ADDENDUM TO FC02-086

FOR THE

MULTI CARRIER RF POWER AMPLIFIER, G3S-800-140-031

FCC PART 90 AND PART 15 SUBPART B SECTION 15.109 CLASS B

COMPLIANCE

DATE OF ISSUE: SEPTEMBER 25, 2002

PREPARED FOR:

Powerwave Technologies
1801 E. St. Andrew Place
Santa Ana, CA 92705

P.O. No.: 60179
W.O. No.: 79565

PREPARED BY:

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CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

Date of test: September 12-16, 2002

Report No.: FC02-086A

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ADMINISTRATIVE INFORMATION

DATE OF TEST:	September 12-16, 2002
DATE OF RECEIPT:	September 12, 2002
PURPOSE OF TEST:	To demonstrate the compliance of the Multi Carrier RF Power Amplifier, G3S-800-140-031 with the requirements for FCC Part 90 and Part 15 Subpart B Section 15.109 Class B devices. Addendum A is to revise the emissions masks on pages 16-18.
TEST METHOD:	ANSI C63.4 (1992) and Part 90
FREQUENCY RANGE TESTED:	8 - 9000 MHz
MANUFACTURER:	Powerwave Technologies 1801 E. St. Andrew Place Santa Ana, CA 92705
REPRESENTATIVE:	Jeffrey Dale
TEST LOCATION:	CKC Laboratories, Inc. 110 Olinda Place Brea, CA 92621

SUMMARY OF RESULTS

As received, the Powerwave Technologies Multi Carrier RF Power Amplifier, G3S-800-140-031 was found to be fully compliant with the following standards and specifications:

United States

- FCC Part 90 and Part 15 Subpart B Section 15.109 using:
- ANSI C63.4 (1992) and Part 90 methods

CONDITIONS FOR COMPLIANCE

Conducted emissions for this device falls under the FCC DoC process. Conducted testing is not included in this report. The manufacturer does not plan to sell a power supply with this device. They will provide a statement in their user manual that in order to comply with FCC regulations, only an approved power supply is to be used with their product.

APPROVALS

QUALITY ASSURANCE:

Steve Behm, Director of Engineering Services

Joyce Walker, Quality Assurance Administrative Manager

Septimiu Apahidean, EMC/Lab Manager

TEST PERSONNEL:

Eddie Wong, EMC Engineer

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The Multi-carrier RF power amplifier tested by CKC Laboratories was a production unit.

EQUIPMENT UNDER TEST

Multi Carrier RF Power Amplifier
Manuf: Powerwave Technologies
Model: G3S-800-140-031
Serial: C00000UM9M
FCC ID: E675JS0056 (pending)

PERIPHERAL DEVICES

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

Signal Generator
Manuf: Agilent
Model: 4433B
Serial: US28440615
FCC ID: DoC

Signal Generator
Manuf: Agilent
Model: 4433B
Serial: US40051329
FCC ID: DoC

Signal Generator
Manuf: Agilent
Model: 4432B
Serial: US40053285
FCC ID: DoC

Power Meter
Manuf: Agilent
Model: E4418B
Serial: US39251692
FCC ID: DoC

RF Combiner
Manuf: Anaren
Model: 44000
Serial: 416
FCC ID: DoC

DC Power Supply
Manuf: Power Ten
Model: NA
Serial: 003973
FCC ID: NA

2.1033(c)(3) USER'S MANUAL
The necessary information is contained in a separate document.

2.1033 (c)(4) TYPE OF EMISSIONS
The necessary information is contained in a separate document.

2.1033(c)(5) FREQUENCY RANGE
The frequency range is 851 – 869 MHz.

2.1033(c)(6) OPERATING POWER
The measured RF power at antenna terminal = 140 watts ERP.

2.1033(c)(7) MAXIMUM POWER RATING
The maximum power limit is 1000 watts.

2.1033(c)(8) DC VOLTAGES
The necessary information is contained in a separate document.

2.1033(c)(9) TUNE-UP PROCEDURE
The necessary information is contained in a separate document.

2.1033(c)(10) SCHEMATICS AND CIRCUITRY DESCRIPTION
The necessary information is contained in a separate document.

2.1033(c)(11) LABEL AND PLACEMENT
The necessary information is contained in a separate document.

2.1033(c)(12) SUBMITTAL PHOTOS
The necessary information is contained in a separate document.

2.1033(c)(13) MODULATION INFORMATION
The necessary information is contained in a separate document.

2.1033(c)(14)/2.1046/90.205(j) - RF POWER OUTPUT

Setup:
The EUT is a rack mount placed on the test bench. Thee signal generators send 64 QAM signal to the RF input of the EUT via a RF Signal combiner. The output of the EUT is connected to RF attenuator and Directional coupler. 140 watts of RF power is maintained.

The Amplified RF signal is measured at the output of the Directional coupler with a RF power meter. A RF attenuation of 52.3 dB is compensated for all measured readings.

Low Channel = 851.03 MHz
Mid Channel = 860.00 MHz
Hi Channel = 868.97 MHz

27 V DC (from a 230Vac60Hz power supply), 27ºC, 55%rh.

The Maximum and minimum power level were measured by adjusting the input RF signal.

Results:
At max power the measured RF power at antenna terminal = 140 watts ERP.

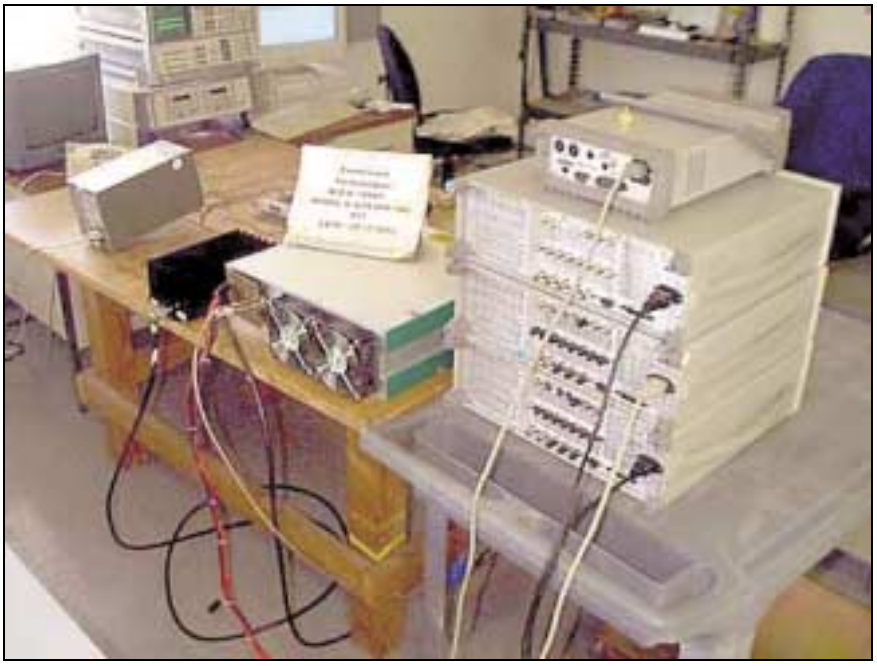
At minimum power the measured RF power at antenna terminal = 0 watts.

Test Equipment:

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
RF Power Meter	02082	HP	435B	2445A11881	091202	091203

Direct Connect at Antenna Port Test Setup – Front

Direct Connect at Antenna Port Test Setup - Front



Direct Connect at Antenna Port Test Setup - Back

2.1033(c)(14)/2.1047(a) - MODULATION CHARACTERISTICS - AUDIO FREQUENCY RESPONSE

Not applicable to this unit.

2.1033(c)(14)/2.1047(b) MODULATION CHARACTERISTICS – Modulation Limiting Response

Not applicable to this unit.

