FCC CFR47 PART 22 CERTIFICATION

TEST REPORT

FOR

CELLULAR AMPLIFIER

MODEL: LPA G3L-800-25-001
FCC ID: E675JS0034

REPORT NUMBER: 98U0116

ISSUE DATE:

Prepared for

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

Prepared by

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1. FCC TYPE ACCEPTANCE INFORMATION

The following information is in accordance with FCC Rules, 47CFR Part2, Subpart J, Sections 2.983 – 2.999.

2.983(a) Applicant: POWERWAVE TECHNOLOGIES, INC.
2026 McGAW AVENUE
IRVINE, CA 92614

Contact person: Jeff Dale

Telephone number: (714) 757-6605

2.983(b) FCC ID:E675JS0034
Model No: G3L-800-25-001

2.983(c) Quantity production is planned

2.983(d) Technical Description

The G3L-800-25-001 (see figures 1-1 and 1-2) is a linear, multichannel power amplifier that operates in the 25 MHz frequency band from 869 MHz to 894 MHz. It is designed as a self-contained module with EMI containment for use in both indoor and outdoor North American cellular base stations. The G3L-800-25-001 accepts single channel and transmit voice RF signals. The G3L-800-25-001 uses an internally generated tone to optimize its performance. The system operating band (A or B) is externally provided to the G3L-800-25-001 so that it knows where the tone frequency is going to be. If the operating band is A, then a tone at B band is generated; if the operating band is B, then a tone at A band is generated.

Each amplifier module has a power, alarm, and control connector that allows the host system to monitor the amplifier module performance. Primary power for the amplifier is +27 Vdc.

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1) Type of emissions

F3W

2) Frequency Range

Minimum: 869MHz
Maximum: 894MHz

3) Range of Operation Power

.
Nominal : 25WATTS
Maximum : 25WATTS

4) Maximum Power Rating

25 Watts

5) Applied voltage and currents into the final transistor elements

Refer to **Attachment**: 25W Parts list. Confidentiality is requested for this item.

6) Function of Each Active Device

Refer to **Attachment**: Schematic Diagram and Parts list. Confidentiality is requested for these items.

7) Complete Circuit Diagrams and Functional Diagram

Refer to **Attachment**: Schematics and Parts list. Confidentiality is requested for these items.

8) Instructions/Installation Manual

Refer to **Attachment**: Installation and Service manual.

9) Tune-up/Optimizations Procedure

Refer to **Attachment**: Installation and Service manual.

10) Means for Frequency Stabilization

Not Applicable. Eut is a power amplifier

11) Means for Limiting Power.

11) Means for Suppressing of Spurious Radiation.

Not Applicable.

12) Description of Digital Modulation Techniques

Not Applicable.

2.983(e) Standard Test Condition

The power amplifier was tested under the following conditions.

DC Supply Voltage: 27Vdc

The amplifier 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 under **Attachment**: PROPOSED FCC ID LABEL FORMAT.

2.983(g) Photographs

Photographs of the equipment, internal and external views, are found in the **Attachment**: Eut Photographs.

2.983 Description of Various Base Station Configuration

Not Applicable.

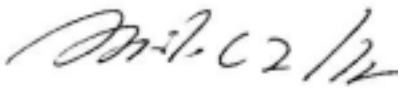
2.983 Use of Various Power Supplies

Normal operation is from 27 Vdc sources.

TYPE OF EQUIPMENT:	Low Power Amplifier
MEASUREMENT DISTANCE:	3 METER
TECHNICAL LIMIT:	FCC 22.359, 22.917
FCC RULES:	PART 2, 15, AND 22
EQUIPMENT AUTHORIZATION PROCEDURE	Certification
MODIFICATIONS MADE ON EUT	☐ YES ☒ NO

The above equipment was tested by Compliance Certification 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 CERTIFICATION SERVICES

2. 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.

3. 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))

4. 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.

5. 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.

6. 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

7. 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.

8. 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

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

9. 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.

10. AMBIENT CONDITIONS

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

	Radiated Emission	Conducted Emission
Temperature	**15**^{o}C	**NA**
Humidity	**65%**	**NA**

11. EQUIPMENT MODIFICATIONS

N/A

12. TEST EQUIPMENT LIST

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

B) SUPPORT EQUIPMENT

Device Type	**Manufacturer**	**Model Number**	**Serial No.**	**FCC ID / DoC**
SIGNAL GENERATORS	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	H.P.	6673A	3620A-01020	N/A
DC SUPPLY	H.P.	E3616A	KR73302167	N/A
DUAL DIRECTIONAL COUPLER	H.P.	778D	17086	N/A

13. EUT SETUP PHOTOS

SUPPORT EQUIPMENT SETUP PHOTO

COMPLIANCE CERTIFICATION SERVICES DOCUMENT NO:CCSUP4031A
1366 BORDEAUX DRIVE SUNNYVALE, CA 94089 USA TEL:(408) 752-8166 FAX:(408) 752-8168

14. TEST RESULT SUMMARY FOR PART 15

FCC PART 15 Radiated Emission Test was conducted by operating the configuration as indicated below. 10 meter data with EN22-b limits.

