



**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT  
INTENTIONAL RADIATOR CERTIFICATION TO  
FCC PART 15 SUBPART C REQUIREMENT**

*OF*

**FCC ID: MGA-KWE2000-HF**

**DIRECT SEQUENCE SPREAD SPECTRUM DATA TRANSCEIVER**

**MODEL NO: KWE2000-HF**

**BRAND NAME: KINGMAX**

**S/N: 5001**

**REPORT NO: 98T0066-1**

**DECEMBER 2, 1998**

*Prepared for*

**KINGMAX TECHNOLOGY INC.**

**NO. 70, KUANG FU NORTH ROAD, HSIN CHU INDUSTRIAL PARK  
HU KOU, HSIN CHU 303, TAIWAN, R.O.C.**

*Prepared by*

**COMPLIANCE ENGINEERING SERVICES, INC.**

**DBa**

**COMPLIANCE CERTIFICATION SERVICES**

**1366 BORDEAUX DRIVE**

**SUNNYVALE, CA 94089, U.S.A.**

**TEL: (408) 752-8166**

**FAX: (408) 752-8168**

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## 1. VERIFICATION OF COMPLIANCE

COMPANY NAME : KINGMAX TECHNOLOGY INC.  
 NO. 70, KUANG FU NORTH ROAD  
 HSIN CHU INDUSTRIAL PARK  
 HU KOU, HSIN CHU 303, TAIWAN, R.O.C.

CONTACT PERSON : MR. DAVID WANG / SECTION MANAGER

TELPHONE NO : 886-3-5985288 ext.568

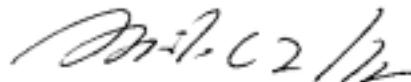
EUT DESCRIPTION : DIRECT SEQUENCE SPREAD SPECTRUM DATA  
 TRANSCEIVER

MODEL NAME : KWE2000-HF

DATE TESTED : DECEMBER 02,1998

LIMIT APPLY TO: FCC PART 15 SECTION 15.247	
TECHNICAL LIMITS	TEST RESULT
Minimum 6dB Bandwidth@ > 500kHz	Passed
RF Power Output < 1 Watt	Passed
Out of Band Measurements	Passed
DSSS Power Density < 8dBm @ 3kHz bandwidth	Passed
Processing Gain of a DSSS > 10dB	Passed
LIMIT APPLY TO: FCC PART 15 SECTION 15.205/SECTION 15.209	
Restricted Band of Operation	Passed
LIMIT APPLY TO: FCC PART 15 SECTION 15.109	
Radiated Emission Limits	Passed
LIMIT APPLY TO: FCC PART 15 SECTION 15.207	
AC Line Conducted Emission	Passed

The above equipment was tested by Compliance Engineering Services Inc. for compliance with the requirements set forth in CFR 47 PART 15 SUBPART C. This said equipment in the configuration described in this report show that maximum emission levels emanating from equipment are within the compliance requirements.



MIKE C.I. KUO / VICE PRESIDENT  
 COMPLIANCE CERTIFICATION SERVICES

PAGE NO: 1

## 2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

CHASSIS TYPE	<b>PLASTIC &amp; METAL</b>
Frequency Range	<b>2412-2462 MHz</b>
Local Osc./Location	<b>22.0 &amp; 40.0 MHz/Top &amp; bottom of board.</b>
Channel Spacing	<b>5 MHz</b>
Transmit Power	<b>16mW</b>
Modulation Technique	<b>DPSK</b>
Radio Technique	<b>Direct Sequence Spread Spectrum</b>
Number of Channels	<b>11</b>
Operating Mode	<b>Point-to-Point</b>
Air Data Rate	<b>2Mbps</b>
Antenna	<b>Permanently Attached (50 ohms / omni-directional)</b>
DC voltage	<b>5Vdc</b>
External Interface	<b>PCMCIA slot</b>
Emission Type	<b>F2D</b>

## 3. TEST LOCATION

All emissions tests were performed at:

Compliance Engineering Services, Inc.  
561F Monterey Road  
Morgan Hill, CA 95037

CCS has site descriptions on file with the FCC for 10 and 3 meter site configurations. CCS is a NVLAP accredited facility.

Radiated emissions from the digital portion of the EUT were performed on site B, one of the 10 meter sites.

## 4. SUPPORT EQUIPMENT

DEVICE TYPE	MANUFACTURER	MODEL NAME	SERIAL NO	FCC ID
LAPTOP PC	<b>COMPAQ</b>	<b>SERIES 2860B</b>	<b>7522HPM71101</b>	<b>CNT75MB2CB</b>
PRINTER	<b>H.P.</b>	<b>2225C+</b>	<b>2930S52630</b>	<b>DSI6XU2225</b>
MODEM	<b>HAYES</b>	<b>07-00038</b>	<b>A45200153875</b>	<b>BFJ 9D9 07-00038A</b>

## 5. TEST PROCEDURES AND TEST RESULTS

### RADIATED EMISSIONS (GENERAL REQUIREMENTS)

#### TEST REQUIREMENT: 15.205

##### Measurement Equipment Used:

HP 8593EM EMC Receiver

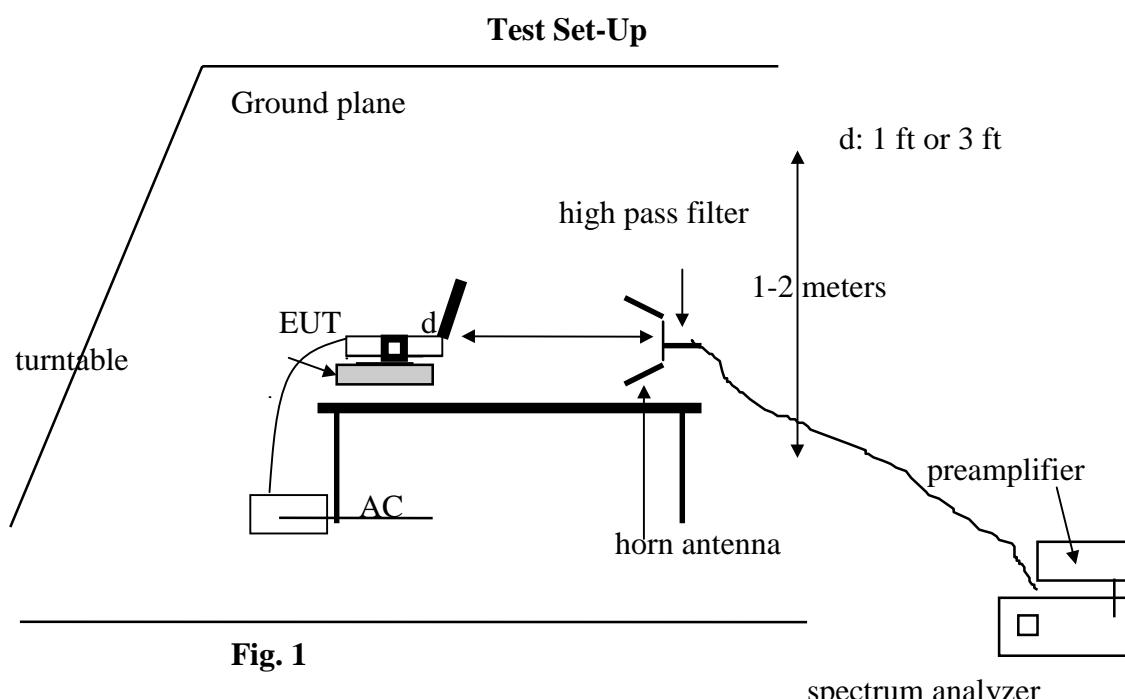
HP 8449B Preamplifier, 1 – 26.5 GHz

ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 GHz

ARA MWH 1826/B Broadband Horn Antenna, 18 – 26 GHz

QIM "The Workhorse" low loss cable, 9ft(loss: 0.85dB/ft @ 26GHz)

