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Product: ISP Direct Indoor and Outdoor Units
Model: 2401-01 (indoor) and 2401-02 (outdoor)
FCC ID: NUX-ISP2401
Reference: EA89226

CFR 47 Part 15.247 calls for a process gain of at least 10 dB for a direct sequence system. This is measured using the jamming margin method where a CW jammer is injected and the jamming margin is measured. This is done in 50 kHz increments across the passband of the system. The worst 20% of the data points are discarded. System Losses of 2 dB are assumed.

The system losses of the unit were measured and found to be in excess of 2 dB. This made the system fail the process gain requirement when previous measurements were taken. A change was made in the receiver DSP software to reduce the system losses. The unit was found to pass when measured using this new software.

A summary of the measurement follows:

Measured Process Gain $G_p = (S/N)_o + L_{sys} + M_j$

$(S/N)_o$ = 10.8 dB for BER of 10^{-4}, See Appendix 1
L_{sys} = 2 dB
System Passband = +/- 8.5 MHz for Wideband Mode (6 dB IF Bandwidth)
= +/- 4.5 MHz for Narrowband Mode (6 dB IF Bandwidth),
See Appendix 2

G_p = 10.8 dB + 2 dB + M_j Must be at least 10 dB

Insert Test Data Here

1. Processing Gain of A Direct Sequence Spread Spectrum, FCC CFR 47, Para. 15.247(e)

PRODUCT NAME: **ISP DIRECT INDOOR & OUTDOOR UNITS, Model No.: 2401-01 (indoor) and 2401-02 (outdoor)**

FCC REQUIREMENTS:

The processing gain of a direct sequence system shall be at least 10 dB. The processing gain shall be determined from the ratio in dB of the signal-to-noise ratio with the system spreading code turned off to the signal-to-noise ratio with the system spreading code turned on, as measured at the demodulated output of the receiver.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23 °C
- Relative humidity: 43 %

POWER INPUT:

AC 120 V 60Hz from Elpac external switching power supply, model WRI4232.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203
- Bird 20 dB Attenuator, 50 Ohm IN/OUT
- IBM PS/1 & IBM 350 ThinkPad Host Computer(s)
- Fluke RF Signal Generator, Model 6061A, Freq. range: 10 KHz - 1050 MHz.
- HP 8900 RF Peak Power Meter, Measuring Frequency Range: 100 MHz - 18 GHz.

METHOD OF MEASUREMENT:

METHOD #1:- Jamming Margin Method

The processing gain may be measured using the CW jamming margin method. Figure 1 shows the test configuration. The test consists of stepping a signal generator in 50 KHz increments across the passband of the system. At each point, the generator level required to produce the recommended Bit Error Rate (BER) is recorded. This level is jammer level. The output power of the transmitting unit is measured at the same point. The Jammer to Signal (J/S) ratio is then calculated. Discard the worst 20% of the J/S data points. The lowest remaining J/S ratio is used when calculating the Process Gain.

The signal to noise ratio for an ideal non-coherent receiver is calculated from:

(1) $$Pe = 1/2e^{(-1/2(S/N)o)}$$

where: Pe = probability of error (BER)
(S/N)o = the required signal to noise ratio at the receiver output for a given received signal quality

Ref.: Viterbi, A.J. Principles of Coherent Communications (New York: McGraw-HILL 1966), Pg. 207

Using equation (1) shown above, calculate the signal to noise ratio required for your chosen BER. This value and the measured J/S ratio are used in the following equation to calculate the Process Gain (Gp) of the system.

$$Gp = (S/N)o+Mj+Lsys$$

Where:

(S/N)o: Theoretical signal to noise ratio required to maintain the normal operation just before the BERappears. In real measurements the maximum error of 0.001 is allowed in an ideal system using their modulation scheme with all codes turned off (i.e. no spreading or processing gain).

Mj: Maximum jammer to Signal Ratio that recorded at the detected BER.

Lsys: System losses such as non-ideal synchronization, tracking circuitry, non-optimal baseband receiver filtering and etc... These losses can be in excess of 2 dB for each transmitter and receiver pair. For the purpose of this processing gain calculation we assume a Lsys at its minimum value of 2 dB.

Ref.: Dixon, R, Spread Spectrum Systems. (New York: Wiley, 1984)

The Signal-to-Noise Ratio (S/N) with respect to the probability of bit error for a differentially QPSK (DQPSK) receiver in the presence of additive white Gaussian noise (AWGN) is given by Figure 4.5.1 as attached.

Ref.: Marvin Simon, Spread Spectrum Communication Handbook, page 695.

Since the CW jamming is a tone jamming, the (S/N)o for a AWGN jamming obtained from Figure 4.5.1 can be converted to the CW jamming or tone jamming using the formula (3.97) of the Marvin Simon Spread Spectrum Communication Handbook as follows:

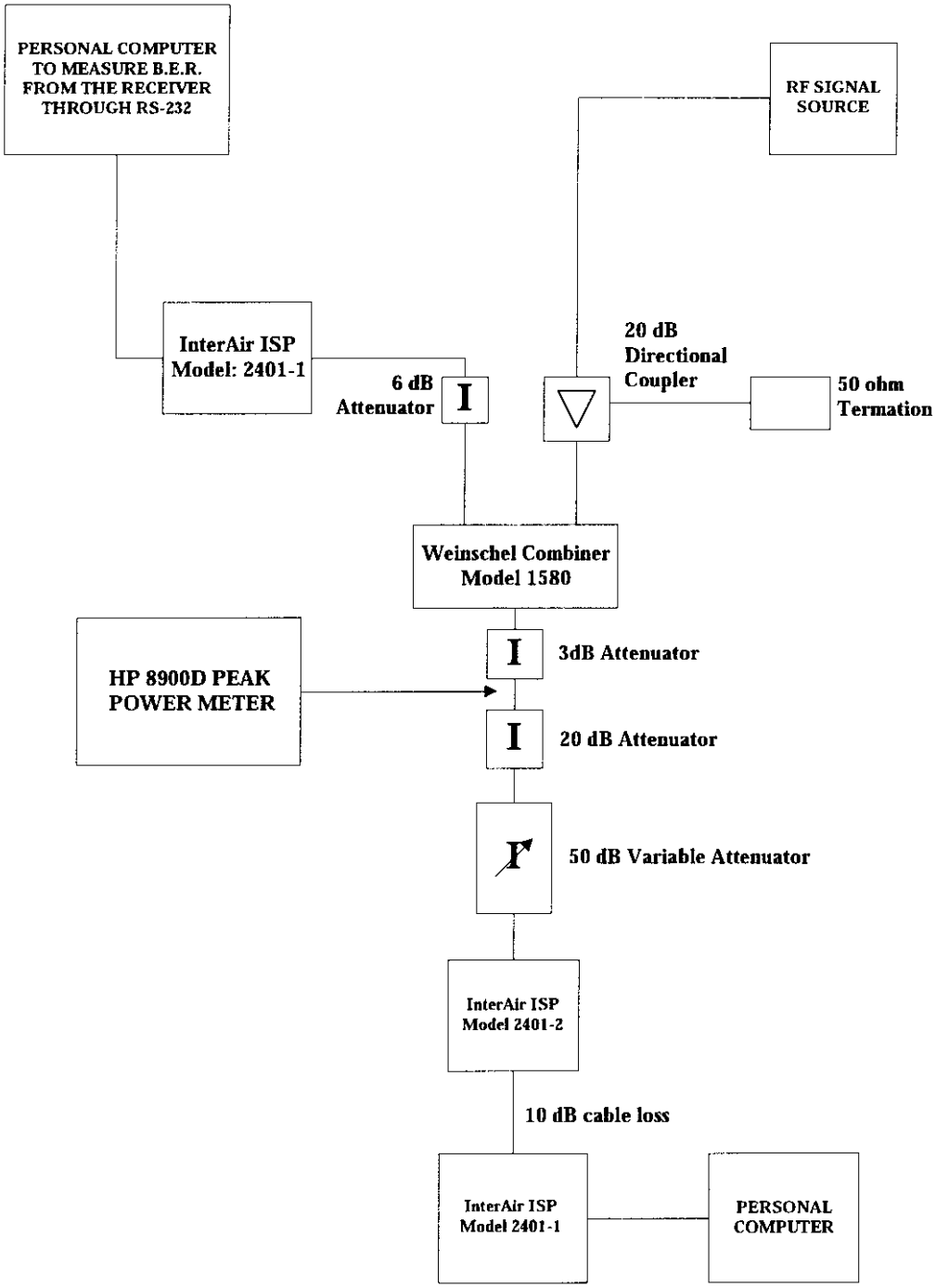
$(S/N)_o^t$ in dB = $(S/N)_o^{AWGN}$ / 0.8

TEST RESULTS: Conforms.

TEST PERSONNEL: Mr. Tri M. Luu, P.Eng.

DATE: July 23 & 24, 1998

Figure 1:- SETUP FOR PROCESSING GAIN MEASUREMENT - JAMMING MARGIN METHOD



MEASUREMENT DATA:

Channel #4, Fc = 2411.4375 MHz	**Data Rate = 1.023 Mbps (DQPSK), Medium**
Chip Rate = 5.625 MHz	**PN Code Length = 11 chips/symbol**
6 dB BW = 5 MHz	

(S/N)o = 12 dB dB per attached Figure 4.5.1
Measured Processing Gain Gp = (S/N)o + Lsys + Mj = 12 + 2 + Mj = 14 + Mj (dB)
Theoretical Calculated Processing Gain = Chip Rate/Data rate = 5.625 MHz / (1.023 Mb/s)/(2 bits/symbol) = 11.0 or 10.4 dB

Note:
- Total Peak Power from the EUT's Tx measured at the EUT's Rx Input: P_t = -72 dBm
- Jamming signal level at measured at the EUT's receiver input: J
- Mj = J-P_t
- The following shaded boxes are discarded worst measurements (18.2% of total measurement points)

SUMMARY OF TEST RESULTS	
Theoretical Process Gain	**10.4 dB**
Minimum Measured Process Gain with discard of 18.2% of the worst measurements	**12.2 dB**

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	2406.93750	-4.50	1.0	12.0	2.0	4.7	18.7	
2	2406.98750	-4.45	1.0	12.0	2.0	4.7	18.7	
3	2407.03750	-4.40	1.0	12.0	2.0	4.4	18.4	
4	2407.08750	-4.35	1.0	12.0	2.0	4.4	18.4	
5	2407.13750	-4.30	1.0	12.0	2.0	4.2	18.2	
6	2407.18750	-4.25	1.0	12.0	2.0	4.0	18.0	
7	2407.23750	-4.20	1.0	12.0	2.0	3.7	17.7	
8	2407.28750	-4.15	1.0	12.0	2.0	3.9	17.9	
9	2407.33750	-4.10	1.0	12.0	2.0	3.5	17.5	
10	2407.38750	-4.05	1.0	12.0	2.0	3.4	17.4	
11	2407.43750	-4.00	1.0	12.0	2.0	3.4	17.4	
12	2407.48750	-3.95	1.0	12.0	2.0	3.1	17.1	
13	2407.53750	-3.90	1.0	12.0	2.0	3.1	17.1	
14	2407.58750	-3.85	1.0	12.0	2.0	3.1	17.1	
15	2407.63750	-3.80	1.0	12.0	2.0	2.9	16.9	
16	2407.68750	-3.75	1.0	12.0	2.0	2.8	16.8	
17	2407.73750	-3.70	1.0	12.0	2.0	2.7	16.7	
18	2407.78750	-3.65	1.0	12.0	2.0	2.5	16.5	
19	2407.83750	-3.60	1.0	12.0	2.0	2.6	16.6	
20	2407.88750	-3.55	1.0	12.0	2.0	2.5	16.5	
21	2407.93750	-3.50	1.0	12.0	2.0	2.2	16.2	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
22	2407.98750	-3.45	1.0	12.0	2.0	2.2	16.2	
23	2408.03750	-3.40	1.0	12.0	2.0	2.2	16.2	
24	2408.08750	-3.35	1.0	12.0	2.0	2.0	16.0	
25	2408.13750	-3.30	1.0	12.0	2.0	2.0	16.0	
26	2408.18750	-3.25	1.0	12.0	2.0	1.8	15.8	
27	2408.23750	-3.20	1.0	12.0	2.0	1.7	15.7	
28	2408.28750	-3.15	1.0	12.0	2.0	1.7	15.7	
29	2408.33750	-3.10	1.0	12.0	2.0	1.7	15.7	
30	2408.38750	-3.05	1.0	12.0	2.0	1.7	15.7	
31	2408.43750	-3.00	1.0	12.0	2.0	1.6	15.6	
32	2408.48750	-2.95	1.0	12.0	2.0	1.6	15.6	
33	2408.53750	-2.90	1.0	12.0	2.0	1.6	15.6	
34	2408.58750	-2.85	1.0	12.0	2.0	1.4	15.4	
35	2408.63750	-2.80	1.0	12.0	2.0	1.2	15.2	
36	2408.68750	-2.75	1.0	12.0	2.0	1.1	15.1	
37	2408.73750	-2.70	1.0	12.0	2.0	1.2	15.2	
38	2408.78750	-2.65	1.0	12.0	2.0	1.2	15.2	
39	2408.83750	-2.60	1.0	12.0	2.0	1.1	15.1	
40	2408.88750	-2.55	1.0	12.0	2.0	1.0	15.0	
41	2408.93750	-2.50	1.0	12.0	2.0	1.0	15.0	
42	2408.98750	-2.45	1.0	12.0	2.0	0.9	14.9	
43	2409.03750	-2.40	1.0	12.0	2.0	0.9	14.9	
44	2409.08750	-2.35	1.0	12.0	2.0	0.8	14.8	
45	2409.13750	-2.30	1.0	12.0	2.0	0.1	14.1	
46	2409.18750	-2.25	1.0	12.0	2.0	0.0	14.0	
47	2409.23750	-2.20	1.0	12.0	2.0	-0.1	13.9	
48	2409.28750	-2.15	1.0	12.0	2.0	-0.5	13.5	
49	2409.33750	-2.10	1.0	12.0	2.0	-1.0	13.0	
50	2409.38750	-2.05	1.0	12.0	2.0	-1.6	12.4	
51	2409.43750	-2.00	1.0	12.0	2.0	-1.7	12.3	
52	2409.48750	-1.95	1.0	12.0	2.0	-1.7	12.3	
53	**2409.53750**	**-1.90**	**1.0**	**12.0**	**2.0**	**-1.8**	**12.2**	
54	2409.58750	-1.85	1.0	12.0	2.0	-1.5	12.5	
55	2409.63750	-1.80	1.0	12.0	2.0	-0.9	13.1	
56	2409.68750	-1.75	1.0	12.0	2.0	-0.5	13.5	
57	2409.73750	-1.70	1.0	12.0	2.0	-0.4	13.6	
58	2409.78750	-1.65	1.0	12.0	2.0	-0.6	13.4	
59	2409.83750	-1.60	1.0	12.0	2.0	-1.1	12.9	
60	2409.88750	-1.55	1.0	12.0	2.0	-2.0	12.0	20
61	2409.93750	-1.50	1.0	12.0	2.0	-2.3	11.7	10
62	2409.98750	-1.45	1.0	12.0	2.0	-2.3	11.7	11

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
63	2410.03750	-1.40	1.0	12.0	2.0	-2.0	12.0	21
64	2410.08750	-1.35	1.0	12.0	2.0	-1.8	12.2	
65	2410.13750	-1.30	1.0	12.0	2.0	-1.4	12.6	
66	2410.18750	-1.25	1.0	12.0	2.0	-1.4	12.6	
67	2410.23750	-1.20	1.0	12.0	2.0	-0.8	13.2	
68	2410.28750	-1.15	1.0	12.0	2.0	-0.8	13.2	
69	2410.33750	-1.10	1.0	12.0	2.0	-1.0	13.0	
70	2410.38750	-1.05	1.0	12.0	2.0	-1.4	12.6	
71	2410.43750	-1.00	1.0	12.0	2.0	-1.8	12.2	
72	2410.48750	-0.95	1.0	12.0	2.0	-1.8	12.2	
73	2410.53750	-0.90	1.0	12.0	2.0	-2.3	11.7	12
74	2410.58750	-0.85	1.0	12.0	2.0	-2.5	11.5	5
75	2410.63750	-0.80	1.0	12.0	2.0	-2.5	11.5	6
76	2410.68750	-0.75	1.0	12.0	2.0	-2.1	11.9	18
77	2410.73750	-0.70	1.0	12.0	2.0	-1.3	12.7	
78	2410.78750	-0.65	1.0	12.0	2.0	-1.3	12.7	
79	2410.83750	-0.60	1.0	12.0	2.0	-1.3	12.7	
80	2410.88750	-0.55	1.0	12.0	2.0	-1.6	12.4	
81	2410.93750	-0.50	1.0	12.0	2.0	-2.0	12.0	22
82	2410.98750	-0.45	1.0	12.0	2.0	-2.3	11.7	13
83	2411.03750	-0.40	1.0	12.0	2.0	-2.8	11.2	1
84	2411.08750	-0.35	1.0	12.0	2.0	-2.8	11.2	2
85	2411.13750	-0.30	1.0	12.0	2.0	-2.6	11.4	3
86	2411.18750	-0.25	1.0	12.0	2.0	-2.3	11.7	14
87	2411.23750	-0.20	1.0	12.0	2.0	-1.5	12.5	
88	2411.28750	-0.15	1.0	12.0	2.0	-1.2	12.8	
89	2411.33750	-0.10	1.0	12.0	2.0	-1.5	12.5	
90	2411.38750	-0.05	1.0	12.0	2.0	-2.5	11.5	7
91	2411.43750	0.00	1.0	12.0	2.0	-2.5	11.5	8
92	2411.48750	0.05	1.0	12.0	2.0	-2.0	12.0	23
93	2411.53750	0.10	1.0	12.0	2.0	-1.9	12.1	27
94	2411.58750	0.15	1.0	12.0	2.0	-1.6	12.4	
95	2411.63750	0.20	1.0	12.0	2.0	-1.3	12.7	
96	2411.68750	0.25	1.0	12.0	2.0	-2.1	11.9	19
97	2411.73750	0.30	1.0	12.0	2.0	-2.3	11.7	16
98	2411.78750	0.35	1.0	12.0	2.0	-2.3	11.7	15
99	2411.83750	0.40	1.0	12.0	2.0	-2.3	11.7	17
100	2411.88750	0.45	1.0	12.0	2.0	-2.0	12.0	24
101	2411.93750	0.50	1.0	12.0	2.0	-2.0	12.0	25
102	2411.98750	0.55	1.0	12.0	2.0	-1.7	12.3	
103	2412.03750	0.60	1.0	12.0	2.0	-1.8	12.2	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
104	2412.08750	0.65	1.0	12.0	2.0	-1.5	12.5	
105	2412.13750	0.70	1.0	12.0	2.0	-1.7	12.3	
106	2412.18750	0.75	1.0	12.0	2.0	-2.0	12.0	26
107	2412.23750	0.80	1.0	12.0	2.0	-2.5	11.5	9
108	2412.28750	0.85	1.0	12.0	2.0	-2.6	11.4	4
109	2412.33750	0.90	1.0	12.0	2.0	-1.9	12.1	28
110	2412.38750	0.95	1.0	12.0	2.0	-1.9	12.1	29
111	2412.43750	1.00	1.0	12.0	2.0	-1.9	12.1	30
112	2412.48750	1.05	1.0	12.0	2.0	-1.4	12.6	
113	2412.53750	1.10	1.0	12.0	2.0	-1.3	12.7	
114	2412.58750	1.15	1.0	12.0	2.0	-1.1	12.9	
115	2412.63750	1.20	1.0	12.0	2.0	-0.9	13.1	
116	2412.68750	1.25	1.0	12.0	2.0	-1.2	12.8	
117	2412.73750	1.30	1.0	12.0	2.0	-1.5	12.5	
118	2412.78750	1.35	1.0	12.0	2.0	-1.8	12.2	
119	2412.83750	1.40	1.0	12.0	2.0	-1.6	12.4	
120	2412.88750	1.45	1.0	12.0	2.0	-1.9	12.1	31
121	2412.93750	1.50	1.0	12.0	2.0	-1.9	12.1	32
122	2412.98750	1.55	1.0	12.0	2.0	-1.9	12.1	33
123	2413.03750	1.60	1.0	12.0	2.0	-1.6	12.4	
124	2413.08750	1.65	1.0	12.0	2.0	-1.1	12.9	
125	2413.13750	1.70	1.0	12.0	2.0	-0.9	13.1	
126	2413.18750	1.75	1.0	12.0	2.0	-0.7	13.3	
127	2413.23750	1.80	1.0	12.0	2.0	-0.8	13.2	
128	2413.28750	1.85	1.0	12.0	2.0	-1.0	13.0	
129	2413.33750	1.90	1.0	12.0	2.0	-1.3	12.7	
130	2413.38750	1.95	1.0	12.0	2.0	-1.2	12.8	
131	2413.43750	2.00	1.0	12.0	2.0	-1.1	12.9	
132	2413.48750	2.05	1.0	12.0	2.0	-1.1	12.9	
133	2413.53750	2.10	1.0	12.0	2.0	-0.5	13.5	
134	2413.58750	2.15	1.0	12.0	2.0	-0.2	13.8	
135	2413.63750	2.20	1.0	12.0	2.0	-0.2	13.8	
136	2413.68750	2.25	1.0	12.0	2.0	0.2	14.2	
137	2413.73750	2.30	1.0	12.0	2.0	0.2	14.2	
138	2413.78750	2.35	1.0	12.0	2.0	0.1	14.1	
139	2413.83750	2.40	1.0	12.0	2.0	0.0	14.0	
140	2413.88750	2.45	1.0	12.0	2.0	0.0	14.0	
141	2413.93750	2.50	1.0	12.0	2.0	0.0	14.0	
142	2413.98750	2.55	1.0	12.0	2.0	0.8	14.8	
143	2414.03750	2.60	1.0	12.0	2.0	1.7	15.7	
144	2414.08750	2.65	1.0	12.0	2.0	1.8	15.8	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
145	2414.13750	2.70	1.0	12.0	2.0	2.7	16.7	
146	2414.18750	2.75	1.0	12.0	2.0	2.6	16.6	
147	2414.23750	2.80	1.0	12.0	2.0	2.6	16.6	
148	2414.28750	2.85	1.0	12.0	2.0	2.7	16.7	
149	2414.33750	2.90	1.0	12.0	2.0	3.4	17.4	
150	2414.38750	2.95	1.0	12.0	2.0	3.3	17.3	
151	2414.43750	3.00	1.0	12.0	2.0	3.3	17.3	
152	2414.48750	3.05	1.0	12.0	2.0	2.9	16.9	
153	2414.53750	3.10	1.0	12.0	2.0	2.5	16.5	
154	2414.58750	3.15	1.0	12.0	2.0	2.5	16.5	
155	2414.63750	3.20	1.0	12.0	2.0	2.5	16.5	
156	2414.68750	3.25	1.0	12.0	2.0	3.0	17.0	
157	2414.73750	3.30	1.0	12.0	2.0	3.6	17.6	
158	2414.78750	3.35	1.0	12.0	2.0	3.9	17.9	
159	2414.83750	3.40	1.0	12.0	2.0	4.1	18.1	
160	2414.88750	3.45	1.0	12.0	2.0	4.5	18.5	
161	2414.93750	3.50	1.0	12.0	2.0	4.4	18.4	
162	2414.98750	3.55	1.0	12.0	2.0	4.3	18.3	
163	2415.03750	3.60	1.0	12.0	2.0	4.3	18.3	
164	2415.08750	3.65	1.0	12.0	2.0	4.4	18.4	
165	2415.13750	3.70	1.0	12.0	2.0	5.0	19.0	
166	2415.18750	3.75	1.0	12.0	2.0	5.2	19.2	
167	2415.23750	3.80	1.0	12.0	2.0	5.7	19.7	
168	2415.28750	3.85	1.0	12.0	2.0	5.7	19.7	
169	2415.33750	3.90	1.0	12.0	2.0	6.0	20.0	
170	2415.38750	3.95	1.0	12.0	2.0	5.9	19.9	
171	2415.43750	4.00	1.0	12.0	2.0	5.9	19.9	
172	2415.48750	4.05	1.0	12.0	2.0	6.3	20.3	
173	2415.53750	4.10	1.0	12.0	2.0	6.3	20.3	
174	2415.58750	4.15	1.0	12.0	2.0	6.6	20.6	
175	2415.63750	4.20	1.0	12.0	2.0	6.7	20.7	
176	2415.68750	4.25	1.0	12.0	2.0	6.7	20.7	
177	2415.73750	4.30	1.0	12.0	2.0	7.1	21.1	
178	2415.78750	4.35	1.0	12.0	2.0	7.1	21.1	
179	2415.83750	4.40	1.0	12.0	2.0	7.6	21.6	
180	2415.88750	4.45	1.0	12.0	2.0	7.5	21.5	
181	2415.93750	4.50	1.0	12.0	2.0	7.8	21.8	

Channel #6, Fc = 2419.8750 MHz	**Data Rate = 2.045 Mbps (DQPSK), Wide**
Chip Rate = 11.25 MHz	**PN Code Length = 11 chips/symbol**
6 dB BW = 8.4 MHz	

(S/N)o = 12 dB per attached Figure 4.5.1
Measured Processing Gain Gp = (S/N)o + Lsys + Mj = 12 + 2 + Mj = 14 + Mj (dB)
Theoretical Calculated Processing Gain = Chip Rate/Data rate = 11.25 MHz / (2.045 Mb/s)/(2 bits/symbol) = 11.0 or 10.4 dB

Note:
- Total Peak Power from the EUT's Tx measured at the EUT's Rx Input: P_t = -72 dBm
- Jamming signal level at measured at the EUT's receiver input: J
- Mj = J-P_t
- The following shaded boxes are discarded worst measurements (19.4% of total measurement points)

SUMMARY OF TEST RESULTS	
Theoretical Process Gain	**10.4 dB**
Minimum Measured Process Gain with discard of 19.4% of the worst measurements	**11.3 dB**

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	2411.37500	-8.50	1.0	12.0	2.0	4.0	18.0	
2	2411.42500	-8.45	1.0	12.0	2.0	4.0	18.0	
3	2411.47500	-8.40	1.0	12.0	2.0	3.8	17.8	
4	2411.52500	-8.35	1.0	12.0	2.0	3.9	17.9	
5	2411.57500	-8.30	1.0	12.0	2.0	3.8	17.8	
6	2411.62500	-8.25	1.0	12.0	2.0	3.5	17.5	
7	2411.67500	-8.20	1.0	12.0	2.0	3.3	17.3	
8	2411.72500	-8.15	1.0	12.0	2.0	3.3	17.3	
9	2411.77500	-8.10	1.0	12.0	2.0	3.2	17.2	
10	2411.82500	-8.05	1.0	12.0	2.0	3.2	17.2	
11	2411.87500	-8.00	1.0	12.0	2.0	3.2	17.2	
12	2411.92500	-7.95	1.0	12.0	2.0	3.1	17.1	
13	2411.97500	-7.90	1.0	12.0	2.0	3.0	17.0	
14	2412.02500	-7.85	1.0	12.0	2.0	2.9	16.9	
15	2412.07500	-7.80	1.0	12.0	2.0	2.9	16.9	
16	2412.12500	-7.75	1.0	12.0	2.0	2.8	16.8	
17	2412.17500	-7.70	1.0	12.0	2.0	2.6	16.6	
18	2412.22500	-7.65	1.0	12.0	2.0	2.6	16.6	
19	2412.27500	-7.60	1.0	12.0	2.0	2.6	16.6	
20	2412.32500	-7.55	1.0	12.0	2.0	2.6	16.6	
21	2412.37500	-7.50	1.0	12.0	2.0	2.3	16.3	
22	2412.42500	-7.45	1.0	12.0	2.0	2.3	16.3	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
23	2412.47500	-7.40	1.0	12.0	2.0	2.3	16.3	
24	2412.52500	-7.35	1.0	12.0	2.0	2.1	16.1	
25	2412.57500	-7.30	1.0	12.0	2.0	2.0	16.0	
26	2412.62500	-7.25	1.0	12.0	2.0	1.9	15.9	
27	2412.67500	-7.20	1.0	12.0	2.0	1.8	15.8	
28	2412.72500	-7.15	1.0	12.0	2.0	1.7	15.7	
29	2412.77500	-7.10	1.0	12.0	2.0	1.7	15.7	
30	2412.82500	-7.05	1.0	12.0	2.0	1.8	15.8	
31	2412.87500	-7.00	1.0	12.0	2.0	1.7	15.7	
32	2412.92500	-6.95	1.0	12.0	2.0	1.7	15.7	
33	2412.97500	-6.90	1.0	12.0	2.0	1.7	15.7	
34	2413.02500	-6.85	1.0	12.0	2.0	1.9	15.9	
35	2413.07500	-6.80	1.0	12.0	2.0	1.5	15.5	
36	2413.12500	-6.75	1.0	12.0	2.0	1.3	15.3	
37	2413.17500	-6.70	1.0	12.0	2.0	1.2	15.2	
38	2413.22500	-6.65	1.0	12.0	2.0	1.1	15.1	
39	2413.27500	-6.60	1.0	12.0	2.0	1.1	15.1	
40	2413.32500	-6.55	1.0	12.0	2.0	1.1	15.1	
41	2413.37500	-6.50	1.0	12.0	2.0	1.0	15.0	
42	2413.42500	-6.45	1.0	12.0	2.0	0.9	14.9	
43	2413.47500	-6.40	1.0	12.0	2.0	1.0	15.0	
44	2413.52500	-6.35	1.0	12.0	2.0	0.8	14.8	
45	2413.57500	-6.30	1.0	12.0	2.0	0.7	14.7	
46	2413.62500	-6.25	1.0	12.0	2.0	0.7	14.7	
47	2413.67500	-6.20	1.0	12.0	2.0	0.8	14.8	
48	2413.72500	-6.15	1.0	12.0	2.0	0.7	14.7	
49	2413.77500	-6.10	1.0	12.0	2.0	0.5	14.5	
50	2413.82500	-6.05	1.0	12.0	2.0	0.6	14.6	
51	2413.87500	-6.00	1.0	12.0	2.0	0.5	14.5	
52	2413.92500	-5.95	1.0	12.0	2.0	0.4	14.4	
53	2413.97500	-5.90	1.0	12.0	2.0	0.5	14.5	
54	2414.02500	-5.85	1.0	12.0	2.0	0.5	14.5	
55	2414.07500	-5.80	1.0	12.0	2.0	0.5	14.5	
56	2414.12500	-5.75	1.0	12.0	2.0	0.3	14.3	
57	2414.17500	-5.70	1.0	12.0	2.0	0.2	14.2	
58	2414.22500	-5.65	1.0	12.0	2.0	0.1	14.1	
59	2414.27500	-5.60	1.0	12.0	2.0	0.1	14.1	
60	2414.32500	-5.55	1.0	12.0	2.0	0.1	14.1	
61	2414.37500	-5.50	1.0	12.0	2.0	0.3	14.3	
62	2414.42500	-5.45	1.0	12.0	2.0	0.2	14.2	
63	2414.47500	-5.40	1.0	12.0	2.0	-0.2	13.8	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
64	2414.52500	-5.35	1.0	12.0	2.0	-0.2	13.8	
65	2414.57500	-5.30	1.0	12.0	2.0	-0.2	13.8	
66	2414.62500	-5.25	1.0	12.0	2.0	-0.1	13.9	
67	2414.67500	-5.20	1.0	12.0	2.0	0.2	14.2	
68	2414.72500	-5.15	1.0	12.0	2.0	-0.5	13.5	
69	2414.77500	-5.10	1.0	12.0	2.0	-0.6	13.4	
70	2414.82500	-5.05	1.0	12.0	2.0	-1.2	12.8	
71	2414.87500	-5.00	1.0	12.0	2.0	-1.5	12.5	
72	2414.92500	-4.95	1.0	12.0	2.0	-1.6	12.4	
73	2414.97500	-4.90	1.0	12.0	2.0	-1.8	12.2	
74	2415.02500	-4.85	1.0	12.0	2.0	-1.8	12.2	
75	2415.07500	-4.80	1.0	12.0	2.0	-1.7	12.3	
76	2415.12500	-4.75	1.0	12.0	2.0	-1.4	12.6	
77	2415.17500	-4.70	1.0	12.0	2.0	-1.4	12.6	
78	2415.22500	-4.65	1.0	12.0	2.0	-1.2	12.8	
79	2415.27500	-4.60	1.0	12.0	2.0	-1.1	12.9	
80	2415.32500	-4.55	1.0	12.0	2.0	-1.0	13.0	
81	2415.37500	-4.50	1.0	12.0	2.0	-0.9	13.1	
82	2415.42500	-4.45	1.0	12.0	2.0	-1.0	13.0	
83	2415.47500	-4.40	1.0	12.0	2.0	-1.4	12.6	
84	2415.52500	-4.35	1.0	12.0	2.0	-1.5	12.5	
85	2415.57500	-4.30	1.0	12.0	2.0	-1.5	12.5	
86	2415.62500	-4.25	1.0	12.0	2.0	-1.7	12.3	
87	2415.67500	-4.20	1.0	12.0	2.0	-2.1	11.9	
88	2415.72500	-4.15	1.0	12.0	2.0	-2.6	11.4	
89	2415.77500	-4.10	1.0	12.0	2.0	-2.7	11.3	
90	2415.82500	-4.05	1.0	12.0	2.0	-2.7	11.3	
91	2415.87500	-4.00	1.0	12.0	2.0	-2.8	11.2	49
92	2415.92500	-3.95	1.0	12.0	2.0	-2.8	11.2	50
93	2415.97500	-3.90	1.0	12.0	2.0	-2.8	11.2	51
94	2416.02500	-3.85	1.0	12.0	2.0	-2.8	11.2	52
95	2416.07500	-3.80	1.0	12.0	2.0	-2.8	11.2	53
96	2416.12500	-3.75	1.0	12.0	2.0	-2.7	11.3	
97	2416.17500	-3.70	1.0	12.0	2.0	-2.5	11.5	
98	2416.22500	-3.65	1.0	12.0	2.0	-2.3	11.7	
99	2416.27500	-3.60	1.0	12.0	2.0	-2.1	11.9	
100	2416.32500	-3.55	1.0	12.0	2.0	-1.8	12.2	
101	2416.37500	-3.50	1.0	12.0	2.0	-1.7	12.3	
102	2416.42500	-3.45	1.0	12.0	2.0	-1.7	12.3	
103	2416.47500	-3.40	1.0	12.0	2.0	-1.6	12.4	
104	2416.52500	-3.35	1.0	12.0	2.0	-1.6	12.4	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
105	2416.57500	-3.30	1.0	12.0	2.0	-2.0	12.0	
106	2416.62500	-3.25	1.0	12.0	2.0	-2.0	12.0	
107	2416.67500	-3.20	1.0	12.0	2.0	-2.8	11.2	54
108	2416.72500	-3.15	1.0	12.0	2.0	-2.8	11.2	55
109	2416.77500	-3.10	1.0	12.0	2.0	-2.9	11.1	41
110	2416.82500	-3.05	1.0	12.0	2.0	-3.4	10.6	10
111	2416.87500	-3.00	1.0	12.0	2.0	-3.3	10.7	15
112	2416.92500	-2.95	1.0	12.0	2.0	-3.4	10.6	11
113	2416.97500	-2.90	1.0	12.0	2.0	-3.0	11.0	34
114	2417.02500	-2.85	1.0	12.0	2.0	-3.0	11.0	35
115	2417.07500	-2.80	1.0	12.0	2.0	-2.9	11.1	42
116	2417.12500	-2.75	1.0	12.0	2.0	-2.8	11.2	56
117	2417.17500	-2.70	1.0	12.0	2.0	-2.8	11.2	57
118	2417.22500	-2.65	1.0	12.0	2.0	-2.6	11.4	
119	2417.27500	-2.60	1.0	12.0	2.0	-2.4	11.6	
120	2417.32500	-2.55	1.0	12.0	2.0	-2.3	11.7	
121	2417.37500	-2.50	1.0	12.0	2.0	-2.0	12.0	
122	2417.42500	-2.45	1.0	12.0	2.0	-1.9	12.1	
123	2417.47500	-2.40	1.0	12.0	2.0	-1.9	12.1	
124	2417.52500	-2.35	1.0	12.0	2.0	-1.8	12.2	
125	2417.57500	-2.30	1.0	12.0	2.0	-1.8	12.2	
126	2417.62500	-2.25	1.0	12.0	2.0	-1.9	12.1	
127	2417.67500	-2.20	1.0	12.0	2.0	-1.9	12.1	
128	2417.72500	-2.15	1.0	12.0	2.0	-2.0	12.0	
129	2417.77500	-2.10	1.0	12.0	2.0	-2.3	11.7	
130	2417.82500	-2.05	1.0	12.0	2.0	-2.4	11.6	
131	2417.87500	-2.00	1.0	12.0	2.0	-2.9	11.1	43
132	2417.92500	-1.95	1.0	12.0	2.0	-3.2	10.8	20
133	2417.97500	-1.90	1.0	12.0	2.0	-3.3	10.7	16
134	2418.02500	-1.85	1.0	12.0	2.0	-3.2	10.8	21
135	2418.07500	-1.80	1.0	12.0	2.0	-3.3	10.7	17
136	2418.12500	-1.75	1.0	12.0	2.0	-3.4	10.6	12
137	2418.17500	-1.70	1.0	12.0	2.0	-3.4	10.6	13
138	2418.22500	-1.65	1.0	12.0	2.0	-3.5	10.5	5
139	2418.27500	-1.60	1.0	12.0	2.0	-3.5	10.5	6
140	2418.32500	-1.55	1.0	12.0	2.0	-3.3	10.7	18
141	2418.37500	-1.50	1.0	12.0	2.0	-3.1	10.9	26
142	2418.42500	-1.45	1.0	12.0	2.0	-3.0	11.0	36
143	2418.47500	-1.40	1.0	12.0	2.0	-2.3	11.7	
144	2418.52500	-1.35	1.0	12.0	2.0	-2.2	11.8	
145	2418.57500	-1.30	1.0	12.0	2.0	-2.1	11.9	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
146	2418.62500	-1.25	1.0	12.0	2.0	-2.1	11.9	
147	2418.67500	-1.20	1.0	12.0	2.0	-2.2	11.8	
148	2418.72500	-1.15	1.0	12.0	2.0	-2.5	11.5	
149	2418.77500	-1.10	1.0	12.0	2.0	-2.5	11.5	
150	2418.82500	-1.05	1.0	12.0	2.0	-2.7	11.3	
151	2418.87500	-1.00	1.0	12.0	2.0	-3.1	10.9	27
152	2418.92500	-0.95	1.0	12.0	2.0	-3.1	10.9	28
153	2418.97500	-0.90	1.0	12.0	2.0	-3.4	10.6	14
154	2419.02500	-0.85	1.0	12.0	2.0	-3.7	10.3	2
155	2419.07500	-0.80	1.0	12.0	2.0	-3.7	10.3	3
156	2419.12500	-0.75	1.0	12.0	2.0	-3.8	10.2	1
157	2419.17500	-0.70	1.0	12.0	2.0	-3.5	10.4	4
158	2419.22500	-0.65	1.0	12.0	2.0	-3.5	10.5	7
159	2419.27500	-0.60	1.0	12.0	2.0	-3.5	10.5	8
160	2419.32500	-0.55	1.0	12.0	2.0	-3.5	10.5	9
161	2419.37500	-0.50	1.0	12.0	2.0	-3.1	10.9	29
162	2419.42500	-0.45	1.0	12.0	2.0	-2.9	11.1	44
163	2419.47500	-0.40	1.0	12.0	2.0	-2.3	11.7	
164	2419.52500	-0.35	1.0	12.0	2.0	-2.3	11.7	
165	2419.57500	-0.30	1.0	12.0	2.0	-2.3	11.7	
166	2419.62500	-0.25	1.0	12.0	2.0	-2.4	11.6	
167	2419.67500	-0.20	1.0	12.0	2.0	-2.5	11.5	
168	2419.72500	-0.15	1.0	12.0	2.0	-2.8	11.2	56
169	2419.77500	-0.10	1.0	12.0	2.0	-3.2	10.8	22
170	2419.82500	-0.05	1.0	12.0	2.0	-3.3	10.7	19
171	2419.87500	0.00	1.0	12.0	2.0	-3.2	10.8	23
172	2419.92500	0.05	1.0	12.0	2.0	-3.1	10.9	30
173	2419.97500	0.10	1.0	12.0	2.0	-3.1	10.9	31
174	2420.02500	0.15	1.0	12.0	2.0	-3.1	10.9	32
175	2420.07500	0.20	1.0	12.0	2.0	-2.6	11.4	
176	2420.12500	0.25	1.0	12.0	2.0	-2.3	11.7	
177	2420.17500	0.30	1.0	12.0	2.0	-2.4	11.6	
178	2420.22500	0.35	1.0	12.0	2.0	-2.5	11.5	
179	2420.27500	0.40	1.0	12.0	2.0	-2.5	11.5	
180	2420.32500	0.45	1.0	12.0	2.0	-2.6	11.4	
181	2420.37500	0.50	1.0	12.0	2.0	-2.7	11.3	
182	2420.42500	0.55	1.0	12.0	2.0	-3.0	11.0	37
183	2420.47500	0.60	1.0	12.0	2.0	-3.1	10.9	33
184	2420.52500	0.65	1.0	12.0	2.0	-2.9	11.1	45
185	2420.57500	0.70	1.0	12.0	2.0	-2.8	11.2	59
186	2420.62500	0.75	1.0	12.0	2.0	-3.0	11.0	38

