



CERTIFICATION TEST REPORT

Report Number. : R12616181-E2

Applicant : ELLIQUENCE LLC
2455 GRAND AVE
BALDWIN, NY 11510-3556

Model : SURGI-MAX VAPOR

FCC ID : 2ARZE-0270089

EUT Description : MEDICAL DEVICE WITH RFID RADIO

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 9

Date Of Issue:

2019-08-28

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NVLAP Lab code: 200246-0

Revision History

Rev.	Issue Date	Revisions	Revised By
1	2019-07-31	Initial issue	Richard Jankovics
2	2019-08-09	Corrected Table of Contents and test dates	Lariah Ijames
3	2019-08-28	Updated worst case, added 20dB, and corrected AC mains limits	Niklas Haydon

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ELLIQUENCE LLC
2455 GRAND AVE
BALDWIN, NY 11510-3556

EUT DESCRIPTION: MEDICAL DEVICE WITH RFID RADIO

MODEL: SURGI-MAX VAPOR

SERIAL NUMBER: 1F130008

DATE TESTED: 2019-06-27 – 2019-07-23

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	Complies

UL LLC tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

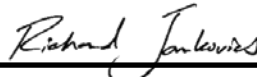
The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. All samples tested were in good operating condition throughout the entire test program. Measurement Uncertainties are published for informational purposes only and were not taken into account unless noted otherwise.

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, any agency of the Federal Government, or any agency of the U.S. government.

Approved & Released For
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Consumer Technology Division
UL LLC

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 5, and RSS-210 Issue 9.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 12 Laboratory Drive, Research Triangle Park, North Carolina, USA and 2800 Suite Perimeter Park Dr., Morrisville, North Carolina, USA. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

12 Laboratory Dr.		2800 Perimeter Park Dr.	
☐	Chamber A (ISED:2180C-1)	☒	Chamber North (ISED:2180C-3)
☐	Chamber C (ISED:2180C-2)	☐	Chamber South (ISED:2180C-4)

UL LLC (RTP) is accredited by NVLAP, Laboratory Code 200246-0

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

RADIATED EMISSIONS

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)
 $36.5 \text{ dBuV} + 18.7 \text{ dB/m} + 0.6 \text{ dB} - 26.9 \text{ dB} = 28.9 \text{ dBuV/m}$

MAINS CONDUCTED EMISSIONS

Where relevant, the following sample calculation is provided:

Final Voltage (dBuV) = Measured Voltage (dBuV) + Cable Loss (dB) + Limiter Factor (dB) + LISN Insertion Loss.
 $36.5 \text{ dBuV} + 0 \text{ dB} + 10.1 \text{ dB} + 0 \text{ dB} = 46.6 \text{ dBuV}$

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Radio Frequency (Spectrum Analyzer)	141.2 Hz
Occupied Channel Bandwidth	2.00%
Unwanted Emissions, conducted	3.05 dB
All emissions, radiated	4.88 dB
Temperature	2.26°C
Humidity	6.79%
DC Supply voltages	1.70%
Time	3.39%

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT, Surgi-Max Vapor, is a medical device that generates high radiofrequency energy for surgical applications. The EUT employs a 13.56 MHz RFID radio for the detection of the type of tool connected to the instrument.

5.2. SOFTWARE AND FIRMWARE

The test utility software used during testing was V6-08.

5.3. WORST-CASE CONFIGURATION AND MODE

The EUT is intended to be installed in only one orientation therefore all radiated testing was performed in its intended orientation (X-Axis). The EUT was tested with both RFIDs transmitting simultaneously for worst case emissions.

Worst case emissions were found to be with the tags (tools) in place. Radiated spurious and AC mains emissions testing were performed in both with and without tags.

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID
Triple footswitch	Elliquence	TF-FSCB	00014	N/A
3-Button Fingerswitch Handpiece	Elliquence	N/A	N/A	N/A
Resistor	N/A	N/A	N/A	N/A
Neutral Plate	Elliquence	N/A	N/A	N/A

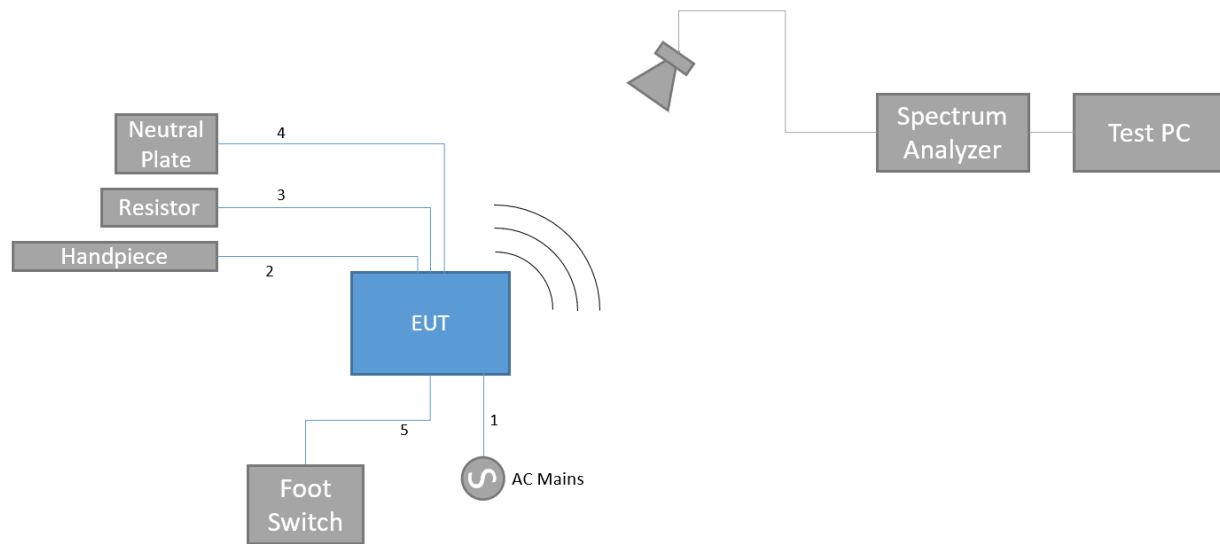
I/O CABLES

I/O Cable List						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length (m)	Remarks
1	AC pwr	1	C14	AC	0.2 m	
2	Monopolar	1	3-pin	I/O	0.3 m	Cable integrated with 3-Button Fingerswitch Handpiece
3	Bipolar	1	2-pin	I/O	0.3 m	Connected to resistor
4	Neutral	1	3-pin	I/O	0.3 m	Cable integrated with neutral plate
5	Footswitch	1	Multi pin	I/O	4 m	Cable integrate with footswitch

TEST SETUP

The EUT is installed as a standalone device.

SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

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

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

Equip. ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	0.009-30MHz	(Loop Ant.)			
AT0079	Active Loop Antenna	ETS-Lindgren	6502	2019-01-24	2020-01-31
	30-1000 MHz				
AT0073	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2018-08-06	2019-08-06
	Gain-Loss Chains				
N-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2019-05-02	2020-05-02
N-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2019-05-02	2020-05-02
	Receiver & Software				
SA0026	Spectrum Analyzer	Agilent	N9030A	2019-03-19	2020-03-19
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
4341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
HPF008	30MHz Highpass Filter	Pasternack	PE8717	2019-06-14	2020-06-14

Test Equipment Used – Conducted RF

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Conducted Room 2				
72822 (PRE0100902)	Spectrum Analyzer	Agilent Technologies	E4446A	2018-11-19	2019-11-19
76023 (EC0225)	Temp/Humid Chamber	Cincinnati Sub-Zero	ZPH-8-3.5-SCT/AC	2019-06-14	2020-06-14
SN 181474341	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
MM0166	Multi-meter	Agilent	U1232A	2019-03-15	2020-03-15

Test Equipment Used - Line-Conducted Emissions – Voltage (Morrisville – Conducted 1)

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
CBL087	Coax cable, RG223, N-male to BNC-male, 20-ft.	Pasternack	PE3W06143-240	2019-05-29	2020-05-29
s/n 181562858	Environmental Meter	Fisher Scientific	14-650-118	2018-09-04	2020-09-04
LISN003	LISN, 50-ohm/50-uH, 2-conductor, 25A	Fischer Custom Com.	FCC-LISN-50-25-2-01-550V	2018-08-21	2019-08-21
75141 (PRE0101521)	EMI Test Receiver 9kHz-7GHz	Rohde & Schwarz	ESCI 7	2018-08-22	2019-08-22
TL001	Transient Limiter, 0.009-30MHz	Com-Power	LIT-930A	2019-05-29	2020-05-29
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA

UL SOFTWARE			
*Radiated Software	UL	UL EMC	Fundamental mask, 5/7/15
*Conducted Software	UL	UL EMC	Ver 2.2, March 31, 2015
*Radiated Software	UL	UL EMC	Below 30Mhz, 6/24/15
*Radiated Software	UL	UL EMC	Below 1Ghz, 7/15/14
*AC Line Conducted Software	UL	UL EMC	Ver 9.5, April 3, 2015

Note: * indicates automation software version used in the compliance certification testing

7. OCCUPIED BANDWIDTH AND 20dB BANDWIDTH

LIMITS

None; for reporting purposes only.