FSY Microwave High Pass Filter, (fo=4600MHz), S/N: 001



**Fig. 1**

### Test Procedures

1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 3 ft from the EUT. The EUT antenna was mounted vertically as per normal installation.
2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.
3. Once maximum direction was determined, the search antenna

was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

**Test Results:** Refer to attached tabular data sheets

<b>COMPLIANCE ENGINEERING SERVICES, INC.</b>																	
Radiated Emissions																	
15.205																	
KINGMAX TECHNOLOGY INC.																	
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)																	
<i>f<sub>0</sub></i> = 2412 MHz (LOW)																	
<b>F(MHz)</b>		<b>READING</b>	<b>AF</b>	<b>CL</b>	<b>AMP</b>	<b>DIST</b>	<b>HPF</b>	<b>TOTAL</b>	<b>LIMIT</b>	<b>MARGIN</b>							
(dBuV)		(dB)	(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)							
<b>Pk</b>	<b>Avg</b>							<b>Pk</b>	<b>Avg</b>	<b>Pk</b>	<b>Avg</b>						
4824	46.42	36.41	35	5	-35	-9.5	1	42.92	32.91	74	54						
7235*	46.81	35.72	44.1	6.6	-35	-9.5	1	54.01	42.92	74	54						
9647*	47.36	35.4	39.4	7.26	-35	-9.5	1	50.52	38.56	74	54						
12058*	49.22	36.76	40.2	8.25	-35	-9.5	1	54.17	41.71	74	54						
14470*	49.52	38.73	44.7	9.07	-35	-9.5	1	59.79	49	74	54						
16882*	50.23	39.98	43.9	10.73	-35	-9.5	1	61.36	51.11	74	54						
* Measured noise floor																	
<b>NOTE: ALL READINGS ARE VERTICAL</b>																	
<b>DIST:</b> Correction to extrapolate reading to 3m specification distance																	
1M measurement distance: <b>-9.5dB</b>																	
<b>AF:</b> Antenna Factor																	
<b>AMP:</b> Pre-amp gain																	
<b>CL:</b> Cable loss																	
<b>HPF:</b> High pass filter insertion loss (4.6GHz)						FSY (S/N: 001)											
<b>ANALYZER SETTING</b>																	
Res bw																	
1MHz																	
AVERAGE(Avg):																	
1MHz																	
10Hz																	

<b>COMPLIANCE ENGINEERING SERVICES, INC.</b>													
Radiated Emissions													
15.205													
KINGMAX TECHNOLOGY INC.													
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)													
<i>f<sub>o</sub></i> = 2437 MHz (MID)													
<b>F(MHz)</b>		<b>READING</b>	<b>AF</b>	<b>CL</b>	<b>AMP</b>	<b>DIST</b>	<b>HPF</b>	<b>TOTAL</b>	<b>LIMIT</b>		<b>MARGIN</b>		
		(dBuV)	(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)		(dB)		
		<b>Pk</b>	<b>Avg</b>					<b>Pk</b>	<b>Avg</b>	<b>Pk</b>	<b>Avg</b>		
4873	52.18	49.97	35	5	-35	-9.5	1	48.68	46.47	74	54	-25.3	-7.53
7311*	45.75		44.1	6.6	-35	-9.5	1	52.95		74		-21.1	0
9747*	46.75		39.4	7.26	-35	-9.5	1	49.91		74		-24.1	0
12185*	46.62		40.2	8.25	-35	-9.5	1	51.57		74		-22.4	0
14622*	49.61		44.7	9.07	-35	-9.5	1	59.88		74		-14.1	0
17059*	50.63		43.9	10.73	-35	-9.5	1	61.76		74		-12.2	0
* Measured noise floor													
<b>NOTE: ALL READINGS ARE HORIZONTAL</b>													
<b>DIST:</b> Correction to extrapolate reading to 3m specification distance													
1M measurement distance: <b>-9.5dB</b>													
<b>PEAK(Pk):</b> 1MHz													
<b>AVERAGE(Avg):</b> 1MHz													
<b>ANALYZER SETTINGS</b>													
Res. bw													
Avg. bw													
10Hz													
<b>AF:</b> Antenna Factor													
<b>AMP:</b> Pre-amp gain													
<b>CL:</b> Cable loss													
<b>HPF:</b> High pass filter insertion loss (4.6GHz)													
FSY(S/N:001)													

COMPLIANCE ENGINEERING SERVICES, INC.													
Radiated Emissions													
15.205													
KINGMAX TECHNOLOGY INC.													
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)													
<i>f<sub>o</sub></i> = 2462 MHz (HIGH)													
F(MHz)	READING	AF	CL	AMP	DIST	HPF	TOTAL	LIMIT	MARGIN				
	(dBuV)	(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)				
Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg	
4924	51.46	47.06	35	5	-35	-9.5	1	47.96	43.56	74	54	-26	-10.4
7386*	48.23		44.1	6.6	-35	-9.5	1	55.43		74		-18.6	0
9848*	47.62		39.4	7.26	-35	-9.5	1	50.78		74		-23.2	0
12310*	48.58		40.2	8.25	-35	-9.5	1	53.53		74		-20.5	0
14772*	50.38		44.7	9.07	-35	-9.5	1	60.65		74		-13.4	0
17234*	50.48		43.9	10.73	-35	-9.5	1	61.61		74		-12.4	0
* Measured noise floor													
NOTE: ALL READINGS ARE HORIZONTAL													
DIST: Correction to extrapolate reading to 3m specification distance													
1M measurement distance: <b>-9.5dB</b>													
PEAK(Pk): <b>1MHz</b>													
AVERAGE(Avg): <b>1MHz</b>													
AF: Antenna Factor													
AMP: Pre-amp gain													
CL: Cable loss													
HPF: High pass filter insertion loss (4.6GHz)													
FSY(S/N:001)													

