Garmin AT

TEST REPORT FOR

Aviation VHF COM Transceiver, VHF COM XCVR

Tested To The Following Standards:

FCC Part 87 and RSS-141 Issue 2

Report No.: 91163-7

Date of issue: September 29, 2010

ACCREDITED

TESTING
CERT #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.

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ADMINISTRATIVE INFORMATION

Test Report Information

REPORT PREPARED FOR:

Garmin AT
2345 Turner Rd. S.E.
Salem, OR 97302

REPRESENTATIVE: George Cooley
Customer Reference Number: 333115

REPORT PREPARED BY:

Joyce Walker
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 91163

DATE OF EQUIPMENT RECEIPT: September 20, 2010
DATE(S) OF TESTING: September 20 - 24, 2010

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

Site Registration & Accreditation Information

Location	JAPAN	CANADA	FCC
Brea A	R-2945, C-3248 & T-1572	3082D-1	90473

SUMMARY OF RESULTS

Standard / Specification: FCC Part 87 and RSS-141 Issue 2

Description	Test Procedure/Method	Results
RF Power Output	FCC 2.1033(c)(14)/2.1046/87.131	Pass
Modulation Characteristics – Audio Frequency Response	FCC 2.1033(c)(14)/2.1047(a)/87.141	Pass
Modulation Characteristics – Modulation Limiting Response	FCC 2.1033(c)(14)/2.1047(b)/ 87.141	Pass
Occupied Bandwidth	FCC 2.1033(c)(14)/2.1049/87.135/87.137/87.139	Pass
Spurious Emissions at Antenna Terminal	FCC 2.1033(c)(14)/2.1051/87.139/RSS-141 §4.2	Pass
Field Strength of Spurious Radiation	FCC 2.1033(c)(14)/2.1053/87.139	Pass
Frequency Stability	FCC 2.1033(c)(14)/2.1055/87.133	Pass
99% Bandwidth	RSS-141 Issue 2	Pass

Conditions During Testing

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
None

EQUIPMENT UNDER TEST (EUT)

EQUIPMENT UNDER TEST

Aviation VHF COM Transceiver
Manuf: Garmin AT, Inc.
Model: VHF COM XCVR
Serial: 1ZA000027

PERIPHERAL DEVICES

The EUT was tested with the following peripheral device(s):

Signal Generator
Manuf: HP
Model: 33120A
Serial: 36023090

Power Supply
Manuf: Topward
Model: 6306D
Serial: 988614

VOR/ILS/GS NAV board
Manuf: Garmin AT, Inc.
Model: NA
Serial: NA

GTN Main Board
Manuf: Garmin AT, Inc
Model: NA
Serial: NA

Laptop
Manuf: Dell
Model: PP18L
Serial: 41476983589

GPS Antenna
Manuf: Garmin International, Inc
Model: GA35
Serial: 46422

Next Gen Com Interface Box
Manuf: Garmin AT, Inc
Model: NA
Serial: NA

FCC PART 87& RSS-141

This report contains EMC emissions test results under United States Federal Communications Commission (FCC) and Industry Canada (IC) requirements for licensed devices.

2.1033(c)(14)/2.1046/87.131 - RF Power Output

Engineer Name: E. Wong

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
02778	RF Power meter	EPM-441A	HP	012610	012612
03072	Power Sensor	E4412A	HP	012610	012612

Test Setup

The EUT is placed on the wooden table lined with Styrofoam of 10 cm thickness. Next Gen Extension is connected to support Next Gen Com Interface box. Com1, Com2, Com3, Com4, 429 In, 429 Out are connected to a section of unterminated cable. A support GPS antenna is connected to the GPS antenna port. RF output port is connected to the power meter. The EUT is set in constant transmit mode. Serial communication between the EUT and support laptop is active via the Next Gen Com Interface box.

Freq Range = 118-136.975MHz
Modulation = **Unmodulated** (see note)
Mode: 10W and 16 W
Tx freq = 118.0MHz, 127.5 MHz, 136.975MHz

28V DC is from support DC power supply. The EUT is intended to operate in avionic environment from a power source of 14 - 28V. Emission profile is evaluated at the antenna port. Insertion loss of the external attenuator was verified and compensated as an amplitude offset.

Test Data

Measured Maximum Power

10W mode	118 MHz	42.0 dBm, 15.8W
	127.5 MHz	42.1 dBm, 16.2W
	136.975 MHz	42.0 dBm, **15.8W**
16W mode	118 MHz	43.3dBm, 21.4W
	127.5 MHz	43.3 dBm, 21.4W
	136.975 MHz	43.3 dBm, **21.4W**

Note: 87.131 note 1

The power is measured at the transmitter output terminals and the type of power is determined according to the emission designator as follows:

(i) Mean power (pY) for amplitude modulated emissions and transmitting both sidebands using unmodulated full carrier.

Test Setup Photos

2.1033(c)(14)/2.1047(a)/87.141 - Modulation Characteristics - Audio Frequency Response

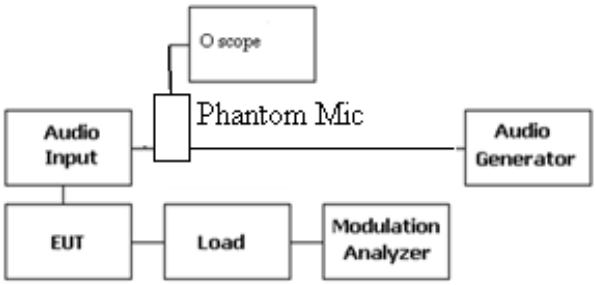
Engineer Name: E. Wong

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
02072	Analyzer, Modulation	8901A	HP	02/13/2009	02/13/2011
00838	Waveform Generator	33120A	HP	03/09/2009	03/09/2011
02847	Oscilloscope	TDS520B	Tektronix	03/17/2009	03/17/2011

Test Setup

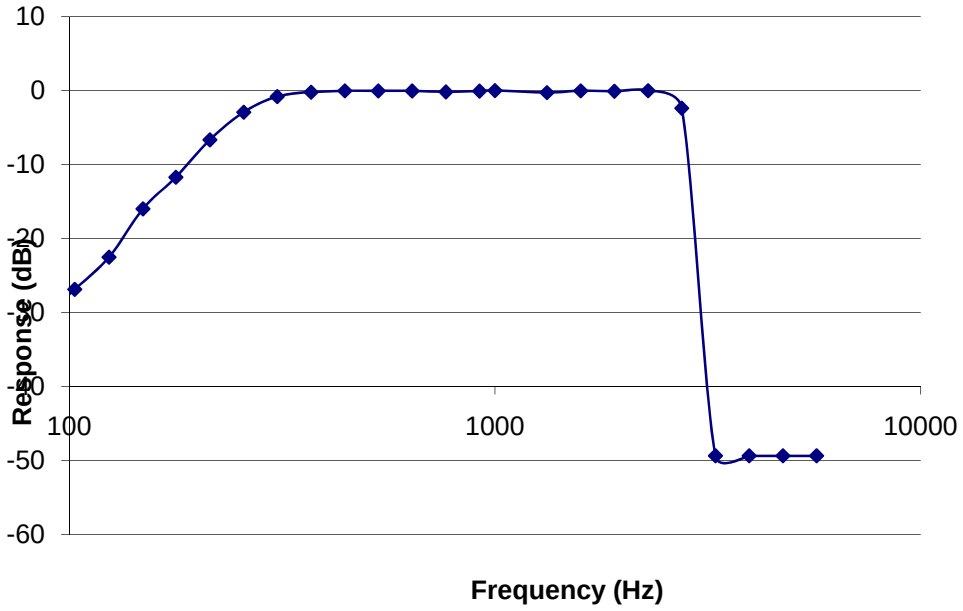
The test setup is in accordance with TIA/EIA 603 2.2.6.2.2 Constant Input Method. The EUT is powered by an external 28VDC power source. The EUT is functioning normally on the indicated frequency. Input voltage is held at 200mV RMS. The measured deviation is in dB, with reference to % AM modulation at 1 kHz.

