



**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

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SUNNYVALE, CA 94089, U.S.A.

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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

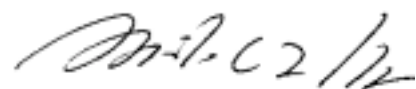
TELEPHONE NO : 886-3-5985288 ext.568

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

2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

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

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	COMPAQ	SERIES 2860B	7522HPM71101	CNT75MB2CB
PRINTER	H.P.	2225C+	2930S52630	DSI6XU2225
MODEM	HAYES	07-00038	A45200153875	BFJ 9D9 07-00038A

5. TEST PROCEDURES AND TEST RESULTS

RADIATED EMISSIONS (GENERAL REQUIREMENTS)

TEST REQUIREMENT: 15.205

Measurement Equipment Used:

HP 8593EM EMC Receiver

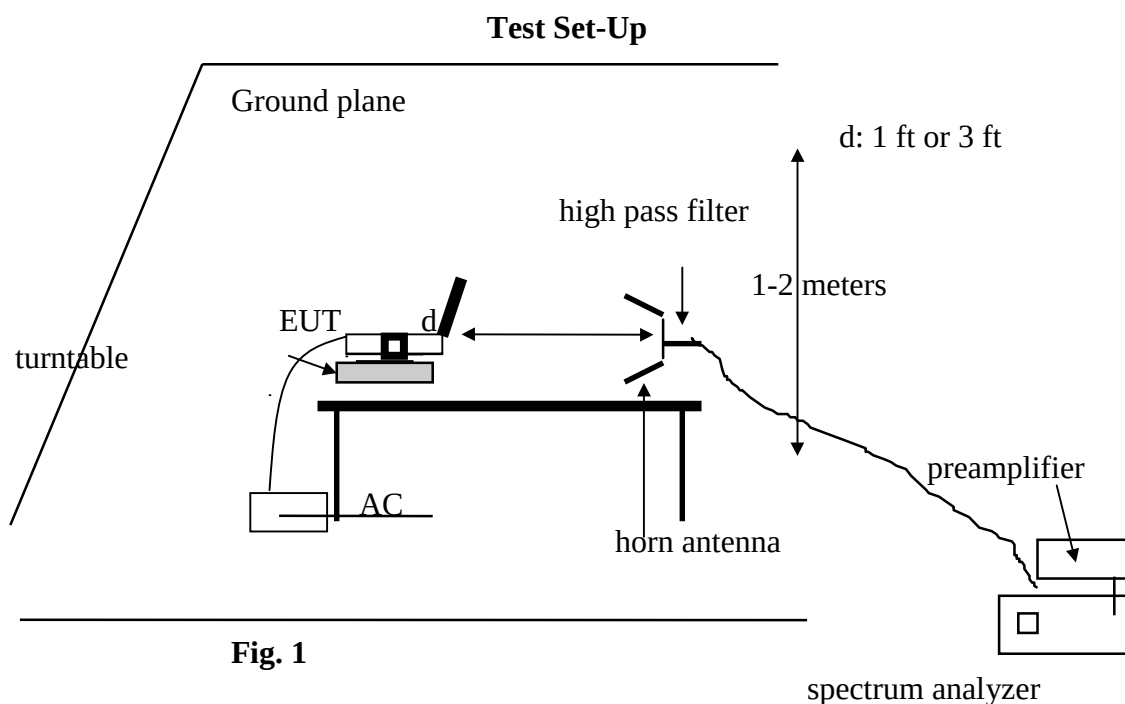
HP 8449B Preamplifier, 1 – 26.5 GHz

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, ($f_o=4600\text{MHz}$), S/N: 001



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

COMPLIANCE ENGINEERING SERVICES, INC.														
Radiated Emissions										12/03/98				
15.205										Kerwin Corpuz				
										A site (1.5 Meter)				
KINGMAX TECHNOLOGY INC.														
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)														
f _o = 2412 MHz (LOW)														
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	
4824	46.42	36.41	35	5	-35	-9.5	1	42.92	32.91	74	54	-31.1	-21.1	
7235*	46.81	35.72	44.1	6.6	-35	-9.5	1	54.01	42.92	74	54	-20	-11.1	
9647*	47.36	35.4	39.4	7.26	-35	-9.5	1	50.52	38.56	74	54	-23.5	-15.4	
12058*	49.22	36.76	40.2	8.25	-35	-9.5	1	54.17	41.71	74	54	-19.8	-12.3	
14470*	49.52	38.73	44.7	9.07	-35	-9.5	1	59.79	49	74	54	-14.2	-5	
16882*	50.23	39.98	43.9	10.73	-35	-9.5	1	61.36	51.11	74	54	-12.6	-2.89	
* Measured noise floor														
NOTE: ALL READINGS ARE VERTICAL											ANALYZER SETTING			
DIST: Correction to extrapolate reading to 3m specification distance											Res bw		Avg. b	
	1M measurement distance: -9.5dB								PEAK(Pk):		1MHz		1MHz	
AF: Antenna Factor								AVERAGE(Avg):		1MHz		10Hz		
AMP: Pre-amp gain														
CL: Cable loss														
HPF: High pass filter insertion loss (4.6GHz)						FSY (S/N: 001)								

