CERTIFICATION TEST REPORT

Report Number. : R12616181-E1

Applicant	:	ELLIQUENCE LLC 2455 GRAND AVE BALDWIN, NY 11510-3556
Model	:	SURGI-MAX ULTRA
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

Prepared by:
UL LLC
12 Laboratory Dr.
Research Triangle Park, NC 27709 U.S.A.
TEL: (919) 549-1400

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

TABLE OF CONTENTS

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 ULTRA

SERIAL NUMBER: 1F130025

DATE TESTED: 2019-06-28 to 2019-08-27

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
UL LLC By:

Bart Mucha
Staff Engineer
Consumer Technology Division
UL LLC

Prepared By:

Richard Jankovics
Operations Leader
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 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 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 dBuV + 0 dB +10.1 dB+ 0 dB = 46.6 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 Ultra, 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 emisisons.

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
Load Resistor	N/A	N/A	N/A	N/A
Neutral Plate	Elliquence	N/A	N/A	N/A

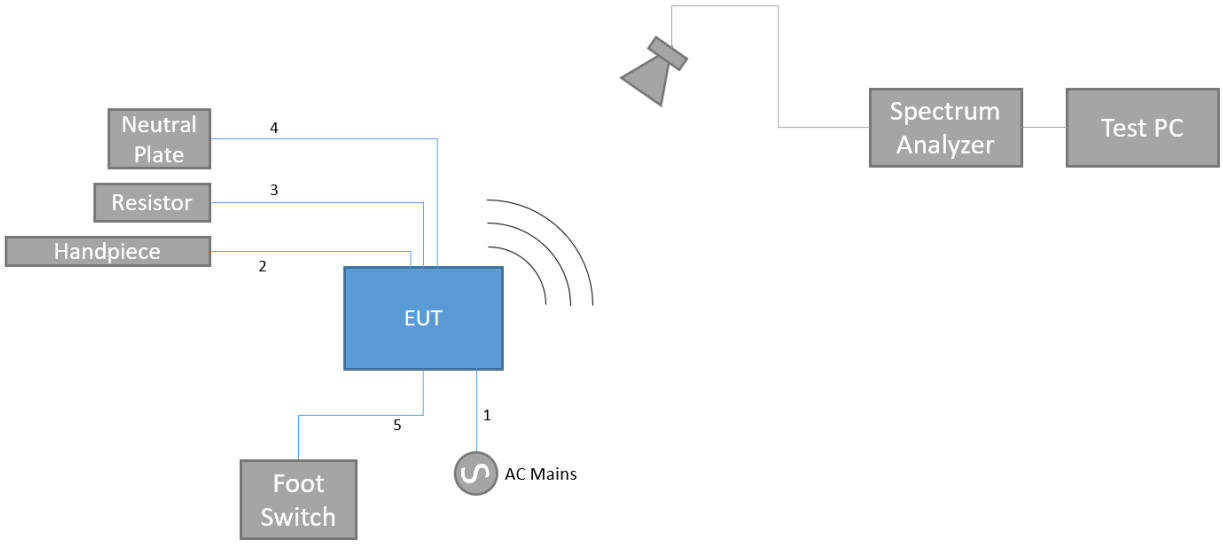
I/O CABLES

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 load 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

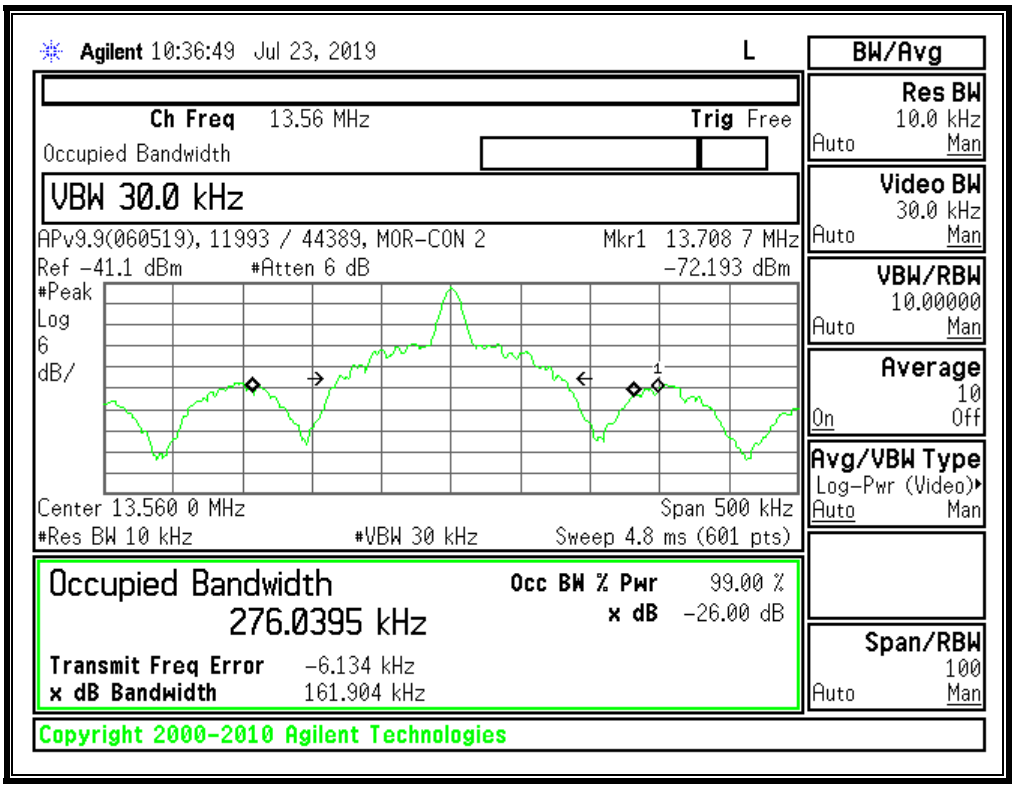
None; for reporting purposes only.

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

Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
13.56	276.04	67.0

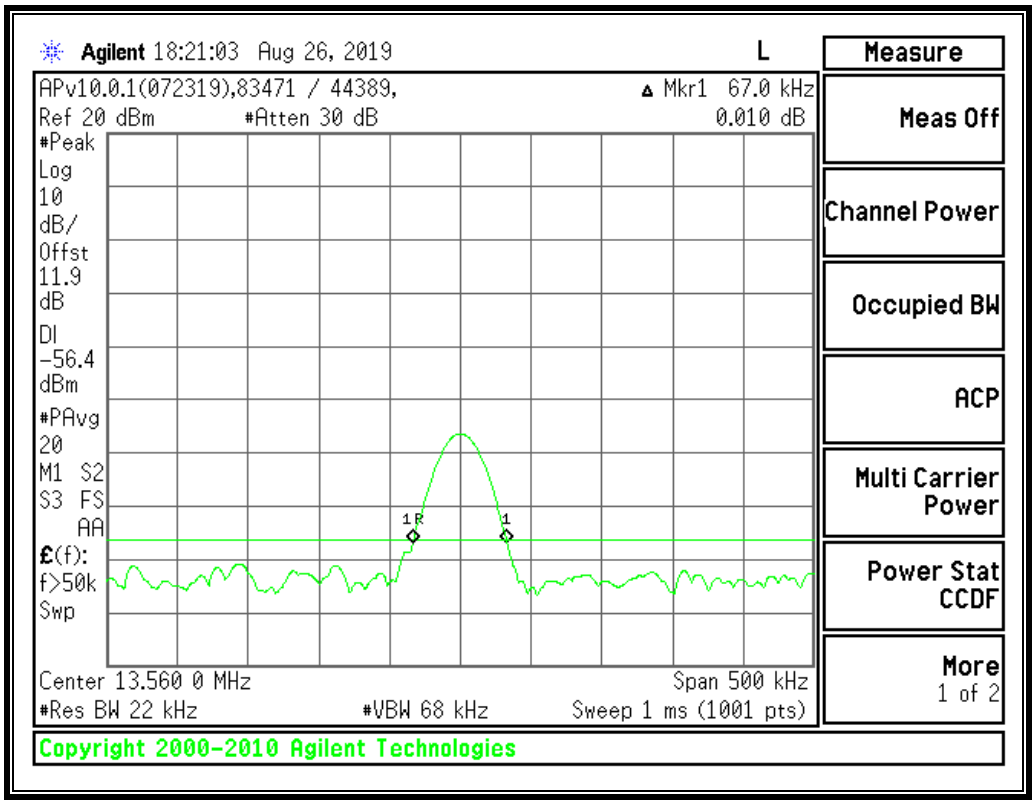
7.1. 99% BANDWIDTH PLOT



TEST INFORMATION

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

7.2. 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 filed strength from uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/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.

