

EE/CprE/SE 4910 WEEKLY REPORT 7

3/28/2026 – 4/3/2026

Group number: SD26-10

Project title: Open-sourced Radio Microcontroller for Fabrication

Client &/Advisor: Henry Duwe duwe@iastate.edu

Client/Company/Organization: ISU; ECPE

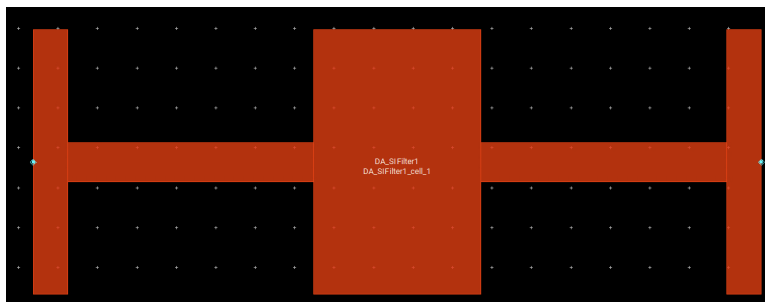
Team Members:

- ***Zane Salti***
- ***Jackson Doyle***
- ***Daniel Pytel***
- ***Tyler Bibus***
- ***Aiden Han-Lindemyer***
- ***Parker Pederson***
- ***Akash Gojuru***
- ***Seth Klaassen***

Weekly Summary:

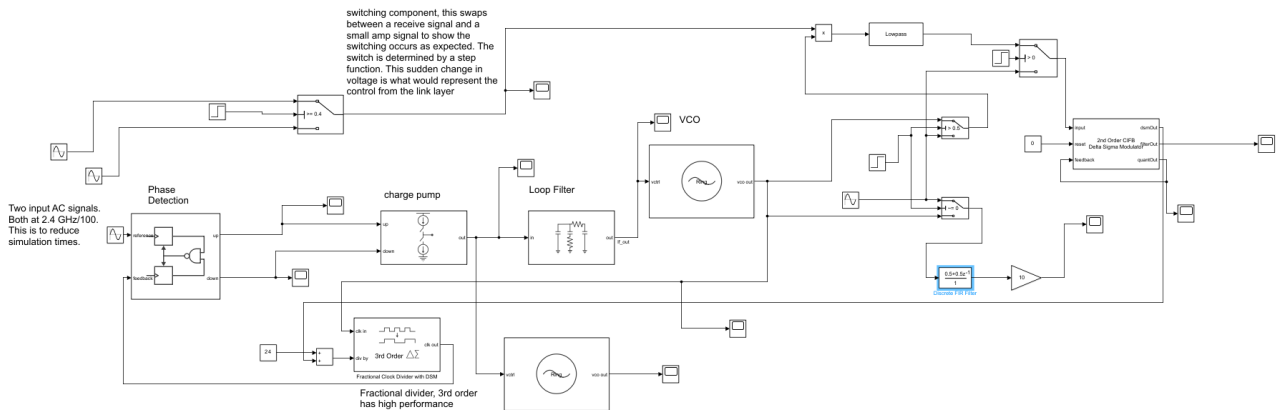
Past week accomplishments

- Zane Salti: Tested and patched up HDL serializer. Seems to work. Looked at different distributed filter architectures and tuned such that the periodicity of the distributed filter wouldn't meet where the beginning odd harmonics are and also being a size such this can be hand hacked together easily. Using ADS's filter "synthesis" tool:



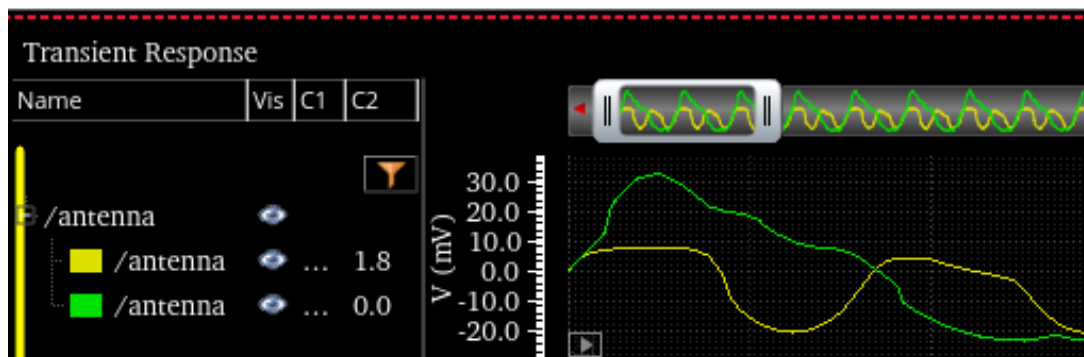
I don't think this is a necessity for the FPGA transceiver to reliably transmit over the antenna, but we will have to see.

