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

CERTIFICATION TEST REPORT

DIGITAL IMAGING SYSTEM

MODEL NUMBER: J1205

REPORT NUMBER: R12720959-E1

FCC ID: 2AS4I-AT1295
IC: 24988-AT1295

ISSUE DATE: 2019-08-26

Prepared for
AIR TECHNIQUES INC.
1295 WALT WHITMAN RD
MEVILLE
NY, 11747, US

Prepared by
UL LLC
12 LABORATORY DR.
RESEARCH TRIANGLE PARK, NC 27709 USA
TEL: (919) 549-1400

NVLAP LAB CODE 200246-0

Revision History

Rev.	Issue Date	Revisions	Revised By
1	2019-04-29	Initial Issue	Niklas Haydon
2	2019-08-12	Updated worst-case configuration	Niklas Haydon
3	2019-08-26	Updated worst-case configuration	Niklas Haydon

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: Air Techniques
1295 Walt Whitman Rd
Melville, NY, 11747, US

EUT DESCRIPTION: Digital Imaging System

MODEL: J1205

SERIAL NUMBER: PROTO B10

DATE TESTED: 2019-04-08 to 2019-04-16

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Complies
ISED CANADA RSS-210 Issue 9, Annex B.6	Complies
ISED CANADA RSS-GEN Issue 5	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.

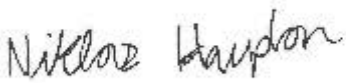
The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. 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, or any agency of the U.S. government.

Approved & Released For
UL LLC By:

Jeffrey Moser
Operations Leader
CONSUMER TECHNOLOGY DIVISION
UL LLC

Prepared By:



Niklas Haydon
Engineer
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., Suite B, 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 is intended to be used for scanning and processing digital images exposed on Phosphor Storage Plates (PSPs) in dental applications. It is intended for use in a medical environment such as dental, medical, veterinary laboratories. The NFC radio is integrated in order to detect what type of PSP has been inserted for scanning and for tracking usage of the PSP plates.

The EUT uses ISO/IEC 15693 with a data rate of 26.48 kbps. The EUT only supports use of one tag (SL2S2602 ICODE SLIX2).

5.2. MAXIMUM FIELD STRENGTH

The testing was performed at 3 meter. The PK transmitter maximum E-field reading at 30m is 10.42 dBuV/m corrected from the 3m reading of 50.42 dBuV/m.

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a loop coil antenna with an area of 0.00627m2.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was J1555 Rev 15 (version 2854 & 4570).
The EUT driver software installed in the host support equipment during testing was J1093 Rev 01 (06/17/2017, 1.0.0.0, signed 15-Feb-2019).
The test utility software used during testing was J1099 Rev 03 (dated 02-Apr-2019).

5.5. 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). There are three NFC radios in the EUT. Only two NFC radios can operate at any given time. The NFC radios radios on the far left and far right were determined to be worst case for emissions; therefore all testing was completed in this mode.

5.6. MODIFICATIONS

No modifications were made during testing.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Use	Product Type	Manufacturer	Model	Serial Number
EUT	Scanx Duo Touch	Air Techniques	J1205	PROTO B10
AE	EUT Power Supply	Mega Electronics Inc.	ATM065T-A240	185200026
AE	Laptop	Lenovo	ThinkPad T430	1ZSLZ3CG0H7
AE	Laptop Power Supply	Lenovo	ADLX45NDC2A	

Note: **EUT** - Equipment Under Test, **AE** - Auxiliary/Associated Equipment, or **SIM** - Simulator (Not Subjected to Test)

I/O CABLES

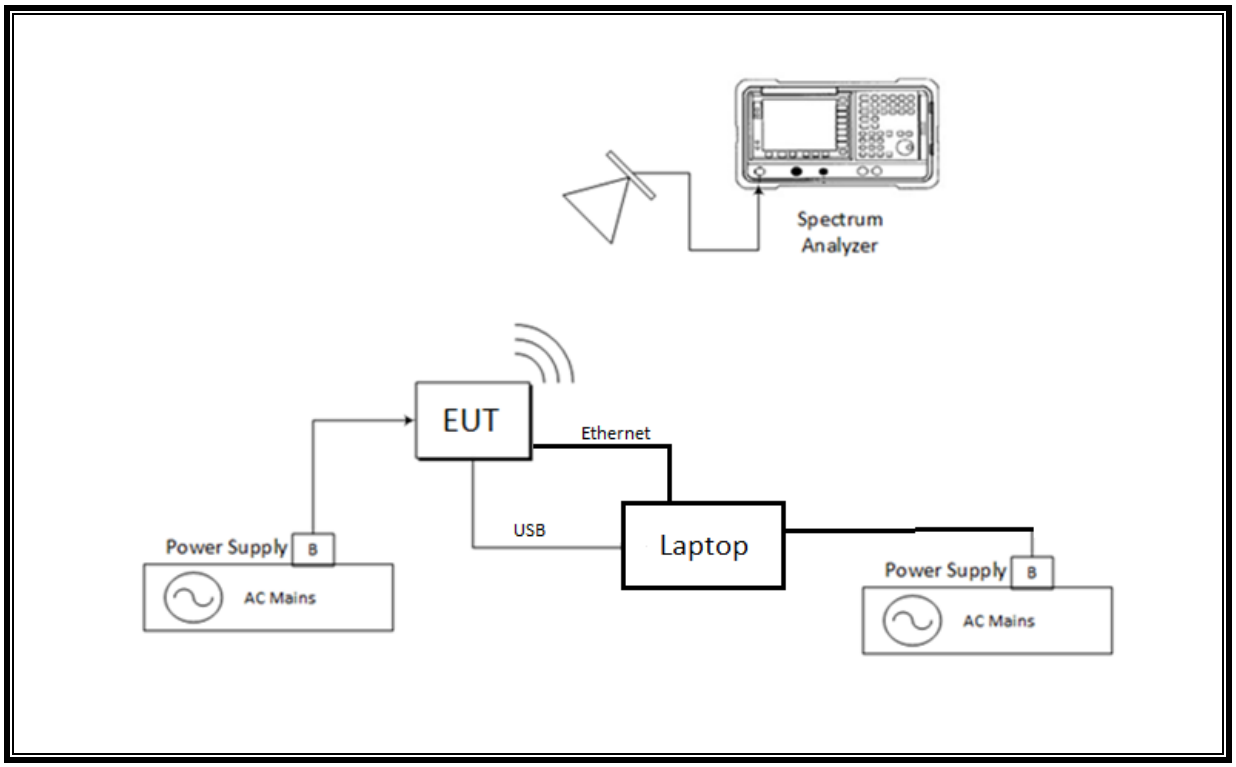
Name	Type*	Cable Max. >3m (Y/N)	Cable Shielded (Y/N)	Comments
Enclosure	N/E	—	—	None
Mains	AC	N	N	None
WiFi USB Adapter	TP	N	N	WiFi USB Dongle plugged into USB Type-A port of the EUT.
Ethernet (10/100Mbps)	I/O	Y	N	Between EUT and Laptop
USB 2.0 TYPE -B	I/O	N	N	Between EUT and Laptop

Note:
AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

TEST SETUP

The EUT is installed as a standalone device.

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 - 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	2019-01-24	2020-01-31
	30-1000 MHz				
AT0074	Hybrid Broadband Antenna	Sunol Sciences Corp.	JB3	2018-07-24	2019-07-24
	Gain-Loss Chains				
S-SAC01	Gain-loss string: 0.009-30MHz	Various	Various	2018-09-06	2019-09-06
S-SAC02	Gain-loss string: 25-1000MHz	Various	Various	2018-05-20	2019-05-20
	Receiver & Software				
SA0025	Spectrum Analyzer	Agilent	N9030A	2019-02-28	2020-02-28
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Additional Equipment used				
s/n 181474409	Environmental Meter	Fisher Scientific	15-077-963	2018-07-27	2020-07-27
PS214	ELGAR Supply	AMETEK	CW2501	NA	NA

Test Equipment Used - Wireless Conducted Measurement Equipment

Equipment ID	Description	Manufacturer	Model Number	Last Cal.	Next Cal.
	Common Equipment				
72822 (SA0019)	Spectrum Analyzer	Agilent Technologies	E4446A	2018-11-19	2019-11-19
SN 161024885	Environmental Meter	Fisher Scientific	15-077-963	2018-09-04	2020-09-04
76022	DC Regulated Power Supply	CircuitSpecialists.Com	CSI3005X5	N/A	N/A
UL 178353	Environmental Chamber	Espec	BTX-475	N/A	N/A
	Additional Equipment used				
PS215	CW-AC Power Source	Ametek	CW2501	NA	NA

NOTE: The environmental chamber was monitored with the environmental Meter in the chamber.

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	2018-06-19	2019-06-19
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	2018-06-13	2019-06-13
PS214	AC Power Source	Elgar	CW2501M (s/n 1523A02396)	NA	NA
SOFTEMI	EMI Software	UL	Version 9.5	NA	NA
	Miscellaneous (if needed)				
LISN008	LISN, 50-ohm/50-uH, 2-conductor, 25A (For support gear only.)	Solar Electronics	8012-50-R-24-BNC	2018-09-03	2019-09-03

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.

