MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
914 WEST PATAPSCO AVENUE • BALTIMORE, MARYLAND 21230 • PHONE (410) 354-3300 • FAX (410) 354-3313
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13301 MCCALLEN PASS • AUSTIN, TEXAS 78753 • PHONE (512) 287-2500 • FAX (512) 287-2513

June 3, 2013

Elecraft
P. O. Box 69
Aptos, CA 95001

Dear Bob Wolbert,

Enclosed is the EMC test report for compliance testing of the Elecraft, KXPA100, tested to the requirements of FCC Part 97.307 (d) and (e).

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Ella Bareng
Documentation Department

Reference: (\Elecraft\EMCS38502-FCC 97)

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Electromagnetic Compatibility
Test Report

for the

Elecraft
KXPA100

Tested under

FCC Part 97. 07 (d) and (e)

MET Report: EMCS38502-FCC 97
June 3, 2013

Prepared for:
Elecraft
P. O. Box 69
Aptos, CA 95001

Prepared by:
MET Laboratories, Inc.
3162 Belick Street
Santa Clara, CA 95054

Electromagnetic Compatibility
Test Report

For the

Elecraft
KXPA100

Tested under

FCC Part 97.307 (d) and (e)

MET Report: EMCS38502-FCC 97

Aaron Chang
Project Engineer, Electromagnetic Compatibility Lab

Ella Bareng
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the applicable limits. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements per Test Summary (Section 1.0).

Asad Bajwa
Director, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
Ø	June 3, 2013	Initial Issue.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent	**kPa**	**k**ilo**pa**scal
ACF	**A**ntenna **C**orrection **F**actor	**kV**	**k**ilo**v**olt
AV	**Av**erage	**LISN**	**L**ine **I**mpedance **S**tabilization **N**etwork
Cal	**Cal**ibration	**MHz**	**M**ega**h**ertz
d	**M**easurement **D**istance	**µH**	**microh**enry
dB	**D**eci**b**els	**µF**	**microf**arad
dBµA	**D**eci**b**els above one **micro**amp	**µs**	**micros**econds
dBµV	**D**eci**b**els above one **micro**volt	**PRF**	**P**ulse **R**epetition **F**requency
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter	**RF**	**R**adio **F**requency
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter	**RMS**	**R**oot-**M**ean-**S**quare
DC	**D**irect **C**urrent	**V/m**	**V**olts **per m**eter
E	**E**lectric Field	**VCP**	**V**ertical **C**oupling **P**lane
ESD	**E**lectro**s**tatic **D**ischarge	**CE**	**C**onducted **E**missions
EUT	**E**quipment **U**nder **T**est	**RE**	**R**adiated **E**missions
f	**F**requency	**VF**	**V**oltage **F**luctuations
CISPR	**C**omite **I**nternational **S**pecial des **P**erturbations **R**adioelectriques (International Special Committee on Radio Interference)	**ESD**	**E**lectro**s**tatic **D**ischarge
GRP	**G**round **R**eference **P**lane	**QP**	**Q**uasi **P**eak
H	Magnetic Field	**RI**	**R**adiated **I**mmunity
HCP	**H**orizontal **C**oupling **P**lane	**EFT/B**	**E**lectrical **F**ast **T**ransient/**B**urst
Hz	**H**er**z**	**CI**	**C**onducted **I**mmunity
IEC	**I**nternational **E**lectrotechnical **C**ommission	**MI**	**M**agnetic **I**mmunity
kHz	**k**ilo**h**er**z**	**VDI**	**V**oltage **D**ips **I**nterruptions

1.0 Testing Summary

1.1. Emissions Test Summary

The emissions tests specified below were performed with the following results:

Radiated Emissions			
Transmitting Frequency	**Specification**	**Margin (dBc)**	**Compliance**
Below 30 MHz	FCC Part 97.307 (d)	>43	**Compliant**
30-225 MHz	FCC Part 19.307 (e)	>60	**Compliant**

2.0 Equipment Configuration

2.1. Overview

MET Laboratories, Inc. was contracted by Elecraft to perform testing on the KXPA100, under Elecraft, purchase order number 19422.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Elecraft, KXPA100.

In accordance with §2.955(a) (3), the following data is presented in support of the verification of the Elecraft, KXPA100. Elecraft should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the KXPA100 has been **permanently** discontinued, as per §2.955(b).

The results obtained relate only to the item(s) tested.

