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CHAPTER 24

UWB OVERVIEW

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24.1 INTRODUCTION

This chapter presents a review on ultra-wideband (UWB) and UWB PHY/MAC layer related topics. Introduction to UWB system, applications and comparison with narrowband systems is presented. UWB physical layers related aspects viz. channel model, pulse generation, and UWB capacity are reviewed. Joint UWB medium access control (MAC) and physical layer (PHY) related works in terms of power control allocation, rate guarantee/control and quality of services is reviewed. UWB power control parameters i.e. signal-to-interference-noise ratio (SINR), multi-user system capacity, maximum sustainable interference (MSI), narrowband interference (NBI), and channel gain design are discussed. Finally, the chapter is summarized

Short-range wireless systems have recently gained a lot of attention to provide seamless, multimedia communications around a user-centric concept, so called wireless personal area networks (WPAN) (FCC, 1998). UWB is a candidate technology for dedicated inexpensive short-range wireless networks. For example, UWB wireless personal area networks could be established at home allowing televisions, VCRs, stereo-systems, and computers to communicate with each other without using cable connections. Similarly in a typical office environment, UWB wireless links could replace wired connections to the computer, monitor, keyboard, mouse, speakers, and printers. Some UWB chipsets are being developed to operate at data rates between 400 and 700 Mbits/s [1].

24.2 ULTRA-WIDEBAND SYSTEM CONCEPTS

UWB transmission is a widely used technology in radar and remote sensing applications and has received great attention in both academic and industry for applications in wireless communications . The federal communications commission (FCC) identifies two types of UWB bandwidths: absolute bandwidth or fractional bandwidth, which is defined by the 10 dB cutoff bandwidths in Fig 24.1. The absolute bandwidth is the difference between the 10 dB high cutoff frequency and the 10 dB low cutoff frequency ($f_H - f_L$). The fractional bandwidth (η) is defined: