
COMPLEXITY AND PERFORMANCE ANALYSIS OF FBMC TRANSCEIVER

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ABSTRACT:

To implement Filter Bank Multicarrier (FBMC) transceiver architecture on FPGA hardware and to emphasize various aspects of physical layer for future communication system. In order to meet the desired goals, different multicarrier modulation techniques such as FBMC and OFDM schemes were thoroughly examined. In this paper efficient FBMC transceiver architecture is designed and implemented on Artix 7 FPGA for future communication system as an alternative to conventional OFDM schemes.

KEYWORDS:

CONVENTIONAL OFDM SCHEMES, FILTER BANK MULTICARRIER (FBMC), MODULATION, TRANSCEIVER

1. INTRODUCTION

Rapid growth and innovations are witnessed in the mobile communication field. This made mobile communication additional economical and effective. With the increase in need for applications of mobile communication network systems, there has been an increasing sophistication in this field. The term mobile communication refers to the type of communication or data over a distance while not the utilization of wires, cables or any other electrical conductors. In case of cellular mobile communication, the transmitted data is in the form of binary sequences. This binary sequence are represented in the form of digital

multimedia content and transmitted through the analog carriers. The nature of the data transmission influences the suitable modulation technique design for the communication systems.

As this is the 4G era, wireless communication is moving towards providing high speed connectivity to costumers through IP (Internet Protocol) based technology and Long Term Evaluation (LTE) systems. As the requirement for bandwidth increases, the next generation wireless communication will gain more demand compared to present 3G and 4G systems. The innovations of new wireless communication systems have their phases of development and decay sooner or later. It is very uncertain whether next generation is beginning new era in the year 2020.

Currently fourth generation (4G) cellular mobile communication system was established and publics are experiencing services. Still they are looking towards the deployment of fifth generation (5G) technology to experience more advancement in new technologies. Based on the present research studies 5G technologies for cellular mobile communication systems can come to end result around 2020. Because the development and establishment of any cellular system is requires several years. The 5G cellular mobile communication devices are quick enough to communicate with each other compared with 4G and LTE systems. And also, 5G is relied upon to accomplish enhanced framework limit and throughput. The main aim of 5G research and development is to improve device-to-device communication, at lower cost, lower latency and better implementation than previous generation. This can be enabled by developing sophisticated machines, like advanced field programmable gate arrays and digital signal processors. These hardware devices allow the use of efficient algorithms implementation for communication system. The potential applications of 5G technology is to facilitate to the users for high speed video downloads, vehicle-to-vehicle communications, and general cellular communication systems.

2. ANALYSIS OF FBMC TRANSCEIVER IMPLEMENTATION

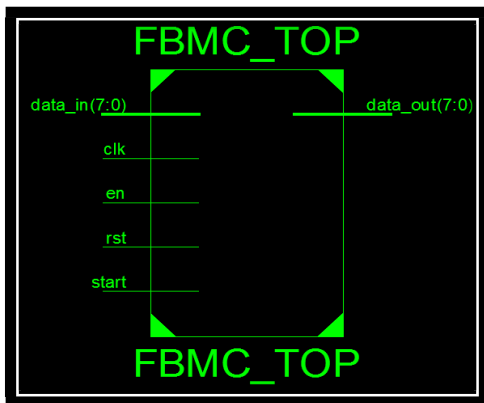


Figure 1: Top level design of FBMC Transceiver.

3. TRANSCEIVER IMPLEMENTATION RESULTS

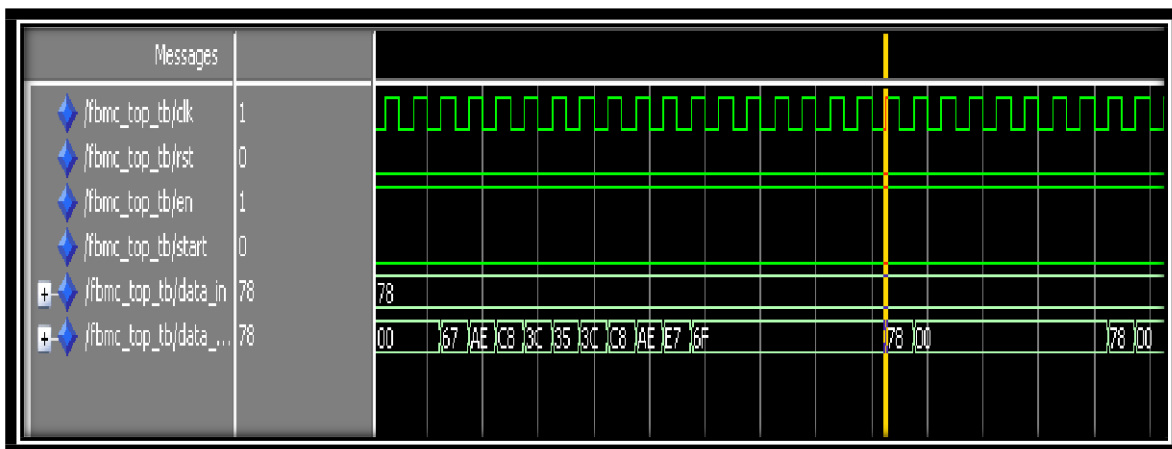


Figure 2: Output waveform

4. PERFORMANCE ANALYSIS AND COMPARISON

Table 1: Comparison of latencies and Throughput of FBMC and OFDM transceivers

Architecture	Input data width	Latency (ns)	Throughput(Mbps)	Maximum Frequency(MHz)
OFDM	8	106	141.44	35.362
FBMC	8	45	276.82	34.603

CONCLUSION

In this paper efficient FBMC transceiver architecture is designed and implemented on Artix 7 FPGA for future communication system as an alternative to conventional OFDM schemes. FBMC transmitter and receiver are designed starting from signal model using VHDL code and synthesize in Xilinx ISE Design Suite. An implementation employing on the transmitter part consist four modules which are SIPO, IFFT, PISO and polyphase filter modules. Each of these modules was tested using ModelSim software and chipscope pro tool in the development stage.

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