Audio Frequency Response Setup Diagram

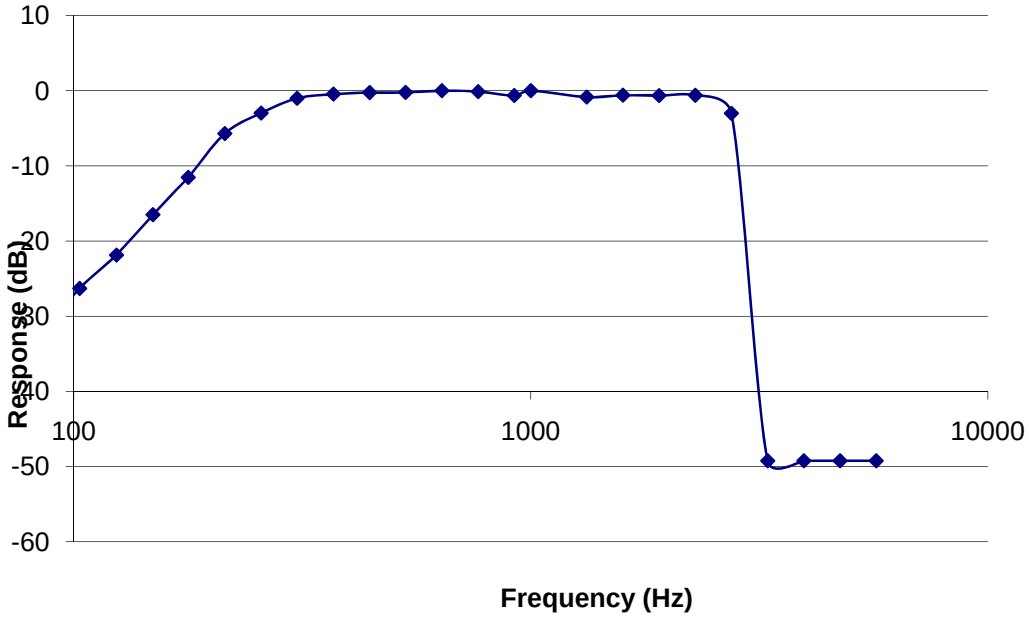


Test Data

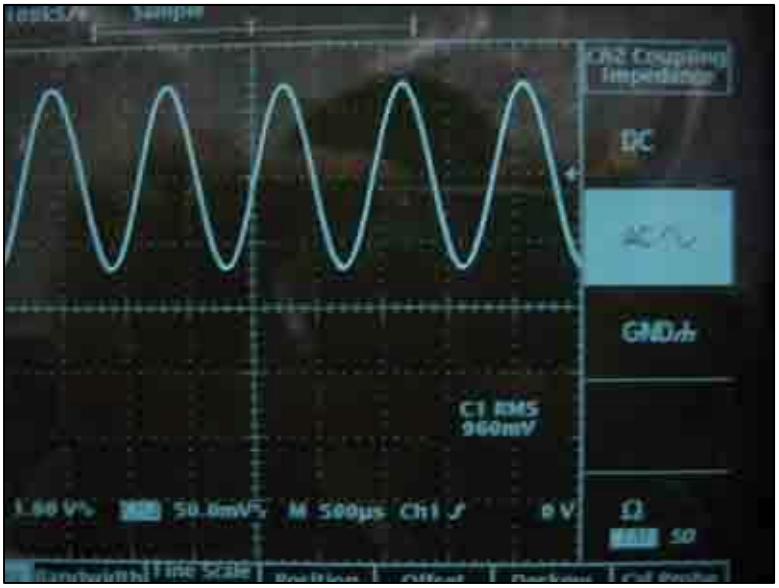
2.1047(a) Audio Frequency Response
VHF COM XCVR 10W 118.0 MHz



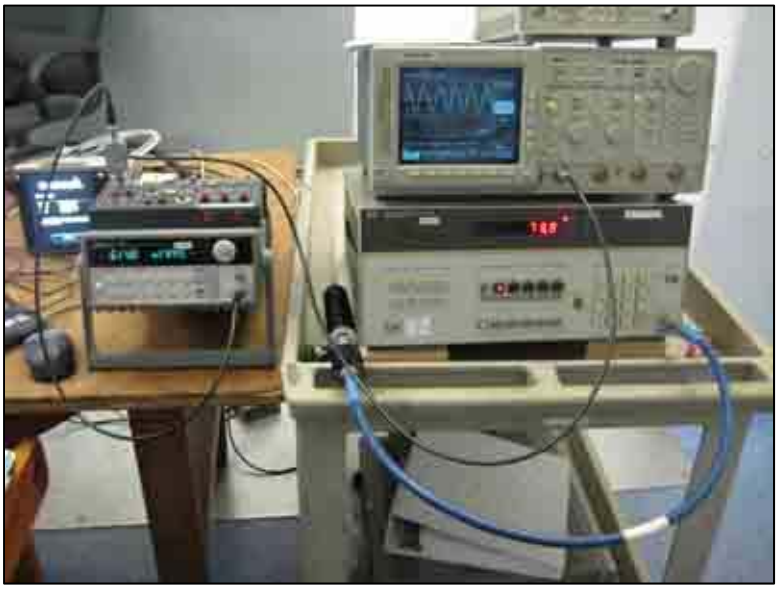
2.1047(a) Audio Frequency Response
VHF COM XCVR 16W 118.0 MHz



Test Setup Photos



Modulation_Oscope Setup



2.1033(c)(14)/2.1047(b)87.141/ Modulation Characteristics– Modulation Limiting Response

Engineer Name: E. Wong

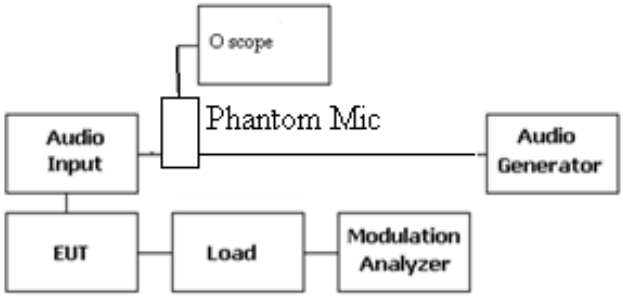
Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
02072	Analyzer, Modulation	8901A	HP	02/13/2009	02/13/2011
00838	Waveform Generator	33120A	HP	03/09/2009	03/09/2011
02847	Oscilloscope	TDS520B	Tektronix	03/17/2009	03/17/2011

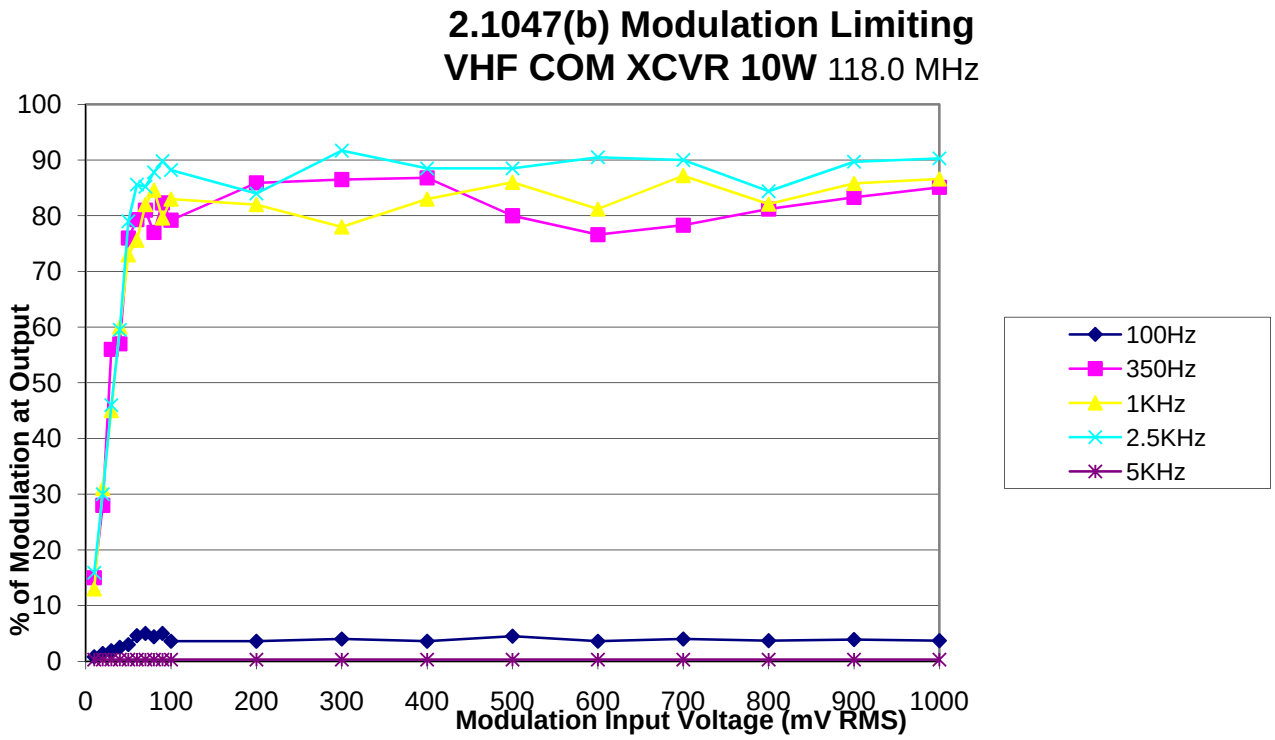
Test Setup

The test setup is in accordance with TIA/EIA 603. The EUT is functioning normally on the indicated frequency. The EUT is powered by an external 28VDC power source. The measured deviation is in % AM modulation.

