



# TEST REPORT

Test Report No. NC1305993.1 Rev B Date of issue: 19 August 2013

Manufacturer CalAmp WNG

Address 299 Johnson Avenue – Suite 110  
Waseca MN 56093

Name of Equipment VIPER SC+ 200 VHF Radio Modem

Model No(s) Tested 1405028504

Serial No(s) Tested EP2271

Test Result  **Compliant**  **Non-compliant**

*TÜV SÜD America Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV SÜD America Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV SÜD America Inc issued reports.*

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## DIRECTORY

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<input type="checkbox"/> - not applicable	
<input checked="" type="checkbox"/> - applicable	

## REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	27	17 July 2013	Initial Release
A	27	01 August 2013	Added Mask b, c and f references.
B	27	19 August 2013	Added Part 95

## STATEMENT OF MEASUREMENT UNCERTAINTY

The data and results referenced in this document are accurate. The reader is cautioned that there is some measurement variability due to the tolerances of the test equipment that can contribute to a nominal product measurement uncertainty. Furthermore, component differences and manufacturing process variability of production units similar to that tested may result in additional product uncertainty. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests.

## ENVIRONMENTAL CONDITIONS IN THE LAB

	<u>Actual</u>
Temperature:	: 22°C
Relative Humidity	: 67%
Atmospheric pressure	: 99 kPa

## POWER SUPPLY UTILIZED

Power supply system : 20 VDC

## TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.

## **EMISSIONS TEST REGULATIONS :**

**The emissions tests were performed according to following regulations:**

FCC Part 2, Section 2.1053

FCC Part 90, Section 90.210 (b)(3), (c)(3), (d)(3), (e)(3), (f)(3)

FCC Part 80, Section 80.211 (f)

FCC Part 95 Subpart F Section 95.853, 95.857



**Radiated emission limits - Transmitter, FCC Part 90, FCC Part 90, Section 90.210 (b)(3), (c)(3), (d)(3), (e)(3), (f)(3) – FCC Part 80 Section 80.211 (f), FCC Part 95 Subpart F Section 95.853/95.857**

**Test summary**

The requirements are: ■ - MET □ - NOT MET

**Test location**

■ - Oakwood Lab (Open Area Test Site)

**Test Distance**

■ - 3 meters  
□ - 10 meters

**Test equipment used:**

TÜV ID	Model Number	Manufacturer	Description	Serial Number	Cal Due
WRLE03958	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0002	Code B 02-Jan-14
OWLE02074	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	2504	07-Mar-14
NBLE03196	8566B	Hewlett-Packard	Spectrum Analyzer	2240A01856	13-Jan-14
NBLE03195	85662A	Hewlett-Packard	Analyzer Display	2648A13518	13-Jan-14
WRLE03333	SME03	Rohde & Schwarz	Signal Generator	100003	29-Oct-13
OWLE02075	3115	Electro-Mechanics (EMCO)	Ridge Guide Antenna	9001-3275	14-Feb-14
NBLE03196	8566B	Hewlett-Packard	Spectrum Analyzer	2240A01856	13-Jan-14
NBLE03195	85662A	Hewlett-Packard	Analyzer Display	2648A13518	13-Jan-14
WRLE02681	85650A	Hewlett-Packard	Quasi-Peak Adapter	2430A00562	29-Jun-13
OWLE03202	EM-6917B	Electro-Metrics	Biconicalog Periodic	101	02-Jul-13
OWLE02671	8447D	Hewlett-Packard	Preamplifier	2648A04942	Code B 07-Feb-14
WRLE03236	UHAP-10dB	Schwarzbeck	Dipole Antenna 300-1000	164	Code Y
WRLE03333	SME03	Rohde & Schwarz	Signal Generator	100003	29-Oct-13

Cal Code B = Calibration verification performed internally. Cal Code Y = Calibration not required when used with other calibrated equipment.

**Test Limit**

90.210 (b)(3), (c)(3) / -13 dBm eirp  
90.210 (f)(3) / -25 dBm eirp

**Test Data**

See following pages

# RADIATED EMISSIONS



Test Report #: NC1305993 Run 1      Test Area: OW  
 EUT Model #: 1405028504      Date: 6/17/2013  
 EUT Serial #: EP2271      EUT Power: 20.0 Vdc      Temperature: 22.0 °C  
 Test Method: FCC      Air Pressure: 99.0 kPa  
 Customer: CalAmp WNG      Rel. Humidity: 67.0 %