2.1033(c)(14)/2.1049(i)/90.210- OCCUPIED BANDWIDTH

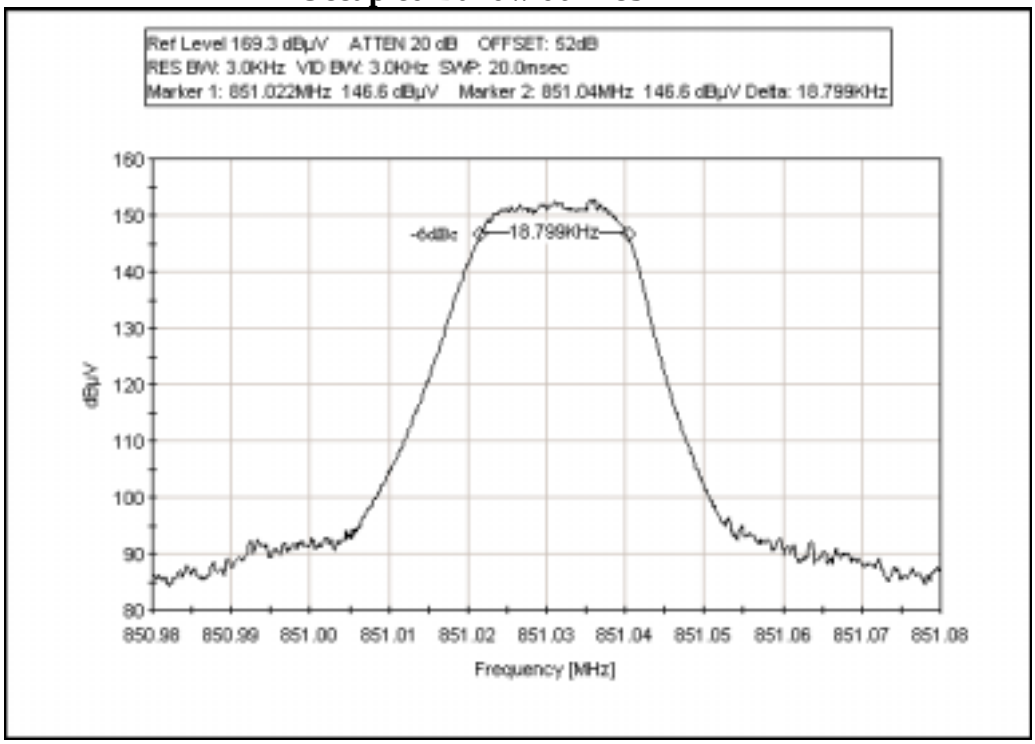
Test Conditions:
The EUT is a rack mount placed on the test bench. The signal generators sends a 64 QAM signal to the RF input of the EUT via a RF signal combiner. The output of the EUT is connected to RF attenuator and Directional coupler. 140 watts of RF power is maintained. The Amplified RF signal is measured at the output of the Directional coupler. A RF attenuation of 52.3 dB is compensated for all measured readings. 27 VDC (from a 230VAC, 60Hz power supply), 27ºC, 55% relative humidity. 20 kHz at 6 dB point per test plan.

Low Channel = 851.03 MHz
Mid Channel = 860.00 MHz
Hi Channel = 868.97 MHz

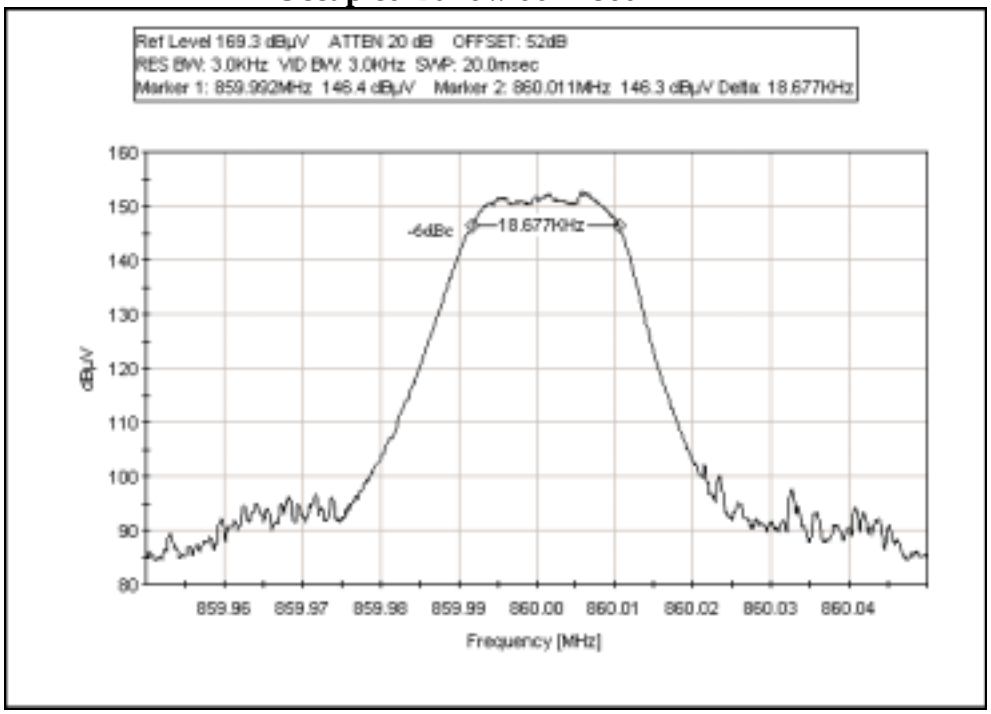
Test Equipment:

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
¼" Heliax Coaxial Cable	NA	Andrew	FSJ-50A-4	Cable#7 (6 ft)	071502	071503
Spectrum Analyzer	02467	Agilent	E7405A	US40240225	032902	032903

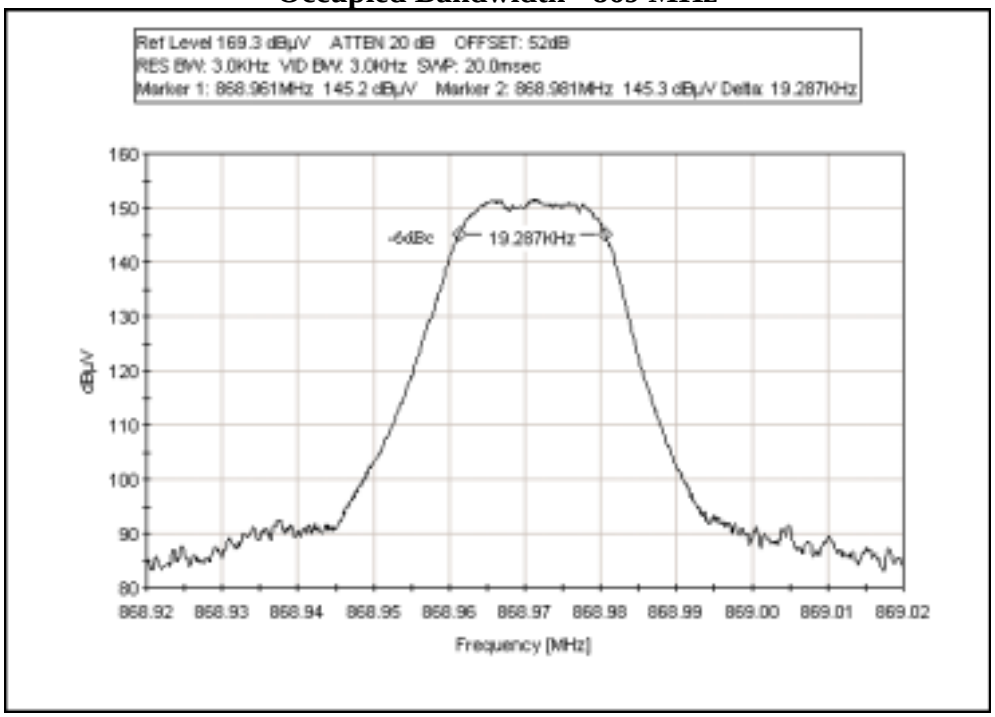
Occupied Bandwidth - 851 MHz



Occupied Bandwidth - 860 MHz



Occupied Bandwidth - 869 MHz



2.1033(c)(14)/2.1051/90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINAL

Emission Mask for EA based Systems: Rated power output: 140 watt & authorized band width: 20 kHz

90.691 Emission mask requirements for EA-based systems:

(a) Out-of-band emission requirement shall apply only to the "outer" channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

Attenuation: 50 + 10 Log (P)
= 50 + 10 Log (140)
= 71.46 dB
(87 dBuV regardless of power)

To calculate break point at 71.46 dB (this is the lesser of the required attenuation)

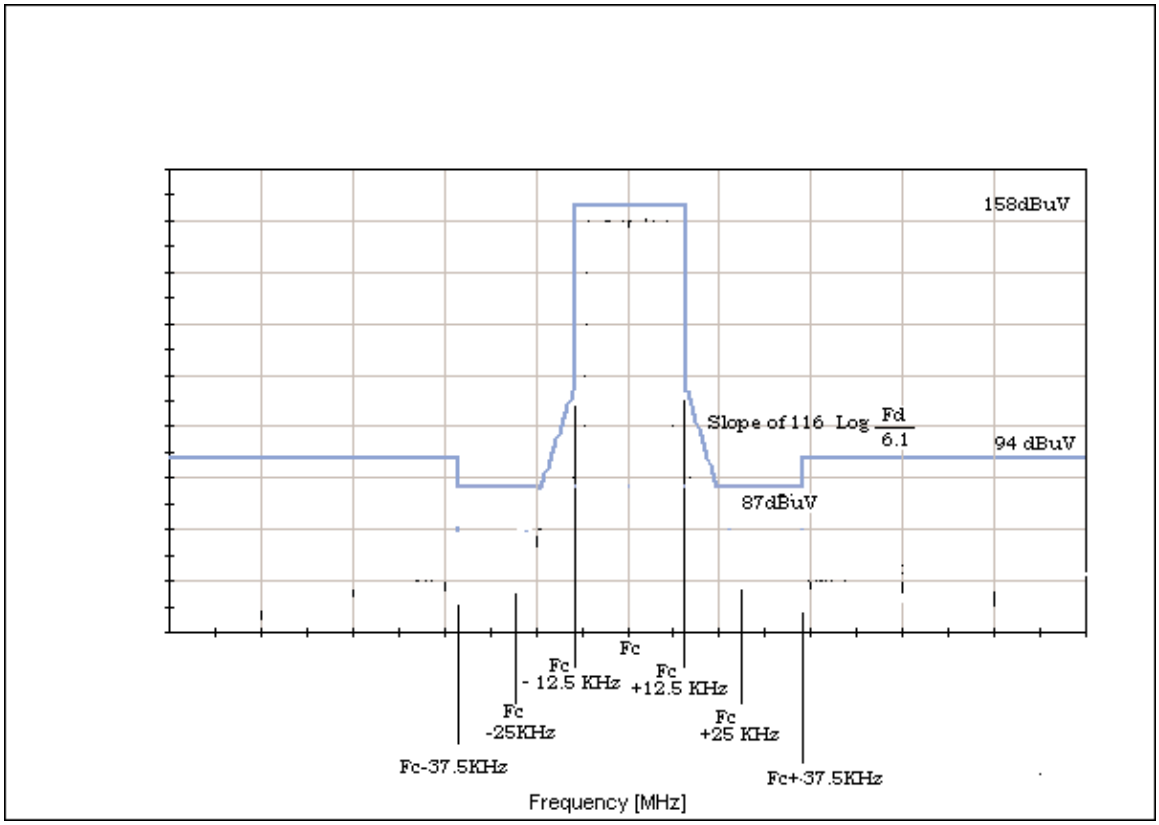
116 log (f_d /6.1) dB = 71.46 dB
f_d = (6.1 x antilog 71.46/116)
= 25 kHz