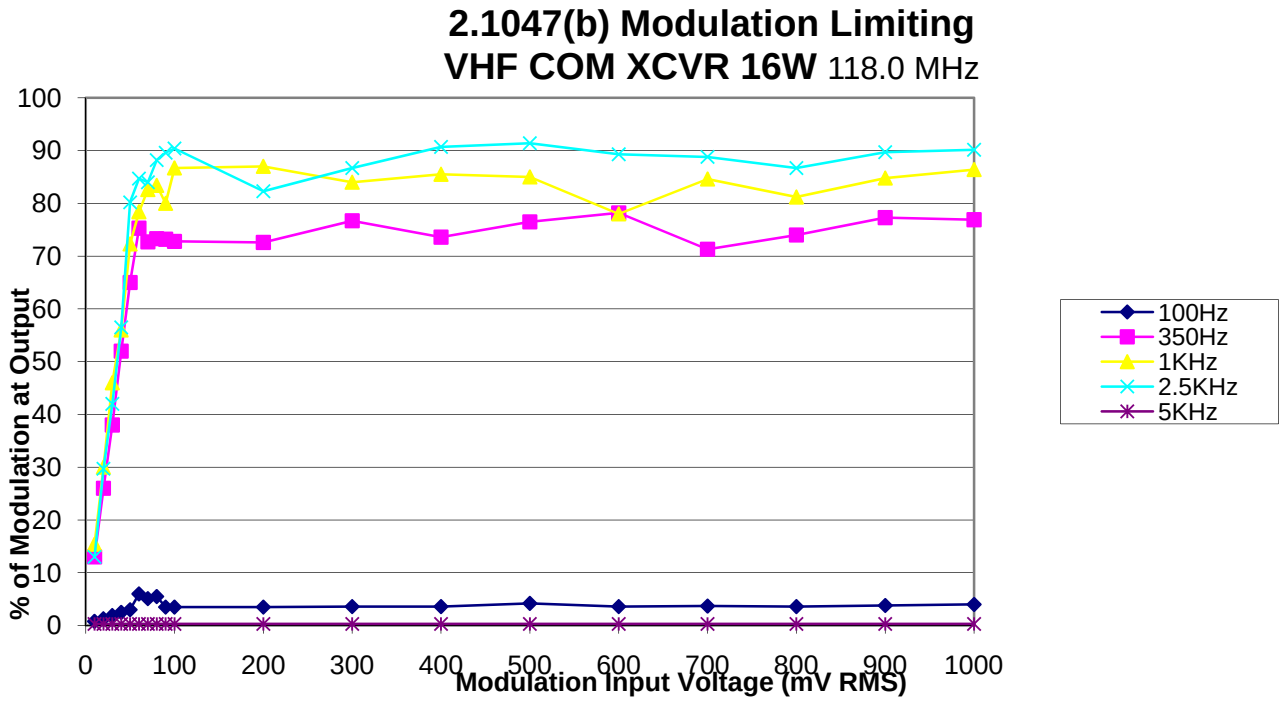
Manufacture declared maximum Audio input signal = 1 V rms,

Modulation Limiting Setup



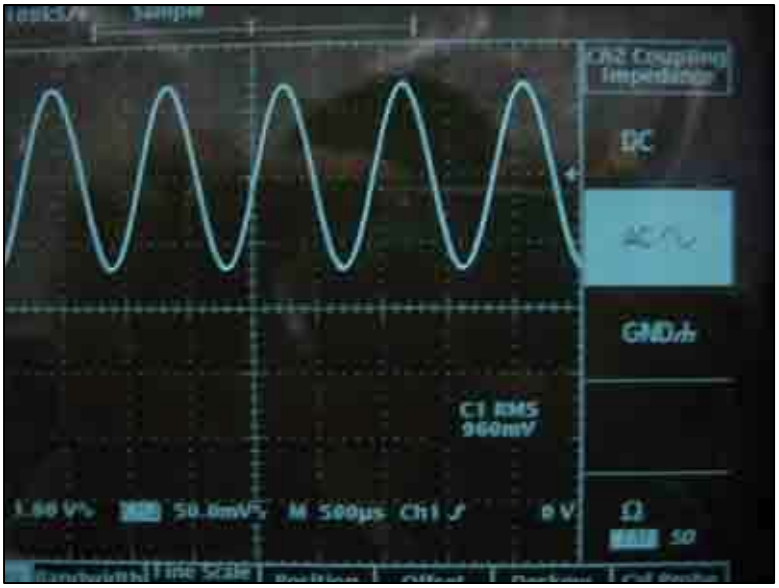


Measured maximum Index = 90.5%

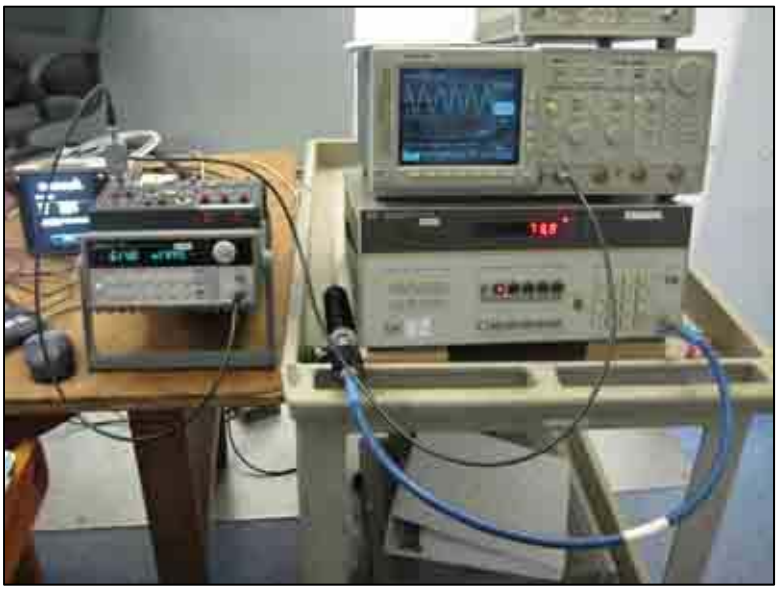


Measured maximum Index = 91.4%

Test Setup Photos



Modulation_Oscope Setup



2.1033(c)(14)/2.1049/87.135/87.137/87.139 - Occupied Bandwidth

Engineer Name: E. Wong

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	E4440A	Agilent	022109	022111
03174	36" 40GHz cable	NA	Astrolab	102809	102811

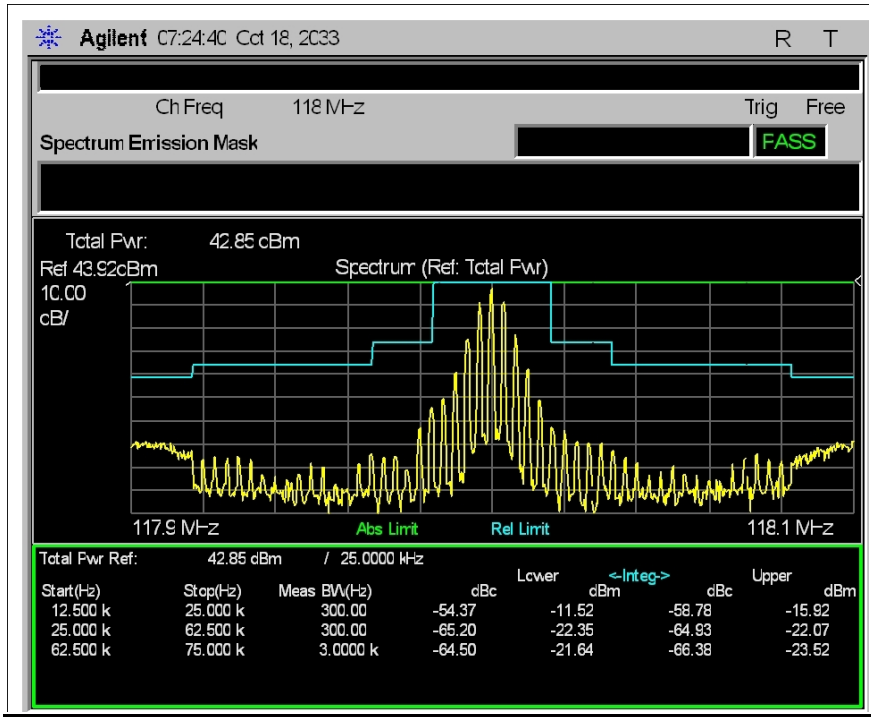
Test Setup

The EUT is placed on the wooden table. Next Gen Extension is connected to support Next Gen Com Interface box. Com1, Com2, Com3, Com4, 429 In, 429 Out are connected to a section of unterminated cable. Audio signal 2500Hz signal (50% modulation +16 dB) is fed into the EUT via Next Gen Com interface box. A support GPS antenna is connected to the GPS antenna port. RF output port is connected to the spectrum analyzer. The EUT is set in constant transmit mode. Serial communication between the EUT and support laptop is active via the Next Gen Com Interface box.

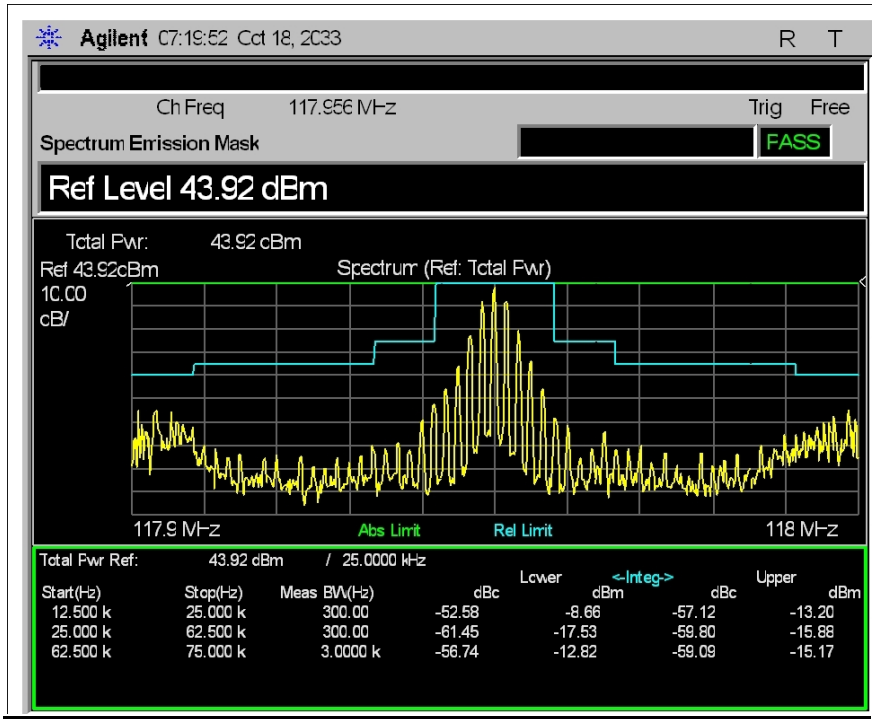
Freq Range= 118-136.975MHz
Modulation= AM
Mode: 10W and 16 W
Tx freq = 118.0MHz, 127.5 MHz, 136.975MHz

28V DC is from support DC power supply. The EUT is intended to operate in avionic environment from a power source of 14 - 28V. Emission profile is evaluated at the antenna port. Insertion loss of the external attenuator was verified and compensated as amplitude offset.