COMPLIANCE ENGINEERING SERVICES, INC.														
Radiated Emissions										12/03/98				
15.205										Kerwin Corpuz				
										A site (1 Meter)				
KINGMAX TECHNOLOGY INC.														
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)														
f0= 2437 MHz (MID)														
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
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														
NOTE: ALL READINGS ARE HORIZONTAL														
DIST: Correction to extrapolate reading to 3m specification distance										ANALYZER SETTINGS				
										Res bw		Avg. bw		
1M measurement distance: -9.5dB										PEAK(Pk):		1MHz	1MHz	
AF: Antenna Factor										AVERAGE(Avg):		1MHz	10Hz	
AMP: Pre-amp gain														
CL: Cable loss														
HPF: High pass filter insertion loss (4.6GHz)										FSY(S/N:001)				

COMPLIANCE ENGINEERING SERVICES, INC.															
Radiated Emissions										12/03/98					
15.205										Kerwin Corpuz					
										A site (1 Meter)					
KINGMAX TECHNOLOGY INC.															
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)															
f ₀ = 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										ANALYZER SETTING					
										Res bw		Avg. bw			
1M measurement distance: -9.5dB										PEAK(Pk):		1MHz		1MHz	
AF: Antenna Factor										AVERAGE(Avg):		1MHz		10Hz	
AMP: Pre-amp gain															
CL: Cable loss															
HPF: High pass filter insertion loss (4.6GHz)										FSY(S/N:001)					

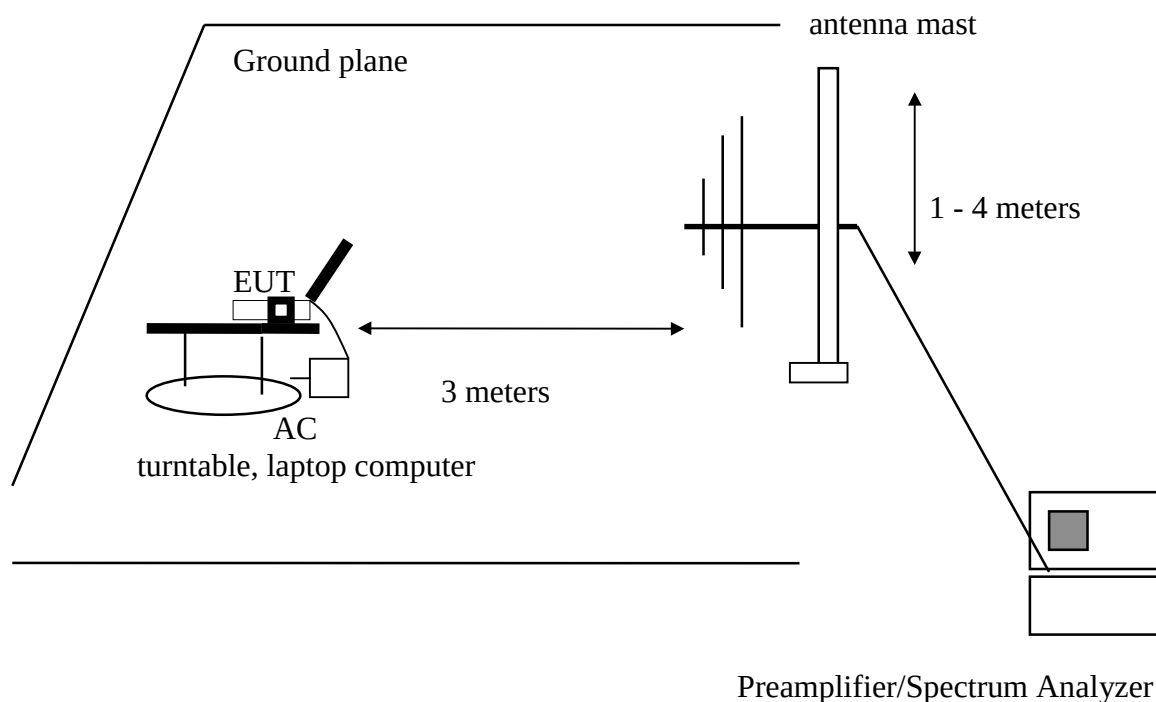
RADIATED EMISSIONS**TEST REQUIREMENT: 15.109****Measurement Equipment Used:**