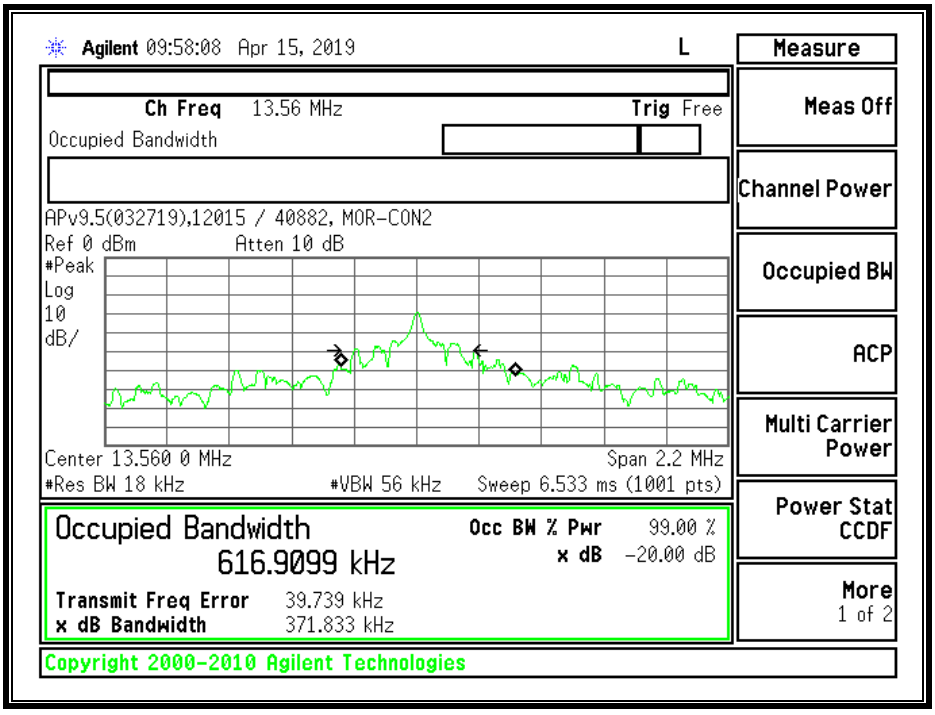
No Tag

Frequency (MHz)	20dB Bandwidth (KHz)	99% Bandwidth (KHz)
13.56	220.000	616.910

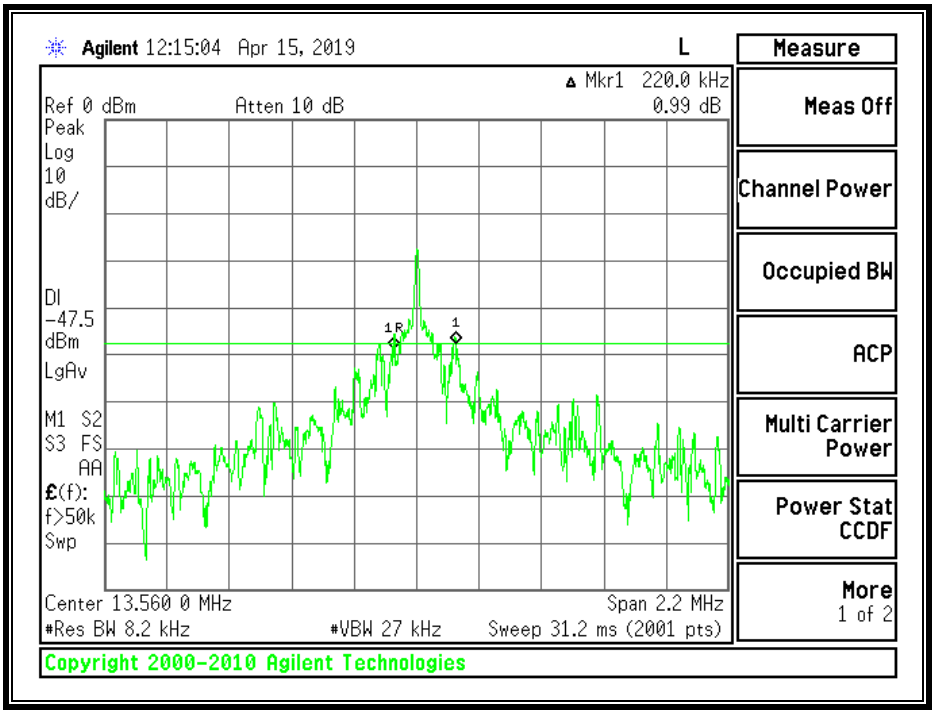
Tag

Frequency (MHz)	20dB Bandwidth (KHz)	99% Bandwidth (KHz)
13.56	123.200	874.884

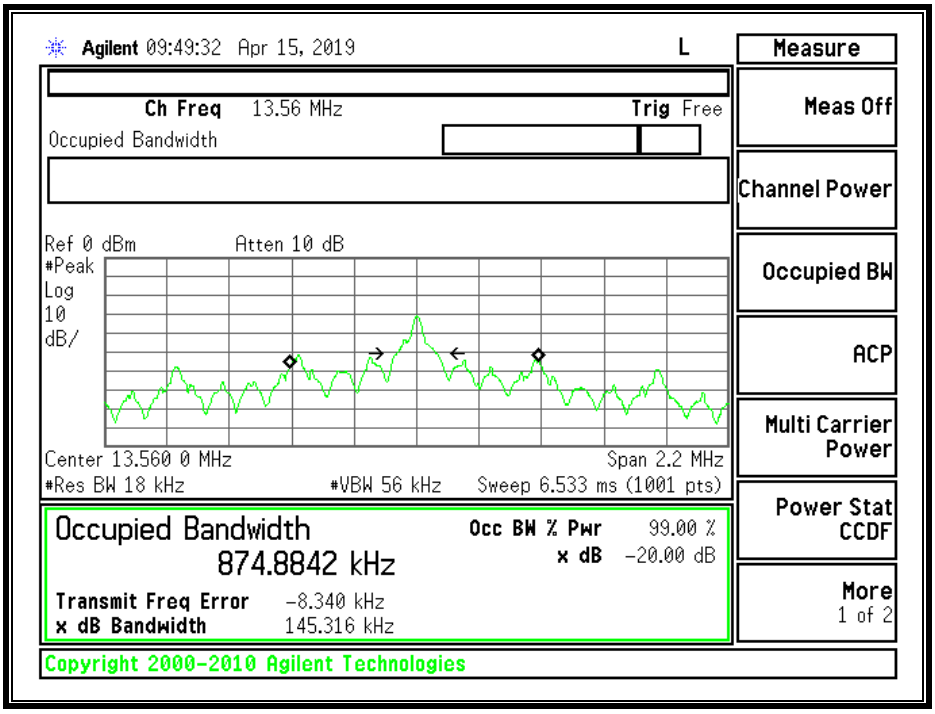
99% BANDWIDTH PLOT – TAG OFF



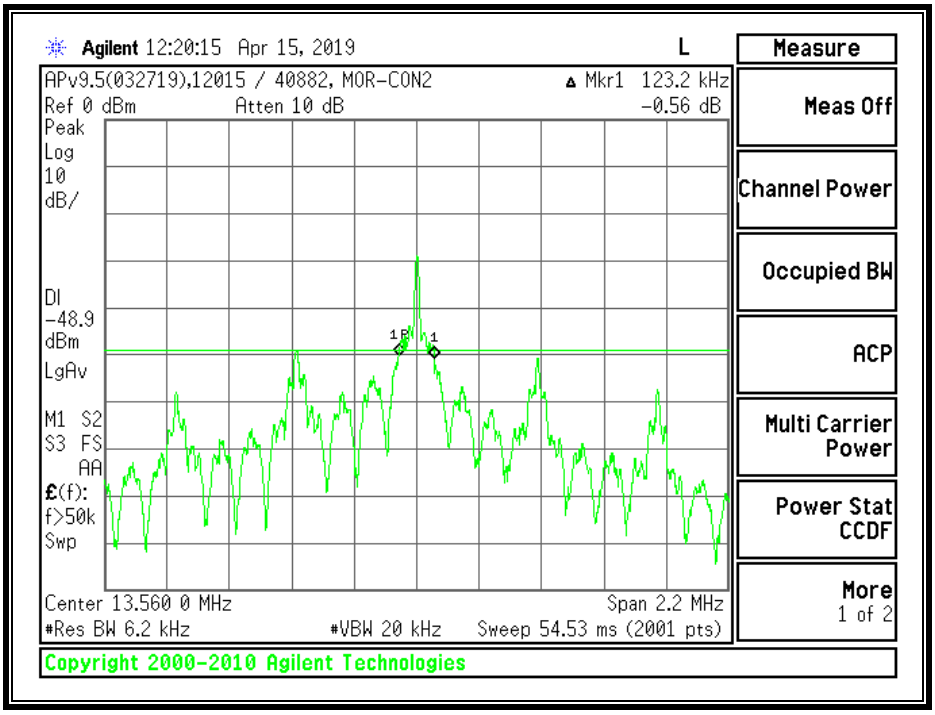
20dB BANDWIDTH PLOT – TAG OFF



99% BANDWIDTH PLOT – TAG ON



20dB BANDWIDTH PLOT – TAG ON



8. RADIATED EMISSION TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

§15.209
§15.225
IC RSS-210, Annex B.6 (Transmitter)
IC RSS-GEN, Section 8.9

(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:

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.		

** 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 uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/m)

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for measurements below 1GHz. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 120 kHz for peak and/or quasi-peak detection measurements in the 30-1000MHz range, 9kHz for peak and/or quasi-peak detection measurements in the 0.15-30MHz range and 200Hz for peak and/or quasi-peak detection measurements in the 9 to 150kHz 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 for above 30 MHz measurements to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

3D antenna use - For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel).

