RJE Technologies, Inc.

EMC TEST REPORT FOR

Pool Safety Alarm
Model: Aquatic Incident Alert (Safety Turtle) AIA100

Tested To The Following Standards:

FCC Part 15 Subpart C Section(s)
15.207 & 15.249

Report No.: 97475-4

Date of issue: September 1, 2015

ACCREDITED
Testing Certificates:
803.01, 803.02, 803.05, 803.06

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of EMC testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Testing the Future
CKC LABORATORIES, INC.

This report contains a total of 44 pages and may be reproduced in full only. Partial reproduction may only be done with the written consent of CKC Laboratories, Inc.

TABLE OF CONTENTS

Administrative Information 3

Test Report Information 3

Report Authorization 3

Test Facility Information 4

Software Versions 4

Site Registration & Accreditation Information 4

Summary of Results 5

Modifications During Testing 5

Conditions During Testing 5

Equipment Under Test 6

FCC Part 15 Subpart C 7

15.207 AC Conducted Emissions 7

15.215(c) 20dB Occupied Bandwidth 16

15.31(e) Voltage Variations 21

15.249(a) Field Strength of Fundamental 25

15.249(a)(d) Field Strength of Spurious Emissions and Band Edge 31

Supplemental Information 43

Measurement Uncertainty 43

Emissions Test Details 43

ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

RJE Technologies, Inc.
15375 Barranca Parkway I-112
Irvine, CA 92618

Representative: Corinne Zemla
Customer Reference Number: 11071

REPORT PREPARED BY:

Morgan Tramontin
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 97475

DATE OF EQUIPMENT RECEIPT: August 26, 2015
DATE(S) OF TESTING: August 26 - 27, 2015

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the sample equipment tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
110 Olinda Place
Brea, CA 92823

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.02.00
Immunity	5.00.07

Site Registration & Accreditation Information

Location	CB #	TAIWAN	CANADA	FCC	JAPAN
Brea A	US0060	SL2-IN-E-1146R	3082D-1	90473	A-0147
Brea D	US0060	SL2-IN-E-1146R	3082D-2	100638	A-0147

SUMMARY OF RESULTS

Standard / Specification: FCC Part 15 Subpart C

Test Procedure	Description	Modifications*	Results
15.207	Conducted Emissions	Mod. 1	Pass
15.215(c)	20dB Occupied Bandwidth	Mod. 1	Pass
15.31(e)	Voltage Variations	Mod. 1	Pass
15.249(a)	Field Strength of Fundamental	Mod. 1	Pass
15.249(a)(d)	Field Strength of Spurious Emissions Band Edge	Mod. 1	Pass

Modifications* During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
Mod. 1: Modification on firmware: rearranging the sequence of setting up the radio as to better gate the coupled noise; the channel/PA isn't enabled until it's ready to transmit, rather than enabling the PA and then setting up the radio, thereby allowing digital noise to couple in and be amplified.

***Modifications listed above must be incorporated into all production units.**

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

During testing numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration 1

Equipment Tested:

Device	Manufacturer	Model #	S/N
Pool Safety Alarm	RJE Technologies, Inc.	Aquatic Incident Alert (Safety Turtle) AIA100	NA
Power Supply	Shen Zhen Keyu Power Supply Technology Co., LTD.	KA23-0502000DEU	NA

Support Equipment:

Device	Manufacturer	Model #	S/N
Pool Safety Alarm	RJE Technologies, Inc.	Safety Turtle Receiver	NA
Power Supply	Samsung	ETAOU61JBE	RT2DA13FS/A-E
Pool Safety Alarm	RJE Technologies, Inc.	Safety Turtle (Watch)	NA

FCC PART 15 SUBPART C

15.207 AC Conducted Emissions

Test Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112		
Customer:	**RJE Technologies, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**97475**	Date:	8/27/2015
Test Type:	**Conducted Emissions**	Time:	08:09:00
Tested By:	Don Nguyen	Sequence#:	3
Software:	EMITest 5.02.00		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

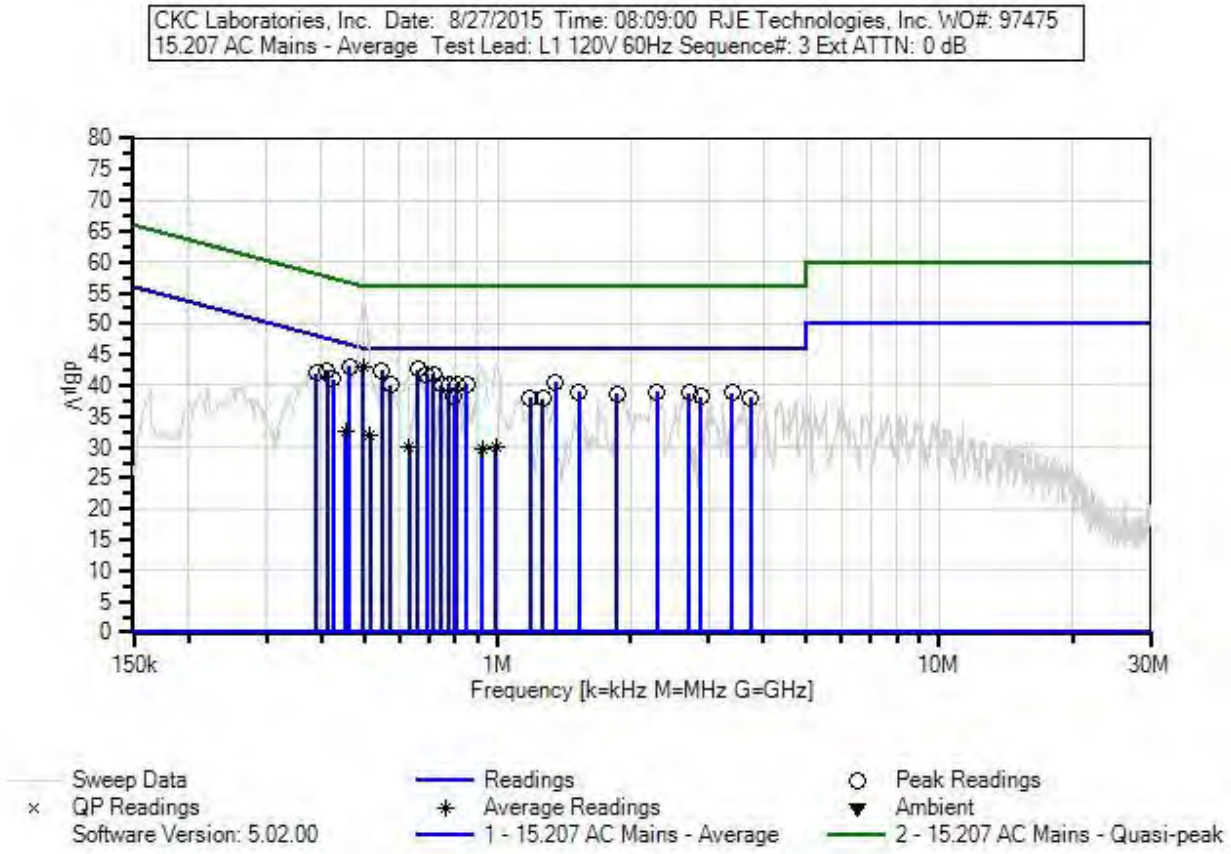
The EUT is stand alone on the table top. The EUT is powered from an external DC power supplying output 5VDC. The EUT transmits solely on a single channel 915 MHz.
The transmission triggered by shorting the support Safety Turtle and the signal will be received by support receiver. All support equipment is located remotely.

Frequency range of data sheet 150kHz-30MHz

RBW=VBW=9kHz. Temperature: 24°C, Relative Humidity: 35%, Atmospheric Pressure: 100kPa.

Test Method: ANSI C63.4 (2009)
Site D.

Mod. 1 was in place during testing.


CKC Laboratories, Inc. Date: 8/27/2015 Time: 08:09:00 RJE Technologies, Inc. WO#: 97475
15.207 AC Mains - Average Test Lead: L1 120V 60Hz Sequence#: 3 Ext ATTN: 0 dB
dBµV
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
150k
1M
10M
30M
Frequency [k=kHz M=MHz G=GHz]
Sweep Data
QP Readings
Software Version: 5.02.00
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06084	Attenuator	SA18N10W-06	12/17/2014	12/17/2016
T2	ANP01910	Cable	RG-142	1/8/2014	1/8/2016
T3	AN00969A	50uH LISN-Line 1 (L1) (dB)	3816/2NM	3/12/2015	3/12/2017
	AN00969A	50uH LISN-Line 2 (L2) (dB)	3816/2NM	3/12/2015	3/12/2017
	AN02869	Spectrum Analyzer	E4440A	7/17/2015	7/17/2016
T4	AN02343	High Pass Filter	HE9615-150K-50-720B	1/8/2015	1/8/2017

Measurement Data: Reading listed by margin. Test Lead: L1

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	497.931k Ave	36.9	+5.7	+0.0	+0.1	+0.2	+0.0	42.9	46.0	-3.1	L1
^	497.931k	47.7	+5.7	+0.0	+0.1	+0.2	+0.0	53.7	46.0	+7.7	L1
^	498.331k	47.6	+5.7	+0.0	+0.1	+0.2	+0.0	53.6	46.0	+7.6	L1
4	659.771k	36.6	+5.7	+0.0	+0.1	+0.2	+0.0	42.6	46.0	-3.4	L1
5	463.425k	37.1	+5.7	+0.0	+0.1	+0.2	+0.0	43.1	46.6	-3.5	L1
6	546.327k	36.4	+5.7	+0.0	+0.1	+0.2	+0.0	42.4	46.0	-3.6	L1
7	691.041k	35.8	+5.7	+0.0	+0.1	+0.2	+0.0	41.8	46.0	-4.2	L1
8	717.220k	35.9	+5.7	+0.0	+0.1	+0.1	+0.0	41.8	46.0	-4.2	L1
9	411.794k	36.4	+5.7	+0.0	+0.1	+0.2	+0.0	42.4	47.6	-5.2	L1
10	1.354M	34.6	+5.7	+0.0	+0.1	+0.1	+0.0	40.5	46.0	-5.5	L1
11	808.121k	34.4	+5.7	+0.0	+0.1	+0.1	+0.0	40.3	46.0	-5.7	L1
12	775.397k	34.3	+5.7	+0.0	+0.1	+0.1	+0.0	40.2	46.0	-5.8	L1
13	851.026k	34.3	+5.7	+0.0	+0.1	+0.1	+0.0	40.2	46.0	-5.8	L1
14	747.036k	34.2	+5.7	+0.0	+0.1	+0.1	+0.0	40.1	46.0	-5.9	L1
15	571.779k	34.0	+5.7	+0.0	+0.1	+0.2	+0.0	40.0	46.0	-6.0	L1
16	389.250k	35.9	+5.7	+0.0	+0.1	+0.2	+0.0	41.9	48.1	-6.2	L1
17	423.429k	35.0	+5.7	+0.0	+0.1	+0.2	+0.0	41.0	47.4	-6.4	L1