Model(s) Tested:	KXPA100
Model(s) Covered:	KXPA100
Primary Power as Tested:	Voltage: 13.8 VDC Current (mA): 24000 mA (24 A) (18A nominal)
Equipment Emissions Class:	B
Highest frequency generated or used by the EUT:	16 MHz
Evaluated by:	Aaron Chang
Report Date:	June 3, 2013

2.1.1. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick Street, Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

MET Laboratories is an ISO/IEC 17025 accredited site by A2LA, (California #0591.02).

Radiated Emissions measurements were performed in a semi anechoic chamber. In accordance with §2.948(a) (3), a complete site description is contained at MET Laboratories.

2.1.2. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty (dB)	K	Confidence Level
Radiated Emissions, (30 MHz – 1 GHz)	±3.45	2	95%

Table 1: Uncertainty Calculations Summary

2.2. Detailed EUT Description and Test Setup

2.2.1. Description of Test Sample

The KXPA100, Equipment Under Test (EUT), is an External 100W RF Power Amplifier for Amateur Radio Service.

2.2.2. Photograph(s) of Test Sample

Photograph 1. Front View of KXPA100

Photograph 2. Rear View of KXPA100

Photograph 3. Right View of KXPA100

Photograph 4. Left View of KXPA100

Photograph 5. Top View of KXPA100

2.2.3. Block Diagram

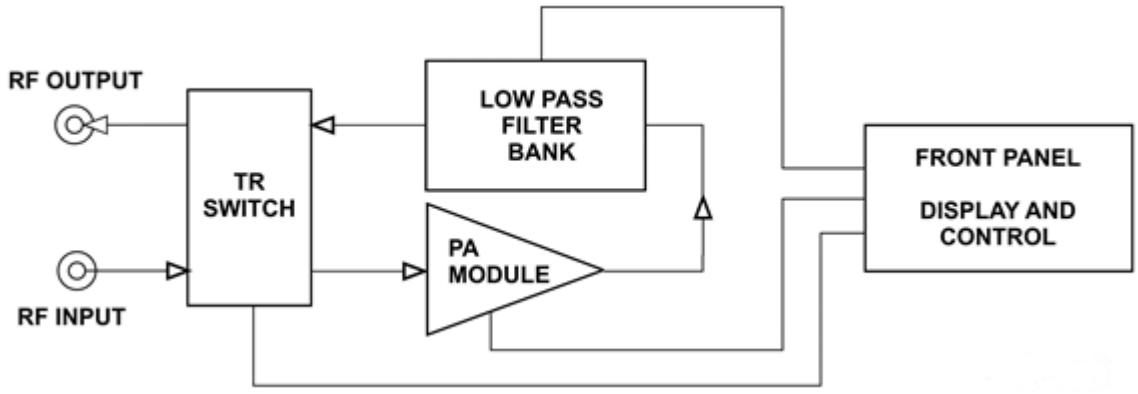


Figure 1. Block Diagram of Test Configuration

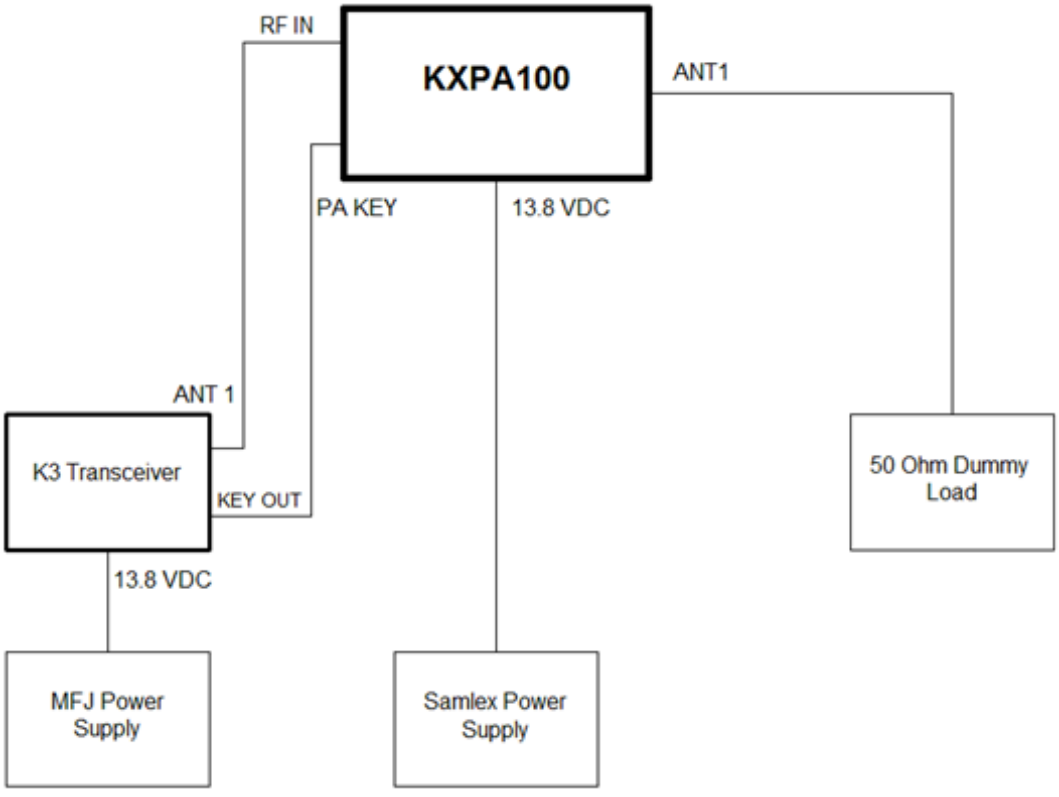


Figure 2. Test Configuration

2.2.4. Equipment Configuration

The EUT was setup as outlined in Figure 1 and Figure 2. All equipment incorporated as part of the EUT is included in the following list.

Name / Description	Model Number	Serial Number
KXPA100	N/A	0

Table 2. Equipment Configuration

2.2.5. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Name / Description	Manufacturer	Model Number	Serial Number
50 Ohm Load	--	--	--
K3 Transceiver	Elecraft	K3	5980
DUT Power Supply	Samlex	RPS1220	none
Transceiver Power Supply	MFJ	MFJ-4125	1072