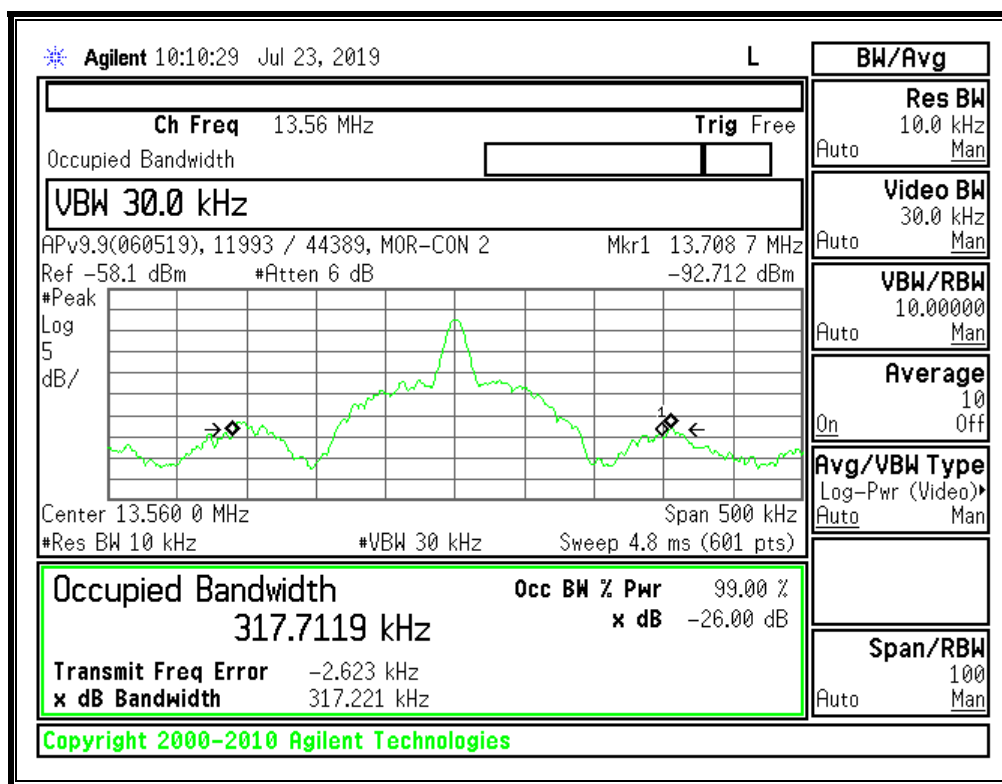
FCC §15.215 (c) and RSS-GEN, ANSI C63.10 Sections 6.9.2 and 6.9.3 were used for the measurement procedure.

RESULTS

99% and 20dB BW

Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
13.56	317.71	66.0

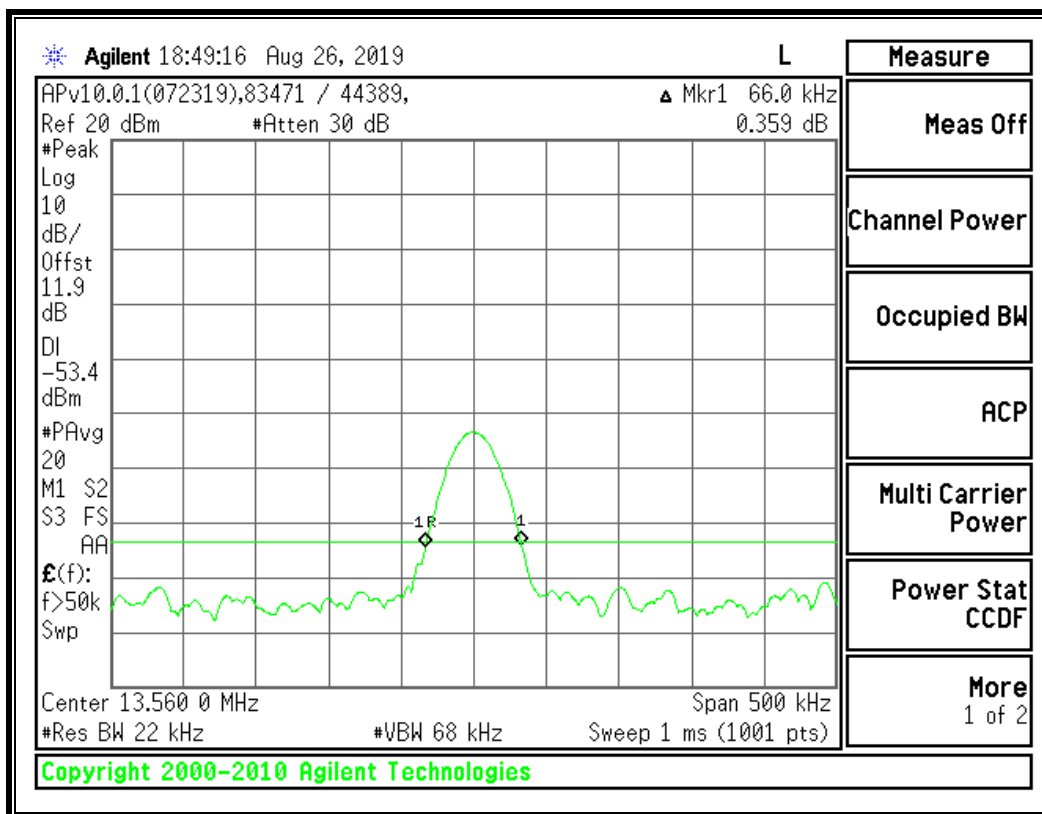
7.1. 99% BANDWIDTH PLOT



TEST INFORMATION

Test Date: 2019-07-23
Tested By: 83471/44389

7.1. 20dB BANDWIDTH PLOT



TEST INFORMATION

Test Date: 2019-08-27
Tested By: 83471/44389

8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMIT

§15.225

IC RSS-210, Annex B.6

IC RSS-GEN, Section 8.9 (Transmitter)

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209 as follows:

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	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 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the field strength from µV/m to dBuV/m is:

Limit (dBuV/m) = 20 log limit (µV/m)

In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

KDB 414788 Open Field Site(OFS) and Chamber Correlation Justification

Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

OFS and chamber correlation testing had been performed and chamber measured test result is the worst case test result.

TEST PROCEDURE

ANSI C63.10, 2013

The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 13.56 MHz; therefore, the frequency range was investigated from 0.15 MHz to the 10th harmonic of highest fundamental frequency or to 40 GHz, whichever is lower.

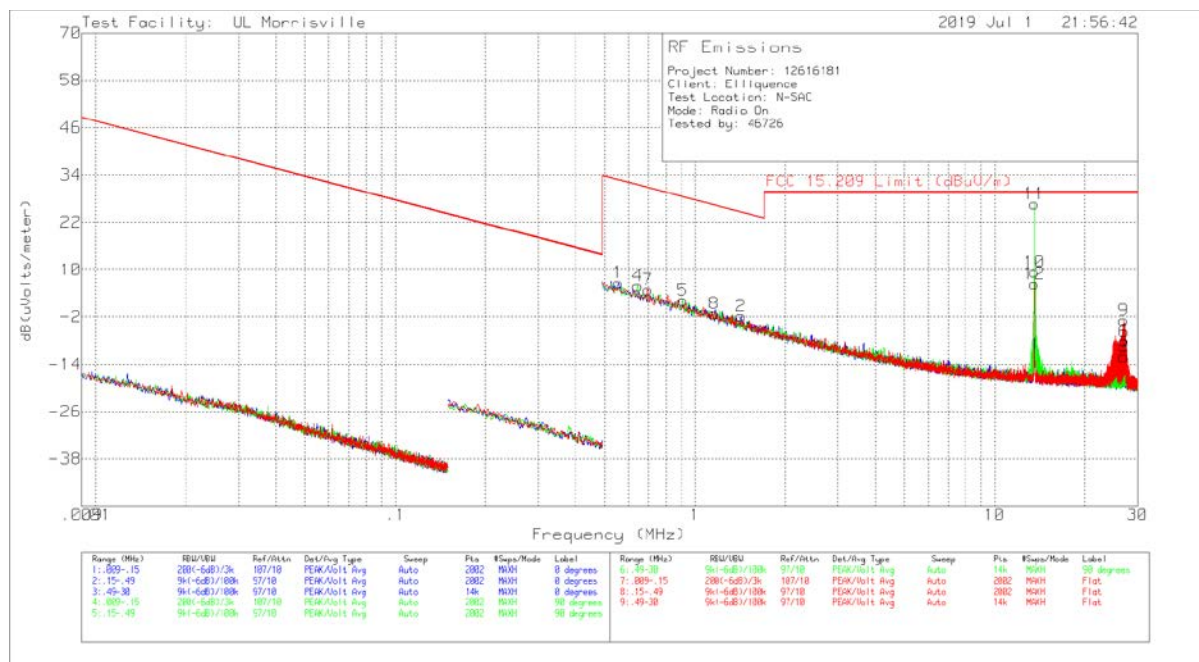
Since the EUT contains a digital device operating at 4 MHz, the frequency range was expanded to 1 GHz, as specified in the following table.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

RESULTS

Tag

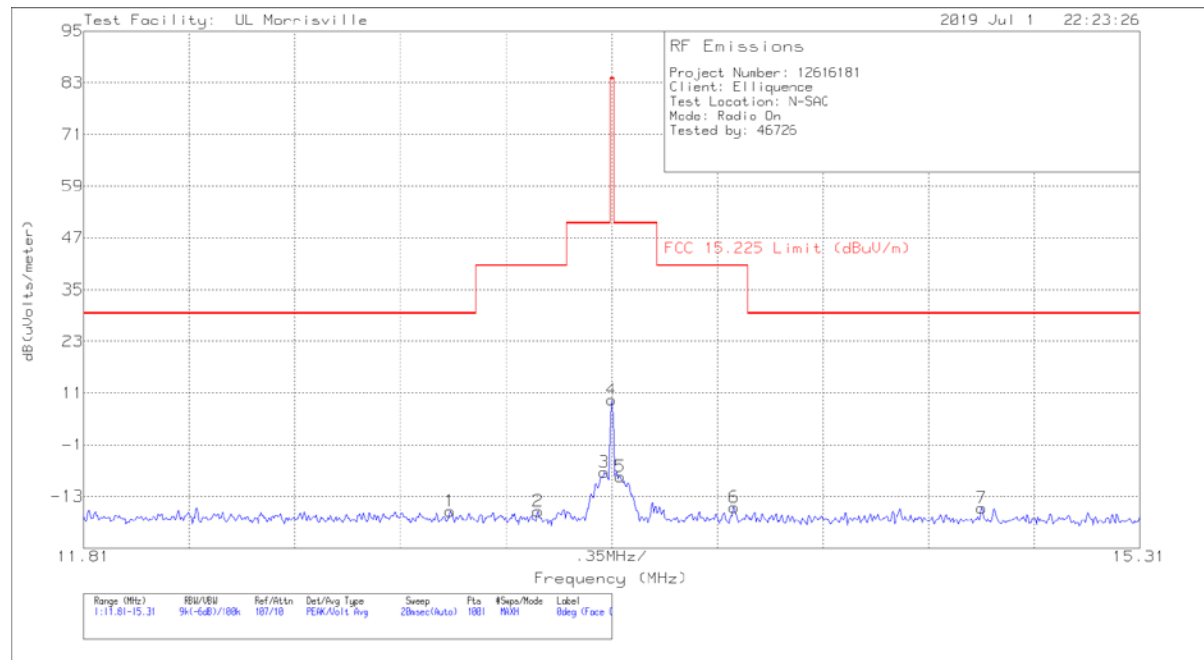
TX SPURIOUS EMISSION 9 kHz TO 30 MHz



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	.55535	35.71	Pk	10.8	.1	-40	6.61	32.71	-26.1	0-360
4	.64388	34.96	Pk	10.8	.1	-40	5.86	31.43	-25.57	0-360
7	.69658	34.03	Pk	10.8	.1	-40	4.93	30.74	-25.81	0-360
5	.9116	31.24	Pk	10.8	.2	-40	2.24	28.41	-26.17	0-360
8	1.15929	27.6	Pk	11	.2	-40	-1.2	26.32	-27.52	0-360
2	1.42174	27	Pk	11	.2	-40	-1.8	24.55	-26.35	0-360
10	13.5596	38.38	Pk	10.4	.6	-40	9.38	29.54	-20.16	0-360
11	13.5596	55.69	Pk	10.4	.6	-40	26.69	29.54	-2.85	0-360
12	13.5596	35.34	Pk	10.4	.6	-40	6.34	29.54	-23.2	0-360
3	26.9707	18.43	Pk	8.6	.9	-40	-12.07	29.54	-41.61	0-360
9	26.9707	27.56	Pk	8.6	.9	-40	-2.94	29.54	-32.48	0-360
6	27.0782	22.33	Pk	8.6	.9	-40	-8.17	29.54	-37.71	0-360

