

APPLICANT: WAVE WIRELESS NETWORKING

FCC ID: NCBSL9101A

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REPORT #: W\WAVE_NCB\1619TU3\1619TU3TestReport.doc

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12/8/03

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

SUBJECT: WAVE WIRELESS NETWORKING

FCC ID: NCBSL9101A

To Whom It May Concern:

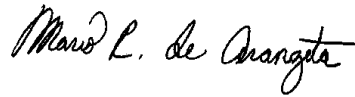
The attached application is for a direct sequence spread spectrum assembly, made up of the Bridge/Radio (FCC ID:MXF-M900821) and an 8 dBi antenna (permanently affixed).

This system has only one type of antenna, an omni type that has a gain of 8 dBi.

WAVE WIRELESS NETWORKING purchases standard antennas from the manufacturer (Andrew). The antenna is intended to be used outside.

Should you have any questions or require any further information with regards to this, please feel free to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read "Mario R. de Aranzeta". The signature is fluid and cursive, with the first name "Mario" being the most prominent.

Mario R. de Aranzeta C.E.T.

MRD/sh
Encl.

EMC Equipment List

EQID	Device	Manufacturer	Model
1	3-Meter OATS	TEI	N/A
2	3/10-Meter OATS	TEI	N/A
3	Tan Tower Spectrum Analyzer	HP	8566B Opt 462
4	Tan Tower RF Preselector	HP	85685A
5	Tan Tower Quasi-Peak Adapter	HP	85650A
6	Tan Tower Preamplifier	HP	8449B-H02
7	Blue Tower Spectrum Analyzer	HP	8568B
8	Blue Tower RF Preselector	HP	85685A
9	Blue Tower Quasi-Peak Adapter	HP	85650A
10	Silver Tower Spectrum Analyzer	HP	8566B Opt 462
11	Silver Tower RF Preselector	HP	85685A
12	Silver Tower Quasi-Peak Adapter	HP	85650A
13	Silver Tower Preamplifier	HP	8449B
14	Biconnical Antenna	Electro-Metrics	BIA-25
15	Biconnical Antenna	Eaton	94455-1
16	Biconnical Antenna	Eaton	94455-1
17	BiconiLog Antenna	EMCO	3143
18	Log-Periodic Antenna	Electro-Metrics	LPA-25
20	Log-Periodic Antenna	Electro-Metrics	LPA-30
21	Log-Periodic Antenna	Eaton	96005
22	Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4
23	Dipole Antenna Kit	Electro-Metrics	TDA-30/1-4
24	Double-Ridged Horn Antenna	Electro-Metrics	RGA-180
25	Horn Antenna *(at 3 meters)	Electro-Metrics	EM-6961
26	Horn Antenna *(at 10 meters)	Electro-Metrics	EM-6961
28	Passive Loop Antenna	EMC Test Systems	EMCO 6512
29	Harmonic Mixer with Horn Antenna	Oleson Microwave Labs	M08HW/A
30	Harmonic Mixer with Horn Antenna	Oleson Microwave Labs	M12HW/A
31	LISN	Electro-Metrics	ANS-25/2
32	LISN	Electro-Metrics	EM-7820
33	Termaline Wattmeter	Bird Electronic Corporation	611
34	Termaline Wattmeter	Bird Electronic Corporation	6104
35	Oscilloscope	Tektronix	2230
36	System One	Audio Precision	System One
37	Temperature Chamber	Tenney Engineering	TTRC
38	AC Voltmeter	HP	400FL
39	AC Voltmeter	HP	400FL
40	AC Voltmeter	HP	400FL
41	Digital Multimeter	Fluke	77
42	Digital Multimeter	Fluke	77
43	Digital Multimeter	HP	E2377A

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EQID	Device	Manufacturer	Model
44	Multimeter	Fluke	FLUKE-77-3
45	Peak Power Meter	HP	8900C
46	Power Sensor	Agilent Technologies	84811A
47	Power Meter	HP	432A
48	Power Sensor	HP	478A
49	Power Meter And Sensor	Bird	4421-107 & 4022
50	Digital Thermometer	Fluke	2166A
51	Thermometer	Traulsen	SK-128
52	Thermometer	Extech	4028
53	Hygro-Thermometer	Extech	445703
54	Frequency Counter	HP	5352B
55	Frequency Counter	HP	5385A
56	Service Monitor	IFR	FM/AM 500A
57	Comm. Serv. Monitor	IFR	FM/AM 1200S
58	Signal Generator	HP	8640B
59	Sweep Generator	Wiltron	6648
60	Sweep Generator	Wiltron	6669M
61	Modulation Analyzer	HP	8901A
62	Modulation Meter	Boonton	8220
63	Near Field Probe	HP	HP11940A
64	BandReject Filter	Lorch Microwave	5BR4-2400/60-N
65	BandReject Filter	Lorch Microwave	6BR6-2442/300-N
66	BandReject Filter	Lorch Microwave	5BR4-10525/900-S
67	Notch Filter	Lorch Microwave	5BRX-850/X100-N
68	High Pass Filter	Unk	3768(5)-400
69	High Pass Filter	Microlab	HA-10N
70	High Pass Filter	Microlab	HA-20N
71	Audio Oscillator	HP	653A
72	Audio Generator	B&K Precision	3010
73	Frequency Counter	HP	5382A
74	Frequency Counter	HP	5385A
75	Amplifier	HP	11975A
76	Egg Timer	Unk	
77	Measuring Tape-20M	Kraftixx	0631-20
78	Measuring Tape-7.5M	Kraftixx	7.5M PROFI
79	Coaxial Cable #51	Insulated Wire Inc.	NPS 2251-2880
80	Coaxial Cable #64	Semflex Inc.	60637
81	Coaxial Cable #65	General Cable Co.	E9917 RG233/U
82	Coaxial Cable #106	Unknown	Unknown
83	Injection Probe	Fischer Custom Communications	F-120-9A
84	Power Line Coupling/Decoupling Network	Fischer Custom Communications	FCC-801-M2-16A
85	Power Line Coupling/Decoupling Network	Fischer Custom Communications	FCC-801-M3-16A
86	VHF/UHF Current Probe	Fischer Custom Communications	F-52
87	Passive Impedance Adapter	Fischer Custom Communications	FCC-801-150-50-CDN

