UNIVERSITI TEKNOLOGI MARA
Institut Pengajian Siswazah

THE DOCTORAL RESEARCH ABSTRACTS

Volume: 13, Issue 13 April 2018

13th ISSUE

IGS Biannual Publication

31

Name : IZWAH BINTI ISMAIL

Title : BALANCED FEMTOCELL MODEL TO ENHANCE INDOOR COVERAGE IN LTE CELLULAR NETWORK

Supervisor : PROF. DR. MOHD DANI BABA (MS)
ASSOC. PROF. DR. AZITA LAILY YUSOF (CS)
DR. MOHD FAIZAL JAMLOS (CS)

The issues of poor coverage for indoor users are mainly due to path loss, building penetration loss, multipath, shadowing and interference. These issues are further compounded with the tremendous increase in subscribers demand for real-time multimedia services, particularly in urban areas. The Femtocel being a low power base station is considered as the promising technology to enhance the QoE for the indoor and the edge users. Based on the two tier network topology, the macro layer will provide wider coverage with low average data speeds while the Femtocell is predicted to extend the network coverage and eventually boost the network capacity for indoor subscribers. Traditionally, the spectrum allocation for the Femtocell is from the similar spectrum bands that are being used by the Macrocell. Obviously, the capacity of the Femtocell is quite limited due to the spectrum constraint and the interference between Macrocell and Femtocell network. These issues motivate the study to mitigate the interference and to increase the network capacity by focusing on the spectrum scarcity problem and the tremendous increase of indoor users. The first part of the thesis is focused on the downlink performance of Femtocell configuration deployed in LTE network. The coverage performance is presented as the percentage of satisfied users achieving a data rate above a minimum requirement, in the range of 90-95% coverage. The walk test performance is evaluated in real time network scenarios, including realistic macro network layouts in homogeneous spatial traffic distributions. Then, by considering the Fractional Frequency Reuse (FFR) scheme to mitigate the interferences, a simulation experiment was conducted. The objective of this study is to boost up the overall throughput and user's satisfaction. In the meantime, it has been shown that the spectrum is not efficiently used by licensed (primary) users according to the exclusive spectrum allocation regulation. Hence the Cognitive Femtocell (CogFem) network has been proposed based on the greedy algorithm to allow unlicensed users to exploit spectrum opportunities from primary systems to enhance the spectrum utilization and mitigate interference. Both functions of frequency channel allocation and transmission power adjustment are proposed. The final contribution presented in this thesis is the Strategic CogFem Spectrum Sensor Scheme (SCFSSS) with the focus on cooperative spectrum sensing to minimize the duration to sense the available bandwidth and avoid the false alarm as well as mitigate the interference and improve user's throughput in a licensed or unlicensed spectrum. The comparisons between local sensing and cooperative sensing are presented. In the proposed SCFSSS mechanism the Femtocell Access Point (FAP) cooperates with Femtocell Users (FUs) as the sensing nodes. The final decision will be decided by the FAP. The results presented have shown 60% improvements by providing enough bandwidth capacity to accommodate the sudden increase of mobile subscribers.