Table 3. Support Equipment

2.2.6. Ports and Cabling Information

Port Name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded (Y/N)	Termination Box ID & Port ID
RF IN	50 ohm Coax to transceiver	1	1	Y	K3 Transceiver
ANT 1	50 ohm coax to load	1	1	Y	50 Ohm Load
PA KEY	Transmit Key Line	1	1	Y	K3 Transceiver
13.8 VDC	Power Supply Input	1	1.5	N	DUT Power Supply
RS232	None. Not used in normal operation.	N/A	N/A	N/A	N/A
CONTROL	None. Not used in normal operation.	N/A	N/A	N/A	N/A
ANT 2	None. Secondary output, not used in normal operation	N/A	N/A	N/A	N/A

Table 4. Ports and Cabling Information

2.2.7. Mode of Operation & Method of Monitoring EUT Operation

The EUT was operated in the following manner:
Test simulates normal intended operation. Apply RF drive (nominally 4 to 5W) at 1.9MHz, 24.93MHz, and 52 MHz. Monitor output, nominally 100W, at same frequency.
Connections: RF In (PL-259/SO-239). RF Out (PL-259/SO-239). 13.8V DC input (cable and power supply provided by Elecraft for this test. Power supply is NOT an Elecraft product and will not be offered to customer. Transmit Control Cable (Phono/RCA plugs).
This is a single-channel RF power amplifier that operates with one frequency at a time.

Performance of the EUT was monitored in the following manner:
RF output dropping from its nominal 100W to a low value (less than 80W) is considered a failure.

Note that the amplifier is not intended for continuous operation. If its duty cycle is exceeded, thermal protection will shut down the amplifier. This is NOT considered a failure as operation will resume after the heat sink cools. Please keep test transmissions to 5 minutes of power output at a time, with a 50% nominal duty cycle.

2.2.8. Modifications to EUT

No modifications were made to the EUT.

2.2.9. Disposition of EUT

The test sample including all support equipment (if any), submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Elecraft upon completion of testing.