Pk - Peak detector

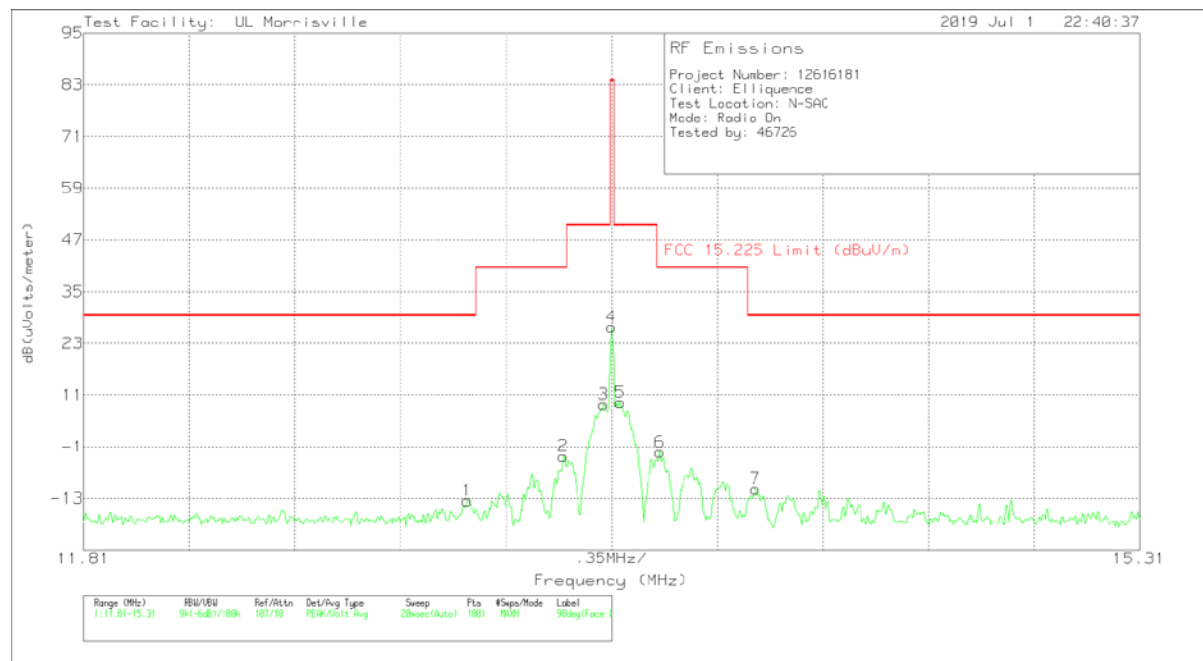
Fundamental (0 degrees)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	13.0245	12.63	Pk	10.4	.6	-40	-16.37	29.5	-45.87	259
2	13.315	12.58	Pk	10.4	.6	-40	-16.42	40.5	-56.92	259
3	13.5355	21.66	Pk	10.4	.6	-40	-7.34	50.5	-57.84	259
4	13.56	38.43	Pk	10.4	.6	-40	9.43	84	-74.57	259
5	13.588	20.68	Pk	10.4	.6	-40	-8.32	50.5	-58.82	259
6	13.966	13.53	Pk	10.4	.6	-40	-15.47	40.5	-55.97	259
7	14.78675	13.38	Pk	10.3	.7	-40	-15.62	29.5	-45.12	259

Pk - Peak detector

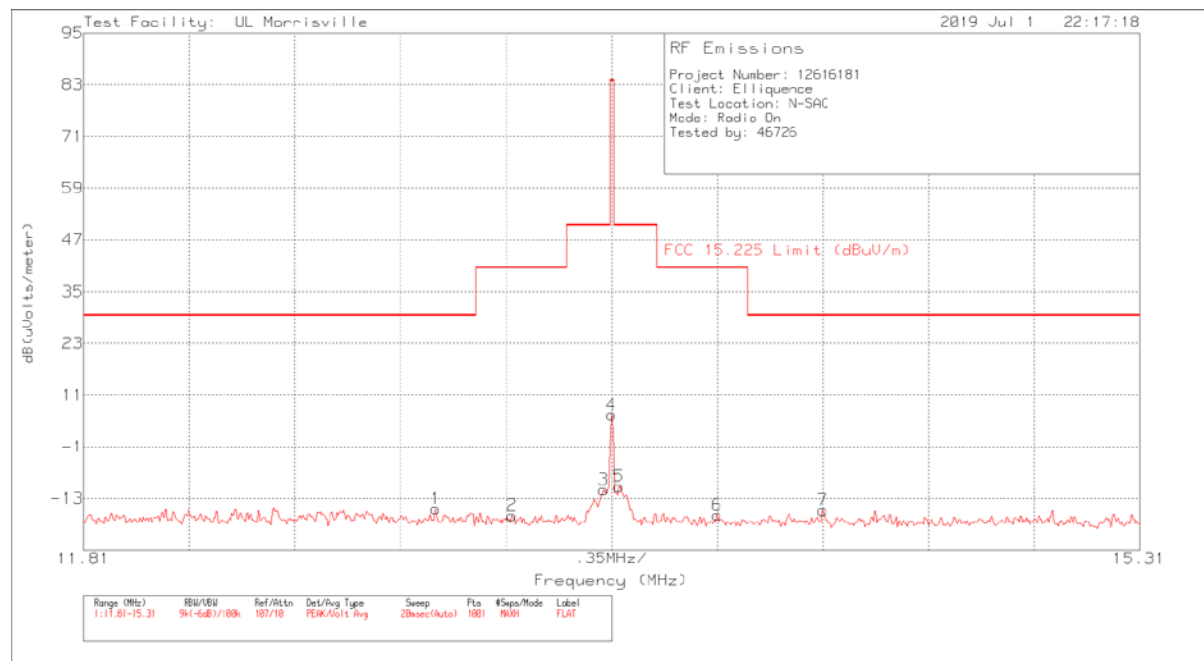
Fundamental (90 degrees)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	13.0805	15.48	Pk	10.4	.6	-40	-13.52	29.5	-43.02	207
2	13.399	25.82	Pk	10.4	.6	-40	-3.18	40.5	-43.68	207
3	13.532	37.87	Pk	10.4	.6	-40	8.87	50.5	-41.63	207
4	13.56	55.81	Pk	10.4	.6	-40	26.81	84	-57.19	207
5	13.588	38.31	Pk	10.4	.6	-40	9.31	50.5	-41.19	207
6	13.71925	26.78	Pk	10.4	.6	-40	-2.22	40.5	-42.72	207
7	14.036	18.24	Pk	10.4	.6	-40	-10.76	29.5	-40.26	207