OATS No:	Data Report No.	Date	Tested By:
A	981223A1	12/23/98	PETE KREBILL

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)
135.0	40.90	-13.77	27.13	30.0	-2.87	Q	V
240.0	47.8	-12.15	35.65	37.0	-1.35	Q	V
255.0	44.6	-11.42	33.18	37.0	-3.82	Q	V
300.0	44.2	-9.85	34.35	37.0	-2.65	Q	V
195.0	43.2	-14.51	28.69	30.0	-1.31	Q	V
195.0	43.1	-15.06	28.04	30.0	-1.96	Q	H

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

15. FCC PART 2: TYPE ACCEPTANCE TEST REQUIREMENT:

SECTION 2.985 RF POWER OUTPUT

Please refer to configuration block diagram (**figure 1.)** for equipment connection. Power meter manufactured by Hewlett Packard was used to measure the RF power output for low, middle, and high channels.

NO. OF AMPLIFIER	**MEASURED RF POWER OUTPUT**
1	**25W**

SECTION 2.987 MODULATION CHARACTERISTICS

Not applicable. EUT is a power amplifier.

Test setup.

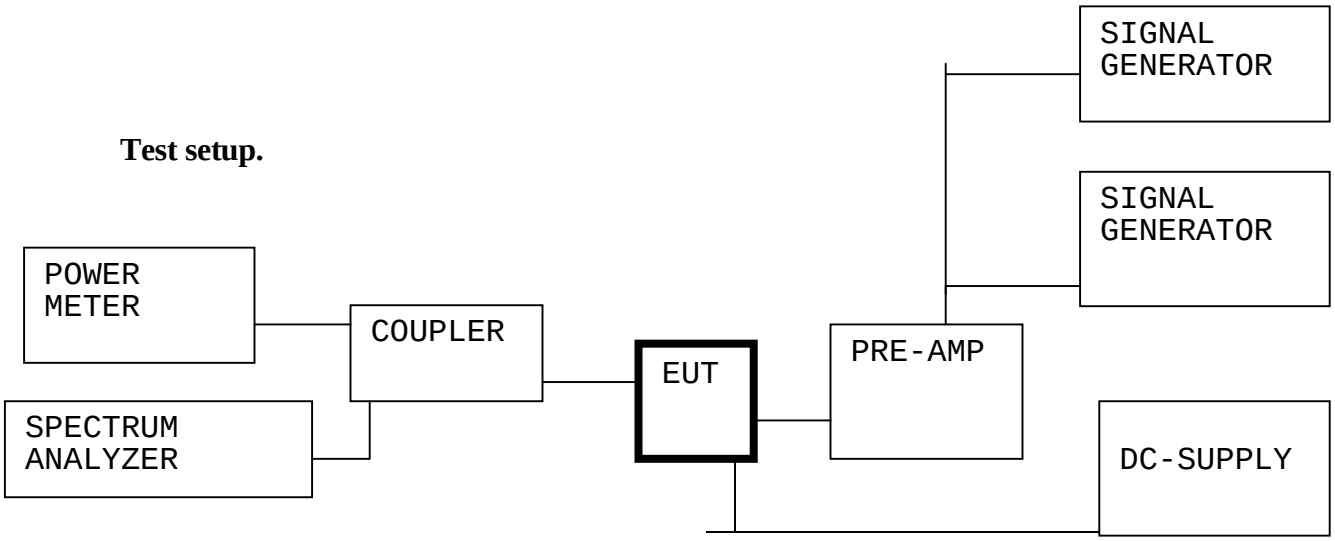


FIGURE 1.

SECTION 2.989 OCCUPIED BANDWIDTH

Test results are presented in spectrum analyzer plots. Plots were made for the output of the amplifier and another for the input from signal generator, used to generate CDMA, TDMA and AMPS Voice and Wideband Data modulations.
Measurements were done for low, middle, and high channels. Table shows order of plots.

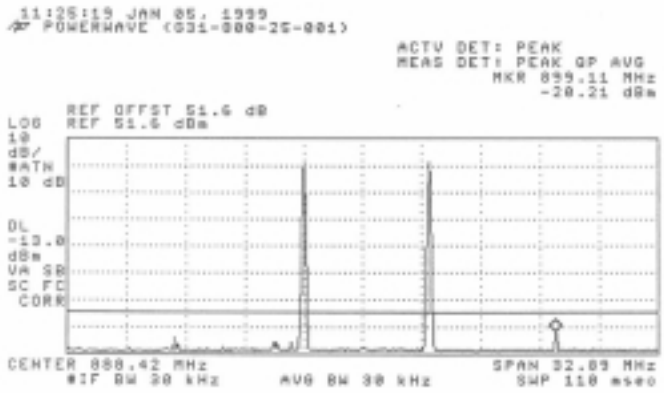
SECTION 2.991 SPURIOUS EMISSION AT ANTENNA TERMINALS

Refer to **figure 1.** for equipment setup. Spurious emission test was performed with two input signals to amplifier. Spectrum Analyzer was used to search for spurious, harmonics, and intermodulation products emissions. Table shows order of plots.

