



RF TEST REPORT



Report No.: FCC_RF_SL13051301-RTC-001 Rev1.2
Supersede Report No.: FCC_RF_SL13051301-RTC-001 Rev1.1

Applicant	Raveon Technologies Corporation		
Product Name	Atlas PT VHF GPS Transponder		
Model No.	RV-PT-VB		
Test Standard	FCC Part 90: 2013		
Test Method	ANSI C63.4: 2009 TIA-603-D: 2009		
FCC ID	SRS-PT-VB		
IC ID	N/A		
Date of test	10/31/2013 - 12/30/2013		
Issue Date	3/14/2014		
Test Result	<u>Pass</u>	Fail	
Equipment complied with the specification			[x]
Equipment did not comply with the specification			[]
			
David Zhang		Choon Sian Ooi	
Test Engineer		Engineer Reviewer	
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only			

Issued By:
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Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.



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Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC , RF/Wireless , Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless , Telecom
Taiwan	BSMI , NCC , NIST	EMC, RF, Telecom , Safety
Hong Kong	OFTA , NIST	RF/Wireless ,Telecom
Australia	NATA, NIST	EMC, RF, Telecom , Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF , Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC , RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom , Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC , RF , Telecom
Canada	IC FCB , NIST	EMC , RF , Telecom
Singapore	iDA, NIST	EMC , RF , Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC (RCB 208)	RF , Telecom
HongKong	OFTA (US002)	RF , Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_RF_SL13051301-RTC-001	None	Original	1/8/2014
FCC_RF_SL13051301-RTC-001 Rev1.0	Rev1.0	Update test result unit	1/20/2014
FCC_RF_SL13051301-RTC-001 Rev1.1	Rev1.1	Correct TIA-603 standard version	2/3/2014
FCC_RF_SL13051301-RTC-001 Rev1.2	Rev1.2	Correct EUT modulation description	3/14/2014

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Raveon Technologies Corporation
Product: Atlas PT VHF GPS Transponder
Model: RV-PT-VB

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	Raveon Technologies Corporation
Applicant Address	2780 La Mirada Drive, Suite C, Vista, CA 92081
Manufacturer Name	Raveon Technologies Corporation
Manufacturer Address	2780 La Mirada Drive, Suite C, Vista, CA 92081

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	Atlas PT VHF GPS Transponder
Model No.	RV-PT-VB
Trade Name	Raveon
Serial No.	N/A
Input Power	12VEC
Power Adapter Manu/Model	N/A
Power Adapter SN	-
Hardware version	N/A
Software version	N/A
Date of EUT received	10/15/2013
Equipment Class/ Category	Class B
Clock Frequencies	150MHz - 174MHz
Port/Connectors	N/A
Remark	NONE

6.2 Radio Description

Spec for Radio -

Radio Type	VHF radio
Operating Frequency	150 – 174 MHz
Modulation	GFSK
BW	12.5KHz

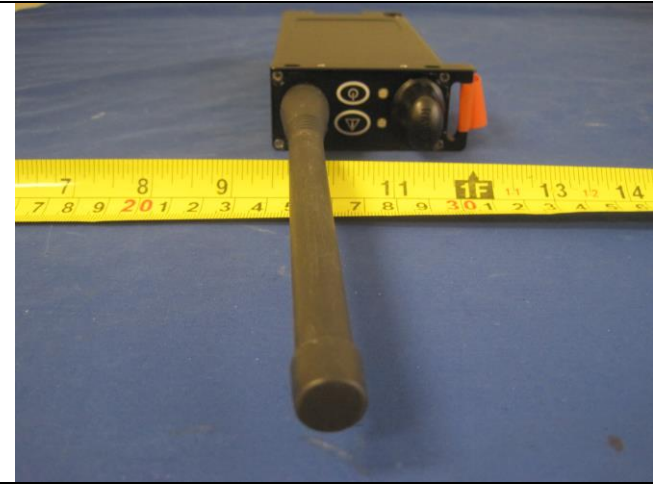
Antenna Type	External Omni-directional antenna
Antenna Gain	1.8 dBi
Antenna Connector Type	TNC-J

6.3 EUT test modes/configuration Description

Test mode

Final Test Mode	Note
Final_test_mode_1	Cont-TX @ Low CH
Final_test_mode_2	Cont-TX @ Mid CH
Final_test_mode_3	Cont-TX @ High CH
Final_test_mode_4	-
Final_test_mode_5	-
Final_test_mode_6	-
Final_test_mode_7	-
Final_test_mode_8	-
Final_test_mode_9	-
Remark:	