EUT Description: Viper SC+ 200 VHF 215-240MHz Radio Modem

Notes: DUT antenna port terminated into a 50 ohm load

Data File Name: 5993.dat

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## List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 -25 dBm eirp	DELTA2
Begin spurious emissions scan 1 - 2.3 GHz						
f0 = 216.05 MHz, 12 W						
1.1 GHz	62.0 Pk	3.27 / 25.5 / 50.52 / 0.0	40.25	V / 1.00 / 0	-29.95	n/a
1.147 GHz	61.6 Pk	3.35 / 25.69 / 50.43 / 0.0	40.21	V / 1.00 / 0	-29.99	n/a
1.15 GHz	65.35 Pk	3.36 / 25.7 / 50.42 / 0.0	43.98	V / 1.00 / 0	-26.22	n/a
1.125 GHz	57.65 Pk	3.31 / 25.6 / 50.47 / 0.0	36.09	V / 1.00 / 0	-34.11	n/a
1.167 GHz	58.35 Pk	3.39 / 25.77 / 50.39 / 0.0	37.11	V / 1.00 / 0	-33.09	n/a
1.197 GHz	63.4 Pk	3.44 / 25.89 / 50.34 / 0.0	42.39	V / 1.00 / 0	-27.81	n/a
1.092 GHz	55.45 Pk	3.25 / 25.42 / 50.53 / 0.0	33.6	V / 1.00 / 0	-36.6	n/a
1.075 GHz	56.2 Pk	3.22 / 25.27 / 50.56 / 0.0	34.14	V / 1.00 / 0	-36.06	n/a
1.112 GHz	56.2 Pk	3.29 / 25.55 / 50.49 / 0.0	34.55	V / 1.00 / 0	-35.65	n/a
1.125 GHz	56.8 Pk	3.31 / 25.6 / 50.47 / 0.0	35.24	V / 1.00 / 0	-34.96	n/a
1.197 GHz	63.55 Pk	3.44 / 25.89 / 50.34 / 0.0	42.54	V / 1.00 / 0	-27.66	n/a
1.247 GHz	61.15 Pk	3.53 / 25.81 / 50.24 / 0.0	40.24	V / 1.00 / 0	-29.96	n/a
1.297 GHz	60.05 Pk	3.62 / 25.71 / 50.15 / 0.0	39.22	V / 1.00 / 0	-30.98	n/a
1.396 GHz	60.9 Pk	3.79 / 25.51 / 49.97 / 0.0	40.23	V / 1.00 / 0	-29.97	n/a
1.45 GHz	58.5 Pk	3.9 / 25.62 / 49.87 / 0.0	38.16	V / 1.00 / 0	-32.04	n/a
1.45 GHz	60.95 Pk	3.9 / 25.62 / 49.87 / 0.0	40.61	V / 1.00 / 90	-29.59	n/a
1.1 GHz	63.65 Pk	3.27 / 25.5 / 50.52 / 0.0	41.9	V / 1.00 / 180	-28.3	n/a
1.147 GHz	65.95 Pk	3.35 / 25.69 / 50.43 / 0.0	44.56	V / 1.00 / 180	-25.64	n/a
1.15 GHz	69.3 Pk	3.36 / 25.7 / 50.42 / 0.0	47.93	V / 1.00 / 180	-22.27	n/a
1.247 GHz	62.95 Pk	3.53 / 25.81 / 50.24 / 0.0	42.04	V / 1.00 / 180	-28.16	n/a
1.075 GHz	57.2 Pk	3.22 / 25.27 / 50.56 / 0.0	35.14	V / 1.00 / 180	-35.06	n/a
1.396 GHz	62.45 Pk	3.79 / 25.51 / 49.97 / 0.0	41.78	H / 1.00 / 270	-28.42	n/a
1.45 GHz	63.75 Pk	3.9 / 25.62 / 49.87 / 0.0	43.41	H / 1.00 / 270	-26.79	n/a
1.475 GHz	59.6 Pk	3.95 / 25.69 / 49.82 / 0.0	39.41	H / 1.00 / 270	-30.79	n/a
1.496 GHz	60.7 Pk	3.99 / 25.74 / 49.78 / 0.0	40.65	H / 1.00 / 270	-29.55	n/a

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# RADIATED EMISSIONS



America

Test Report #: NC1305993 Run 1 Test Area: OW  
EUT Model #: 1405028504 Date: 6/17/2013  
EUT Serial #: EP2271 EUT Power: 20.0 Vdc Temperature: 22.0 °C  
Test Method: FCC Air Pressure: 99.0 kPa  
Customer: CalAmp WNG Rel. Humidity: 67.0 %

EUT Description: Viper SC+ 200 VHF 215-240MHz Radio Modem

Notes: DUT antenna port terminated into a 50 ohm load

Data File Name: 5993.dat

Page: 2 of 4

## List of measurements for run #: 1

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 -25 dBm eirp	DELTA2
1.65 GHz	57.35 Pk	4.3 / 26.35 / 49.5 / 0.0	38.5	H / 1.00 / 270	-31.7	n/a
maximized						
1.45 GHz	64.55 Pk	3.9 / 25.62 / 49.87 / 0.0	44.21	H / 1.04 / 244	-25.99	n/a
1.15 GHz	69.4 Pk	3.36 / 25.7 / 50.42 / 0.0	48.03	V / 1.07 / 355	-22.17	n/a
1.147 GHz	68.4 Pk	3.35 / 25.69 / 50.43 / 0.0	47.01	V / 1.00 / 179	-23.19	n/a
bore sight						
no higher emissions detected						
absorbers down						
no higher emissions detected						
Sample substitution measurement at 1.15 GHz						
Matching 69.4 dBuV at spectrum analyzer input						
Signal generator level = -45.7 dBm						
Coax attenuation = 6.2 dB						
Substitution antenna gain = 4.2 dBi (acf = 27.2 dB)						
-45.7 dBm - 6.2 dB + 4.2 dBi = -47.7 dBm eirp						
Limit = -25 dBm eirp						
f0 = 216.05 MHz, 1 W						
No higher emissions detected						
f0 = 217.05, 219.05, 221.95 MHz at both 12 W & 1 W						
No change in emission frequencies or levels						
End scan 1 - 2.3 GHz						

