FCC CFR47 PART 22 TYPE ACCEPTANCE

TEST REPORT

FOR

MULTICARRIER CELLULAR AMPLIFIER SYSTEM

MODEL:MCA 9XXX-50, MCR3100

REPORT NUMBER: 98E7336

FCC ID:E675JS0029

ISSUE DATE: MAY 26,1997

Prepared for
POWERWAVE TECHNOLOGIES, INC.
2026 McGAW AVENUE
IRVINE, CA 92614

Prepared by
COMPLIANCE ENGINEERING SERVICES, INC.
1366 BORDEAUX DRIVE
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NVLAP®

LAB CODE:200065-0

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Consulting Services

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UL,CSA,TÜV, BCIQ,DHHS, NVLAP

1366 BORDEAUX DRIVE, SUNNYVALE, CA 94089-1005

FCC TYPE ACCEPTANCE INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part 2, Subpart J, Section 2.983-2.999.

2.983 (a) Applicant : Powerwave Technologies, Inc.
2026 McGaw Avenue
Irvine CA 92614

2.983 (b) FCC ID: E675JS0029

2.983 (c) Quantity production is planned.

2.983 (d) Technical Description

Subsections

(1) Types of Emissions: F9W, F3D,F2D,F1D, F8W
(2) Frequency Range: 869 – 894 MHz
(3) Range of Operating Power: 0 -/+ 59.8dBm@880MHz
(4) Maximum Power Rating : 120 Watts
(5) Applied Voltage and currents into the final transistor elements: Refer to Exhibit 2, Schematic and Functional Block Diagram. Confidentiality is requested for these items.
(6) Function of Each Active Device: Refer to Exhibit 2, Schematic and Functional Block Diagram. Confidentiality is requested for these items.
(7) Complete Circuit Diagrams and Functional Block Diagram: Refer to Exhibit 2, Schematic and Functional Block Diagram. Confidentiality is requested for these items.
(8) Instructions / Installation Manual: Refer to Exhibit 5
(9) Tune-up/ Optimization Procedure: Refer to installation manual, Exhibit 5.
(10) Means for Frequency Stabilization: Not Applicable. EUT is a power amplifier.
(11) Means for Limiting Power: The alarm logic controls the +5Vdc bias voltage which shuts down the amplifier on an input overpower condition.
(11) Means for attenuating Higher Audio Frequencies: Not Applicable.
(11) Means for Limiting Modulation: Not Applicable. EUT is a power amplifier.
(12) Description of Digital Modulation techniques: Not Applicable.

2.983 (e) Standard Test Conditions

The power amplifier was tested under the following conditions:

DC Supply Voltage: +27V

The transmitter was aligned and tuned up according to manufacturer's alignment procedure, prior to testing. All data presented represents the worst case parameter being measured.

2.983(f) Equipment Identification

A drawing of the equipment identification nameplate appears in Exhibit 5

2.983(g) Photographs

Photographs of the equipment, internal and external views, are found in Exhibit 3.

2.983 Description of Various Base Station Configurations

Not Applicable

2.983 Use of Various Power Supplies
Supply Voltage : 27V dc input.

Please refer to the following technical report for the test requirement outline in Section: 2.985 – 2.997.

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2. PROPOSED FCC ID LABEL FORMAT
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6. INSTALLATION & SERVICE MANUAL (044-05024 REV.A)

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1. VERIFICATION OF COMPLIANCE

COMPANY NAME: POWERWAVE TECHNOLOGIES,INC.
2026 McGAW AVENUE
IRVINE, CA 92614
USA

CONTACT PERSON: GEORGE SOREMEKUM

TELEPHONE NO: (714)757-6605

MODEL NO/NAME: MCA 9XXX-50, MCA3100

DATE TESTED: MAY 26 ,1998

TYPE OF EQUIPMENT:	MCR3100 SERIES SUBRACK / MCA9100-50 AMPLIFIER
MEASUREMENT DISTANCE:	3 METER
TECHNICAL LIMIT:	FCC 22.359, 22.917
FCC RULES:	PART 15, PART 22
EQUIPMENT AUTHORIZATION PROCEDURE	TYPE ACCEPTANCE
MODIFICATIONS MADE ON EUT	☒ YES ☐ NO

The above equipment was tested by Compliance Consulting Services for compliance with the requirements set forth in the FCC CFR 47, PART 15 AND 22. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved By

MIKE C.I. KUO / VICE - PRESIDENT
COMPLIANCE CONSULTING SERVICES

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2. PRODUCT DESCRIPTION

The MCA9XXX-50 is a linear, feed-forward power amplifier that operates in the 25 MHz frequency band from 869 MHz to 894 MHz. The amplifier can simultaneously transmit multiple frequencies, with better than -65dBc third order intermodulation distortion (IMD). The amplifier system is modular in design, and is ideally suited for use in AMPS/TDMA/CDMA base stations. The plug-in Model MCA9100-50 amplifier modules can each provide 50Watts of power and function completely independently of each other. The amplifier modules are designed for parallel operation to produce high peak power output and backup redundancy for remote applications. The system is housed in the MCS6503-4 subrack which holds up to three MCA9100-50 amplifiers to produce up to 120Watts output.