TDMA	
INTERMOD PLOT W/ 885 & 892MHz INPUT	**1**
30MHz TO 2679MHz	**2**
2679MHz TO 8940MHz	**3**
Input From Signal Generator for Above	**4**
BANDWIDTH PLOT	**5**
Input From Signal Generator for Above	**6**
CDMA	
INTERMOD PLOT W/ 885 & 892MHz INPUT Average Reading	**7**
30MHz TO 2679MHz	**8**
2679MHz TO 8940MHz	**9**
Input From Signal Generator for Above	**10**
BANDWIDTH PLOT	**11**
Input From Signal Generator for Above	**12**

AMPS VOICE	
INTERMOD PLOT W/ 885 & 892MHz INPUT	**13**
30MHz TO 2679MHz	**14**
2679MHz TO 8940MHz	**15**
Input From Signal Generator for Above	**16**
BANDWIDTH PLOT	**17**
Input From Signal Generator for Above	**18**
AMPS WIDEBAND DATA	
INTERMOD PLOT W/ 885 & 892MHz INPUT	**19**
30MHz TO 2679MHz	**20**
2679MHz TO 8940MHz	**21**
Input From Signal Generator for Above	**22**
BANDWIDTH PLOT	**23**
Input From Signal Generator for Above	**24**

FCC



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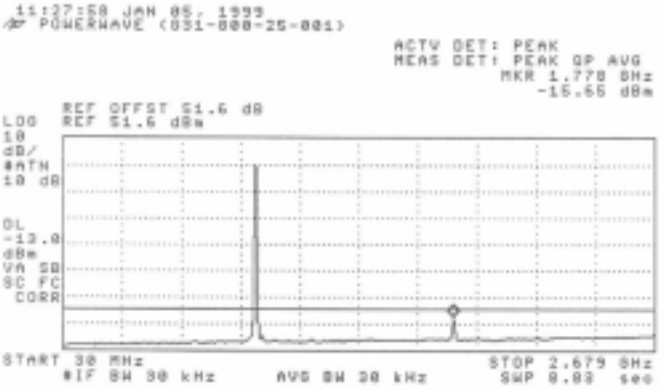

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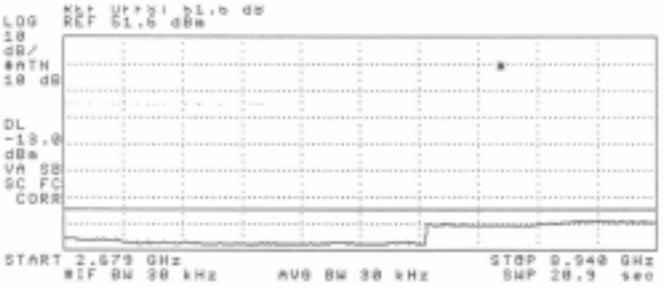

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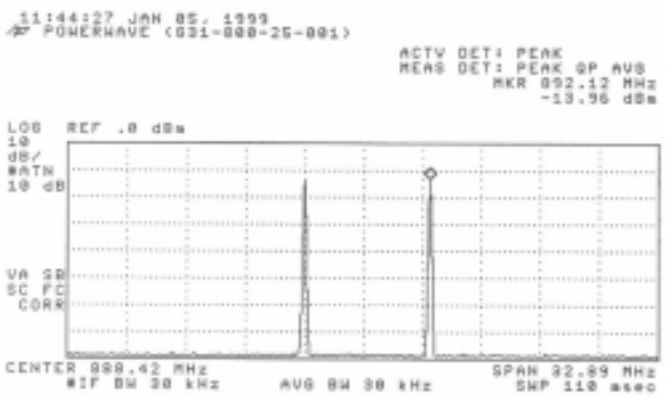

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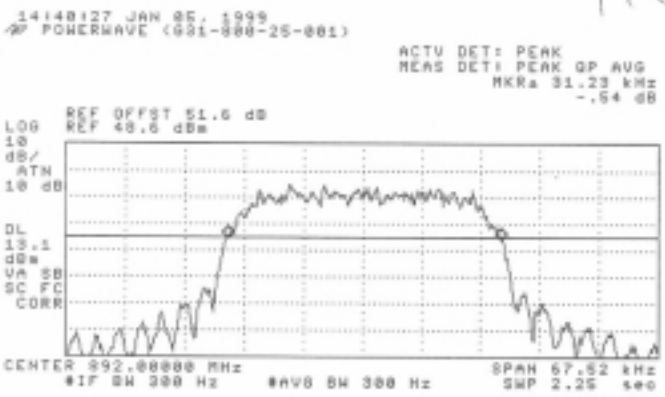