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

Attenuation: 43 + 10Log10(P)
= 43 + 10 Log (140)
= 64.46 dB (this is the lesser of the required attenuation)
(94 dBuV regardless of power)

(b) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section

Emission Mask Calculations



Frequency band	**Required attenuation**
–12.5 kHz to +12.5 kHz	0 dB
– 25 kHz to – 12.5 kHz, +12.5 kHz to +25 kHz	116 log (f_d /6.1) dB
– 37 kHz to – 25 kHz + 25 kHz to +37 kHz	71.46 dBc (87 dBuV)
+8 MHz to -37 kHz, +37 kHz to +9000 MHz	43+10 Log (P) = 64.46 dBc (P = 140 watt) (94 dBuV)

Emission Mask Calculations

Power to voltage level (dBuV) conversion

Rated power = 140 watts
R = 50 Ohm

$$\text{Power} = \frac{V^2}{R}$$

$$V = \sqrt{\text{Power x R}}$$

$$V = \sqrt{140 \text{ x } 50}$$

$$V = \sqrt{7000}$$

$$V = 83.66 \text{ V}$$

$$V\,(\text{dB}\mu\text{V}) = 20 \text{ Log}\left(\frac{83.66}{1 \text{ x } 10^{-6}}\right)$$
$$= 158 \text{ dB}\mu\text{V}$$

Limit line for Spurious Conducted Emission :

Required Attenuation = 43+10 Log P dB

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

V_{dBuV} = $20 \text{ Log } \frac{V}{1 \text{ x } 10^{-6}}$

= $20 \left(\text{Log } V - \text{Log } 1 \text{ x } 10^{-6} \right)$

= $20 \text{ Log } V - 20 \text{ Log} 1 \text{ x } 10^{-6}$

= $20 \text{ Log } V - 20 \left(-6 \right)$

= $20 \text{ Log } V + 120$

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

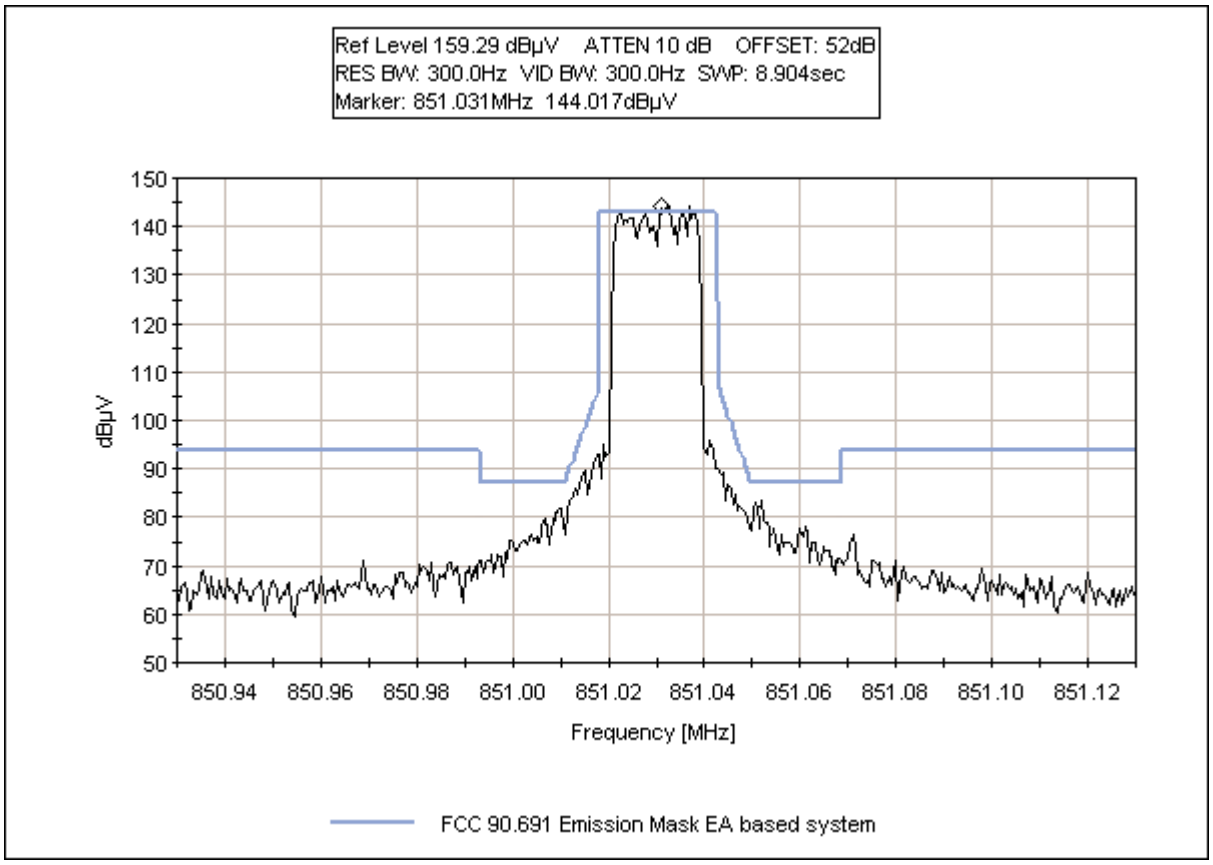
= 20 Log V + 120 – 43 – 20 Log V + 10Log R