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# RADIATED EMISSIONS



America

Test Report #: NC1305993 Run 1 Test Area: OW  
 EUT Model #: 1405028504 Date: 6/17/2013  
 EUT Serial #: EP2271 EUT Power: 20.0 Vdc Temperature: 22.0 °C  
 Test Method: FCC Air Pressure: 99.0 kPa  
 Customer: CalAmp WNG Rel. Humidity: 67.0 %

EUT Description: Viper SC+ 200 VHF 215-240MHz Radio Modem

Notes: DUT antenna port terminated into a 50 ohm load

Data File Name: 5993.dat

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## Measurement summary for limit1: -25 dBm eirp (Pk)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 -25 dBm eirp
1.15 GHz	69.4 Pk	3.36 / 25.7 / 50.42 / 0.0	48.03	V / 1.07 / 355	-22.17
1.147 GHz	68.4 Pk	3.35 / 25.69 / 50.43 / 0.0	47.01	V / 1.00 / 179	-23.19
1.45 GHz	64.55 Pk	3.9 / 25.62 / 49.87 / 0.0	44.21	H / 1.04 / 244	-25.99
1.197 GHz	63.55 Pk	3.44 / 25.89 / 50.34 / 0.0	42.54	V / 1.00 / 0	-27.66
1.197 GHz	63.4 Pk	3.44 / 25.89 / 50.34 / 0.0	42.39	V / 1.00 / 0	-27.81
1.247 GHz	62.95 Pk	3.53 / 25.81 / 50.24 / 0.0	42.04	V / 1.00 / 180	-28.16
1.1 GHz	63.65 Pk	3.27 / 25.5 / 50.52 / 0.0	41.9	V / 1.00 / 180	-28.3
1.396 GHz	62.45 Pk	3.79 / 25.51 / 49.97 / 0.0	41.78	H / 1.00 / 270	-28.42
1.496 GHz	60.7 Pk	3.99 / 25.74 / 49.78 / 0.0	40.65	H / 1.00 / 270	-29.55
1.475 GHz	59.6 Pk	3.95 / 25.69 / 49.82 / 0.0	39.41	H / 1.00 / 270	-30.79
1.297 GHz	60.05 Pk	3.62 / 25.71 / 50.15 / 0.0	39.22	V / 1.00 / 0	-30.98
1.65 GHz	57.35 Pk	4.3 / 26.35 / 49.5 / 0.0	38.5	H / 1.00 / 270	-31.7
1.167 GHz	58.35 Pk	3.39 / 25.77 / 50.39 / 0.0	37.11	V / 1.00 / 0	-33.09
1.125 GHz	57.65 Pk	3.31 / 25.6 / 50.47 / 0.0	36.09	V / 1.00 / 0	-34.11
1.075 GHz	57.2 Pk	3.22 / 25.27 / 50.56 / 0.0	35.14	V / 1.00 / 180	-35.06
1.112 GHz	56.2 Pk	3.29 / 25.55 / 50.49 / 0.0	34.55	V / 1.00 / 0	-35.65
1.092 GHz	55.45 Pk	3.25 / 25.42 / 50.53 / 0.0	33.6	V / 1.00 / 0	-36.6

