Wake-up Harvester Design for Batteryless IoT System

sdmay21-14 (2/8 – 2/22)

Client & Advisor: Prof. Duwe

Team Members:

Edmund (Eddie) Duan - Powercast Harvester Team, Project Lead

Jacob Bernardi - MCU Team

Douglas Zuercher - Transceiver Team

Kwanghum (Ted) Park - MCU Team

Bryce Staver - Powercast Harvester Team

Zacharias (Zack) Komodromos - Transceiver Team

Weekly Summary

This week, the team has been focused on continuing work on the Altium schematics in preparation of our first design and on the debugging of our MCUs. The MCU team was able to program the MCU after additional digging and debugging, which was an achievement as most testing now depends on the MCU. The team is currently working on getting the SPI functionality of the MCU working. The goal for this week is to get the SPI functionality working and to test programming on the transceiver in addition to integrating the MCU and harvester into the overall system.

Past week accomplishments

MCU Team (Jacob and Ted)

- Solved issue with being unable to program MCU for testing
- Created basic project that will communicate with transceiver over SPI
- Work on the simple code to learn how the code works in Code Composer Studio using VMware Horizon Client

Transceiver Team (Zack and Douglas)

The below achievements were contributed to evenly by Zack and Douglas. Work was done together, at the same time, so contribution is approximately 50/50.
- Accomplished first power-on of the transceiver on breadboard in preparation for transceiver testing
- Worked on interfacing MCU and transceiver by setting up a breadboard
- Helped on code for transceiver SPI programming

Harvester Team (Bryce and Eddie)

- Tested time with different loads over distances from 5 inches to 40 inches with the 50 mF capacitor
- Researched RF traces for the input of the harvester

Altium Schematic Work (Eddie, Bryce, Zack, and Douglas)

Over the past week Douglas and Zack created the schematics for the harvester, MCU and transceiver and created a top-level schematic. They also added the supporting components for the transceiver and harvester.

Eddie and Bryce jointly worked on the supporting components for the MCU as well as the capacitor on the harvester that will hold the charge. Bryce showed Eddie the basics of Altium to get him started.

Pending issues

Transceiver testing:
- The first issue will be making sure that the MCU is able to communicate with the transceiver. There is no easy way to make sure the transceiver is programmed since we will need another programmed transceiver to receive the data and use an oscilloscope to probe.

Individual contributions

The below hours include a rough estimate of hours worked over the last two weeks.

NAME	Individual Contributions (Quick list of contributions. This should be short.)	Hours this week	HOURS cumulative
Bryce Staver	Altium Schematic work (MCU), Harvester testing distances	8	18
Douglas Zuercher	Basic transceiver setup on breadboard Schematic work in Altium Designer MCU SPI setup	6	21
Edmund Duan	Tested harvester with 50 mF capacitor and varying distances, recorded results	8	18
Jacob Bernardi	Began programming SPI testing program for MCU, solved flashing issue with MCU	7	16
Zack Komodromos	Schematic and Altium work Help on interfacing MCU and transceiver	7	22
Kwanghum Park	Work on Code Composer Studio with VMware	6	11

Plans for the upcoming week

MCU Testing (Jacob, Ted, and Douglas)

- Get SPI communication between transceiver and MCU for testing
- Solve issues with sharing project files between different devices in CCS

Harvester Testing (Eddie and Bryce)

Eddie and Bryce plan to be working on these at the same time and will consider this a 50/50 joint effort.

- Testing has been done and more system wide integration will be worked on such as RF input on the PCB

Transceiver Testing (Zack and Douglas)

- Test that the transceiver can be programmed to transmit
- Test that the transceiver can be programmed to receive
- Measure power consumption in the different modes
- Test that WoR mode works

Altium Schematic (Eddie and Bryce)

- Finish Transceiver schematic and connections
- Add testing connections or other features to make the PCB easier to test, such as test points, probe hooks, banana jacks, etc.