= 120 – 43 + 10 Log 50 Note : R = 50 Ω

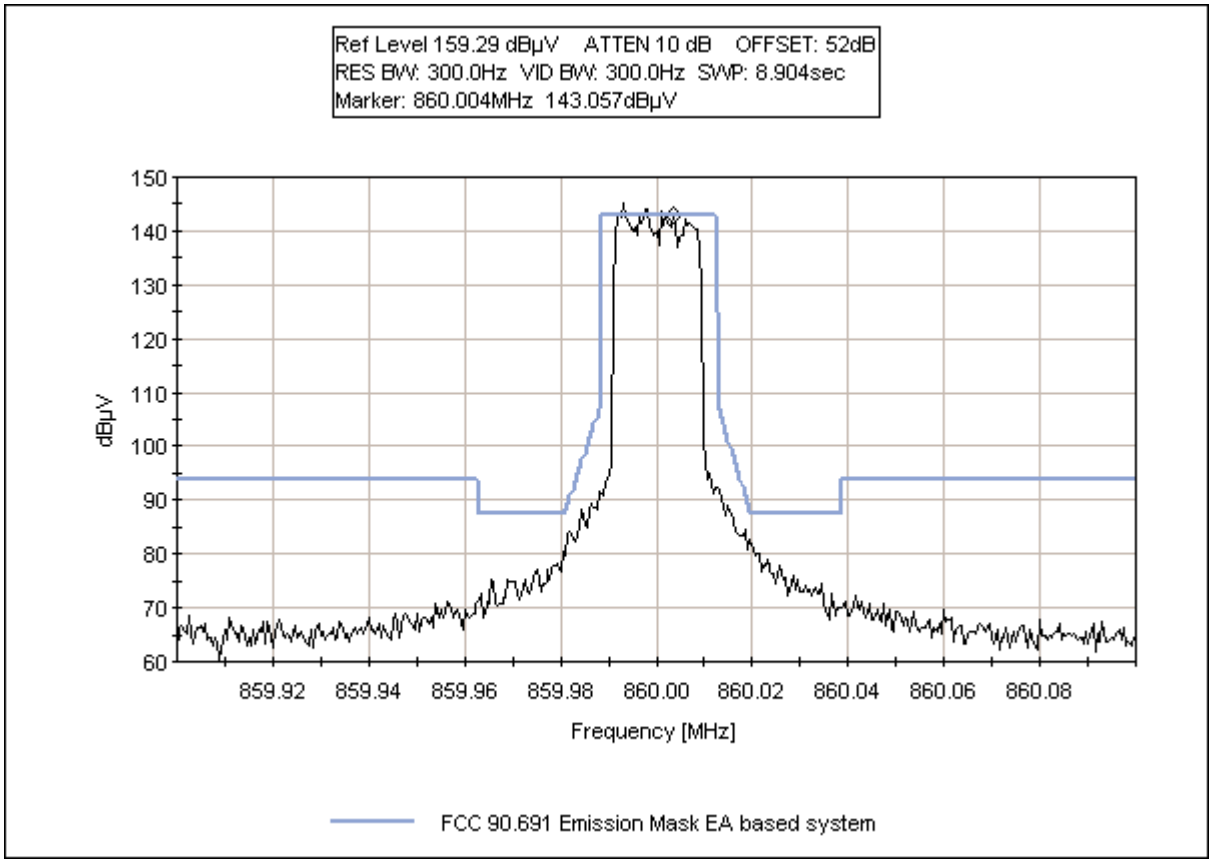
= 120 –43 + 16.897

= 94 dBuV at any power level

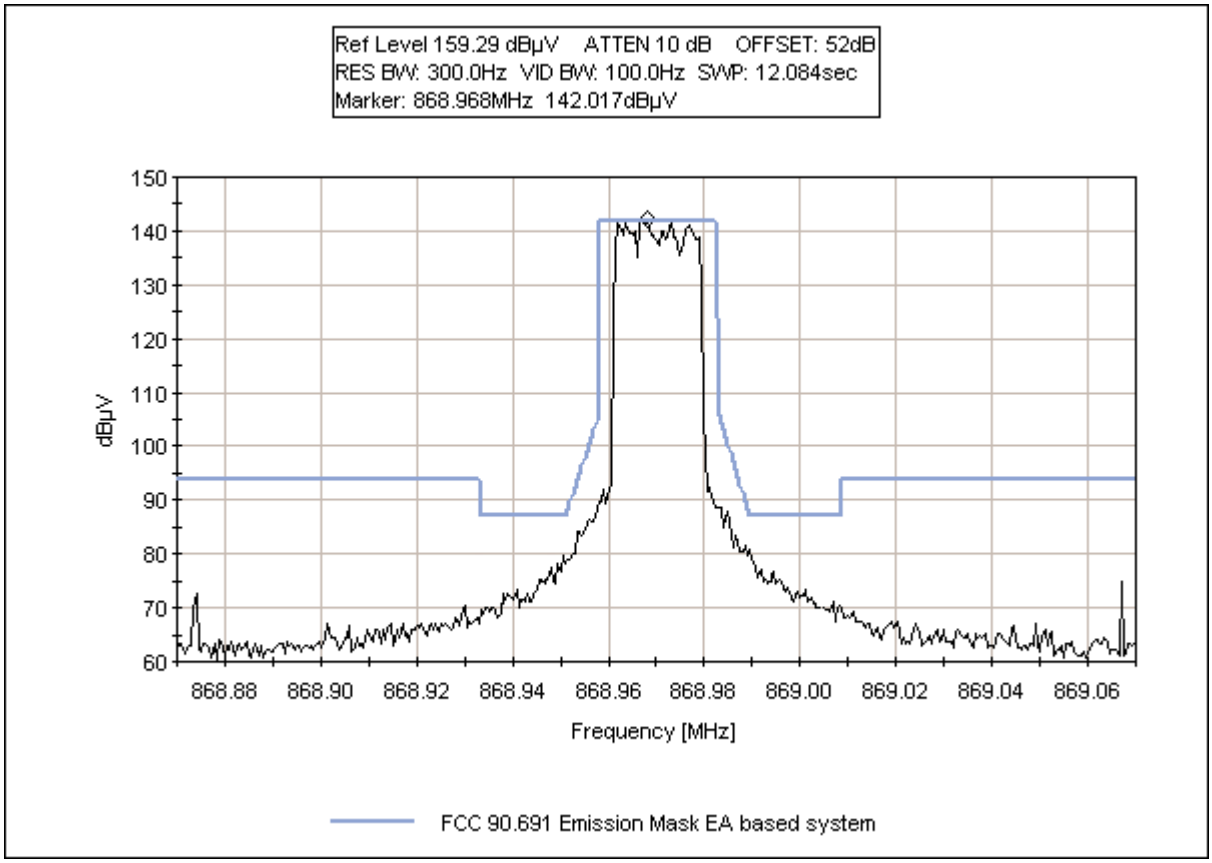
Emission Mask - 851 MHz



Emission Mask - 860 MHz



Emission Mask - 868 MHz



Test Location: CKC Laboratories Inc. •180 N Olinda Place • Brea CA, 92823 • 714-993-6112

Customer: **Powerwave Technologies**
Specification: **FCC 90.210 Spurious Emission at Antenna Terminal**
Work Order #: **79565** Date: 9/12/02
Test Type: **Conducted Emissions** Time: 16:36:51
Equipment: **Multi Carrier RF Power Amplifier** Sequence#: 1
Manufacturer: Powerwave Technologies Tested By: Eddie Wong
Model: G3S-800-140-031 27 V dc
S/N: C00000UM9M

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

Function	Manufacturer	Model #	S/N
Multi Carrier RF Power Amplifier*	Powerwave Technologies	G3S-800-140-031	C00000UM9M

Support Devices:

Function	Manufacturer	Model #	S/N
Signal Generator	Agilent	4433B	US28440615
Signal Generator	Agilent	4433B	US40051329
Signal Generator	Agilent	4432B	US40053285
Power Meter	Agilent	E4418B	US39251692
RF Combiner	Anaren	44000	416
DC Power Supply	Power Ten	NA	003973

Test Conditions / Notes:

Rack mount EUT placed on the test bench. Three signal generators send 64 QAM signal to the RF input of the EUT via a RF signal combiner. The output of the EUT is connected to RF attenuator and Directional coupler. A RF attenuation of 52.3 dB is compensated for all measured readings. 140 watts of RF power is maintained at time load. The Amplified RF signal is measured at the output of the Directional coupler. Low Channel = 851.03 MHz, Mid Channel = 860.00 MHz, Hi Channel = 868.97 MHz. Range of measurement: 8 MHz - 9 GHz. Required Attenuation = -43+10Log(P) = -43+10 Log(140) = 64.46 dB (Emission limit = 94 dB at antenna terminal). 8-30 MHz: RBW=VBW= 9 kHz. 30-1000 MHz: RBW=VBW= 120 kHz. 1000-9000 MHz:RBW=VBW= 1 MHz. 27 VDC (from a 230VAC, 60Hz power supply), 27ºC, 55% relative humidity.

Transducer Legend:

T1=Brea Cable: 6' 1/4" Heliax - Brea # 7. T2=1.5GHz High Pass Filter, A/N 01415

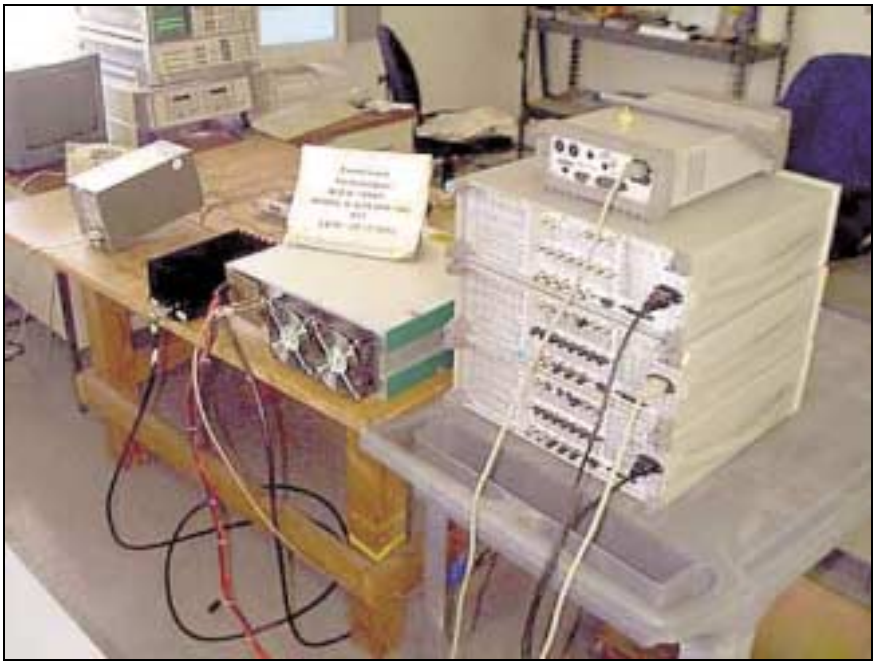
Measurement Data: Reading listed by margin. Test Lead: Antenna Terminal

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	dB	dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	860.053M	159.0	+0.0	+0.0			+0.0	159.0	94.0 Fundamental	+65.0	Anten
2	868.998M	158.9	+0.0	+0.0			+0.0	158.9	94.0 Fundamental	+64.9	Anten
3	851.095M	158.8	+0.0	+0.0			+0.0	158.8	94.0 Fundamental	+64.8	Anten
4	1728.958M Ave	89.5	+0.6	+0.4			+0.0	90.5	94.0	-3.5	Anten
^	1728.958M	110.5	+0.6	+0.4			+0.0	111.5	94.0	+17.5	Anten

