QUATECH

CONFIDENTIAL

PRODUCT NAME: QTM-8524

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

Processing Gain Measurement and Calculation

The processing gain of this spread spectrum system was measured using the CW jamming method. Figure 1 illustrates the measurement setup. The output power of the spread spectrum transmitter is fixed and the output power of jammer is adjustable. The frequency of jammer was stopped through the pass band of nominal channel in 50khz. In each frequency step of the jammer, the output power of jammer is adjusted to cause the Bit Error Rate (BER) to be $1.0*10^{-3}$. The power levels are recorded to calculate the J/S as shown in Table 1.

The processing gain Gp was calculated using the formula:

$$Gp = (S/N)_0 + Mj + Lsys$$

where S/N is the signal to noise ratio. Mj is the jammer to signal ratio (J/S), and Lsys is the system loss.

For the BER = $1.0*10^{-3}$, the Eh/No of the GMSK discriminator (BT=0.5) is about 14dB. Due to using the hard-decision receiver, the Eh/No will be 17dB and then signal to moise ratio (S/N) should be 15.24dB. From Table 1, the minimum J/S ratio is -4.4dB. And assume the system loss is 1dB. Therefore, the processing gain is calculated below:
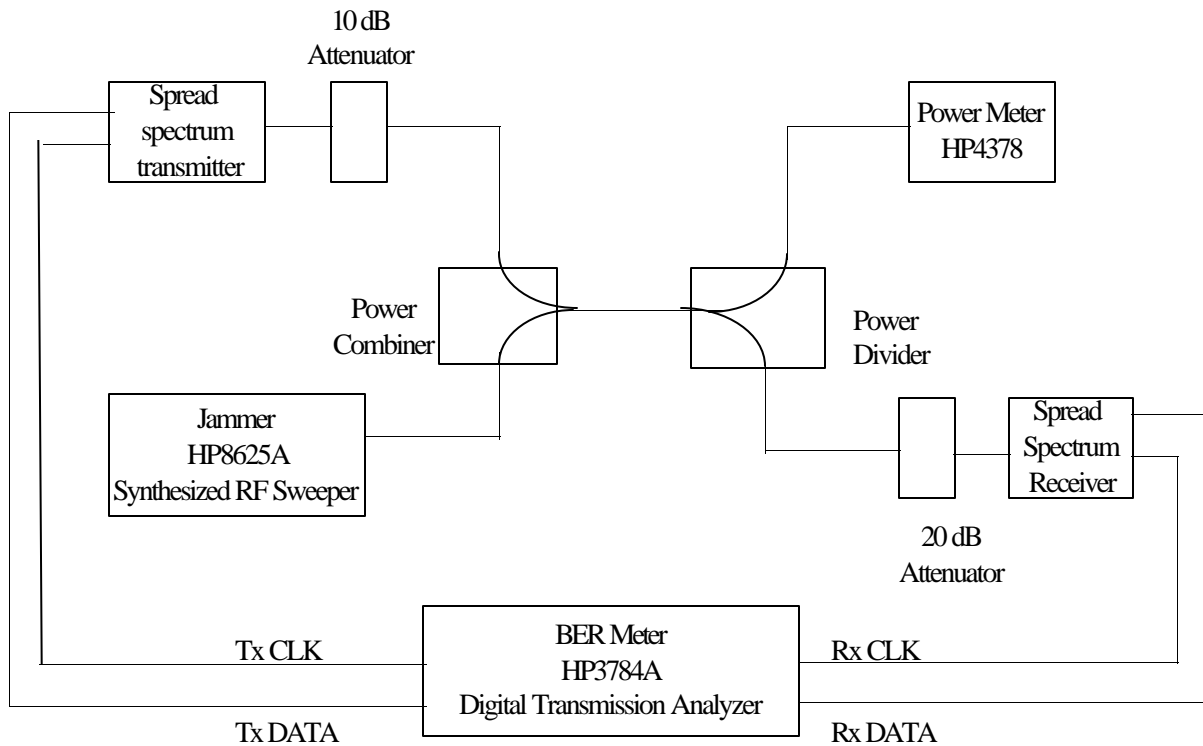
$$Gp = S/N = Mj + Lsys = 15.24 + (-4.4) + 1 = 11.84$$

Figure 1: Processing Gain Measurement Setup

File:processing gain.DOC