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# RADIATED EMISSIONS



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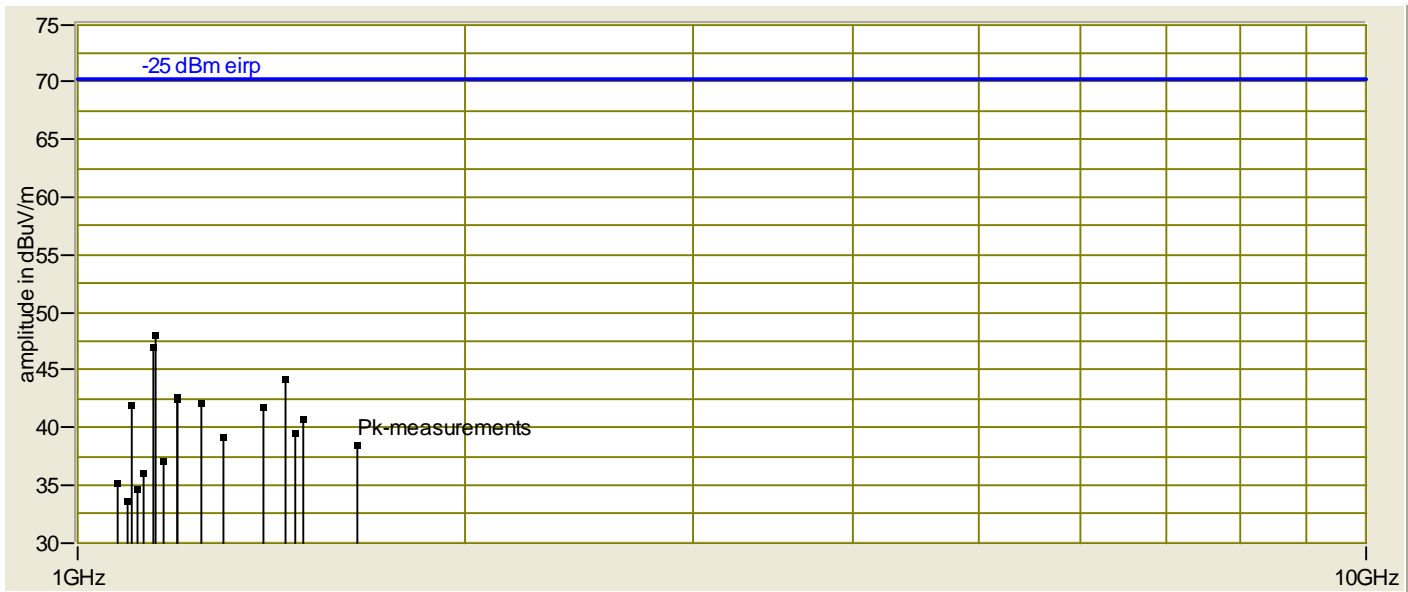
Test Report #: NC1305993 Run 1 Test Area: OW  
EUT Model #: 1405028504 Date: 6/17/2013  
EUT Serial #: EP2271 EUT Power: 20.0 Vdc Temperature: 22.0 °C  
Test Method: FCC Air Pressure: 99.0 kPa  
Customer: CalAmp WNG Rel. Humidity: 67.0 %

EUT Description: Viper SC+ 200 VHF 215-240MHz Radio Modem

Notes: DUT antenna port terminated into a 50 ohm load

Data File Name: 5993.dat Page: 4 of 4

## Graph:



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# RADIATED EMISSIONS



Test Report #: NC1305993 Run 2      Test Area: OW  
 EUT Model #: 1405028504      Date: 6/17/2013  
 EUT Serial #: EP2271      EUT Power: 20.0 Vdc      Temperature: 22.0 °C  
 Test Method: FCC      Air Pressure: 99.0 kPa  
 Customer: CalAmp WNG      Rel. Humidity: 67.0 %

EUT Description: Viper SC+ 200 VHF 215-240MHz Radio Modem

DUT antenna port terminated into 50 ohm load

Notes: \_\_\_\_\_

Data File Name: 5993.dat

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## List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 -25 dBm eirp	DELTA2
Begin transmitter spurious emissions scan, 30 - 1000 MHz						
f0 = 216.05 MHz, 12 W						
175.008 MHz	37.2 Pk	1.01 / 9.37 / 24.4 / 0.0	23.18	V / 1.00 / 0	-47.02	n/a
225.0 MHz	38.2 Pk	1.19 / 11.12 / 24.3 / 0.0	26.21	V / 1.00 / 0	-43.99	n/a
274.998 MHz	40.3 Pk	1.37 / 12.4 / 24.3 / 0.0	29.77	V / 1.00 / 0	-40.43	n/a
299.36 MHz	38.05 Pk	1.46 / 13.17 / 24.3 / 0.0	28.38	V / 1.00 / 0	-41.82	n/a
432.098 MHz	36.95 Pk	1.95 / 16.31 / 24.3 / 0.0	30.91	V / 1.00 / 0	-39.29	n/a
864.14 MHz	35.25 Pk	2.85 / 22.28 / 24.15 / 0.0	36.23	V / 1.00 / 0	-33.97	n/a
299.36 MHz	38.6 Pk	1.46 / 13.17 / 24.3 / 0.0	28.93	V / 1.00 / 0	-41.27	n/a
432.098 MHz	38.1 Pk	1.95 / 16.31 / 24.3 / 0.0	32.06	V / 1.00 / 180	-38.14	n/a
864.14 MHz	37.9 Pk	2.85 / 22.28 / 24.15 / 0.0	38.88	V / 1.00 / 180	-31.32	n/a
432.098 MHz	39.55 Pk	1.95 / 16.31 / 24.3 / 0.0	33.51	V / 1.00 / 270	-36.69	n/a
224.952 MHz	42.6 Pk	1.19 / 11.12 / 24.3 / 0.0	30.61	H / 1.00 / 90	-39.59	n/a
274.998 MHz	43.0 Pk	1.37 / 12.4 / 24.3 / 0.0	32.47	H / 1.00 / 90	-37.73	n/a
299.36 MHz	42.55 Pk	1.46 / 13.17 / 24.3 / 0.0	32.88	H / 1.00 / 90	-37.32	n/a
274.998 MHz	43.85 Pk	1.37 / 12.4 / 24.3 / 0.0	33.32	H / 1.00 / 270	-36.88	n/a
299.36 MHz	44.85 Pk	1.46 / 13.17 / 24.3 / 0.0	35.18	H / 1.00 / 270	-35.02	n/a
Maximized						
864.2 MHz	39.65 Pk	2.85 / 22.28 / 24.15 / 0.0	40.63	V / 1.00 / 179	-29.57	n/a
432.098 MHz	42.35 Pk	1.95 / 16.31 / 24.3 / 0.0	36.31	V / 1.22 / 210	-33.89	n/a
f0 = 216.05 MHz, 1 W						
No higher emissions detected						