6 Ave	1710.958M	89.1	+0.6	+0.5	+0.0	90.2	94.0	-3.8	Anten
^	1710.958M	110.0	+0.6	+0.5	+0.0	111.1	94.0	+17.1	Anten
8	761.350M	84.9	+0.0	+0.0	+0.0	84.9	94.0	-9.1	Anten
9 Ave	1702.318M	83.3	+0.6	+0.5	+0.0	84.4	94.0	-9.6	Anten
^	1702.318M	106.0	+0.6	+0.5	+0.0	107.1	94.0	+13.1	Anten
11	758.450M	81.7	+0.0	+0.0	+0.0	81.7	94.0	-12.3	Anten
12	113.100M	76.4	+0.0	+0.0	+0.0	76.4	94.0	-17.6	Anten
13 Ave	1693.198M	74.9	+0.6	+0.5	+0.0	76.0	94.0	-18.0	Anten
^	1693.198M	94.5	+0.6	+0.5	+0.0	95.6	94.0	+1.6	Anten
15 Ave	1684.198M	73.3	+0.6	+0.5	+0.0	74.4	94.0	-19.6	Anten
^	1684.198M	92.0	+0.6	+0.5	+0.0	93.1	94.0	-0.9	Anten
17 Ave	2580.070M	68.6	+1.1	+0.6	+0.0	70.3	94.0	-23.7	Anten
^	2580.070M	84.8	+1.1	+0.6	+0.0	86.5	94.0	-7.5	Anten

Direct Connect at Antenna Port Test Setup – Front

Direct Connect at Antenna Port Test Setup - Front



Direct Connect at Antenna Port Test Setup - Back

Test Equipment:

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer (Site D)	02554	HP	8566B	2746A06369	052102	052103
QP Adapter (Site D)	00311	HP	85650A	2430A00532	061402	061403
¼" Heliax Coaxial Cable	NA	Andrew	FSJ-50A-4	Cable#7 (6 ft)	071502	071503
1.5 GHz, HPF	01415	HP	84300-80037	3643A00026	030502	030503

2.1033(c)(14)/2.1053/90.210 - FIELD STRENGTH OF SPURIOUS RADIATION

Operating Frequency: 851 – 869 MHz
Channels: Low, middle, high
Highest Measured Output Power: 51.46 ERP(dBm)= 140 ERP(Watts)
Distance: 3 meters
Limit: 43+10Log(P) 64.46 dBc

Freq. (MHz)	Reference Level (dBm)	Antenna Polarity (H/V)	dBc
43.97	-32.3	Vert	83.76
878.02	-32.70	Vert	84.16
842.16	-32.70	Vert	84.16
3,458.04	-37.10	Horiz	88.56
3,449.25	-38.70	Vert	90.16
3,458.52	-39.80	Vert	91.26
54.51	-41.20	Vert	92.66
842.14	-41.70	Horiz	93.16
887.00	-41.80	Vert	93.26
3,413.18	-42.20	Vert	93.66
3,431.24	-42.40	Vert	93.86
44.18	-43.40	Horiz	94.86
3,440.21	-44.00	Vert	95.46
833.19	-44.80	Vert	96.26
3,421.85	-45.40	Vert	96.86
886.97	-45.70	Horiz	97.16
878.04	-46.50	Horiz	97.96
4,308.94	-46.60	Horiz	98.06
4,308.94	-46.60	Horiz	98.06
58.05	-47.80	Horiz	99.26
1,737.91	-48.60	Vert	100.06
1,729.01	-49.60	Vert	101.06
1,030.54	-49.70	Horiz	101.16
1,702.04	-49.90	Vert	101.36
1,728.84	-50.00	Horiz	101.46
266.76	-51.60	Horiz	103.06
46.44	-51.90	Horiz	103.36
83.39	-52.80	Horiz	104.26
183.39	-52.90	Horiz	104.36
116.71	-54.00	Vert	105.46
56.22	-54.60	Horiz	106.06
64.27	-55.20	Vert	106.66
1,212.85	-55.90	Vert	107.36
2,307.94	-56.30	Horiz	107.76

Limit line for Spurious Radiated Emission:

Required Attenuation = 43+10 Log P (dB)
For radiated spurious emission measured at 3 meter test distance:
Required attenuation = 43+10 Log $P_{t \text{ at 3 meter}}$ dB
Limit line (dBuV) = E_{dBuv} - Attenuation
E_{dBuv} = Measured field strength at 3 meter in dBuV/m

Power Density (Isotropic):

$$P_D = \frac{P_t}{4\pi r^2}$$

P_D = Power Density in Watts /m^2
Pt = Average Transmit Power
r = Test distance

Field Intensity E (V/m):

$$E = \sqrt{P_D \text{ x } 377}$$

$$E = \frac{\sqrt{P_t \text{ x } 377}}{4\pi r^2}$$

$$E = \sqrt{\frac{P_t \text{ x } 30}{r^2}}$$

$$P_t = \left(\frac{E^2 \text{ x } r^2}{30} \right)$$

$10 \text{ Log } P_t = 10 \text{ Log } E^2 \text{ (V/m)} + 10 \text{ Log } r^2 - 10 \text{ Log } 30$

$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (V/m)} + 20 \text{ Log } r - 10 \text{ Log } 30$

At 3 meter, r = 3 m

$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (V/m)} + 20 \text{ Log } 3 - 10 \text{ Log } 30$

$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (V/m)} + 9.54 - 14.77$

$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (V/m)} - 5.23$

Since 20 Log E (V/m) = 20 Log E (**u**V/m) –120

$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (uV/m)} - 120 - 5.23$

$10 \text{ Log } P_t = 20 \text{ Log } E \text{ (uV/m)} - 125.23$

Limit line (dBuV) at 3 meter = E_{dBuv} - Attenuation

= E_{dBuv} - (43+10 Log $P_{t \text{ at 3 meter}}$)

= E_{dBuv} - 43 - 10 Log $P_{t \text{ at 3 meter}}$

= E_{dBuv} - 43 - (20 Log E (uV/m) - 125.23)

= E_{dBuv} - 43 - 20 Log E (uV/m) + 125.23

= E_{dBuv} - 20 Log E (uV/m) + 82.23

Since 20 Log E (uV/m) = E in dBuV/m

= E_{dBuv} - E_{dBuv} + 82.23

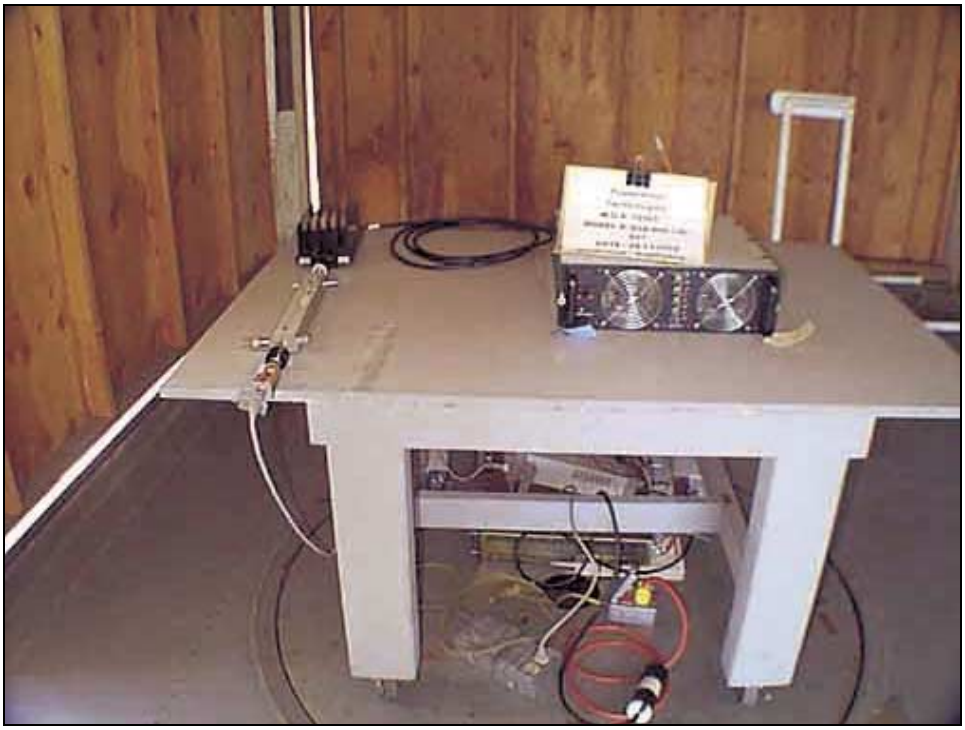
Radiated emission limit 3 meter = 82.23 dBuV at any power level measured in dBuV

Test Conditions:

Rack mount EUT placed on the test bench. Three remotely located signal generators send 64 QAM signal to the RF input of the EUT via a RF signal combiner. The output of the EUT is connected to RF load and directional coupler. 140 watts of RF power is maintained at the RF load. Low Channel = 851.03 MHz, Mid Channel = 860.00 MHz, Hi Channel = 868.97 MHz. Range of measurement: 8 MHz- 9 GHz. Required attenuation = -43+10 Log(P) = -43+10 Log (140) = 64.46 dB (Emission limit = 82.23 dBuV/m at 3 meter). 8 MHz- 30 MHz: RBW=VBW= 9 kHz. 30 MHz - 1000 MHz: RBW=VBW= 120 kHz. 1000 MHz - 9000 MHz:RBW=VBW= 1 MHz. 27 VDC (from a 230VAC, 60Hz power supply), 22ºC, 48% relative humidity.