3.0 Electromagnetic Compatibility Emission Criteria

3.1. 97.307(d) Radiated Spurious Emissions for TX Operating Below 30 MHz

3.1.1. Test Method, Test Requirements, and Test Procedures

3.1.1.1. Test Method

TIA/EIA-603

3.1.1.2. Test Requirements

For transmitters installed after January 1, 2003, the mean power of any spurious emission from a station transmitter or external RF power amplifier transmitting on a frequency a 30 MHz must be at least 43 dB below the mean power of the fundamental emission. For transmitters installed on or before January 1, 2003, the mean power of any spurious emission from a station transmitter or external RF power amplifier transmitting on a frequency below 30 MHz must not exceed 50 mW and must be at least 40 dB below the mean power of the fundamental emission. For a transmitter of mean power less than 5 W installed on or before January 1, 2003, the attenuation must be at least 30 dB. A transmitter built before April 15, 1977, or first marketed before January 1, 1978, is exempt from this requirement.

3.1.1.3. Test Procedure

The EUT was placed on top of an 80 centimeter high table inside a semi-anechoic chamber. A transceiver was connected to the input of the EUT and a 50 Ohm load was connected to the output. Various antennas were placed near the EUT and measurements were taken of the field strengths and frequencies. For final radiated measurements, the EUT was placed inside a semi-anechoic chamber, and located 10 meters from the antenna mast.

3.1.2. Test Results, Test Data, and Test Setup

3.1.2.1. Test Results

The EUT was **compliant** with the requirement(s) of this section. Measured emissions were below applicable limits.

97.307(d) Radiated Spurious Emissions for TX Operating Below 30 MHz	
Ambient Temperature:	21.2°C
Relative Humidity:	34%
Atmospheric Pressure:	101.9 kPa

Test Engineer(s): Aaron Chang

Test Date(s): 05/22/2013

3.1.2.2. Test Data

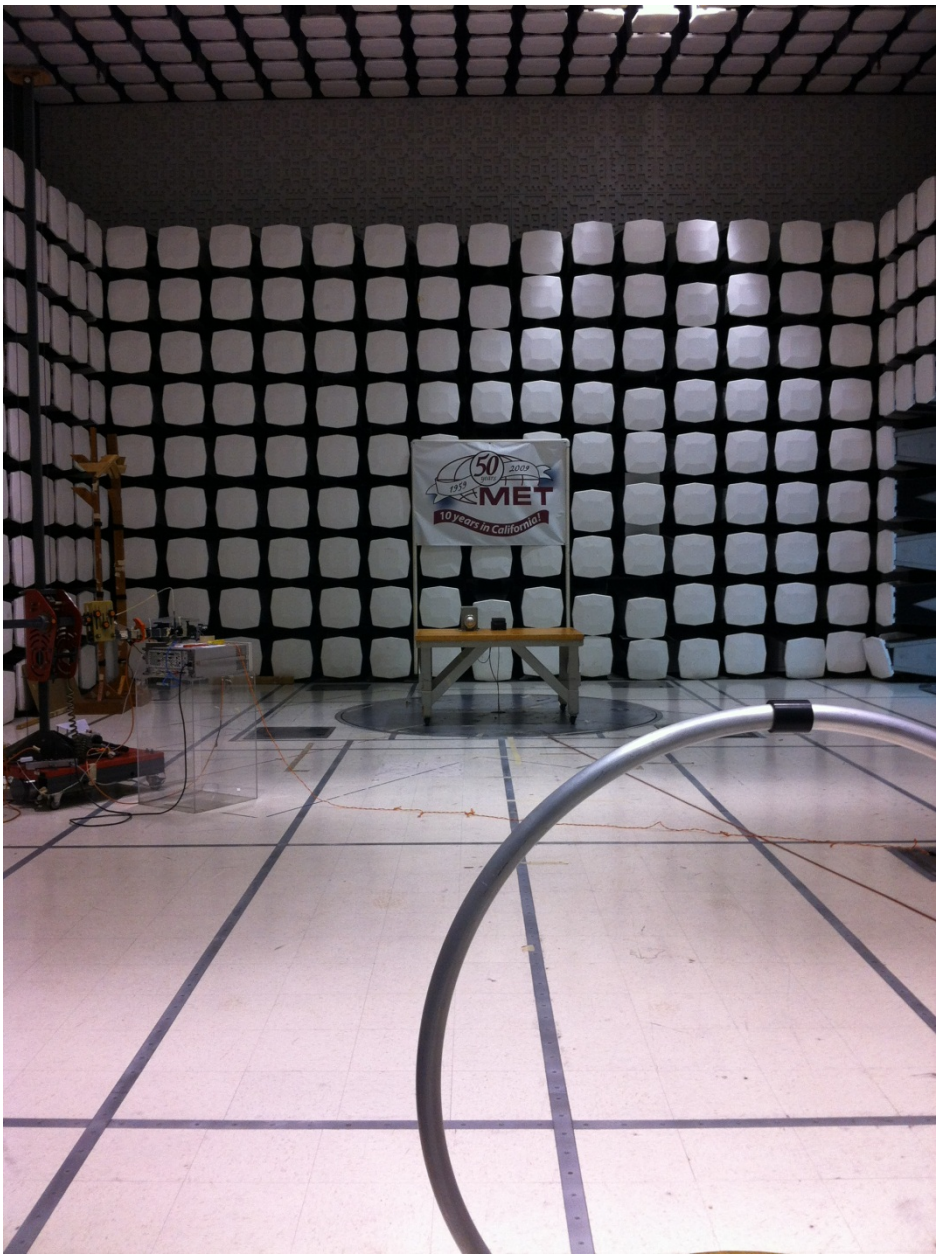
Frequency	Harmonic	dB below Fundamental	>43dB
1.9	1.9	-	-
1.9	3.8	>43dB	Yes
1.9	5.7	>43dB	Yes
1.9	7.6	>43dB	Yes
1.9	9.5	>43dB	Yes
1.9	11.4	>43dB	Yes
1.9	13.3	>43dB	Yes
1.9	15.2	>43dB	Yes
1.9	17.1	>43dB	Yes
1.9	19	>43dB	Yes
3.75	3.75	-	-
3.75	7.5	>43dB	Yes
3.75	11.25	>43dB	Yes
3.75	15	>43dB	Yes
3.75	18.75	>43dB	Yes
3.75	22.5	>43dB	Yes
3.75	26.25	>43dB	Yes
3.75	30	>43dB	Yes
3.75	33.75	>43dB	Yes
3.75	37.5	>43dB	Yes
5.357	5.357	-	-