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EQID	Device	Manufacturer	Model
88	Radiating Field Coil	Fischer Custom Communications	F-1000-4-8/9/10-L-1M
89	EMC Immunity Test System	Keytek	CEMASTER
90	Compliance Test System - AC Power Source	California Instruments	1251RP
91	Compliance Test System - PACS-1 Module	California Instruments	PACS-1
92	Isotropic Field Probe	Amplifier Research	FP5000
93	Isotropic Field Probe	Amplifier Research	FP5000
94	Capacitor Clamp	Keytek	CM-CCL
95	Amplifier	Amplifier Research	10W1000B
96	Field Monitor	Amplifier Research	FM5004
97	ELF Meter	F. W. Bell	4060
98	Standard Gain Horn 1.0-2.4 GHz	Polarad	CA-L
100	Standard Gain Horn 2.14-4.34 GHz	Polarad	CA-S
101	Standard Gain Horn 3.95-5.85 GHz	Scientific-Atlanta Inc.	11A-3.9
102	Standard Gain Horn 8.2-12.5 GHz	Systron Donner	DBG-520-20
103	Standard Gain Horn 18.0-26.3 GHz	Systron Donner	DBE-520-20
104	Standard Gain Horn 26.5-40.2 GHz	Systron Donner	DBD-520-20
105	Standard Gain Horn 40.0-60.0 GHz	ATM	19-443-6R
106	Double-Ridged Horn Antenna	EMCO	3116
107	Standard Gain Horn 12.4-18.0 GHz	ATM	62-442-6
108	Standard Gain Horn 5.85-8.2 GHz	ATM	137-442-2
109	AC Voltmeter	HP	400F
110	RF Power Amplifier	Ophir RF	5150F
111	Electric Field Probe	Amplifier Research	FP6001
112	Electric Field Probe	Amplifier Research	FP6001

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TEST PROCEDURE

GENERAL: This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC. Shielded interface cables were used in all cases except for cables connecting to the telephone line and the power cords. A test program was run which simulated a normal data transmission on a network.

POWER LINE CONDUCTED INTERFERENCE: The procedure used was ANSI STANDARD C63.4-1992 using a 50uH LISN. Both lines were observed with the UUT transmitting. The bandwidth of the spectrum analyzer was 10 kHz with an appropriate sweep speed. The ambient temperature of the UUT was 78°F with a humidity of 45%.

BANDWIDTH 6.0dB: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW)=1 MHz and the video bandwidth (VBW) =3 MHz and the span set as shown on plot.

POWER OUTPUT: The RF power output was measured at the antenna feed point using a peak power meter.

ANTENNA CONDUCTED EMISSIONS: The RBW=100 kHz, VBW=300 kHz and the span set to 10 MHz and the spectrum was scanned from 30 MHz to the 10th harmonic of the fundamental. Above 1 GHz the resolution bandwidth was 1 MHz and the VBW = 3 MHz and the span to 50 MHz.

RADIATION INTERFERENCE: The test procedure used was ANSI STANDARD C63.4-1992 using a HEWLETT PACKARD spectrum analyzer with a preselector. The bandwidth (RBW) of the spectrum analyzer was 100 kHz up to 1 GHz and 1 MHz above 1 GHz with an appropriate sweep speed. The VBW above 1 GHz was = 3 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the UUT was 80°F with a humidity of 40%.

APPLICANT: WAVE WIRELESS NETWORKING
FCC ID: NCBSL9101A
NAME OF TEST: POWER LINE CONDUCTED INTERFERENCE
RULES PART NO.: 15.107(a)

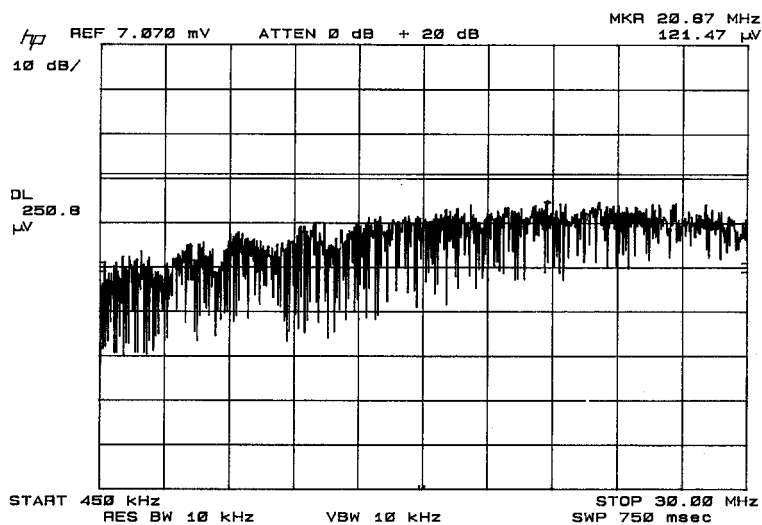
REQUIREMENTS:	QUASI-PEAK	AVERAGE
.15 - 0.5 MHz	66-56 dBuV	56-46 dBuV
0.5 - 5.0	56	46
5.0 - 30.	60	50

TEST PROCEDURE: ANSI STANDARD C63.4-1992. The spectrum was scanned from 0.15 to 30 MHz.