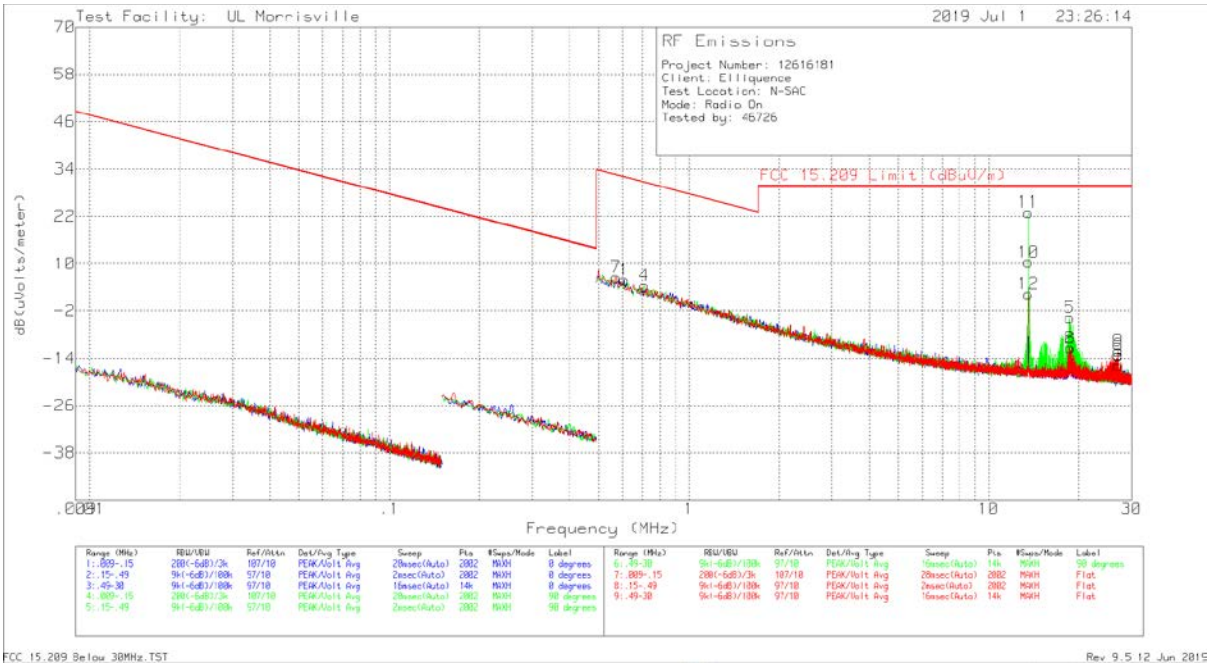
Since the EUT contains a digital device operating at 4 MHz, the frequency range was expanded to 1 GHz, as specified in the following table.

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

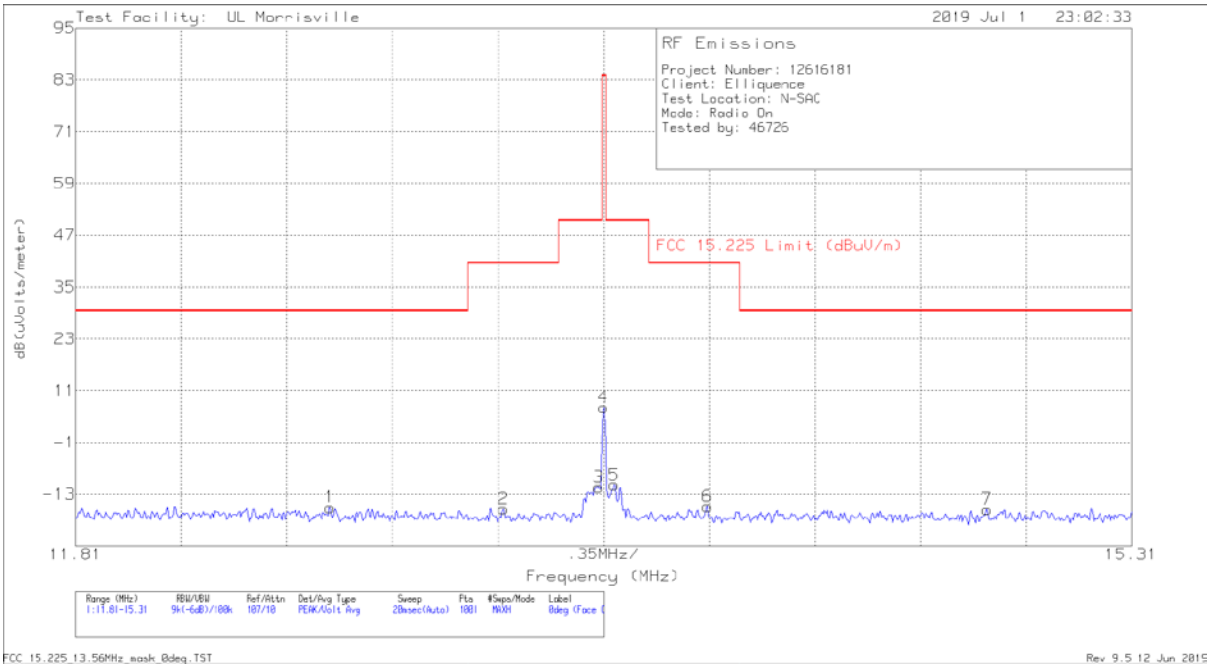
TX SPURIOUS EMISSION 9 kHz TO 30 MHz



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)
7	.57221	35.65	Pk	10.8	.1	-40	6.55	32.45	-25.9	0-360
1	.60805	35	Pk	10.8	.1	-40	5.9	31.93	-26.03	0-360
4	.70923	33.49	Pk	10.8	.1	-40	4.39	30.59	-26.2	0-360
10	13.5596	39.36	Pk	10.4	.6	-40	10.36	29.54	-19.18	0-360
11	13.5596	52.04	Pk	10.4	.6	-40	23.04	29.54	-6.5	0-360
12	13.5596	31.3	Pk	10.4	.6	-40	2.3	29.54	-27.24	0-360
5	18.6968	25.58	Pk	10	.7	-40	-3.72	29.54	-33.26	0-360
2	18.71366	17.96	Pk	10	.7	-40	-11.34	29.54	-40.88	0-360
8	18.71788	17.96	Pk	10	.7	-40	-11.34	29.54	-40.88	0-360
3	27.12142	14.68	Pk	8.6	.9	-40	-15.82	29.54	-45.36	0-360
6	27.12247	17.36	Pk	8.6	.9	-40	-13.14	29.54	-42.68	0-360
9	27.12247	18.33	Pk	8.6	.9	-40	-12.17	29.54	-41.71	0-360

Pk - Peak detector

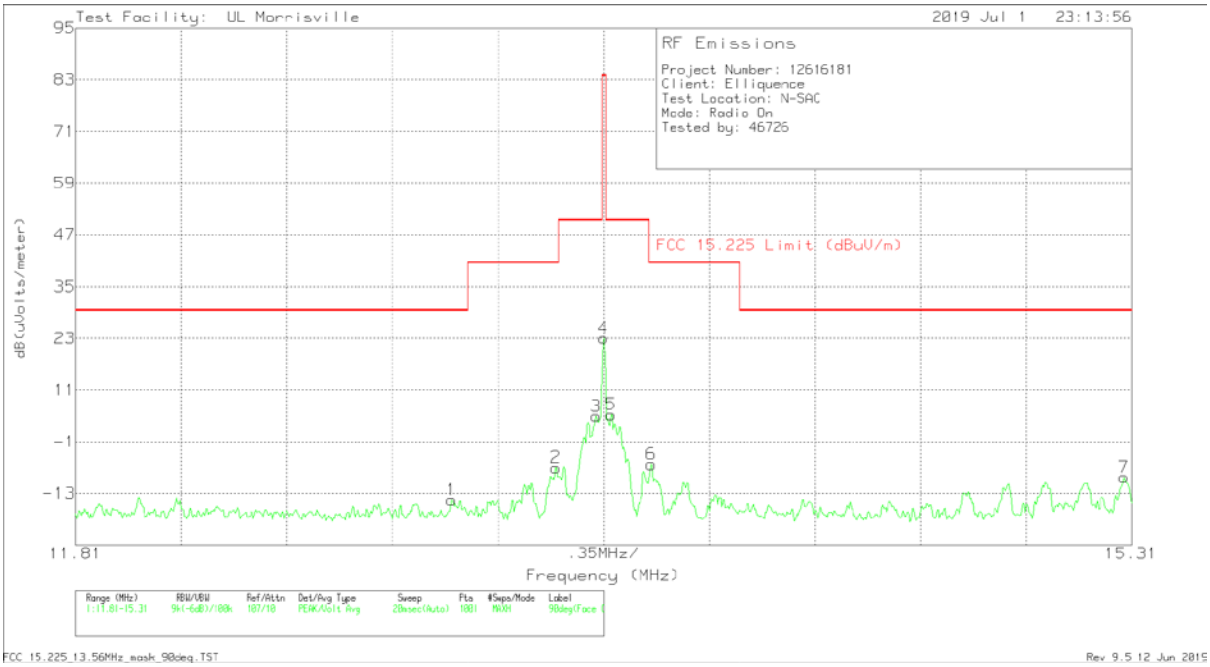
Fundamental (0 degrees)



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	12.6535	12.99	Pk	10.4	.6	-40	-16.01	29.5	-45.51	272
2	13.2275	12.6	Pk	10.4	.6	-40	-16.4	40.5	-56.9	272
3	13.5425	17.62	Pk	10.4	.6	-40	-11.38	50.5	-61.88	272
4	13.56	36.17	Pk	10.4	.6	-40	7.17	84	-76.83	272
5	13.595	18.18	Pk	10.4	.6	-40	-10.82	50.5	-61.32	272
6	13.903	13.19	Pk	10.4	.6	-40	-15.81	40.5	-56.31	272
7	14.8305	12.52	Pk	10.3	.7	-40	-16.48	29.5	-45.98	272