Pk - Peak detector

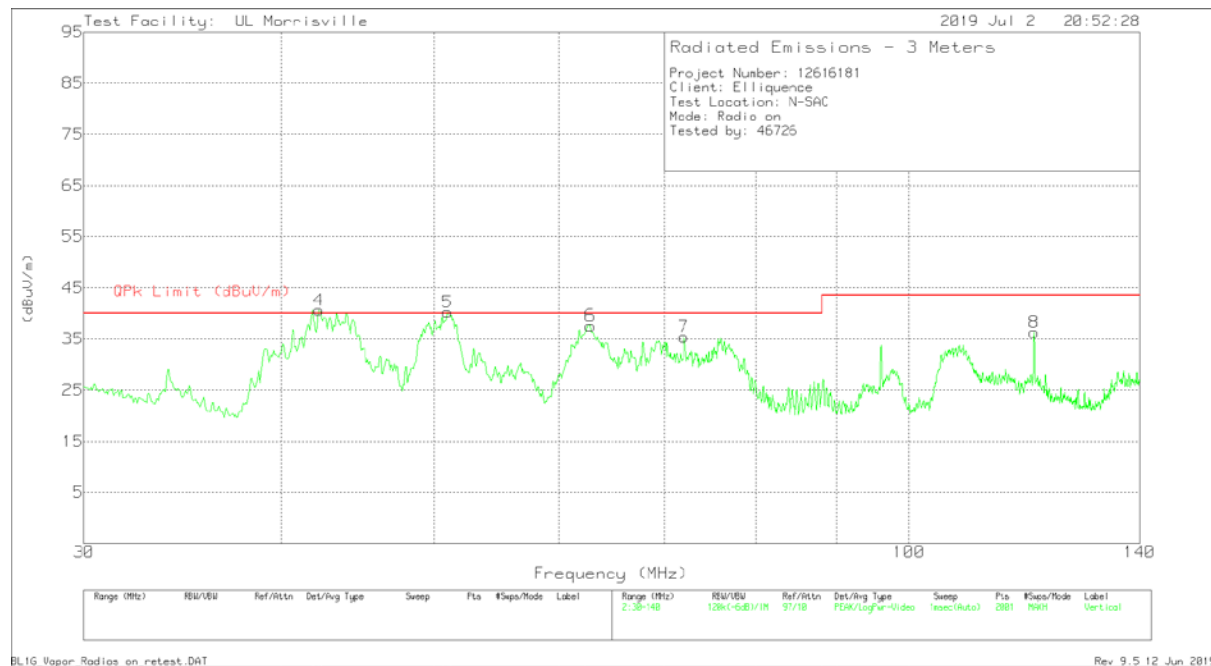
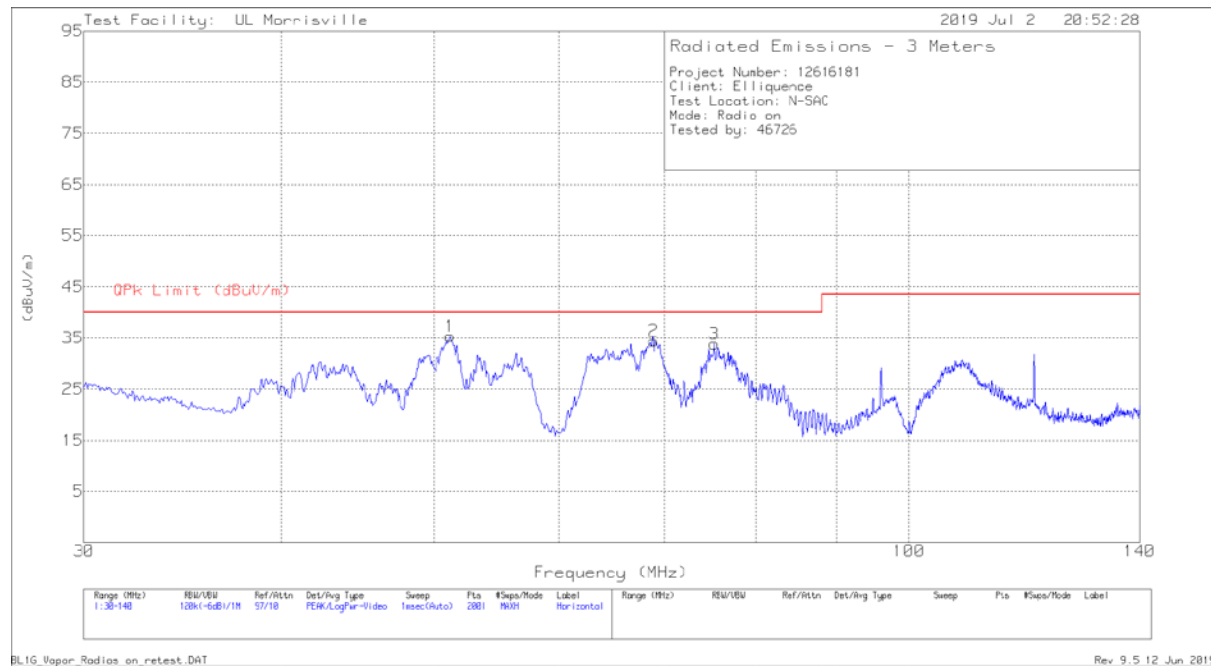
Fundamental (Parallel to GRP)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	12.9755	13.65	Pk	10.4	.6	-40	-15.35	29.5	-44.85	327
2	13.231	12.1	Pk	10.4	.6	-40	-16.9	40.5	-57.4	327
3	13.532	18.08	Pk	10.4	.6	-40	-10.92	50.5	-61.42	327
4	13.56	35.42	Pk	10.4	.6	-40	6.42	84	-77.58	327
5	13.5845	18.82	Pk	10.4	.6	-40	-10.18	50.5	-60.68	327
6	13.91	12.15	Pk	10.4	.6	-40	-16.85	40.5	-57.35	327
7	14.26	13.3	Pk	10.4	.6	-40	-15.7	29.5	-45.2	327

Pk - Peak detector

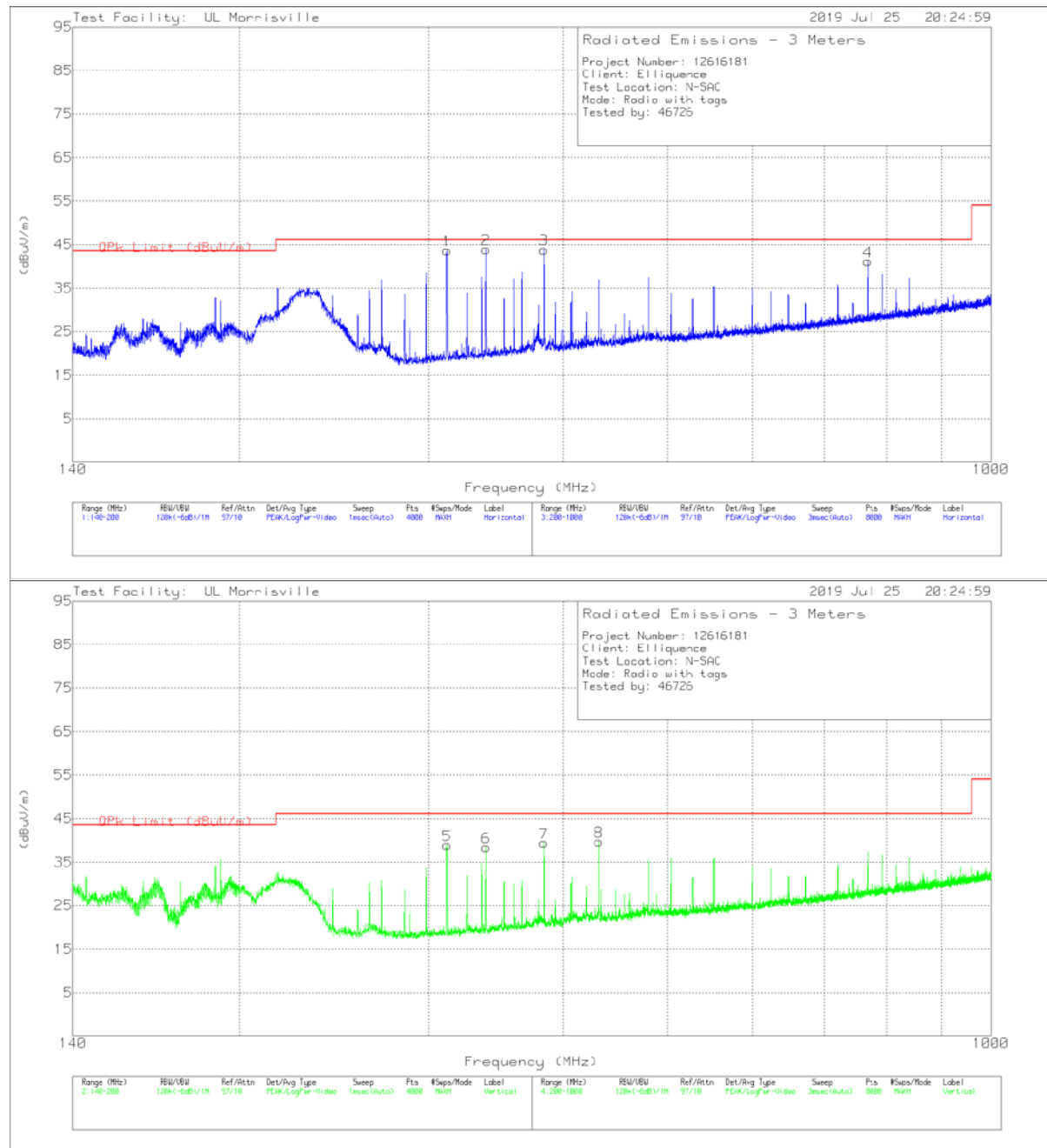
TX SPURIOUS EMISSION 30 TO 140 MHz



Markers	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	42.2818	50.16	Qp	18.8	-31.6	.2	37.56	40	-2.44	347	118	V
1	51.0252	47.97	Qp	14.3	-31.5	.3	31.07	40	-8.93	360	365	H
5	51.0532	53.34	Qp	14.3	-31.5	.3	36.44	40	-3.56	33	113	V
6	62.825	49.55	Qp	14	-31.3	.3	32.55	40	-7.45	303	143	V
2	68.7597	45.47	Qp	14.3	-31.3	.3	28.77	40	-11.23	51	185	H
7	72.0234	47.4	Qp	14.3	-31.2	.3	30.8	40	-9.2	92	123	V
3	75.2506	44.89	Qp	14.3	-31.2	.3	28.29	40	-11.71	62	229	H
8	120.0088	46.24	Qp	20	-30.8	.3	35.74	43.52	-7.78	282	104	V

Qp - Quasi-Peak detector

TX SPURIOUS EMISSION 140 TO 1000 MHz

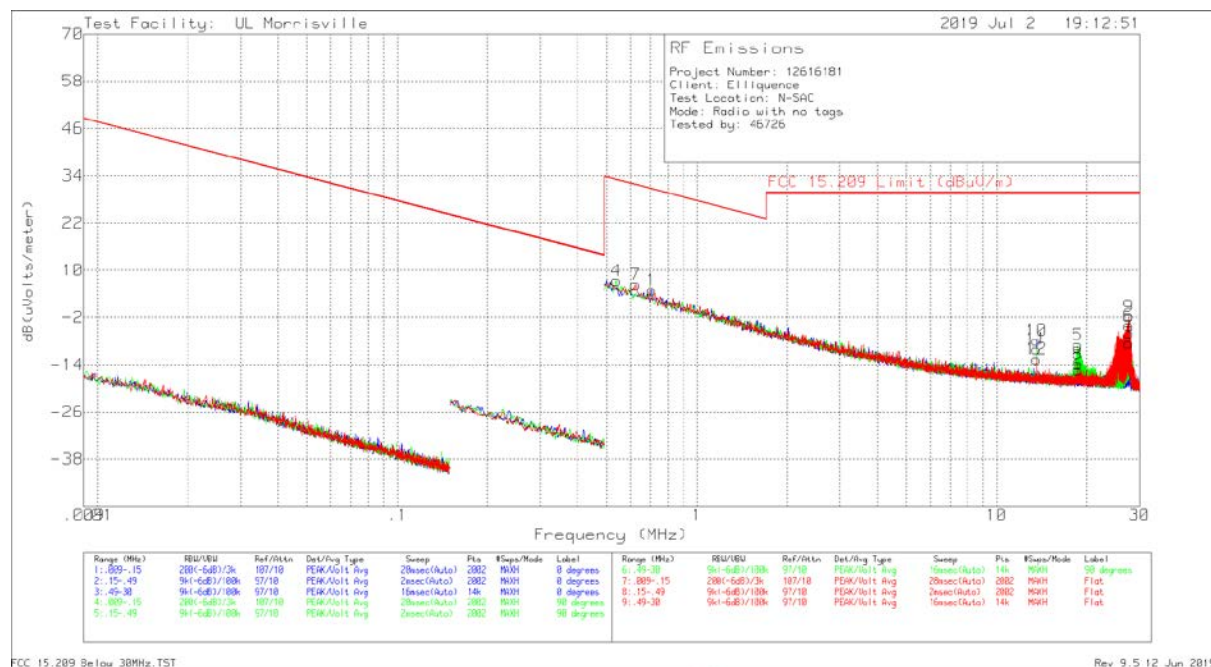


Markers	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
5	311.8799	47.23	Qp	20.4	-29.3	38.33	46.02	-7.69	4	203	V
1	311.8987	51.27	Qp	20.4	-29.3	42.37	46.02	-3.65	163	107	H
2	338.9931	51.92	Qp	20.8	-29.2	43.52	46.02	-2.5	223	103	H
6	339.0013	47.72	Qp	20.8	-29.2	39.32	46.02	-6.7	263	173	V
7	384.0009	49.47	Qp	21.8	-29	42.27	46.02	-3.75	22	153	V
3	384.0095	49.55	Qp	21.8	-29	42.35	46.02	-3.67	249	104	H
8	431.9985	45.8	Qp	22.9	-28.6	40.1	46.02	-5.92	8	127	V
4	767.9997	40.35	Qp	27.5	-27.4	40.45	46.02	-5.57	276	101	H

