TEST REPORT

Report Number: 101207197DEN-001
Project Number: G101207197

Report Issue Date: June 28th, 2013

Product Designation: **Model: M9 Portable (Series 900 TOC Analyzers)**

Standards: **FCC 47CFR Part 15C**
RSS-210 - Issue 8: 2010
RSS-GEN - Issue 3: 2010

Tested by:	Client:
Intertek Testing Services NA, Inc. 1795 Dogwood St. Suite 200 Louisville, CO 80027	GE Analytical Instruments 6060 Spine Road Boulder, CO 80301-3687

Report prepared by	Report reviewed by
Randy Thompson Senior EMC Project Engineer	Michael Spataro Engineering Team Leader

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1   Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the **product tested complies with the requirements of the standard(s) indicated.** The results obtained in this test report pertain only to the item(s) tested.

2   Test Summary

Section	Test full name	Test date	Result
5	Radiated Unintentional/ Tx Spurious Emissions - FCC 15.209/15.225(b)(c)(d) Covers IC RSS-Gen 7.2.5/ RSS-210 A2.6(b)(c)(d)	06/24/2013 06/25/2013	Pass
6	Tx Voltage Variation - FCC 15.31(e)	06/24/2013	Pass
7	Tx Frequency Tolerance (Stability) – FCC 15.225(e) Covers RSS-Gen, Section 7.2.6/RSS-210 A2.6	10/12/2013	Pass
8	Tx Intentional Radiated Emissions (Fundamental & Harmonics) FCC 15.209/15.225(a)(d) Covers IC RSS-Gen 7.2.5/RSS-210 A2.6(a)(d)	06/20/2013	Pass
9	AC Conducted Emissions - FCC 15.207 Covers RSS-Gen, Section 7.2.4	06/07/2013	Pass
10	Occupied Bandwidth Measurement (OBW) - RSS-Gen, Section 4.6.1	06/20/2013	Pass

General Notes:

1) The testing in this report covers the following product(s): Model M9 (Series 900 TOC Analyzers)

2) The following product options were covered by manufacturer's "Declaration of Similarity":
    - Model M9 Portable, M9^e Portable, M5310 C Portable
    - Model M9 Laboratory, M9^e Laboratory, M5310 C Laboratory
    - Model M9 On-line, M9^e On-Line, M5310 C On-Line

3) The Model M9 Portable was deemed "worst-case" for radio testing. This specific model is configured with a plastic enclosure and is configured with a comprehensive set of electronics. Moreover, the Model M9 Portable represents the highest density electronics of all models. During testing of the radio, the transmit antenna was modified to directly face the measurement antenna – absolute worst-case.

4) Product is RSS-210 Category 1 equipment.

Radio Notes:

1) Test Method used for this report: ANSI C63.10:2009 – "American National Standard for Testing Unlicensed Wireless Devices".

2) FCC CFR47 Part 15.31: Measurement Standards: In any case where the device is powered off a battery, a fresh battery was used during test. In cases where the device is powered off an AC supply, voltage was varied per Part 15.31 to find worst case emissions.

3) FCC CFR47 Part 15.35: Measurement Detector Functions and Bandwidths: FCC Part 15.35 was utilized when performing the measurements within this report.

4) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified. When performing measurements at a distance other than that specified, the results are extrapolated to the specified distance using the inverse linear distance extrapolation factor (20dB/decade). For frequencies below 30MHz, results are extrapolated 40dB/decade.

5) FCC 15.35 and IC RSS-Gen 4.5: No duty cycle correction for pulsed-signals utilized in this report.

2.1 Test Facility

Intertek Denver's testing facilities are located at 1795 Dogwood St. Suite 200 Louisville, CO 80027. The testing facility is ISO17025:2005 accredited by A2LA, our lab code is 2506.02, our VCCI registration numbers are. R-1643, C-1752 and T-1558, our FCC designation no. US1121 and our IC lab no. 2042N.

Testing contained in this test report may not be covered under the laboratories scope of accreditation. A note will be placed in the specific test section for testing not coved under the laboratories scope.

3   Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
TOC Analyzer (Series 900)	GE Analytical	M9 Portable	13040025

Receive Date:	06/03/2013
Received Condition:	Good
Type:	Production Sample

Description of Equipment Under Test (provided by client)
The Model M9 Series 900 Total Organic Carbon Analyzers from GE Analytical Instruments include high-sensitivity analyzers used to measure the concentration of total organic carbon (TOC), total inorganic carbon (TIC), and total carbon (TC = TOC + TIC) in water samples. The Analyzer is based on the oxidation of organic compounds to form carbon dioxide (CO_2) using UV radiation and a chemical oxidizing agent. Carbon dioxide is measured using a sensitive, selective membrane-based conductometric detection technique. For each TOC measurement, the concentration of inorganic carbon species is determined and, after oxidation of the organic compounds, the total carbon (TC) content of the sample is measured. The concentration of the organic compounds is then calculated from the difference between the concentrations of TC and total inorganic carbon (TIC), generally referred to simply as inorganic carbon (IC). (TOC = TC - IC) The Analyzer can be used to monitor water samples ranging from high-purity water containing <0.3 parts per billion (ppb) TOC to water samples containing up to 50 parts per million (ppm) TOC.

System Components:
- Sample inlet system and sample pump
- Chemical reagent subsystem (reservoirs, syringe pumps)
- Oxidation reactor
- Measurement module (CO_2 transfer modules, conductivity cells)
- DI water loop (reservoir, resin bed, water pump)
- Electronics subsystems (microprocessors, circuit boards, data outputs)

Specific Product Option tested in this report: M9 Portable

Radio: Tx Frequency 13.560MHz (+/- 10ppm), inductive loop single integral antenna, carrier duty-cycled

Product will marketed in the US and Canada.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Power	Rated Frequency	Number of Phases
100-240 VAC	65 W	50-60Hz	1

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Primary product powered-up and in standby-idles state. RFID configured to operate ~ 100% duty cycle, performing RFID tracking of reagent volume and expiration date.
2	All operations controlled and viewed in real-time by remote laptop/utility program – data analyzed and logged.
3	Query tags commands sent from instrument RFID radio to tags and receive data from tags.
4	Ethernet commands sent from external computer to instrument to query tag data.

3.1   Photo: Product Under Test – Model M9 Portable
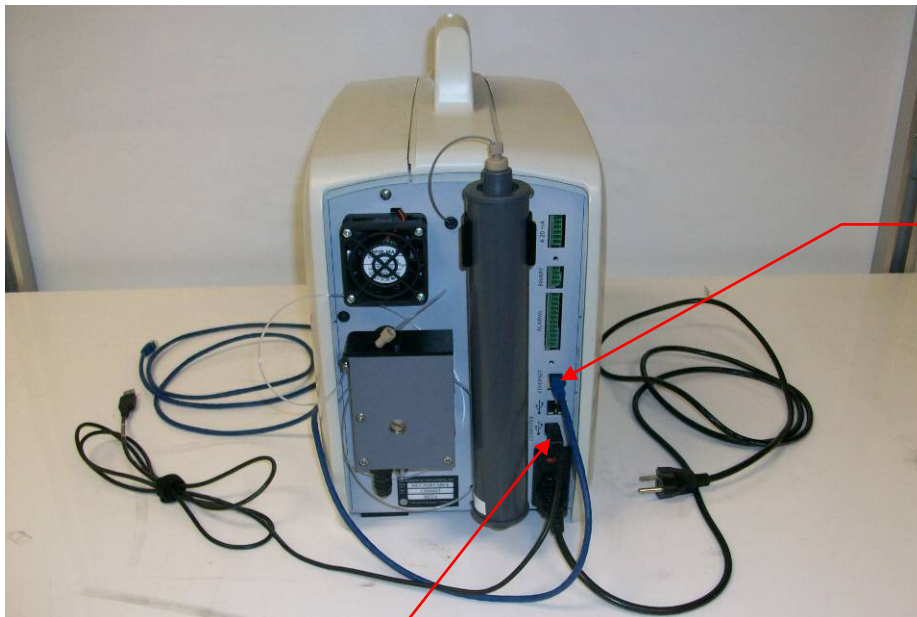
Ethernet Cable

USB Cable

Photo: Product Under Test – Model M9 Portable

RFID 13.56MHz Antenna Section (Normal Configuration)
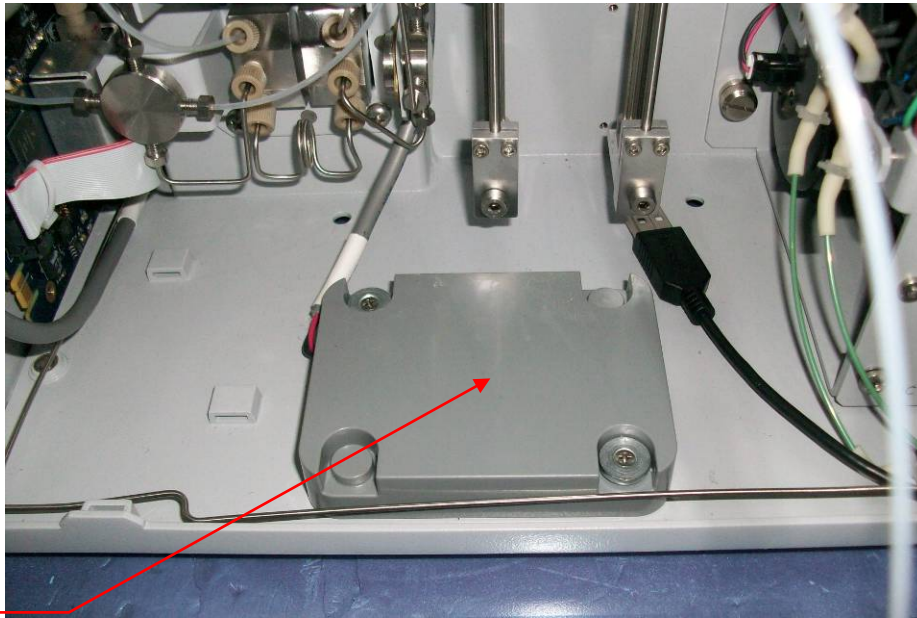
RFID 13.56MHz Antenna Section (Test Configuration)
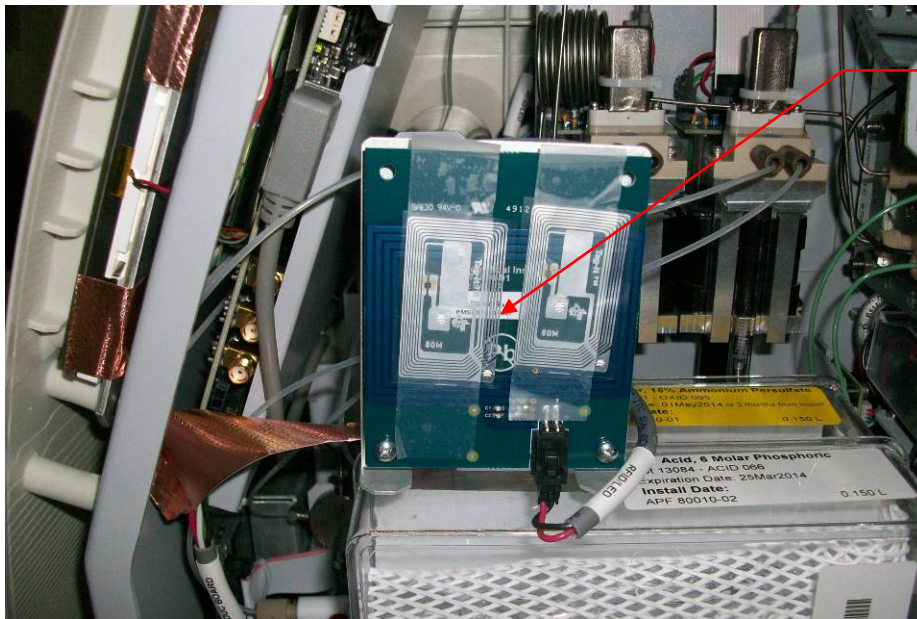
Note: For all testing of the Tx Fundamental & Harmonics, the RFID antenna was facing directly towards the measurement antenna (worst-case)

4 System setup including cable interconnection details, support equipment and simplified block diagram

4.1 Method:
Record the details of EUT cabling, document the support equipment, and show the interconnections in a block diagram.

4.2 EUT Block Diagram: EMC Perspective
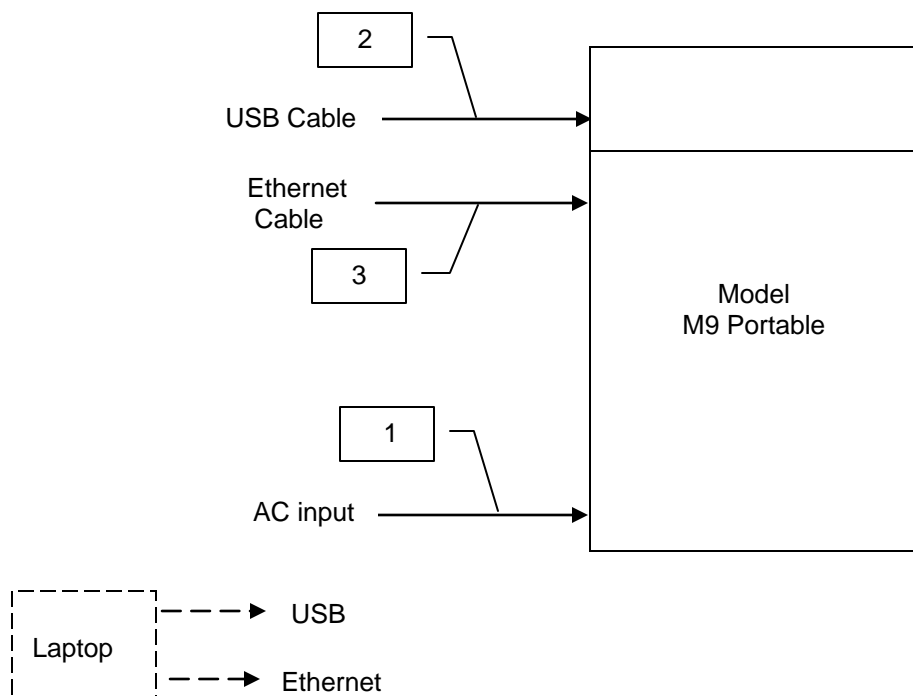
Note:
1) Support equipment denoted as dashed lines and were located outside the test chambers.
   (Minimum 1-meter of cable was located inside the test chamber for both USB and Ethernet)

4.3   EUT Instrument Control Block Diagram

Instrument Controller Board
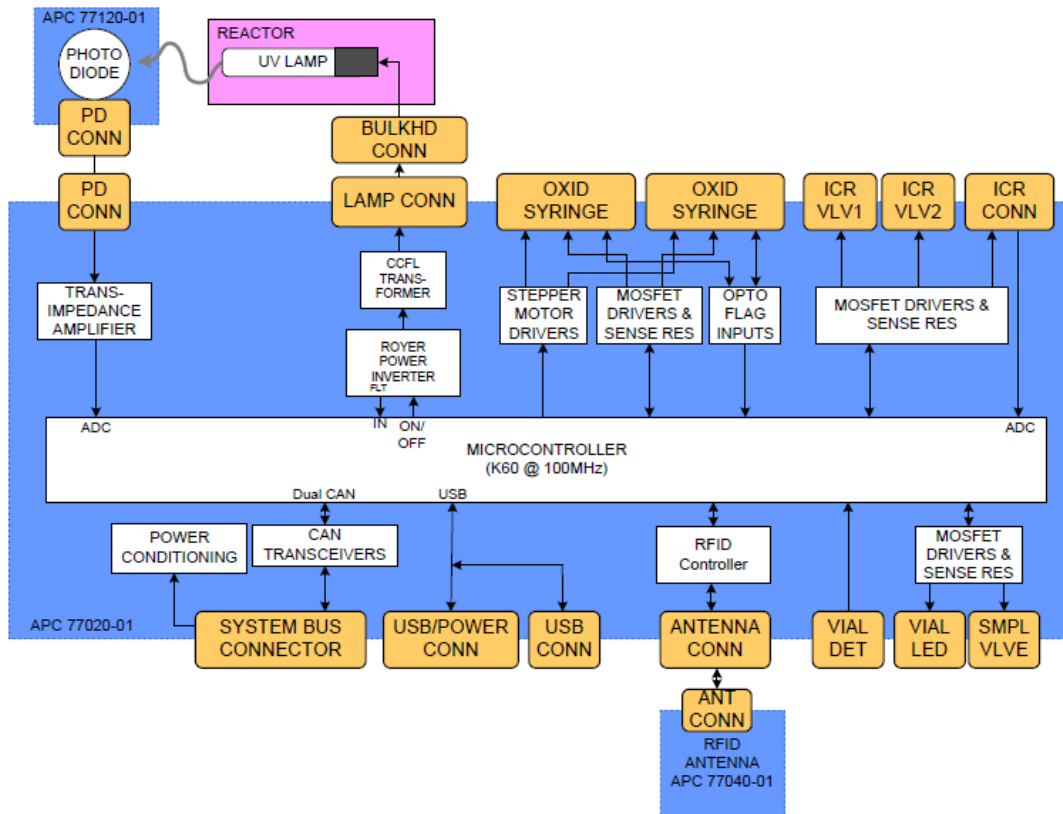
4.4   Support Data:

ID	Description/ Function	Shield	Length	Connector	Connection	Ferrites
1	AC power cord	None	1.2-meter	AC	AC Power	None
2	USB Cable	Yes	< 3-meters	USB	Product-to-Laptop	Yes
3	Ethernet Cable	None	> 3-meters	RJ45	Product-to-Laptop	None

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Laptop	Dell	E6430	---

5 Radiated Unintentional & Tx Spurious Emissions

5.1 Method

Unless otherwise stated no deviations were made from FCC 15.209/15.225(b)(c)(d) and IC RSS-Gen 7.2.5/RSS-210 A2.6(b)(c)(d).

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

5.2 Test Equipment Used:

Asset ID	Description	Manufacture	Model	Serial	Cal Date	Cal Due
DEN-073	EMI Receiver	ROHDE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	06/07/2013	06/07/2014
18906	RF Pre-Amp (1-4GHz)	Mini-Circuits Lab	ZHL-42	N052792-2	06/08/2013	06/08/2014
18900	RF Pre-Amplifier (4-8 GHz)	Avantek	AFT97-8434-10F	1007	06/08/2013	06/08/2014
18897	Active Loop Antenna	EMCO	6502	9205-2738	11/29/2012	11/29/2013
19936	Bilog Antenna 30MHz - 6GHz	Sunol Sciences	JB6	A050707-1	11/15/2012	11/15/2013
18887	Horn Antenna 1-18GHz	EMCO	3115	9205-3886	03/19/2013	03/19/2014
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 1.0	VBU	VBU

5.3 Results:

The sample tested was found to Comply.

5.4 Setup Photographs: Radiated Unintentional & Spurious

Test setup – Front view

Photo:

Test setup – Rear view
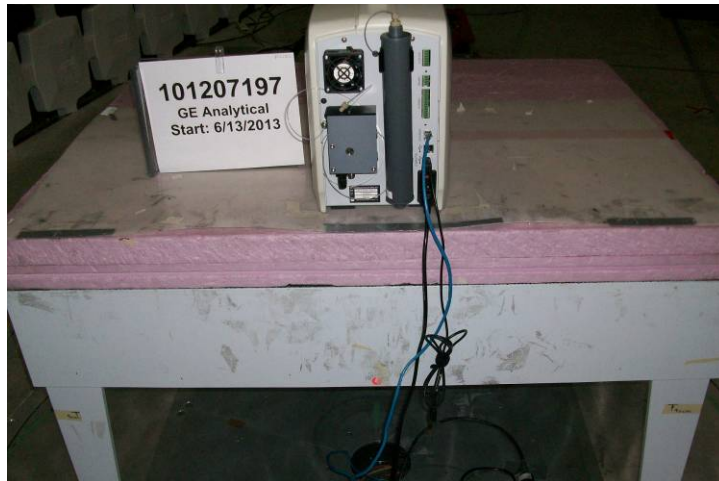
Photo: Antenna Setups

Antenna Setup: Active Loop Antenna - 10kHz to 30MHz

Antenna Setup: BiLog Antenna - 30MHz to 1000MHz

Antenna Setup: Horn Antenna – Above 1GHz

5.5   Pre-scan Plots: Reference Only – Not Final Data:

Radiated Emissions – FCC 15.209/15.225/IC RSS-Gen/RSS-210 (10kHz to 30MHz)

Loop Parallel
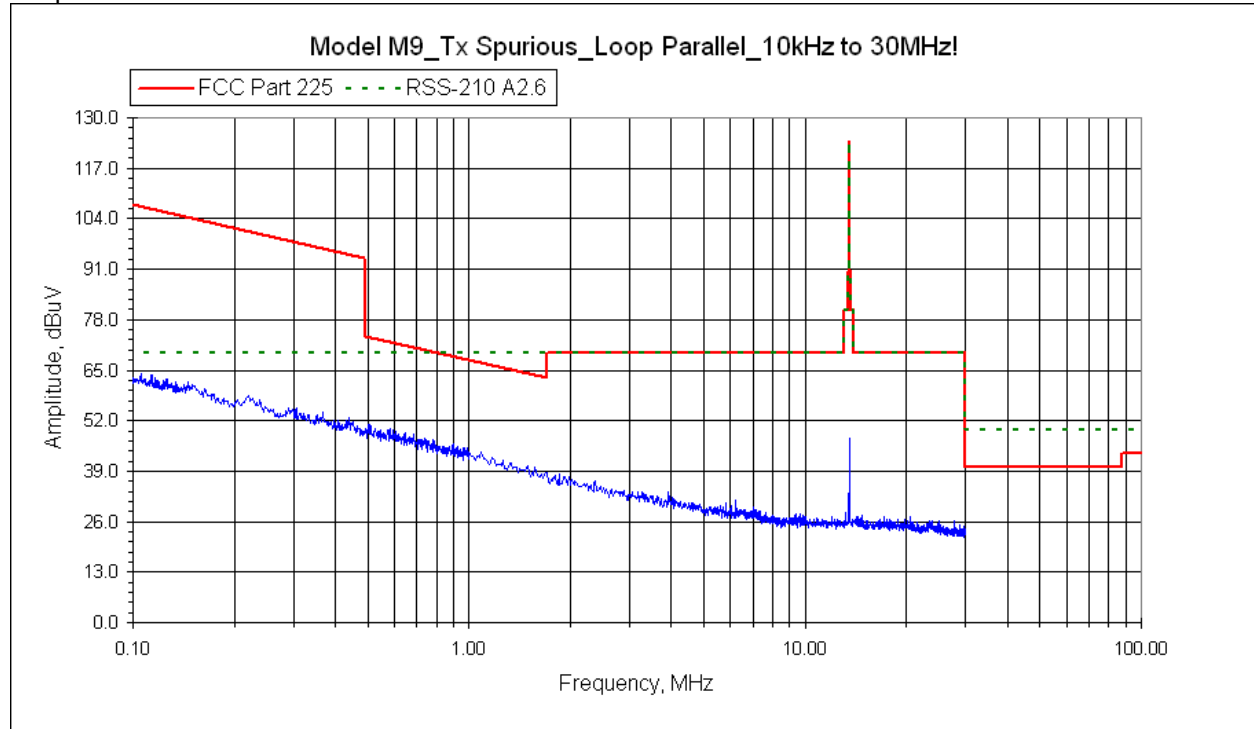
Tx Mask
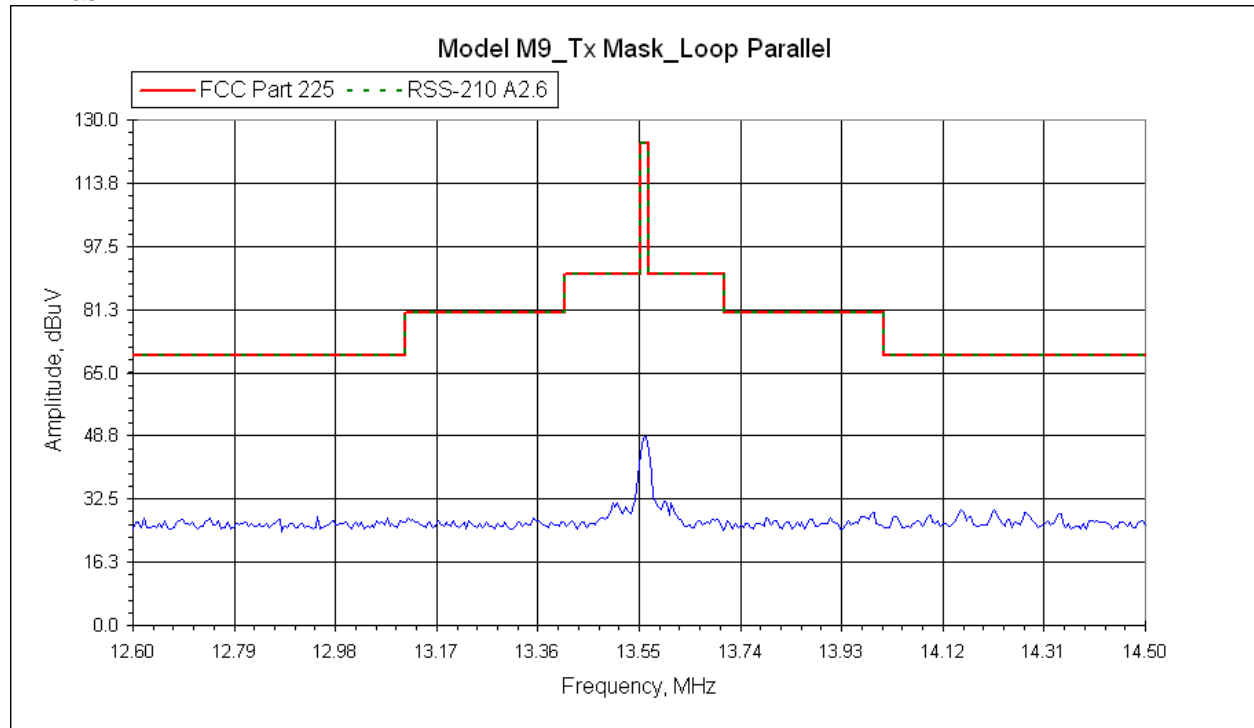
Note: Peak detector measurements plotted against quasi-peak limits