Pk - Peak detector

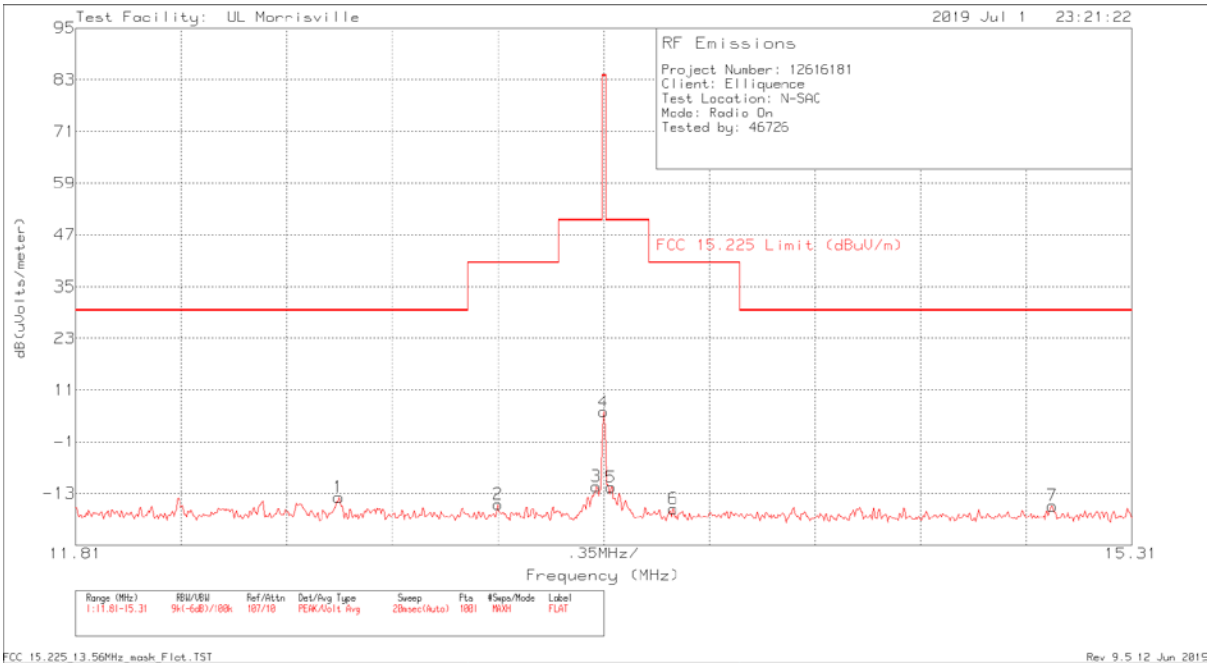
Fundamental (90 degrees)



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	13.056	14.54	Pk	10.4	.6	-40	-14.46	29.5	-43.96	177
2	13.40075	22.01	Pk	10.4	.6	-40	-6.99	40.5	-47.49	177
3	13.5355	33.95	Pk	10.4	.6	-40	4.95	50.5	-45.55	177
4	13.56	52.05	Pk	10.4	.6	-40	23.05	84	-60.95	177
5	13.5845	34.29	Pk	10.4	.6	-40	5.29	50.5	-45.21	177
6	13.7175	22.78	Pk	10.4	.6	-40	-6.22	40.5	-46.72	177
7	15.2855	19.73	Pk	10.3	.7	-40	-9.27	29.5	-38.77	177

Pk - Peak detector

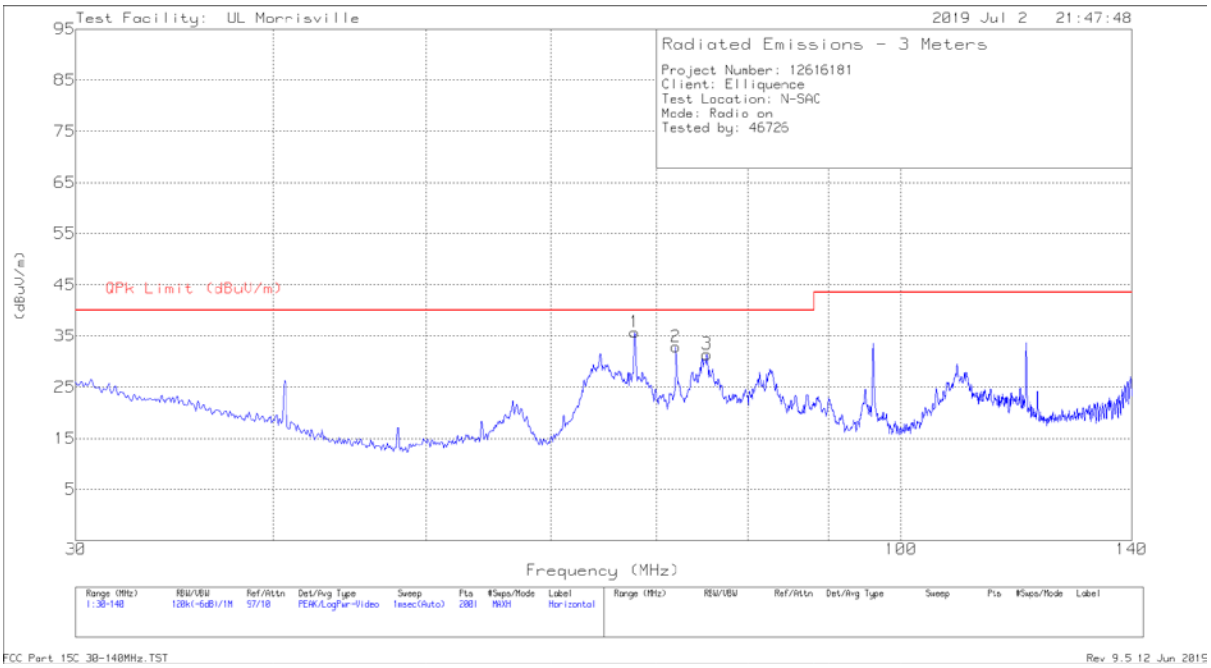
Fundamental (Parallel to GRP)



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	12.6815	15.11	Pk	10.4	.6	-40	-13.89	29.5	-43.39	344
2	13.21	13.45	Pk	10.4	.6	-40	-15.55	40.5	-56.05	344
3	13.5355	17.64	Pk	10.4	.6	-40	-11.36	50.5	-61.86	344
4	13.56	34.95	Pk	10.4	.6	-40	5.95	84	-78.05	344
5	13.5845	17.44	Pk	10.4	.6	-40	-11.56	50.5	-62.06	344
6	13.791	12.5	Pk	10.4	.6	-40	-16.5	40.5	-57	344
7	15.0475	13.14	Pk	10.3	.7	-40	-15.86	29.5	-45.36	344

