Dual-Mode PSK Transceiver on SDR With FPGA

Wuqiong Zhao, *Student Member, IEEE*

***Abstract*—In this experiment, we implement a dual-mode PSK transceiver on SDR with FPGA, supporting both BPSK and QPSK. Moreover, the transceiver is designed to be able to switch between the two modes by introducing packet-based communication, where modulation information can be extracted from the packet header.**

***Index Terms*—Phase-shift keying (PSK), software-defined radio (SDR), transceiver design, modulation, demodulation, field programmable gate array (FPGA).**

I. Introduction

SOFTWARE-DEFINED radio is interesting. Channel estimation is also interesting! [1], [2].

II. System Overview

A. Software-Defined Radio

B. Transceiver Design

C. BPSK/QPSK Modulation

III. Transmitter

IV. Receiver

A. Overview

B. Carrier Synchronization Using Costas Loop

C. Symbol Synchronization Using Gardner Loop

V. Packet-Based Communication

A. Frame Structure

B. Packetizer Design

C. Depacketizer Design

D. SPB Detection

1) Strength Detection (SD):

2) Packet Detection (SD):

3) Boundary Detection (BD):

VI. Experiment Results

VII. Discussions

VIII. Conclusion

References

[1] W. Zhao, Y. You, L. Zhang, X. You, and C. Zhang, "OMPL-SBL algorithm for intelligent reflecting surface-aided mmWave channel estimation," *IEEE Trans. Veh. Technol.*, vol. 72, no. 11, pp. 15 121–15 126, Nov. 2023.

[2] Y. You, W. Zhao, L. Zhang, X. You, and C. Zhang, "Beam pattern and reflection pattern design for channel estimation in RIS-assisted mmwave MIMO systems," *IEEE Trans. Veh. Technol.*, 2023, to be published, doi: 10.1109/TVT.2023.3309950.

Date of publication 1 January 2024; date of current version 1 January 2024. The author would like to thank Lecturer Dan Yang for the guidance and help in the course of the experiment.

Wuqiong Zhao is with Southeast University, Nanjing 211189, China. (e-mail: wqzhao@seu.edu.cn).

Online URL: https://go.wqzhao.org/sdr-psk-fpga