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

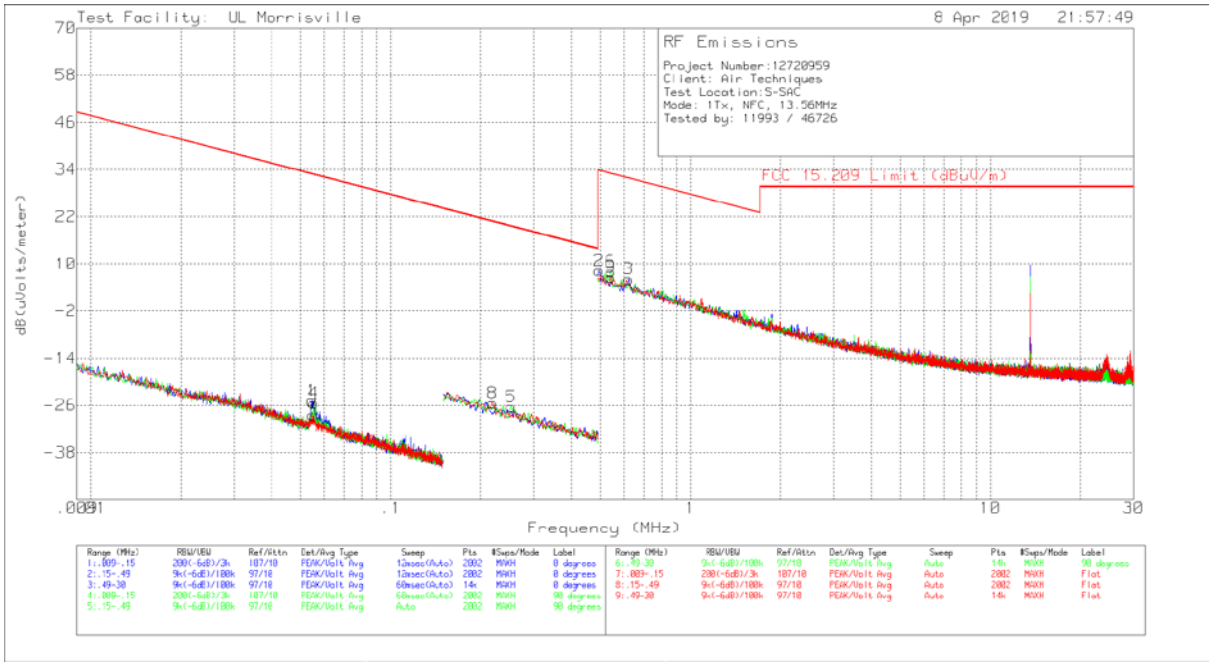
Base on FCC 15.31 (f) (2): measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field.

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

8.2. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15-30MHz)

Note: All measurements were made at a test distance of 3 m. The measured data was extrapolated from the test distance (3m) to the specification distance (300 m from 9-490 kHz and 30 m from 490 kHz – 30 MHz) 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 data was 40*Log (test distance / specification distance).

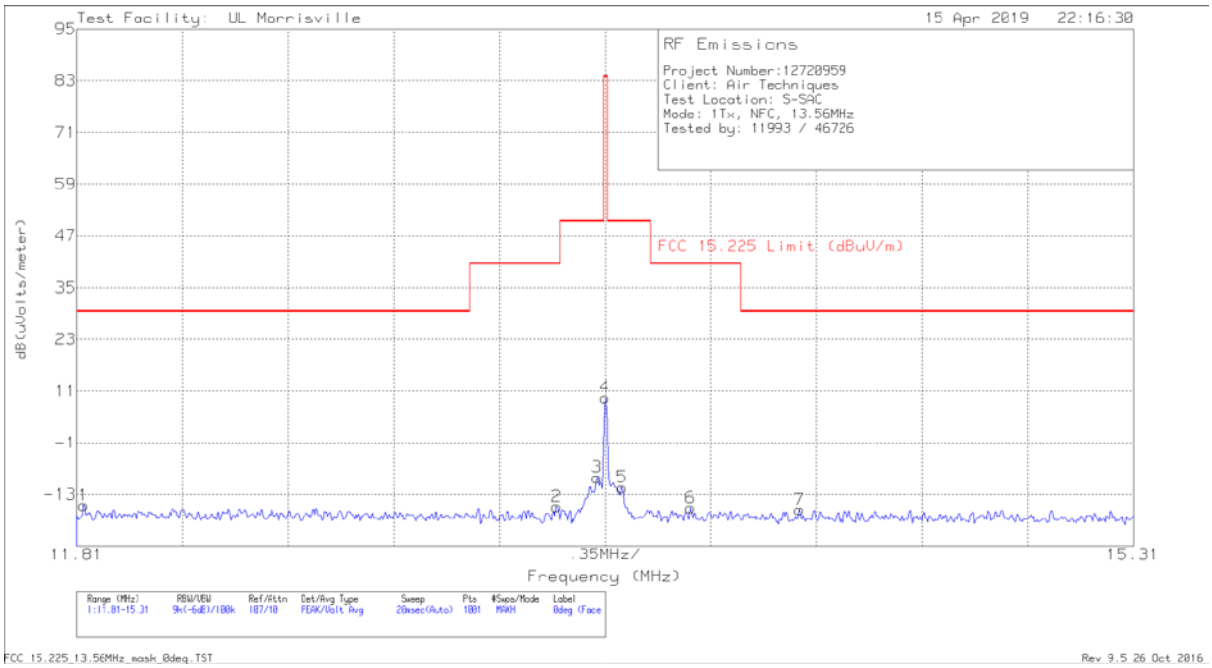
Tag



Marker	Freq. (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uV/m)	FCC 15.209 QP Limit (dBuV/m)	FCC 15.209 AVE Limit (dBuV/m)	FCC 15.209 PK Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)	Antenna Face
1	.05464	43.55	Pk	11.5	.1	-80	-24.85	-	32.85	52.85	-57.7	0-360	On
7	.05513	39.9	Pk	11.5	.1	-80	-28.5	-	32.78	52.78	-61.28	0-360	Flat
4	.05548	43.01	Pk	11.5	.1	-80	-25.39	-	32.72	52.72	-58.11	0-360	Off
8	.21851	43.78	Pk	10.7	.1	-80	-25.42	-	20.81	40.81	-46.23	0-360	Flat
5	.25243	42.91	Pk	10.6	.1	-80	-26.39	-	19.56	39.56	-45.95	0-360	Off
2	.49422	37.39	Pk	10.8	.1	-40	8.29	33.73	-	-	-25.44	0-360	On
6	.5427	37.12	Pk	10.8	.1	-40	8.02	32.91	-	-	-24.89	0-360	Off
9	.5427	35.58	Pk	10.8	.1	-40	6.48	32.91	-	-	-26.43	0-360	Flat
3	.6207	35.23	Pk	10.8	.1	-40	6.13	31.75	-	-	-25.62	0-360	On

Pk - Peak detector

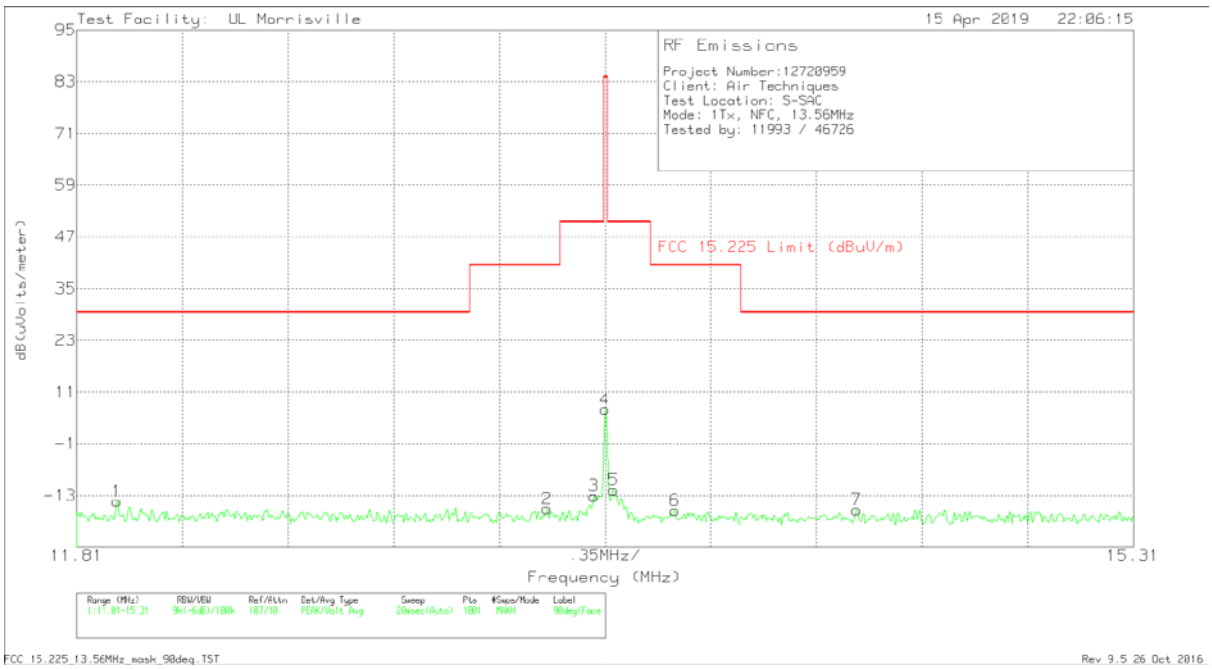
Fundamental (0 degrees)



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	11.83275	13.4	Pk	10.5	.6	-40	-15.5	29.5	-45	9
2	13.399	13.16	Pk	10.4	.6	-40	-15.84	40.5	-56.34	9
3	13.532	19.99	Pk	10.4	.6	-40	-9.01	50.5	-59.51	9
4	13.56	38.51	Pk	10.4	.6	-40	9.51	84	-74.49	9
5	13.616	17.66	Pk	10.4	.6	-40	-11.34	50.5	-61.84	9
6	13.8435	12.89	Pk	10.4	.6	-40	-16.11	40.5	-56.61	9
7	14.204	12.51	Pk	10.4	.6	-40	-16.49	29.5	-45.99	9