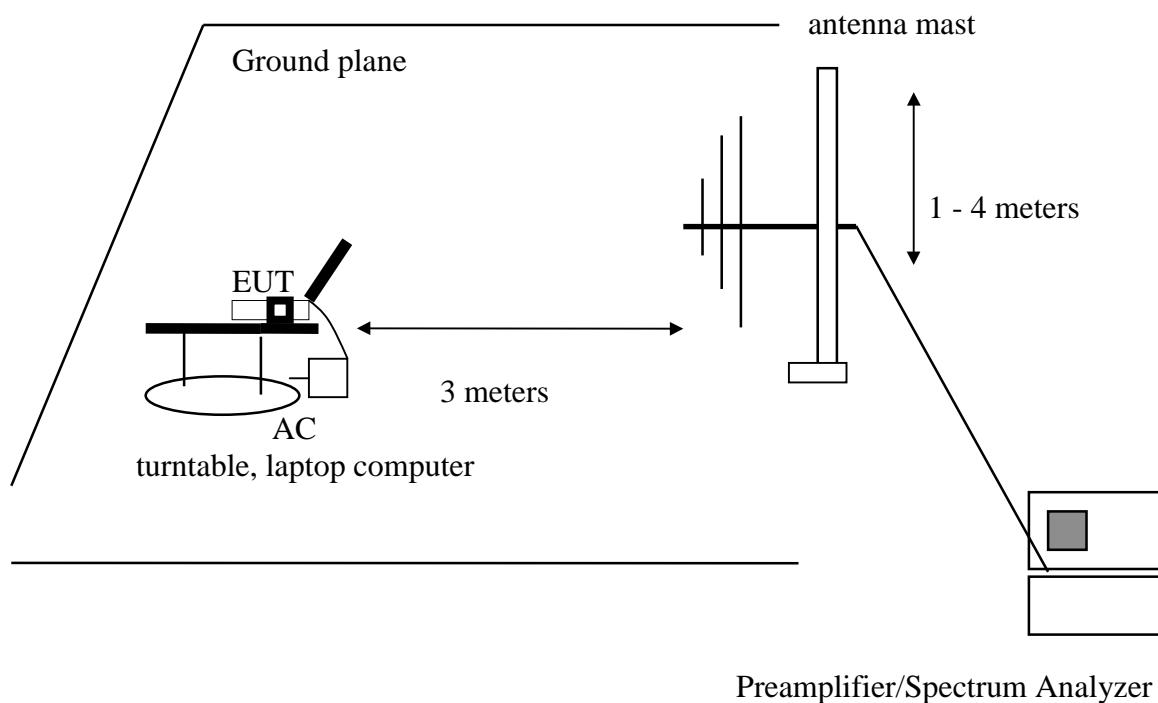
**RADIATED EMISSIONS****TEST REQUIREMENT: 15.109****Measurement Equipment Used:**

HP 8568A Spectrum Analyzer

HP 8447D Preamplifier, 0.1 – 1300 MHz

Eaton 94455-1 Biconical Antenna, 30 - 200 MHz

EMCO 3146 Log Periodic Antenna, 200 - 1000 MHz

**Test Set-up****Fig.3**

The EUT was placed on a turntable at a distance of 3 meters from a Biconical or Log Periodic search antenna. The antenna was raised and lowered, the EUT rotated on the turntable, until the EUT azimuth, antenna elevation, and antenna polarity were found which yielded maximum received emission levels on the spectrum analyzer.

**Test Result:** Refer to attached tabular data sheets.

Compliance Engineering Services Inc.

Project No. : 98T0066-1

Report No. : 981204B2

Date : 12/04/1998

Time : 10:08

>> 3 M RADIATED EMISSION DATA <<

Test Engr : KERWIN CORPUZ

Company : KINGMAX TECHNOLOGY INC.

Equipment Under Test : WIRELESS LAN PCMCIA CARD (M/N: EN2000-H)

Test Configuration : EUT/LAPTOP/PRINTER/MODEM

Type of Test : FCC CLASS B

Mode of Operation : RX AT CHANNEL 6

Freq.	dBuV	PreAmp	Ant	Cable	dBuV/m	Limit	Margin	Pol	Hgt(m)	Az
LP 2120 ; Pre-pamp = 8447D-P8 2944A06589:										
360.00	50.30	-27.09	15.38	4.05	42.64	46.00	-3.36	H	1.3	180
600.00	46.60	-28.10	19.27	5.39	43.16	46.00	-2.84	H	1.3	180
680.00	45.10	-28.08	20.59	5.90	43.52	46.00	-2.48	H	1.3	225
560.00	47.70	-28.00	18.01	5.18	42.89	46.00	-3.11	V	1.0	270

BELOW DATA ARE QUASI-PEAK MEASUREMENTS:

560.00	49.50	-28.00	18.57	5.18	45.25	46.00	-0.75	H	1.3	45
640.00	46.40	-28.09	19.93	5.65	43.89	46.00	-2.11	H	1.3	180

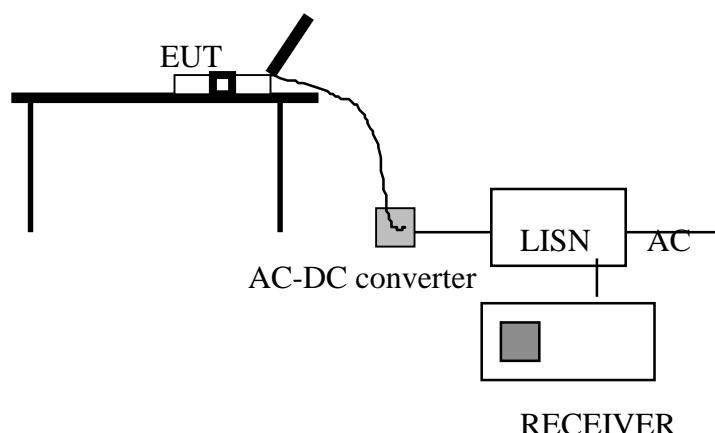
Total # of data 6

V. b2.2

**AC LINE CONDUCTED EMISSIONS****TEST REQUIREMENT: 15.207****Measurement Equipment Used:**

Rhode &amp; Schwarz EMI Receiver ESHS-20

Fischer Custom Communication LISN, LISN2 &amp; CISPR Adapter

**Test Set-up****Fig. 2****Test Procedure**

1. The EUT was placed on a wooden table 40 cm from a vertical ground plane and approximately 80 cm above the horizontal ground plane on the floor. The EUT was set to transmit in a normal mode.
2. Line conducted data was recorded for both NEUTRAL and HOT lines.

**Test Results**

Refer to attached graph.