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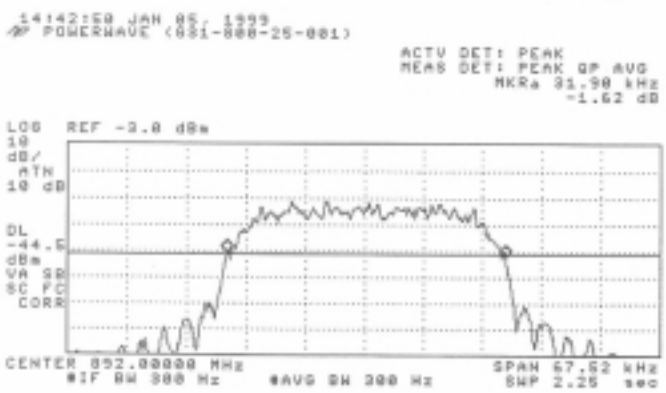

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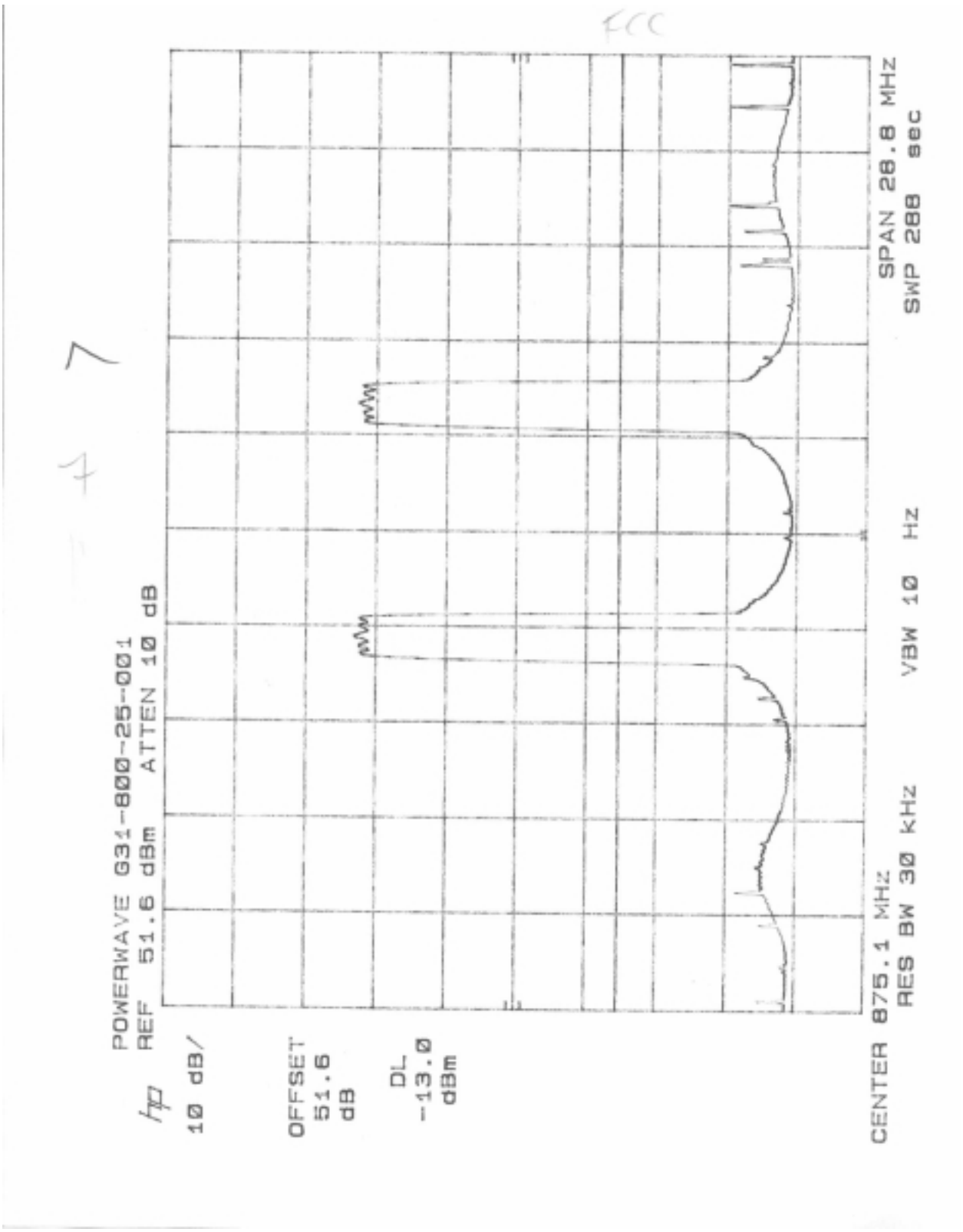