18	1.528M	33.0	+5.7	+0.1	+0.1	+0.1	+0.0	39.0	46.0	-7.0	L1
19	2.293M	32.9	+5.7	+0.1	+0.1	+0.1	+0.0	38.9	46.0	-7.1	L1
20	2.714M	32.8	+5.7	+0.1	+0.1	+0.1	+0.0	38.8	46.0	-7.2	L1
21	3.395M	32.6	+5.7	+0.2	+0.2	+0.1	+0.0	38.8	46.0	-7.2	L1
22	1.868M	32.7	+5.7	+0.1	+0.1	+0.1	+0.0	38.7	46.0	-7.3	L1
23	796.486k	32.5	+5.7	+0.0	+0.1	+0.1	+0.0	38.4	46.0	-7.6	L1
24	2.884M	32.1	+5.7	+0.1	+0.2	+0.1	+0.0	38.2	46.0	-7.8	L1
25	3.739M	31.9	+5.7	+0.2	+0.2	+0.1	+0.0	38.1	46.0	-7.9	L1
26	1.183M	32.1	+5.7	+0.0	+0.1	+0.1	+0.0	38.0	46.0	-8.0	L1
27	1.268M	32.0	+5.7	+0.0	+0.1	+0.1	+0.0	37.9	46.0	-8.1	L1
28	513.603k Ave	25.9	+5.7	+0.0	+0.1	+0.2	+0.0	31.9	46.0	-14.1	L1
^	513.603k	42.5	+5.7	+0.0	+0.1	+0.2	+0.0	48.5	46.0	+2.5	L1
30	453.972k Ave	26.6	+5.7	+0.0	+0.1	+0.2	+0.0	32.6	46.8	-14.2	L1
^	453.972k	37.8	+5.7	+0.0	+0.1	+0.2	+0.0	43.8	46.8	-3.0	L1
32	629.956k Ave	24.1	+5.7	+0.0	+0.1	+0.2	+0.0	30.1	46.0	-15.9	L1
^	629.955k	38.4	+5.7	+0.0	+0.1	+0.2	+0.0	44.4	46.0	-1.6	L1
34	992.029k Ave	24.0	+5.7	+0.0	+0.1	+0.1	+0.0	29.9	46.0	-16.1	L1
^	992.028k	37.5	+5.7	+0.0	+0.1	+0.1	+0.0	43.4	46.0	-2.6	L1
36	923.985k Ave	23.7	+5.7	+0.0	+0.1	+0.1	+0.0	29.6	46.0	-16.4	L1
^	923.984k	37.2	+5.7	+0.0	+0.1	+0.1	+0.0	43.1	46.0	-2.9	L1

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112		
Customer:	**RJE Technologies, Inc.**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**97475**	Date:	8/27/2015
Test Type:	**Conducted Emissions**	Time:	08:19:04
Tested By:	Don Nguyen	Sequence#:	4
Software:	EMITest 5.02.00		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is stand alone on the table top. The EUT is powered from an external DC power supplying output 5VDC. The EUT transmits solely on a single channel 915 MHz.
The transmission triggered by shorting the support Safety Turtle and the signal will be received by support receiver. All support equipment is located remotely.

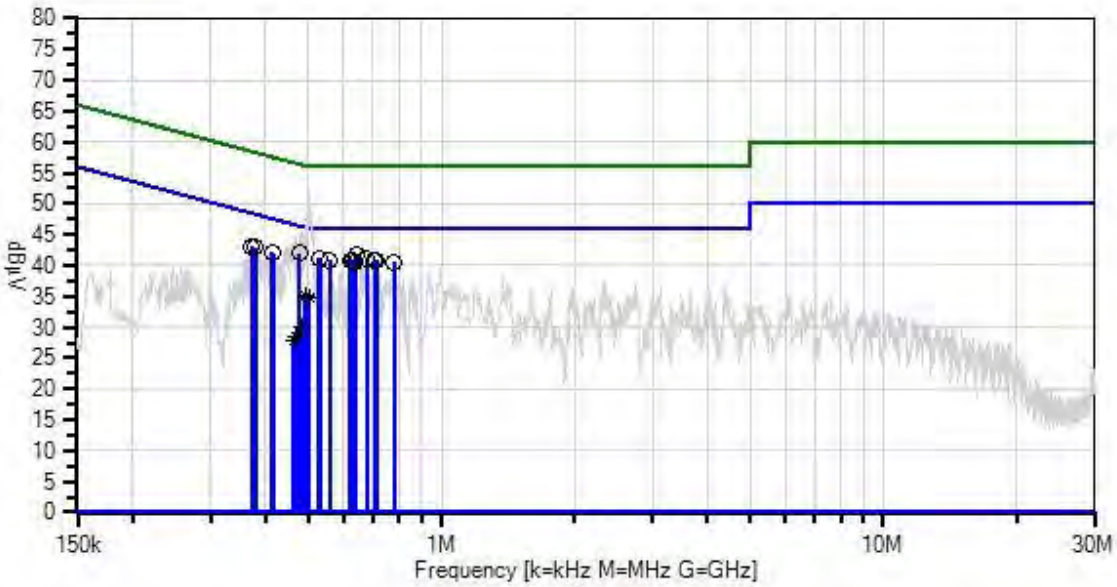
Frequency range of data sheet 150kHz-30MHz

RBW=VBW=9kHz. Temperature: 24°C, Relative Humidity: 35%, Atmospheric Pressure: 100kPa.

Test Method: ANSI C63.4 (2009)
Site D.

Mod. 1 was in place during testing.

CKC Laboratories, Inc. Date: 8/27/2015 Time: 08:19:04 RJE Technologies, Inc. WO#: 97475
15.207 AC Mains - Average Test Lead: L2 120V 60Hz Sequence#: 4 Ext ATTN: 0 dB



Sweep Data
× QP Readings
Software Version: 5.02.00
Readings
Average Readings
1 - 15.207 AC Mains - Average
Peak Readings
Ambient
2 - 15.207 AC Mains - Quasi-peak

Test Equipment:

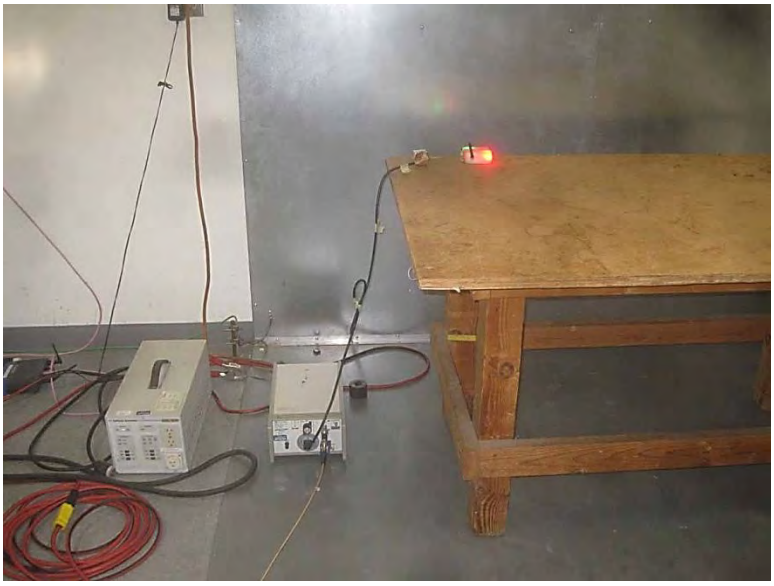
ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	ANP06084	Attenuator	SA18N10W-06	12/17/2014	12/17/2016
T2	ANP01910	Cable	RG-142	1/8/2014	1/8/2016
	AN00969A	50uH LISN-Line 1 (L1) (dB)	3816/2NM	3/12/2015	3/12/2017
T3	AN00969A	50uH LISN-Line 2 (L2) (dB)	3816/2NM	3/12/2015	3/12/2017
	AN02869	Spectrum Analyzer	E4440A	7/17/2015	7/17/2016
T4	AN02343	High Pass Filter	HE9615-150K-50-720B	1/8/2015	1/8/2017

Measurement Data: Reading listed by margin. Test Lead: L2

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	640.136k	35.7	+5.7	+0.0	+0.1	+0.2	+0.0	41.7	46.0	-4.3	L2
2	475.788k	35.9	+5.7	+0.0	+0.1	+0.2	+0.0	41.9	46.4	-4.5	L2
3	526.692k	35.2	+5.7	+0.0	+0.1	+0.2	+0.0	41.2	46.0	-4.8	L2
4	530.328k	35.0	+5.7	+0.0	+0.1	+0.2	+0.0	41.0	46.0	-5.0	L2
5	677.224k	35.0	+5.7	+0.0	+0.1	+0.2	+0.0	41.0	46.0	-5.0	L2
6	711.403k	35.0	+5.7	+0.0	+0.1	+0.1	+0.0	40.9	46.0	-5.1	L2
7	557.235k	34.9	+5.7	+0.0	+0.1	+0.2	+0.0	40.9	46.0	-5.1	L2
8	627.047k	34.9	+5.7	+0.0	+0.1	+0.2	+0.0	40.9	46.0	-5.1	L2
9	620.502k	34.8	+5.7	+0.0	+0.1	+0.2	+0.0	40.8	46.0	-5.2	L2
10	630.683k	34.8	+5.7	+0.0	+0.1	+0.2	+0.0	40.8	46.0	-5.2	L2
11	705.585k	34.8	+5.7	+0.0	+0.1	+0.2	+0.0	40.8	46.0	-5.2	L2
12	372.525k	37.1	+5.7	+0.0	+0.1	+0.2	+0.0	43.1	48.4	-5.3	L2
13	379.797k	37.0	+5.7	+0.0	+0.1	+0.2	+0.0	43.0	48.3	-5.3	L2
14	712.857k	34.8	+5.7	+0.0	+0.1	+0.1	+0.0	40.7	46.0	-5.3	L2
15	636.500k	34.6	+5.7	+0.0	+0.1	+0.2	+0.0	40.6	46.0	-5.4	L2
16	779.760k	34.7	+5.7	+0.0	+0.1	+0.1	+0.0	40.6	46.0	-5.4	L2
17	413.248k	36.1	+5.7	+0.0	+0.1	+0.2	+0.0	42.1	47.6	-5.5	L2