COMPLIANCE ENGINEERING SERVICES INC.  
RFI VOLTAGE

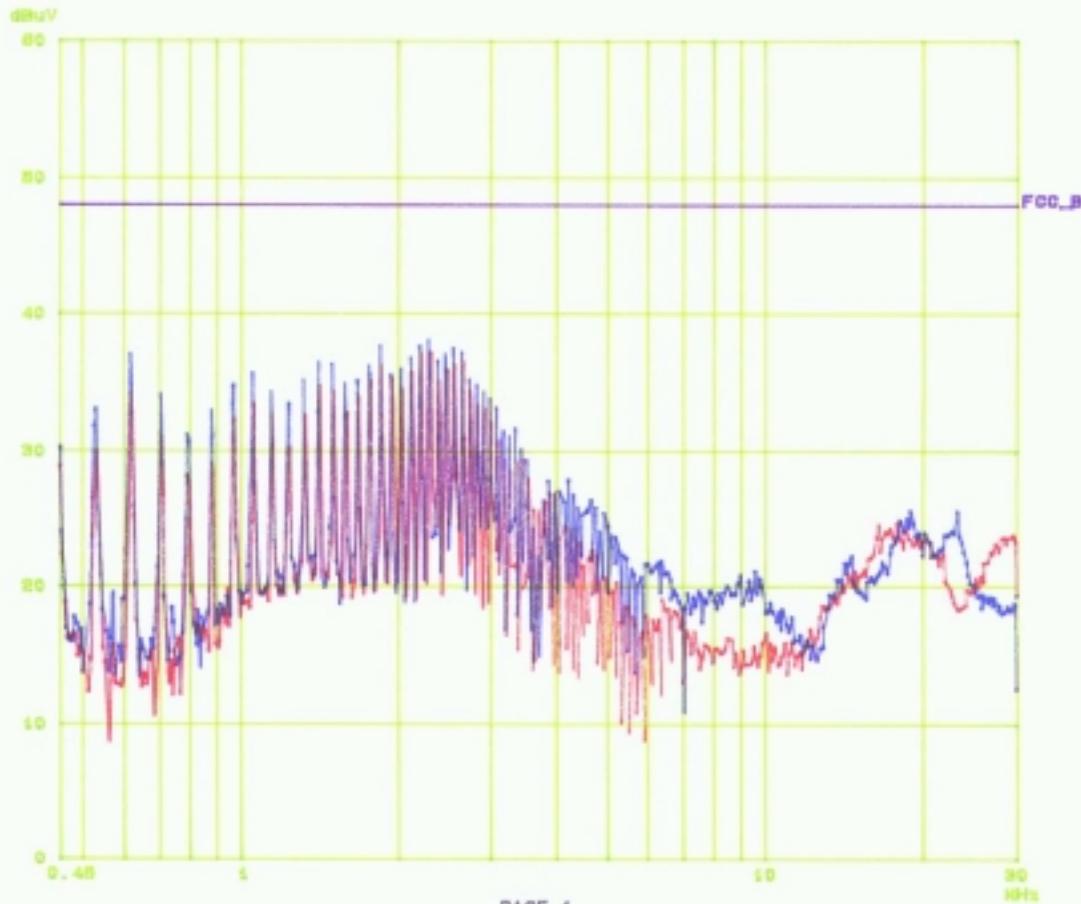
07. Dec 98 18:43

EUT: WIRELESS LAN POMOJA CARD (M/N: KWE2000-HF)  
 Manuf: KINGMAX TECHNOLOGY INC.  
 Op Cond: RX  
 Operator: KERNIK CORPUZ  
 Test Spec: FCC CLASS B  
 Comment: LINE: HOT (RED), NEUTRAL (BLUE)  
 120Vac, 60Hz

## Scan Settings (2 Ranges)

Frequencies				Receiver Settings				
Start	Stop	Step	IF BW	Detector	H-Time	Atten	Preamp	
450k	800k	500Hz	10k	PK	100ms	AUTO	LN OFF	80dB
800k	30M	5k	10k	PK	20ms	AUTO	LN OFF	80dB

Final Measurement: x SP Transducer No. Start Stop Name  
 Meas Time: 1 s 1 10k 30M FISCHER  
 Subranges: 25  
 Acc Margin: 6dB



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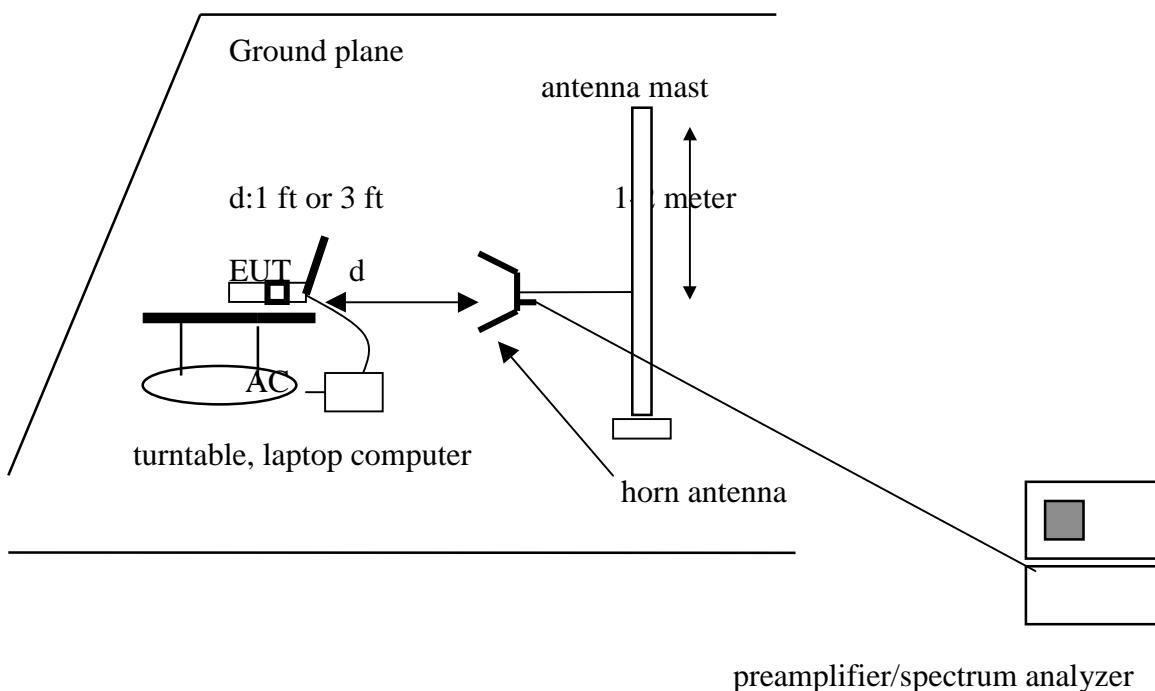
**MINIMUM 6 DB BANDWIDTH FOR DSSS****TEST REQUIREMENT: 15.247(A)1(I)-(II)****Measurement Equipment Used:**

HP 8593EM EMC Receiver

HP 8449B Preamplifier, 1 – 26.5 GHz

ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 GHz

QIM “The Workhorse” low loss cable, 9ft(loss: 0.85dB/ft @ 26GHz)

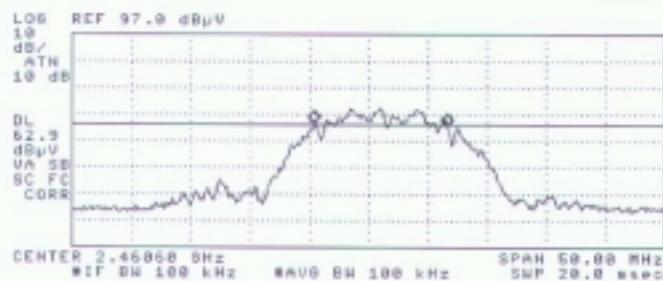
**Test Set-up****Fig.3**

The EUT was placed on a turntable at a distance of 1 ft or 3 ft from a Horn search antenna. The antenna was raised and lowered, the EUT rotated on the turntable, until the EUT azimuth, antenna elevation, and antenna polarity were found which yielded maximum received emission levels on the spectrum analyzer.

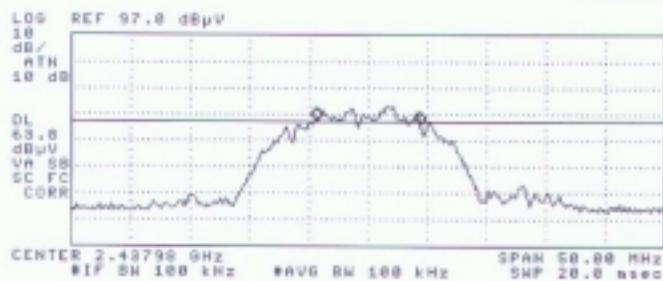
The analyzer center frequency was set to the EUT carrier frequency. Using the analyzer DISPLAY LINE and MARKER DELTA functions, the 6 dB bandwidth of the emission was determined.