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

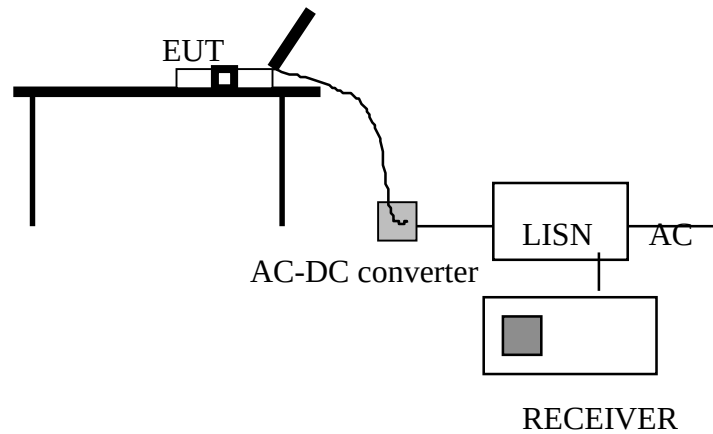
Total # of data 6

V. b2.2

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

Rhode & Schwarz EMI Receiver ESHS-20

Fischer Custom Communication LISN, LISN2 & 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

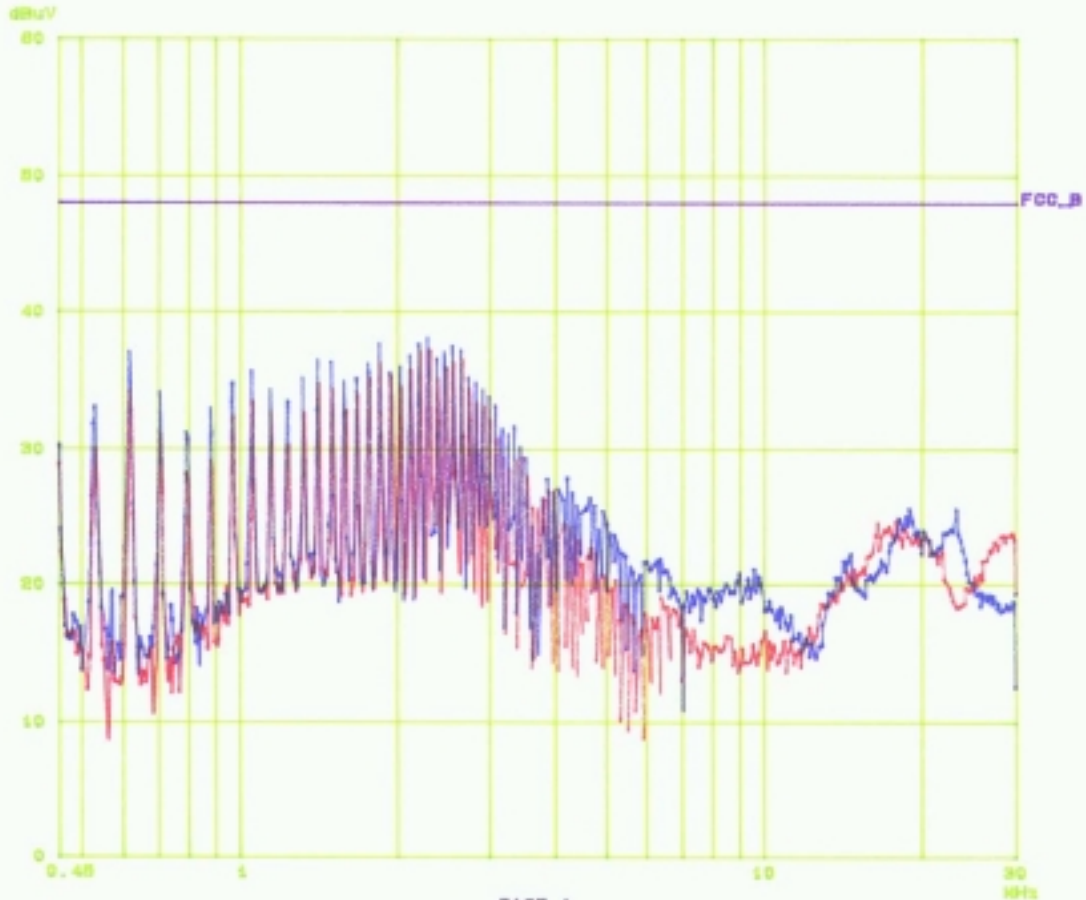
07. Dec 98 18:43

EUT: WIRELESS LAN PCMCIA CARD (M/N: KWE2000-4P)
Manuf: KINGMAX TECHNOLOGY INC.
Op Cond: RX
Operator: KERWIN 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	M-Time	Atten	Preamp	OpRge	
450k	500k	500Hz	10k	PK	100ms	AUTO	LN	OFF	
500k	30M	5k	10k	PK	20ms	AUTO	LN	OFF	