18	416.157k	36.0	+5.7	+0.0	+0.1	+0.2	+0.0	42.0	47.5	-5.5	L2
19 Ave	492.514k	29.2	+5.7	+0.0	+0.1	+0.2	+0.0	35.2	46.1	-10.9	L2
^	492.514k	41.5	+5.7	+0.0	+0.1	+0.2	+0.0	47.5	46.1	+1.4	L2
^	494.695k	38.8	+5.7	+0.0	+0.1	+0.2	+0.0	44.8	46.1	-1.3	L2
^	488.877k	37.8	+5.7	+0.0	+0.1	+0.2	+0.0	43.8	46.2	-2.4	L2
23 Ave	501.842k	28.9	+5.7	+0.0	+0.1	+0.2	+0.0	34.9	46.0	-11.1	L2
^	501.240k	46.1	+5.7	+0.0	+0.1	+0.2	+0.0	52.1	46.0	+6.1	L2
^	501.842k	45.2	+5.7	+0.0	+0.1	+0.2	+0.0	51.2	46.0	+5.2	L2
^	496.877k	41.5	+5.7	+0.0	+0.1	+0.2	+0.0	47.5	46.1	+1.4	L2
27 Ave	483.060k	24.0	+5.7	+0.0	+0.1	+0.2	+0.0	30.0	46.3	-16.3	L2
^	483.060k	39.3	+5.7	+0.0	+0.1	+0.2	+0.0	45.3	46.3	-1.0	L2
^	487.423k	38.6	+5.7	+0.0	+0.1	+0.2	+0.0	44.6	46.2	-1.6	L2
^	480.151k	38.6	+5.7	+0.0	+0.1	+0.2	+0.0	44.6	46.3	-1.7	L2
^	478.697k	37.2	+5.7	+0.0	+0.1	+0.2	+0.0	43.2	46.4	-3.2	L2
32 Ave	467.789k	22.4	+5.7	+0.0	+0.1	+0.2	+0.0	28.4	46.6	-18.2	L2
^	467.789k	38.6	+5.7	+0.0	+0.1	+0.2	+0.0	44.6	46.6	-2.0	L2
^	470.697k	37.6	+5.7	+0.0	+0.1	+0.2	+0.0	43.6	46.5	-2.9	L2
35 Ave	461.971k	21.8	+5.7	+0.0	+0.1	+0.2	+0.0	27.8	46.7	-18.9	L2
^	461.971k	38.8	+5.7	+0.0	+0.1	+0.2	+0.0	44.8	46.7	-1.9	L2

Test Setup Photo(s)



15.215(c) 20dB Occupied Bandwidth

Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112		
Customer:	RJE Technologies, Inc.		
Specification:	**Occupied Bandwidth**		
Work Order #:	**97475**	Date:	8/26/2015
Test Type:	**Maximized Emissions**	Time:	14:28:24
Tested By:	Don Nguyen	Sequence#:	2
Software:	EMITest 5.02.00		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

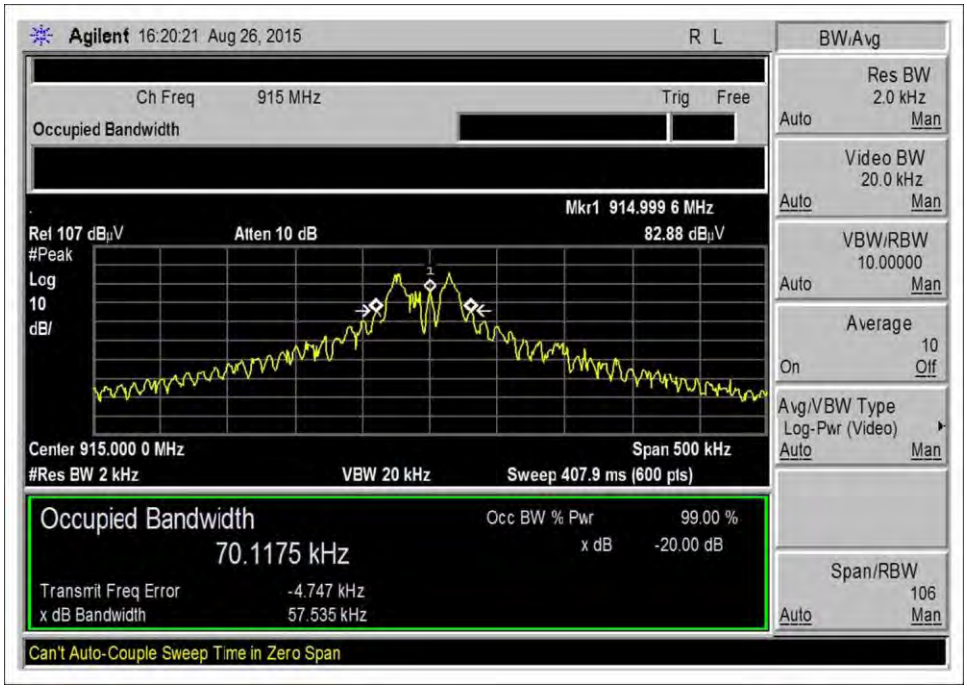
The EUT is stand alone on the Styrofoam table top. The EUT is powered from an external DC power supplying output 5VDC. The EUT transmits solely on a single channel 915 MHz. • The transmission triggered by shorting the support Safety Turtle and the signal will be received by support receiver. • All support equipment is located remotely. • The EUT is positioned in three different axis and data is taken in each axis. Frequency range of data sheet 915.0 to 915.05MHz. • RBW=VBW=120kHz.

Temperature: 26°C, Relative Humidity: 35%, Atmospheric Pressure: 100kPa. ••

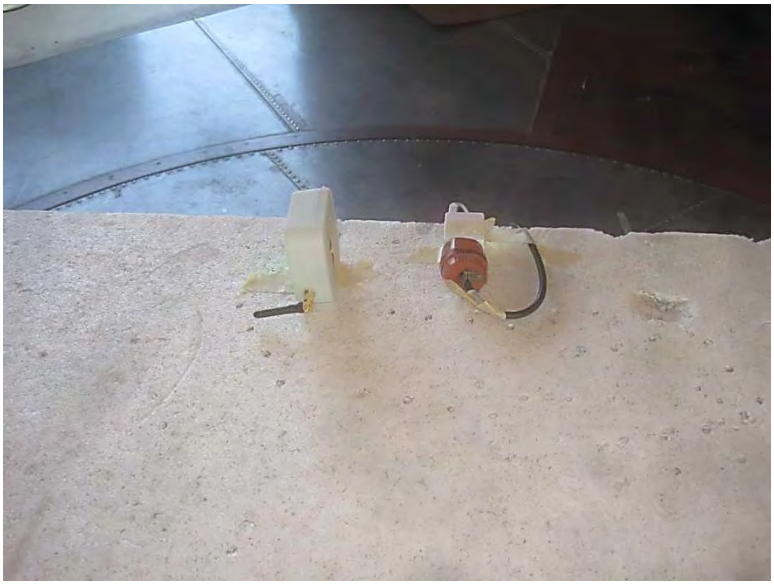
Test Method: ANSI C63.4 (2009)• Site D.• •

Mod. 1 was in place during testing.

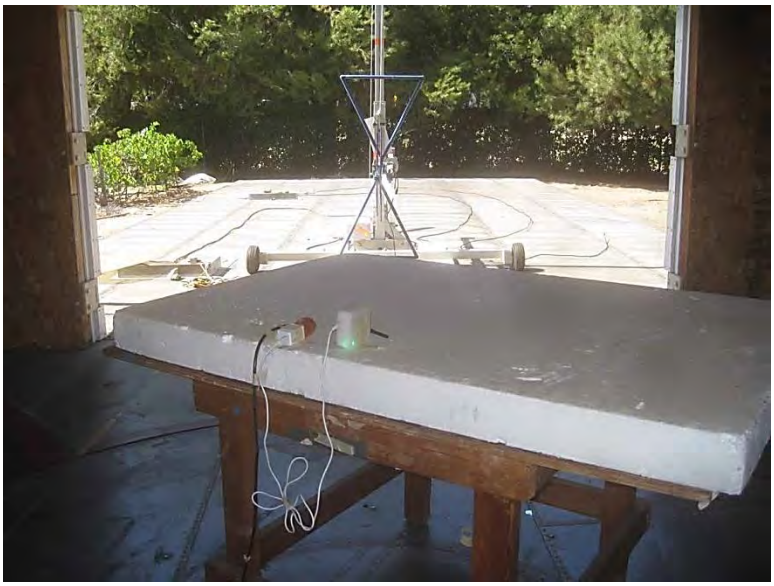
Test Data


Agilent 16:20:21 Aug 26, 2015
R L
Ch Freq 915 MHz
Trig Free
Occupied Bandwidth
Mkr1 914.999 6 MHz
Ref 107 dBµV
Atten 10 dB
82.88 dBµV
#Peak
Log
10
dB/
Center 915.000 0 MHz
Span 500 kHz
#Res BW 2 kHz
VBW 20 kHz
Sweep 407.9 ms (600 pts)
Occupied Bandwidth
70.1175 kHz
Occ BW % Pwr 99.00 %
x dB -20.00 dB
Transmit Freq Error -4.747 kHz
x dB Bandwidth 57.535 kHz
BW/Avg
Res BW 2.0 kHz
Auto Man
Video BW 20.0 kHz
Auto Man
VBW/RBW 10.00000
Auto Man
Average 10
On Off
Avg/VBW Type Log-Pwr (Video)
Auto Man
Span/RBW 106
Auto Man
Can't Auto-Couple Sweep Time in Zero Span

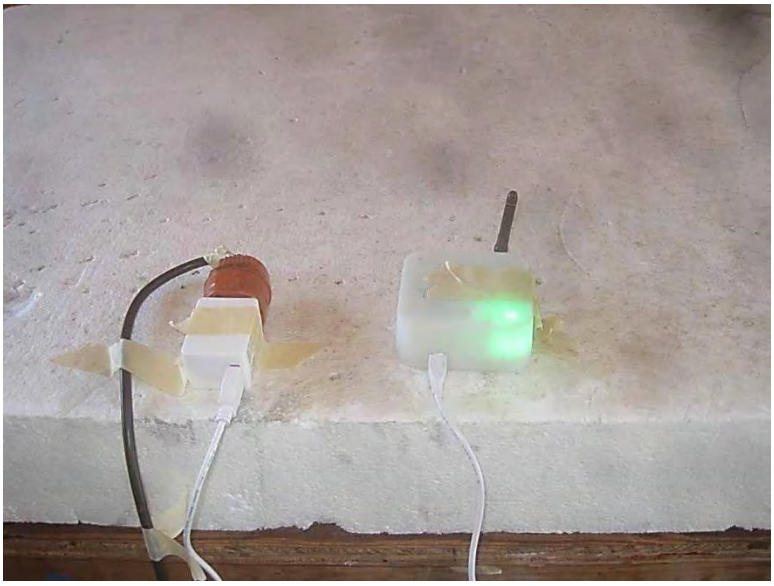
Test Setup Photo(s)