Pk - Peak detector

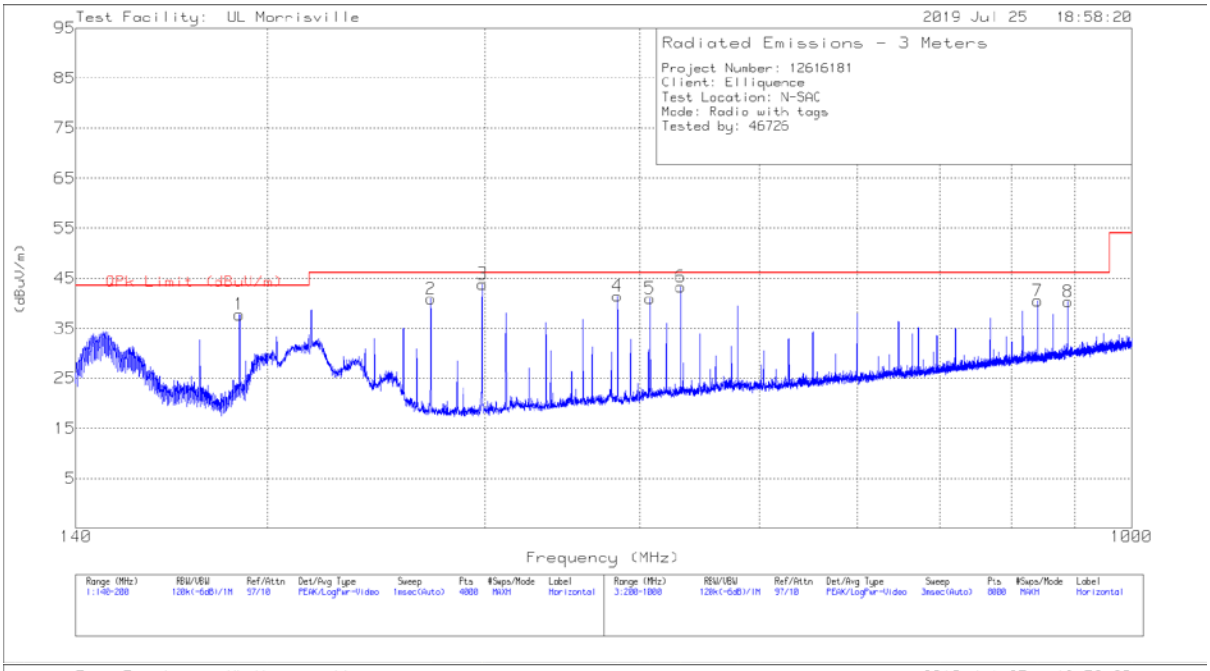
TX SPURIOUS EMISSION 30 TO 140 MHz

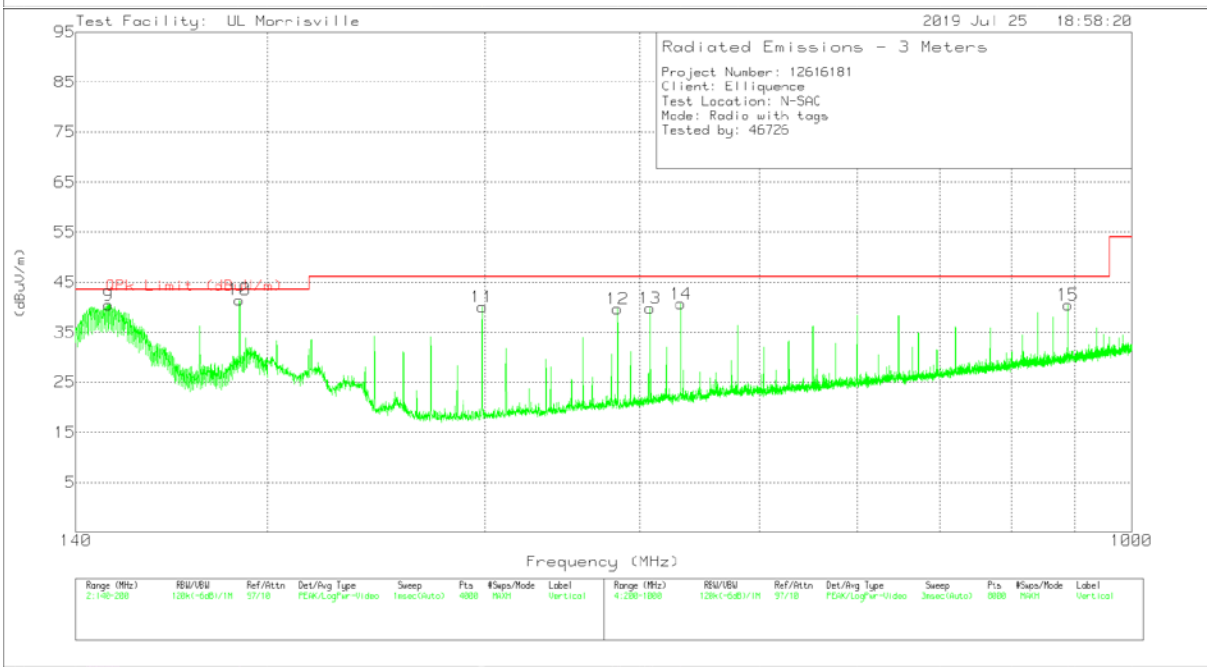


Markers	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	40.6734	43.44	Qp	20	-31.6	.3	32.14	40	-7.86	14	106	V
1	67.7783	50.34	Qp	14.3	-31.3	.3	33.64	40	-6.36	55	299	H
5	67.7965	55.52	Qp	14.3	-31.3	.3	38.82	40	-1.18	306	108	V
2	71.9994	46.94	Qp	14.3	-31.2	.3	30.34	40	-9.66	186	225	H
3	75.3219	42.53	Qp	14.3	-31.2	.3	25.93	40	-14.07	70	240	H
6	96.0005	55.13	Qp	15.2	-31	.3	39.63	43.52	-3.89	334	102	V
7	120.0026	49	Qp	20	-30.8	.3	38.5	43.52	-5.02	268	102	V

Qp - Quasi-Peak detector

TX SPURIOUS EMISSION 140 TO 1000 MHz



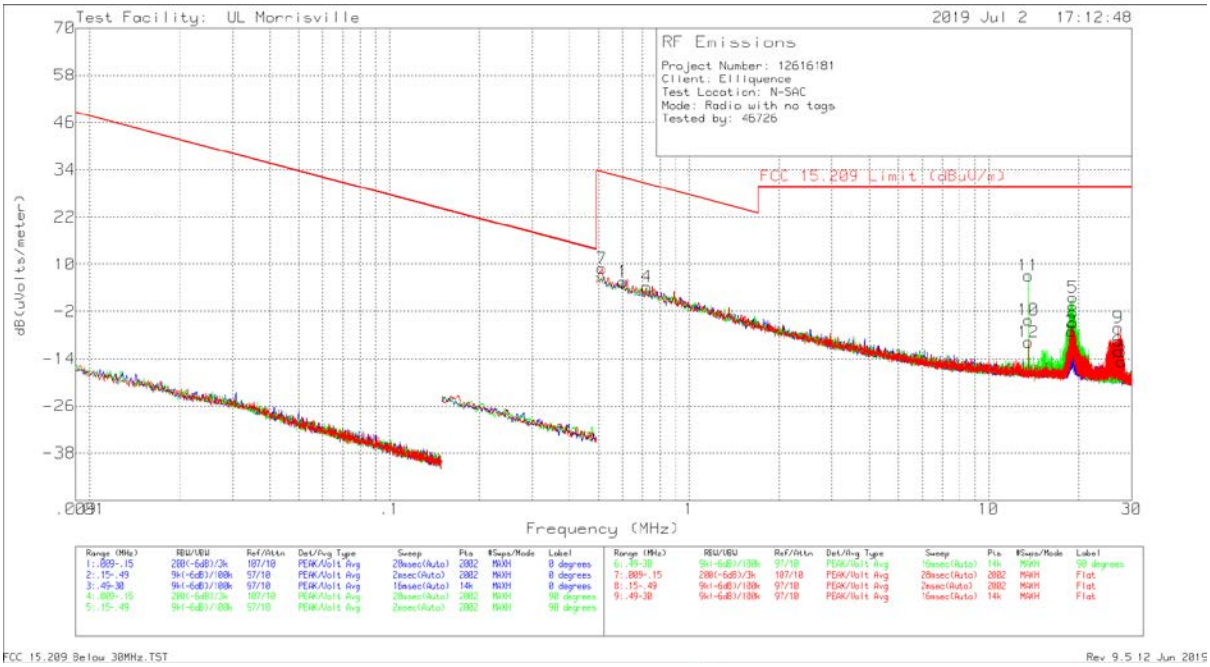


Markers	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
9	147.7523	50.28	Qp	19	-30.5	38.78	43.52	-4.74	278	107	V
1	189.8385	50.47	Qp	17.8	-30.2	38.07	43.52	-5.45	104	115	H
10	189.8433	54.25	Qp	17.8	-30.2	41.85	43.52	-1.67	160	102	V
2	271.2016	50.91	Qp	19.8	-29.6	41.11	46.02	-4.91	296	105	H
11	298.3166	47.93	Qp	19.9	-29.4	38.43	46.02	-7.59	80	103	V
3	298.321	52.28	Qp	19.9	-29.4	42.78	46.02	-3.24	83	103	H
12	383.9999	47.14	Qp	21.8	-29	39.94	46.02	-6.08	19	139	V
4	384.0042	46.81	Qp	21.8	-29	39.61	46.02	-6.41	75	103	H
5	408.0001	46.24	Qp	22.6	-28.8	40.04	46.02	-5.98	59	186	H
13	408.0083	45.38	Qp	22.6	-28.8	39.18	46.02	-6.84	25	135	V
6	432.0004	49.7	Qp	22.9	-28.6	44	46.02	-2.02	215	102	H
14	432.0048	46.46	Qp	22.9	-28.6	40.76	46.02	-5.26	279	111	V
7	840.0149	38.71	Qp	28.2	-27	39.91	46.02	-6.11	351	103	H
8	888.0115	37.63	Qp	28.7	-26.5	39.83	46.02	-6.19	356	101	H
15	888.0134	38.01	Qp	28.7	-26.5	40.21	46.02	-5.81	212	104	V

Qp - Quasi-Peak detector

No Tag

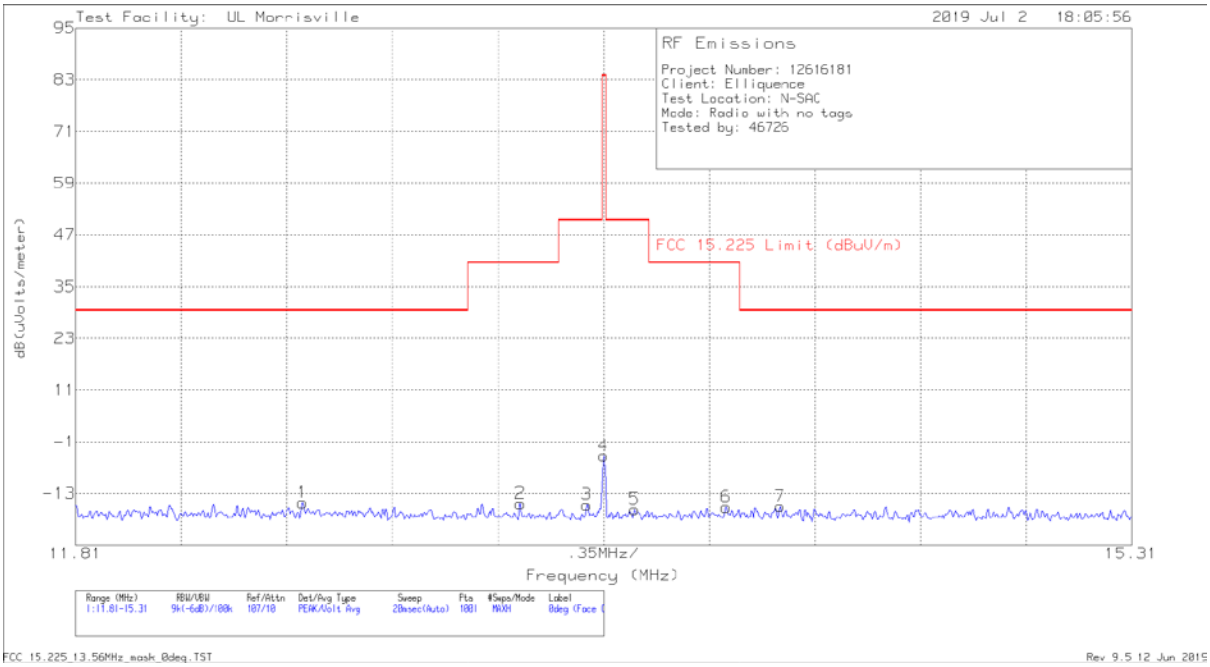
TX SPURIOUS EMISSION 9 kHz TO 30 MHz



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)
7	.51108	37.97	Pk	10.8	.1	-40	8.87	33.43	-24.56	0-360
1	.60383	34.7	Pk	10.8	.1	-40	5.6	31.99	-26.39	0-360
4	.72399	33.38	Pk	10.8	.1	-40	4.28	30.41	-26.13	0-360
10	13.56171	24.78	Pk	10.4	.6	-40	-4.22	29.54	-33.76	0-360
11	13.56171	36.1	Pk	10.4	.6	-40	7.1	29.54	-22.44	0-360
12	13.56171	19.17	Pk	10.4	.6	-40	-9.83	29.54	-39.37	0-360
2	18.91603	22.2	Pk	10	.7	-40	-7.1	29.54	-36.64	0-360
5	19.11629	30.75	Pk	10	.8	-40	1.55	29.54	-27.99	0-360
8	19.11629	24.44	Pk	10	.8	-40	-4.76	29.54	-34.3	0-360
6	27.12669	18.37	Pk	8.6	.9	-40	-12.13	29.54	-41.67	0-360
9	27.12669	24.34	Pk	8.6	.9	-40	-6.16	29.54	-35.7	0-360
3	27.75066	16.04	Pk	8.4	.9	-40	-14.66	29.54	-44.2	0-360

