

Homework III

2. ϵ -outage probability

The simulation consists of two parts:

(1) Generate theoretical curve

Generate the theoretical curve under different L and SNR by

$$C_{\epsilon, \text{theoretical}} = \log(1 + F^{-1}(1 - \epsilon) \text{SNR})$$

where $F(x) = P(\|h\|^2 > x)$ and $\|h\|^2$ is chi-square distribution with $2L$ degrees of freedom.

(2) Generate Simulated curve

To generate the simulated curve, recall the definition of ϵ -outage probability:

$$\epsilon(C) = P(\log(1 + \|h\|^2 \text{SNR}) < C)$$

Given ϵ , L , and SNR, we first generate a large number ($N = 10^6$) of channel realizations from a chi-square distribution with $2L$ degrees of freedom. Calculate $\log(1 + \|h\|^2 \text{SNR})$ for each realization and sort them into nondecreasing order. Let $k = N\epsilon$, and pick the k th smallest value from the sorted data, which is then the simulated result.

The comparison between theoretical computation and simulation is shown below. Solid lines represent the theoretical result and marked points show the simulated result.

