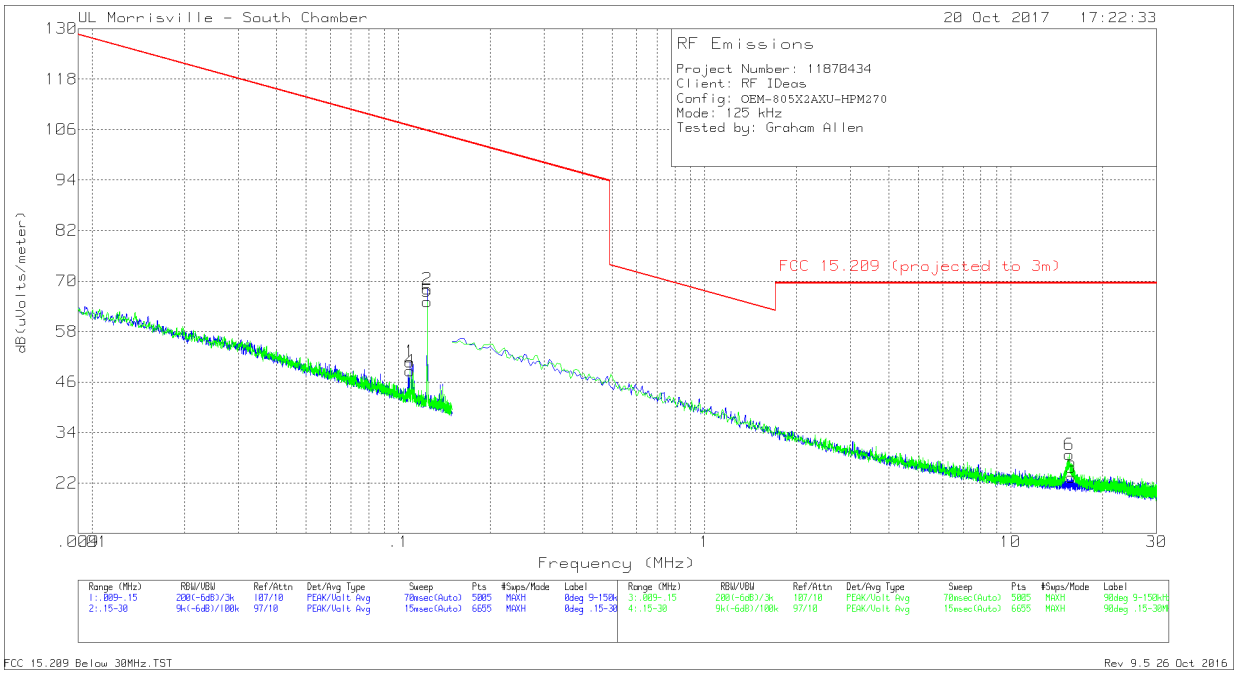
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

8.2. TX SPURIOUS EMISSIONS 0.15 TO 30 MHz

Note: All measurements were made at a test distance of 3 m. The limits in the plots and tabular data are the FCC/IC limits extrapolated from the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) to the measurement distance to clearly show the relative levels of fundamental and spurious emissions and demonstrate compliance with the requirement that the level of any spurious emissions be below the level of the intentionally transmitted signal. The extrapolation factor for the limits were 40*Log (specification distance / test distance).

Although these tests were performed at a test site other than an open area test site, adequate comparison measurements were confirmed against an open area test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

