Opportunistic transmission strategy for non-zero outage probability

\[ p := \text{Prob[outage]} = \text{Prob[SNR} < \rho] \]

- Cumulative distribution function of \( \mathcal{E}^* \)
- \( t \) is the threshold where \( F_{\mathcal{E}^*}(t) = 1 - p \)
- Minimum total energy will exceed the threshold with probability \( p \)

Numerical Results

- The average total transmit energy decreases for both MRC and EGC as relay channel becomes more advantaged and \( p \to 1 \).
- MRC is more energy efficient than EGC.
- CSIR is more critical when the relay does not have a clearly advantaged channel.
- Direct transmission outperforms cooperative transmission with EGC when the relay channel is not advantaged and \( p \to 1 \).

Conclusions

- Investigation of interplay between destination's combining strategy and optimum energy allocation strategy of A&F cooperative transmission.
- Optimum energy allocation problem solved for A&F cooperative transmission when the destination uses MRC or EGC.
- Optimum energy allocation in EGC shown to be a convex optimization problem.
- Cooperative transmission is always optimum when the destination uses EGC.