6.4 EUT Photos - External



EUT – Front View



EUT – Rear View



EUT – Left View



EUT – Right View



EUT – Top View



EUT – Bottom View



Antenna – Top View



Antenna – Port View

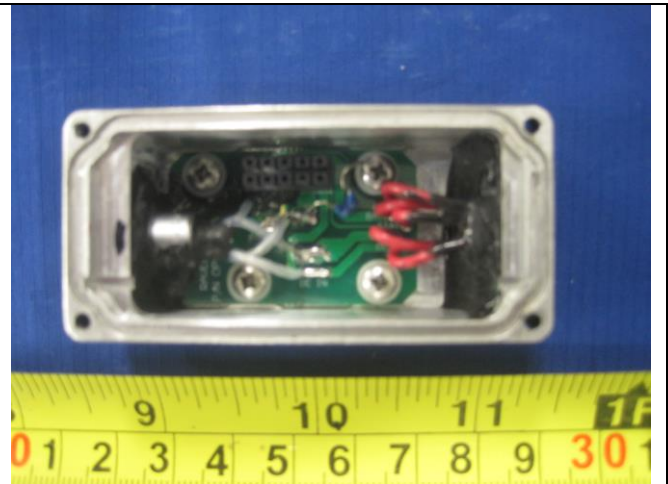


USB Cable used during testing

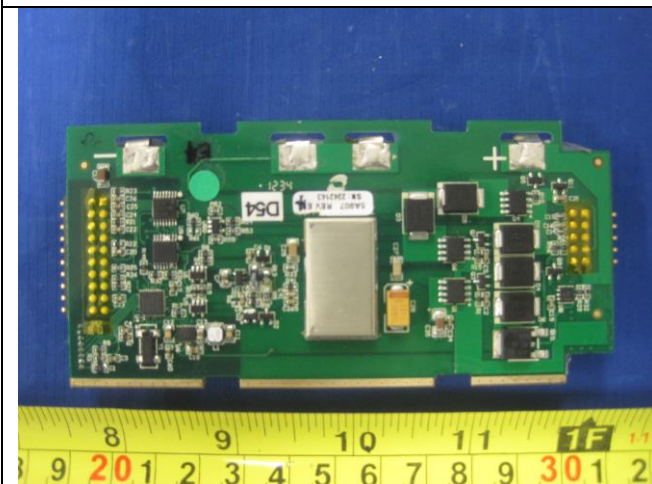
6.5 EUT Photos - Internal



EUT Cover Off View-1



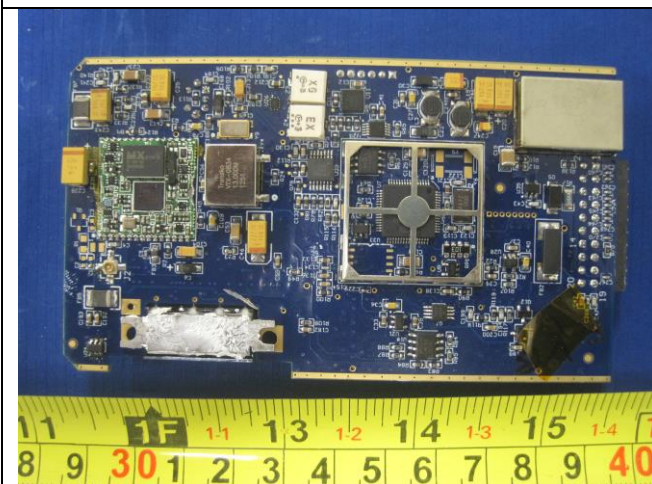
EUT Cover Off View-2



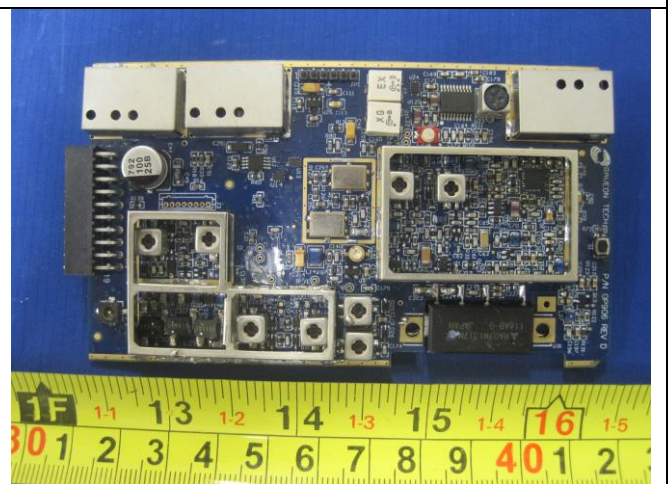
PCBA1 Top View



PCBA1 Bottom View



PCBA2 Top View

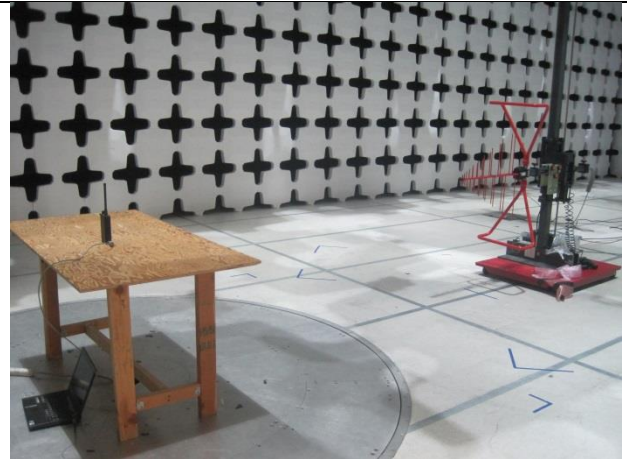


PCBA2 Bottom View

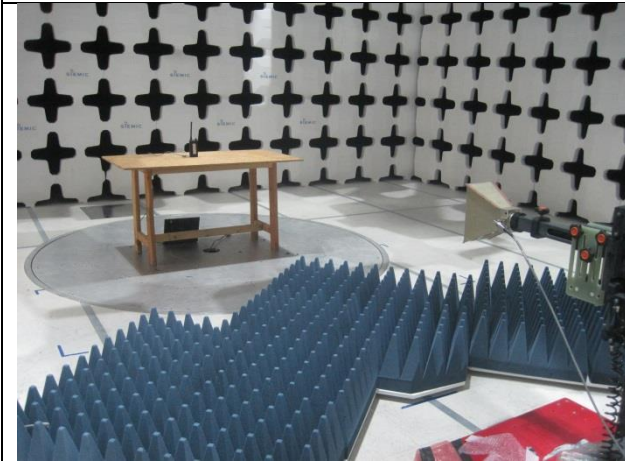
6.6 EUT Test Setup Photos



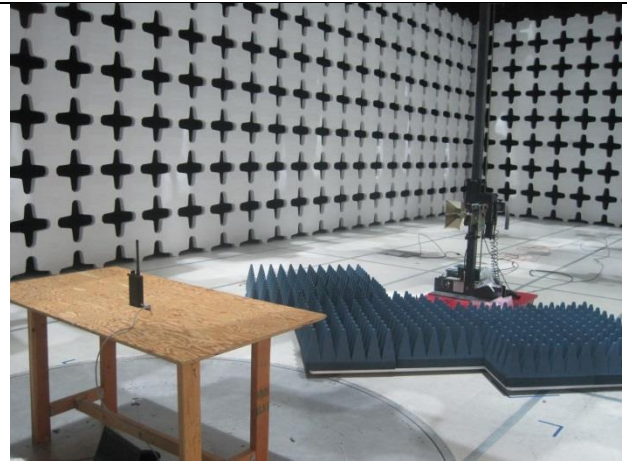
Radiated Emissions (<1GHz) – Front View



Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (>1GHz) – Front View



Radiated Emissions (>1GHz) – Rear View

8 Test Summary

Emissions			
Test Item	Test standard	Test Method/Procedure	Pass / Fail
RF Output Power	47 CFR 2.1046, 47 CFR 90.205	TIA-603-D 2.2.1	Pass
Modulation characteristic	47 CFR 2.1047, 47 CFR 90.207	TIA-603-D 2.2.1	N/A
Occupied Bandwidth	47 CFR 2.1049, 47 CFR 90.209	ANSI C63.4	Pass
Emission Mask	47 CFR 2.1049, 47 CFR 90.209	TIA-603-D 2.2.11	Pass
Spurious Emission at Antenna Terminals	47 CFR 2.1051	TIA-603-D 2.2.11	Pass
Frequency Stability	47 CFR 2.1055, 47 CFR 22.355, 47 CFR 90.213	TIA-603-D 2.2.11	Pass
Field Strength of Spurious radiation	47 CFR 2.1053, 47 CFR 90.210	TIA-603-D 2.2.11	Pass
Transient Frequency Behavior	47 CFR 90.214	TIA-603-D 2.2.2 / 2.3.2	Pass


9 Measurement Uncertainty

Emissions			
Test Item	Frequency Range	Description	Uncertainty
Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Radiated Spurious Emissions	1GHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+4.3dB/-4.1dB

10 Measurements, Examination and Derived Results

10.1 RF Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
47 CFR 90.205	-	Conducted RF Output Power	<input checked="" type="checkbox"/>
Test Setup			
Test Procedure	<ul style="list-style-type: none"> - EUT was set for low , mid, high channel with modulated mode and highest RF output power. - The spectrum analyzer was connected to the antenna terminal. 		
Test Date	10/31/2013	Environmental condition	Temperature 23°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	EUT bandwidth: 12.5 KHz		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
Output Power	100 KHz	300 KHz	1MHz	PK	Auto	Maxhold	-

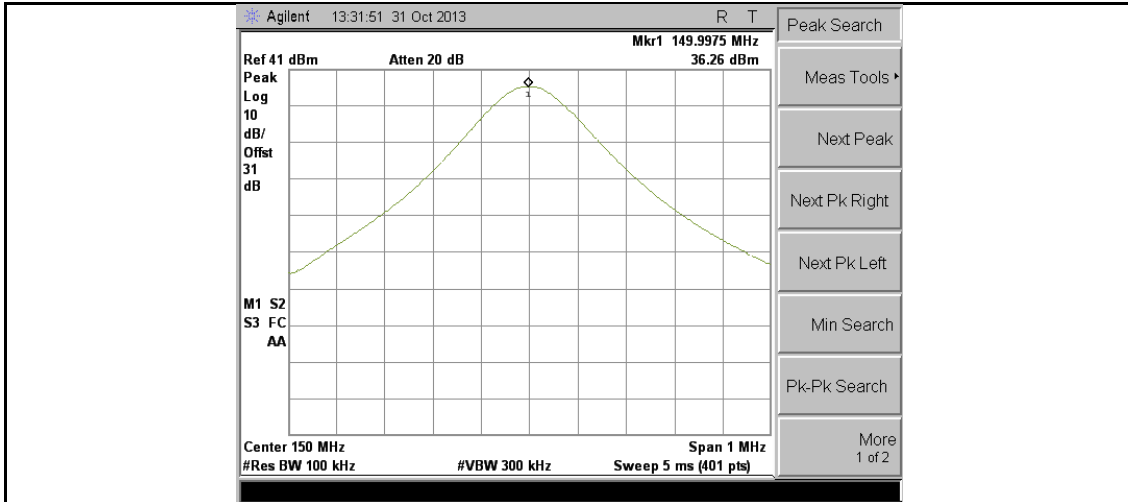
Test Data Yes N/A

Test Plot Yes (See below) N/A

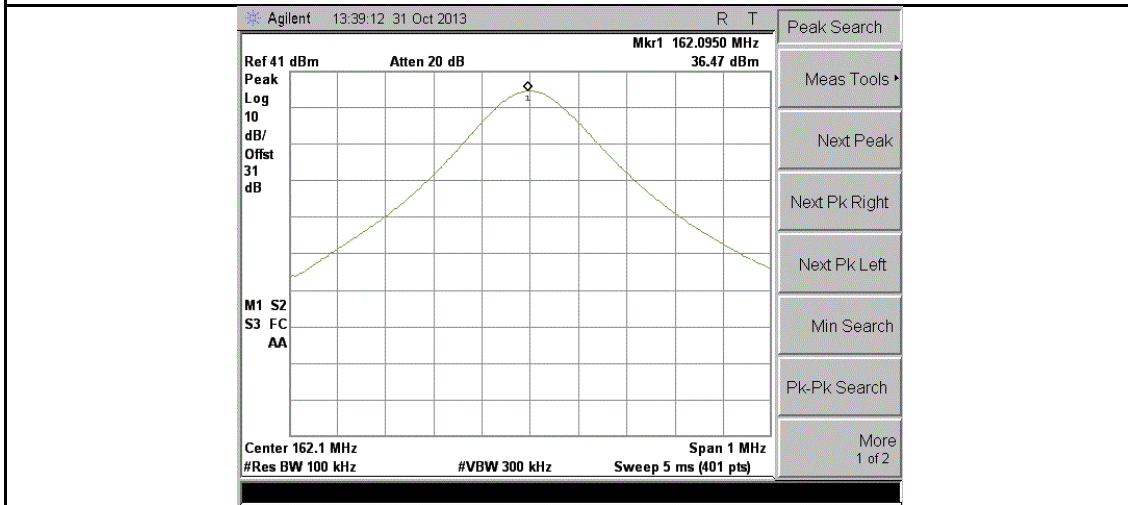
Test Data

Channel	Channel Frequency (MHz)	Power (dBm)
Low	150.00	36.26
Mid	162.10	36.47
High	174.00	36.09