**Test Results:** Refer to attached spectrum analyzer data chart.

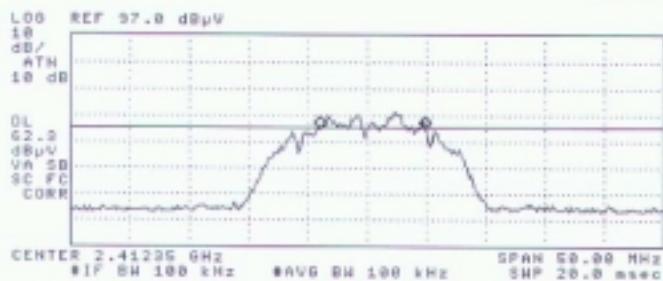
16124145 DEC 03, 1998  
 40 6dB BANDWIDTH, KINGMAX(EN2000-H), CH.11  
 ACTV DET: PEAK  
 MEAS DET: PEAK OP AVG  
 MKRA 11.25 MHz  
 -0.00 dB



16128135 DEC 03, 1998  
 40 6dB BANDWIDTH, KINGMAX(EN2000-H), CH.6  
 ACTV DET: PEAK  
 MEAS DET: PEAK OP AVG  
 MKRA 8.75 MHz  
 -1.79 dB



16135159 DEC 03, 1998  
 40 6dB BANDWIDTH, KINGMAX(EN2000-H), CH.1  
 ACTV DET: PEAK  
 MEAS DET: PEAK OP AVG  
 MKRA 8.00 MHz  
 -2.00 dB



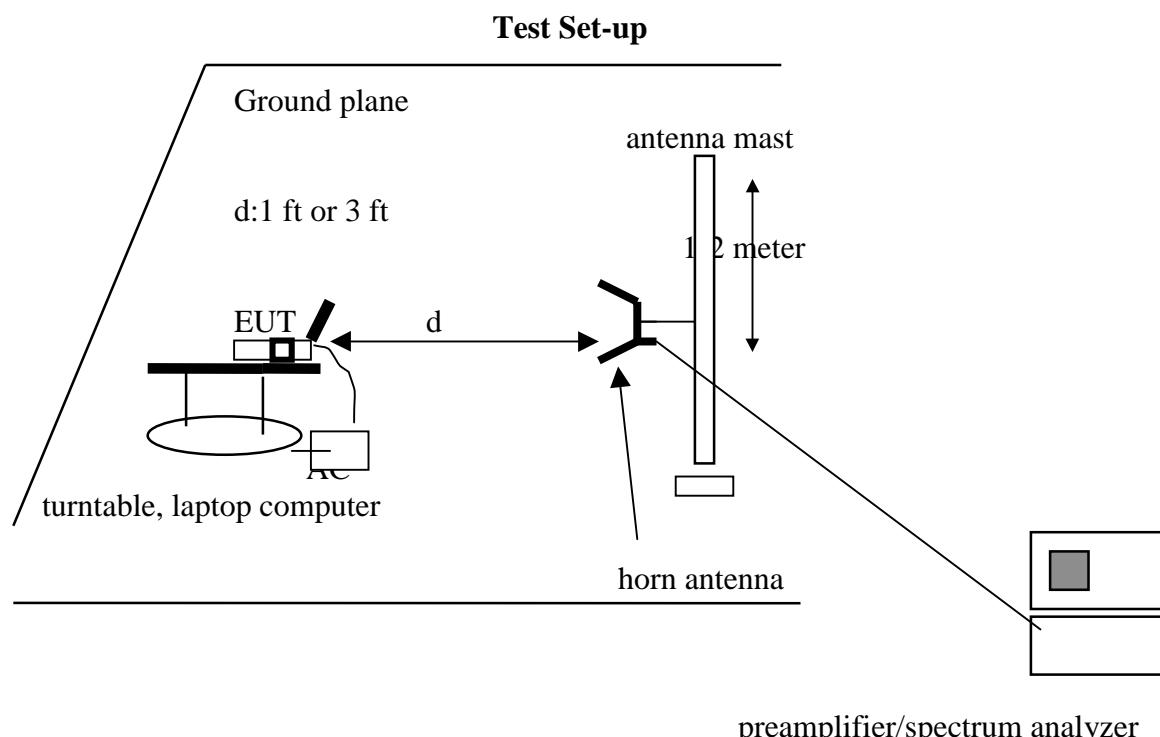
**RF POWER OUTPUT****TEST REQUIREMENT: 15.247(B)****Measurement Equipment Used:**

HP 8593EM EMC Receiver

HP 8449B Preamplifier, 1 – 26.5 GHz

ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 GHz

QIM "The Workhorse" low loss cable, 9ft(loss: 0.85dB/ft @ 26GHz)

**Fig. 3****Test Procedure**

The EUT has a permanently attached antenna, so output power levels were calculated from radiated emission levels.

Power at 2412 MHz (LOW Channel)

Field strength at 1 meter (3 ft): 111.61 dBuV/m = .3806 V/m

Using the relationship between field strength and RF power into an isotropic transmit antenna:

$$E = \frac{(30 \times P: \text{watts})^5}{d: \text{meters}}$$

$$P = (.3806 \times 1)^2 / 30 = 4.8285 \text{ mW}$$

**Test Results**

TX Freq.(MHz)	Power Output(dBm)	LIMIT(dBm)
2412(LOW)	6.84	30
2432(MID)	9.15	30
2462(HIGH)	8.0	30

Design goal for transmitter output power: 16 mW output.

**OUT OF BAND MEASUREMENTS****TEST REQUIREMENT: 15.247(C)****Measurement Equipment Used:**

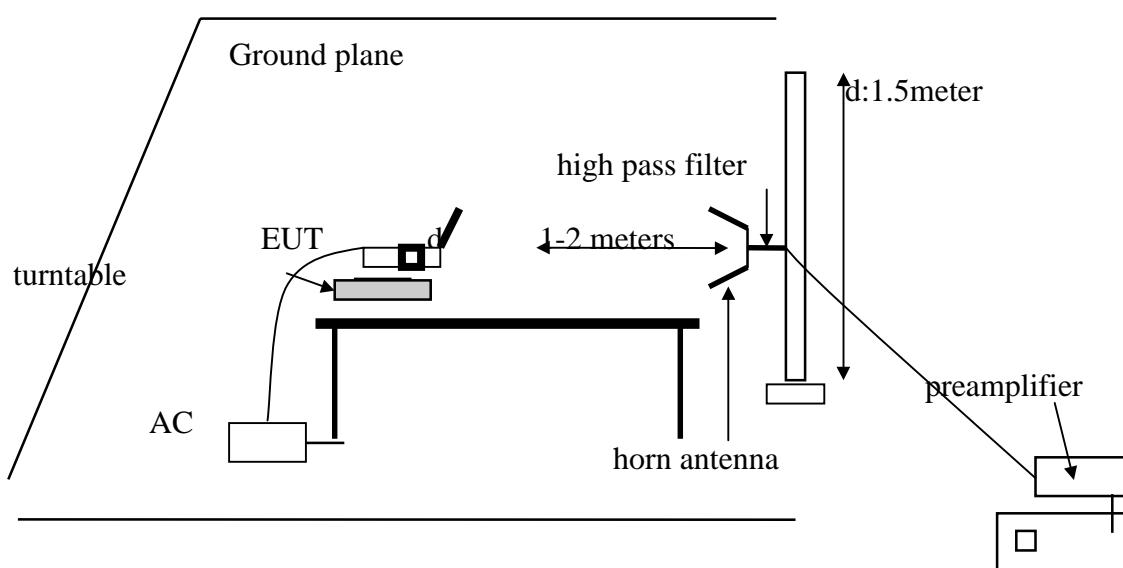
HP 8563E Spectrum Analyzer

HP 8449 B Preamplifier, 1-26 GHz

ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 GHz

QIM "The Workhorse" low loss cable, 9ft(loss: 0.85dB/ft @ 26GHz)

FSY Microwave High Pass Filter, (fo=4600MHz), S/N: 001

**Test Set-Up****Fig. 1**

spectrum analyzer

**Test Procedure:**

Radiated emissions from the transmitter were compared against the radiated field strength of the fundamental frequency. The only emissions detected up to the 10th harmonic of the operating frequency were harmonics of the fundamental. All harmonics were at levels less than 54 dBuV/m, as per measurements taken to show compliance with 15.205.