5.6   Pre-scan Plots: Reference Only – Not Final Data:

Radiated Emissions – FCC 15.209/15.225/IC RSS-Gen/RSS-210 (10kHz to 30MHz)

Loop Perpendicular
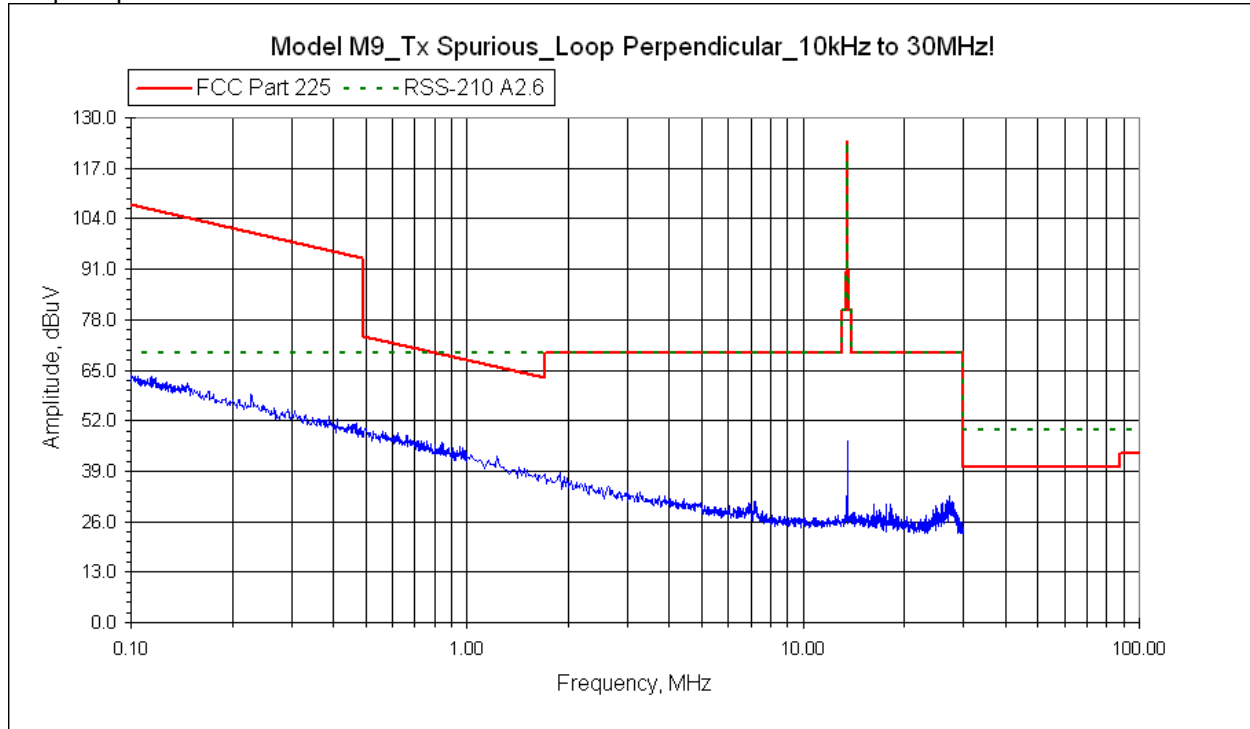
Tx Mask
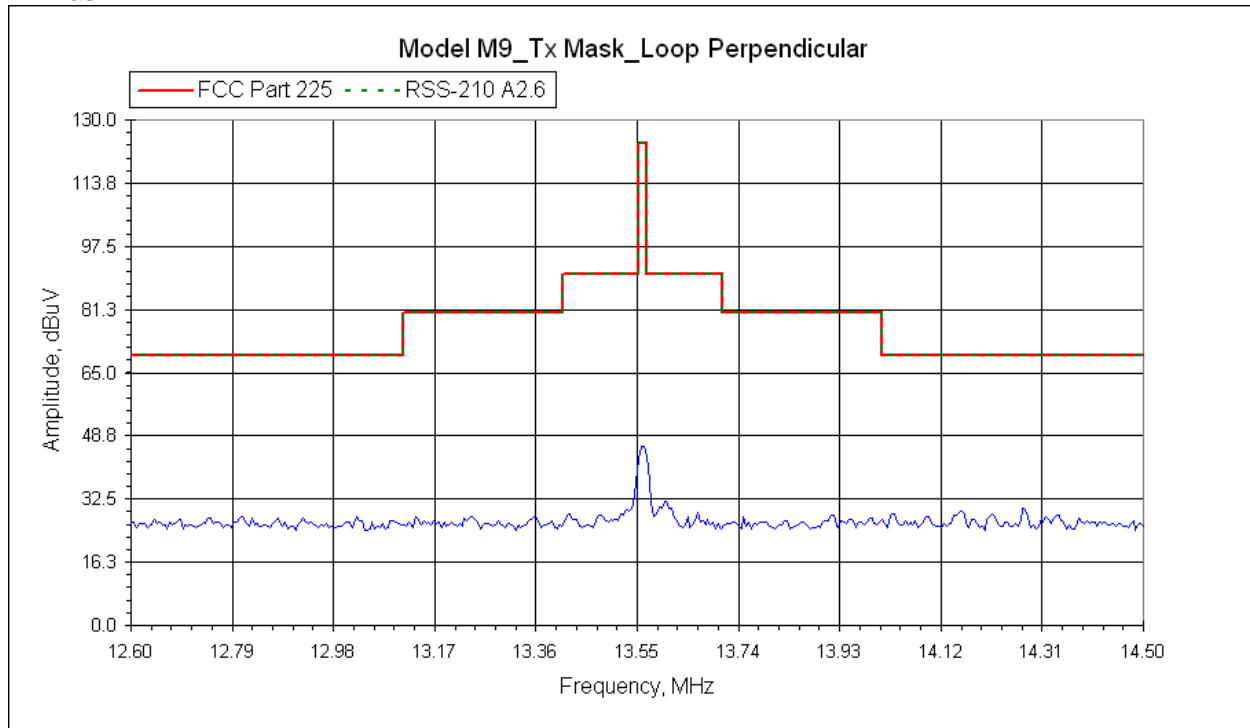
Note: Peak detector measurements plotted against quasi-peak limits

5.7 Pre-scan Plots: Reference Only – Not Final Data:

Radiated Emissions – FCC 15.209/15.225 IC RSS-Gen/RSS-210 (30MHz to 1000MHz)
Antenna Vertical.
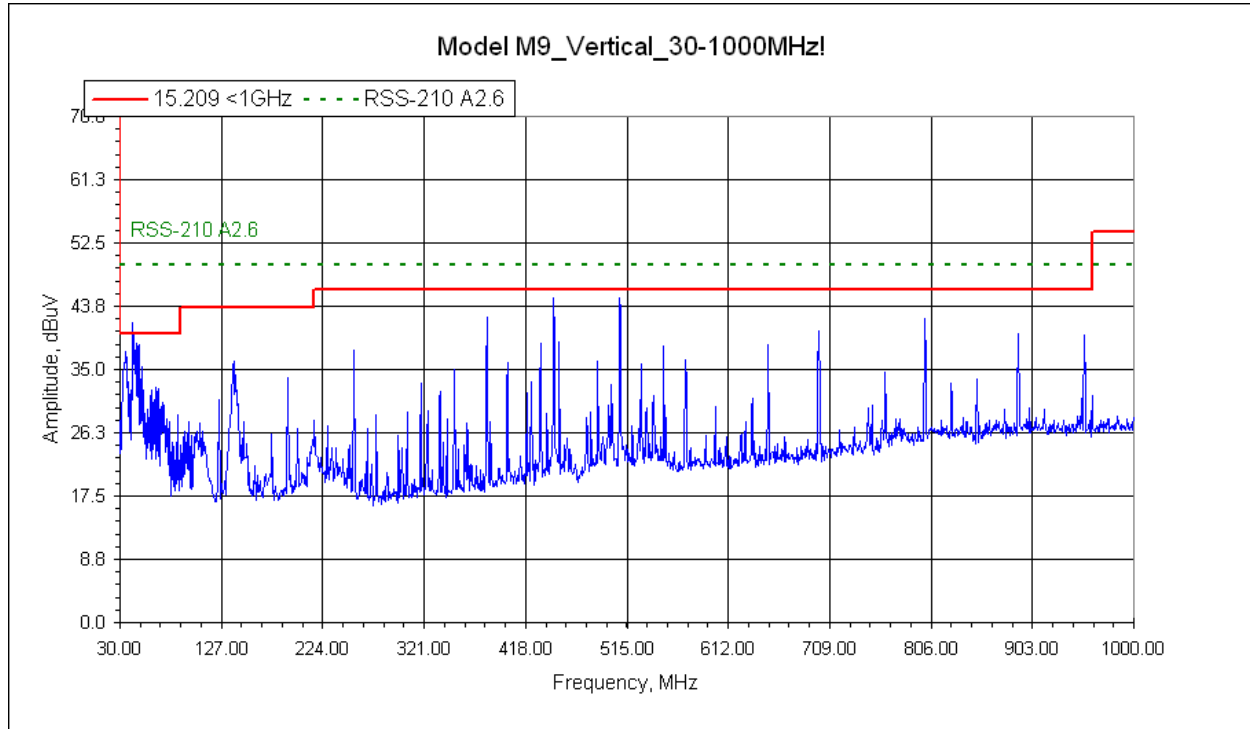
Antenna Horizontal
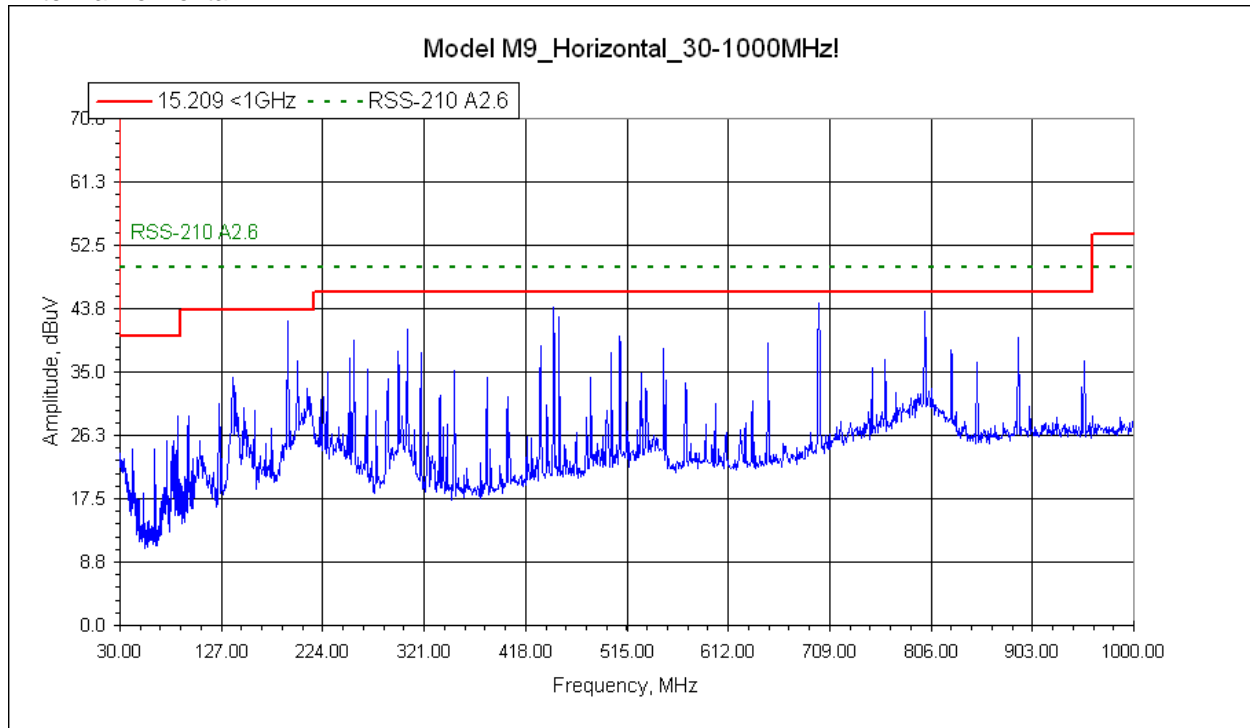
Note: Peak detector measurements plotted against quasi-peak limits

5.8   Pre-scan Plots: Reference Only – Not Final Data:

Radiated Emissions – FCC 15.209/15.225 IC RSS-Gen/RSS-210 (1GHz to 4 GHz)
Antenna Vertical.

Antenna Horizontal

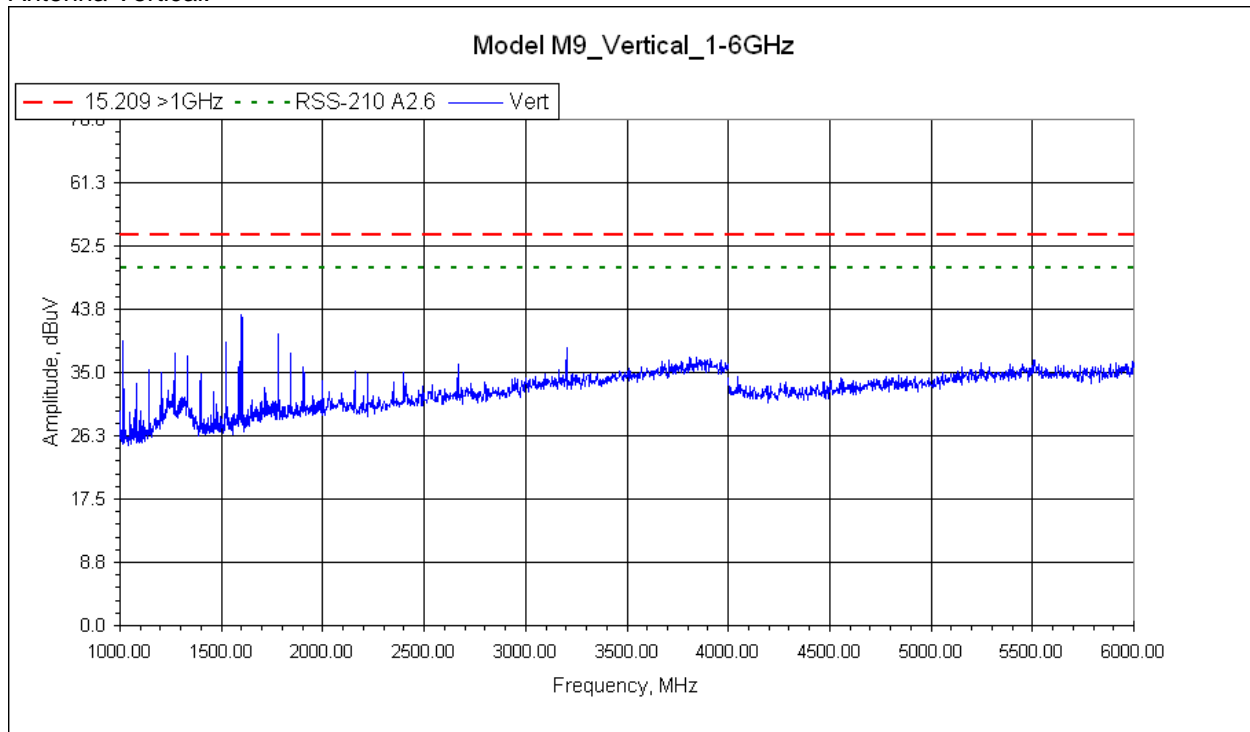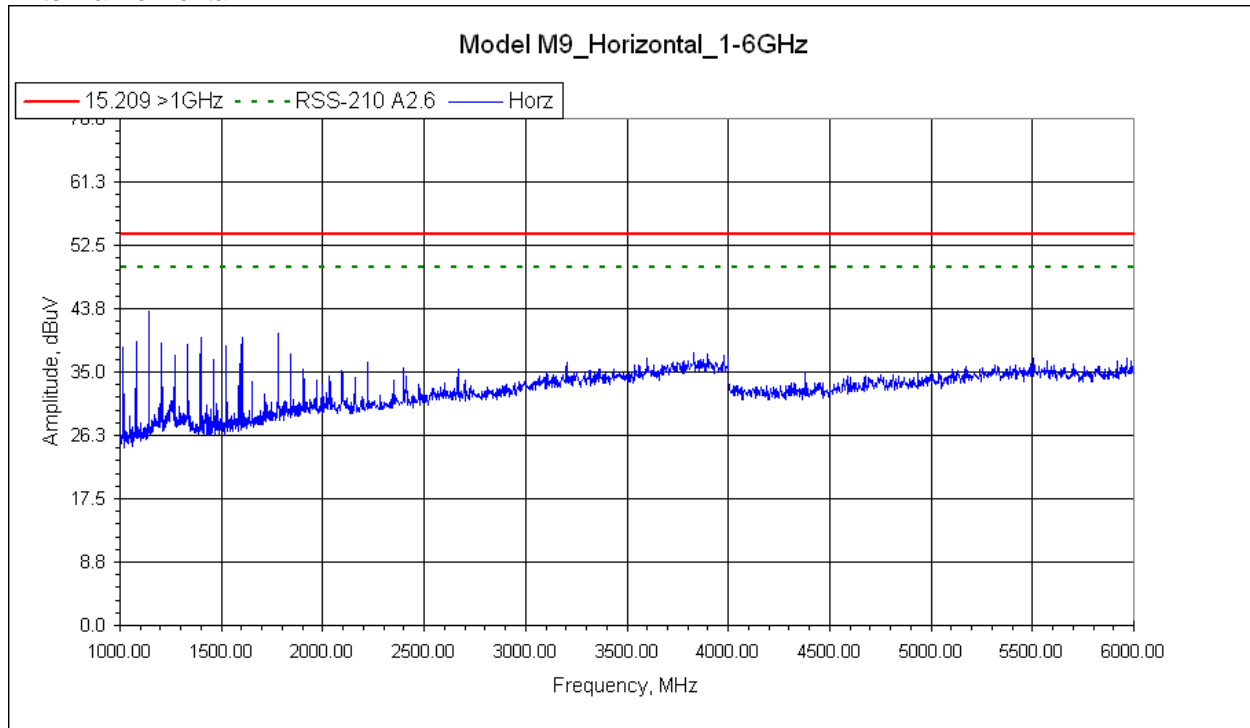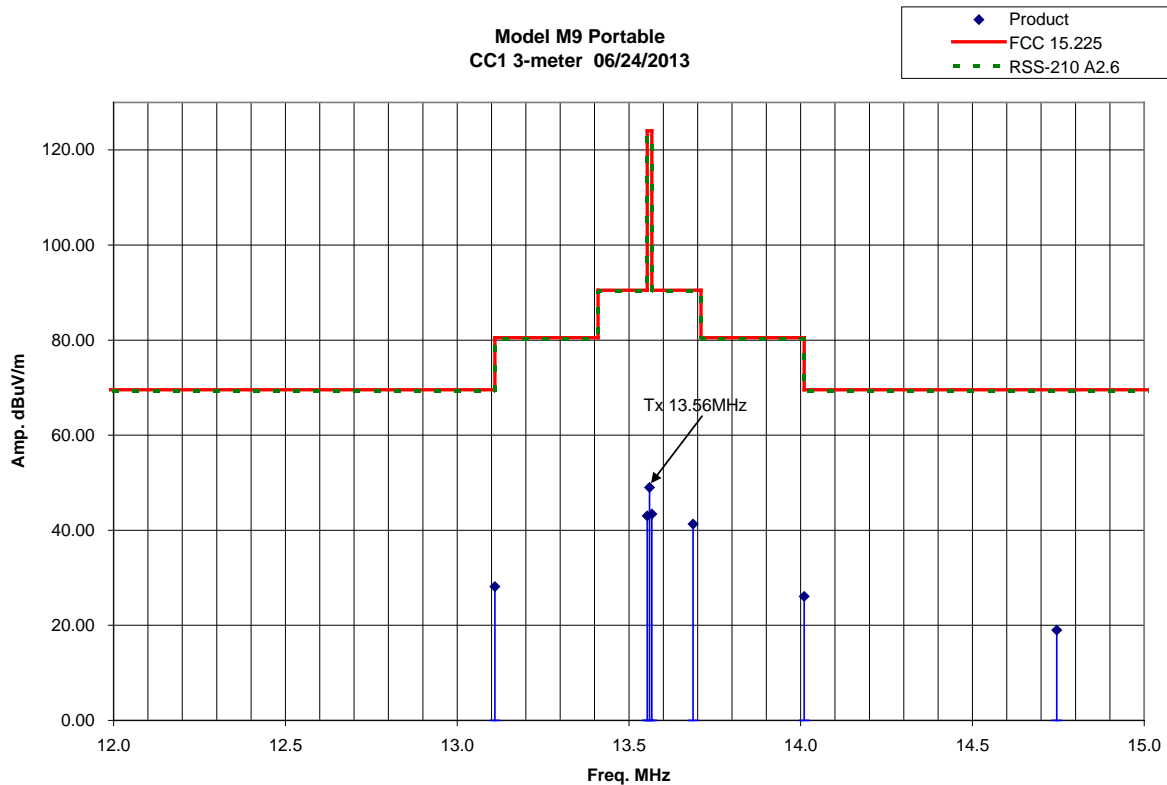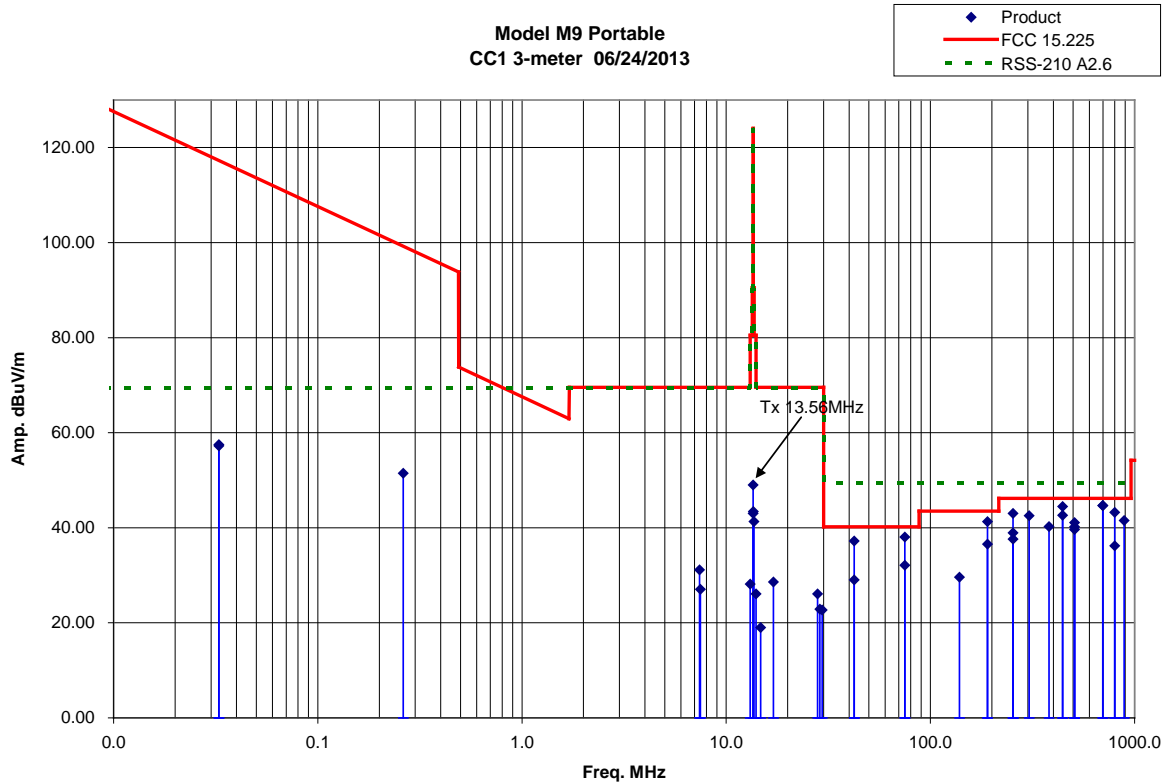Note: Peak detector measurements plotted against quasi-peak limits

5.9   Final Plots:

Radiated Emissions – FCC 15.209/ IC RSS-Gen 7.2.5 (10kHz to 1000MHz)

Model M9 Portable
CC1 3-meter 06/24/2013

Model M9 Portable
CC1 3-meter 06/24/2013

5.10 Test Data:

Radiated Electromagnetic Emissions

Test Report #:	**G101207197**	Test Area:	CC1 Radiated	Temperature: 22.9 ℃
Test Method:	FCC 15.225/15.209 IC RSS-210 A2.6	Test Date:	06/24/2013 06/25/2013	Relative Humidity: 31.2 %
EUT Model #:	M9 Portable	EUT Power:	120VAC/60Hz	Air Pressure: 83.1 kPa
EUT Serial #:	13040025			