Frequency	Harmonic	dB below Fundamental	>43dB
5.357	10.714	>43dB	Yes
5.357	16.071	>43dB	Yes
5.357	21.428	>43dB	Yes
5.357	26.785	>43dB	Yes
5.357	32.142	>43dB	Yes
5.357	37.499	>43dB	Yes
5.357	42.856	>43dB	Yes
5.357	48.213	>43dB	Yes
5.357	53.57	>43dB	Yes
7.15	7.15	-	-
7.15	14.3	>43dB	Yes
7.15	21.45	>43dB	Yes
7.15	28.6	>43dB	Yes
7.15	35.75	>43dB	Yes
7.15	42.9	>43dB	Yes
7.15	50.05	>43dB	Yes
7.15	57.2	>43dB	Yes
7.15	64.35	>43dB	Yes
7.15	71.5	>43dB	Yes
10.125	10.125	-	-
10.125	20.25	>43dB	Yes
10.125	30.375	>43dB	Yes
10.125	40.5	>43dB	Yes
10.125	50.625	>43dB	Yes
10.125	60.75	>43dB	Yes
10.125	70.875	>43dB	Yes
10.125	81	>43dB	Yes
10.125	91.125	>43dB	Yes
10.125	101.25	>43dB	Yes
14.175	14.175	-	-
14.175	28.35	>43dB	Yes
14.175	42.525	>43dB	Yes
14.175	56.7	>43dB	Yes
14.175	70.875	>43dB	Yes
14.175	85.05	>43dB	Yes
14.175	99.225	>43dB	Yes
14.175	113.4	>43dB	Yes
14.175	127.575	>43dB	Yes
14.175	141.75	>43dB	Yes
18.118	18.118	-	-
18.118	36.236	>43dB	Yes
18.118	54.354	>43dB	Yes
18.118	72.472	>43dB	Yes