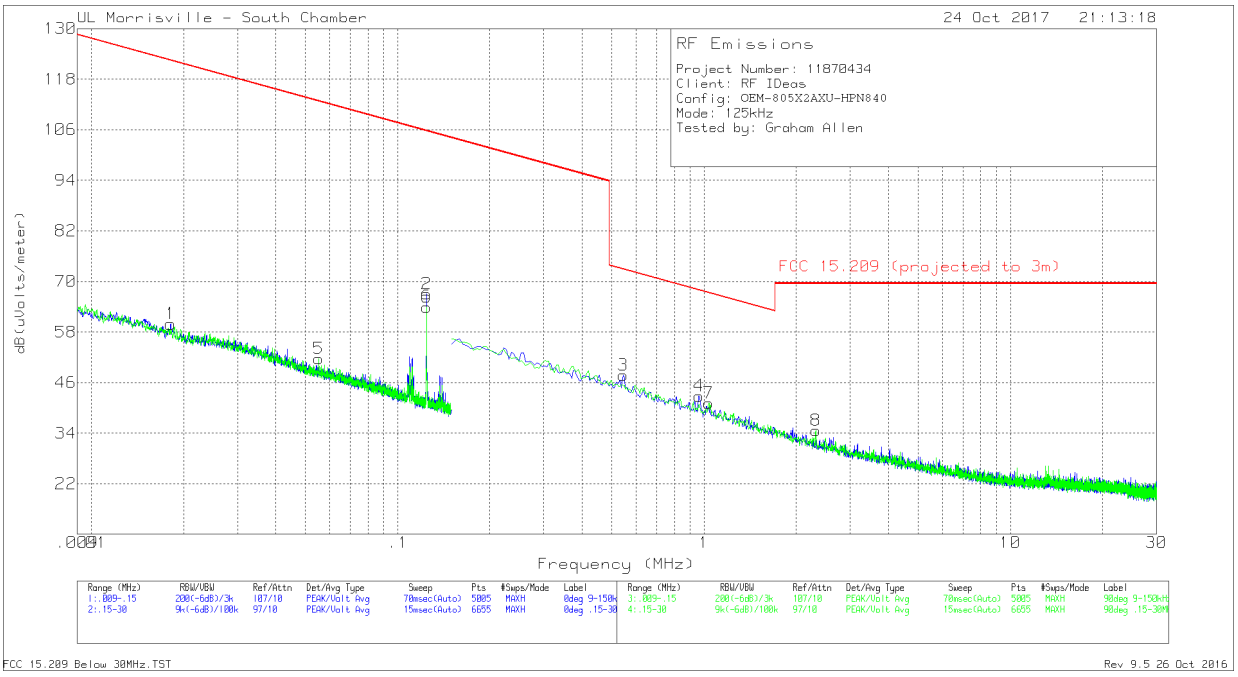
RESULTS – HPM270



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 (projected to 3m)	Margin (dB)	Azimuth (Degs)	Face
4	.10904	37.74	Pk	10.8	.1	48.64	106.85	-58.21	0-360	Face Off
5	.125	54.27	Pk	10.8	.1	65.17	105.67	-40.5	97	Face Off
3	15.75231	12.41	Pk	10.2	.7	23.31	69.54	-46.23	0-360	Face Off
1	.10904	39.95	Pk	10.8	.1	50.85	106.85	-56	0-360	Face On
2	.125	57.41	Pk	10.8	.1	68.31	105.67	-37.36	178	Face On
6	15.53025	17.94	Pk	10.2	.6	28.74	69.54	-40.8	0-360	Face On