Final Measurement: x 9P Transducer No. Start Stop Name
Meas Time: 1 s 1 10k 30M FISCHER
Subrange: 25
Acc Margin: 8dB



PAGE 1

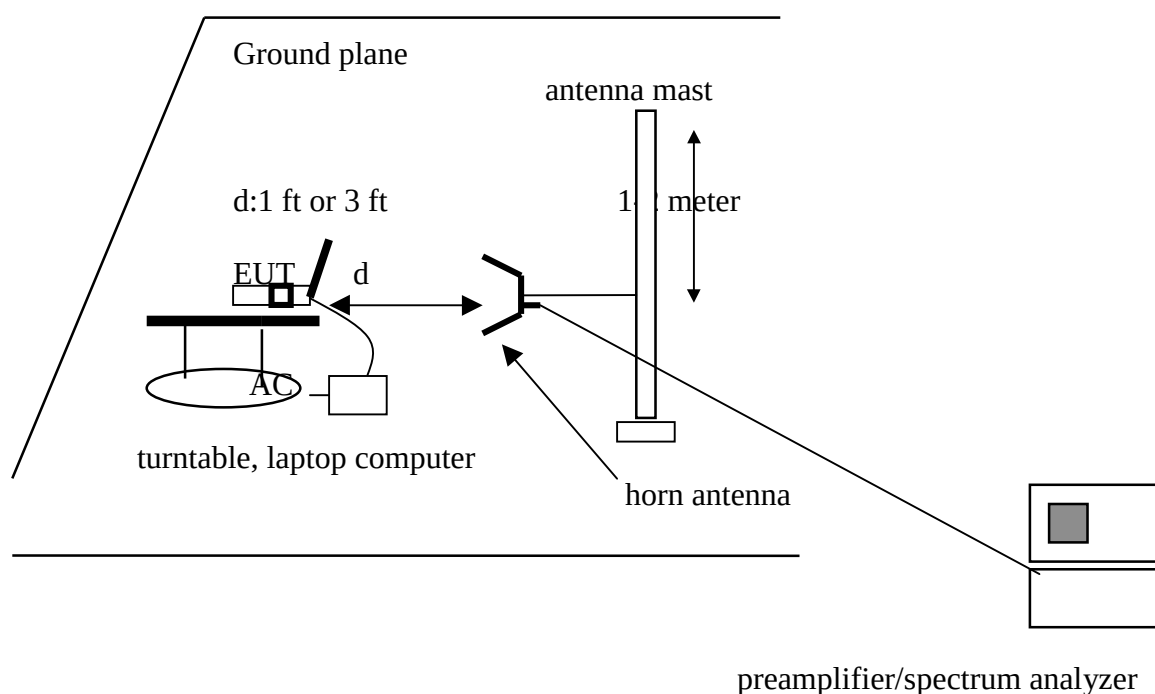
MINIMUM 6 DB BANDWIDTH FOR DSSS**TEST REQUIREMENT: 15.247(A)1(I)-(II)****Measurement Equipment Used:**

HP 8593EM EMC Receiver

HP 8449B Preamplifier, 1 – 26.5 GHz

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

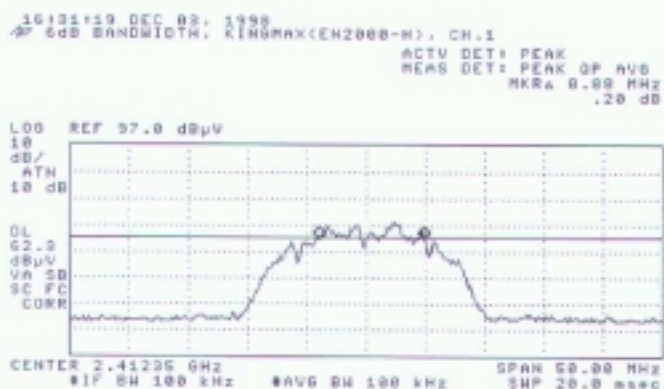
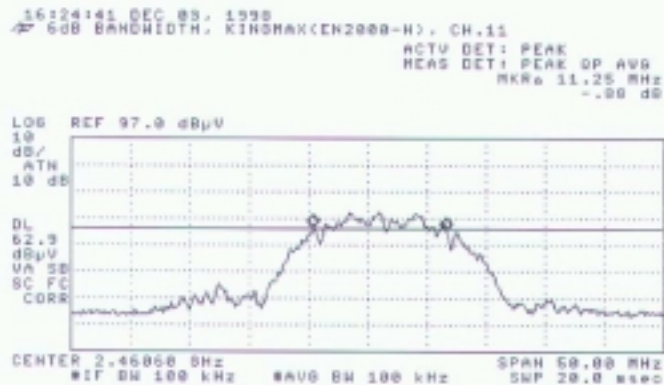
QIM “The Workhorse” low loss cable, 9ft(loss: 0.85dB/ft @ 26GHz)

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.