The MCR3100 series subrack contains an RF power splitter/combiner and a summary logic module that monitors the functional status of all plug-in amplifiers. The rear panel of the subrack has the system RF I/O connectors, an RF output sample connector, an DC power input terminals. The front panel of each amplifier module has a status connector, which allows the host system to monitor the amplifier module performance.

SYSTEM NO.	DESCRIPTION OF SYSTEM NO.	SUB-COMPONENT MODEL NO.	QTY PER SYSTEM	DESCRIPTION OF SUB-COMPONENT MODEL NO.
MCR3100	**120W 869-894 MHz MCPA SYSTEM FOR BASE STATION EQUIPMENT**	**MCA9100-50**	**3**	**50W 869-894 MHz MCPA MODULE**
		PWIC-24A	**1**	**24-WAY INPUT COMBINER IN A 19" CENTER-MOUNT CONFIGURATION**
		MCR3100	**1**	**3-WAY 19" CENTER-MOUNT CONFIGURATION SUBRACK**

3. TEST FACILITY

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

4. ACCREDITATION AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code:200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT(1300F2))

5. MEASUREMENT INSTRUMENTATION

Radiated emissions were measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, BI-log, ridged waveguide, liner horn. EMI receivers were used for line conducted readings, spectrum analyzers with pre-selectors and quasi-peak detectors were used to perform radiated measurements. Receiving equipment (i.e., receiver, analyzer, quasi-peak adapter, pre-selector) and LISNs conform to CISPR specification for "Radio Interference Measuring Apparatus and Measurement Methods," Publication 16.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

6. MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

7. UNITS OF MEASUREMENT

Measurements of radiated interference are reported in terms of dB(uV/m) at a specified distance. The indicated readings on the spectrum analyzer were converted to dB(uV/m) by use of appropriate conversion factors. Measurements of conducted interference are reported in terms of dB(uV).

The field strength is calculated by adding the Antenna Factor and Cable Factors, then by subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

Where FS = Field Strength

RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5 dBuV is obtained. The Antenna Factor of 7.4dB/m and a Cable Factor of 1.1dB is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/m. The 32 dBuV/m value was mathematically converted to its corresponding level in uV/m.

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBuV/m

Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m

8. CLASSIFICATION OF DIGITAL DEVICE

Class A includes digital devices that are marketed for use in commercial, industrial or business environments, excluding devices which are marketed for use by the general public or are intended to be used in the home.

Class B includes digital devices that are marketed for use in residential environments, notwithstanding use in commercial, business and industrial environments.

Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as Class B device, and in fact is encouraged to do so provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

9. RADIATED EMISSION LIMITS

FCC PART 15 CLASS A

MEASURING DISTANCE OF 10 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	90	39.1
88-216	150	43.5
216-960	210	46.4
Above 960	300	49.5

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FCC PART 15 CLASS B

MEASURING DISTANCE OF 3 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

10. RADIATED EMISSION TEST PROCEDURE

The EUT and all other support equipment are placed on a wooden table 80-cm above the ground screen. Antenna to EUT distance is 3 meters . During the test, the table is rotated 360 degrees to maximize emissions and the antenna is positioned from 1 to 4 meters above the ground screen to further maximize emissions. The antenna is polarized in both vertical and horizontal positions.

EUT test configuration is according to Section 8 of ANSI C63.4/1992.

Monitor the frequency range of interest at a fixed antenna height and EUT azimuth. Frequency span should be small enough to easily differentiate between broadcast stations and intermittent ambients. Rotate EUT 360 degrees to maximize emissions received from EUT. If emission increases by more than 1 dB, or if another emission appears that is greater by 1 dB, return to azimuth where maximum occurred and perform additional cable manipulation to further maximize received emission.

Move antenna up and down to further maximize suspected highest amplitude signal. If emission increased by 1 dB or more, or if another emission appears that is greater by 1dB or more, return to antenna height where maximum signal was observed and manipulate cables to produce highest emissions, noting frequency and amplitude.