Test Equipment:

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	01865	HP	8566B	2532A02509	092801	092802
QP Adapter	01437	HP	85650A	3303A01884	092801	092802
8MHz-30MHz						
Loop Antenna	00314	EMCO	6502	2014	72302	72303
Antenna cable	NA	NA	RG214	Cable#15	122001	122002
30 MHz-1000MHz						
Bicon Antenna	306	AH	SAS200/540	220	092401	092402
Log Periodic Antenna	331	AH	SAS 00/516	330	092401	092402
Pre-amp	00309	HP	8447D	1937A02548	082302	082303
Antenna cable	NA	NA	RG214	Cable#15	122001	122002
Pre-amp to SA cable	NA	Harbour	RG223/U	Cable#10	070802	070803
1000-9000MHz						
Horn Antenna	0849	EMCO	3115	6246	091002	091003
Microwave Pre-amp	00786	HP	83017A	3123A00281	091102	091103
¼" Heliax Coaxial Cable	NA	Andrew	FSJ-50A-4	Cable#7 (6 ft)	071502	071503
Antenna (25ft)	NA	Andrew	FSJ1-50A	Cable#13	07/15/02	071503
1.5 GHz, HPF	01415	HP	84300-80037	3643A00026	030502	030503
12' SMA Cable	1337	W. L. Gore	NA	244922	121201	121202



Radiated Emissions - Front View

Radiated Emissions - Back View

Radiated Emissions - with Loop Antenna

2.1033(c)(14)/2.1055/90.205(j) & 90.213- VOLTAGE VARIATIONS & FREQUENCY STABILITY

Note: FCC 90.213, Frequency Stability does not apply to this device because the EUT does not contain any frequency stability determining components.

FCC 90.205(j) Voltage Variation on Power Output:
FCC 90.213 Frequency Stability limit: 851-866 MHz: 1.5 ppm & 866-869 MHz: 1.0 ppm

Setup:
Rack mount EUT placed on the test bench. Three signal generators send 64 QAM signal to the RF input of the EUT via a RF signal combiner. The output of the EUT is connected to RF attenuator and Directional coupler. 140 watts of RF power is maintained. The Amplified RF signal is measured at the output of the Directional coupler with a RF power meter and Spectrum analyzer. A RF attenuation of 52.3 dB is compensated for all measured readings.

Low Channel = 851.03 MHz
Mid Channel = 860.00 MHz
Hi Channel = 868.97 MHz

27 VDC (from a 230 VAC, 60Hz power supply), 27ºC, 55% relative humidity.

Results:

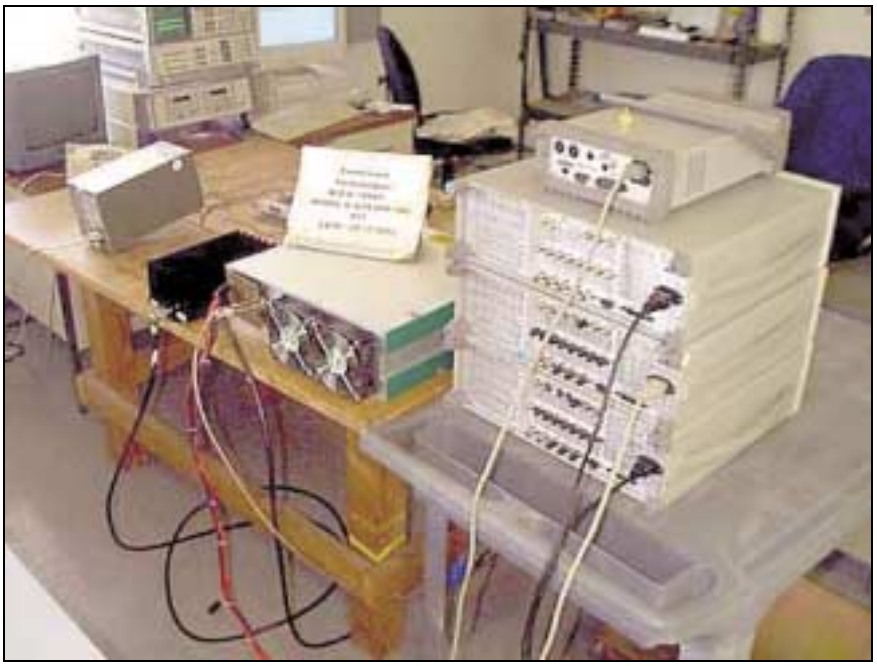
DC Voltage	Variation in %	Measured RF Power	Difference (ppm)
23 VDC	85%	140 Watts	0
27 VDC (Nominal)	100%	140 Watts	0
31 VDC	115%	140 Watts	0

DC Voltage	Variation in %	Measured Freq (MHz)	Difference (ppm)
23 VDC	85%	851.03, 860, 868.07	0
27 VDC (Nominal)	100%	851.03, 860, 868.07	0
31 VDC	115%	851.03, 860, 868.07	0

The EUT fulfilled the requirement by demonstrating power and frequency deviation of 0 ppm when the DC voltage was varied from 85% to 115 % of the nominal DC voltage.

Test Equipment:

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
RF Power Meter	02082	HP	435B	2445A11881	091202	091203



Direct Connect at Antenna Port Test Setup - Back

Direct Connect at Antenna Port Test Setup – Front

Direct Connect at Antenna Port Test Setup - Front

2.1091 – MAXIMUM PERMISSIBLE EXPOSURE CALCULATIONS

Date of Report: Aug 28, 2002

Calculations prepared for:

Powerwave Technologies
1801 E. St. Andrew Place
Santa Ana, CA 92705

Calculations prepared by:

Eddie Wong
110 N. Olinda Place
Brea, CA 9283

Model Number: G3S-800-140-31
FCC Identification: Pending

Fundamental Operating Frequency: 851-869 MHz

Maximum Rated Output Power: 140.00 Watts
Measured Output Power: 140.00 Watts

MPE Limit in accordance with 1.1310(b): Limits for general population/uncontrolled exposure

MPE Limit for 851 MHz = 851/1500 = **0.5673** mW/cm^2 ($5.673W/M^2$)
MPE Limit for 869 MHz = 869/1500 = **0.5793** mW/cm^2 ($5.793W/M^2$)

Power Output (Watts)	Power Density Limit (mW/cm^2)	Minimum Distance (Meters)
140	**0.5793**	**4.385**

Power Density (W/M^2) = (30 * P_t * G) / (d^2 * Zo)

P_t = Power Delivered to the Antenna
G = Antenna Gain
d = Distance in meters
Zo = Impedance of Free Space

The typical antennas to be used with the EUT are structure mount antennas which under normal operation have an antenna height of at least 5 meters. As can be seen from the MPE result, this device passes the limit specified in 1.1310 at a distance of 4.385 meter.

15.109 – RADIATED EMISSIONS

Test Location: CKC Laboratories Inc. •180 N Olinda Place • Brea CA, 92823 • 714-993-6112

Customer: **Powerwave Technologies**
Specification: **FCC 15.109 Class B**
Work Order #: **79565** Date: 9/13/02
Test Type: **Maximized emission** Time: 16:00:58
Equipment: **Multi Carrier RF Power Amplifier** Sequence#: 3
Manufacturer: Powerwave Technologies Tested By: Eddie Wong
Model: G3S-800-140-031
S/N: C00000UM9M

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

Function	Manufacturer	Model #	S/N
Multi Carrier RF Power Amplifier*	Powerwave Technologies	G3S-800-140-031	C00000UM9M

Support Devices:

Function	Manufacturer	Model #	S/N
Signal Generator	Agilent	4433B	US28440615
Signal Generator	Agilent	4433B	US40051329
Signal Generator	Agilent	4432B	US40053285
Power Meter	Agilent	E4418B	US39251692
RF Combiner	Anaren	44000	416
DC Power Supply	Power Ten	NA	003973

Test Conditions / Notes:

Rack mount EUT placed on the test bench. Three remotely located signal generators are connected to a RF signal combiner which is connected to the RF input port of the EUT. The output of the EUT is connected to RF load and Directional coupler. Mode: Standby mode (No RF signal sent from the signal generators). Low Channel = 851.03 MHz, Mid Channel = 860.00 MHz, Hi Channel = 868.97 MHz. Range of measurement: 30 MHz - 1000MHz.
30 MHz - 1000 MHz: RBW=VBW= 120 kHz. 27 VDC (from a 230VAC, 60Hz power supply), 22ºC, 48% relative humidity.