Frequency	Harmonic	dB below Fundamental	>43dB
18.118	90.59	>43dB	Yes
18.118	108.708	>43dB	Yes
18.118	126.826	>43dB	Yes
18.118	144.944	>43dB	Yes
18.118	163.062	>43dB	Yes
18.118	181.18	>43dB	Yes
21.225	21.225	-	-
21.225	42.45	>43dB	Yes
21.225	63.675	>43dB	Yes
21.225	84.9	>43dB	Yes
21.225	106.125	>43dB	Yes
21.225	127.35	>43dB	Yes
21.225	148.575	>43dB	Yes
21.225	169.8	>43dB	Yes
21.225	191.025	>43dB	Yes
21.225	212.25	>43dB	Yes
24.94	24.94	-	-
24.94	49.88	>43dB	Yes
24.94	74.82	>43dB	Yes
24.94	99.76	>43dB	Yes
24.94	124.7	>43dB	Yes
24.94	149.64	>43dB	Yes
24.94	174.58	>43dB	Yes
24.94	199.52	>43dB	Yes
24.94	224.46	>43dB	Yes
24.94	249.4	>43dB	Yes
28.85	28.85	-	-
28.85	57.7	>43dB	Yes
28.85	86.55	>43dB	Yes
28.85	115.4	>43dB	Yes
28.85	144.25	>43dB	Yes
28.85	173.1	>43dB	Yes
28.85	201.95	>43dB	Yes
28.85	230.8	>43dB	Yes
28.85	259.65	>43dB	Yes
28.85	288.5	>43dB	Yes

Table 5. 97.307(d) Radiated Spurious Emissions for TX Operating Below 30 MHz Test Results

3.1.2.3. Test Setup Photograph



Photograph 6. 97.307(d) Radiated Spurious Emissions for TX Operating Below 30 MHz Test Setup

Photograph 7. 97.307(d) Radiated Spurious Emissions for TX Operating Below 30 MHz Test Setup (Front View)

3.2. 97.307(e) Radiated Spurious Emissions for TX Operating Above 30 MHz

3.2.1. Test Method, Test Requirements, and Test Procedures

3.2.1.1. Test Method

TIA/EIA-603

3.2.1.2. Test Requirements

The mean power of any spurious emission from a station transmitter or external RF power amplifier transmitting on a frequency between 30-225 MHz must be at least 60 dB below the mean power of the fundamental. For a transmitter having a mean power of 25 W or less, the mean power of any spurious emission supplied to the antenna transmission line must not exceed 25 µW and must be at least 40 dB below the mean power of the fundamental emission, but need not be reduced below the power of 10 µW. A transmitter built before April 15, 1977, or first marketed before January 1, 1978, is exempt from this requirement.

3.2.1.3. Test Procedure

The EUT was placed on top of an 80 centimeter high table inside a semi-anechoic chamber. A transceiver was connected to the input of the EUT and a 50 Ohm load was connected to the output. Various antennas were placed near the EUT and measurements were taken of the field strengths and frequencies. For final radiated measurements, the EUT was placed inside a semi-anechoic chamber, and located 10 meters from the antenna mast.

3.2.2. Test Results, Test Data, and Test Setup

3.2.2.1. Test Results

The EUT was **compliant** with the requirement(s) of this section. Measured emissions were below applicable limits.

97.307(e) Radiated Spurious Emissions for TX Operating Below 30 MHz	
Ambient Temperature:	21.2°C
Relative Humidity:	34%
Atmospheric Pressure:	101.9 kPa