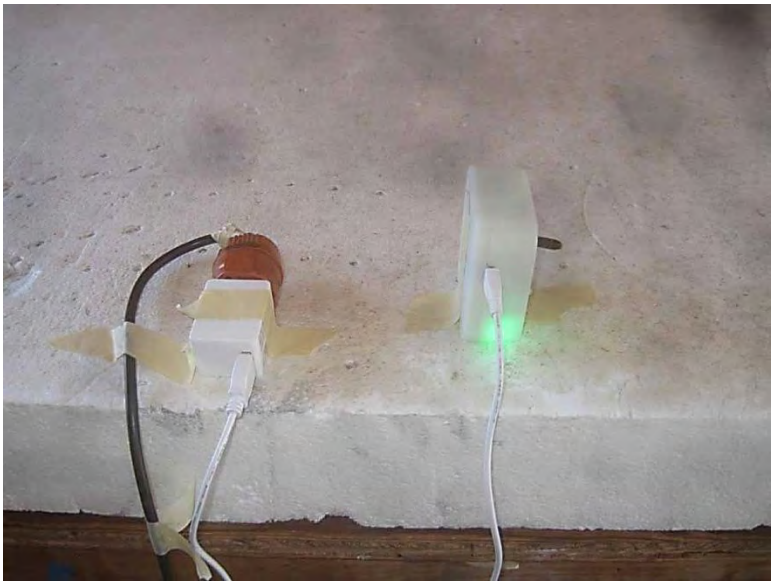
Front View



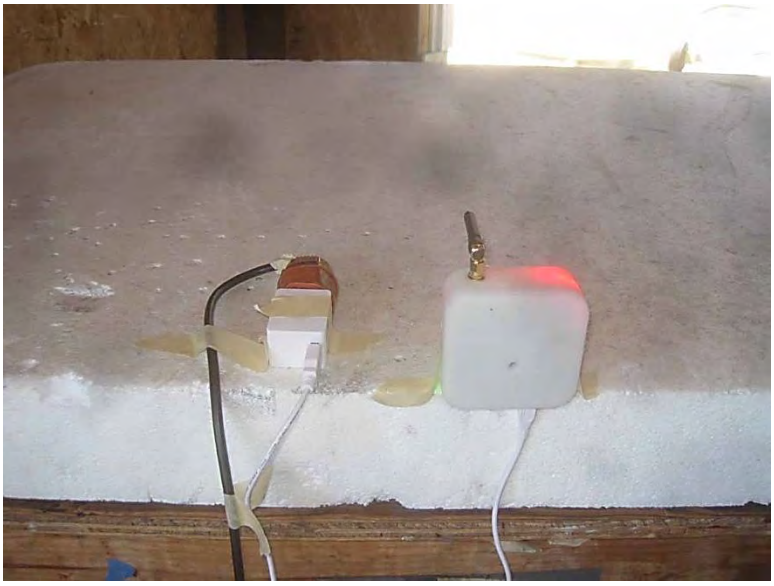
Back View



X-Axis



Y-Axis



Z-Axis

15.31(e) Voltage Variations

Test Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112		
Customer:	RJE Technologies, Inc.		
Specification:	**15.31e**		
Work Order #:	**97475**	Date:	8/26/2015
Test Type:	**Maximized Emissions**	Time:	14:28:24
Tested By:	Don Nguyen	Sequence#:	2
Software:	EMITest 5.02.00		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is stand alone on the Styrofoam table top. The EUT is powered from an external DC power supplying output 5VDC. The EUT transmits solely on a single channel 915 MHz. • The transmission triggered by shorting the support Safety Turtle and the signal will be received by support receiver. • All support equipment is located remotely. • The EUT is positioned in three different axis and data is taken in each axis. Frequency range of data sheet 915.0 to 915.05MHz. • RBW=VBW=120kHz.

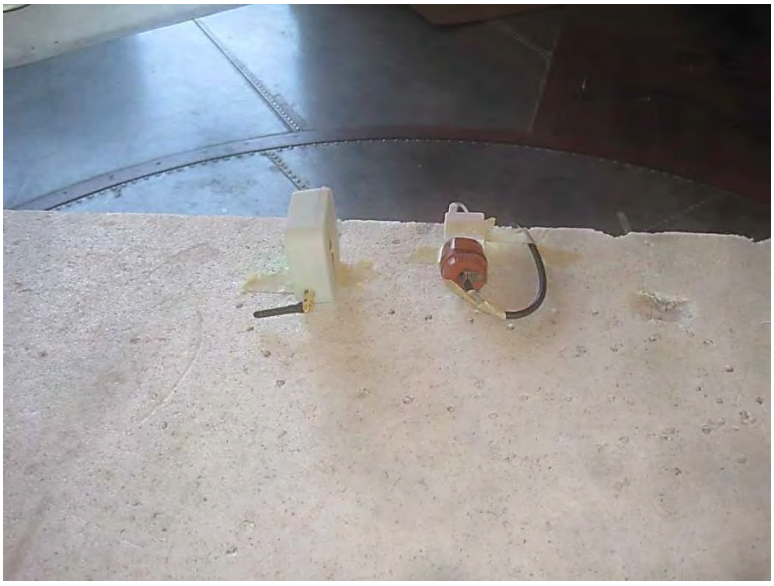
Temperature: 26°C, Relative Humidity: 35%, Atmospheric Pressure: 100kPa. ••

Test Method: ANSI C63.4 (2009)• Site D.• •

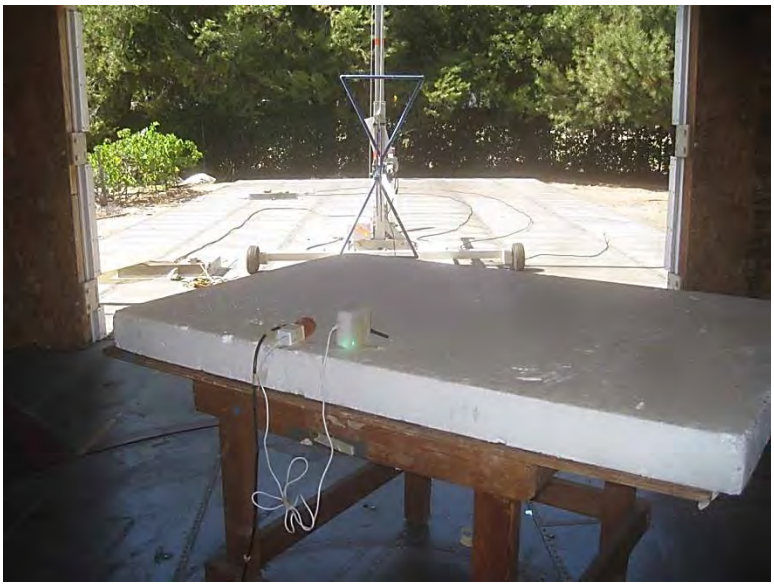
Mod. 1 was in place during testing.

15.31(e) compliance: the supply voltage was varied between 85% and 115% of the nominal rated supply voltage, no change in the fundamental signal level was observed.

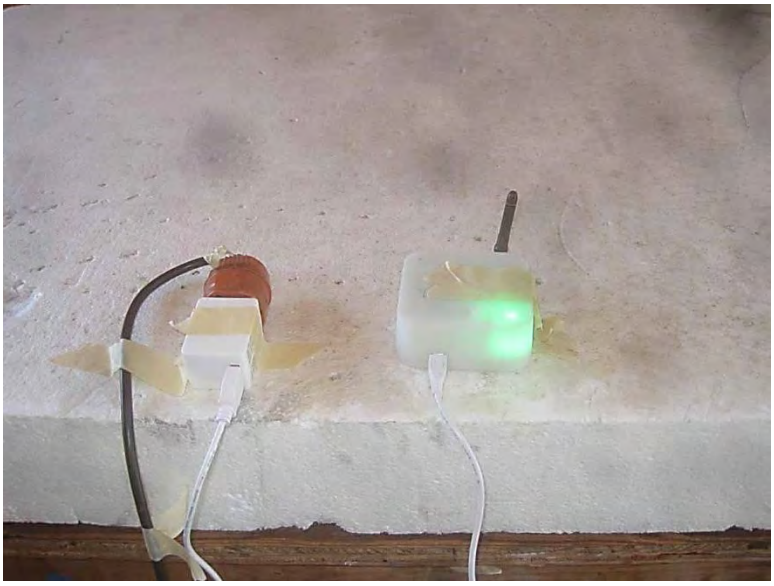
Test Setup Photo(s)



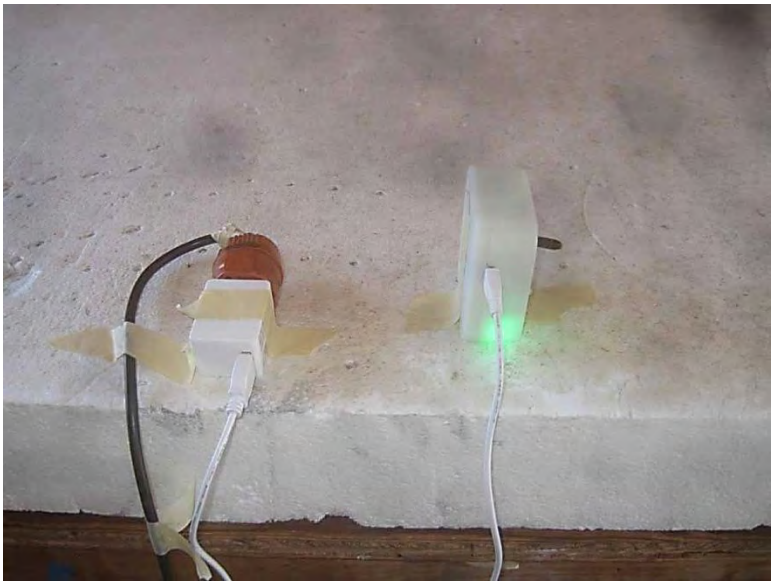
Front View



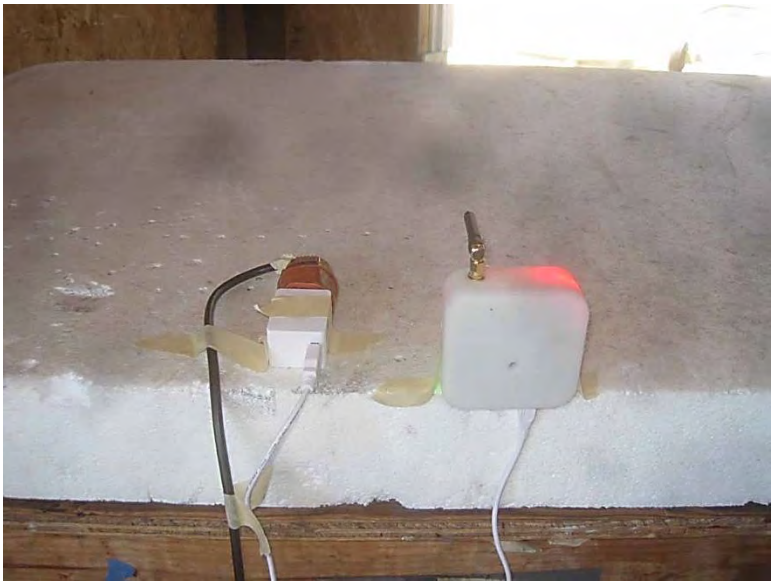
Back View



X-Axis



Y-Axis



Z-Axis

15.249(a) Field Strength of Fundamental

Test Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112		
Customer:	**RJE Technologies, Inc.**		
Specification:	**15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**		
Work Order #:	**97475**	Date:	8/26/2015
Test Type:	**Maximized Emissions**	Time:	14:28:24
Tested By:	Don Nguyen	Sequence#:	2
Software:	EMITest 5.02.00		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is stand alone on the Styrofoam table top. The EUT is powered from an external DC power supplying output 5VDC. The EUT transmits solely on a single channel 915 MHz.
The transmission triggered by shorting the support Safety Turtle and the signal will be received by support receiver.
All support equipment is located remotely.
The EUT is positioned in three different axes and data is taken in each axis.

