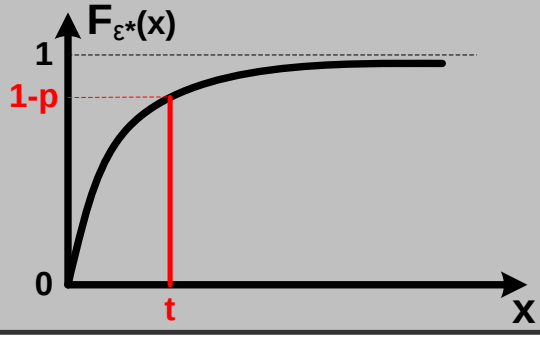
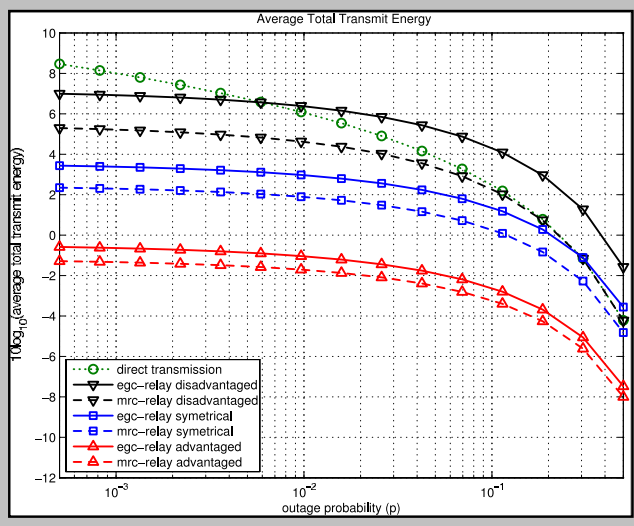
Opportunistic transmission strategy for non-zero outage probability

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

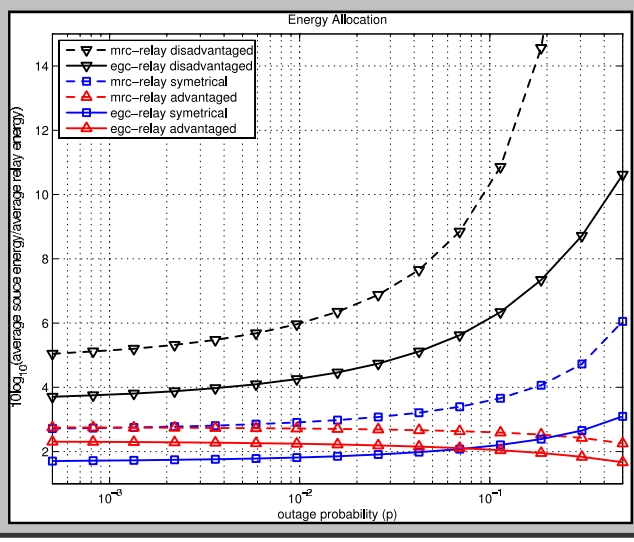


- **Cumulative distribution function of** $\mathcal{E}^*$
- **t is the threshold where** $F_{\mathcal{E}^*}(t) = 1 - p$
- **Minimum total energy will exceed the threshold with probability** p

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 $p \to 1$.



- Relay assumes a larger role when EGC is used.
- When the relay channel is not advantaged. The relay tends to transmit with less relative energy for both MRC and EGC as $p \to 1$, while it is the opposite as $p \to 0$.
- When the relay has an advantaged channel to the destination, the above trends won't hold, for the relay tends to experience a greater reduction than the source due to its advantaged channel to the destination.

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.