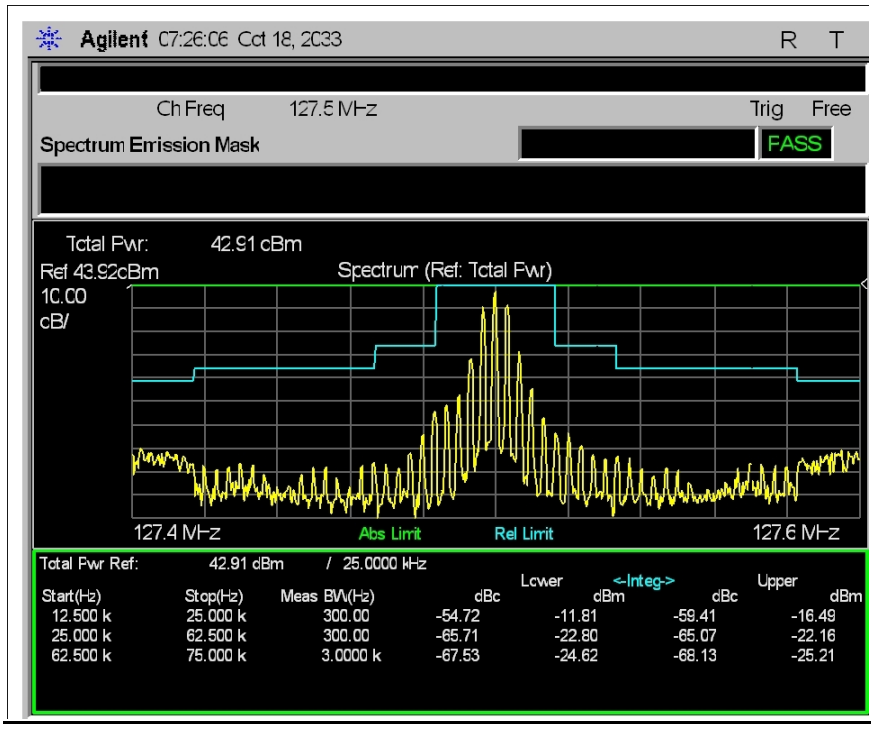
Test Data



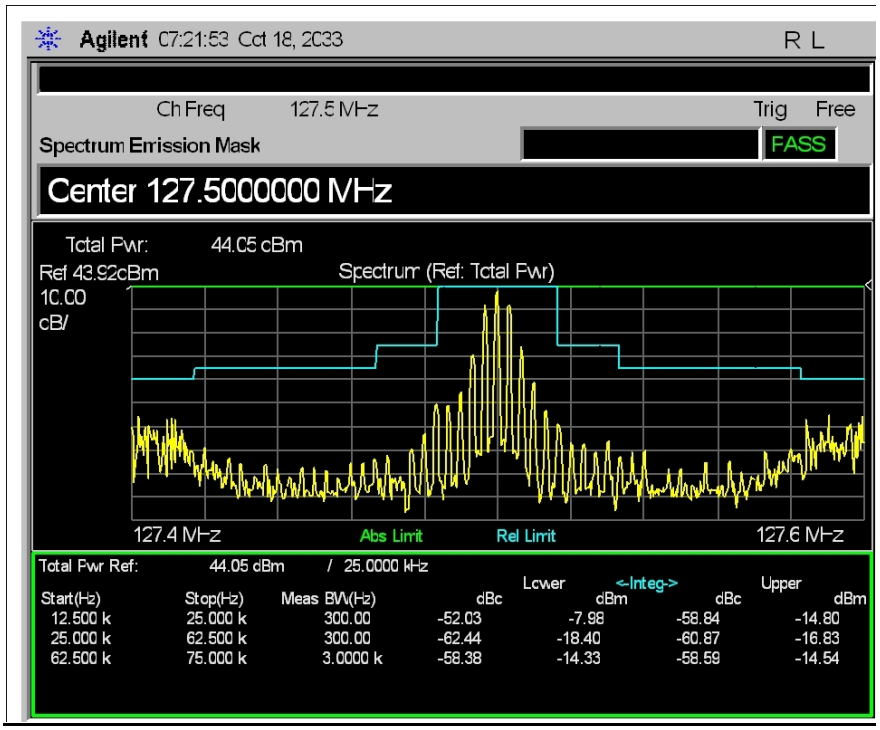
118MHz_10W



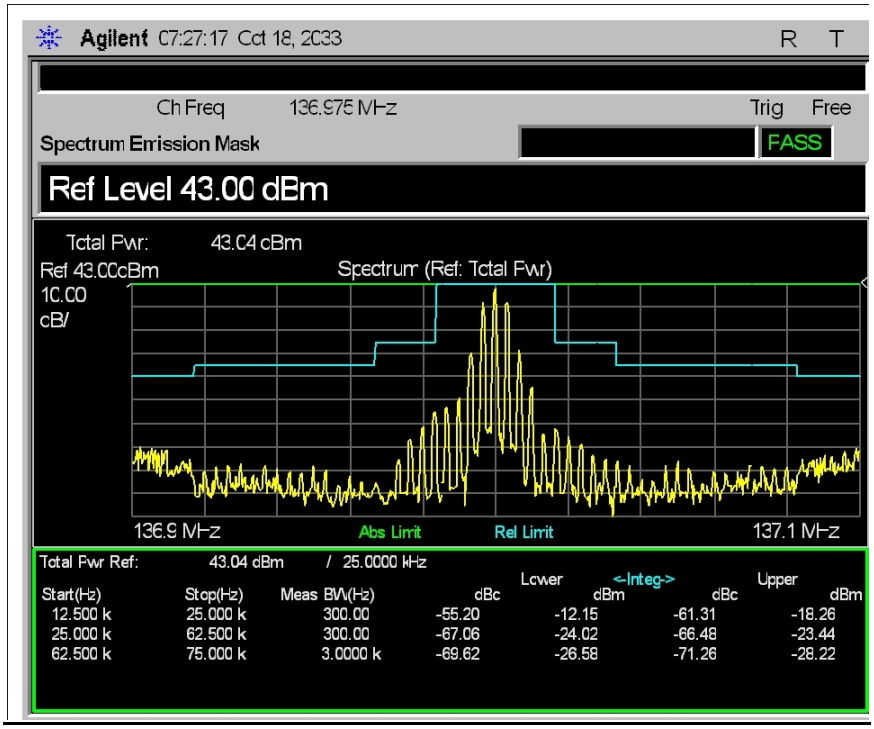
118MHz_16W



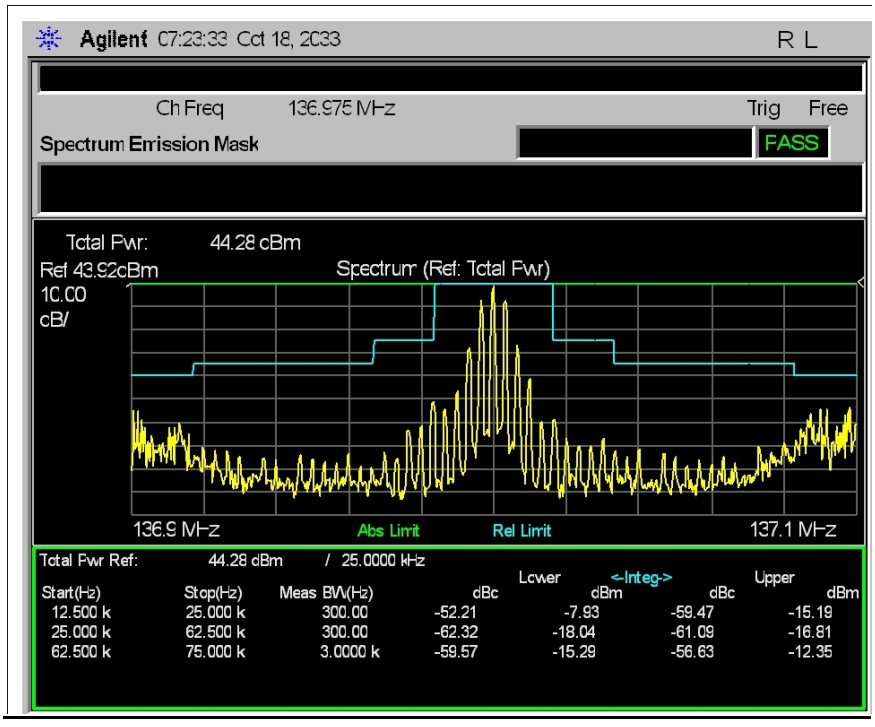
127MHz_10W



127MHz_16W



137MHz_10W



137MHz_16W

Test Setup

2.1033(c)(14)/2.1051/87.139/RSS-141§4.2 - Spurious Emissions at Antenna Terminal

Engineer Name: E. Wong

Test Calculations

Limit line for Spurious Conducted Emission

Required Attenuation = 43+10 Log P dB

Limit line (dBuV) = V_{dBuv} - Attenuation

$$V_{dBuV} = 20 \text{ Log } \frac{V}{1 \times 10^{-6}}$$
$$= 20\left(\text{Log } V - \text{Log } 1 \times 10^{-6}\right)$$
$$= 20 \text{ Log } V - 20 \text{ Log} 1 \times 10^{-6}$$
$$= 20 \text{ Log } V - 20(-6)$$
$$= 20 \text{ Log } V + 120$$

$$\text{Attenuation} = 43 + 10 \text{ Log } P$$
$$= 43 + 10 \text{ Log } \frac{V^2}{R}$$
$$= 43 + 10\left(\text{Log } V^2 - \text{Log } R\right)$$
$$= 43 + 10\left(2 \text{ Log } V - \text{Log } R\right)$$
$$= 43 + 20 \text{ Log } V - 10 \text{ Log } R$$