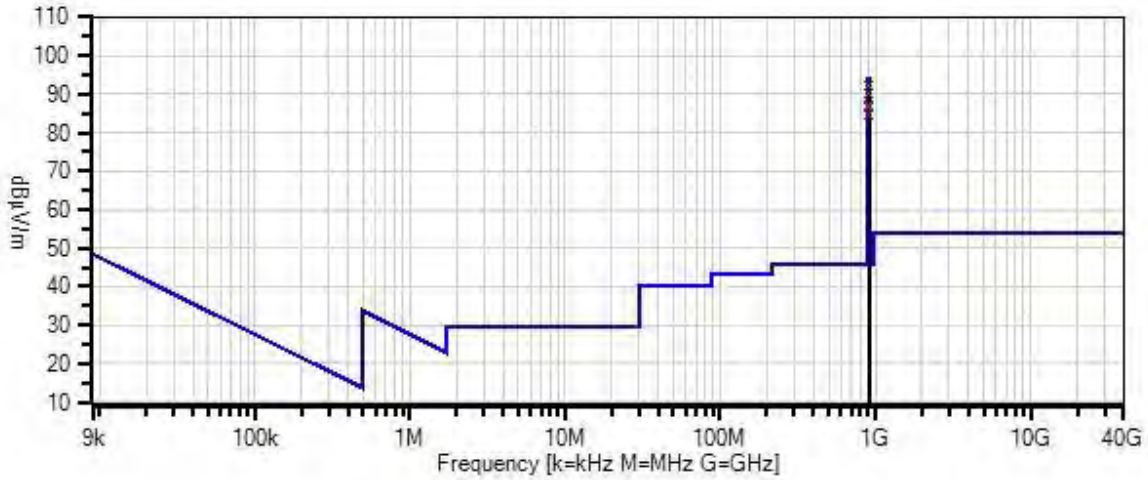
Frequency range of data sheet 915.0 to 915.05MHz.
RBW=VBW=120kHz.

Temperature: 26°C, Relative Humidity: 35%, Atmospheric Pressure: 100kPa.

Test Method: ANSI C63.4 (2009)
Site D.

Mod. 1 was in place during testing.

CKC Laboratories, Inc. Date: 8/26/2015 Time: 14:28:24 RJE Technologies, Inc. WO#: 97475
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter) Test Distance: 3 Meters Sequence#: 2 Ext ATTN: 0 dB



Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.02.00
1 - 15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

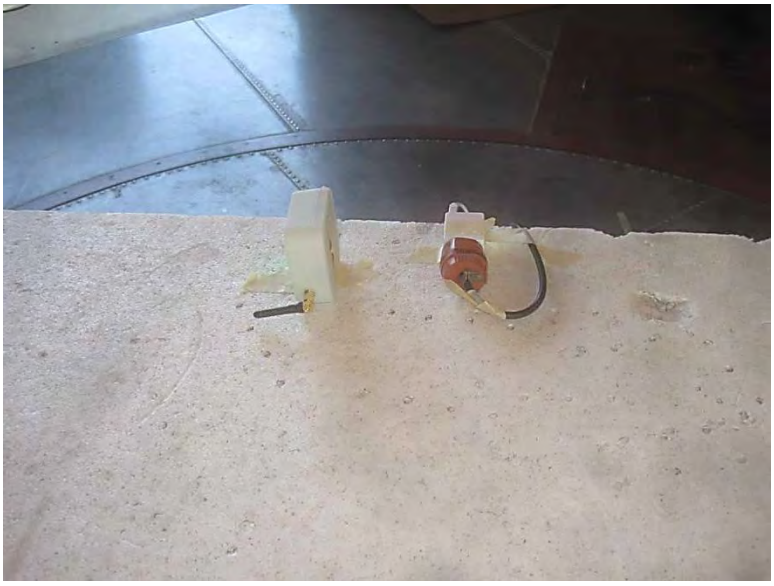
Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
T1	AN00010	Preamp	8447D	3/12/2014	3/12/2016
T2	ANP05555	Cable	RG223/U	5/7/2014	5/7/2016
T3	ANP05569	Cable	RG-214/U	5/7/2014	5/7/2016
T4	AN01992	Biconilog Antenna	CBL6111C	12/4/2014	12/4/2016
T5	AN02869	Spectrum Analyzer	E4440A	7/17/2015	7/17/2016
T6	ANP04382	Cable	LDF-50	7/30/2014	7/30/2016

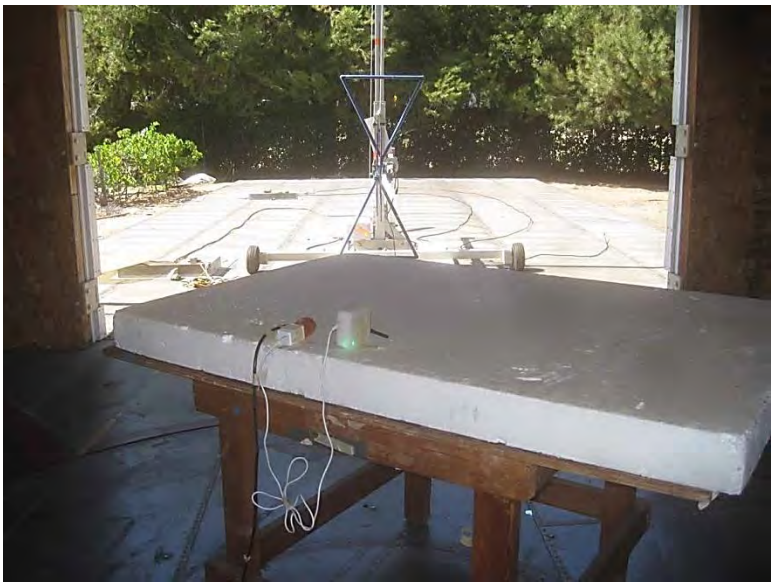
Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	914.993M	89.7	-27.5	+0.5	+3.4	+22.8	+0.0	92.3	94.0	-1.7	Horiz
	QP		+0.0	+3.4					Y axis		
2	914.995M	87.5	-27.5	+0.5	+3.4	+22.8	+0.0	90.1	94.0	-3.9	Vert
	QP		+0.0	+3.4					X axis		
3	914.995M	84.8	-27.5	+0.5	+3.4	+22.8	+0.0	87.4	94.0	-6.6	Vert
	QP		+0.0	+3.4					Y axis		
4	914.995M	83.8	-27.5	+0.5	+3.4	+22.8	+0.0	86.4	94.0	-7.6	Vert
	QP		+0.0	+3.4					Z axis		
^	914.995M	90.7	-27.5	+0.5	+3.4	+22.8	+0.0	93.3	94.0	-0.7	Vert
			+0.0	+3.4					X axis		
^	914.995M	88.9	-27.5	+0.5	+3.4	+22.8	+0.0	91.5	94.0	-2.5	Vert
			+0.0	+3.4					Y axis		
^	914.995M	87.8	-27.5	+0.5	+3.4	+22.8	+0.0	90.4	94.0	-3.6	Vert
			+0.0	+3.4					Z axis		
8	914.995M	82.1	-27.5	+0.5	+3.4	+22.8	+0.0	84.7	94.0	-9.3	Horiz
	QP		+0.0	+3.4					Z axis		
^	914.993M	92.9	-27.5	+0.5	+3.4	+22.8	+0.0	95.5	94.0	+1.5	Horiz
			+0.0	+3.4					Y axis		
^	914.995M	86.5	-27.5	+0.5	+3.4	+22.8	+0.0	89.1	94.0	-4.9	Horiz
			+0.0	+3.4					Z axis		
^	914.995M	85.2	-27.5	+0.5	+3.4	+22.8	+0.0	87.8	94.0	-6.2	Horiz
			+0.0	+3.4					X axis		

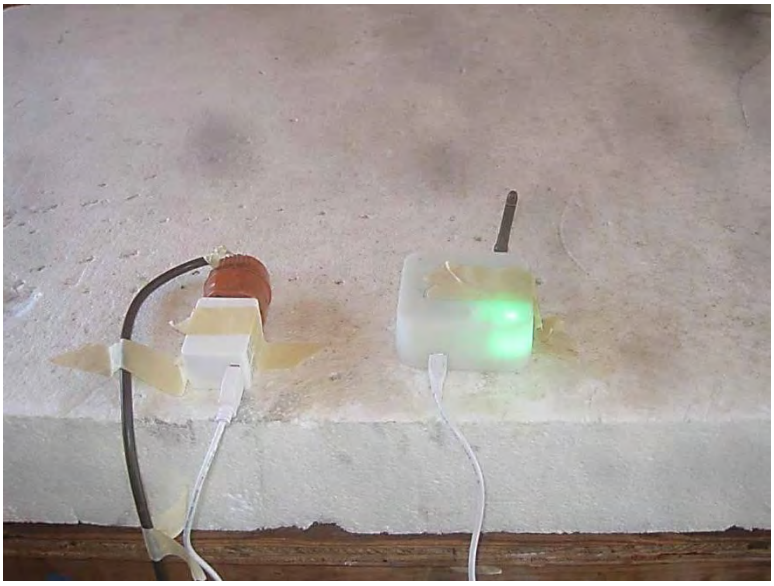
Test Setup Photo(s)



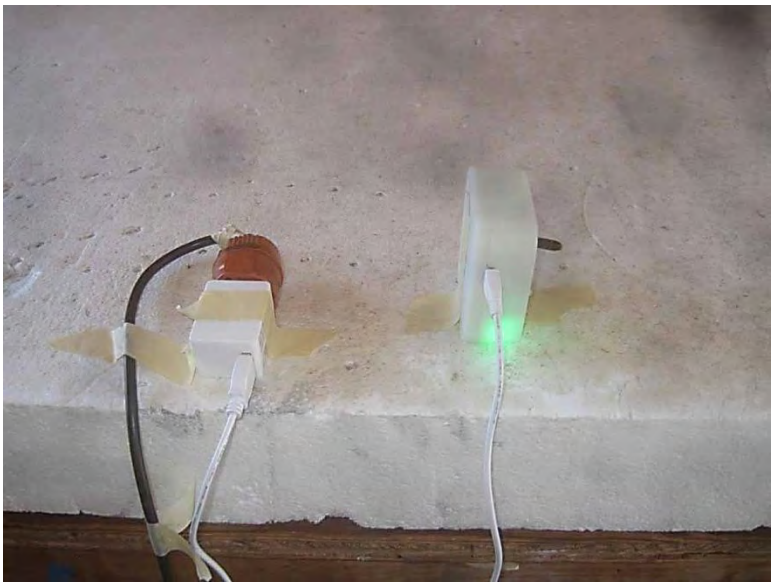
Front View



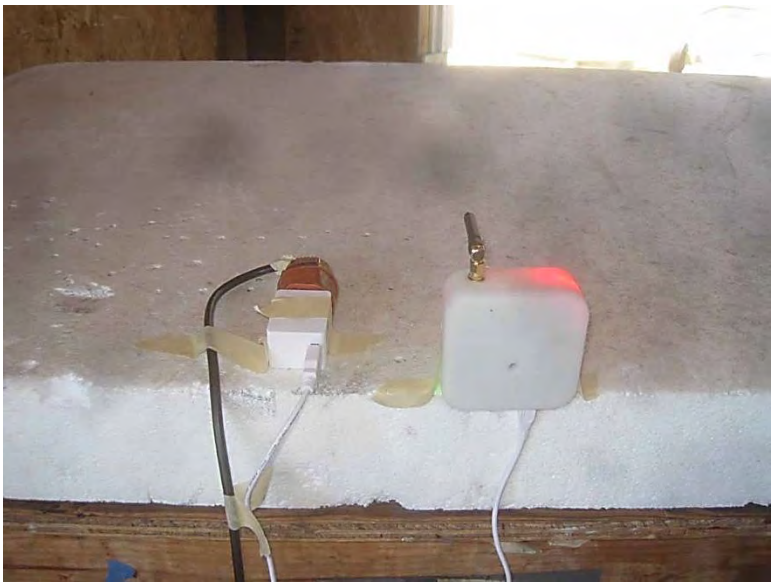
Back View



X-Axis



Y-Axis



Z-Axis

15.249(a)(d) Field Strength of Spurious Emissions and Band Edge

Test Data

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 714-993-6112		
Customer:	**RJE Technologies, Inc.**		
Specification:	**15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)**		
Work Order #:	**97475**	Date:	8/26/2015
Test Type:	**Maximized Emissions**	Time:	15:40:12
Tested By:	Don Nguyen	Sequence#:	2
Software:	EMITest 5.02.00		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