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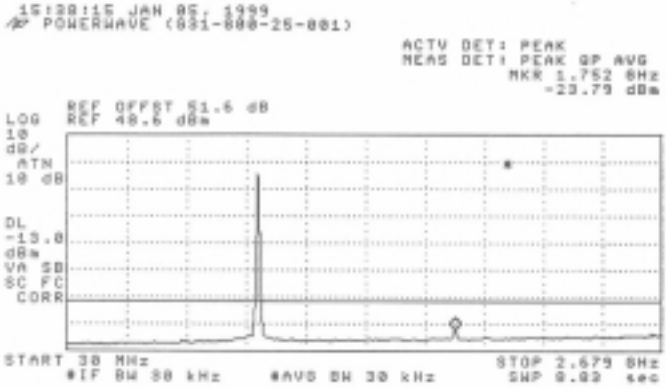

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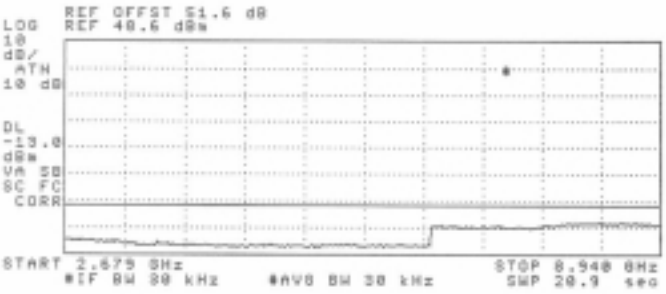

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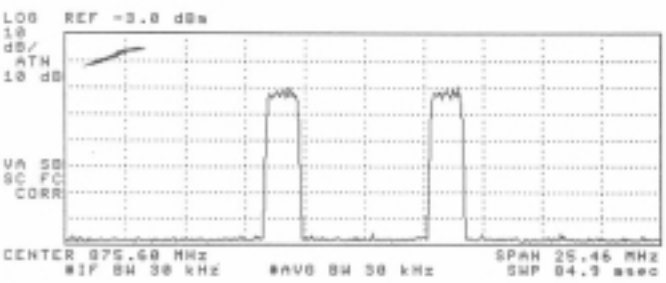

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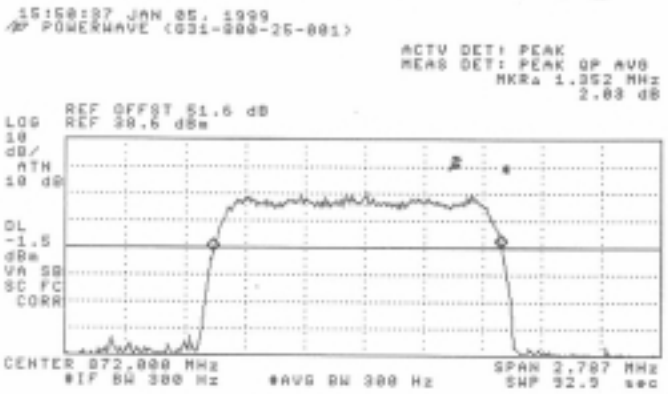

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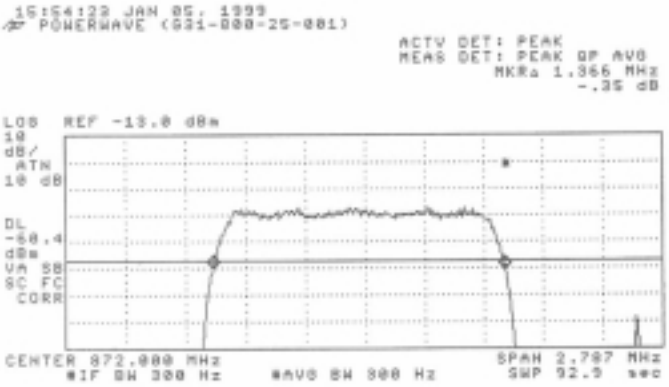

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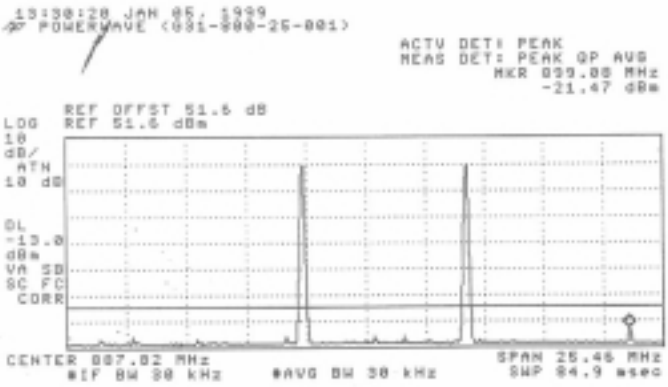