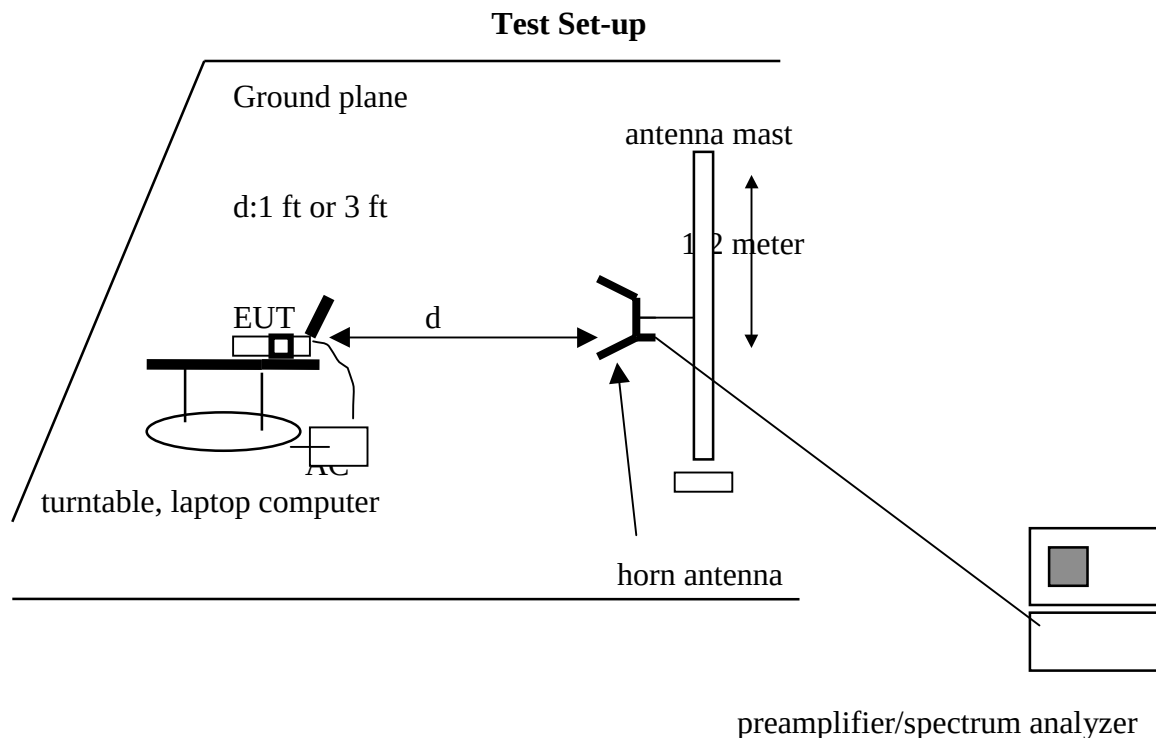
RF POWER OUTPUT**TEST REQUIREMENT: 15.247(B)****Measurement Equipment Used:**

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.

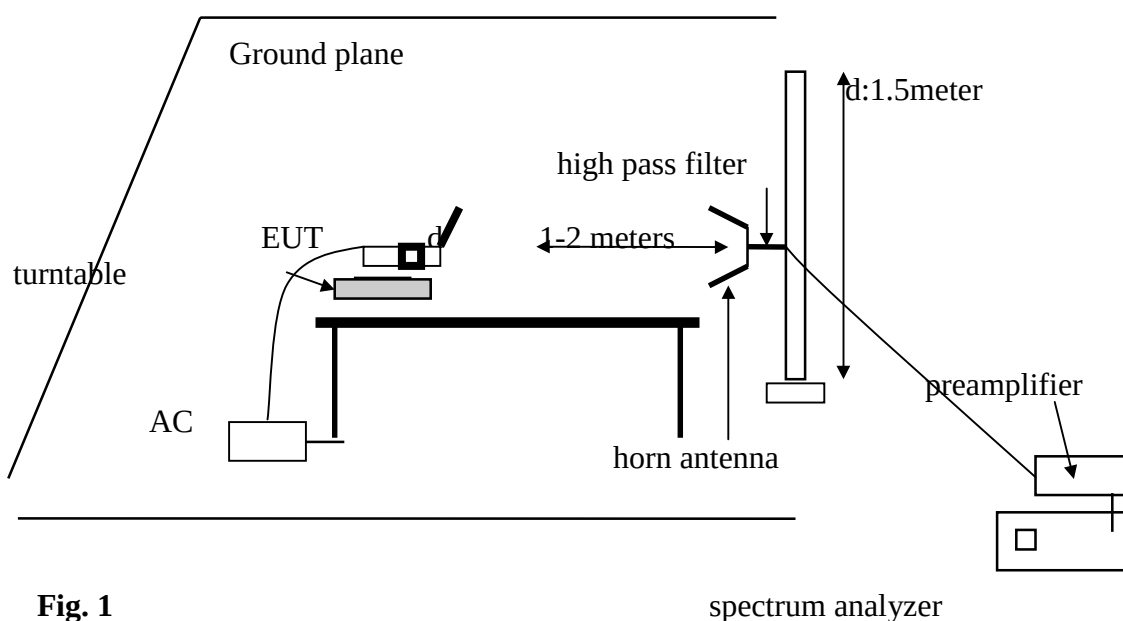
OUT OF BAND MEASUREMENTS**TEST REQUIREMENT: 15.247(C)****Measurement Equipment Used:**