Pk - Peak detector

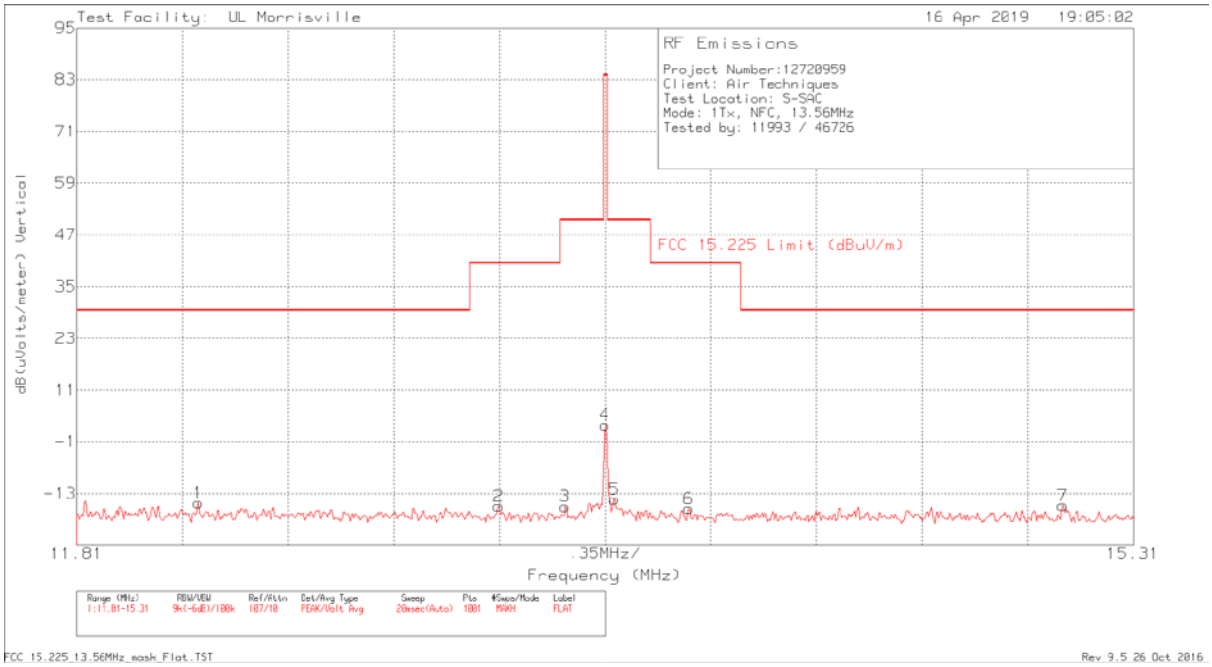
Fundamental (90 degrees)



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	11.943	14.58	Pk	10.5	.6	-40	-14.32	29.5	-43.82	346
2	13.3675	12.88	Pk	10.4	.6	-40	-16.12	40.5	-56.62	346
3	13.5215	15.9	Pk	10.4	.6	-40	-13.1	50.5	-63.6	346
4	13.56	35.99	Pk	10.4	.6	-40	6.99	84	-77.01	346
5	13.588	17.29	Pk	10.4	.6	-40	-11.71	50.5	-62.21	346
6	13.791	12.53	Pk	10.4	.6	-40	-16.47	40.5	-56.97	346
7	14.393	12.67	Pk	10.4	.6	-40	-16.33	29.5	-45.83	346

Pk - Peak detector

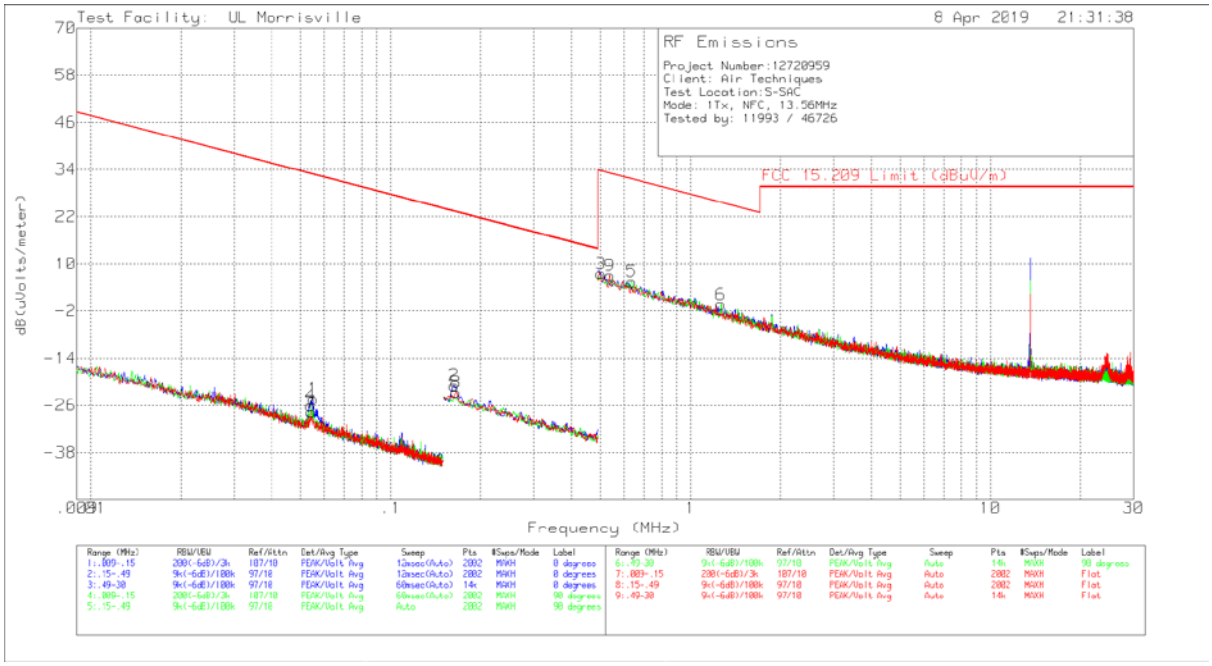
Fundamental (Parallel to GRP)



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	12.2125	13.73	Pk	10.5	.6	-40	-15.17	29.5	-44.67	358
2	13.2065	13.07	Pk	10.4	.6	-40	-15.93	40.5	-56.43	358
3	13.427	12.99	Pk	10.4	.6	-40	-16.01	50.5	-66.51	358
4	13.56	31.93	Pk	10.4	.6	-40	2.93	84	-81.07	358
5	13.5915	14.65	Pk	10.4	.6	-40	-14.35	50.5	-64.85	358
6	13.8365	12.46	Pk	10.4	.6	-40	-16.54	40.5	-57.04	358
7	15.0755	13.28	Pk	10.3	.6	-40	-15.82	29.5	-45.32	358

Pk - Peak detector

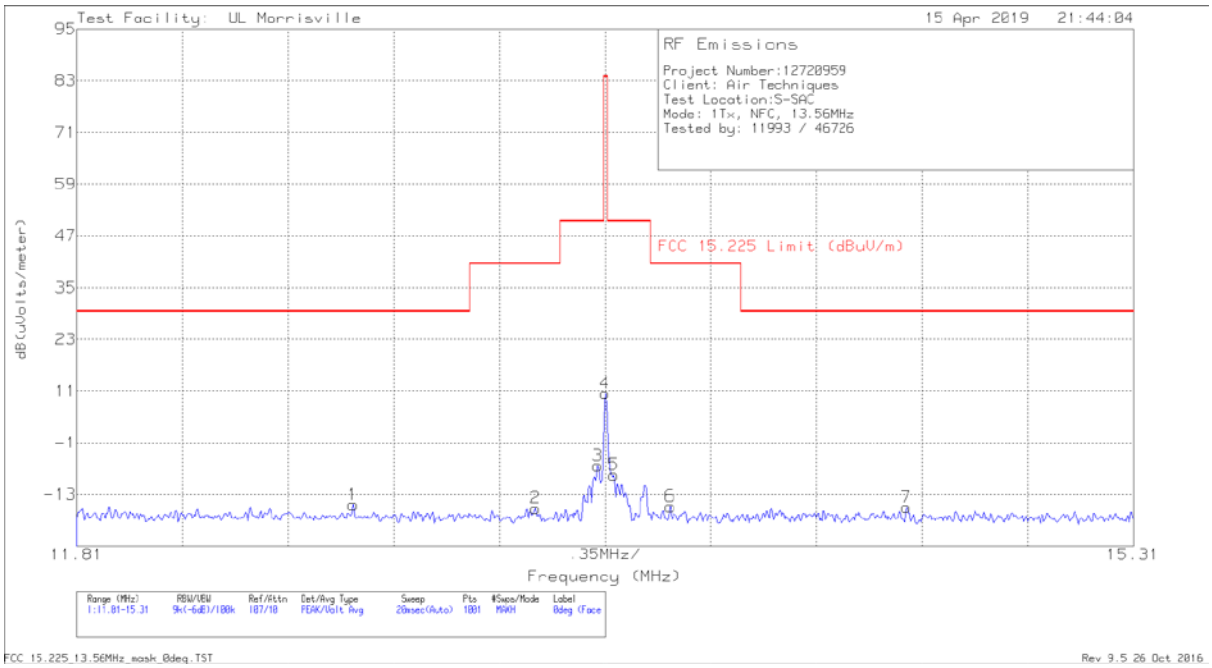
No Tag



Marker	Freq. (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uV/m)	FCC 15.209 QP Limit (dBuV/m)	FCC 15.209 AVE Limit (dBuV/m)	FCC 15.209 PK Limit (dBuV/m)	Worst-Case Margin (dB)	Azimuth (Degs)	Antenna Face
4	.05415	42.35	Pk	11.5	.1	-80	-26.05	-	32.93	52.93	-58.98	0-360	Off
7	.05443	40.75	Pk	11.5	.1	-80	-27.65	-	32.89	52.89	-60.54	0-360	Flat
1	.05527	44.04	Pk	11.5	.1	-80	-24.36	-	32.75	52.75	-57.11	0-360	On
2	.16267	48.22	Pk	10.7	.1	-80	-20.98	-	23.38	43.38	-44.36	0-360	On
8	.16539	46.47	Pk	10.7	.1	-80	-22.73	-	23.23	43.23	-45.96	0-360	Flat
3	.50265	36.55	Pk	10.8	.1	-40	7.45	33.58	-	-	-26.13	0-360	On
9	.53848	36.09	Pk	10.8	.1	-40	6.99	32.98	-	-	-25.99	0-360	Flat
5	.63545	34.58	Pk	10.8	.1	-40	5.48	31.54	-	-	-26.06	0-360	Off
6	1.26364	28.49	Pk	11	.2	-40	-.31	25.57	-	-	-25.88	0-360	Off