**Test Results:**

Refer to attached tabular data sheets .

<b>COMPLIANCE ENGINEERING SERVICES, INC.</b>																	
Out of Band																	
15.247C																	
Kerwin Corpuz																	
A site (1.5 Meter)																	
KINGMAX TECHNOLOGY INC.																	
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)																	
<i>f<sub>o</sub></i> = 2412 MHz (LOW); measured 97.89dB <sub>u</sub> V																	
F(MHz)	READING	AF	CL	AMP	DIST	HPF	TOTAL	LIMIT	MARGIN								
(dB <sub>u</sub> V)		(dB)	(dB)	(dB)	(dB)	(dB)	(dB <sub>u</sub> V/m)	(dB <sub>u</sub> V/m)	(dB)								
Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg					
2135	65.2	28.3	3.6	-35	-6	1	57.1	77.89		-20.8							
2372R	60.5	50.2	28.6	3.6	-35	-6	1	52.7	42.4	74	54	-21.3	-11.6				
2451	54.6	29.2	3.6	-35	-6	1	47.4	77.89		-30.5							
4829R	53.2	52	35.9	5.4	-35	-6	1	54.5	53.3	74	54	-19.5	-0.7				
<b>R: restricted band</b>																	
<b>NOTE: ALL READINGS ARE VERTICAL</b>																	
<b>DIST:</b> Correction to extrapolate reading to 3m specification distance																	
1.5M measurement distance: <b>-6.0dB</b>																	
<b>AF:</b> Antenna Factor																	
<b>AMP:</b> Pre-amp gain																	
<b>CL:</b> Cable loss																	
<b>HPF:</b> High pass filter insertion loss (4.6GHz)						FSY (S/N: 001)											
<b>ANALYZER SETTINGS</b>																	
Res.bw																	
Avg_bw																	
PEAK(Pk): 1MHz																	
AVERAGE(Avg): 1MHz																	
10Hz																	

<b>COMPLIANCE ENGINEERING SERVICES, INC.</b>																			
Out of Band		12/03/98																	
15.247©		Kerwin Corpuz																	
		A site (1.5 Meter)																	
KINGMAX TECHNOLOGY INC.																			
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)																			
<i>f<sub>o</sub></i> = 2432 MHz (MID); measured 100.9dBuV																			
F(MHz)	READING	AF	CL	AMP	DIST	HPF	TOTAL	LIMIT	MARGIN										
	(dBuV)	(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)										
Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg							
2159	72.95	28.3	3.6	-35	-6	1	64.85		80.9		-16.1								
2477	49.43	29.2	3.6	-35	-6	1	42.23		80.9		-38.7								
3316	47.29	30.6	4.5	-35	-6	1	42.39		80.9		-38.5								
4371R	48.5	36.9	35.3	5.4	-35	-6	1	49.2	37.6	74	54	-24.8	-16.4						
4828R	53.3	52.1	35.9	5.4	-35	-6	1	54.6	53.4	74	54	-19.4	-0.6						
R: restricted band																			
<b>NOTE: ALL READINGS ARE VERTICAL</b>											<b>ANALYZER SETTINGS</b>								
DIST: Correction to extrapolate reading to 3m specification distance											Res bw	Avg bw							
1.5M measurement distance: <b>-6.0dB</b>											<b>PEAK(Pk):</b>	<b>1MHz</b>	<b>1MHz</b>						
AF: Antenna Factor											<b>AVERAGE(Avg):</b>	<b>1MHz</b>	<b>10Hz</b>						
AMP: Pre-amp gain																			
CL: Cable loss																			
HPF: High pass filter insertion loss (4.6GHz)												FSY (S/N: 001)							

<b>COMPLIANCE ENGINEERING SERVICES, INC.</b>																	
Out of Band																	
15.247©																	
Kerwin Corpuz																	
A site (1.5 Meter)																	
KINGMAX TECHNOLOGY INC.																	
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)																	
<i>f<sub>o</sub></i> = 2462 MHz (HIGH); measured 99.04dBuV																	
<b>F(MHz)</b>		<b>READING</b>	<b>AF</b>	<b>CL</b>	<b>AMP</b>	<b>DIST</b>	<b>HPF</b>	<b>TOTAL</b>	<b>LIMIT</b>	<b>MARGIN</b>							
		(dBuV)	(dB)	(dB)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)							
<b>Pk</b>		<b>Avg</b>						<b>Pk</b>	<b>Avg</b>	<b>Pk</b>	<b>Avg</b>						
2188	76.97	28.3	3.6	-35	-6	1	68.87		79.04		-10.2						
2388R	60.32	57.32	29.2	3.6	-35	-6	1	53.12	50.12	74	54						
4925R	52.59	51.29	35.9	5.4	-35	-6	1	53.89	52.59	74	54						
<b>R: restricted band</b>																	
<b>NOTE: ALL READINGS ARE VERTICAL</b>																	
<b>DIST:</b> Correction to extrapolate reading to 3m specification distance																	
1.5M measurement distance: <b>-6.0dB</b>																	
<b>AF:</b> Antenna Factor																	
<b>AMP:</b> Pre-amp gain																	
<b>CL:</b> Cable loss																	
<b>HPF:</b> High pass filter insertion loss (4.6GHz)						FSY (S/N: 001)											
<b>ANALYZER SETTINGS</b>																	
<b>Res bw</b>																	
<b>Avg. bw</b>																	
<b>PEAK(Pk):</b> 1MHz																	
<b>AVERAGE(Avg):</b> 1MHz																	
<b>10Hz</b>																	

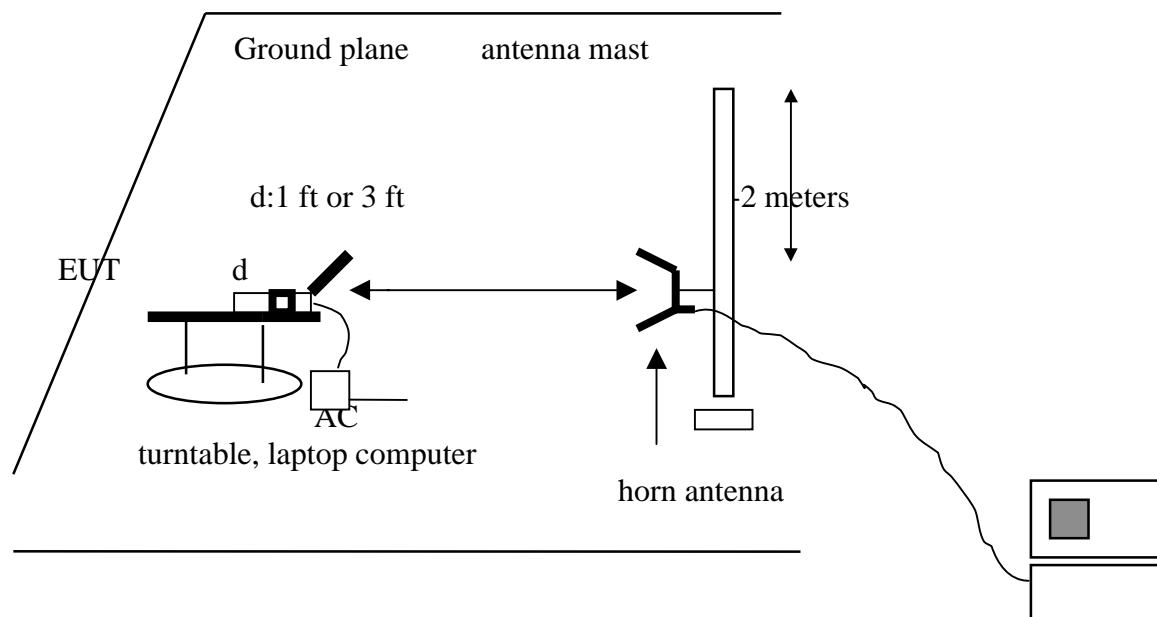
**DSSS POWER DENSITY****TEST REQUIREMENT: 15.247(D)****Measurement Equipment Used:**

HP 8563E Spectrum Analyzer

HP 8449 B Preamplifier, 1-26 GHz

ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 GHz

QIM "The Workhorse" low loss cable, 9ft(loss: 0.85dB/ft @ 26GHz)

**Test Set-up****Fig.3**

preamplifier/spectrum analyzer

**Test Procedure**

The EUT has a permanently attached antenna, so output power levels were calculated from radiated emission levels.