11. AMBIENT CONDITIONS

The ambient conditions at the time of final tests were as follows:

	Radiated Emission	Conducted Emission
Temperature	**17°C**	**21°C**
Humidity	**81%**	**62%**

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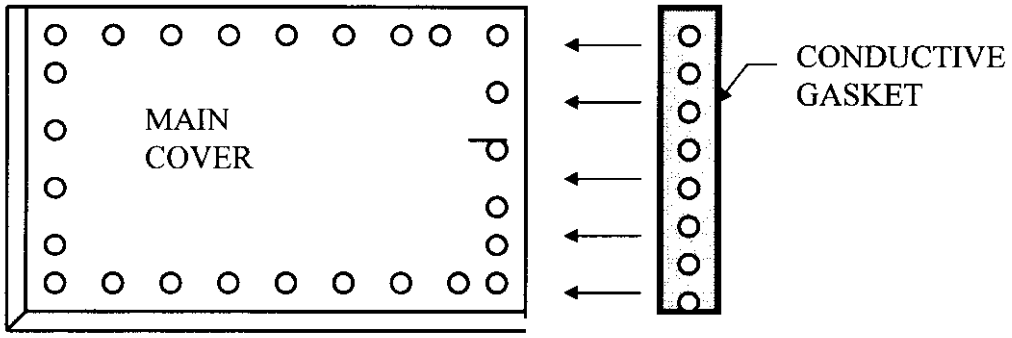
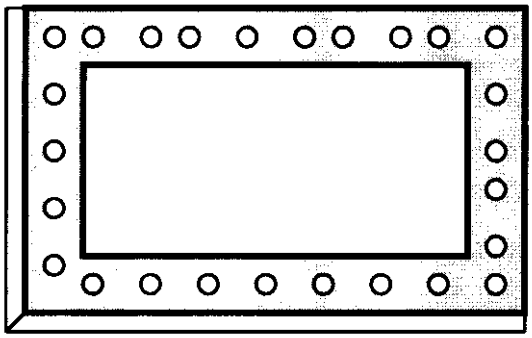
12. EQUIPMENT MODIFICATIONS

To achieve compliance to FCC PART 15/22 requirement, the following change(s) were made during compliance testing:

Mod.#1 Added conductive gasket around covers of main amp and error amp for better contact between cover and main chassis



RESULT:



13. A) TEST EQUIPMENT LIST

Equipment	Manufacturer	Model No.	Serial No.	Site	Cal Date	Due Date
Spectrum Analyzer	H.P.	8593EM	3710A00205	F	05/97	05/98
Receiver	H.P.	8546A	3520A00259	A	03/97	03/98
Bilog Antenna	CHASE	CBL6112	2049	A	05/97	05/98
Horn Antenna	EMCO	3115	9001-3245	B	12/97	12/00
Pre-Amp	H.P. (1-26.5GHz)	8449B	3008A00369	B	04/98	04/99
Antenna	Eaton	94455-1	1197	B	10/97	10/98
Antenna	Emco	3146	2120	B	10/97	10/98

B) SUPPORT EQUIPMENT LIST

Device Type	Manufacturer	Model Number	Serial No.	FCC ID / DoC
SIGNAL GENERATOR	ROHDE & SCHWARZ	SMIQ 03	DEZ3346	N/A
SIGNAL GENERATOR	H.P.	E4432A	US3626061A	N/A
POWER METER	H.P.	437B	3125722256	N/A
HIGH POWER ATTENUATOR	NARDA	269-30	06260	N/A
POWER SUPPLY	POWER TEN INC.	P62B-30100	1007075	N/A
LAPTOP	COMPAQ	N/A	1057895	DOC

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15. TEST RESULT SUMMARY

FCC PART 15 Radiated Emission Test was conducted by operating the configuration as indicated below.

MCA9XXX-50 (RACK WITH 3 CELLULAR AMPS)							
OATS No: B / 3 Meter		Data Report No. 980527B1		Date 05/27/98		Tested By: JUAN MARTINEZ	
Six Highest Radiated Emission Readings							
Frequency Range Investigated				30 MHz TO 9000 MHz			
Freq. (MHz)	Meter Reading (dBuV)	C.F. (dB/m)	Corrected Reading (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Reading Type (P/Q/A)	Polar (H/V)
104.05	**11.2**	**+12.25**	**23.45**	**43.5**	**-20.05**	**P**	**V**
164	**9.4**	**+19.81**	**29.21**	**43.5**	**-14.29**	**P**	**V**
86.89	**11.9**	**+11.25**	**23.15**	**40.0**	**-16.85**	**P**	**V**
65	**12.6**	**+7.66**	**20.26**	**40.0**	**-19.73**	**P**	**V**
224	**9.9**	**+15.22**	**25.12**	**46.0**	**-20.88**	**P**	**V**
245	**8.8**	**+15.52**	**24.32**	**46.0**	**-21.68**	**P**	**V**

C.F.(Correction Factor)=Antenna Factor + Cable Loss-Amplifier Gain
Corrected Reading = Metering Reading + C.F. Margin = Corrected Reading - Limits
P= Peak Reading H= Horizontal Polarization/Antenna
Q= Quasi-peak V= Vertical Polarization/Antenna
A= Average Reading
Comments: N/A

FCC PART 2 TYPE ACCEPTANCE TEST REQUIREMENT:

SECTION 2.985 RF POWER OUTPUT

Please refer to configuration block diagram for equipment connection. Power meter manufactured by Hewlett Packard is used to measure the RF power output.