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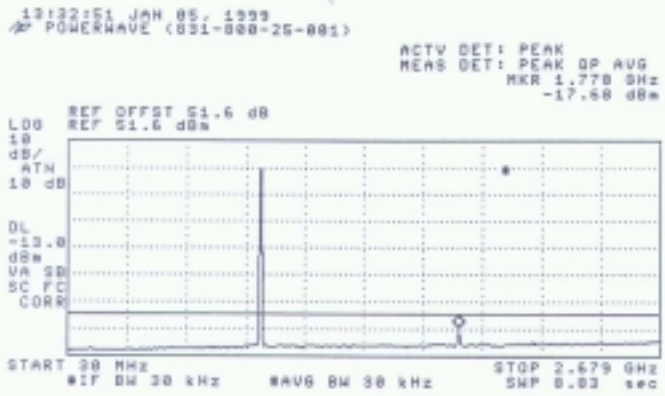

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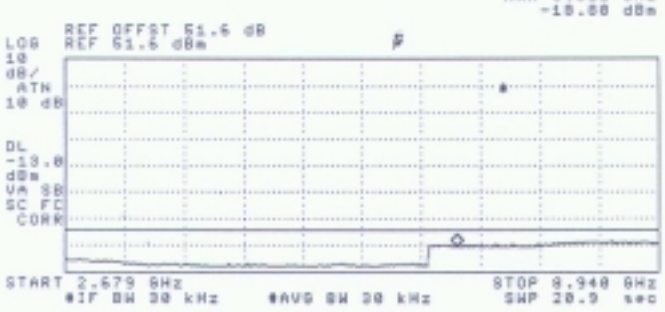

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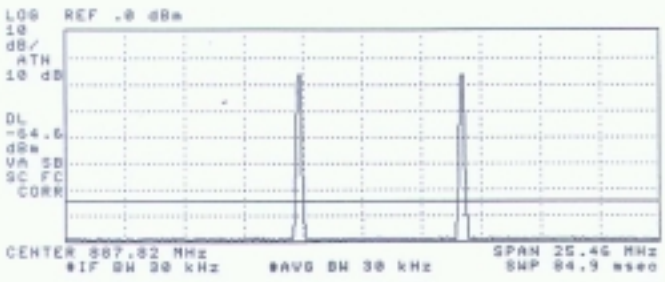

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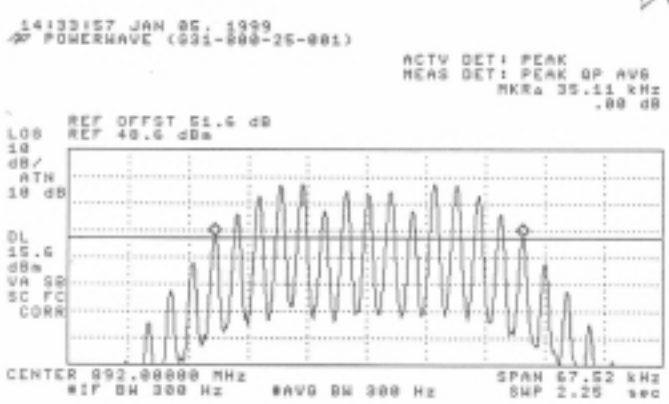

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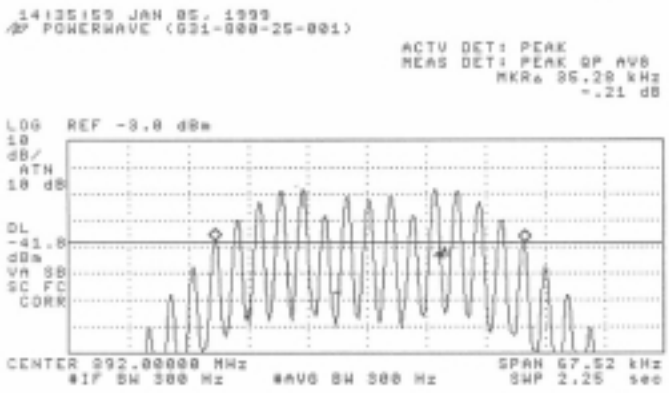

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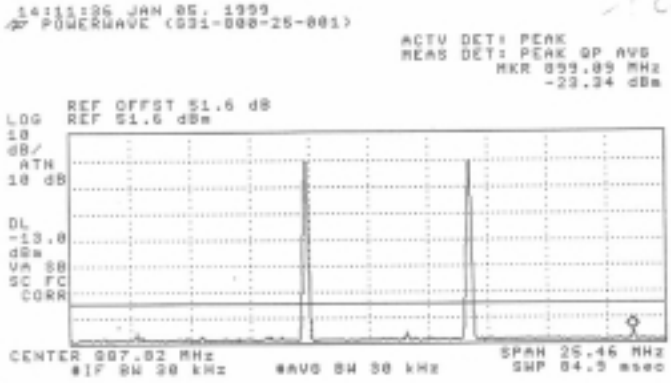

