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Interference Temperature Measurements and Spectrum Occupancy Evaluation in the Context of Cognitive Radio

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ABSTRACT

This paper presents a refined radio spectrum measurement platform specifically designed for spectrum occupancy surveys in the context of Cognitive radio. Cognitive radio permits the opportunistic usage of licensed bands by unlicensed users without causing harmful interference to the licensed user. In this work, a study based on the measurement of the 800 MHz to 2.4 GHz frequency band at two different locations inside Universiti Teknologi Malaysia (UTM), Johor Bahru campus, Malaysia is presented. Two Tektronix RSA306B spectrum analyzer are set up to conduct simultaneous measurements at different locations for a 24 hours period. The analysis conducted in this work is based on the real spectrum data acquired from environment in the experimental set up. Busy and idle channels were identified. The channels subject to adjacent-channel interference were also identified, and the impact of the detection threshold used to detect channel activities was also discussed. The consistency of the observed channel occupation over a range of thresholds and a sudden drop has good characteristics in determining an appropriate threshold needed in order to avoid interference.

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1. INTRODUCTION

As wireless devices and wireless communication technology is being advanced, there is an increased scarcity of the radio spectrum resources. In the meantime, studies show that the present spectrum allocated isn't optimally utilised. During the last few years, cognitive radio (CR) has appeared as a technology that promises to put an end to the problem of spectrum scarcity. This concept relies on the basic premise that spectrum is currently underutilized. In CR, the secondary user (SU) is permitted to simultaneously access the licensed frequency band of the primary user (PU) as long as the interference caused by the SU to the PU is kept below a predefined threshold. This ensures the spectrum is dynamically utilized, hence, there is a significant improvement in the spectrum utilization rate. In order to enable dynamic spectrum utilization (DSU), there is a need to critically comprehend the amount of spectrum used by the PU, identify the presence or the absence of PU, therefore having a formidable SU access policy. The measurement of spectrum occupancy level and analysing the interference temperature which is the core aim of this paper, has been motivated by the needs stated above. This problem is addressed using spectrum data collected at an indoor environment of two spatially different locations concurrently.