MCA9XXX-50 (3 AMPS)	
NO. OF AMPLIFIER	**MEASURED RF POWER OUTPUT**
3	**120W**
2	**76W**
1	**BELOW NOISE FLOOR OF 35 dBuV**

SECTION 2.987 MODULATION CHARACTERISTICS

Not applicable. EUT is a power amplifier.

SECTION 2.989 OCCUPIED BANDWIDTH

Please refer to configuration block diagram for equipment connections. Test result are presented in spectrum analyzer plot# 1 with a SPAN: 100KHz AND plot#2 with a SPAN: 2MHz BOTH showing CDMA modulation.

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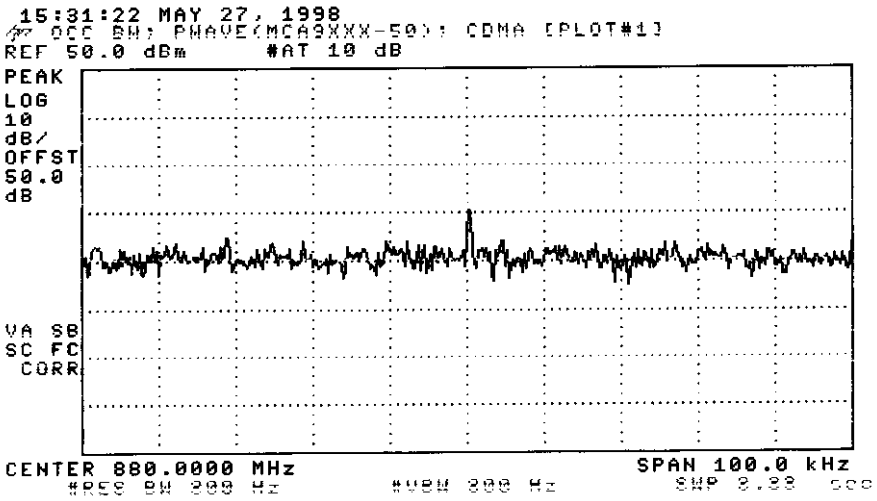
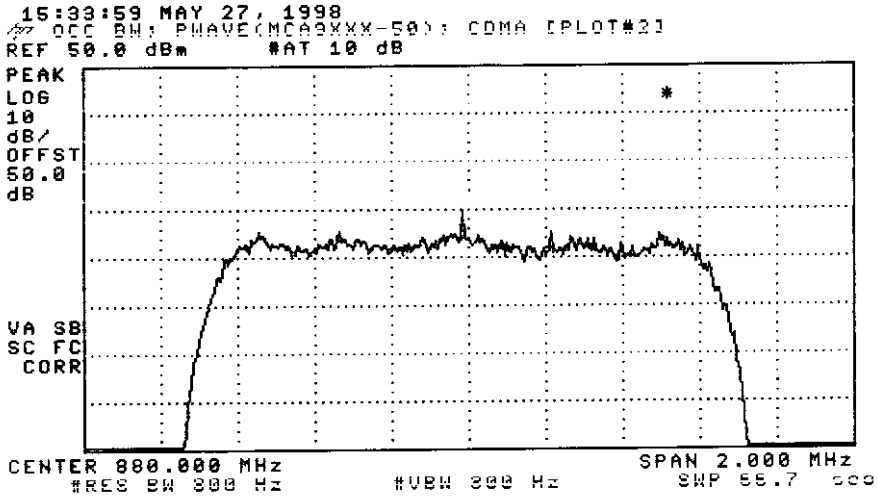

15:31:22 MAY 27, 1998
OCC BW: PWAVE(MCA9XXX-50): CDMA [PLOT#1]
REF 50.0 dBm
#AT 10 dB
PEAK
LOG
10
dB/
OFFST
50.0
dB
VA SB
SC FC
CORR
CENTER 880.0000 MHz
SPAN 100.0 kHz
#RES BW 200 Hz
#VBW 200 Hz
SWP 8.88 sec


15:33:59 MAY 27, 1998
OCC BW: PWAVE(MCA9XXX-50): CDMA [PLOT#2]
REF 50.0 dBm
#AT 10 dB
PEAK
LOG
10
dB/
OFFST
50.0
dB
VA SB
SC FC
CORR
CENTER 880.000 MHz
SPAN 2.000 MHz
#RES BW 300 Hz
#VBW 300 Hz
SWP 55.7 sec

SECTION 2.991 SPURIOUS EMISSION AT ANTENNA TERMINALS

Spurious emissions tests were performed for 3 input signals to amplifier. Worse case modulation tested CDMA. Spectrum was scanned from 30 MHz to 8940 MHz to search for spurious, harmonics, and intermodulation product emissions.