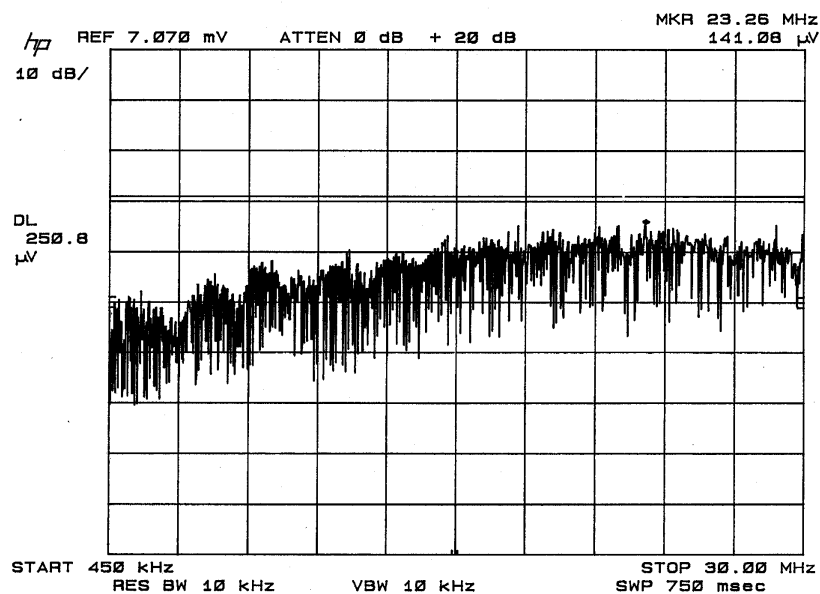
TEST DATA: See plots on following pages.

TEST RESULTS: Both lines were observed. The measurements indicate that the unit DOES meet the FCC requirements for this class of equipment.

POWERLINE CONDUCTED EMISSIONS PLOT - LINE 1



POWERLINE CONDUCTED EMISSIONS PLOT - LINE 2

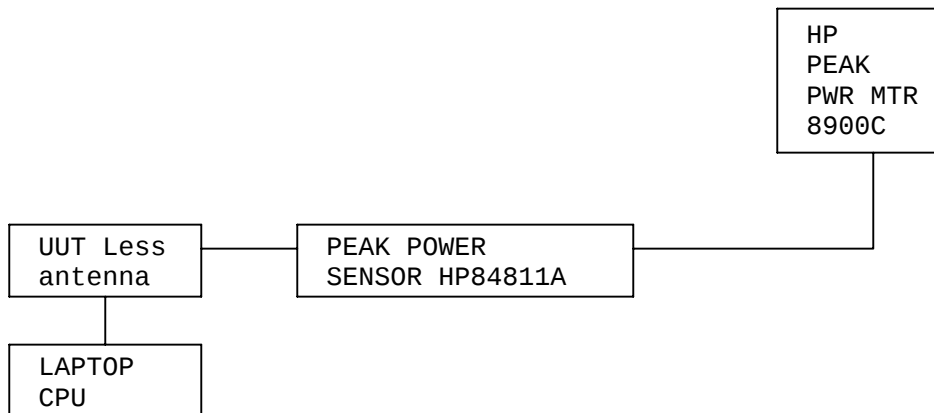


APPLICANT: WAVE WIRELESS NETWORKING
FCC ID: NCBSL9101A
NAME OF TEST: 6.0dB BANDWIDTH
RULES PART NO.: 15.247(a)(2)
REQUIREMENTS: The 6.0 dB bandwidth must be greater than 500 kHz.
MEASUREMENT: See plot on next page.