Manufacturer:	GE Analytical Instruments	Level Key
EUT Description:	TOC Analyzer – Series 900	Pk – Peak
Notes :	Product powered-up and running operations continuously.	Qp – Quasi Peak
	RFID running at ~ 100% duty cycle reading reagent tags	Av - Average

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	Delta2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.225 15.209	IC RSS-210 A2.6	(MHz)
Loop Antenna Parallel: 10kHz to 30MHz Data													
Tx Band Edge Measurements – Edge of Allowed Fundamental Tx Band													
13.5530	31.79	Qp	0.30	10.94	0.00	0.00	43.03	H	1.71	71.6	- 80.97	- 80.97	0.010
13.5670	32.17	Qp	0.30	10.94	0.00	0.00	43.41	H	1.39	80.2	- 47.09	- 47.09	0.010
Tx Band Edge Measurements – Outer Edge of Tx Mask													
13.1100	16.92	Qp	0.30	10.92	0.00	0.00	28.14	H	1.09	0.0	- 41.40	- 41.36	0.010
14.0100	14.81	Qp	0.30	10.96	0.00	0.00	26.07	H	1.54	72.4	- 43.47	- 43.43	0.010
0.0328	44.19	Qp	0.10	13.21	0.00	0.00	57.50	H	1.00	114.0	- 59.11	- 12.04	0.009
0.2621	41.03	Qp	0.10	10.34	0.00	0.00	51.47	H	1.05	182.0	- 47.61	- 18.07	0.009
13.6870	30.29	Qp	0.90	10.13	0.00	0.00	41.32	H	1.00	180.0	- 49.18	- 49.18	0.009
17.0220	17.24	Qp	1.10	10.24	0.00	0.00	28.58	H	1.00	69.0	- 40.96	- 40.96	0.009
29.4912	12.89	Qp	1.40	8.43	0.00	0.00	22.72	H	1.06	140.0	- 46.82	- 46.82	0.009
Loop Antenna Perpendicular : 10kHz to 30MHz Data													
7.4670	15.97	Qp	0.44	10.65	0.00	0.00	27.06	H	1.00	360.0	- 42.48	- 42.48	0.009
14.7456	12.23	Qp	1.00	10.03	0.00	0.00	23.26	H	1.00	360.0	- 46.28	- 46.28	0.009
28.0216	15.97	Qp	1.30	8.81	0.00	0.00	26.08	H	1.00	92.0	- 43.46	- 43.46	0.009

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	Delta2	RBW
		Qp Av Pk									FCC 15.225 15.209	IC RSS-210 A2.6	
MHz	dBuV		+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	DEG			(MHz)
BiLog Antenna Vertical: 30MHz to 1000MHz Data													
42.3000	44.38	Qp	0.77	12.16	28.27	0.00	29.04	V	1.00	16.3	- 10.96	- 20.46	0.120
42.3000	52.58	Qp	0.77	12.16	28.27	0.00	37.24	V	1.00	204.1	- 2.76	- 12.26	0.120
75.0000	51.40	Qp	0.77	8.10	28.16	0.00	32.11	V	1.18	238.5	- 7.89	- 17.39	0.120
75.0000	57.33	Qp	0.77	8.10	28.16	0.00	38.04	V	1.14	238.5	- 1.96	- 11.46	0.120
138.6000	43.80	Qp	0.80	12.90	27.88	0.00	29.61	V	1.00	331.3	- 13.91	- 19.89	0.120
190.5100	51.75	Qp	0.92	11.50	27.60	0.00	36.57	V	1.09	342.2	- 6.95	- 12.93	0.120
254.0100	53.24	Qp	1.07	11.98	27.36	0.00	38.94	V	1.09	342.2	- 7.08	- 10.56	0.120
254.0100	57.33	Qp	1.07	11.98	27.36	0.00	43.03	V	1.42	277.4	- 2.99	- 6.47	0.120
381.0200	51.17	Qp	1.34	15.50	27.75	0.00	40.26	V	1.43	6.7	- 5.76	- 9.24	0.120
444.5800	55.15	Qp	1.44	17.09	28.21	0.00	45.48	V	1.43	0.0	- 0.54	- 4.02	0.120
508.0000	49.31	Qp	1.55	18.00	28.65	0.00	40.21	V	1.16	342.5	- 5.81	- 9.29	0.120
508.0000	50.18	Qp	1.55	18.00	28.65	0.00	41.08	V	1.16	267.1	- 4.94	- 8.42	0.120
698.5000	51.59	Qp	1.85	19.70	28.45	0.00	44.69	V	1.38	287.8	- 1.33	- 4.81	0.120
800.0000	41.16	Qp	1.97	21.20	28.12	0.00	36.21	V	1.29	227.0	- 9.81	- 13.29	0.120
BiLog Antenna Horizontal: 30MHz to 1000MHz Data													
190.5100	56.49	Qp	0.92	11.50	27.60	0.00	41.31	H	1.63	33.2	- 2.21	- 8.19	0.120
254.0200	51.92	Qp	1.07	11.98	27.36	0.00	37.62	H	1.64	78.1	- 8.40	- 11.88	0.120
304.7800	54.63	Qp	1.20	14.00	27.30	0.00	42.52	H	1.21	208.2	- 3.50	- 6.98	0.120
444.5200	52.28	Qp	1.44	17.09	28.20	0.00	42.61	H	1.60	97.4	- 3.41	- 6.89	0.120
508.0000	48.73	Qp	1.55	18.00	28.65	0.00	39.63	H	1.36	18.6	- 6.39	- 9.87	0.120
698.5200	51.56	Qp	1.85	19.70	28.45	0.00	44.66	H	1.62	35.7	- 1.36	- 4.84	0.120
800.0000	48.21	Qp	1.97	21.20	28.12	0.00	43.26	H	1.56	180.1	- 2.76	- 6.24	0.120
889.0200	45.30	Qp	2.08	21.98	27.85	0.00	41.51	H	1.37	77.9	- 4.51	- 7.99	0.120
Horn Antenna Vertical: 1GHz to 5GHz Data													
1016.0000	57.99	Av	2.23	23.92	37.17	0.00	46.97	V	1.57	11.3	- 7.03	- 2.53	1.000
1270.0500	52.87	Av	2.51	25.20	37.01	0.00	43.57	V	1.62	286.4	- 10.43	- 5.93	1.000
1524.0500	52.09	Av	2.75	25.39	36.62	0.00	43.61	V	1.43	113.6	- 10.39	- 5.89	1.000
1600.0000	54.67	Av	2.82	25.45	36.67	0.00	46.28	V	1.72	91.7	- 7.72	- 3.22	1.000
1778.0000	54.07	Av	2.99	26.64	37.03	0.00	46.67	V	1.49	236.8	- 7.33	- 2.83	1.000
Horn Antenna Horizontal: 1GHz to 5GHz Data													
1015.9000	51.81	Av	2.23	23.92	37.17	0.00	40.79	H	1.95	303.7	- 13.21	- 8.71	1.000
1143.1000	54.87	Av	2.39	24.73	37.27	0.00	44.72	H	1.83	14.7	- 9.28	- 4.78	1.000
1397.1000	55.11	Av	2.63	25.09	36.72	0.00	46.11	H	1.75	12.2	- 7.89	- 3.39	1.000
1600.0000	50.48	Av	2.82	25.45	36.67	0.00	42.09	H	2.10	187.4	- 11.91	- 7.41	1.000
1778.1000	51.20	Av	2.99	26.64	37.03	0.00	43.80	H	1.53	287.9	- 10.20	- 5.70	1.000
2400.0000	48.56	Av	3.51	28.58	37.58	0.00	43.06	H	1.89	149.7	- 10.94	- 6.44	1.000
2667.2000	48.11	Av	3.72	28.99	37.47	0.00	43.35	H	1.61	0.0	- 10.65	- 6.15	1.000
3200.0000	43.66	Av	4.15	30.91	37.56	0.00	41.16	H	1.78	259.6	- 12.84	- 8.34	1.000
4000.0000	40.30	Av	4.67	32.66	36.93	0.00	40.70	H	1.72	100.7	- 13.30	- 8.80	1.000
1015.9000	51.81	Av	2.23	23.92	37.17	0.00	40.79	H	1.95	303.7	- 13.21	- 8.71	1.000
1143.1000	54.87	Av	2.39	24.73	37.27	0.00	44.72	H	1.83	14.7	- 9.28	- 4.78	1.000

Example calculation:

Measured Level		Cable Loss		Antenna Factor		Pre-Amp		Atten		Final Corrected Reading	Specification Limit		Final Corrected Reading		Delta Specification
	+		+		-		+		=			-		=	
(dBμV)		(dB)		(dB)		(dB)		(dB)		(dBμV/m)	(dBμV/m)		(dBμV/m)		
20.0		3.0		5.0		10.0		0.0		18.0	40.0		18.0		- 22.0

Notes: None

Deviations, Additions, or Exclusions: None

6   Tx Voltage Variation

6.1   Method

Unless otherwise stated no deviations were made from FCC 15.31(e).

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

6.2   Test Equipment Used:

Asset ID:	Description:	Manufacturer:	Model:	Serial:	Cal Date	Cal Due
DEN-073	EMI Receiver	RHODE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18897	Active Loop Antenna	EMCO	6502	9205-2738	11/29/2012	11/29/2013
SW-6	Software application for Radiated and Conducted Emissions	Intertek	OATS_Vba	V003	VBU	VBU

6.3   Test Data:

Tx Voltage Variation

Test Report #: **G101207197**

Test Area: CC1 Radiated

Temperature: 23.8   °C

Test Method: FCC 15.31(e)

Test Date: 06/24/2013

Relative Humidity: 23.9   %

EUT Model #:   M9 Portable

EUT Power: 115VAC/60Hz

Air Pressure: 83.2   kPa

EUT Serial #:   13040025

Manufacturer: GE Analytical Instruments

EUT Description: TOC Analyzer (Series 900)

Notes: Product powered-up in standby-idle mode.

RFID running ~ 100% duty cycle – reading tags

Level Key

Pk – Peak

Qp – Quasi Peak

Av - Average

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	Delta2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)			(MHz)
Fundamental Measurement at Nominal AC Voltage: 115VAC/60Hz (ambient temperature)													
13.5600	37.89	**Pk**	0.30	10.94	0.00	0.00	49.13	H	1.61	67.9	- 74.87	- 74.87	0.010
Fundamental Measurement at 85% Nominal AC Voltage: 98VAC/60Hz (ambient temperature)													
13.5600	37.61	**Pk**	0.30	10.94	0.00	0.00	48.85	H	1.61	67.9	- 75.15	- 75.15	0.010
Fundamental Measurement at 115% Nominal AC Voltage: 132VAC/60Hz (ambient temperature)													
13.5600	37.66	**Pk**	0.30	10.94	0.00	0.00	48.90	H	1.61	67.9	- 75.10	- 75.10	0.010

Note: There is no significant difference in the amplitude of the Tx Fundamental

7 Tx Frequency Tolerance (Stability)

7.1 Method

Unless otherwise stated no deviations were made from FCC 15.31(e)/15.225(e) and IC RSS-Gen 7.2.6/RSS-210 A2.6(e).

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

7.2 Test Equipment Used:

Asset ID:	Description:	Manufacturer:	Model:	Serial:	Cal Date	Cal Due
DEN-073	EMI Receiver	RHODE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
DEN-137	AC Variable Power Supply	Pacific Power	VPC12	-----	VBU	VBU
DEN-136	True RMS Multimeter	Fluke	87 V	20100152	01/30/2013	01/30/2014
18784	Loop Antenna	SOLAR	7334-1	927606	02/11/2013	02/11/2014
18648	Environmental Chamber	Envirotronics	System Plus	---	VBU	VBU
DEN-019	Thermometer	Fluke	54 II	25460	11/26/2012	11/26/2013

7.3 Results:

The sample tested was found to Comply.

7.4   Setup Photographs: Frequency Stability
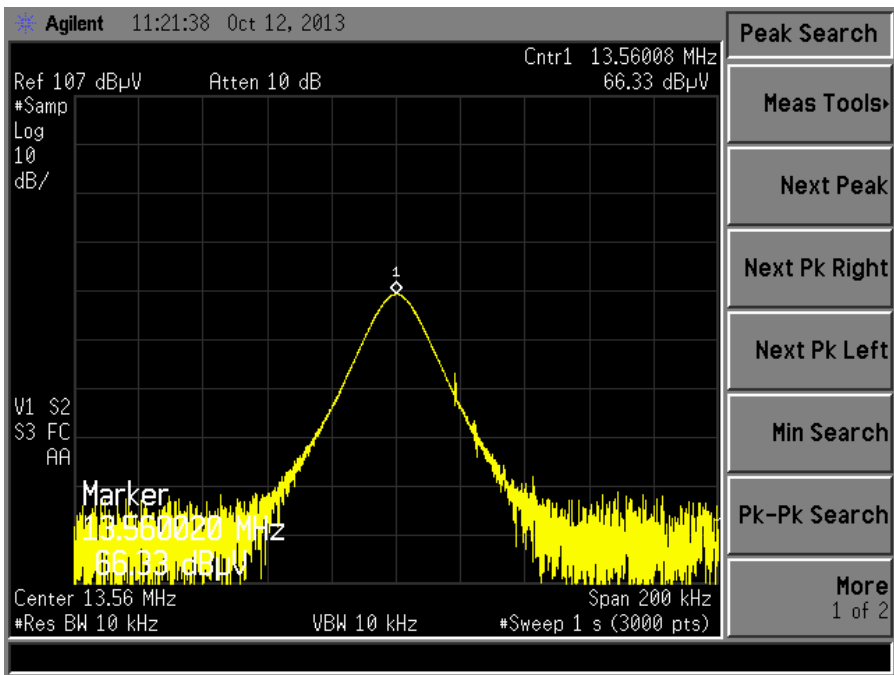
Test Setup

7.5 Plots: Frequency Stability (Temperature Variation)

50°C/ 115VAC (High Temperature Specification)
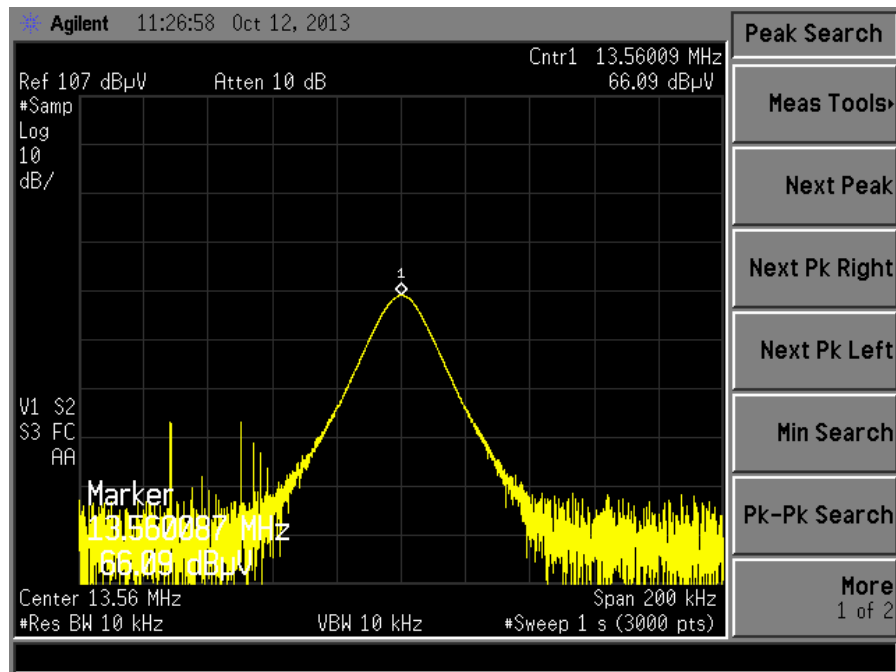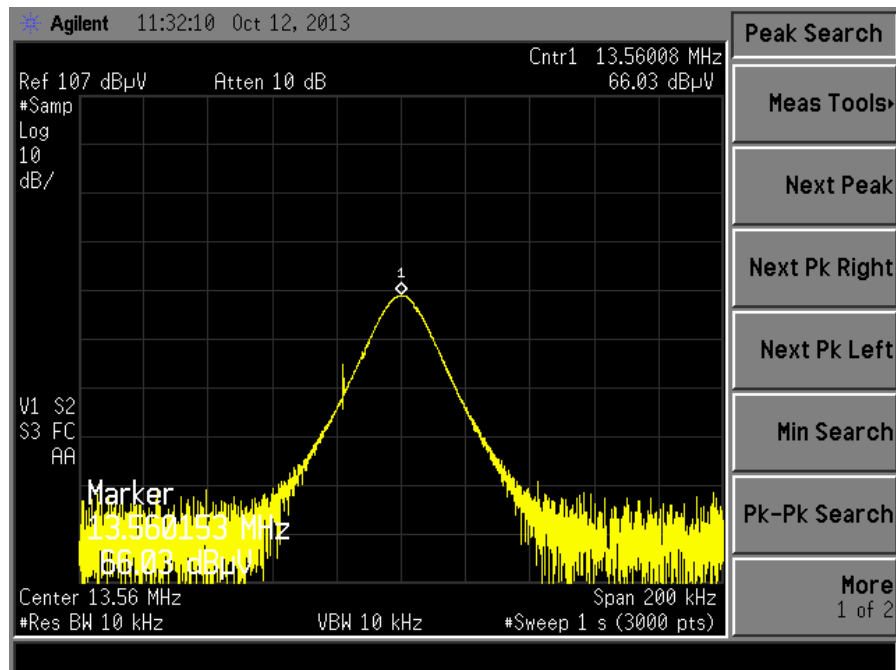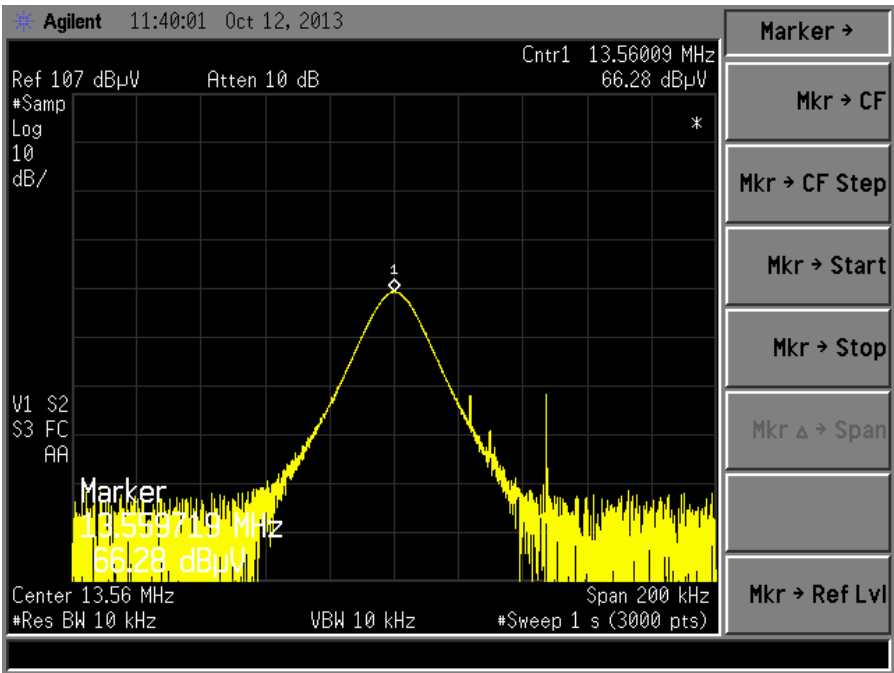
T = 0 minutes
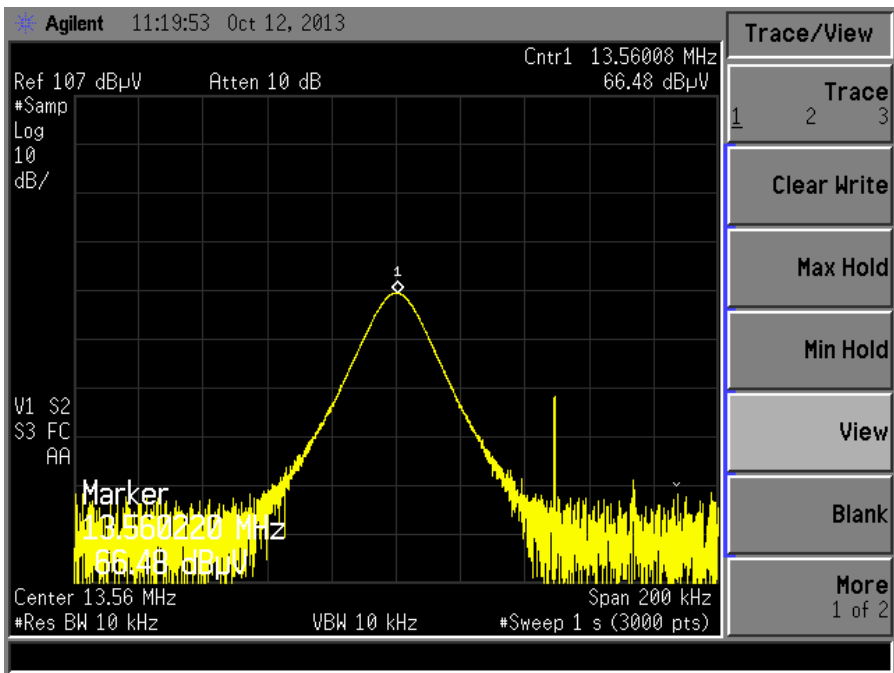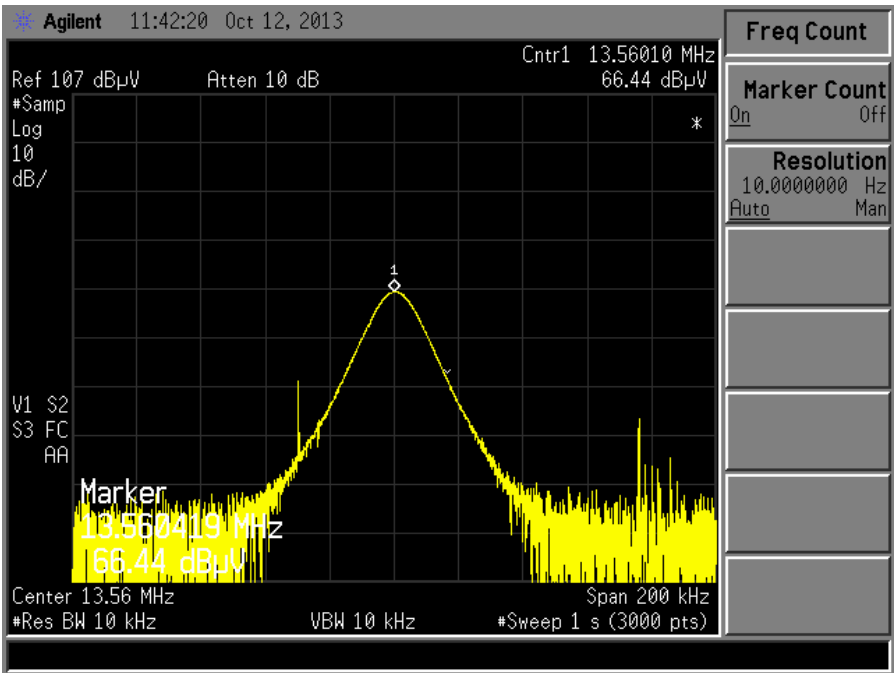