Pk - Peak detector

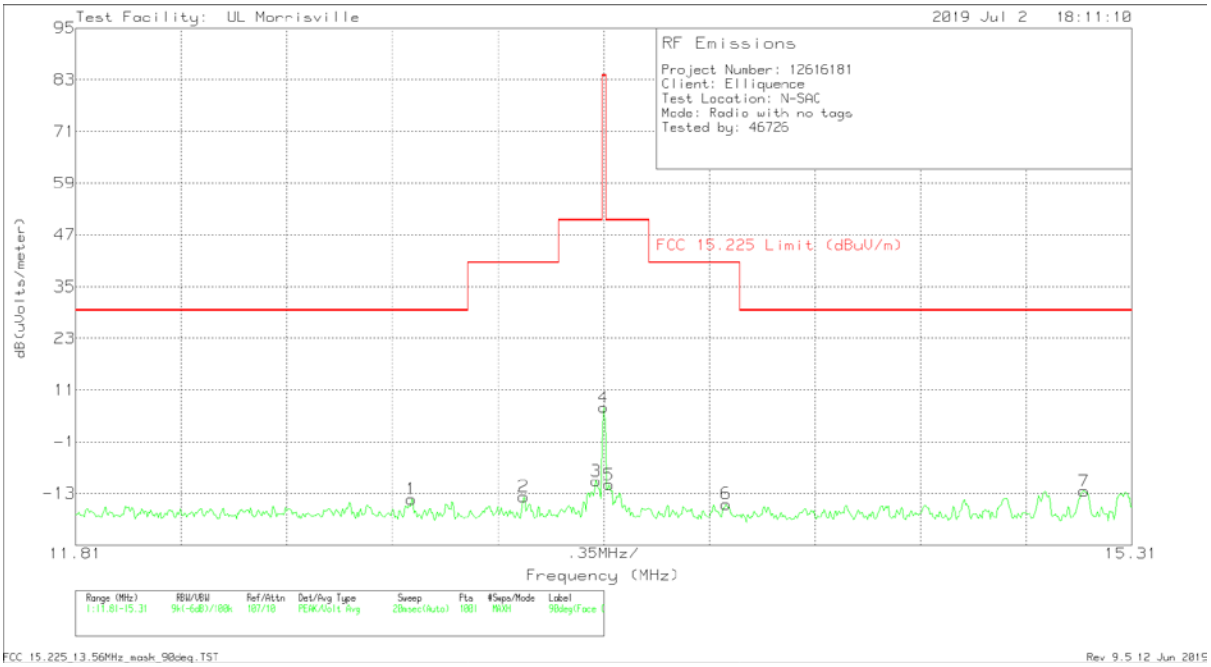
Fundamental (0 degrees)



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	12.5625	13.88	Pk	10.4	.6	-40	-15.12	29.5	-44.62	283
2	13.2835	13.69	Pk	10.4	.6	-40	-15.31	40.5	-55.81	283
3	13.504	13.42	Pk	10.4	.6	-40	-15.58	50.5	-66.08	283
4	13.56	24.7	Pk	10.4	.6	-40	-4.3	84	-88.3	283
5	13.6615	12.38	Pk	10.4	.6	-40	-16.62	50.5	-67.12	283
6	13.966	12.85	Pk	10.4	.6	-40	-16.15	40.5	-56.65	283
7	14.1445	13.05	Pk	10.4	.6	-40	-15.95	29.5	-45.45	283

Pk - Peak detector

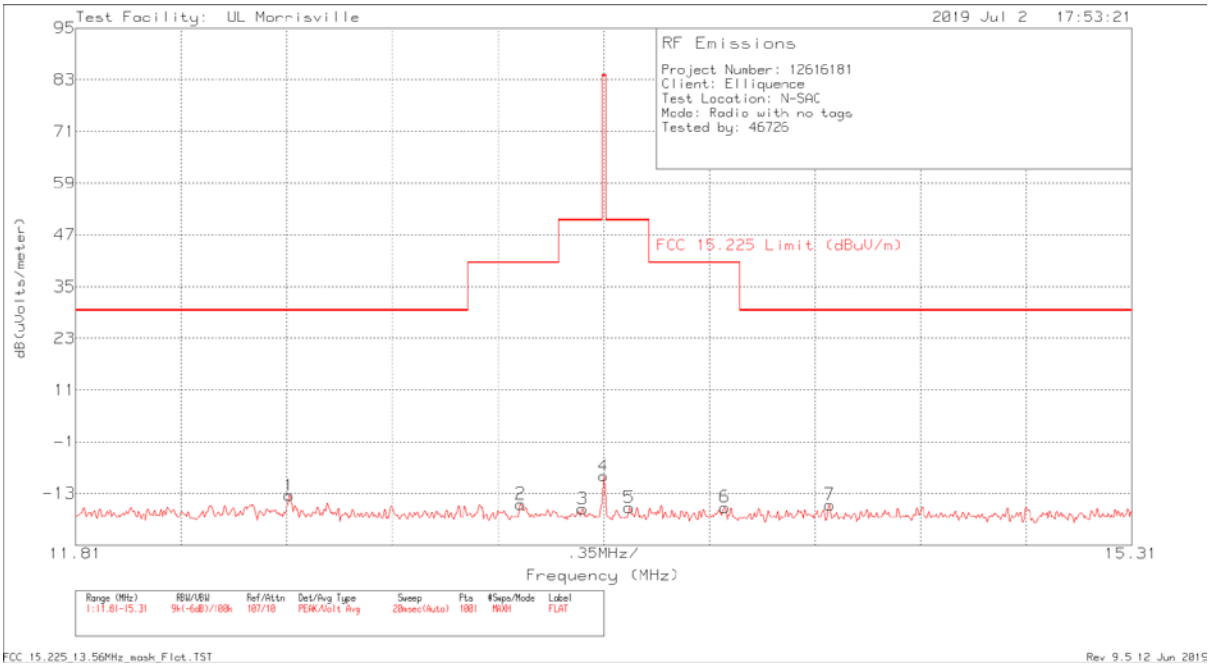
Fundamental (90 degrees)



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	12.923	14.67	Pk	10.4	.6	-40	-14.33	29.5	-43.83	178
2	13.294	15.28	Pk	10.4	.6	-40	-13.72	40.5	-54.22	178
3	13.5355	18.9	Pk	10.4	.6	-40	-10.1	50.5	-60.6	178
4	13.56	35.93	Pk	10.4	.6	-40	6.93	84	-77.07	178
5	13.5775	17.98	Pk	10.4	.6	-40	-11.02	50.5	-61.52	178
6	13.966	13.57	Pk	10.4	.6	-40	-15.43	40.5	-55.93	178
7	15.1525	16.55	Pk	10.3	.7	-40	-12.45	29.5	-41.95	178

Pk - Peak detector

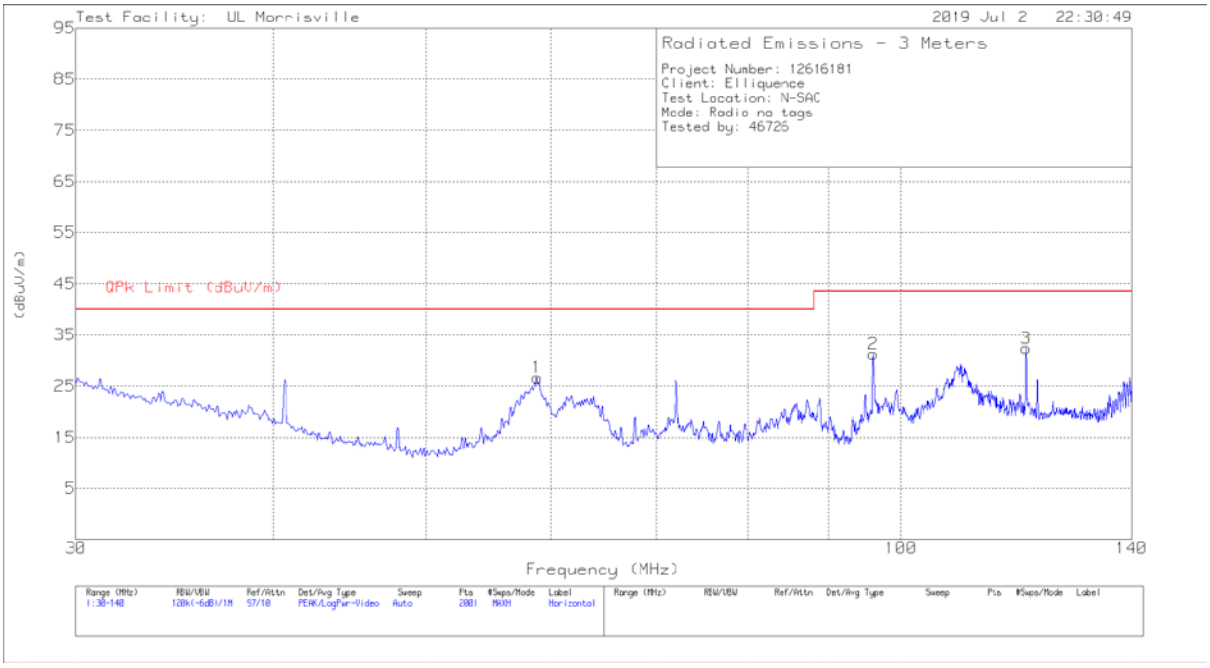
Fundamental (Parallel to GRP)

