A Review on Orthogonal Frequency Division Multiple Access (OFDMA) in Broadband Wireless Access

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Abstract: OFDMA is the basis of future broadband access, due to its many inherent advantages such as scalability and fine granularity for multi-user access. OFDMA is a multi-user version of the popular Orthogonal Frequency-Division Multiplexing (OFDM) digital modulation scheme. Multiple accesses are achieved in OFDMA by assigning subsets of subcarriers to individual users. The purpose of this paper is to review on Orthogonal Frequency Division Multiple Access (OFDMA) in broadband wireless access. The review analysis is purely based on OFDMA Uplink system, OFDMA Cognitive Radio Networks, OFDAM cellular networks and the OFDMA interference. Some of the challenges faced in a multi-carrier OFDM/OFDMA system are dynamic resource allocation which requires the exact knowledge of channel status that is not always easy to be obtained. This paper reviewed a wide range of challenges faced by OFDMA and their suggested solutions extensively. Apart from that a thorough comparison analysis between different techniques is studied and presented in this paper.

Keywords: OFDMA; Subcarriers; Networks; Modulation Scheme

I. INTRODUCTION

In communication systems, the increasing demand for high data rates over wired and wireless networks resulting the adoption of Orthogonal Frequency division Multiplexing (OFDM) technology which offer high rate transmission with low complexity for implementation over frequency-selective fading channels. The orthogonal frequency-division multiple access (OFDMA) scheme has been adopted by the IEEE 802.16 (WiMAX) standard [1] to provide efficient broadband wireless access to subscribers. One common property of OFDMA systems is the sensitivity to timing and frequency synchronization errors. In the uplink channel of OFDMA systems where multiple Subscriber Stations (SSs) with different timing and frequency offsets transmit simultaneously, synchronization can be achieved by a contention based random access process referred to as ranging in the IEEE 802.16 (WiMAX) standard [2 - 4]. A ranging process starts with the allocation of a set of subcarriers in specific time slots, which is known as a ranging opportunity. Multiple SSs can take this opportunity by modulating randomly selected ranging codes onto the allocated subcarriers.

In the same ranging opportunity, usually the number of possible ranging signals is much larger than the number of Ranging Subscriber Stations (RSSs), so the Base Station (BS) can distinguish each individual RSS and estimate its timing, frequency, and power [5]. In the event of multi-cell networks, inter-cell interference must be considered during scheduling. A few systems for reusing the frequencies are utilized as a part of request to farthest point the inter-cell interference. There are static reuse systems based upon the partial frequency reuse (FFR) [6]. The cell is isolated into an inner zone