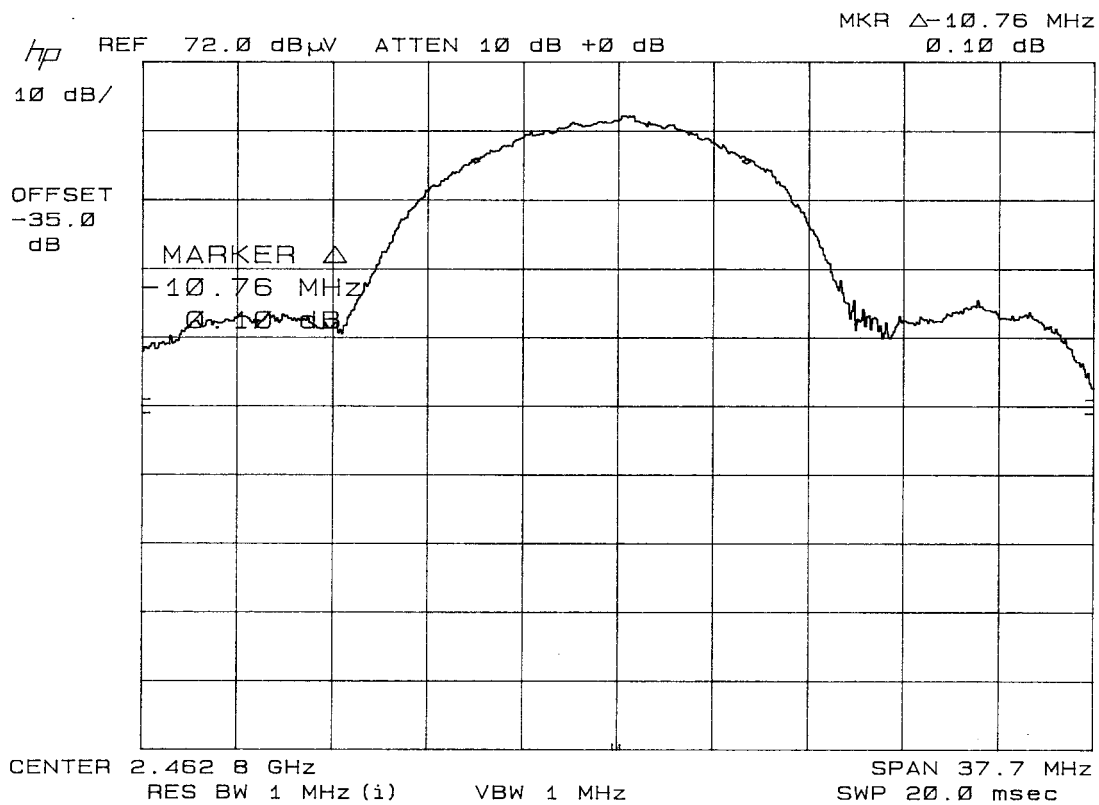
Three places in the band were measured and the worst case reported.

NAME OF TEST: POWER OUTPUT
RULES PART NO.: 15.247(b) 1.0Watt or +30dBm
MEASUREMENT: 55 mWatts or 17.2 dBm @ 2413.0MHz

15.247(c) Method of Measuring RF Power output: The Peak power Sensor was connected in place of the antenna.

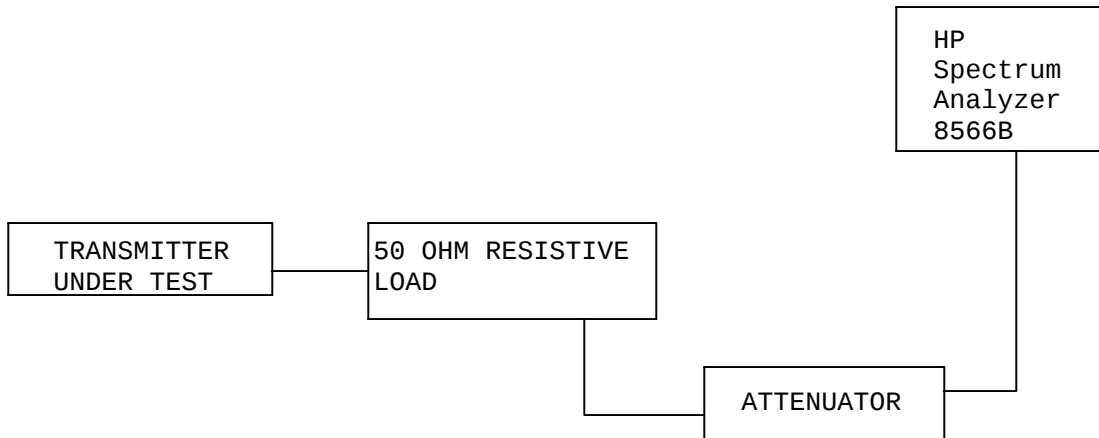


Three places in the band were measured and the worst case reported.



6 dB Bandwidth

15.247(c) Method of Measuring RF Conducted Spurious Emissions



NAME OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

REQUIREMENTS: Emissions must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW.

TF	EF	M reading	dB below carrier
2412	2412	111.3	0
	4824	57.2	54.1
	7236	0	111.3
	2037.7	69.4	41.9
	2786	56.5	54.8

TF	EF	M reading	dB below carrier
2437	2437	111	0
	4874	54.1	56.9
	7311	0	111
	2062.7	70.4	40.6
	2811.7	57.5	53.5

TF	EF	M reading	dB below carrier
2462	2462	110.8	0
	4924	54.3	56.5
	7386	0	110.8
	2087.7	70.7	40.1
	2836	56.6	54.2

NOTE: THE SPECTRUM WAS SCANNED TO THE TENTH HARMONIC.

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15.247(c), 15.205 & 15.209(b) Field strength of spurious emissions:

REQUIREMENTS:

FIELD STRENGTH of Fundamental: 902-928MHz 2.4-2.4835GHz 127.38dBuV/m @3m	FIELD STRENGTH of Harmonics 54 dBuV/m @3m	S15.209 30 - 88 MHz 40 dBuV/m @3M 88 -216 MHz 43.5 216 -960 MHz 46 ABOVE 960 MHz 54dBuV/m
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EMISSIONS RADIATED OUTSIDE OF THE SPECIFIED FREQUENCY BANDS, EXCEPT FOR HARMONICS, SHALL BE ATTENUATED BY AT LEAST 50 dB BELOW THE LEVEL OF THE FUNDAMENTAL OR TO THE GENERAL RADIATED EMISSION LIMITS IN 15.209, WHICHEVER IS THE LESSER ATTENUATION.