Limit line = V_{dBuv} - Attenuation
= 20 Log V + 120 – (43 + 20 Log V – 10Log R)
= 20 Log V + 120 – 43 – 20 Log V + 10Log R
= 20 Log V + 120 – 43 – 20 Log V + 10Log R
= 120 – 43 + 10 Log 50 Note : R = 50 Ω
= 120 –43 + 16.897
= 94 dBuV at any power level

Test Data

Test Location: CKC Laboratories, Inc • 110 N. Olinda Place • Brea, CA 92823 • (714) 993-6112

Customer:	**Garmin AT, Inc.**		
Specification:	**FCC Part 87.139(a)(3) Conducted Spurious Emission**		
Work Order #:	**91163**	Date:	9/21/2010
Test Type:	**Conducted Emissions**	Time:	14:08:26
Equipment:	**Aviation VHF COM Transceiver**	Sequence#:	2
Manufacturer:	Garmin AT, Inc.	Tested By:	E. Wong
Model:	VHF COM XCVR		110V 60Hz
S/N:	1ZA000027		

***Test Equipment*:**

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02869	Spectrum Analyzer	E4440A	2/21/2009	2/21/2011
	AN02752	High Pass Filter	6IH40-500/T3000-O/O	3/5/2010	3/5/2012
T1	AN03174	Cable	16301	10/28/2009	10/28/2011

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N
Aviation VHF COM Transceiver*	Garmin AT, Inc.	VHF COM XCVR	1ZA000027

Support Devices:

Function	Manufacturer	Model #	S/N
Signal generator	HP	33120A	36023090
Power Supply	Topward	6306D	988614
VOR/ILS/GS NAV board	Garmin AT, Inc.	NA	NA
GTN Main Board	Garmin AT, Inc	NA	NA
Laptop	Dell	PP18L	41476983589
GPS Antenna	Garmin International, Inc	GA35	46422
Next Gen Com Interface Box	Garmin AT, Inc	NA	NA

Test Conditions / Notes:

The EUT is placed on the wooden table. Next Gen Extension is connected to support Next Gen Com Interface box. Com1, Com2, Com3, Com4, 429 In, 429 Out are connected to a section of unterminated cable. Audio signal 2500Hz signal (50% modulation +16 dB) is fed into the EUT via Next Gen Com interface box.
A support GPS antenna is connected to the GPS antenna port. RF output port is connected to the spectrum analyzer.

The EUT is set in constant transmit mode. Serial communication between the EUT and support laptop is active via the Next Gen Com Interface box.

Freq Range= 118-136.975MHz
Modulation= AM
Mode: 10W and 16 W
Tx freq = 118.0MHz, 127.5 MHz, 136.975MHz

28V DC is from support DC power supply. The EUT is intended to operate in avionic environment from a power source of 14 - 28V.

Frequency range of measurement = 9 kHz- 7 GHz.
Frequency 9 kHz - 150 kHz RBW=200 Hz, VBW=200 Hz; 150 kHz- 30 MHz RBW=9 kHz, VBW=9 kHz; 30 MHz- 1000 MHz RBW=120 kHz, VBW=120 kHz; 1000 MHz-7000 MHz RBW=1 MHz, VBW=1 MHz.

Emission profile is evaluated at the antenna port.

Insertion loss of the external attenuator was verified and compensated as an amplitude offset of the spectrum analyzer.

22ºC & 56% relative humidity

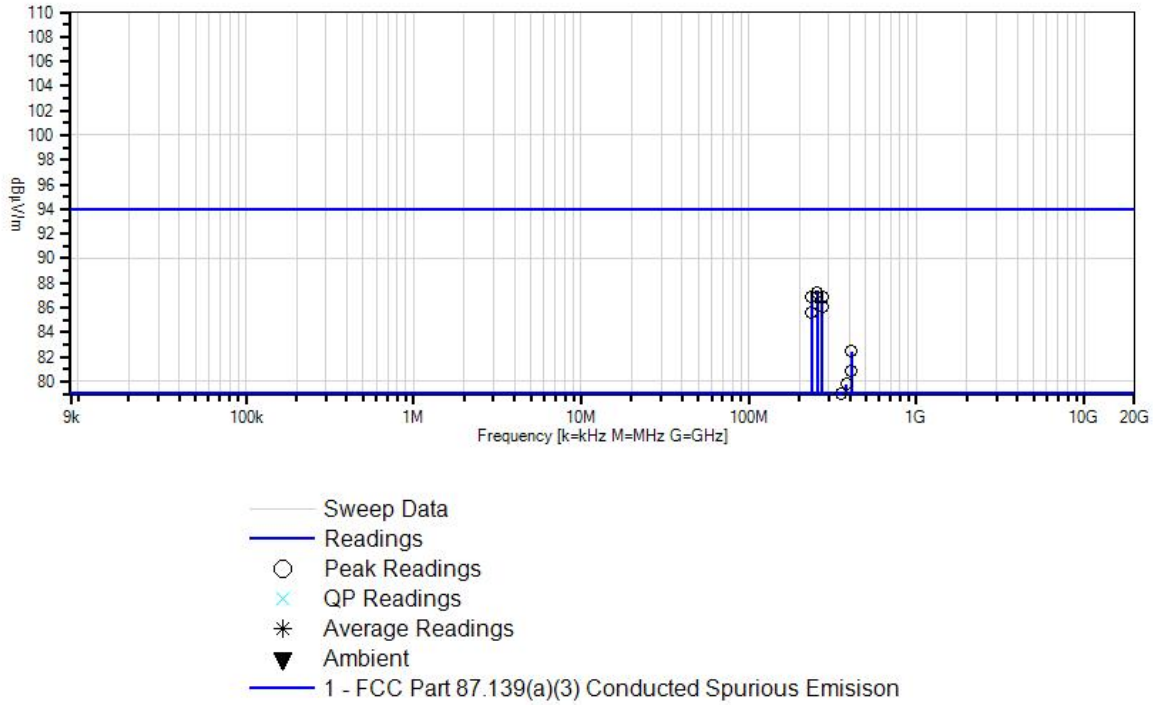
Ext Attn: 0 dB

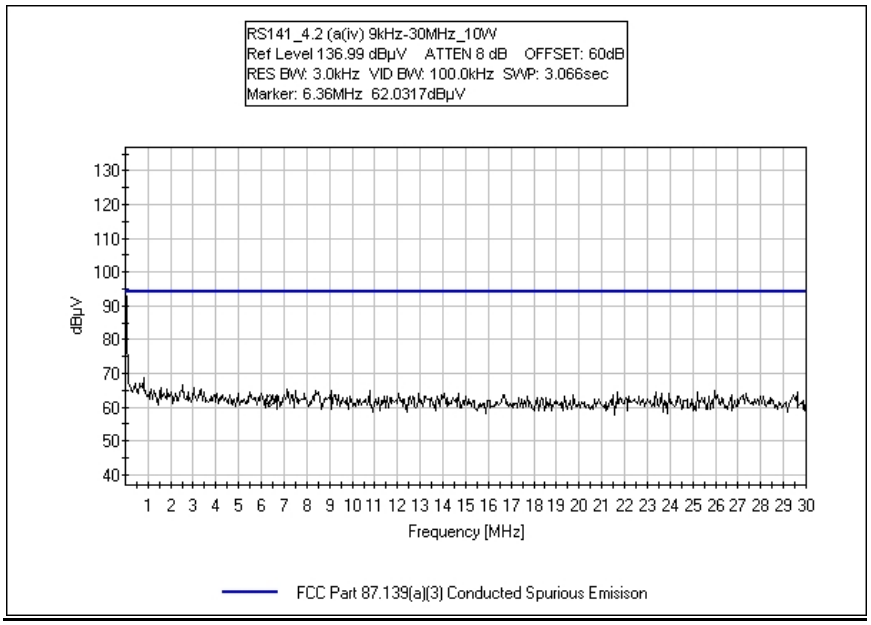
Measurement Data: Reading listed by margin. Test Lead: Antenna Port

#	Freq MHz	Rdng dBµV	T1 dB	dB	dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	254.998M	87.0	+0.2				+0.0	87.2	94.0 16W	-6.8	Anten
2	254.996M	86.7	+0.2				+0.0	86.9	94.0 10W	-7.1	Anten
3	236.000M	86.7	+0.2				+0.0	86.9	94.0 16W	-7.1	Anten
4	273.941M	86.7	+0.2				+0.0	86.9	94.0 16W	-7.1	Anten
5	273.953M	85.9	+0.2				+0.0	86.1	94.0 10W	-7.9	Anten
6	236.000M	85.4	+0.2				+0.0	85.6	94.0 10W	-8.4	Anten
7	410.933M	82.2	+0.3				+0.0	82.5	94.0 16W	-11.5	Anten
8	410.943M	80.6	+0.3				+0.0	80.9	94.0 10W	-13.1	Anten
9	382.490M	79.5	+0.3				+0.0	79.8	94.0 10W	-14.2	Anten

