

## ABSTRACT

Multicarrier technique and Multiple Input Multiple Output-Space Time Code (MIMO-STC) is very effective to solve the problems of communication systems with high data rate. Multicarrier techniques and Space Time Code widely used in wireless communication systems are Orthogonal Frequency Division Multiplexing (OFDM) technique and Space Time Block Code (STBC). The challenges faced in implementing this techniques in FPGA is getting minimum the utilities of memory with due regard to their reliability. In the research that has been done by previous researchers before, especially the design of processor FFT / IFFT in OFDM transceiver<sup>[9,12-13,19-20]</sup>, generally use radix-2 algorithm that have disadvantage. The disadvantage is if the number of point FFT / IFFT is large, then the stages of the calculations become more complex when applied to FPGA requires a larger memory. Another issue is how to integration of both techniques becomes a unified communication system

This research applied OFDM technique with 512 subcarrier using 512 points FFT / IFFT technique, and an approach radix-8 algorithm namely the 512 points FFT / IFFT system was arranged from blocks of 8 points FFT. STBC technique applied Alamouti scheme with two transmitters. The techniques of FFT/IFFT, STBC, and their integration was described in VHDL Hardware Description Language (VHDL) language as one of the simulators to produce an Integrated Circuit (IC). Other supporting parts such as the symbol mapping, multiplexing and demultiplexing were also applied in order to support the overall system.

The results of the design and experiments, this system was able to work at a frequency of 100 MHz so the data were able to be transmitted at the speed of 28.3 Mbps in average. This design might be applied because based on the WiMAX 802.16e standard with 5 MHz of bandwidth, a minimum data rate of 4 Mbps was needed. The tests were also helped by logic analyzer and software LA-2124A. The results showed that the output value generated in the FPGA board based on pin output description was the same as the value obtained by Modelsim simulation.

Keyword : OFDM, MIMO, STBC, FPGA, FFT/IFFT, VHDL