Pk - Peak detector

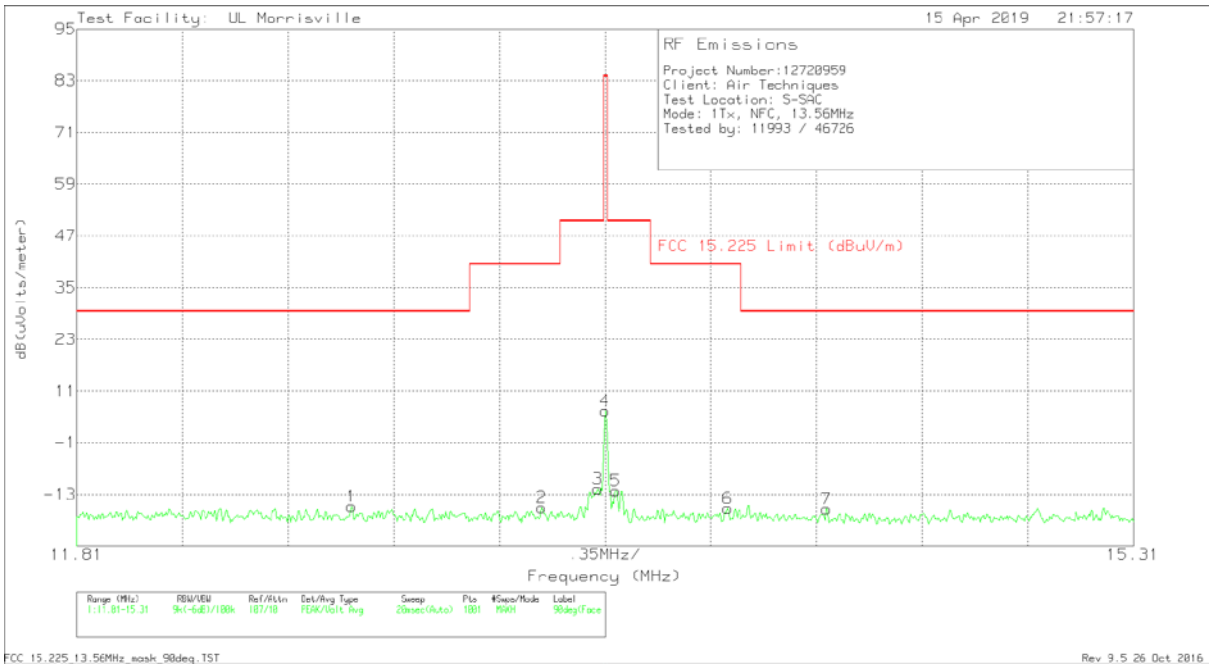
Fundamental (0 degrees)



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	12.72525	13.64	Pk	10.4	.6	-40	-15.36	29.5	-44.86	42
2	13.329	12.84	Pk	10.4	.6	-40	-16.16	40.5	-56.66	42
3	13.5355	22.68	Pk	10.4	.6	-40	-6.32	50.5	-56.82	42
4	13.56	39.42	Pk	10.4	.6	-40	10.42	84	-73.58	42
5	13.588	20.58	Pk	10.4	.6	-40	-8.42	50.5	-58.92	42
6	13.77525	13.27	Pk	10.4	.6	-40	-15.73	40.5	-56.23	42
7	14.5575	13.19	Pk	10.3	.6	-40	-15.91	29.5	-45.41	42

Pk - Peak detector

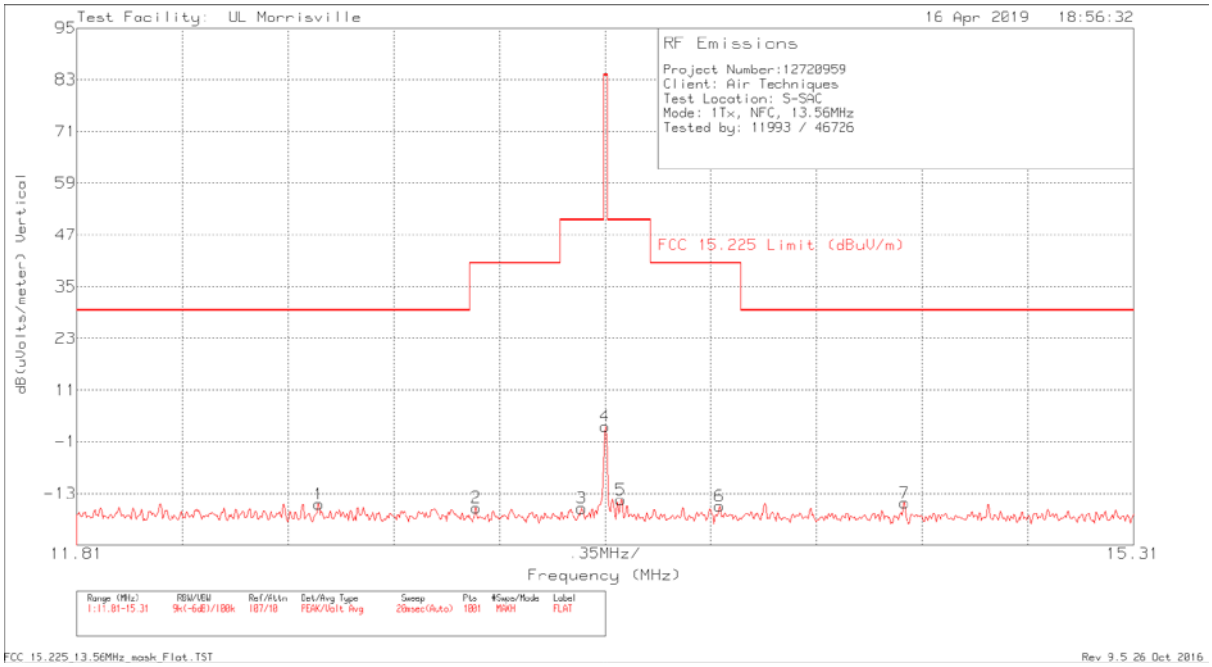
Fundamental (90 degrees)



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	12.72	13.22	Pk	10.4	.6	-40	-15.78	29.5	-45.28	317
2	13.35	12.96	Pk	10.4	.6	-40	-16.04	40.5	-56.54	317
3	13.5355	17.29	Pk	10.4	.6	-40	-11.71	50.5	-62.21	317
4	13.56	35.35	Pk	10.4	.6	-40	6.35	84	-77.65	317
5	13.595	16.81	Pk	10.4	.6	-40	-12.19	50.5	-62.69	317
6	13.966	12.76	Pk	10.4	.6	-40	-16.24	40.5	-56.74	317
7	14.29325	12.64	Pk	10.4	.6	-40	-16.36	29.5	-45.86	317

Pk - Peak detector

Fundamental (Parallel to GRP)