Qp - Quasi-Peak detector

No Tag

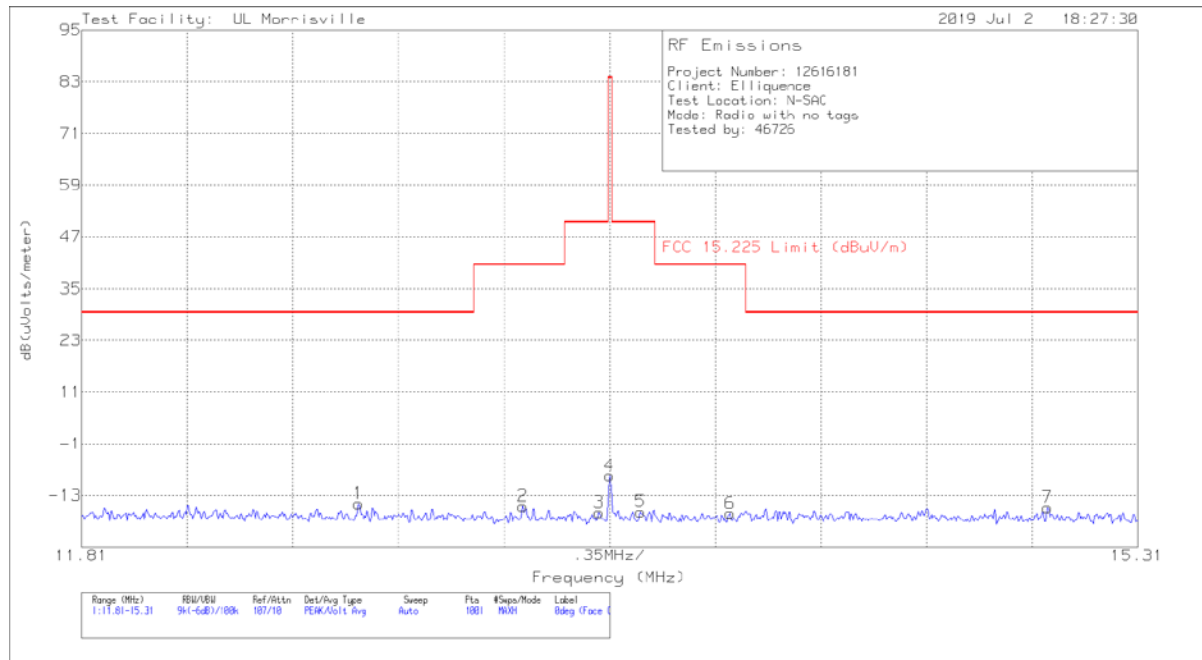
TX SPURIOUS EMISSION 9 kHz TO 30 MHz



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.209 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
4	.53848	36.37	Pk	10.8	.1	-40	7.27	32.98	-25.71	0-360
7	.6228	35.46	Pk	10.8	.1	-40	6.36	31.72	-25.36	0-360
1	.70712	34.02	Pk	10.8	.1	-40	4.92	30.61	-25.69	0-360
10	13.56171	21.11	Pk	10.4	.6	-40	-7.89	29.54	-37.43	0-360
11	13.56171	18.97	Pk	10.4	.6	-40	-10.03	29.54	-39.57	0-360
12	13.56382	16.42	Pk	10.4	.6	-40	-12.58	29.54	-42.12	0-360
2	18.6441	14.12	Pk	10	.7	-40	-15.18	29.54	-44.72	0-360
8	18.6462	15.51	Pk	10	.7	-40	-13.79	29.54	-43.33	0-360
5	18.66518	20.37	Pk	10	.7	-40	-8.93	29.54	-38.47	0-360
9	27.59677	28.79	Pk	8.5	.9	-40	-1.81	29.54	-31.35	0-360
3	27.59888	22.15	Pk	8.5	.9	-40	-8.45	29.54	-37.99	0-360
6	27.59888	26.63	Pk	8.5	.9	-40	-3.97	29.54	-33.51	0-360

Pk - Peak detector

Fundamental (0 degrees)

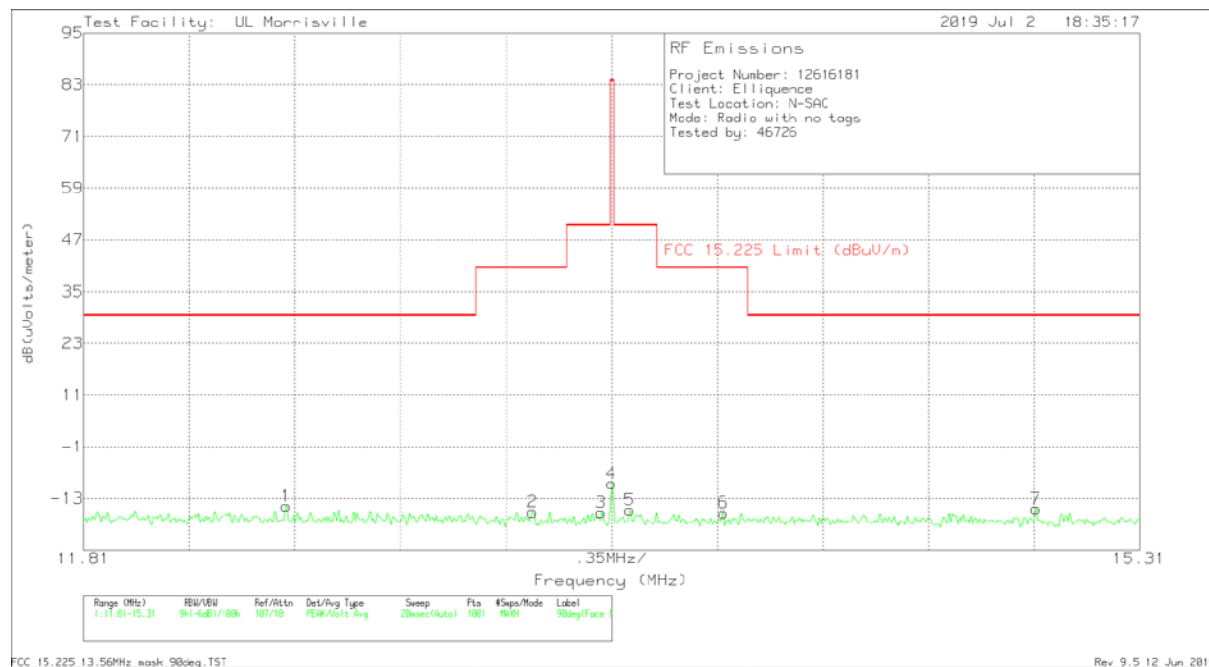


Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	12.727	14.14	Pk	10.4	.6	-40	-14.86	29.5	-44.36	313
2	13.273	13.55	Pk	10.4	.6	-40	-15.45	40.5	-55.95	313
3	13.525	12.1	Pk	10.4	.6	-40	-16.9	50.5	-67.4	313
4	13.56	20.6	Pk	10.4	.6	-40	-8.4	84	-92.4	313
5	13.6615	12.26	Pk	10.4	.6	-40	-16.74	50.5	-67.24	313
6	13.959	11.91	Pk	10.4	.6	-40	-17.09	40.5	-57.59	313
7	15.0125	13.27	Pk	10.3	.7	-40	-15.73	29.5	-45.23	313

Pk - Peak detector

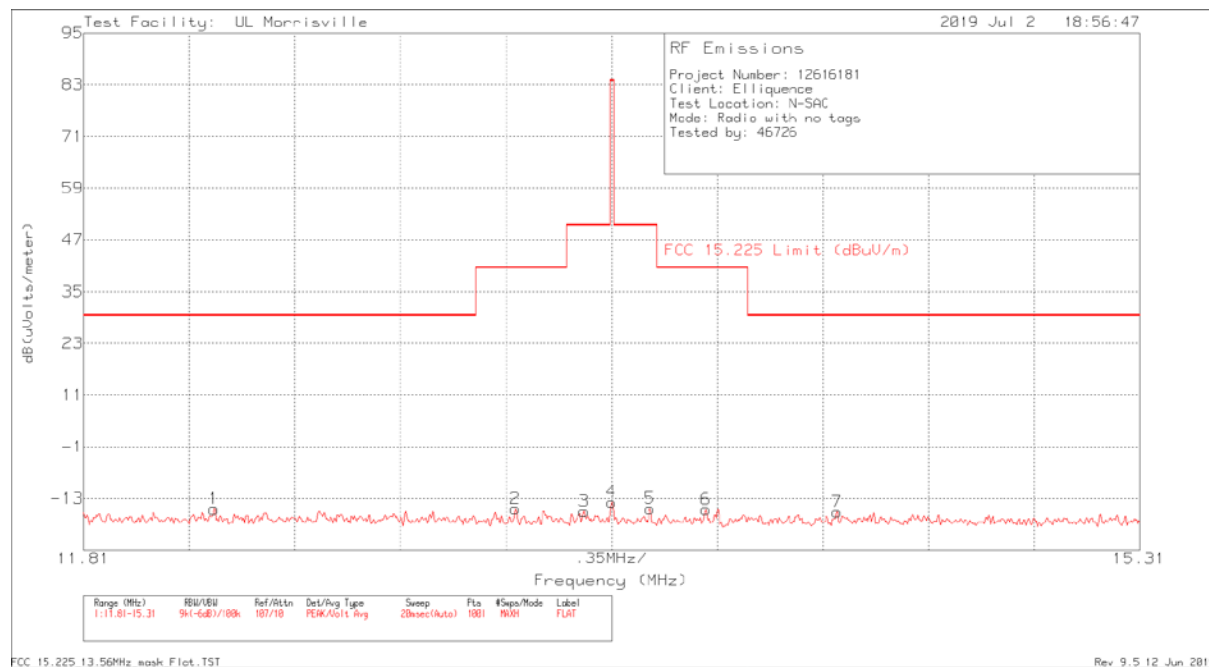
Fundamental (90 degrees)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	12.48025	14.14	Pk	10.5	.6	-40	-14.76	29.5	-44.26	351
2	13.2975	12.85	Pk	10.4	.6	-40	-16.15	40.5	-56.65	351
3	13.525	12.78	Pk	10.4	.6	-40	-16.22	50.5	-66.72	351
4	13.56	19.5	Pk	10.4	.6	-40	-9.5	84	-93.5	351
5	13.6195	13.37	Pk	10.4	.6	-40	-15.63	50.5	-66.13	351
6	13.931	12.68	Pk	10.4	.6	-40	-16.32	40.5	-56.82	351
7	14.967	13.66	Pk	10.3	.7	-40	-15.34	29.5	-44.84	351

