1 Introduction

1.1 Background

2 Theory

2.1 Problem description

Since decades now modern wireless devices have become so ubiquitous and are no longer employed under carefully chosen conditions [1]. Cellphones and IoT devices are carried around by users and thus have to work in environments where reflexions are omnipresent. In order to efficiently develop such devices we need for mathematical models to simulate such environments.

In this chapter we will briefly illustrate some undergraduate level mathematical models employed in modern communication devices.

2.2 Geometric Model

2.3 Statistical Model

2.3.1 Continuous time model

Continuous time small scale fading channel response.

time varying channel impulse response:

$$h(t,\tau) = \sum_k c_k(t)\delta(\tau - \tau_k(t)) \tag{2.1}$$

received signal $y = h * x$, i.e. convolution with channel model.

2.3.2 Time discretization of the model

Assume x is a time discrete signal with and bandwidth W, thus the pulse is sinc shaped

$$x(t) = \sum_n x[n]\,\mathrm{sinc}(t/T - n) \tag{2.2}$$

Ideal sampling at rate $2W$ of y gives

3 Implementation

3.1 Simulaton

3.2 Hardware

3.3 Measurements

3.4 Results

4 Conclusions

Bibliography

[1] C. Xiao, Y. R. Zheng **and** N. C. Beaulieu, "Statistical simulation models for Rayleigh and Rician fading," **in***IEEE International Conference on Communications, 2003. ICC '03* Anchorage, AK, USA: IEEE, 2004.