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## FCC PART 90

## TEST REPORT

<b>APPLICANT</b>	VERTEX STANDARD USA, INC.
	8000 WEST SUNRISE BLVD. FT. LAUDERDALE FL 33322
<b>FCC ID</b>	AXI1134720
<b>IC CERTIFICATION</b>	10239A-11134720
<b>MODEL NUMBER</b>	EVX-531-G7-5
<b>PRODUCT DESCRIPTION</b>	PORTABLE RADIO
<b>DATE SAMPLE RECEIVED</b>	10/12/2012
<b>DATE TESTED</b>	10/16/2012
<b>TESTED BY</b>	Nam Nguyen
<b>APPROVED BY</b>	Mario de Aranzeta
<b>TIMCO REPORT NO.</b>	2697AUT12TestReport.doc
<b>TEST RESULTS</b>	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

THE ATTACHED REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL  
WITHOUT THE WRITTEN APPROVAL OF TIMCO ENGINEERING, INC.



Certificate # 0955-01



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Applicant: VERTEX STANDARD USA, INC.

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## GENERAL REMARKS

The attached report shall not be reproduced except in full without the written permission of Timco Engineering Inc.

The test results relate only to the items tested.

### Summary

The device under test does:

fulfill the general approval requirements as identified in this test report  
 not fulfill the general approval requirements as identified in this test report

### Attestations

This equipment has been tested in accordance with the standards identified in this test report. To the best of my knowledge and belief, these tests were performed using the measurement procedures described in this report.

All instrumentation and accessories used to test products for compliance to the indicated standards are calibrated regularly in accordance with ISO 17025: 2005 requirements.



Testing Certificate # 0955-01

I attest that the necessary measurements were made, under my supervision, at:

Timco Engineering Inc.  
849 NW State Road 45  
Newberry, FL 32669

### Authorized Signatory Name:



Mario de Aranzeta C.E.T.  
Compliance Engineer/ Lab. Supervisor

Applicant: VERTEX STANDARD USA, INC.

FCC ID: 1134720

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**GENERAL INFORMATION**  
**DUT Specification**

<b>DUT Description</b>	PORTABLE RADIO
<b>FCC ID</b>	1134720
<b>IC Certification</b>	10239A-1134720
<b>Model Number</b>	EVX531-G7-5
<b>Serial Number</b>	N/A
<b>Operating Frequency</b>	450 – 470 MHz
<b>Test Frequencies</b>	450.25, 460.00, and 469.75 MHz
<b>No. of Channels</b>	16
<b>Type of Emission</b>	7K60F1E, 7K60F1D 7K60FXE 7K60FXD 7K60F1W 11K2F3E
<b>Modulation</b>	FM
<b>DUT Power Source</b>	<input type="checkbox"/> 110–120Vac/ 50– 60Hz
	<input type="checkbox"/> DC Power 12V
	<input checked="" type="checkbox"/> Battery Operated Exclusively
<b>Test Item</b>	<input type="checkbox"/> Prototype
	<input checked="" type="checkbox"/> Pre-Production
	<input type="checkbox"/> Production
<b>Type of Equipment</b>	<input type="checkbox"/> Fixed
	<input type="checkbox"/> Mobile
	<input checked="" type="checkbox"/> Portable
<b>Test Conditions</b>	Temperature was 26°C Relative humidity of 50%.
<b>Modification to the DUT</b>	None
<b>Test Exercise</b>	The DUT was placed in continuous transmit mode.
<b>Applicable Standards</b>	ANSI/TIA 603-C:2004, FCC CFR 47 Part 90, IC RSS-119 (i11), RSS-GEN (i3)
<b>Test Facility</b>	Timco Engineering Inc. at 849 NW State Road 45 Newberry, FL 32669 USA.

Applicant: VERTEX STANDARD USA, INC.

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## TEST PROCEDURES

**Power Line Conducted Interference:** The procedure used was ANSI/TIA 603-C: 2004 using a 50uH LISN. Both lines were observed with the DUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed.

**Bandwidth 20 dB:** The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on plot.

**Power Output:** The RF power output was measured at the antenna feed point using a peak power meter.

**Antenna Conducted Emissions:** The RBW = 100 kHz, VBW = 300 kHz and the span set to 10.0 MHz and the spectrum was scanned from 30 MHz to the 10<sup>th</sup> harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

**Radiation Interference:** The test procedure used was ANSI/TIA 603-C: 2004 using an Agilent spectrum receiver with pre-selector. The bandwidth (RBW) of the spectrum receiver was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was 3 MHz. The analyzer was calibrated in dB above a micro volt at the output of the antenna.

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## RF POWER OUTPUT

**Rule Part No.:** FCC Part 2.1046(a), IC RSS-119 4.1 and 5.4, RSS-GEN 4.8

### Test Requirements:

**Method of Measurement:** RF power is measured by connecting a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage and the transmitter properly adjusted the RF output measures:

### Test Setup Diagram:



### Test Data:

OUTPUT POWER:

TX Frequency	Power	
	High Watts	Low Watts
450	4.9	0.20
460	5.0	0.23
470	5.0	0.21

### Part 2.1033 (C)(8) DC Input into the final amplifier

FOR LOW POWER SETTING INPUT POWER:  $(7.4V)(0.4A) = 11.1$  Watts

FOR HIGH POWER SETTING INPUT POWER:  $(7.4V)(1.5A) = 2.96$  Watts

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## MODULATION CHARACTERISTICS

### Part 2.1033(c)

Part 2.1033(c) (4) Type of Emission: 11K2F3E

### FCC Part 90.209, IC RSS-119 5.5

### FCC Part 90.207

Type of Emission: 11K2F3E

$$Bn = 2M + 2DK$$

$$M = 3000$$

$$D = 2500$$

$$K=1$$

$$Bn = 2(3000) + 2(2500) = 11.k$$

EVX-531-G7-5 Digital function complies with the DMR (Digital Mobile Radio).

