

**Problem 9.10** A DSC-SC modulated signal is transmitted over a noisy channel, with the power spectral density of the noise as shown in Fig. 9.19. The message bandwidth is 4 kHz and the carrier frequency is 200 kHz. Assume the average received power of the signal is -80 dBm, determine the output signal-to-noise ratio of the receiver.

**Solution**

From Fig. 9.19, the noise power spectral density at 200 kHz is approximately  $5 \times 10^{-19}$  W/Hz. Using this value for  $N_0/2$  (we are assuming the noise spectral density is approximately flat across a bandwidth of 4 kHz), the post-detection SNR is given by

$$\begin{aligned} \text{SNR} &= \frac{A_c^2 P}{2N_0 W} \\ &= \frac{10^{-11}}{4 \times 10^3 \times 5 \times 10^{-19}} \\ &= 5 \times 10^3 \\ &\sim 37 \text{ dB} \end{aligned}$$

where we have used the fact that the received power is -80 dBm implies that  $A_c^2 P / 2 = 10^{-11}$  watts .