MCA9XXX-50/MCR3100 (3 AMPS)	
MODULATION TYPE: CDMA	
FREQUENCY RANGE	**PLOT NUMBER**
1 MHz TO 850 MHz	**3**
850 MHz TO 900 MHz	**4**
900 MHz TO 2.5 GHz	**5**
2.5 GHz TO 8800GHz	**6**

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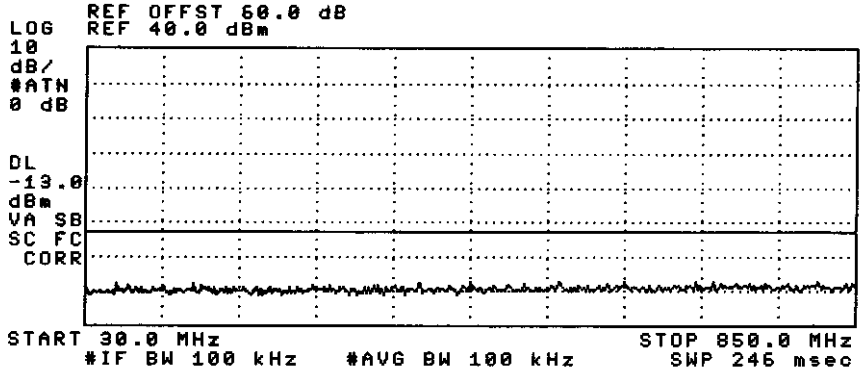
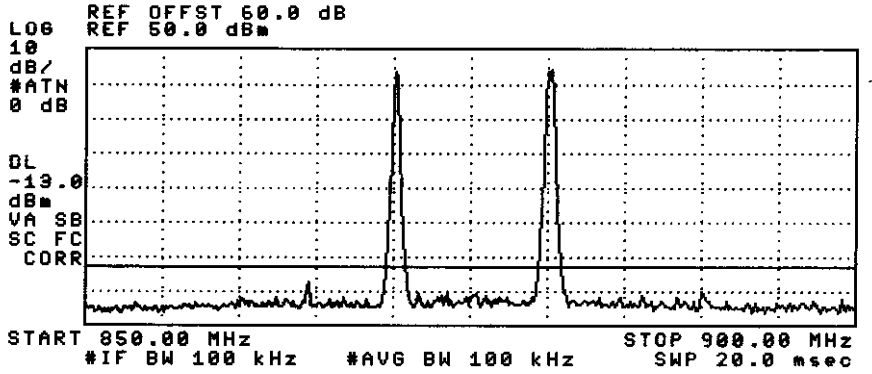
12:43:52 MAY 26, 1998
OUT OF BAND: POWERWAVE(MCA9XXX-50): CDMA
ACTV DET: PEAK
MEAS DET: PEAK QP AVG



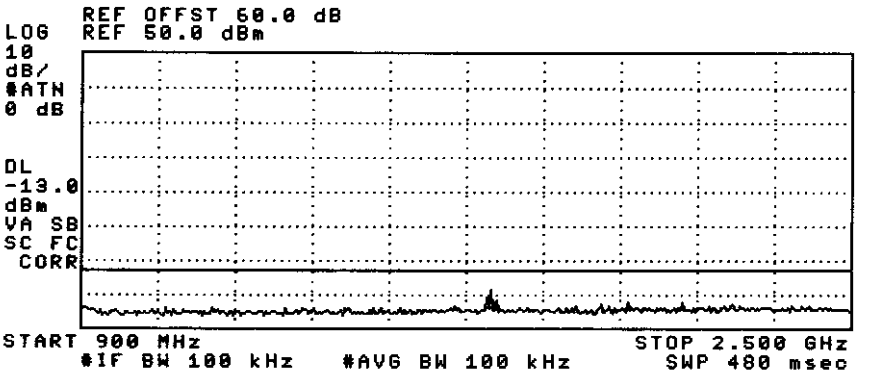
plot 3

12:46:16 MAY 26, 1998
OUT OF BAND: POWERWAVE(MCA9XXX-50): CDMA
ACTV DET: PEAK
MEAS DET: PEAK QP AVG



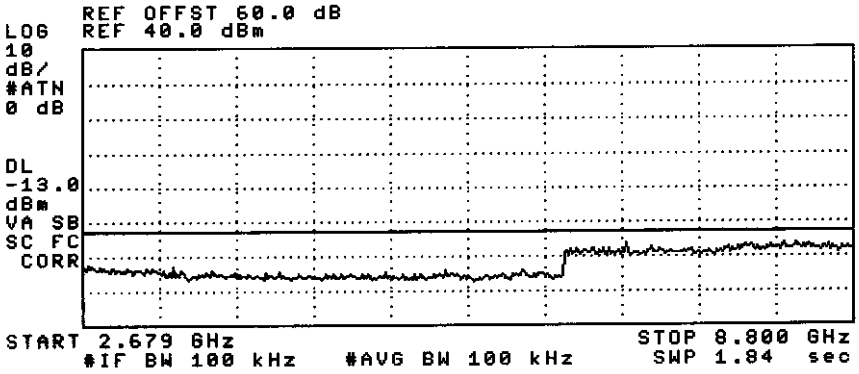
plot 4

12:47:29 MAY 26, 1998
OUT OF BAND: POWERWAVE(MCA9XXX-50): CDMA
ACTV DET: PEAK
MEAS DET: PEAK QP AVG



plot 5

12:48:28 MAY 26, 1998
OUT OF BAND; POWERWAVE(MCA9XXX-50); CDMA
ACTV DET: PEAK
MEAS DET: PEAK QP AVG



plot 6

SECTION 2.995 FREQUENCT STABILITY

Not Applicable. Device is a power amplifier.