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# RADIATED EMISSIONS



Test Report #: NC1305993 Run 2                      Test Area: OW  
 EUT Model #: 1405028504                              Date: 6/17/2013  
 EUT Serial #: EP2271                                  EUT Power: 20.0 Vdc                      Temperature: 22.0 °C  
 Test Method: FCC    Air Pressure: 99.0 kPa  
 Customer: CalAmp WNG    Rel. Humidity: 67.0 %

EUT Description: Viper SC+ 200 VHF 215-240MHz Radio Modem  
DUT antenna port terminated into 50 ohm load

Notes: \_\_\_\_\_

Data File Name: 5993.dat    Page: 2 of 5

## List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 -25 dBm eirp	DELTA2
Sample substitution measurement at 864.2 MHz						
Matching 39.7 dBuV at spectrum analyzer input						
Signal generator level = -44.4 dBm						
Coax attenuation = 4.4 dB						
Substitution antenna gain = -6.2 dBi						
-44.4 dBm - 4.4 dB + -6.2 dBi = -55 dBm eirp						
Limit = -25 dBm eirp						
f0 = 217.05 MHz, 12 W						
Maximized						
434.101 MHz	41.15 Pk	1.96 / 16.26 / 24.3 / 0.0	35.07	V / 1.23 / 216	-35.13	n/a
868.201 MHz	39.35 Pk	2.85 / 22.36 / 24.16 / 0.0	40.41	V / 1.00 / 213	-29.79	n/a
no other new or higher emissions detected						
f0 = 217.05 MHz, 1 W						
No higher emissions detected						
f0 = 219.05 MHz, 12 W						
Maximized						
438.1 MHz	41.4 Pk	1.97 / 16.15 / 24.3 / 0.0	35.22	V / 1.30 / 218	-34.98	n/a
876.2 MHz	39.5 Pk	2.87 / 22.48 / 24.19 / 0.0	40.66	V / 1.00 / 225	-29.54	n/a
no other new or higher emissions detected						
f0 = 219.05 MHz, 1 W						
No higher emissions detected						
f0 = 221.95 MHz, 12 W						
maximized						
443.9 MHz	41.85 Pk	1.99 / 16.3 / 24.3 / 0.0	35.84	V / 1.20 / 229	-34.36	n/a
887.8 MHz	39.5 Pk	2.89 / 22.5 / 24.2 / 0.0	40.69	V / 1.00 / 237	-29.51	n/a

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# RADIATED EMISSIONS



America

Test Report #: NC1305993 Run 2 Test Area: OW  
EUT Model #: 1405028504 Date: 6/17/2013  
EUT Serial #: EP2271 EUT Power: 20.0 Vdc Temperature: 22.0 °C  
Test Method: FCC Air Pressure: 99.0 kPa  
Customer: CalAmp WNG Rel. Humidity: 67.0 %

EUT Description: Viper SC+ 200 VHF 215-240MHz Radio Modem  
Notes: DUT antenna port terminated into 50 ohm load

Data File Name: 5993.dat Page: 3 of 5

## List of measurements for run #: 2

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 -25 dBm eirp	DELTA2
f0 = 221.95 MHz, 1 W						
No higher emissions detected						
End transmitter spurious emissions scan, 30 - 1000 MHz						

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# RADIATED EMISSIONS



Test Report #: NC1305993 Run 2 Test Area: OW  
EUT Model #: 1405028504 Date: 6/17/2013  
EUT Serial #: EP2271 EUT Power: 20.0 Vdc Temperature: 22.0 °C  
Test Method: FCC Air Pressure: 99.0 kPa  
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EUT Description: Viper SC+ 200 VHF 215-240MHz Radio Modem  
DUT antenna port terminated into 50 ohm load

Notes: \_\_\_\_\_

Data File Name: 5993.dat Page: 4 of 5

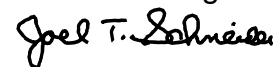
## Measurement summary for limit1: -25 dBm eirp (Pk)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 -25 dBm eirp
887.8 MHz	39.5 Pk	2.89 / 22.5 / 24.2 / 0.0	40.69	V / 1.00 / 237	-29.51
876.2 MHz	39.5 Pk	2.87 / 22.48 / 24.19 / 0.0	40.66	V / 1.00 / 225	-29.54
864.2 MHz	39.65 Pk	2.85 / 22.28 / 24.15 / 0.0	40.63	V / 1.00 / 179	-29.57
868.201 MHz	39.35 Pk	2.85 / 22.36 / 24.16 / 0.0	40.41	V / 1.00 / 213	-29.79
432.098 MHz	42.35 Pk	1.95 / 16.31 / 24.3 / 0.0	36.31	V / 1.22 / 210	-33.89
443.9 MHz	41.85 Pk	1.99 / 16.3 / 24.3 / 0.0	35.84	V / 1.20 / 229	-34.36
438.1 MHz	41.4 Pk	1.97 / 16.15 / 24.3 / 0.0	35.22	V / 1.30 / 218	-34.98
299.36 MHz	44.85 Pk	1.46 / 13.17 / 24.3 / 0.0	35.18	H / 1.00 / 270	-35.02
434.101 MHz	41.15 Pk	1.96 / 16.26 / 24.3 / 0.0	35.07	V / 1.23 / 216	-35.13
274.998 MHz	43.85 Pk	1.37 / 12.4 / 24.3 / 0.0	33.32	H / 1.00 / 270	-36.88
224.952 MHz	42.6 Pk	1.19 / 11.12 / 24.3 / 0.0	30.61	H / 1.00 / 90	-39.59
175.008 MHz	37.2 Pk	1.01 / 9.37 / 24.4 / 0.0	23.18	V / 1.00 / 0	-47.02