The EUT is stand alone on the Styrofoam table top. The EUT is powered from an external DC power supplying output 5VDC. The EUT transmits solely on a single channel 915 MHz.
The transmission triggered by shorting the support Safety Turtle and the signal will be received by support receiver.
All support equipment is located remotely.
The EUT is positioned in three different axes.

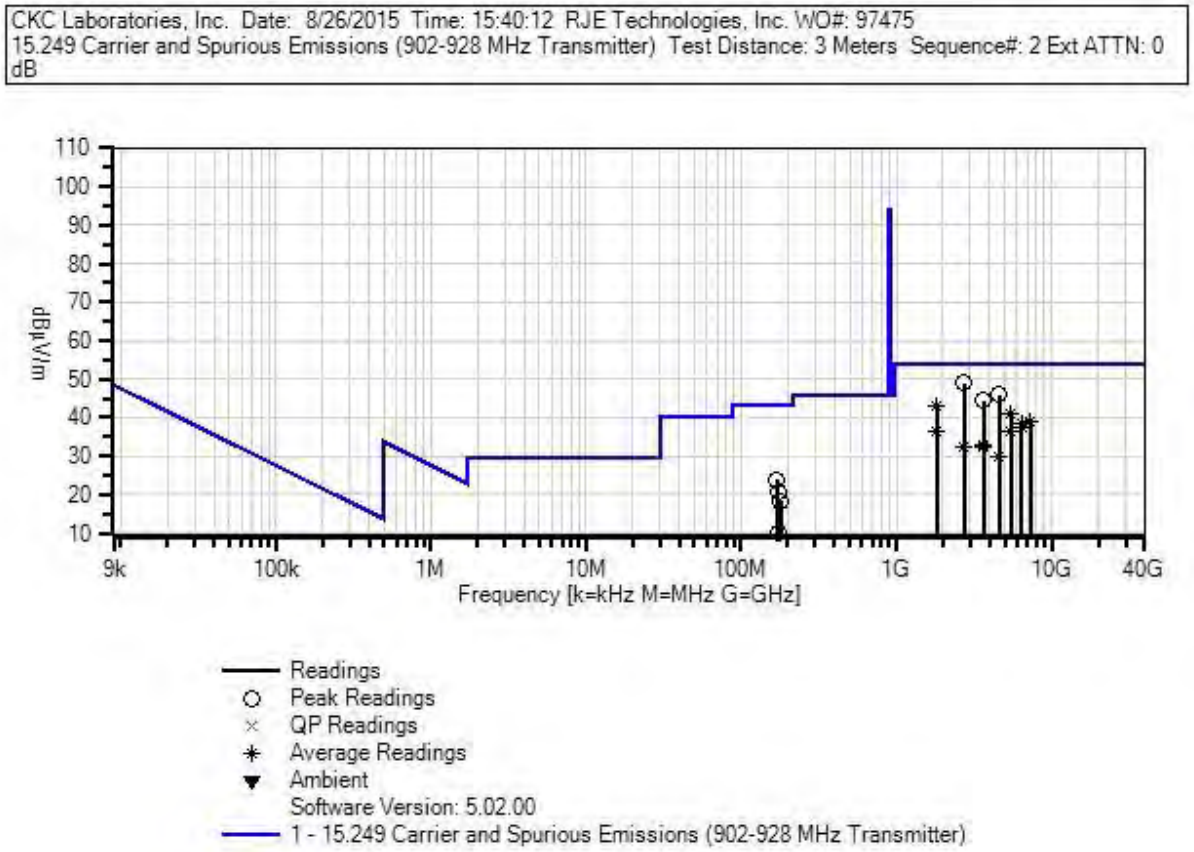
Frequency range of data sheet: 0.009-10000MHz
0.009 to 0.15MHz, RBW=VBW=0.2kHz.
0.15 to 30MHz, RBW=VBW=9kHz.
30 to 1000MHz, RBW=VBW=120kHz.
1000 to 10000MHz, RBW=VBW=1MHz

Temperature: 26°C, Relative Humidity: 34%, Atmospheric Pressure: 100kPa.

Test Method: ANSI C63.4 (2009)
Site D.

Spurious emissions of this data sheet represent worst case emission levels for each axis and antenna polarity

Mod. 1 was in place during testing.



Test Equipment:

ID	Asset #/Serial #	Description	Model	Calibration Date	Cal Due Date
	AN00314	Loop Antenna	6502	7/2/2014	7/2/2016
T1	AN00010	Preamp	8447D	3/12/2014	3/12/2016
T2	ANP05555	Cable	RG223/U	5/7/2014	5/7/2016
T3	ANP05569	Cable	RG-214/U	5/7/2014	5/7/2016
T4	AN01992	Biconilog Antenna	CBL6111C	12/4/2014	12/4/2016
T5	AN02869	Spectrum Analyzer	E4440A	7/17/2015	7/17/2016
T6	ANP04382	Cable	LDF-50	7/30/2014	7/30/2016
T7	AN00787	Preamp	83017A	6/10/2015	6/10/2017
T8	AN01646	Horn Antenna	3115	3/18/2014	3/18/2016
T9	ANP06360	Cable	L1-PNMNM-48	7/29/2014	7/29/2016
T10	ANP06554	Cable	32022-29094K-29094K-24TC	3/19/2014	3/19/2016
T11	AN03169	High Pass Filter	HM1155-11SS	6/24/2015	6/24/2017

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7 T11	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2745.000M	51.4	+0.0 +0.0 +3.5	+0.0 +6.9 +0.4	+0.0 -40.0 +0.2	+0.0 +26.6	+0.0	49.0	54.0	-5.0	Horiz
2	4574.942M	42.2	+0.0 +0.0 +4.6	+0.0 +9.1 +0.5	+0.0 -40.2 +0.1	+0.0 +29.6	+0.0	45.9	54.0	-8.1	Horiz
3	3658.160M	44.1	+0.0 +0.0 +4.1	+0.0 +7.5 +0.5	+0.0 -40.4 +0.1	+0.0 +28.6	+0.0	44.5	54.0	-9.5	Vert
4	3658.092M	43.9	+0.0 +0.0 +4.1	+0.0 +7.5 +0.5	+0.0 -40.4 +0.1	+0.0 +28.6	+0.0	44.3	54.0	-9.7	Horiz
5	1830.030M Ave	49.8	+0.0 +0.0 +2.7	+0.0 +5.1 +0.3	+0.0 -39.4 +0.3	+0.0 +24.4	+0.0	43.2	54.0	-10.8	Vert
^	1830.030M	75.5	+0.0 +0.0 +2.7	+0.0 +5.1 +0.3	+0.0 -39.4 +0.3	+0.0 +24.4	+0.0	68.9	54.0	+14.9	Vert
7	5489.950M Ave	34.3	+0.0 +0.0 +5.3	+0.0 +9.7 +0.6	+0.0 -40.1 +0.2	+0.0 +30.9	+0.0	40.9	54.0	-13.1	Horiz
^	5489.950M	59.1	+0.0 +0.0 +5.3	+0.0 +9.7 +0.6	+0.0 -40.1 +0.2	+0.0 +30.9	+0.0	65.7	54.0	+11.7	Horiz
9	7319.950M Ave	27.5	+0.0 +0.0 +5.9	+0.0 +11.3 +0.7	+0.0 -40.3 +0.2	+0.0 +33.5	+0.0	38.8	54.0	-15.2	Horiz
^	7319.950M	45.2	+0.0 +0.0 +5.9	+0.0 +11.3 +0.7	+0.0 -40.3 +0.2	+0.0 +33.5	+0.0	56.5	54.0	+2.5	Horiz
11	6404.950M Ave	29.2	+0.0 +0.0 +5.5	+0.0 +10.5 +0.6	+0.0 -39.8 +0.3	+0.0 +32.0	+0.0	38.3	54.0	-15.7	Horiz
^	6404.950M	51.5	+0.0 +0.0 +5.5	+0.0 +10.5 +0.6	+0.0 -39.8 +0.3	+0.0 +32.0	+0.0	60.6	54.0	+6.6	Horiz
13	6404.968M Ave	28.3	+0.0 +0.0 +5.5	+0.0 +10.5 +0.6	+0.0 -39.8 +0.3	+0.0 +32.0	+0.0	37.4	54.0	-16.6	Vert
^	6404.968M	49.8	+0.0 +0.0 +5.5	+0.0 +10.5 +0.6	+0.0 -39.8 +0.3	+0.0 +32.0	+0.0	58.9	54.0	+4.9	Vert
15	5489.968M Ave	30.0	+0.0 +0.0 +5.3	+0.0 +9.7 +0.6	+0.0 -40.1 +0.2	+0.0 +30.9	+0.0	36.6	54.0	-17.4	Vert