SECTION 2.993 FIELD STRENGTH OF SPURIOUS RADIATION

Technical Limits applied Section 22.359, 22.917 emission masks

(a) Analog modulation applied.

All readings CDMA Vertical on second harmonic @1760MHz

3 Amplifiers 120 WATTS OUTPUT

(√30*120) / 3 = 20 V/m = 146dBuV/m

Emission Masks=43 + 10 log (120) = 63.79

146 - 63.79 = 82.2

dBuV	AF	CL	AMP	dBuV/m	Limit	Margin
68.12	26	2.6	-35	61.72	82.2	-20.48

2 Amplifiers 76 WATTS OUTPUT

(√30*76) / 3 = 15.9 V/m = 144.03dBuV/m

Emission Masks=43 + 10 log(76) = 61.8

144.03 - 61.8 = 82.2

dBuV	AF	CL	AMP	dBuV/m	Limit	Margin
65.58	26	2.6	-35	59.18	82.2	-23.02

ONE AMPLIFIER READING WAS BELOW NOISE FLOOR OF 35 dBuV

b) Radiation data of Fundamental harmonics at 3 meters from second harmonic to 10*f*o attached.

Radiated Emissions
FCC 22.359

5/27/98
Juan Martinez
Site B(3 meter)

Powerwave Technologies
MCA9XXX-50 MULTICARRIER CELLULAR AMPLIFIER SYSTEM

fo = 880MHz (+11.8dBm)
NOTE: Amplifiers tested with gasket 120W.

F(MHz)	READING (dBuV)	AF (dB)	CL (dB)	Amp (dB)	Other (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)
1760P	69.12	26	2.6	-35	0	62.72	82	-19.28
2640P	62.6	30	3.96	-35	1	62.56	82	-19.44
3520P	45.84	30	4.5	-35	1	46.34	82	-35.66
4400P(N.F.)	43.99	33.1	5.04	-35	1	48.13	82	-33.87
5280P(N.F.)	43.5	34.5	5.4	-35	1	49.4	82	-32.6
6160P(N.F.)	43.77	35.3	5.94	-35	1	51.01	82	-30.99
7040P(N.F.)	44.2	36.2	6.3	-35	1	52.7	82	-29.3
7920P(N.F.)	45.1	37	7.2	-35	1	55.3	82	-26.7
8800P(N.F.)	45.3	38	7.56	-35	1	56.86	82	-25.14

All measuerements were taken at 3 meter distance
OTHER: High pass filter insertion loss (**1.802GHz**)
AF: Antenna Factor **CL:** CABLE LOSS
AMP: Pre-amp gain
N.F.= Noise Floor

ANALYZER BANDWIDTH SETTINGS

	Res Bw:	Video Bw:
Peak(P):	1MHz	1MHz

16. External I/O Cable Construction Description (Config.#1)

CABLE NO:1	
I/O Port: : RF OUTPUT TO POWER METER	Number of I/O ports of this type:1
Number of Conductors: 2	**Connector Type: N TYPE**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:1.5 M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO:2	
I/O Port:: RF INOUT	Number of I/O ports of this type:1
Number of Conductors: 2	**Connector Type: SMA**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:2.0**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO:3	
I/O Port: EUT (27Vdc INPUT)	Number of I/O ports of this type:1
Number of Conductors: 8	**Connector Type: POWER CONNECTORS**
Capture Type: SNAP-IN	**Type of Cable used: UN-SHIELDED**
Cable Connector Type: PLASTIC	**Cable Length: 2.5**
Bundled During Tests: NO	**Data Traffic Generated: NO**
Remark: N/A	

CABLE NO:4	
I/O Port: ATTENUATOR RF-OUT	Number of I/O ports of this type:1
Number of Conductors: 2	**Connector Type: N TYPE TO SMA**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:1.5M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO: 5	
I/O Port: RS-232	Number of I/O ports of this type:1
Number of Conductors: 9	**Connector Type: DB9**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:1.5M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