T = 2-minutes

T = 5-minutes

T = 10 minutes

7.6   Plots: Frequency Stability (Temperature Variation)
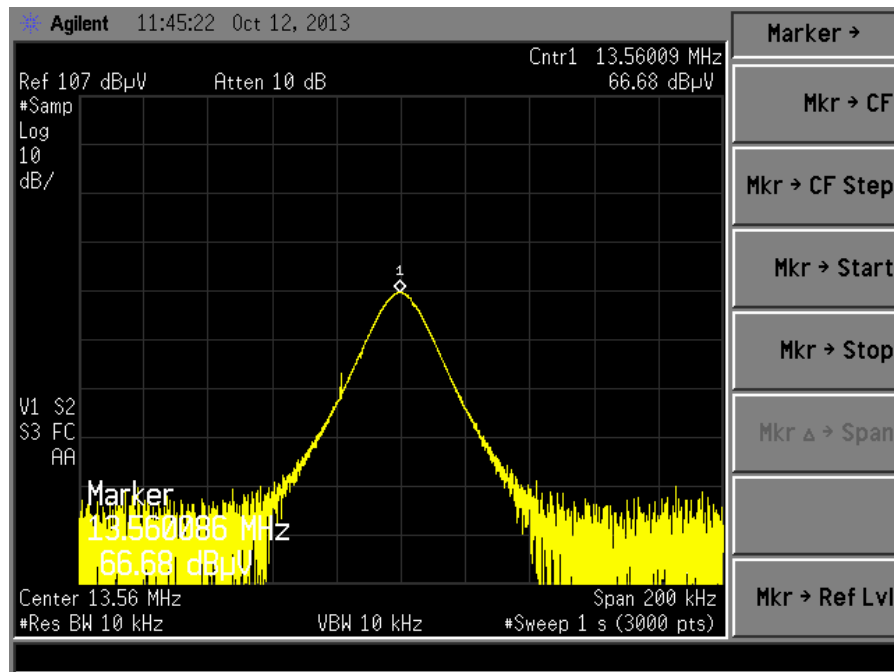
40°C/ 115VAC (Step Temperature)
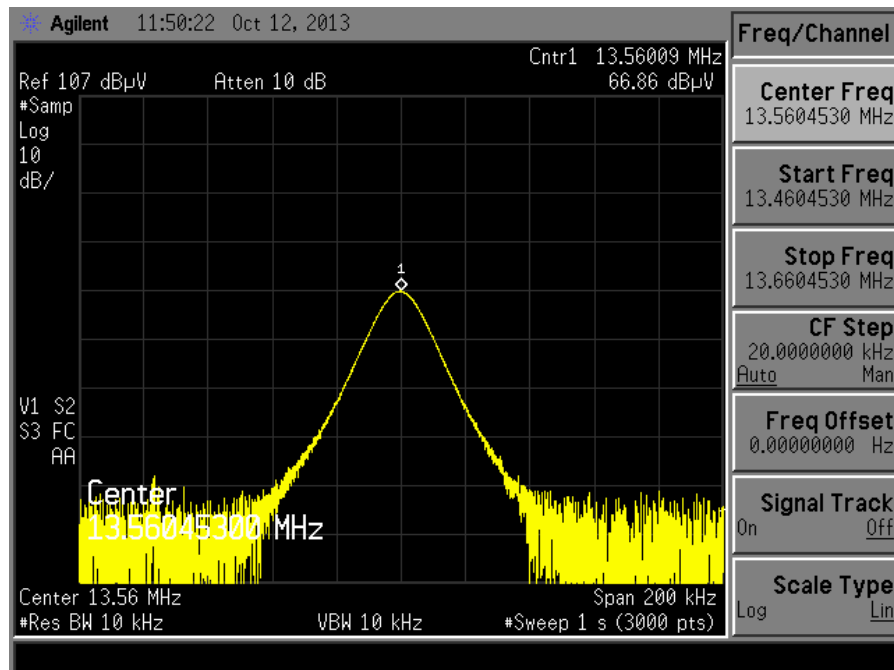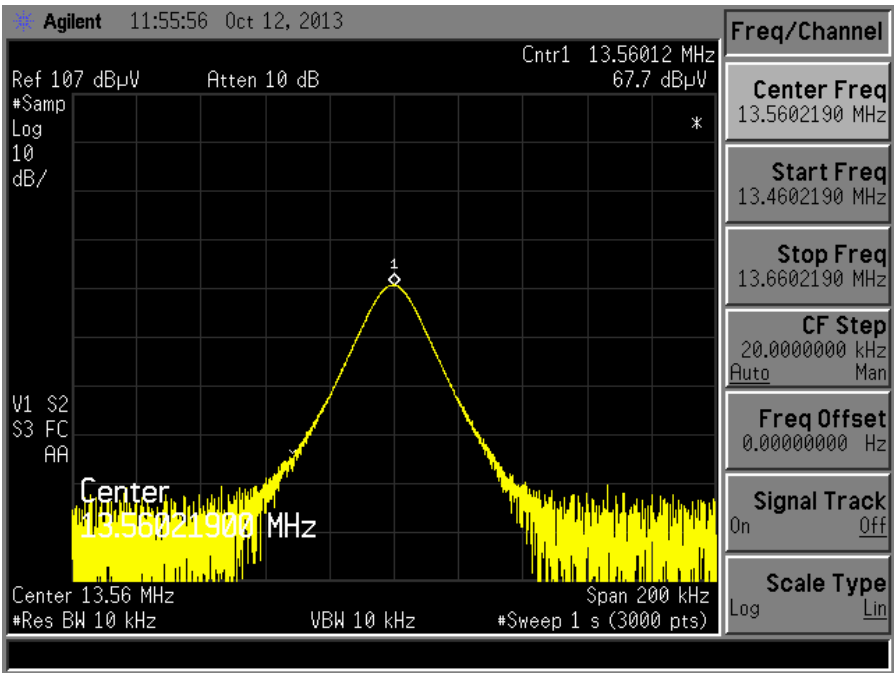
T = 0 minutes

T = 2-minutes

T = 5-minutes

T = 10 minutes

7.7   Plots: Frequency Stability (Temperature Variation)

30°C/ 115VAC (Step Temperature)

T = 0 minutes

T = 2-minutes

T = 5-minutes

T = 10 minutes

7.8 Plots: Frequency Stability (Temperature Variation)

20°C/ 115VAC (Ambient Nominal Temperature)

T = 0 minutes

T = 2-minutes

T = 5-minutes
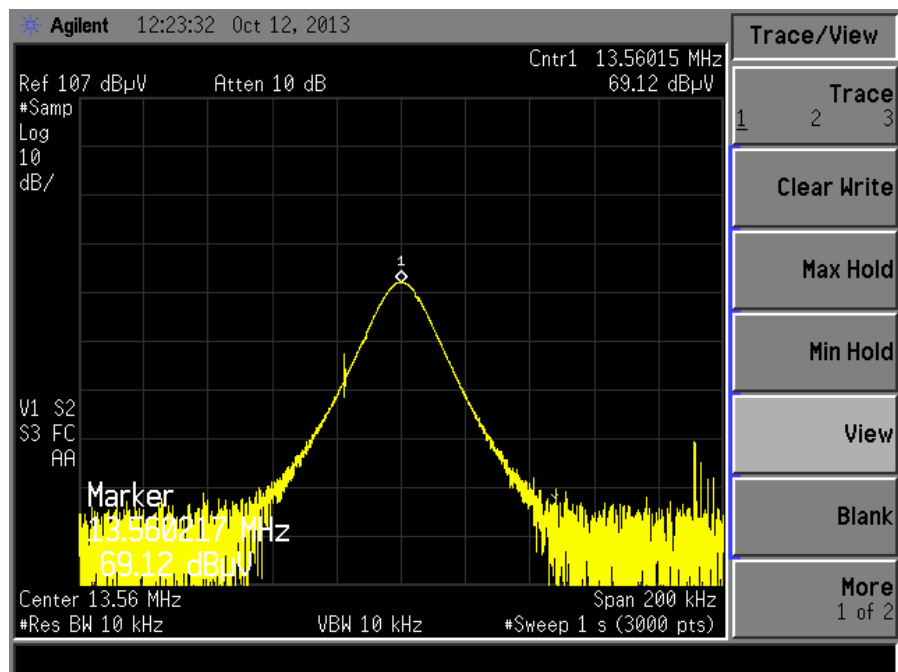
T = 10 minutes

7.9 Plots: Frequency Stability (Temperature Variation)

10°C/ 115VAC (Step Temperature)
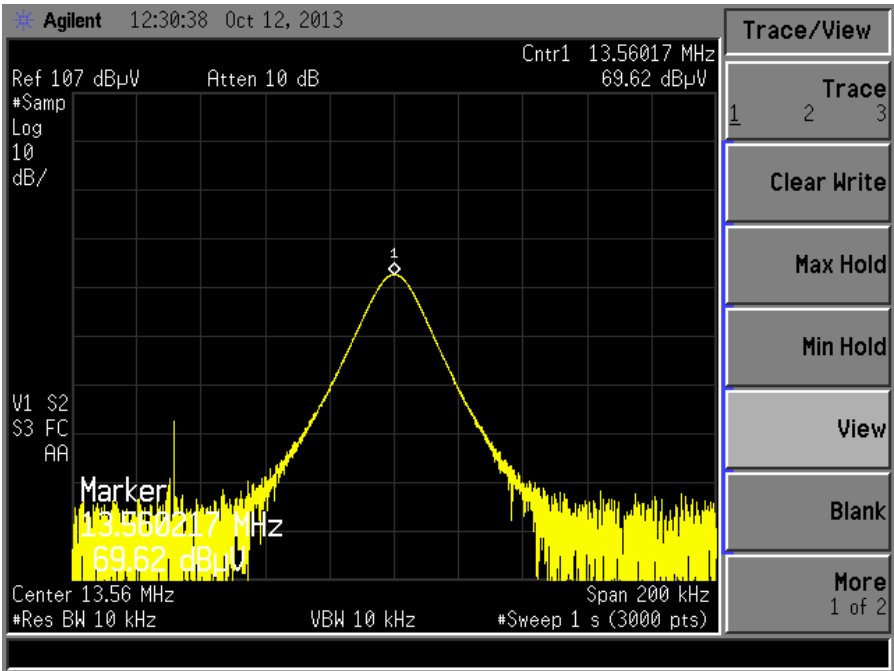
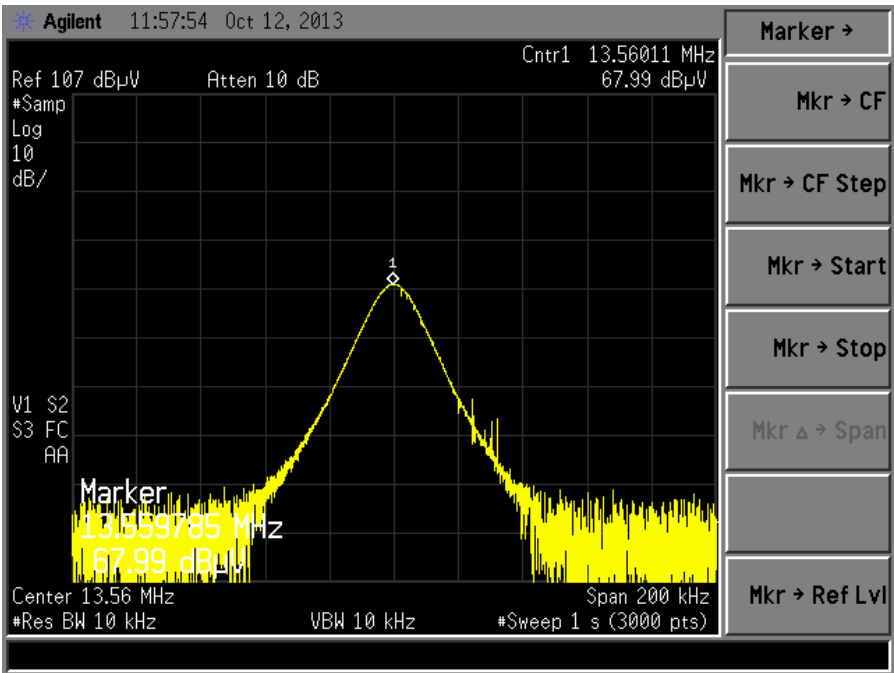T = 0 minutes

T = 2-minutes

T = 5-minutes
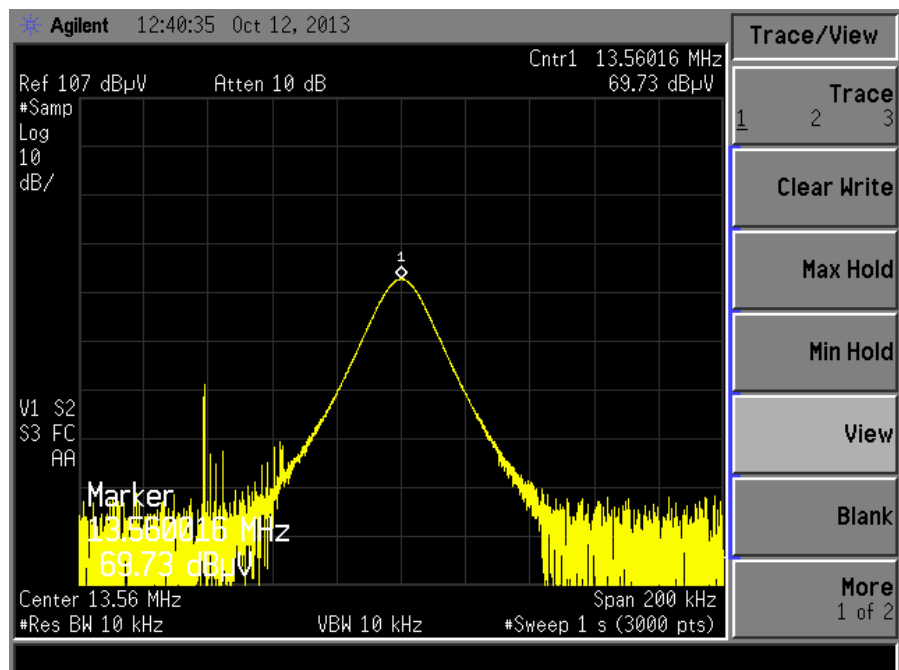
T = 10 minutes

7.10 Plots: Frequency Stability (Temperature Variation)
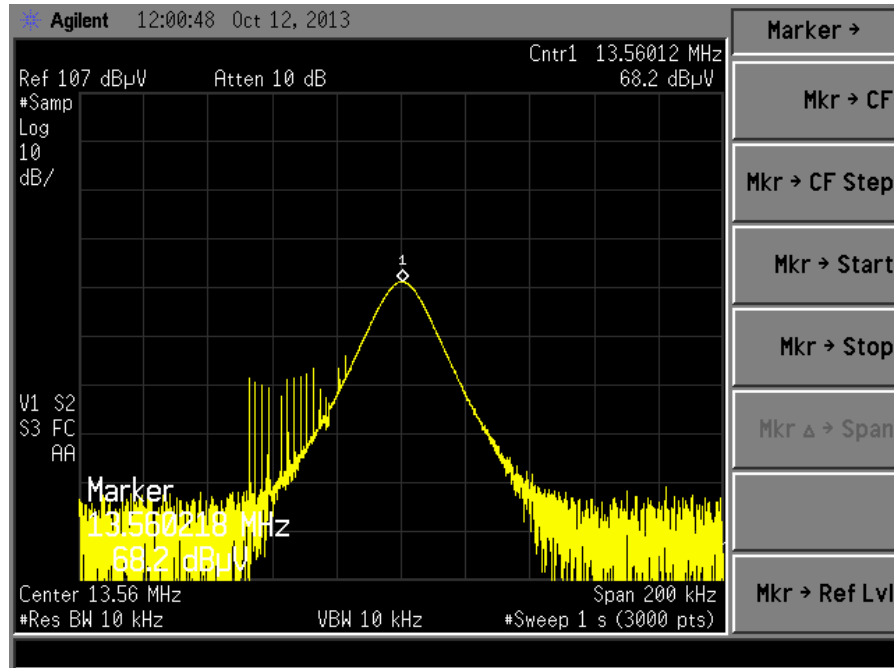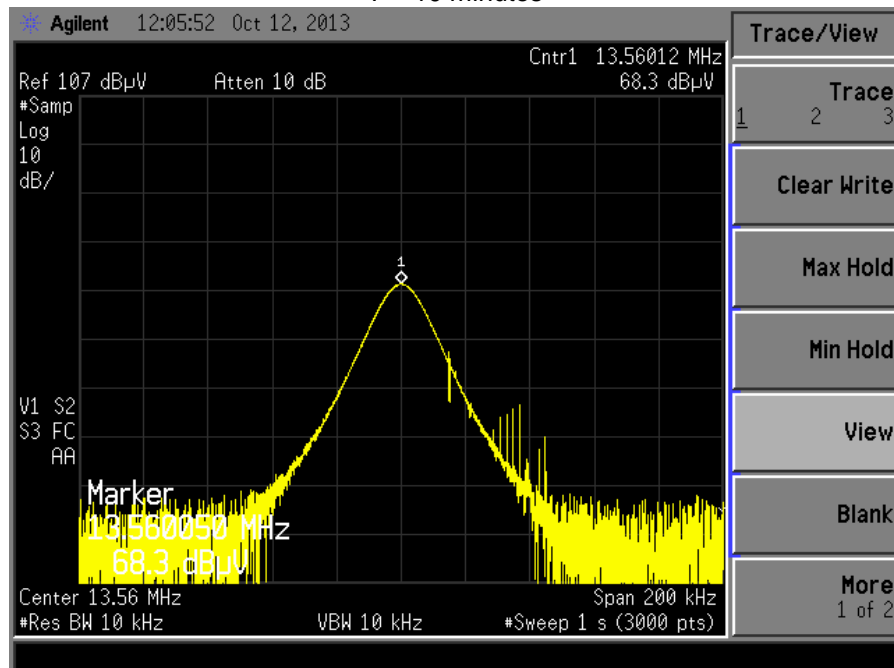
0°C/ 115VAC (Step Temperature)
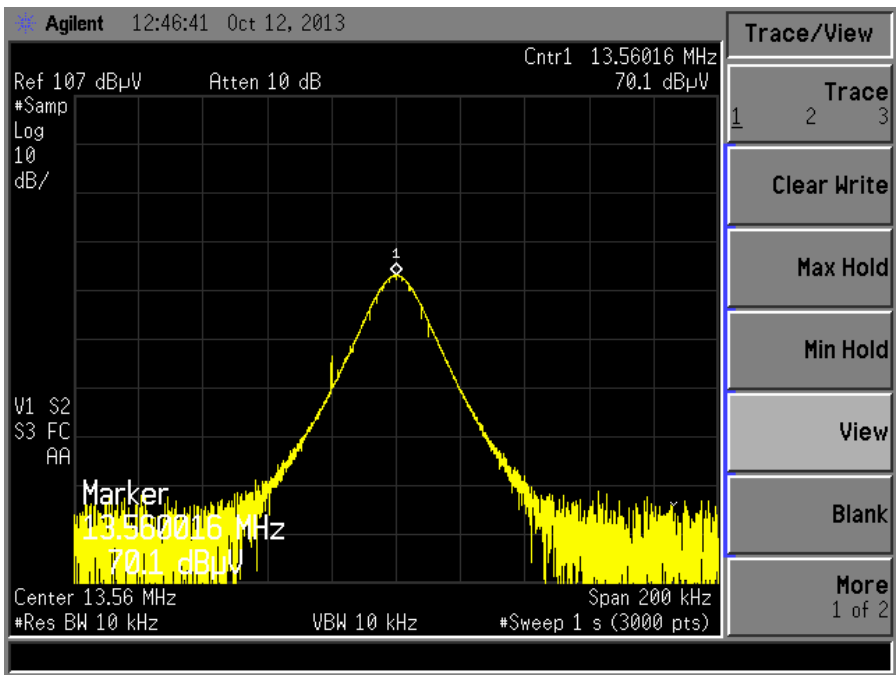
T = 0 minutes

T = 2-minutes
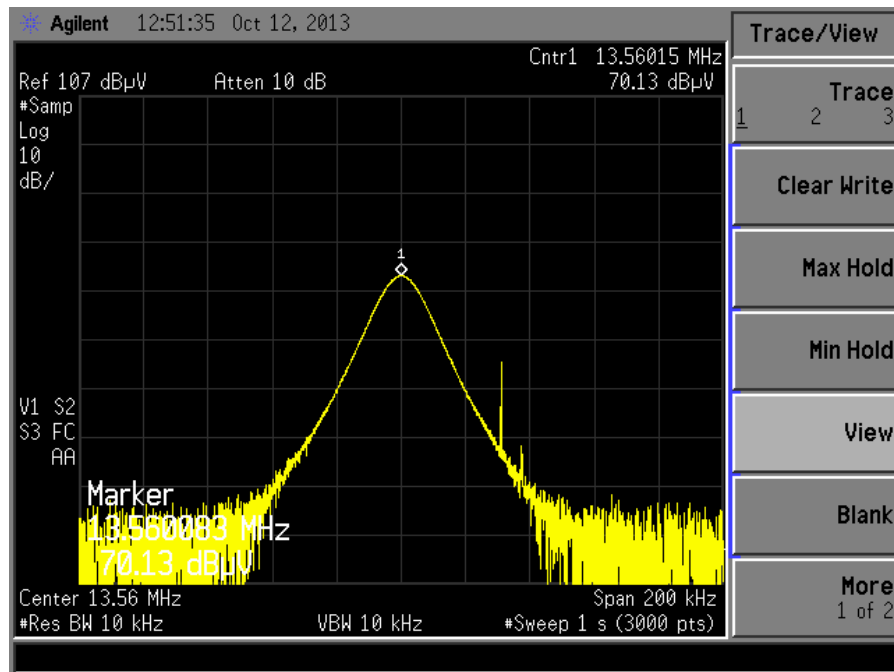
T = 5-minutes
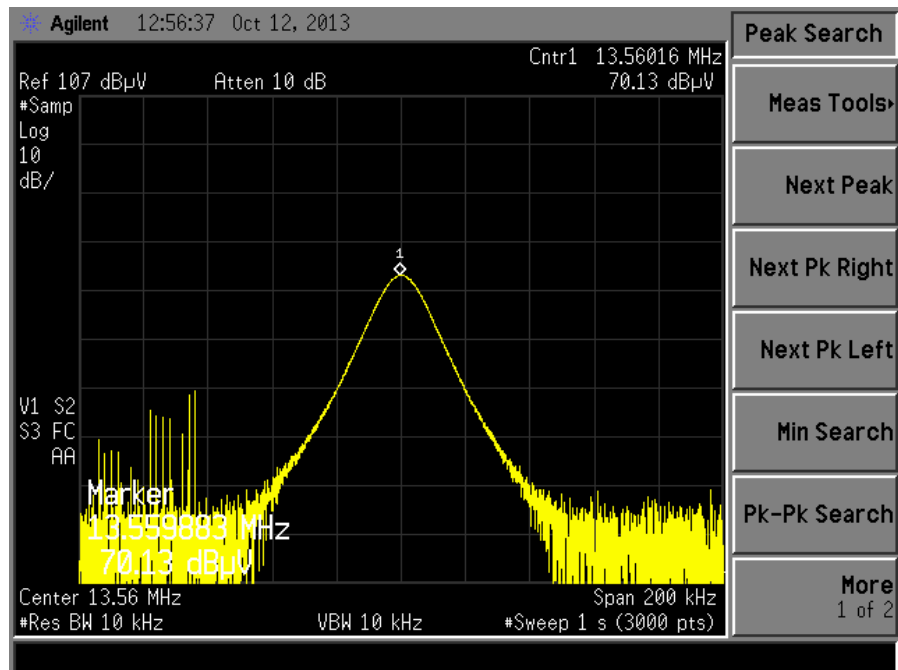
T = 10 minutes