Tested by: Greg Jakubowski  
Printed

  
Signature

Reviewed by: Joel T Schneider  
Printed

  
Signature

# RADIATED EMISSIONS



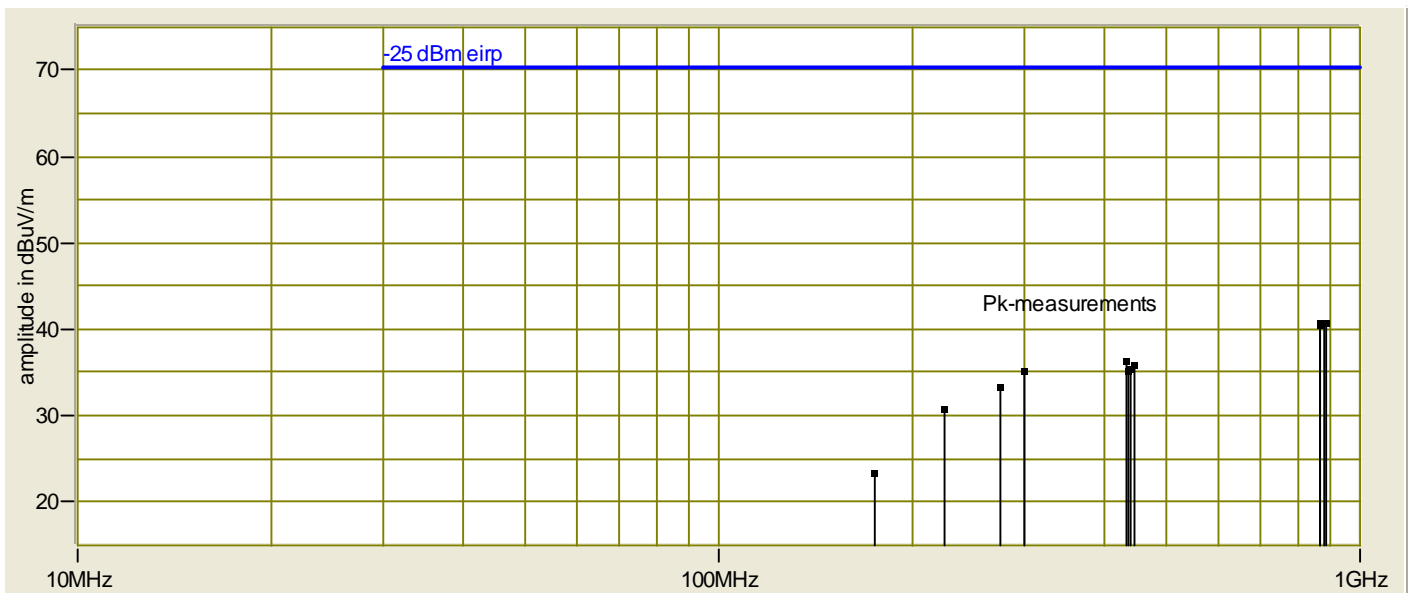
America

Test Report #: NC1305993 Run 2 Test Area: OW  
EUT Model #: 1405028504 Date: 6/17/2013  
EUT Serial #: EP2271 EUT Power: 20.0 Vdc Temperature: 22.0 °C  
Test Method: FCC Air Pressure: 99.0 kPa  
Customer: CalAmp WNG Rel. Humidity: 67.0 %

EUT Description: Viper SC+ 200 VHF 215-240MHz Radio Modem  
Notes: DUT antenna port terminated into 50 ohm load

Data File Name: 5993.dat Page: 5 of 5

## Graph:



Tested by: Greg Jakubowski *Greg Jakubowski*  
Printed Signature  
Reviewed by: Joel T Schneider *Joel T. Schneider*  
Printed Signature

**Test Setup Photo**  
Radiated emissions



NC1305993  
mn: 1405028504

**Test Setup Photo**  
Radiated emissions





**Test Setup Photo**  
Radiated emissions



**DEVIATIONS FROM STANDARD:**

None.

**GENERAL REMARKS:**Modifications required to pass:

- None
- As indicated in the Test Plan

Test Specification Deviations: Additions to or Exclusions from:

- None
- As indicated in the Test Plan

**SUMMARY:**

The requirements according to the technical regulations are

- met
- **not** met.