Format: 2-slot TDMA

Modulation: 4FSK

Bandwidth: 12.5 kHz channel

Data rate: 9,600 bps (bit per second)

Voice: AMBE+2 Vocoder (digitized) 3,600bps

7K60F1D, 7K60F1E, 7K60F1W, 7K60FXE, & 7K60FXD

Applicant: VERTEX STANDARD USA, INC.

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## AUDIO FREQUENCY RESPONSE

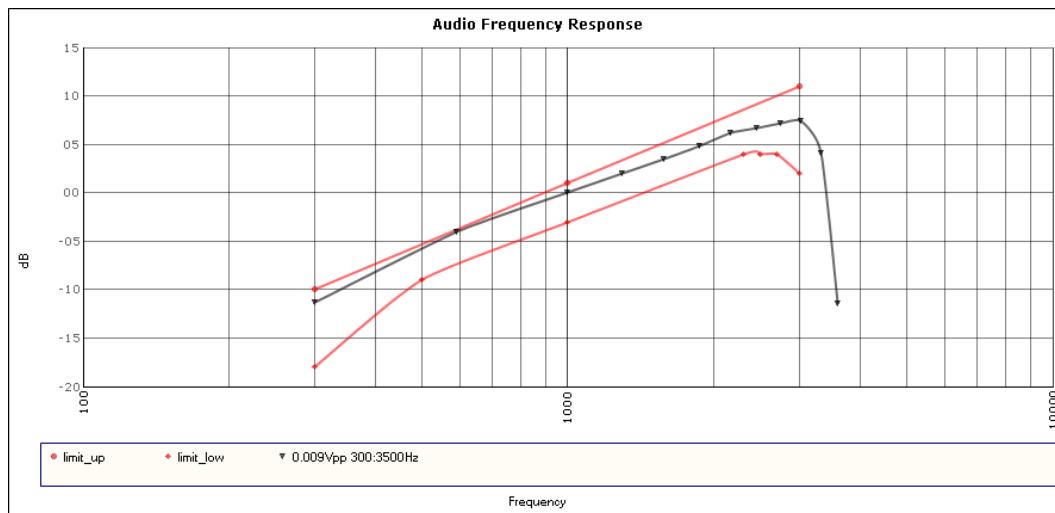
**Rule Part No.:** FCC Part 2.1047(a)(b), IC RSS-119 5.2

**Test Requirements:**

**Method of Measurement:**

The audio frequency response was measured in accordance with ANSI/TIA 603-C: 2004. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 – 5000Hz shall be submitted. The audio frequency response curve is shown below.

**AUDIO FREQUENCY RESPONSE PLOT**



Applicant: VERTEX STANDARD USA, INC.

FCC ID: 1134720

IC CERT #: 10239A-1134720

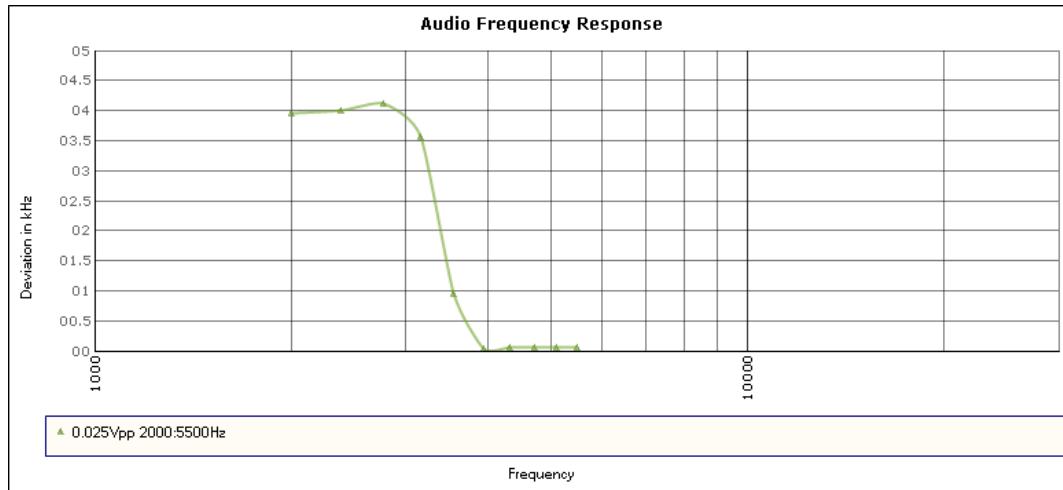
Report: W:\V\VERTEX STANDARD USA\2697AUT12\2697AUT12TestReport rev 1 FCC.doc

## AUDIO LOW PASS FILTER

### VOICE MODULATED COMMUNICATION EQUIPMENT

**Part 2.1047(a) Voice modulated communication equipment:** For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all the circuitry installed between the modulation limiter and the modulated stage shall be submitted.

#### AUDIO LOW PASS FILTER



Applicant: VERTEX STANDARD USA, INC.