7.11 Plots: Frequency Stability (Temperature Variation)

-10°C/ 115VAC (Step Temperature)
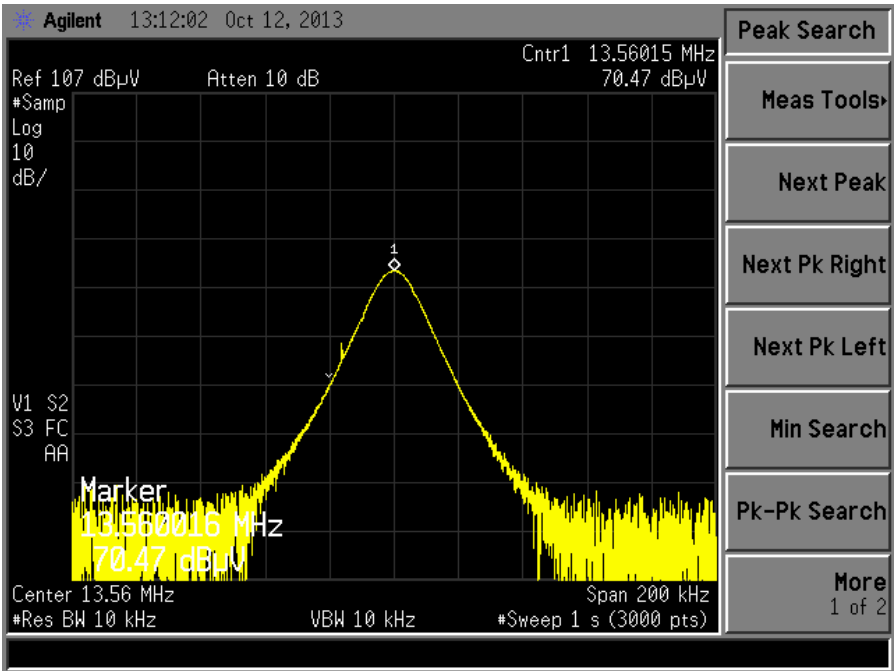
T = 0 minutes
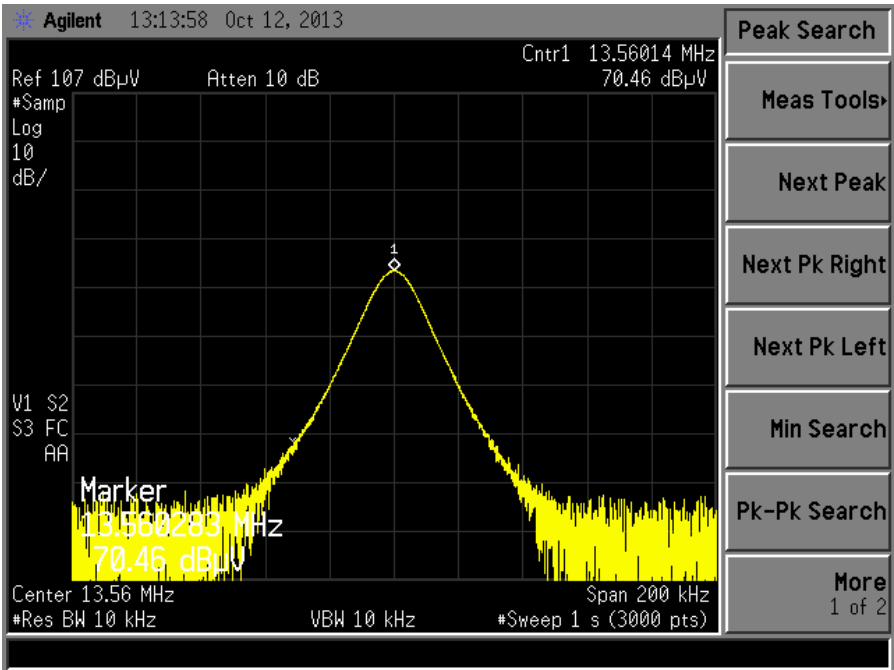
T = 2-minutes
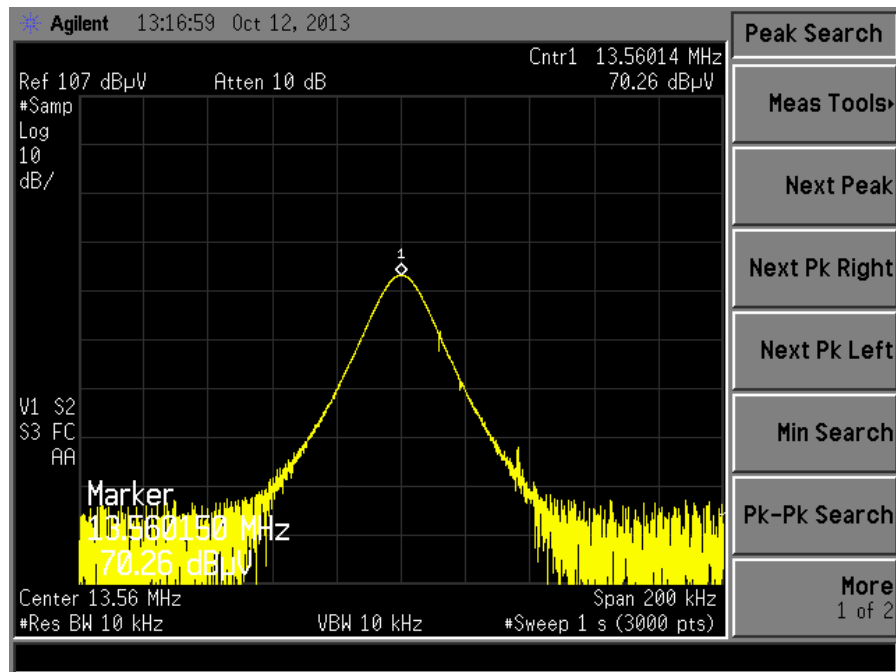
T = 5-minutes
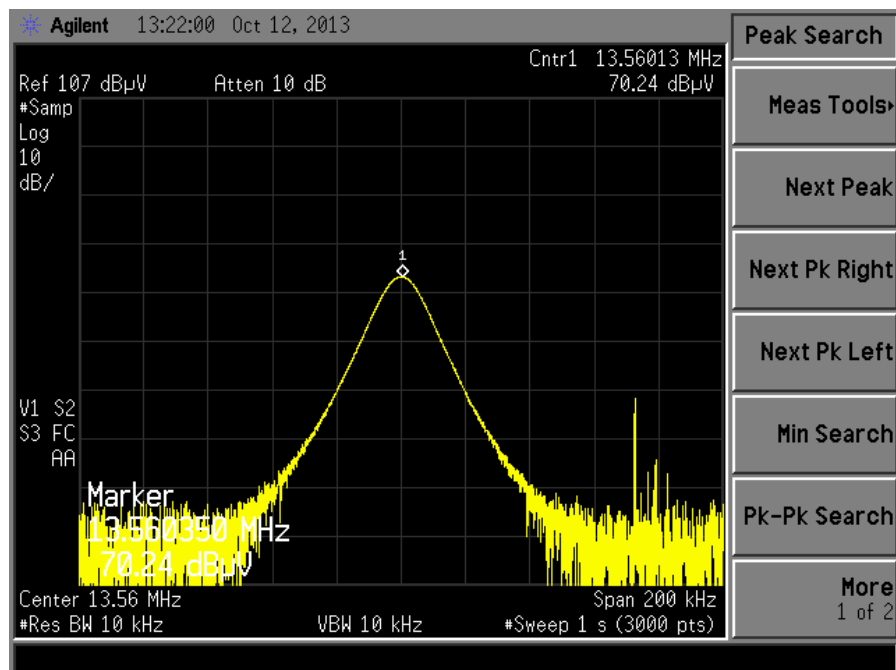
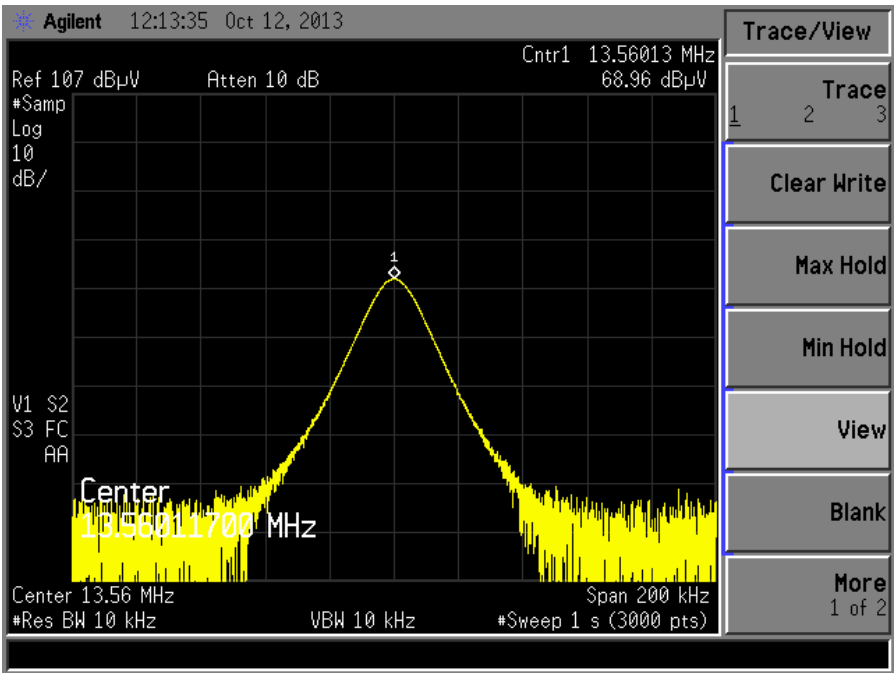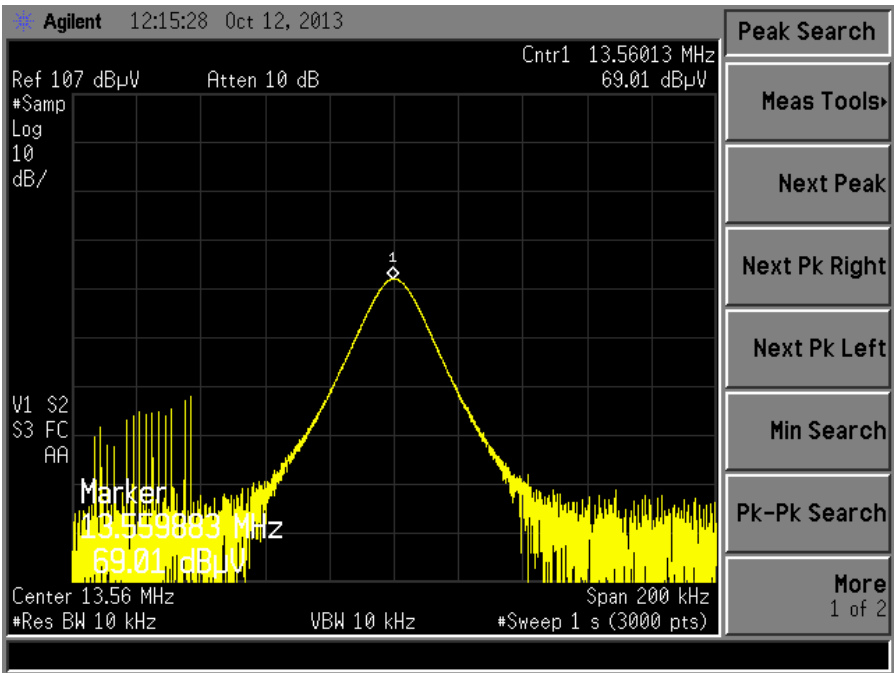T = 10 minutes

7.12 Plots: Frequency Stability (Temperature Variation)

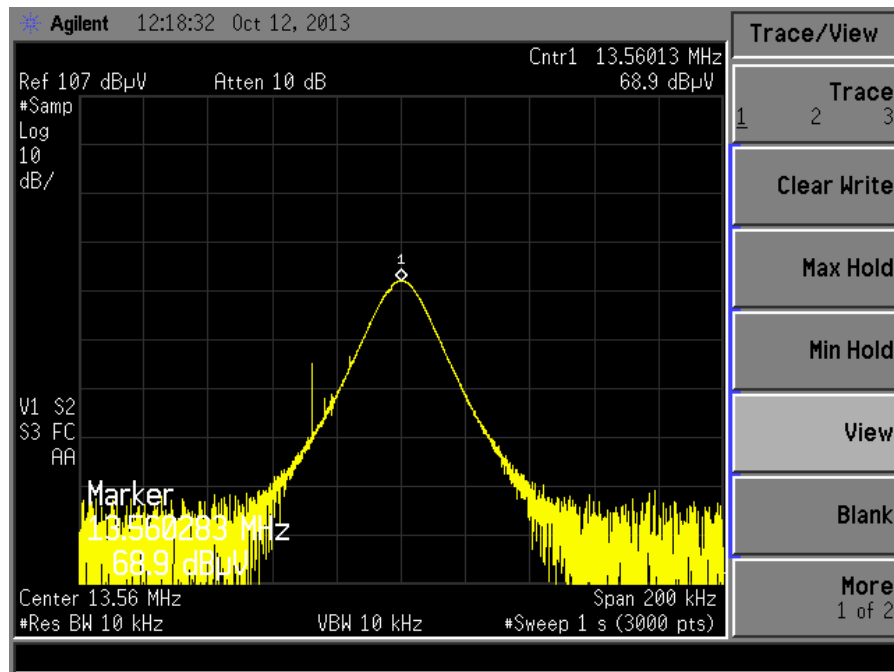**-20°C/ 115VAC (Low Specification Temperature)**

T = 0 minutes
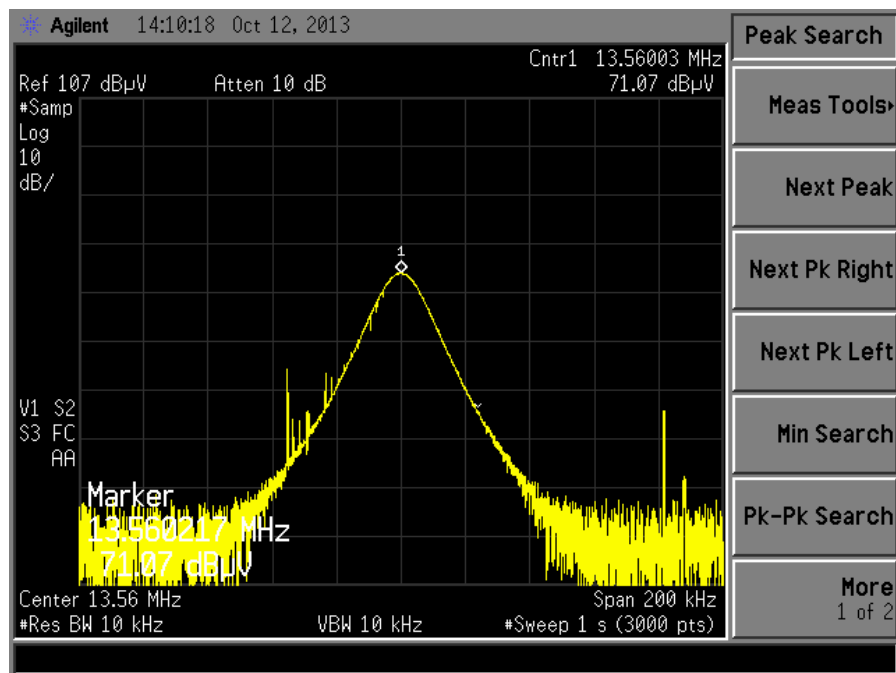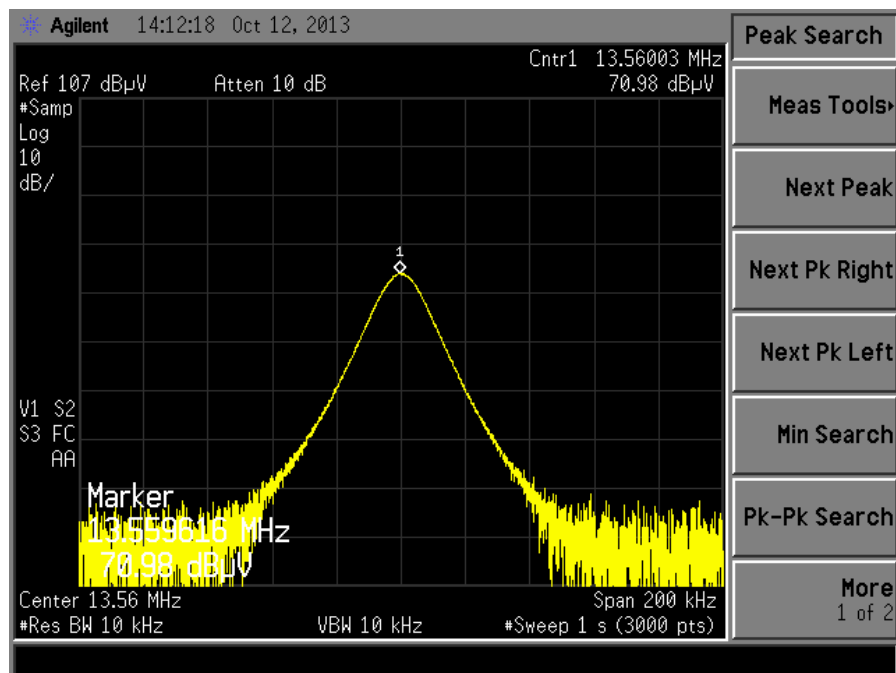
T = 2-minutes
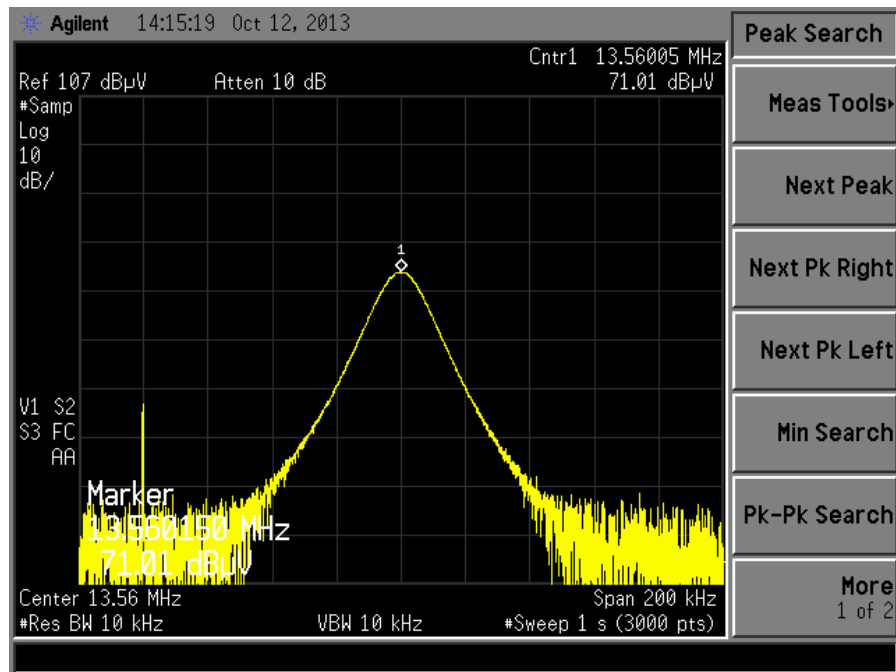
T = 5-minutes

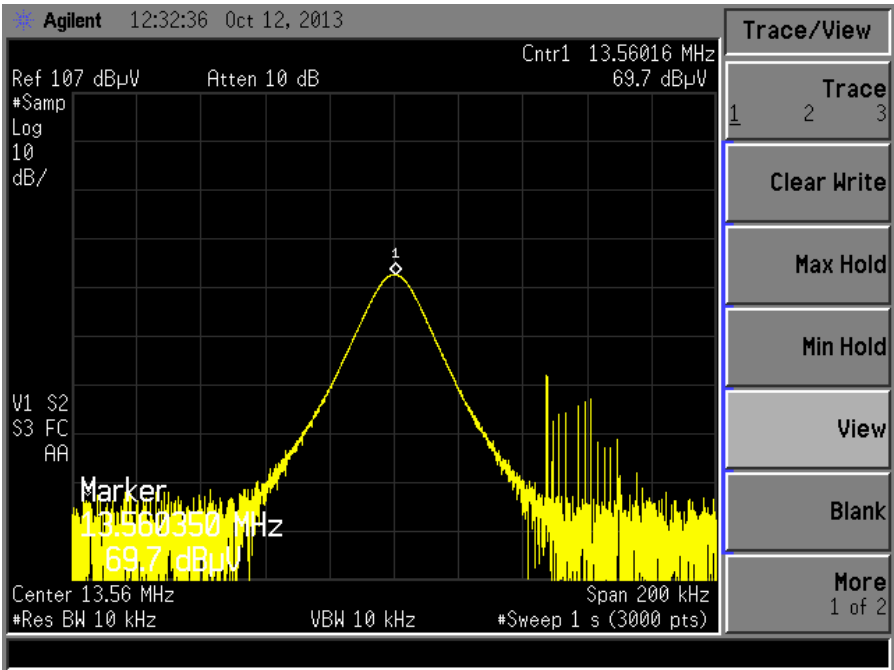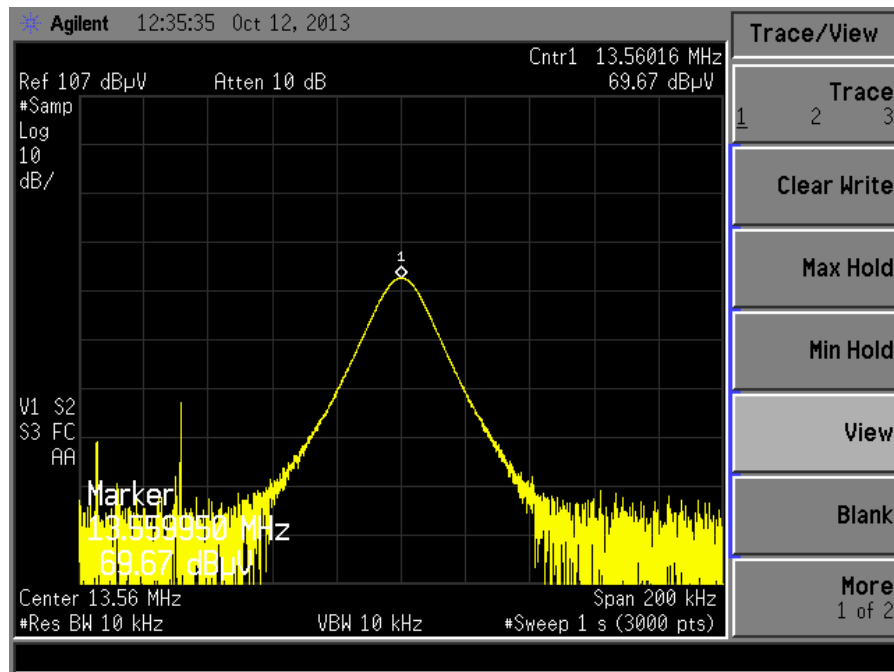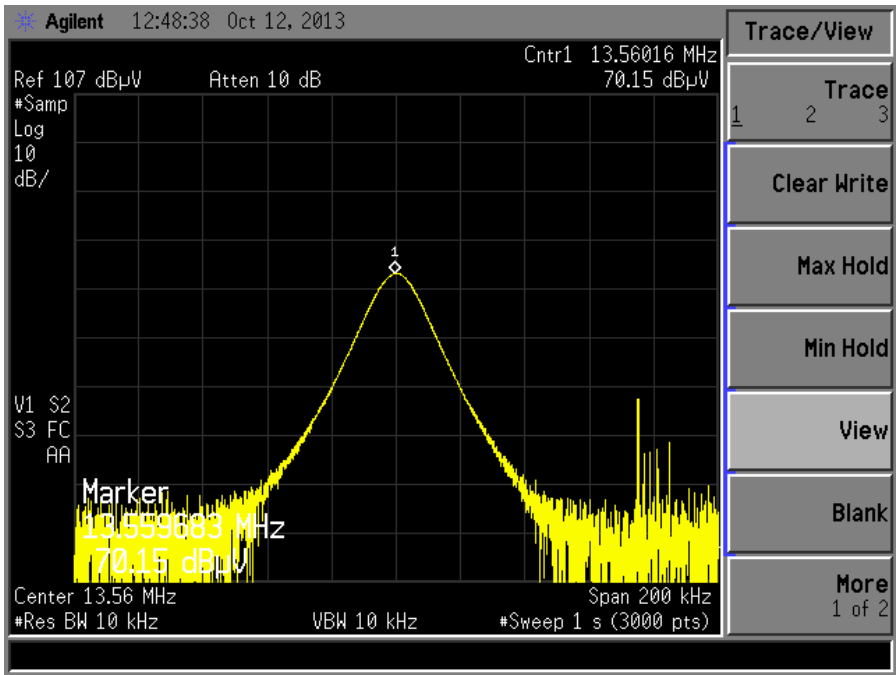T = 10 minutes
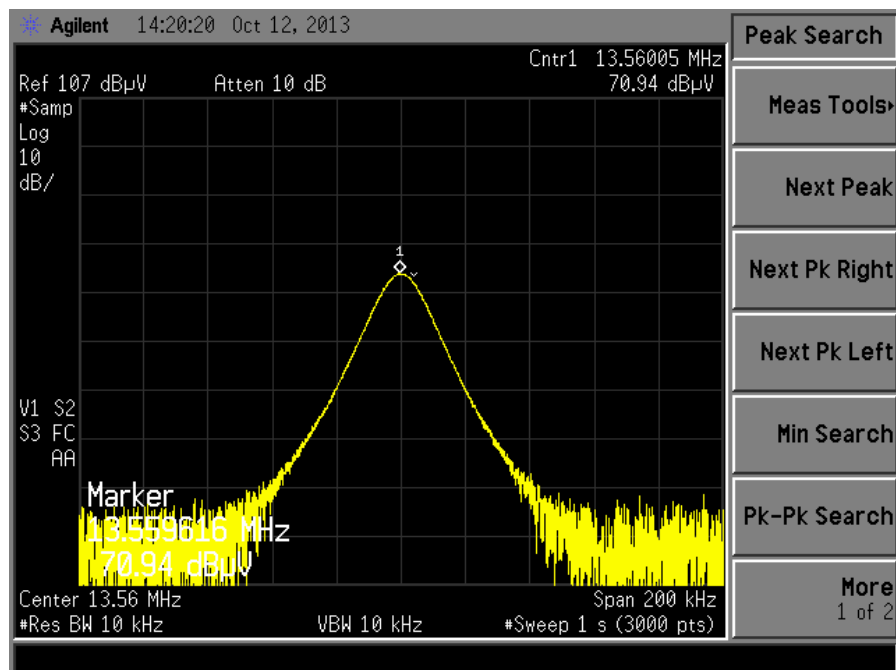
7.13 Plots: Frequency Stability (AC Voltage Variation)

115VAC (Nominal AC Voltage)
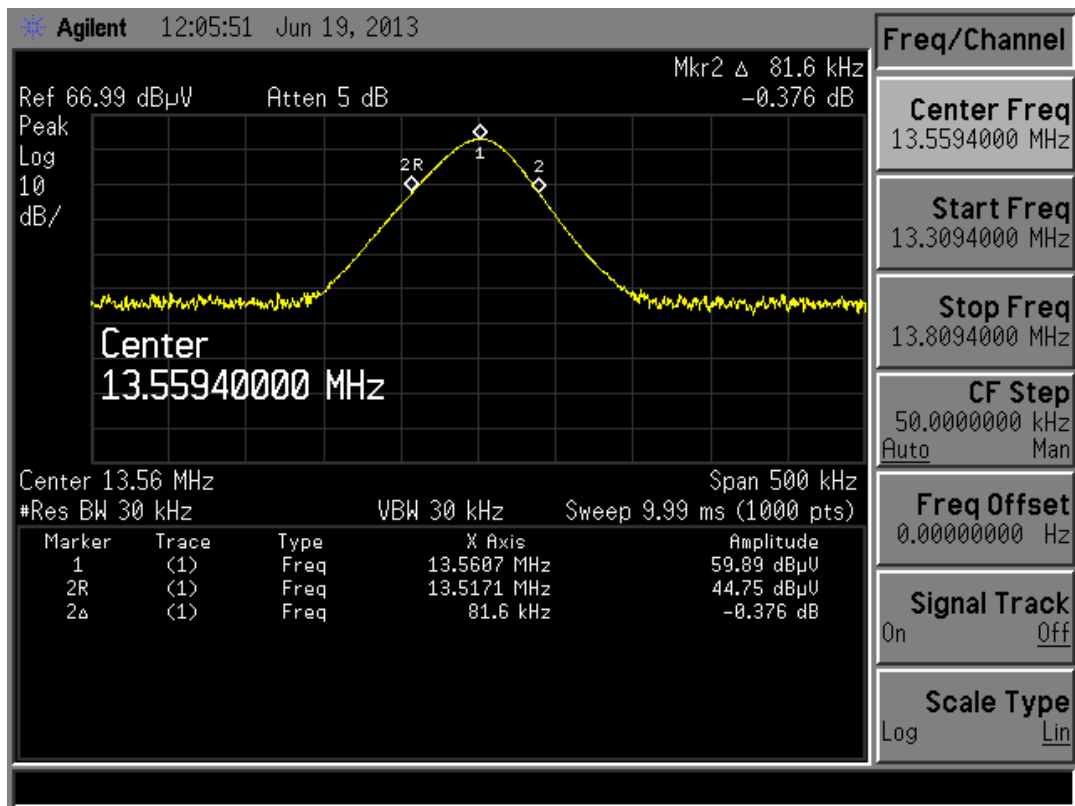
Note: Baseline Frequency = 13.55940000 MHz