Pk - Peak detector

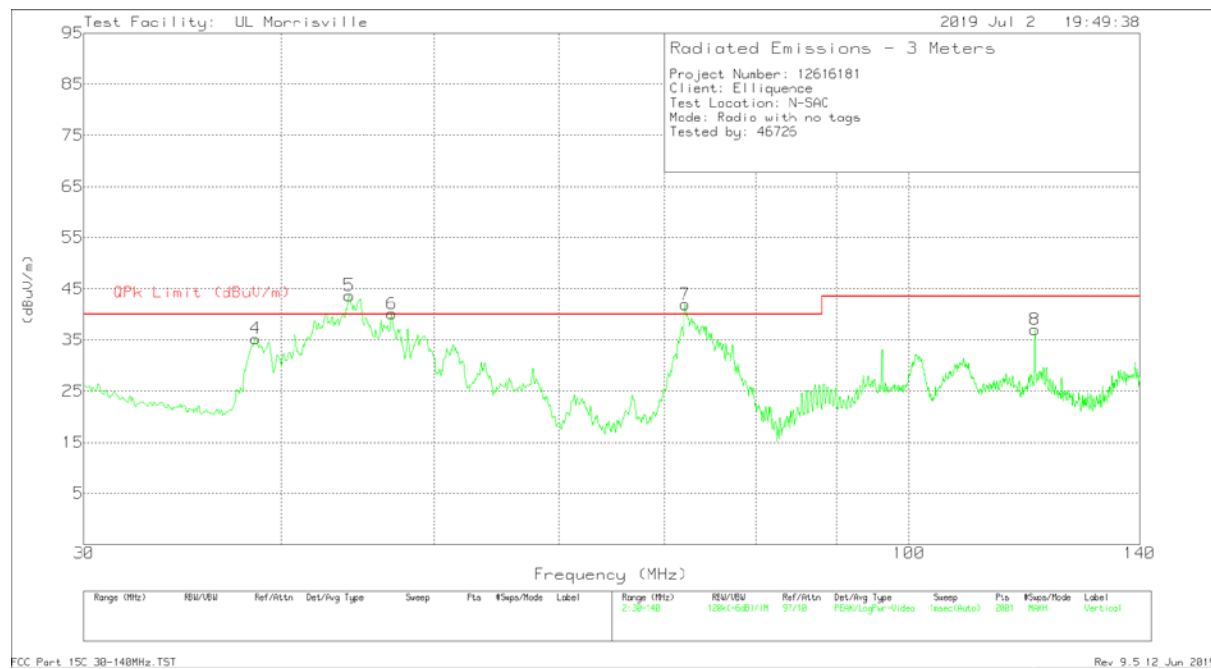
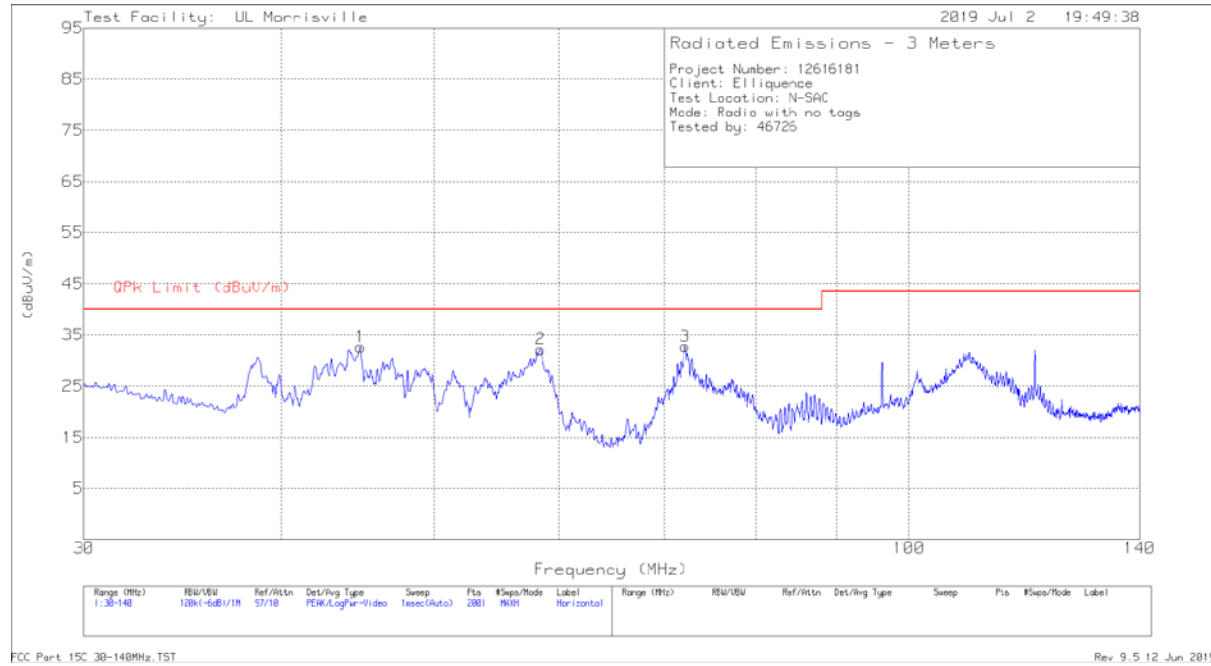
Fundamental (Parallel to GRP)



Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	12.2405	13.48	Pk	10.5	.6	-40	-15.42	29.5	-44.92	42
2	13.2415	13.62	Pk	10.4	.6	-40	-15.38	40.5	-55.88	42
3	13.469	13.06	Pk	10.4	.6	-40	-15.94	50.5	-66.44	42
4	13.56	15.17	Pk	10.4	.6	-40	-13.83	84	-97.83	42
5	13.686	13.68	Pk	10.4	.6	-40	-15.32	50.5	-65.82	42
6	13.8715	13.47	Pk	10.4	.6	-40	-15.53	40.5	-56.03	42
7	14.30725	12.94	Pk	10.4	.6	-40	-16.06	29.5	-45.56	42