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## AUDIO INPUT VERSUS MODULATION

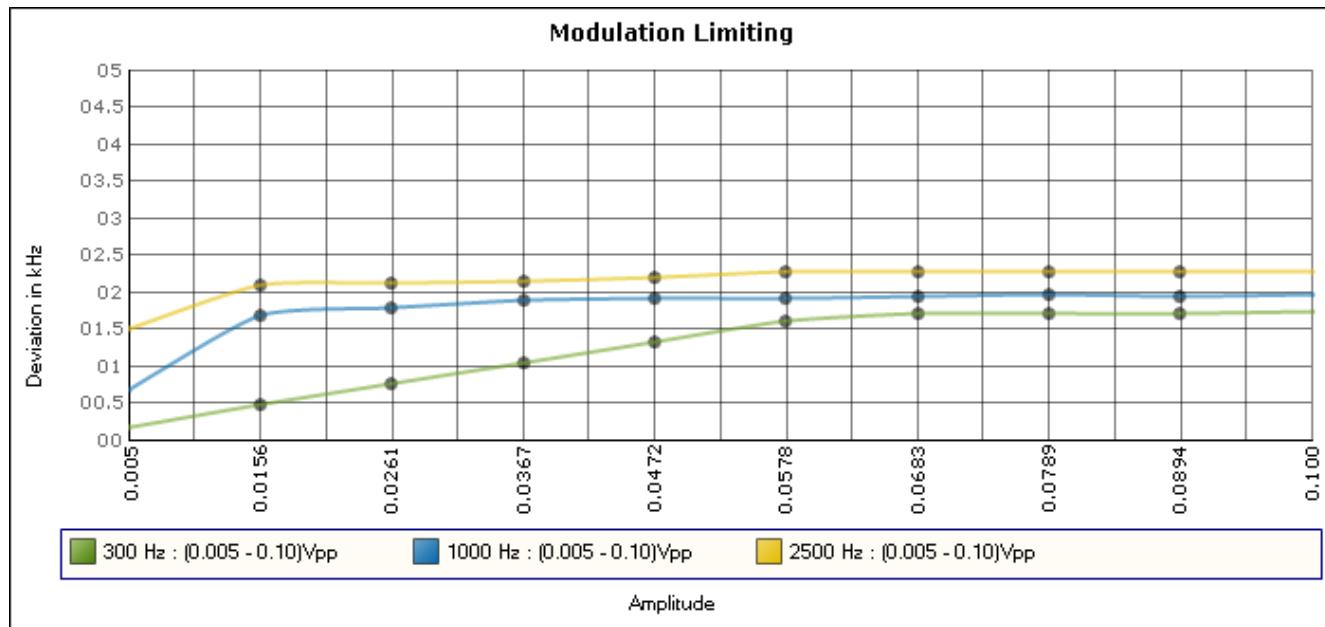
**Rule Part No.:** FCC Part 2.1047(b) & 90, IC RSS-119 5.2

### Test Requirements:

**Method of Measurement:** **Modulation cannot exceed 100%,** The audio input level needed for a particular percentage of modulation was measured in accordance with ANSI/TIA 603-C: 2004. The audio input curves versus modulation are shown below. Curves are provided for audio input frequencies of 300, 1000, and 2500 Hz.

### Test data:

Modulation Limiting Plot - 12.5 kHz Bandwidth



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## OCCUPIED BANDWIDTH

### FCC Part 2.1049(c), RSS-GEN 4.6 EMISSION BANDWIDTH

#### Part 90.210(d) Emission Mask D - 12.5 kHz channel BW equipment.

For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth  $f_0$  to 5.625 kHz removed from  $f_0$ : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least 7.27 ( $f_d - 2.88$  kHz) dB.
- (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 12.5 kHz: At least  $50 + 10\log(P)$  dB or 70 dB, whichever is the lesser attenuation.

#### Part 90.210(e) Emission Mask E - 6.25 kHz channel BW equipment.

For transmitters designed to operate with a 6.25 kHz bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

- (1) On any frequency from the center of the authorized bandwidth  $f_0$  to 3.0 kHz removed from  $f_0$ : Zero dB.
- (2) On any frequency from the center of the authorized bandwidth by a displacement frequency ( $f_d$  in kHz) of more than 3.0 kHz but no more than 4.6 kHz: At least  $30 + 16.67(f_d - 3.0$  kHz) or  $55 + 10 \log(P)$  or 65, whichever is the lesser attenuation.
- (3) On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least  $55 + 10\log(P)$  dB or 65 dB, whichever is the lesser attenuation.

Applicant: VERTEX STANDARD USA, INC.

FCC ID: 1134720

IC CERT #: 10239A-1134720

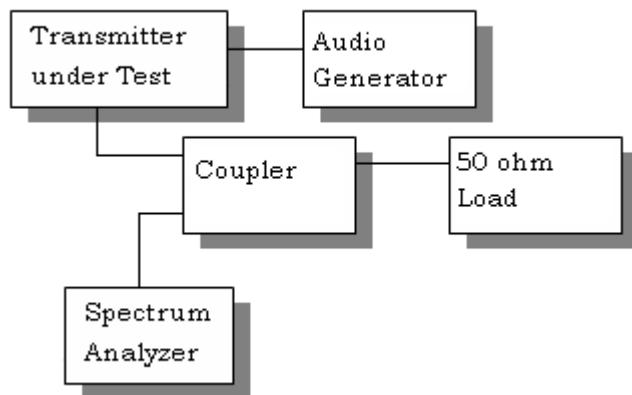
Report: W:\V\VERTEX STANDARD USA\2697AUT12\2697AUT12TestReport rev 1 FCC.doc

## OCCUPIED BANDWIDTH MEASUREMENT

**Test procedure:** ANSI/TIA-603-C: 2004 para 2.2.11.

**Test Setup Diagram:**

OCCUPIED BANDWIDTH MEASUREMENT



**Test Data:** See the plots below

Applicant: VERTEX STANDARD USA, INC.