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
187	2420.67500	0.80	1.0	12.0	2.0	-3.0	11.0	38
188	2420.72500	0.85	1.0	12.0	2.0	-2.8	11.2	60
189	2420.77500	0.90	1.0	12.0	2.0	-2.8	11.2	61
190	2420.82500	0.95	1.0	12.0	2.0	-2.6	11.4	
191	2420.87500	1.00	1.0	12.0	2.0	-2.6	11.4	
192	2420.92500	1.05	1.0	12.0	2.0	-2.5	11.5	
193	2420.97500	1.10	1.0	12.0	2.0	-2.5	11.5	
194	2421.02500	1.15	1.0	12.0	2.0	-2.6	11.4	
195	2421.07500	1.20	1.0	12.0	2.0	-2.5	11.5	
196	2421.12500	1.25	1.0	12.0	2.0	-2.4	11.6	
197	2421.17500	1.30	1.0	12.0	2.0	-2.0	12.0	
198	2421.22500	1.35	1.0	12.0	2.0	-2.2	11.8	
199	2421.27500	1.40	1.0	12.0	2.0	-2.2	11.8	
200	2421.32500	1.45	1.0	12.0	2.0	-2.2	11.8	
201	2421.37500	1.50	1.0	12.0	2.0	-2.9	11.1	46
202	2421.42500	1.55	1.0	12.0	2.0	-2.9	11.1	47
203	2421.47500	1.60	1.0	12.0	2.0	-3.2	10.8	24
204	2421.52500	1.65	1.0	12.0	2.0	-3.2	10.8	25
205	2421.57500	1.70	1.0	12.0	2.0	-2.9	11.1	48
206	2421.62500	1.75	1.0	12.0	2.0	-3.0	11.0	40
207	2421.67500	1.80	1.0	12.0	2.0	-2.7	11.3	
208	2421.72500	1.85	1.0	12.0	2.0	-2.8	11.2	62
209	2421.77500	1.90	1.0	12.0	2.0	-2.7	11.3	
210	2421.82500	1.95	1.0	12.0	2.0	-2.8	11.2	63
211	2421.87500	2.00	1.0	12.0	2.0	-2.5	11.5	
212	2421.92500	2.05	1.0	12.0	2.0	-2.5	11.5	
213	2421.97500	2.10	1.0	12.0	2.0	-2.1	11.9	
214	2422.02500	2.15	1.0	12.0	2.0	-2.1	11.9	
215	2422.07500	2.20	1.0	12.0	2.0	-2.1	11.9	
216	2422.12500	2.25	1.0	12.0	2.0	-2.1	11.9	
217	2422.17500	2.30	1.0	12.0	2.0	-1.8	12.2	
218	2422.22500	2.35	1.0	12.0	2.0	-1.8	12.2	
219	2422.27500	2.40	1.0	12.0	2.0	-1.8	12.2	
220	2422.32500	2.45	1.0	12.0	2.0	-1.8	12.2	
221	2422.37500	2.50	1.0	12.0	2.0	-2.0	12.0	
222	2422.42500	2.55	1.0	12.0	2.0	-2.0	12.0	
223	2422.47500	2.60	1.0	12.0	2.0	-2.1	11.9	
224	2422.52500	2.65	1.0	12.0	2.0	-2.2	11.8	
225	2422.57500	2.70	1.0	12.0	2.0	-2.3	11.7	
226	2422.62500	2.75	1.0	12.0	2.0	-2.5	11.5	
227	2422.67500	2.80	1.0	12.0	2.0	-2.5	11.5	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
228	2422.72500	2.85	1.0	12.0	2.0	-2.6	11.4	
229	2422.77500	2.90	1.0	12.0	2.0	-2.7	11.3	
230	2422.82500	2.95	1.0	12.0	2.0	-2.8	11.2	64
231	2422.87500	3.00	1.0	12.0	2.0	-2.8	11.2	65
232	2422.92500	3.05	1.0	12.0	2.0	-2.7	11.3	
233	2422.97500	3.10	1.0	12.0	2.0	-2.8	11.2	66
234	2423.02500	3.15	1.0	12.0	2.0	-2.6	11.4	
235	2423.07500	3.20	1.0	12.0	2.0	-2.3	11.7	
236	2423.12500	3.25	1.0	12.0	2.0	-2.1	11.9	
237	2423.17500	3.30	1.0	12.0	2.0	-2.0	12.0	
238	2423.22500	3.35	1.0	12.0	2.0	-1.9	12.1	
239	2423.27500	3.40	1.0	12.0	2.0	-1.7	12.3	
240	2423.32500	3.45	1.0	12.0	2.0	-1.5	12.5	
241	2423.37500	3.50	1.0	12.0	2.0	-1.5	12.5	
242	2423.42500	3.55	1.0	12.0	2.0	-1.5	12.5	
243	2423.47500	3.60	1.0	12.0	2.0	-1.6	12.4	
244	2423.52500	3.65	1.0	12.0	2.0	-1.6	12.4	
245	2423.57500	3.70	1.0	12.0	2.0	-1.8	12.2	
246	2423.62500	3.75	1.0	12.0	2.0	-2.0	12.0	
247	2423.67500	3.80	1.0	12.0	2.0	-2.0	12.0	
248	2423.72500	3.85	1.0	12.0	2.0	-2.1	11.9	
249	2423.77500	3.90	1.0	12.0	2.0	-1.9	12.1	
250	2423.82500	3.95	1.0	12.0	2.0	-1.9	12.1	
251	2423.87500	4.00	1.0	12.0	2.0	-1.9	12.1	
252	2423.92500	4.05	1.0	12.0	2.0	-1.6	12.4	
253	2423.97500	4.10	1.0	12.0	2.0	-1.5	12.5	
254	2424.02500	4.15	1.0	12.0	2.0	-1.7	12.3	
255	2424.07500	4.20	1.0	12.0	2.0	-1.2	12.8	
256	2424.12500	4.25	1.0	12.0	2.0	-0.9	13.1	
257	2424.17500	4.30	1.0	12.0	2.0	-0.9	13.1	
258	2424.22500	4.35	1.0	12.0	2.0	-0.9	13.1	
259	2424.27500	4.40	1.0	12.0	2.0	-0.6	13.4	
260	2424.32500	4.45	1.0	12.0	2.0	-0.5	13.5	
261	2424.37500	4.50	1.0	12.0	2.0	-0.4	13.6	
262	2424.42500	4.55	1.0	12.0	2.0	-0.3	13.7	
263	2424.47500	4.60	1.0	12.0	2.0	-0.3	13.7	
264	2424.52500	4.65	1.0	12.0	2.0	-0.3	13.7	
265	2424.57500	4.70	1.0	12.0	2.0	-0.3	13.7	
266	2424.62500	4.75	1.0	12.0	2.0	-0.5	13.5	
267	2424.67500	4.80	1.0	12.0	2.0	-0.6	13.4	
268	2424.72500	4.85	1.0	12.0	2.0	-0.7	13.3	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
269	2424.77500	4.90	1.0	12.0	2.0	-0.6	13.4	
270	2424.82500	4.95	1.0	12.0	2.0	-0.4	13.6	
271	2424.87500	5.00	1.0	12.0	2.0	-0.2	13.8	
272	2424.92500	5.05	1.0	12.0	2.0	0.2	14.2	
273	2424.97500	5.10	1.0	12.0	2.0	0.5	14.5	
274	2425.02500	5.15	1.0	12.0	2.0	1.0	15.0	
275	2425.07500	5.20	1.0	12.0	2.0	1.0	15.0	
276	2425.12500	5.25	1.0	12.0	2.0	2.0	16.0	
277	2425.17500	5.30	1.0	12.0	2.0	2.0	16.0	
278	2425.22500	5.35	1.0	12.0	2.0	2.1	16.1	
279	2425.27500	5.40	1.0	12.0	2.0	2.1	16.1	
280	2425.32500	5.45	1.0	12.0	2.0	2.1	16.1	
281	2425.37500	5.50	1.0	12.0	2.0	2.1	16.1	
282	2425.42500	5.55	1.0	12.0	2.0	2.1	16.1	
283	2425.47500	5.60	1.0	12.0	2.0	2.2	16.2	
284	2425.52500	5.65	1.0	12.0	2.0	2.2	16.2	
285	2425.57500	5.70	1.0	12.0	2.0	2.2	16.2	
286	2425.62500	5.75	1.0	12.0	2.0	2.3	16.3	
287	2425.67500	5.80	1.0	12.0	2.0	2.4	16.4	
288	2425.72500	5.85	1.0	12.0	2.0	2.8	16.8	
289	2425.77500	5.90	1.0	12.0	2.0	3.0	17.0	
290	2425.82500	5.95	1.0	12.0	2.0	3.0	17.0	
291	2425.87500	6.00	1.0	12.0	2.0	3.0	17.0	
292	2425.92500	6.05	1.0	12.0	2.0	3.0	17.0	
293	2425.97500	6.10	1.0	12.0	2.0	3.0	17.0	
294	2426.02500	6.15	1.0	12.0	2.0	2.8	16.8	
295	2426.07500	6.20	1.0	12.0	2.0	2.6	16.6	
296	2426.12500	6.25	1.0	12.0	2.0	2.6	16.6	
297	2426.17500	6.30	1.0	12.0	2.0	2.6	16.6	
298	2426.22500	6.35	1.0	12.0	2.0	2.6	16.6	
299	2426.27500	6.40	1.0	12.0	2.0	2.9	16.9	
300	2426.32500	6.45	1.0	12.0	2.0	3.0	17.0	
301	2426.37500	6.50	1.0	12.0	2.0	3.5	17.5	
302	2426.42500	6.55	1.0	12.0	2.0	3.8	17.8	
303	2426.47500	6.60	1.0	12.0	2.0	4.1	18.1	
304	2426.52500	6.65	1.0	12.0	2.0	3.9	17.9	
305	2426.57500	6.70	1.0	12.0	2.0	4.2	18.2	
306	2426.62500	6.75	1.0	12.0	2.0	4.1	18.1	
307	2426.67500	6.80	1.0	12.0	2.0	4.1	18.1	
308	2426.72500	6.85	1.0	12.0	2.0	4.6	18.6	
309	2426.77500	6.90	1.0	12.0	2.0	4.6	18.6	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
310	2426.82500	6.95	1.0	12.0	2.0	4.6	18.6	
311	2426.87500	7.00	1.0	12.0	2.0	4.5	18.5	
312	2426.92500	7.05	1.0	12.0	2.0	4.6	18.6	
313	2426.97500	7.10	1.0	12.0	2.0	4.7	18.7	
314	2427.02500	7.15	1.0	12.0	2.0	4.7	18.7	
315	2427.07500	7.20	1.0	12.0	2.0	4.7	18.7	
316	2427.12500	7.25	1.0	12.0	2.0	4.9	18.9	
317	2427.17500	7.30	1.0	12.0	2.0	4.9	18.9	
318	2427.22500	7.35	1.0	12.0	2.0	5.0	19.0	
319	2427.27500	7.40	1.0	12.0	2.0	5.3	19.3	
320	2427.32500	7.45	1.0	12.0	2.0	5.2	19.2	
321	2427.37500	7.50	1.0	12.0	2.0	5.4	19.4	
322	2427.42500	7.55	1.0	12.0	2.0	5.4	19.4	
323	2427.47500	7.60	1.0	12.0	2.0	5.6	19.6	
324	2427.52500	7.65	1.0	12.0	2.0	5.8	19.8	
325	2427.57500	7.70	1.0	12.0	2.0	5.8	19.8	
326	2427.62500	7.75	1.0	12.0	2.0	5.8	19.8	
327	2427.67500	7.80	1.0	12.0	2.0	5.7	19.7	
328	2427.72500	7.85	1.0	12.0	2.0	6.1	20.1	
329	2427.77500	7.90	1.0	12.0	2.0	6.0	20.0	
330	2427.82500	7.95	1.0	12.0	2.0	6.4	20.4	
331	2427.87500	8.00	1.0	12.0	2.0	6.2	20.2	
332	2427.92500	8.05	1.0	12.0	2.0	6.3	20.3	
333	2427.97500	8.10	1.0	12.0	2.0	6.3	20.3	
334	2428.02500	8.15	1.0	12.0	2.0	6.3	20.3	
335	2428.07500	8.20	1.0	12.0	2.0	6.6	20.6	
336	2428.12500	8.25	1.0	12.0	2.0	6.6	20.6	
337	2428.17500	8.30	1.0	12.0	2.0	7.0	21.0	
338	2428.22500	8.35	1.0	12.0	2.0	7.0	21.0	
339	2428.27500	8.40	1.0	12.0	2.0	7.1	21.1	
340	2428.32500	8.45	1.0	12.0	2.0	7.2	21.2	
341	2428.37500	8.50	1.0	12.0	2.0	7.3	21.3	

Channel #18, Fc = 2464.8750 MHz	**Data Rate = 0.818 Mbps (DQPSK), Narrow**
Chip Rate = 4.5 MHz	**PN Code Length = 11 chips/symbol**
6 dB BW = 4 MHz	

(S/N)o = 12 dB per attached Figure 4.5.1
Measured Processing Gain Gp = (S/N)o + Lsys + Mj = 12 + 2 + Mj = 14 + Mj (dB)
Theoretical Calculated Processing Gain = Chip Rate/Data rate = 4.5 MHz / (0.818 Mb/s)/(2 bits/symbol) = 11 or 10.4 dB

Note:
- Total Peak Power from the EUT's Tx measured at the EUT's Rx Input: P_t = -74 dBm
- Jamming signal level at measured at the EUT's receiver input: J
- Mj = J-P_t
- The following shaded boxes are discarded worst measurements (17.7% of total measurement points)

SUMMARY OF TEST RESULTS	
Theoretical Process Gain	**10.4 dB**
Minimum Measured Process Gain with discard of 17.7% of the worst measurements	**12.2 dB**

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	2460.37500	-4.50	1.0	12.0	2.0	5.0	19.0	
2	2460.42500	-4.45	1.0	12.0	2.0	5.0	19.0	
3	2460.47500	-4.40	1.0	12.0	2.0	5.0	19.0	
4	2460.52500	-4.35	1.0	12.0	2.0	4.9	18.9	
5	2460.57500	-4.30	1.0	12.0	2.0	4.7	18.7	
6	2460.62500	-4.25	1.0	12.0	2.0	4.6	18.6	
7	2460.67500	-4.20	1.0	12.0	2.0	4.5	18.5	
8	2460.72500	-4.15	1.0	12.0	2.0	4.3	18.3	
9	2460.77500	-4.10	1.0	12.0	2.0	4.1	18.1	
10	2460.82500	-4.05	1.0	12.0	2.0	4.0	18.0	
11	2460.87500	-4.00	1.0	12.0	2.0	3.8	17.8	
12	2460.92500	-3.95	1.0	12.0	2.0	3.8	17.8	
13	2460.97500	-3.90	1.0	12.0	2.0	3.5	17.5	
14	2461.02500	-3.85	1.0	12.0	2.0	3.5	17.5	
15	2461.07500	-3.80	1.0	12.0	2.0	3.3	17.3	
16	2461.12500	-3.75	1.0	12.0	2.0	3.1	17.1	
17	2461.17500	-3.70	1.0	12.0	2.0	3.0	17.0	
18	2461.22500	-3.65	1.0	12.0	2.0	3.0	17.0	
19	2461.27500	-3.60	1.0	12.0	2.0	2.7	16.7	
20	2461.32500	-3.55	1.0	12.0	2.0	2.7	16.7	
21	2461.37500	-3.50	1.0	12.0	2.0	2.6	16.6	
22	2461.42500	-3.45	1.0	12.0	2.0	2.5	16.5	
23	2461.47500	-3.40	1.0	12.0	2.0	2.2	16.2	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
24	2461.52500	-3.35	1.0	12.0	2.0	2.4	16.4	
25	2461.57500	-3.30	1.0	12.0	2.0	2.3	16.3	
26	2461.62500	-3.25	1.0	12.0	2.0	2.2	16.2	
27	2461.67500	-3.20	1.0	12.0	2.0	1.9	15.9	
28	2461.72500	-3.15	1.0	12.0	2.0	1.9	15.9	
29	2461.77500	-3.10	1.0	12.0	2.0	1.8	15.8	
30	2461.82500	-3.05	1.0	12.0	2.0	1.9	15.9	
31	2461.87500	-3.00	1.0	12.0	2.0	1.8	15.8	
32	2461.92500	-2.95	1.0	12.0	2.0	1.7	15.7	
33	2461.97500	-2.90	1.0	12.0	2.0	1.6	15.6	
34	2462.02500	-2.85	1.0	12.0	2.0	1.5	15.5	
35	2462.07500	-2.80	1.0	12.0	2.0	1.4	15.4	
36	2462.12500	-2.75	1.0	12.0	2.0	1.4	15.4	
37	2462.17500	-2.70	1.0	12.0	2.0	1.3	15.3	
38	2462.22500	-2.65	1.0	12.0	2.0	1.1	15.1	
39	2462.27500	-2.60	1.0	12.0	2.0	1.2	15.2	
40	2462.32500	-2.55	1.0	12.0	2.0	0.8	14.8	
41	2462.37500	-2.50	1.0	12.0	2.0	0.8	14.8	
42	2462.42500	-2.45	1.0	12.0	2.0	0.7	14.7	
43	2462.47500	-2.40	1.0	12.0	2.0	0.9	14.9	
44	2462.52500	-2.35	1.0	12.0	2.0	1.0	15.0	
45	2462.57500	-2.30	1.0	12.0	2.0	0.9	14.9	
46	2462.62500	-2.25	1.0	12.0	2.0	0.9	14.9	
47	2462.67500	-2.20	1.0	12.0	2.0	0.8	14.8	
48	2462.72500	-2.15	1.0	12.0	2.0	0.9	14.9	
49	2462.77500	-2.10	1.0	12.0	2.0	0.9	14.9	
50	2462.82500	-2.05	1.0	12.0	2.0	0.4	14.4	
51	2462.87500	-2.00	1.0	12.0	2.0	-0.6	13.4	
52	2462.92500	-1.95	1.0	12.0	2.0	-1.0	13.0	
53	2462.97500	-1.90	1.0	12.0	2.0	-0.8	13.2	
54	2463.02500	-1.85	1.0	12.0	2.0	-0.4	13.6	
55	2463.07500	-1.80	1.0	12.0	2.0	0.0	14.0	
56	2463.12500	-1.75	1.0	12.0	2.0	-0.2	13.8	
57	2463.17500	-1.70	1.0	12.0	2.0	-0.8	13.2	
58	2463.22500	-1.65	1.0	12.0	2.0	-1.4	12.6	
59	2463.27500	-1.60	1.0	12.0	2.0	-1.4	12.6	
60	2463.32500	-1.55	1.0	12.0	2.0	-1.5	12.5	
61	2463.37500	-1.50	1.0	12.0	2.0	-1.5	12.5	
62	2463.42500	-1.45	1.0	12.0	2.0	-1.0	13.0	
63	2463.47500	-1.40	1.0	12.0	2.0	-0.6	13.4	
64	2463.52500	-1.35	1.0	12.0	2.0	-0.4	13.6	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
65	2463.57500	-1.30	1.0	12.0	2.0	-0.6	13.4	
66	2463.62500	-1.25	1.0	12.0	2.0	-1.6	12.4	
67	2463.67500	-1.20	1.0	12.0	2.0	-2.3	11.7	16
68	2463.72500	-1.15	1.0	12.0	2.0	-2.3	11.7	17
69	2463.77500	-1.10	1.0	12.0	2.0	-2.0	12.0	28
70	2463.82500	-1.05	1.0	12.0	2.0	-1.6	12.4	
71	2463.87500	-1.00	1.0	12.0	2.0	-1.4	12.6	
72	2463.92500	-0.95	1.0	12.0	2.0	-0.8	13.2	
73	2463.97500	-0.90	1.0	12.0	2.0	-0.9	13.1	
74	2464.02500	-0.85	1.0	12.0	2.0	-1.2	12.8	
75	2464.07500	-0.80	1.0	12.0	2.0	-1.9	12.1	21
76	2464.12500	-0.75	1.0	12.0	2.0	-2.5	11.5	9
77	2464.17500	-0.70	1.0	12.0	2.0	-2.8	11.4	5
78	2464.22500	-0.65	1.0	12.0	2.0	-2.6	11.4	6
79	2464.27500	-0.60	1.0	12.0	2.0	-2.3	11.7	18
80	2464.32500	-0.55	1.0	12.0	2.0	-1.2	12.8	
81	2464.37500	-0.50	1.0	12.0	2.0	-1.3	12.7	
82	2464.42500	-0.45	1.0	12.0	2.0	-1.6	12.4	
83	2464.47500	-0.40	1.0	12.0	2.0	-2.3	11.7	19
84	2464.52500	-0.35	1.0	12.0	2.0	-2.4	11.6	13
85	2464.57500	-0.30	1.0	12.0	2.0	-2.8	11.2	2
86	2464.62500	-0.25	1.0	12.0	2.0	-2.8	11.2	3
87	2464.67500	-0.20	1.0	12.0	2.0	-2.5	11.5	10
88	2464.72500	-0.15	1.0	12.0	2.0	-1.7	12.3	
89	2464.77500	-0.10	1.0	12.0	2.0	-1.9	12.1	22
90	2464.82500	-0.05	1.0	12.0	2.0	-2.8	11.4	7
91	2464.87500	0.00	1.0	12.0	2.0	-2.9	11.1	1
92	2464.92500	0.05	1.0	12.0	2.0	-2.3	11.7	20
93	2464.97500	0.10	1.0	12.0	2.0	-2.0	12.0	27
94	2465.02500	0.15	1.0	12.0	2.0	-2.0	12.0	26
95	2465.07500	0.20	1.0	12.0	2.0	-2.3	11.7	21
96	2465.12500	0.25	1.0	12.0	2.0	-2.5	11.5	11
97	2465.17500	0.30	1.0	12.0	2.0	-2.6	11.4	8
98	2465.22500	0.35	1.0	12.0	2.0	-2.4	11.6	14
99	2465.27500	0.40	1.0	12.0	2.0	-2.4	11.6	15
100	2465.32500	0.45	1.0	12.0	2.0	-2.1	11.9	25
101	2465.37500	0.50	1.0	12.0	2.0	-1.8	12.2	
102	2465.42500	0.55	1.0	12.0	2.0	-1.8	12.2	
103	2465.47500	0.60	1.0	12.0	2.0	-2.3	11.7	22
104	2465.52500	0.65	1.0	12.0	2.0	-2.7	11.3	4
105	2465.57500	0.70	1.0	12.0	2.0	-2.5	11.5	12

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
106	2465.62500	0.75	1.0	12.0	2.0	-2.2	11.8	23
107	2465.67500	0.80	1.0	12.0	2.0	-2.2	11.8	24
108	2465.72500	0.85	1.0	12.0	2.0	-1.5	12.5	
109	2465.77500	0.90	1.0	12.0	2.0	-1.4	12.6	
110	2465.82500	0.95	1.0	12.0	2.0	-1.1	12.9	
111	2465.87500	1.00	1.0	12.0	2.0	-1.2	12.8	
112	2465.92500	1.05	1.0	12.0	2.0	-1.8	12.2	
113	2465.97500	1.10	1.0	12.0	2.0	-1.8	12.2	
114	2466.02500	1.15	1.0	12.0	2.0	-1.8	12.2	
115	2466.07500	1.20	1.0	12.0	2.0	-2.0	12.0	29
116	2466.12500	1.25	1.0	12.0	2.0	-2.0	12.0	30
117	2466.17500	1.30	1.0	12.0	2.0	-1.3	12.7	
118	2466.22500	1.35	1.0	12.0	2.0	-1.1	12.9	
119	2466.27500	1.40	1.0	12.0	2.0	-0.7	13.3	
120	2466.32500	1.45	1.0	12.0	2.0	-1.0	13.0	
121	2466.37500	1.50	1.0	12.0	2.0	-1.3	12.7	
122	2466.42500	1.55	1.0	12.0	2.0	-1.3	12.7	
123	2466.47500	1.60	1.0	12.0	2.0	-1.3	12.7	
124	2466.52500	1.65	1.0	12.0	2.0	-1.3	12.7	
125	2466.57500	1.70	1.0	12.0	2.0	-0.4	13.6	
126	2466.62500	1.75	1.0	12.0	2.0	-0.2	13.8	
127	2466.67500	1.80	1.0	12.0	2.0	0.0	14.0	
128	2466.72500	1.85	1.0	12.0	2.0	-0.1	13.9	
129	2466.77500	1.90	1.0	12.0	2.0	-0.1	13.9	
130	2466.82500	1.95	1.0	12.0	2.0	-0.4	13.6	
131	2466.87500	2.00	1.0	12.0	2.0	-0.1	13.9	
132	2466.92500	2.05	1.0	12.0	2.0	0.7	14.7	
133	2466.97500	2.10	1.0	12.0	2.0	1.6	15.6	
134	2467.02500	2.15	1.0	12.0	2.0	1.7	15.7	
135	2467.07500	2.20	1.0	12.0	2.0	1.7	15.7	
136	2467.12500	2.25	1.0	12.0	2.0	1.8	15.8	
137	2467.17500	2.30	1.0	12.0	2.0	1.9	15.9	
138	2467.22500	2.35	1.0	12.0	2.0	2.1	16.1	
139	2467.27500	2.40	1.0	12.0	2.0	1.9	15.9	
140	2467.32500	2.45	1.0	12.0	2.0	1.7	15.7	
141	2467.37500	2.50	1.0	12.0	2.0	1.6	15.6	
142	2467.42500	2.55	1.0	12.0	2.0	1.5	15.5	
143	2467.47500	2.60	1.0	12.0	2.0	1.9	15.9	
144	2467.52500	2.65	1.0	12.0	2.0	2.3	16.3	
145	2467.57500	2.70	1.0	12.0	2.0	2.6	16.6	
146	2467.62500	2.75	1.0	12.0	2.0	2.8	16.8	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
147	2467.67500	2.80	1.0	12.0	2.0	2.9	16.9	
148	2467.72500	2.85	1.0	12.0	2.0	2.9	16.9	
149	2467.77500	2.90	1.0	12.0	2.0	3.0	17.0	
150	2467.82500	2.95	1.0	12.0	2.0	3.0	17.0	
151	2467.87500	3.00	1.0	12.0	2.0	3.3	17.3	
152	2467.92500	3.05	1.0	12.0	2.0	3.7	17.7	
153	2467.97500	3.10	1.0	12.0	2.0	3.7	17.7	
154	2468.02500	3.15	1.0	12.0	2.0	3.9	17.9	
155	2468.07500	3.20	1.0	12.0	2.0	4.0	18.0	
156	2468.12500	3.25	1.0	12.0	2.0	4.0	18.0	
157	2468.17500	3.30	1.0	12.0	2.0	4.5	18.5	
158	2468.22500	3.35	1.0	12.0	2.0	4.5	18.5	
159	2468.27500	3.40	1.0	12.0	2.0	4.5	18.5	
160	2468.32500	3.45	1.0	12.0	2.0	4.8	18.8	
161	2468.37500	3.50	1.0	12.0	2.0	4.8	18.8	
162	2468.42500	3.55	1.0	12.0	2.0	4.8	18.8	
163	2468.47500	3.60	1.0	12.0	2.0	5.0	19.0	
164	2468.52500	3.65	1.0	12.0	2.0	5.4	19.4	
165	2468.57500	3.70	1.0	12.0	2.0	5.6	19.6	
166	2468.62500	3.75	1.0	12.0	2.0	5.7	19.7	
167	2468.67500	3.80	1.0	12.0	2.0	5.8	19.8	
168	2468.72500	3.85	1.0	12.0	2.0	6.1	20.1	
169	2468.77500	3.90	1.0	12.0	2.0	6.1	20.1	
170	2468.82500	3.95	1.0	12.0	2.0	6.2	20.2	
171	2468.87500	4.00	1.0	12.0	2.0	6.3	20.3	
172	2468.92500	4.05	1.0	12.0	2.0	6.9	20.9	
173	2468.97500	4.10	1.0	12.0	2.0	6.9	20.9	
174	2469.02500	4.15	1.0	12.0	2.0	7.1	21.1	
175	2469.07500	4.20	1.0	12.0	2.0	7.3	21.3	
176	2469.12500	4.25	1.0	12.0	2.0	7.3	21.3	
177	2469.17500	4.30	1.0	12.0	2.0	7.7	21.7	
178	2469.22500	4.35	1.0	12.0	2.0	7.9	21.9	
179	2469.27500	4.40	1.0	12.0	2.0	7.9	21.9	
180	2469.32500	4.45	1.0	12.0	2.0	8.0	22.0	
181	2469.37500	4.50	1.0	12.0	2.0	8.0	22.0	

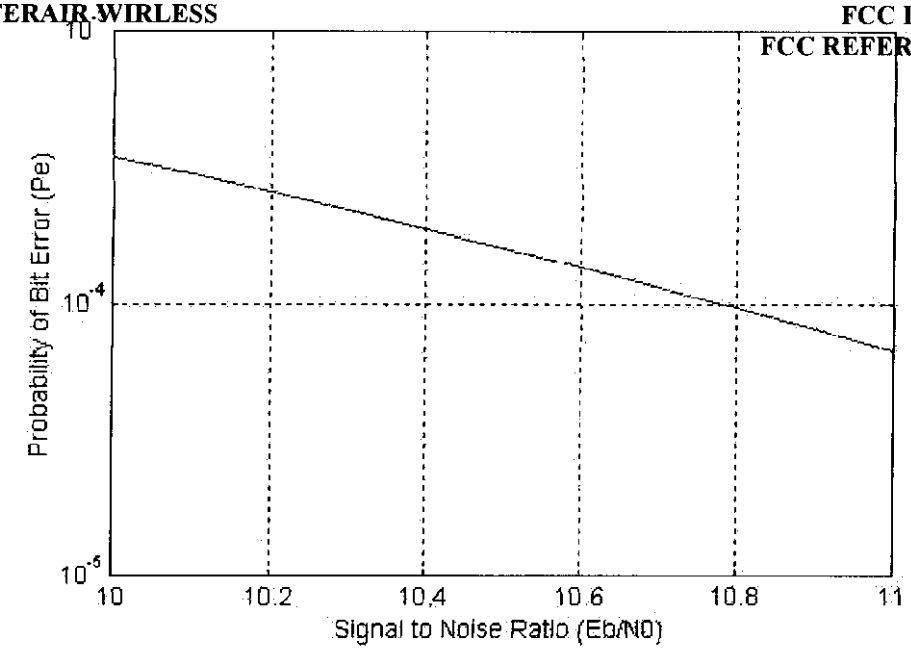
Appendix 1

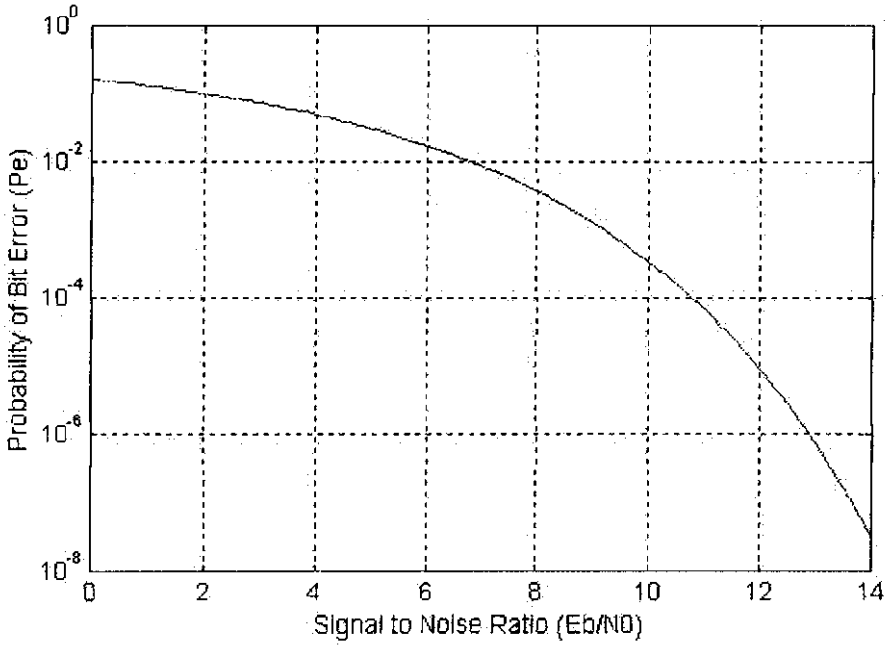
The following is a Matlab program which plots the DQPSK probability of error vs. Eb/No. This was derived using a formula from the following reference:

Feher, Kamilo: *Wireless Digital Communications: Modulation and Spread Spectrum Applications*, Prentice Hall, Upper Saddle River, New Jersey, 1995, pp211-213

Matlab Code

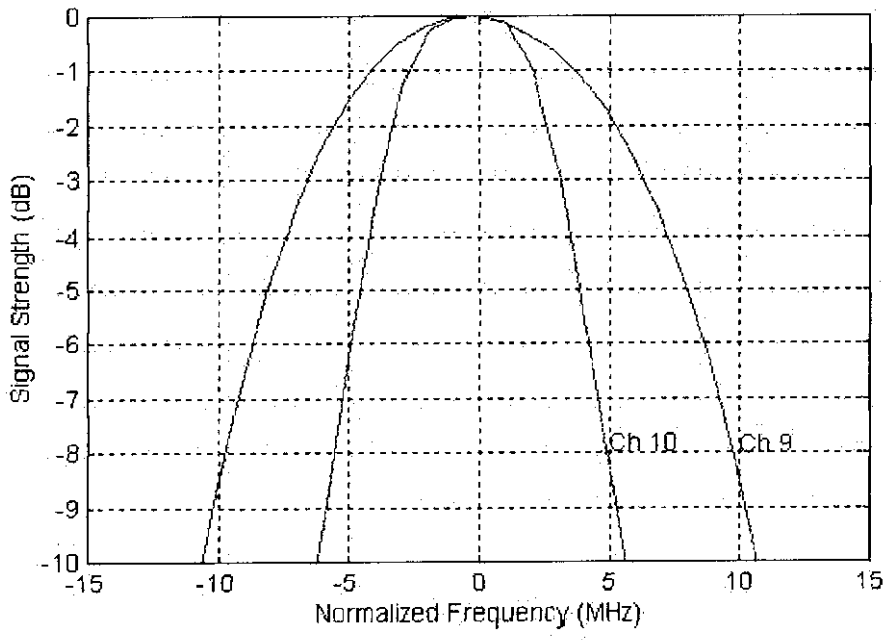
```
function [SNR,BER]=berdqpsk(K)

%this is an m-file to calculate the ber of a
%dqpsk system. The Eb/N ranges from 0 to 14 dB
%The formula used is on page 212 of Dr. Feher's
%book, "Wireless Digital Communications"
%K is the number of sums in the Q function

SNR=0:0.1:13;
GAMMA=10.^(SNR/10);
A=sqrt(2*GAMMA*(1-1/sqrt(2)));
B=sqrt(2*GAMMA*(1+1/sqrt(2)));
Q=zeros(size(SNR));
for k=0:K
   Q=Q+(A./B).^(k).*besseli(k,A.*B);
end
BER=exp(-(A.^2+B.^2)/2).*(Q-besseli(0,A.*B)/2);
semilogy(SNR,BER);
```

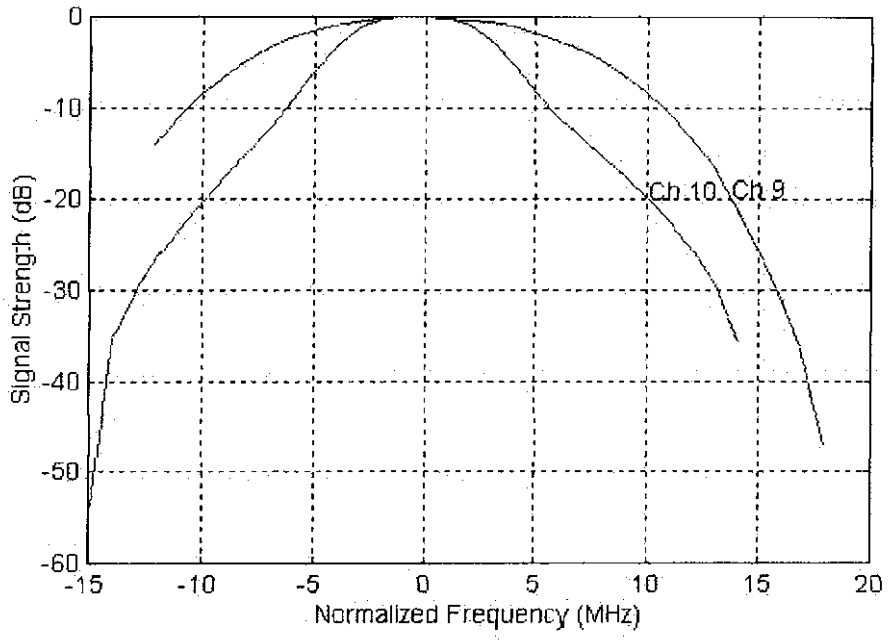

Probability of Bit Error (Pe)
10^0
10^-4
10^-5
10
10.2
10.4
10.6
10.8
11
Signal to Noise Ratio (Eb/N0)


Probability of Bit Error (Pe)
10^0
10^-2
10^-4
10^-6
10^-8
0
2
4
6
8
10
12
14
Signal to Noise Ratio (Eb/N0)

Appendix 2

The receiver has two IF filter bandwidths. A signal generator was used to sweep the receiver RF input and the IF output was measured. Measurements were made on two different channels with the two bandwidths. The following plot was made from the test data. The plot represents the IF filter bandwidths of the receiver. The 6 dB bandwidth is 17 MHz in wideband mode and 9 MHz in narrowband mode.




0
-10
-20
-30
-40
-50
-60
Signal Strength (dB)
-15
-10
-5
0
5
10
15
20
Normalized Frequency (MHz)
Ch 10
Ch 9

MEASUREMENT DATA

RADIATED EMISSIONS MEASUREMENTS @ 3 METERS

TEST CONFIGURATION

- *This lowest, middle and highest channels were established at its full rated output power. The emissions were investigated from the lowest frequency generated by the transmitter up to the 10th harmonic of the fundamental emissions in each case. the measured level of the carrier was recorded and compared to the level of the emissions as required in Parts 15.247(c) or 15.209(a) whichever was applicable.*
- *For measuring radiated emissions at frequencies below 1 GHz, the Spectrum Analyzer was set as 100 KHz RBW, VBW ≥ RBW, SWEEP TIME: AUTO, PEAK DETECTOR.*
- *For measuring radiated emissions at frequencies above 1 GHz, the Spectrum Analyzer was set as 1 MHz RBW, 1 MHz VBW, SWEEP TIME: AUTO for PEAK measurements and 1 MHz RBW, 10 Hz VBW, SWEEP TIME: AUTO for AVERAGE measurements.*
- *The following measurements were the worst cases when the radiating antenna was placed in both horizontal and vertical polarization.*
- *The following **AVERAGE** rf levels were obtained from either Peak or Average readings added by the duty cycle correction factor. **DUTY CYCLE FACTOR = $20LOG_{10}(0.45)$ = -6.9 dB***

▪ Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi

Channel #: 3, Frequency: 2408.625 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 126.3 dBuV/m** **Limit = 106.3 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1493.00	61.4	48.1	V	54.0	106.3	-5.9	PASS
1493.00	60.1	49.4	H	54.0	106.3	-4.6	PASS
2373.00	72.1	51.3	H	54.0	106.3	-2.7	PASS
2390.00	65.2	47.4	H	54.0	106.3	-6.6	PASS
2408.63	114.6	--	V	--	--	--	--
2408.63	126.3	--	H	--	--	--	--
4816.00	50.7	29.3	V	54.0	106.3	-24.7	PASS
4816.00	49.3	28.3	H	54.0	106.3	-25.7	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi**

Channel #: 4, Frequency: 2411.4375 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, medium , 11 chips/symbol,** **Data Rate: 5.625 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 125.3 dBuV/m** **Limit = 105.3 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1496.00	61.3	47.2	V	54.0	105.3	-6.8	PASS
1496.00	62.0	49.0	H	54.0	105.3	-5.0	PASS
2376.00	72.7	52.4	H	54.0	105.3	-1.6	PASS
2390.00	64.9	43.0	H	54.0	105.3	-11.0	PASS
2411.44	109.3	--	V	--	--	--	--
2411.44	125.3	--	H	--	--	--	--
4488.00	48.3	30.1	V	54.0	105.3	-75.2	PASS
4488.00	47.4	31.4	H	54.0	105.3	-73.9	PASS
4822.00	52.3	34.3	V	54.0	105.3	-19.7	PASS
4822.00	51.2	31.8	H	54.0	105.3	-22.2	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi**

Channel #: 6, Frequency: 2419.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, wide, 11 chips/symbol,** **Data Rate: 11.25 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 123.9 dBuV/m** **Limit = 103.9 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1504.00	60.1	47.0	V	54.0	103.9	-7.0	PASS
1504.00	62.8	49.8	H	54.0	103.9	-4.2	PASS
2379.30	67.1	43.9	H	54.0	103.9	-10.1	PASS
2385.30	73.1	50.3	H	54.0	103.9	-3.7	PASS
2390.00	73.2	46.1	H	54.0	103.9	-7.9	PASS
2419.88	108.6	--	V	--	--	--	--
2419.88	123.9	--	H	--	--	--	--
4512.00	48.2	29.4	V	54.0	103.9	-24.6	PASS
4512.00	47.6	30.0	H	54.0	103.9	-24.0	PASS
4838.00	55.0	33.9	V	54.0	103.9	-20.1	PASS
4838.00	50.3	30.4	H	54.0	103.9	-23.6	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi**

Channel #: 18, Frequency: 2464.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 125.5 dBuV/m** **Limit = 105.5 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1549.00	61.3	46.9	V	54.0	105.5	-7.1	PASS
1549.00	60.7	47.0	H	54.0	105.5	-7.0	PASS
2383.50	67.3	42.6	H	54.0	105.5	-11.4	PASS
2464.88	111.3	--	V	--	--	--	--
2464.88	125.5	--	H	--	--	--	--
4647.00	50.2	34.6	V	54.0	105.5	-19.4	PASS
4647.00	48.3	31.0	H	54.0	105.5	-23.0	PASS
4928.00	50.4	31.0	V	54.0	105.5	-23.0	PASS
4928.00	50.4	31.5	H	54.0	105.5	-22.5	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x1 Patch Antenna, P/N:64958022, Gain: 8.5 dBi**

Channel #: 3, Frequency: 2408.625 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 119.5 dBuV/m** **Limit = 99.5 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1493.00	62.7	50.4	V	54.0	99.5	-3.6	PASS
1493.00	59.7	46.9	H	54.0	99.5	-7.1	PASS
2408.63	113.8	--	V	--	--	--	--
2408.63	119.5	--	H	--	--	--	--
4816.00	51.4	35.0	V	54.0	99.5	-19.0	PASS
4816.00	50.5	33.4	H	54.0	99.5	-20.6	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x1 Patch Antenna, P/N:64958022, Gain: 8.5 dBi**

Channel #: 4, Frequency: 2411.4375 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, medium , 11 chips/symbol,** **Data Rate: 5.625 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: dBuV/m** **Limit = dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1496.00	59.3	42.7	V	54.0	105.2	-11.3	PASS
1496.00	59.5	42.7	H	54.0	105.2	-11.3	PASS
2376.70	63.8	40.6	H	54.0	105.2	-13.4	PASS
2390.00	62.8	40.9	H	54.0	105.2	-13.1	PASS
2411.44	115.5	--	V	--	--	--	--
2411.44	125.2	--	H	--	--	--	--
4488.00	48.2	34.0	V	54.0	105.2	-71.2	PASS
4488.00	48.3	32.6	H	54.0	105.2	-72.6	PASS
4822.00	49.3	34.5	V	54.0	105.2	-19.5	PASS
4822.00	50.8	35.4	H	54.0	105.2	-18.7	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x1 Patch Antenna, P/N:64958022, Gain: 8.5 dBi**

Channel #: 6, Frequency: 2419.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, wide, 11 chips/symbol,** **Data Rate: 11.25 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 123.3 dBuV/m** **Limit = 103.3 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1504.00	61.3	47.3	V	54.0	103.3	-6.7	PASS
1504.00	61.8	48.8	H	54.0	103.3	-5.2	PASS
2385.00	60.4	46.1	V	54.0	103.3	-7.9	PASS
2385.00	73.9	58.6	H	54.0	103.3	4.6	PASS
2390.00	69.1	44.6	H	54.0	103.3	-9.4	PASS
2419.88	112.8	--	V	--	--	--	--
2419.88	123.3	--	H	--	--	--	--
4838.00	50.6	30.4	V	54.0	103.3	-23.6	PASS
4838.00	53.3	36.9	H	54.0	103.3	-17.2	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x1 Patch Antenna, P/N:64958022, Gain: 8.5 dBi**

Channel #: 18, Frequency: 2464.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 125.4 dBuV/m** **Limit = 105.4 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2464.88	114.1	--	V	--	--	--	--
2464.88	125.4	--	H	--	--	--	--
2383.50	71.5	43.9	H	54.0	98.5	-54.6	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Andrew Omni Antenna , P/N: RT1N0F-024V-013A, Gain: 13 dBi**

Channel #: 3, Frequency: 2408.625 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 125.3 dBuV/m** **Limit = 105.3 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1493.00	62.0	44.4	V	54.0	105.3	-9.7	PASS
1493.00	59.6	45.4	H	54.0	105.3	-8.7	PASS
2374.10	66.4	47.3	V	54.0	105.3	-6.7	PASS
2384.00	60.1	42.7	V	54.0	105.3	-11.3	PASS
2390.00	69.4	45.7	V	54.0	105.3	-8.3	PASS
2408.63	125.3	--	V	--	--	--	--
2408.63	115.1	--	H	--	--	--	--
4816.00	52.3	32.6	V	54.0	105.3	-21.4	PASS
4816.00	51.5	32.7	H	54.0	105.3	-21.3	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Andrew Omni Antenna , P/N: RT1N0F-024V-013A, Gain: 13 dBi**

Channel #: 4, Frequency: 2411.4375 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, medium , 11 chips/symbol,** **Data Rate: 5.625 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 124.6 dBuV/m** **Limit = 104.6 dBuV/m**			
(MHz) FREQUENCY	RF (dBuV/m) PEAK LEVEL	RF (dBuV/m) AVG LEVEL	ANTENNA (H/V) PLANE	LIMIT (dBuV/m) 15.209	LIMIT (dBuV/m) 15.247	(dB) MARGIN	FAIL PASS/
1496.00	64.4	50.7	V	54.0	104.6	-3.3	PASS
1496.00	60.3	46.8	H	54.0	104.6	-7.2	PASS
2377.00	69.8	51.1	V	54.0	104.6	-2.9	PASS
2390.00	63.7	43.6	V	54.0	104.6	-10.4	PASS
2411.44	124.6	117.7	V	54.0	104.6	63.7	PASS
2411.44	112.0	105.1	H	54.0	104.6	51.1	PASS
4488.00	50.2	31.9	V	54.0	104.6	-72.8	PASS
4488.00	48.5	30.9	H	54.0	104.6	-73.7	PASS
4822.00	57.9	38.8	V	54.0	104.6	-15.2	PASS
4822.00	57.7	37.8	H	54.0	104.6	-16.2	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Andrew Omni Antenna , P/N: RT1N0F-024V-013A, Gain: 13 dBi**

Channel #: 6, Frequency: 2419.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, wide, 11 chips/symbol,** **Data Rate: 11.25 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 120.6 dBuV/m** **Limit = 100.6 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1504.00	63.0	46.6	V	54.0	100.6	-7.4	PASS
1504.00	60.0	42.5	H	54.0	100.6	-11.5	PASS
2385.00	67.6	46.5	V	54.0	100.6	-7.5	PASS
2419.88	120.6	--	V	--	--	--	--
2419.88	107.3	--	H	--	--	--	--
4838.00	54.1	33.7	V	54.0	100.6	-20.3	PASS
4838.00	50.0	30.3	H	54.0	100.6	-23.7	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Andrew Omni Antenna , P/N: RT1N0F-024V-013A, Gain: 13 dBi**

Channel #: 18, Frequency: 2464.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 119.6 dBuV/m** **Limit = 99.6 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1549.00	61.1	45.4	V	54.0	99.6	-8.6	PASS
1549.00	59.8	46.9	H	54.0	99.6	-7.1	PASS
2464.88	119.6	--	V	--	--	--	--
2464.88	111.4	--	H	--	--	--	--
4647.00	50.2	35.0	V	54.0	99.6	-19.0	PASS
4647.00	48.8	33.8	H	54.0	99.6	-20.2	PASS
4928.00	53.5	38.2	V	54.0	99.6	-15.8	PASS
4928.00	53.3	34.8	H	54.0	99.6	-19.2	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Processing Gain of A Direct Sequence Spread Spectrum, FCC CFR 47, Para. 15.247(e)**

PRODUCT NAME: **ISP DIRECT INDOOR & OUTDOOR UNITS, Model No.: 2401-01 (indoor) and 2401-02 (outdoor)**

FCC REQUIREMENTS:

The processing gain of a direct sequence system shall be at least 10 dB. The processing gain shall be determined from the ratio in dB of the signal-to-noise ratio with the system spreading code turned off to the signal-to-noise ratio with the system spreading code turned on, as measured at the demodulated output of the receiver.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23 °C
- Relative humidity: 43 %

POWER INPUT:

AC 120 V 60Hz from Elpac external switching power supply, model WRI4232.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203
- Bird 20 dB Attenuator, 50 Ohm IN/OUT
- IBM PS/1 & IBM 350 ThinkPad Host Computer(s)
- Fluke RF Signal Generator, Model 6061A, Freq. range: 10 KHz - 1050 MHz.
- HP 8900 RF Peak Power Meter, Measuring Frequency Range: 100 MHz - 18 GHz.