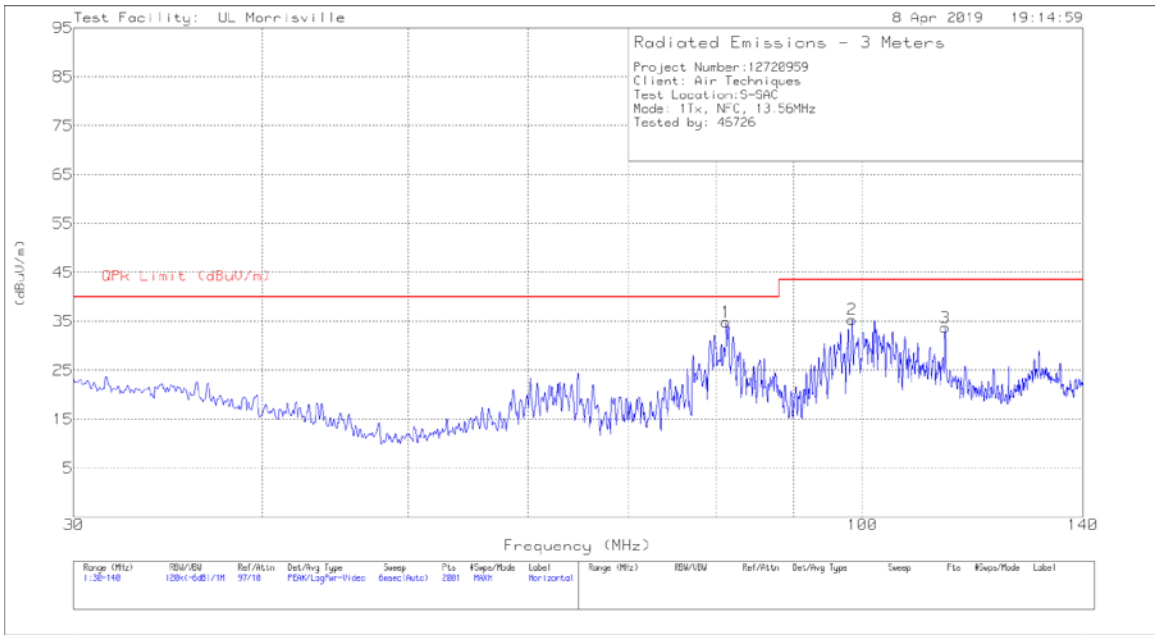


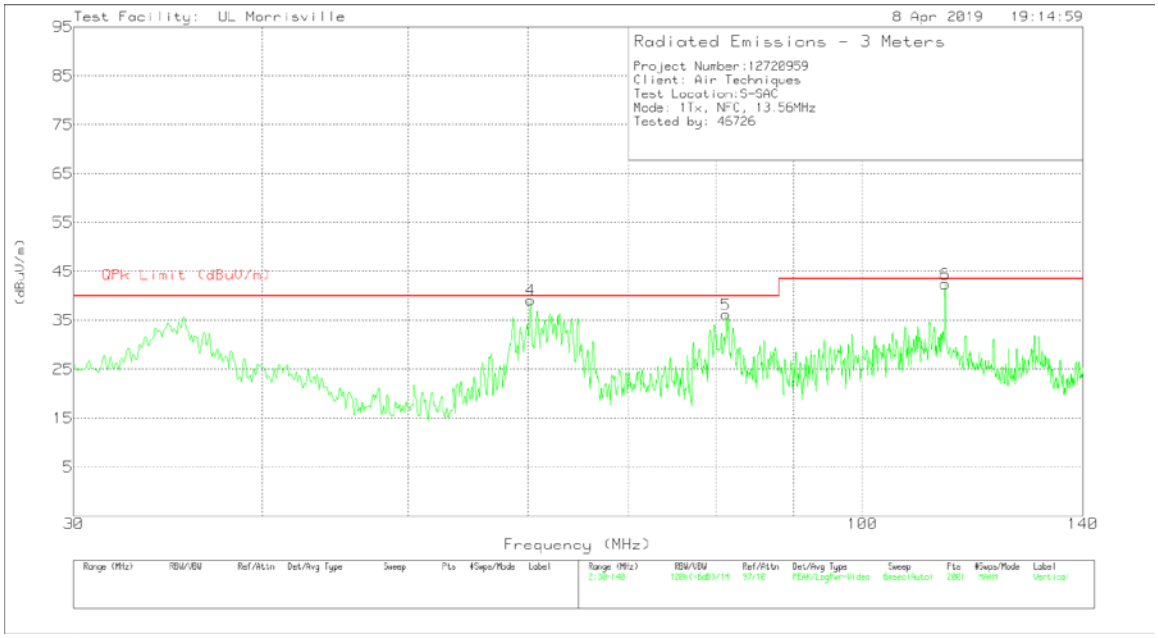
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0079 AF (dB/m)	Cbl (dB)	Dist. Corr. Factor (dB)	Corrected Reading dB(uVolts/meter)	FCC 15.225 Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1	12.6115	13.49	Pk	10.4	.6	-40	-15.51	29.5	-45.01	49
2	13.133	12.67	Pk	10.4	.6	-40	-16.33	40.5	-56.83	49
3	13.483	12.56	Pk	10.4	.6	-40	-16.44	50.5	-66.94	49
4	13.56	31.6	Pk	10.4	.6	-40	2.6	84	-81.4	49
5	13.6125	14.48	Pk	10.4	.6	-40	-14.52	50.5	-65.02	49
6	13.938	13.01	Pk	10.4	.6	-40	-15.99	40.5	-56.49	49
7	14.5505	13.9	Pk	10.3	.6	-40	-15.2	29.5	-44.7	49

Pk - Peak detector

8.3. TX SPURIOUS EMISSION 30 TO 140 MHz

Tag

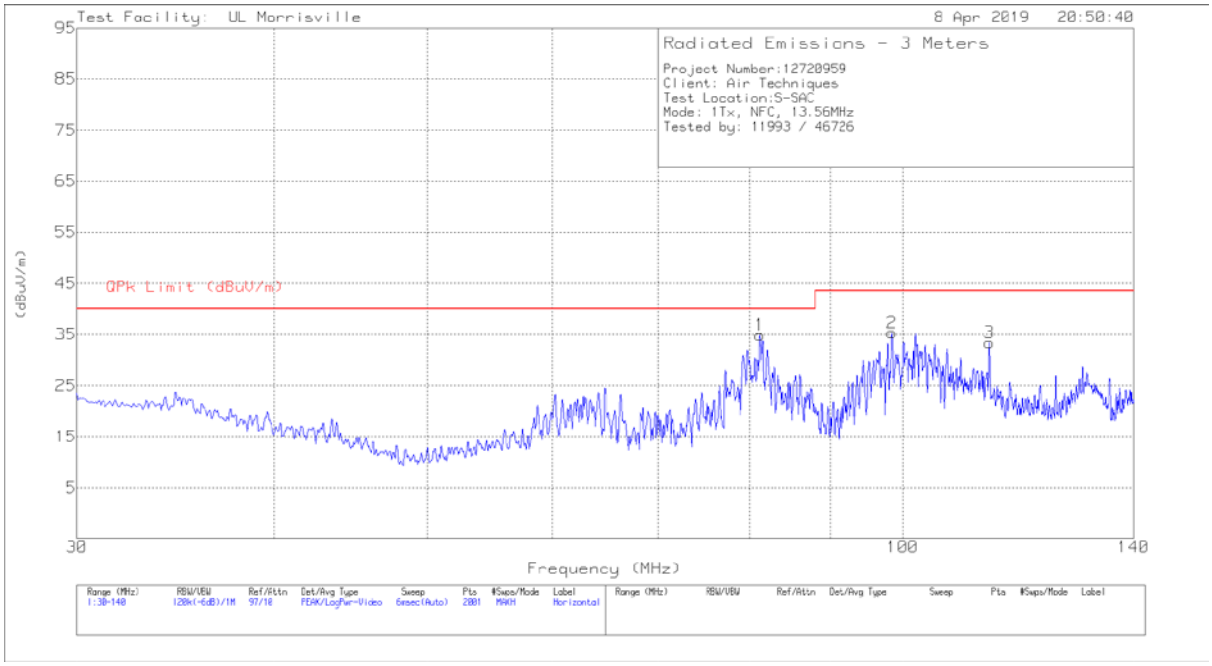


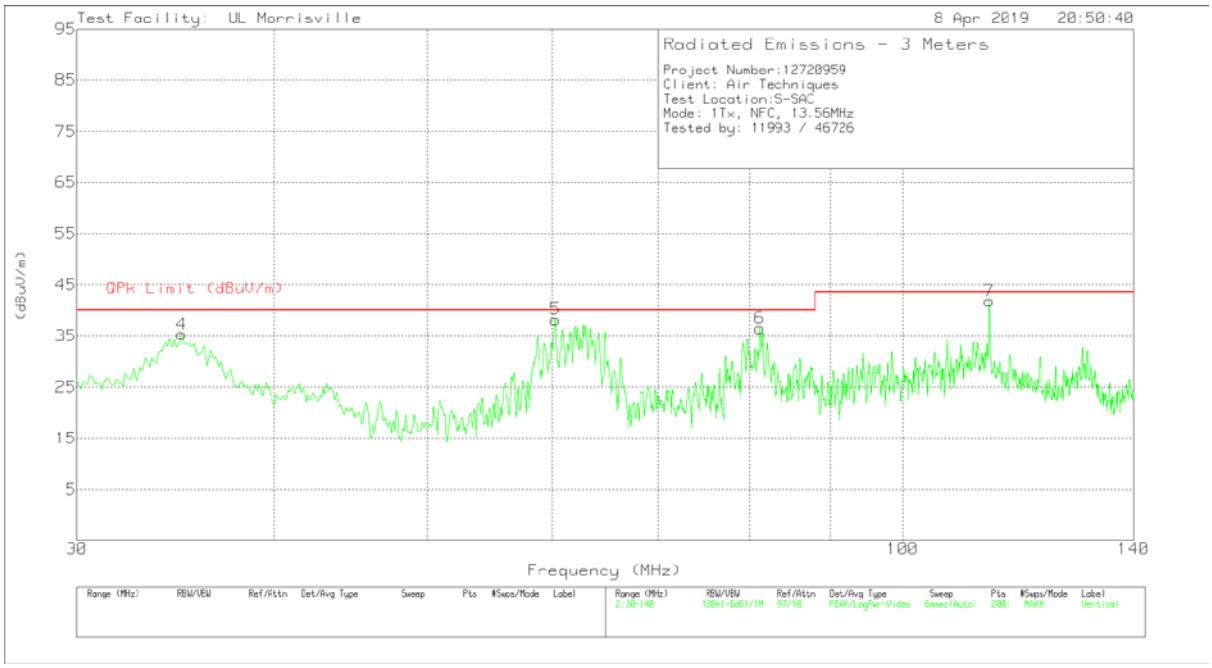


Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	60.2284	52.02	Qp	11.9	-31.4	.3	32.82	40	-7.18	276	124	V
1	81.2007	50.86	Qp	12	-31.2	.3	31.96	40	-8.04	5	253	H
5	81.2036	52.47	Qp	12	-31.2	.3	33.57	40	-6.43	237	104	V
2	98.4243	48.34	Qp	14	-31	.3	31.64	43.52	-11.88	111	280	H
3	113.4552	45.02	Qp	17.4	-30.8	.3	31.92	43.52	-11.6	16	306	H
6	113.4614	52.36	Qp	17.4	-30.8	.3	39.26	43.52	-4.26	68	109	V

Qp - Quasi-Peak detector

No Tag





Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	AT0074 AF (dB/m)	Cbl/Amp	Filter (dB)	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
4	35.1775	37.33	Qp	22.2	-31.7	.3	28.13	40	-11.87	15	117	V
5	60.201	55.73	Qp	11.9	-31.4	.3	36.53	40	-3.47	264	118	V
1	81.1944	53.02	Qp	12	-31.2	.3	34.12	40	-5.88	360	246	H
6	81.1949	54	Qp	12	-31.2	.3	35.1	40	-4.9	35	102	V
2	98.42	52.05	Pk	14	-31	.3	35.35	43.52	-8.17	0-360	299	H
3	113.435	46.52	Pk	17.4	-30.8	.3	33.42	43.52	-10.1	0-360	199	H
7	113.4556	52.46	Qp	17.4	-30.8	.3	39.36	43.52	-4.16	73	110	V

Pk - Peak detector
Qp - Quasi-Peak detector

9. 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.