Pk - Peak detector

RESULTS – HPN840

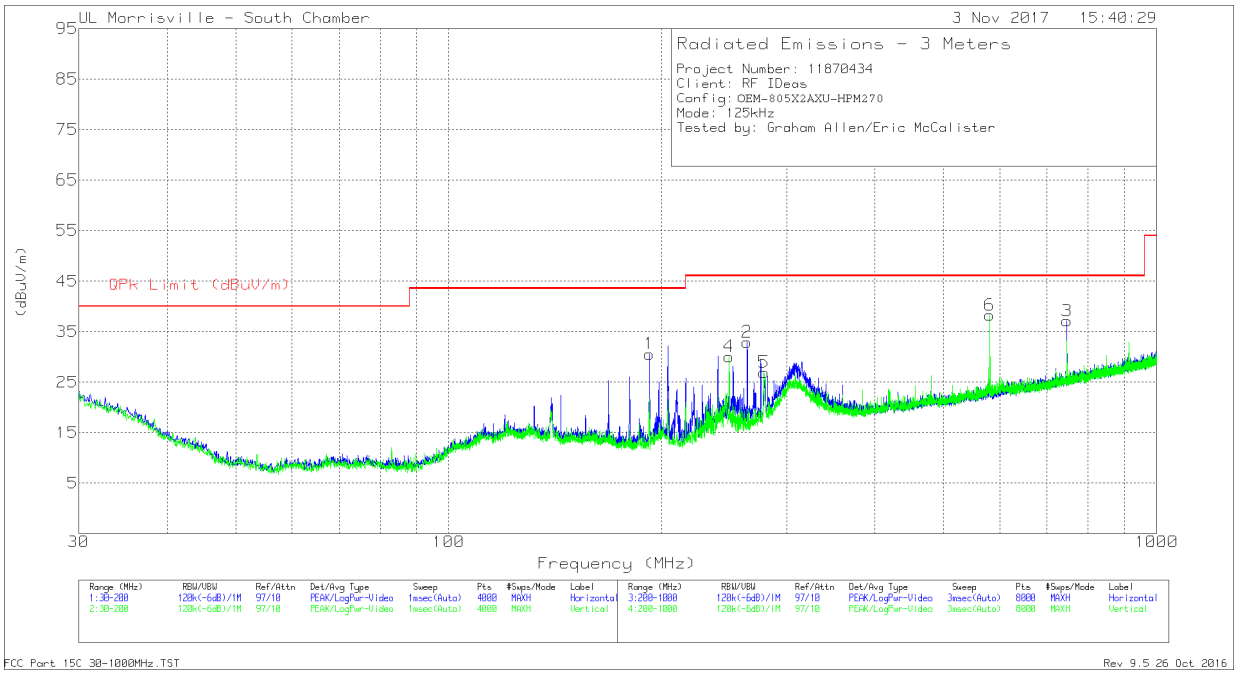


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 (projected to 3m)	Margin (dB)	Azimuth (Degs)	Face
1	.01816	45.01	Pk	14.8	.1	59.91	122.42	-62.51	0-360	On
5	.05531	40.03	Pk	11.5	.1	51.63	112.75	-61.12	0-360	Off
2	.125	56.29	Pk	10.8	.1	67.19	105.67	-38.48	185	On
6	.125	52.97	Pk	10.8	.1	63.87	105.67	-41.8	107	Off
3	.54477	36.89	Pk	10.8	.1	47.79	72.88	-25.09	0-360	On
4	.96197	31.84	Pk	10.9	.1	42.84	67.94	-25.1	0-360	On
7	1.03599	29.89	Pk	11	.2	41.09	67.3	-26.21	0-360	Off
8	2.31674	23.4	Pk	11	.2	34.6	69.54	-34.94	0-360	Off