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, ($f_o=4600\text{MHz}$), 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 .

COMPLIANCE ENGINEERING SERVICES, INC.															
Out of Band										12/03/98					
15.247©										Kerwin Corpuz					
										A site (1.5 Meter)					
KINGMAX TECHNOLOGY INC.															
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)															
f _o = 2412 MHz (LOW); measured 97.89dBuV															
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	
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	
R: restricted band															
NOTE: ALL READINGS ARE VERTICAL															
ANALYZER SETTINGS															
DIST: Correction to extrapolate reading to 3m specification distance										Res bw		Avg bw			
1.5M measurement distance: -6.0dB										PEAK(Pk):		1MHz		1MHz	
AF: Antenna Factor										AVERAGE(Avg):		1MHz		10Hz	
AMP: Pre-amp gain															
CL: Cable loss															
HPF: High pass filter insertion loss (4.6GHz)										FSY (S/N: 001)					

EUT: DIRECT SEQUENCE SPREAD SPECTRUM DATA TRANSCEIVER

COMPLIANCE ENGINEERING SERVICES, INC.													
Out of Band								12/03/98					
15.247©								Kerwin Corpuz					
								A site (1.5 Meter)					
KINGMAX TECHNOLOGY INC.													
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)													
f0= 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													
NOTE: ALL READINGS ARE VERTICAL													
DIST: Correction to extrapolate reading to 3m specification distance										ANALYZER SETTINGS			
										Res bw		Avg. bw	
1.5M measurement distance: -6.0dB										PEAK(Pk):		1MHz	
AF: Antenna Factor										AVERAGE(Avg):		1MHz	
AMP: Pre-amp gain												10Hz	
CL: Cable loss													
HPF: High pass filter insertion loss (4.6GHz)										FSY (S/N: 001)			

COMPLIANCE ENGINEERING SERVICES, INC.															
Out of Band										12/03/98					
15.247©										Kerwin Corpuz					
										A site (1.5 Meter)					
KINGMAX TECHNOLOGY INC.															
2412 - 2462MHz DSSS TRANSCEIVER (KWE2000-HF)															
f _o = 2462 MHz (HIGH); measured 99.04dBuV															
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	
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	-20.9	-3.88	
4925R		52.59	51.29	35.9	5.4	-35	-6	1	53.89	52.59	74	54	-20.1	-1.41	
R: restricted band															
NOTE: ALL READINGS ARE VERTICAL															
ANALYZER SETTINGS															
DIST: Correction to extrapolate reading to 3m specification distance										Res bw		Avg. bw			
1.5M measurement distance: -6.0dB										PEAK(Pk):		1MHz		1MHz	
AF: Antenna Factor										AVERAGE(Avg):		1MHz		10Hz	
AMP: Pre-amp gain															
CL: Cable loss															
HPF: High pass filter insertion loss (4.6GHz)															
FSY (S/N: 001)															