The device under test does

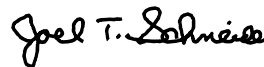
- fulfill the general approval requirements mentioned on page 3.
- **not** fulfill the general approval requirements mentioned on page 3.

EUT Received Date: 17 June 2013  
Condition of EUT: Normal  
Testing Start Date: 17 June 2013  
Testing End Date: 17 June 2013

- TÜV SÜD AMERICA INC -



Greg S Jakubowski  
Senior EMC Technician



Joel T Schneider  
Senior EMC Engineer

## Appendix A

Constructional Data Form

and

Block Diagram





## EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.  
**NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.**

Company: CalAmp WNG  
 Address: 299 Johnson Ave Suite 110  
Waseca, MN 56093  
 Contact: Bill Junge Position: RF Engineering Technologist  
 Phone: 507-833-6733 Fax: 507-833-6758  
 E-mail Address: bjunge@calamp.com

**General Equipment Description -- NOTE: This information will be input into your test report as shown below.**

EUT Description 220 MHz Radio Modem  
 EUT Name VIPER SC+ 200 VHF 215-240MHZ  
 Model No.: 1405028504 Serial No.: TBD  
 Product Options: None  
 Configurations to be tested: Power Supply @ 20.0 Vdc, RS232 connected to laptop, Antenna port 50 ohm load.

**Equipment Modification (If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)**

Modifications since last test: \_\_\_\_\_  
 Modifications made during test: \_\_\_\_\_

**Test Objective(s): Please indicate the tests to be performed, entering the applicable standard(s) where noted.**

- |   |  |
|---|--|
| <input type="checkbox"/> EMC Directive 2004/108/EC (EMC)<br>Std: _____  | <input checked="" type="checkbox"/> FCC: Class <input checked="" type="checkbox"/> A <input type="checkbox"/> B Part _____   |
| <input type="checkbox"/> Machinery Directive 89/392/EEC (EMC)<br>Std: _____   | <input type="checkbox"/> VCCI: Class <input type="checkbox"/> A <input type="checkbox"/> B   |
| <input type="checkbox"/> Medical Device Directive 93/42/EEC (EMC)<br>Std: _____                                     | <input type="checkbox"/> BSMI: Class <input type="checkbox"/> A <input type="checkbox"/> B (Separate Report)   |
|   | <input checked="" type="checkbox"/> Canada: Class <input checked="" type="checkbox"/> A <input type="checkbox"/> B   |
|   | <input type="checkbox"/> Australia: Class <input type="checkbox"/> A <input type="checkbox"/> B  |
|   | FCC Parts 15 Subpart B receive mode radiated emissions.<br>FCC Parts 80 and 90 transmitter mode radiated emissions.<br>IC RSS119 transmitter mode radiated emissions.<br>IC RSS-Gen receive mode radiated emissions. |
|   | <input type="checkbox"/> Other: _____  |
| <input type="checkbox"/> Vehicle Directive - 2004/104/EC (EMC)<br><input type="checkbox"/> Other Vehicle Std: _____ | <input type="checkbox"/> Ag Directive *2009/64/EC (EMC)  |
| <input type="checkbox"/> FDA Reviewers Guidance for Premarket Notification Submissions (EMC)                        |  |



## EMC Test Plan and Constructional Data Form

<b>Third Party Certification (contact TÜV for quote), if applicable (*Signature on last page required).</b>	
<input type="checkbox"/> Attestation of Compliance (AoC)*	<input type="checkbox"/> EMC Certification (used with Octagon Mark)*
<input type="checkbox"/> Statement of Compliance (SoC, previously CoC)* - All aspects of the essential requirements were assessed	
Protection Class (Req'd for AoC, SoC, EMC Cert. N/A for vehicles) <input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III (Press F1 when field is selected to show additional information on Protection Class.)	
<input type="checkbox"/> FCC / TCB Certification	<input type="checkbox"/> Taiwan Certification
<input type="checkbox"/> Industry Canada / FCB Certification	<input type="checkbox"/> Korean Certification
<input type="checkbox"/> e-Mark Certification	

<b>Attendance</b>
Test will be: <input type="checkbox"/> Attended by the customer <input type="checkbox"/> Unattended by the customer

<b>Failure - Complete this section if testing will not be attended by the customer.</b>
If a failure occurs, TÜV SÜD America should:
<input type="checkbox"/> Call contact listed above, if not available then stop testing.    (After hrs phone): _____
<input type="checkbox"/> Continue testing to complete test series.
<input type="checkbox"/> Continue testing to define corrective action.
<input type="checkbox"/> Stop testing.