REQUIREMENTS: Emissions that fall in the restricted bands (15.205) must be less than 54dBuV/m otherwise the spurious and harmonics must be attenuated by at least 20dB.

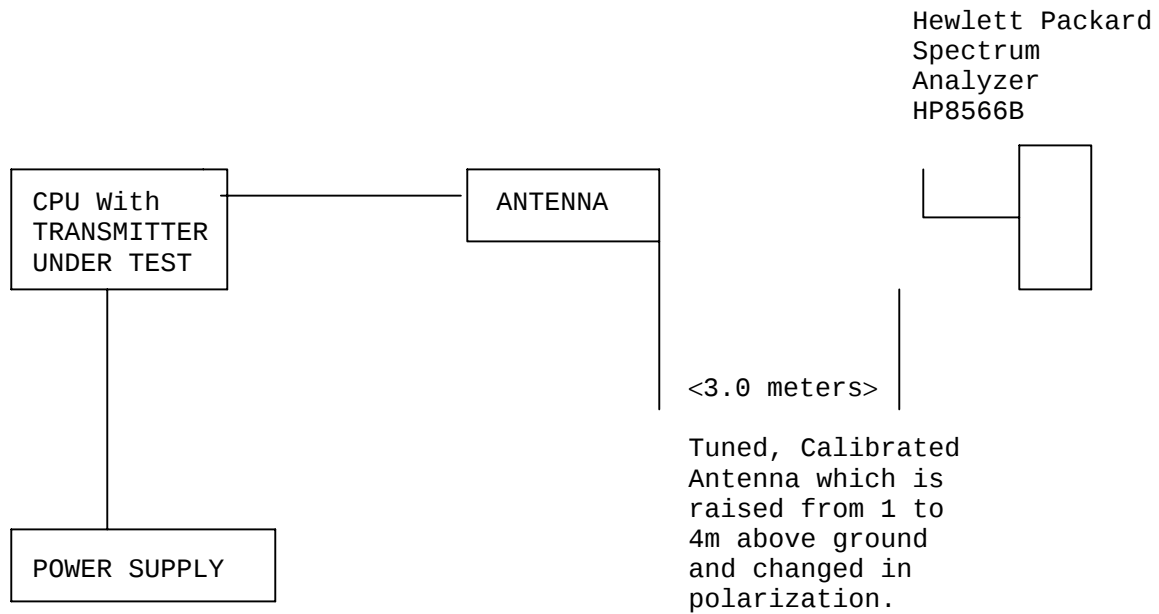
TEST DATA: All readings are peak unless noted otherwise.

Tuned Frequency MHz	Emission Frequency MHz	Meter Reading dBuV	Ant. Polarity	Coax Loss dB	Correction Factor dB	Field Strength dBuV/m	Margin dB
2,412.0	2,050.00	33.9	V	1.72	28.88	64.50	0.96
2,412.0	2,412.00	84.4	V	1.86	29.20	115.46	11.92
2,412.0	4,824.00	17.5 A	V	2.65	33.63	53.78	0.13
2,412.0	4,824.00	36.5	V	2.65	33.63	72.78	1.22
2,437.0	2,062.80	24.8	V	1.73	28.90	55.43	8.78
2,437.0	2,438.00	83.1	V	1.88	29.23	114.21	13.17
2,437.0	4,874.90	17.5 A	V	2.66	33.75	53.91	0.09
2,437.0	4,874.90	36.6	V	2.66	33.75	73.01	0.99
2,462.0	2,088.00	26.7	V	1.74	28.92	57.36	6.58
2,462.0	2,463.00	82.8	V	1.89	29.25	113.94	13.44
2,462.0	4,924.00	17.2 A	V	2.68	33.87	53.75	0.25
2,462.0	4,924.00	34.8	V	2.68	33.87	71.35	2.65

Note: A= average
Emissions were measured to the tenth harmonic.