Transducer Legend:

T1=Bicon 092401	T2=Log 331 092401
T3=Cable #10 070803	T4=Cable #15 120602
T5=Preamp 8447D 082302	

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	60.000M	58.5	+8.1	+0.0	+0.1	+1.3	+0.0	39.6	40.0	-0.4	Vert
	QP		-28.4								
^	60.000M	62.2	+8.1	+0.0	+0.1	+1.3	+0.0	43.3	40.0	+3.3	Vert
			-28.4								
3	59.477M	58.2	+8.2	+0.0	+0.1	+1.3	+0.0	39.4	40.0	-0.6	Vert
	QP		-28.4								
^	59.477M	62.1	+8.2	+0.0	+0.1	+1.3	+0.0	43.3	40.0	+3.3	Vert
			-28.4								

5	59.466M QP	54.8	+8.2 -28.4	+0.0	+0.1	+1.3	+0.0	36.0	40.0	-4.0	Horiz
^	59.466M	60.5	+8.2 -28.4	+0.0	+0.1	+1.3	+0.0	41.7	40.0	+1.7	Horiz
7	50.159M	51.4	+10.9 -28.4	+0.0	+0.1	+1.2	+0.0	35.2	40.0	-4.8	Vert
8	64.151M	53.8	+7.6 -28.4	+0.0	+0.1	+1.4	+0.0	34.5	40.0	-5.5	Vert
9	37.500M QP	46.2	+15.4 -28.5	+0.0	+0.1	+1.1	+0.0	34.3	40.0	-5.7	Vert
^	37.500M	50.5	+15.4 -28.5	+0.0	+0.1	+1.1	+0.0	38.6	40.0	-1.4	Vert
11	60.994M	51.3	+8.0 -28.4	+0.0	+0.1	+1.3	+0.0	32.3	40.0	-7.7	Horiz
12	44.581M	46.8	+12.8 -28.5	+0.0	+0.1	+1.1	+0.0	32.3	40.0	-7.7	Vert
13	65.638M	51.6	+7.4 -28.5	+0.0	+0.1	+1.4	+0.0	32.0	40.0	-8.0	Vert
14	224.008M	45.9	+17.3 -28.3	+0.0	+0.2	+2.7	+0.0	37.8	46.0	-8.2	Horiz
15	200.517M	43.7	+16.8 -28.4	+0.0	+0.2	+2.6	+0.0	34.9	43.5	-8.6	Vert
16	879.973M	35.1	+0.0 -27.5	+22.7	+0.5	+5.9	+0.0	36.7	46.0	-9.3	Horiz
17	223.993M	43.1	+17.3 -28.3	+0.0	+0.2	+2.7	+0.0	35.0	46.0	-11.0	Vert
18	61.306M	48.0	+7.9 -28.4	+0.0	+0.1	+1.3	+0.0	28.9	40.0	-11.1	Horiz
19	256.022M	41.5	+18.4 -28.3	+0.0	+0.3	+2.9	+0.0	34.8	46.0	-11.2	Horiz
20	256.000M	41.4	+18.4 -28.3	+0.0	+0.3	+2.9	+0.0	34.7	46.0	-11.3	Vert
21	416.070M	42.7	+0.0 -28.2	+15.7	+0.3	+3.9	+0.0	34.4	46.0	-11.6	Horiz
22	111.987M	43.4	+13.9 -28.3	+0.0	+0.2	+1.9	+0.0	31.1	43.5	-12.4	Horiz
23	45.594M	42.2	+12.4 -28.4	+0.0	+0.1	+1.2	+0.0	27.5	40.0	-12.5	Horiz
24	83.305M	46.2	+7.6 -28.5	+0.0	+0.1	+1.6	+0.0	27.0	40.0	-13.0	Vert
25	415.998M	40.6	+0.0 -28.2	+15.7	+0.3	+3.9	+0.0	32.3	46.0	-13.7	Vert
26	233.908M	39.4	+17.5 -28.3	+0.0	+0.2	+2.8	+0.0	31.6	46.0	-14.4	Vert
27	72.101M	45.6	+6.9 -28.5	+0.0	+0.1	+1.5	+0.0	25.6	40.0	-14.4	Vert
28	79.230M	45.6	+6.8 -28.5	+0.0	+0.1	+1.6	+0.0	25.6	40.0	-14.4	Vert

29	320.092M	35.1	+0.0 -28.3	+20.9	+0.3	+3.4	+0.0	31.4	46.0	-14.6	Horiz
30	112.062M	41.2	+13.9 -28.3	+0.0	+0.2	+1.9	+0.0	28.9	43.5	-14.6	Vert
31	336.074M	36.1	+0.0 -28.3	+19.7	+0.3	+3.4	+0.0	31.2	46.0	-14.8	Horiz
32	80.087M	45.1	+6.8 -28.5	+0.0	+0.1	+1.6	+0.0	25.1	40.0	-14.9	Vert
33	52.617M	41.9	+10.1 -28.4	+0.0	+0.1	+1.2	+0.0	24.9	40.0	-15.1	Horiz
34	352.064M	36.7	+0.0 -28.3	+18.6	+0.3	+3.5	+0.0	30.8	46.0	-15.2	Horiz
35	128.087M	38.1	+16.1 -28.3	+0.0	+0.2	+2.0	+0.0	28.1	43.5	-15.4	Vert
36	70.123M	44.6	+6.9 -28.5	+0.0	+0.1	+1.5	+0.0	24.6	40.0	-15.4	Vert
37	480.062M	37.4	+0.0 -28.2	+16.6	+0.4	+4.2	+0.0	30.4	46.0	-15.6	Horiz
38	288.013M	34.0	+21.2 -28.3	+0.0	+0.3	+3.2	+0.0	30.4	46.0	-15.6	Horiz
39	80.016M	44.4	+6.8 -28.5	+0.0	+0.1	+1.6	+0.0	24.4	40.0	-15.6	Horiz
40	240.030M	37.9	+17.6 -28.3	+0.0	+0.3	+2.8	+0.0	30.3	46.0	-15.7	Horiz
41	367.976M	37.0	+0.0 -28.3	+17.5	+0.3	+3.6	+0.0	30.1	46.0	-15.9	Vert
42	207.983M	36.2	+17.0 -28.4	+0.0	+0.2	+2.6	+0.0	27.6	43.5	-15.9	Horiz
43	56.716M	42.1	+9.0 -28.4	+0.0	+0.1	+1.3	+0.0	24.1	40.0	-15.9	Horiz
44	368.042M	36.7	+0.0 -28.3	+17.5	+0.3	+3.6	+0.0	29.8	46.0	-16.2	Horiz
45	600.111M	32.9	+0.0 -27.7	+18.9	+0.4	+4.9	+0.0	29.4	46.0	-16.6	Horiz
46	400.094M	38.0	+0.0 -28.2	+15.5	+0.3	+3.8	+0.0	29.4	46.0	-16.6	Horiz
47	199.955M	35.7	+16.8 -28.4	+0.0	+0.2	+2.6	+0.0	26.9	43.5	-16.6	Horiz
48	199.955M	35.7	+16.8 -28.4	+0.0	+0.2	+2.6	+0.0	26.9	43.5	-16.6	Horiz
49	160.066M	35.1	+17.6 -28.4	+0.0	+0.2	+2.3	+0.0	26.8	43.5	-16.7	Vert
50	351.997M	35.1	+0.0 -28.3	+18.6	+0.3	+3.5	+0.0	29.2	46.0	-16.8	Vert
51	175.993M	35.0	+17.4 -28.4	+0.0	+0.2	+2.4	+0.0	26.6	43.5	-16.9	Horiz
52	127.975M	36.6	+16.1 -28.3	+0.0	+0.2	+2.0	+0.0	26.6	43.5	-16.9	Horiz
53	817.291M	28.4	+0.0 -27.5	+21.8	+0.5	+5.7	+0.0	28.9	46.0	-17.1	Horiz