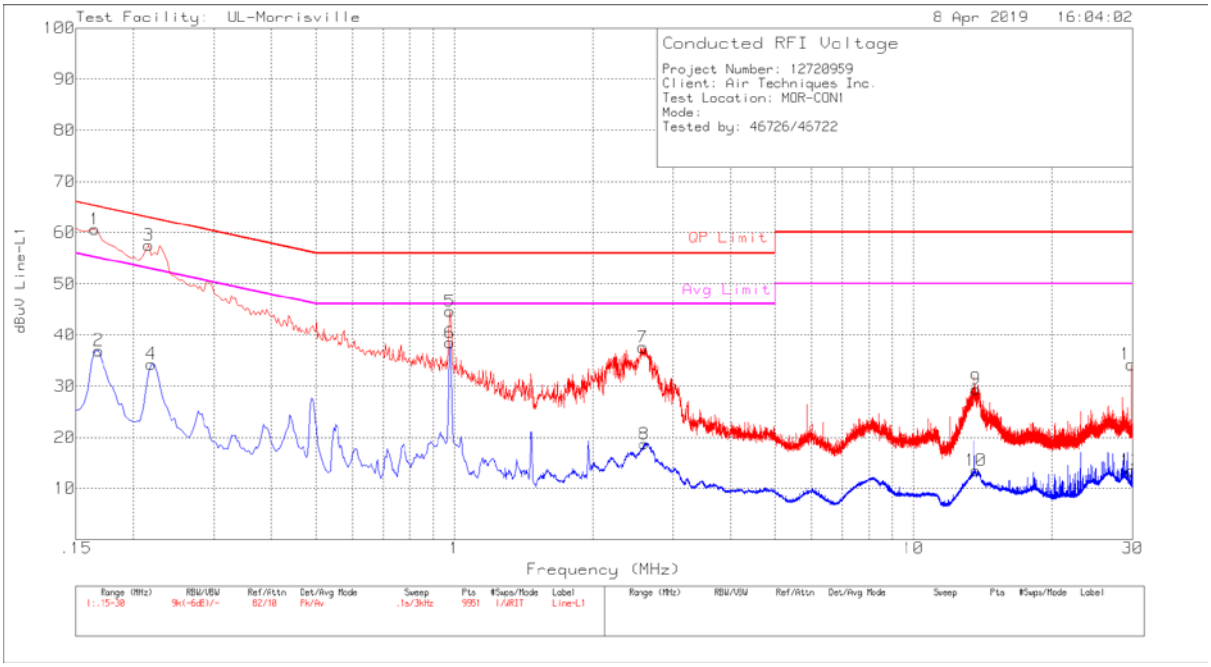
Frequency range	Limits (dBµV)	
(MHz)	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

TEST PROCEDURE

ANSI C63.10

RESULTS

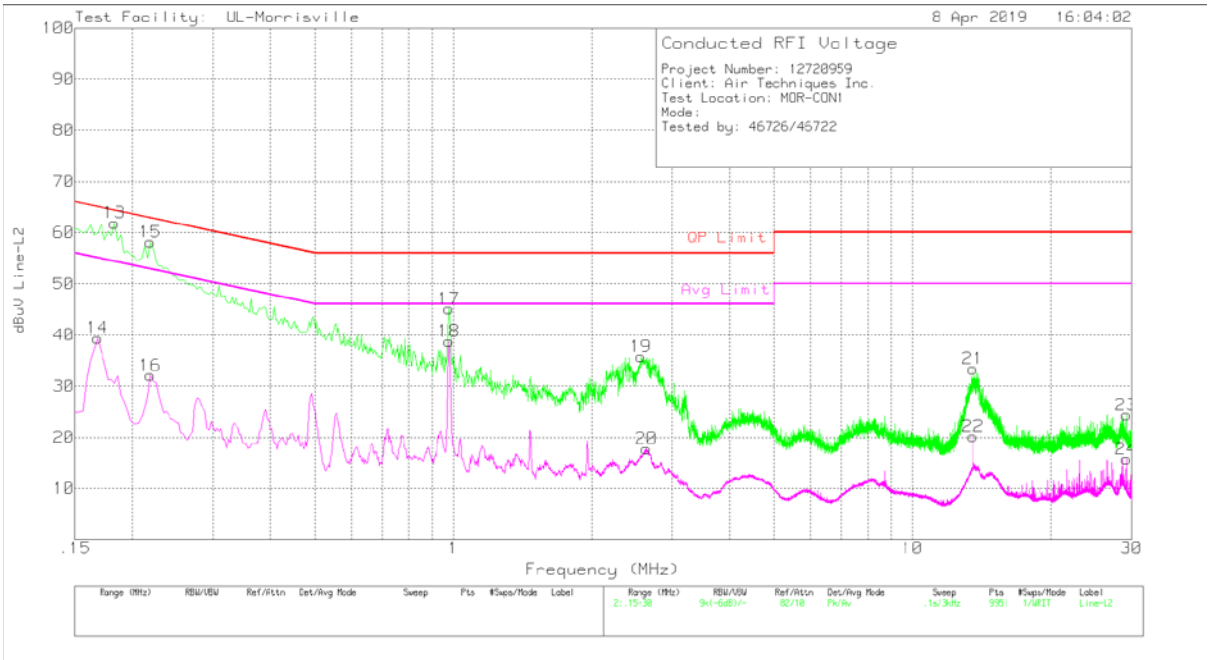
LINE 1 RESULTS – No Tag



Range 1: Line-L1 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
1	.16317	42.83	Qp	.2	10	53.03	65.3	-12.27	-	-
2	.16317	27.13	Av	.2	10	37.33	-	-	55.3	-17.97
3	.23004	36.99	Qp	.1	10	47.09	62.45	-15.36	-	-
4	.23004	14.99	Av	.1	10	25.09	-	-	52.45	-27.36
5	.978	34.63	Pk	0	10	44.63	56	-11.37	-	-
6	.978	28.5	Av	0	10	38.5	-	-	46	-7.5
7	2.574	27.49	Pk	0	10.1	37.59	56	-18.41	-	-
8	2.592	8.6	Av	0	10.1	18.7	-	-	46	-27.3
9	13.665	18.93	Pk	.1	10.4	29.43	60	-30.57	-	-
10	13.668	3.02	Av	.1	10.4	13.52	-	-	50	-36.48
11	29.823	23.16	Pk	.3	10.8	34.26	60	-25.74	-	-
12	29.784	2.4	Av	.3	10.8	13.5	-	-	50	-36.5

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector

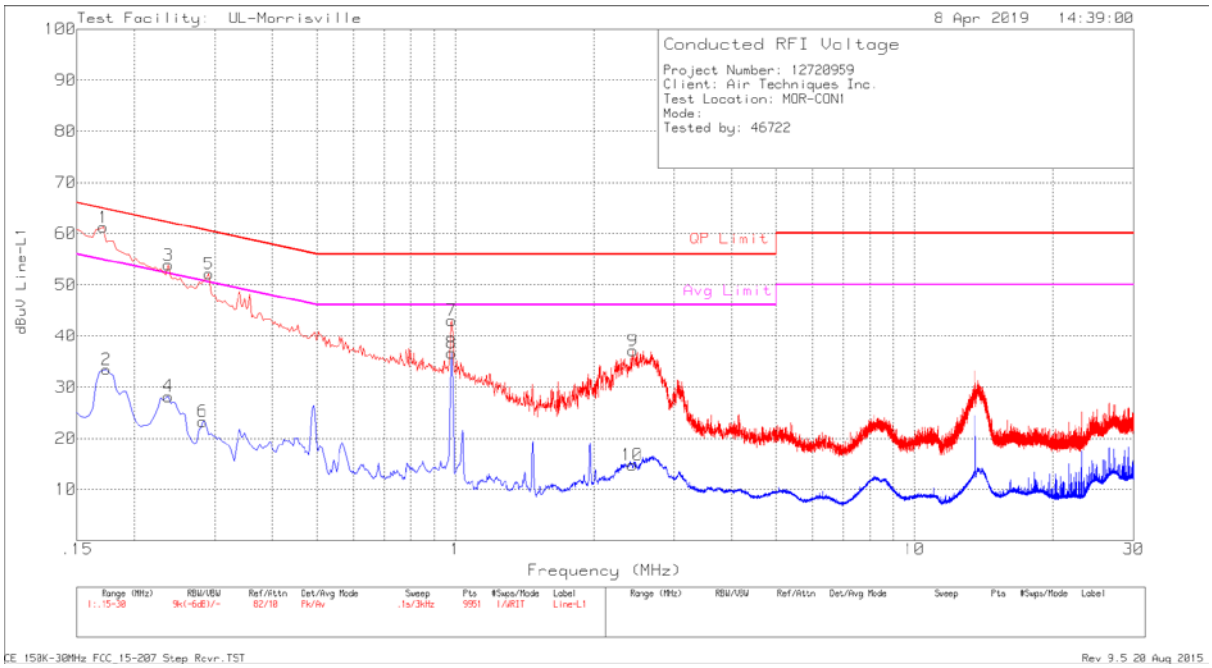
LINE 2 RESULTS – No Tag



Range 2: Line-L2 .15 - 30MHz										
Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	LISN VCF (dB)	Cbl/Limiter (dB)	Corrected Reading dBuV	QP Limit	Margin (dB)	Avg Limit	Margin (dB)
13	.16619	42.94	Qp	.2	10	53.14	65.15	-12.01	-	-
14	.16619	26.58	Av	.2	10	36.78	-	-	55.15	-18.37
15	.22116	39.64	Qp	.1	10	49.74	62.78	-13.04	-	-
16	.22116	21.58	Av	.1	10	31.68	-	-	52.78	-21.1
17	.16619	42.94	Qp	.2	10	53.14	65.15	-12.01	-	-
18	.978	28.78	Av	0	10	38.78	-	-	46	-7.22
19	2.562	25.68	Pk	0	10.1	35.78	56	-20.22	-	-
20	2.634	7.66	Av	0	10.1	17.76	-	-	46	-28.24
21	13.548	22.91	Pk	.1	10.4	33.41	60	-26.59	-	-
22	13.56	9.71	Av	.1	10.4	20.21	-	-	50	-29.79
23	29.235	13.34	Pk	.3	10.7	24.34	60	-35.66	-	-
24	29.235	4.78	Av	.3	10.7	15.78	-	-	50	-34.22

