DISSERTATION INFORMATION

Title	:**Research and analyze techniques for reducing the impact of co-channel interferences in wireless communication networks**
Major	: Telecommunications Engineering
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PhD. candidate	: Pham Thi Dan Ngoc
Scientific advisor	: Assoc. Prof. Ho Van Khuong
	: Assoc. Prof. Tran Trung Duy
University	: Ho Chi Minh City University of Technology – Vietnam National University Ho Chi Minh City

Abstract

This thesis studies and analyzes techniques for reducing the impact of co-channel interferences in wireless communication networks. Specifically, this thesis considers three system models: single-hop wireless communication, two-hop wireless communication, and multi-hop wireless communication. In the single-hop wireless communication, the thesis considers co-channel interferences caused by hardware impairment and interference between secondary and primary systems in cognitive wireless communication networks. In addition, this network also considers channel correlation at secondary receiver and interference channels caused at primary receivers with heterogeneous independent distributions. The proposed solution for this network is to apply selection combining to reduce simultaneous effects of these co-channel interferences.

In the two-hop wireless communication, the thesis considers co-channel interferences as hardware impairment and mutual interference between two primary-secondary systems. Moreover, the relay nodes in this network use decode-and-forward protocols to assist signal transmission from the source to the destination. Further, this network also considers the presence of an eavesdropping node in the secondary network. Therefore, this network needs a mechanism to adjust the transmit power to ensure reliable transmission and avoid information eavesdropping. The proposed solution for this network is to choose the best relay node to reduce simultaneous effects of co-channel interferences.

In the multi-hop wireless communication, the thesis scrutinizes co-channel interferences as hardware impairment and co-channel interference sources due to frequency reuse. These co-channel interferences effect simultaneously on multi-hop networks in conventional wireless communications context. The decode-and-forward protocol is used to forward signals throughout the multi-hop network. Moreover, hardware impairment and interference

between two primary-secondary systems are studied simultaneously in the multi-hop communication in a cognitive radio context. The multi-hop communication uses two protocols: decode-and-forward and amplify-and-forward. The solution proposed for the multi-hop wireless communication to reduce co-channel interferences is to select the best path for the whole process.

The thesis analyzes the performance of solutions of reducing co-channel interferences via proposing precise mathematical expressions in closed-form. Many results are presented to prove the accuracy of the performance expressions as well as the effectiveness of the proposed co-channel interference reducing solutions.

Based on these results, some useful recommendations can be applied to transmission activities in wireless communication systems when designing real systems. To be more specific, when setting proper system parameters for one-hop transmission, hardware impairment level must be below 0.7 for reliable communication. For multi-hop transmission using the decode-and-forward protocol, hardware impairment level must be less than 6.72. Meanwhile, if the system model uses the amplify-and-forward protocol, hardware impairment level should be below 1.77. The values stated above are the results of the analysis and have been verified for correctness. Note that these recommended values will change depending on the change of different parameters when setting up different proposed system models.

Scientific Advisor PhD Candidate

Assoc. Prof. Ho Van Khuong Assoc. Prof. Tran Trung Duy Pham Thi Dan Ngoc