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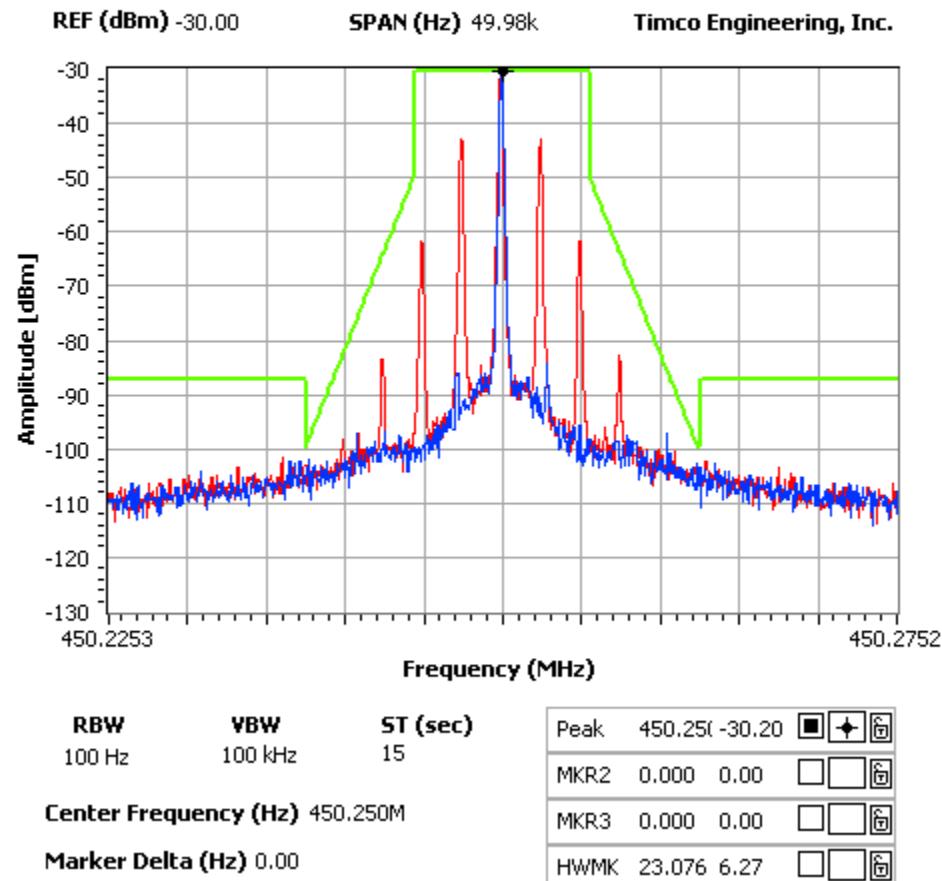
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## 12.5 kHz

### NOTES:

VERTEX STANDARD USA, INC.- UHF PORTABLE RADIO  
 OCCUPIED BANDWIDTH PLOT - NARROW BAND

### FCC 90.210 Mask D



Applicant: VERTEX STANDARD USA, INC.

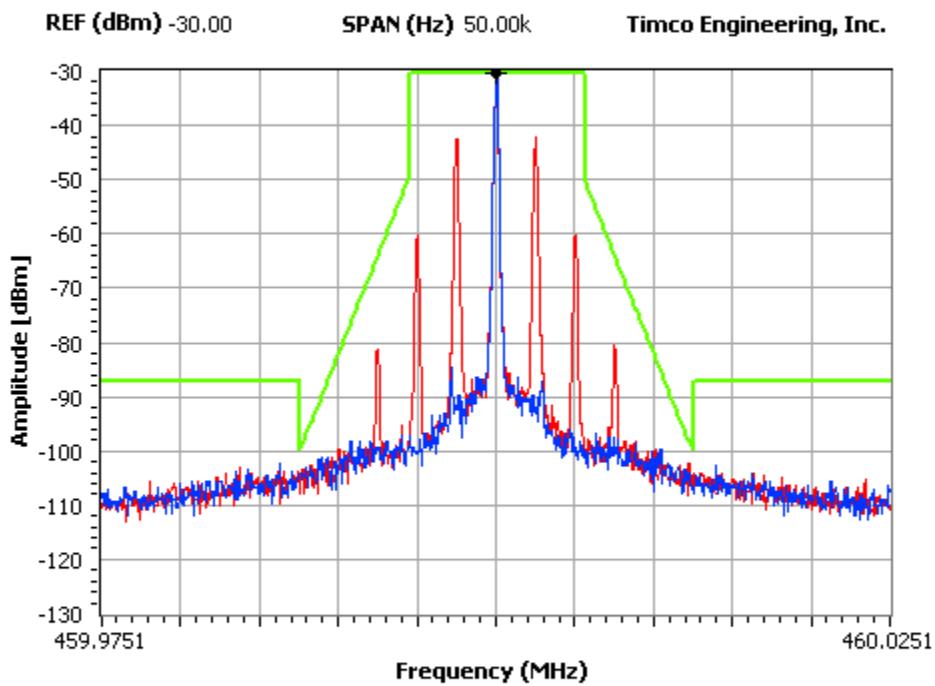
FCC ID: 1134720

IC CERT #: 10239A-1134720

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**NOTES:**

 VERTEX STANDARD USA, INC.- UHF PORTABLE RADIO  
 OCCUPIED BANDWIDTH PLOT - NARROW BAND

**FCC 90.210 Mask D**

 RBW      VBW  
 100 Hz      100 kHz

 ST (sec)  
 15

 Peak 460.000 -30.30     
 MKR2 0.000 0.00     
 MKR3 0.000 0.00   

Center Frequency (Hz) 460.000M

Marker Delta (Hz) 0.00

 HWMK 23.076 6.27   

Applicant: VERTEX STANDARD USA, INC.