- Jackson Doyle: Began a system level model of the phy layer. From this began developing a simulink model to simulate our phy layer. Still a work in progress

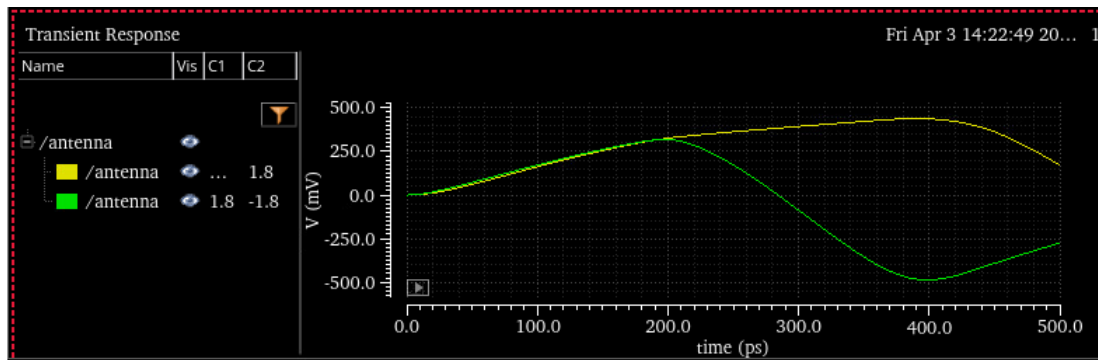


- Daniel Pytel: Perused BLE PHY spec to make sure our standards are up to date.
- Tyler Bibus: Restructured the Sim Environment file structure to align with the top level diagram.
- Parker Pederson: Fixed makefile for decomposed sim environment. Fixed headers inside of simulation environment to prevent double include situations.
- Akash Gojuru: successfully sent advertising packets on channels 37, 38, and 39. Currently using the back channel for communication and the packets are seen on the peripheral device and confirmed that the advertising flow is partially working.
- Aiden Han-Lindemyer: Implemented the BLE advertising state machine, successfully transmitting packets on channels, and improved the simulation environment structure and build system
- Seth Klaassen: Improved RF switch gain from -35.6dB to -11.1dB, noise isolation still low.

Quality before



After improvements



Pending issues

- Zane Salti: Going to need to get arts and crafts supplies (razor, ruler, and copper foil tape), if the filter is immediately necessary.
- Jackson Doyle: Continue to develop simulink model. Develop an argument/gather evidence to show the shortcomings of the skywater 130nm process for RF design.
- Daniel Pytel: System level design still needs some work
- Tyler Bibus: Sim environment not BLE compliant, design document needs updates to reflect advisor feedback.
- Aiden Han-Lindemyer: System is not BLE 4.0 compliant, lacks logging, and relies on a back channel instead of the 2.4 GHz radio channel.
- Parker Pederson: Sim environment has bad logging. Sim environment needs rework to generate correct output.
- Akash Gojuru: The central device cannot see the advertising packets because we are still using the back channel instead of the 2G4 radio channel.
- Seth Klaassen: system level model still needs to be done, our antenna still needs to be decided, and documentation on the limitations of the skywater130 process still needs to be obtained

Time Tracking

<u>NAME</u>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Zane Salti	4	47
Jackson Doyle	8	35
Daniel Pytel	4	26
Tyler Bibus	6	34
Aiden Han-Lindemyer	3	30
Parker Pederson	4	31

Akash Gojuru	5	31
Seth Klaassen	5	30

Comments and extended discussion

Plans for the upcoming week

- Zane Salti: Get working on utilizing the FPGA transceiver as a radio transmitter.
- Jackson Doyle: Continue work on the simulink model. Hopefully achieve relevant results.
- Daniel Pytel: Present limitations of SKY130, look for workarounds.
- Tyler Bibus: Improve design document based on advisor feedback. Continue improvements to Sim Environment. Learn the toolflow to prepare for the conversion of software sim environment to hardware implementation.
- Aiden Han-Lindemyer: Transition communication to the 2.4 GHz radio channel, add logging, and continue improving the simulation environment and overall BLE compliance.
- Parker Pederson: Add logging to the simulation in order to capture IO to create a simulation for hardware. Probably using a TCL script.
- Akash Gojuru: Move communication from the back channel to the actual 2G4 radio channel. Then test and debug packet transmission so the central device can correctly detect the advertising packets.
- Seth Klaassen: find documentation on the limitations of the skywater130 process. Work on the system level model

Summary of weekly advisor meeting

4/3 Duwe Summary

Zane:

- Draw diagrams for ideas
- Using FPGA for verification makes sense as additional confidence

Jackson:

- Simulate smaller component sections before the larger whole

Akash:

- Using Zephyr makes more sense for operating the other side of the babble environment than using the bumble interface.

Parker:

- Good test plan, when writing up the test plan make sure to talk about how the tools are verified.

Seth:

- He liked the switch improvements
- Find documentation on the limitations of the skywater130 process.

General: Stay on the same page. LL team was taking parallel paths to the same obj this week. He wants a slide about the problems and risks related to the sky 130 process. Ie. Bad models, parasitics, bad documentation. Etc