Level One Communications, Inc.

Processing gain for model LDB 810 Demonstration System REV 7
(REV 7B: Base, REV 7P: Poratble)

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: Fd = .35 Fs. 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 Gp = S/N + J/S + Lsys with:

Gp = 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
Lsys = 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.

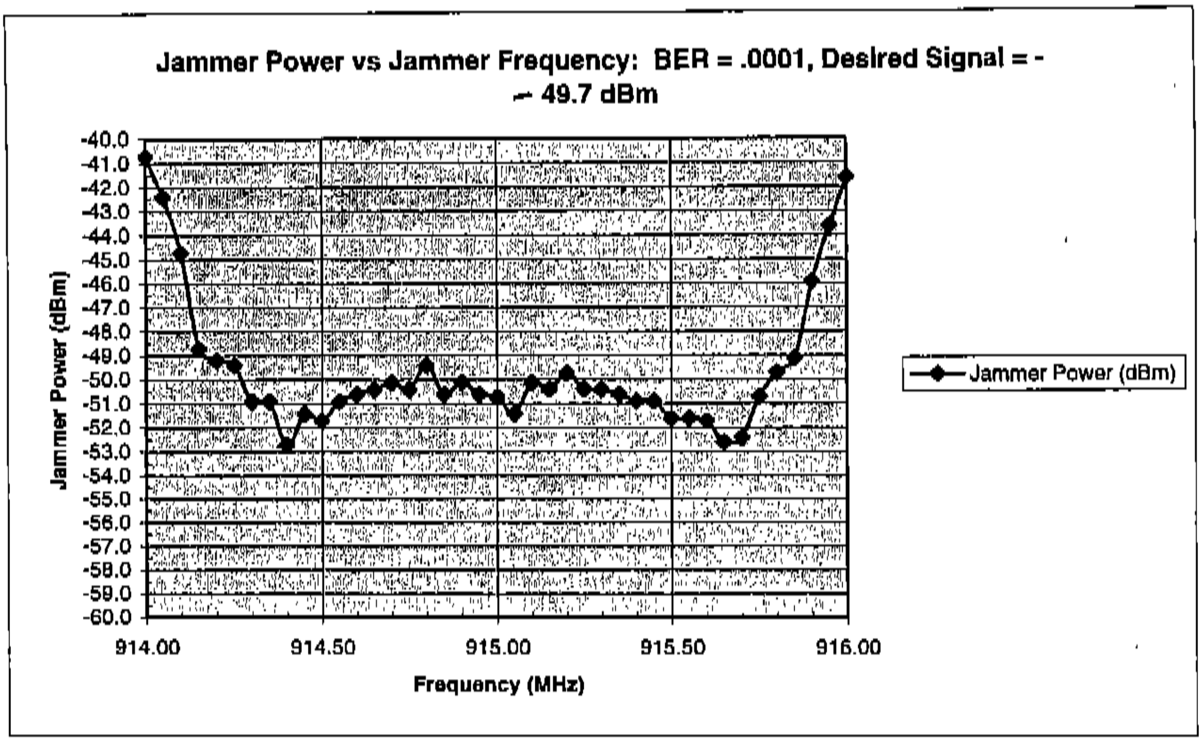
Refer to the attached data sheets for more details.