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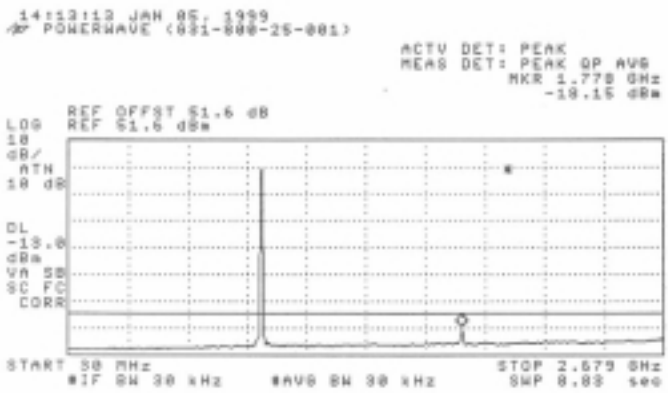

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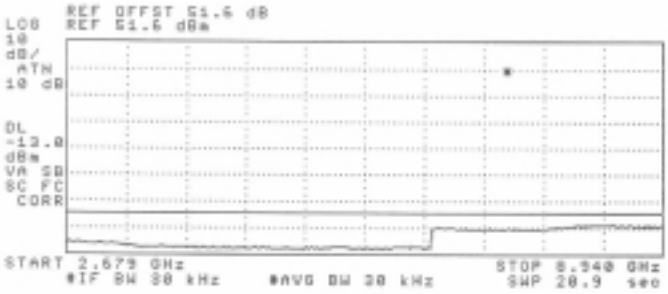

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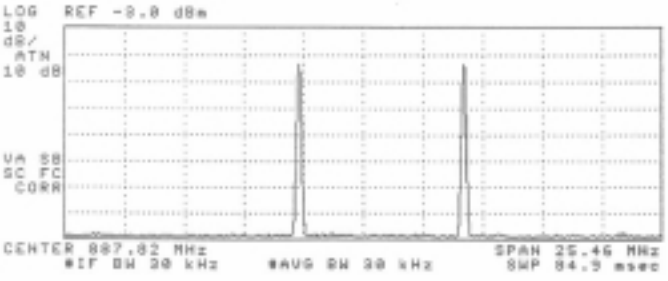

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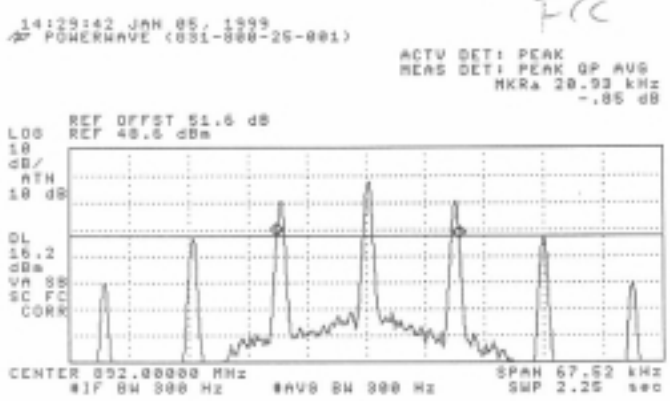

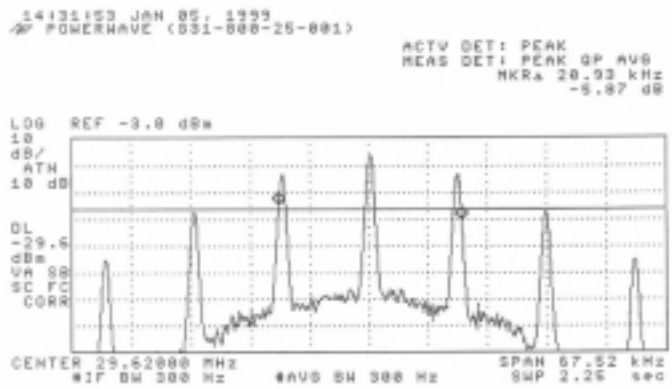

SECTION 2.995 FREQUENCT STABILITY

Not Applicable. Device is a power amplifier.

