

**THEORETICAL ANALYSIS FOR PERFORMANCES OF BROADBAND  
CELLULAR SYSTEMS**

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**ABSTRACT**

This thesis presents theoretical analysis on digital signal transmissions over cellular communication system. Our work can be divided into 3 parts. The first part is on the signal analysis of modern cellular environment in which femto-cell technology is employed. Based on the spectrum deployment technique, multiple femto cells share the identical frequency in the same coverage area. With the guaranteed signal quality, we introduce a new mathematical model to evaluate the maximum number of femto cells that can be accommodated in the same coverage area. On arbitrary system parameters and channel conditions, the proposed model gives the maximum number of femto cells. The second and the third part are on the in-depth analysis of probability of bit error and spectral efficiency on Rayleigh and Nakagami fading environments. Due to the difficulty of random variable computation, most of the previous work use computer simulation to evaluate those parameters which is time consumption. Instead of applying simulation, we propose new mathematic models for probability of bit error and spectral efficiency. This benefits us finding exact values of both parameters under various system parameters and channel conditions.

**KEY WORDS: FEMTOCELL/ PROBABILITY OF BIT ERROR RATE/  
CHANNEL CAPACITY**

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