<b>EUT Specifications and Requirements</b>
Length: <u>4.74"</u> Width: <u>5.75"</u> Height: <u>2.17"</u> Weight: <u>2.4 lbs.</u>

<b>Power Requirements</b>
<i>Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)</i>
Voltage: <u>10-30 Vdc</u> (If battery powered, make sure battery life is sufficient to complete testing.)
# of Phases:    _____
Current (Amps/phase(max)): <u>2.3</u> Current (Amps/phase(nominal)): _____
Other:    _____

<b>Other Special Requirements</b>
None

<b>Typical Installation and/or Operating Environment</b>
(ie. Hospital, Small Business, Industrial/Factory, etc.) Industrial Monitoring and Control

<b>EUT Power Cable</b>
<input type="checkbox"/> Permanent    OR <input checked="" type="checkbox"/> Removable    Length (in meters): <u>1.5m (60")</u>
<input type="checkbox"/> Shielded    OR <input checked="" type="checkbox"/> Unshielded
<input type="checkbox"/> Not Applicable



## EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables														
Type	Analog	Digital	During Test		Qty	Shielding		Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent	
			Active	Passive		Yes	No							Type
<b>EXAMPLE:</b> RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>			Metallized 9-pin D-Sub	Characteristic Impedance	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Power Cable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Weidmuller Power Plug		Two DC Power and Ground.	Characteristic Impedance of the power supply.	1.5m	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Antenna Port	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1	<input type="checkbox"/>	<input type="checkbox"/>	Bird 25-T-MN 50 ohm 25 Watt Load		Shielded Load	50 ohms	0	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>



## EMC Test Plan and Constructional Data Form

### EUT Software.

Revision Level: V1.01.00

Description: Viper Tools Software

### Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test.

It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Tested with the transmitter keyed up at 10.0 Watts at the low, mid and high frequencies of the authorized FCC and IC bands into a 50 ohm load.
2. Tested with the transmitter keyed up at 1.0 Watts at the low, mid and high frequencies of the authorized FCC and IC bands into a 50 ohm load.
3. Tested in receive mode for Local Oscillators and Modem emissions at the mid frequencies of the FCC and IC authorized bands into a 50 ohm load.

### Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC & Taiwan testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc)

Description	Model #	Serial #	FCC ID #
None			



## EMC Test Plan and Constructional Data Form

**Support Equipment** -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)  
This information is required for FCC & Taiwan testing.

Description	Model #	Serial #	FCC ID #
Compaq	nc6000	CNU447F26M	CNTWM3B2200BGA
RS232	Cable	N/A	N/A

### Oscillator Frequencies

Manufacturer	Frequency	Derived Frequency	Component # / Location	Description of Use
Discrete Components	430-480 MHz		On Board VCO	215-240 MHz Transmitter VCO
Discrete Components	286-311 MHz		On Board VCO	On board Receiver Local Oscillator
Transko TCXO-1250	23.04 MHz		4187009230 - Y101	TCXO stable frequency source for the VCO/Synthesizers.
AD9864 PLL VCO	73.880 MHz		4444002040 - Y280	Second Oscillator Mix frequency

### Power Supply

Manufacturer	Model #	Serial #	Type
HP	HP6284	N/A	<input type="checkbox"/> Switched-mode: (Frequency) _____ <input checked="" type="checkbox"/> Linear <input type="checkbox"/> Other: _____
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

### Power Line Filters

Manufacturer	Model #	Location in EUT
None		





## EMC Test Plan and Constructional Data Form

<b>Critical EMI Components (Capacitors, ferrites, etc.)</b>				
<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>
None				

**EMC Critical Detail --** Describe other EMC Design details used to reduce high frequency noise.

None

PLEASE ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

**Authorization (Signature Required if a Third Party Certification is checked on pg 1)**

William M. Junge

5/22/2013

Customer authorization to perform tests according to this test plan.

Date

Test Plan/CDF Prepared By (please print)

Date

## Appendix B

### Measurement Protocol



## MEASUREMENT PROTOCOL

### Test Methodology

Emissions testing is performed according to the procedures in TIA-603-C and ANSI C63.4-2003.

### Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of  $\pm 1.8$  dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of  $\pm 4.8$  dB. The equipment comprising the test systems is calibrated on an annual basis.

### Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

### Radiated Emissions

The final level, in  $\text{dB}\mu\text{V}/\text{m}$ , equals the reading from the spectrum analyzer (Level  $\text{dB}\mu\text{V}$ ), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data sheets in Attachment A.

Example:

FREQ (MHz)	LEVEL ( $\text{dB}\mu\text{V}$ )	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL ( $\text{dB}\mu\text{V}/\text{m}$ )	POL/HGT/AZ (m) (deg)	DELTA1
60.80	42.5Qp +	1.2 + 10.9 - 25.5 =	29.1	V 1.0 0.0	-10.9

### Substitution Method

Per TIA/EIA 603-C-2004, a radiated emission scan was also made, at TUV America's Wild River Lab Large Test Site, with the EUT's antenna replaced with a termination to demonstrate case radiation compliance to the  $-13$  dBm requirement. Radiated emissions from the EUT are measured in the frequency range of 30 to 27000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. The field strength levels were measured per ANSI C63.4. The EUT is then replaced with a tuned dipole antenna (below 1 GHz) or horn antenna (above 1 GHz). The substitute antenna was placed in the same polarization as the test antenna. A signal generator was used to generate a signal level that matched the highest level measured from the EUT. The signal generator level minus the cable loss from the signal generator to the substitute antenna plus the substitute antenna gain equals the spurious power level.