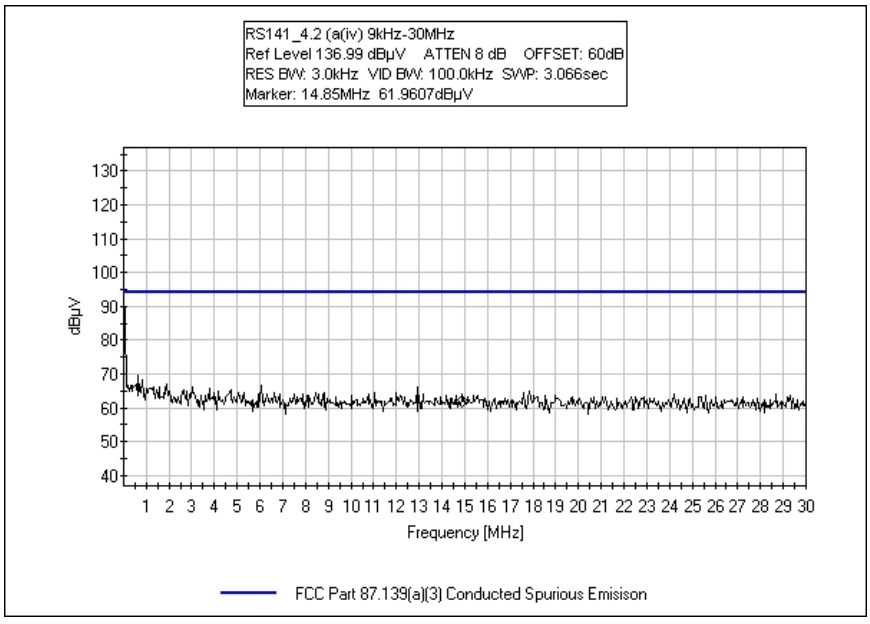
10	354.000M	78.8	+0.2	+0.0	79.0	94.0 10W	-15.0	Anten
11	58.830M	78.1	+0.1	+0.0	78.2	94.0 16W	-15.8	Anten
12	354.001M	77.7	+0.2	+0.0	77.9	94.0 16W	-16.1	Anten

CKC Laboratories, Inc Date: 9/21/2010 Time: 14:08:26 Garmin AT, Inc. WO#: 91163
FCC Part 87.139(a)(3) Conducted Spurious Emisison Test Lead: Antenna Port 110V 60Hz Sequence#: 2 Ext
ATTN: 0 dB

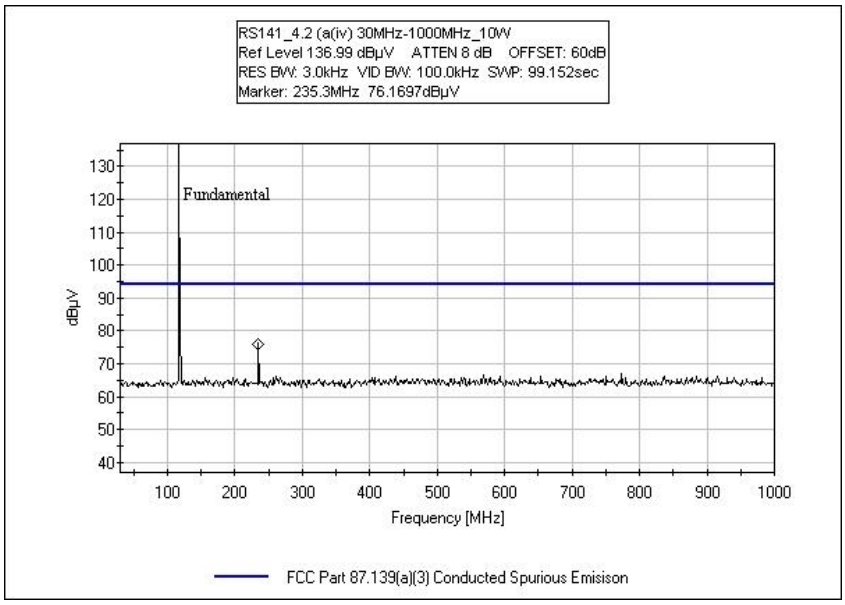




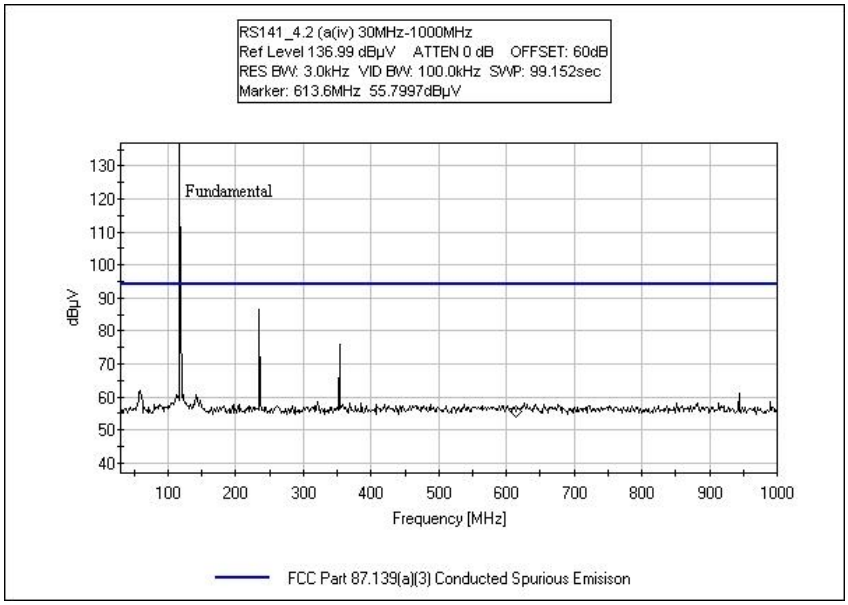
9kHz – 30MHz_10W



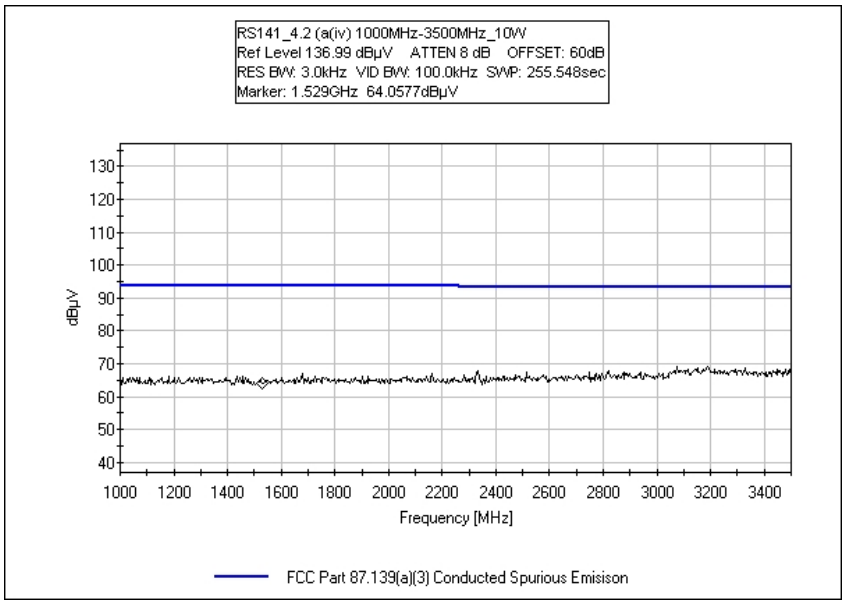
9kHz – 30MHz_16W



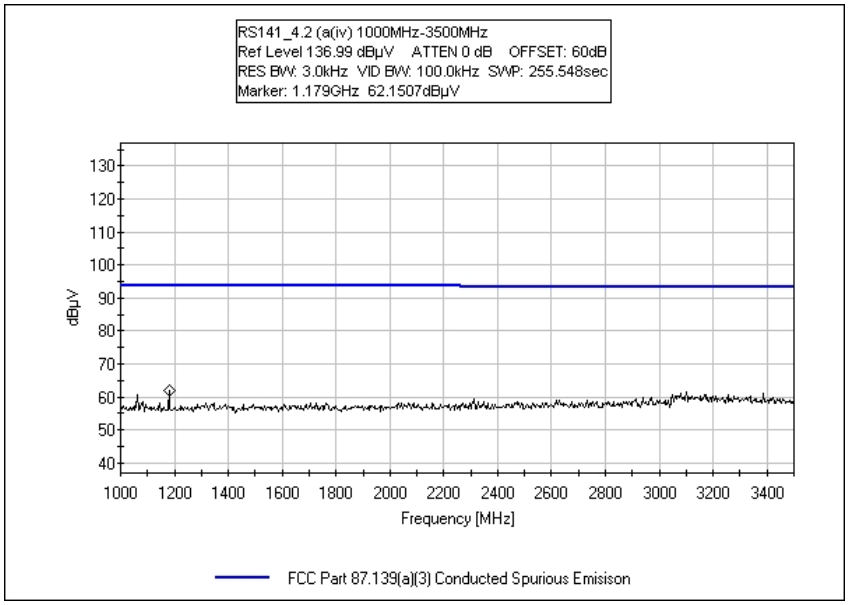
30-1000MHz_10W



30-1000MHz_16W



1000M-3500Hz_10W



1000M-3500Hz_16W

Test Setup Photos

2.1033(c)(14)/2.1053/87.139 - Field Strength of Spurious Radiation

Engineer Name: E. Wong

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
AN02869	Spectrum Analyzer	E4440A	Agilent	2/21/2009	2/21/2011
AN01995	Biconilog Antenna	CBL6111C	Chase	3/8/2010	3/8/2012
AN00309	Preamp	8447D	HP	5/7/2010	5/7/2012
ANP05050	Cable	RG223/U	Pasternack	4/16/2009	4/16/2011
ANP05198	Cable	8268	Belden	1/5/2009	1/5/2011
AN00314	Loop Antenna	6502	EMCO	6/30/2010	6/30/2012
AN00786	Preamp	83017A	HP	8/5/2010	8/5/2012
AN00849	Horn Antenna	3115	ETS	4/23/2010	4/23/2012
AN02948	Cable	32022-2-2909K-24TC	Astrolab Inc.	9/21/2009	9/21/2011
ANP05565	Cable	ANDL-1-PNMN-54	Andrews	9/3/2010	9/3/2012