^	5489.968M	53.0	+0.0 +0.0 +5.3	+0.0 +9.7 +0.6	+0.0 -40.1 +0.2	+0.0 +30.9	+0.0	59.6	54.0	+5.6	Vert
17	1830.000M Ave	42.8	+0.0 +0.0 +2.7	+0.0 +5.1 +0.3	+0.0 -39.4 +0.3	+0.0 +24.4	+0.0	36.2	54.0	-17.8	Horiz
^	1830.000M	67.6	+0.0 +0.0 +2.7	+0.0 +5.1 +0.3	+0.0 -39.4 +0.3	+0.0 +24.4	+0.0	61.0	54.0	+7.0	Horiz
19	169.510M	37.7	-26.8 +0.0 +0.0	+0.2 +1.5 +0.0	+1.3 +0.0 +0.0	+10.0 +0.0	+0.0	23.9	43.5	-19.6	Vert
20	3660.000M Ave	32.5	+0.0 +0.0 +4.1	+0.0 +7.5 +0.5	+0.0 -40.4 +0.1	+0.0 +28.6	+0.0	32.9	54.0	-21.1	Horiz
^	3660.000M	55.4	+0.0 +0.0 +4.1	+0.0 +7.5 +0.5	+0.0 -40.4 +0.1	+0.0 +28.6	+0.0	55.8	54.0	+1.8	Horiz
22	3659.968M Ave	32.1	+0.0 +0.0 +4.1	+0.0 +7.5 +0.5	+0.0 -40.4 +0.1	+0.0 +28.6	+0.0	32.5	54.0	-21.5	Vert
^	3659.968M	49.1	+0.0 +0.0 +4.1	+0.0 +7.5 +0.5	+0.0 -40.4 +0.1	+0.0 +28.6	+0.0	49.5	54.0	-4.5	Vert
24	2744.968M Ave	34.8	+0.0 +0.0 +3.5	+0.0 +6.9 +0.4	+0.0 -40.0 +0.2	+0.0 +26.6	+0.0	32.4	54.0	-21.6	Vert
^	2744.960M	53.5	+0.0 +0.0 +3.5	+0.0 +6.9 +0.4	+0.0 -40.0 +0.2	+0.0 +26.6	+0.0	51.1	54.0	-2.9	Vert
26	173.310M	34.7	-26.8 +0.0 +0.0	+0.2 +1.5 +0.0	+1.3 +0.0 +0.0	+9.7 +0.0	+0.0	20.6	43.5	-22.9	Vert
27	4574.968M Ave	26.3	+0.0 +0.0 +4.6	+0.0 +9.1 +0.5	+0.0 -40.2 +0.1	+0.0 +29.6	+0.0	30.0	54.0	-24.0	Vert
^	4574.968M	47.0	+0.0 +0.0 +4.6	+0.0 +9.1 +0.5	+0.0 -40.2 +0.1	+0.0 +29.6	+0.0	50.7	54.0	-3.3	Vert
29	180.310M	33.0	-26.8 +0.0 +0.0	+0.2 +1.5 +0.0	+1.3 +0.0 +0.0	+9.1 +0.0	+0.0	18.3	43.5	-25.2	Vert
30	172.510M	24.0	-26.8 +0.0 +0.0	+0.2 +1.5 +0.0	+1.3 +0.0 +0.0	+9.8 +0.0	+0.0	10.0	43.5	-33.5	Horiz

Band Edge Test Conditions / Setup

Test Location:	CKC Laboratories, Inc. • 110 N. Olinda Place • Brea, CA 92823 • 7149936112		
Customer:	RJE Technologies, Inc.		
Specification:	**Band Edge**		
Work Order #:	**97475**	Date:	8/26/2015
Test Type:	**Maximized Emissions**	Time:	14:28:24
Tested By:	Don Nguyen	Sequence#:	2
Software:	EMITest 5.02.00		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

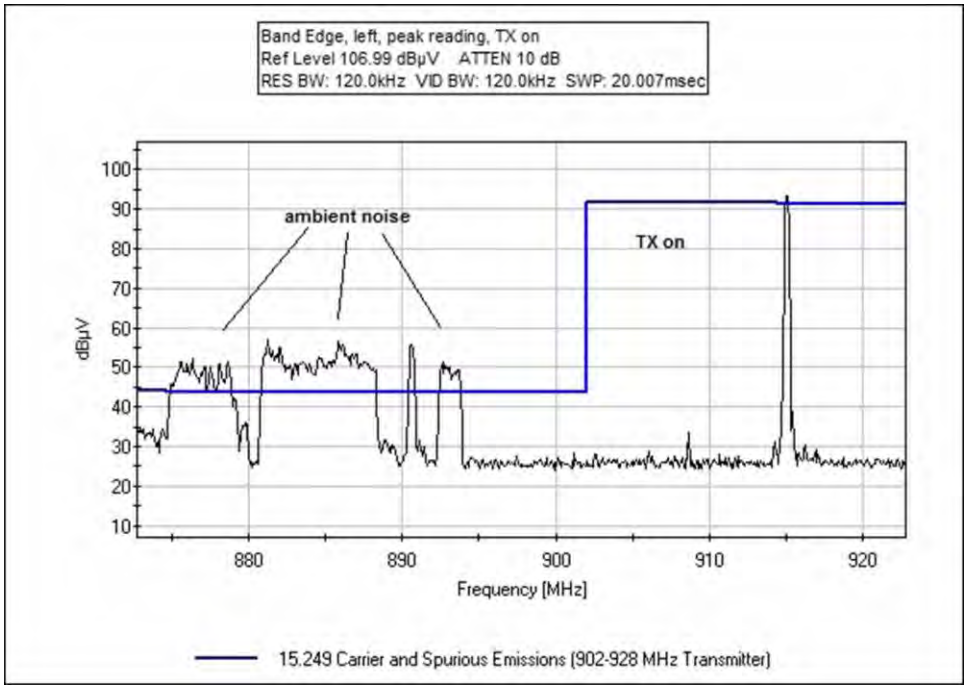
The EUT is stand alone on the Styrofoam table top. The EUT is powered from an external DC power supplying output 5VDC. The EUT transmits solely on a single channel 915 MHz. • The transmission triggered by shorting the support Safety Turtle and the signal will be received by support receiver. • All support equipment is located remotely. • The EUT is positioned in three different axis and data is taken in each axis. • Frequency range of data sheet 915.0 to 915.05MHz. • RBW=VBW=120kHz.

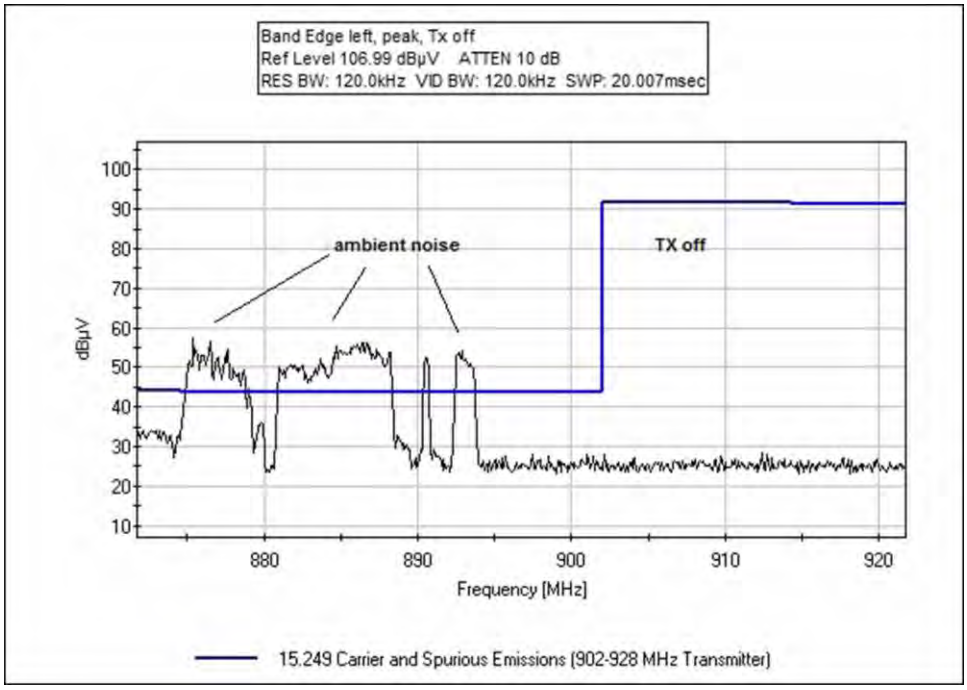
Temperature: 26°C, Relative Humidity: 35%, Atmospheric Pressure: 100kPa. ••

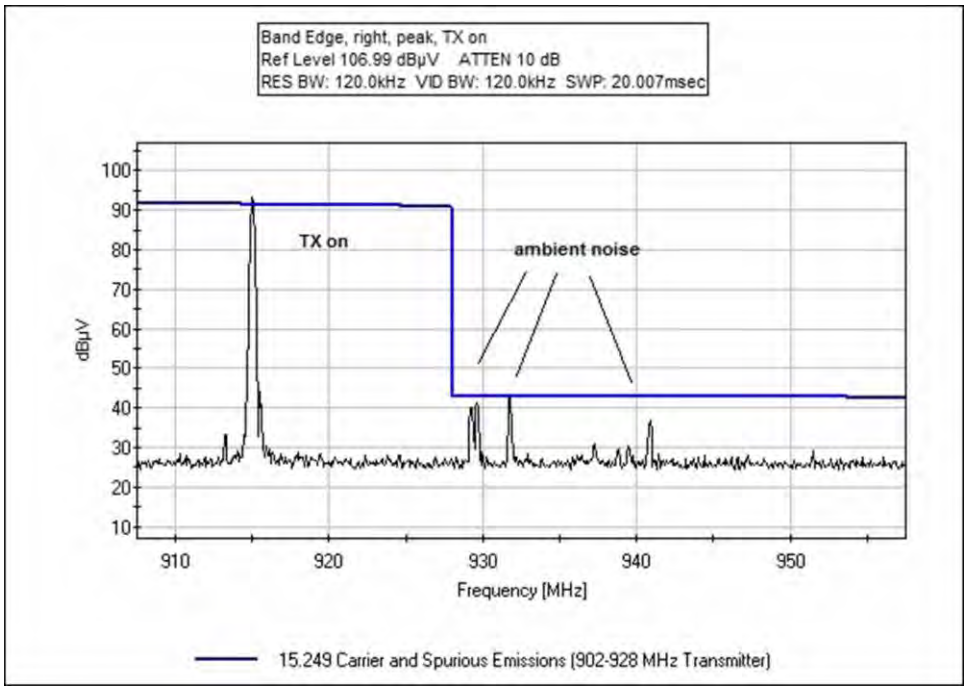
Test Method: ANSI C63.4 (2009)• Site D.• •

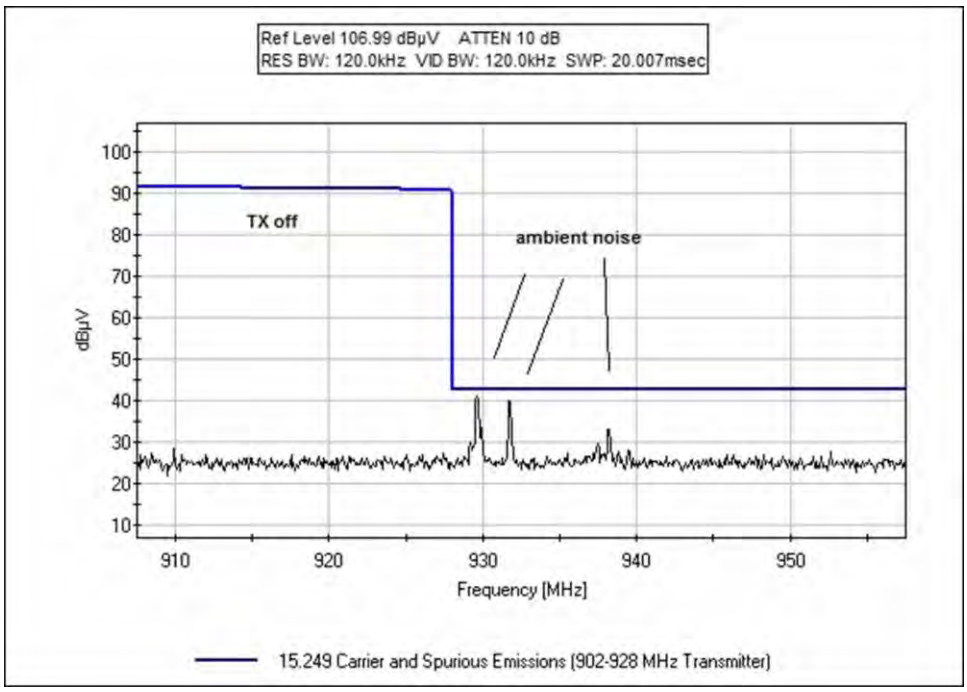
Mod. 1 was in place during testing.