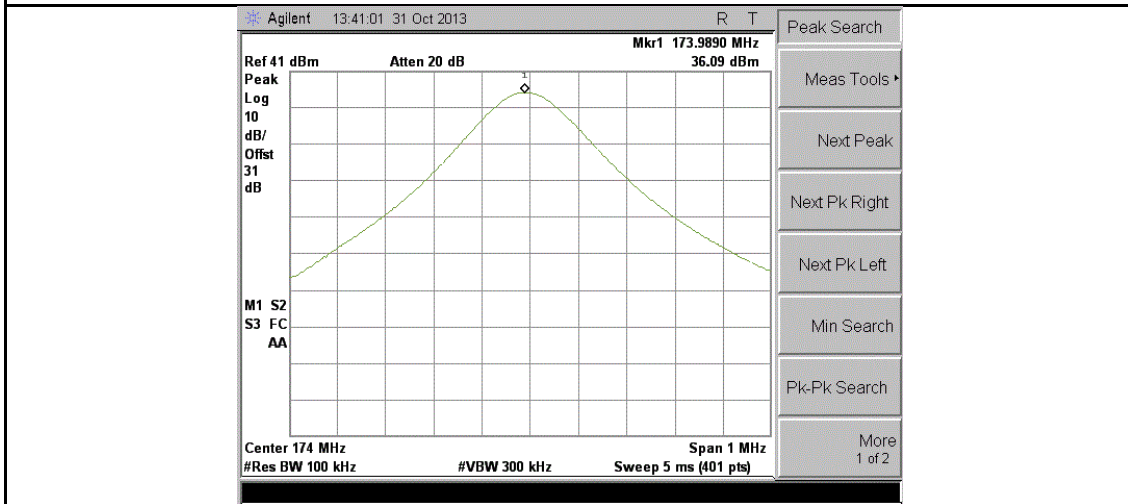
Test Plots



Output Power Low CH



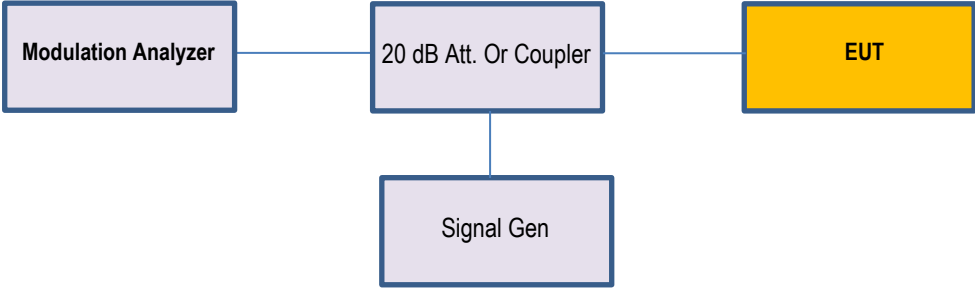
Output Power Mid CH



Output Power High CH

10.2 Modulation characteristic

Requirement(s):


Spec	Requirement	Applicable									
47 CFR 90.207	(a) Equipment which utilizes voice modulated communication shall show the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz. For equipment which is required to have a low pass filter, the frequency response of the filter, or all of the circuitry installed between the modulation limited and the modulated stage shall be supplied.	<input type="checkbox"/>									
	(b) Equipment which employs modulation limiting, a curve showing the percentage of modulation versus the modulation input voltage shall be supplied.	<input type="checkbox"/>									
Test Setup	 <pre> graph LR MA[Modulation Analyzer] --- AC[20 dB Att. Or Coupler] AC --- EUT[EUT] SG[Signal Gen] --- AC </pre>										
Procedure	<p>Modulation Limit</p> <ol style="list-style-type: none"> Configure the EUT as shown in diagram above, adjust the audio input for 60% of rated system deviation at 1 KHz using this level as a reference (0 dB) and vary the input level from -20 dB to + 20 dB. Record the frequency deviation obtained as a function of the input level. Repeat step 1 with input frequency changing to 300, 1004, 1500 and 2500Hz in sequence. <p>Audio Frequency Response</p> <ol style="list-style-type: none"> Configure the EUT as shown in diagram above. Adjust the audio input for 20% of rated system deviation at 1KHz using this level as a reference (0 dB). Vary the Audio frequency from 100 Hz to 3 KHz and record the frequency deviation. Audio frequency Response=$20 \log_{10}$ (Deviation of test frequency/Deviation of 1 KHz reference) 										
Test Date	N/A	<table border="1"> <tr> <td>Environmental condition</td> <td>Temperature</td> <td>N/A</td> </tr> <tr> <td></td> <td>Relative Humidity</td> <td>N/A</td> </tr> <tr> <td></td> <td>Atmospheric Pressure</td> <td>N/A</td> </tr> </table>	Environmental condition	Temperature	N/A		Relative Humidity	N/A		Atmospheric Pressure	N/A
Environmental condition	Temperature	N/A									
	Relative Humidity	N/A									
	Atmospheric Pressure	N/A									
Remark	EUT doesn't use voice modulated communication and it's using digital modulation (GFSK), so the modulation characteristic requirement is not applicable.										
Result	<input type="checkbox"/> Pass <input type="checkbox"/> Fail										

Test Data Yes N/A

Test Plot Yes (See below) N/A

10.3 Occupied Bandwidth

Requirement(s):

Spec	Requirement	Applicable
47 CFR 90.209	Operations using equipment designed to operate with a 25 kHz channel bandwidth will be authorized a 20 kHz bandwidth.	<input type="checkbox"/>
	Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized a 11.25 kHz bandwidth.	<input checked="" type="checkbox"/>
	Operations using equipment designed to operate with a 6.25 kHz channel bandwidth will be authorized a 6 kHz bandwidth.	<input type="checkbox"/>
Test Setup		
Procedure	<ol style="list-style-type: none"> EUT was set for low , mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal. Both the 99% and 26 dB bandwidth are measured using spectrum analyzer's internal meas function. 	
Test Date	10/31/2013	Environmental condition Temperature 23°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	EUT bandwidth: 12.5 KHz	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
99% Bandwidth	Around 1% SPAN	3 x RBW	≥EBW	PK	Auto	Maxhold	-

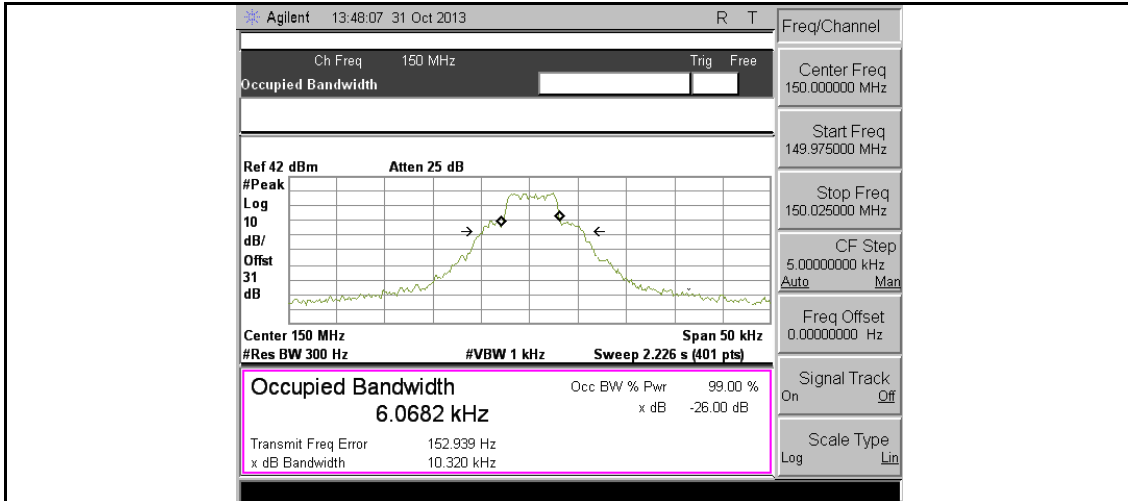
Test Data Yes N/A

Test Plot Yes (See below) N/A

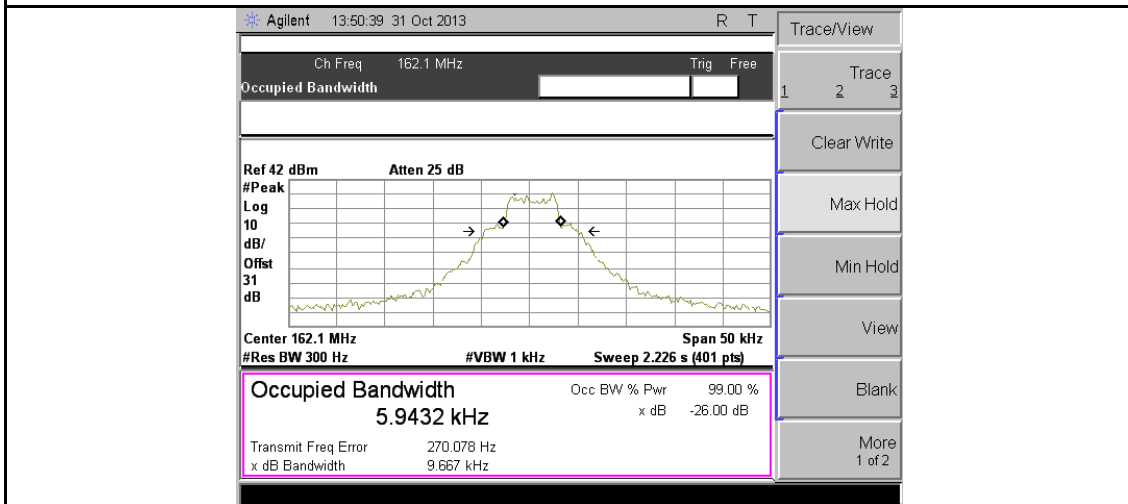
99% Bandwidth measurement result

Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (KHz)	26 dB Bandwidth (KHz)
Low	150.00	6.068	10.320
Mid	162.10	5.943	9.667
High	174.00	6.939	10.227