Pk - Peak detector

8.3. TX SPURIOUS EMISSION 30 TO 1000 MHz

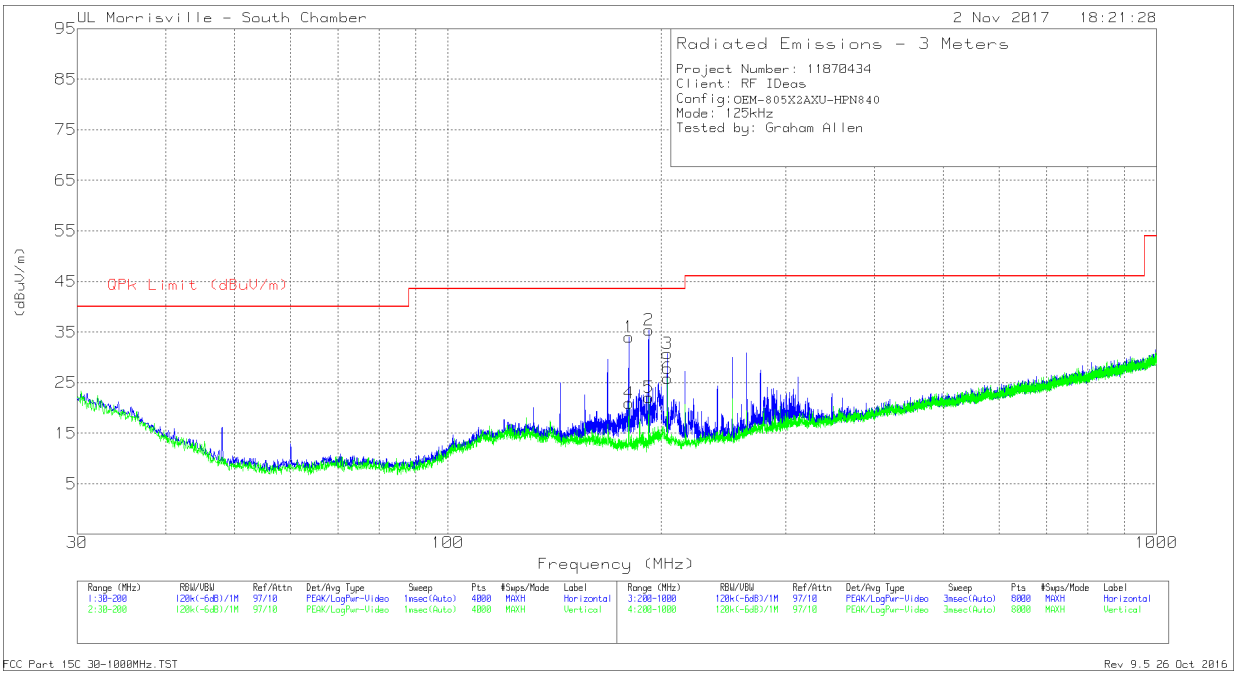
RESULTS – HPM270



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
2	* 263.9083	45.41	Pk	17.4	-29.9	32.91	46.02	-13.11	0-360	102	H
1	192.0094	44.68	Pk	16.1	-30.2	30.58	43.52	-12.94	0-360	99	H
3	746.9711	40.03	Pk	25.3	-28.2	37.13	46.02	-8.89	0-360	102	H
4	* 249.0064	43.66	Pk	16.3	-29.9	30.06	46.02	-15.96	0-360	198	V
5	* 278.8102	38.93	Pk	17.8	-29.8	26.93	46.02	-19.09	0-360	198	V
6	580.9495	43.58	Pk	23.4	-28.7	38.28	46.02	-7.74	0-360	102	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

RESULTS – HPN840



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	180.0638	48.59	Pk	15.7	-30.3	33.99	43.52	-9.53	0-360	199	H
2	192.0519	49.46	Pk	16.1	-30.2	35.36	43.52	-8.16	0-360	101	H
3	204.0005	44.95	Pk	16	-30.2	30.75	43.52	-12.77	0-360	198	H
4	180.0213	35.52	Pk	15.7	-30.3	20.92	43.52	-22.6	0-360	101	V
5	192.0519	36.18	Pk	16.1	-30.2	22.08	43.52	-21.44	0-360	101	V
6	204.1005	40.04	Pk	16	-30.2	25.84	43.52	-17.68	0-360	198	V

Pk - Peak detector

9. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207
IC RSS-GEN, Section 7.2.2