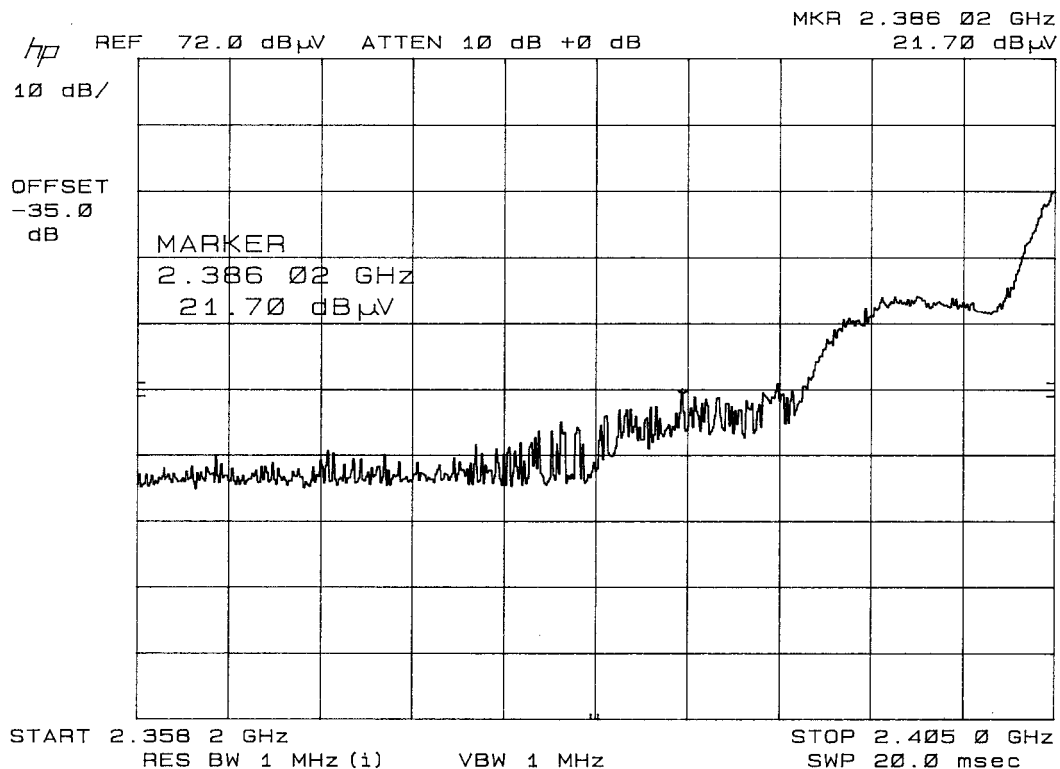
METHOD OF MEASUREMENT: The procedure used was ANSI STANDARD C63.4-1992 & the FCC/OET Guidance on Measurements for Direct Sequence Spread Spectrum Systems - Public Notice 54797 Dated July 12, 1995. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 849 N.W. State Road 45, Newberry, FL 32669.

Method of Measuring Radiated Spurious Emissions



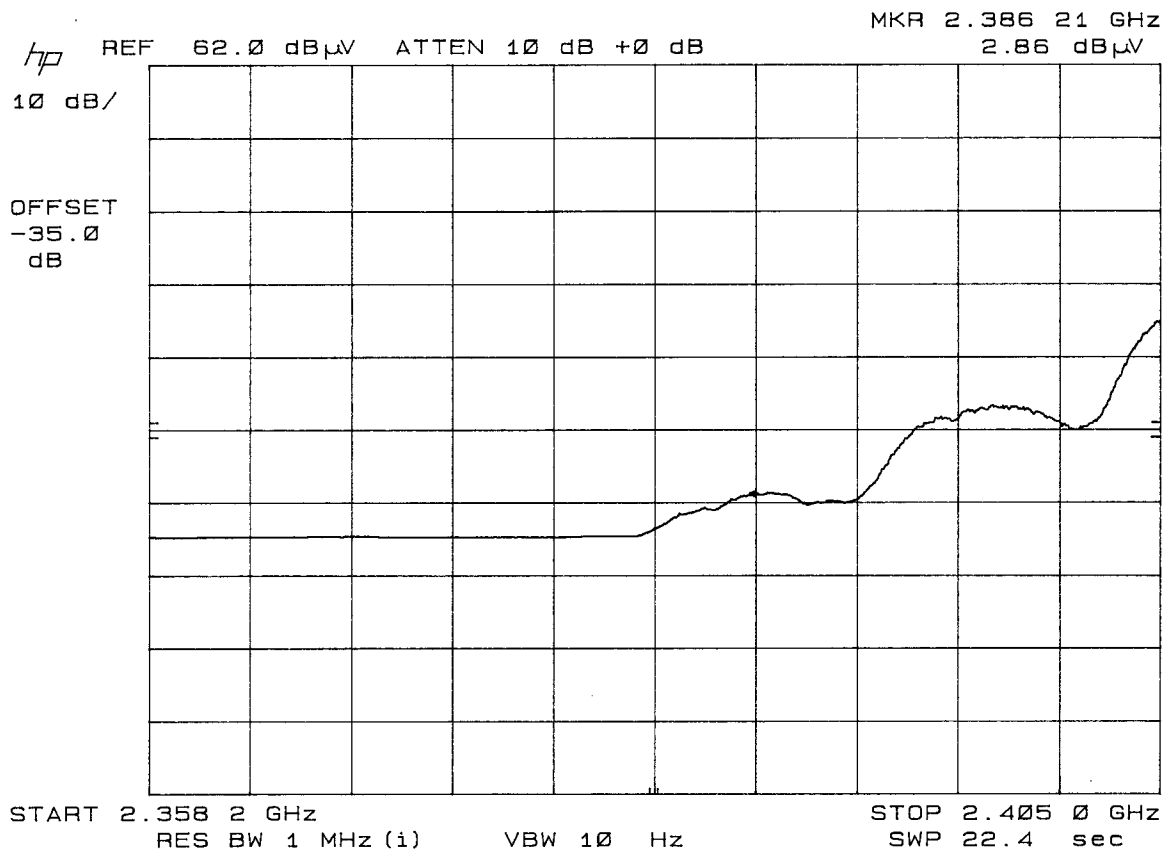
Equipment placed 80cm above ground on a rotatable platform.

