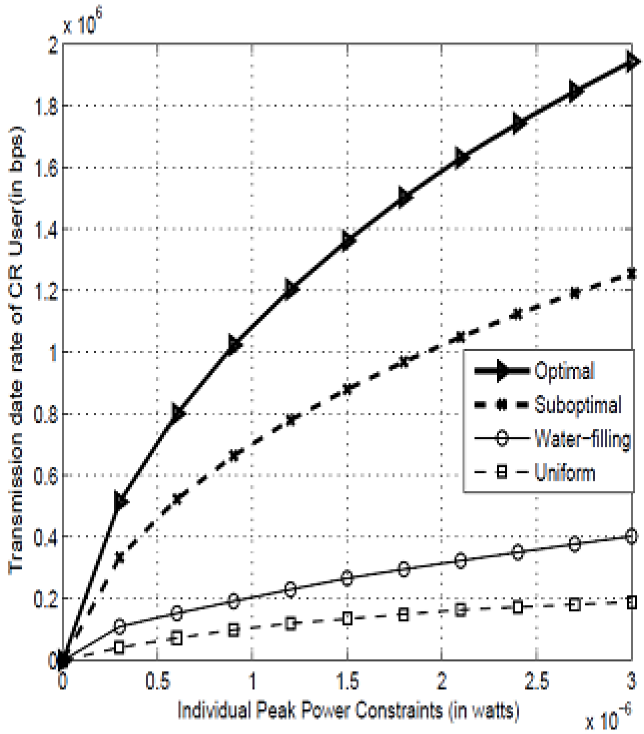

Figure 7: Transmission rate of the CR user vs. Individual power constraints, with which instantaneous interference introduced to the PU band remains below interference threshold, Ith

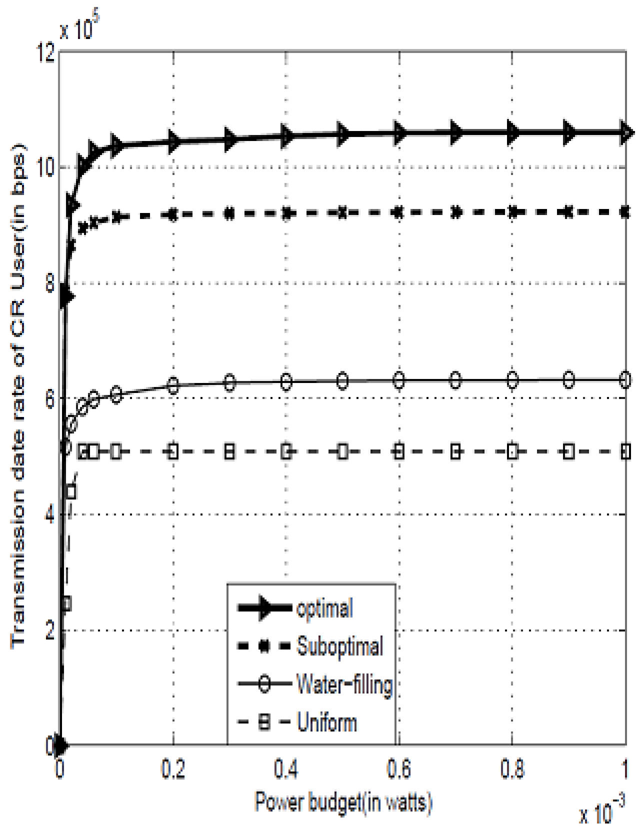

Figure 8: Maximum transmitted data rate vs. power budget (PT) for CR users

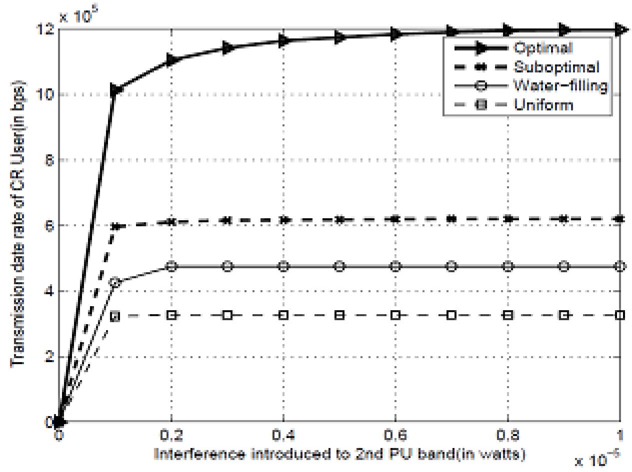

Figure 9: Transmission data rate of the CR user vs. interference threshold for the 2*nd* PU band, I^2th

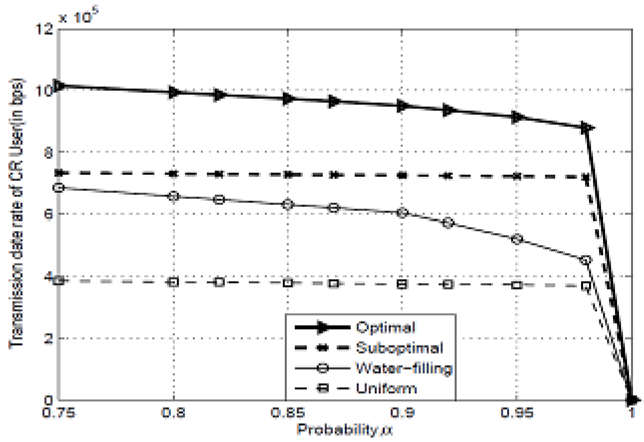

Figure 10: Transmission rate of the CR user vs. probability, α with which instantaneous interference introduced to the PU band remains below interference threshold, Ith

6. Conclusions

In this thesis, first we develop an novel cognitive radio concept using underlay channel band and an optimal power allocation algorithm for the orthogonal frequency division multiplexing (OFDM)-based CR system with total power, interference and individual peak power constraints. Also we developed an suboptimal power allocation algorithm using nulling method for this problem in order to reduce the complexity of computation. As such the transmission rate of the CR user is maximized for a given total power budget, probabilistic interference and individual peak power constraints. Instead of instantaneous channel fading gains between the PU receivers and the CR transmitter, the developed power allocation algorithm requires the fading statistics and corresponding parameters to be known at the CR transmitter. Second, we propose and investigate performance of a low complexity suboptimal power allocation algorithm for subcarrier power allocation with total power and interference constraints. Simulation results have shown that our proposed optimal and suboptimal power allocation algorithms can achieve higher transmission rate for CR user compared to the existing power allocation algorithms namely, the uniform and water-filling power allocation algorithms. The proposed low complexity suboptimal algorithm achieves better performance than existing suboptimal, uniform and water-filling power loading algorithms.

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