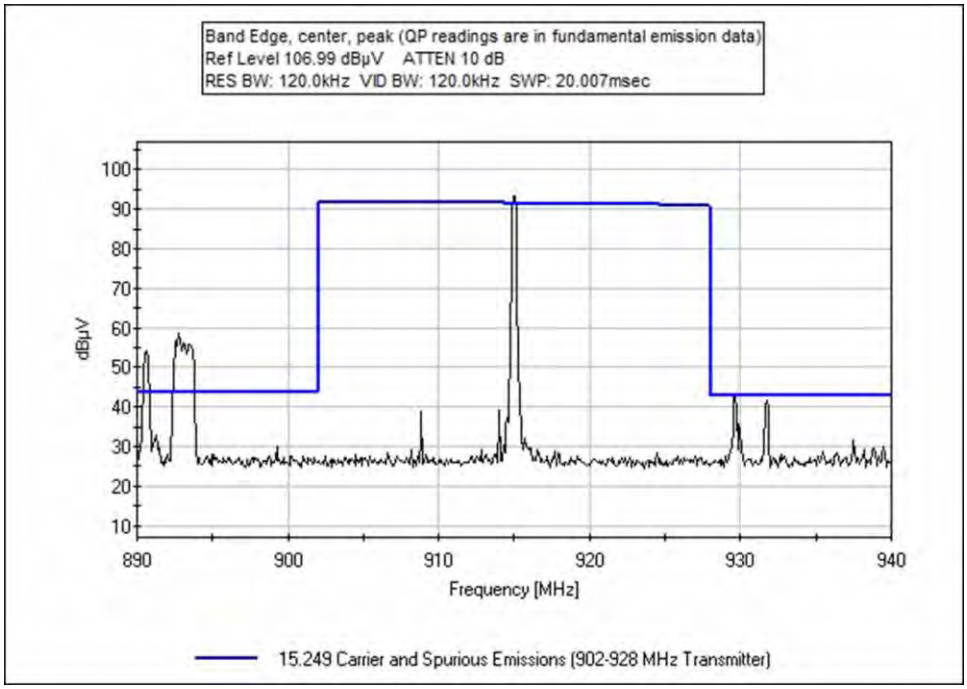
Band Edge Plots



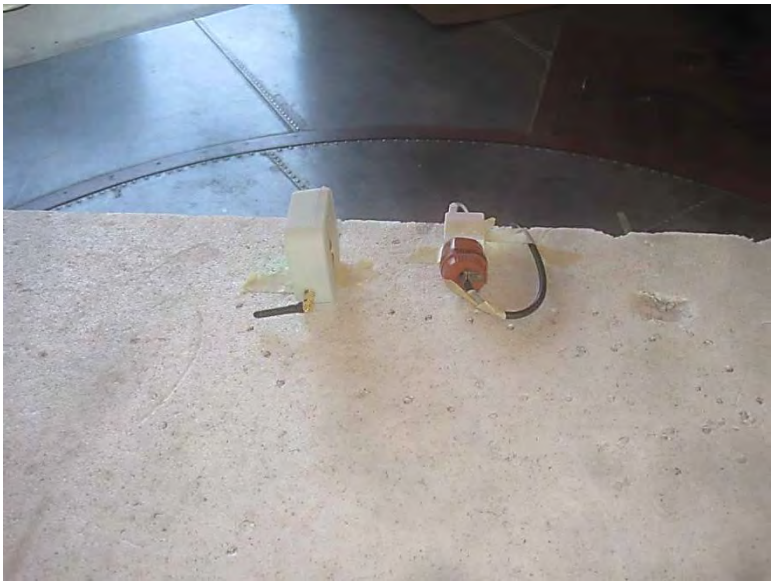



Band Edge, right, peak, TX on
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.007msec
TX on
ambient noise
dBµV
Frequency [MHz]
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

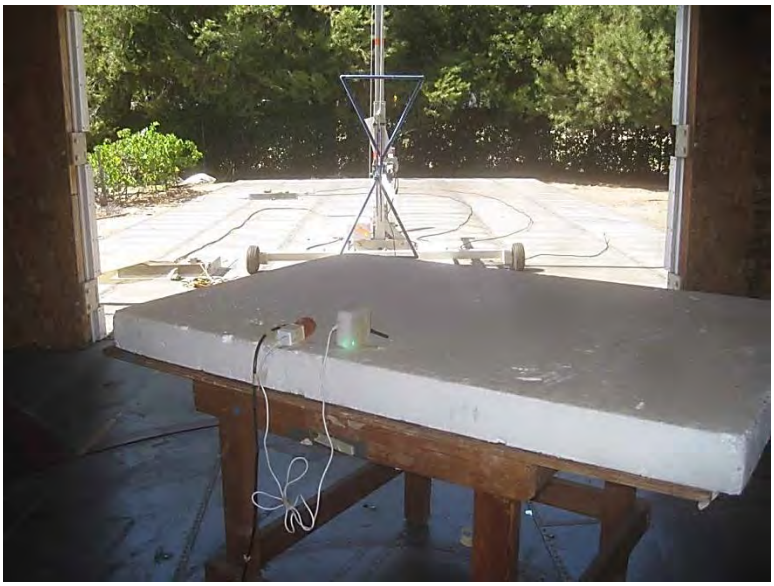

Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.007msec
TX off
ambient noise
dBµV
Frequency [MHz]
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)


Band Edge, center, peak (QP readings are in fundamental emission data)
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 120.0kHz VID BW: 120.0kHz SWP: 20.007msec
dBµV
100
90
80
70
60
50
40
30
20
10
890
900
910
920
930
940
Frequency [MHz]
15.249 Carrier and Spurious Emissions (902-928 MHz Transmitter)

Test Setup Photo(s)



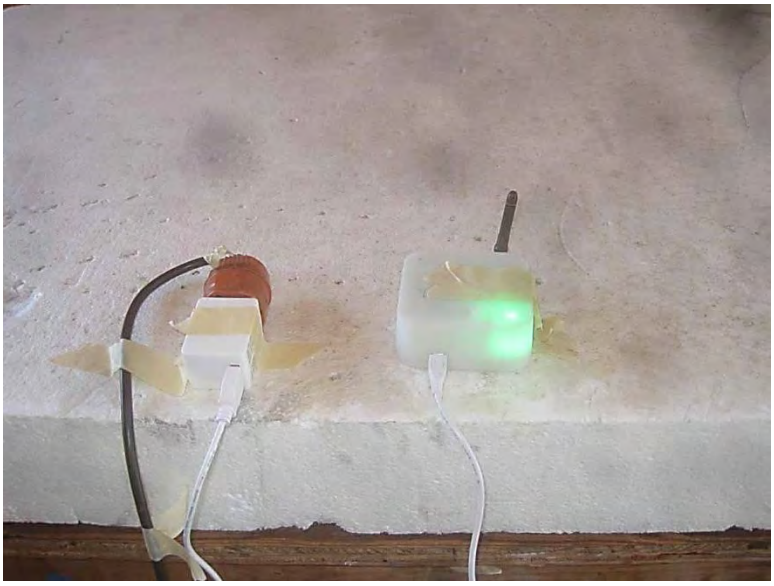
Front View



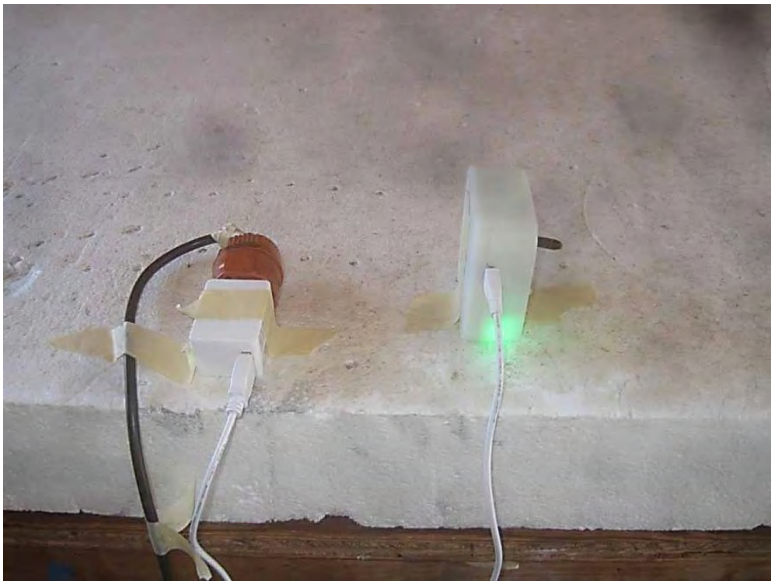
Back View

Cone 1

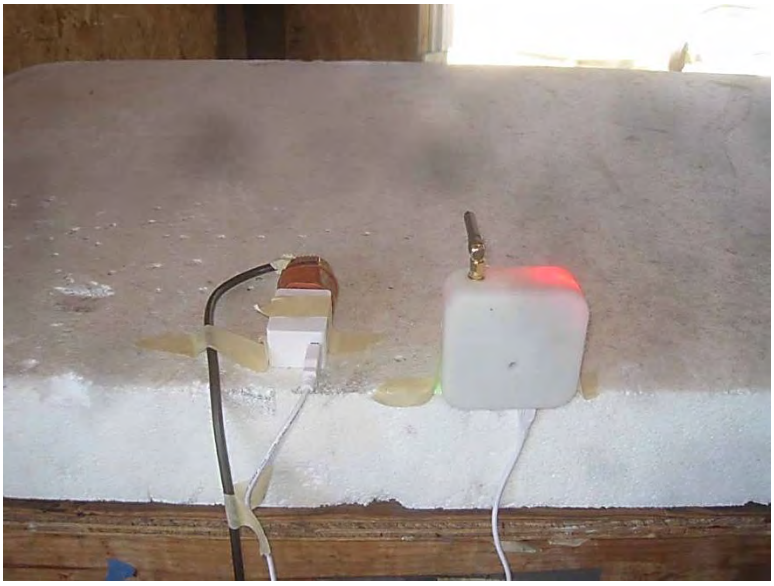
Cone 2



X-Axis



Y-Axis



Z-Axis

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or carrot ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point the measuring device is set into the linear mode and the scan time is reduced.