METHOD OF MEASUREMENT:

METHOD #1:- Jamming Margin Method

The processing gain may be measured using the CW jamming margin method. Figure 1 shows the test configuration. The test consists of stepping a signal generator in 50 KHz increments across the passband of the system. At each point, the generator level required to produce the recommended Bit Error Rate (BER) is recorded. This level is jammer level. The output power of the transmitting unit is measured at the same point. The Jammer to Signal (J/S) ratio is then calculated. Discard the worst 20% of the J/S data points. The lowest remaining J/S ratio is used when calculating the Process Gain.

The signal to noise ratio for an ideal non-coherent receiver is calculated from:

(1) $$Pe = 1/2e^{(-1/2(S/N)o)}$$

where: Pe = probability of error (BER)
(S/N)o = the required signal to noise ratio at the receiver output for a given received signal quality

Ref.: Viterbi, A.J. Principles of Coherent Communications (New York: McGraw-HILL 1966), Pg. 207

Using equation (1) shown above, calculate the signal to noise ratio required for your chosen BER. This value and the measured J/S ratio are used in the following equation to calculate the Process Gain (Gp) of the system.

$$Gp = (S/N)o+Mj+Lsys$$

Where:

(S/N)o: Theoretical signal to noise ratio required to maintain the normal operation just before the BERappears. In real measurements the maximum error of 0.001 is allowed in an ideal system using their modulation scheme with all codes turned off (i.e. no spreading or processing gain).

Mj: Maximum jammer to Signal Ratio that recorded at the detected BER.

Lsys: System losses such as non-ideal synchronization, tracking circuitry, non-optimal baseband receiver filtering and etc... These losses can be in excess of 2 dB for each transmitter and receiver pair. For the purpose of this processing gain calculation we assume a Lsys at its minimum value of 2 dB.

Ref.: Dixon, R, Spread Spectrum Systems. (New York: Wiley, 1984)

The Signal-to-Noise Ratio (S/N) with respect to the probability of bit error for a differentially QPSK (DQPSK) receiver in the presence of additive white Gaussian noise (AWGN) is given by Figure 4.5.1 as attached.

Ref.: Marvin Simon, Spread Spectrum Communication Handbook, page 695.

Since the CW jamming is a tone jamming, the (S/N)o for a AWGN jamming obtained from Figure 4.5.1 can be converted to the CW jamming or tone jamming using the formula (3.97) of the Marvin Simon Spread Spectrum Communication Handbook as follows:

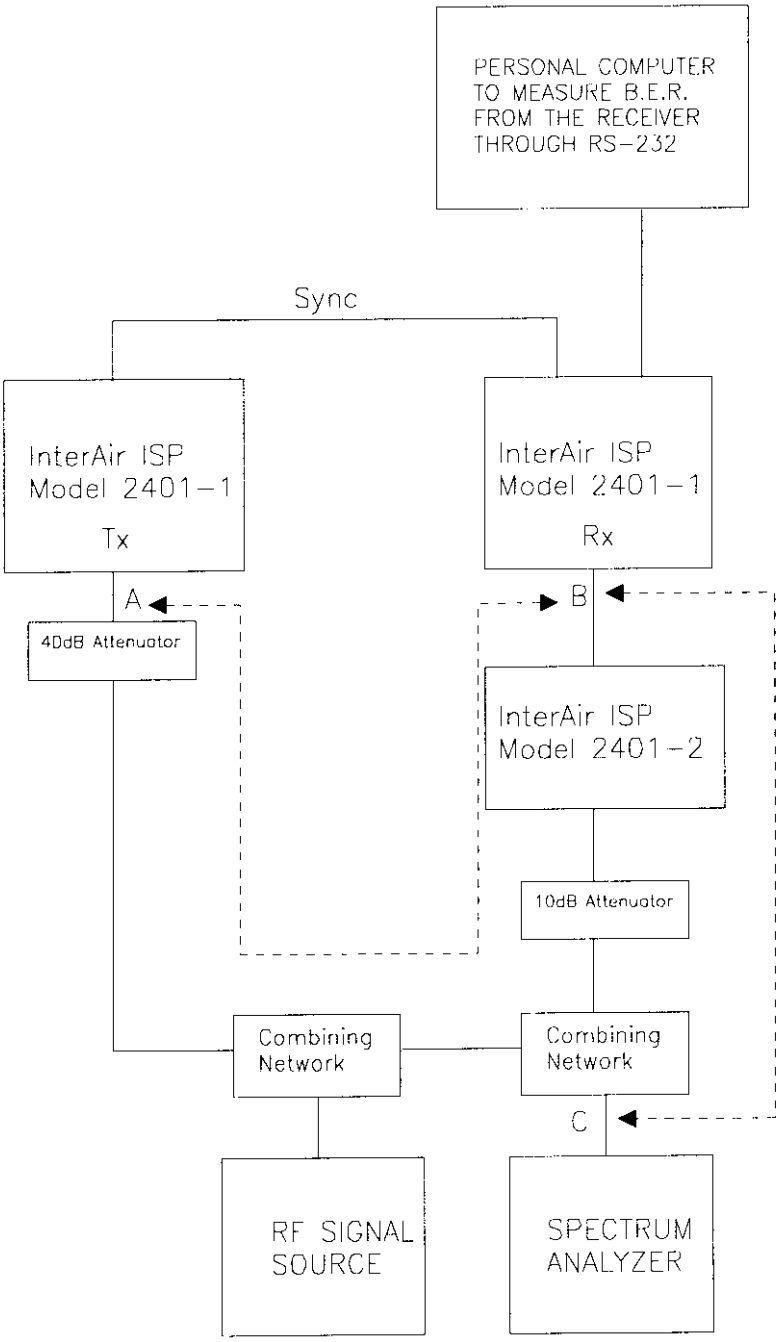
$(S/N)_o^t$ in dB = $(S/N)_o^{AWGN}$ / 0.8

TEST RESULTS: Conforms.

TEST PERSONNEL: Mr. Tri M. Luu, P.Eng.

DATE: Mar. 31 & Apr. 01, 1998

Figure 1:- **SETUP FOR PROCESSING GAIN MEASUREMENT - JAMMING MARGIN METHOD**



MEASUREMENT DATA:

Channel #4, Fc = 2411.4375 MHz	**Data Rate = 1.023 Mbps (DQPSK), Medium**
Chip Rate = 5.625 MHz	**PN Code Length = 11 chips/symbol**
6 dB BW = 5 MHz	

(S/N)o = 12 dB dB per attached Figure 4.5.1
Measured Processing Gain Gp = (S/N)o + Lsys + Mj = 15 + 2 + Mj = 17 + Mj (dB)
Theoretical Calculated Processing Gain = Chip Rate/Data rate = 5.625 MHz / (1.023 Mb/s)/(2 bits/symbol) = 11.0 or 10.4 dB

Note:
- Total Peak Power from the EUT's Tx measured at the EUT's Rx Input: P_t = -46.7 dBm
- Jamming signal level at measured at the EUT's receiver input: J
- Mj = J-P_t
- The following shaded boxes are discarded worst measurements (19.1% of total measurement points)

SUMMARY OF TEST RESULTS	
Theoretical Process Gain	**10.4 dB**
Minimum Measured Process Gain with discard of 19.1% of the worst measurements	**12.0 dB**

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	-3.5	0.00001	12	4.5	1.7	18.2	
2	-3.5	0.00001	12	4.5	2.0	18.5	
3	-3.4	0.00001	12	4.5	1.6	18.1	
4	-3.4	0.00001	12	4.5	1.7	18.2	
5	-3.3	0.00001	12	4.5	0.6	17.1	
6	-3.3	0.00001	12	4.5	-0.4	16.1	
7	-3.2	0.00001	12	4.5	-0.4	16.1	
8	-3.2	0.00001	12	4.5	-0.4	16.1	
9	-3.1	0.00001	12	4.5	0.0	16.5	
10	-3.1	0.00001	12	4.5	0.8	17.3	
11	-3.0	0.00001	12	4.5	0.8	17.3	
12	-3.0	0.00001	12	4.5	1.6	18.1	
13	-2.9	0.00001	12	4.5	1.6	18.1	
14	-2.9	0.00001	12	4.5	1.7	18.2	
15	-2.8	0.00001	12	4.5	1.5	18.0	
16	-2.8	0.00001	12	4.5	1.1	17.6	
17	-2.7	0.00001	12	4.5	0.8	17.3	
18	-2.7	0.00001	12	4.5	0.7	17.2	
19	-2.6	0.00001	12	4.5	-0.4	16.1	
20	-2.6	0.00001	12	4.5	-2.4	14.1	
21	-2.5	0.00001	12	4.5	-2.7	13.8	
22	-2.5	0.00001	12	4.5	-2.8	13.7	
23	-2.4	0.00001	12	4.5	-2.9	13.6	
24	-2.4	0.00001	12	4.5	-2.9	13.6	
25	-2.3	0.00001	12	4.5	-2.6	13.9	
26	-2.3	0.00001	12	4.5	-2.6	13.9	

27	-2.2	0.00001	12	4.5	-2.5	14.0	
28	-2.2	0.00001	12	4.5	-2.9	13.6	
29	-2.1	0.00001	12	4.5	-3.6	12.9	
30	-2.1	0.00001	12	4.5	-4.4	12.1	
31	**-2.0**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
32	-2.0	0.00001	12	4.5	-4.6	11.9	20
33	**-1.9**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
34	-1.9	0.00001	12	4.5	-4.8	11.7	13
35	-1.8	0.00001	12	4.5	-4.4	12.1	
36	-1.8	0.00001	12	4.5	-3.8	12.7	
37	-1.7	0.00001	12	4.5	-3.2	13.3	
38	-1.7	0.00001	12	4.5	-3.1	13.4	
39	-1.6	0.00001	12	4.5	-3.3	13.2	
40	-1.6	0.00001	12	4.5	-4.0	12.5	
41	-1.5	0.00001	12	4.5	-6.3	10.2	1
42	-1.5	0.00001	12	4.5	-5.4	11.1	3
43	-1.4	0.00001	12	4.5	-5.8	10.7	2
44	-1.4	0.00001	12	4.5	-5.0	11.5	7
45	-1.3	0.00001	12	4.5	-4.8	11.7	14
46	-1.3	0.00001	12	4.5	-4.3	12.2	
47	-1.2	0.00001	12	4.5	-3.9	12.6	
48	-1.2	0.00001	12	4.5	-3.8	12.7	
49	-1.1	0.00001	12	4.5	-3.3	13.2	
50	-1.1	0.00001	12	4.5	-3.8	12.7	
51	-1.0	0.00001	12	4.5	-3.8	12.7	
52	-1.0	0.00001	12	4.5	-4.6	11.9	21
53	-0.9	0.00001	12	4.5	-4.9	11.6	12
54	-0.9	0.00001	12	4.5	-5.1	11.4	6
55	-0.8	0.00001	12	4.5	-5.3	11.2	4
56	-0.8	0.00001	12	4.5	-5.3	11.2	5
57	-0.7	0.00001	12	4.5	-4.8	11.7	15
58	-0.7	0.00001	12	4.5	-4.0	12.5	
59	-0.6	0.00001	12	4.5	-3.3	13.2	
60	-0.6	0.00001	12	4.5	-2.7	13.8	
61	-0.5	0.00001	12	4.5	-3.8	12.7	
62	-0.5	0.00001	12	4.5	-4.2	12.3	
63	-0.4	0.00001	12	4.5	-4.1	12.4	
64	-0.4	0.00001	12	4.5	-4.0	12.5	
65	-0.3	0.00001	12	4.5	-4.8	11.7	16
66	-0.3	0.00001	12	4.5	-3.3	13.2	
67	-0.2	0.00001	12	4.5	-3.8	12.7	
68	-0.2	0.00001	12	4.5	-3.6	12.9	
69	-0.1	0.00001	12	4.5	-2.7	13.8	
70	-0.1	0.00001	12	4.5	-3.0	13.5	
71	0.0	0.00001	12	4.5	-3.3	13.2	
72	0.1	0.00001	12	4.5	-5.0	11.5	8
73	0.1	0.00001	12	4.5	-4.6	11.9	22
74	0.2	0.00001	12	4.5	-4.6	11.9	23
75	**0.2**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
76	0.3	0.00001	12	4.5	-4.7	11.8	17

77	0.3	0.00001	12	4.5	-4.5	12.0	
78	0.4	0.00001	12	4.5	-5.0	11.5	9
79	0.4	0.00001	12	4.5	-5.0	11.5	10
80	0.5	0.00001	12	4.5	-4.6	11.9	24
81	0.5	0.00001	12	4.5	-4.6	11.9	25
82	0.6	0.00001	12	4.5	-4.2	12.3	
83	0.6	0.00001	12	4.5	-5.0	11.5	11
84	0.7	0.00001	12	4.5	-4.6	11.9	26
85	0.7	0.00001	12	4.5	-4.2	12.3	
86	0.8	0.00001	12	4.5	-4.4	12.1	
87	0.8	0.00001	12	4.5	-4.3	12.2	
88	0.9	0.00001	12	4.5	-4.2	12.3	
89	**0.9**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
90	**1.0**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
91	1.0	0.00001	12	4.5	-4.1	12.4	
92	1.1	0.00001	12	4.5	-3.7	12.8	
93	1.1	0.00001	12	4.5	-3.9	12.6	
94	1.2	0.00001	12	4.5	-4.0	12.5	
95	1.2	0.00001	12	4.5	-3.8	12.7	
96	1.3	0.00001	12	4.5	-4.1	12.4	
97	1.3	0.00001	12	4.5	-4.4	12.1	
98	1.4	0.00001	12	4.5	-4.7	11.8	18
99	1.4	0.00001	12	4.5	-4.2	12.3	
100	1.5	0.00001	12	4.5	-4.7	11.8	19
101	1.5	0.00001	12	4.5	-4.6	11.9	27
102	1.6	0.00001	12	4.5	-2.5	14.0	
103	1.6	0.00001	12	4.5	-2.2	14.3	
104	1.7	0.00001	12	4.5	-2.2	14.3	
105	1.7	0.00001	12	4.5	-3.8	12.7	
106	1.8	0.00001	12	4.5	-2.6	13.9	
107	1.8	0.00001	12	4.5	-2.8	13.7	
108	1.9	0.00001	12	4.5	-2.8	13.7	
109	1.9	0.00001	12	4.5	-2.4	14.1	
110	2.0	0.00001	12	4.5	-2.4	14.1	
111	2.0	0.00001	12	4.5	-2.2	14.3	
112	2.1	0.00001	12	4.5	-1.9	14.6	
113	2.1	0.00001	12	4.5	-2.7	13.8	
114	2.2	0.00001	12	4.5	-2.2	14.3	
115	2.2	0.00001	12	4.5	-2.0	14.5	
116	2.3	0.00001	12	4.5	-1.8	14.7	
117	2.3	0.00001	12	4.5	-2.2	14.3	
118	2.4	0.00001	12	4.5	-2.2	14.3	
119	2.4	0.00001	12	4.5	-2.4	14.1	
120	2.5	0.00001	12	4.5	-2.4	14.1	
121	2.5	0.00001	12	4.5	-2.4	14.1	
122	2.6	0.00001	12	4.5	-2.3	14.2	
123	2.6	0.00001	12	4.5	-2.2	14.3	
124	2.7	0.00001	12	4.5	-1.9	14.6	
125	2.7	0.00001	12	4.5	0.9	17.4	
126	2.8	0.00001	12	4.5	1.2	17.7	

127	2.8	0.00001	12	4.5	1.0	17.5	
128	2.9	0.00001	12	4.5	1.2	17.7	
129	2.9	0.00001	12	4.5	1.0	17.5	
130	3.0	0.00001	12	4.5	1.2	17.7	
131	3.0	0.00001	12	4.5	0.8	17.3	
132	3.1	0.00001	12	4.5	0.0	16.5	
133	3.1	0.00001	12	4.5	-0.7	15.8	
134	3.2	0.00001	12	4.5	-1.4	15.1	
135	3.2	0.00001	12	4.5	-1.6	14.9	
136	3.3	0.00001	12	4.5	-1.6	14.9	
137	3.3	0.00001	12	4.5	-0.5	16.0	
138	3.4	0.00001	12	4.5	0.0	16.5	
139	3.4	0.00001	12	4.5	0.4	16.9	
140	3.5	0.00001	12	4.5	0.7	17.2	
141	3.5	0.00001	12	4.5	-0.1	16.4	

Channel #6, Fc = 2419.8750 MHz	**Data Rate = 2.045 Mbps (DQPSK), Wide**
Chip Rate = 11.25 MHz	**PN Code Length = 11 chips/symbol**
6 dB BW = 8.4 MHz	

(S/N)o = 12 dB per attached Figure 4.5.1

Measured Processing Gain Gp = (S/N)o + Lsys + Mj = 15 + 2 + Mj = 17 + Mj (dB)

Theoretical Calculated Processing Gain = Chip Rate/Data rate = 11.25 MHz / (2.045 Mb/s)/(2 bits/symbol) = 11.0 or 10.4 dB

Note:

- Total Peak Power from the EUT's Tx measured at the EUT's Rx Input: P_t = -46.7 dBm
- Jamming signal level at measured at the EUT's receiver input: J
- Mj = J-P_t
- The following shaded boxes are discarded worst measurements (17.9% of total measurement points)

SUMMARY OF TEST RESULTS	
Theoretical Process Gain	**10.4 dB**
Minimum Measured Process Gain with discard of 17.9% of the worst measurements	**10.5 dB**

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	-5.0	0.00001	12	4.5	-3.7	12.8	
2	-5.0	0.00001	12	4.5	-4.2	12.3	
3	-4.9	0.00001	12	4.5	-4.2	12.3	
4	-4.9	0.00001	12	4.5	-4.6	11.9	
5	-4.8	0.00001	12	4.5	-4.6	11.9	
6	-4.8	0.00001	12	4.5	-4.1	12.4	
7	-4.7	0.00001	12	4.5	-3.6	12.9	
8	-4.7	0.00001	12	4.5	-3.6	12.9	
9	-4.6	0.00001	12	4.5	-3.6	12.9	
10	-4.6	0.00001	12	4.5	-3.5	13.0	
11	-4.5	0.00001	12	4.5	-3.5	13.0	
12	-4.5	0.00001	12	4.5	-3.4	13.1	
13	-4.4	0.00001	12	4.5	-3.5	13.0	
14	-4.4	0.00001	12	4.5	-3.6	12.9	
15	-4.3	0.00001	12	4.5	-4.3	12.2	
16	-4.3	0.00001	12	4.5	-4.9	11.6	
17	-4.2	0.00001	12	4.5	-5.6	10.9	
18	-4.2	0.00001	12	4.5	-5.7	10.8	
19	-4.1	0.00001	12	4.5	-5.8	10.7	
20	-4.1	0.00001	12	4.5	-5.8	10.7	
21	-4.0	0.00001	12	4.5	-6.2	10.3	25
22	-4.0	0.00001	12	4.5	-6.2	10.3	26
23	-3.9	0.00001	12	4.5	-6.2	10.3	27
24	-3.9	0.00001	12	4.5	-6.0	10.5	34
25	-3.8	0.00001	12	4.5	-6.0	10.5	35
26	-3.8	0.00001	12	4.5	-6.0	10.5	36

27	-3.7	0.00001	12	4.5	-6.0	10.5	
28	-3.7	0.00001	12	4.5	-6.0	10.5	
29	-3.6	0.00001	12	4.5	-6.0	10.5	
30	-3.6	0.00001	12	4.5	-5.0	11.5	
31	-3.5	0.00001	12	4.5	-5.2	11.3	
32	-3.5	0.00001	12	4.5	-5.0	11.5	
33	-3.4	0.00001	12	4.5	-4.8	11.7	
34	-3.4	0.00001	12	4.5	-5.0	11.5	
35	-3.3	0.00001	12	4.5	-5.4	11.1	
36	-3.3	0.00001	12	4.5	-7.2	9.3	6
37	-3.2	0.00001	12	4.5	-6.0	8.5	1
38	-3.2	0.00001	12	4.5	-6.0	8.5	2
39	-3.1	0.00001	12	4.5	-6.0	8.5	3
40	-3.1	0.00001	12	4.5	-6.0	8.5	4
41	-3.0	0.00001	12	4.5	-7.9	8.6	5
42	-3.0	0.00001	12	4.5	-7.2	9.3	7
43	-2.9	0.00001	12	4.5	-7.2	9.3	8
44	-2.9	0.00001	12	4.5	-6.7	9.8	14
45	-2.8	0.00001	12	4.5	-6.2	10.3	26
46	-2.8	0.00001	12	4.5	-6.0	10.5	
47	-2.7	0.00001	12	4.5	-6.0	10.5	
48	-2.7	0.00001	12	4.5	-5.8	10.7	
49	-2.6	0.00001	12	4.5	-5.8	10.7	
50	-2.6	0.00001	12	4.5	-5.8	10.7	
51	-2.5	0.00001	12	4.5	-5.4	11.1	
52	-2.5	0.00001	12	4.5	-5.0	11.5	
53	-2.4	0.00001	12	4.5	-5.0	11.5	
54	-2.4	0.00001	12	4.5	-5.0	11.5	
55	-2.3	0.00001	12	4.5	-4.6	11.9	
56	-2.3	0.00001	12	4.5	-4.8	11.7	
57	-2.2	0.00001	12	4.5	-5.1	11.4	
58	-2.2	0.00001	12	4.5	-5.2	11.3	
59	-2.1	0.00001	12	4.5	-5.4	11.1	
60	-2.1	0.00001	12	4.5	-5.8	10.7	
61	-2.0	0.00001	12	4.5	-5.8	10.7	
62	-2.0	0.00001	12	4.5	-5.4	10.1	23
63	-1.9	0.00001	12	4.5	-5.1	10.4	29
64	-1.9	0.00001	12	4.5	-5.4	11.1	
65	-1.8	0.00001	12	4.5	-5.3	11.2	
66	-1.8	0.00001	12	4.5	-5.5	11.0	
67	-1.7	0.00001	12	4.5	-5.6	10.9	
68	-1.7	0.00001	12	4.5	-5.5	11.0	
69	-1.6	0.00001	12	4.5	-5.4	11.1	
70	-1.6	0.00001	12	4.5	-4.5	12.0	
71	-1.5	0.00001	12	4.5	-5.8	10.7	
72	-1.5	0.00001	12	4.5	-4.4	12.1	
73	-1.4	0.00001	12	4.5	-4.9	11.6	
74	-1.4	0.00001	12	4.5	-4.9	11.6	
75	-1.3	0.00001	12	4.5	-5.1	11.4	
76	-1.3	0.00001	12	4.5	-5.2	11.3	

77	-1.2	0.00001	12	4.5	-5.1	11.4	
78	-1.2	0.00001	12	4.5	-5.4	11.1	
79	-1.1	0.00001	12	4.5	-5.6	10.9	
80	-1.1	0.00001	12	4.5	-5.6	10.9	
81	-1.0	0.00001	12	4.5	-5.6	10.9	
82	-1.0	0.00001	12	4.5	-5.9	10.6	
83	-0.9	0.00001	12	4.5	-6.5	10.0	20
84	-0.9	0.00001	12	4.5	-6.8	9.7	13
85	-0.8	0.00001	12	4.5	-6.9	9.6	9
86	-0.8	0.00001	12	4.5	-6.6	9.9	18
87	-0.7	0.00001	12	4.5	-6.9	9.6	10
88	-0.7	0.00001	12	4.5	-6.9	9.6	11
89	-0.6	0.00001	12	4.5	-6.9	9.6	12
90	-0.6	0.00001	12	4.5	-6.7	9.8	15
91	-0.5	0.00001	12	4.5	-6.7	9.8	16
92	-0.5	0.00001	12	4.5	-5.8	10.7	
93	-0.4	0.00001	12	4.5	-5.1	11.4	
94	-0.4	0.00001	12	4.5	-5.1	11.4	
95	-0.3	0.00001	12	4.5	-5.1	11.4	
96	-0.3	0.00001	12	4.5	-5.1	11.4	
97	-0.2	0.00001	12	4.5	-5.1	11.4	
98	-0.2	0.00001	12	4.5	-5.5	11.0	
99	-0.1	0.00001	12	4.5	-6.3	10.2	24
100	-0.1	0.00001	12	4.5	-6.7	9.8	17
101	0.0	0.00001	12	4.5	-6.5	10.0	21
102	0.1	0.00001	12	4.5	-6.6	9.9	19
103	0.1	0.00001	12	4.5	-6.5	10.0	22
104	0.2	0.00001	12	4.5	-5.7	10.8	
105	0.2	0.00001	12	4.5	-5.2	11.3	
106	0.3	0.00001	12	4.5	-5.0	11.5	
107	0.3	0.00001	12	4.5	-5.1	11.4	
108	0.4	0.00001	12	4.5	-5.3	11.2	
109	0.4	0.00001	12	4.5	-5.5	11.0	
110	0.5	0.00001	12	4.5	-5.5	11.0	
111	0.5	0.00001	12	4.5	-5.7	10.8	
112	0.6	0.00001	12	4.5	-5.7	10.8	
113	0.6	0.00001	12	4.5	-5.7	10.8	
114	0.7	0.00001	12	4.5	-5.7	10.8	
115	0.7	0.00001	12	4.5	-5.6	10.9	
116	0.8	0.00001	12	4.5	-6.1	10.4	30
117	0.8	0.00001	12	4.5	-6.1	10.4	31
118	0.9	0.00001	12	4.5	-6.1	10.4	32
119	0.9	0.00001	12	4.5	-6.1	10.4	33
120	1.0	0.00001	12	4.5	-5.5	11.0	
121	1.0	0.00001	12	4.5	-5.5	11.0	
122	1.1	0.00001	12	4.5	-5.3	11.2	
123	1.1	0.00001	12	4.5	-5.3	11.2	
124	1.2	0.00001	12	4.5	-4.8	11.7	
125	1.2	0.00001	12	4.5	-5.3	11.2	
126	1.3	0.00001	12	4.5	-5.3	11.2	

127	1.3	0.00001	12	4.5	-4.8	11.7	
128	1.4	0.00001	12	4.5	-4.7	11.8	
129	1.4	0.00001	12	4.5	-4.6	11.9	
130	1.5	0.00001	12	4.5	-4.9	11.6	
131	1.5	0.00001	12	4.5	-4.9	11.6	
132	1.6	0.00001	12	4.5	-5.5	11.0	
133	**1.6**	**0.00001**	**12**	**4.5**	**-6.0**	**10.5**	
134	1.7	0.00001	12	4.5	-5.8	10.7	
135	1.7	0.00001	12	4.5	-5.5	11.0	
136	1.8	0.00001	12	4.5	-5.4	11.1	
137	1.8	0.00001	12	4.5	-5.7	10.8	
138	1.9	0.00001	12	4.5	-5.7	10.8	
139	1.9	0.00001	12	4.5	-5.5	11.0	
140	2.0	0.00001	12	4.5	-5.7	10.8	
141	2.0	0.00001	12	4.5	-5.2	11.3	
142	2.1	0.00001	12	4.5	-4.7	11.8	
143	2.1	0.00001	12	4.5	-4.3	12.2	
144	2.2	0.00001	12	4.5	-4.2	12.3	
145	2.2	0.00001	12	4.5	-4.4	12.1	
146	2.3	0.00001	12	4.5	-4.9	11.6	
147	2.3	0.00001	12	4.5	-5.1	11.4	
148	2.4	0.00001	12	4.5	-5.1	11.4	
149	2.4	0.00001	12	4.5	-5.1	11.4	
150	2.5	0.00001	12	4.5	-5.1	11.4	
151	2.5	0.00001	12	4.5	-5.2	11.3	
152	2.6	0.00001	12	4.5	-5.3	11.2	
153	2.6	0.00001	12	4.5	-5.3	11.2	
154	2.7	0.00001	12	4.5	-5.4	11.1	
155	2.7	0.00001	12	4.5	-5.3	11.2	
156	2.8	0.00001	12	4.5	-5.4	11.1	
157	2.8	0.00001	12	4.5	-5.4	11.1	
158	2.9	0.00001	12	4.5	-5.5	11.0	
159	2.9	0.00001	12	4.5	-5.8	10.7	
160	3.0	0.00001	12	4.5	-5.9	10.6	
161	3.0	0.00001	12	4.5	-5.9	10.6	
162	3.1	0.00001	12	4.5	-5.9	10.6	
163	3.1	0.00001	12	4.5	-5.5	11.0	
164	3.2	0.00001	12	4.5	-5.5	11.0	
165	3.2	0.00001	12	4.5	-5.5	11.0	
166	3.3	0.00001	12	4.5	-5.7	10.8	
167	3.3	0.00001	12	4.5	-5.7	10.8	
168	3.4	0.00001	12	4.5	-5.7	10.8	
169	3.4	0.00001	12	4.5	-5.6	10.9	
170	3.5	0.00001	12	4.5	-5.9	10.6	
171	3.5	0.00001	12	4.5	-5.9	10.6	
172	3.6	0.00001	12	4.5	-5.5	11.0	
173	3.6	0.00001	12	4.5	-5.5	11.0	
174	3.7	0.00001	12	4.5	-5.5	11.0	
175	3.7	0.00001	12	4.5	-5.5	11.0	
176	3.8	0.00001	12	4.5	-5.5	11.0	

177	3.8	0.00001	12	4.5	-4.8	11.7	
178	3.9	0.00001	12	4.5	-4.9	11.6	
179	3.9	0.00001	12	4.5	-4.9	11.6	
180	4.0	0.00001	12	4.5	-4.9	11.6	
181	4.0	0.00001	12	4.5	-4.9	11.6	
182	4.1	0.00001	12	4.5	-4.9	11.6	
183	4.1	0.00001	12	4.5	-4.5	12.0	
184	4.2	0.00001	12	4.5	-4.5	12.0	
185	4.2	0.00001	12	4.5	-4.1	12.4	
186	4.3	0.00001	12	4.5	-4.1	12.4	
187	4.3	0.00001	12	4.5	-3.9	12.6	
188	4.4	0.00001	12	4.5	-3.9	12.6	
189	4.4	0.00001	12	4.5	-3.9	12.6	
190	4.5	0.00001	12	4.5	-3.9	12.6	
191	4.5	0.00001	12	4.5	-3.7	12.8	
192	4.6	0.00001	12	4.5	-3.7	12.8	
193	4.6	0.00001	12	4.5	-3.7	12.8	
194	4.7	0.00001	12	4.5	-3.7	12.8	
195	4.7	0.00001	12	4.5	-3.7	12.8	
196	4.8	0.00001	12	4.5	-3.7	12.8	
197	4.8	0.00001	12	4.5	-3.7	12.8	
198	4.9	0.00001	12	4.5	-3.7	12.8	
199	4.9	0.00001	12	4.5	-3.7	12.8	
200	5.0	0.00001	12	4.5	-3.7	12.8	
201	5.0	0.00001	12	4.5	-3.3	13.2	

Channel #18, Fc = 2464.8750 MHz	**Data Rate = 0.818 Mbps (DQPSK), Narrow**
Chip Rate = 4.5 MHz	**PN Code Length = 11 chips/symbol**
6 dB BW = 4 MHz	

(S/N)o = 12 dB per attached Figure 4.5.1

Measured Processing Gain Gp = (S/N)o + Lsys + Mj = 15 + 2 + Mj = 17 + Mj (dB)

Theoretical Calculated Processing Gain = Chip Rate/Data rate = $\frac{4.5\ \text{MHz}}{(0.818\ \text{Mb/s})/(2\ \text{bits/symbol})}$ = 11 or 10.4 dB

Note:

- Total Peak Power from the EUT's Tx measured at the EUT's Rx Input: P_t = -49.9 dBm
- Jamming signal level at measured at the EUT's receiver input: J
- Mj = J-P_t
- The following shaded boxes are discarded worst measurements (18.8% of total measurement points)

SUMMARY OF TEST RESULTS	
Theoretical Process Gain	**10.4 dB**
Minimum Measured Process Gain with discard of 18.8% of the worst measurements	**10.7 dB**

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	-2.50	0.00001	12	4.5	-1.0	15.5	
2	-2.45	0.00001	12	4.5	-1.1	15.4	
3	-2.40	0.00001	12	4.5	-0.1	16.4	
4	-2.35	0.00001	12	4.5	0.0	16.5	
5	-2.30	0.00001	12	4.5	0.8	17.3	
6	-2.25	0.00001	12	4.5	1.3	17.8	
7	-2.20	0.00001	12	4.5	2.1	18.6	
8	-2.15	0.00001	12	4.5	1.6	18.1	
9	-2.10	0.00001	12	4.5	1.0	17.5	
10	-2.05	0.00001	12	4.5	0.2	16.7	
11	-2.00	0.00001	12	4.5	-0.4	16.1	
12	-1.95	0.00001	12	4.5	-1.7	14.8	
13	-1.90	0.00001	12	4.5	-1.6	14.9	
14	-1.85	0.00001	12	4.5	-1.3	15.2	
15	-1.80	0.00001	12	4.5	0.4	16.9	
16	-1.75	0.00001	12	4.5	0.6	17.1	
17	-1.70	0.00001	12	4.5	0.6	17.1	
18	-1.65	0.00001	12	4.5	0.1	16.6	
19	-1.60	0.00001	12	4.5	0.1	16.6	
20	-1.55	0.00001	12	4.5	0.5	17.0	
21	-1.50	0.00001	12	4.5	0.6	17.1	
22	-1.45	0.00001	12	4.5	0.6	17.1	
23	-1.40	0.00001	12	4.5	2.0	18.5	

Continued ...

Test Point	Jammer Signal Freq. +/- Fc	(BER) (DQPSK)	(S/N)o	System Loss Lsys	Jammer to Signal Ratio Mj	Measured Processing Gain	Discarded Readings
24	-1.35	0.00001	12	4.5	1.9	18.4	
25	-1.30	0.00001	12	4.5	2.1	18.6	
26	-1.25	0.00001	12	4.5	2.0	18.5	
27	-1.20	0.00001	12	4.5	2.4	18.9	
28	-1.15	0.00001	12	4.5	2.4	18.9	
29	-1.10	0.00001	12	4.5	2.4	18.9	
30	-1.05	0.00001	12	4.5	3.0	19.5	
31	-1.00	0.00001	12	4.5	-4.1	12.4	
32	-0.95	0.00001	12	4.5	-5.7	10.8	
33	-0.90	0.00001	12	4.5	-5.6	10.9	
34	-0.85	0.00001	12	4.5	-5.2	11.3	
35	-0.80	0.00001	12	4.5	-5.6	10.9	
36	-0.75	0.00001	12	4.5	-5.5	11.0	
37	-0.70	0.00001	12	4.5	-6.4	10.1	9
38	-0.65	0.00001	12	4.5	-5.9	10.6	15
39	-0.60	0.00001	12	4.5	-5.2	11.3	
40	-0.55	0.00001	12	4.5	-4.5	12.0	
41	-0.50	0.00001	12	4.5	-5.0	11.5	
42	**-0.45**	**0.00001**	**12**	**4.5**	**-5.8**	**10.7**	
43	-0.40	0.00001	12	4.5	-6.3	10.2	10
44	-0.35	0.00001	12	4.5	-5.6	10.9	
45	-0.30	0.00001	12	4.5	-6.1	10.4	13
46	-0.25	0.00001	12	4.5	-6.8	9.7	2
47	-0.20	0.00001	12	4.5	-5.5	11.0	
48	-0.15	0.00001	12	4.5	-4.9	11.6	
49	-0.10	0.00001	12	4.5	-4.7	11.8	
50	-0.05	0.00001	12	4.5	-4.4	12.1	
51	0.00	0.00001	12	4.5	-6.6	9.9	4
52	0.05	0.00001	12	4.5	-4.8	11.7	
53	0.10	0.00001	12	4.5	-4.5	12.0	
54	0.15	0.00001	12	4.5	-3.9	12.6	
55	0.20	0.00001	12	4.5	-4.4	12.1	
56	0.25	0.00001	12	4.5	-5.1	11.4	
57	0.30	0.00001	12	4.5	-6.5	10.0	6
58	0.35	0.00001	12	4.5	-4.9	11.6	
59	0.40	0.00001	12	4.5	-4.5	12.0	
60	0.45	0.00001	12	4.5	-5.3	11.2	
61	0.50	0.00001	12	4.5	-4.5	12.0	
62	0.55	0.00001	12	4.5	-6.3	10.2	11
63	0.60	0.00001	12	4.5	-6.5	10.0	7
64	0.65	0.00001	12	4.5	-5.7	10.8	
65	0.70	0.00001	12	4.5	-5.6	10.9	
66	0.75	0.00001	12	4.5	-6.1	10.4	14

Continued ...

Test Point	Jammer Signal Freq. +/- Fc	(BER) (DQPSK)	(S/N)o	System Loss Lsys	Jammer to Signal Ratio Mj	Measured Processing Gain	Discarded Readings
67	0.80	0.00001	12	4.5	-5.2	11.3	
68	0.85	0.00001	12	4.5	-5.2	11.3	
69	0.90	0.00001	12	4.5	-5.2	11.3	
70	0.95	0.00001	12	4.5	-4.6	11.9	
71	1.00	0.00001	12	4.5	-4.6	11.9	
72	1.05	0.00001	12	4.5	-6.5	10.0	8
73	1.10	0.00001	12	4.5	-6.7	9.8	3
74	**1.15**	**0.00001**	**12**	**4.5**	**-5.8**	**10.7**	
75	1.20	0.00001	12	4.5	-6.6	9.9	5
76	1.25	0.00001	12	4.5	-7.0	9.5	1
77	1.30	0.00001	12	4.5	-6.3	10.2	12
78	1.35	0.00001	12	4.5	-5.9	10.6	16
79	1.40	0.00001	12	4.5	-5.9	10.6	17
80	1.45	0.00001	12	4.5	-5.9	10.6	18
81	**1.50**	**0.00001**	**12**	**4.5**	**-5.8**	**10.7**	
82	1.55	0.00001	12	4.5	-5.9	10.6	19
83	**1.60**	**0.00001**	**12**	**4.5**	**-5.8**	**10.7**	
84	1.65	0.00001	12	4.5	-5.7	10.8	
85	1.70	0.00001	12	4.5	-4.8	11.7	
86	1.75	0.00001	12	4.5	-4.4	12.1	
87	1.80	0.00001	12	4.5	-4.4	12.1	
88	1.85	0.00001	12	4.5	-4.4	12.1	
89	1.90	0.00001	12	4.5	-4.4	12.1	
90	1.95	0.00001	12	4.5	-4.3	12.2	
91	2.00	0.00001	12	4.5	-5.2	11.3	
92	2.05	0.00001	12	4.5	-3.3	13.2	
93	2.10	0.00001	12	4.5	-0.8	15.7	
94	2.15	0.00001	12	4.5	0.7	17.2	
95	2.20	0.00001	12	4.5	0.9	17.4	
96	2.25	0.00001	12	4.5	0.9	17.4	
97	2.30	0.00001	12	4.5	1.2	17.7	
98	2.35	0.00001	12	4.5	1.0	17.5	
99	2.40	0.00001	12	4.5	0.6	17.1	
100	2.45	0.00001	12	4.5	1.0	17.5	
101	2.50	0.00001	12	4.5	1.0	17.5	

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)
23	-1.40	0.00001	15.0	2.0	2.0	19.0
24	-1.35	0.00001	15.0	2.0	1.9	18.9
25	-1.30	0.00001	15.0	2.0	2.1	19.1
26	-1.25	0.00001	15.0	2.0	2.0	19.0
27	-1.20	0.00001	15.0	2.0	2.4	19.4
28	-1.15	0.00001	15.0	2.0	2.4	19.4
29	-1.10	0.00001	15.0	2.0	2.4	19.4
30	-1.05	0.00001	15.0	2.0	3.0	20.0
31	-1.00	0.00001	15.0	2.0	-4.1	12.9
32	-0.95	0.00001	15.0	2.0	-5.7	11.3
33	-0.90	0.00001	15.0	2.0	-5.6	11.4
34	-0.85	0.00001	15.0	2.0	-5.2	11.8
35	-0.80	0.00001	15.0	2.0	-5.6	11.4
36	-0.75	0.00001	15.0	2.0	-5.5	11.5
37	-0.70	0.00001	15.0	2.0	-6.4	10.6
38	-0.65	0.00001	15.0	2.0	-5.9	11.1
39	-0.60	0.00001	15.0	2.0	-5.2	11.8
40	-0.55	0.00001	15.0	2.0	-4.5	12.5
41	-0.50	0.00001	15.0	2.0	-5.0	12.0
42	-0.45	0.00001	15.0	2.0	-5.8	11.2
43	-0.40	0.00001	15.0	2.0	-6.3	10.7
44	-0.35	0.00001	15.0	2.0	-5.6	11.4
45	-0.30	0.00001	15.0	2.0	-6.1	10.9
46	-0.25	0.00001	15.0	2.0	-6.8	10.2
47	-0.20	0.00001	15.0	2.0	-5.5	11.5
48	-0.15	0.00001	15.0	2.0	-4.9	12.1
49	-0.10	0.00001	15.0	2.0	-4.7	12.3
50	-0.05	0.00001	15.0	2.0	-4.4	12.6
51	0.00	0.00001	15.0	2.0	-6.6	10.4
52	0.05	0.00001	15.0	2.0	-4.8	12.2
53	0.10	0.00001	15.0	2.0	-4.5	12.5
54	0.15	0.00001	15.0	2.0	-3.9	13.1
55	0.20	0.00001	15.0	2.0	-4.4	12.6
56	0.25	0.00001	15.0	2.0	-5.1	11.9
57	0.30	0.00001	15.0	2.0	-6.5	10.5
58	0.35	0.00001	15.0	2.0	-4.9	12.1
59	0.40	0.00001	15.0	2.0	-4.5	12.5
60	0.45	0.00001	15.0	2.0	-5.3	11.7
61	0.50	0.00001	15.0	2.0	-4.5	12.5
62	0.55	0.00001	15.0	2.0	-6.3	10.7
63	0.60	0.00001	15.0	2.0	-6.5	10.5

Continued ..