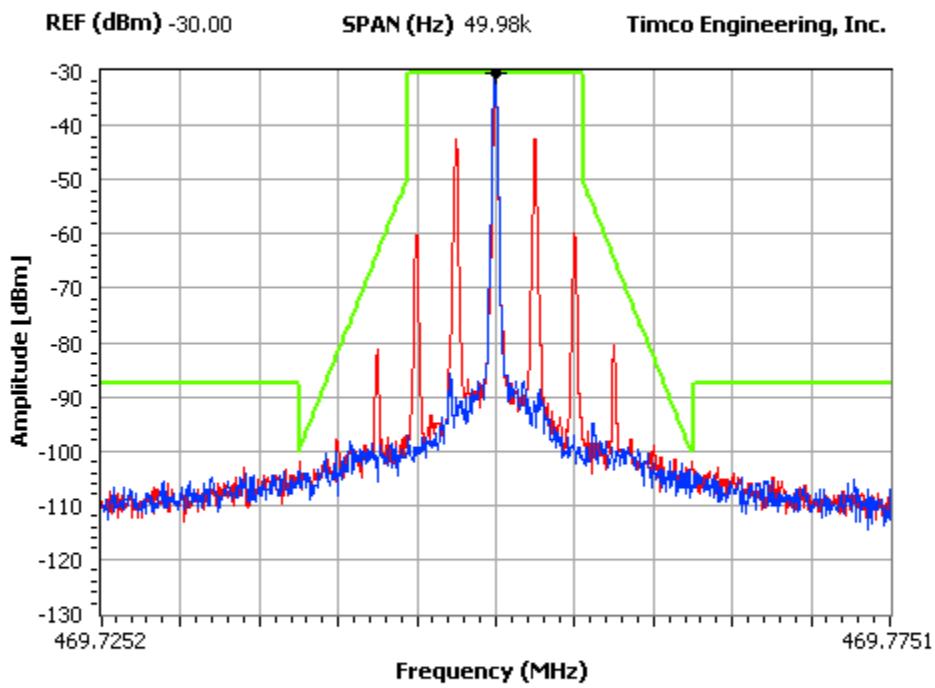
FCC ID: 1134720

IC CERT #: 10239A-1134720

Report: W:\V\VERTEX STANDARD USA\2697AUT12\2697AUT12TestReport rev 1 FCC.doc

**NOTES:**

 VERTEX STANDARD USA, INC.- UHF PORTABLE RADIO  
 OCCUPIED BANDWIDTH PLOT - NARROW BAND

**FCC 90.210 Mask D**

 RBW      VBW  
 100 Hz      100 kHz

 ST (sec)  
 15

Center Frequency (Hz) 469.750M

Marker Delta (Hz) 0.00

Peak	469.750	-30.40	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
MKR2	0.000	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
MKR3	0.000	0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
HWMK	23.076	6.27	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Applicant: VERTEX STANDARD USA, INC.

FCC ID: 1134720

IC CERT #: 10239A-1134720

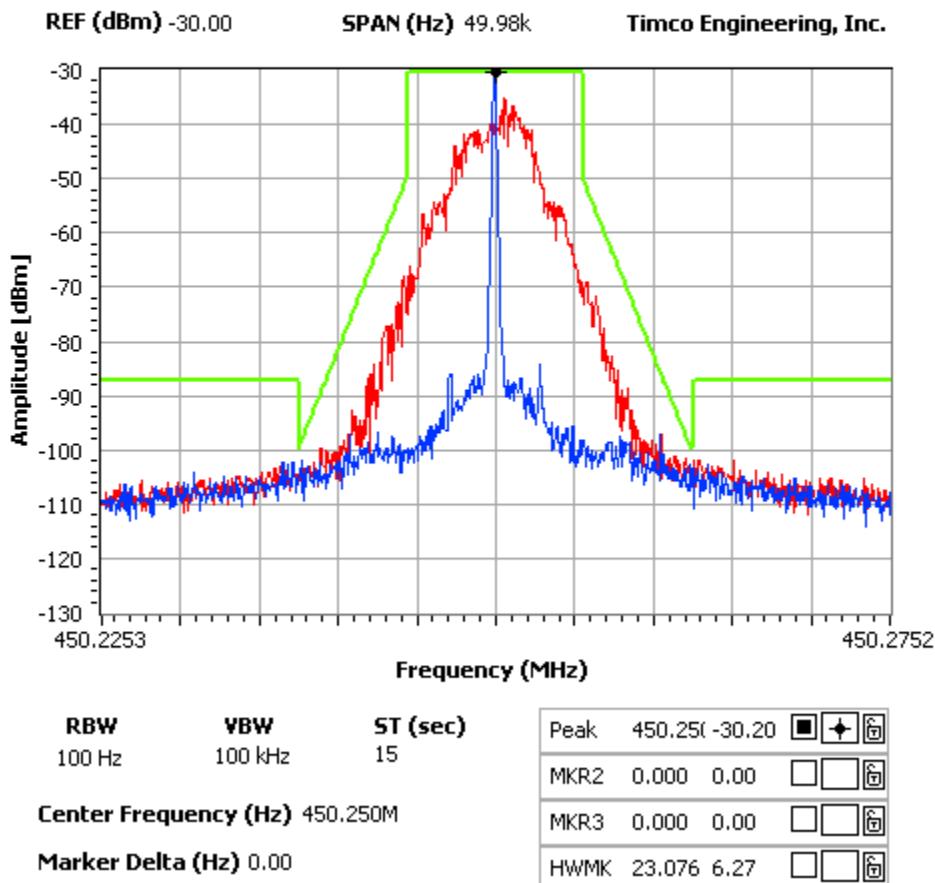
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## 12.5 kHz - DIGITAL

### NOTES:

VERTEX STANDARD USA, INC.- UHF PORTABLE RADIO  
 OCCUPIED BANDWIDTH PLOT - NARROW BAND (DIGITAL)

### FCC 90.210 Mask D



Applicant: VERTEX STANDARD USA, INC.

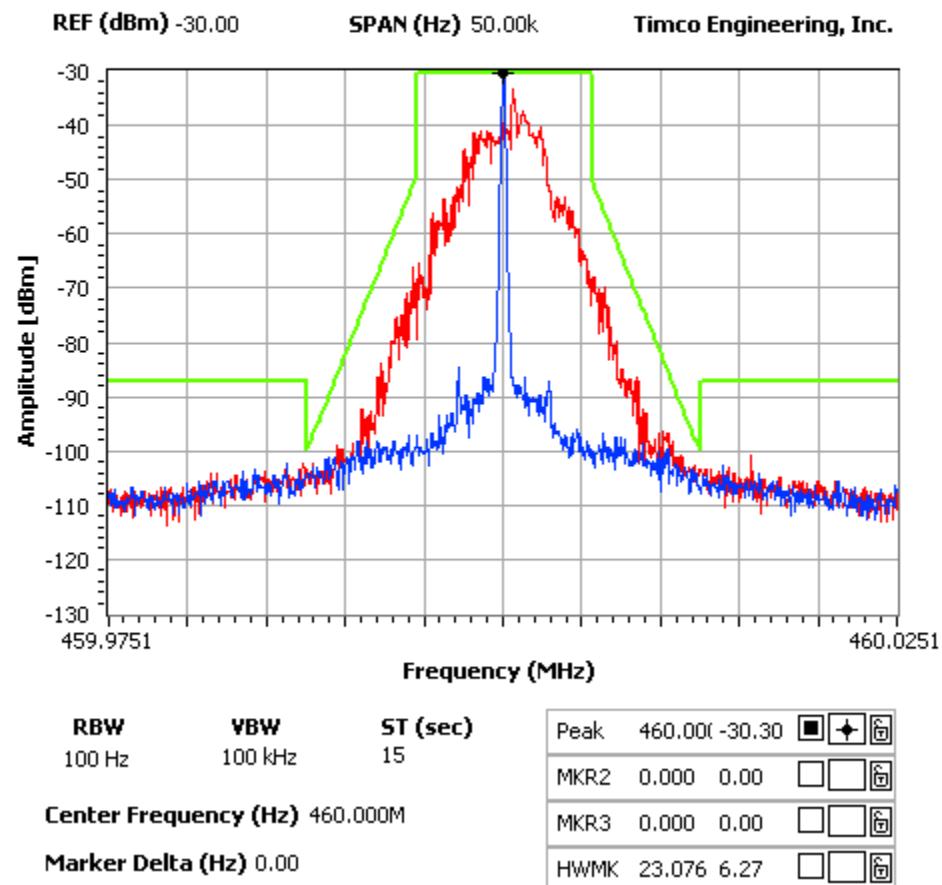
FCC ID: 1134720

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Report: W:\V\VERTEX STANDARD USA\2697AUT12\2697AUT12TestReport rev 1 FCC.doc

**NOTES:**

 VERTEX STANDARD USA, INC.- UHF PORTABLE RADIO  
 OCCUPIED BANDWIDTH PLOT - NARROW BAND (DIGITAL)

**FCC 90.210 Mask D**


Applicant: VERTEX STANDARD USA, INC.

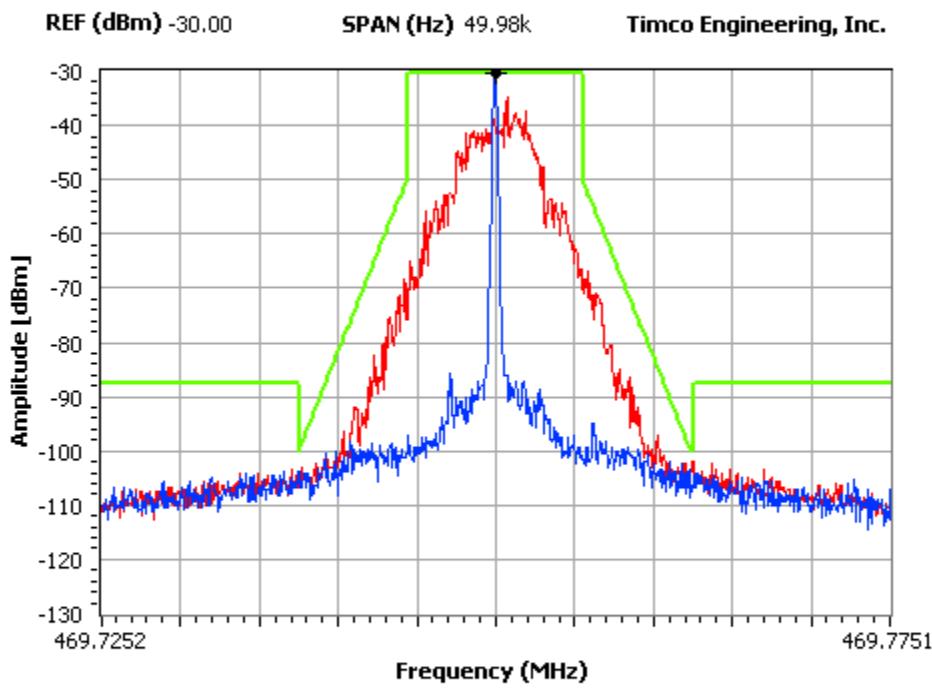
FCC ID: 1134720

IC CERT #: 10239A-1134720

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**NOTES:**

 VERTEX STANDARD USA, INC.- UHF PORTABLE RADIO  
 OCCUPIED BANDWIDTH PLOT - NARROW BAND (DIGITAL)

**FCC 90.210 Mask D**

 RBW      VBW  
 100 Hz      100 kHz

 ST (sec)  
 15

Center Frequency (Hz) 469.750M

Marker Delta (Hz) 0.00

Peak	469.75(-30.40)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
MKR2	0.000 0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
MKR3	0.000 0.00	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
HWMK	23.076 6.27	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Applicant: VERTEX STANDARD USA, INC.

FCC ID: 1134720

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

**Rule Part No.:** FCC Part 2.1051(a), RSS-GEN 7.1.4

**Requirements:** 12.5 kHz Channel Spacing = 57 dBc (for 5 Watts)  
 12.5 kHz Channel Spacing = 44 dBc (for 0.25 Watts)

**Method of Measurement:** The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from 0.4 to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard ANSI/TIA 603-C: 2004.

### Test Data:

TF HIGH POWER	EF	dB below carrier		TF LOW POWER	EF	dB below carrier
450.25	900.50	102.3		450.25	900.50	91
	1350.75	92.8			1350.75	91.6
	1801.00	79.9			1801.00	88.7
	2251.25	73.3			2251.25	90.6
	2701.50	87.4			2701.50	98.1
	3151.75	82.7			3151.75	99.3
	3602.00	92.6			3602.00	99.7
	4052.25	90.3			4052.25	99.6
	4502.50	88.7			4502.50	95.4

TF HIGH POWER	EF	dB below carrier		TF LOW POWER	EF	dB below carrier
460.00	920.00	103.2		460.00	920.00	92.4
	1380.00	92.7			1380.00	94.9
	1840.00	80.3			1840.00	93.9
	2300.00	75.5			2300.00	94.2
	2760.00	85.6			2760.00	96.4
	3220.00	82.7			3220.00	99.7
	3680.00	91.8			3680.00	99.9
	4140.00	89.4			4140.00	98.5
	4600.00	86			4600.00	91.2

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<b>TF HIGH POWER</b>	<b>EF</b>	<b>dB below carrier</b>		<b>TF LOW POWER</b>	<b>EF</b>	<b>dB below carrier</b>
469.75	939.50	103.7		469.75	939.50	91.8
	1409.25	92.6			1409.25	95.1
	1879.00	80.8			1879.00	93.1
	2348.75	74.8			2348.75	93.2
	2818.50	90.1			2818.50	96.1
	3288.25	83.5			3288.25	99.7
	3758.00	90.5			3758.00	97.8
	4227.75	92			4227.75	98
	4697.50	85			4697.50	89.5

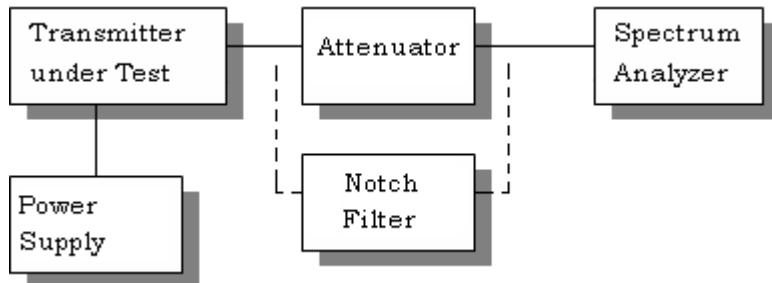
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### **Method of Measuring Conducted Spurious Emissions**



**METHOD OF MEASUREMENT:** The procedure used was ANSI/TIA 603-C: 2004. The measurements were made at TIMCO ENGINEERING INC. 849 N.W. State Road 45, Newberry, Florida 32669.

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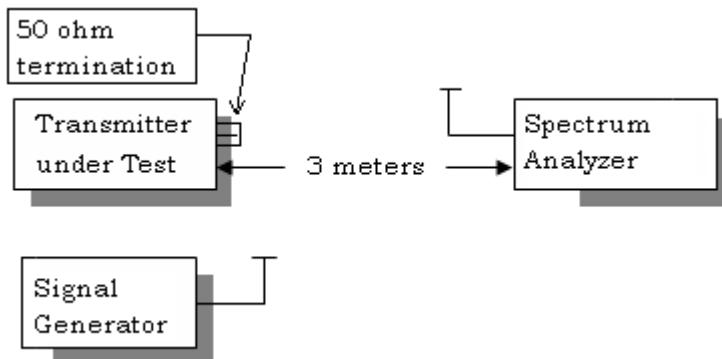
## FIELD STRENGTH OF SPURIOUS EMISSIONS

**Rule Parts. No.:** FCC Part 2.1053, RSS-GEN 4.9

**Requirements:** The FCC limits for radiated emissions are the same as previously stated for the conducted emissions.

**METHOD OF MEASUREMENT:** The tabulated data shows the results of the radiated field strength emissions test. The spectrum was scanned from 30 MHz to at least the tenth harmonic of the fundamental. This test was conducted per ANSI/TIA 603-C: 2004 using the substitution method. Measurements were made at the test site of TIMCO ENGINEERING, INC. located at 849 NW State Road 45, Newberry, FL 32669.

### Test Setup Diagram:



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**Test Data:**
**High Power**

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
450.25	0	0.00
900.50	V	65.6
1350.75	V	74.0
1801.00	V	65.5
2251.25	V	70.1
2701.50	H	68.2
3151.75	V	83.3
3602.00	V	90.9
4052.25	V	91.4
4502.50	H	90.2

**Low Power**

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
450.25	0	0.00
900.50	V	58.9
1350.75	H	68.5
1801.00	H	63.2
2251.25	H	71.5
2701.50	H	64.0
3151.75	V	75.2
3602.00	H	77.3
4052.25	H	76.3
4502.50	V	76.1

**High Power**

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
460.00	0	0.00
920.00	V	69.6
1380.00	V	78.5
1840.00	V	74.1
2300.00	H	77.2
2760.00	H	67.1
3220.00	V	83.8
3680.00	H	92.2
4140.00	H	90.0
4600.00	V	86.8

**Low Power**

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
460.00	0	0.00
920.00	V	60.0
1380.00	V	69.3
1840.00	H	66.3
2300.00	V	71.9
2760.00	H	67.8
3220.00	V	76.0
3680.00	V	77.5
4140.00	V	78.3
4600.00	H	76.3

Applicant: VERTEX STANDARD USA, INC.

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**HIGH POWER**

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
469.75	0	0.00
939.50	V	74.6
1409.25	V	78.0
1879.00	V	76.6
2348.75	H	76.7
2818.50	H	72.7
3288.25	V	85.4
3758.00	H	89.7
4227.75	H	91.4
4697.50	V	84.9

**LOW POWER**

Emission Frequency MHz	Ant. Polarity	dB Below Carrier (dBc)
469.75	0	0.00
939.50	V	61.5
1409.25	V	68.8
1879.00	H	64.5
2348.75	H	73.8
2818.50	H	67.9
3288.25	V	76.0
3758.00	H	75.4
4227.75	V	78.2
4697.50	V	77.5

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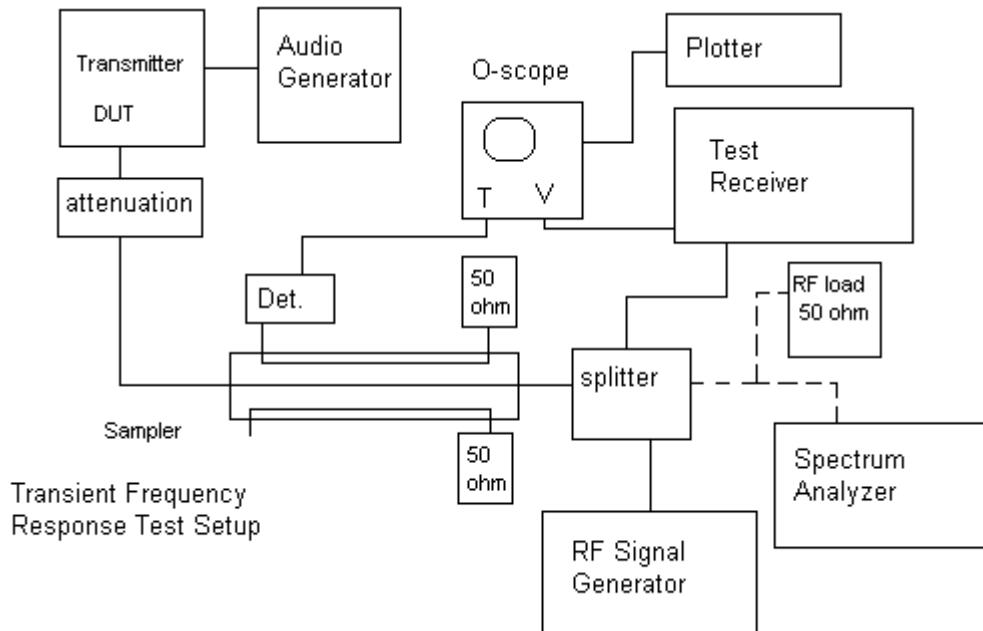
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**TEST PROCEDURE:** ANSI/TIA 603-C: 2004 PARA 2.2.19

1. Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, then the transmitter was turned off.
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained with the signal generator through-out the test.
3. Reduce the attenuation between the transmitter and the RF detector by 30 dB. With the levels set as above the transient frequency behavior was observed & recorded.



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**EMC EQUIPMENT LIST**

<b>Device</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Cal/Char Date</b>	<b>Due Date</b>
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	Listed 12/31/11	12/31/13
AC Voltmeter	HP	400FL	2213A14499	CAL 6/12/11	6/12/13
Antenna: Active Loop	ETS-Lindgren	3117	00041534	CAL 10/5/12	10/5/14
Frequency Counter	HP	5385A	2730A03025	CAL 8/17/11	8/17/13
Hygro-Thermometer	Extech	445703	0602	CAL 6/15/11	6/15/13
Modulation Analyzer	HP	8901A	3435A06868	CAL 7/18/11	7/18/13
Digital Multimeter	Fluke	FLUKE-77	35053830	CAL 9/9/11	9/9/13
Power Meter	Boonton Electronics	4531	11793	CAL 11/12/2011	11/12/2013
EMI Receiver	Rohde & Schwarz	ESIB40	100274	CAL 3/16/2012	3/16/2014
Analyzer Tan Tower Preamplifier	HP	8449B-H02	3008A00372	CAL 10/28/11	10/28/13
Analyzer Tan Tower Quasi-Peak Adapter	HP	85650A	3303A01690	CAL 10/28/11	10/28/13
Analyzer Tan Tower RF Preselector	HP	85685A	3221A01400	CAL 10/28/11	10/28/13
Analyzer Tan Tower Spectrum Analyzer	HP	8566B Opt 462	3138A07786 3144A20661	CAL 10/28/11	10/28/13
Temperature Chamber	Tenney Engineering	TTRC	11717-7	CHAR 2/22/12	2/22/13
Antenna	ETS	3117	35923	12/7/2011	12/7/2013
Antenna	Electro metrics	LPA-25	1122	5/04/2011	5/04/2013
Antenna	Electro metrics	BIA-25	1096	5/04/2011	5/04/2013

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