APPLICANT: WAVE WIRELESS NETWORKING
FCC ID: NCBSL9101A
NAME OF TEST: RADIATED SPURIOUS EMISSIONS INTO ADJACENT RESTRICTED BAND
REQUIREMENTS: Emissions that fall in the restricted bands (15.205). These emissions must be less than or equal to 500 uV/m (54 dBuV/m).
TEST PROCEDURE: An in band field strength measurement of the fundamental Emission using the RBW and detector function required by C63.4-2000 and FCC Rules. The procedure was repeated with an average detector and a plot made. The calculated field strength in the adjacent restricted band is presented below.



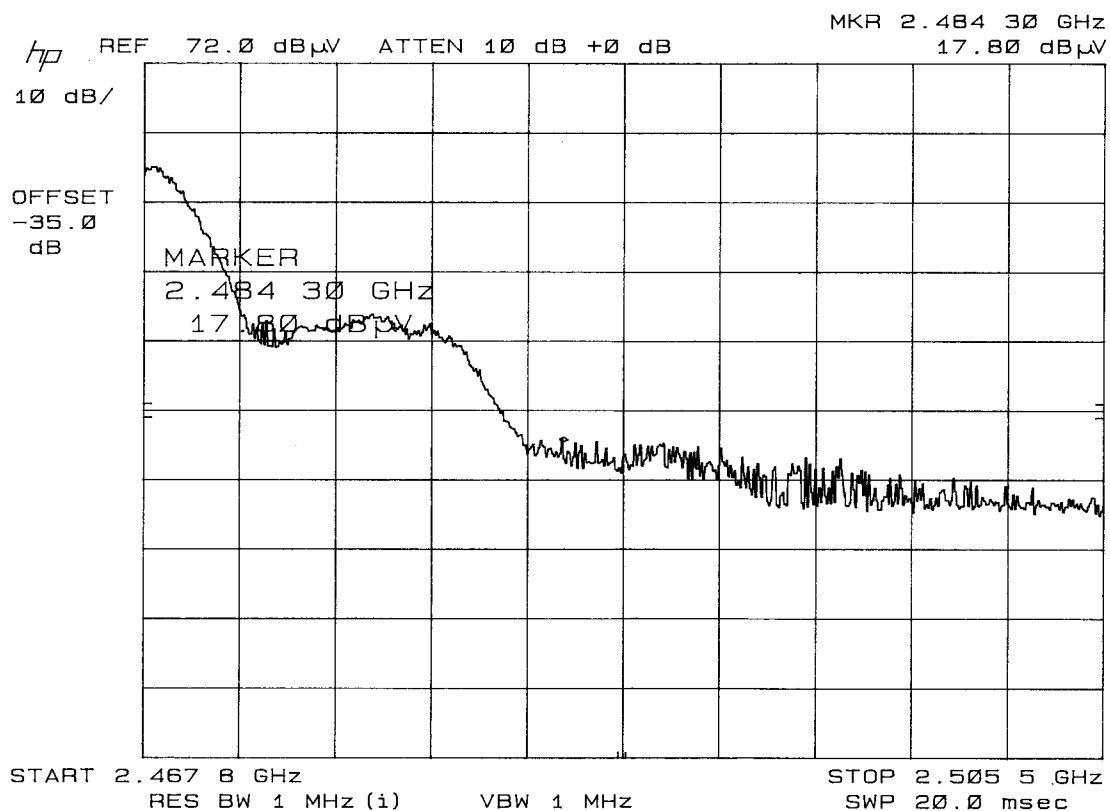
2386.02 MHz - PEAK MEASUREMENT

21.7	dBuV	MR
20.0	dB	attenuator
29.18		ACF
1.85		CL
72.73	dBuV/m	



2386.21 MHz - AVERAGE MEASUREMENT

2.86 dBuV	MR
20.0 dB	attenuator
29.18	ACF
1.85 dB	CL
53.89	dBuV/m



2484.3 MHz - PEAK MEASUREMENT

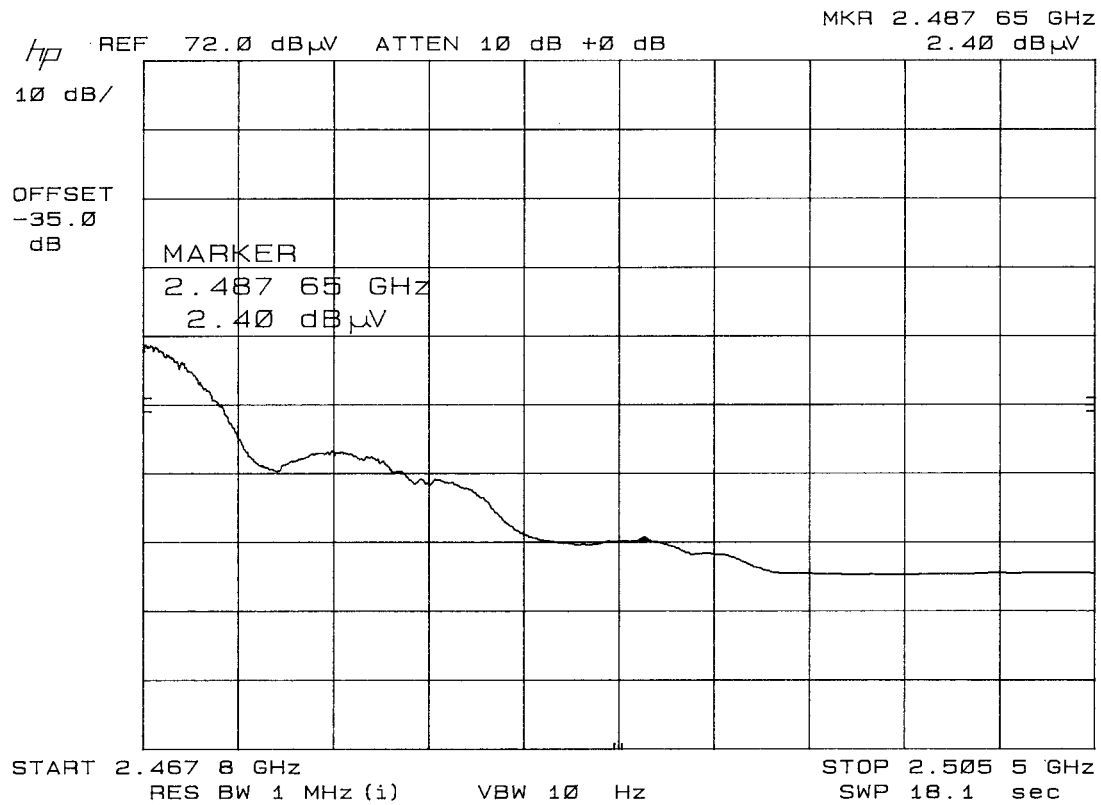
17.8	dBuV	MR
20.0	dB	attenuator
29.27		ACF
1.89	dB	CL
68.96	dBuV/m	

