

Level One Communications, Inc.**Processing gain for model LDB 810 Demonstration System REV 7
(REV 7B: Base, REV 7P: Portable)**

The C/W jamming method was used to determine processing gain. The jamming frequency was swept from 914.00 MHz to 915.00 MHz in 50 kHz increments. The desired input power was set at -49.7 dBm. The jamming power was adjusted to obtain a bit error rate of $1e-4$.

The system utilizes non-coherent FM with discrimination detection. The peak frequency deviation is 0.35 the modulation frequency: $F_d = .35 F_s$. A copy of page 229 out of Jakes "Microwave Mobile Communications" is attached to demonstrate the required S/N of 11.0 dB for a $1e-4$ error probability.

Using the equation $G_p = S/N + J/S + L_{sys}$ with:

G_p = processing gain

S/N = required signal to noise ratio for a given probability of error (in this case $1e-4$)

J/S = Jammer to desired signal ratio

L_{sys} = System loss due to non-idealities, maximum allowed is 2.0 dB

The calculated worse case processing gain was 10.0 dB for jamming frequencies of 914.40 MHz and 915.65 MHz. For all other jamming frequencies, the processing gain was greater than 10.0 dB.

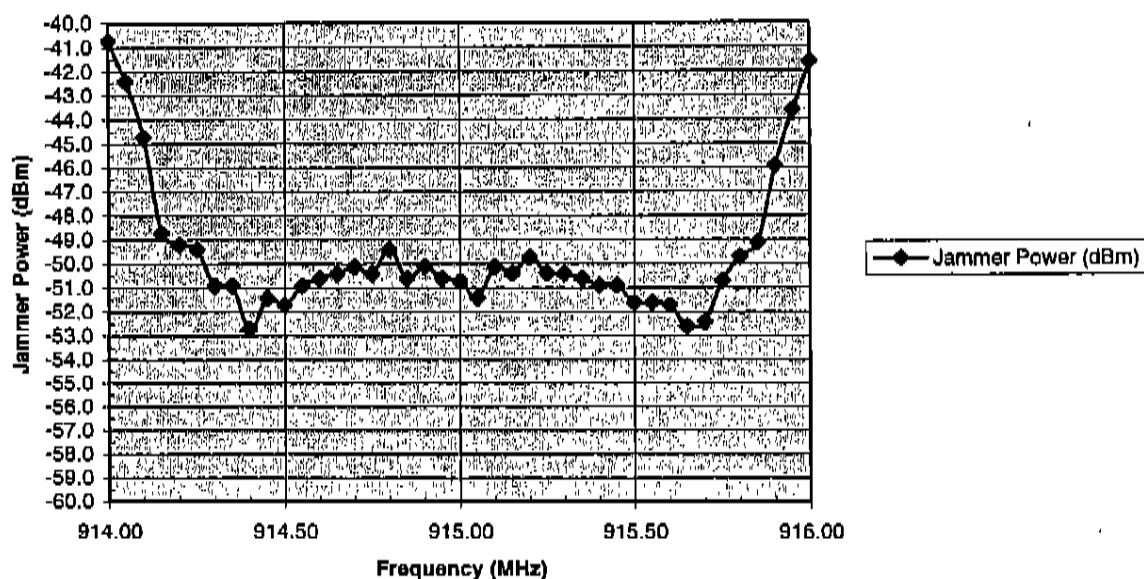
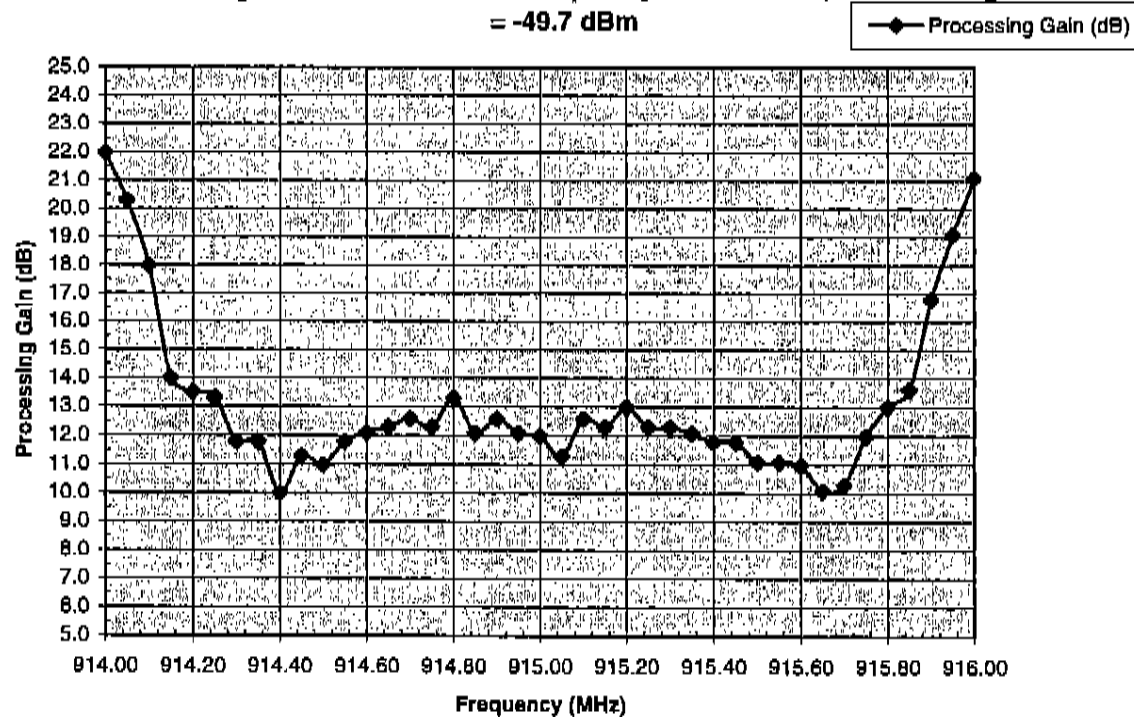
The test results represent the processing gain for both the portable and base units.