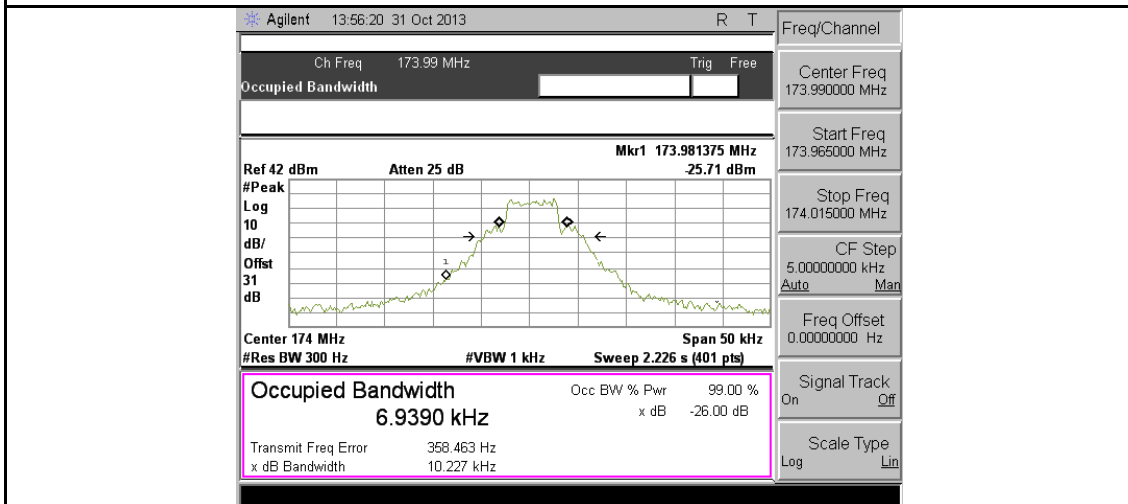
Test Plots



99% & 26 dB BW Low CH




99% & 26 dB Mid CH



99% & 26 dB High CH

10.4 Emission Mask

Requirement(s):

Spec	Item	Requirement	Applicable
47 CFR 90.209	a)	<i>Emission Mask C.</i> For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows: (1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_{ain} kHz) of more than 5 kHz, but not more than 10 kHz: At least $83 \log(f_a/5)$ dB; (2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_{ain} kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least $29 \log(f_a^2/11)$ dB or 50 dB, whichever is the lesser attenuation; (3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log(P)$ dB.	<input type="checkbox"/>
	b)	<i>Emission Mask D—12.5 kHz channel bandwidth equipment.</i> 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 removed from the center of the authorized bandwidth by a displacement frequency (f_{ain} kHz) of more than 5.625 kHz but no more than 12.5 kHz: At least $7.27(f_a - 2.88 \text{ kHz})$ dB. (3) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_{ain} kHz) of more than 12.5 kHz: At least $50 + 10 \log(P)$ dB or 70 dB, whichever is the lesser attenuation.	<input checked="" type="checkbox"/>
Test Setup			
Test Procedure	<ol style="list-style-type: none"> EUT was set for low, mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal. 		
Test Date	10/31/2013	Environmental condition	Temperature 23°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	EUT bandwidth: 12.5 KHz		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

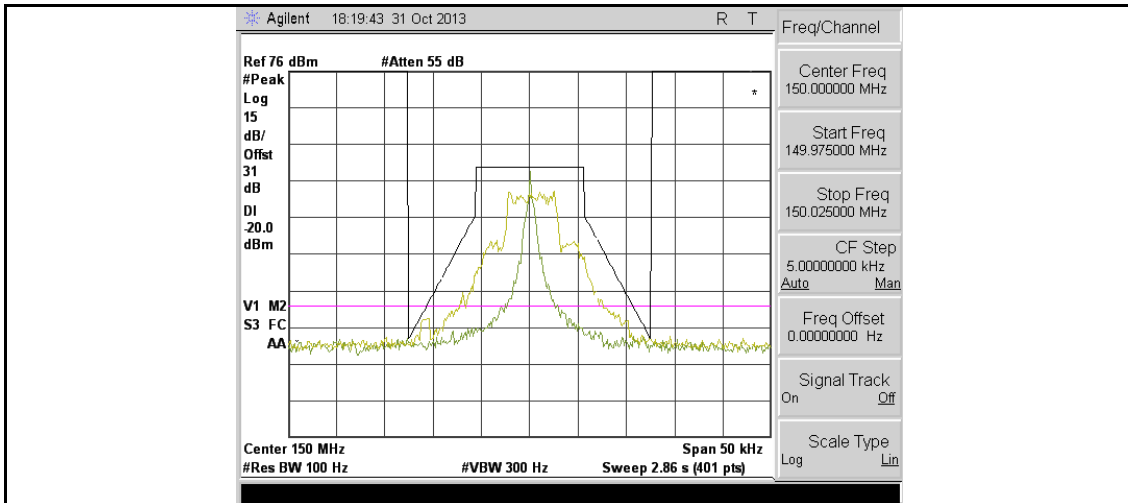
Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
Channel Separation	100 Hz	$\geq 3 \times \text{RBW}$	50 KHz	PK	Auto	Maxhold	-

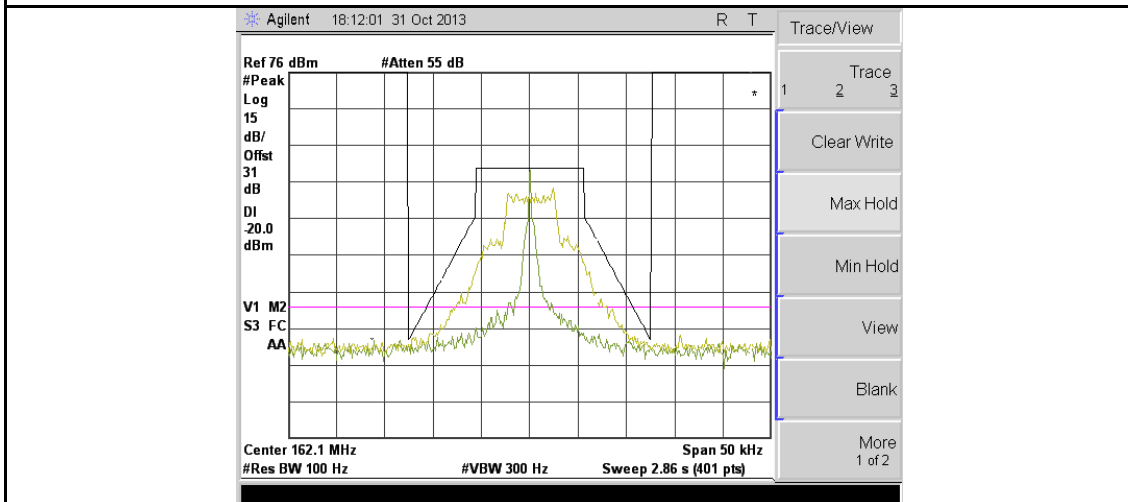
Test Data Yes N/A

Test Plot Yes (See below) N/A

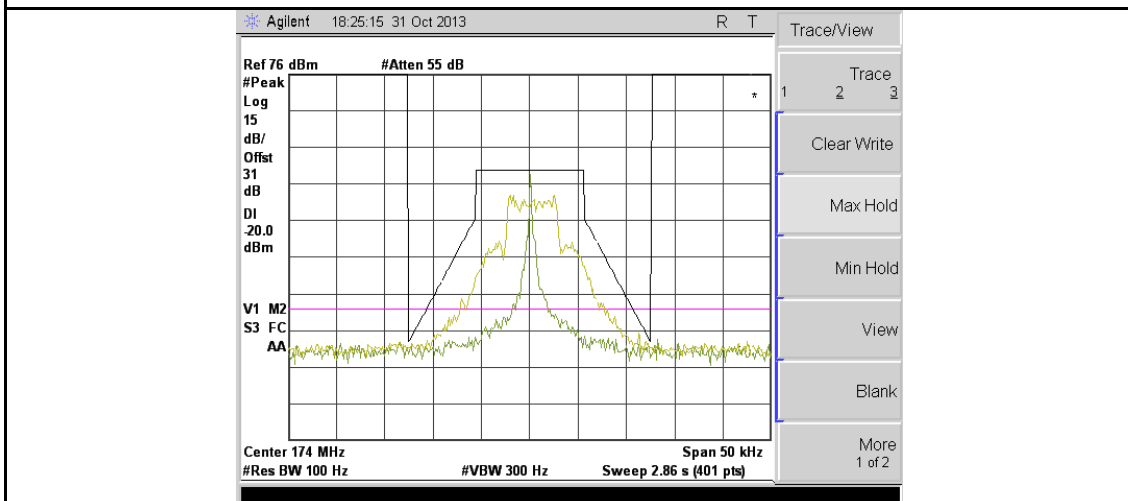
Test Plots



Emission Mask Low CH




Emission Mask Mid CH



Emission Mask High CH

10.5 Spurious Emissions at Antenna Terminals

Requirement(s):