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)
64	0.65	0.00001	15.0	2.0	-5.7	11.3
65	0.70	0.00001	15.0	2.0	-5.6	11.4
66	0.75	0.00001	15.0	2.0	-6.1	10.9
67	0.80	0.00001	15.0	2.0	-5.2	11.8
68	0.85	0.00001	15.0	2.0	-5.2	11.8
69	0.90	0.00001	15.0	2.0	-5.2	11.8
70	0.95	0.00001	15.0	2.0	-4.6	12.4
71	1.00	0.00001	15.0	2.0	-4.6	12.4
72	1.05	0.00001	15.0	2.0	-6.5	10.5
73	1.10	0.00001	15.0	2.0	-6.7	10.3
74	1.15	0.00001	15.0	2.0	-5.8	11.2
75	1.20	0.00001	15.0	2.0	-6.6	10.4
76	1.25	0.00001	15.0	2.0	-7.0	10.0
77	1.30	0.00001	15.0	2.0	-6.3	10.7
78	1.35	0.00001	15.0	2.0	-5.9	11.1
79	1.40	0.00001	15.0	2.0	-5.9	11.1
80	1.45	0.00001	15.0	2.0	-5.9	11.1
81	1.50	0.00001	15.0	2.0	-5.8	11.2
82	1.55	0.00001	15.0	2.0	-5.9	11.1
83	1.60	0.00001	15.0	2.0	-5.8	11.2
84	1.65	0.00001	15.0	2.0	-5.7	11.3
85	1.70	0.00001	15.0	2.0	-4.8	12.2
86	1.75	0.00001	15.0	2.0	-4.4	12.6
87	1.80	0.00001	15.0	2.0	-4.4	12.6
88	1.85	0.00001	15.0	2.0	-4.4	12.6
89	1.90	0.00001	15.0	2.0	-4.4	12.6
90	1.95	0.00001	15.0	2.0	-4.3	12.7
91	2.00	0.00001	15.0	2.0	-5.2	11.8
92	2.05	0.00001	15.0	2.0	-3.3	13.7
93	2.10	0.00001	15.0	2.0	-0.8	16.2
94	2.15	0.00001	15.0	2.0	0.7	17.7
95	2.20	0.00001	15.0	2.0	0.9	17.9
96	2.25	0.00001	15.0	2.0	0.9	17.9
97	2.30	0.00001	15.0	2.0	1.2	18.2
98	2.35	0.00001	15.0	2.0	1.0	18.0
99	2.40	0.00001	15.0	2.0	0.6	17.6
100	2.45	0.00001	15.0	2.0	1.0	18.0
101	2.50	0.00001	15.0	2.0	1.0	18.0

FEDERAL COMMUNICATIONS COMMISSION
Equipment Authorization Division, Applications Processing Branch
7435 Oakland Mills Road, Columbia, MD 21046
Telephone: (301) 725-1585, Facsimile: (301) 344-2050

Sent Again on July 15, 1998

Date: July 1, 1998 02:43 pm
From: Joe Dichoso Extension: 214
To: Tri Luu
Organization: UltraTech Engineering Labs Inc.
Telephone: 800 263 7670 Facsimile: 905 569 2480
This cover sheet is page 1 of ____. Please direct inquiries to the sender at the above extension.

Reference FCC ID: NUX-ISP2401

Applicant: InterAir Wireless Inc

The response to our request for additional information dated FCC ID: NUX-ISP2401 was incomplete. Please respond to all unanswered items within 60 days of the date of the original request.
Failure to provide the requested information with this time period may result in application dismissal pursuant to section 2.917(c) and forfeiture of the filing fee pursuant to section 1.1106.

1) The installer is not going to read the test report to determine how to comply with the RF Safety requirements. Supply a statement for the installer. State what's needed to comply with RF Safety requirements.

2) With regard to Output power. The form 731 must list the power at the antenna terminal. If the device puts out 190 mW and you include cable loss of a minimum of 10.1 dB. You get a maximum output power of 12.68 dBm or 18.56 mW. Please correct the Form 731 and supply a verification statement from the applicant that the cables listed on page 7 of the report are the only ones that will be supplied.

* 3) I don't think we've allowed more than 2dB system losses when calculating Process Gain. I'm still working on this and will let you know if additional information is needed.

Replies to this letter MUST contain the Reference Number: 1696

Verified item 3). with Greg Czumak.
You cannot use a system loss greater than 2 dB. Recalculate Process Gain with the system losses less than or equal to 2dB.

2) With regard to Output power. The form 731 must list the power at the antenna terminal. If the device puts out 190 mW and you include cable loss of a minimum of 10.1 dB. You get a maximum output power of 12.68 dBm or 18.56 mW. Please correct the Form 731 and supply a verification statement from the applicant that the cables listed on page 7 of the report are the only ones that will be supplied.

3) I don't think we've allowed more than 2dB system losses when calculating Process Gain. I'm still working on this and will let you know if additional information is needed.

Replies to this letter MUST contain the Reference Number: 1696

Verified item 3). with Greg Czumak.
You cannot use a system loss greater than 2 dB. Recalculate Process Gain with the system losses less than or equal to 2dB.

REASON FOR ERROR
E-1) HANG UP OR LINE FAIL
E-2) BUSY
E-3) NO ANSWER
E-4) NO FACSIMILE CONNECTION

---

983 MEMORY TX 81-9190556924 80 OK P. 1/1

FILE MODE OPTION ADDRESS (GROUP) RESULT PAGE

TTI CONG MAIL/OLIA FCC

* * * COMMUNICATION RESULT REPORT (JUL.15.1998 2:31PM) * * *

P. 1

FCC ID: NUX-ISP2401
Interair Wireless

Analysis of Increased System Losses Measured During Process Gain Tests

Summary

Part 15.247 of CFR 47 requires the processing gain of a direct sequence system to be a minimum of 10 dB. A 2 dB system loss is assumed when measuring the process gain using the jamming margin method. Measurements using this procedure on the subject receiver/ transmitter (R/T) system show a system loss of 4.5 dB. This higher system loss can be accounted for in the design of the R/T system.

System Description

The R/T system uses direct sequence spread spectrum to transfer data from one user to another. The data is broken into packets and each packet is transmitted as a separate burst data transmission. A Stanford Telecom STEL-2000A digital spread spectrum processor is used to achieve the direct sequence spreading/despreading. This ASIC is specifically designed to meet the process gain requirements of Part 15.247 (see Appendix A, page 5 of STEL-2000A data sheet). The jamming margin method must be used to measure the process gain since no meaningful output is available from this ASIC with the despreader turned off.

The R/T system operates using three different data and chip rates as follows:

Mode	Chip Rate	Data Rate	Modulation
1	11.25 Mcps	2.045 Mbps	DQPSK
2	5.625 Mcps	1.023 Mbps	DQPSK
3	4.5 Mcps	818.2 kbps	DQPSK

An 11-bit Barker code is used in all cases to obtain the required 10 dB minimum processing gain.

The R/T system also uses Reed-Solomon Forward Error Correction (FEC) hardware (see Appendix B) to obtain additional processing gain for interference avoidance and increased radio performance. 255 byte packets are transmitted in which 20 bytes are FEC information. This allows 10 byte errors to be corrected in each transmitted packet. The FEC system will correct a 10^{-4} bit error rate (BER) to a 10^{-10} BER. Figure 1 shows that the effect of the FEC corresponds to a 5 dB increase in BER performance. The FEC system was disabled during the process gain tests to avoid the sharp roll off of the

corrected BER curve. Therefore, the standard DQPSK BER curve was used in the measurement.

Sources and Prediction of System Loss

The 4.5 dB system losses are due to several factors. The first source can be found in the transmitter. The baseband data is heavily filtered to reduce the energy in the sidebands. Figures 2 to 4 show the transmit data spectrum for the three modes of operation. It can be seen from these plots that the first sideband is -25 dBc minimum and the second sideband is -45 dBc minimum. This filtering reduces the amount of sideband energy to allow better use of the shared spectrum. However, the filtering increases the residual amplitude modulation (AM) of the signal. This AM is evident in Figure 5 which is the detected RF output of the transmitter. Figure 6 shows the received IF signal at the output of the demodulator with a linear IF amplifier. It can be seen from this plot that the filtering applied to the transmit data does not allow the high frequency transitions in the spread code to reach full amplitude. Note that this figure was measured with the logarithmic amplifier in the receiver disabled. The output power measured with a peak power meter (HP 8900D) is .8 dB higher than measured with an average power meter (HP 435B). These measurements show that the system loss due to the transmitter is approximately 1 dB.

The other major source of system loss is in the receiver. The R/T system uses a logarithmic amplifier to produce the required IF system gain. The design of the IF amplifier is such that it is in limiting for strong signals but is nearly linear near the noise floor. A logarithmic amplifier was chosen because of its instantaneous response to the interfering signals found in the ISM band. The logarithmic IF amplifier, coupled with the FEC, makes the data transmission system more immune to other users of the band. However, the logarithmic characteristic of the IF amplifier limits the system performance. It is difficult to despread signals with a negative signal to noise ratio because of the limiting characteristics of this amplifier. Cahn[1] describes system losses due to limiting of up to 6 dB. Measurements were made of the jamming margin with the logarithmic IF amplifier and with a linear IF amplifier substituted for the logarithmic amplifier. The difference in process gain between the two types of amplifiers was measured to be 1.3 dB when a strong input signal is used.

There is also a system loss due to the time quantization which occurs in the digital matched filter correlator. The correlator uses two samples per chip for both the I and Q channels. Energy is lost when the received signal straddles the adjacent chips in the correlator. This error has been characterized to be 1.2 dB[2].

measuring system loss with this method lies in the fact that the logarithmic IF amplifier operates nearly linear at low signal levels. However, the above measurements show a system loss of approximately 4.5 dB for Mode 1 and 3.5 dB for Modes 2 and 3. These numbers roughly correlate with the predicted system loss.

CW Jamming Vs. White Gaussian Noise Jamming

Dixon states that the worst case jammer for a direct sequence system is a CW jammer[5]. The difference between a CW jammer and a gaussian white noise jammer has been characterized by Simon, Omura, Scholtz, and Levitt[6] as follows:

$$(SJR)^{awgn}_{(dB)} = .8 * (SJR)^{cw}_{(dB)}$$

where $(SJR)^{awgn}_{(dB)}$ is the signal-to-jammer ratio (in dB) for gaussian white noise jamming and $(SJR)^{awgn}_{(dB)}$ is the signal-to-jammer ratio (in dB) for CW jamming. This factor modifies the Eb/No curve of figure 1 such that the signal-to-jammer ratio required for a 10-4 BER is 13.4 dB. Using this correction, the system meets the process gain requirement called out in CFR 47 Part 15.247 when measured using the jamming margin method.

Measurements of jamming margin were made using a white gaussian noise jammer . The measurements showed that the system performs according to the uncorrected DQPSK curve of figure 1 when compensated for the system losses described earlier.

Conclusion

The R/T system has a system loss of approximately 4.5 dB. Measurements were made to characterize and account for this loss. The embedded FEC circuitry assures that the R/T system will perform efficiently with the measured system loss. The R/T system uses a digital spread spectrum processor which guarantees that the minimum process gain requirement of CFR 47 Part 15.247 is being met.

References

1. Cahn, Charles R., "A Note on Signal-to-Noise Ratio in Band-Pass Limiters," *IRE Trans. Info. Th.*, January 1961

2. Nathanson, Fred E.: *Radar Design Principles*, McGraw-Hill, New York, 1969, p 478

3. Feher, Kamilo: *Wireless Digital Communications: Modulation and Spread Spectrum Applications*, Prentice Hall, Upper Saddle River, New Jersey, 1995, p 211

4. Dixon, Robert C.: *Spread Spectrum Systems*, John Wiley & Sons, New York, 1984, p 10

5. Dixon, Robert C.: *Spread Spectrum Systems*, John Wiley & Sons, New York, 1984, p 173

6. Simon, Marvin K., Omura, Jim K., Scholtz, Robert A., and Levitt, Barry K.: *Spread Spectrum Communications Handbook*, McGraw-Hill, New York, 1994, p 695

List of Figures

5.4 TEST EQUIPMENT LIST

(1) Microprocessor Controlled E-Class Series 400 EFT/Burst Test Generator, by KeyTek Instrument Corp., Model E420, Serial No.: 9205213:

The characteristics and performance of the generator are as follows:

- Test Level:
  Open Circuit Output Voltage: upto 4.4 kV (10kHz) and upto 8kV (2.5kHz)
  Short Circuit Output Current: 0.25kA min, 2kA max.
  Waveshape of Surge Voltage and Current: meet figure 2 and 3 of table 2 specified in IEC 1000-4-4 (Third Impression 1991)
  . Pulse Rise Time: 5nS ± 30%
  . Pulse Duration: 50nS ± 30%
  . Burst Train Repetition Rate: 1 kHz to 10 kHz
  . Burst Train Duration: 1 to 20mS
  . Burst Period: 0.3 to 5 seconds
- Generator Source Impedance: 50 Ohms
- Polarity of the Surge: positive/negative
- Internal or External Generator Trigger: internal
- Number of Tests: at least 5 positive and 5 negative at the selected points.

(2) Coupling Clamp, by KeyTek Instrument, Model CCL-801/S, S/N: 9211339. Characteristics: typical coupling capacitance between cable and clamp: 50 pF to 200pF, usable diameter range of round cables: 4mm to 40mm, insulation withstanding capability: 5kV min (test pulse 1.2/50uS)

(3) Patriot Personal Computer with National Instruments GPIB Card and Keytek E-Class Software control. Fibre optic RS-232 link to EFT Simulator.

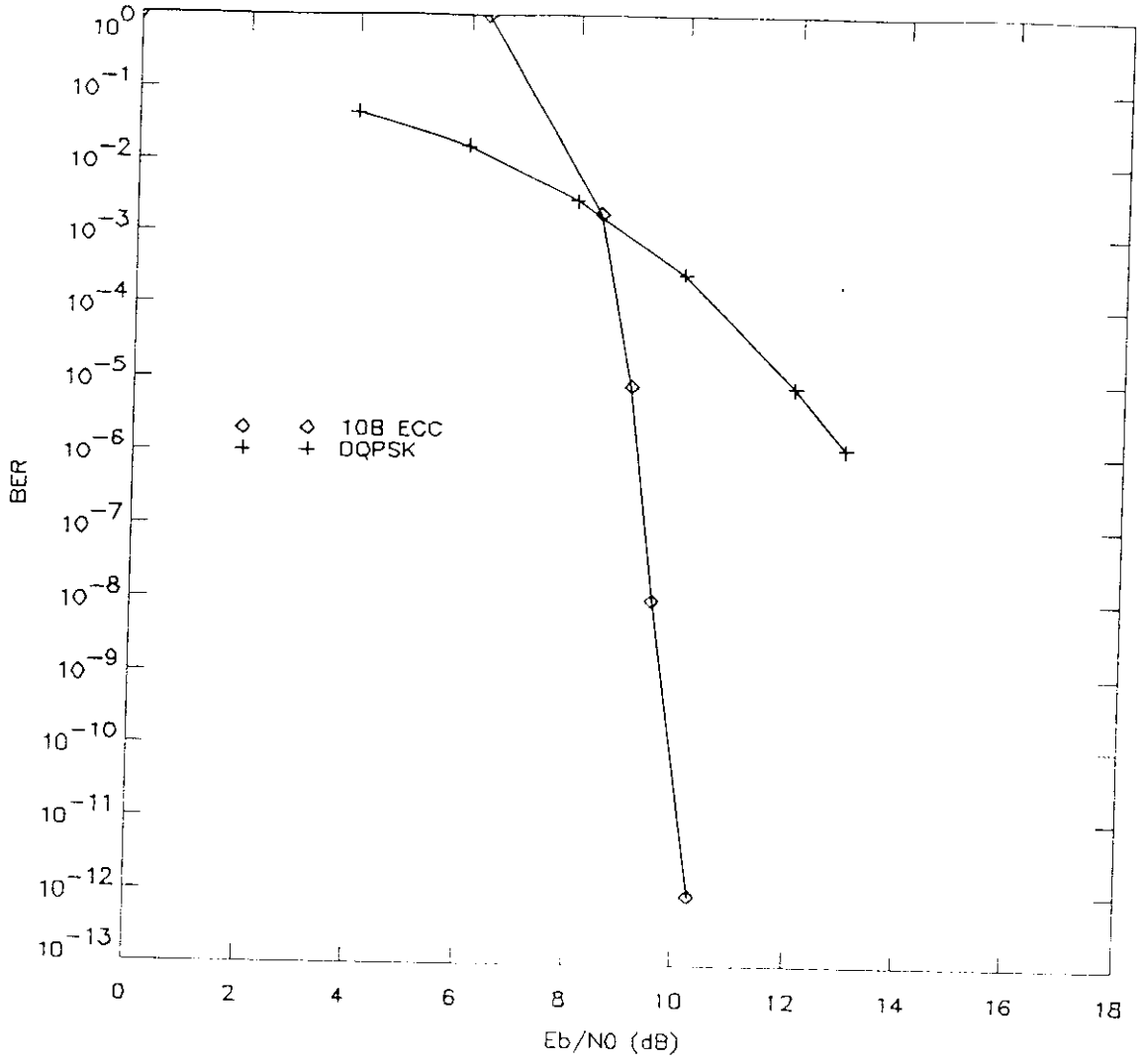


Figure 1 E_b/N_o Vs. BER

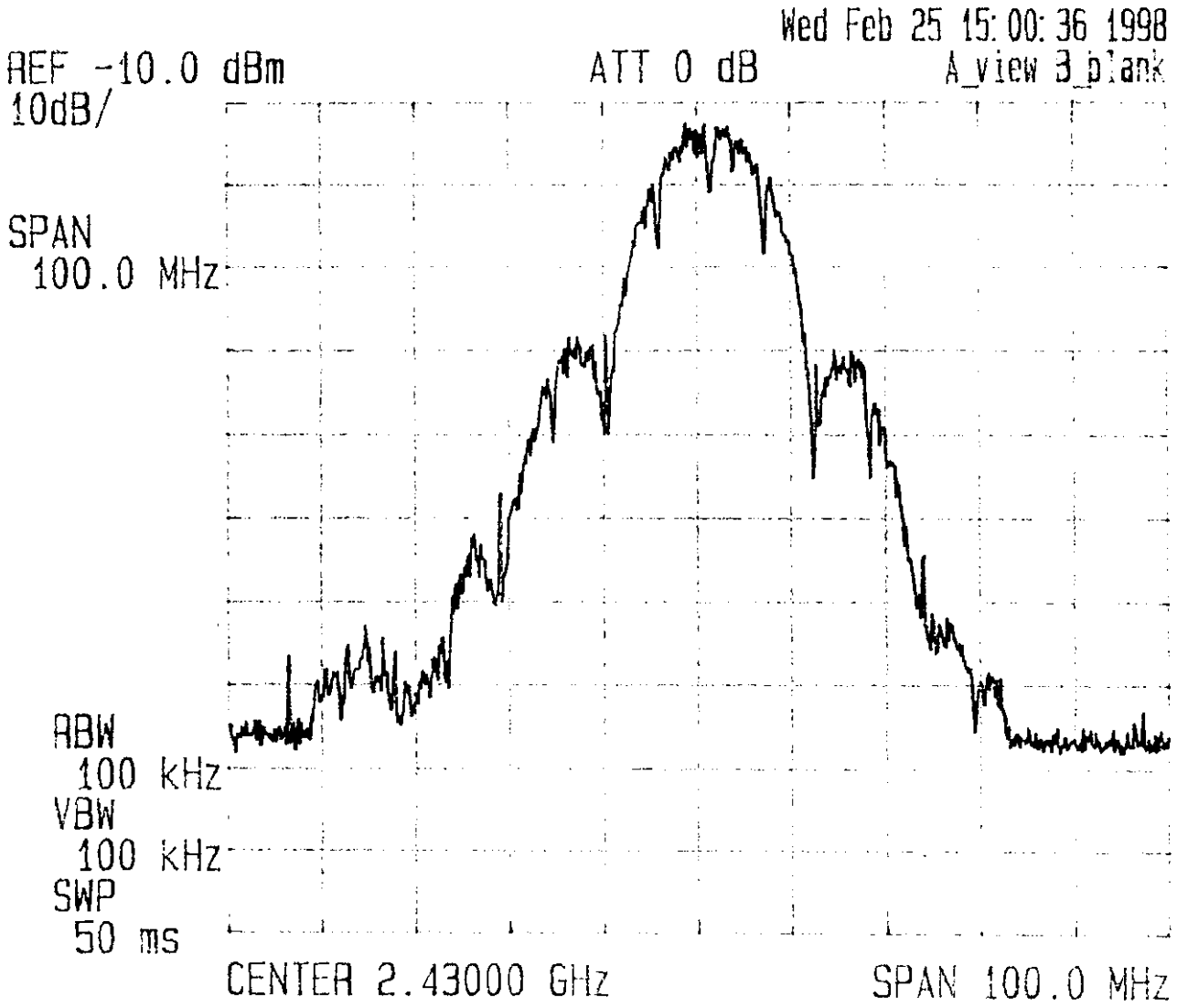


Figure 2 RF Output Spectrum – Mode 1

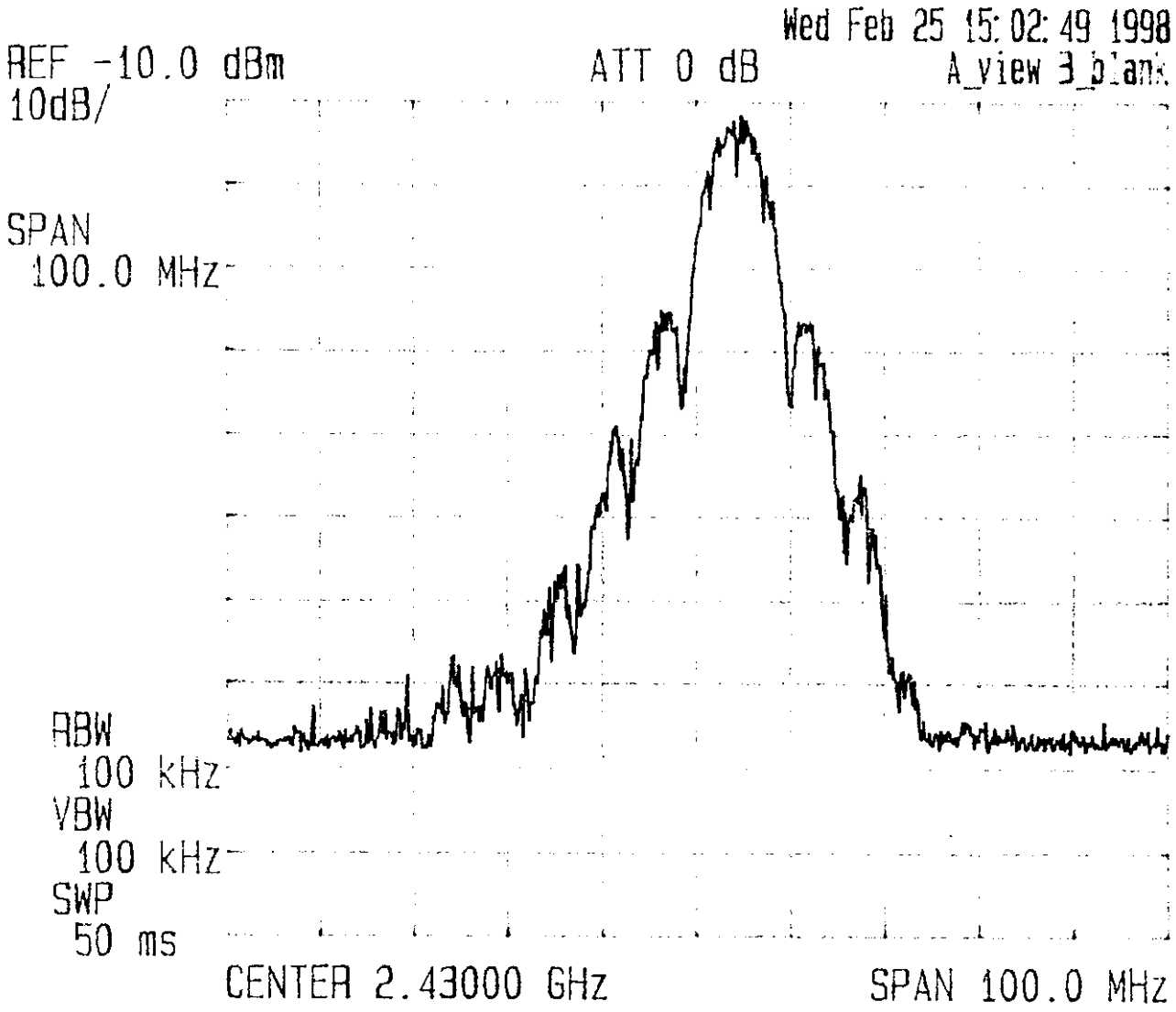


Figure 3 RF Output Spectrum – Mode 2

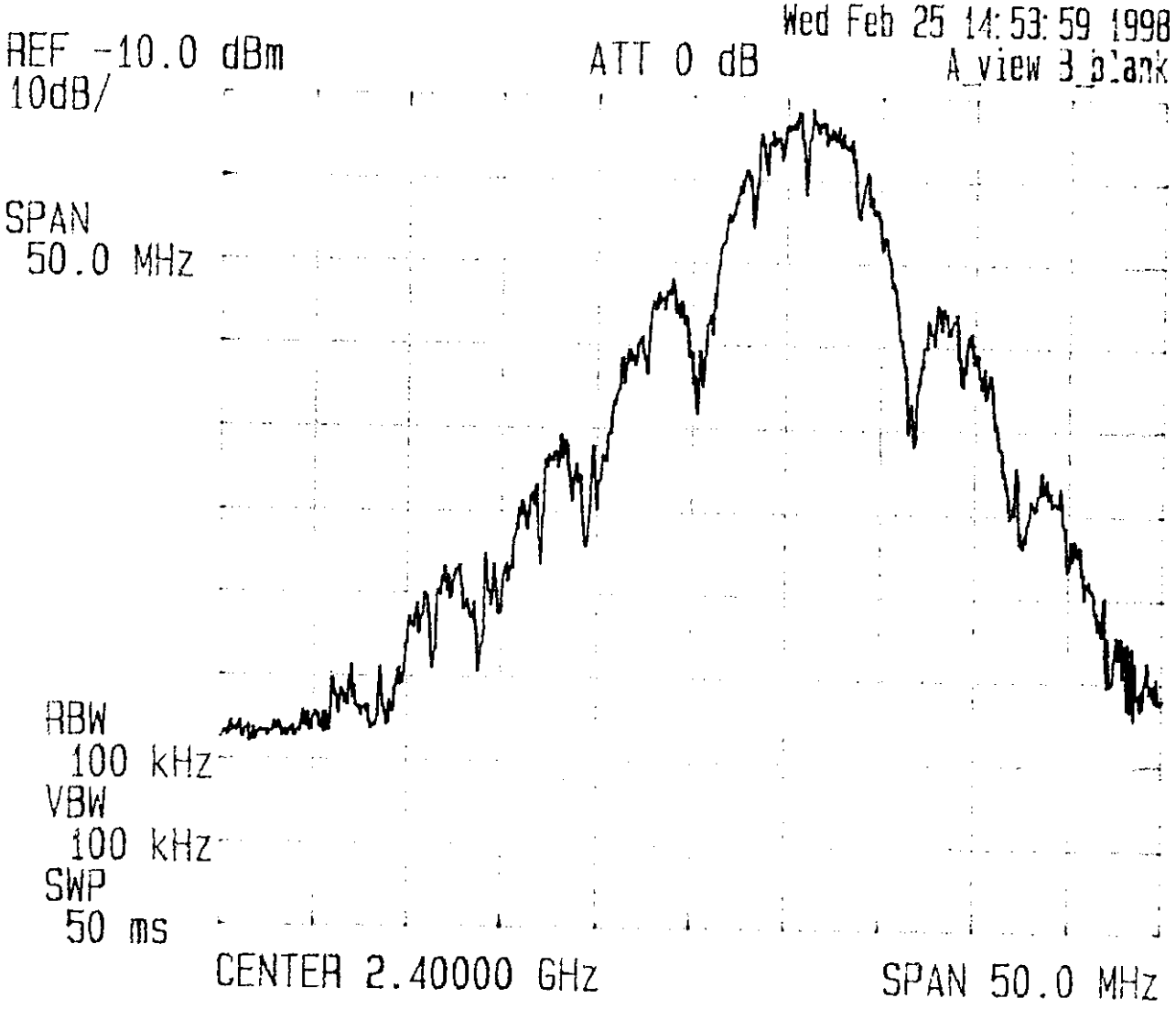


Figure 4 RF Output Spectrum – Mode 3

The above factors account for 3.5 dB of the 4.5 dB total system losses. Other measurements were taken to verify the total system loss.

Measurement of System Loss

The total system loss was measured using the minimum detectable signal of the R/T. Two units were connected together and the signal strength required for a 10^{-4} BER was measured. The test set up is shown in Figure 7. This measured value can then be compared to the theoretical signal required for a 10^{-4} BER. The difference between measured and theoretical is the total system losses.

The following is the calculation of the theoretical value:

Required E_b/N_o for 10^{-4} BER for DQPSK = 10.7 dB See Reference 3

Process Gain = $G_p = BW_{RF}/R_{info}$ See Reference 4

Receiver Noise Floor = kTBF

$P_{Rcalc} = kTBF + E_b/N_o - G_p$

where k is Boltzman's constant, T is the temperature, B is the receiver bandwidth, F is the receiver noise figure and P_{Rcalc} is the theoretical signal strength required for 10^{-4} BER .

The receiver bandwidth can be determined from Figure 8 which is a plot of the IF filter bandwidth. The bandwidth is 17.25 MHz for Mode 1 and is 9.25 MHz for Modes 2 and 3. This data was taken from the 6 dB points on the filter curves.

The receiver noise figure was measured using the set up of Figure 9. The noise figure was found to be 3.8 dB. Appendix C is a description of the measurement process.

The signal strength required for a 10^{-4} BER was measured to be –93.1 dBm for Mode 1, -96.8 dBm for Mode 2, and –96.9 dBm for Mode 3 using the test set up of Figure 7. Therefore, the system losses are:

System Losses = $P_{Rcalc} - P_{Rmeas}$ = -97.5 dBm + -93.1 dBm = 4.4 dB for Mode 1

System Losses = $P_{Rcalc} - P_{Rmeas}$ = -100.2 dBm + -96.8 dBm = 3.4 dB for Mode 2

System Losses = $P_{Rcalc} - P_{Rmeas}$ = -100.2 dBm + -96.9 dBm = 3.3 dB for Mode 3

The measurement of the minimum detectable signal is difficult to make accurately. This is due to calibration errors of approximately .2 to .5 dB. Another source of error in