SECTION 2.993 FIELD STRENGTH OF SPURIOUS RADIATION

Test setup

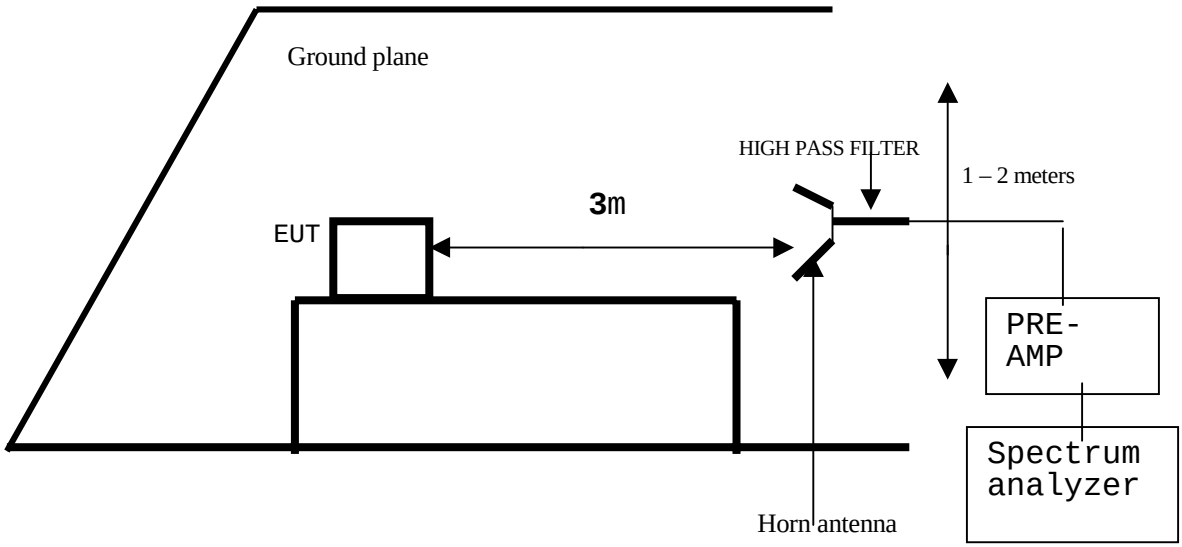

Figure 2. Radiated Emissions Configuration

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

FCC22.359
POWERWAVE
TECHNOLOGIES
25 Watt LPA
G31-800-25-
001

PETE KREBILL
12/23/98

SITE A

F(MHz)	Level (dBuV)	AF (dB)	CL (dB)	AMP (dB)	FILTER (dB)	DIST (dB)	Total (dBuV/m)	Limit (dBuV/m)	Margin (dB)
Horizontal									
1762P	74.05	26	2.34	-35.5	0	-10.45	56.44	82	-25.56
2643P	56.72	29.9	2.88	-35.5	1	-10.45	44.55	82	-37.45
3524PNF	42.74	33.1	4.68	-35.5	1	-20	26.02	82	-55.98
4405PNF	39.8	32.3	5.22	-35.5	1	-20	22.82	82	-59.18
5286PNF	38.8	34.7	5.4	-35.5	1	-20	24.4	82	-57.6
6167PNF	38.7	35.5	5.58	-35.5	1	-20	25.28	82	-56.72
7048PNF	42.1	36.2	6.48	-35.5	1	-20	30.28	82	-51.72
7929PNF	43	37	6.84	-35.5	1	-20	32.34	82	-49.66
8810PNF	41.9	38.1	7.38	-35.5	1	-20	32.88	82	-49.12

881MHz input 25Watts
output

AF=ANTENNA FACTOR
CL=CABLE
LOSS
AMP=AMPLIFIER GAIN
FILTER=FILTE
R LOSS
DIST=DISTANCE
CORRECTION

P=PEAK READING
NF=NOISE FLOOR
READING

16. EXTERNAL I/O CABLE CONSTRUCTION DESCRIPTION

CABLE NO:1	
I/O Port: : signal generator to combiner/preamp	Number of I/O ports of this type:1 OF EACH
Number of Conductors: 2	**Connector Type: N to SMA**
Capture Type: screw-in	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:1 M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO: 2	
I/O Port:: preamp to RF in of EUT	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:1.0M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO: 3	
I/O Port: RF OUT	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: 1.0M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
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**
Capture Type: SCREW-IN	**Type of Cable used: SHIELDED**
Cable Connector Type: METAL	**Cable Length:0.25M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO: 5	
I/O Port: RF OUT FROM DIRECT COUPLER	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:1.5M**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO: 6	
I/O Port: RF OUT FROM DIRECT COUPLER	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:15ft**
Bundled During Tests: NO	**Data Traffic Generated: YES**
Remark: N/A	

CABLE NO: 7	
I/O Port: POWER SUPPLY	Number of I/O ports of this type: DC INPUT
Number of Conductors: 2 WIRES	**Connector Type: N/A**
Capture Type: N/A	**Type of Cable used: SHIELDED**
Cable Connector Type: N/A	**Cable Length:1.5M**
Bundled During Tests: NO	**Data Traffic Generated: NO**
Remark: N/A	

CABLE NO: 9	
I/O Port: ANXIETY CONTROLLER	Number of I/O ports of this type: 1
Number of Conductors: 18	**Connector Type: MOLEX CONNECTOR**
Capture Type: SNAP-IN	**Type of Cable used: UN-SHIELDED**
Cable Connector Type: METAL	**Cable Length:2.0M**
Bundled During Tests: NO	**Data Traffic Generated: NO**
Remark: N/A	

COMPLIANCE CERTIFICATION SERVICES DOCUMENT NO:CCSUP4031A
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17. CONFIGURATION BLOCK DIAGRAM