7.14 Plots: AC Voltage Variation

98VAC (85% Nominal Voltage)

132VAC (115% Nominal Voltage)
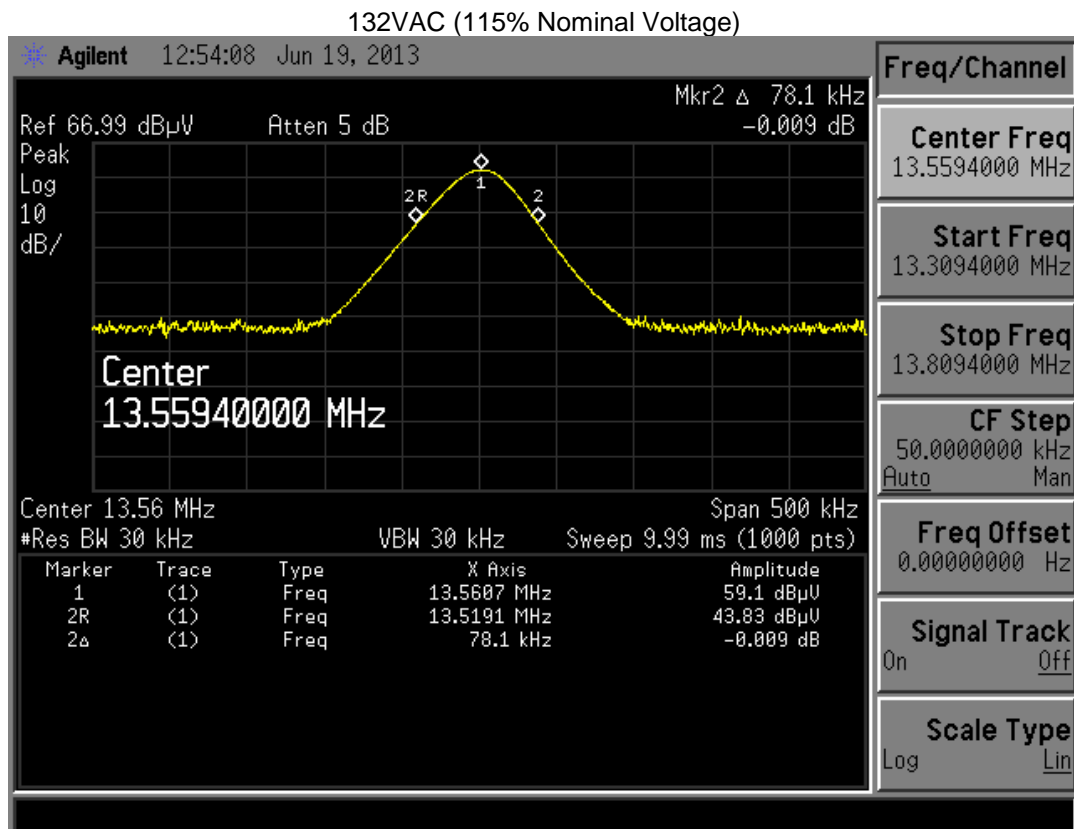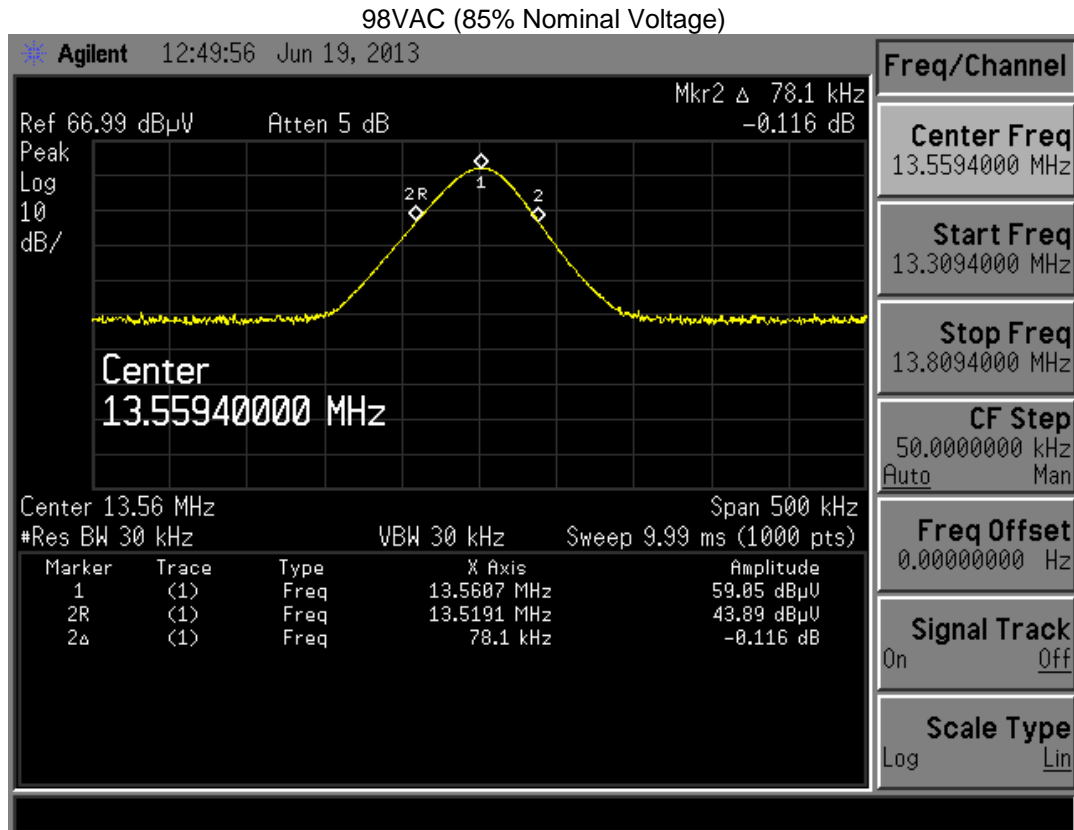
7.15 Test Data: Frequency Stability (Temperature & Voltage Variation)

Tx Frequency Stability - FCC Part 15.225(e)

Temperature, °C	Frequency at Nominal Voltage (MHz)				Maximum Deviation, From Nominal Frequency Δ°C ppm
	t = 0 (min)	t = 2 (min)	t = 5 (min)	t = 10 (min)	Worst-Case (t = 0, 2, 5, 10 min)
+50 degrees (High Spec)	13.56008	13.56008	13.56009	13.56008	3.6873
+40 degrees (step)	13.56009	13.56010	13.56009	13.56009	2.9498
+30 degrees (step)	13.56012	13.56011	13.56012	13.56012	1.4749
+20 degrees (Nominal)	13.56013	13.56013	13.56013	13.56014	Nominal
+10 degrees (step)	13.56017	13.56016	13.56016	13.56016	2.9498
0 degrees (step)	13.56016	13.56015	13.56016	13.56016	2.2124
-10 degrees (step)	13.56015	13.56014	13.56014	13.56013	1.4749
-20 degrees (Low Spec)	13.56003	13.56003	13.56005	13.56005	7.3746

Voltage (VAC)	Frequency at Nominal Temperature, 25°C	Maximum Deviation, From Frequency at Δ VAC ppm
115 (Nominal)	13.559400	0
98 (85% Nominal)	13.559400	0
132 (115% Nominal)	13.559400	0

0.001% = 10ppm
0.01% = 100ppm
0.1% = 1000ppm
1.0% = 10000ppm

FCC 15.225(e) Specification: +/- 0.01% = +/- 100ppm

Notes:

1. The radio was tested outside of the main product enclosure as a stand-alone.
   Note that the radio cannot be fully tested within the main product enclosure since there are water lines and other components subject to freezing conditions.

2. AC voltage was varied between ±15% of nominal with no significant change in frequency stability.

3. The specification calls for a temperature range of -20°C to +50°C. However, the manufacturer specification for operating temperature is +10º C to +50º C.
   The temperature range is limited to avoid the risk of fluids (water) freezing inside the product.

4. Manufacturer frequency tolerance specifications: 10 ppm

$$\Delta f = \frac{f \times ppm}{10^6}$$

where ppm is the peak variation (expressed as +/-), f is the center frequency (in Hz), and Δf is the peak frequency variation (in Hz).

8 Radiated Tx Intentional Emissions – Fundamental & Harmonics of the Fundamental

8.1 Method

Unless otherwise stated no deviations were made from FCC 15.225(a)(d)15.209/ IC RSS-210 A2.6(a)(d).

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

8.2 Test Equipment Used:

Asset ID	Description	Manufacture	Model	Serial	Cal Date	Cal Due
DEN-073	EMI Receiver	ROHDE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
18912	9 kHz- 1.3GHz Pre Amp	Hewlett-Packard	8447F	3113A05545	06/07/2013	06/07/2014
18897	Active Loop Antenna	EMCO	6502	9205-2738	11/29/2012	11/29/2013
19936	Bilog Antenna 30MHz - 6GHz	Sunol Sciences	JB6	A050707-1	11/15/2012	11/15/2013
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 1.0	VBU	VBU

8.3 Results:

The sample tested was found to Comply.

8.4   Product Test Orientations:

RFID Antenna Module Configured in Test Position – (Facing Receive Antenna)
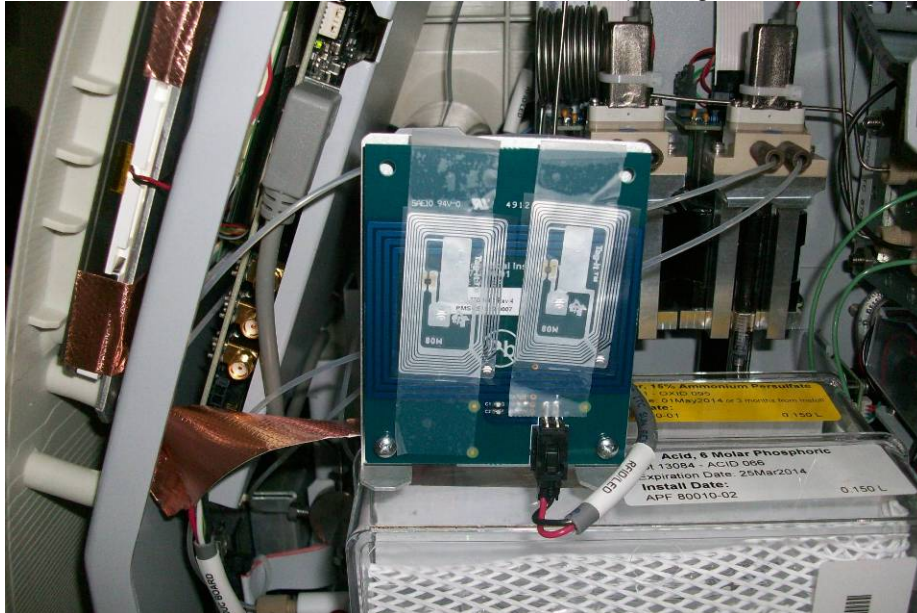
Normal RFID Antenna Module Configuration in Product (Facing Down)
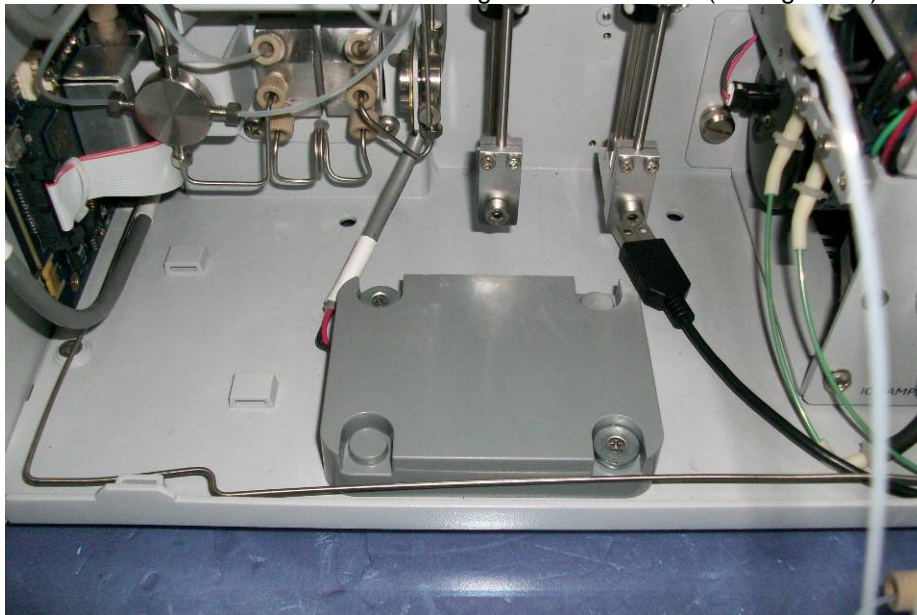
8.5   Setup Photographs: Tx Fundamental & Harmonics of Fundamental

Test setup – Front view

Photo:

Test setup – Rear view

Photo: Antenna Setup

Antenna Setup: Active Loop Antenna - 10kHz to 30MHz
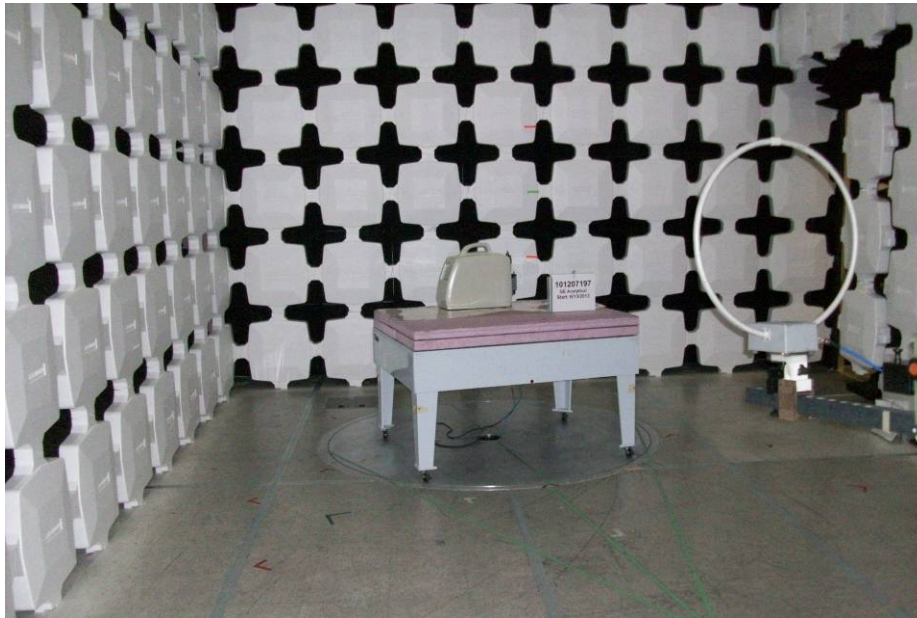
Antenna Setup: BiLog Antenna – 30MHz to 1000MHz
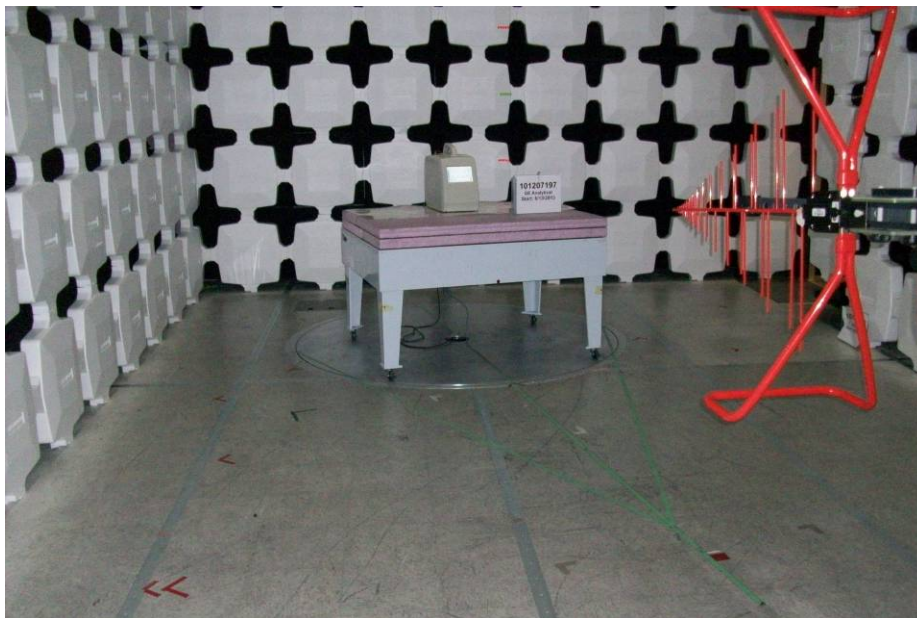
8.6 Test Data: FCC Part 15.225

Tx Intentional Radiated Electromagnetic Emissions

Test Report #:	**G101207197**	Test Area:	CC1 Radiated	Temperature:	23.3	°C
Test Method:	FCC 15.225(a)(d)/ 15.209	Test Date:	06/20/2013	Relative Humidity:	24.5	%
EUT Model #:	M9 Portable	EUT Power:	120VAC/60Hz	Air Pressure:	82.9	kPa

EUT Serial #: 13040025

Manufacturer: GE Analytical Instruments

EUT Description: TOC Analyzer (Series 900)

Notes: Primary product powered-up and in normal operation state

RFID running at ~ 100% duty cycle – continuously reading reagent tags

Level Key
Pk – Peak
Qp – Quasi Peak
Av - Average

Limits below 30 MHz were extrapolated using FCC 15.31(f)(2) and RSS-GEN section 4.11. No duty-cycle correction for pulsed-signals was utilized.

| Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	LIMIT	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	FCC 15.225(a)(d) 15.209	FCC 15.225(a)(d) 15.209	(MHz)
Loop Antenna Parallel to EUT													
Fundamental Measurement													
13.5600	37.77	**Pk**	0.30	10.94	0.00	0.00	49.01	H	1.62	54.7	- 74.99	124.00	0.009
Harmonics measurements - Vertical													
27.1200	21.02	**Pk**	0.40	9.05	0.00	0.00	30.47	H	1.50	10.8	- 39.07	69.54	0.009
40.6800	48.13	**Pk**	0.77	13.29	28.20	0.00	33.99	V	1.28	87.7	- 6.01	40.00	0.120
54.2400	46.50	**Pk**	0.77	7.52	28.18	0.00	26.61	V	1.28	86.3	- 13.39	40.00	0.120
67.8000	49.35	**Pk**	0.77	8.10	28.11	0.00	30.10	V	1.49	69.9	- 9.90	40.00	0.120
81.3600	53.01	**Pk**	0.77	7.60	28.05	0.00	33.33	V	1.42	79.1	- 6.67	40.00	0.120
94.9200	42.37	**Pk**	0.77	9.28	27.98	0.00	24.43	V	1.41	11.9	- 19.09	43.52	0.120
108.4800	36.43	**Pk**	0.77	12.55	27.92	0.00	21.83	V	1.54	97.3	- 21.69	43.52	0.120
122.0400	32.23	**Pk**	0.77	13.60	27.85	0.00	18.74	V	1.53	59.4	- 24.78	43.52	0.120
135.6000	33.18	**Pk**	0.79	13.06	27.79	0.00	19.24	V	1.46	82.9	- 24.28	43.52	0.120
Loop Antenna Perpendicular to EUT													
Fundamental Measurement													
13.5600	35.99	**Pk**	0.30	10.94	0.00	0.00	47.23	H	1.70	12.1	- 76.77	124.00	0.009
Harmonics measurements - Horizontal													
27.1200	14.84	**Pk**	0.40	9.05	0.00	0.00	24.29	H	1.53	85.1	- 45.25	69.54	0.009
40.6800	32.37	**Pk**	0.77	13.29	28.20	0.00	18.23	H	1.56	81.9	- 21.77	40.00	0.120
54.2400	34.73	**Pk**	0.77	7.52	28.18	0.00	14.84	H	1.59	89.1	- 25.16	40.00	0.120
67.8000	42.36	**Pk**	0.77	8.10	28.11	0.00	23.11	H	1.58	92.2	- 16.89	40.00	0.120
81.3600	53.35	**Pk**	0.77	7.60	28.05	0.00	33.67	H	1.51	80.6	- 6.33	40.00	0.120
94.9200	50.27	**Pk**	0.77	9.28	27.98	0.00	32.33	H	1.53	100.2	- 11.19	43.52	0.120
108.4800	39.37	**Pk**	0.77	12.55	27.92	0.00	24.77	H	1.56	105.3	- 18.75	43.52	0.120
122.0400	36.22	**Pk**	0.77	13.60	27.85	0.00	22.73	H	1.63	92.8	- 20.79	43.52	0.120
135.6000	44.73	**Pk**	0.79	13.06	27.79	0.00	30.79	H	1.44	96.0	- 12.73	43.52	0.120

8.7 Test Data: IC RSS-210 A2.6

Tx Intentional Radiated Electromagnetic Emissions

Test Report #: **G101207197**   Test Area: CC1 Radiated   Temperature: 23.3 °C

Test Method: IC RSS-210 (A2.6(a)(d))   Test Date: 06/20/2013   Relative Humidity: 24.5 %

EUT Model #: M9 Portable   EUT Power: **120VAC/60Hz**   Air Pressure: 82.9 kPa

EUT Serial #: 13040025

Manufacturer: GE Analytical Instruments

Level Key

EUT Description: TOC Analyzer (Series 900)

Pk – Peak

Notes: Primary product powered-up and in normal operating state

Qp – Quasi Peak

RFID running at ~ 100% duty cycle – continuously reading reagent tags

Av - Average

Limits below 30 MHz were extrapolated using FCC 15.31(f)(2) and RSS-GEN section 4.11. No duty-cycle correction for pulsed-signals was utilized.

Freq	Level	Det	Cable	Ant	Preamp	Atten	Final	Pol	Hgt	Az	Delta1	LIMIT	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]	(V/H)	(m)	(DEG)	IC RSS-210 A2.6	IC RSS-210 A2.6	(MHz)
Loop Antenna Parallel to EUT													
Fundamental Measurement													
13.5600	37.77	**Pk**	0.30	10.94	0.00	0.00	49.01	H	1.62	54.7	- 74.99	124.00	0.009
Harmonics measurements - Vertical													
27.1200	14.84	**Pk**	0.40	9.05	0.00	0.00	24.29	H	1.53	85.1	- 45.21	69.50	0.009
40.6800	32.37	**Pk**	0.77	13.29	28.20	0.00	18.23	H	1.56	81.9	- 31.27	49.50	0.120
54.2400	34.73	**Pk**	0.77	7.52	28.18	0.00	14.84	H	1.59	89.1	- 34.66	49.50	0.120
67.8000	42.36	**Pk**	0.77	8.10	28.11	0.00	23.11	H	1.58	92.2	- 26.39	49.50	0.120
81.3600	53.35	**Pk**	0.77	7.60	28.05	0.00	33.67	H	1.51	80.6	- 15.83	49.50	0.120
94.9200	50.27	**Pk**	0.77	9.28	27.98	0.00	32.33	H	1.53	100.2	- 17.17	49.50	0.120
108.4800	39.37	**Pk**	0.77	12.55	27.92	0.00	24.77	H	1.56	105.3	- 24.73	49.50	0.120
122.0400	36.22	**Pk**	0.77	13.60	27.85	0.00	22.73	H	1.63	92.8	- 26.77	49.50	0.120
135.6000	44.73	**Pk**	0.79	13.06	27.79	0.00	30.79	H	1.44	96.0	- 18.71	49.50	0.120
Loop Antenna Perpendicular to EUT													
Fundamental Measurement													
13.5600	35.99	**Pk**	0.30	10.94	0.00	0.00	47.23	H	1.70	12.1	- 76.77	124.00	0.009
Harmonics measurements - Horizontal													
27.1200	21.02	**Pk**	0.40	9.05	0.00	0.00	30.47	H	1.50	10.8	- 39.03	69.50	0.009
40.6800	48.13	**Pk**	0.77	13.29	28.20	0.00	33.99	V	1.28	87.7	- 15.51	49.50	0.120
54.2400	46.50	**Pk**	0.77	7.52	28.18	0.00	26.61	V	1.28	86.3	- 22.89	49.50	0.120
67.8000	49.35	**Pk**	0.77	8.10	28.11	0.00	30.10	V	1.49	69.9	- 19.40	49.50	0.120
81.3600	53.01	**Pk**	0.77	7.60	28.05	0.00	33.33	V	1.42	79.1	- 16.17	49.50	0.120
94.9200	42.37	**Pk**	0.77	9.28	27.98	0.00	24.43	V	1.41	11.9	- 25.07	49.50	0.120
108.4800	36.43	**Pk**	0.77	12.55	27.92	0.00	21.83	V	1.54	97.3	- 27.67	49.50	0.120
122.0400	32.23	**Pk**	0.77	13.60	27.85	0.00	18.74	V	1.53	59.4	- 30.76	49.50	0.120
135.6000	33.18	**Pk**	0.79	13.06	27.79	0.00	19.24	V	1.46	82.9	- 30.26	49.50	0.120

Example calculation:

Measured Level		Cable Loss		Antenna Factor		Pre-Amp		Atten		Final Corrected Reading	Specification Limit		Final Corrected Reading		Delta Specification
	+		+		-		+		=			-		=	
(dBμV)		(dB)		(dB)		(dB)		(dB)		(dBμV/m)	(dBμV/m)		(dBμV/m)		
20.0		3.0		5.0		10.0		0.0		18.0	40.0		18.0		- 22.0

Notes:
1) The RFID was tested in an absolute worst-case configuration. Specifically, the RFID antenna module was configured in the product to directly face the measurement antenna.
   Note that the RFID antenna module normally faces downward in the primary product.