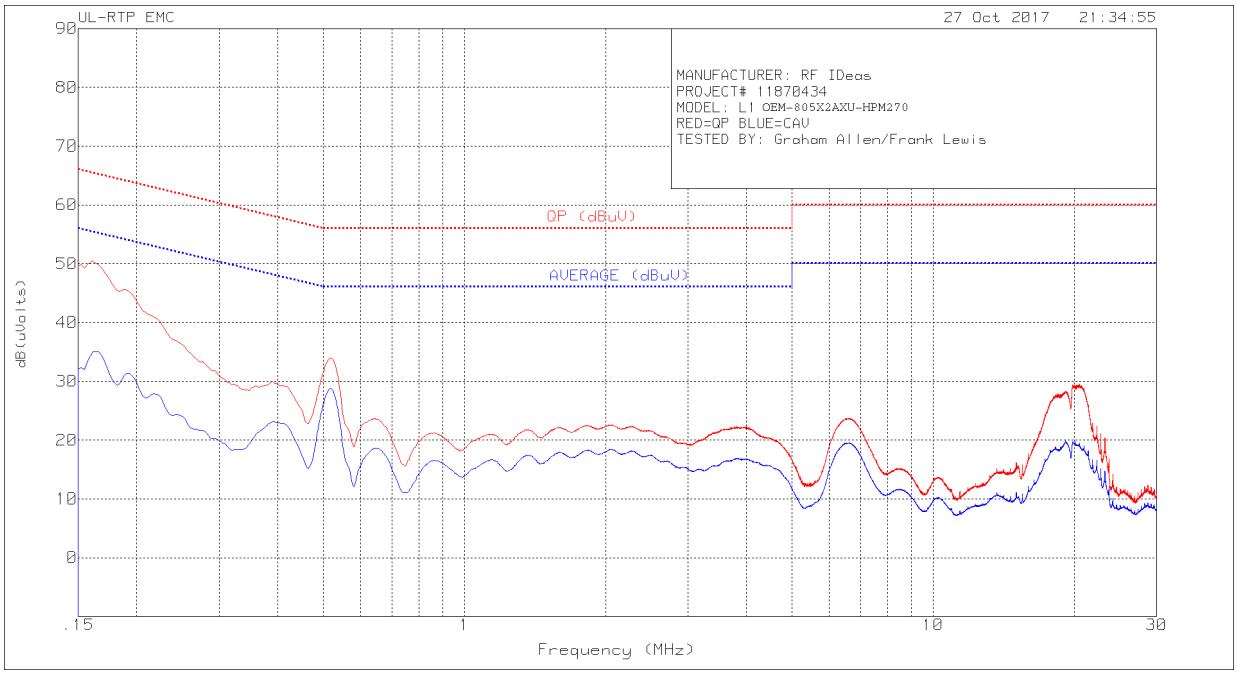
(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
* Decreases with the logarithm of the frequency.		

