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1. Introduction

Ultra-wideband (UWB) or impulse radio for commercial communication applications is a recent innovation. UWB transmitters employ short carrierless pulses at low power with bandwidths of up to or more than several GHz. For example, revisions to Part 15 of the Federal Communications Commission (FCC) rules regarding ultra-wideband transmission systems are currently being investigated. Potential applications include wireless local area networks (LAN), medical information distribution systems, entertainment systems, ranging devices and indoor wireless multiple-access communication systems. The technology has many advantages which stem from its ultra-wideband nature. It not only experiences significantly less fading margins as reported recently and others. It also offers can penetrate walls, greater resistance to fading, extremely fine time-resolution and the possibility of achieving processing gains much larger than those of typical direct-sequence spread-spectrum communication systems. In particular, the absence of a sinusoidal carrier obviates the need for radio frequency (RF) or intermediate frequency (IF) mixers. These characteristics give it a substantial advantage over conventional narrowband, wideband and infrared wireless communication systems.

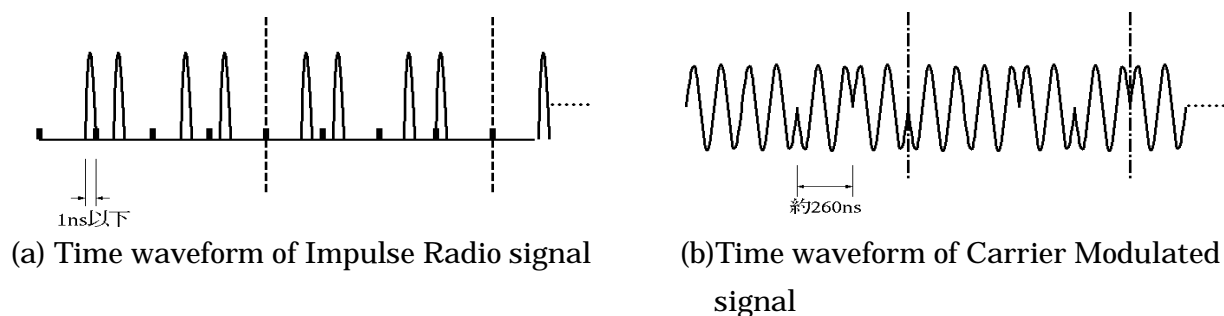


Figure 1. Comparison between Impulse Radio and Carrier Modulated Signals

It is important to note the many challenges of UWB deployment. These include regulatory issues and, in particular, co-existence and interference-related issues with Global Positioning System (GPS) receivers. Potential applications include wireless local area networks (LAN), medical information distribution systems, entertainment systems, ranging devices and multiple-access communication systems for short-range or indoor applications.

2. CRL UWB Project and Consortium

Communication Research Laboratory (CRL) has started a project focused on total R&D of ultra wideband (UWB) wireless communication systems including devices, systems and regulatory issues in a range of micro-wave (3-30GHz) and millimeter-wave (over 30GHz) in order to pursue standardization and business as for UWB four years later. To achieve collaboration among industry, government and academia to promote the R&D of UWB, CRL organizes a consortium supported by YRP corp. in Yokosuka Radio Communications Research Center(YRC), and will design a test-bed for experiments. The consortium consists of micro-wave and millimeter-wave groups. Micro-wave group focuses on a short-term development of UWB commercial products including devices, system architecture, standard specification etc. Millimeter-wave group starts a long-term fundamental research to create a novel technology and theory for UWB. This paper describes an overview of the CRL's project on UWB R&D.

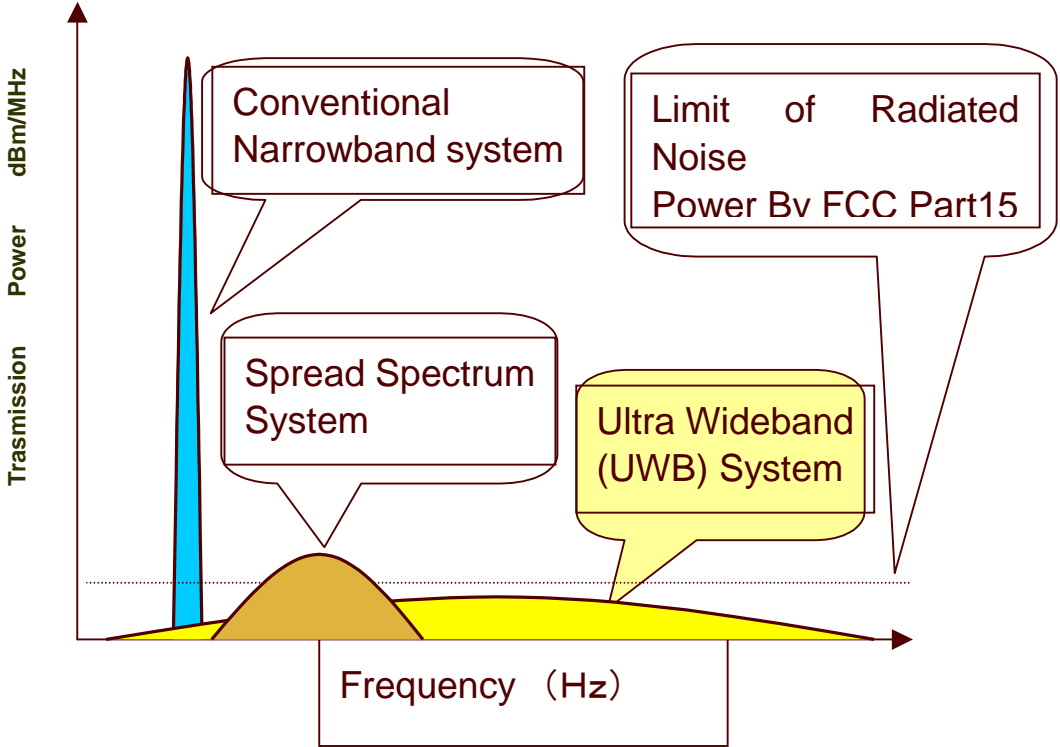


Figure 2. Comparison of Spectrum