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## FCC PART 90 UHF PORTABLE TEST REPORT

<b>APPLICANT</b>	VERTEX STANDARD USA, INC.
	8000 WEST SUNRISE BLVD. FT. LAUDERDALE FL 33322 USA
<b>FCC ID</b>	AXI11274620
<b>MODEL NUMBER</b>	VX-264-G6-5
<b>PRODUCT DESCRIPTION</b>	UHF PORTABLE RADIO
<b>STANDARD APPLIED</b>	CFR 47 Part 90
<b>DATE SAMPLE RECEIVED</b>	1/6/2015
<b>DATE TESTED</b>	1/15/2015 – 1/25/2015
<b>REPORT ISSUE DATE</b>	2/11/2015
<b>TESTED BY</b>	Cory Leverett
<b>APPROVED BY</b>	Sid Sanders
<b>TEST RESULTS</b>	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL

Report Number	Version Number	Description	Issue Date
35AUT15TestReport.docx	Rev.1	Initial Issue	2/11/2015

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

## 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.

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:

Cory Leverett  
Engineering Project Manager



**Date:** 2/11/2015

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## GENERAL INFORMATION

### EUT Specification

<b>EUT Description</b>	UHF PORTABLE RADIO
<b>FCC ID</b>	AXI11274620
<b>Model Number</b>	VX-264-G6-5
<b>Operating Frequency</b>	403 – 470 MHz
<b>Test Frequencies</b>	406.25, 429.75, 450.25, 469.75 MHz
<b>Type of Emission</b>	11K0F3E
<b>Modulation</b>	FM Voice
<b>EUT 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>	The temperature was 26°C with a relative humidity of 50%.
<b>Revision History to the EUT</b>	None
<b>Test Exercise</b>	The EUT was placed in continuous transmit mode.
<b>Applicable Standards</b>	ANSI/TIA 603-D:2010, FCC CFR 47 Part 90
<b>Test Facility</b>	Timco Engineering Inc. 849 NW State Road 45 Newberry, FL 32669 USA.

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## TEST REPORT SUMMARY

Rule Part No.	Scope of Work	Status Pass/Fail/NA
<a href="#">Part 2.1033(c)(8)</a> , <a href="#">Part 2.1046(a)</a> , <a href="#">Part 90</a>	RF Power Output	Pass
<a href="#">Part 2.1033(c) (4)</a> <a href="#">Part 2.1047(a)(6)</a>	Modulation Characteristics	Pass
<a href="#">2.1049(c)</a> , <a href="#">90.210(b)</a> , <a href="#">90.210 (c)</a> <a href="#">90.210(d)</a> , <a href="#">90.210(e)</a>	Emission Mask and Occupied Bandwidths	Pass
<a href="#">2.1051(a)</a>	Antenna Conducted Emissions	Pass
<a href="#">2.1053</a> , <a href="#">Part 90</a>	Field Strength Spurious Emissions	Pass
<a href="#">Part 2.1055</a> , <a href="#">Part 90.213</a>	Frequency Stability	Pass
<a href="#">Part 90.214</a>	Transient Frequency Behavior	Pass

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## TEST PROCEDURE

**Power Line Conducted Interference:** The procedure used was ANSI/TIA 603-D:2010, using a 50uH LISN. Both lines were observed with the EUT 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-D:2010, using an Rohde & Schwarz – EMI test receiver. 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 microvolt at the output of the antenna.

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## RF POWER OUTPUT

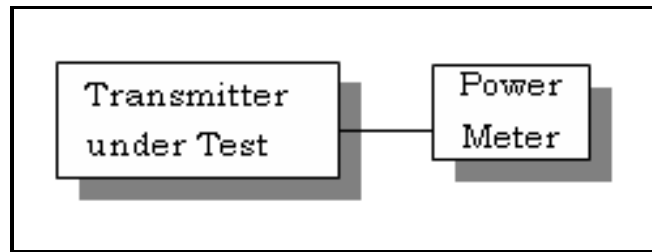
**Rule Part No.:** Part 2.1046(a), Part 90

**Test Requirements:** Manufacturer's Specification

**Method of Measurement:** RF power is measured by using a 50-ohm, resistive wattmeter to the RF output connector. With a nominal battery voltage (if battery operated), or a properly adjusted power supply (if not battery operated), and the transmitter properly adjusted the RF output measures:

For the device with a fixed or integral antenna, the RF power is measured as ERP. The substitution method was used. The RF output measures:

**Test Setup Diagram:**



**Test Data:** RF power of the EUT can be set at 1W or 5W.

OUTPUT POWER:

Tuned Frequency (MHz)	RF POWER (dBm)	
	HI	LOW
406.25	36.5	29.8
429.75	36.6	30.01
450.25	37.01	30.2
469.75	37.07	30.2

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

FOR LOW POWER SETTING INPUT POWER:  $(7.4V)(.6A) = 4.44$  Watts

FOR HIGH POWER SETTING INPUT POWER:  $(7.4V)(1.9A) = 14.06$  Watts

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## **MODULATION CHARACTERISTICS**

**Rule Part No.:** Part 2.1047(a)(b)

**Test Requirements:**

**Method of Measurement:**

**Part 2.1033(c)**

**Part 90.209**

**Part 90.207**

**Part 2.1033(c) (4) Type of Emission:** 11K0F3E

$$B_n = 2M + 2DK$$

$$M = 3000$$

$$D = 2500$$

$$K=1$$

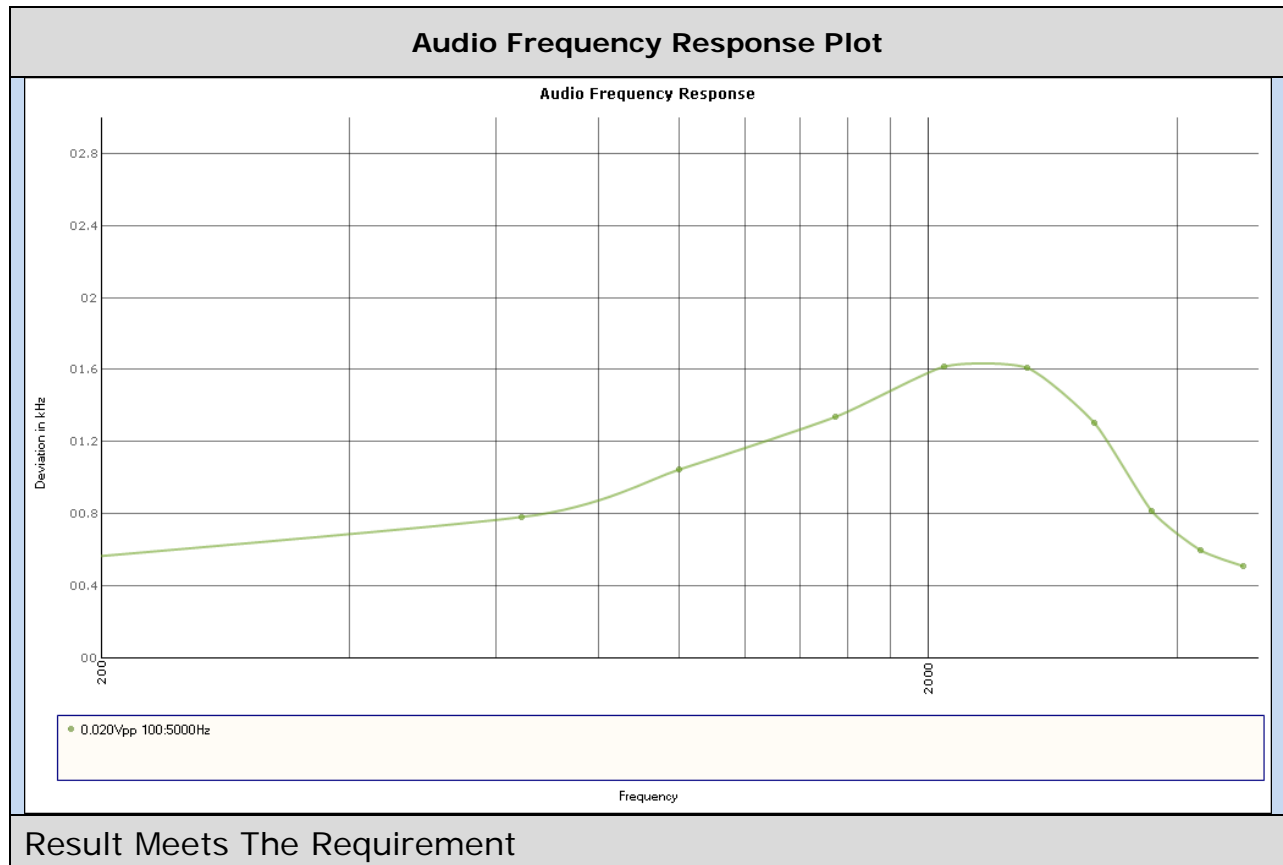
$$B_n = 2(3000) + 2(2500) = 11.0k$$

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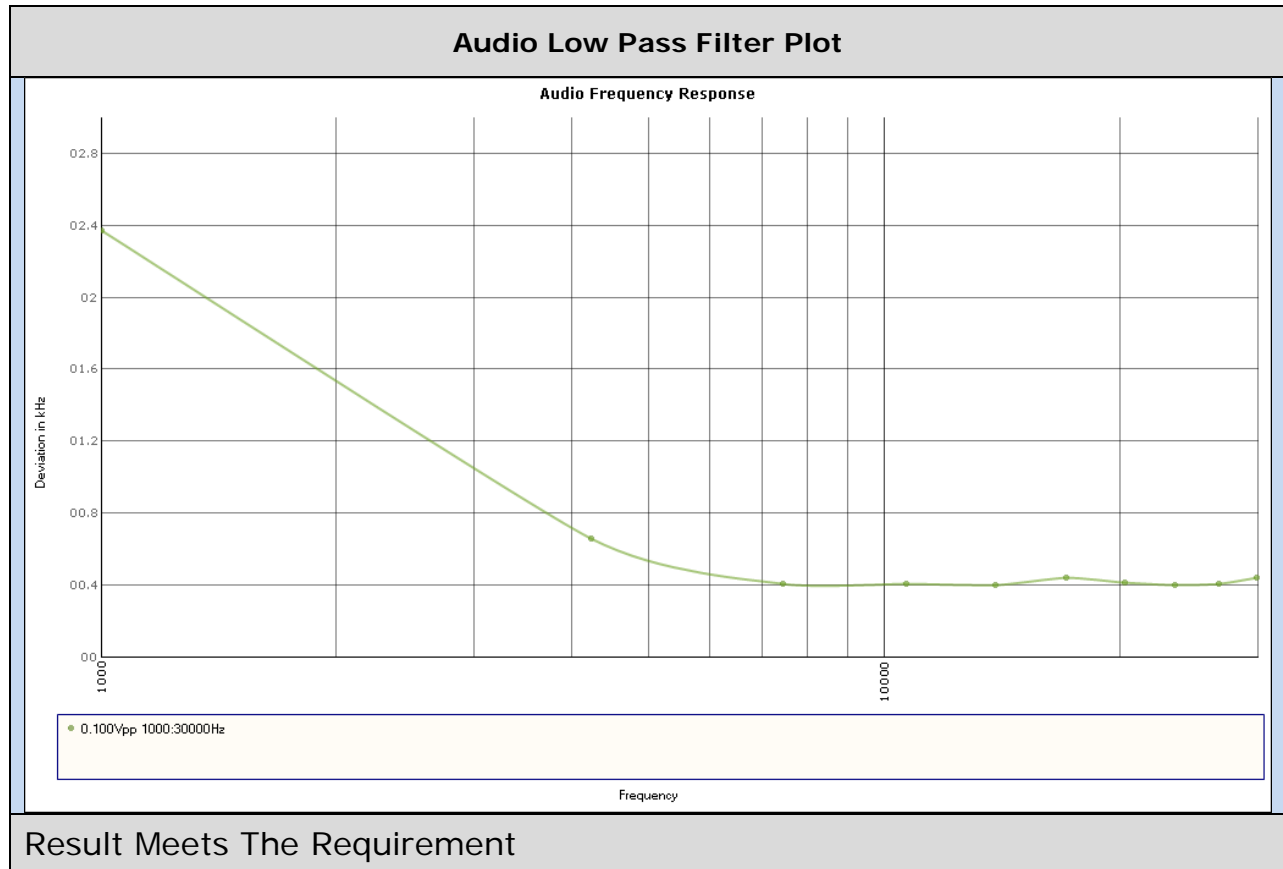
### Audio frequency response

The audio frequency response was measured in accordance with ANSI/TIA 603-D: 2010. 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.



## VOICE MODULATED COMMUNICATION EQUIPMENT

**Part 2.1047(a):** 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.



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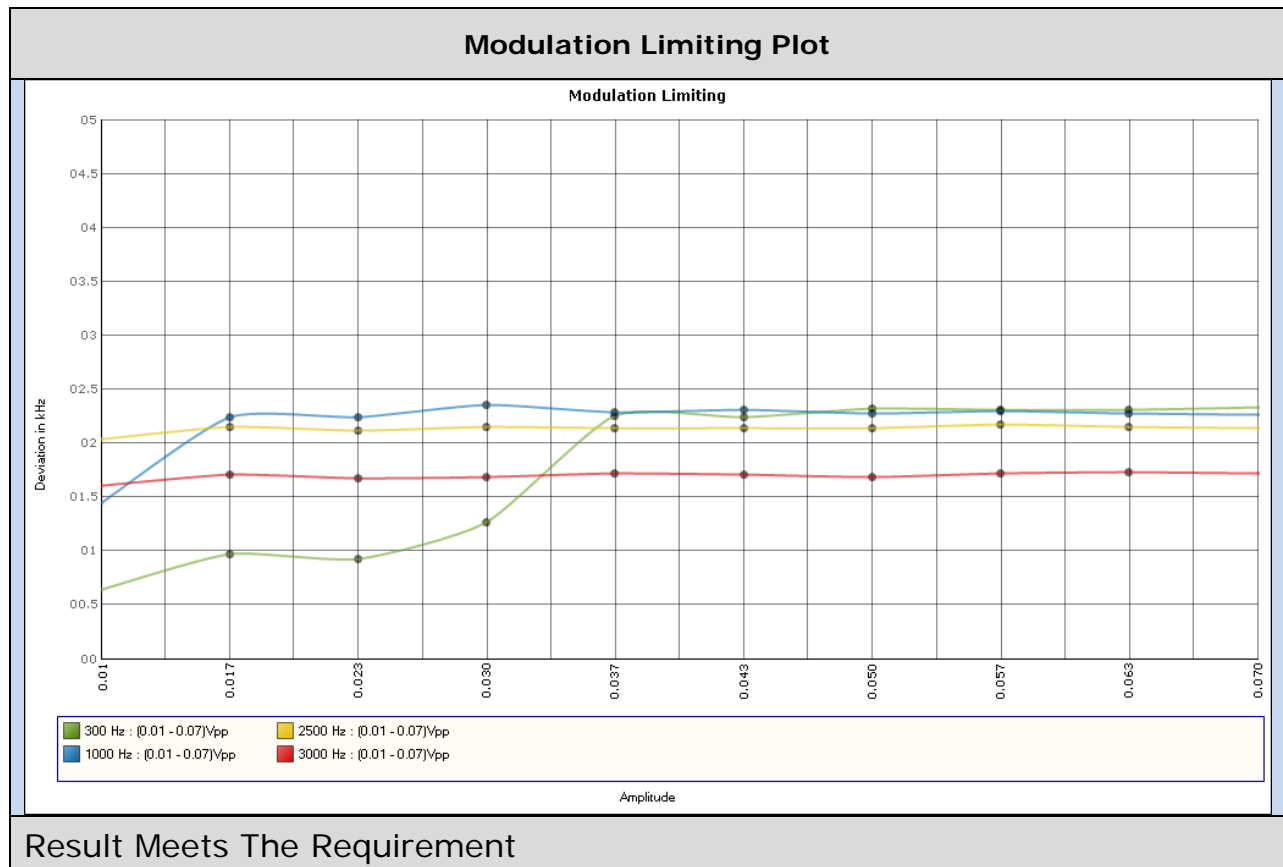
## AUDIO INPUT VERSUS MODULATION

Rule Part No.: Part 2.1047(b) & 90

### 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-D: 2010. The audio input curves versus modulation are shown below. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz.

### Test data:



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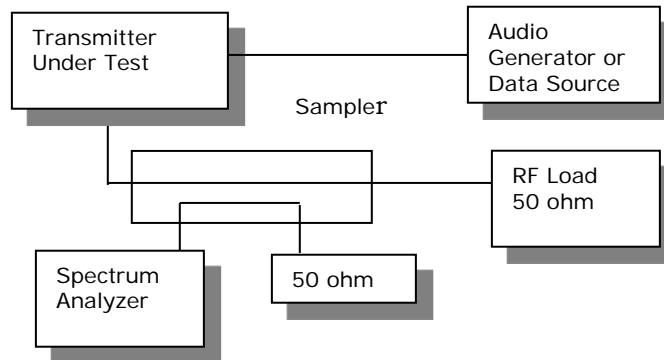
Report: V\VERTEX STANDARD USA\35AUT15\35AUT15TestReport.docx

## OCCUPIED BANDWIDTH

**Rule Part: 2.1049(c)**

**Method of Measurement: ANSI/TIA 603-D: 2010**

**Test Setup Diagram:**



**Test Data:** 11K0F3E Occupied Bandwidth Table

Tuned Frequency (MHz)	Measured Bandwidth (KHz)	Necessary Bandwidth (KHz)	Channel Spacing (KHz)
406.25	5.2	11	12.5
429.75	5.2	11	12.5
450.25	5.2	11	12.5
469.75	5.2	11	12.5

**Notes:** See Spectrum Mask Results for Plots.

## UNWANTED EMISSIONS / EMISSION MASKS

### Rule Part: 90.210(d)

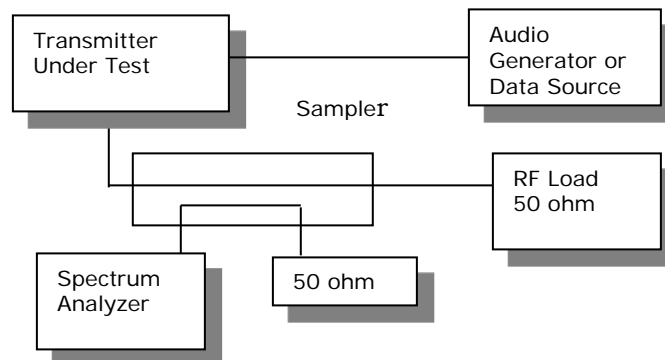
#### Emission Mask D - 12.5 kHz channel BW equipment.

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  $7.27 (f_d - 2.88 \text{ kHz})$  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.

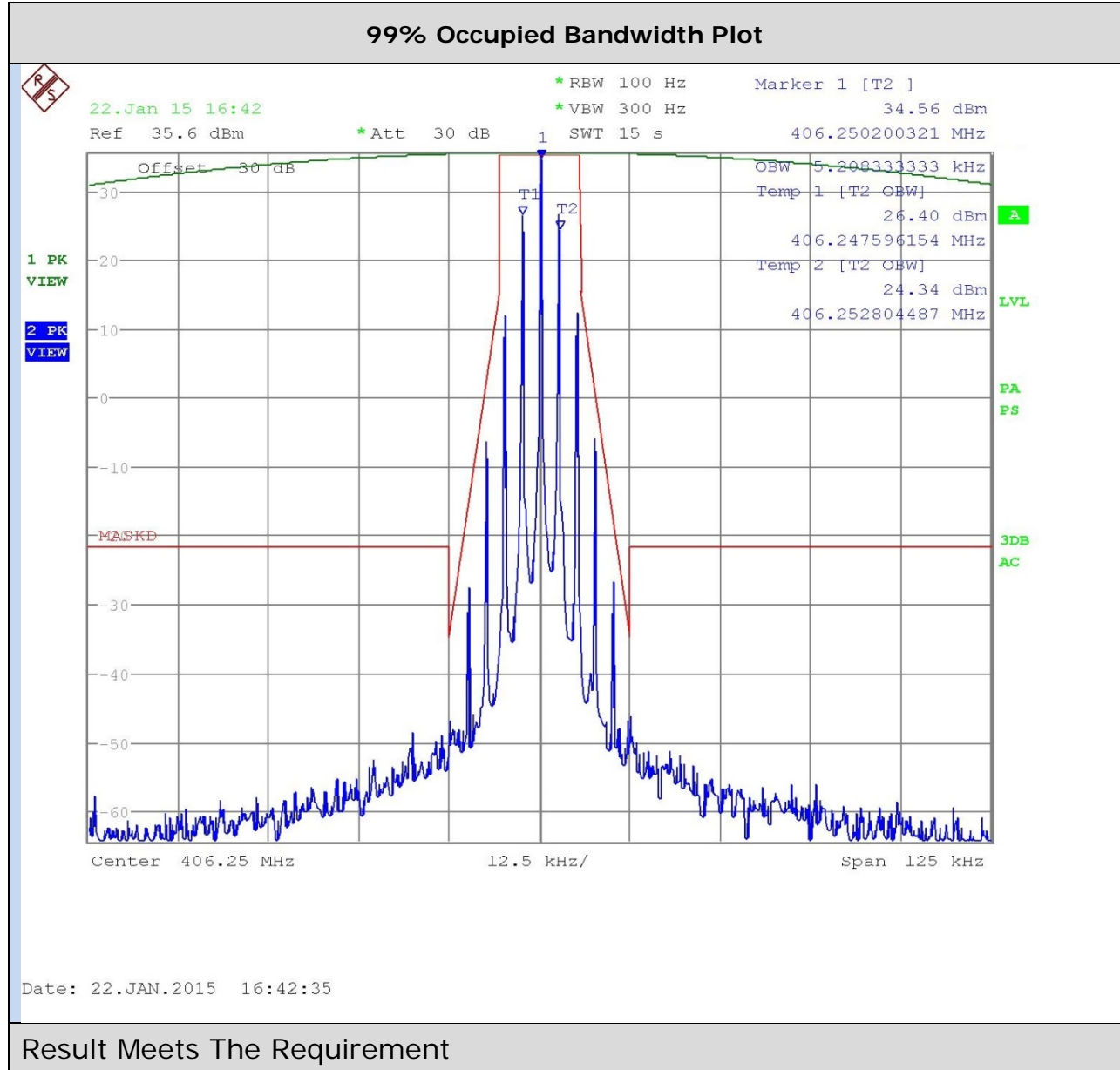
#### Method of Measurement: ANSI/TIA 603-D: 2010

#### Test Setup Diagram:



## UNWANTED EMISSIONS / EMISSION MASKS

Test Data: 11K0F3E Mask D High Power Low End of Band

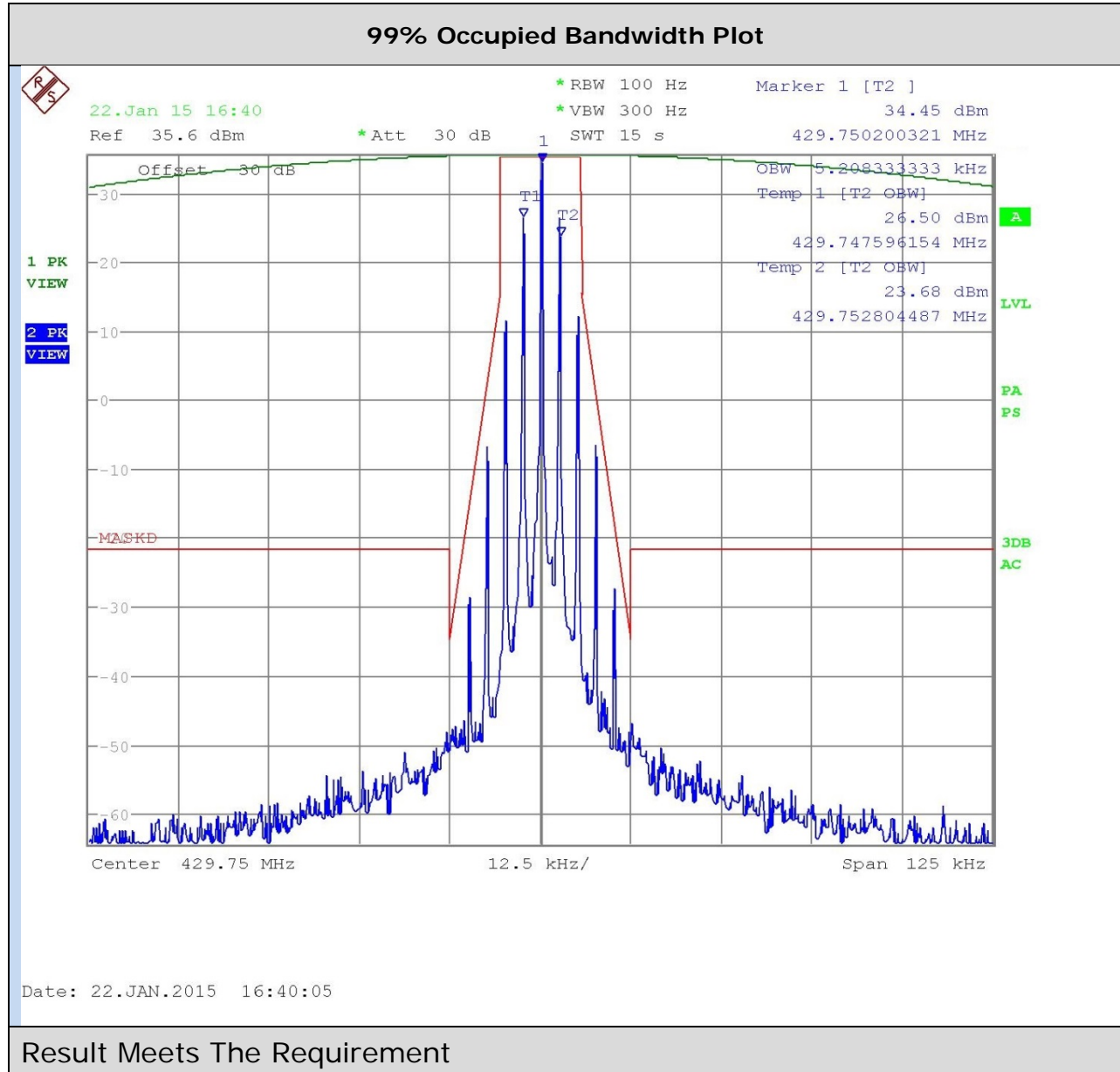


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## UNWANTED EMISSIONS / EMISSION MASKS

Test Data: 11k0F3E High Power Middle of Band

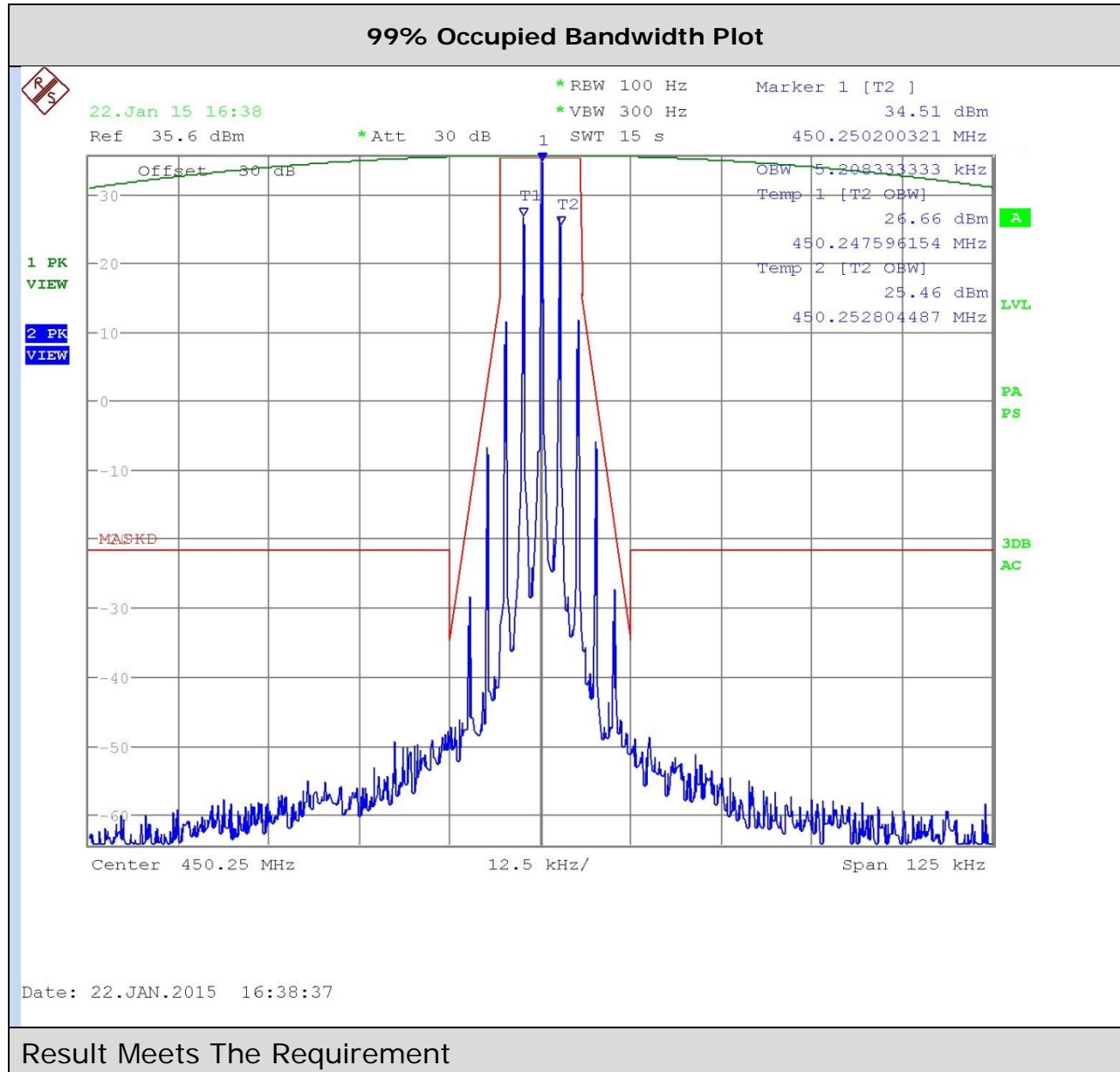


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## UNWANTED EMISSIONS / EMISSION MASKS

Test Data: 11k0F3E High Power Middle of Band



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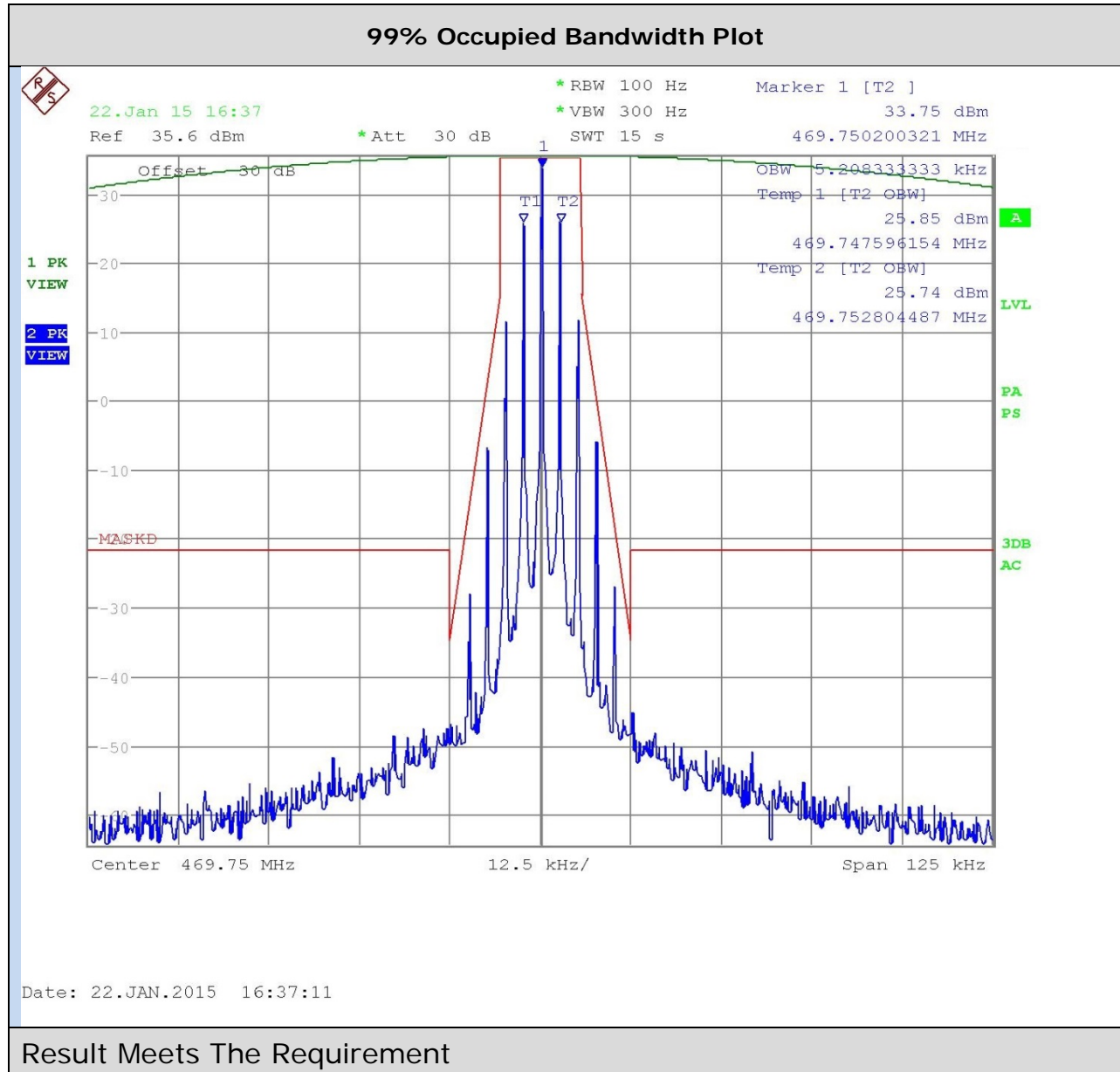
FCC ID: AXI11274620

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## UNWANTED EMISSIONS / EMISSION MASKS

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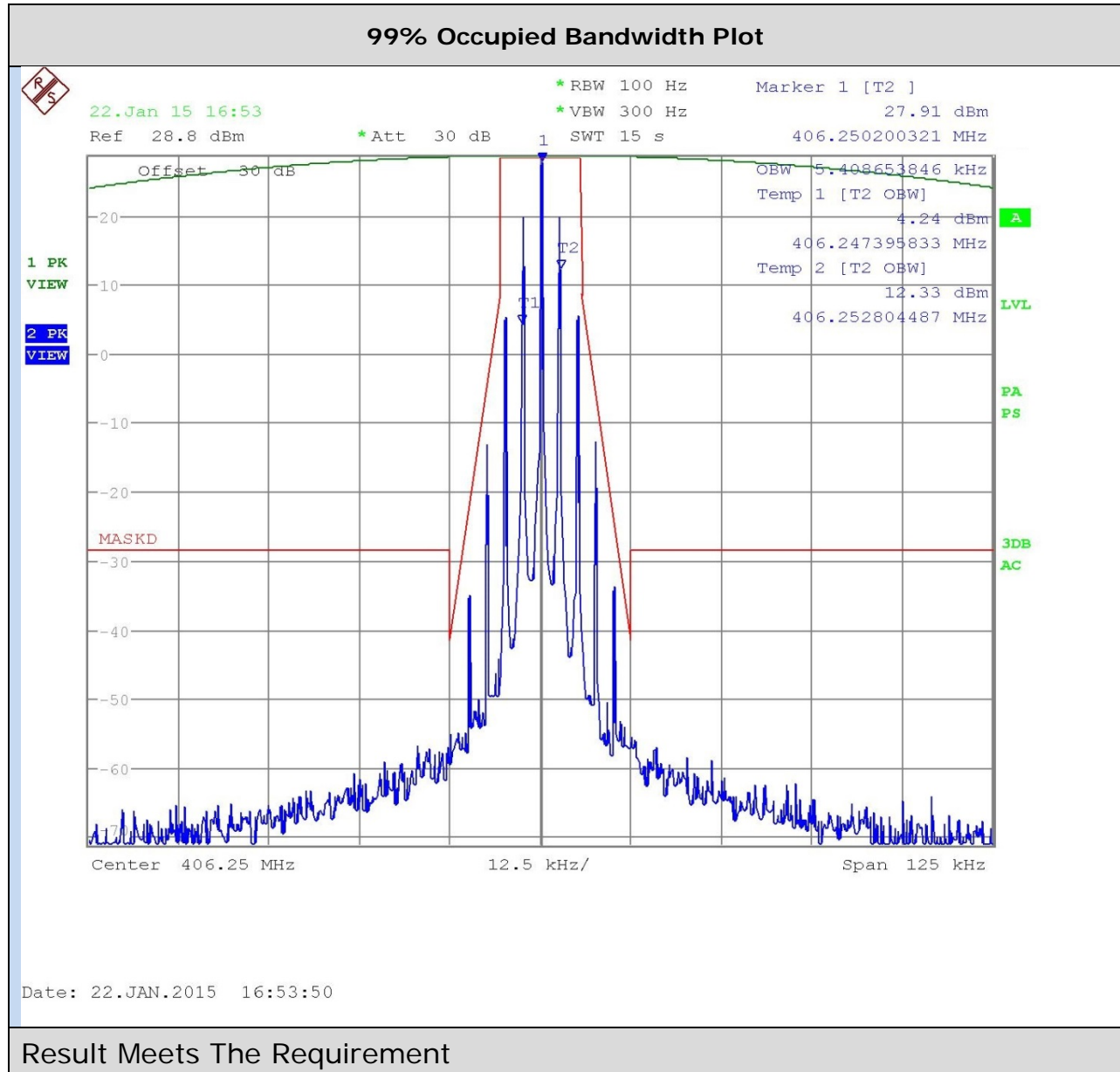


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## UNWANTED EMISSIONS / EMISSION MASKS

Test Data: 11k0F3E Low Power Low end of Band



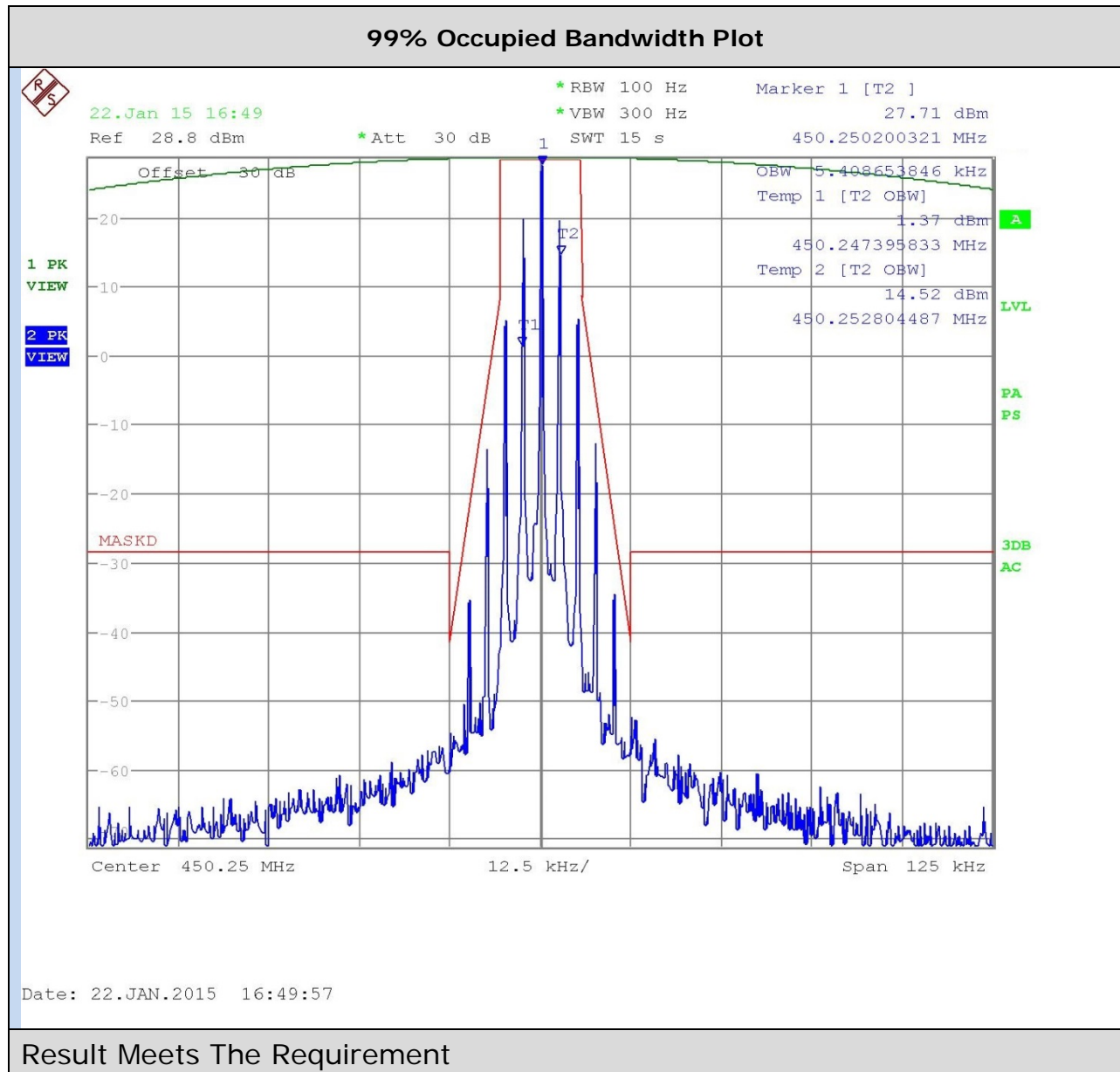
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## UNWANTED EMISSIONS / EMISSION MASKS

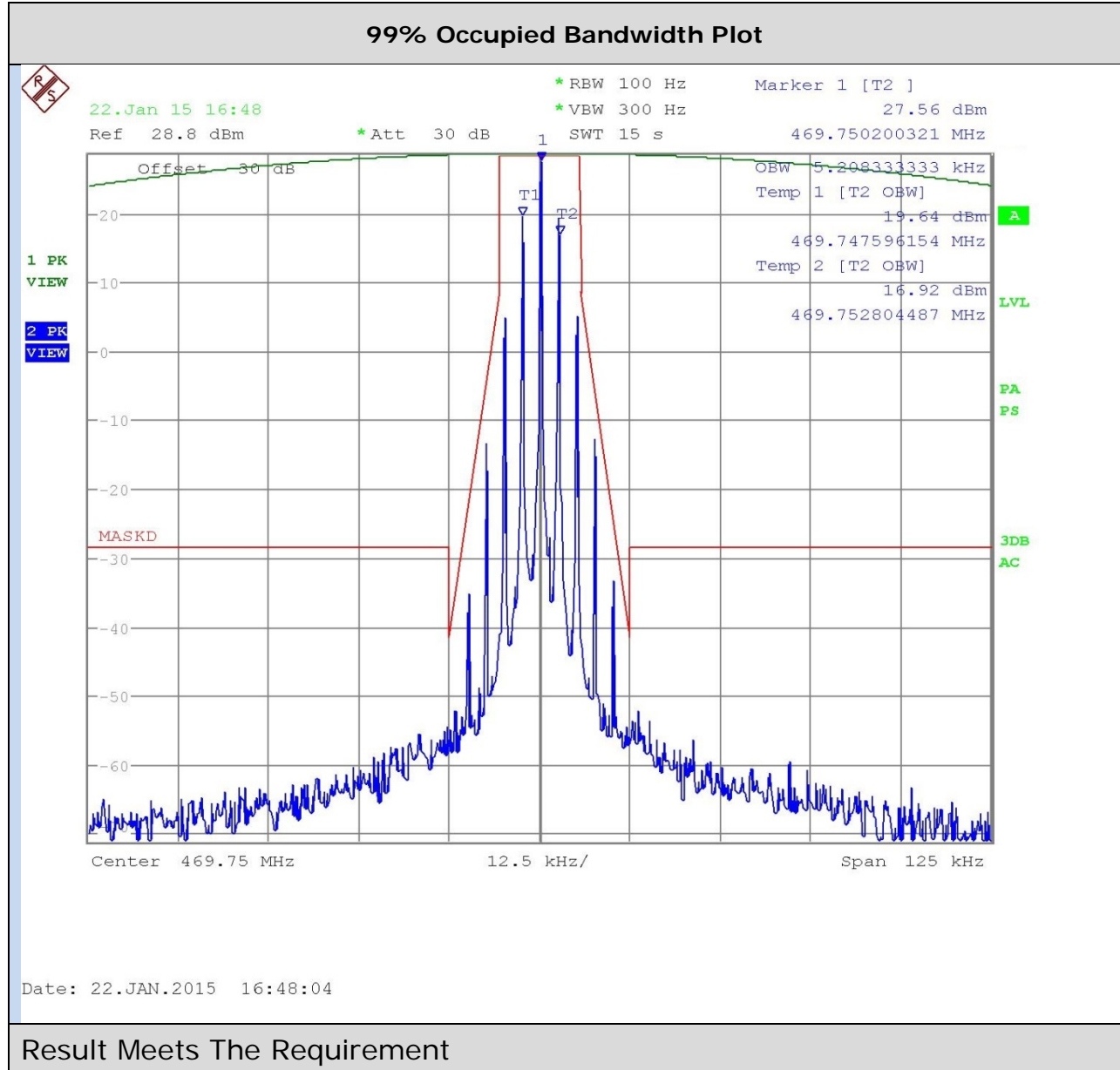
Test Data: 11k0F3E Low Power Middle of Band



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## UNWANTED EMISSIONS / EMISSION MASKS

### 11kOF3E low Power High End of Band



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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS (CONDUCTED)

**Rule Part No.:** Part 2.1051(a)

### Requirements:

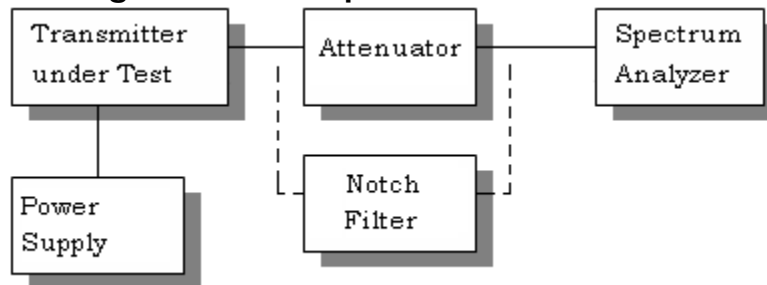
**6.25kHz Channel Spacing** = On any frequency removed from the center of the authorized bandwidth by more than 4.6kHz: At least  $55 + 10\log(P)$  dB or 65 dB, whichever is the lesser attenuation.

12.5 kHz Channel Spacing =  $50 + 10 \log (25.0) = 64.0$  dBc (high power)

12.5 kHz Channel Spacing =  $50 + 10 \log (5.0) = 57.0$  dBc (low power)

**Method of Measurement:** The carrier was modulated 100% using a 2500 Hz tone. The spectrum was scanned from the lowest frequency generated to at least the 10th harmonic of the fundamental. The measurements were made in accordance with standard ANSI/TIA 603-D: 2010.

### Method of Measuring Conducted Spurious Emissions



### Test Data: 11k0F3E High Power Low end of Band

	dBm	Watts	Limit
Power Output	37	5	57
	Frequency	dBc	Margin
	406.25	0	
	812.5	61.1	4.1
	1218.75	105.6	48.6
	1625	NE	
	2031.25	NE	
	2437.5	NE	
	2843.75	NE	
	3250	NE	
	3656.25	NE	
	4062.5	NE	

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### Test Data: 11k0F3E High Power Middle of Band

	dBm	Watts	Limit
Power Output	37	5	57
	Frequency	dBc	Margin
	429.75	0	
	859.5	75	18
	1289.25	102.1	45.1
	1719	NE	
	2148.75	NE	
	2578.5	NE	
	3008.25	NE	
	3438	NE	
	3867.75	NE	
	4297.5	NE	

### Test Data: 11k0F3E High Power Middle of Band

	dBm	Watts	Limit
Power Output	37	5	57
	Frequency	dBc	Margin
	450.25	0	
	900.5	75.1	18.1
	1350.75	102.3	102.3
	1801	NE	
	2251.25	NE	
	2701.5	NE	
	3151.75	NE	
	3602	NE	
	4052.25	NE	
	4502.5	NE	

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### Test Data: 11k0F3E High Power High End of Band

	dBm	Watts	Limit
Power Output	37	5	57
	frequency	dBc	Margin
	469.75	0	
	939.5	88.6	31.6
	1409.25	105.6	48.6
	1879	NE	
	2348.75	NE	
	2818.5	NE	
	3288.25	NE	
	3758	NE	
	4227.75	NE	
	4697.5	NE	

### Test Data: 11k0F3E Low Power Low end of Band

	dBm	Watts	Limit
Power Output	30	1	50
	Frequency	dBc	Margin
	406.25	0	
	812.5	59.8	9.8
	1218.75	107.8	57.8
	1625	NE	
	2031.25	NE	
	2437.5	NE	
	2843.75	NE	
	3250	NE	
	3656.25	NE	
	4062.5	NE	

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### Test Data: 11k0F3E Low Power Middle of Band

	dBm	Watts	Limit
Power Output	30	1	50
	Frequency	dBc	Margin
	429.25	0	
	858.5	71.9	21.9
	1287.75	102.3	52.3
	1717	NE	
	2146.25	NE	
	2575.5	NE	
	3004.75	NE	
	3434	NE	
	3863.25	NE	
	4292.5	NE	

### Test Data: 11k0F3E Low Power Middle of Band

	dBm	Watts	Limit
Power Output	30	1	50
	Frequency	dBc	Margin
	450.25	0	
	900.5	78.9	28.9
	1350.75	103.6	53.6
	1801	NE	
	2251.25	NE	
	2701.5	NE	
	3151.75	NE	
	3602	NE	
	4052.25	NE	
	4502.5	NE	

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## SPURIOUS EMISSIONS AT ANTENNA TERMINALS

### 11k0F3E low Power High End of Band

	dBm	Watts	Limit
Power Output	30	1	50
	Frequency	dBc	Margin
	469.75	0	
	939.5	84.4	34.4
	1409.25	103.8	53.8
	1879	NE	
	2348.75	NE	
	2818.5	NE	
	3288.25	NE	
	3758	NE	
	4227.75	NE	
	4697.5	NE	

**RESULTS: PASS**

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## FIELD STRENGTH OF SPURIOUS EMISSIONS

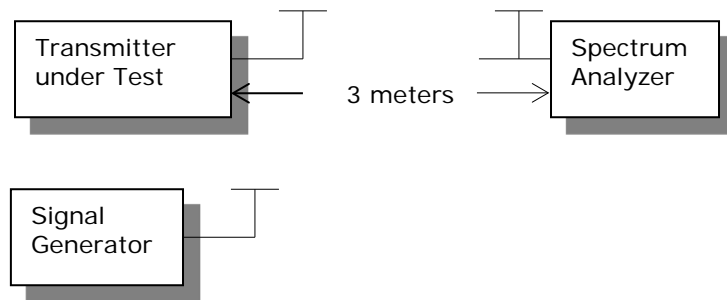
**Rule Parts. No.:** Part 2.1053

### Requirements:

High Power = 12.5 kHz Channel Spacing =  $50 + 10\log(1) = 50$  dBc  
 Low Power = 12.5 KHz Channel Spacing =  $50 + 10\log(5) = 57$  dBc

**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-D: 2010 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:



### Test Data: Low Power High End of Band

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
469.75	Lo	30.00	1.00	50.00	12.50
Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)		Margin	
939.50	H	81.90		31.90	
1,409.25	H	84.34		34.34	
1,879.00	H	97.27		47.27	
2,348.75	H	67.99		47.99	
2,818.50	H	65.88		45.88	
3,288.25	H	63.07		43.07	
3,758.00	H	60.79		40.79	
4,227.75	H	60.22		40.22	
4,697.50	H	63.53		43.53	

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## FIELD STRENGTH OF SPURIOUS EMISSIONS

### Test Data: High Power Low End of Band

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
406.25	Hi	37.00	5.01	57.00	12.50
Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)		Margin	
812.50	H	78.71		21.71	
1,218.75	H	106.68		49.68	
1,625.00	H	69.91		49.91	
2,031.25	H	68.14		48.14	
2,437.50	H	67.43		47.43	
2,843.75	H	65.79		45.79	
3,250.00	H	63.08		43.08	
3,656.25	H	61.68		41.68	
4,062.50	H	57.51		37.51	

### Test Data: High Power High End of Band

Emission Frequency (MHz)	Power Mode	ERP Power Output (dBm)	ERP Power Output (Watts)	FCC Requirement dB	Bandwidth - BW - kHz
469.75	Hi	37.00	5.01	57.00	12.50
Emission Frequency (MHz)	Ant. Polarity	Below Carrier (dBc)		Margin	
939.50	H	84.70		27.70	
1,409.25	H	87.33		30.33	
1,879.00	H	88.50		31.50	
2,348.75	H	87.98		30.98	
2,818.50	V	85.91		28.91	
3,288.25	H	63.07		43.07	
3,758.00	H	60.79		40.79	
4,227.75	H	60.22		40.22	
4,697.50	H	63.53		43.53	

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## FREQUENCY STABILITY

**Rule Parts. No.:** Part 2.1055, Part 90.213

**Requirements:** Temperature range requirements: -30 to +50° C.  
Voltage Variation +, -15%  
±2.5 PPM

**Method of Measurements:** ANSI/TIA 603-D: 2010.

**Test Data:**

Temperature	Frequency MHz	Cycles	PPM
25°C (reference)	450.249859		
-30°C	450.249694	-165	-0.366
-20°C	450.249754	-105	-0.233
-10°C	450.249798	-61	-0.135
0°C	450.249801	-58	-0.129
10°C	450.249839	-20	-0.044
20°C	450.24989	31	0.069
30°C	450.249902	43	0.096
40°C	450.249922	63	0.140
50°C	450.249944	85	0.189
Battery Voltage	Frequency	Cycles	PPM
-15%	450.249874	15	0.033
15%	450.249849	-10	-0.022

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## TRANSIENT FREQUENCY BEHAVIOR

### Part 90.214 Transient Frequency Behavior

**REQUIREMENTS:** Transmitters designed to operate in the 150-174 MHz and 421-512 MHz frequency bands must maintain transient frequencies within the maximum transient frequencies within the maximum frequency difference limits during the time intervals indicated:

Time Intervals	Maximum frequency difference	All Equipment	
		150-174 MHz	421-512 MHz

#### Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels

$t_1^4$	$\pm 25.0$ kHz	5.0 ms	10.0 ms
$t_2$	$\pm 12.5$ kHz	20.0 ms	25.0 ms
$t_3^4$	$\pm 25.0$ kHz	5.0 ms	10.0 ms

#### Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels

$t_1^4$	$\pm 12.5$ kHz	5.0 ms	10.0 ms
$t_2$	$\pm 6.25$ kHz	20.0 ms	25.0 ms
$t_3^4$	$\pm 12.5$ kHz	5.0 ms	10.0 ms

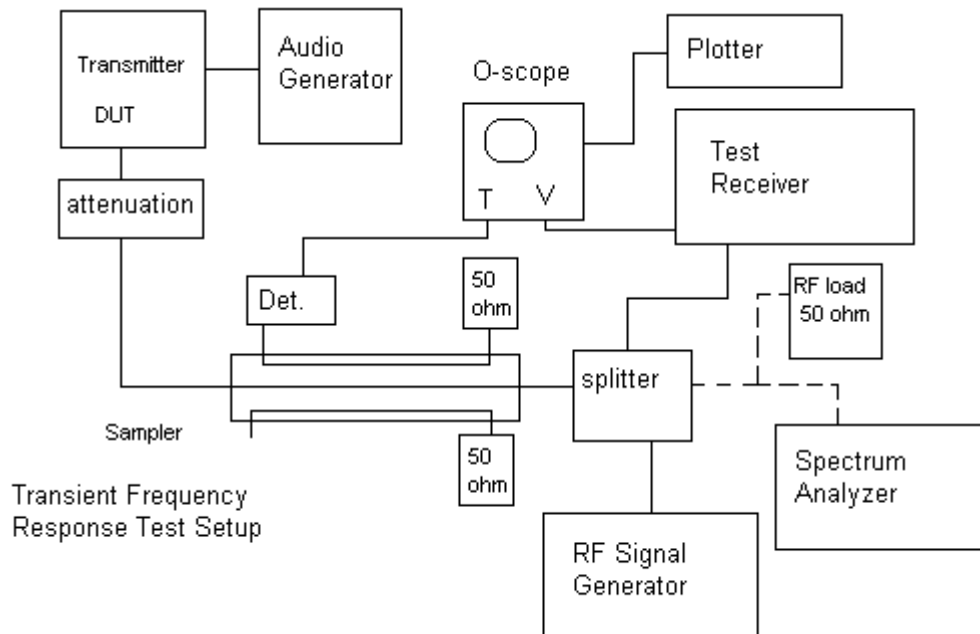
#### Transient Frequency Behavior for Equipment Designed to Operate on 6.25 kHz Channels

$t_1^4$	$\pm 6.25$ kHz	5.0 ms	10.0 ms
$t_2$	$\pm 3.125$ kHz	20.0 ms	25.0 ms
$t_3^4$	$\pm 6.25$ kHz	5.0 ms	10.0 ms

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**TEST PROCEEDURE:** ANSI/TIA 603-D:2010, the levels were set as follows:

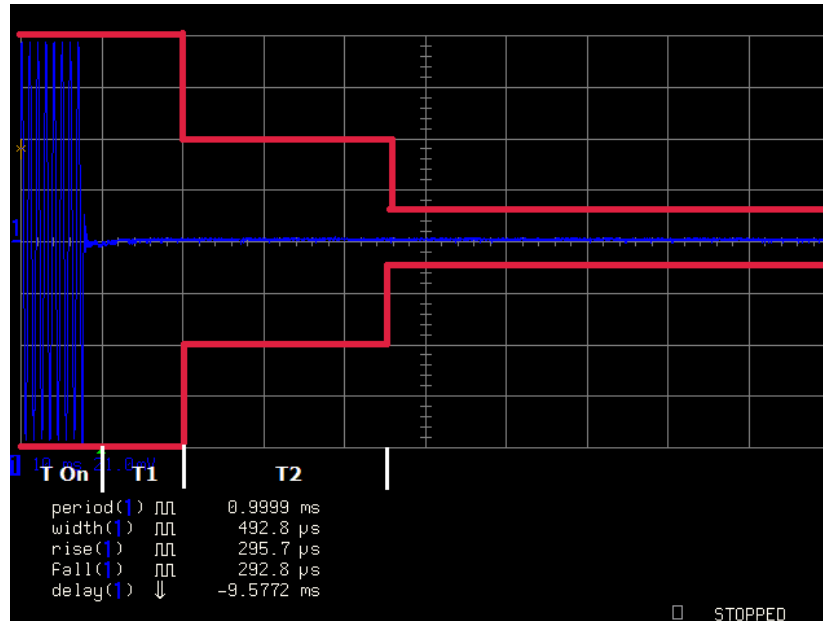
1. Using the variable attenuator the transmitter level was set to 40 dB below the test receivers maximum input level, then the transmitter was turned off.
2. With the transmitter off the signal generator was set 20dB below the level of the transmitter in the above step, this level will be maintained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



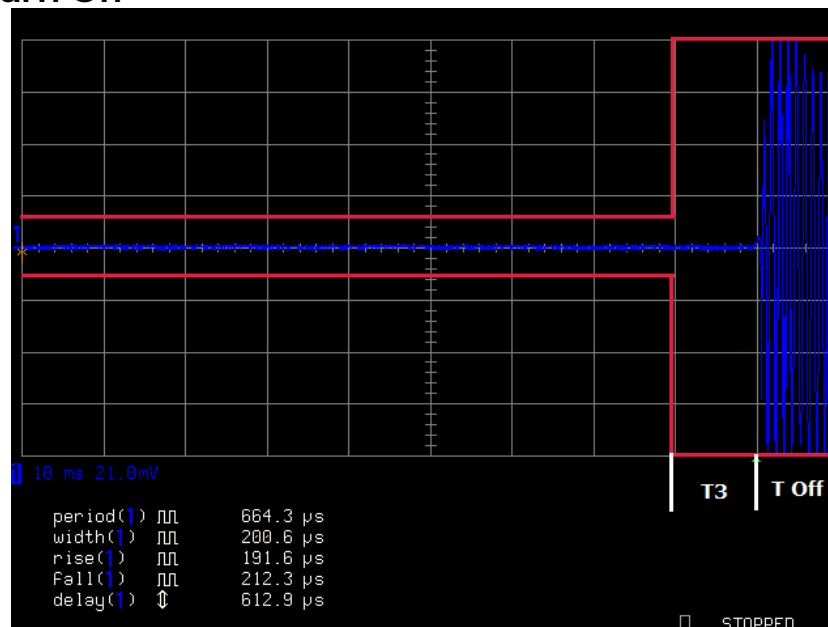
## TRANSIENT FREQUENCY BEHAVIOR

### Test Results:

#### 12.5KHz Turn On



#### 12.5 KHz Turn Off



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## EQUIPMENT LIST

Device	Manufacturer	Model	Serial Number	Cal/Char Date	Due Date
DC Power Supply	HP	6286A	1744A03842	12/12/99	12/12/99
Antenna: Biconnical Chamber	Eaton Chamber	94455-1	1057	06/14/13	06/14/15
Antenna: Log-Periodic Chamber	Eaton	96005	1243	05/31/13	05/31/15
AC Voltmeter	HP	400FL	2213A14728	06/26/13	06/26/15
Digital Multimeter	Fluke	77	35053830	08/22/13	08/22/15
Audio Analyzer	HP	8903B	3011A13084	08/22/13	08/22/15
DC Power Supply	HP	6286A	2411A09414	12/12/99	12/12/99
Frequency Counter Small Chamber	HP	5385A	3242A07460	06/16/13	06/16/15
3-Meter Semi-Anechoic Chamber	Panashield	N/A	N/A	12/31/13	12/31/15
Ant: Double-Ridged Horn/ETS Horn 1 Ch	ETS-Lindgren Chamber	3117	00035923	06/13/14	06/13/16
Audio Analyzer	HP	8903A	2336A03066	08/30/13	08/30/15
Temperature Chamber Small	Thermotron Corp.	S1.2 Mini Max	25-1420-09	08/20/14	08/20/16
EMI Test Receiver R & S ESIB 40 Screen Room	Rohde & Schwarz	ESIB 40	100274	08/12/14	08/12/16
Software: Field Strength Program	Timco	N/A	Version 4.0	12/12/99	12/12/99
Hygro-Thermometer	Extech	445703	0602	06/20/13	06/20/15
30 dB Attenuator	Narda	769-30	10267	03/15/13	03/15/15
EMI Test Receiver R & S ESU 40 Chamber	Rohde & Schwarz	ESU 40	100320	03/11/14	03/11/16
Signal Generator HP 8648C	HP	8648C	3623A02898	08/29/13	08/29/15

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