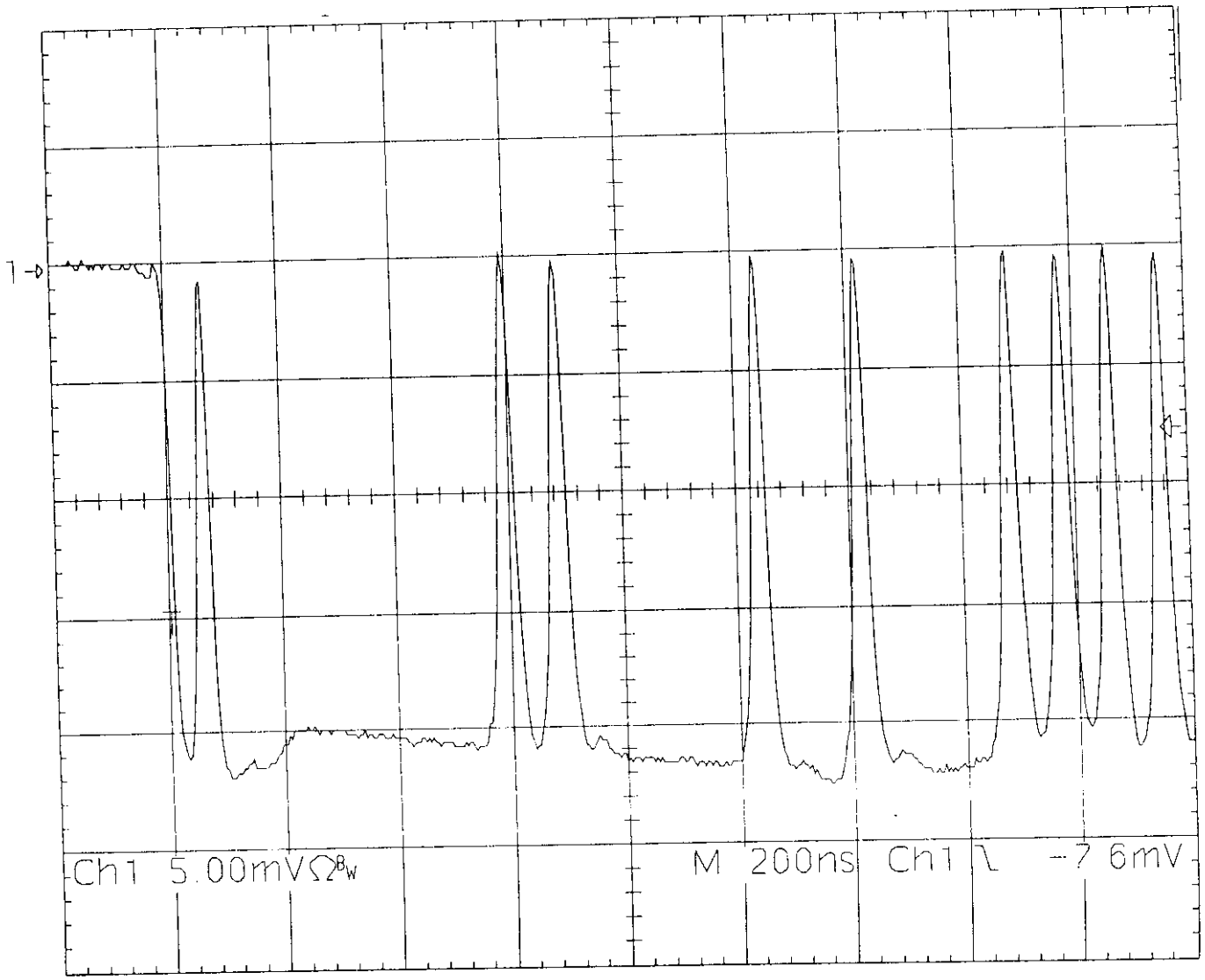


Figure 5a Detected RF Output – Mode 1

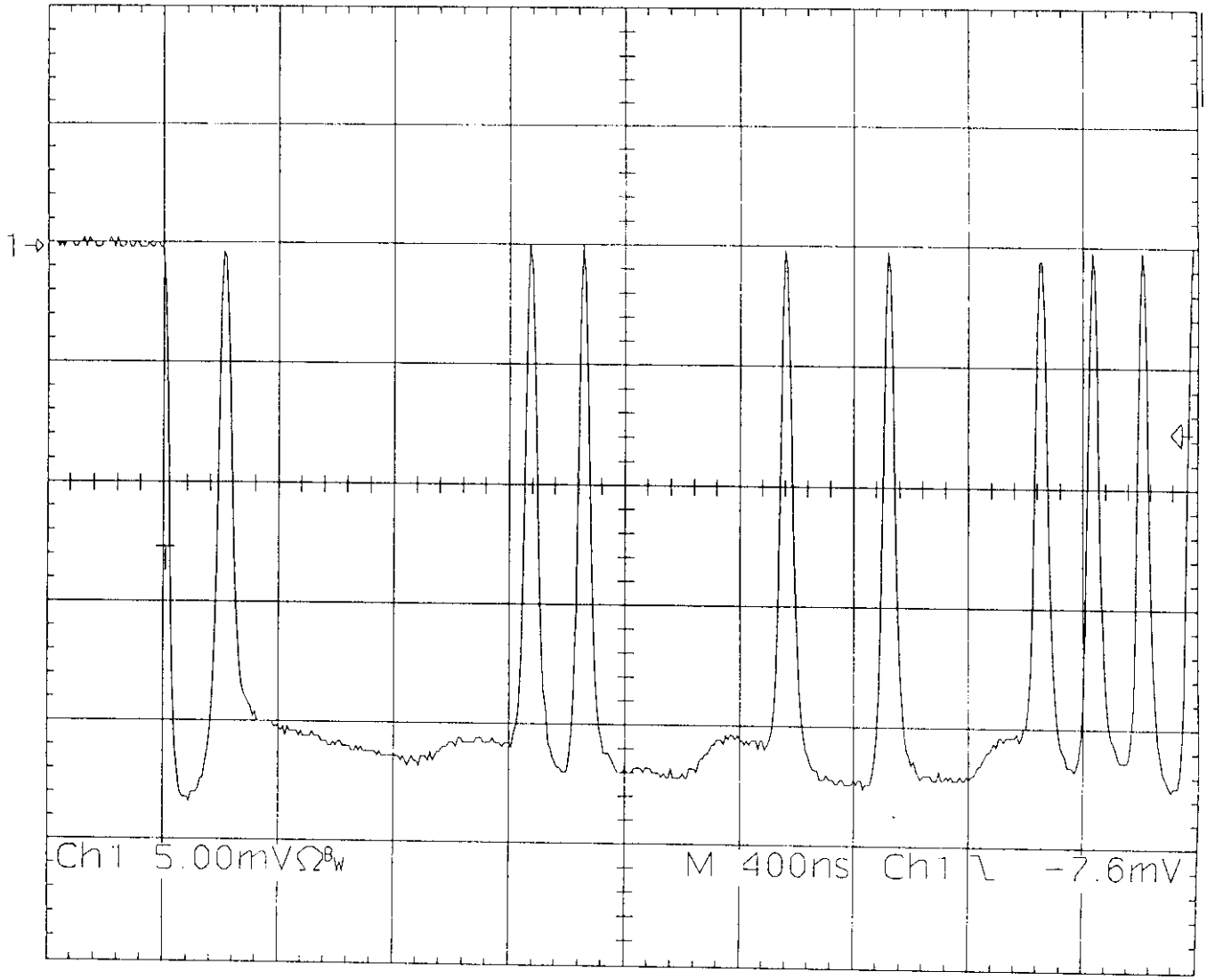


Figure 5b Detected RF Output – Mode 2

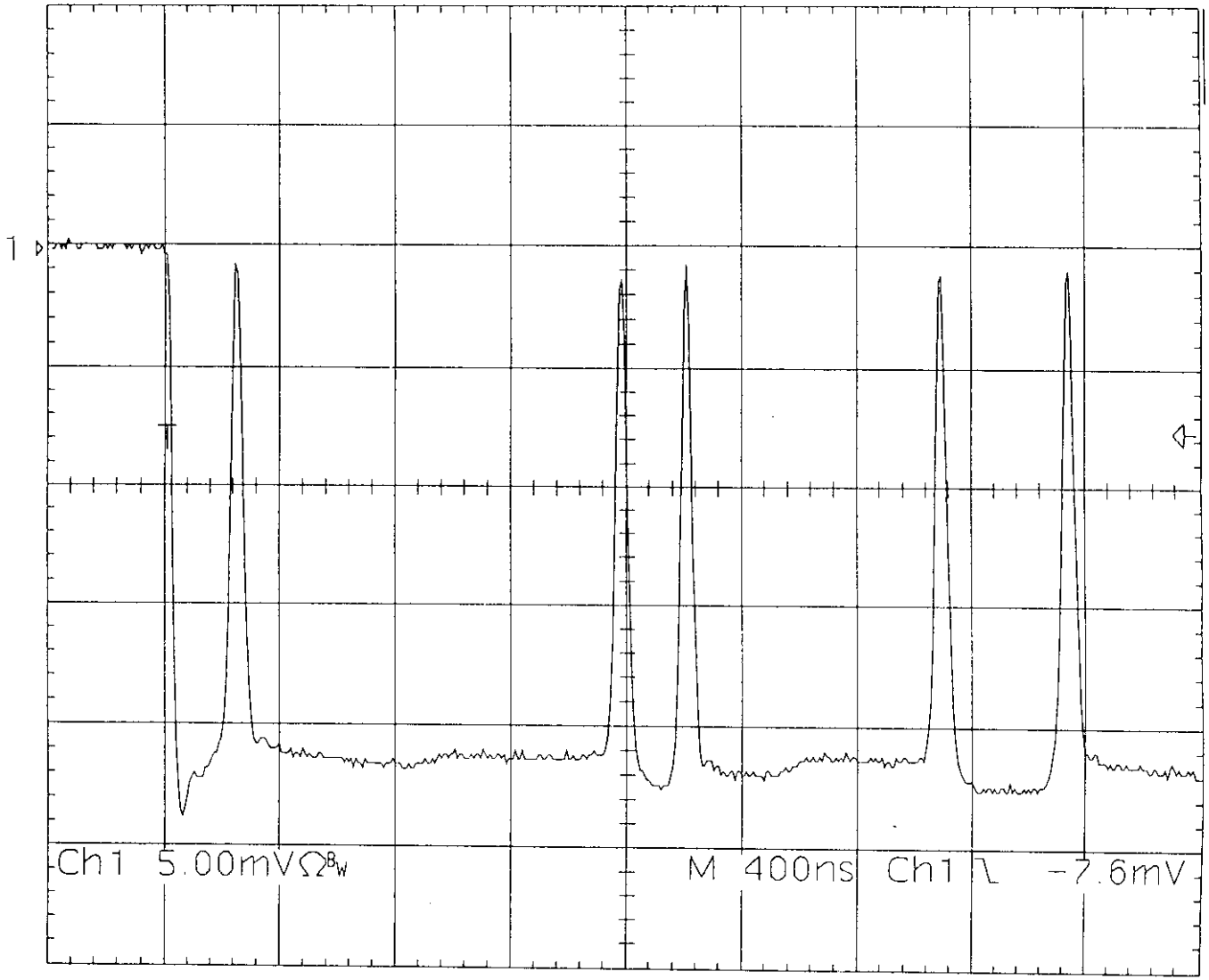


Figure 5c Detected RF Output – Mode 3

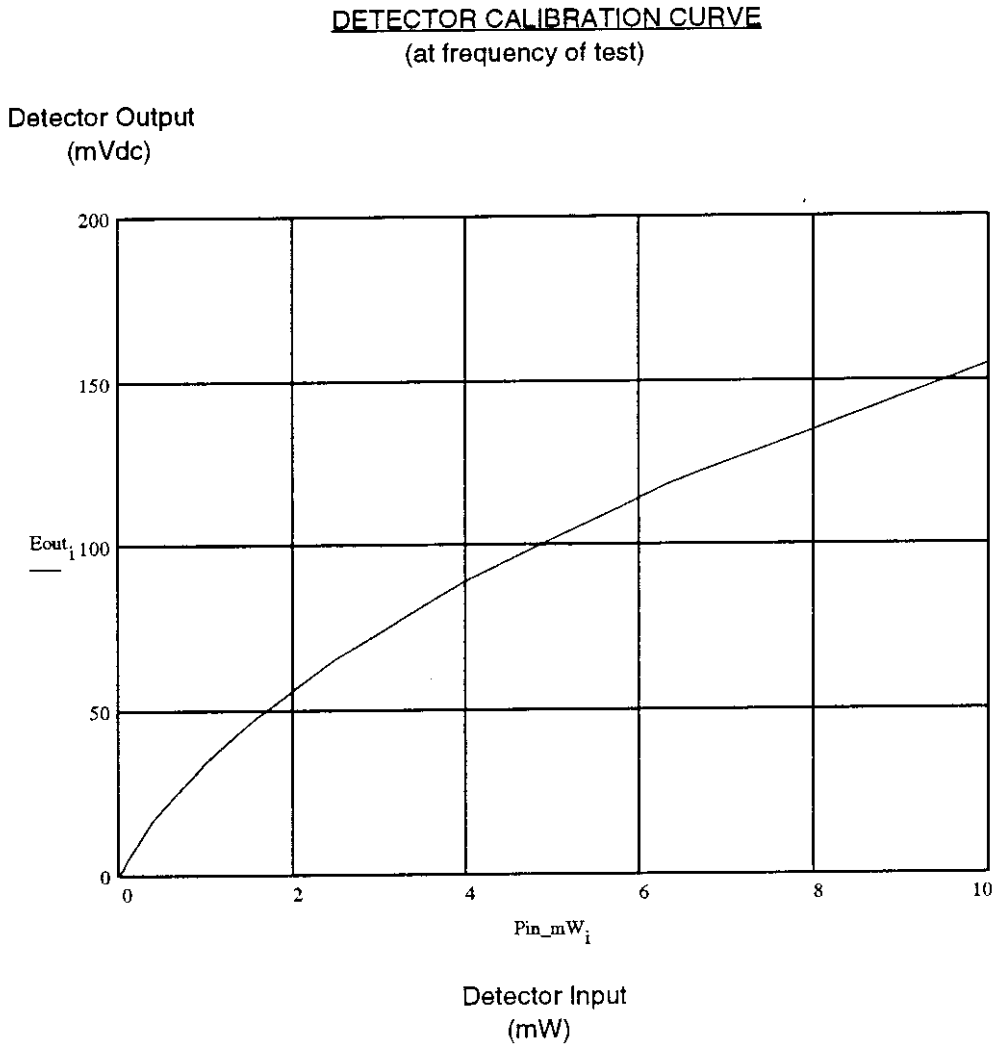


Figure 5d Detector Calibration

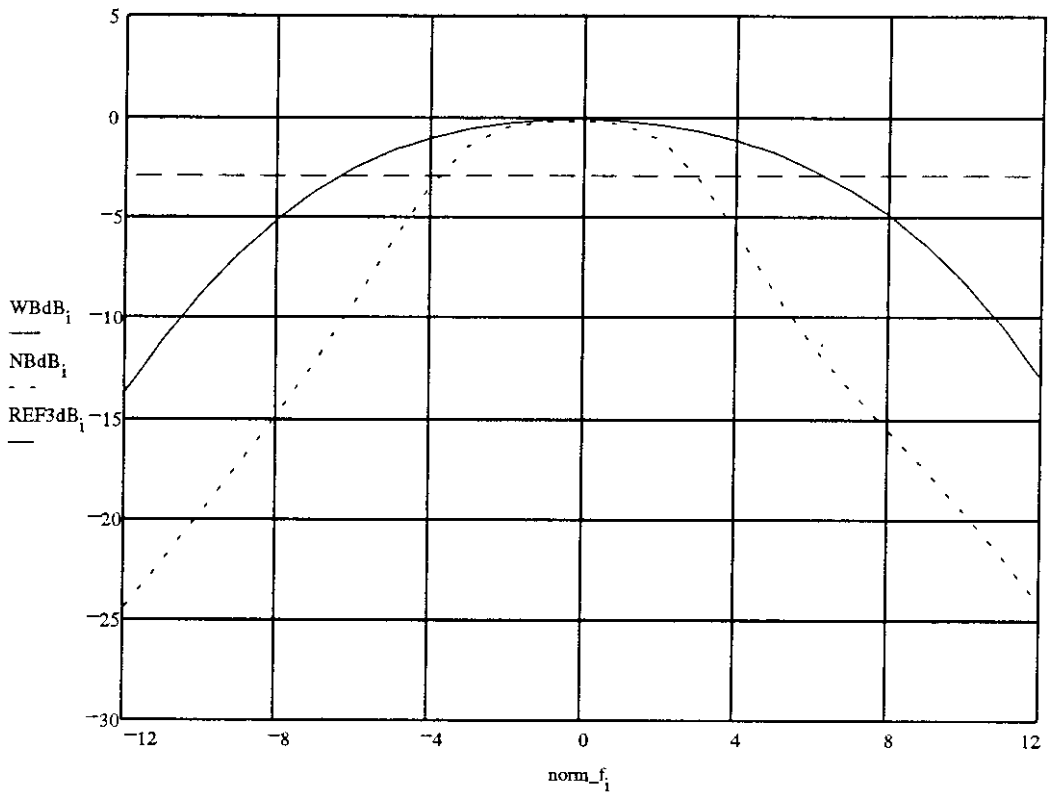


Figure 8 IF Filter Bandwidths

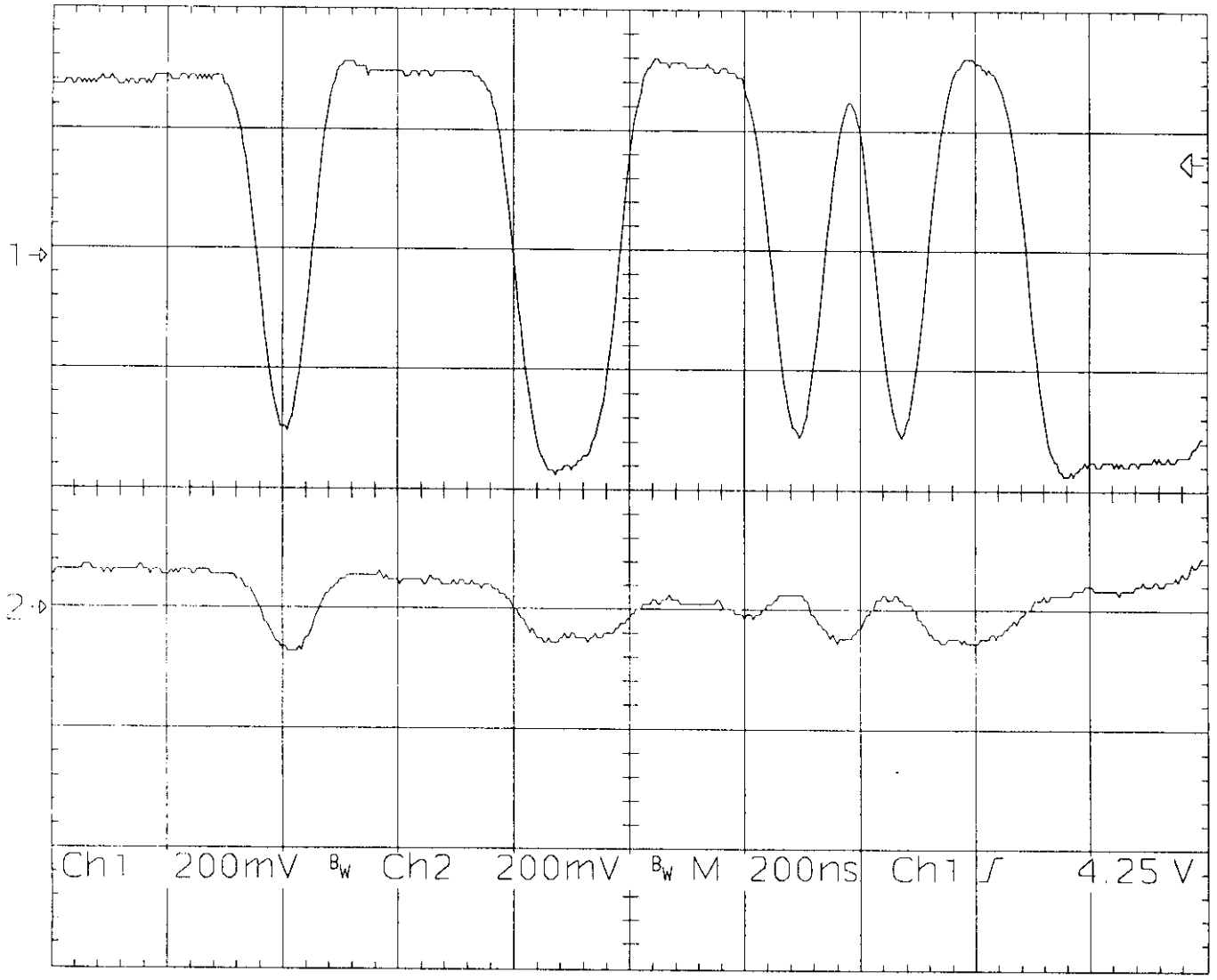


Figure 6 Demodulated Baseband Output – CH 1 is I Channel, CH 2 is Q Channel

TEST SETUP
MDS MEASUREMENT

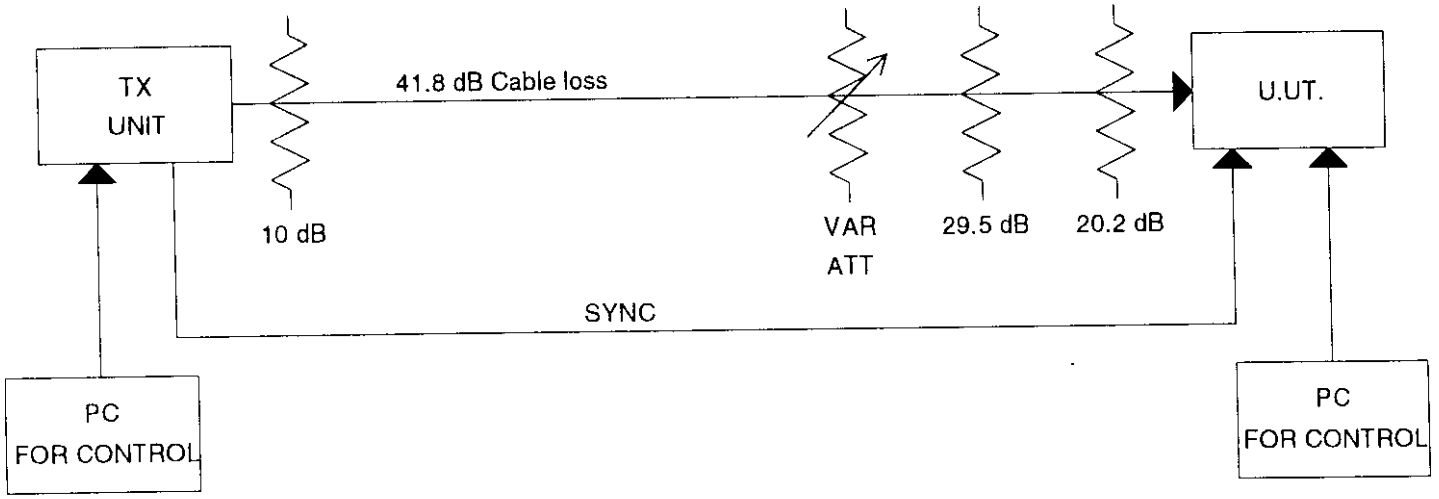
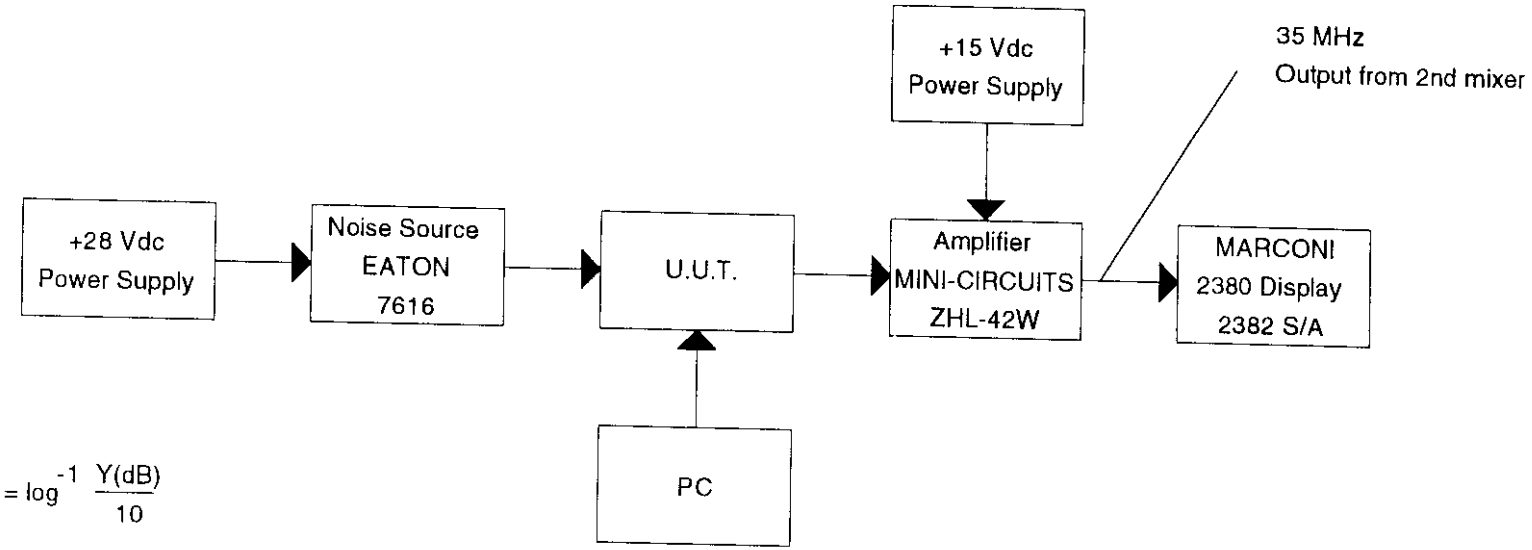


Figure 7

TEST SETUP
NOISE FIGURE MEASUREMENT



$$Y = \log^{-1}\frac{Y(dB)}{10}$$

$$NF = ENR(dB) - 10\log(Y - 1)$$

Where:
1) Y(dB) is the difference in output noise level when the noise source is biased on and off.
2) ENR(dB) is the calibrated level appearing on the noise souce.
3) NF is the noise figure of the system under test.

Figure 9

MEASUREMENT DATA

RADIATED EMISSIONS MEASUREMENTS @ 3 METERS

TEST CONFIGURATION

- *This lowest, middle and highest channels were established at its full rated output power. The emissions were investigated from the lowest frequency generated by the transmitter up to the 10th harmonic of the fundamental emissions in each case. the measured level of the carrier was recorded and compared to the level of the emissions as required in Parts 15.247(c) or 15.209(a) whichever was applicable.*
- *For measuring radiated emissions at frequencies below 1 GHz, the Spectrum Analyzer was set as 100 KHz RBW, VBW ≥ RBW, SWEEP TIME: AUTO, PEAK DETECTOR.*
- *For measuring radiated emissions at frequencies above 1 GHz, the Spectrum Analyzer was set as 1 MHz RBW, 1 MHz VBW, SWEEP TIME: AUTO for PEAK measurements and 1 MHz RBW, 10 Hz VBW, SWEEP TIME: AUTO for AVERAGE measurements.*
- *The following measurements were the worst cases when the radiating antenna was placed in both horizontal and vertical polarization.*
- *The following **AVERAGE** rf levels were obtained from either Peak or Average readings added by the duty cycle correction factor. **DUTY CYCLE FACTOR = $20LOG_{10}(0.45)$ = -6.9 dB***

- **Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi**

Channel #: 3, Frequency: 2408.625 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 126.3 dBuV/m** **Limit = 106.3 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1493.00	61.4	48.1	V	54.0	106.3	-5.9	PASS
1493.00	60.1	49.4	H	54.0	106.3	-4.6	PASS
2373.00	72.1	51.3	H	54.0	106.3	-2.7	PASS
2390.00	65.2	47.4	H	54.0	106.3	-6.6	PASS
2408.63	114.6	--	V	--	--	--	--
2408.63	126.3	--	H	--	--	--	--
4816.00	50.7	29.3	V	54.0	106.3	-24.7	PASS
4816.00	49.3	28.3	H	54.0	106.3	-25.7	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi**

Channel #: 4, Frequency: 2411.4375 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, medium , 11 chips/symbol,** **Data Rate: 5.625 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 125.3 dBuV/m** **Limit = 105.3 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1496.00	61.3	47.2	V	54.0	105.3	-6.8	PASS
1496.00	62.0	49.0	H	54.0	105.3	-5.0	PASS
2376.00	72.7	52.4	H	54.0	105.3	-1.6	PASS
2390.00	64.9	43.0	H	54.0	105.3	-11.0	PASS
2411.44	109.3	--	V	--	--	--	--
2411.44	125.3	--	H	--	--	--	--
4488.00	48.3	30.1	V	54.0	105.3	-75.2	PASS
4488.00	47.4	31.4	H	54.0	105.3	-73.9	PASS
4822.00	52.3	34.3	V	54.0	105.3	-19.7	PASS
4822.00	51.2	31.8	H	54.0	105.3	-22.2	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi**

Channel #: 6, Frequency: 2419.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, wide, 11 chips/symbol,** **Data Rate: 11.25 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 123.9 dBuV/m** **Limit = 103.9 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1504.00	60.1	47.0	V	54.0	103.9	-7.0	PASS
1504.00	62.8	49.8	H	54.0	103.9	-4.2	PASS
2379.30	67.1	43.9	H	54.0	103.9	-10.1	PASS
2385.30	73.1	50.3	H	54.0	103.9	-3.7	PASS
2390.00	73.2	46.1	H	54.0	103.9	-7.9	PASS
2419.88	108.6	--	V	--	--	--	--
2419.88	123.9	--	H	--	--	--	--
4512.00	48.2	29.4	V	54.0	103.9	-24.6	PASS
4512.00	47.6	30.0	H	54.0	103.9	-24.0	PASS
4838.00	55.0	33.9	V	54.0	103.9	-20.1	PASS
4838.00	50.3	30.4	H	54.0	103.9	-23.6	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi**

Channel #: 18, Frequency: 2464.875 MHz Full Rated Peak Power: 190 mW Modulation: DQPSK, narrow, 11 chips/symbol, Data Rate: 4.5 Mb/s, 2 bits/symbol				Power Level in 1 MHz BW: 125.5 dBuV/m Limit = 105.5 dBuV/m			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1549.00	61.3	46.9	V	54.0	105.5	-7.1	PASS
1549.00	60.7	47.0	H	54.0	105.5	-7.0	PASS
2383.50	67.3	42.6	H	54.0	105.5	-11.4	PASS
2464.88	111.3	--	V	--	--	--	--
2464.88	125.5	--	H	--	--	--	--
4647.00	50.2	34.6	V	54.0	105.5	-19.4	PASS
4647.00	48.3	31.0	H	54.0	105.5	-23.0	PASS
4928.00	50.4	31.0	V	54.0	105.5	-23.0	PASS
4928.00	50.4	31.5	H	54.0	105.5	-22.5	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x1 Patch Antenna, P/N:64958022, Gain: 8.5 dBi**

Channel #: 3, Frequency: 2408.625 MHz Full Rated Peak Power: 190 mW Modulation: DQPSK, narrow, 11 chips/symbol, Data Rate: 4.5 Mb/s, 2 bits/symbol				Power Level in 1 MHz BW: 119.5 dBuV/m Limit = 99.5 dBuV/m			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1493.00	62.7	50.4	V	54.0	99.5	-3.6	PASS
1493.00	59.7	46.9	H	54.0	99.5	-7.1	PASS
2408.63	113.8	--	V	--	--	--	--
2408.63	119.5	--	H	--	--	--	--
4816.00	51.4	35.0	V	54.0	99.5	-19.0	PASS
4816.00	50.5	33.4	H	54.0	99.5	-20.6	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x1 Patch Antenna, P/N:64958022, Gain: 8.5 dBi**

Channel #: 4, Frequency: 2411.4375 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, medium , 11 chips/symbol,** **Data Rate: 5.625 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: dBuV/m** **Limit = dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1496.00	59.3	42.7	V	54.0	105.2	-11.3	PASS
1496.00	59.5	42.7	H	54.0	105.2	-11.3	PASS
2376.70	63.8	40.6	H	54.0	105.2	-13.4	PASS
2390.00	62.8	40.9	H	54.0	105.2	-13.1	PASS
2411.44	115.5	--	V	--	--	--	--
2411.44	125.2	--	H	--	--	--	--
4488.00	48.2	34.0	V	54.0	105.2	-71.2	PASS
4488.00	48.3	32.6	H	54.0	105.2	-72.6	PASS
4822.00	49.3	34.5	V	54.0	105.2	-19.5	PASS
4822.00	50.8	35.4	H	54.0	105.2	-18.7	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x1 Patch Antenna, P/N:64958022, Gain: 8.5 dBi**

Channel #: 6, Frequency: 2419.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, wide, 11 chips/symbol,** **Data Rate: 11.25 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 123.3 dBuV/m** **Limit = 103.3 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1504.00	61.3	47.3	V	54.0	103.3	-6.7	PASS
1504.00	61.8	48.8	H	54.0	103.3	-5.2	PASS
2385.00	60.4	46.1	V	54.0	103.3	-7.9	PASS
2385.00	73.9	58.6	H	54.0	103.3	4.6	PASS
2390.00	69.1	44.6	H	54.0	103.3	-9.4	PASS
2419.88	112.8	--	V	--	--	--	--
2419.88	123.3	--	H	--	--	--	--
4838.00	50.6	30.4	V	54.0	103.3	-23.6	PASS
4838.00	53.3	36.9	H	54.0	103.3	-17.2	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Huber Suhner 1x1 Patch Antenna, P/N:64958022, Gain: 8.5 dBi**

Channel #: 18, Frequency: 2464.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 125.4 dBuV/m** **Limit = 105.4 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
2464.88	114.1	--	V	--	--	--	--
2464.88	125.4	--	H	--	--	--	--
2383.50	71.5	43.9	H	54.0	98.5	-54.6	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Andrew Omni Antenna , P/N: RT1N0F-024V-013A, Gain: 13 dBi**

Channel #: 3, Frequency: 2408.625 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 125.3 dBuV/m** **Limit = 105.3 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1493.00	62.0	44.4	V	54.0	105.3	-9.7	PASS
1493.00	59.6	45.4	H	54.0	105.3	-8.7	PASS
2374.10	66.4	47.3	V	54.0	105.3	-6.7	PASS
2384.00	60.1	42.7	V	54.0	105.3	-11.3	PASS
2390.00	69.4	45.7	V	54.0	105.3	-8.3	PASS
2408.63	125.3	--	V	--	--	--	--
2408.63	115.1	--	H	--	--	--	--
4816.00	52.3	32.6	V	54.0	105.3	-21.4	PASS
4816.00	51.5	32.7	H	54.0	105.3	-21.3	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Andrew Omni Antenna , P/N: RT1N0F-024V-013A, Gain: 13 dBi**

Channel #: 4, Frequency: 2411.4375 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, medium , 11 chips/symbol,** **Data Rate: 5.625 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 124.6 dBuV/m** **Limit = 104.6 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1496.00	64.4	50.7	V	54.0	104.6	-3.3	PASS
1496.00	60.3	46.8	H	54.0	104.6	-7.2	PASS
2377.00	69.8	51.1	V	54.0	104.6	-2.9	PASS
2390.00	63.7	43.6	V	54.0	104.6	-10.4	PASS
2411.44	124.6	117.7	V	54.0	104.6	63.7	PASS
2411.44	112.0	105.1	H	54.0	104.6	51.1	PASS
4488.00	50.2	31.9	V	54.0	104.6	-72.8	PASS
4488.00	48.5	30.9	H	54.0	104.6	-73.7	PASS
4822.00	57.9	38.8	V	54.0	104.6	-15.2	PASS
4822.00	57.7	37.8	H	54.0	104.6	-16.2	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Andrew Omni Antenna , P/N: RT1N0F-024V-013A, Gain: 13 dBi**

Channel #: 6, Frequency: 2419.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, wide, 11 chips/symbol,** **Data Rate: 11.25 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 120.6 dBuV/m** **Limit = 100.6 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1504.00	63.0	46.6	V	54.0	100.6	-7.4	PASS
1504.00	60.0	42.5	H	54.0	100.6	-11.5	PASS
2385.00	67.6	46.5	V	54.0	100.6	-7.5	PASS
2419.88	120.6	--	V	--	--	--	--
2419.88	107.3	--	H	--	--	--	--
4838.00	54.1	33.7	V	54.0	100.6	-20.3	PASS
4838.00	50.0	30.3	H	54.0	100.6	-23.7	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

- **Andrew Omni Antenna , P/N: RT1N0F-024V-013A, Gain: 13 dBi**

Channel #: 18, Frequency: 2464.875 MHz **Full Rated Peak Power: 190 mW** **Modulation: DQPSK, narrow, 11 chips/symbol,** **Data Rate: 4.5 Mb/s, 2 bits/symbol**				**Power Level in 1 MHz BW: 119.6 dBuV/m** **Limit = 99.6 dBuV/m**			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
1549.00	61.1	45.4	V	54.0	99.6	-8.6	PASS
1549.00	59.8	46.9	H	54.0	99.6	-7.1	PASS
2464.88	119.6	--	V	--	--	--	--
2464.88	111.4	--	H	--	--	--	--
4647.00	50.2	35.0	V	54.0	99.6	-19.0	PASS
4647.00	48.8	33.8	H	54.0	99.6	-20.2	PASS
4928.00	53.5	38.2	V	54.0	99.6	-15.8	PASS
4928.00	53.3	34.8	H	54.0	99.6	-19.2	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							

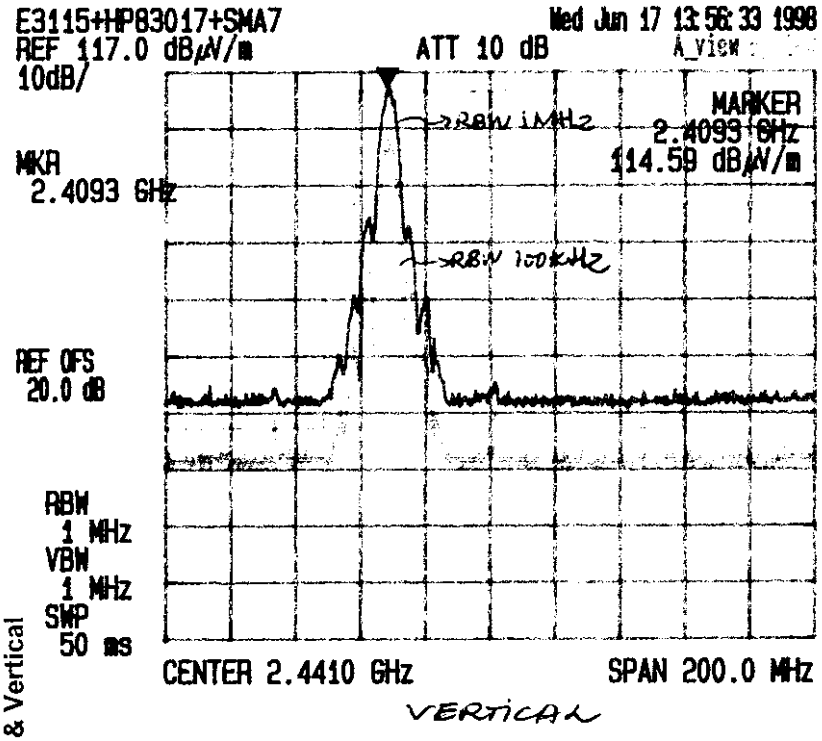
** FCC Limit @ 15.209 was applied for frequency fell within restricted band @ 15.205*

Date: June 15,1998
Tested by: Hung Trinh

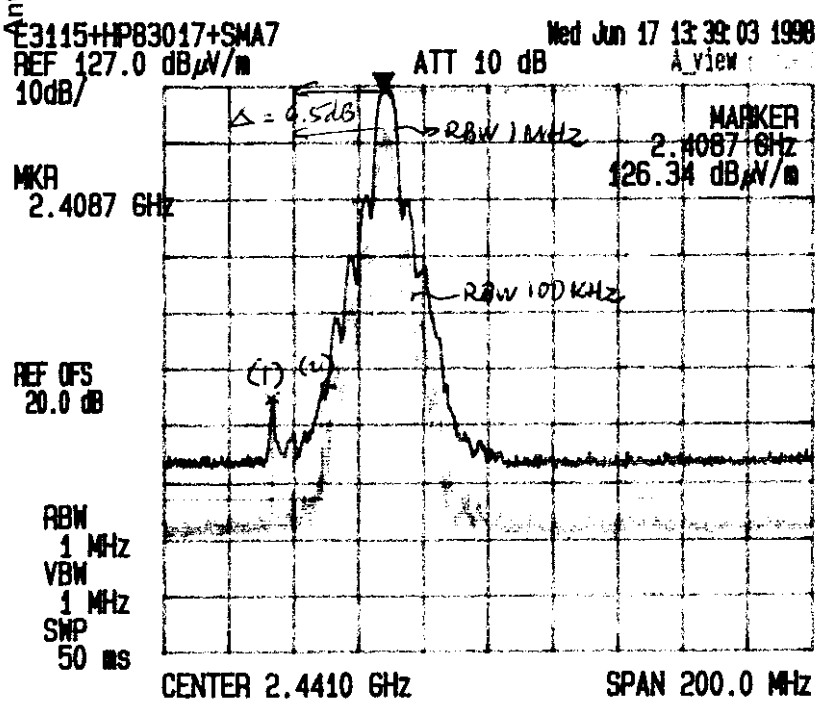
INTERAIR WIRELESS

ISP DIRECT,MODEL 2401-01 (INDOOR)& 2401-02 (OUTDOOR)
Channel #: 3, Tx Frequency: 2408.625
Modulation: DSSS,BW:MEDIUM (5.625 Mc/s),11 chips/symbol,1.023 Mbps DQPSK
BETA 2 WITH 1 x 10 PATCH ANTENNA

Radiated Emissions Measurements at 3 Meters
Antenna Polarization: Horizontal & Vertical



VERTICAL



HORIZONTAL

	FREQ (MHz)	dBµV/m PEAK	dBµV/m AVG
(1)	2373.9	72.1	58.2
(2)	2390	(71.7) −6.5	(54.3) −6.5

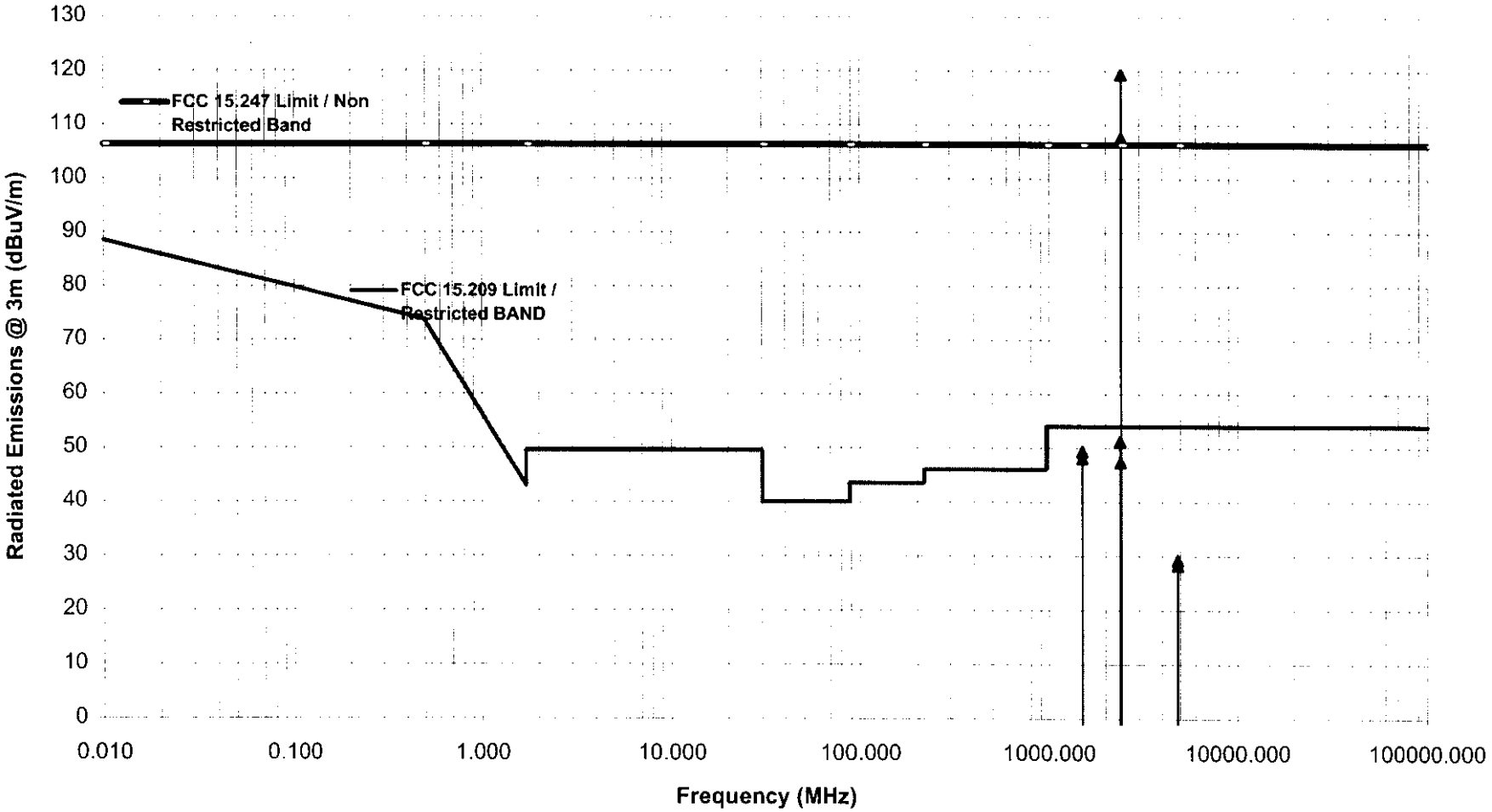
UltraTech
Engineering Labs Inc.

Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 3, Tx Frequency: 2408.625 MHz

Tx Antenna: Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi

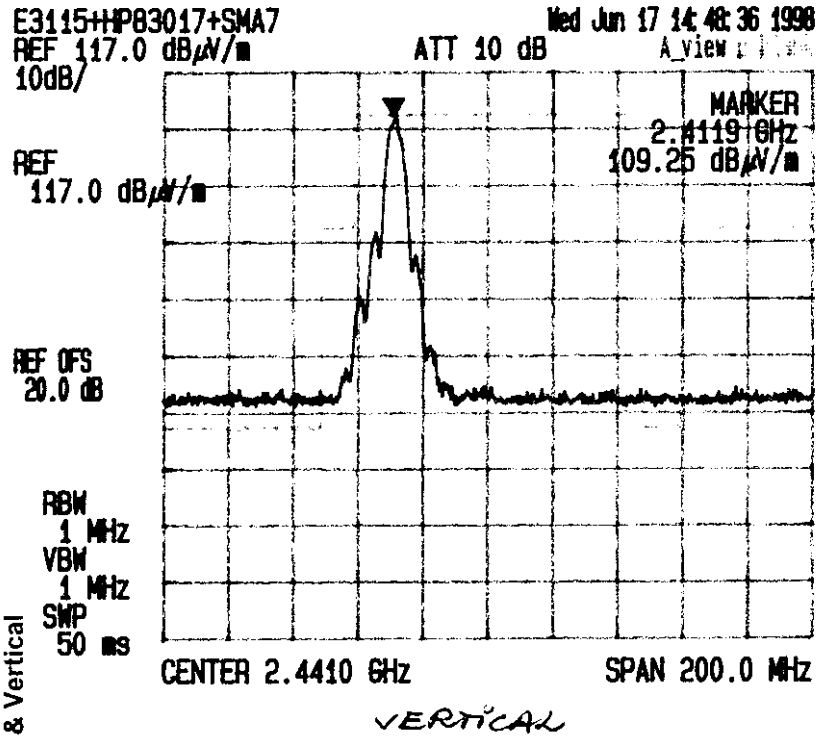


Date: June 15,1998
Tested by: Hung Trinh

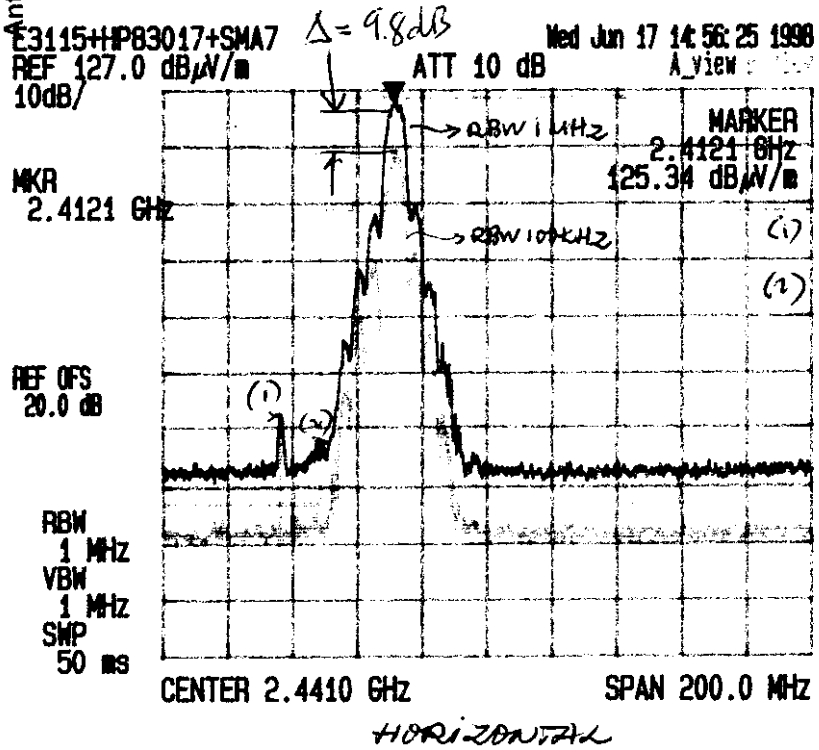
INTERAIR WIRELESS

ISP DIRECT,MODEL 2401-01 (INDOOR)& 2401-02 (OUTDOOR)
Channel #: 4, Tx Frequency: 2411.4375
Modulation: DSSS,BW:MEDIUM (5.625 Mc/s),11 chips/symbol,1.023 Mbps DQPSK
BETA2 WITH 1x10 PATCH ANTENNA

Radiated Emissions Measurements at 3 Meters
Antenna Polarization: Horizontal & Vertical



VERTICAL



HORIZONTAL

	FREQ (MHz)	PEAK dBµV/m	AVG dBµV/m
(1)	2376.7	72.7	59.3
(2)	2390	64.9	49.9

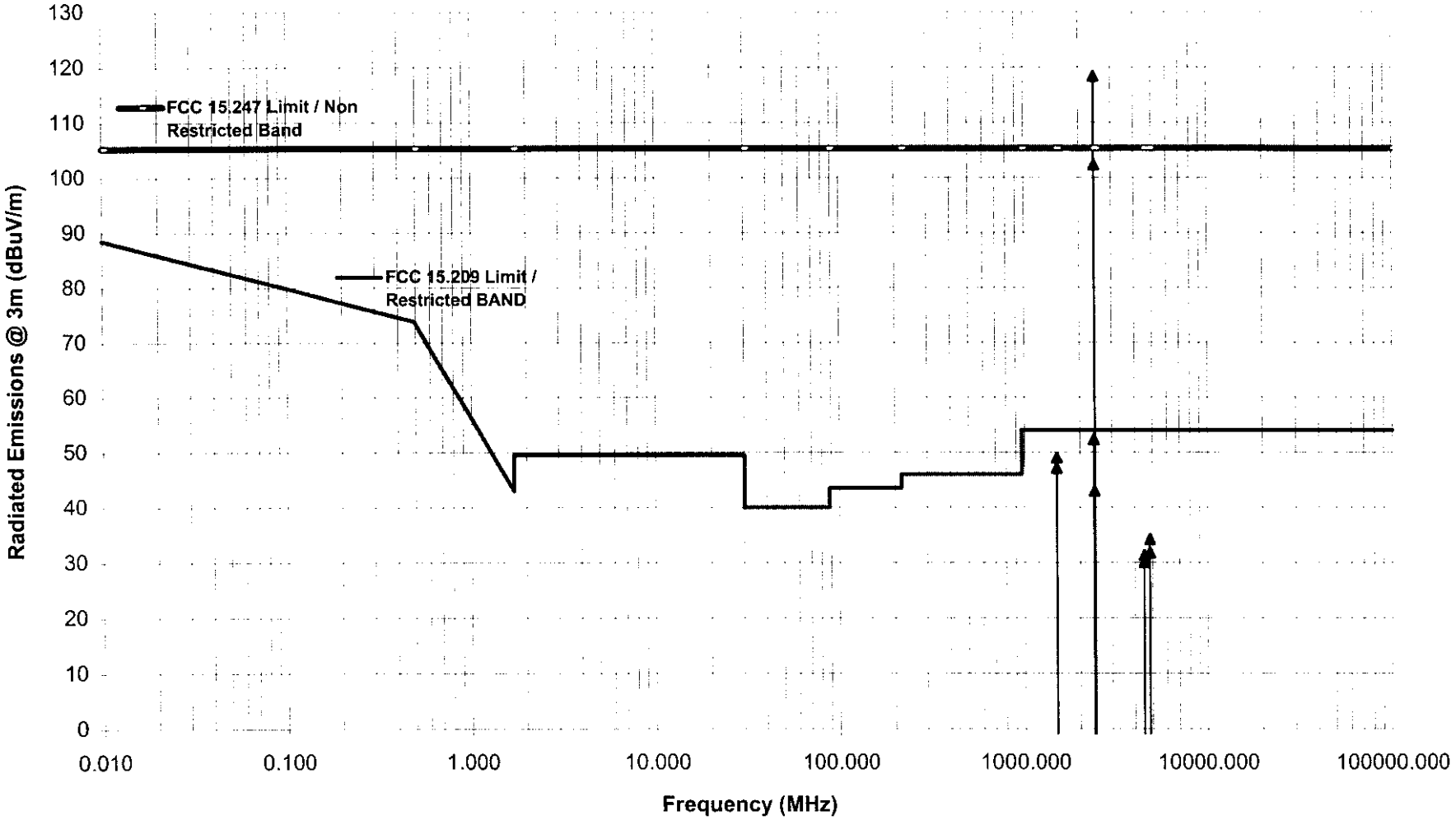
UltraTech
Engineering Labs Inc.

Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 4, Tx Frequency: 2411.4375 MHz

Tx Antenna: Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi

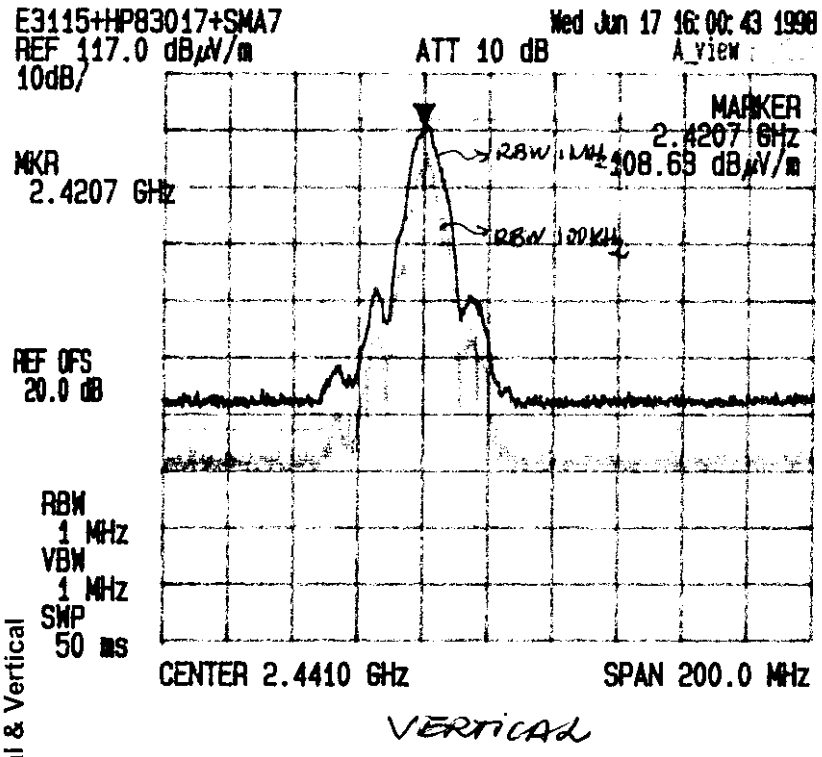


Date: June 15,1998
Tested by: Hung Trinh

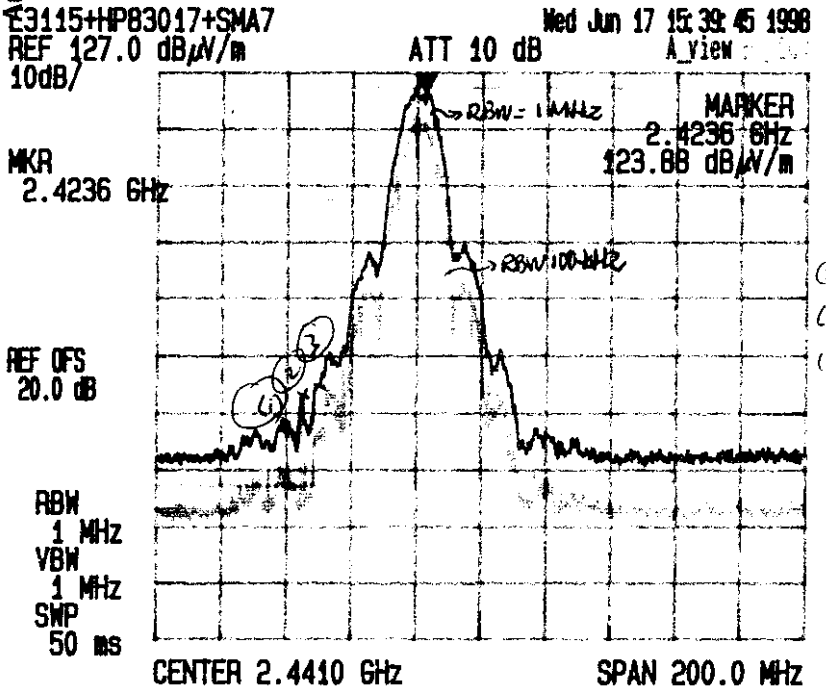
INTERAIR WIRELESS

ISP DIRECT,MODEL 2401-01 (INDOOR)& 2401-02 (OUTDOOR)
Channel #: 6, Tx Frequency: 2419.875
Modulation: DSSS,BW:MEDIUM (5.625 Mc/s),11 chips/symbol,1.023 Mbps DQPSK
BETA 2 WIRE 1 x 10 PATCH ANTENNA.

Radiated Emissions Measurements at 3 Meters
Antenna Polarization: Horizontal & Vertical



VERTICAL



HORIZONTAL

	(MHz) FREQ.	dBµV/m PK	AVG
(1)	2399.3	67.1	50.3
(2)	2385.3	73.1	57.2
(3)	2390	73.2	53.0

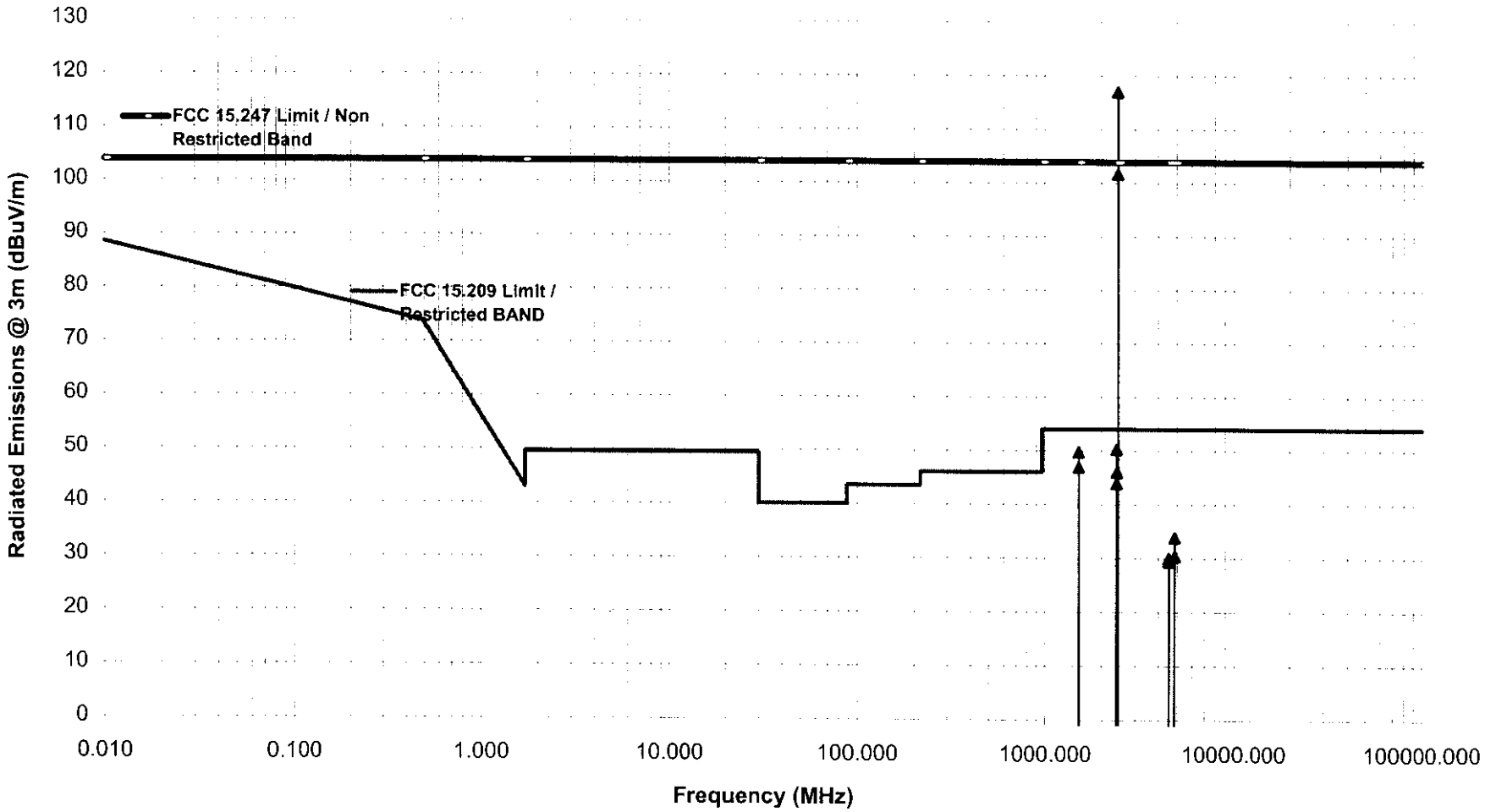
UltraTech
Engineering Labs Inc.

Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 6, Tx Frequency: 2419.875 MHz

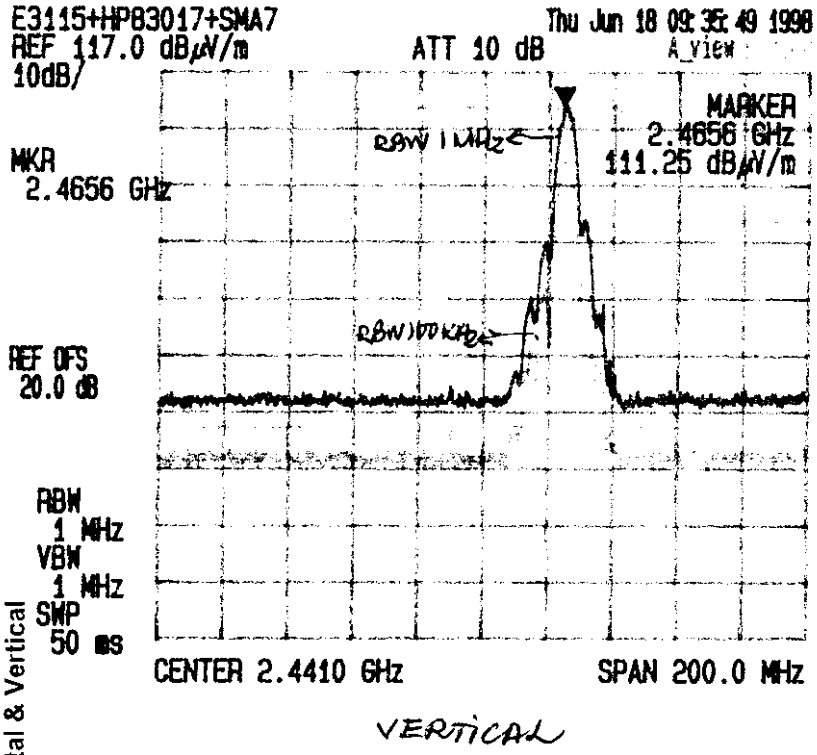
Tx Antenna: Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi



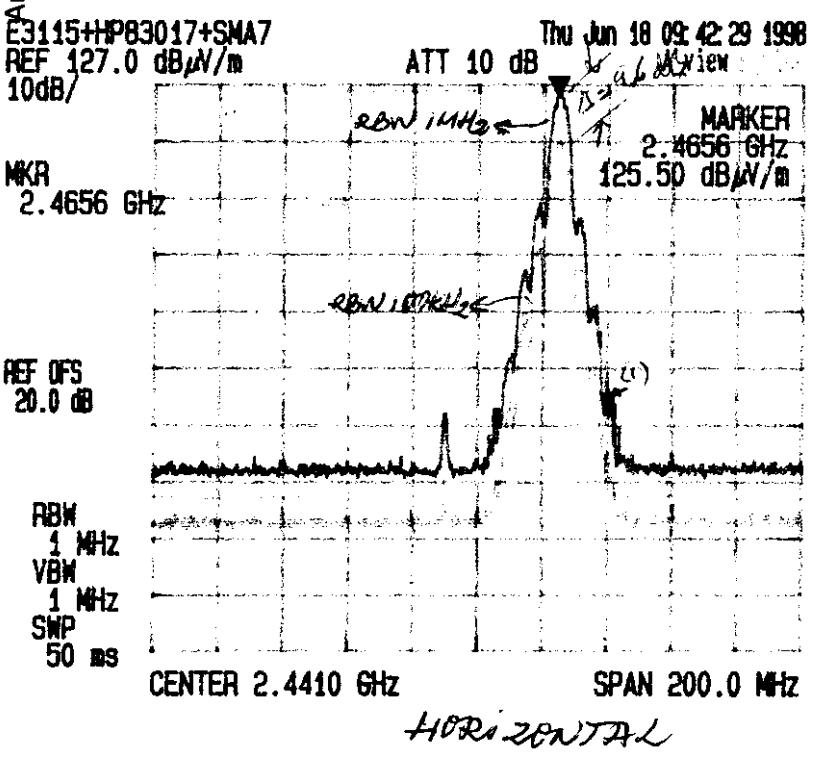
Date: June 15,1998
Tested by: Hung Trinh

INTERAIR WIRELESS
ISP DIRECT,MODEL 2401-01 (INDOOR)& 2401-02 (OUTDOOR)
Channel #: 18, Tx Frequency: 2464.875
Modulation: DSSS,BW:MEDIUM (5.625 Mc/s),11 chips/symbol,1.023 Mbps DQPSK
BETA 2 with 1x10 PATCH ANTENNA

Radiated Emissions Measurements at 3 Meters
Antenna Polarization: Horizontal & Vertical



VERTICAL



HORIZONTAL

(1) 2483.5 MHz
PEAK: 67.3 dBµV/m
AVG: 49.5 dBµV/m.

UltraTech
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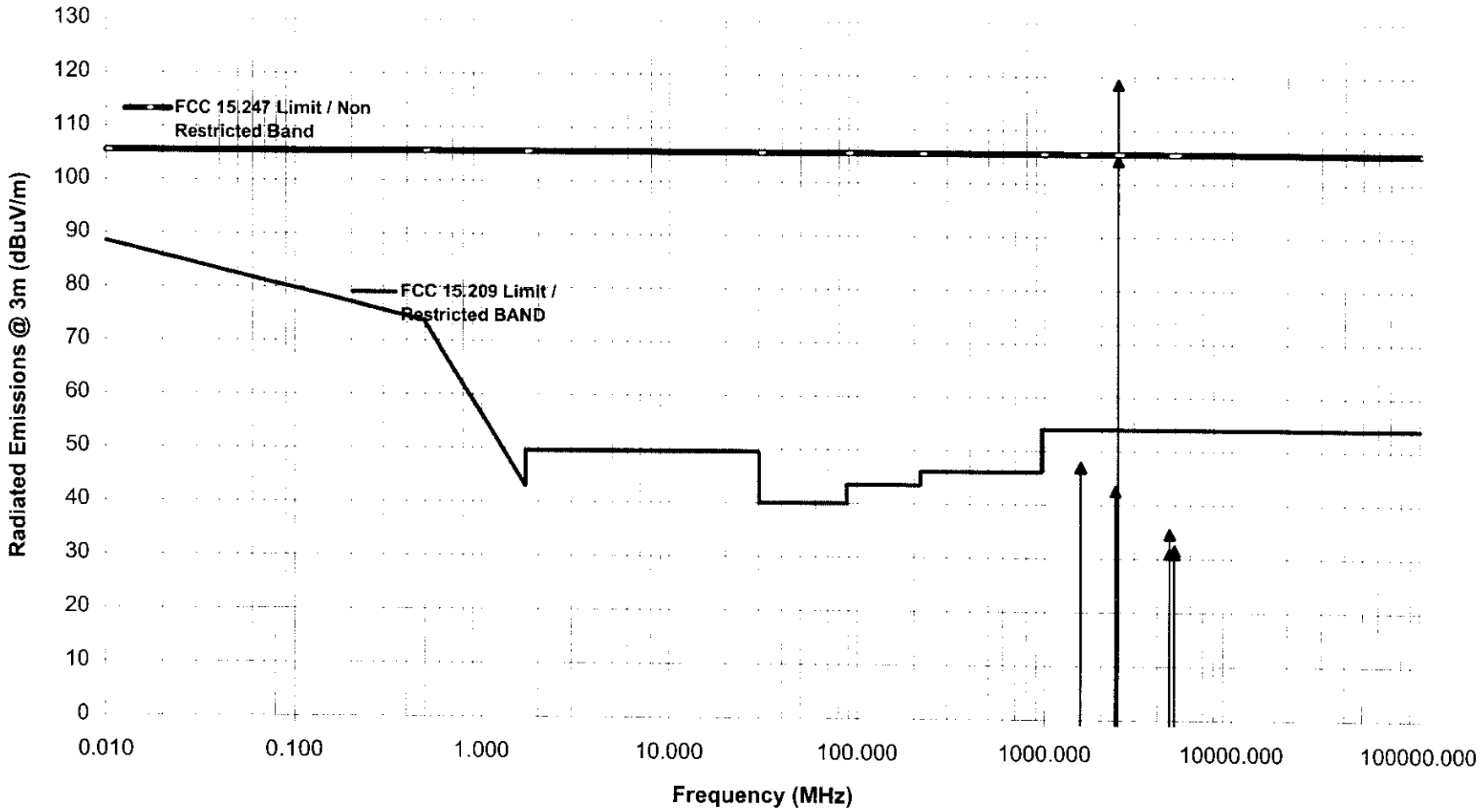
Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 18, Tx Frequency: 2464.875 MHz

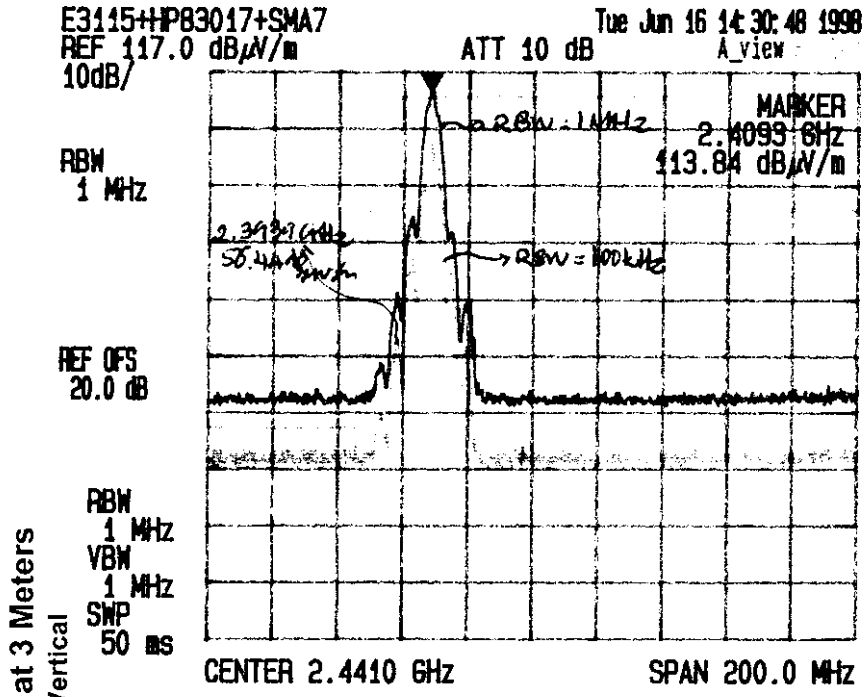
Tx Antenna: Huber Suhner 1x10 Patch Antenna, P/N: 65247322, Gain: 16.5 dBi



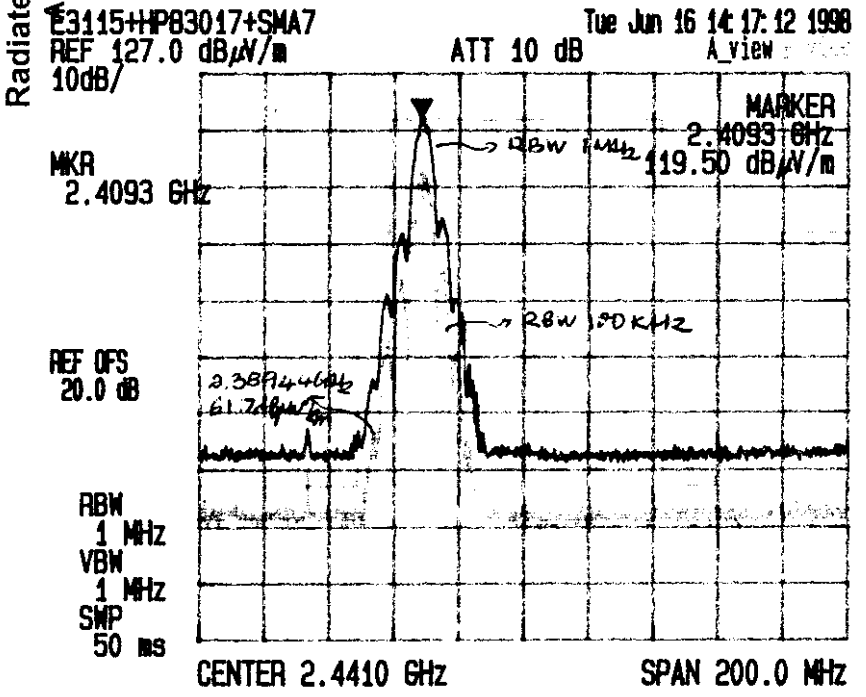
Date: June 15,1998
Tested by: Hung Trinh

INTERAIR WIRELESS
ISP DIRECT,MODEL 2401-01 (INDOOR)& 2401-02 (OUTDOOR)
Channel #: 3, Tx Frequency: 2408.625
Modulation: DSSS,BW:MEDIUM (5.625 Mc/s),11 chips/symbol,1.023 Mbps DQPSK
1 x 1 PATCH ANTENNA

Radiated Emissions Measurements at 3 Meters
Antenna Polarization: Horizontal & Vertical



VERTICAL



HORIZONTAL

Δ = 9.5 dBµV/m

UltraTech
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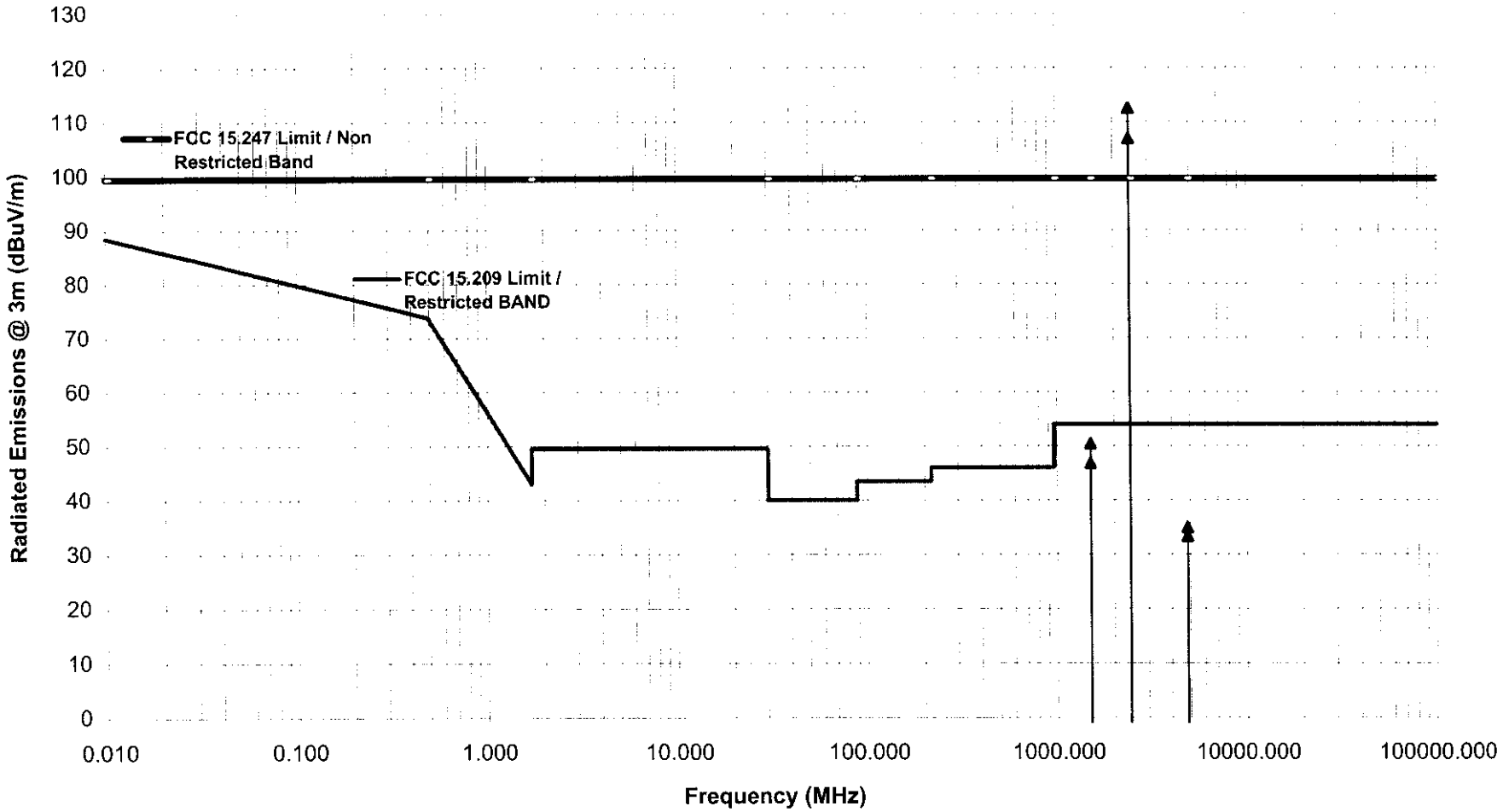
Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 3, Tx Frequency: 2408.625 MHz

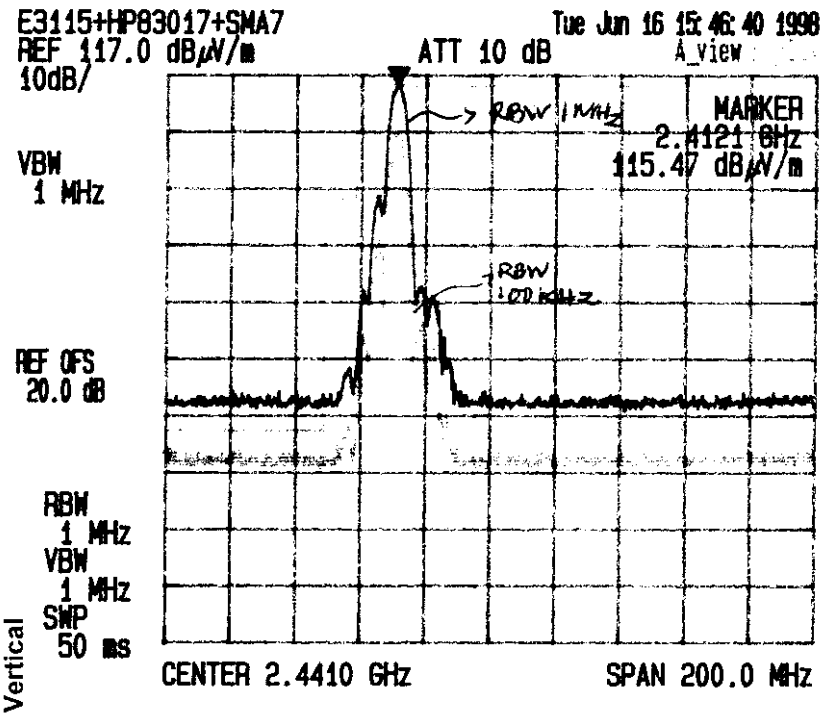
Tx Antenna: Huber Suhner 1x1 Patch Antenna, P/N: 64958022, Gain: 8.5 dBi



Date: June 15,1998
Tested by: Hung Trinh

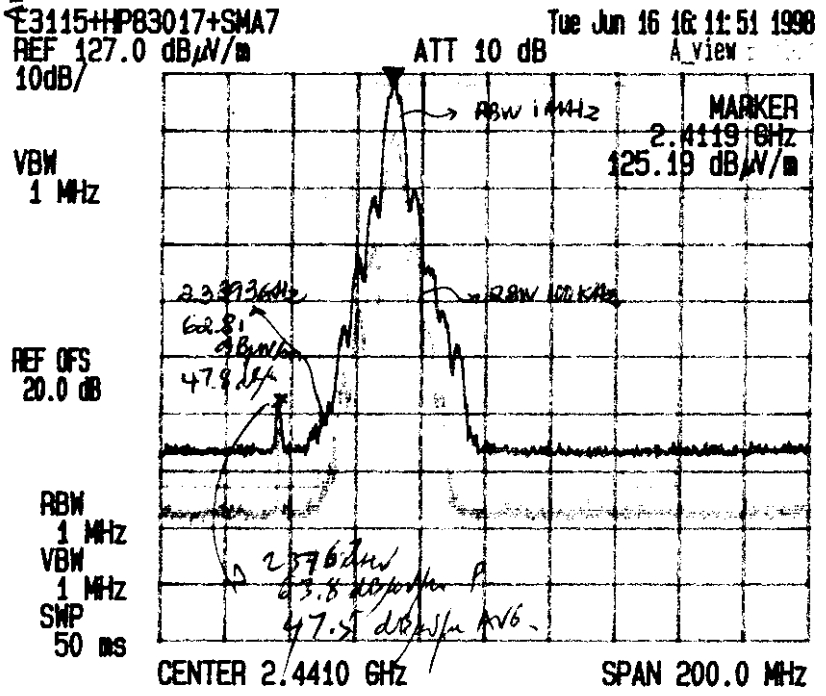
INTERAIR WIRELESS
ISP DIRECT,MODEL 2401-01 (INDOOR)& 2401-02 (OUTDOOR)
Channel #: 4, Tx Frequency: 2441.4MHz
Modulation: DSSS,BW:MEDIUM (5.625 Mc/s),11 chips/symbol,1.023 Mbps DQPSK
1 x 1 PATCH ANTENNA

Radiated Emissions Measurements at 3 Meters
Antenna Polarization: Horizontal & Vertical



VERTICAL

Δ = 7 dBµV/m



HORIZONTAL

Δ = 9 dBµV/m

UltraTech
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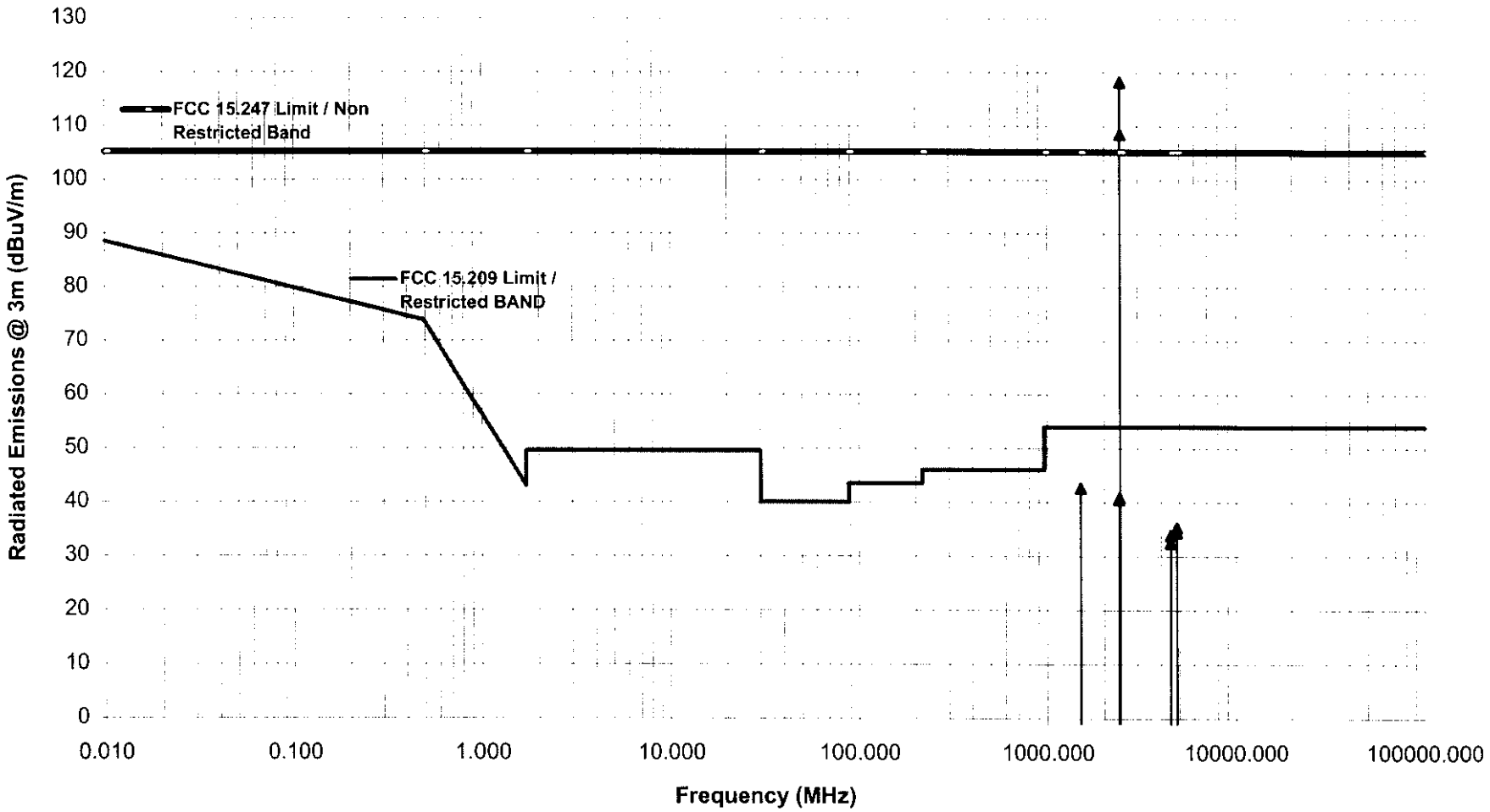
Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 4, Tx Frequency: 2411.4375 MHz

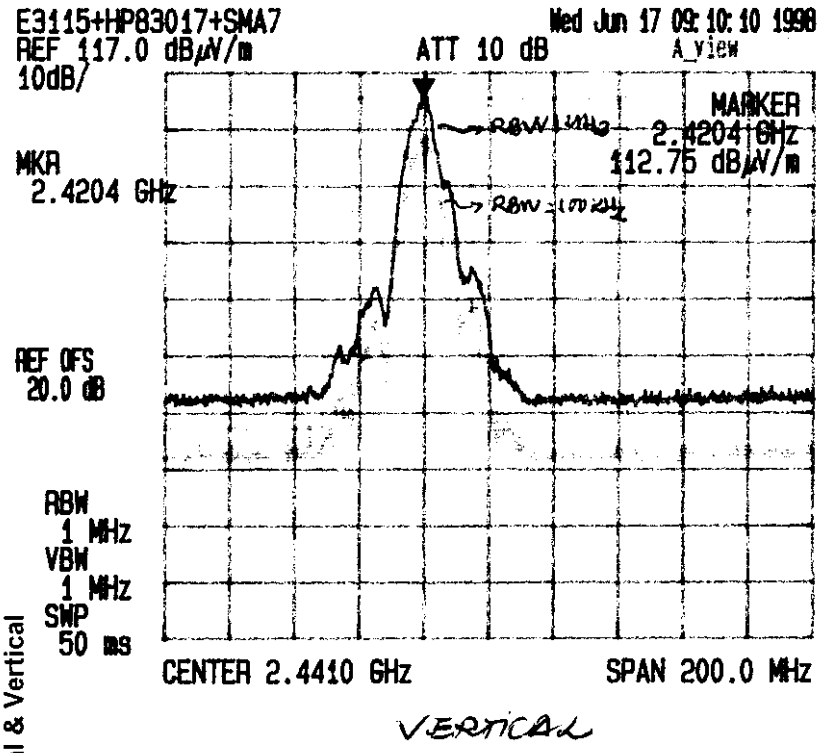
Tx Antenna: Huber Suhner 1x1 Patch Antenna, P/N: 64958022, Gain: 8.5 dBi



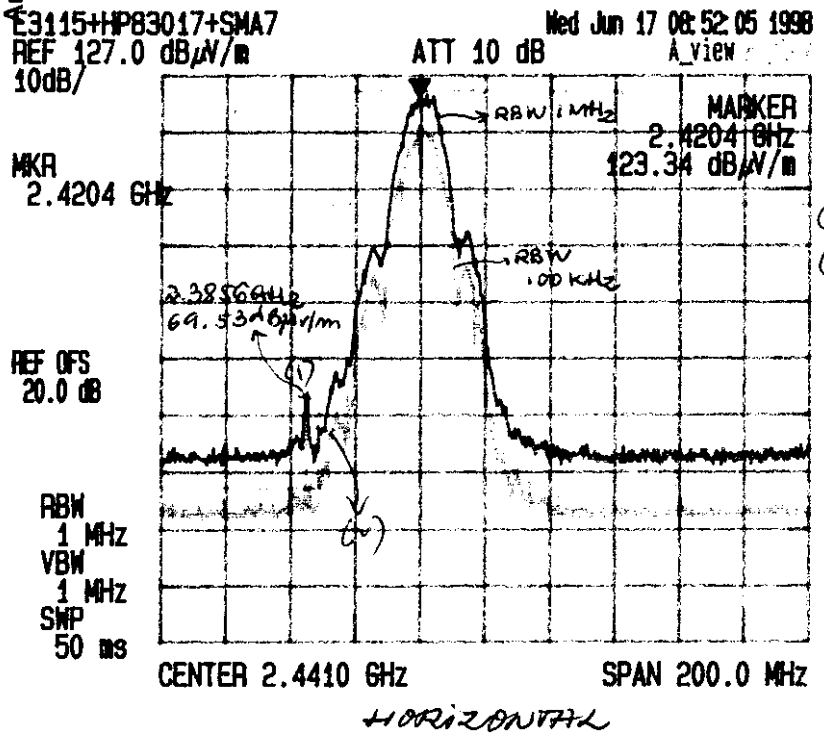
Date: June 15,1998
Tested by: Hung Trinh

INTERAIR WIRELESS
ISP DIRECT,MODEL 2401-01 (INDOOR)& 2401-02 (OUTDOOR)
Channel #: 6, Tx Frequency: 2419.875
Modulation: DSSS,BW:MEDIUM (5.625 Mc/s),11 chips/symbol,1.023 Mbps DQPSK
BETA & WIFI 1 X 1 PATCH ANTENNA

Radiated Emissions Measurements at 3 Meters
Antenna Polarization: Horizontal & Vertical



VERTICAL



HORIZONTAL

Δ = 5.10 dBµV/m

	MHz	dBµV/m PIC	dBµV/m AVG.
(1)	2385.6	~~74.91~~	65.50
(2)	2390	69.10	51.51

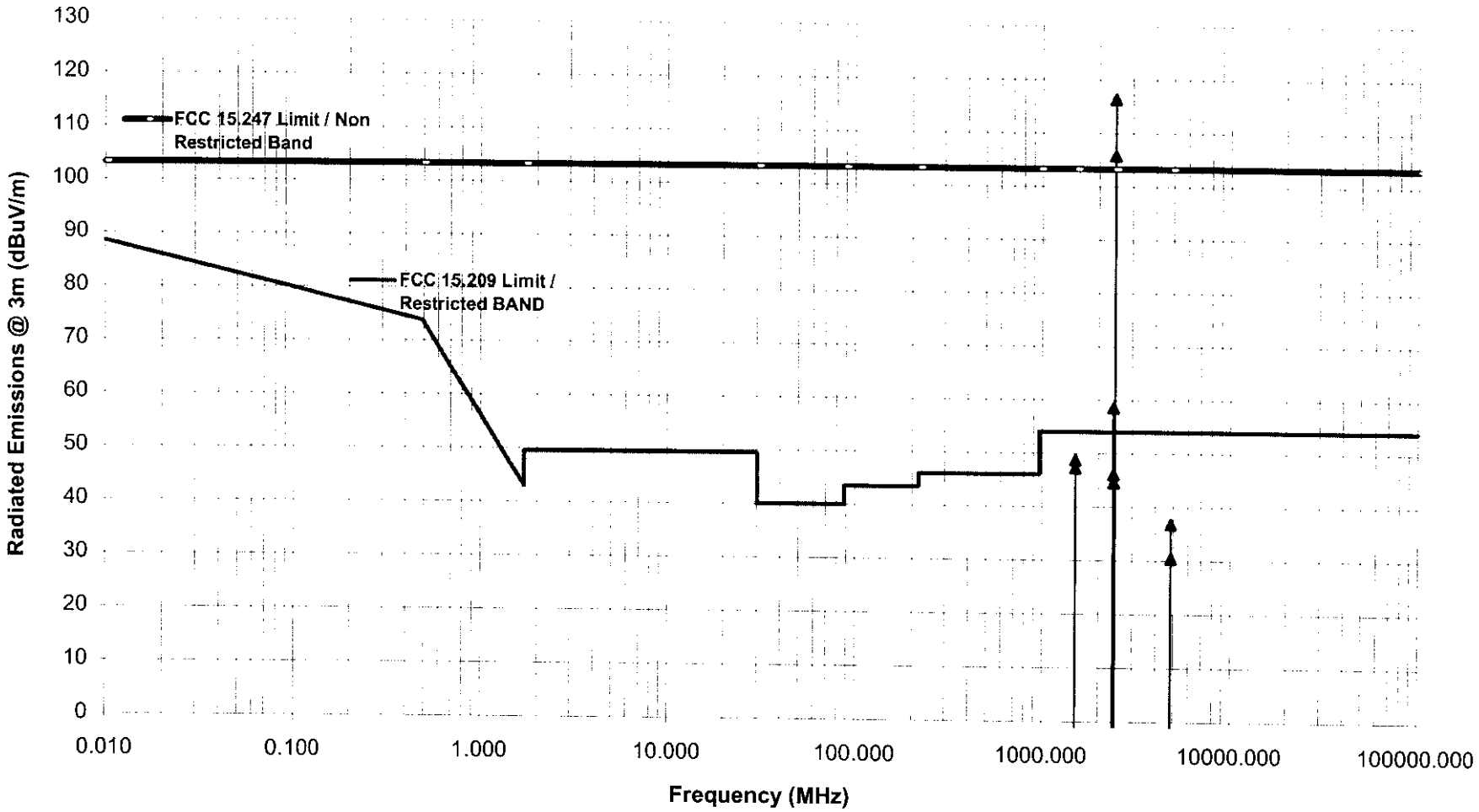
UltraTech
Engineering Labs Inc.

Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 6, Tx Frequency: 2419.875 MHz

Tx Antenna: Huber Suhner 1x1 Patch Antenna, P/N: 64958022, Gain: 8.5 dBi



Date: June 15,1998
Tested by: Hung Trinh

INTERAIR WIRELESS

ISP DIRECT,MODEL 2401-01 (INDOOR)& 2401-02 (OUTDOOR)

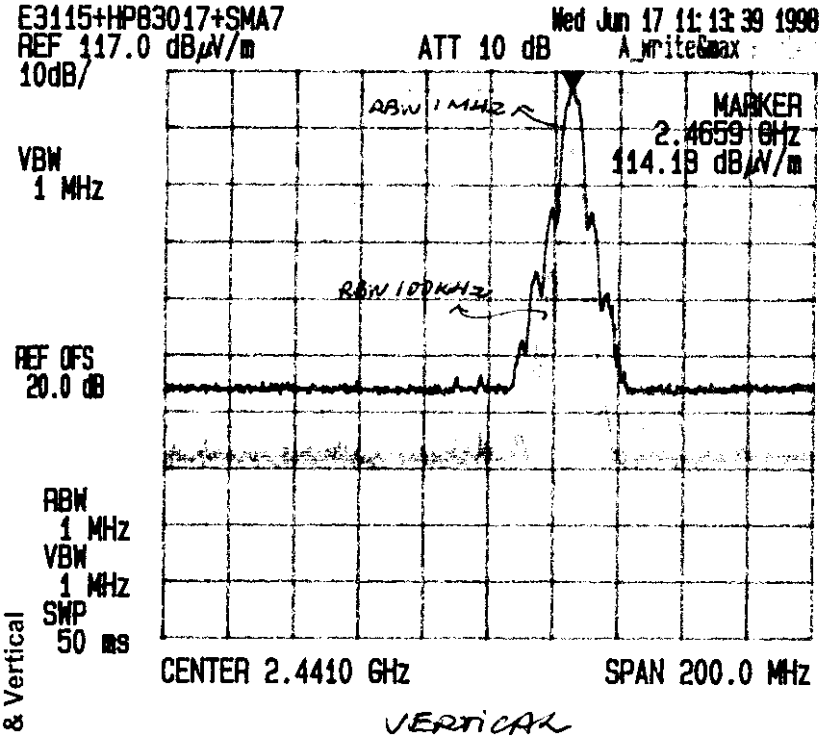
Channel #: 18 , Tx Frequency: 2466 / 2475

Modulation: DSSS,BW:MEDIUM (5.625 Mc/s),11 chips/symbol,1.023 Mbps DQPSK

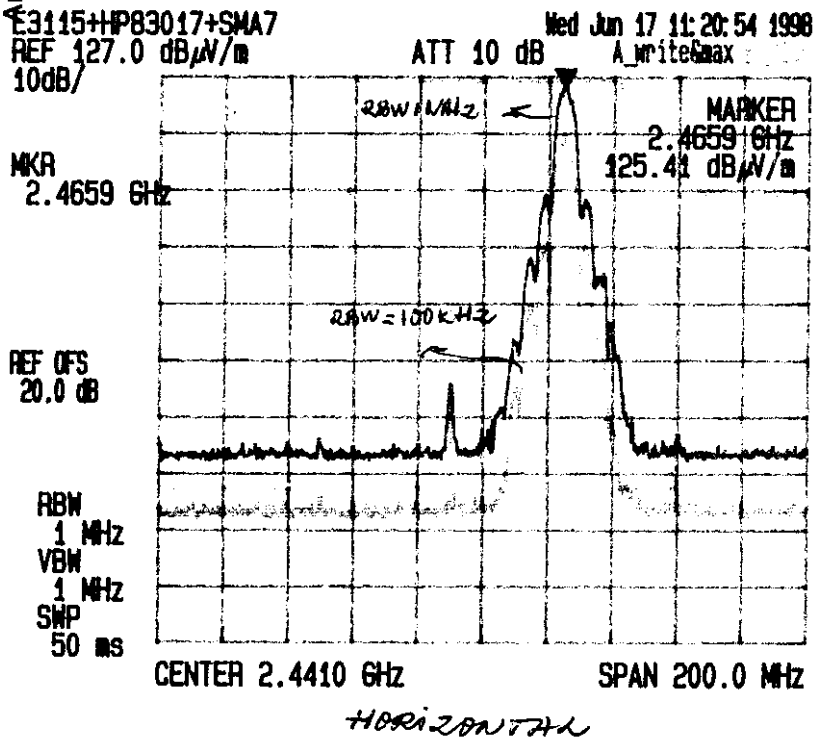
BETA 2 WITH 1X1 PATCH ANTENNA

Radiated Emissions Measurements at 3 Meters

Antenna Polarization: Horizontal & Vertical



VERTICAL



HORIZONTAL

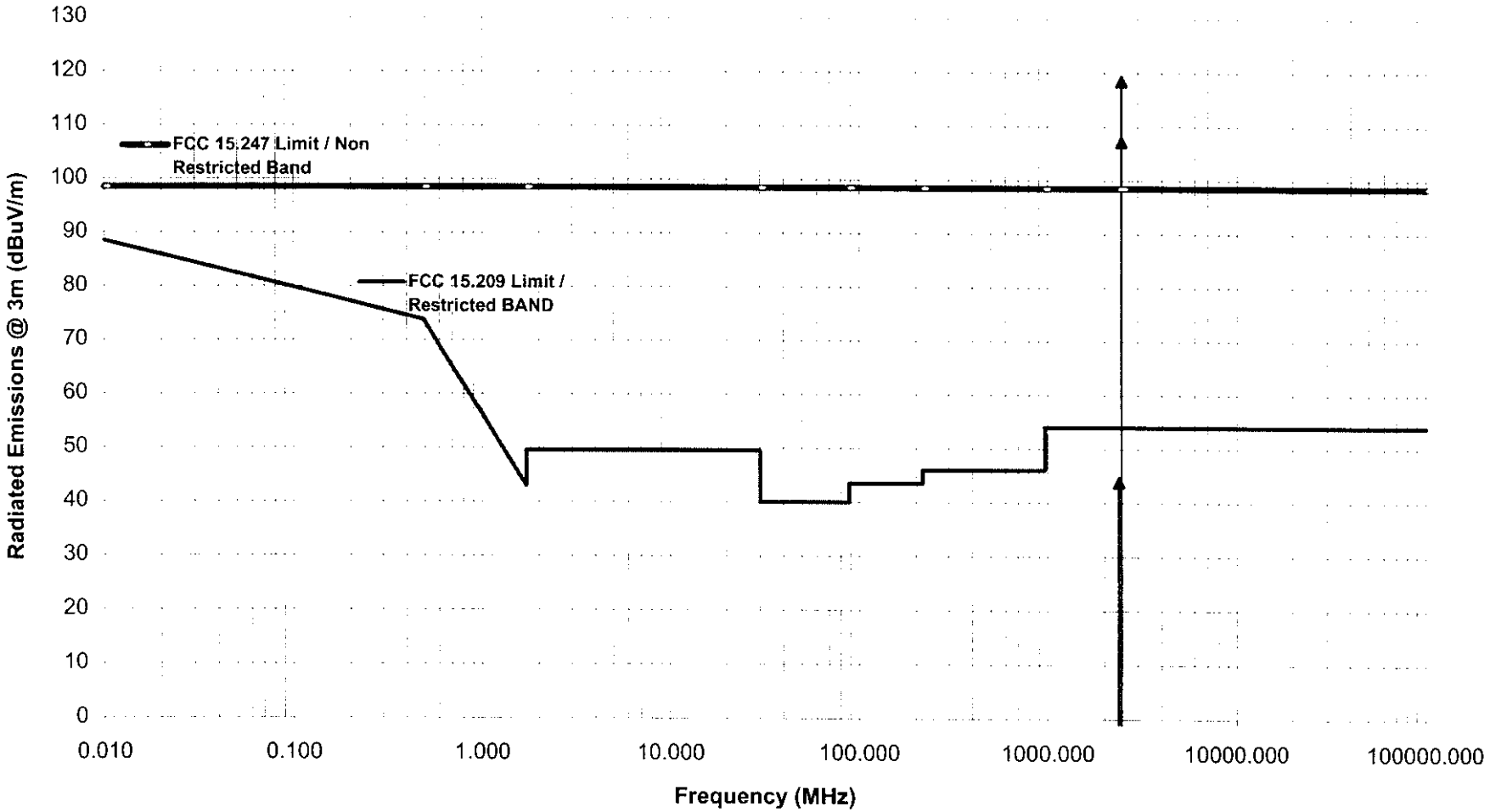
UltraTech
Engineering Labs Inc.

Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 18, Tx Frequency: 2464.875 MHz

Tx Antenna: Huber Suhner 1x1 Patch Antenna, P/N: 64958022, Gain: 8.5 dBi



Date: June 18, 1998
Tested by: Hung Trinh

INTERAIR WIRELESS

ISP DIRECT, MODEL 241-01 (INDOOR) & 2401-02 (OUTDOOR)

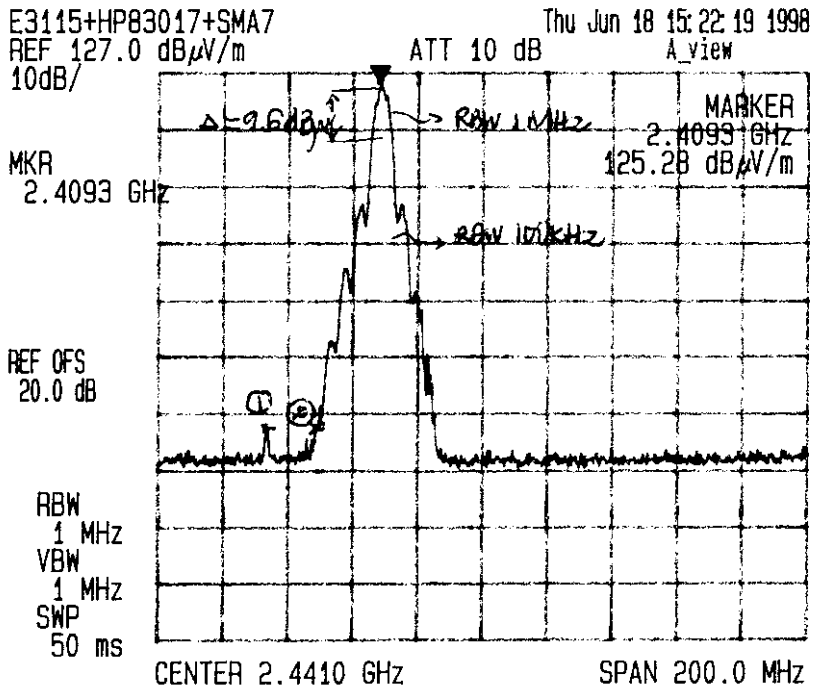
Channel #: 3 Tx Frequency: 2442.623

Modulation: DSSS, BW: MEDIUM (5.625 Mc/s), 11 chips/symbol, 1.023 Mbps, DQPSK

BETA 2 WITH OMNI ANTENNA

Radiated Emissions Measurements @ 3 Meters

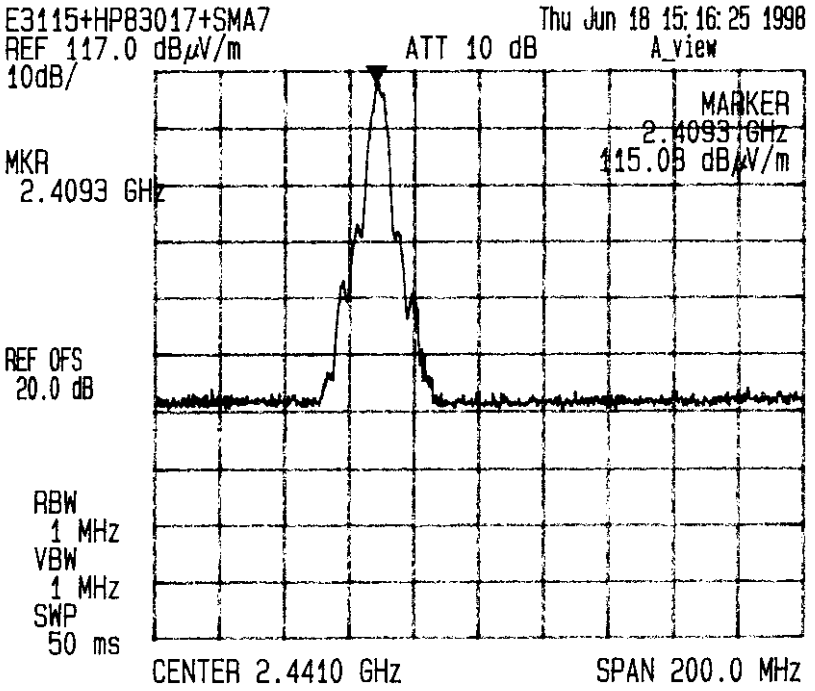
Antenna Polarization: Horizontal & Vertical



① 2.374 1 GHz
PEAK = 60.33 dBµV/m
AVG = 54.19 dBµV/m

② 2.390 GHz
PEAK = 69.44 dBµV/m
AVG = 52.63 dBµV/m

VERTICAL



HORIZONTAL

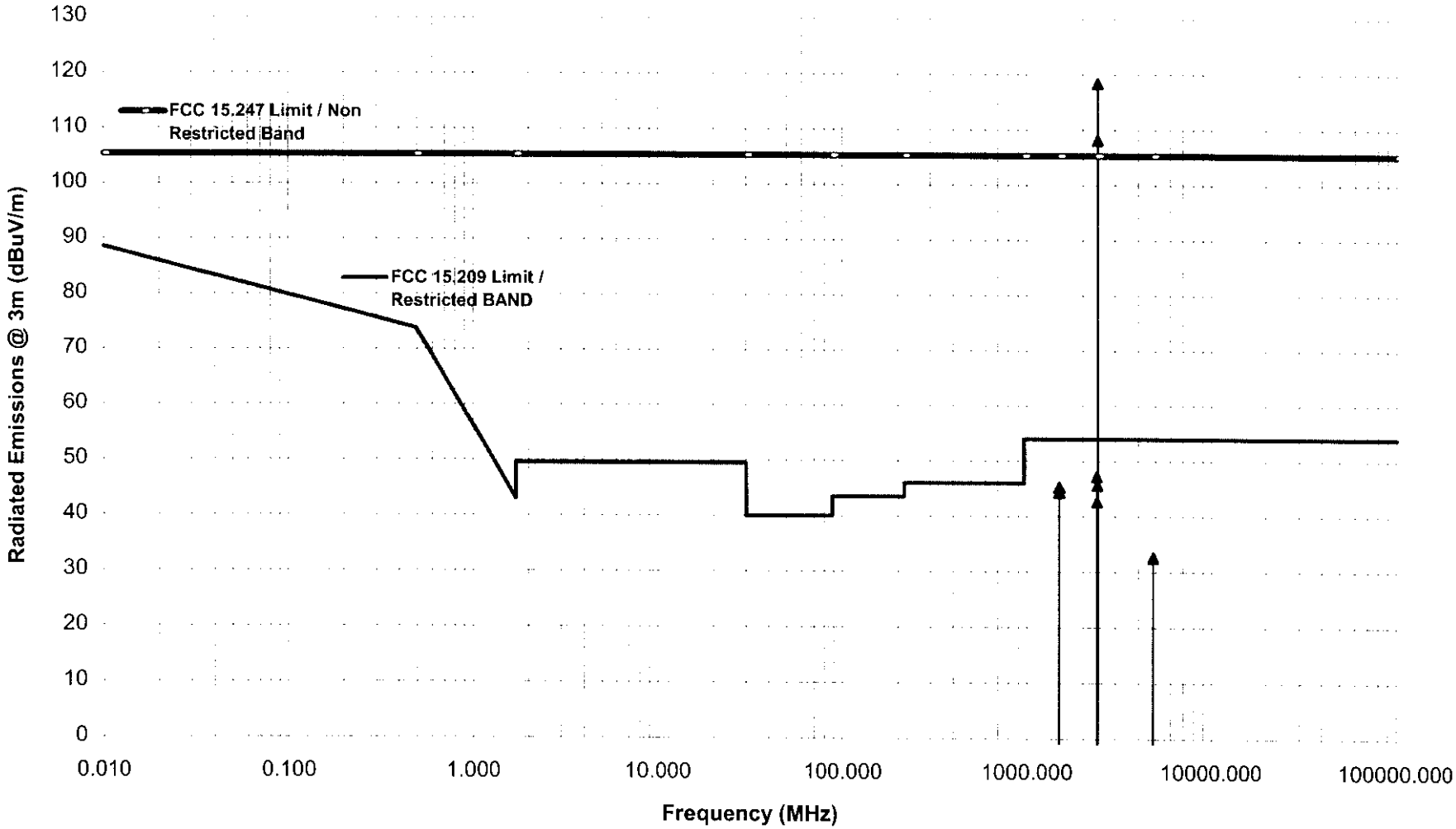
UltraTech Engineering Labs Inc.

Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 3, Tx Frequency: 2408.625 MHz

Tx Antenna: Andrew Omni Antenna, P/N: RT1N0F-024V-013A, Gain: 13 dBi



Date: June 18, 1998
Tested by: Hung Trinh

INTERAIR WIRELESS

ISP DIRECT, MODEL 241-01 (INDOOR) & 2401-02 (OUTDOOR)

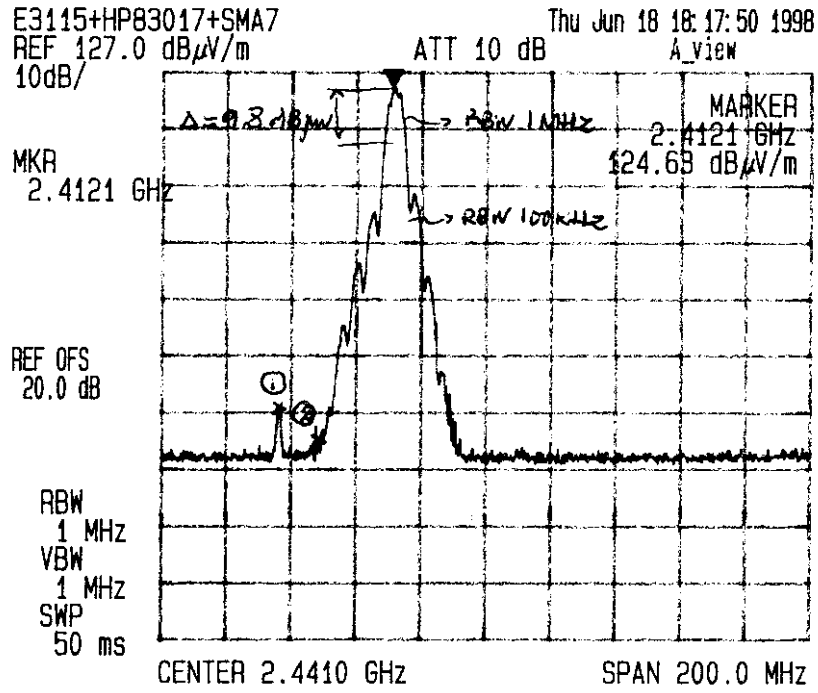
Channel #: 4 Tx Frequency: 2411.4375

Modulation: DSSS, BW: MEDIUM (5.625 Mc/s), 11 chips/symbol, 1.023 Mbps, DQPSK

3ETA 2 WITH OMNI ANTENNA

Radiated Emissions Measurements @ 3 Meters

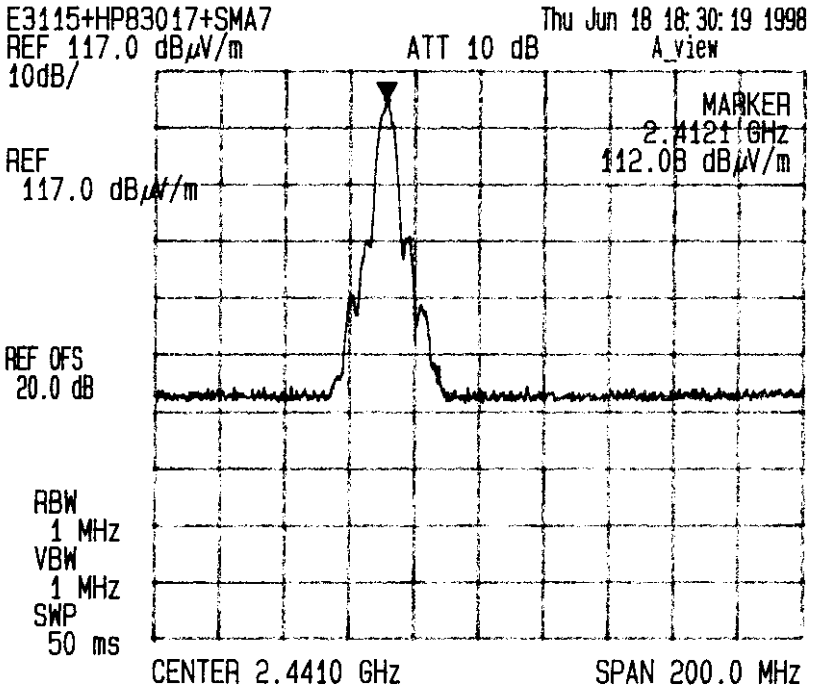
Antenna Polarization: Horizontal & Vertical



① 2.3770 GHz
PEAK = 69.84 dBµV/m
AVG = 57.97 dBµV/m

② 2.390 GHz
PEAK = 63.72 dBµV/m
AVG = 50.50 dBµV/m

VERTICAL



HORIZONTAL

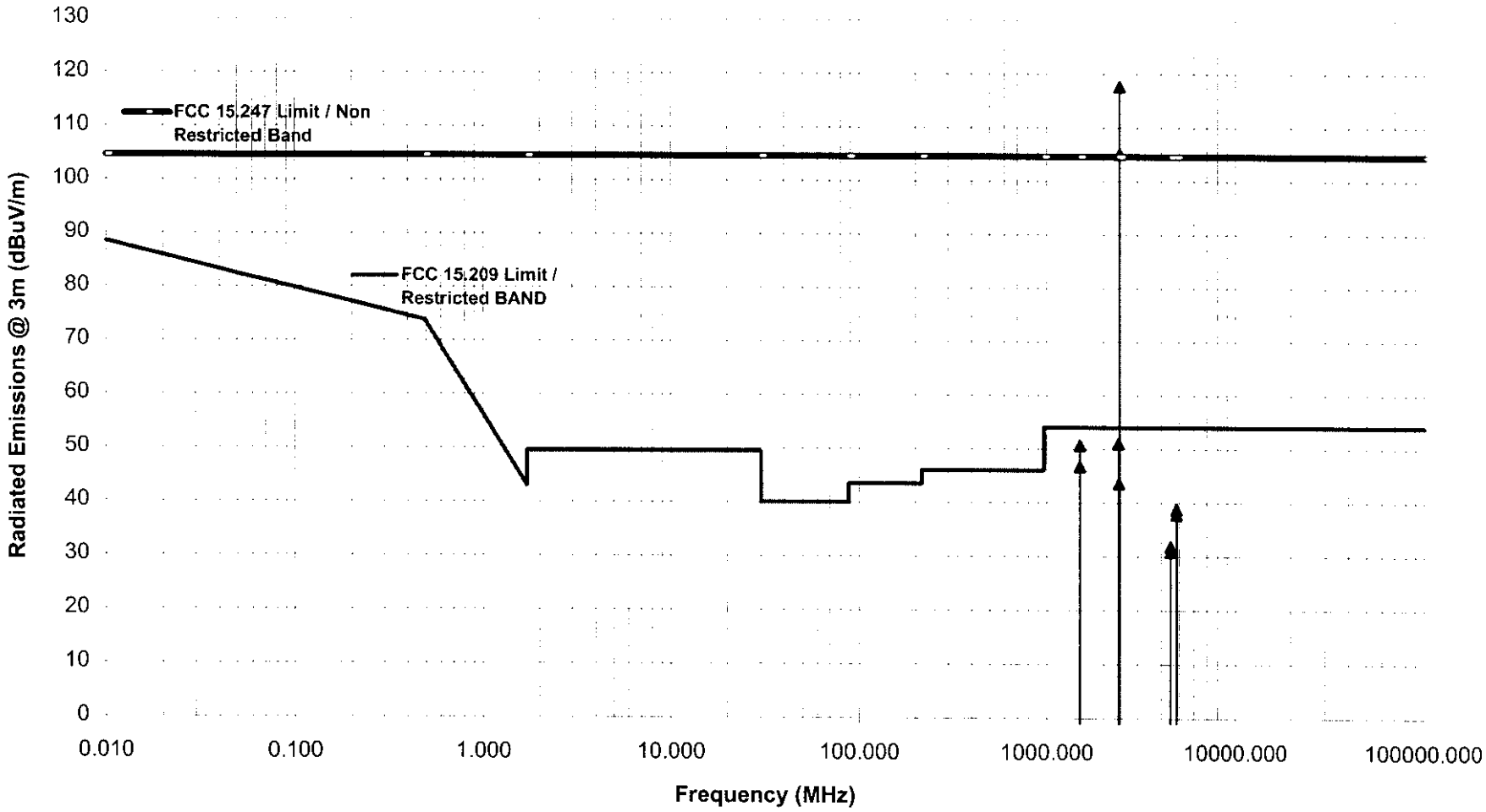
UltraTech Engineering Labs Inc.

Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 4, Tx Frequency: 2411.4375 MHz

Tx Antenna: Andrew Omni Antenna, P/N: RT1N0F-024V-013A, Gain: 13 dBi



Date: June 18, 1998
Tested by: Hung Trinh

INTERAIR WIRELESS

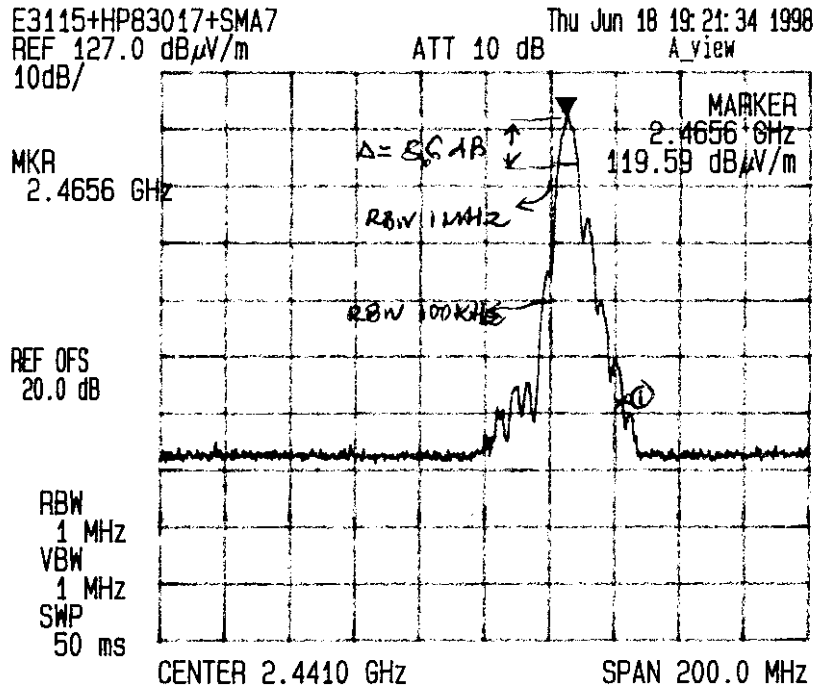
ISP DIRECT, MODEL 241-01 (INDOOR) & 2401-02 (OUTDOOR)

Channel #: 18 Tx Frequency: 2464.875

Modulation: DSSS, BW: MEDIUM (5.625 Mc/s), 11 chips/symbol, 1.023 Mbps, DQPSK

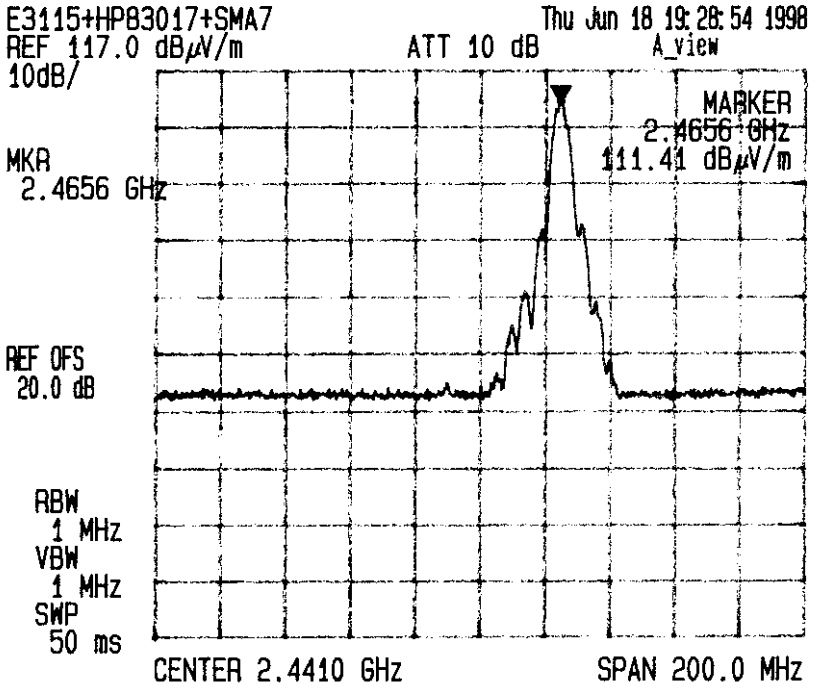
Radiated Emissions Measurements @ 3 Meters

Antenna Polarization: Horizontal & Vertical



① 2.4835 GHz
PEAK = 66.47 dBµV/m
AVG = 50.59 dBµV/m

VERTICAL



HORIZONTAL

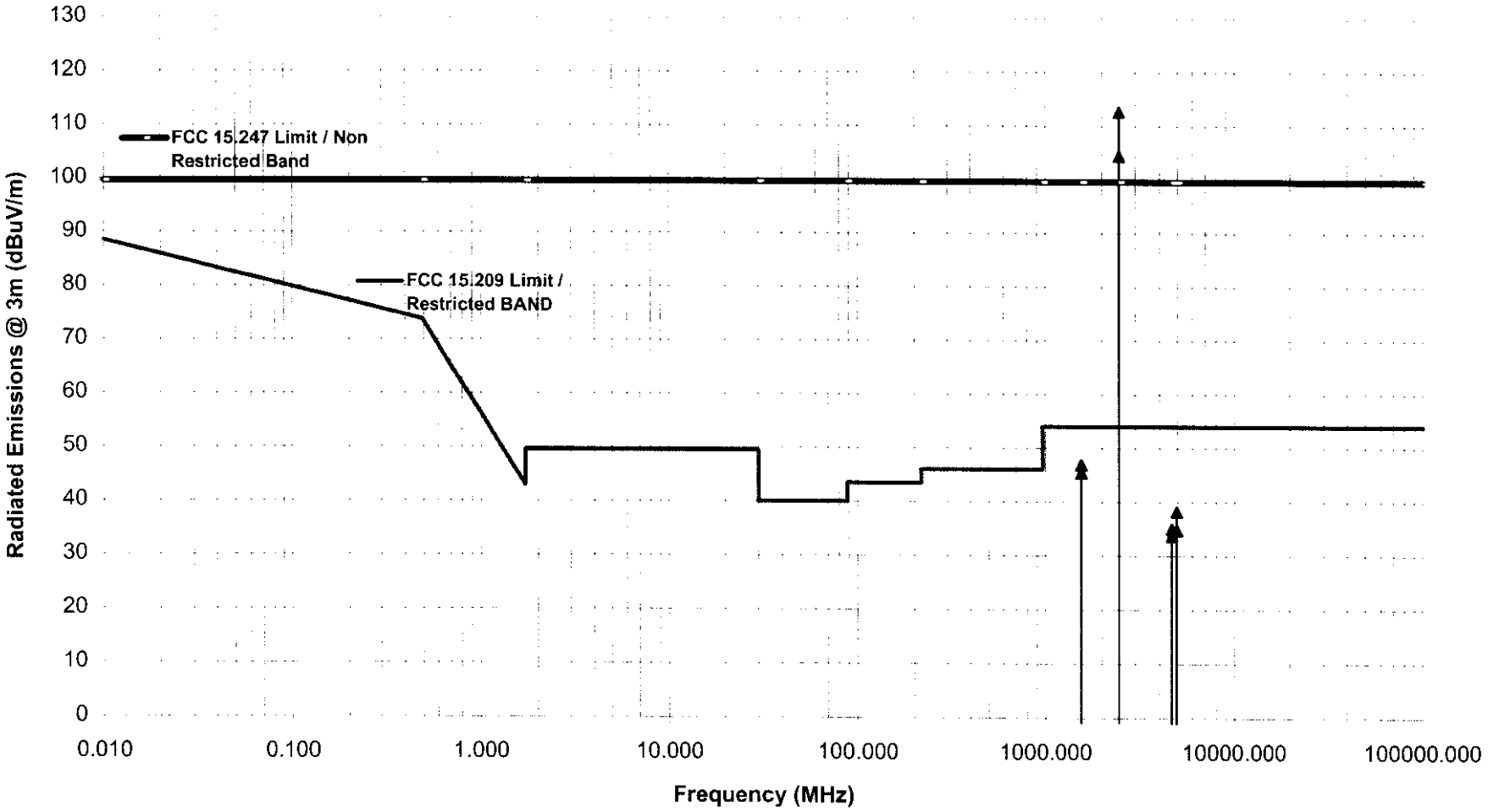
UltraTech Engineering Labs Inc.

Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 18, Tx Frequency: 2464.875 MHz

Tx Antenna: Andrew Omni Antenna, P/N: RT1N0F-024V-013A, Gain: 13 dBi



Date: June 18, 1998
Tested by: Hung Trinh

INTERAIR WIRELESS

ISP DIRECT, MODEL 241-01 (INDOOR) & 2401-02 (OUTDOOR)

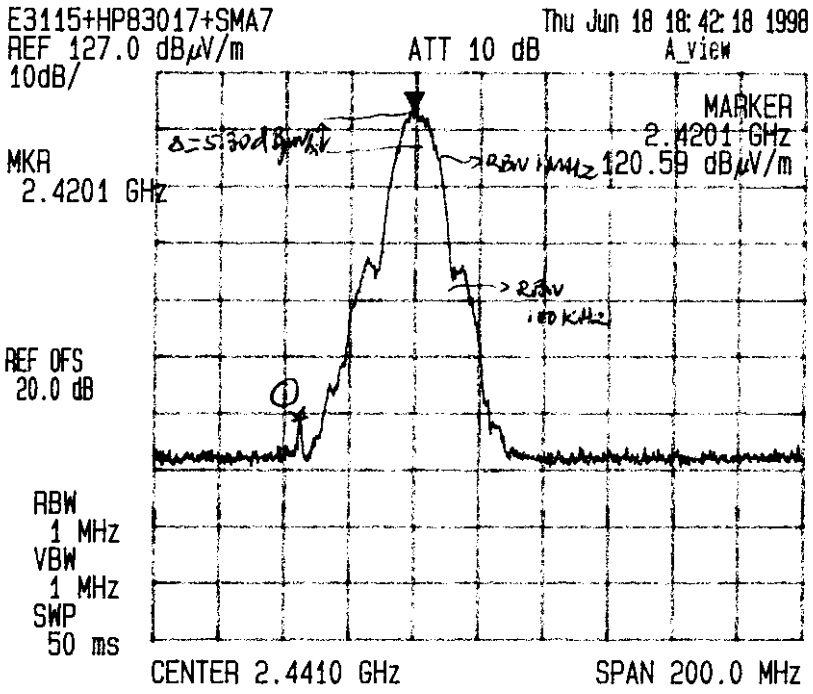
Channel #: 6 Tx Frequency: 2417, 8, 25

Modulation: DSSS, BW: MEDIUM (5.625 Mc/s), 11 chips/symbol, 1.023 Mbps, DQPSK

BETA 2 WITH SMALL ANTENNA

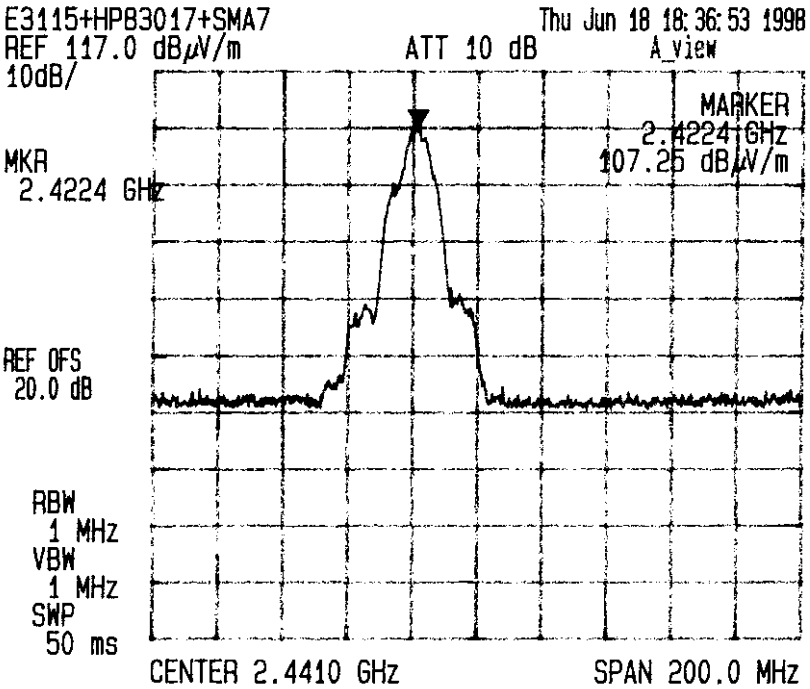
Radiated Emissions Measurements @ 3 Meters

Antenna Polarization: Horizontal & Vertical



① 2.3853 GHz
PEAK = 67.59 dBµV/m
AVG = 53.44 dBµV/m

VERTICAL



HORIZONTAL

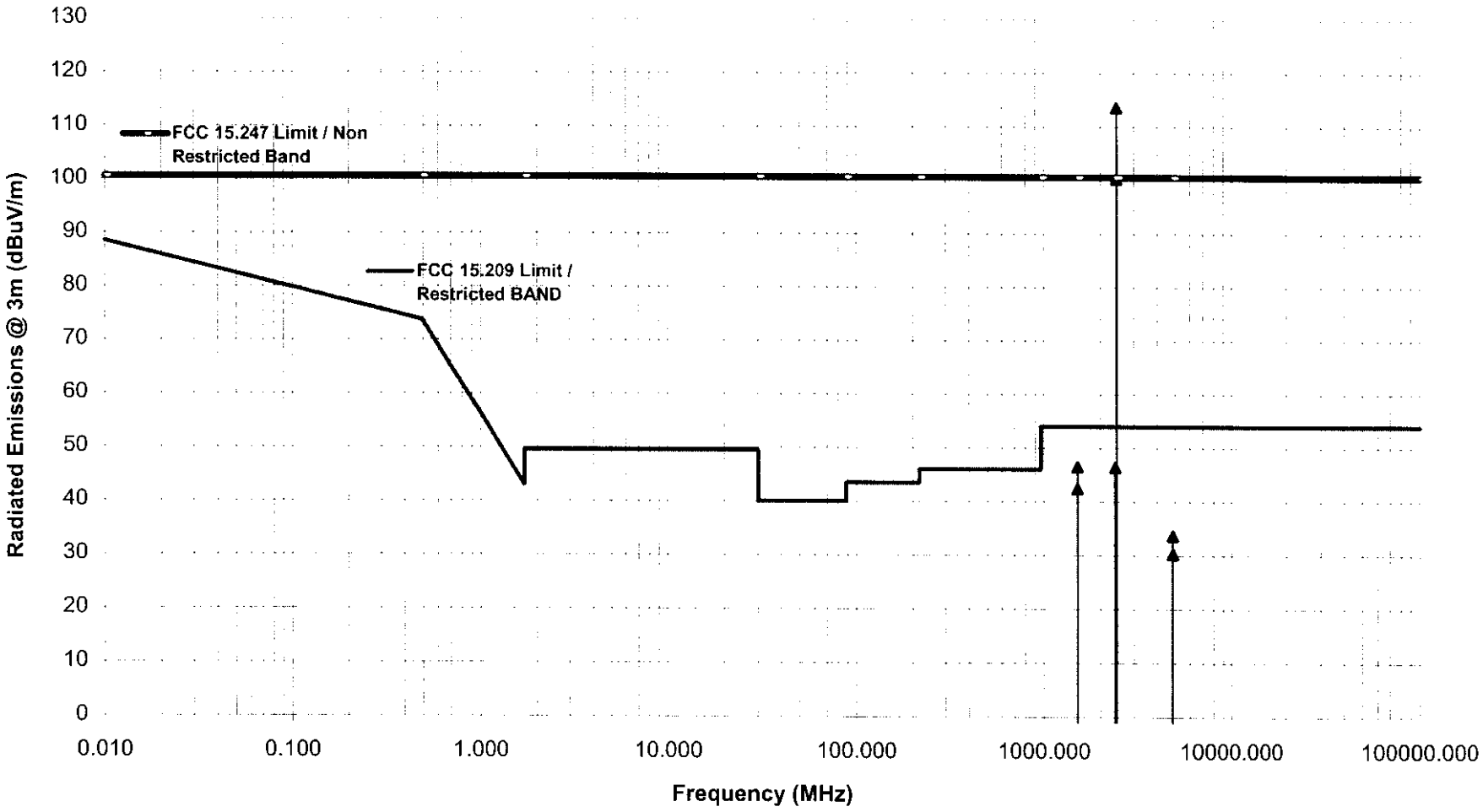
UltraTech Engineering Labs Inc.

Transmitter Radiated Emissions Measurements at 3 Meter OFTS

INTERAIR WIRELESS ISP INDOOR & OUTDOOR UNITS, MODEL: 2401-01 & 2401-02

Tx Channel: 6, Tx Frequency: 2419.875 MHz

Tx Antenna: Andrew Omni Antenna, P/N: RT1N0F-024V-013A, Gain: 13 dBi



- **Processing Gain of A Direct Sequence Spread Spectrum, FCC CFR 47, Para. 15.247(e)**

PRODUCT NAME: **ISP DIRECT INDOOR & OUTDOOR UNITS, Model No.: 2401-01 (indoor) and 2401-02 (outdoor)**

FCC REQUIREMENTS:

The processing gain of a direct sequence system shall be at least 10 dB. The processing gain shall be determined from the ratio in dB of the signal-to-noise ratio with the system spreading code turned off to the signal-to-noise ratio with the system spreading code turned on, as measured at the demodulated output of the receiver.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23 °C
- Relative humidity: 43 %

POWER INPUT:

AC 120 V 60Hz from Elpac external switching power supply, model WRI4232.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203
- Bird 20 dB Attenuator, 50 Ohm IN/OUT
- IBM PS/1 & IBM 350 ThinkPad Host Computer(s)
- Fluke RF Signal Generator, Model 6061A, Freq. range: 10 KHz - 1050 MHz.
- HP 8900 RF Peak Power Meter, Measuring Frequency Range: 100 MHz - 18 GHz.

METHOD OF MEASUREMENT:

METHOD #1:- Jamming Margin Method

The processing gain may be measured using the CW jamming margin method. Figure 1 shows the test configuration. The test consists of stepping a signal generator in 50 KHz increments across the passband of the system. At each point, the generator level required to produce the recommended Bit Error Rate (BER) is recorded. This level is jammer level. The output power of the transmitting unit is measured at the same point. The Jammer to Signal (J/S) ratio is then calculated. Discard the worst 20% of the J/S data points. The lowest remaining J/S ratio is used when calculating the Process Gain.

The signal to noise ratio for an ideal non-coherent receiver is calculated from:

(1) $$Pe = 1/2e^{(-1/2(S/N)o)}$$

where: Pe = probability of error (BER)
(S/N)o = the required signal to noise ratio at the receiver output for a given received signal quality

Ref.: Viterbi, A.J. Principles of Coherent Communications (New York: McGraw-HILL 1966), Pg. 207

Using equation (1) shown above, calculate the signal to noise ratio required for your chosen BER. This value and the measured J/S ratio are used in the following equation to calculate the Process Gain (Gp) of the system.

$$Gp = (S/N)o+Mj+Lsys$$

Where:

(S/N)o: Theoretical signal to noise ratio required to maintain the normal operation just before the BERappears. In real measurements the maximum error of 0.001 is allowed in an ideal system using their modulation scheme with all codes turned off (i.e. no spreading or processing gain).

Mj: Maximum jammer to Signal Ratio that recorded at the detected BER.

Lsys: System losses such as non-ideal synchronization, tracking circuitry, non-optimal baseband receiver filtering and etc... These losses can be in excess of 2 dB for each transmitter and receiver pair. For the purpose of this processing gain calculation we assume a Lsys at its minimum value of 2 dB.

Ref.: Dixon, R, Spread Spectrum Systems. (New York: Wiley, 1984)

The Signal-to-Noise Ratio (S/N) with respect to the probability of bit error for a differentially QPSK (DQPSK) receiver in the presence of additive white Gaussian noise (AWGN) is given by Figure 4.5.1 as attached.

Ref.: Marvin Simon, Spread Spectrum Communication Handbook, page 695.

Since the CW jamming is a tone jamming, the (S/N)o for a AWGN jamming obtained from Figure 4.5.1 can be converted to the CW jamming or tone jamming using the formula (3.97) of the Marvin Simon Spread Spectrum Communication Handbook as follows:

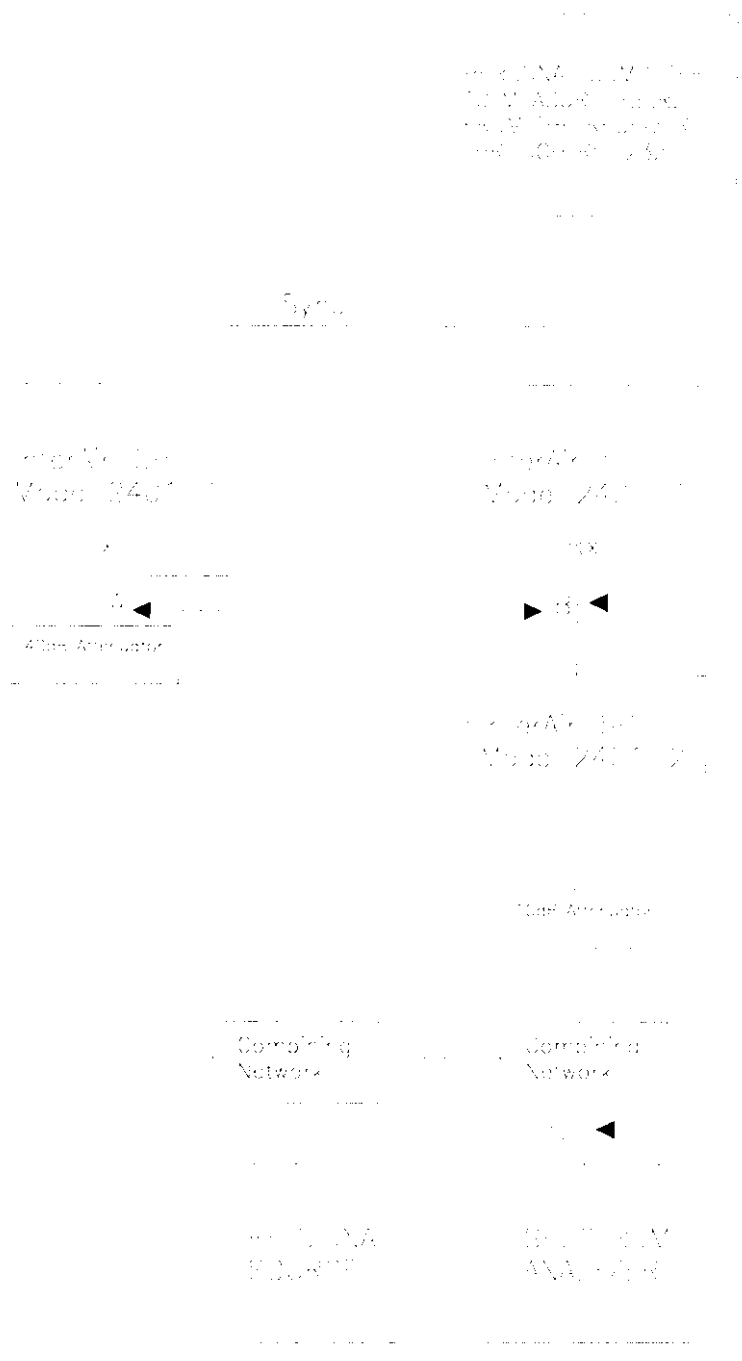
$(S/N)_o'$ in dB = $(S/N)_o^{AWGN}$ / 0.8

TEST RESULTS: Conforms.