The analyzer center frequency was set to the EUT carrier frequency. The frequencies between which maximum RF emissions occurred were determined using the analyzer DISPLAY LINE and MARKER DELTA functions.

The transmitter emissions so measured were compared to the 8 dBm limit in the Rules.

## Test Results

Tabulated data follows:

Power Density								
15.247(d)								
							Kerwin Corpuz	
							A site(1 Meter)	
KingMax								
2.4GHz Wireless PCMCIA Card (DSSS)								
F(GHz)	READING	AF	CL	AMP	HPF	Total	Power Density	LIMIT
	(dBuV)	(dB)	(dB)	(dB)		(dBuV/m)	(dBm)	(dBm)
2.414	53.45	29	5	0	0	87.45	-7.78	8
2.489	56.12	29	5	0	0	90.12	-5.11	8
2.464	54.58	29	5	0	0	88.58	-6.64	8

**NOTE: All readings were taken at 3 meter distance.**

**AF:** Antenna Factor

**AMP:** Pre-amp gain

**CL:** Cable loss

**HPF:** High pass filter insertion loss

**Formulas used to calculate Power Density.**

Using the relationship between field strength and RF power into an isotropic transmit antenna:

$$E = (30 \times P \text{ Watts})^{0.5}$$

d:meters

$$P \text{ (Watts)} = (E \text{ (V/m)} \times D \text{ meters})^2 / 30$$

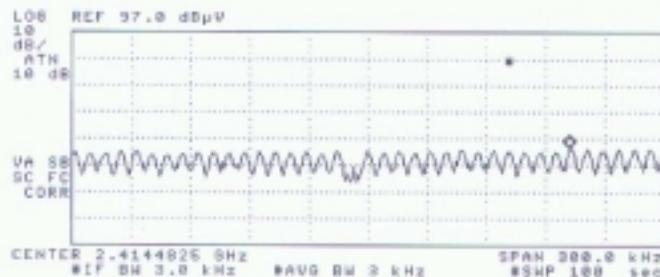
**D = Distance**

$$87.45 \text{ dBuV/m} = .023577621 \text{ V/m}$$

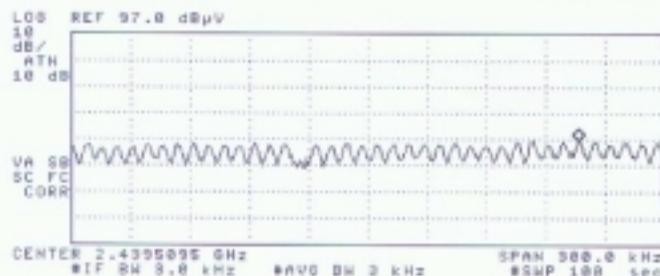
$$P \text{ (Watts)} = (0.23577621 \text{ V/m} \times 3 \text{ Meters})^2 / 30 = .00016671$$

$$10 \times \log (.00016671 \times 1000) = -7.78 \text{ dBm}$$

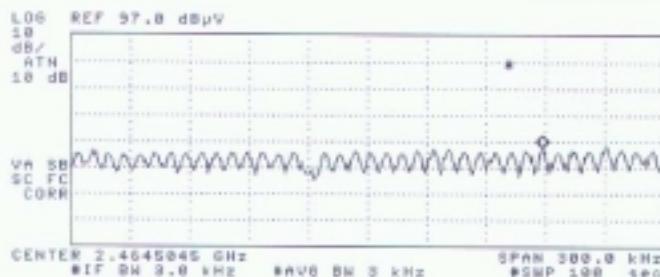
16148182 DEC 03, 1998  
 10 POWER DENSITY: KINGMAX(EH2000-H), CH.1  
 ACTV DET: PEAK  
 MEAS DET: PEAK OP AVG  
 MHR 2.4144826 GHz  
 55.45 dBµV



16155189 DEC 03, 1998  
 10 POWER DENSITY: KINGMAX(EH2000-H), CH.6  
 ACTV DET: PEAK  
 MEAS DET: PEAK OP AVG  
 MHR 2.4396160 GHz  
 56.12 dBµV