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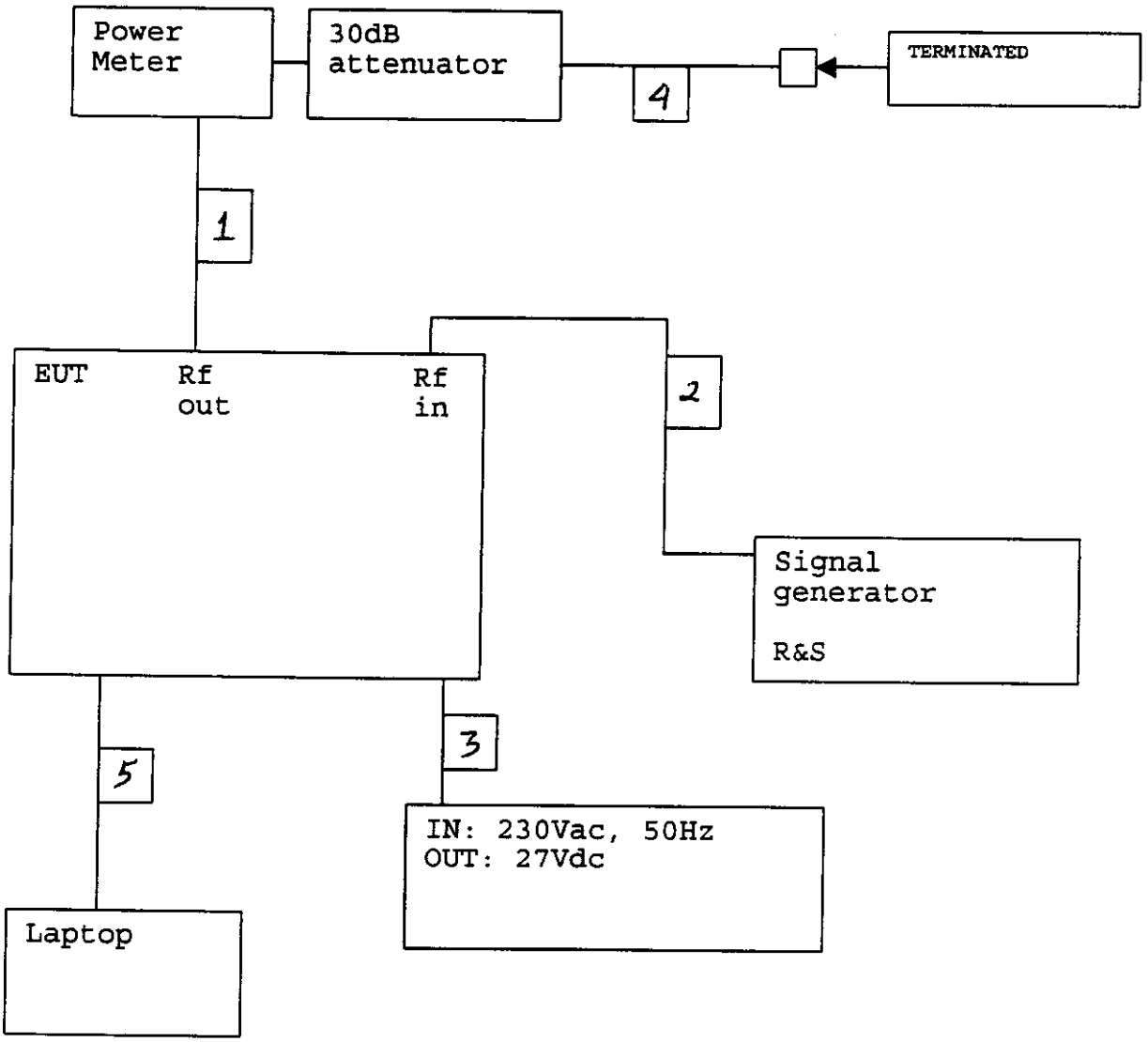
DOCUMENT NO:CCSUP4031A
TEL:(408) 752-8166 FAX:(408) 752-8168

17. Configuration Block Diagram #1



18. EXTERNAL I/O CABLE COSTRUCTION DESCRIPTION FOR #2

CABLE NO:1	
I/O Port: : RF OUTPUT TO POWER METER	Number of I/O ports of this type:1
Number of Conductors: 2	**Connector Type: N TYPE**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:1.5 M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO:2	
I/O Port:: RF INOUT	Number of I/O ports of this type:1
Number of Conductors: 2	**Connector Type: SMA**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:2.0**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO:3	
I/O Port: EUT (27Vdc INPUT)	Number of I/O ports of this type:1
Number of Conductors: 8	**Connector Type: POWER CONNECTORS**
Capture Type: SNAP-IN	**Type of Cable used: UN-SHIELDED**
Cable Connector Type: PLASTIC	**Cable Length: 2.5**
Bundled During Tests: NO	**Data Traffic Generated: NO**
Remark: N/A	

CABLE NO:4	
I/O Port: ATTENUATOR RF-OUT	Number of I/O ports of this type:1
Number of Conductors: 2	**Connector Type: N TYPE TO SMA**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:1.5M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: Terminated	

CABLE NO:5	
I/O Port: SIGNAL TO COMBINER	Number of I/O ports of this type:3
Number of Conductors: 2	**Connector Type: SMA**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length: 1M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

