Discrete-time channel model (after matched filter) of received complex symbol:

\[ y[n] = b[n] + z[n] \]

1. One complex symbol received every \( T \) seconds, with \( T = 1/B \), where \( T \) is the symbol period and \( B \) is the one-sided bandwidth.

2. \( E_s \): Average energy of a complex symbol

3. \( z[n] \): complex Gaussian noise, with iid \( N(0, N_0/2) \) components (iid across \( n \) and across real/imaginary components)

**Signal-to-noise-ratio (SNR):**

\[
\text{SNR} = \frac{\text{signal power}}{\text{noise power}} = \frac{P}{N_0B} = \frac{E_s}{N_0} = \frac{\text{signal energy per symbol}}{\text{noise energy per symbol}}
\]

**Channel Capacity:**

Maximum rate of reliable communication over an AWGN channel with one-sided bandwidth \( B \), noise spectral density \( N_0/2 \) (passband), and signal power \( P \):

\[
C = \log_2 \left( 1 + \frac{P}{N_0B} \right) \text{ bits/complex symbol} = B \log_2 \left( 1 + \frac{P}{N_0B} \right) \text{ bits/sec.}
\]