Refer to the attached data sheets for more details.

Fchannel = 915.00 MHz

Channel Frequency =		915.00 MHz	
Bit Error Rate =		1.00E-04	
Required S/N for BER =		11.0 dB	
System Losses =		2.0 dB	
Signal Strength at Receiver =		-49.7 dBm	
Jammer Frequency (MHz)	Jammer Power (dBm)	Jammer to Signal Ratio J / S (dB)	Processing Gain (dB)
914.00	-40.7	9.0	22.0
914.05	-42.4	7.3	20.3
914.10	-44.7	5.0	18.0
914.15	-48.7	1.0	14.0
914.20	-49.2	0.5	13.5
914.25	-49.4	0.3	13.3
914.30	-50.9	-1.2	11.8
914.35	-50.9	-1.2	11.8
914.40	-52.7	-3.0	10.0
914.45	-51.4	-1.7	11.3
914.50	-51.7	-2.0	11.0
914.55	-50.9	-1.2	11.8
914.60	-50.6	-0.9	12.1
914.65	-50.4	-0.7	12.3
914.70	-50.1	-0.4	12.6
914.75	-50.4	-0.7	12.3
914.80	-49.4	0.3	13.3
914.85	-50.6	-0.9	12.1
914.90	-50.1	-0.4	12.6
914.95	-50.6	-0.9	12.1
915.00	-50.7	-1.0	12.0
915.05	-51.4	-1.7	11.3
915.10	-50.1	-0.4	12.6
915.15	-50.4	-0.7	12.3
915.20	-49.7	0.0	13.0
915.25	-50.4	-0.7	12.3
915.30	-50.4	-0.7	12.3
915.35	-50.6	-0.9	12.1
915.40	-50.9	-1.2	11.8
915.45	-50.9	-1.2	11.8
915.50	-51.6	-1.9	11.1
915.55	-51.6	-1.9	11.1
915.60	-51.7	-2.0	11.0
915.65	-52.6	-2.9	10.1
915.70	-52.4	-2.7	10.3
915.75	-50.7	-1.0	12.0
915.80	-49.7	0.0	13.0
915.85	-49.1	0.6	13.6
915.90	-45.9	3.8	16.8
915.95	-43.6	6.1	19.1
916.00	-41.6	8.1	21.1

