

TITLE: **Simulation and Synthesis of OFDM System Components for Ultra Wide Band Communication Applications**

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There is much progress to be made in the development of radio solutions and industry specifications before compatible applications can be developed and deployed. UWB (ultra wideband) is a new category introducing new techniques for wideband radio technology. Key application areas that will benefit from UWB technology are Personal Computer Peripherals, Consumer Electronics and Mobile Communications. UWB technology will likely to be most promising in WPAN (Wireless Personal Area Network) applications due to high data throughput capability, lower power requirements and short-range characteristics. The Orthogonal frequency division Multiplexing (OFDM) approach has been a leading proposal for the IEEE 802.15.3a WPAN standard. OFDM is a special case of multicarrier transmission, where a single data stream is transmitted over a number of lower-rate subcarriers. One of the main reasons to use OFDM is to increase robustness against frequency-selective fading or narrowband interference.

The very high data sampling rate up to 528M sample/s or more poses a challenge to realize the physical layer of such UWB system, particularly the components with high computational complexity implemented in Very Large Scale Integration (VLSI). Fast Fourier Transform (FFT) processor is one of the key components in the design of wideband OFDM systems. The present project deals with the VLSI implementation of such a computationally complex and low power FFT processor. FFT processor with pipelined radix-2 FFT architecture was designed using VHDL (Very high speed integrated circuit Hardware Description Language).

Architectures with structured pipeline have been used to meet the high speed real-time processing and low-power consumption requirement for the mobile environment. By exploiting the spatial regularity of the algorithm, both dominant elements of VLSI implementation, i.e. memory size and the number of complex multipliers, have been investigated. The FFT processor was simulated using Modelsim provided by Mentor Graphics and was synthesized using Xilinx's ISE Foundation Series Software.