TEST PROCEDURE

ANSI C63.10

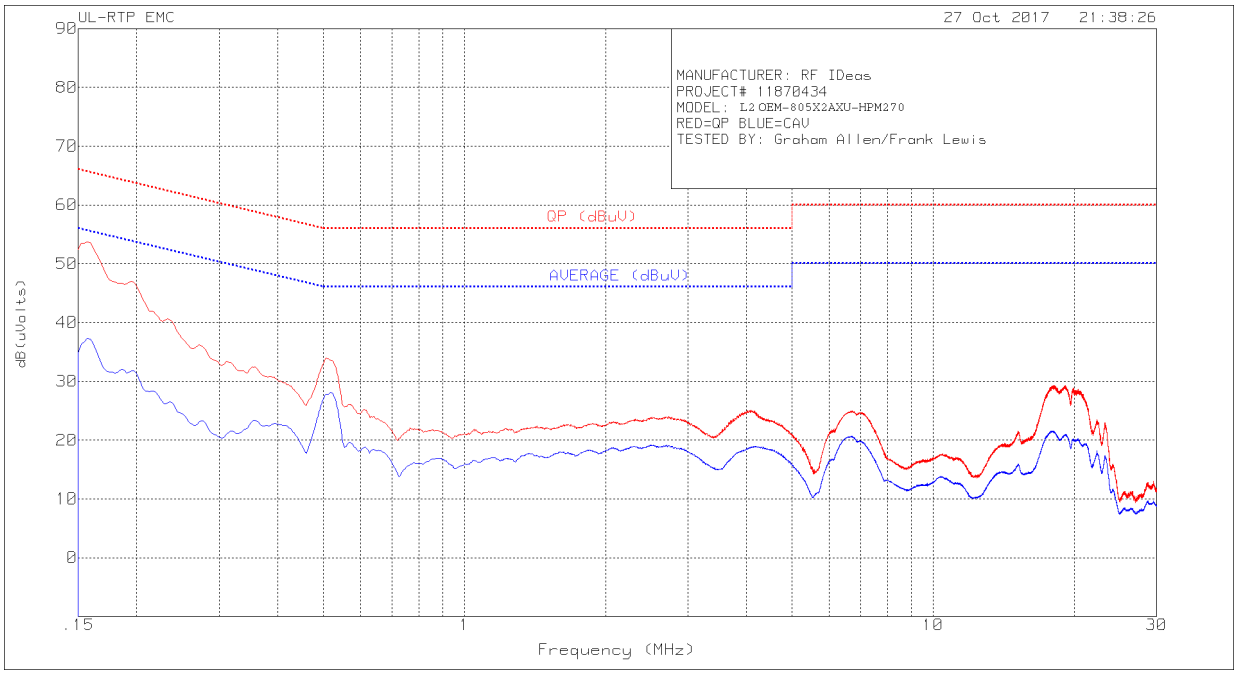
LINE 1 RESULTS – HPM270



Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002_DUE 2018-08-23	ATA508_509 DUE_2018-08-31	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AVERAGE (dBuV)	Margin (dB)
.1635	25.53	Ca	.3	9.2	35.03	-	-	55.28	-20.25
.51675	19.44	Ca	.1	9.2	28.74	-	-	46	-17.26
3.84675	7.6	Ca	0	9.3	16.9	-	-	46	-29.1
6.60975	10.11	Ca	.1	9.3	19.51	-	-	50	-30.49
18.80475	8.97	Ca	.2	9.6	18.77	-	-	50	-31.23
20.39775	9.37	Ca	.2	9.6	19.17	-	-	50	-30.83
.16125	40.94	Qp	.3	9.2	50.44	65.4	-14.96	-	-
.519	24.69	Qp	.1	9.2	33.99	56	-22.01	-	-
3.84225	12.92	Qp	0	9.3	22.22	56	-33.78	-	-
6.603	14.27	Qp	.1	9.3	23.67	60	-36.33	-	-
18.81375	17.81	Qp	.2	9.6	27.61	60	-32.39	-	-
20.40675	19.47	Qp	.2	9.6	29.27	60	-30.73	-	-