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2487.65 MHz - AVERAGE MEASUREMENT

2.4 dBuV MR
20.0 dB attenuator
29.27 ACF
1.9 dB CL
53.57 dBuV/m

APPLICANT: WAVE WIRELESS NETWORKING

FCC ID: NCBSL9101A

NAME OF TEST: POWER SPECTRAL DENSITY

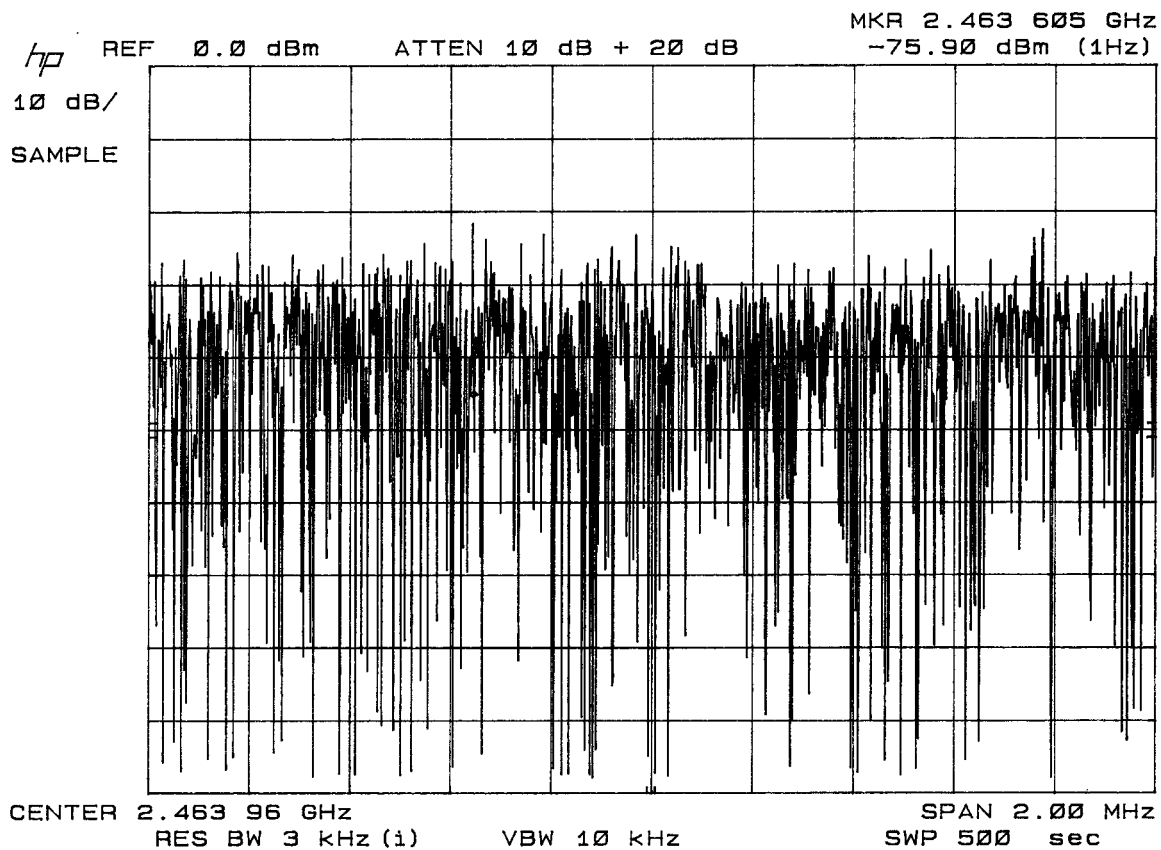
RULES PART NO.: 15.247(d)

REQUIREMENTS: The peak level measured must be no greater than +8.0dBm.

DATA: See plot below.

The level at 2432.94 MHz was -75.90 dBm.

+10 dB Attenuator
+35 dB Correction Factor
+45 dB
-75.9 dBm
-30.9 dBm Power Spectral Density



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