Pk - Peak detector

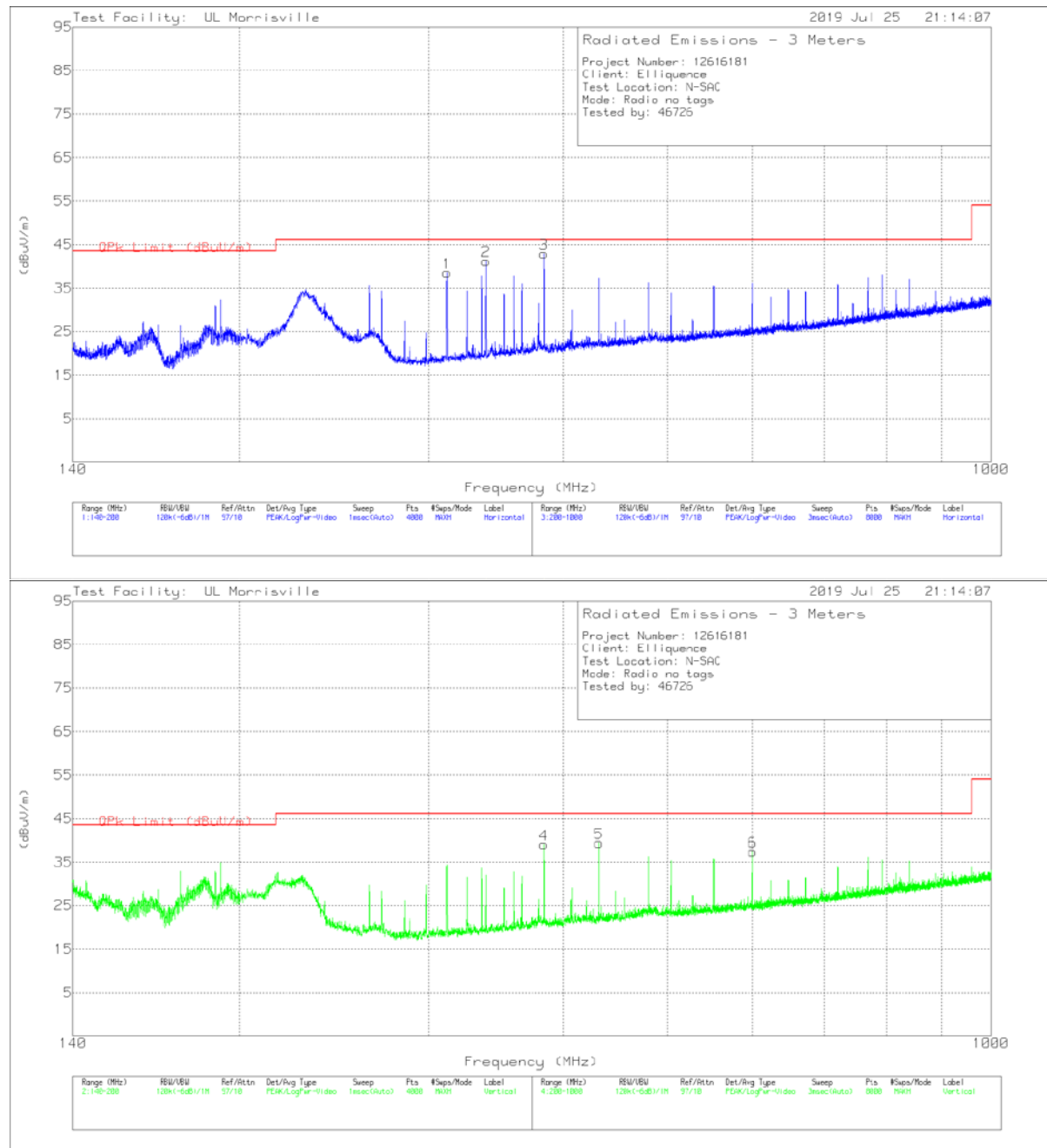
TX SPURIOUS EMISSION 30 TO 140 MHz



Markers	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	38.4837	39.48	Qp	21.6	-31.6	.3	29.78	40	-10.22	10	101	V
1	44.7149	44.55	Qp	17.2	-31.5	.3	30.55	40	-9.45	303	337	H
5	44.715	53.63	Qp	17.2	-31.5	.3	39.63	40	-.37	0	105	V
6	46.9192	51.38	Qp	15.9	-31.5	.3	36.08	40	-3.92	27	112	V
2	58.2501	43.62	Qp	13.8	-31.4	.3	26.32	40	-13.68	196	385	H
7	71.998	55.42	Qp	14.3	-31.2	.3	38.82	40	-1.18	96	109	V
3	72.0004	47.55	Qp	14.3	-31.2	.3	30.95	40	-9.05	75	239	H
8	120.0044	45.44	Qp	20	-30.8	.3	34.94	43.52	-8.58	294	110	V

Qp - Quasi-Peak detector

TX SPURIOUS EMISSION 140 TO 1000 MHz



Markers	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	311.9892	46.74	Qp	20.4	-29.3	37.84	46.02	-8.18	121	101	H
2	338.9946	49.68	Qp	20.8	-29.2	41.28	46.02	-4.74	322	103	H
3	383.9994	49.75	Qp	21.8	-29	42.55	46.02	-3.47	246	104	H
4	383.9999	48.81	Qp	21.8	-29	41.61	46.02	-4.41	36	133	V
5	431.9952	45.6	Qp	22.9	-28.6	39.9	46.02	-6.12	26	117	V
6	600.0019	40.02	Qp	25.4	-28.2	37.22	46.02	-8.8	349	102	V

Qp - Quasi-Peak detector

9. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency, over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

IC RSS-210, Annex B.6

Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

TEST PROCEDURE

ANSI C63.10-2013 Clause 6.8

RESULTS

No non-compliance noted.

Startup

Reference Frequency: EUT Channel 13.56 MHz @ 20°C				
Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
120.00	50	13.5600290	4.720	± 100
120.00	40	13.5600480	3.319	± 100
120.00	30	13.5600730	1.475	± 100
120.00	20	13.5600930	0.000	± 100
120.00	10	13.5601070	-1.032	± 100
120.00	0	13.5600950	-0.147	± 100
120.00	-10	13.5600790	1.032	± 100
120.00	-20	13.5601020	-0.664	± 100
138.00	20	13.5600260	4.941	± 100
102	20	13.5600300	4.646	± 100

2 Minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20°C				
Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
120.00	50	13.5600260	4.425	± 100
120.00	40	13.5600420	3.245	± 100
120.00	30	13.5600650	1.549	± 100
120.00	20	13.5600860	0.000	± 100
120.00	10	13.5601020	-1.180	± 100
120.00	0	13.5600980	-0.885	± 100
120.00	-10	13.5600850	0.074	± 100
120	-20	13.5601430	-4.204	± 100
138.00	20	13.5600340	3.835	± 100
102	20	13.5600360	3.687	± 100

5 Minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20°C				
Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
120.00	50	13.5600230	4.277	± 100
120.00	40	13.5600370	3.245	± 100
120.00	30	13.5600580	1.696	± 100
120.00	20	13.5600810	0.000	± 100
120.00	10	13.5600990	-1.327	± 100
120.00	0	13.5601030	-1.622	± 100
120.00	-10	13.5600900	-0.664	± 100
120	-20	13.5600920	-0.811	± 100
138.00	20	13.5600480	2.434	± 100
102	20	13.5600640	1.254	± 100

10 Minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20°C				
Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
120.00	50	13.5600220	3.982	± 100
120.00	40	13.5600320	3.245	± 100
120.00	30	13.5600520	1.770	± 100
120.00	20	13.5600760	0.000	± 100
120.00	10	13.5600960	-1.475	± 100
120.00	0	13.5601110	-2.581	± 100
120.00	-10	13.5600920	-1.180	± 100
120	-20	13.5600770	-0.074	± 100
138.00	20	13.5600640	0.885	± 100
102	20	13.5600610	1.106	± 100

TEST INFORMATION

Test Date: 2019-07-01
Tested By: 83471/44389

10. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207

IC RSS-GEN, Section 8.8

(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 50 μ H/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 range (MHz)	Limits (dB μ V)	
	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
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

TEST PROCEDURE

ANSI C63.10:2013

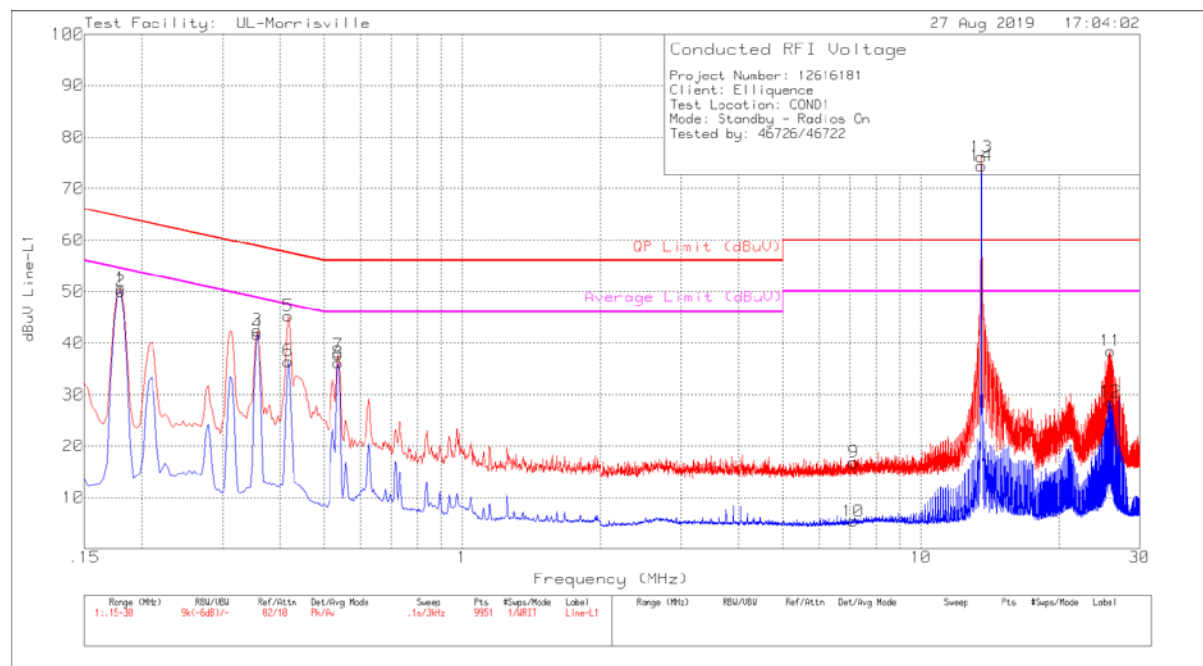
RESULTS

No non-compliance noted:

10.1. RFID

10.1.1. NORMAL OPERATION

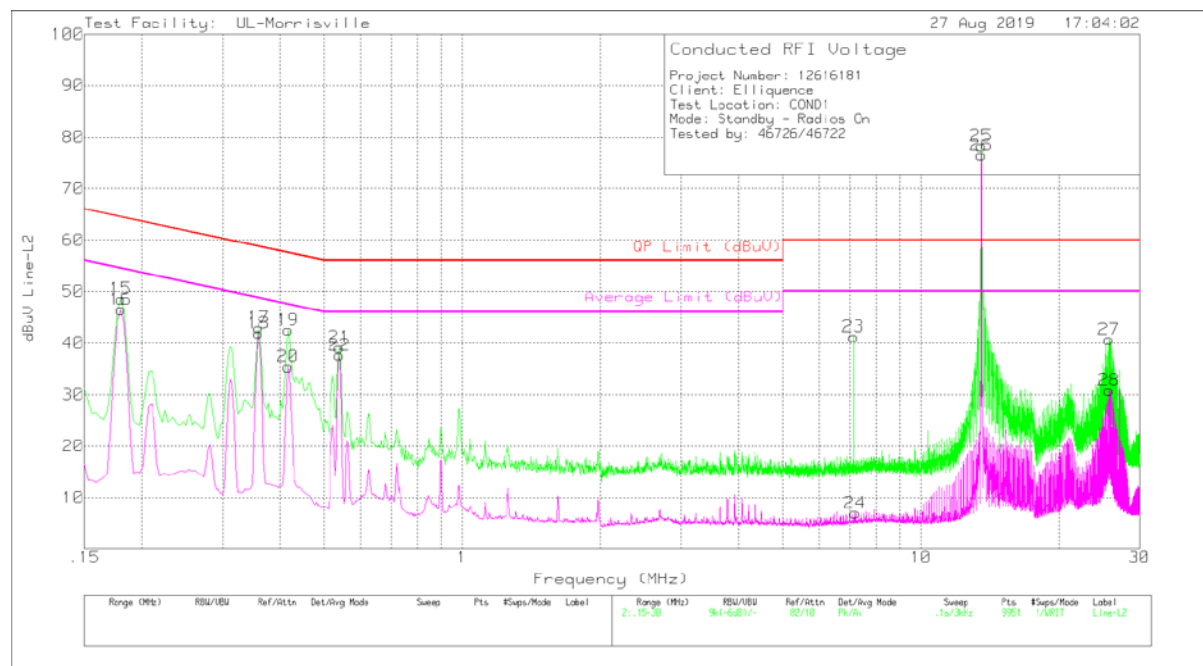
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.18025	37.1	Qp	.2	10	47.3	64.47	-17.17	-	-
2	.18025	36.44	Ca	.2	10	46.64	-	-	54.47	-7.83
3	.357	32.4	Pk	.1	10	42.5	58.8	-16.3	-	-
4	.357	31.67	Av	.1	10	41.77	-	-	48.8	-7.03
5	.417	35.17	Pk	.1	10	45.27	57.51	-12.24	-	-
6	.417	26.4	Av	.1	10	36.5	-	-	47.51	-11.01
7	.537	27.69	Pk	.1	10	37.79	56	-18.21	-	-
8	.537	26.1	Av	.1	10	36.2	-	-	46	-9.8
9	7.134	6.55	Pk	.1	10.2	16.85	60	-43.15	-	-
10	7.122	-4.9	Av	.1	10.2	5.4	-	-	50	-44.6
11	25.959	27.46	Pk	.3	10.7	38.46	60	-21.54	-	-
12	25.959	17.52	Av	.3	10.7	28.52	-	-	50	-21.48
13	13.56	65.66	Pk	.1	10.4	76.16	60	16.16	-	-
14	13.56	63.95	Av	.1	10.4	74.45	-	-	50	24.45