Fchannel = 915.00 MHz

Jammer Power vs Jammer Frequency: BER = .0001, Desired Signal = -49.7 dBm**Processing Gain vs CW Jammer Frequency: BER = .0001, Desired Signal = -49.7 dBm**

From: "Microwave Mobile Communications"
 Edited by William C. Jakes

Modulation, Noise, and Interference

229

1. COHERENT DETECTION BINARY AM
 2. DPSK DETECTION
 3. ON OFF AM, ENVELOPE DETECTION
 4. GUNDE'S FM SYSTEM
 5. FM WITH DISCRIMINATOR DETECTION
- $f_d = 0.35 f_s$ BIF = f_s

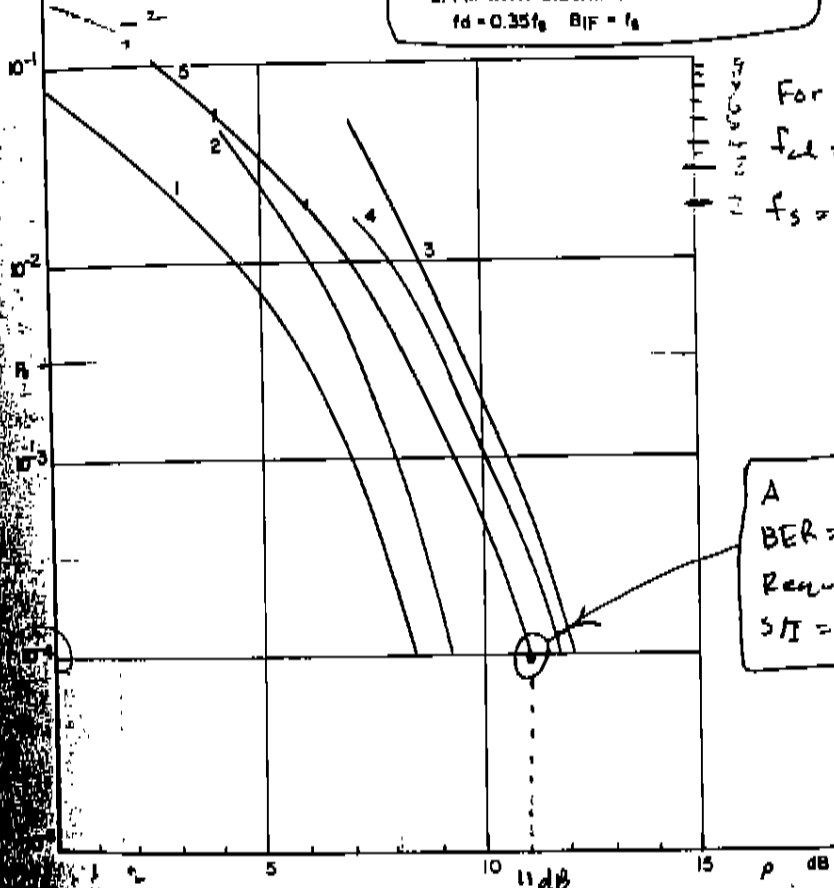


Figure 4.2-6 Error rate as a function of average transmitter power to noise ratio, P_T/N_{0f} .

peak frequency deviation is f_d . It is clear that $x(t)$ is no longer band limited. Calculations show^{31, 32} that for small deviations, that is, $f_d < f_s/4$, the spectrum of $x(t)$ is essentially contained in a narrow RF bandwidth of $1.5 f_s$. A narrow-band system has been described by Salz^{32, 33} with $f_d = f_s/4$ and small amplitude fluctuations. With conventional limiter discrim-