CHAPTER 5 CONCLUSIONS

We have modeled a multipath fading using MMSE technique. The closed form expressions for outage probability in a non-Gaussian fading environment of digital cellular mobile radio communication systems employing optimum linear diversity are investigated in this paper. The non-Gaussian is chosen to model fading channel of wireless communication systems. The numerical results show that this model gives an alternative for fading channel. The system model may be applied with an indoor environment and some other environments that Gaussian model cannot be applied.
Spectrum is a very valuable resource in wireless communications, and it has been an important point for research and development efforts over the last several decades. The situation is especially severe in lower frequencies where the radio signal propagation characteristics are more favorable. The imbalance between spectrum scarcity and spectrum underutilization is inappropriate, when significant amount of radio spectrum is needed to provide everywhere wireless broadband connectivity. Spectrum sharing, which is one of the efforts to utilize the available spectrum more efficiently through opportunistic spectrum usage, has become an exciting and promising concept. It is divided into spectrum bands that are allocated to different services. The increase of wireless services and devices for uses such as mobile communications, Wi-Fi, and TV broadcast. MIMO is viewed as an approach for improving the utilization natural resource. There are three viewpoints of MIMO as capacity, flexible, and non-interfering.

The key aspects of MIMO systems are optimum combining is most effective in practical because it is robust and maximize the output SINR. MIMO-MMSE is a solution to problems that occur due to uncertainty of noise, multipath fading, and channel capacity. To ensure operation, fading channel is first considered. The fading channel must identified by radio systems. Classification of signal fading can be classified into three types that indicate the level of signal fading. Rayleigh fading represents strongly signal fading environment. Rayleigh fading is the specialized model for stochastic fading when there is no line of sight signal. Rician fading occurs when one of the paths, typically a line of sight signal, is much stronger than the others. This model is based on the assumption that a direct line of sight (LOS) signal components exist during cell transmission. The Nakagami fading is more flexibility than Rayleigh fading and Rician fading because it is based on empirical measurement. MIMO systems based MMSE, may be needed in a practical environment. This is practically possible to correctly identify the signal transmission.

We considered the potential use of multiple antennas in a smart radio for primary user detection by analyzing a few receiver signal processing schemes. We showed that by proper combination of a multiple antenna processing scheme with energy detection, it is possible to achieve high probabilities of detection even at low to moderate SNRs. In particular, we derived closed-form expressions for the probability of detection and expressions for the probability of false-alarm for each multiple antenna processing based energy detection scheme to analyze the detection performance gain as compared to a single antenna energy detection scheme. The detection performance gain using multiple antenna processing is obtained by exploiting the micro-diversity offered by the wireless channel. The maximum ratio processing based energy detection scheme in particular gives an upper bound on the detection performance of such multiple antenna processing based energy detectors since it utilizes perfect channel information and employs optimum coherent combining.

As future work directions, the error probability performance would be interesting to find a simpler closed form solution. Cooperative relay communications would also be useful to analyze the system performance over non-Gaussian fading channels.

In the near future wireless communications will bear little similarities to currently used systems. The demand for multi-media communications and seamless access to heterogeneous mobile networks is extremely rising and this tendency is expected to continue in the next few years. Unfortunately, spectrum allocation today is very inflexible. A further drawback due to complicated and time-consuming regulatory issues is an inefficient utilization of spectral resources. In order to overcome these barriers, advanced resource access algorithms and sharing techniques must be employed. Here, resource is not only restricted to the most common terms of power and bandwidth, but also means timeslots in time division multiple access systems, (orthogonal) codes in code division multiple access systems, and different sub-carriers in orthogonal frequency-division multiple access (OFDMA) systems. Furthermore, all thinkable combinations of the above mentioned aspects can be envisaged.