Qp - Quasi-Peak detector
Ca - CISPR average detection

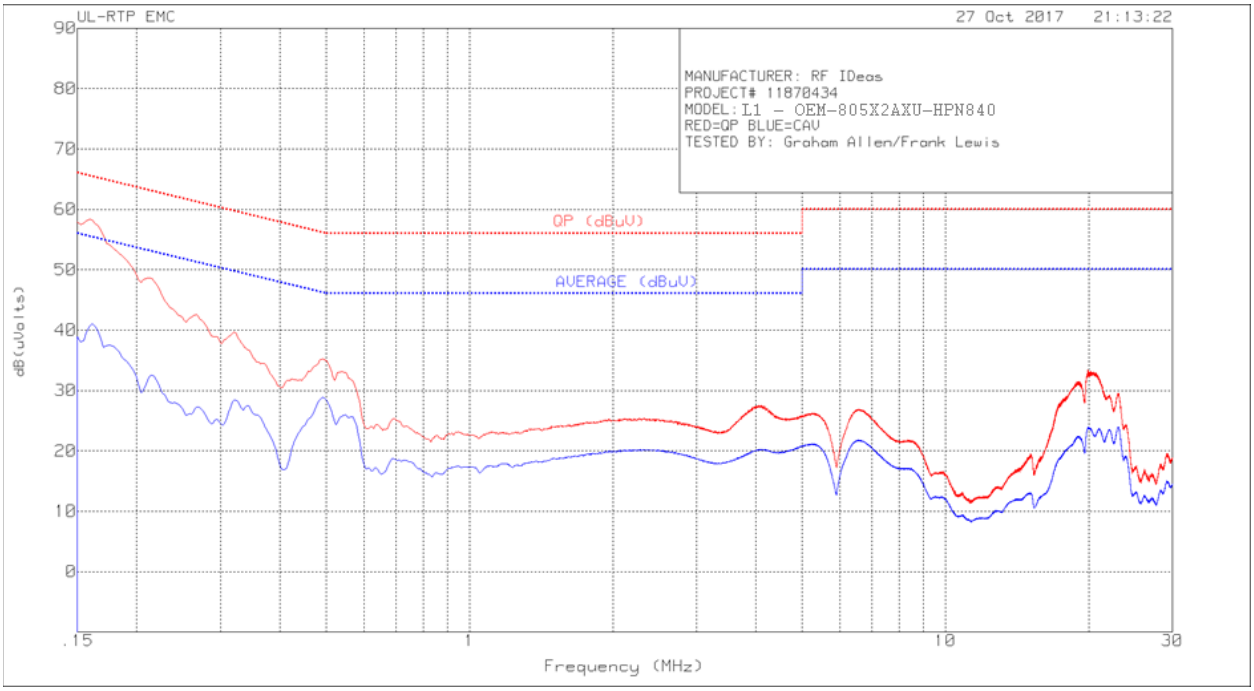
LINE 2 RESULTS -HPM270



Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002_DUE 2018-08-23	ATA508_509 DUE_2018-08-31	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AVERAGE (dBuV)	Margin (dB)
.18825	22.41	Ca	.3	9.2	31.91	-	-	54.11	-22.2
.519	18.8	Ca	.1	9.2	28.1	-	-	46	-17.9
4.00875	9.25	Ca	0	9.3	18.55	-	-	46	-27.45
6.62888	11.17	Ca	.1	9.3	20.57	-	-	50	-29.43
17.98575	11.89	Ca	.1	9.6	21.59	-	-	50	-28.41
20.26838	10.37	Ca	.2	9.6	20.17	-	-	50	-29.83
.195	37.46	Qp	.3	9.2	46.96	63.82	-16.86	-	-
.50775	24.6	Qp	.1	9.2	33.9	56	-22.1	-	-
4.002	15.53	Qp	0	9.3	24.83	56	-31.17	-	-
6.63	15.43	Qp	.1	9.3	24.83	60	-35.17	-	-
17.99025	19.49	Qp	.1	9.6	29.19	60	-30.81	-	-
20.2695	18.5	Qp	.2	9.6	28.3	60	-31.7	-	-