Test Data

Operating Frequency: 118 MHz - 136.975 MHz
Channels: Low, Mid and High
Highest Measured Output Power: 43.30 ERP(dBm)= 21.4 ERP(Watts)
Distance: 3 meters
Limit: 43+10Log(P) 56.30 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
139.70	-69.3	Horiz	112.60
147.18	-64.8	Horiz	108.10
151.07	-64.1	Vert	107.40
151.13	-62.5	Horiz	105.80
152.32	-58.7	Vert	102.00
152.33	-57.8	Horiz	101.10
152.33	-62.1	Vert	105.40
152.35	-55.7	Vert	99.00
152.37	-58.3	Horiz	101.60
152.37	-58.2	Horiz	101.50
152.38	-56.3	Vert	99.60
152.38	-58.2	Horiz	101.50
205.13	-61.8	Horiz	105.10
205.15	-63.1	Horiz	106.40
207.98	-65.4	Horiz	108.70
208.02	-66	Horiz	109.30
221.05	-69.6	Horiz	112.90
224.00	-67.1	Horiz	110.40
224.98	-62.5	Vert	105.80
225.00	-62.8	Vert	106.10
236.00	-46.4	Vert	89.70
236.00	-47.8	Vert	91.10
236.00	-47	Horiz	90.30
236.03	-48.9	Horiz	92.20
239.98	-63.3	Vert	106.60
240.00	-61.7	Horiz	105.00
240.00	-62.9	Horiz	106.20
249.99	-61.5	Horiz	104.80
250.03	-61.6	Horiz	104.90
254.97	-58.8	Vert	102.10
254.98	-57.8	Horiz	101.10
255.00	-56.8	Vert	100.10
255.00	-54.4	Horiz	97.70

Test Setup Photos

2.1033(c)(14)/2.1055/87.133 - Frequency Stability

Engineer Name: E. Wong

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	E4440A	Agilent	022109	022111
01830	Multimeter	45	Fluke	022210	022212
01878	Temperature Chamber	S1.2	Thermaltron	NCR	NCR
05947	Thermometer	51	Fluke	110909	110911
01438	DC Power Supply	6306D	Topward	101408	101410

NCR = No calibration required because the chamber temperature was monitored by Asset # 05947

Test Setup

The EUT is placed in the temperature chamber. RF signal is monitored from the antenna port. A spectrum analyzer is employed to measured the frequency stability of the EUT

Test Data

Frequency Stability

Customer: Garmin AT, Inc
WO#: 91163
Date: 23-Sep-10
Test Engineer: E. wong

Device Model #: EUT
Operating Voltage: 28 **Vdc (11-33 V).**

Frequency Limit: 3.00E+01 **ppm**

Temperature Variations

Channel Frequency:		Channel 1 (MHz) **117.999907000**	Dev (ppm)	Channel 2 (MHz) **127.499890000**	Dev (ppm)	Channel 3 (MHz) **136.974872000**	Dev (ppm)
Temp (C)	Voltage						
-30	28	117.999916000	-0.076271	127.499916000	-0.203922	136.974918000	-0.335828
-20	28	117.999893000	0.118644	127.499890000	0.000000	136.974890000	-0.131411
-10	28	117.999931000	-0.203390	127.499931000	-0.321569	136.974932000	-0.438037
0	28	117.999894000	0.110170	127.499891000	-0.007843	136.974887000	-0.109509
10	28	117.999913000	-0.050847	127.499908000	-0.141177	136.974905000	-0.240920
20	28	117.999907000	0.000000	127.499890000	0.000000	136.974872000	0.000000
30	28	117.999940000	-0.279661	127.499941000	-0.400000	136.974940000	-0.496441
40	28	117.999875000	0.271187	127.499873000	0.133333	136.974870000	0.014601
50	28	117.999862000	0.381356	127.499856000	0.266667	136.974851000	0.153313

Variations (±15%)

Temp (C)	Voltage	Channel 1 (MHz)	Dev. (ppm)	Channel 2 (MHz)	Dev. (ppm)	Channel 3 (MHz)	Dev. (ppm)
20	9.4	117.999900000	0.059322	127.499883	0.054902	136.974880	-0.058405
20	28.0	117.999907000	0.000000	127.499890	0.000000	136.974872	0.000000
20	38.0	117.999897000	0.084746	127.499893	-0.023529	136.974881	-0.065705

Max Deviation (ppm)	**+**	**0.38136**		+	**0.26667**	+	**0.15331**
Max Deviation (ppm)	**-**	**0.27966**		**-**	**0.40000**	**-**	**0.49644**
		PASS			**PASS**		**PASS**

Test Setup Photos

RSS-141 – 99% Bandwidth

Engineer Name: E. Wong

Test Equipment					
Asset/Serial #	**Description**	**Model**	**Manufacturer**	**Cal Date**	**Cal Due**
02869	Spectrum Analyzer	E4440A	Agilent	022109	022111
03174	36" 40GHz cable	NA	Astrolab	102809	102811

Test Setup

The EUT is placed on the wooden table. Next Gen Extension is connected to support Next Gen Com Interface box. Com1, Com2, Com3, Com4, 429 In, 429 Out are connected to a section of unterminated cable. Audio signal 2500Hz signal (50% modulation +16 dB) is fed into the EUT via Next Gen Com interface box. A support GPS antenna is connected to the GPS antenna port. RF output port is connected to the spectrum analyzer. The EUT is set in constant transmit mode. Serial communication between the EUT and support laptop is active via the Next Gen Com Interface box.

Freq Range= 118-136.975MHz
Modulation= AM
Mode: 10W and 16 W
Tx freq = 118.0MHz, 127.5 MHz, 136.975MHz

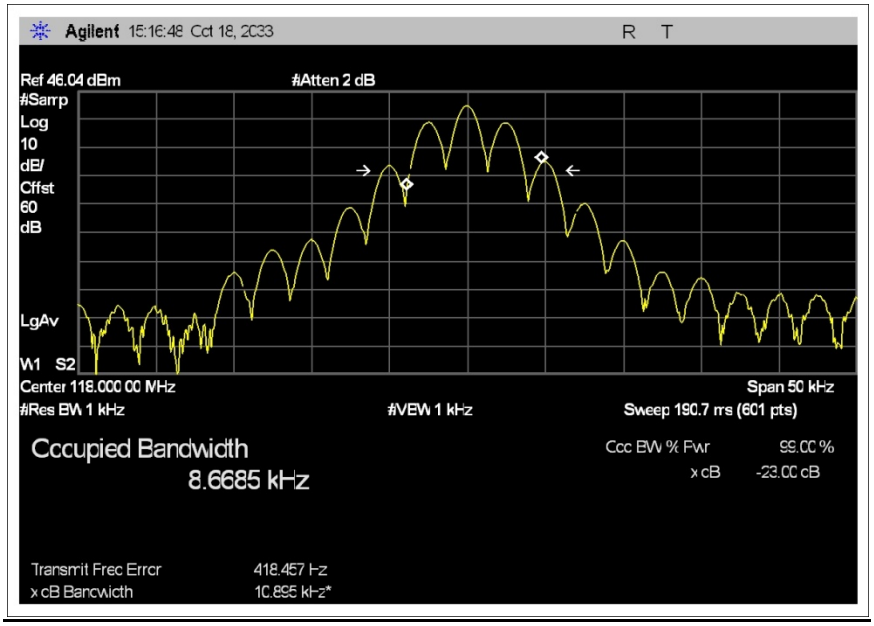
28V DC is from support DC power supply. The EUT is intended to operate in avionic environment from a power source of 14 - 28V. 99% BW of the transmit signal is evaluated at the antenna port. Insertion loss of the external attenuator was verified and compensated as amplitude offset.