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CABLE NO:6	
I/O Port: SIGNAL TO COMBINER	Number of I/O ports of this type:1
Number of Conductors: 2	**Connector Type: SMA**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length: 1M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO:7	
I/O Port: RS-232	Number of I/O ports of this type:1
Number of Conductors: 9	**Connector Type: DB9**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:1.5M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

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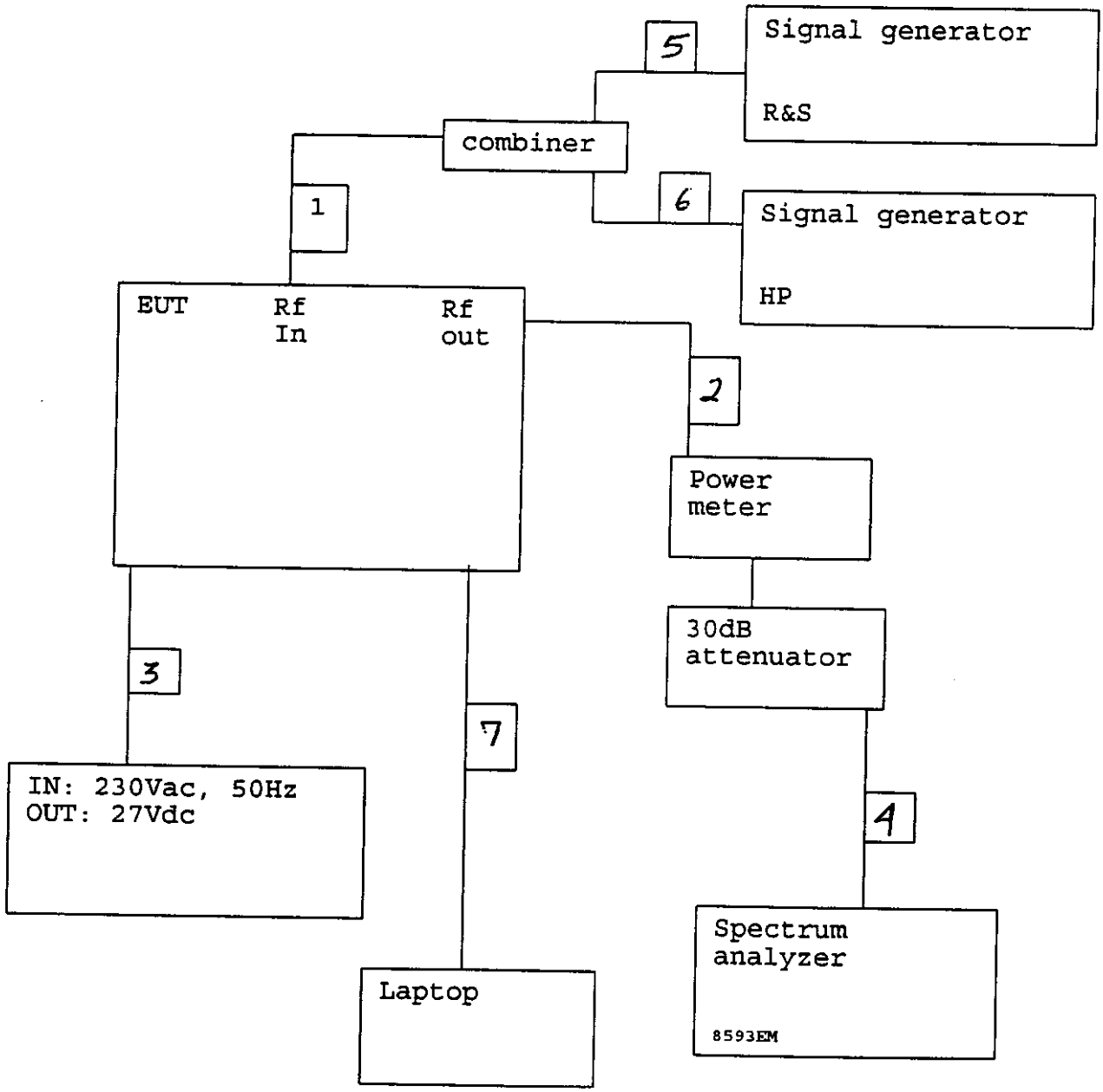
19. Configuration Block Diagram #2

(TWO TONES TESTS, DIRECT CONNECTION)



POWERWAVE TECHNOLOGIES

November 12, 1997

Federal Communications Commission
Authorization and Evaluation Division
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

We, the undersigned, hereby authorize Compliance Consulting Services to act on our behalf in all matters relating to applications for equipment authorization, including the signing of all documents relating to these matters. Any and all acts carried out by Compliance Consulting Services on our behalf shall have the same effect as acts of our own.

We also hereby certify that no party to the applications authorized hereunder is subject to a denial of benefits, that includes FCC benefits, pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853 (a).

This agreement expires one year from the current date.

Mark D. Winters
Vice President, Quality

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