Spec	Item	Requirement	Applicable
47 CFR 2.1051	a)	For Operating channel bandwidth 12.5KHz On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_{a} in kHz) of more than 12.5 kHz: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation	<input type="checkbox"/>
	b)	For Operating channel bandwidth 25KHz On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.	<input checked="" type="checkbox"/>
Test Setup			
Test Procedure	<ol style="list-style-type: none"> EUT was set for low , mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal. 		
Test Date	11/01/2013	Environmental condition	Temperature 23°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	<ol style="list-style-type: none"> EUT bandwidth: 12.5 KHz Frequency emission in 150-174MHz is carrier frequency emission. 		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

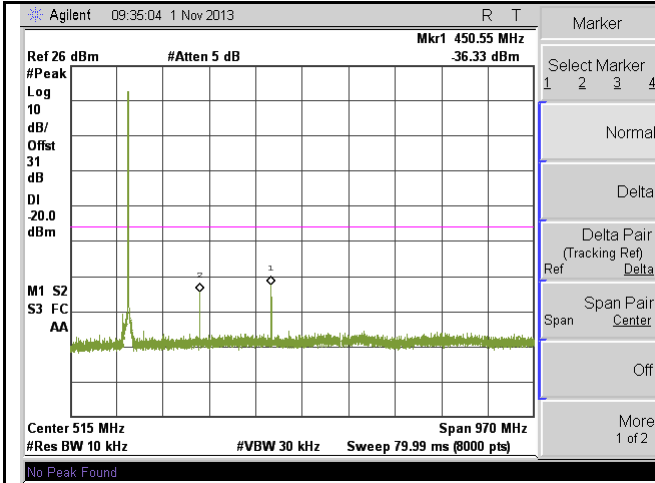
Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
CSE-TX	10 KHz	$\geq 3 \times \text{RBW}$	-	PK	Auto	Maxhold	For below 1GHz
CSE-TX	1MHz	$\geq 3 \times \text{RBW}$	-	PK	Auto	Maxhold	For above 1GHz