Qp - Quasi-Peak detector
Ca - CISPR average detection

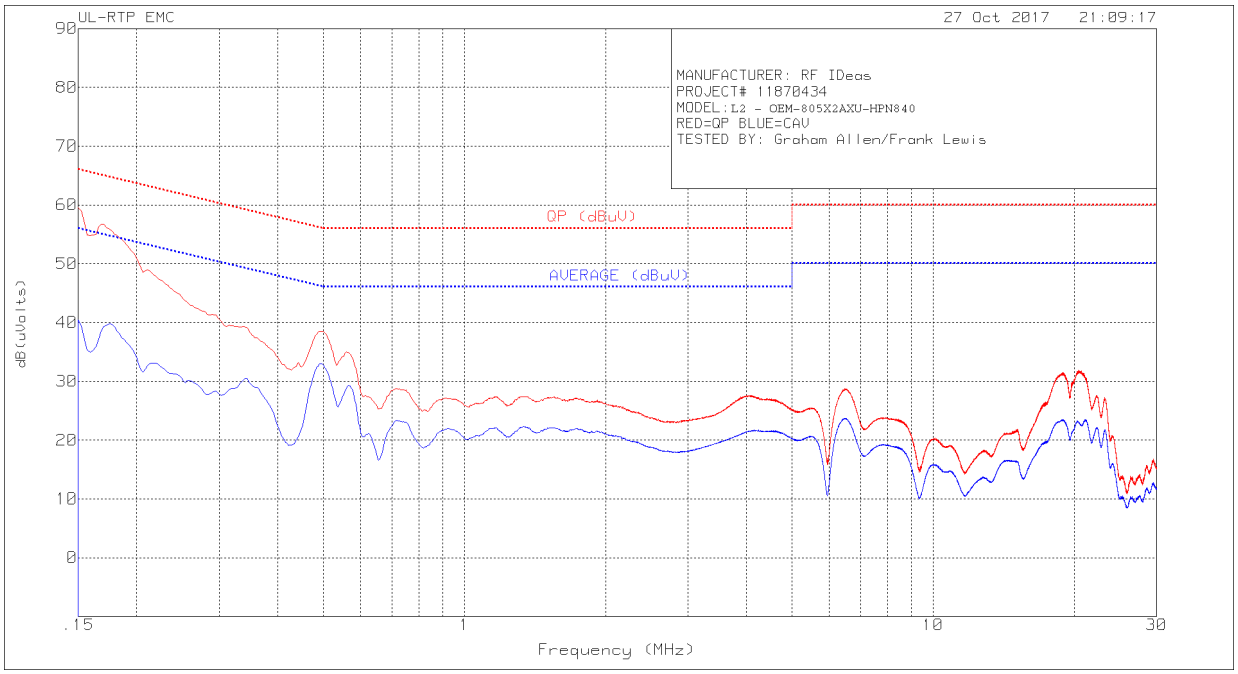
LINE 1 RESULTS – HPN840



Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002_DUE 2018-08-23	ATA508_509 DUE_2018-08-31	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AVERAGE (dBuV)	Margin (dB)
.16125	31.52	Ca	.3	9.2	41.02	-	-	55.4	-14.38
.321	19.14	Ca	.1	9.2	28.44	-	-	49.68	-21.24
.492	19.53	Ca	.1	9.2	28.83	-	-	46.13	-17.3
3.9795	10.75	Ca	0	9.3	20.05	-	-	46	-25.95
6.567	12.39	Ca	.1	9.3	21.79	-	-	50	-28.21
19.8285	13.73	Ca	.2	9.6	23.53	-	-	50	-26.47
.159	48.83	Qp	.3	9.2	58.33	65.52	-7.19	-	-
.321	30.39	Qp	.1	9.2	39.69	59.68	-19.99	-	-
.492	25.9	Qp	.1	9.2	35.2	56.13	-20.93	-	-
3.98175	18.08	Qp	0	9.3	27.38	56	-28.62	-	-
6.585	17.55	Qp	.1	9.3	26.95	60	-33.05	-	-
19.82738	22.87	Qp	.2	9.6	32.67	60	-27.33	-	-

Qp - Quasi-Peak detector
Ca - CISPR average detection

LINE 2 RESULTS – HPN840



Frequency (MHz)	Meter Reading (dBuV)	Det	LISN002_DUE 2018-08-23	ATA508_509 DUE_2018-08-31	Corrected Reading dB(uVolts)	QP (dBuV)	Margin (dB)	AVERAGE (dBuV)	Margin (dB)
.17475	30.31	Ca	.3	9.2	39.81	-	-	54.73	-14.92
.49425	23.69	Ca	.1	9.2	32.99	-	-	46.1	-13.11
.56625	19.96	Ca	.1	9.2	29.26	-	-	46	-16.74
4.0155	12.16	Ca	0	9.3	21.46	-	-	46	-24.54
6.61313	13.79	Ca	.1	9.3	23.19	-	-	50	-26.81
18.81375	13.54	Ca	.2	9.6	23.34	-	-	50	-26.66
.168	47.26	Qp	.3	9.2	56.76	65.06	-8.3	-	-
.49763	29.23	Qp	.1	9.2	38.53	56.04	-17.51	-	-
.56625	25.58	Qp	.1	9.2	34.88	56	-21.12	-	-
4.00425	18.29	Qp	0	9.3	27.59	56	-28.41	-	-
6.61425	18.84	Qp	.1	9.3	28.24	60	-31.76	-	-
18.8025	21.52	Qp	.2	9.6	31.32	60	-28.68	-	-

Qp - Quasi-Peak detector
Ca - CISPR average detection