

EE/CPRE/SE 492 WEEKLY REPORT 2

INTRODUCTION

Date: 9/27/2019

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

Met with Power Circuit Team to discuss the architecture of the power supply, MSP430, and polling device, as well as what each one's role would be. Also got energy consumption and power requirements for the chip.

RF and Antenna Team

Ordered the patch antenna, and (with help from Power Circuit Team) ordered test boards for the components of the CW rectifier (for frequency response analysis).

Tested the patch antenna with a spectrum analyzer with the help of a graduate student. Gathered data from spectrum analyzer for future analysis.

Power Circuit Team

Soldered and began testing on 3.3V regulator boards, as well as solar panel relay boards (for backup power). Received parts from ETG and boards for 2-stage CW rectifier; however, we still need the SMA connectors.

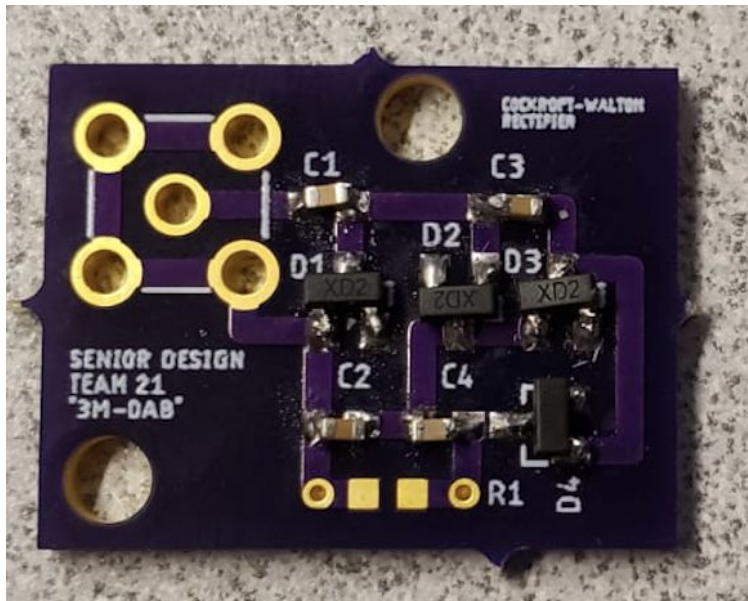


Figure 01: Soldered rectifier circuit

PENDING ISSUES

Need SMA connectors. Power Circuit Team needs to finish testing 3.3V regulator output current limits; also need to build and test CW multiplier (good documentation). Also need to make 2nd voltage regulator circuit.

INDIVIDUAL CONTRIBUTIONS

Team Member	Contribution	Weekly Hours
Derek Nash	Soldered regulator boards, designed and ordered test boards, met with Embedded Team to decide board architecture, ordered parts, and built solar relay boards	20

Matt Goetzman	Researched and purchased commercial 2.4GHz Antenna, tested said antenna and gathered data. Reviewed schematic for rectifier. (with RF team)	5
Mohamed Gesalla	Purchased, tested and collected data for a 2.4 GHz antenna using spectrum analyzer. Reviewed and ran simulations for a 3- stage rectifier design	5
Adithya Basnayake	Soldered the rectifier circuit and researched alternative ways to regulate voltage and provide constant power to the MSP430.	
Mohammed-AI-Mukhaini	Measured and discovered various energy level consumption of the MSP. This was accomplished using code composer to determine accurate readings across a period of time. From these results we were able to communicate power and energy levels expected to power on the MSP430	10
Bradley Rhein	Measured energy consumption of the MSP for various implementations of the program (constant active mode, using LPM4/0, etc.). Worked with Derek on power-on implementation ideas	10

PLANS FOR THE UPCOMING WEEK

Power Circuit Team needs to finish testing 3.3V regulator output current limits; also need to build and test CW multiplier (good documentation). Also need to make 2nd voltage reg circuit.

The RF team plans to analyze the data gathered from the antenna to discern whether the project is still feasible, and if so, how feasible.

SUMMARY OF WEEKLY ADVISOR MEETING

Main points:

- Update on CW rectifier: most of the parts are here and will start testing shortly
 - Collecting points for IV curve (what's the output voltage at different load resistances?)
 - IMPORTANT: thorough documentation of test process
- Questions on 3.3V regulator
 - Might be too powerful
 - Could go with another board with less output current, in exchange for lower min voltage and lower quiescent current
- Embedded Systems Team gave report on energy usage tests

- Averaged out multiple cycles of: power on, take temp, store to FRAM, turn off
 - About 2.8 μ J each time
 - Also, wattage in low-power mode is 2.2mW (important for later)
- Very important that Power Circuit Team meet with Embedded Systems Team to set concrete plan for architecture between the voltage regulator, MSP430, and polling device
 - Done