

EE/CPRE/SE 492 BI-WEEKLY REPORT 05

INTRODUCTION

Date: 11/8/2019

Group Number: 21

Project Title: Battery-less IoT Devices

Advisor: Dr. Henry Duwe

Clients: Dr. Nathan Neihart, Dr. Daji Qiao

Team Members:

Derek Nash – *Meeting Scribe, Power Systems Engineer, Test Engineer*

Matt Goetzman – *RF Systems Engineer, Test Engineer*

Mohamed Gesalla - *RF Systems Engineer, Test Engineer*

Adithya Basnayake – *Report Manager, Power Systems Engineer, Test Engineer*

Mohammed-Al-Mukhaini – *Meeting Facilitator, Embedded Systems Engineer, Test Engineer*

Bradley Rhein – *Embedded Systems Engineer, Test Engineer*

PAST WEEK ACCOMPLISHMENTS

Embedded Systems Team

RF and Antenna Team

The RF team has made progress characterizing several components to create a parasitic model for them. This will go into creating an accurate RF rectifier circuit. The RF team has also looked into and is currently calculating the received power from the routers. At two meters directly underneath the antenna our signal analyzer is showing that the antenna receives approximately -43dBm of power. This power is from channel 11, which is furthest away from the antenna's center frequency at 2.4GHz. We are looking into the measurement data for channel six but we were unable to get the router to switch to channel 1 for testing purposes. Our next goal is to add the parasitic models and impedance matching to the Cockcroft-Walton rectifier to get it to work at 2.4GHz.

Power Circuit Team

Currently, the CW rectifier is unable to “cold start” the voltage regulator, possibly due to the amount of inrush current required of it. This can be resolved by charging the capacitor with the Enable pin of the regulator set to low, and then switching it over when it has been sufficiently charged.

After a brief meeting between Derek and Vishak Narayanan, a solution for incorporating a voltage supervisor as a type of memory-enabled on-signal generator (to enable the voltage reg) was never found. The idea was tabled indefinitely.

Derek and Brad met Friday to do tests with the Powercast antenna and harvester. It was possible to maintain a 3.3V output from the voltage reg using the Powercast antenna and harvester. The patch antenna was not compatible with the Powercast RF blaster, however, because the RF blaster operates at 915MHz.

PENDING ISSUES

INDIVIDUAL CONTRIBUTIONS

Team Member	Contribution	Weekly Hours
Derek Nash	<ul style="list-style-type: none"> ● Took the FE - Electrical exam ● Designed a simple board for cap bank ● Tested Powercast energy harvester with Brad 	6
Matt Goetzman	<ul style="list-style-type: none"> ● Characterized components, spent time designing rectifier. 	12
Mohamed Gesalla	<ul style="list-style-type: none"> ● Helped with retesting and rectifier design 	8
Adithya Basnayake	<ul style="list-style-type: none"> ● Soldered and tested voltage regulator circuit prototypes ● Looked into ultra low power voltage supervisors 	5
Mohammed-Al-Mukha ini		
Bradley Rhein	<ul style="list-style-type: none"> ● Worked with Derek testing power circuit components 	4

PLANS FOR THE UPCOMING WEEK

- Create the rectifier schematic/layout and send it in for fabrication.

- Characterize the antenna itself. Since we couldn't force the router to broadcast over channel 1 we are going to see if we can accurately extrapolate the data of 6 and 11 along with the antenna characteristics to estimate the power received at channel 1.
- Test CW rectifiers (get IV curve and measure at different distances from router)
- Build enclosure

SUMMARY OF WEEKLY ADVISOR MEETING

- Dr. Duwe emphasized the importance of gathering data (measurements) on the CW rectifiers
 - Also stressed that we agree on a concrete plan for the rest of the semester