Freq	99% BW (10W mode)	99% BW (16 W mode)
118.0 MHz	**8.6685 kHz**	**9.5995 kHz**
128.5 MHz	6.6813 kHz	6.7549 kHz
136.975 MHz	6.6616kHz	6.7329 kHz

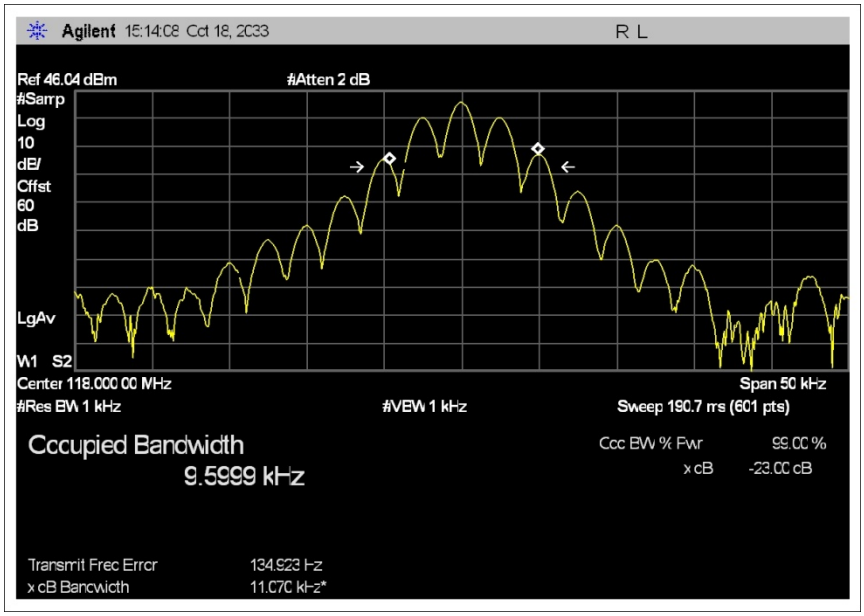
Result: measured 99% occupied BW is less than the 25kHz authorized BW as defined for A3E emission designator (note 3) and exceeds the necessary BW of 6 kHz.

Note (3) In the band 117.975-136 MHz, the authorized bandwidth is 25 kHz for transmitters approved after January 1, 1974.

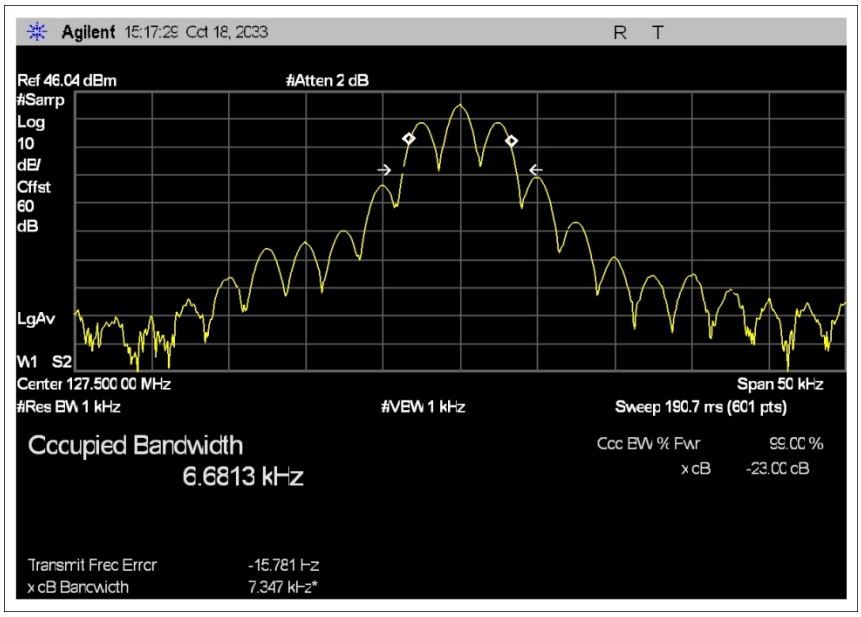
Test Data



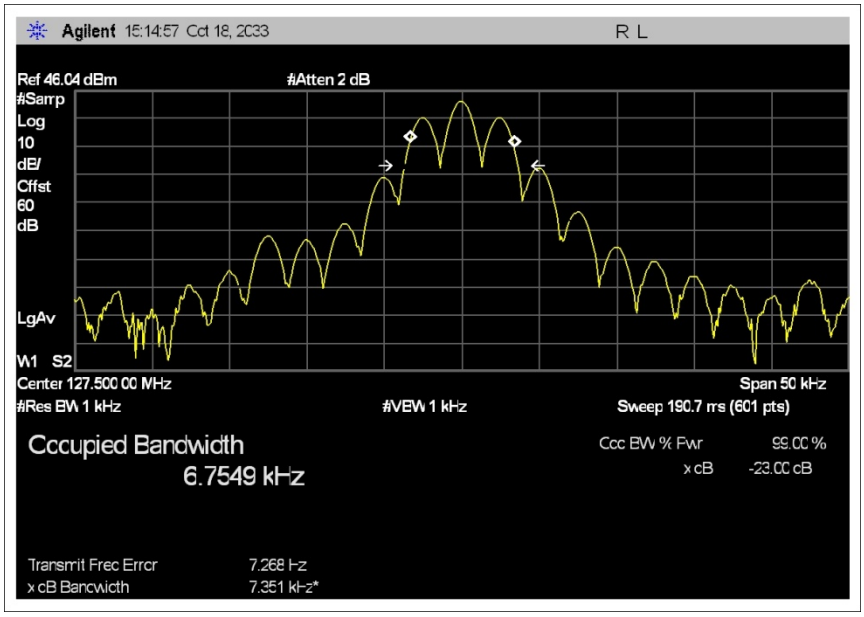
118MHz_10W



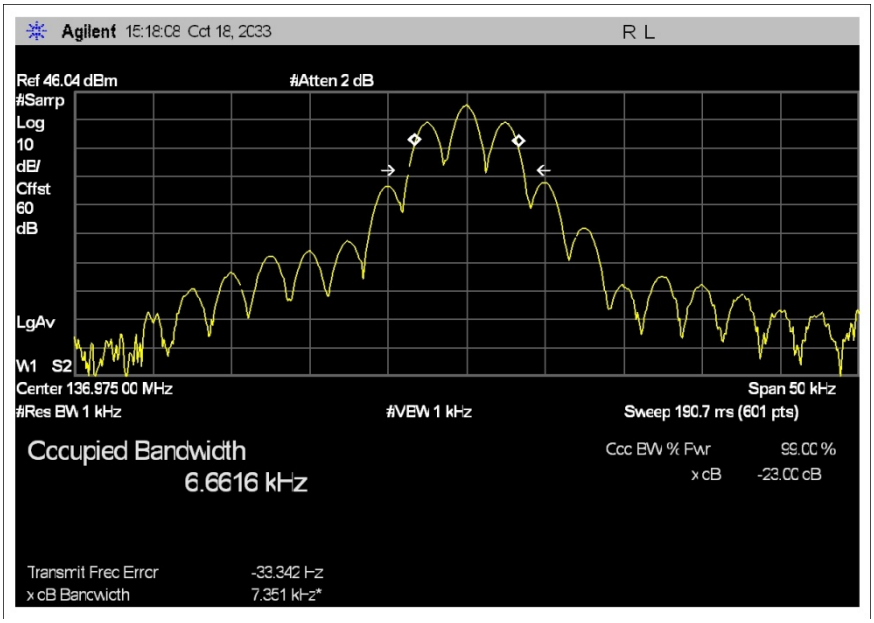
118MHz_16W



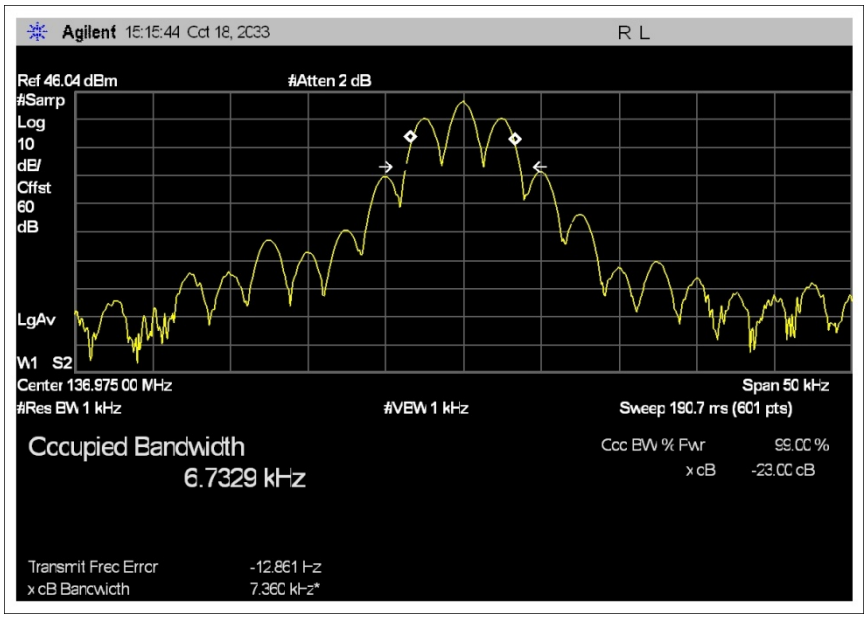
128MHz_10W



128MHz_16W



137MHz_10W



137MHz_16W

Test Setup Photos

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

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

The reported measurement uncertainties are calculated based on the worst case of all laboratory environments from CKC Laboratories, Inc. test sites. Only those parameters which require estimation of measurement uncertainty are reported. The reported worst case measurement uncertainty is less than the maximum values derived in CISPR 16-4-2. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

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.

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 "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the highest readings, this is indicated as a "QP" or an "Ave" on the appropriate rows of the data sheets. 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/receiver readings recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the measuring device called "peak hold," the measuring device had the ability to measure transients 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

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the quasi-peak detector.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer/receiver. 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.