2) Limits below 30 MHz were extrapolated using FCC 15.31 and RSS-GEN section 4.11

3) All radiated field measurements were taken at 3-meters (product-to-antenna).

Deviations, Additions, or Exclusions: None

9   AC Mains Conducted Emissions

9.1   Method

Unless otherwise stated no deviations were made from FCC 15.207 and RSS-GEN, Clause 7.2.4.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

9.2   Test Equipment Used:

Asset ID	Description	Manufacture	Model	Serial	Cal Date	Cal Due
18885	Transient Limiter	Hewlett-Packard	11947A	3107A00700	05/05/2013	05/05/2014
18914	Single Phase LISN	EMCO	3816/NM	9408-1003	04/11/2013	04/11/2014
DEN-073	EMI Receiver	ROHDE & SCHWARZ	ESU 26	100265	01/23/2013	01/23/2014
SW-6	Software for Radiated and Conducted emissions.	Intertek	OATS vba	V. 1.0	VBU	VBU

9.3   Results:

The product tested was found to comply.

9.4   Setup Photographs: AC Conducted Emissions

Test Setup (Front View)
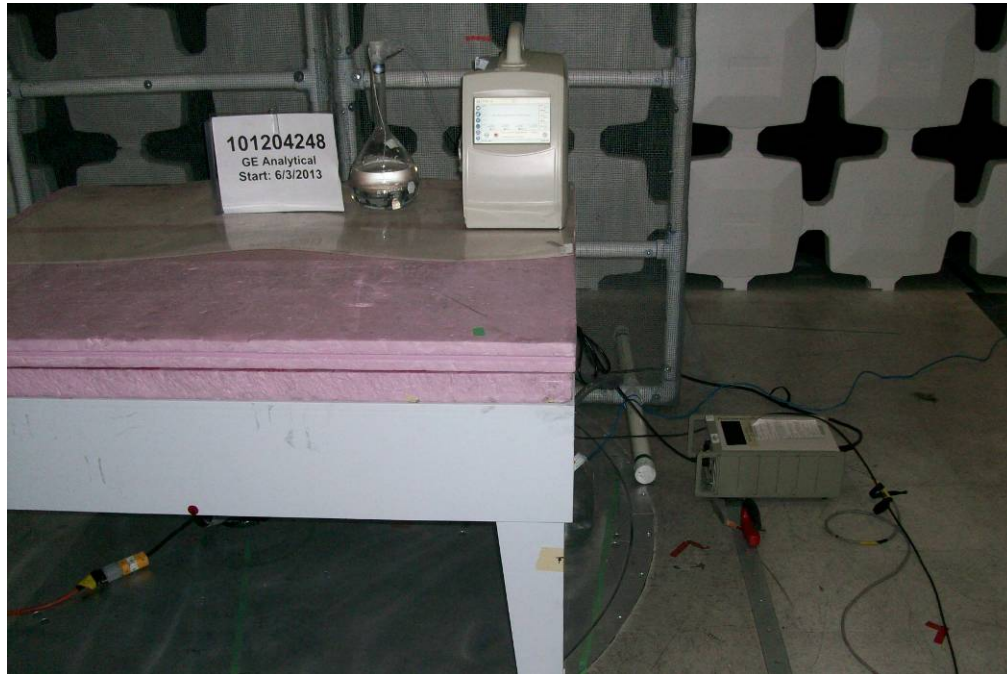
Setup Photographs:

Test Setup (Side View)
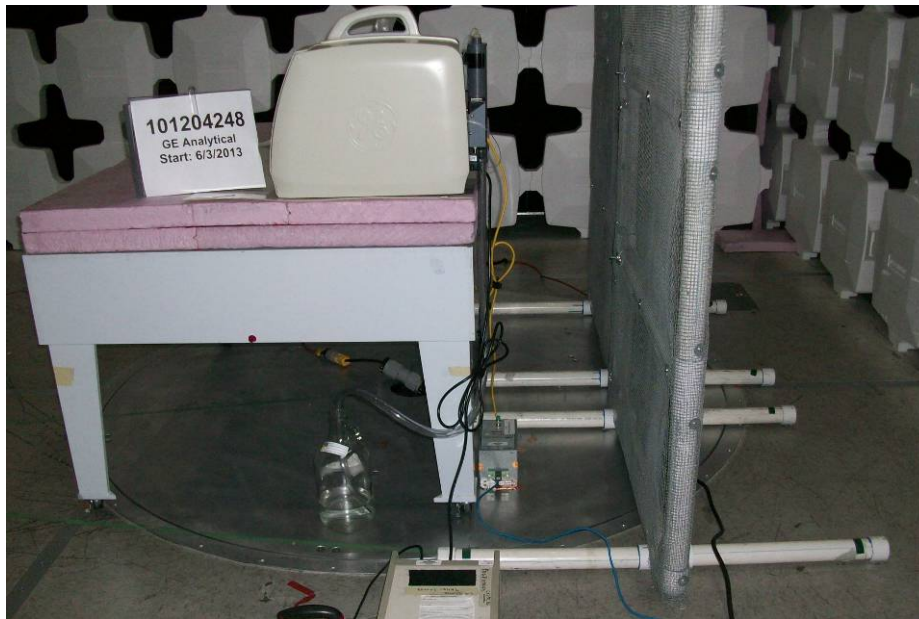
9.5 Pre-scan Plots: Reference Only – Not Final Data: POE

Conducted Emissions – FCC 15.207 (150kHz to 30MHz)

Line 1
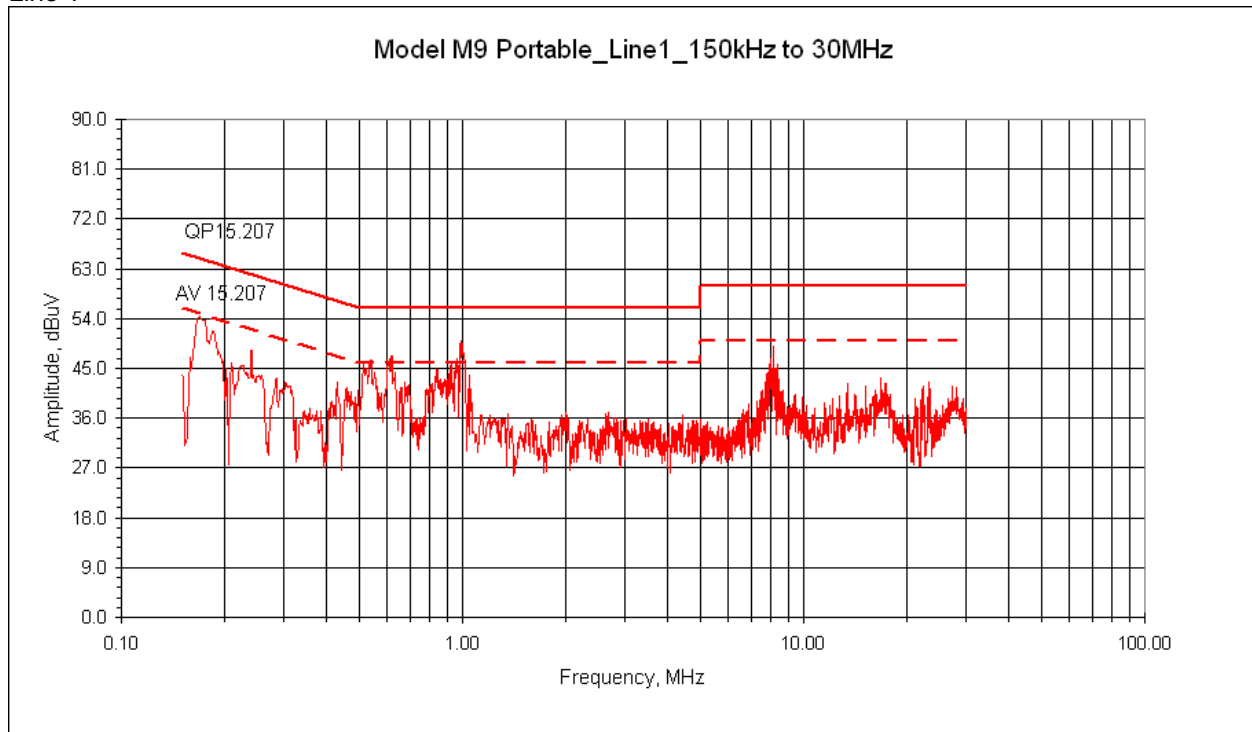
Line 2
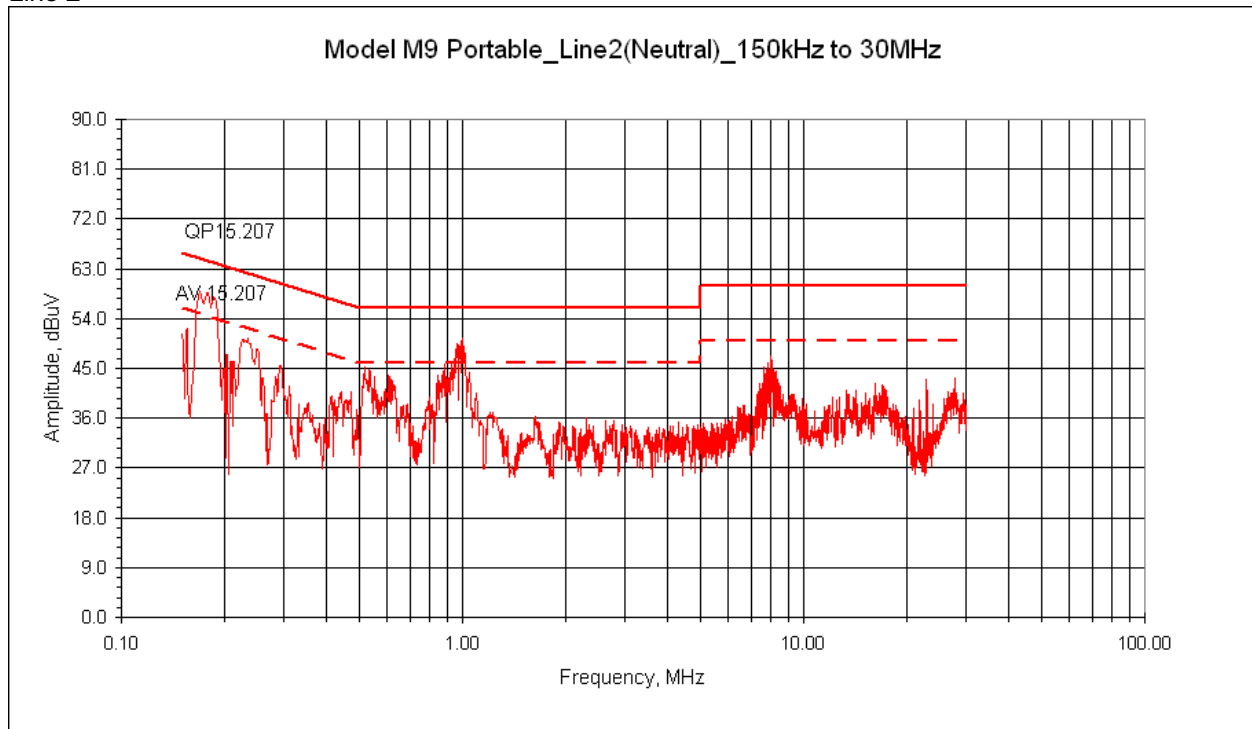
Note: Peak measurements plotted against Average and QP limits

9.6 Final Plots:

Conducted Emissions – FCC 15.207 (150 kHz to 30 MHz)

Model M9 Portable
Line and Neutral Conducted Emission Summary
CC1 06/07/2013

Model M9 Portable
Line and Neutral Conducted Emission Summary
CC1 06/07/2013

9.7 Test Data:

AC Conducted Electromagnetic Emissions

Test Report #:	G101207197		Test Area:	CC1 Conducted	Temperature:		23.1	C
Test Method:	FCC 15.207 IC RSS-GEN, Clause 7.2.4		Test Date:	06/07/2013	Relative Humidity:		28.4	%
EUT Model #:	MC9 (Link Portable)		EUT Power:	**120VAC/ 60Hz**	Air Pressure:		83.1	kPa
EUT Serial #:	13040025							
Manufacturer:	GE Analytical Instruments				Level Key			
EUT Description:	TOC Analyzer – Series 900 portable version				Pk - Peak	Nb - Narrow Band		
Notes:	Product powered-up and running in normal operation – continuously looping. TOC measurements, analysis and data logging.				Qp - QuasiPeak	Bb - Broad Band		
					Av - Average			

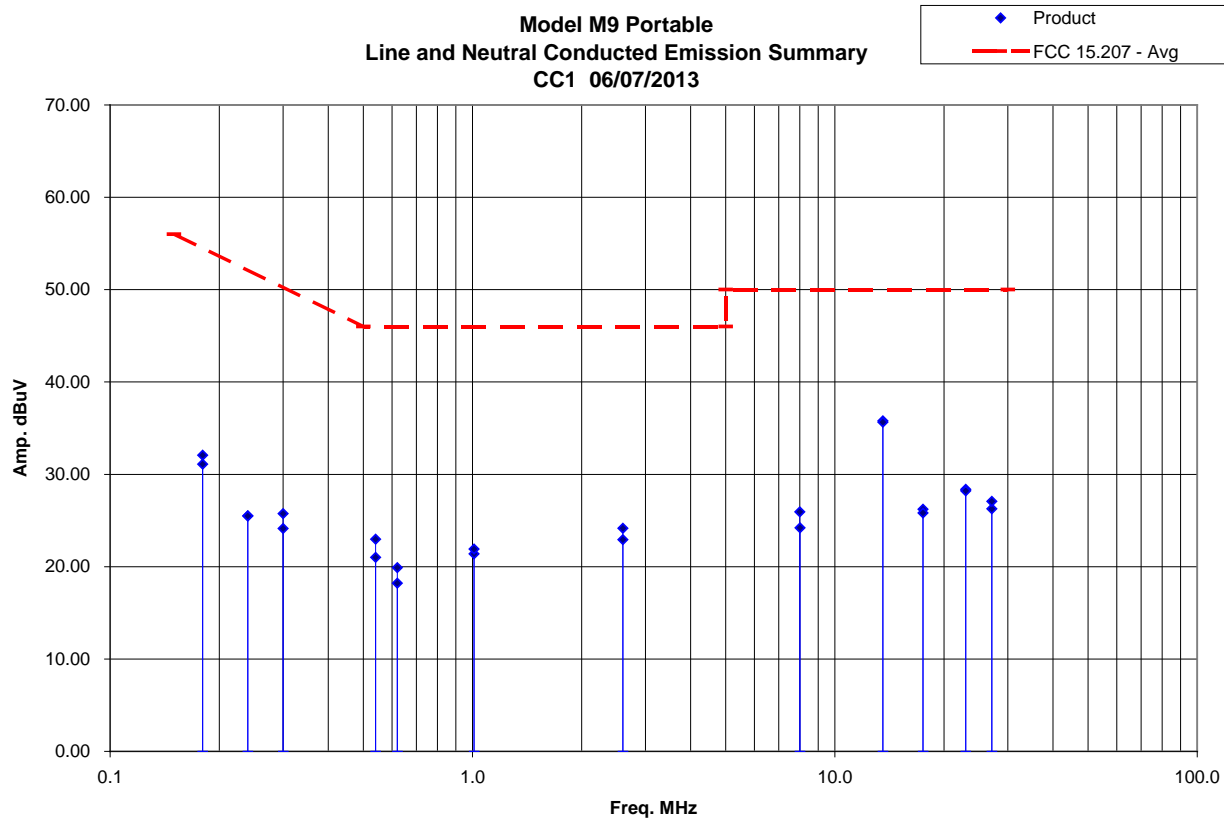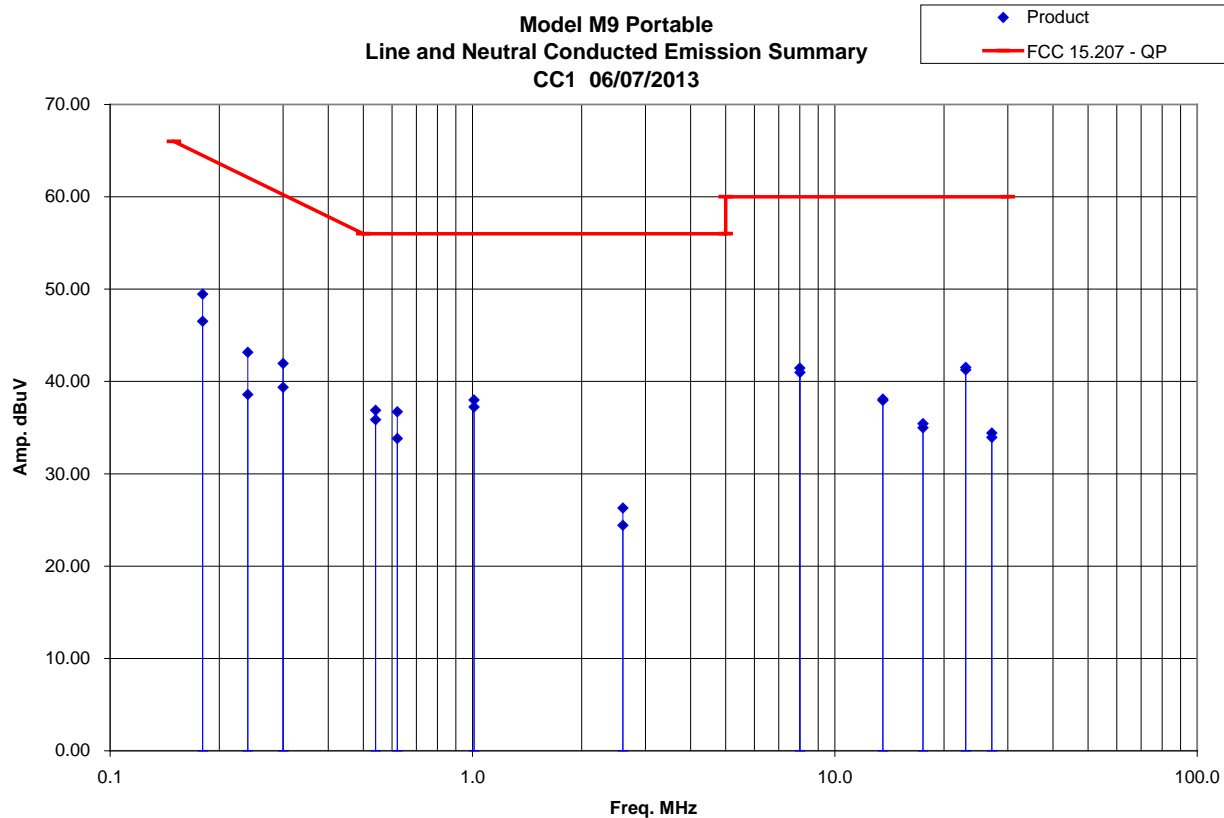| FREQ	LEVEL	DET	CABLE	LISN	PREAMP	ATTEN	FINAL	TEST POINT	DELTA1	DELTA2	RBW
MHz	dBuV	Qp Av Pk	+ [dB]	+ [dB/m]	- [dB]	+ [dB]	= [dBuV]		FCC 15.207 IC RSS-GEN Average	FCC 15.207 IC RSS-GEN QP	(MHz)
Line 1 Data – 150kHz to 30MHz											
0.180	21.00	**Av**	0.10	0.03	0.00	9.96	31.10	Line 1	- 23.39	NA	0.009
0.180	39.37	**Qp**	0.10	0.03	0.00	9.96	49.47	Line 1	NA	- 15.02	0.009
0.240	15.39	**Av**	0.10	0.03	0.00	9.96	25.48	Line 1	- 26.61	NA	0.009
0.240	33.08	**Qp**	0.10	0.03	0.00	9.96	43.17	Line 1	NA	- 18.92	0.009
0.300	14.04	**Av**	0.10	0.03	0.00	9.97	24.13	Line 1	- 26.11	NA	0.009
0.300	31.87	**Qp**	0.10	0.03	0.00	9.97	41.96	Line 1	NA	- 18.28	0.009
0.540	10.91	**Av**	0.10	0.02	0.00	9.97	21.01	Line 1	- 24.99	NA	0.009
0.540	25.76	**Qp**	0.10	0.02	0.00	9.97	35.86	Line 1	NA	- 20.14	0.009
0.620	8.12	**Av**	0.10	0.02	0.00	9.98	18.22	Line 1	- 27.78	NA	0.009
0.620	23.72	**Qp**	0.10	0.02	0.00	9.98	33.82	Line 1	NA	- 22.18	0.009
1.010	11.71	**Av**	0.20	0.03	0.00	9.98	21.92	Line 1	- 24.08	NA	0.009
1.010	27.79	**Qp**	0.20	0.03	0.00	9.98	38.00	Line 1	NA	- 18.00	0.009
2.600	12.71	**Av**	0.20	0.03	0.00	9.98	22.92	Line 1	- 23.08	NA	0.009
2.600	14.22	**Qp**	0.20	0.03	0.00	9.98	24.43	Line 1	NA	- 31.57	0.009
8.000	15.37	**Av**	0.50	0.08	0.00	9.99	25.95	Line 1	- 24.05	NA	0.009
8.000	30.88	**Qp**	0.50	0.08	0.00	9.99	41.46	Line 1	NA	- 18.54	0.009
13.560	24.63	**Av**	0.90	0.12	0.00	10.01	35.66	Line 1	- 14.34	NA	0.009
13.560	26.92	**Qp**	0.90	0.12	0.00	10.01	37.95	Line 1	NA	- 22.05	0.009
17.500	14.52	**Av**	1.10	0.17	0.00	10.02	25.81	Line 1	- 24.19	NA	0.009
17.500	23.69	**Qp**	1.10	0.17	0.00	10.02	34.98	Line 1	NA	- 25.02	0.009

22.960	16.86	**Av**	1.10	0.22	0.00	10.03	28.22	Line 1	- 21.78	NA	0.009
22.960	29.91	**Qp**	1.10	0.22	0.00	10.03	41.27	Line 1	NA	- 18.73	0.009
27.120	15.58	**Av**	1.30	0.16	0.00	10.04	27.08	Line 1	- 22.92	NA	0.009
27.120	22.91	**Qp**	1.30	0.16	0.00	10.04	34.41	Line 1	NA	- 25.59	0.009

Line 2 (Neutral) Data – 150kHz to 30MHz											
0.180	21.98	**Av**	0.10	0.03	0.00	9.96	32.08	Line 2	- 22.41	NA	0.009
0.180	36.43	**Qp**	0.10	0.03	0.00	9.96	46.53	Line 2	NA	- 17.96	0.009
0.240	15.42	**Av**	0.10	0.03	0.00	9.96	25.51	Line 2	- 26.58	NA	0.009
0.240	28.49	**Qp**	0.10	0.03	0.00	9.96	38.58	Line 2	NA	- 23.51	0.009
0.300	15.66	**Av**	0.10	0.03	0.00	9.97	25.75	Line 2	- 24.49	NA	0.009
0.300	29.28	**Qp**	0.10	0.03	0.00	9.97	39.37	Line 2	NA	- 20.87	0.009
0.540	12.88	**Av**	0.10	0.02	0.00	9.97	22.98	Line 2	- 23.02	NA	0.009
0.540	26.79	**Qp**	0.10	0.02	0.00	9.97	36.89	Line 2	NA	- 19.11	0.009
0.620	9.81	**Av**	0.10	0.02	0.00	9.98	19.91	Line 2	- 26.09	NA	0.009
0.620	26.62	**Qp**	0.10	0.02	0.00	9.98	36.72	Line 2	NA	- 19.28	0.009
1.010	11.18	**Av**	0.20	0.02	0.00	9.98	21.38	Line 2	- 24.62	NA	0.009
1.010	27.04	**Qp**	0.20	0.02	0.00	9.98	37.24	Line 2	NA	- 18.76	0.009
2.600	13.95	**Av**	0.20	0.03	0.00	9.98	24.16	Line 2	- 21.84	NA	0.009
2.600	16.09	**Qp**	0.20	0.03	0.00	9.98	26.30	Line 2	NA	- 29.70	0.009
8.010	13.63	**Av**	0.50	0.09	0.00	9.99	24.22	Line 2	- 25.78	NA	0.009
8.010	30.38	**Qp**	0.50	0.09	0.00	9.99	40.97	Line 2	NA	- 19.03	0.009
13.560	24.75	**Av**	0.90	0.13	0.00	10.01	35.79	Line 2	- 14.21	NA	0.009
13.560	27.04	**Qp**	0.90	0.13	0.00	10.01	38.08	Line 2	NA	- 21.92	0.009
17.500	14.92	**Av**	1.10	0.18	0.00	10.02	26.22	Line 2	- 23.78	NA	0.009
17.500	24.14	**Qp**	1.10	0.18	0.00	10.02	35.44	Line 2	NA	- 24.56	0.009
22.960	16.91	**Av**	1.10	0.35	0.00	10.03	28.39	Line 2	- 21.61	NA	0.009
22.960	30.04	**Qp**	1.10	0.35	0.00	10.03	41.52	Line 2	NA	- 18.48	0.009
27.120	14.69	**Av**	1.30	0.24	0.00	10.04	26.27	Line 2	- 23.73	NA	0.009
27.120	22.36	**Qp**	1.30	0.24	0.00	10.04	33.94	Line 2	NA	- 26.06	0.009

Notes:
1) The following AC power was tested: 120VAC/60Hz
2) All RFID functions were continuously active during testing.