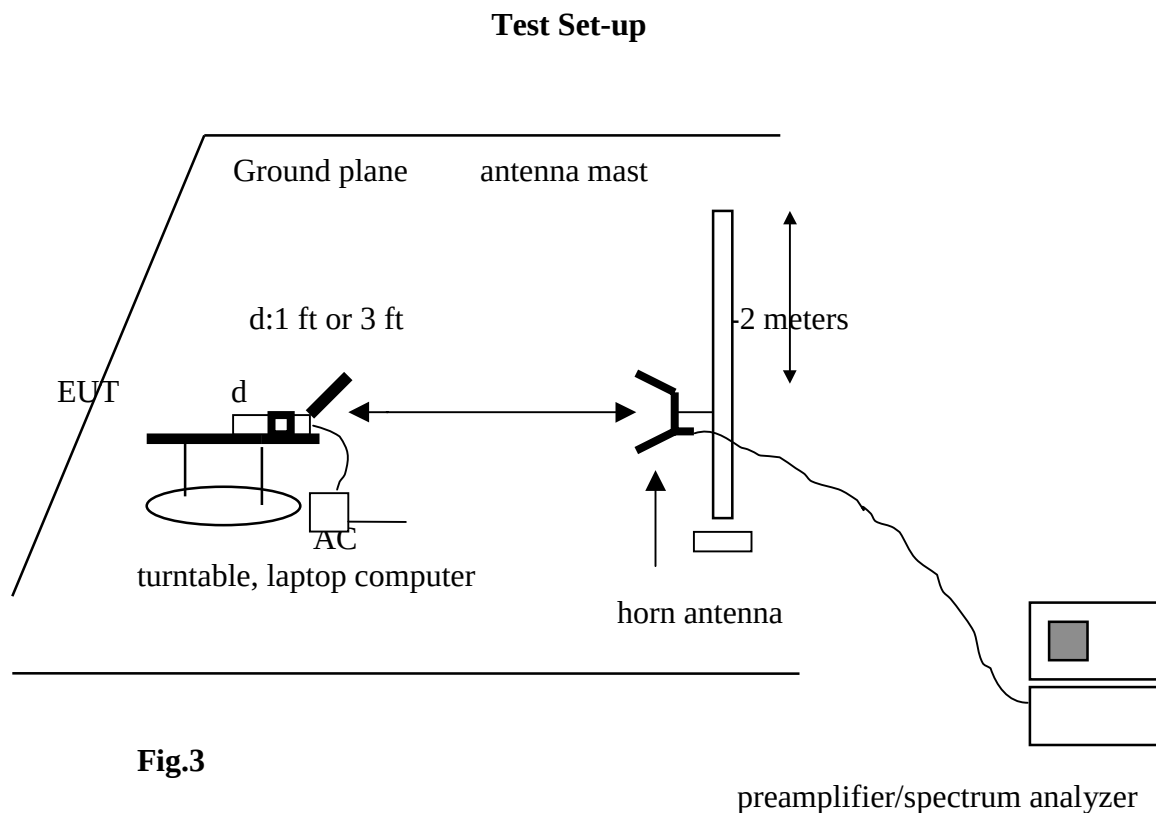
DSSS POWER DENSITY**TEST REQUIREMENT: 15.247(D)****Measurement Equipment Used:**

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 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.

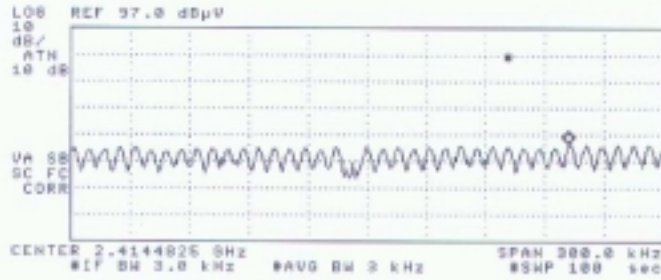
The transmitter emissions so measured were compared to the 8 dBm limit in the Rules.

Test Results

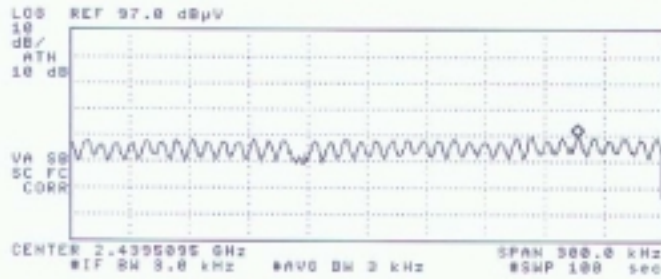
Tabulated data follows:

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:										
$E = (30 \times P_{\text{watts}})^{.5}$										
d: meters										
P (Watts) = (E(V/m) x D: meters)² / 30										
D = Distance										
87.45 dBuV/m = .023577621 V/m										
P (Watts) = (0.23577621 V/m x 3 Meters) ² / 30 = .00016671										
10 * log (.00016671 * 1000) = -7.78 dBm										

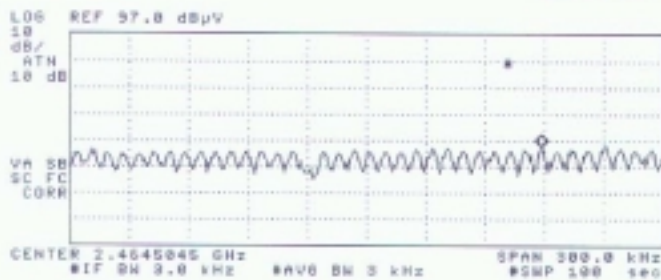
16:48:32 DEC 03, 1998
POWER DENSITY, KINGHAX(EN2000-H), CH.1
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 2.4145045 GHz
53.45 dBμV



