Problem 9.5. The message signal of Problem 9.2 having a bandwidth W of 4 kHz is transmitted over the same noisy channel having a noise spectral density $N_0/2$ of $2\text{x}10^{-17}$ watts per hertz using single-sideband modulation. If the average received power of the signal is -80 dBm, what is the post-detection signal-to-noise ratio of the receiver? Compare the transmission bandwidth of the SSB receiver to that of the DSB-SC receiver.

Solution

From Eq. (9.23)

$$\text{SNR}_{\text{post}}^{\text{SSB}} = \frac{A_c^2 P}{2N_0 W}$$

with $\frac{A_c^2 P}{2} = -80 \text{ dBm}$, $W = 4 \text{ kHz}$, and $N_0 = 4 \times 10^{-17}$. The

$$\text{SNR}_{\text{post}}^{\text{SSB}} = 18 \; dB$$

The transmission bandwidth of SSB is 4 kHz, half of the 8 kHz used with DSB-SC.