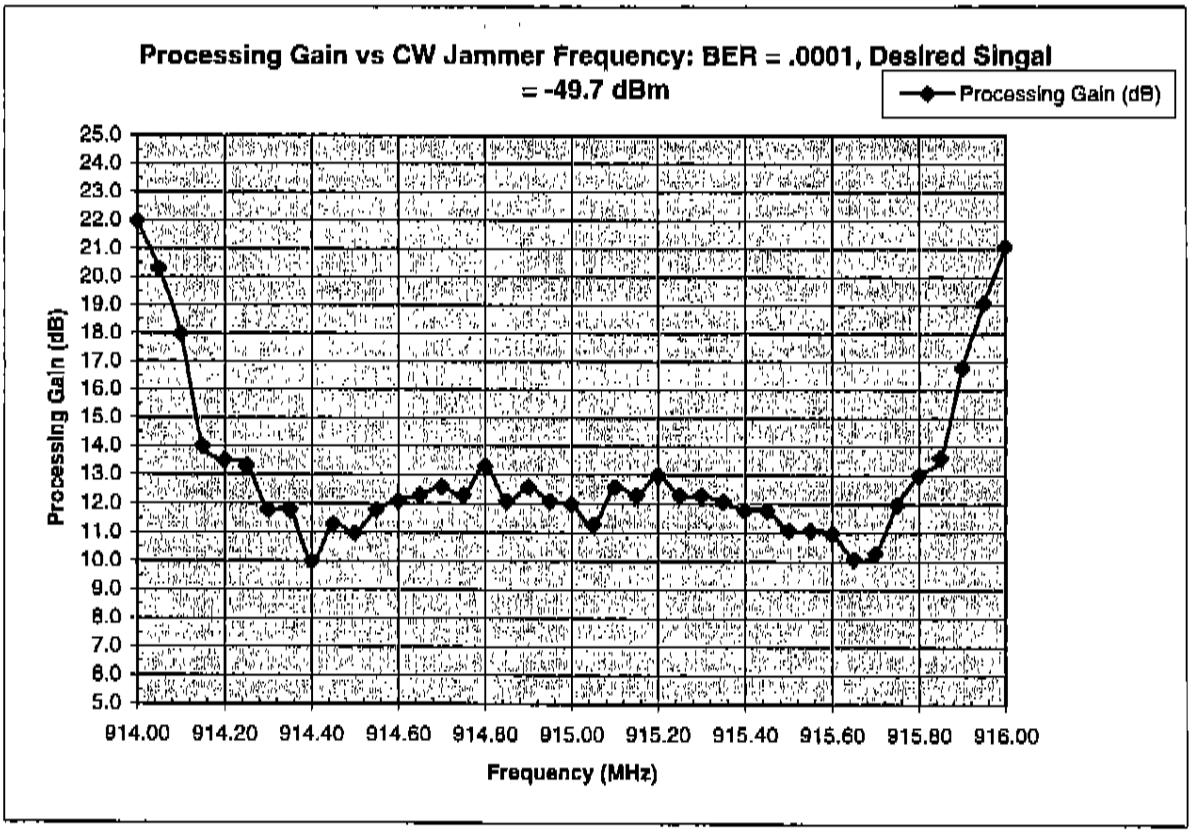
Fchannel = 915.00 MHz

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





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

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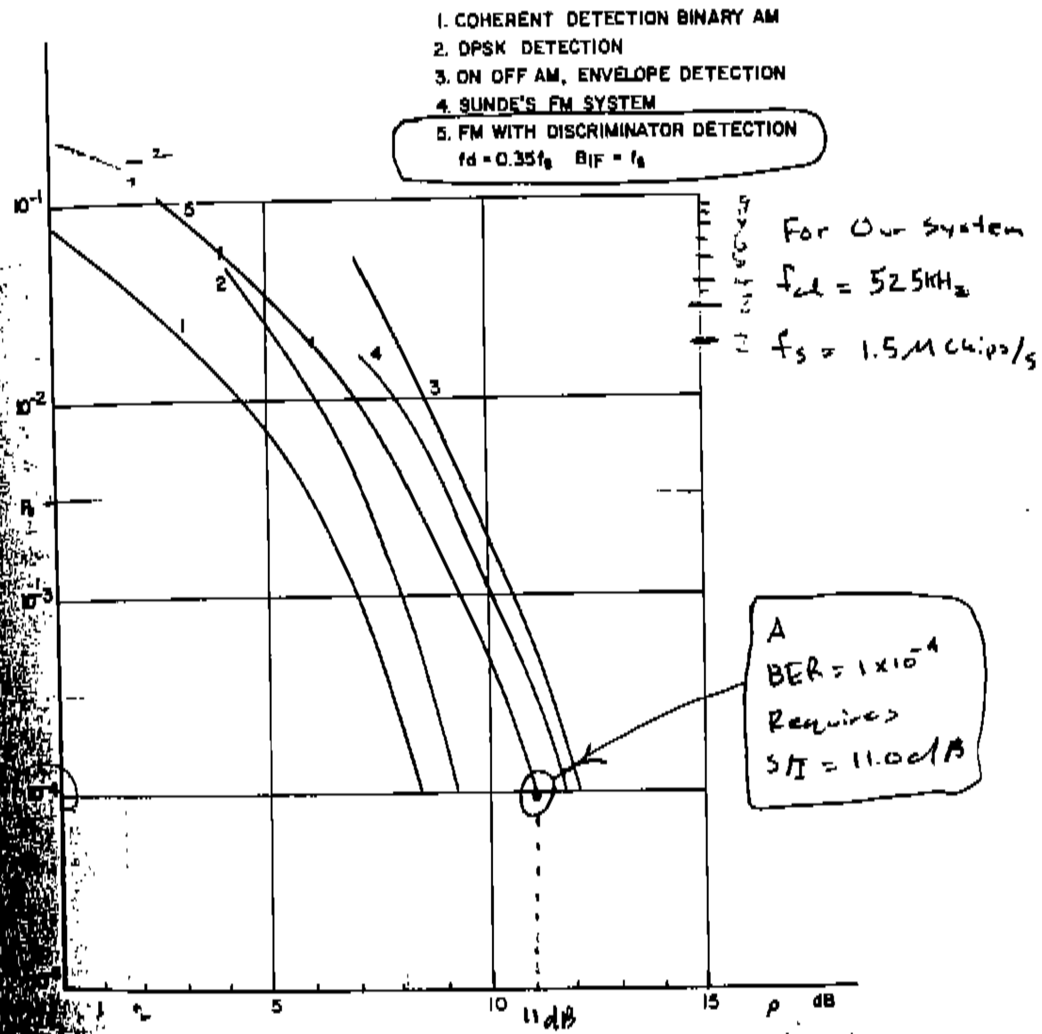

Figure 4.2-6 Error rate as a function of average transmitter power to noise ratio, $\rho = P_T/N_0 f_s$.

...peak frequency deviation is f_d. It is clear that $x(t)$ is no longer band ...ted. Calculations show[31, 32] that for small deviations, that is, $f_d < f_s/4$, ...spectrum of $x(t)$ is essentially contained in a narrow RF bandwidth of ... A narrow-band system has been described by Salz[32, 33] with $f_d = f_s/4$ ... bandwidth of $1.5\, f_s$. The transmitted wave was no longer strictly FM ...d small amplitude fluctuations. With conventional limiter discrim-