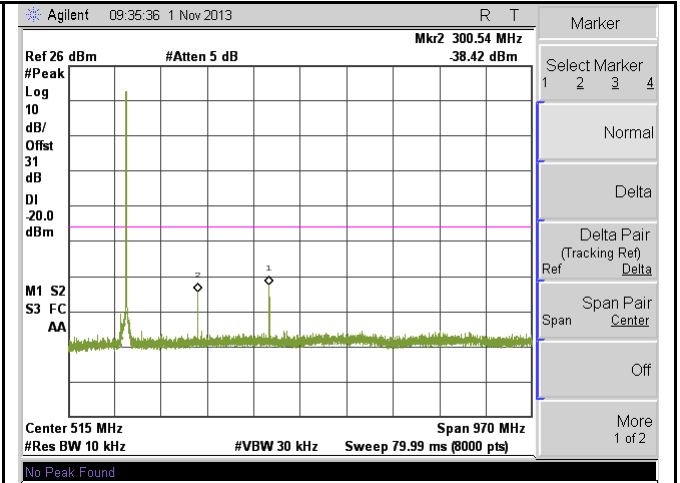
Test Data Yes N/A

Test Plot Yes (See below) N/A

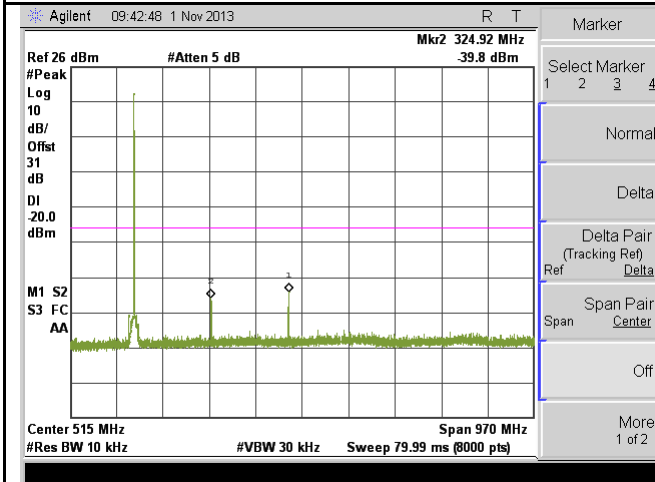
Test Plots – Below 1GHz measurement



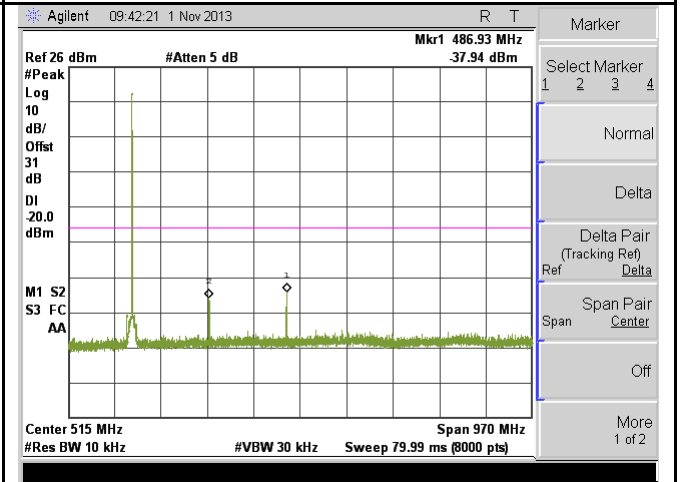
CSE_Low CH_below 1GHz-Marker 1



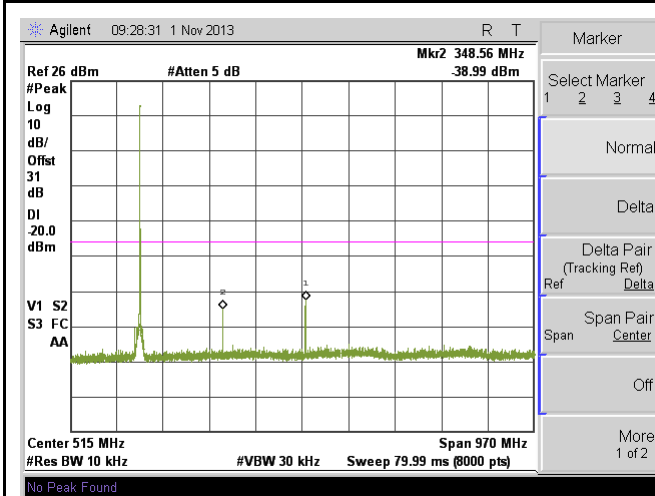
CSE_Low CH_below 1GHz-Marker 2



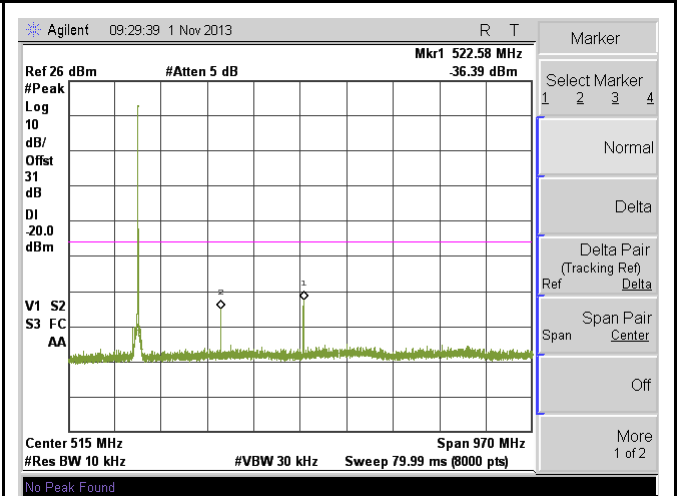
CSE_Mid CH_below 1GHz-Marker 1



CSE_Mid CH_below 1GHz-Marker 2

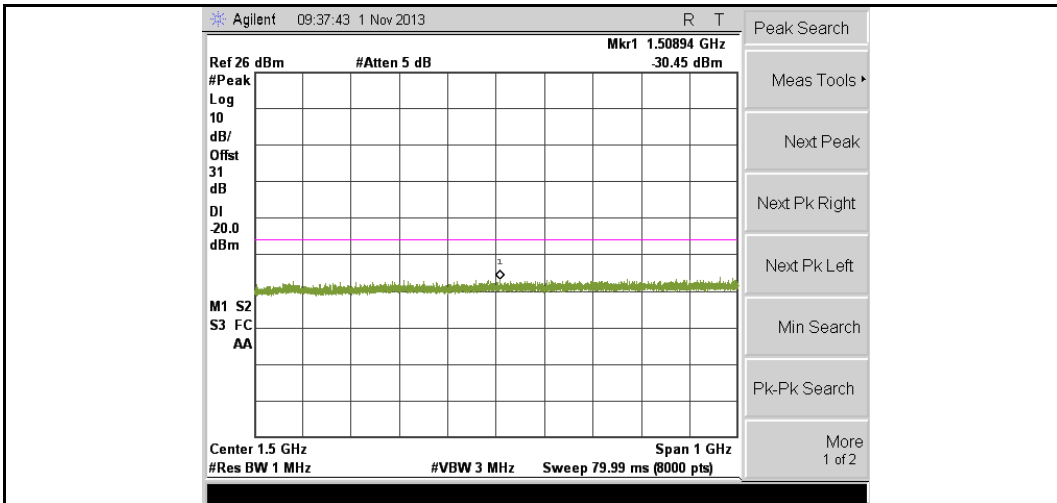


CSE_High CH_below 1GHz-Marker 1

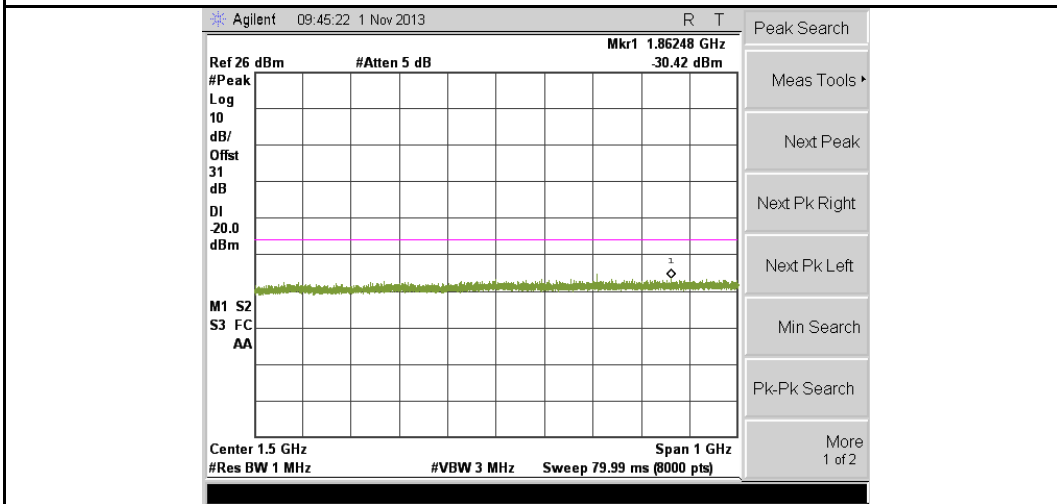


CSE_High CH_below 1GHz-Marker 2

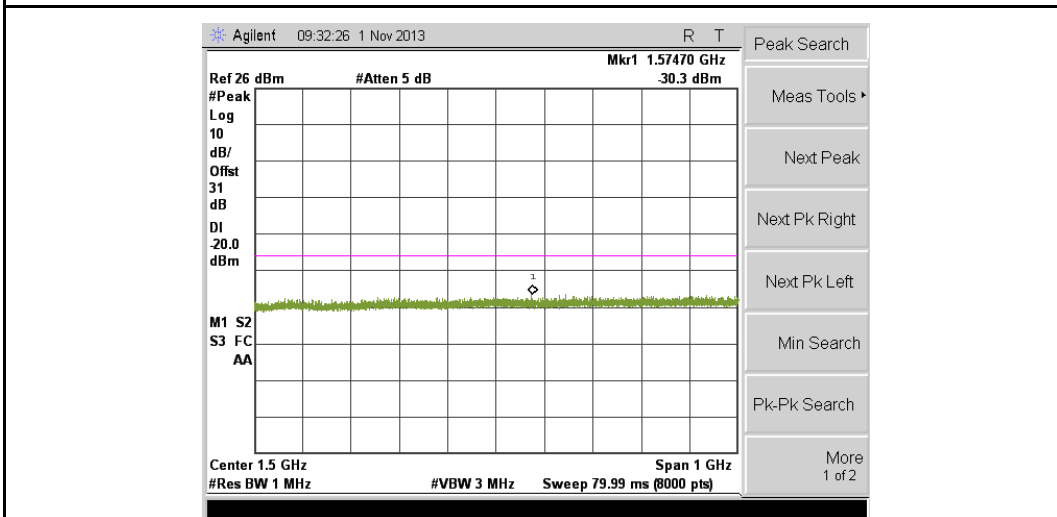
Test Plots – Above 1GHz measurement



CSE_Low CH_ above 1GHz




CSE_Mid CH_ above 1GHz



CSE_High CH_ above 1GHz

10.6 Frequency Stability

Requirement(s):

Spec	Item	Requirement	Applicable
47 CFR 2.1055, 47 CFR 90.213	-	For output power >2 watts, the limit is 5.0ppm	<input checked="" type="checkbox"/>
Test Setup			
Test Procedure	1. EUT was set for low , mid, high channel with modulated mode and highest RF output power. 2. The spectrum analyzer was connected to the antenna terminal.		
Test Date	11/01/2013	Environmental condition	Temperature 23°C Relative Humidity 47% Atmospheric Pressure 1019mbar
Remark	EUT bandwidth: 12.5 KHz		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes N/A

Test Plot Yes (See below) N/A

Frequency Stability versus Temperature: The Frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20°C to $+50^{\circ}\text{C}$ at normal supply voltage.

Reference Frequency: 162.102505MHz at -30°C and $+60^{\circ}\text{C}$

Temperature ($^{\circ}\text{C}$)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (ppm)	Pass/Fail
60	162.102505	0	< 5	Pass
50	162.102505	0	< 5	Pass
40	162.102505	0	< 5	Pass
30	162.102505	0	< 5	Pass
20	Reference			
10	162.102505	0	< 5	Pass
0	162.102505	0	< 5	Pass
-10	162.102505	0	< 5	Pass
-20	162.102505	0	< 5	Pass
-30	162.102505	0	< 5	Pass

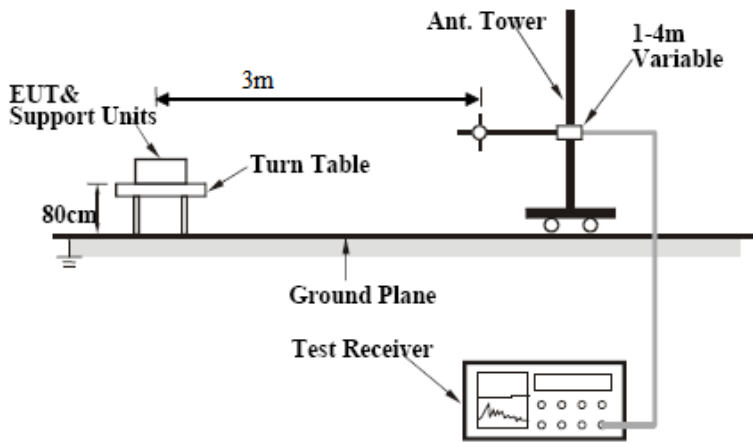
Frequency Stability versus Input Voltage: The Frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$, the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage at 20°C environmental temperature.

Carrier Frequency: 162.102505MHz at 20°C at 12 VDC

Measured Voltage $\pm 15\%$ of nominal (DC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
13.8	162.1025050	0	< 5	Pass
10.2	162.1025050	0	< 5	Pass

10.8 Field Strength of spurious, Radiation (Transmitter) – Below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47 CFR 90.210	a)	For Operating channel bandwidth 12.5KHz On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_{off} kHz) of more than 12.5 kHz: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation	<input checked="" type="checkbox"/>
	b)	For Operating channel bandwidth 25KHz On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.	<input type="checkbox"/>
Test Setup			
Procedure	<ol style="list-style-type: none"> The EUT was switched on and allowed to warm up to its normal operating condition. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. The EUT was then rotated to the direction that gave the maximum emission. Finally, the antenna height was adjusted to the height that gave the maximum emission. A peak measurement was then made for that frequency point. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured. 		
Test Date	12/30/2013	Environmental condition	Temperature 22°C Relative Humidity 43% Atmospheric Pressure 1019mbar
Remark	<ol style="list-style-type: none"> EUT bandwidth: 12.5 KHz Testing was performed with USB cable which has ferrite on it, as the worst case configuration. 		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
RSE-TX	10 KHz	≥ 3 x RBW	-	PK	Auto	Maxhold	For below 1GHz
RSE-TX	1MHz	≥ 3 x RBW	-	PK	Auto	Maxhold	For above 1GHz

Test Data Yes (See below) N/A

Test Plot Yes (See below) N/A

Radiated Emission Test Results (Below 1GHz)

Below 1GHz: Low CH

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
300	-38.9	2.94	13.1	-22.86	Peak Max	H	161	350	-20	-2.86	Pass
450.03	-56.73	3.63	16.5	-36.59	Peak Max	H	304	34	-20	-16.59	Pass
971.16	-58.06	5.6	23.04	-29.42	Peak Max	V	387	16	-20	-9.42	Pass
31.26	-59.96	0.65	20.07	-39.24	Peak Max	H	218	252	-20	-19.24	Pass
37.32	-60.14	0.71	15.74	-43.69	Peak Max	H	324	140	-20	-23.69	Pass

Below 1GHz: Mid CH

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
324.21	-46.19	3.07	13.7	-29.49	Peak Max	H	360	19	-20	-9.49	Pass
964.25	-58.19	5.58	22.91	-29.77	Peak Max	V	325	54	-20	-9.77	Pass
486.34	-51.92	3.76	17.33	-30.9	Peak Max	H	187	166	-20	-10.9	Pass
30.16	-58.45	0.64	20.96	-36.92	Peak Max	H	362	76	-20	-16.92	Pass
39.14	-60.13	0.73	14.47	-45	Peak Max	H	224	32	-20	-25	Pass