Deviations, Additions, or Exclusions: None

10 Occupied Bandwidth (OBW) – RSS-GEN, Section 4.6.1

10.1 Method

Unless otherwise stated no deviations were made from RSS-GEN:2010, Section 4.6.1.

This testing was performed at Intertek Denver, located at 1795 Dogwood St. Suite 200, Louisville, CO 80027.

10.2 Test Equipment Used:

Asset ID:	Description:	Manufacturer:	Model:	Serial:	Cal Date	Cal Due
DEN-073	EMI Receiver	RHODE & SCHWARZ	ESU 26	100265	01/11/2012	01/11/2013
18897	Active Loop Antenna	EMCO	6502	9205-2738	11/29/2012	11/29/2013
SW-6	Software application for Radiated and Conducted Emissions	Intertek	OATS_Vba	V003	VBU	VBU

10.3 Results:
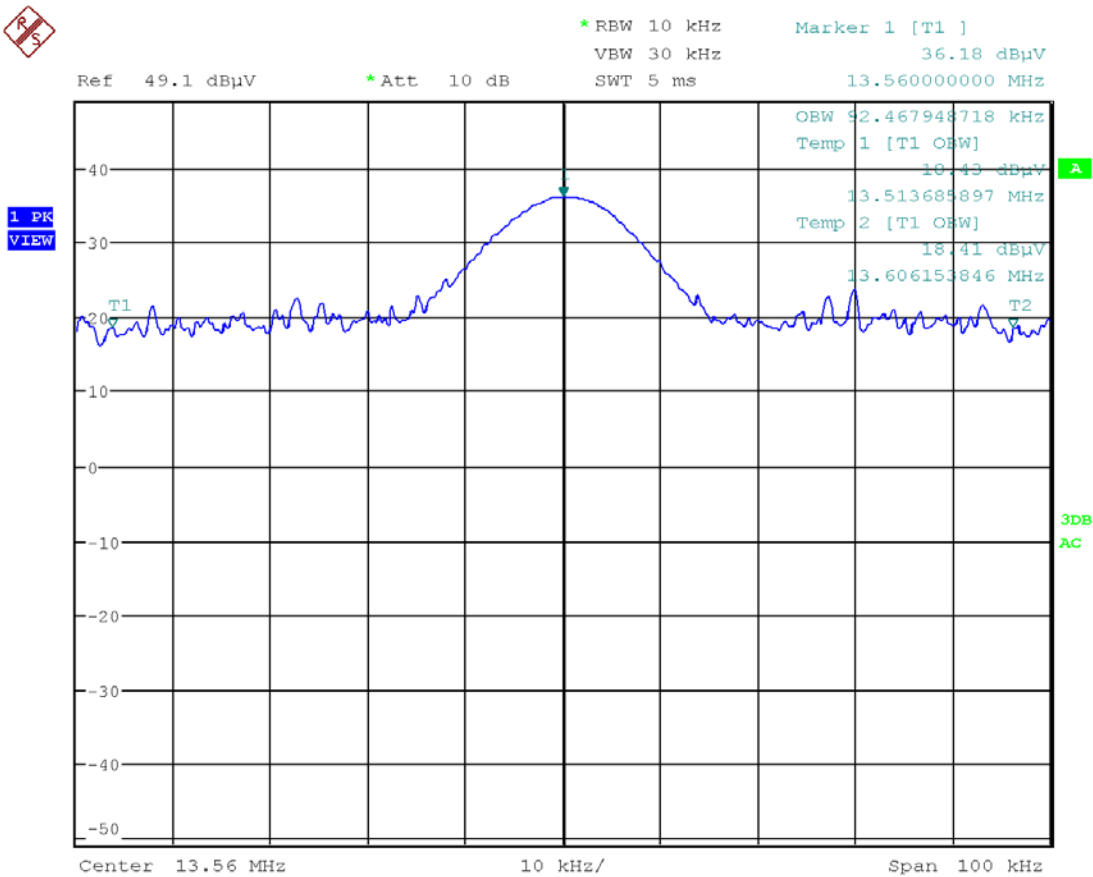
The product tested was found to comply.

10.4 Setup Photographs: Occupied Bandwidth

Test Setup (Front View)

10.5 Final Plots:
Occupied Bandwidth - (RSS-GEN, Section 4.6.1) – Model M9 Portable
Tx – 13.560 MHz

99% Power Plot

Date: 20.JUN.2013 15:18:41

Notes: The measured OBW for the product: 92.47 kHz

Deviations, Additions, or Exclusions: None

11   Product Modifications

11.1   Radiated Unintentional and Spurious Emissions

The following product modifications were required to pass the Unintentional Radiated Emissions testing.

From: Dettling, Allen (GE Power & Water) [allen.dettling@ge.com]
Sent: Tuesday, June 25, 2013 4:06 PM
To: Randall Thompson Intertek
Subject: FCC emissions final configuration on Link Portable
Randy,

The final configuration of the Link Portable TOC Analyzer that was tested contained the following changes:
1   Installed ferrite core (Fair-Rite P/N 0431164951) on the display cable.
2   Installed display with mounting tabs on the bezel and mounted directly to the aluminum mounting plate.
3   Mounted the display mounting plate with ¼" standoffs directly to the front chassis for better grounding.
4   Closed the large hole in the front chassis with aluminum tape.
5   Added ferrite plate (Laird P/N MP0760-100) on top of the Freescale iMX 535 microprocessor.

Regards,
Allen Dettling
Electrical Engineer

g   GE Power & Water
Water & Process Technologies
Analytical Instruments

T 720-622-0243
F 303-444-9543
E allen.dettling@ge.com
www.geinstruments.com
6060 Spine Road
Boulder, Colorado 80301-3687, USA
GE Analytical Instruments, Inc.

12 Manufacturer's "Declaration of Similarity"

The following information was provided by the manufacturer. Note the RFID radio and associated antenna is identical in all product models.

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September 4, 2013

Declaration of Similarity
(DoS)

This is to certify that the following GE Analytical Instruments, Inc. products are electrically similar with respect to EMC Radio testing. The following product models incorporate the identical intentional transmitter (radio).

- Model M9 Portable, M9ᵉ Portable, M5310 C Portable
- Model M9 Laboratory, M9ᵉ Laboratory, M5310 C Laboratory
- Model M9 On-line, M9ᵉ On-Line, M5310 C On-Line

The differences between the above models are as follows:

Model	Primary Application (software configuration)	IOS (external sample manifold)	Inorganic Carbon Remover (ICR) (sample stream fluidics module)	I/O Board (PCBA)	Sample Conductivity Cell	Sample Valve	2 Stream sample manifold and valve	Dataguard (software security option)
M5310 C Laboratory	Municipal	N/A	Standard w/out pump	N/A	Optional	Standard	N/A	N/A
M5310 C Portable	Municipal	Standard	Standard w/out pump	Standard	Optional	N/A	N/A	N/A
M5310 C On-Line	Municipal	Standard	Standard w/out pump	Standard	N/A	N/A	Optional	N/A
M9 Laboratory	Pharmaceutical	N/A	Option w/ pump	N/A	Optional	Standard	N/A	Optional
M9 Portable	Pharmaceutical	Standard	Option w/ pump	Standard	Optional	N/A	N/A	Optional
M9 On-Line	Pharmaceutical	Standard	Option w/ pump	Standard	N/A	N/A	N/A	Optional
M9ᵉ Laboratory	Semi-Conductor	N/A	Option w/ pump	N/A	Optional	Standard	N/A	N/A
M9ᵉ Portable	Semi-Conductor	Standard	Option w/ pump	Standard	Optional	N/A	N/A	N/A
M9ᵉ On-Line	Semi-Conductor	Standard	Option w/ pump	Standard	N/A	N/A	N/A	N/A

All of the above models have the electrically-identical radio detailed on pages 2-22:

Signature

Matt Gilhousen
Quality Engineer

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GE Analytical Instruments has developed a circuit and antenna for its Sievers M9 series of TOC analyzers to use RFID tags for monitoring the use and viability of the reagents used in the analyzer. The RFID function is one of several functions incorporated on a single circuit board (Instrument Controller Board part number APC 77020-01).

The Instrument Controller Board incorporates a Texas Instruments TRF7960A RFID reader/writer integrated circuit to communicate with RFID tags located on the instrument's reagent bottles. The TRF7960A is used in a configuration based on a reference design from the manufacturer. The SPI interface was chosen to communicate with the TRF7960A. The ISO15693 protocol is implemented to communicate with the RFID tags.

The circuit board block diagram is shown below:

Instrument Controller Board
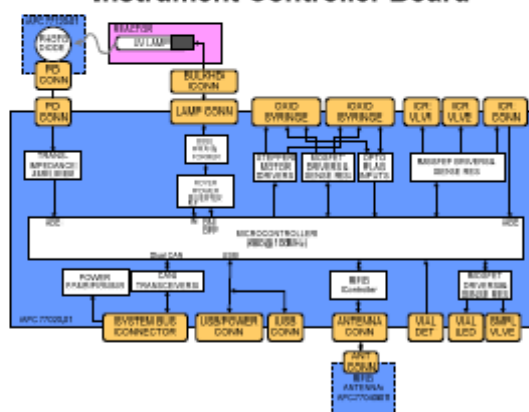
Following is a description of the TRF7960A excerpted from the manufacturer's datasheet:

The TRF7960A is a high-performance 13.56-MHz HF RFID reader IC comprising an integrated analog
front end (AFE) and a built-in data framing engine for ISO15693, ISO14443A/B, and FeliCa. It supports

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data rates up to 848 kbps for ISO14443 with all framing and synchronization tasks on board (in ISO Mode, default). The TRF7960A also supports NFC Forum Tag Types 1, 2, 3, and 4 operations (as reader/writer only). This architecture enables the customer to build a complete and cost-effective yet high-performance multiprotocol HF RFID/NFC reader/writer using a low-cost microcontroller.
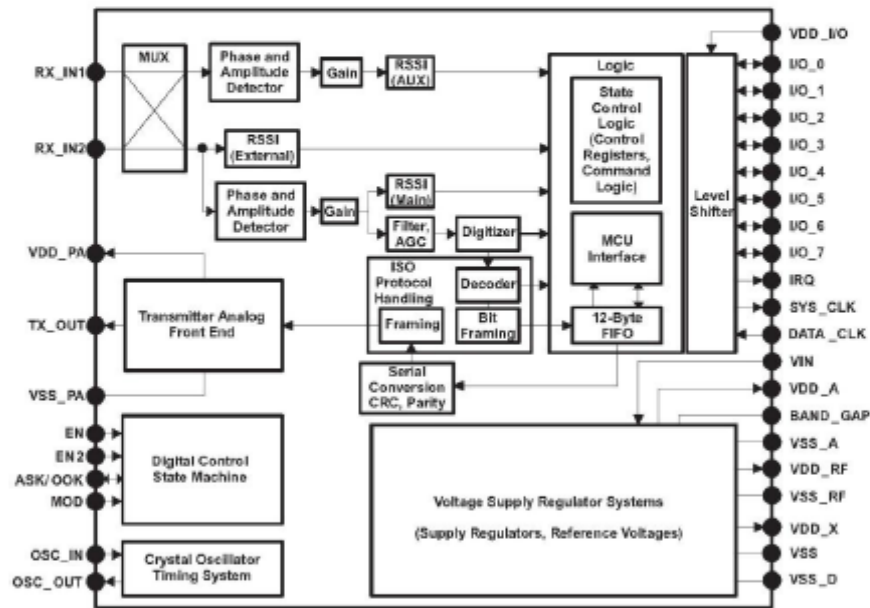
Figure 1-1. Block Diagram

The transmitter supports OOK and ASK modulation with selectable modulation depth. The TRF7960A includes a data transmission engine that supports low-level encoding for ISO15693 and modified Miller encoding for ISO14443A/B and FeliCa. Included with the transmit data coding is the automatic generation of Start Of Frame (SOF), End Of Frame (EOF), Cyclic Redundancy Check (CRC), and parity bits. Several integrated voltage

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regulators ensure a proper power-supply noise rejection for the complete reader system. The built-in programmable auxiliary voltage regulator

VDD_X (pin32) delivers up to 20mA to supply a microcontroller and additional external circuits within the reader system.

The receiver system has a dual-input receiver architecture. The receivers also include various automatic and manual gain control options. The received input bandwidth can be selected to cover a broad range of input subcarrier signal options.

The received signal strength from transponders, ambient sources or internal levels is available via the
RSSI register. The receiver output is selectable among a digitized subcarrier signal and any of the
integrated subcarrier decoders. The selected subcarrier decoder delivers the data bit stream and the data clock as outputs.

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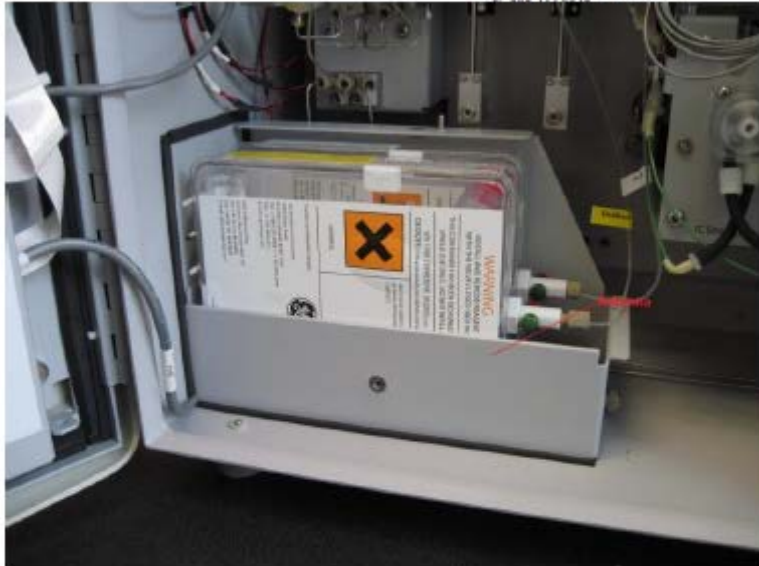Boulder, Colorado 80301
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Following are pictures of the RFID Radio and Antenna locations in the three instrument configurations:

Online Configuration:

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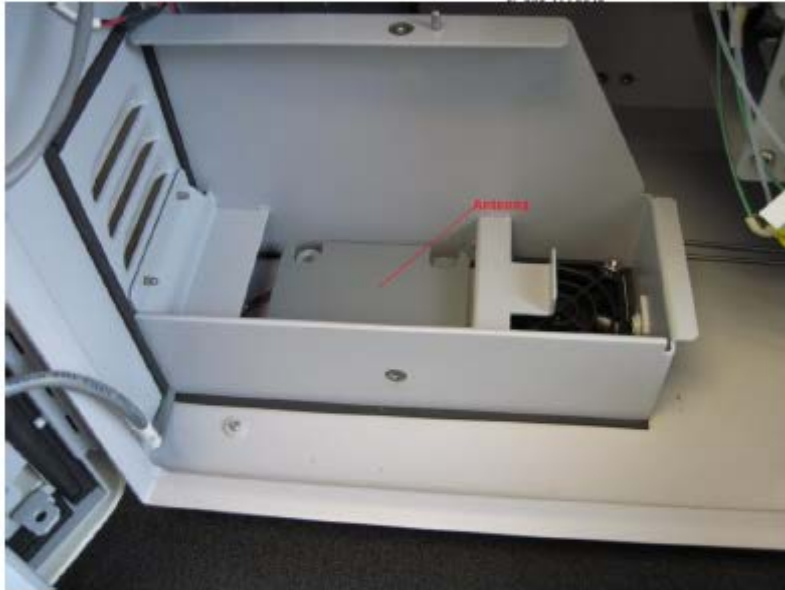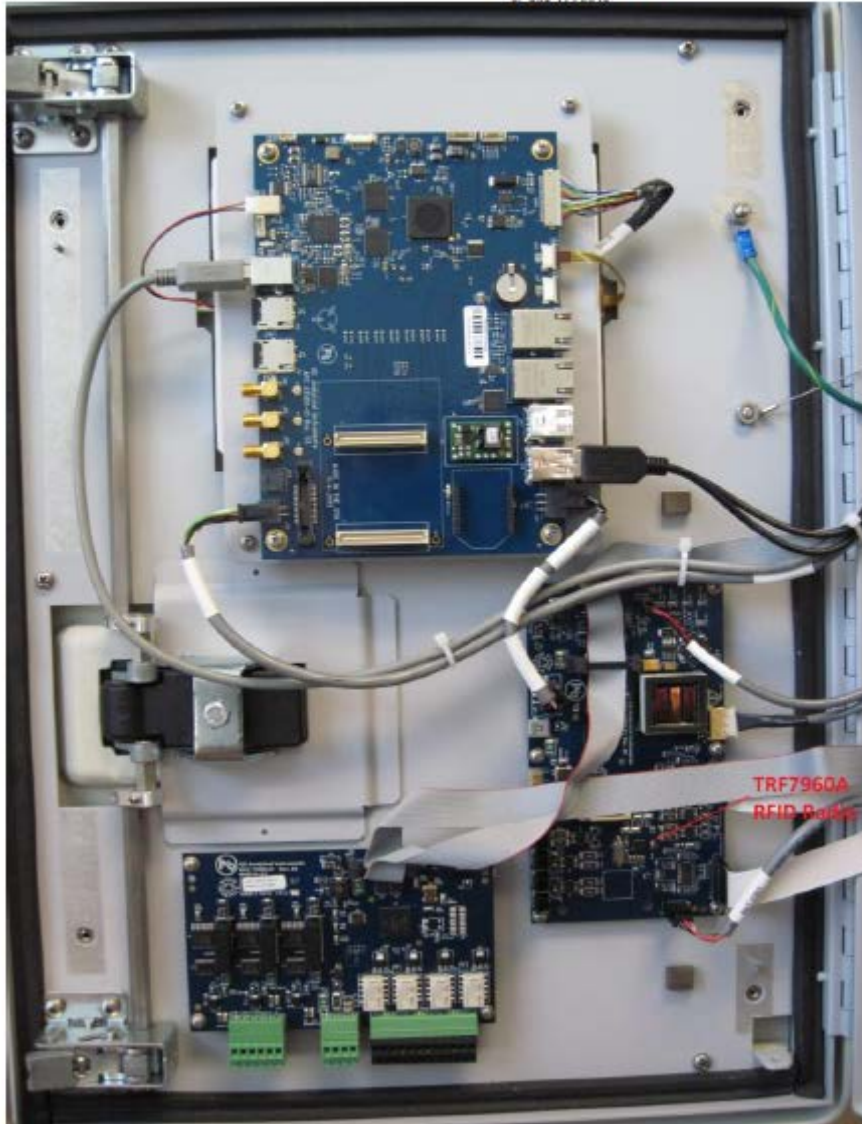Boulder, Colorado 80301
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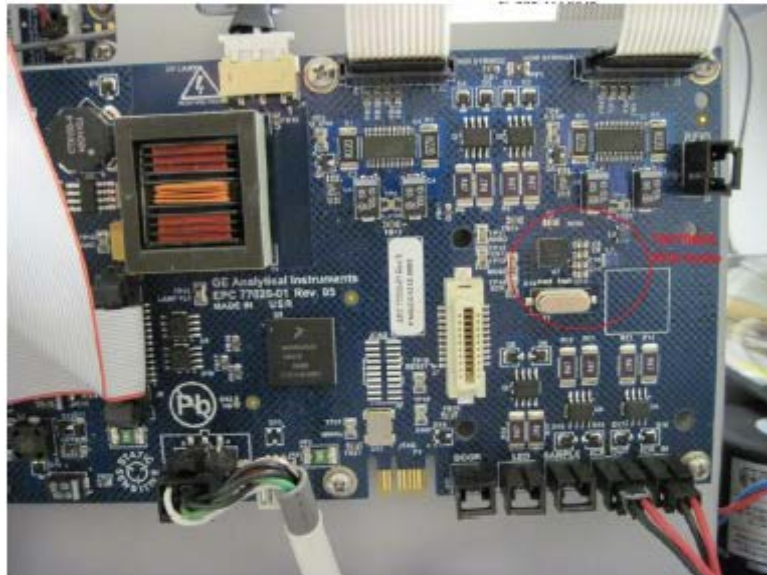T 800 255 6964 / 303 444 2009
F 303 444 9543

Portable Configuration:

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Laboratory Configuration:

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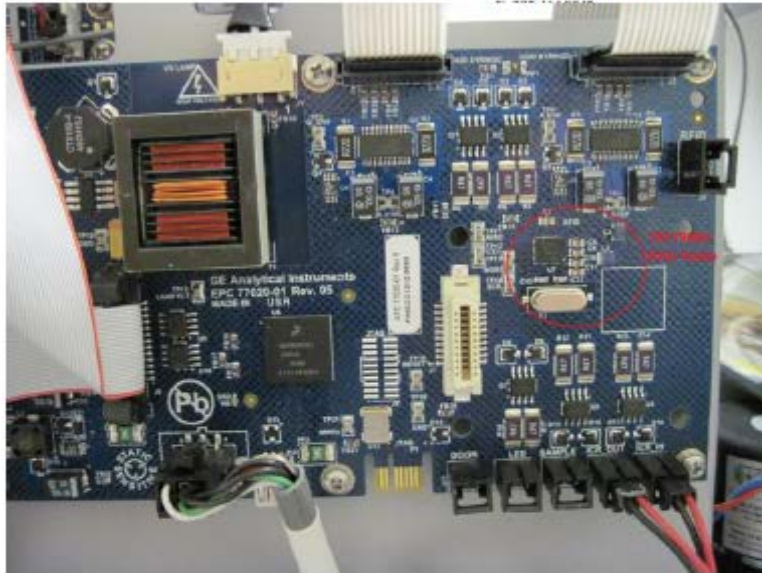

RFID Radio Circuit Board

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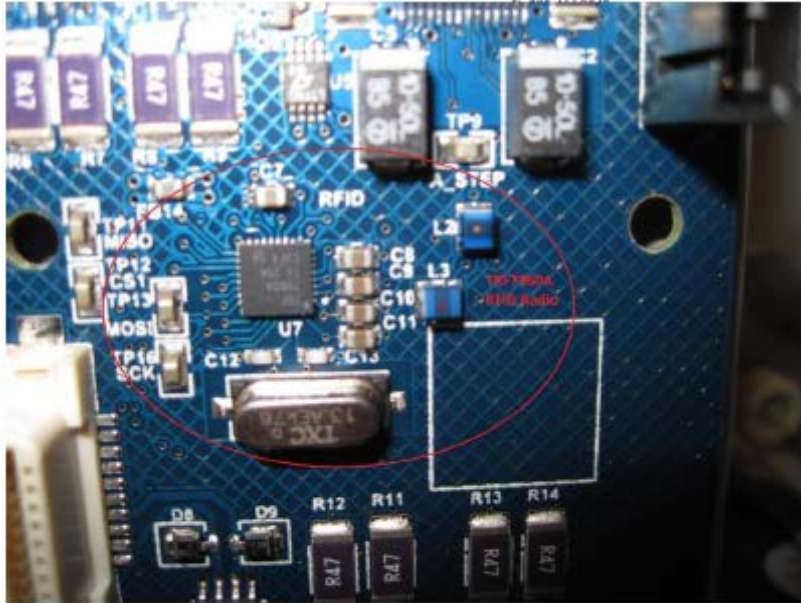USA

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13 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of k = 2, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty ±	Notes
Radiated emissions, 10kHz to 1000 MHz	4.4 dB	
Radiated emissions, 1 to 18 GHz	4.7 dB	
AC mains Conducted emissions, 9kHz to 30 MHz	3.14 dB	
Disturbance Power 30 to 1000 MHz	3.3 dB	
Telecom Port Conducted emissions, Voltage 150 kHz to 30 MHz	3.11 dB	
Harmonics	-	Meets the requirements specified by the standard.
Flicker	-	Meets the requirements specified by the standard.
ESD	4.4 %	
Radiated RF field immunity 80MHz to 2.7GHz	2.2 dB	
EFT	4.3 %	
Surge	4.3 %	
Conducted RF immunity	2.1 dB	
Power frequency magnetic field immunity	2.3 dB	
Voltage dips / interruptions immunity	0.3 mV	

14 Revision History

Revision Level	Date	Report Number	Notes
0	6/28/2013	101207197DEN-001	Original Issue
1	10/14/2013	101207197DEN-001	Revision: TCB Review Request 1. Added note, page 2 describing product models covered in report 2. Added Manufacturer's DoS, Section 12 2. Corrected 18912 pre-amp cal date, page32 3. Added notes with respect to radiated field measurement distance, note 3 page 39 4. Revised Section 7 (Frequency Stability) re-testing from -20 degrees to +50 degrees 5. All references to Model M9 changed to Model M9 Portable. Revised by: Randy Thompson Reviewed by: Mike Spataro