16:55:09 DEC 03, 1998
POWER DENSITY, KINGHAX(EN2000-H), CH.6
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 2.4396160 GHz
56.12 dBμV



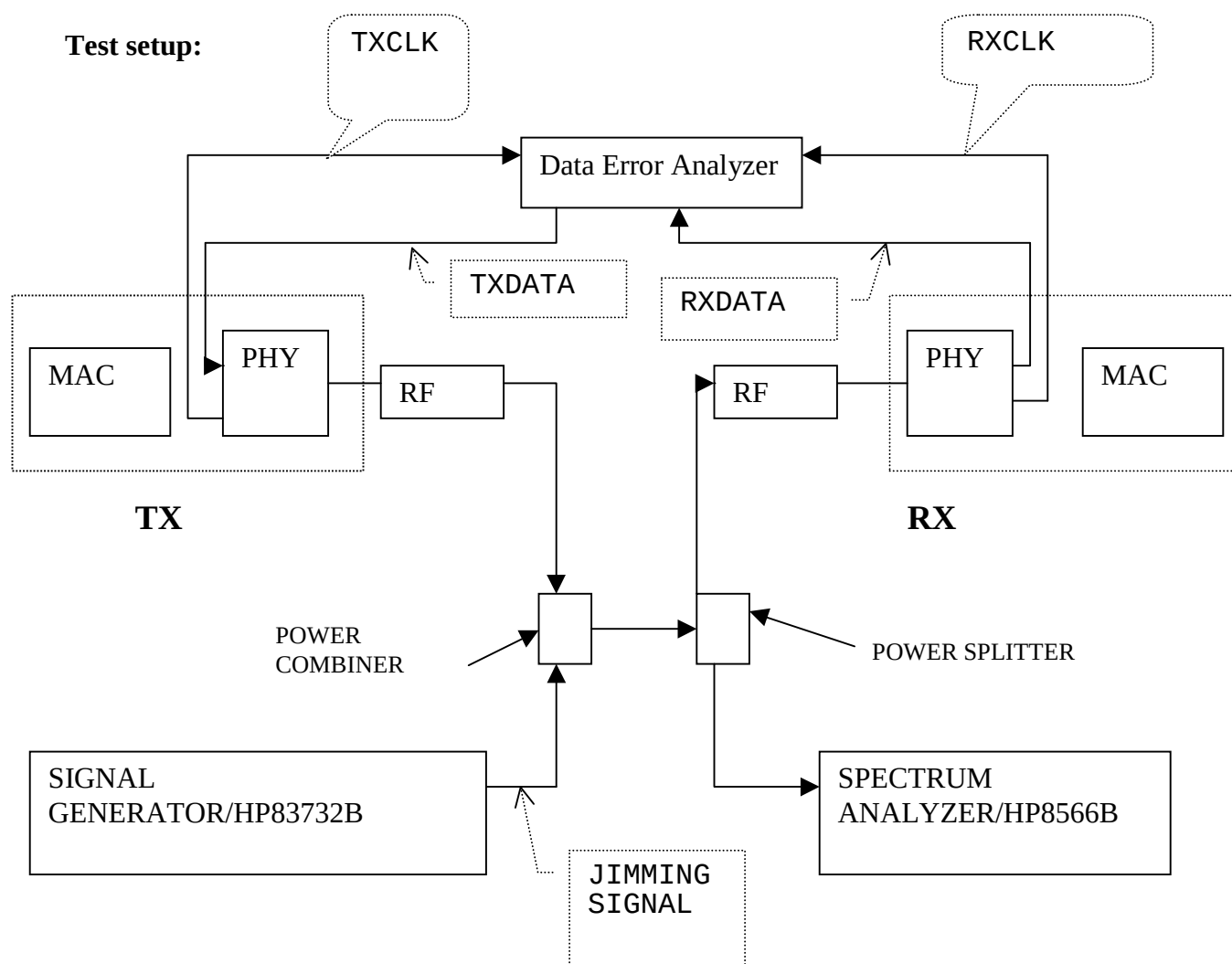
17:01:00 DEC 03, 1998
POWER DENSITY, KINGHAX(EN2000-H), CH.11
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 2.4645045 GHz
54.58 dBμV



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 Error 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

Frequency (MHz)	BER Xexp-5 Coherent	(S/N) of Detection (dB)	Lsys (dB) of Diff. Encoded	J/S (dB)	Signal (S) (dBm)	Jammer (J) (dBm)	Processing 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 of Differentially Encoded DPSK
- Processing gain $G_p = (S/N)_o + L_{sys} + J/S = (S/N)_o + 2 + J/S$
- Air data rate of EUT is 2 Mbps

TEST SETUP PHOTO

FIG. 1



FIG. 2

FIG. 3