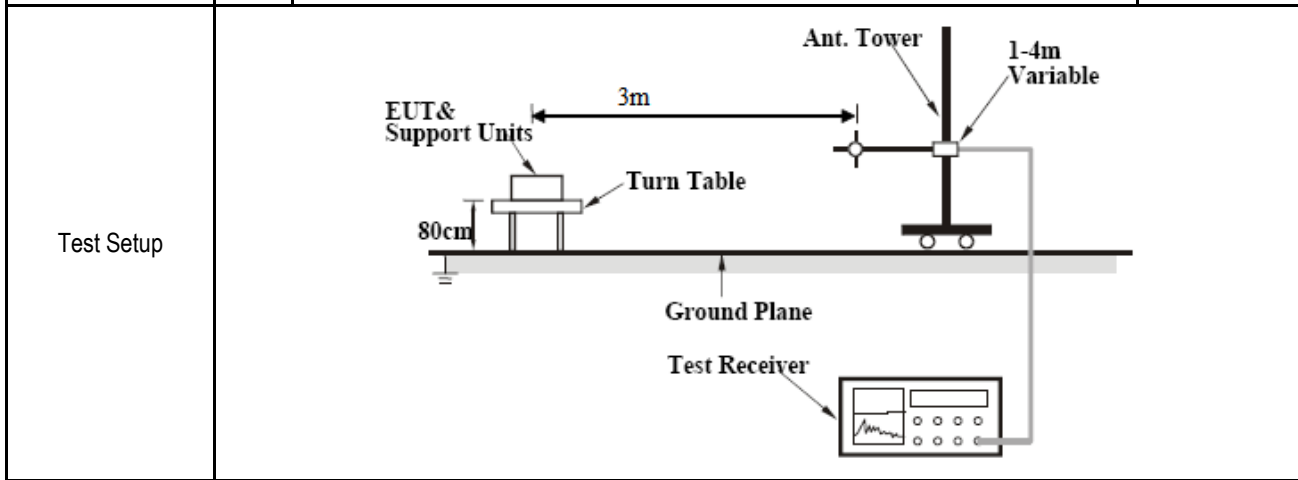
Below 1GHz: High CH

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
971.23	-58.34	5.6	23.03	-29.78	Peak Max	H	110	3	-20	-9.78	Pass
31.3	-59.54	0.65	20.05	-38.91	Peak Max	H	385	21	-20	-18.91	Pass
38.85	-60.71	0.73	14.69	-45.37	Peak Max	H	103	55	-20	-25.37	Pass

10.9 Radiated Spurious Emissions above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47 CFR 90.210	a)	For Operating channel bandwidth 12.5KHz On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_{ain} kHz) of more than 12.5 kHz: At least $50 + 10 \log (P)$ dB or 70 dB, whichever is the lesser attenuation	<input checked="" type="checkbox"/>
	b)	For Operating channel bandwidth 25KHz On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10 \log (P)$ dB.	<input type="checkbox"/>



Procedure	<ol style="list-style-type: none"> 1. The EUT was switched on and allowed to warm up to its normal operating condition. 2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. b. The EUT was then rotated to the direction that gave the maximum emission. c. Finally, the antenna height was adjusted to the height that gave the maximum emission. 3. A peak measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
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Remark	EUT bandwidth: 12.5 KHz
--------	-------------------------

Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
--------	--

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
RSE-TX	10 KHz	$\geq 3 \times \text{RBW}$	-	PK	Auto	Maxhold	For below 1GHz
RSE-TX	1MHz	$\geq 3 \times \text{RBW}$	-	PK	Auto	Maxhold	For above 1GHz

Test Data Yes (See below) N/A

Test Plot Yes (See below) N/A

Radiated Emission Test Results (Above 1GHz)

Above 1GHz-2GHz: Low CH

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
1146.33	-26.48	0.88	-6.34	-31.93	Peak Max	H	150	335	-20	-11.93	Pass
1435.71	-36.73	1.09	-5.80	-41.44	Peak Max	H	104	45	-20	-21.44	Pass
1410.61	-40.15	1.07	-5.90	-44.98	Peak Max	H	101	61	-20	-24.98	Pass

Above 1GHz-2GHz: Mid CH

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
1434.21	-35.58	1.09	-5.81	-40.30	Peak Max	H	129	42	-20	-20.30	Pass
1133.80	-27.44	0.86	-6.36	-32.94	Peak Max	H	102	336	-20	-12.94	Pass
3482.19	-50.12	2.04	-0.71	-48.79	Peak Max	V	237	54	-20	-28.79	Pass

Above 1GHz-2GHz: High CH

Frequency MHz	Raw dBm	Cable Loss	AF dB	Level dBm	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBm	Margin dB	Pass /Fail
4242.89	-33.98	2.31	-0.25	-31.92	Peak Max	V	115	147	-20	-11.92	Pass
8742.61	-49.9	3.19	5.86	-40.86	Peak Max	H	171	190	-20	-20.86	Pass
1443.46	-32.55	1.10	-5.77	-37.22	Peak Max	V	121	306	-20	-17.22	Pass

10.10 Transient Frequency Behaviour

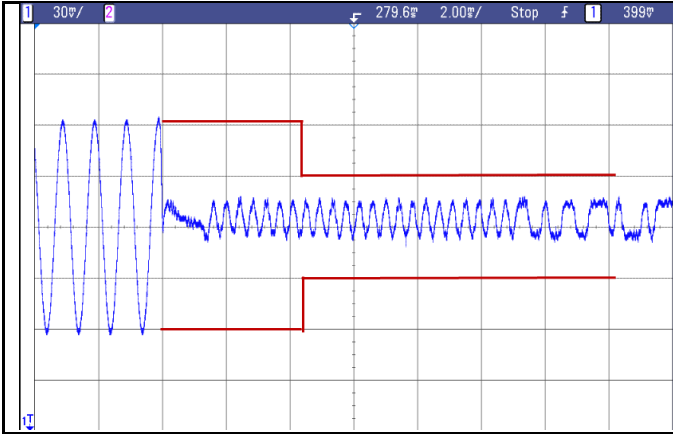
Requirement(s):

Spec	Item	Requirement	Applicable																																								
47 CFR 90.210	a)	<table border="1"> <thead> <tr> <th rowspan="3">Time intervals^{1,2}</th> <th>Maximum</th> <th colspan="2">All equipment</th> </tr> <tr> <th>frequency</th> <th rowspan="2">150 to 174 MHz</th> <th rowspan="2">421 to 512 MHz</th> </tr> <tr> <th>difference³</th> </tr> </thead> <tbody> <tr> <td colspan="4">Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels</td> </tr> <tr> <td>t_1^4</td> <td>±25.0 kHz</td> <td>5.0 ms</td> <td>10.0 ms</td> </tr> <tr> <td>t_2</td> <td>±12.5 kHz</td> <td>20.0 ms</td> <td>25.0 ms</td> </tr> <tr> <td>t_3^4</td> <td>±25.0 kHz</td> <td>5.0 ms</td> <td>10.0 ms</td> </tr> <tr> <td colspan="4">Transient Frequency Behavior for Equipment Designed to Operate on 12.5 kHz Channels</td> </tr> <tr> <td>t_1^4</td> <td>±12.5 kHz</td> <td>5.0 ms</td> <td>10.0 ms</td> </tr> <tr> <td>t_2</td> <td>±6.25 kHz</td> <td>20.0 ms</td> <td>25.0 ms</td> </tr> <tr> <td>t_3^4</td> <td>±12.5 kHz</td> <td>5.0 ms</td> <td>10.0 ms</td> </tr> </tbody> </table>	Time intervals ^{1,2}	Maximum	All equipment		frequency	150 to 174 MHz	421 to 512 MHz	difference ³	Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels				t_1^4	±25.0 kHz	5.0 ms	10.0 ms	t_2	±12.5 kHz	20.0 ms	25.0 ms	t_3^4	±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	±12.5 kHz	5.0 ms	10.0 ms	t_2	±6.25 kHz	20.0 ms	25.0 ms	t_3^4	±12.5 kHz	5.0 ms	10.0 ms	<input checked="" type="checkbox"/>
		Time intervals ^{1,2}		Maximum	All equipment																																						
				frequency	150 to 174 MHz	421 to 512 MHz																																					
			difference ³																																								
		Transient Frequency Behavior for Equipment Designed to Operate on 25 kHz Channels																																									
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		t_3^4	±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	±12.5 kHz	5.0 ms	10.0 ms																																						
t_2	±6.25 kHz	20.0 ms	25.0 ms																																								
t_3^4	±12.5 kHz	5.0 ms	10.0 ms																																								
Test Setup		<ol style="list-style-type: none"> EUT was set for low, mid, high channel with modulated mode and highest RF output power. The spectrum analyzer was connected to the antenna terminal. 																																									
Procedure		<ol style="list-style-type: none"> The EUT was setup as shown above, following TIA/EIA-603. The EUT was setup for Narrow Band channel operation The transmitter was turned on and off by briefly sending a data message. Sufficient attenuation was provided so that the transmitter carrier level measured at the output of the combiner was 40 dB below the maximum input level of the test receiver. An RF signal generator (1) modulated with a 1 kHz tone at either 25, 12.5, or 6.25 kHz deviation, and set to the same frequency as the assigned transmitter frequency, (2) was adjusted to a level -20 dB below the level recorded for step 3) above, measured at the output of the combiner. This level was then fixed for the remainder of the test. The oscilloscope was setup using TIA/EIA-603 procedures. The 30 dB attenuator was removed, the transmitter was turned on, and the level of the carrier at the output of the combiner was recorded. The carrier on-time and off-time was captured and plotted. 																																									
Remark		EUT bandwidth: 12.5 KHz																																									
Result		<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail																																									

