Attestation Statements (Processing Gain)

Wireless LAN Mini-PCI Adapter

Cisco MPI 350 Radio

Chip/symbol rate, symbol/bit rate, Chip/bit, and the measurement results

Bit rate	Chip/symbol rate	Bit/symbol rate	Chip/bit rate	Gp (dB)	Spec (dB)
1 Mbit/sec	11	1, DBPSK	11	10.8	10
2 Mbit/sec	11	2, DQPSK	5.5	10.8	10
5.5 Mbit/sec	8	4, CCK	2	10.7	10
11 Mbit/sec	8	8, CCK	1	10.6	10

Note: Gp is Processing Gain;

The attached Processing Gain data is provided by CISCO Systems, Inc.
Dated March/7/2001

Prepared by T. Murota

PRODUCT NAME: Cisco MPI350 Radio

NAME OF TEST: The Processing Gain of a Direct Sequence System.

FCC Part 15.247(e) specifies that the processing gain of a direct sequence system shall be at least 10 dB.

Guidance on measurement by FCC

The processing gain may be measured using the CW jamming margin method (refer to figure 1). The test consists of stepping a signal generator, in 50kHz increments, across the passband of the system. At each point, the generator level required to the produce the recommended Bit Error Rate (10-5) is recorded. This is the 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, discarding the worst 20% of the J/S data points. The total losses in a system, including transmitter and receiver, should be assumed to be no more than 2 dB.

Processing Gain = S/N + Mj + Lsys

Where: S/N = Signal to noise ratio required at the receiver output for 10-5 error rate of a ideal receiver for your demodulation scheme
Mj = Jammer to signal ratio
Lsys = System losses (2dB max)

Test Results

for 1 mb data rate:
S/N = 13.0 dB; taken from Wireless Information Networks by Pahlavan & Levesque
Mj = - 4.2 dB; worst case jamming margin from tests in lab
Lsys = 2.0 dB; system losses
therefore the processing gain at 1mb is 13.0 dB – 4.2 dB + 2.0 dB = 10.8 dB

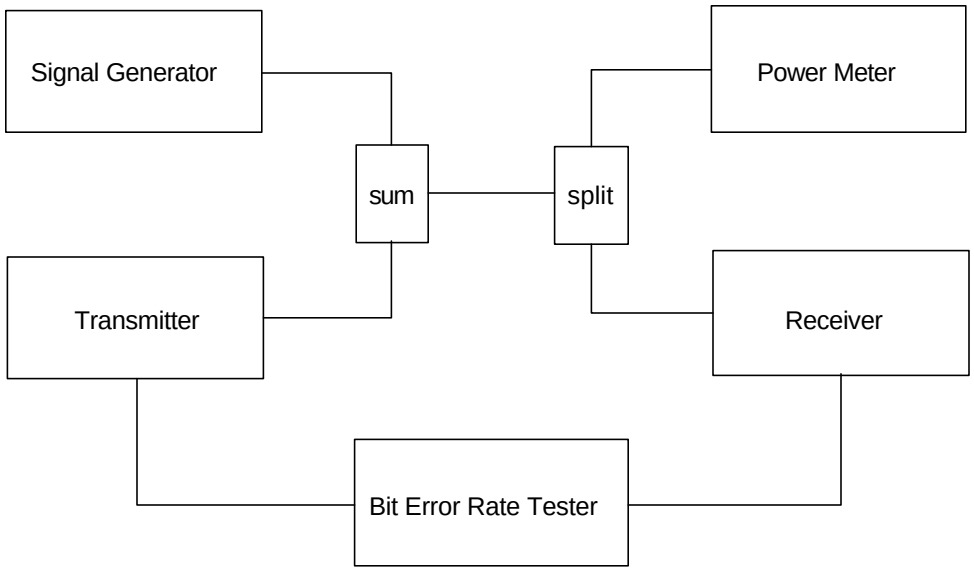
for 2 mb data rate:
S/N = 13.0 dB; taken from Wireless Information Networks by Pahlavan & Levesque
Mj = - 4.2 dB; worst case jamming margin from tests in lab
Lsys = 2.0 dB; system losses
therefore the processing gain at 2mb is 13.0 dB – 4.2 dB + 2.0 dB = 10.8 dB

for 5.5 mb data rate:
S/N = 13.6 dB; taken from Harris CCK encoding modulation
Mj = - 4.9 dB; worst case jamming margin from tests in lab
Lsys = 2.0 dB; system losses
therefore the processing gain at 5.5mb is 13.6 dB – 4.9 dB + 2.0 dB = 10.7 dB

for 11 mb data rate:
S/N = 16.0 dB; taken from Harris CCK encoding modulation
Mj = - 7.4 dB; worst case jamming margin from tests in lab
Lsys = 2.0 dB; system losses

therefore the processing gain at 11mb is 16.0 dB – 7.4 dB + 2.0 dB = 10.6 dB

Jamming Test Setup



CISCO Confidential	
RF Systems Engineering 2.4GHz Spread Sperctrum Radio - Jammer Test	
Eng: Jim Nahra Drawn: Diane Simon	Date: 3/2/01

Figure 1

MPI350 Spread Spectrum Transceiver Alignment Procedures

- Put the radio in Tx mode
- Set the power out (using the power meter)
  - Use +20 dBm ± 1 dB for 100 mW power setting
  - Use +17 dBm ± 1 dB for 50 mW power setting
  - Use +15 dBm ± 1 dB for 30 mW power setting
  - Use +13 dBm ± 1 dB for 20 mW power setting
  - Use 0 dBm ± 1 dB for 1 mW power setting
- Turn the Tx on, ch 12-84
- Set the power amp output power by adjusting voltage to the IF attenuator in the Tx chain. Note: This is done by software, which changes the DAC voltage output.