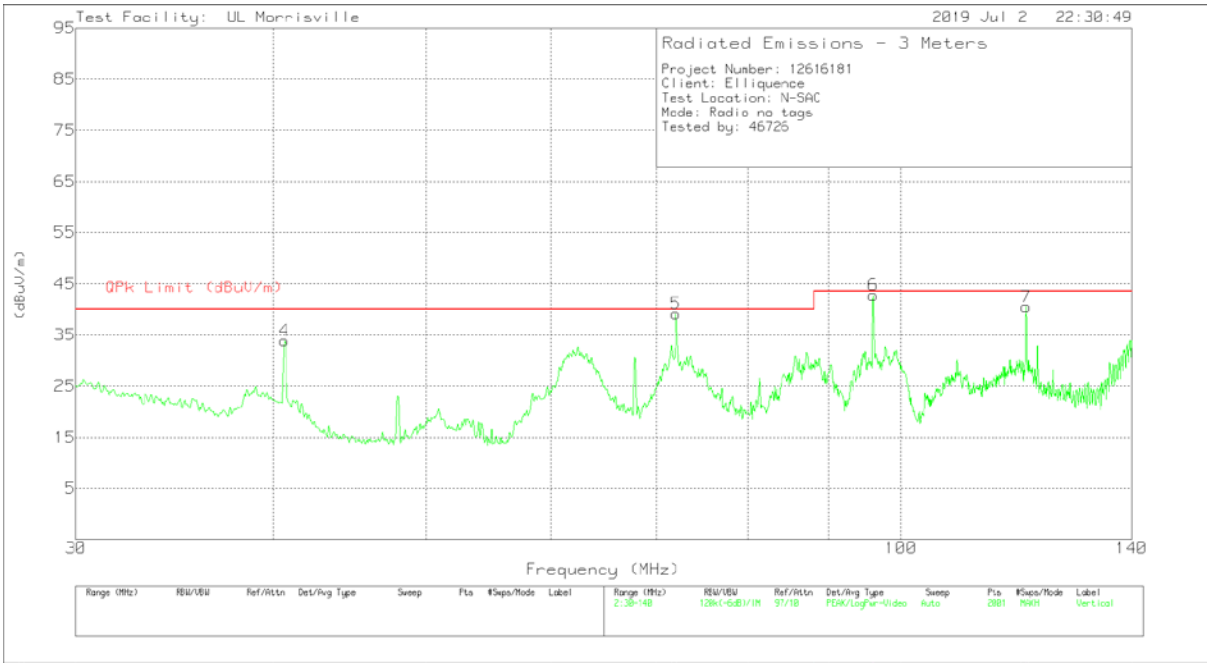


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	12.517	15.49	Pk	10.4	.6	-40	-13.51	29.5	-43.01	33
2	13.28525	13.56	Pk	10.4	.6	-40	-15.44	40.5	-55.94	33
3	13.49	12.49	Pk	10.4	.6	-40	-16.51	50.5	-67.01	33
4	13.56	20.04	Pk	10.4	.6	-40	-8.96	84	-92.96	33
5	13.644	12.72	Pk	10.4	.6	-40	-16.28	50.5	-66.78	33
6	13.9625	12.84	Pk	10.4	.6	-40	-16.16	40.5	-56.66	33
7	14.309	13.39	Pk	10.4	.6	-40	-15.61	29.5	-45.11	33

Pk - Peak detector

TX SPURIOUS EMISSION 30 TO 140 MHz

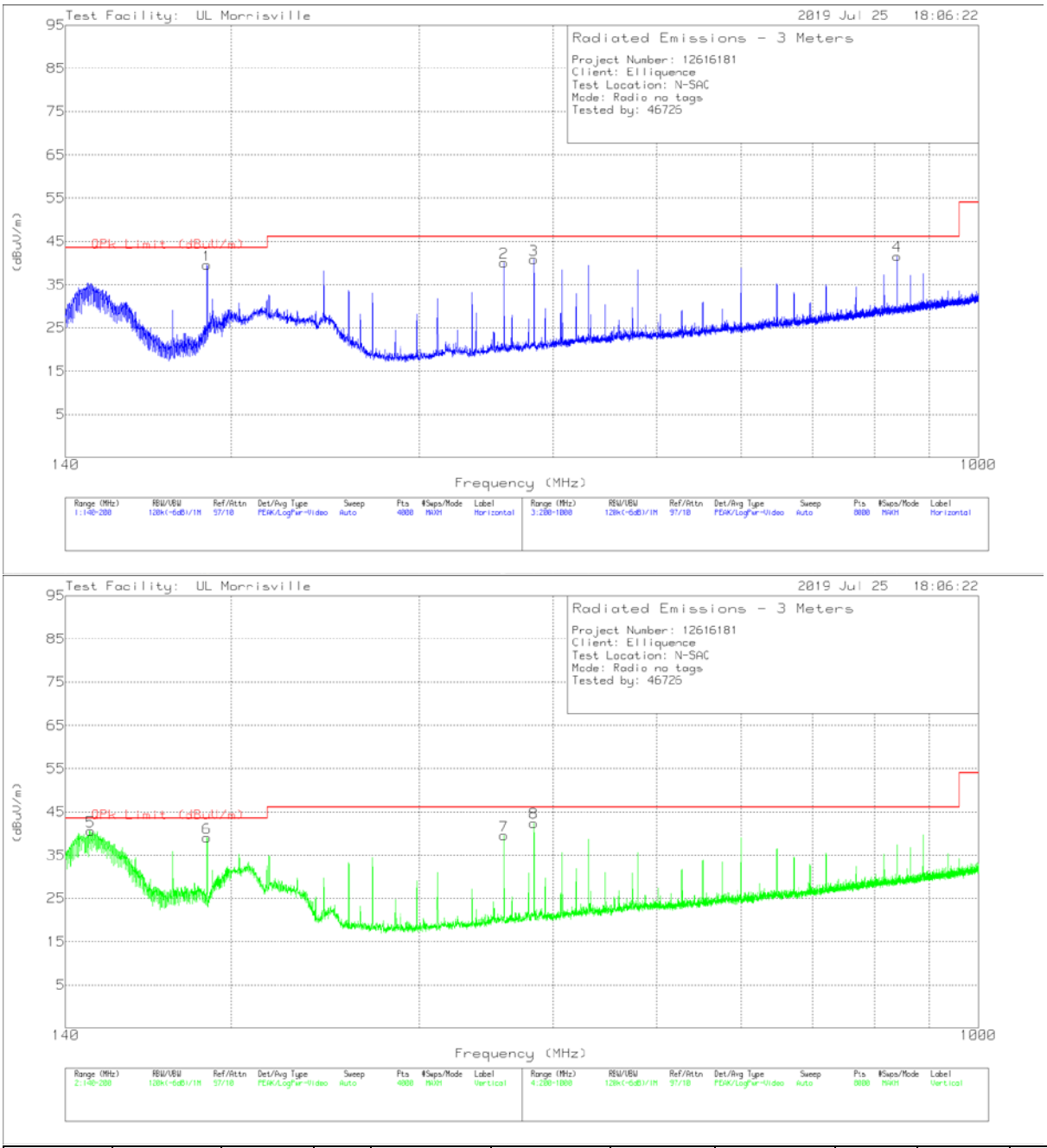




Markers	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0073 ACF (dB/m)	Amp/Cbl (dB)	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	40.6743	44.09	Qp	20	-31.6	.3	32.79	40	-7.21	21	101	V
1	58.7	38.56	Qp	13.8	-31.3	.3	21.36	40	-18.64	11	394	H
5	72.0171	50.7	Qp	14.3	-31.2	.3	34.1	40	-5.9	121	158	V
2	96.0014	45.66	Qp	15.2	-31	.3	30.16	43.52	-13.36	271	295	H
6	96.0125	54.65	Qp	15.2	-31	.3	39.15	43.52	-4.37	315	102	V
3	120.0045	42.17	Qp	20	-30.8	.3	31.67	43.52	-11.85	98	344	H
7	120.0054	49.7	Qp	20	-30.8	.3	39.2	43.52	-4.32	295	109	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	147.7371	49.98	Qp	19	-30.5	38.48	43.52	-5.04	260	115	V
1	189.8366	51.78	Qp	17.8	-30.2	39.38	43.52	-4.14	300	111	H
6	189.8433	50.8	Qp	17.8	-30.2	38.4	43.52	-5.12	3	102	V
2	360.005	47.48	Qp	21.6	-29.2	39.88	46.02	-6.14	327	102	H
7	360.0068	46.98	Qp	21.6	-29.2	39.38	46.02	-6.64	5	108	V
3	384.0009	47.98	Qp	21.8	-29	40.78	46.02	-5.24	337	102	H
8	384.0037	50.09	Qp	21.8	-29	42.89	46.02	-3.13	4	133	V
4	840.0142	39.66	Qp	28.2	-27	40.86	46.02	-5.16	83	105	H