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector
Ca - CISPR average detection

LINE 2 RESULTS

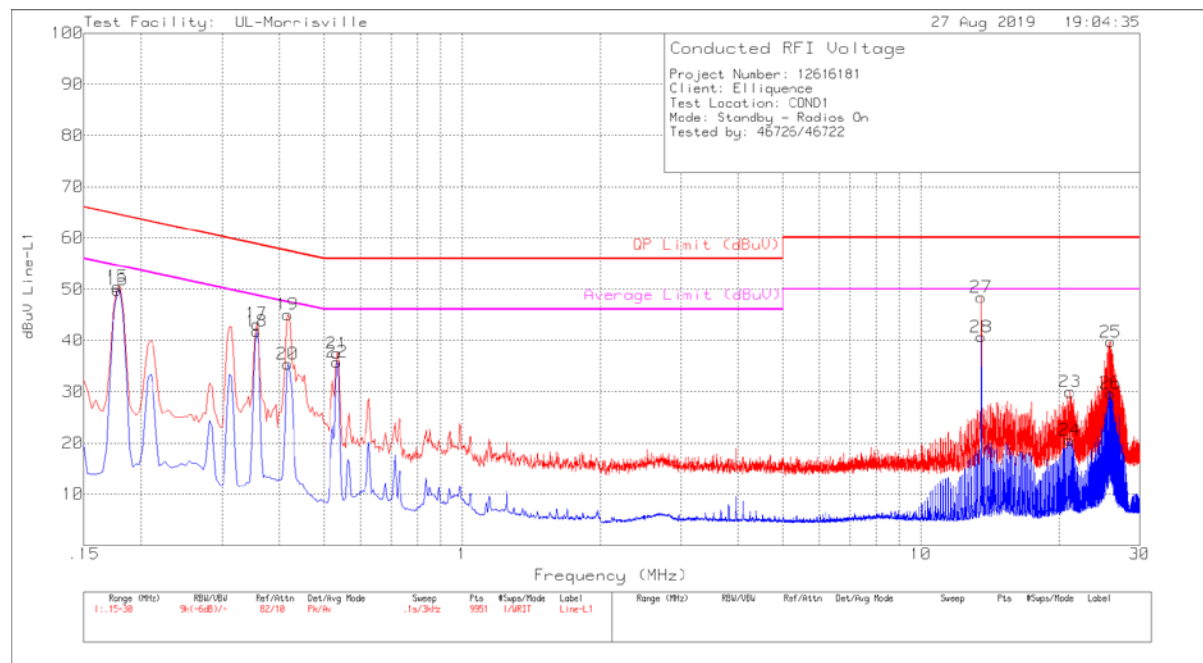


Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
15	.18	38.37	Pk	.2	10	48.57	64.49	-15.92	-	-
16	.18	36.33	Av	.2	10	46.53	-	-	54.49	-7.96
17	.3596	31.75	Qp	.1	10	41.85	58.74	-16.89	-	-
18	.3596	31.87	Ca	.1	10	41.97	-	-	48.74	-6.77
19	.417	32.45	Pk	.1	10	42.55	57.51	-14.96	-	-
20	.417	25.33	Av	.1	10	35.43	-	-	47.51	-12.08
21	.54	29.17	Pk	0	10	39.17	56	-16.83	-	-
22	.54	27.66	Av	0	10	37.66	-	-	46	-8.34
23	7.131	30.95	Pk	.1	10.2	41.25	60	-18.75	-	-
24	7.191	-3.3	Av	.1	10.2	7	-	-	50	-43
25	13.56	67.78	Pk	.1	10.4	78.28	60	18.28	-	-
26	13.56	66.02	Av	.1	10.4	76.52	-	-	50	26.52
27	25.74	29.83	Pk	.2	10.7	40.73	60	-19.27	-	-
28	25.74	19.94	Av	.2	10.7	30.84	-	-	50	-19.16

Pk - Peak detector
Qp - Quasi-Peak detector
Av - Average detection
Ca - CISPR average detection

10.1.2. NORMAL OPERATION WITH ANTENNA PORT TERMINATED

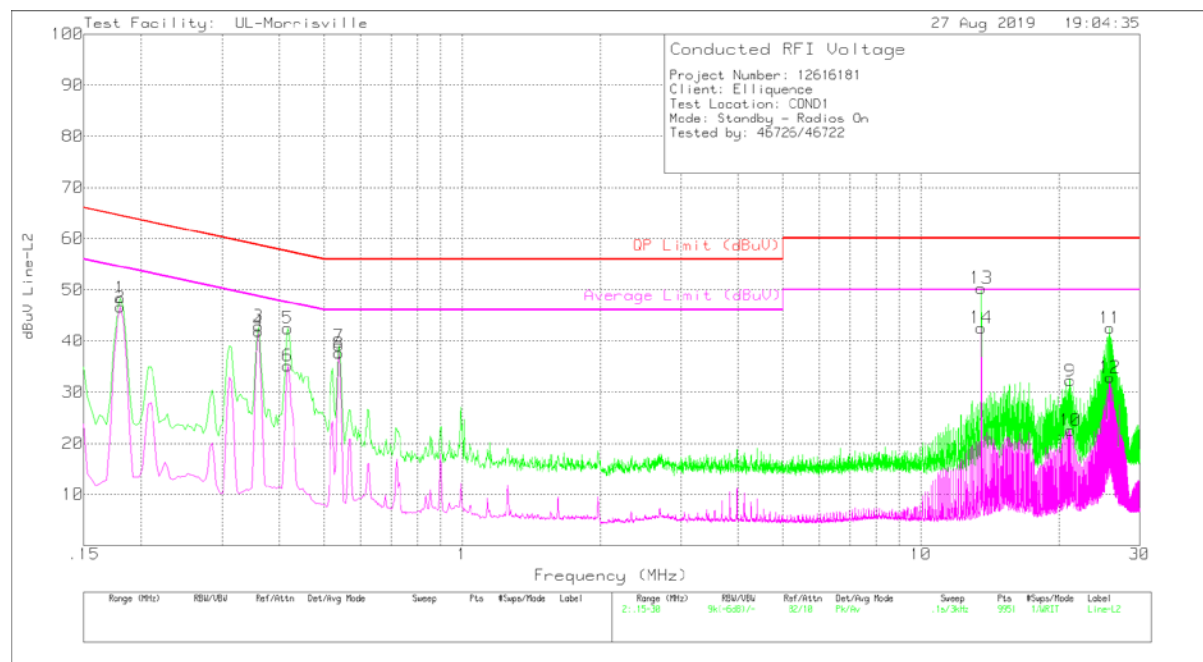
LINE 1 RESULTS



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
15	.17999	40.52	Qp	.2	10	50.72	64.49	-13.77	-	-
16	.17999	40.66	Ca	.2	10	50.86	-	-	54.49	-3.63
17	.357	33.12	Pk	.1	10	43.22	58.8	-15.58	-	-
18	.357	31.69	Av	.1	10	41.79	-	-	48.8	-7.01
19	.417	34.97	Pk	.1	10	45.07	57.51	-12.44	-	-
20	.417	25.34	Av	.1	10	35.44	-	-	47.51	-12.07
21	.534	27.42	Pk	.1	10	37.52	56	-18.48	-	-
22	.534	25.71	Av	.1	10	35.81	-	-	46	-10.19
23	21.162	19.16	Pk	.2	10.6	29.96	60	-30.04	-	-
24	21.144	9.71	Av	.2	10.6	20.51	-	-	50	-29.49
25	25.956	28.75	Pk	.3	10.7	39.75	60	-20.25	-	-
26	25.956	18.69	Av	.3	10.7	29.69	-	-	50	-20.31
27	13.56	37.96	Pk	.1	10.4	48.46	60	-11.54	-	-
28	13.56	30.18	Av	.1	10.4	40.68	-	-	50	-9.32

Pk - Peak detector
Qp - Quasi-Peak detector
Av - Average detection
Ca - CISPR average detection

LINE 2 RESULTS



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit (dBuV)	Margin (dB)	Average Limit (dBuV)	Margin (dB)
1	.18	38.25	Pk	.2	10	48.45	64.49	-16.04	-	-
2	.18	36.37	Av	.2	10	46.57	-	-	54.49	-7.92
3	.36	32.78	Pk	.1	10	42.88	58.73	-15.85	-	-
4	.36	31.85	Av	.1	10	41.95	-	-	48.73	-6.78
5	.417	32.4	Pk	.1	10	42.5	57.51	-15.01	-	-
6	.417	25.1	Av	.1	10	35.2	-	-	47.51	-12.31
7	.54	29.12	Pk	0	10	39.12	56	-16.88	-	-
8	.54	27.61	Av	0	10	37.61	-	-	46	-8.39
9	21.159	21.42	Pk	.2	10.6	32.22	60	-27.78	-	-
10	21.177	11.71	Av	.2	10.6	22.51	-	-	50	-27.49
11	25.848	31.65	Pk	.2	10.7	42.55	60	-17.45	-	-
12	25.848	21.98	Av	.2	10.7	32.88	-	-	50	-17.12
13	13.56	39.83	Pk	.1	10.4	50.33	60	-9.67	-	-
14	13.56	32.09	Av	.1	10.4	42.59	-	-	50	-7.41

Pk - Peak detector
Av - Average detection