Test Engineer(s): Aaron Chang

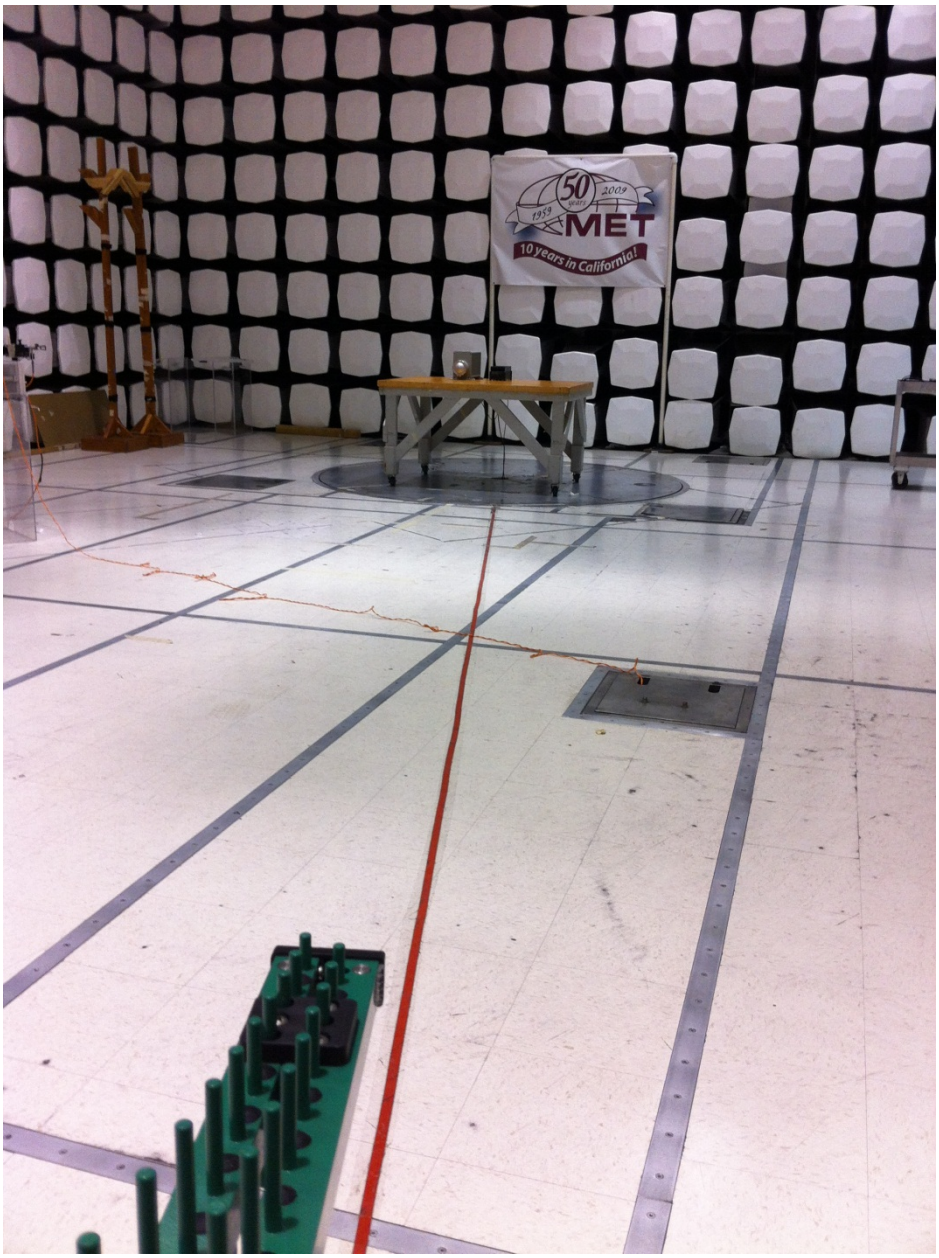
Test Date(s): 05/22/2013

3.2.2.2. Test Data

Frequency	Harmonic	dB below Fundamental	>60dB
52	52	-	-
52	104	>60dB	Yes
52	156	>60dB	Yes
52	208	>60dB	Yes
52	260	>60dB	Yes
52	312	>60dB	Yes
52	364	>60dB	Yes
52	416	>60dB	Yes
52	468	>60dB	Yes
52	520	>60dB	Yes

Table 6. 97.307(e) Radiated Spurious Emissions for TX Operating Between 30-225 MHz Test Results

3.2.2.3. Test Setup Photograph



Photograph 8. 97.307(e) Radiated Spurious Emissions for TX Operating Above 30 MHz Test Setup

Photograph 9. 97.307(e) Radiated Spurious Emissions for TX Operating Between 30-225 Test Setup (Front View)

4.0 Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ISO/IEC 17025:2005.

Test Name: 97.307(d) Radiated Spurious Emissions for TX Operating Below 30 MHz			Test Date(s): 05/22/2013		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2404	Passive Loop Antenna	EMCO	6512	02/20/2013	08/20/2014
1S2460	9 kHz - 26 GHZ Spectrum Analyzer	Agilent Technologies	E4407B	07/27/2012	01/27/2014
1S2481	10 Meter Chamber (NSA)	ETS-Lingren	DKE- 8X8 DBL	12/05/2011	06/05/2013
1S2746	Bilog Antenna	Sunol Science	JB3	11/06/2012	11/06/2013
Test Name: 97.307(e) Radiated Spurious Emissions for TX Operating Below 30 MHz			**Test Date(s): 05/22/2013**		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2404	Passive Loop Antenna	EMCO	6512	02/20/2013	08/20/2014
1S2460	9 kHz - 26 GHZ Spectrum Analyzer	Agilent Technologies	E4407B	07/27/2012	01/27/2014
1S2481	10 Meter Chamber (NSA)	ETS-Lingren	DKE- 8X8 DBL	12/05/2011	06/05/2013
1S2746	Bilog Antenna	Sunol Science	JB3	11/06/2012	11/06/2013

Table 7. Emissions Test Equipment List