TEST PERSONNEL: Mr. Tri M. Luu, P.Eng.

DATE: Mar. 31 & Apr. 01, 1998

Figure 1:- **SETUP FOR PROCESSING GAIN MEASUREMENT - JAMMING MARGIN METHOD**



MEASUREMENT DATA:

Channel #4, Fc = 2411.4375 MHz	**Data Rate = 1.023 Mbps (DQPSK), Medium**
Chip Rate = 5.625 MHz	**PN Code Length = 11 chips/symbol**
6 dB BW = 5 MHz	

(S/N)o = 12 dB dB per attached Figure 4.5.1

Measured Processing Gain Gp = (S/N)o + Lsys + Mj = 15 + 2 + Mj = 17 + Mj (dB)

Theoretical Calculated Processing Gain = Chip Rate/Data rate = $\frac{5.625\ \text{MHz}}{(1.023\ \text{Mb/s})/(2\ \text{bits/symbol})}$ = 11.0 or 10.4 dB

Note:

- Total Peak Power from the EUT's Tx measured at the EUT's Rx Input: P_t = -46.7 dBm
- Jamming signal level at measured at the EUT's receiver input: J
- Mj = J-P_t
- The following shaded boxes are discarded worst measurements (19.1% of total measurement points)

SUMMARY OF TEST RESULTS	
Theoretical Process Gain	**10.4 dB**
Minimum Measured Process Gain with discard of 19.1% of the worst measurements	**12.0 dB**

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	-3.5	0.00001	12	4.5	1.7	18.2	
2	-3.5	0.00001	12	4.5	2.0	18.5	
3	-3.4	0.00001	12	4.5	1.6	18.1	
4	-3.4	0.00001	12	4.5	1.7	18.2	
5	-3.3	0.00001	12	4.5	0.6	17.1	
6	-3.3	0.00001	12	4.5	-0.4	16.1	
7	-3.2	0.00001	12	4.5	-0.4	16.1	
8	-3.2	0.00001	12	4.5	-0.4	16.1	
9	-3.1	0.00001	12	4.5	0.0	16.5	
10	-3.1	0.00001	12	4.5	0.8	17.3	
11	-3.0	0.00001	12	4.5	0.8	17.3	
12	-3.0	0.00001	12	4.5	1.6	18.1	
13	-2.9	0.00001	12	4.5	1.6	18.1	
14	-2.9	0.00001	12	4.5	1.7	18.2	
15	-2.8	0.00001	12	4.5	1.5	18.0	
16	-2.8	0.00001	12	4.5	1.1	17.6	
17	-2.7	0.00001	12	4.5	0.8	17.3	
18	-2.7	0.00001	12	4.5	0.7	17.2	
19	-2.6	0.00001	12	4.5	-0.4	16.1	
20	-2.6	0.00001	12	4.5	-2.4	14.1	
21	-2.5	0.00001	12	4.5	-2.7	13.8	
22	-2.5	0.00001	12	4.5	-2.8	13.7	
23	-2.4	0.00001	12	4.5	-2.9	13.6	
24	-2.4	0.00001	12	4.5	-2.9	13.6	
25	-2.3	0.00001	12	4.5	-2.6	13.9	
26	-2.3	0.00001	12	4.5	-2.6	13.9	
27	-2.2	0.00001	12	4.5	-2.5	14.0	

28	-2.2	0.00001	12	4.5	-2.9	13.6	
29	-2.1	0.00001	12	4.5	-3.6	12.9	
30	-2.1	0.00001	12	4.5	-4.4	12.1	
31	**-2.0**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
32	-2.0	0.00001	12	4.5	-4.6	11.9	20
33	**-1.9**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
34	-1.9	0.00001	12	4.5	-4.8	11.7	13
35	-1.8	0.00001	12	4.5	-4.4	12.1	
36	-1.8	0.00001	12	4.5	-3.8	12.7	
37	-1.7	0.00001	12	4.5	-3.2	13.3	
38	-1.7	0.00001	12	4.5	-3.1	13.4	
39	-1.6	0.00001	12	4.5	-3.3	13.2	
40	-1.6	0.00001	12	4.5	-4.0	12.5	
41	-1.5	0.00001	12	4.5	-6.3	10.2	1
42	-1.5	0.00001	12	4.5	-5.4	11.1	3
43	-1.4	0.00001	12	4.5	-5.8	10.7	2
44	-1.4	0.00001	12	4.5	-5.0	11.5	7
45	-1.3	0.00001	12	4.5	-4.8	11.7	14
46	-1.3	0.00001	12	4.5	-4.3	12.2	
47	-1.2	0.00001	12	4.5	-3.9	12.6	
48	-1.2	0.00001	12	4.5	-3.8	12.7	
49	-1.1	0.00001	12	4.5	-3.3	13.2	
50	-1.1	0.00001	12	4.5	-3.8	12.7	
51	-1.0	0.00001	12	4.5	-3.8	12.7	
52	-1.0	0.00001	12	4.5	-4.6	11.9	21
53	-0.9	0.00001	12	4.5	-4.9	11.6	12
54	-0.9	0.00001	12	4.5	-5.1	11.4	6
55	-0.8	0.00001	12	4.5	-5.3	11.2	4
56	-0.8	0.00001	12	4.5	-5.3	11.2	5
57	-0.7	0.00001	12	4.5	-4.8	11.7	15
58	-0.7	0.00001	12	4.5	-4.0	12.5	
59	-0.6	0.00001	12	4.5	-3.3	13.2	
60	-0.6	0.00001	12	4.5	-2.7	13.8	
61	-0.5	0.00001	12	4.5	-3.8	12.7	
62	-0.5	0.00001	12	4.5	-4.2	12.3	
63	-0.4	0.00001	12	4.5	-4.1	12.4	
64	-0.4	0.00001	12	4.5	-4.0	12.5	
65	-0.3	0.00001	12	4.5	-4.8	11.7	16
66	-0.3	0.00001	12	4.5	-3.3	13.2	
67	-0.2	0.00001	12	4.5	-3.8	12.7	
68	-0.2	0.00001	12	4.5	-3.6	12.9	
69	-0.1	0.00001	12	4.5	-2.7	13.8	
70	-0.1	0.00001	12	4.5	-3.0	13.5	
71	0.0	0.00001	12	4.5	-3.3	13.2	
72	0.1	0.00001	12	4.5	-5.0	11.5	8
73	0.1	0.00001	12	4.5	-4.6	11.9	22
74	0.2	0.00001	12	4.5	-4.8	11.9	23
75	**0.2**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
76	0.3	0.00001	12	4.5	-4.7	11.8	17
77	**0.3**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
78	0.4	0.00001	12	4.5	-5.0	11.5	9

79	0.4	0.00001	12	4.5	-5.0	11.5	10
80	0.5	0.00001	12	4.5	-4.6	11.9	24
81	0.5	0.00001	12	4.5	-4.6	11.9	25
82	0.6	0.00001	12	4.5	-4.2	12.3	
83	0.6	0.00001	12	4.5	-5.0	11.5	11
84	0.7	0.00001	12	4.5	-4.6	11.9	26
85	0.7	0.00001	12	4.5	-4.2	12.3	
86	0.8	0.00001	12	4.5	-4.4	12.1	
87	0.8	0.00001	12	4.5	-4.3	12.2	
88	0.9	0.00001	12	4.5	-4.2	12.3	
89	**0.9**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
90	**1.0**	**0.00001**	**12**	**4.5**	**-4.5**	**12.0**	
91	1.0	0.00001	12	4.5	-4.1	12.4	
92	1.1	0.00001	12	4.5	-3.7	12.8	
93	1.1	0.00001	12	4.5	-3.9	12.6	
94	1.2	0.00001	12	4.5	-4.0	12.5	
95	1.2	0.00001	12	4.5	-3.8	12.7	
96	1.3	0.00001	12	4.5	-4.1	12.4	
97	1.3	0.00001	12	4.5	-4.4	12.1	
98	1.4	0.00001	12	4.5	-4.7	11.8	18
99	1.4	0.00001	12	4.5	-4.2	12.3	
100	1.5	0.00001	12	4.5	-4.7	11.8	19
101	1.5	0.00001	12	4.5	-4.6	11.9	27
102	1.6	0.00001	12	4.5	-2.5	14.0	
103	1.6	0.00001	12	4.5	-2.2	14.3	
104	1.7	0.00001	12	4.5	-2.2	14.3	
105	1.7	0.00001	12	4.5	-3.8	12.7	
106	1.8	0.00001	12	4.5	-2.6	13.9	
107	1.8	0.00001	12	4.5	-2.8	13.7	
108	1.9	0.00001	12	4.5	-2.8	13.7	
109	1.9	0.00001	12	4.5	-2.4	14.1	
110	2.0	0.00001	12	4.5	-2.4	14.1	
111	2.0	0.00001	12	4.5	-2.2	14.3	
112	2.1	0.00001	12	4.5	-1.9	14.6	
113	2.1	0.00001	12	4.5	-2.7	13.8	
114	2.2	0.00001	12	4.5	-2.2	14.3	
115	2.2	0.00001	12	4.5	-2.0	14.5	
116	2.3	0.00001	12	4.5	-1.8	14.7	
117	2.3	0.00001	12	4.5	-2.2	14.3	
118	2.4	0.00001	12	4.5	-2.2	14.3	
119	2.4	0.00001	12	4.5	-2.4	14.1	
120	2.5	0.00001	12	4.5	-2.4	14.1	
121	2.5	0.00001	12	4.5	-2.4	14.1	
122	2.6	0.00001	12	4.5	-2.3	14.2	
123	2.6	0.00001	12	4.5	-2.2	14.3	
124	2.7	0.00001	12	4.5	-1.9	14.6	
125	2.7	0.00001	12	4.5	0.9	17.4	
126	2.8	0.00001	12	4.5	1.2	17.7	
127	2.8	0.00001	12	4.5	1.0	17.5	
128	2.9	0.00001	12	4.5	1.2	17.7	
129	2.9	0.00001	12	4.5	1.0	17.5	

130	3.0	0.00001	12	4.5	1.2	17.7	
131	3.0	0.00001	12	4.5	0.8	17.3	
132	3.1	0.00001	12	4.5	0.0	16.5	
133	3.1	0.00001	12	4.5	-0.7	15.8	
134	3.2	0.00001	12	4.5	-1.4	15.1	
135	3.2	0.00001	12	4.5	-1.6	14.9	
136	3.3	0.00001	12	4.5	-1.6	14.9	
137	3.3	0.00001	12	4.5	-0.5	16.0	
138	3.4	0.00001	12	4.5	0.0	16.5	
139	3.4	0.00001	12	4.5	0.4	16.9	
140	3.5	0.00001	12	4.5	0.7	17.2	
141	3.5	0.00001	12	4.5	-0.1	16.4	

Channel #6, Fc = 2419.8750 MHz	Data Rate = 2.045 Mbps (DQPSK), Wide
Chip Rate = 11.25 MHz	PN Code Length = 11 chips/symbol
6 dB BW = 8.4 MHz	

(S/N)o = 12 dB per attached Figure 4.5.1

Measured Processing Gain Gp = (S/N)o + Lsys + Mj = 15 + 2 + Mj = 17 + Mj (dB)

Theoretical Calculated Processing Gain = Chip Rate/Data rate = $\frac{11.25\ \text{MHz}}{(2.045\ \text{Mb/s})/(2\ \text{bits/symbol})}$ = 11.0 or 10.4 dB

Note:

- Total Peak Power from the EUT's Tx measured at the EUT's Rx Input: P_t = -46.7 dBm
- Jamming signal level at measured at the EUT's receiver input: J
- Mj = J-P_t
- The following shaded boxes are discarded worst measurements (17.9% of total measurement points)

SUMMARY OF TEST RESULTS	
Theoretical Process Gain	10.4 dB
Minimum Measured Process Gain with discard of 17.9% of the worst measurements	10.5 dB

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	-5.0	0.00001	12	4.5	-3.7	12.8	
2	-5.0	0.00001	12	4.5	-4.2	12.3	
3	-4.9	0.00001	12	4.5	-4.2	12.3	
4	-4.9	0.00001	12	4.5	-4.6	11.9	
5	-4.8	0.00001	12	4.5	-4.6	11.9	
6	-4.8	0.00001	12	4.5	-4.1	12.4	
7	-4.7	0.00001	12	4.5	-3.6	12.9	
8	-4.7	0.00001	12	4.5	-3.6	12.9	
9	-4.6	0.00001	12	4.5	-3.6	12.9	
10	-4.6	0.00001	12	4.5	-3.5	13.0	
11	-4.5	0.00001	12	4.5	-3.5	13.0	
12	-4.5	0.00001	12	4.5	-3.4	13.1	
13	-4.4	0.00001	12	4.5	-3.5	13.0	
14	-4.4	0.00001	12	4.5	-3.6	12.9	
15	-4.3	0.00001	12	4.5	-4.3	12.2	
16	-4.3	0.00001	12	4.5	-4.9	11.6	
17	-4.2	0.00001	12	4.5	-5.6	10.9	
18	-4.2	0.00001	12	4.5	-5.7	10.8	
19	-4.1	0.00001	12	4.5	-5.8	10.7	
20	-4.1	0.00001	12	4.5	-5.8	10.7	
21	-4.0	0.00001	12	4.5	-6.2	10.3	25
22	-4.0	0.00001	12	4.5	-6.2	10.3	26
23	-3.9	0.00001	12	4.5	-6.2	10.3	27
24	-3.9	0.00001	12	4.5	-6.0	10.5	34
25	-3.8	0.00001	12	4.5	-6.0	10.5	35
26	-3.8	0.00001	12	4.5	-6.0	10.5	36
27	-3.7	0.00001	12	4.5	-6.0	10.5	

28	-3.7	0.00001	12	4.5	-6.0	10.5	
29	-3.6	0.00001	12	4.5	-6.0	10.5	
30	-3.6	0.00001	12	4.5	-5.0	11.5	
31	-3.5	0.00001	12	4.5	-5.2	11.3	
32	-3.5	0.00001	12	4.5	-5.0	11.5	
33	-3.4	0.00001	12	4.5	-4.8	11.7	
34	-3.4	0.00001	12	4.5	-5.0	11.5	
35	-3.3	0.00001	12	4.5	-5.4	11.1	
36	-3.3	0.00001	12	4.5	-7.2	9.3	6
37	-3.2	0.00001	12	4.5	-8.0	8.5	1
38	-3.2	0.00001	12	4.5	-8.0	8.5	2
39	-3.1	0.00001	12	4.5	-8.0	8.5	3
40	-3.1	0.00001	12	4.5	-8.0	8.5	4
41	-3.0	0.00001	12	4.5	-7.9	8.6	5
42	-3.0	0.00001	12	4.5	-7.2	9.3	7
43	-2.9	0.00001	12	4.5	-7.2	9.3	8
44	-2.9	0.00001	12	4.5	-6.7	9.8	14
45	-2.8	0.00001	12	4.5	-6.2	10.3	28
46	-2.8	0.00001	12	4.5	-6.0	10.5	
47	-2.7	0.00001	12	4.5	-6.0	10.5	
48	-2.7	0.00001	12	4.5	-5.8	10.7	
49	-2.6	0.00001	12	4.5	-5.8	10.7	
50	-2.6	0.00001	12	4.5	-5.8	10.7	
51	-2.5	0.00001	12	4.5	-5.4	11.1	
52	-2.5	0.00001	12	4.5	-5.0	11.5	
53	-2.4	0.00001	12	4.5	-5.0	11.5	
54	-2.4	0.00001	12	4.5	-5.0	11.5	
55	-2.3	0.00001	12	4.5	-4.6	11.9	
56	-2.3	0.00001	12	4.5	-4.8	11.7	
57	-2.2	0.00001	12	4.5	-5.1	11.4	
58	-2.2	0.00001	12	4.5	-5.2	11.3	
59	-2.1	0.00001	12	4.5	-5.4	11.1	
60	-2.1	0.00001	12	4.5	-5.8	10.7	
61	-2.0	0.00001	12	4.5	-5.8	10.7	
62	-2.0	0.00001	12	4.5	-6.4	10.1	23
63	-1.9	0.00001	12	4.5	-6.1	10.4	29
64	-1.9	0.00001	12	4.5	-5.4	11.1	
65	-1.8	0.00001	12	4.5	-5.3	11.2	
66	-1.8	0.00001	12	4.5	-5.5	11.0	
67	-1.7	0.00001	12	4.5	-5.6	10.9	
68	-1.7	0.00001	12	4.5	-5.5	11.0	
69	-1.6	0.00001	12	4.5	-5.4	11.1	
70	-1.6	0.00001	12	4.5	-4.5	12.0	
71	-1.5	0.00001	12	4.5	-5.8	10.7	
72	-1.5	0.00001	12	4.5	-4.4	12.1	
73	-1.4	0.00001	12	4.5	-4.9	11.6	
74	-1.4	0.00001	12	4.5	-4.9	11.6	
75	-1.3	0.00001	12	4.5	-5.1	11.4	
76	-1.3	0.00001	12	4.5	-5.2	11.3	
77	-1.2	0.00001	12	4.5	-5.1	11.4	
78	-1.2	0.00001	12	4.5	-5.4	11.1	

79	-1.1	0.00001	12	4.5	-5.6	10.9	
80	-1.1	0.00001	12	4.5	-5.6	10.9	
81	-1.0	0.00001	12	4.5	-5.6	10.9	
82	-1.0	0.00001	12	4.5	-5.9	10.6	
83	-0.9	0.00001	12	4.5	-6.5	10.0	20
84	-0.9	0.00001	12	4.5	-6.8	9.7	13
85	-0.8	0.00001	12	4.5	-6.9	9.6	9
86	-0.8	0.00001	12	4.5	-6.6	9.9	18
87	-0.7	0.00001	12	4.5	-6.9	9.6	10
88	-0.7	0.00001	12	4.5	-6.9	9.6	11
89	-0.6	0.00001	12	4.5	-6.9	9.6	12
90	-0.6	0.00001	12	4.5	-6.7	9.8	15
91	-0.5	0.00001	12	4.5	-6.7	9.8	16
92	-0.5	0.00001	12	4.5	-5.8	10.7	
93	-0.4	0.00001	12	4.5	-5.1	11.4	
94	-0.4	0.00001	12	4.5	-5.1	11.4	
95	-0.3	0.00001	12	4.5	-5.1	11.4	
96	-0.3	0.00001	12	4.5	-5.1	11.4	
97	-0.2	0.00001	12	4.5	-5.1	11.4	
98	-0.2	0.00001	12	4.5	-5.5	11.0	
99	-0.1	0.00001	12	4.5	-6.3	10.2	24
100	-0.1	0.00001	12	4.5	-6.7	9.8	17
101	0.0	0.00001	12	4.5	-6.5	10.0	21
102	0.1	0.00001	12	4.5	-6.6	9.9	19
103	0.1	0.00001	12	4.5	-6.5	10.0	22
104	0.2	0.00001	12	4.5	-5.7	10.8	
105	0.2	0.00001	12	4.5	-5.2	11.3	
106	0.3	0.00001	12	4.5	-5.0	11.5	
107	0.3	0.00001	12	4.5	-5.1	11.4	
108	0.4	0.00001	12	4.5	-5.3	11.2	
109	0.4	0.00001	12	4.5	-5.5	11.0	
110	0.5	0.00001	12	4.5	-5.5	11.0	
111	0.5	0.00001	12	4.5	-5.7	10.8	
112	0.6	0.00001	12	4.5	-5.7	10.8	
113	0.6	0.00001	12	4.5	-5.7	10.8	
114	0.7	0.00001	12	4.5	-5.7	10.8	
115	0.7	0.00001	12	4.5	-5.6	10.9	
116	0.8	0.00001	12	4.5	-6.1	10.4	30
117	0.8	0.00001	12	4.5	-6.1	10.4	31
118	0.9	0.00001	12	4.5	-6.1	10.4	32
119	0.9	0.00001	12	4.5	-6.1	10.4	33
120	1.0	0.00001	12	4.5	-5.5	11.0	
121	1.0	0.00001	12	4.5	-5.5	11.0	
122	1.1	0.00001	12	4.5	-5.3	11.2	
123	1.1	0.00001	12	4.5	-5.3	11.2	
124	1.2	0.00001	12	4.5	-4.8	11.7	
125	1.2	0.00001	12	4.5	-5.3	11.2	
126	1.3	0.00001	12	4.5	-5.3	11.2	
127	1.3	0.00001	12	4.5	-4.8	11.7	
128	1.4	0.00001	12	4.5	-4.7	11.8	
129	1.4	0.00001	12	4.5	-4.6	11.9	

130	1.5	0.00001	12	4.5	-4.9	11.6	
131	1.5	0.00001	12	4.5	-4.9	11.6	
132	1.6	0.00001	12	4.5	-5.5	11.0	
133	**1.6**	**0.00001**	**12**	**4.5**	**-6.0**	**10.5**	
134	1.7	0.00001	12	4.5	-5.8	10.7	
135	1.7	0.00001	12	4.5	-5.5	11.0	
136	1.8	0.00001	12	4.5	-5.4	11.1	
137	1.8	0.00001	12	4.5	-5.7	10.8	
138	1.9	0.00001	12	4.5	-5.7	10.8	
139	1.9	0.00001	12	4.5	-5.5	11.0	
140	2.0	0.00001	12	4.5	-5.7	10.8	
141	2.0	0.00001	12	4.5	-5.2	11.3	
142	2.1	0.00001	12	4.5	-4.7	11.8	
143	2.1	0.00001	12	4.5	-4.3	12.2	
144	2.2	0.00001	12	4.5	-4.2	12.3	
145	2.2	0.00001	12	4.5	-4.4	12.1	
146	2.3	0.00001	12	4.5	-4.9	11.6	
147	2.3	0.00001	12	4.5	-5.1	11.4	
148	2.4	0.00001	12	4.5	-5.1	11.4	
149	2.4	0.00001	12	4.5	-5.1	11.4	
150	2.5	0.00001	12	4.5	-5.1	11.4	
151	2.5	0.00001	12	4.5	-5.2	11.3	
152	2.6	0.00001	12	4.5	-5.3	11.2	
153	2.6	0.00001	12	4.5	-5.3	11.2	
154	2.7	0.00001	12	4.5	-5.4	11.1	
155	2.7	0.00001	12	4.5	-5.3	11.2	
156	2.8	0.00001	12	4.5	-5.4	11.1	
157	2.8	0.00001	12	4.5	-5.4	11.1	
158	2.9	0.00001	12	4.5	-5.5	11.0	
159	2.9	0.00001	12	4.5	-5.8	10.7	
160	3.0	0.00001	12	4.5	-5.9	10.6	
161	3.0	0.00001	12	4.5	-5.9	10.6	
162	3.1	0.00001	12	4.5	-5.9	10.6	
163	3.1	0.00001	12	4.5	-5.5	11.0	
164	3.2	0.00001	12	4.5	-5.5	11.0	
165	3.2	0.00001	12	4.5	-5.5	11.0	
166	3.3	0.00001	12	4.5	-5.7	10.8	
167	3.3	0.00001	12	4.5	-5.7	10.8	
168	3.4	0.00001	12	4.5	-5.7	10.8	
169	3.4	0.00001	12	4.5	-5.6	10.9	
170	3.5	0.00001	12	4.5	-5.9	10.6	
171	3.5	0.00001	12	4.5	-5.9	10.6	
172	3.6	0.00001	12	4.5	-5.5	11.0	
173	3.6	0.00001	12	4.5	-5.5	11.0	
174	3.7	0.00001	12	4.5	-5.5	11.0	
175	3.7	0.00001	12	4.5	-5.5	11.0	
176	3.8	0.00001	12	4.5	-5.5	11.0	
177	3.8	0.00001	12	4.5	-4.8	11.7	
178	3.9	0.00001	12	4.5	-4.9	11.6	
179	3.9	0.00001	12	4.5	-4.9	11.6	
180	4.0	0.00001	12	4.5	-4.9	11.6	

181	4.0	0.00001	12	4.5	-4.9	11.6	
182	4.1	0.00001	12	4.5	-4.9	11.6	
183	4.1	0.00001	12	4.5	-4.5	12.0	
184	4.2	0.00001	12	4.5	-4.5	12.0	
185	4.2	0.00001	12	4.5	-4.1	12.4	
186	4.3	0.00001	12	4.5	-4.1	12.4	
187	4.3	0.00001	12	4.5	-3.9	12.6	
188	4.4	0.00001	12	4.5	-3.9	12.6	
189	4.4	0.00001	12	4.5	-3.9	12.6	
190	4.5	0.00001	12	4.5	-3.9	12.6	
191	4.5	0.00001	12	4.5	-3.7	12.8	
192	4.6	0.00001	12	4.5	-3.7	12.8	
193	4.6	0.00001	12	4.5	-3.7	12.8	
194	4.7	0.00001	12	4.5	-3.7	12.8	
195	4.7	0.00001	12	4.5	-3.7	12.8	
196	4.8	0.00001	12	4.5	-3.7	12.8	
197	4.8	0.00001	12	4.5	-3.7	12.8	
198	4.9	0.00001	12	4.5	-3.7	12.8	
199	4.9	0.00001	12	4.5	-3.7	12.8	
200	5.0	0.00001	12	4.5	-3.7	12.8	
201	5.0	0.00001	12	4.5	-3.3	13.2	

Channel #18, Fc = 2464.8750 MHz	**Data Rate = 0.818 Mbps (DQPSK), Narrow**
Chip Rate = 4.5 MHz	**PN Code Length = 11 chips/symbol**
6 dB BW = 4 MHz	

(S/N)o = 12 dB per attached Figure 4.5.1

Measured Processing Gain Gp = (S/N)o + Lsys + Mj = 15 + 2 + Mj = 17 + Mj (dB)

Theoretical Calculated Processing Gain = Chip Rate/Data rate = 4.5 MHz / (0.818 Mb/s)/(2 bits/symbol) = 11 or 10.4 dB

Note:

- Total Peak Power from the EUT's Tx measured at the EUT's Rx Input: P_t = -49.9 dBm
- Jamming signal level at measured at the EUT's receiver input: J
- Mj = J-P_t
- The following shaded boxes are discarded worst measurements (18.8% of total measurement points)

SUMMARY OF TEST RESULTS	
Theoretical Process Gain	**10.4 dB**
Minimum Measured Process Gain with discard of 18.8% of the worst measurements	**10.7 dB**

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	-2.50	0.00001	12	4.5	-1.0	15.5	
2	-2.45	0.00001	12	4.5	-1.1	15.4	
3	-2.40	0.00001	12	4.5	-0.1	16.4	
4	-2.35	0.00001	12	4.5	0.0	16.5	
5	-2.30	0.00001	12	4.5	0.8	17.3	
6	-2.25	0.00001	12	4.5	1.3	17.8	
7	-2.20	0.00001	12	4.5	2.1	18.6	
8	-2.15	0.00001	12	4.5	1.6	18.1	
9	-2.10	0.00001	12	4.5	1.0	17.5	
10	-2.05	0.00001	12	4.5	0.2	16.7	
11	-2.00	0.00001	12	4.5	-0.4	16.1	
12	-1.95	0.00001	12	4.5	-1.7	14.8	
13	-1.90	0.00001	12	4.5	-1.6	14.9	
14	-1.85	0.00001	12	4.5	-1.3	15.2	
15	-1.80	0.00001	12	4.5	0.4	16.9	
16	-1.75	0.00001	12	4.5	0.6	17.1	
17	-1.70	0.00001	12	4.5	0.6	17.1	
18	-1.65	0.00001	12	4.5	0.1	16.6	
19	-1.60	0.00001	12	4.5	0.1	16.6	
20	-1.55	0.00001	12	4.5	0.5	17.0	
21	-1.50	0.00001	12	4.5	0.6	17.1	
22	-1.45	0.00001	12	4.5	0.6	17.1	
23	-1.40	0.00001	12	4.5	2.0	18.5	

Continued ...

Test Point	Jammer Signal Freq. +/- Fc	(BER) (DQPSK)	(S/N)o	System Loss Lsys	Jammer to Signal Ratio Mj	Measured Processing Gain	Discarded Readings
24	-1.35	0.00001	12	4.5	1.9	18.4	
25	-1.30	0.00001	12	4.5	2.1	18.6	
26	-1.25	0.00001	12	4.5	2.0	18.5	
27	-1.20	0.00001	12	4.5	2.4	18.9	
28	-1.15	0.00001	12	4.5	2.4	18.9	
29	-1.10	0.00001	12	4.5	2.4	18.9	
30	-1.05	0.00001	12	4.5	3.0	19.5	
31	-1.00	0.00001	12	4.5	-4.1	12.4	
32	-0.95	0.00001	12	4.5	-5.7	10.8	
33	-0.90	0.00001	12	4.5	-5.6	10.9	
34	-0.85	0.00001	12	4.5	-5.2	11.3	
35	-0.80	0.00001	12	4.5	-5.6	10.9	
36	-0.75	0.00001	12	4.5	-5.5	11.0	
37	-0.70	0.00001	12	4.5	-6.4	10.1	9
38	-0.65	0.00001	12	4.5	-5.9	10.6	15
39	-0.60	0.00001	12	4.5	-5.2	11.3	
40	-0.55	0.00001	12	4.5	-4.5	12.0	
41	-0.50	0.00001	12	4.5	-5.0	11.5	
42	**-0.45**	**0.00001**	**12**	**4.5**	**-5.8**	**10.7**	
43	-0.40	0.00001	12	4.5	-6.3	10.2	10
44	-0.35	0.00001	12	4.5	-5.6	10.9	
45	-0.30	0.00001	12	4.5	-6.1	10.4	13
46	-0.25	0.00001	12	4.5	-6.8	9.7	2
47	-0.20	0.00001	12	4.5	-5.5	11.0	
48	-0.15	0.00001	12	4.5	-4.9	11.6	
49	-0.10	0.00001	12	4.5	-4.7	11.8	
50	-0.05	0.00001	12	4.5	-4.4	12.1	
51	0.00	0.00001	12	4.5	-6.6	9.9	4
52	0.05	0.00001	12	4.5	-4.8	11.7	
53	0.10	0.00001	12	4.5	-4.5	12.0	
54	0.15	0.00001	12	4.5	-3.9	12.6	
55	0.20	0.00001	12	4.5	-4.4	12.1	
56	0.25	0.00001	12	4.5	-5.1	11.4	
57	0.30	0.00001	12	4.5	-6.5	10.0	6
58	0.35	0.00001	12	4.5	-4.9	11.6	
59	0.40	0.00001	12	4.5	-4.5	12.0	
60	0.45	0.00001	12	4.5	-5.3	11.2	
61	0.50	0.00001	12	4.5	-4.5	12.0	
62	0.55	0.00001	12	4.5	-6.3	10.2	11
63	0.60	0.00001	12	4.5	-6.5	10.0	7
64	0.65	0.00001	12	4.5	-5.7	10.8	
65	0.70	0.00001	12	4.5	-5.6	10.9	
66	0.75	0.00001	12	4.5	-6.1	10.4	14

Continued ...

Test Point	Jammer Signal Freq. +/- Fc	(BER) (DQPSK)	(S/N)o	System Loss Lsys	Jammer to Signal Ratio Mj	Measured Processing Gain	Discarded Readings
67	0.80	0.00001	12	4.5	-5.2	11.3	
68	0.85	0.00001	12	4.5	-5.2	11.3	
69	0.90	0.00001	12	4.5	-5.2	11.3	
70	0.95	0.00001	12	4.5	-4.6	11.9	
71	1.00	0.00001	12	4.5	-4.6	11.9	
72	1.05	0.00001	12	4.5	-6.5	10.0	8
73	1.10	0.00001	12	4.5	-6.7	9.8	3
74	**1.15**	**0.00001**	**12**	**4.5**	**-5.8**	**10.7**	
75	1.20	0.00001	12	4.5	-6.6	9.9	5
76	1.25	0.00001	12	4.5	-7.0	9.5	1
77	1.30	0.00001	12	4.5	-6.3	10.2	12
78	1.35	0.00001	12	4.5	-5.9	10.6	16
79	1.40	0.00001	12	4.5	-5.9	10.6	17
80	1.45	0.00001	12	4.5	-5.9	10.6	18
81	**1.50**	**0.00001**	**12**	**4.5**	**-5.8**	**10.7**	
82	1.55	0.00001	12	4.5	-5.9	10.6	19
83	**1.60**	**0.00001**	**12**	**4.5**	**-5.8**	**10.7**	
84	1.65	0.00001	12	4.5	-5.7	10.8	
85	1.70	0.00001	12	4.5	-4.8	11.7	
86	1.75	0.00001	12	4.5	-4.4	12.1	
87	1.80	0.00001	12	4.5	-4.4	12.1	
88	1.85	0.00001	12	4.5	-4.4	12.1	
89	1.90	0.00001	12	4.5	-4.4	12.1	
90	1.95	0.00001	12	4.5	-4.3	12.2	
91	2.00	0.00001	12	4.5	-5.2	11.3	
92	2.05	0.00001	12	4.5	-3.3	13.2	
93	2.10	0.00001	12	4.5	-0.8	15.7	
94	2.15	0.00001	12	4.5	0.7	17.2	
95	2.20	0.00001	12	4.5	0.9	17.4	
96	2.25	0.00001	12	4.5	0.9	17.4	
97	2.30	0.00001	12	4.5	1.2	17.7	
98	2.35	0.00001	12	4.5	1.0	17.5	
99	2.40	0.00001	12	4.5	0.6	17.1	
100	2.45	0.00001	12	4.5	1.0	17.5	
101	2.50	0.00001	12	4.5	1.0	17.5	

Test Point	Jammer Signal Freq. + /- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)
23	-1.40	0.00001	15.0	2.0	2.0	19.0
24	-1.35	0.00001	15.0	2.0	1.9	18.9
25	-1.30	0.00001	15.0	2.0	2.1	19.1
26	-1.25	0.00001	15.0	2.0	2.0	19.0
27	-1.20	0.00001	15.0	2.0	2.4	19.4
28	-1.15	0.00001	15.0	2.0	2.4	19.4
29	-1.10	0.00001	15.0	2.0	2.4	19.4
30	-1.05	0.00001	15.0	2.0	3.0	20.0
31	-1.00	0.00001	15.0	2.0	-4.1	12.9
32	-0.95	0.00001	15.0	2.0	-5.7	11.3
33	-0.90	0.00001	15.0	2.0	-5.6	11.4
34	-0.85	0.00001	15.0	2.0	-5.2	11.8
35	-0.80	0.00001	15.0	2.0	-5.6	11.4
36	-0.75	0.00001	15.0	2.0	-5.5	11.5
37	-0.70	0.00001	15.0	2.0	-6.4	10.6
38	-0.65	0.00001	15.0	2.0	-5.9	11.1
39	-0.60	0.00001	15.0	2.0	-5.2	11.8
40	-0.55	0.00001	15.0	2.0	-4.5	12.5
41	-0.50	0.00001	15.0	2.0	-5.0	12.0
42	-0.45	0.00001	15.0	2.0	-5.8	11.2
43	-0.40	0.00001	15.0	2.0	-6.3	10.7
44	-0.35	0.00001	15.0	2.0	-5.6	11.4
45	-0.30	0.00001	15.0	2.0	-6.1	10.9
46	-0.25	0.00001	15.0	2.0	-6.8	10.2
47	-0.20	0.00001	15.0	2.0	-5.5	11.5
48	-0.15	0.00001	15.0	2.0	-4.9	12.1
49	-0.10	0.00001	15.0	2.0	-4.7	12.3
50	-0.05	0.00001	15.0	2.0	-4.4	12.6
51	0.00	0.00001	15.0	2.0	-6.6	10.4
52	0.05	0.00001	15.0	2.0	-4.8	12.2
53	0.10	0.00001	15.0	2.0	-4.5	12.5
54	0.15	0.00001	15.0	2.0	-3.9	13.1
55	0.20	0.00001	15.0	2.0	-4.4	12.6
56	0.25	0.00001	15.0	2.0	-5.1	11.9
57	0.30	0.00001	15.0	2.0	-6.5	10.5
58	0.35	0.00001	15.0	2.0	-4.9	12.1
59	0.40	0.00001	15.0	2.0	-4.5	12.5
60	0.45	0.00001	15.0	2.0	-5.3	11.7
61	0.50	0.00001	15.0	2.0	-4.5	12.5
62	0.55	0.00001	15.0	2.0	-6.3	10.7
63	0.60	0.00001	15.0	2.0	-6.5	10.5

Continued ..

Test Point	Jammer Signal Freq. + /- Fc (MHz)	(BER) (DQPSK)	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)
64	0.65	0.00001	15.0	2.0	-5.7	11.3
65	0.70	0.00001	15.0	2.0	-5.6	11.4
66	0.75	0.00001	15.0	2.0	-6.1	10.9
67	0.80	0.00001	15.0	2.0	-5.2	11.8
68	0.85	0.00001	15.0	2.0	-5.2	11.8
69	0.90	0.00001	15.0	2.0	-5.2	11.8
70	0.95	0.00001	15.0	2.0	-4.6	12.4
71	1.00	0.00001	15.0	2.0	-4.6	12.4
72	1.05	0.00001	15.0	2.0	-6.5	10.5
73	1.10	0.00001	15.0	2.0	-6.7	10.3
74	1.15	0.00001	15.0	2.0	-5.8	11.2
75	1.20	0.00001	15.0	2.0	-6.6	10.4
76	1.25	0.00001	15.0	2.0	-7.0	10.0
77	1.30	0.00001	15.0	2.0	-6.3	10.7
78	1.35	0.00001	15.0	2.0	-5.9	11.1
79	1.40	0.00001	15.0	2.0	-5.9	11.1
80	1.45	0.00001	15.0	2.0	-5.9	11.1
81	1.50	0.00001	15.0	2.0	-5.8	11.2
82	1.55	0.00001	15.0	2.0	-5.9	11.1
83	1.60	0.00001	15.0	2.0	-5.8	11.2
84	1.65	0.00001	15.0	2.0	-5.7	11.3
85	1.70	0.00001	15.0	2.0	-4.8	12.2
86	1.75	0.00001	15.0	2.0	-4.4	12.6
87	1.80	0.00001	15.0	2.0	-4.4	12.6
88	1.85	0.00001	15.0	2.0	-4.4	12.6
89	1.90	0.00001	15.0	2.0	-4.4	12.6
90	1.95	0.00001	15.0	2.0	-4.3	12.7
91	2.00	0.00001	15.0	2.0	-5.2	11.8
92	2.05	0.00001	15.0	2.0	-3.3	13.7
93	2.10	0.00001	15.0	2.0	-0.8	16.2
94	2.15	0.00001	15.0	2.0	0.7	17.7
95	2.20	0.00001	15.0	2.0	0.9	17.9
96	2.25	0.00001	15.0	2.0	0.9	17.9
97	2.30	0.00001	15.0	2.0	1.2	18.2
98	2.35	0.00001	15.0	2.0	1.0	18.0
99	2.40	0.00001	15.0	2.0	0.6	17.6
100	2.45	0.00001	15.0	2.0	1.0	18.0
101	2.50	0.00001	15.0	2.0	1.0	18.0

InterAir Frequencies

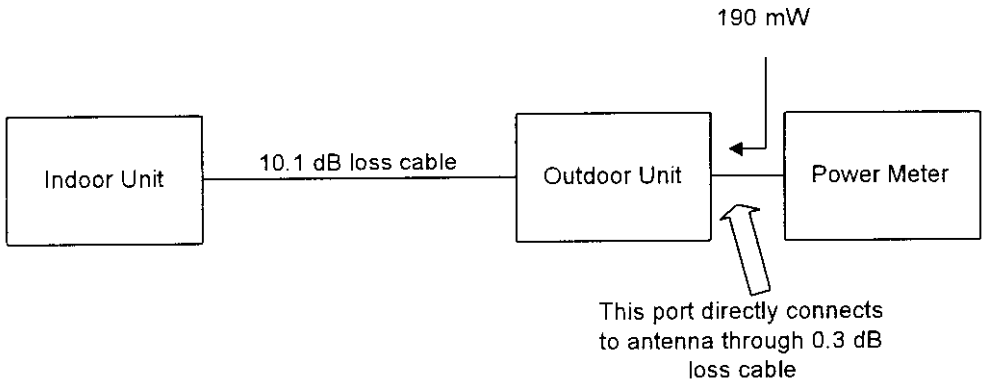
Ch. No.	CH Freq. (MHz)	LO Freq. (MHz)	Chip Rate(MHz)	
3	2,408.6250	1,493.62[illegible]	4.5	Narrow
4	2,411.4375	1,496.43[illegible]	5.625	Medium
5	2,417.0625	1,502.06[illegible]	5.625	Medium
6	2,419.8750	1,504.87[illegible]	11.25	Wide
7	2,422.6875	1,507.68[illegible]	5.625	Medium
8	2,428.3125	1,513.31[illegible]	5.625	Medium
9	2,431.1250	1,516.12[illegible]	11.25	Wide
10	2,433.9375	1,518.93[illegible]	5.625	Medium
11	2,439.5625	1,524.56[illegible]	5.625	Medium
12	2,442.3750	1,527.37[illegible]	11.25	Wide
13	2,445.1875	1,530.18[illegible]	5.625	Medium
14	2,450.8125	1,535.8125	5.625	Medium
15	2,453.6250	1,538.62[illegible]	11.25	Wide
16	2,456.4375	1,541.43[illegible]	5.625	Medium
17	2,462.0625	1,547.06[illegible]	5.625	Medium
18	2,464.8750	1,549.87[illegible]	4.5	Narrow

4W + 2N	Wideband	[illegible] MHz
	Narrowband	[illegible] MHz
10 CH	Narrowband	[illegible] MHz

		ANTENNA SELECTION					
DESCRIPTION	VENDOR	P/N	GAIN (dBi)	BW AZ	BW EL	ODU Pout	EiRP
1X1 PATCH	HUBER SUHNER	64958022	8.5	75	60	22.7	31.2
3X3 PATCH	HUBER SUHNER	65119522	16.5	27	25	22.7	39.2
1X10 PATCH	HUBER SUHNER	65247322	16.5	85	6	22.7	39.2
OMNI	ANDREW	RT1N0F-024V-013A	13	360	4.5	22.7	35.7
REFLECTOR	CONIFER	18T-2400	17	14	14	22.7	39.7

			CABLE SELECTION				
PART NO.	DESCRIPTION	VENDOR	LOSS(dB/100')	LOSS (ft/dB)	P/N	LENGTH (ft)	LOSS (dB)
LMR-400-DB	.4" CABLE - WP	TIMES	6.8	14.705882	-5	150	10.2
LMR-300	.3" CABLE	TIMES	10.4	9.6153846	-4	100	10.4
LMR-240	.24" CABLE	TIMES	12.9	7.751938	-3	80	10.3
LMR-200	.2" CABLE	TIMES	16.9	5.9171598	-2	60	10.1
LMR-500-DB	.5" CABLE - WP	TIMES	5.5	18.181818	-6	200	11
LMR-600-DB	.6" CABLE - WP	TIMES	4.4	22.727273	-7	250	11
LMR-900-DB	.9" CABLE - WP	TIMES	3	33.333333	-8	400	12
RG-223/U	.25 INCH FLEX	MISC	35	2.8571429	-1	30	10.5

minimum cable loss of 36 dBm (max EIRP allowed) – [22.8 dBm + 10.1 dBi] (power delivered from indoor unit) – 17 dBi (antenna gain)= 13.9 dB.



We, InterAir Wireless, confirm that the cables listed on page 7 of the test report are the only cables that will be supplied.

3. Process Gain tests:

See Attached Discussion