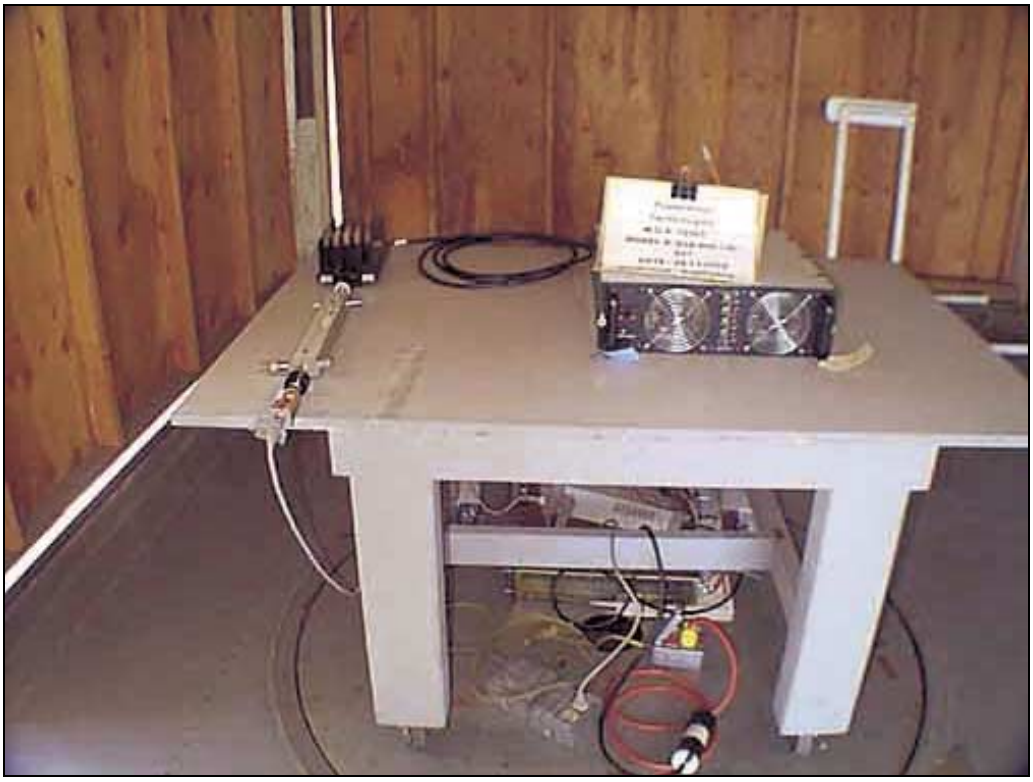
54	160.041M	34.7	+17.6 -28.4	+0.0	+0.2	+2.3	+0.0	26.4	43.5	-17.1	Horiz
55	399.994M	37.4	+0.0 -28.2	+15.5	+0.3	+3.8	+0.0	28.8	46.0	-17.2	Vert
56	320.013M	32.4	+0.0 -28.3	+20.9	+0.3	+3.4	+0.0	28.7	46.0	-17.3	Vert
57	131.260M	35.9	+16.3 -28.3	+0.0	+0.2	+2.1	+0.0	26.2	43.5	-17.3	Vert
58	288.002M	32.2	+21.2 -28.3	+0.0	+0.3	+3.2	+0.0	28.6	46.0	-17.4	Vert
59	464.034M	35.5	+0.0 -28.2	+16.4	+0.4	+4.1	+0.0	28.2	46.0	-17.8	Horiz
60	152.007M	34.3	+17.4 -28.4	+0.0	+0.2	+2.2	+0.0	25.7	43.5	-17.8	Horiz
61	192.067M	34.4	+17.0 -28.4	+0.0	+0.2	+2.5	+0.0	25.7	43.5	-17.8	Vert
62	132.760M	35.2	+16.5 -28.3	+0.0	+0.2	+2.1	+0.0	25.7	43.5	-17.8	Vert
63	848.031M	27.2	+0.0 -27.6	+22.2	+0.5	+5.8	+0.0	28.1	46.0	-17.9	Horiz
64	384.068M	35.8	+0.0 -28.2	+16.5	+0.3	+3.7	+0.0	28.1	46.0	-17.9	Horiz
65	800.116M	27.8	+0.0 -27.5	+21.5	+0.5	+5.7	+0.0	28.0	46.0	-18.0	Horiz
66	324.070M	32.0	+0.0 -28.3	+20.6	+0.3	+3.4	+0.0	28.0	46.0	-18.0	Horiz
67	480.022M	35.0	+0.0 -28.2	+16.6	+0.4	+4.2	+0.0	28.0	46.0	-18.0	Vert
68	139.276M	34.6	+17.0 -28.4	+0.0	+0.2	+2.1	+0.0	25.5	43.5	-18.0	Horiz
69	240.032M	35.6	+17.6 -28.3	+0.0	+0.3	+2.8	+0.0	28.0	46.0	-18.0	Vert
70	448.035M	35.6	+0.0 -28.3	+16.2	+0.4	+4.0	+0.0	27.9	46.0	-18.1	Horiz
71	444.556M	35.6	+0.0 -28.3	+16.2	+0.4	+4.0	+0.0	27.9	46.0	-18.1	Horiz
72	120.069M	36.2	+15.3 -28.3	+0.0	+0.2	+2.0	+0.0	25.4	43.5	-18.1	Vert
73	143.989M	34.1	+17.2 -28.4	+0.0	+0.2	+2.2	+0.0	25.3	43.5	-18.2	Horiz
74	312.060M	30.7	+0.0 -28.3	+21.5	+0.3	+3.4	+0.0	27.6	46.0	-18.4	Horiz
75	800.000M	27.1	+0.0 -27.5	+21.5	+0.5	+5.7	+0.0	27.3	46.0	-18.7	Vert
76	114.782M	36.6	+14.4 -28.3	+0.0	+0.2	+1.9	+0.0	24.8	43.5	-18.7	Vert
77	324.024M	31.1	+0.0 -28.3	+20.6	+0.3	+3.4	+0.0	27.1	46.0	-18.9	Vert
78	230.490M	35.0	+17.4 -28.3	+0.0	+0.2	+2.7	+0.0	27.0	46.0	-19.0	Horiz

79	432.078M	34.8	+0.0 -28.3	+16.0	+0.4	+3.9	+0.0	26.8	46.0	-19.2	Horiz
80	228.517M	34.8	+17.4 -28.3	+0.0	+0.2	+2.7	+0.0	26.8	46.0	-19.2	Horiz
81	282.672M	30.7	+20.8 -28.2	+0.0	+0.3	+3.2	+0.0	26.8	46.0	-19.2	Vert
82	383.995M	34.4	+0.0 -28.2	+16.5	+0.3	+3.7	+0.0	26.7	46.0	-19.3	Vert
83	136.086M	33.4	+16.8 -28.3	+0.0	+0.2	+2.1	+0.0	24.2	43.5	-19.3	Vert
84	192.002M	32.8	+17.0 -28.4	+0.0	+0.2	+2.5	+0.0	24.1	43.5	-19.4	Horiz
85	109.559M	37.1	+13.4 -28.4	+0.0	+0.1	+1.9	+0.0	24.1	43.5	-19.4	Vert
86	272.024M	31.5	+19.8 -28.2	+0.0	+0.3	+3.1	+0.0	26.5	46.0	-19.5	Horiz
87	184.416M	32.5	+17.2 -28.4	+0.0	+0.2	+2.5	+0.0	24.0	43.5	-19.5	Vert
88	144.071M	32.8	+17.2 -28.4	+0.0	+0.2	+2.2	+0.0	24.0	43.5	-19.5	Vert
89	615.341M	29.1	+0.0 -27.6	+19.5	+0.4	+5.0	+0.0	26.4	46.0	-19.6	Horiz
90	360.094M	32.6	+0.0 -28.3	+18.1	+0.3	+3.6	+0.0	26.3	46.0	-19.7	Horiz
91	464.004M	33.6	+0.0 -28.2	+16.4	+0.4	+4.1	+0.0	26.3	46.0	-19.7	Vert
92	207.995M	32.0	+17.0 -28.4	+0.0	+0.2	+2.6	+0.0	23.4	43.5	-20.1	Vert
93	600.050M	29.3	+0.0 -27.7	+18.9	+0.4	+4.9	+0.0	25.8	46.0	-20.2	Vert
94	272.007M	30.4	+19.8 -28.2	+0.0	+0.3	+3.1	+0.0	25.4	46.0	-20.6	Vert
95	406.424M	33.8	+0.0 -28.2	+15.6	+0.3	+3.8	+0.0	25.3	46.0	-20.7	Vert
96	280.074M	29.6	+20.5 -28.2	+0.0	+0.3	+3.1	+0.0	25.3	46.0	-20.7	Vert
97	360.020M	31.2	+0.0 -28.3	+18.1	+0.3	+3.6	+0.0	24.9	46.0	-21.1	Vert
98	447.947M	32.3	+0.0 -28.3	+16.2	+0.4	+4.0	+0.0	24.6	46.0	-21.4	Vert
99	460.862M	31.8	+0.0 -28.3	+16.4	+0.4	+4.1	+0.0	24.4	46.0	-21.6	Horiz
100	376.066M	31.5	+0.0 -28.2	+17.0	+0.3	+3.7	+0.0	24.3	46.0	-21.7	Horiz
101	216.020M	32.1	+17.1 -28.3	+0.0	+0.2	+2.7	+0.0	23.8	46.0	-22.2	Horiz
102	126.047M	31.5	+15.9 -28.3	+0.0	+0.2	+2.0	+0.0	21.3	43.5	-22.2	Horiz
103	527.986M	29.3	+0.0 -28.0	+17.5	+0.4	+4.5	+0.0	23.7	46.0	-22.3	Vert

104	229.488M	31.4	+17.4 -28.3	+0.0	+0.2	+2.7	+0.0	23.4	46.0	-22.6	Vert
105	511.974M	27.3	+0.0 -28.1	+17.2	+0.4	+4.4	+0.0	21.2	46.0	-24.8	Vert
106	1002.690M	26.5	+0.0 +0.0	+0.0	+0.0	+0.0	+0.0	26.5	54.0	-27.5	Vert

Test Equipment:

Equipment	Asset #	Manufacturer	Model #	Serial #	Cal Date	Cal Due
Spectrum Analyzer	01865	HP	8566B	2532A02509	092801	092802
QP Adapter	01437	HP	85650A	3303A01884	092801	092802
30 MHz-1000MHz						
Bicon Antenna	306	AH	SAS200/540	220	092401	092402
Log Periodic Antenna	331	AH	SAS 00/516	330	092401	092402
Pre-amp	00309	HP	8447D	1937A02548	082302	082303
Antenna cable	NA	NA	RG214	Cable#15	122001	122002
Pre-amp to SA cable	NA	Harbour	RG223/U	Cable#10	070802	070803



Radiated Emissions - Front View

Radiated Emissions - Back View