Qp - Quasi-Peak detector

9. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±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 ±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 @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
120.00	50	13.5599850	6.932	± 100
120.00	40	13.5600070	5.310	± 100
120.00	30	13.5600500	2.139	± 100
120.00	***20***	***13.5600790***	***0.000***	***± 100***
120.00	10	13.5600960	-1.254	± 100
120.00	0	13.5600940	-1.106	± 100
120.00	-10	13.5600860	-0.516	± 100
120.00	-20	13.5600830	-0.295	± 100
138.00	20	13.5600930	-1.032	± 100
102	20	13.5600620	1.254	± 100

2 Minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply	**Environment**	**Frequency Deviation Measureed with Time Elapse**		
(Vdc)	**Temperature (ºC)**	**(MHz)**	**Delta (ppm)**	**Limit (ppm)**
120.00	50	13.5599820	4.130	± 100
120.00	40	13.5600010	2.729	± 100
120.00	30	13.5600330	0.369	± 100
120.00	***20***	***13.5600380***	***0.000***	***± 100***
120.00	10	13.5600920	-3.982	± 100
120.00	0	13.5600970	-4.351	± 100
120.00	-10	13.5600960	-4.277	± 100
120.00	-20	13.5600760	-2.802	± 100
138.00	20	13.5600800	-3.097	± 100
102	20	13.5600650	-1.991	± 100

5 Minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply	**Environment**	**Frequency Deviation Measureed with Time Elapse**		
(Vdc)	**Temperature (ºC)**	**(MHz)**	**Delta (ppm)**	**Limit (ppm)**
120.00	50	13.5599790	6.268	± 100
120.00	40	13.559998	4.867	± 100
120.00	30	13.5600280	2.655	± 100
120.00	***20***	***13.5600640***	***0.000***	***± 100***
120.00	10	13.5600890	-1.844	± 100
120.00	0	13.5600980	-2.507	± 100
120.00	-10	13.5601040	-2.950	± 100
120.00	-20	13.5600730	-0.664	± 100
138.00	20	13.5600690	-0.369	± 100
102	20	13.5600650	-0.074	± 100

10 Minutes

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vdc)	**Environment Temperature (ºC)**	**Frequency Deviation Measureed with Time Elapse**		
		(MHz)	**Delta (ppm)**	**Limit (ppm)**
120.00	50	13.5599780	6.342	± 100
120.00	40	13.5599960	5.015	± 100
120.00	30	13.5600280	2.655	± 100
120.00	***20***	***13.5600640***	***0.000***	***± 100***
120.00	10	13.5600860	-1.622	± 100
120.00	0	13.5601000	-2.655	± 100
120.00	-10	13.5600950	-2.286	± 100
120.00	-20	13.5600690	-0.369	± 100
138.00	20	13.5600620	0.147	± 100
102	20	13.5600640	0.000	± 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 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 range	Limits (dBµV)	
(MHz)	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

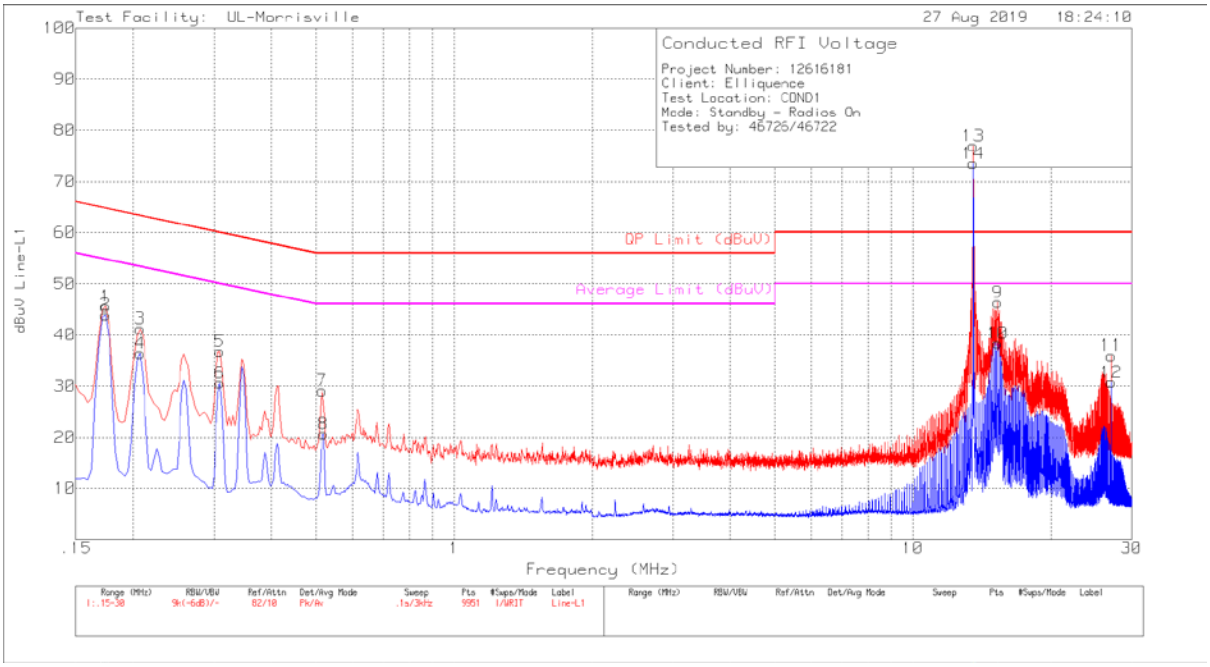
RESULTS

No non-compliance noted:

10.1. RFID

10.1.1. NORMAL OPERATION

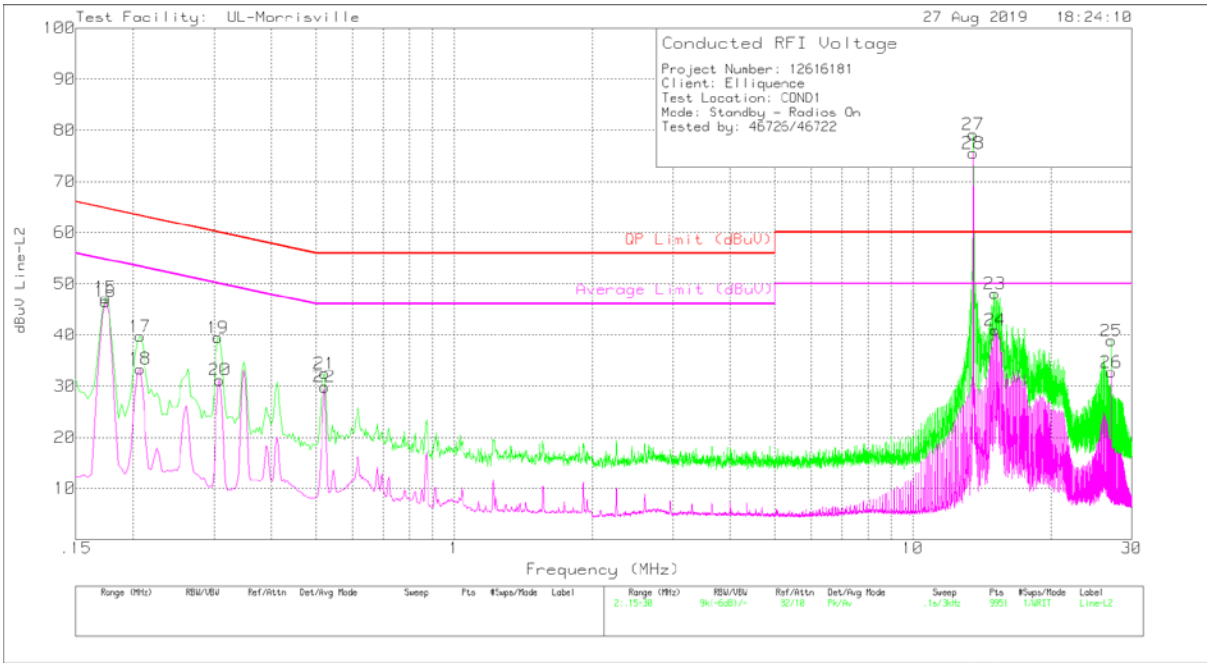
LINE 1 RESULTS



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	.174	35.39	Pk	.2	10	45.59	64.77	-19.18	-	-
2	.174	33.76	Av	.2	10	43.96	-	-	54.77	-10.81
3	.207	31.15	Pk	.1	10	41.25	63.32	-22.07	-	-
4	.207	26.29	Av	.1	10	36.39	-	-	53.32	-16.93
5	.309	26.64	Pk	.1	10	36.74	60	-23.26	-	-
6	.309	20.51	Av	.1	10	30.61	-	-	50	-19.39
7	.516	19	Pk	.1	10	29.1	56	-26.9	-	-
8	.519	10.56	Av	.1	10	20.66	-	-	46	-25.34
9	15.318	35.75	Pk	.1	10.5	46.35	60	-13.65	-	-
10	15.327	27.74	Av	.1	10.5	38.34	-	-	50	-11.66
11	27.12	24.95	Pk	.3	10.7	35.95	60	-24.05	-	-
12	27.12	19.75	Av	.3	10.7	30.75	-	-	50	-19.25
13	13.56	66.47	Pk	.1	10.4	76.97	**60**	**16.97**	-	-
14	13.56	63.02	Av	.1	10.4	73.52	-	-	**50**	**23.52**