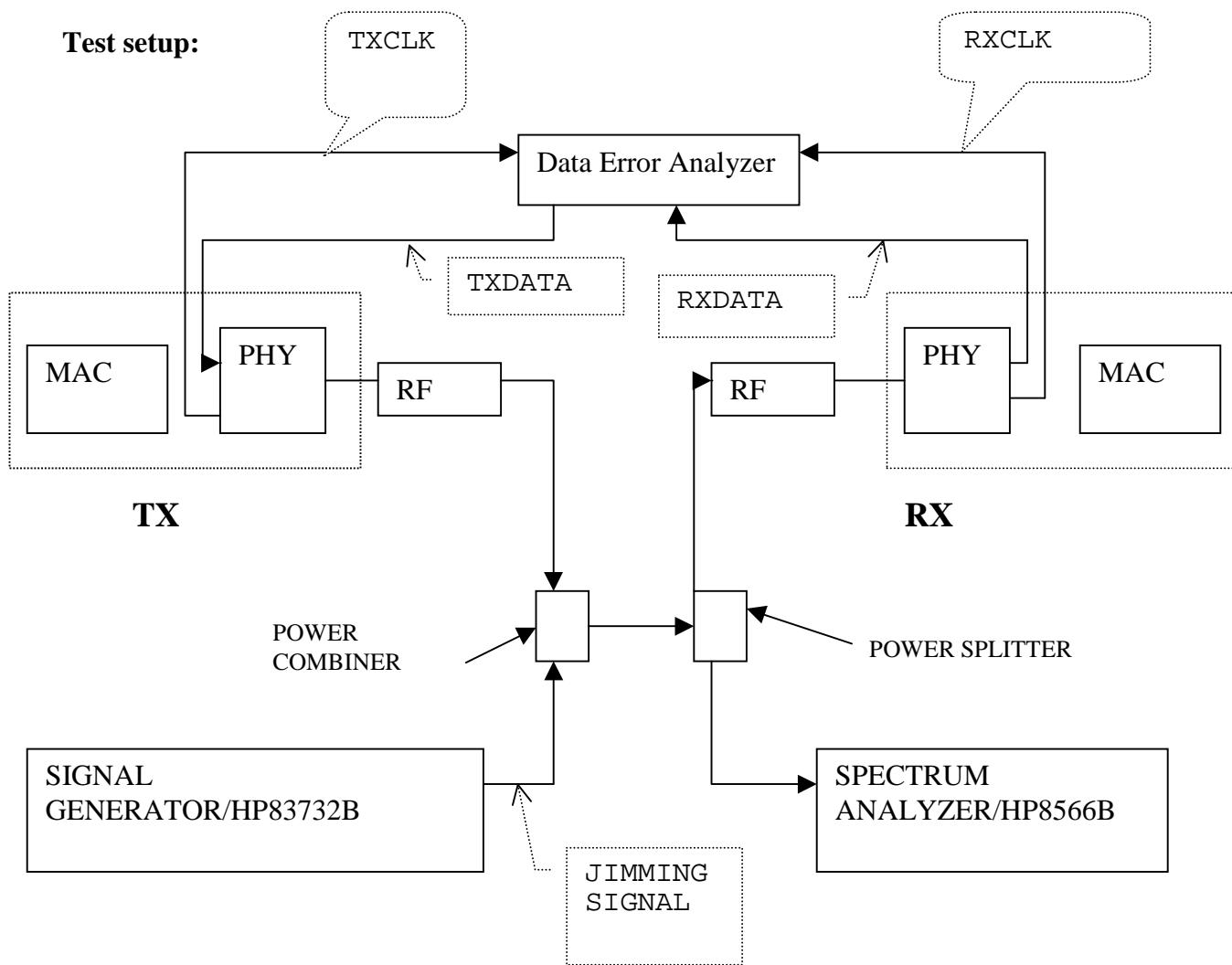


17101188 DEC 03, 1998  
 10 POWER DENSITY: KINGMAX(EH2000-H), CH.11  
 ACTV DET: PEAK  
 MEAS DET: PEAK OP AVG  
 MHR 2.4645938 GHz  
 54.58 dBµV



**PROCESSING GAIN OF A DSSS**  
**TEST REQUIREMENT: 15.247(E)**

Processing gain was performed by manufacturer. Please refer to the following information provided by the manufacturer.



**Test Procedure:**

Follow FCC section 15.247(e). Program procedures are as follow:

- 1) Type "Prism" and enter
- 2) Processing gain:

One card can run the following procedures to transmit :

- 1) Push "F1" to load firmware.
- 2) Push "F6" to transmit continuously.
- 3) Push "F2" to choose which channel to transmit, e.g. 1 for low channel and 6 for mid, and 11 for high channel.

4) Push "F1" to transmit.

The other takes the following procedure to receive:

- 1) Push "F1" to load firmware.
- 2) Push "F5" to receive continuously.
- 3) Push "F2" to choose which channel to receive. The channel number must be the same as transmission card.
- 4) Push "F1" to receive.

Test equipment used for jamming test:

- 1) Data Errore Analyzer: Tektronic CSA907A or HP 1645A
- 2) Signal Generator: HP 8373213
- 3) Power Combiner : Mini-Ckt ZFSC-2-2500
- 4) Power Splitter: M/A-COM PN:2025-6012-20

S/N is 12.5 dB theoretically, system losses should be assumed no more 2 dB.

#### Test Result

Frequenc y (MHz)	BER Xexp-5 Coheren t	(S/N)o (dB) Detecti on	Lsys (dB) of Diff. Encoded	J/S (dB)	Sign al (S) (dBm )	Jammer (J) (dBm)	Process ing Gain (dB)
2.440	0.8	9.2	2.0	1.3	-3.3	-2.0	12.5
2.445	1.2	10.0	2.0	1.1	-3.3	-2.2	13.1
2.450	0.8	9.2	2.0	0.8	-3.3	-2.5	12
2.455	0.8	9.2	2.0	1.0	-3.3	-2.3	12.2
2.460	1.2	10.0	2.0	1.1	-3.3	-2.2	13.1
2.465	0.8	9.2	2.0	0.8	-3.3	-2.5	12.0
2.470	0.8	9.2	2.0	-0.1	-3.3	-3.4	11.1
2.475	1.5	10.0	2.0	-0.2	-3.3	-3.5	11.8
2.480	1.5	10.0	2.0	-0.5	-3.3	-3.8	11.5
2.485	1.6	9.9	2.0	0.0	-3.3	-3.3	11.9
2.490	2.4	9.8	2.0	-0.1	-3.3	-3.4	11.7
2.495	1.6	9.9	2.0	-0.6	-3.3	-3.9	11.3
2.500	1.2	10.0	2.0	-0.8	-3.3	-4.1	11.2
2.505	1.2	10.0	2.0	-0.3	-3.3	-3.6	11.7
2.510	1.0	9.2	2.0	-0.4	-3.3	-3.7	10.8
2.515	1.2	10.0	2.0	0.1	-3.3	-3.2	12.1
2.520	1.8	9.9	2.0	0.4	-3.3	-2.9	12.3
2.525	1.3	10.0	2.0	0.4	-3.3	-2.9	12.4
2.530	1.5	10.0	2.0	-0.8	-3.3	-4.1	11.2
2.535	1.6	9.9	2.0	-0.8	-3.3	-4.1	11.1
2.540	1.2	10.0	2.0	-0.6	-3.3	-3.9	11.4
2.545	1.2	10.0	2.0	-0.4	-3.3	-3.7	11.6
2.550	1.2	10.0	2.0	-0.4	-3.3	-3.7	11.6
2.555	1.2	10.0	2.0	-0.2	-3.3	-3.5	11.8
2.560	1.3	10.0	2.0	0.2	-3.3	-3.1	12.2

2.565	1.5	10.0	2.0	0.1	-3.3	-3.2	12.1
2.570	1.8	9.9	2.0	0.3	-3.3	-3.0	12.2
2.575	0.9	9.2	2.0	0.5	-3.3	-2.8	11.7
2.580	1.9	9.9	2.0	0.6	-3.3	-2.7	12.5
2.585	1.2	10.0	2.0	0.4	-3.3	-2.9	12.4
2.590	1.8	9.9	2.0	1.0	-3.3	-2.3	12.9
2.595	1.2	9.2	2.0	0.4	-3.3	-2.9	11.6
2.600	1.8	9.9	2.0	1.1	-3.3	-2.2	13.0
2.605	1.2	10.0	2.0	1.4	-3.3	-1.9	13.4
2.610	1.5	10.0	2.0	1.6	-3.3	-1.7	13.6
2.615	1.2	10.0	2.0	1.9	-3.3	-1.4	13.9
2.620	1.2	10.0	2.0	2.4	-3.3	-0.9	14.4
2.625	1.8	9.9	2.0	2.9	-3.3	-0.4	14.8
2.630	1.8	9.9	2.0	2.3	-3.3	-1.0	14.2
2.635	1.2	9.2	2.0	2.2	-3.3	-1.1	13.4
2.640	2.3	9.8	2.0	1.7	-3.3	-1.6	13.5
2.645	2.4	9.8	2.0	1.4	-3.3	-1.9	13.2
2.650	1.2	10.0	2.0	1.4	-3.3	-1.9	13.4
2.655	1.9	9.2	2.0	1.4	-3.3	-1.9	12.6
2.660	1.9	9.9	2.0	1.4	-3.3	-1.9	13.3
2.665	1.9	9.9	2.0	1.5	-3.3	-1.8	13.4
2.670	1.2	9.2	2.0	1.5	-3.3	-1.8	12.7
2.675	1.0	9.2	2.0	1.5	-3.3	-1.8	12.7
2.680	1.2	10.0	2.0	1.5	-3.3	-1.8	13.5

- (S/N)o: Refer to attached curves, BER versus (S/N)o for Differential Coherent or Differentially Encoded DPSK
- Processing gain Gp= (S/N)o + Lsys + J/S = (S/N)o + 2 + J/S
- Air data rate of EUT is 2 Mbps

**TEST SETUP PHOTO****FIG. 1**

**FIG. 2**

**FIG. 3**