Pk - Peak detector
Av - Average detection
Qp - Quasi-Peak detector

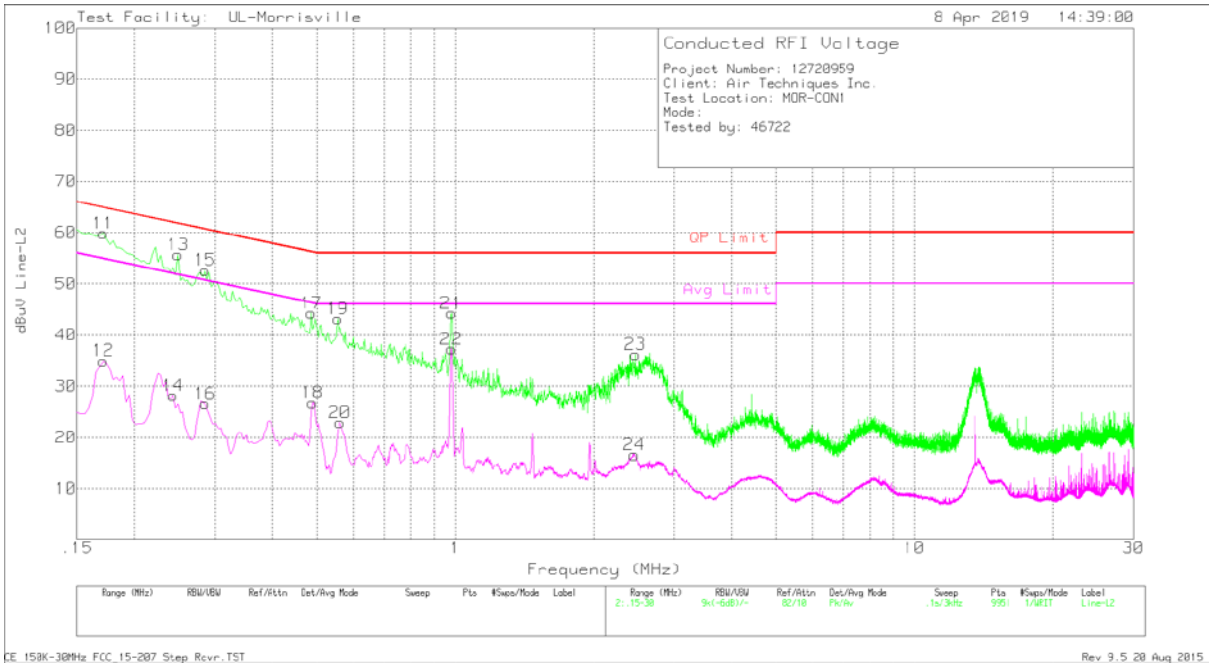
LINE 1 RESULTS – Tag



Range 1: Line-L1 .15 - 30MHz										
Marker	**Frequency (MHz)**	**Meter Reading (dBuV)**	**Det**	**LISN VCF (dB)**	**Cbl/Limiter (dB)**	**Corrected Reading dBuV**	**QP Limit**	**Margin (dB)**	**Avg Limit**	**Margin (dB)**
1	.16884	45.32	Qp	.2	10	55.52	65.02	-9.5	-	-
2	.174	23.24	Av	.2	10	33.44	-	-	54.77	-21.33
3	.237	43.75	Pk	.1	10	53.85	62.2	-8.35	-	-
4	.237	18.11	Av	.1	10	28.21	-	-	52.2	-23.99
5	.291	42.06	Pk	.1	10	52.16	60.5	-8.34	-	-
6	.282	13.21	Av	.1	10	23.31	-	-	50.76	-27.45
7	.981	33.04	Pk	0	10	43.04	56	-12.96	-	-
8	.981	26.66	Av	0	10	36.66	-	-	46	-9.34
9	2.433	27.03	Pk	0	10.1	37.13	56	-18.87	-	-
10	2.427	4.66	Av	0	10.1	14.76	-	-	46	-31.24

Qp - Quasi-Peak detector
Pk - Peak detector
Av - Average detection

LINE 2 RESULTS – Tag



Range 2: Line-L2 .15 - 30MHz										
Marker	**Frequency (MHz)**	**Meter Reading (dBuV)**	**Det**	**LISN VCF (dB)**	**Cbl/Limiter (dB)**	**Corrected Reading dBuV**	**QP Limit**	**Margin (dB)**	**Avg Limit**	**Margin (dB)**
11	.16801	45.44	Qp	.2	10	55.64	65.06	-9.42	-	-
12	.171	24.78	Av	.2	10	34.98	-	-	54.91	-19.93
13	.249	45.62	Pk	.1	10	55.72	61.79	-6.07	-	-
14	.243	18.05	Av	.1	10	28.15	-	-	51.99	-23.84
15	.285	42.57	Pk	.1	10	52.67	60.67	-8	-	-
16	.285	16.44	Av	.1	10	26.54	-	-	50.67	-24.13
17	.486	34.15	Pk	.1	10	44.25	56.24	-11.99	-	-
18	.489	16.66	Av	.1	10	26.76	-	-	46.18	-19.42
19	.555	33.15	Pk	0	10	43.15	56	-12.85	-	-
20	.561	12.88	Av	0	10	22.88	-	-	46	-23.12
21	.981	34.28	Pk	0	10	44.28	56	-11.72	-	-
22	.981	27.29	Av	0	10	37.29	-	-	46	-8.71
23	2.466	26.11	Pk	0	10.1	36.21	56	-19.79	-	-
24	2.454	6.47	Av	0	10.1	16.57	-	-	46	-29.43

Qp - Quasi-Peak detector
Pk - Peak detector
Av - Average detection

10. 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.

RSS-210 Annex B.6: Carrier frequency stability shall be maintained to ±0.01% (±100 ppm).

TEST PROCEDURE

ANSI C63.10 6.8.2, 6.8.3

RESULTS – No Tag

Startup

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply (Vac)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
120.00	50	13.5606820	-6.858	± 100
120.00	40	13.5606990	-8.112	± 100
120.00	30	13.5606450	-4.130	± 100
120.00	***20***	***13.5605890***	***0.000***	***± 100***
120.00	10	13.5606340	-3.318	± 100
120.00	0	13.5606350	-3.392	± 100
120.00	-10	13.5606330	-3.245	± 100
120.00	-20	13.5606350	-3.392	± 100
102.00	20	13.5605880	0.074	± 100
138	20	13.5605880	0.074	± 100

2 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	13.5606820	-6.858	± 100
120.00	40	13.5606990	-8.112	± 100
120.00	30	13.5606450	-4.130	± 100
120.00	***20***	***13.5605890***	***0.000***	***± 100***
120.00	10	13.5606355	-3.429	± 100
120.00	0	13.5606320	-3.171	± 100
120.00	-10	13.5606330	-3.245	± 100
120.00	-20	13.5606350	-3.392	± 100
102.00	20	13.5605890	0.000	± 100
138	20	13.5605890	0.000	± 100

5 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	13.5606830	-6.932	± 100
120.00	40	13.5606990	-8.112	± 100
120.00	30	13.5606450	-4.130	± 100
120.00	***20***	***13.5605890***	***0.000***	***± 100***
120.00	10	13.5606355	-3.429	± 100
120.00	0	13.5606320	-3.171	± 100
120.00	-10	13.5606330	-3.245	± 100
120.00	-20	13.5606350	-3.392	± 100
102.00	20	13.5605880	0.074	± 100
138	20	13.5605880	0.074	± 100

10 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	13.5606820	-6.932	± 100
120.00	40	13.5606990	-8.185	± 100
120.00	30	13.5606450	-4.203	± 100
120.00	***20***	***13.5605880***	***0.000***	***± 100***
120.00	10	13.5606340	-3.392	± 100
120.00	0	13.5606320	-3.245	± 100
120.00	-10	13.5606340	-3.392	± 100
120.00	-20	13.5606350	-3.466	± 100
102.00	20	13.5605880	0.000	± 100
138	20	13.5605890	-0.074	± 100

TEST INFORMATION

Date: 2019-04-12 – 2019-04-20
Tested by: Jeffrey Cabrera

RESULTS – Tag

Startup

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC Limit: ± 100 ppm = 1.356 kHz				
Power Supply	**Environment**	**Frequency Deviation Measureed with Time Elapse**		
(Vac)	**Temperature (ºC)**	**(MHz)**	**Delta (ppm)**	**Limit (ppm)**
120.00	50	13.5605760	0.074	± 100
120.00	40	13.5605790	-0.147	± 100
120.00	30	13.5605790	-0.147	± 100
120.00	***20***	***13.5605770***	***0.000***	***± 100***
120.00	10	13.5605780	-0.074	± 100
120.00	0	13.5605770	0.000	± 100
120.00	-10	13.5605750	0.147	± 100
120.00	-20	13.5605760	0.074	± 100
102.00	20	13.5605780	-0.074	± 100
138	20	13.5605770	0.000	± 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	13.5605760	0.074	± 100
120.00	40	13.5605790	-0.147	± 100
120.00	30	13.5605790	-0.147	± 100
120.00	***20***	***13.5605770***	***0.000***	***± 100***
120.00	10	13.5605780	-0.074	± 100
120.00	0	13.5605770	0.000	± 100
120.00	-10	13.5605750	0.147	± 100
120.00	-20	13.5605760	0.074	± 100
102.00	20	13.5605780	-0.074	± 100
138	20	13.5605780	-0.074	± 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	13.5605760	0.074	± 100
120.00	40	13.5605790	-0.147	± 100
120.00	30	13.5605790	-0.147	± 100
120.00	***20***	***13.5605770***	***0.000***	***± 100***
120.00	10	13.5605790	-0.147	± 100
120.00	0	13.5605770	0.000	± 100
120.00	-10	13.5605750	0.147	± 100
120.00	-20	13.5605760	0.074	± 100
102.00	20	13.5605770	0.000	± 100
138	20	13.5605770	0.000	± 100

10 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	13.5605760	0.000	± 100
120.00	40	13.5605790	-0.221	± 100
120.00	30	13.5605790	-0.221	± 100
120.00	***20***	***13.5605760***	***0.000***	***± 100***
120.00	10	13.5605780	-0.147	± 100
120.00	0	13.5605700	0.442	± 100
120.00	-10	13.5605750	0.074	± 100
120.00	-20	13.5605760	0.000	± 100
102.00	20	13.5605760	0.000	± 100
138	20	13.5605780	-0.147	± 100

TEST INFORMATION

Date: 2019-04-12 – 2019-04-20
Tested by: Jeffrey Cabrera