Pk - Peak detector
Av - Average detection

LINE 2 RESULTS

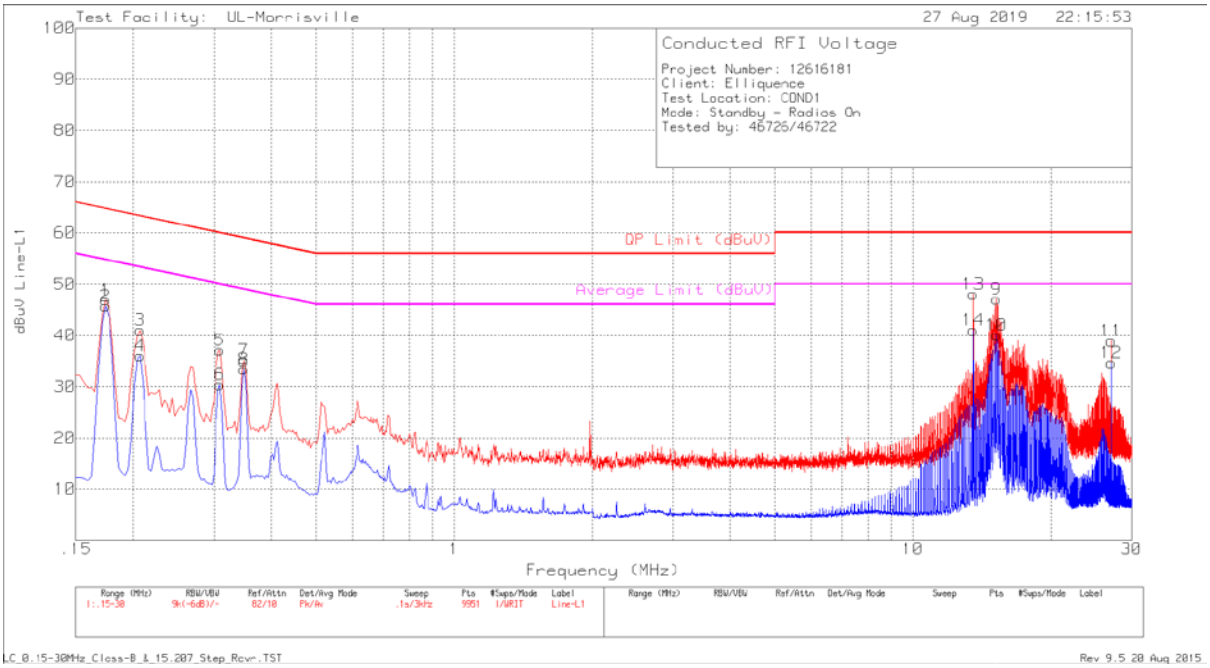


Range 2: Line-L2 .15 - 30MHz										
Marker	**Frequency (MHz)**	**Meter Reading (dBuV)**	**Det**	**LISN VCF (dB)**	**Cbl/Limiter (dB)**	**Corrected Reading dBuV**	**QP Limit (dBuV)**	**Margin (dB)**	**Average Limit (dBuV)**	**Margin (dB)**
15	.174	37.08	Pk	.2	10	47.28	64.77	-17.49	-	-
16	.174	36.36	Av	.2	10	46.56	-	-	54.77	-8.21
17	.207	29.65	Pk	.1	10	39.75	63.32	-23.57	-	-
18	.207	23.28	Av	.1	10	33.38	-	-	53.32	-19.94
19	.306	29.37	Pk	.1	10	39.47	60.08	-20.61	-	-
20	.309	21.08	Av	.1	10	31.18	-	-	50	-18.82
21	.522	22.46	Pk	0	10	32.46	56	-23.54	-	-
22	.522	19.84	Av	0	10	29.84	-	-	46	-16.16
23	15.102	37.47	Pk	.1	10.5	48.07	60	-11.93	-	-
24	15.12	30.38	Av	.1	10.5	40.98	-	-	50	-9.02
25	27.12	27.99	Pk	.2	10.7	38.89	60	-21.11	-	-
26	27.12	21.83	Av	.2	10.7	32.73	-	-	50	-17.27
27	13.56	68.67	Pk	.1	10.4	79.17	**60**	**19.17**	-	-
28	13.56	65.04	Av	.1	10.4	75.54	-	-	**50**	**25.54**

Pk - Peak detector
Av - Average detection

10.1.2. NORMAL OPERATION WITH ANTENNA PORT TERMINATED

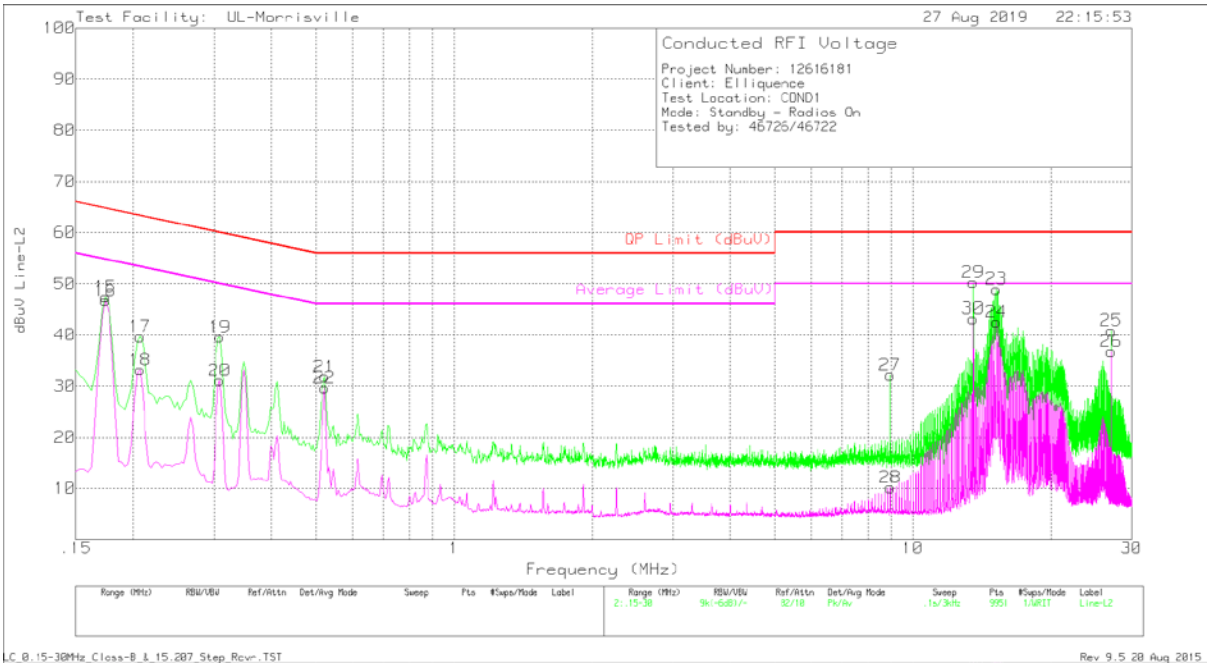
LINE 1 RESULTS



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)**
1	.174	36.8	Pk	.2	10	47	64.77	-17.77	-	-
2	.174	35.54	Av	.2	10	45.74	-	-	54.77	-9.03
3	.207	30.92	Pk	.1	10	41.02	63.32	-22.3	-	-
4	.207	25.95	Av	.1	10	36.05	-	-	53.32	-17.27
5	.309	27.01	Pk	.1	10	37.11	60	-22.89	-	-
6	.309	20.33	Av	.1	10	30.43	-	-	50	-19.57
7	.348	25.02	Pk	.1	10	35.12	59.01	-23.89	-	-
8	.348	23.37	Av	.1	10	33.47	-	-	49.01	-15.54
9	15.204	36.5	Pk	.1	10.5	47.1	60	-12.9	-	-
10	15.204	29.46	Av	.1	10.5	40.06	-	-	50	-9.94
11	27.12	27.94	Pk	.3	10.7	38.94	60	-21.06	-	-
12	27.12	23.68	Av	.3	10.7	34.68	-	-	50	-15.32
13	13.56	37.61	Pk	.1	10.4	48.11	60	-11.89	-	-
14	13.56	30.52	Av	.1	10.4	41.02	-	-	50	-8.98

Pk - Peak detector
Av - 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	.174	37.25	Pk	.2	10	47.45	64.77	-17.32	-	-
16	.174	36.55	Av	.2	10	46.75	-	-	54.77	-8.02
17	.207	29.57	Pk	.1	10	39.67	63.32	-23.65	-	-
18	.207	23.13	Av	.1	10	33.23	-	-	53.32	-20.09
19	.309	29.47	Pk	.1	10	39.57	60	-20.43	-	-
20	.309	21.04	Av	.1	10	31.14	-	-	50	-18.86
21	.522	21.84	Pk	0	10	31.84	56	-24.16	-	-
22	.522	19.67	Av	0	10	29.67	-	-	46	-16.33
23	15.207	38.39	Pk	.1	10.5	48.99	60	-11.01	-	-
24	15.219	31.91	Av	.1	10.5	42.51	-	-	50	-7.49
25	27.12	29.97	Pk	.2	10.7	40.87	60	-19.13	-	-
26	27.12	25.84	Av	.2	10.7	36.74	-	-	50	-13.26
27	8.922	21.77	Pk	.1	10.3	32.17	60	-27.83	-	-
28	8.943	-.22	Av	.1	10.3	10.18	-	-	50	-39.82
29	13.56	39.8	Pk	.1	10.4	50.3	60	-9.7	-	-
30	13.56	32.72	Av	.1	10.4	43.22	-	-	50	-6.78

Pk - Peak detector
Av - Average detection