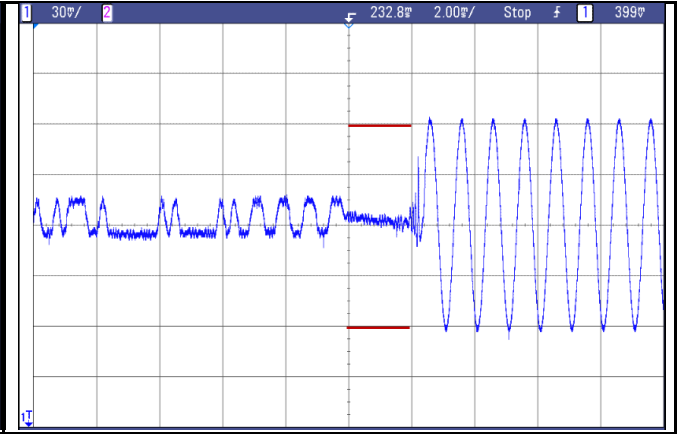
Test Data Yes (See below) N/A

Test Plot Yes (See below) N/A

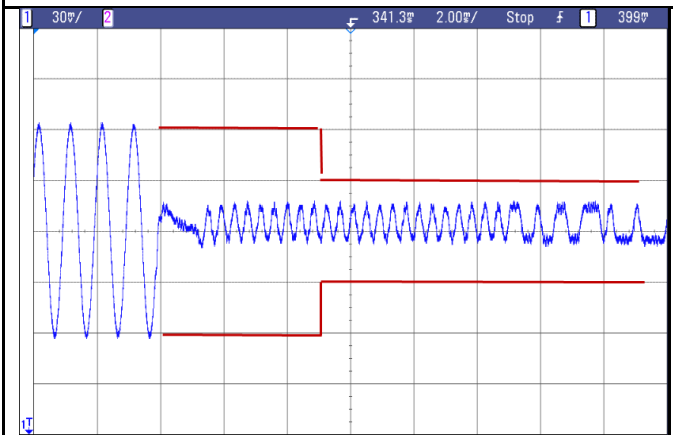
Test Plots



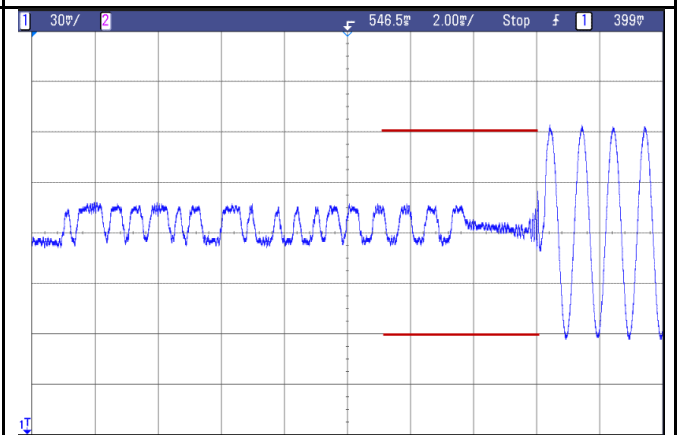
Transmitter turn on - Low CH



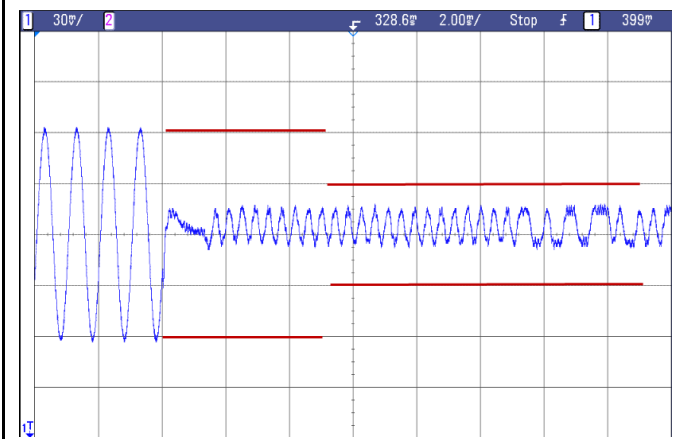
Transmitter turn off - Low CH



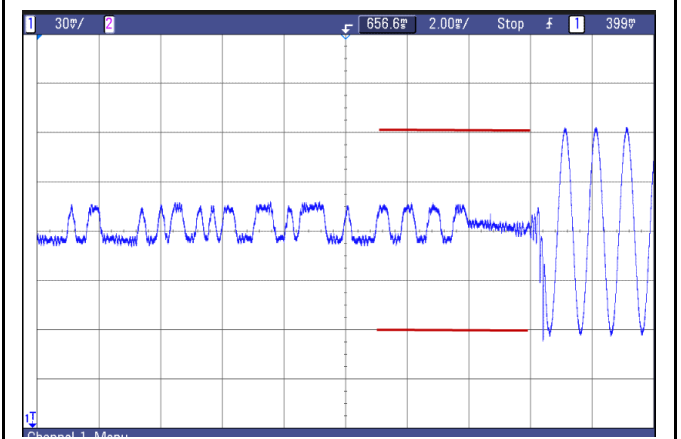
Transmitter turn on - Mid CH



Transmitter turn off - Mid CH



Transmitter turn on - High CH



Transmitter turn off - High CH

Annex A. TEST INSTRUMENT

















Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESIB 40	100179	04/20/2013	1 Year	04/20/2014	<input checked="" type="checkbox"/>
R&S LISN	ESH2-Z5	861741/013	05/18/2013	1 Year	05/18/2014	<input checked="" type="checkbox"/>
CHASE LISN	MN2050B	1018	07/24/2013	1 Year	07/24/2014	<input checked="" type="checkbox"/>
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2013	1 Year	05/25/2014	<input checked="" type="checkbox"/>
Radiated Emissions						
R & S Receiver	ESL6	100178	03/01/2013	1 Year	03/01/2014	<input checked="" type="checkbox"/>
R & S Receiver	ESIB 40	100179	04/20/2013	1 Year	04/20/2014	<input checked="" type="checkbox"/>
ETS-Lingren Loop Antenna	6512	00049120	05/13/2013	1 Year	05/13/2014	<input checked="" type="checkbox"/>
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	02/09/2013	1 Year	02/09/2014	<input checked="" type="checkbox"/>
Horn Antenna (1-26.5GHz)	3115	10SL0059	04/26/2013	1 Year	04/26/2014	<input checked="" type="checkbox"/>
Horn Antenna (18-40 GHz)	AH-840	101013	04/23/2013	1 Year	04/23/2014	<input checked="" type="checkbox"/>
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	05/30/2013	1 Year	05/30/2014	<input checked="" type="checkbox"/>
Microwave Preamplifier (18-40 GHz)	PA-840	181251	05/30/2013	1 Year	05/30/2014	<input checked="" type="checkbox"/>
3 Meters SAC	3M	N/A	10/13/2013	1 Year	10/13/2014	<input type="checkbox"/>
10 Meters SAC	10M	N/A	06/05/2013	1 Year	06/05/2014	<input checked="" type="checkbox"/>
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2013	1 Year	05/25/2014	<input checked="" type="checkbox"/>
RF Conducted Measurement						
Spectrum Analyzer	N9010A	MY50210206	05/30/2013	1 Year	05/30/2014	<input checked="" type="checkbox"/>
Spectrum Analyzer	E4407B	US88441016	05/31/2013	1 Year	05/31/2014	<input checked="" type="checkbox"/>
R & S Receiver	ESIB 40	100179	04/20/2013	1 Year	04/20/2014	<input checked="" type="checkbox"/>








Test report No.	FCC_RF_SL13051301-RTC-001 Rev1.2
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Annex B. USER MANUAL, BLOCK & CIRCUIT DIAGRAM

Please see attachment

Annex C. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3 meter site
FCC Site Registration		10 meter site
IC Site Registration		3 meter site
IC Site Registration		10 meter site
EU NB		Radio & Telecommunications Terminal Equipment: EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
Singapore iDA CB(Certification Body)	 	Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
HongKong OFCA		(Phase II) OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		Radio: Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		<p>Radio : A1. Terminal equipment for purpose of calling</p> <p>Telecom : B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law</p>
Korea CAB Accreditation		<p>EMI: KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI EMS: KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS</p>
		<p>Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68</p> <p>Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4</p>
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		<p>R-3083: Radiation 3 meter site</p> <p>C-3421: Main Ports Conducted Interference Measurement</p> <p>T-1597: Telecommunication Ports Conducted Interference Measurement</p>
Australia CAB Recognition		<p>EMC: AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4</p>
		<p>Radiocommunications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771</p>
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016, AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2