EE/CPRE/SE 492 WEEKLY REPORT 3

Introduction

Date: 10/11/2019
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

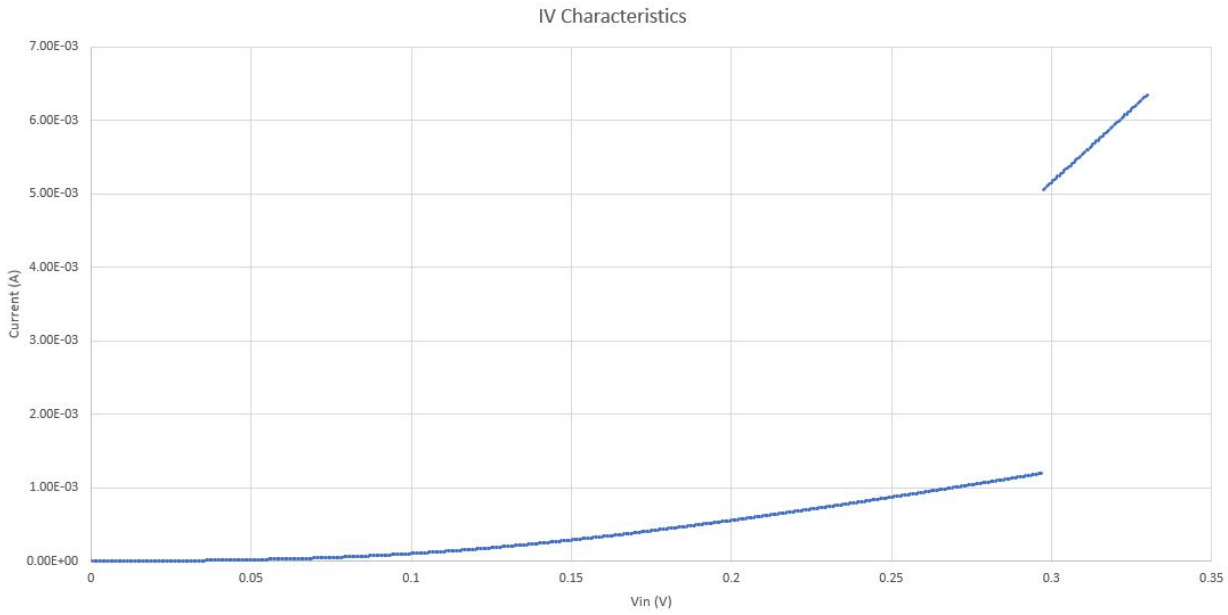
Full team gave 2nd peer review presentation.

Embedded Systems Team

The Embedded Systems team worked with the Power Circuit team with planning the integration of the MSP430 into the rest of the circuit as well as how to properly design a voltage supervisor to turn on the MSP430 at an appropriate time.

RF and Antenna Team

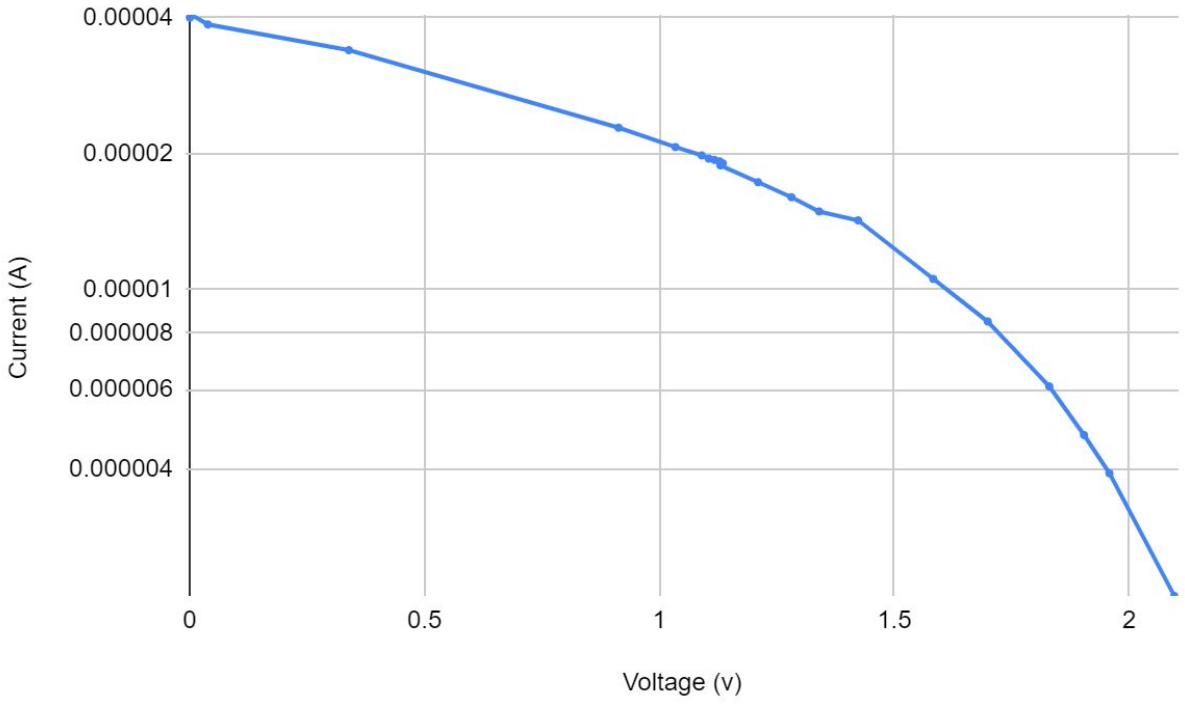
This week the RF team attempted to characterize the Schottky diodes by DC testing them to see their IV characteristics (To validate our simulation diode models). The diode doesn't seem to function exponentially. The diode we tested had a slow, linear build-up before suddenly allowing massive current to come through as we swept the DC input. This weekend we'll re-test the diodes again with a more sophisticated set up.



(Step size of 0.5mV)

Power Circuit Team

- Met with Embedded Systems team to reach conclusions on power circuit architecture
- Reluctantly pivoted design away from solar panel implementation
    - Smaller capacitor bank
    - Smaller voltage reg
    - Possible implementation of supervisor IC to control the ENABLE pin of voltage reg
- After acquiring SMA connectors, we finished building the 2-stage CW rectifiers
    - Tested them and found max power output (~20uW) below



Pending issues

- Power circuit team needs to build the new regulator boards
    - And research supervisor ICs
- RF team needs to perform frequency analysis on individual components of CW rectifier
    - Then do impedance matching
    - Then coordinate with Power Circuit team on final design of CW rectifier

Individual Contributions

Team Member	Contribution	Weekly Hours
Derek Nash	● Researched smaller capacitors with less leakage current ● Calculated energy depletion from capacitor from constant load over time (and factoring in regulator efficiency) ● Prepared new voltage regulator board ● Tested 2-stage CW rectifier	15
Matt Goetzman	● Tested diode IV Characteristics. ● Reviewed signal analysis techniques. ● Started calculations for power of WiFi received signal.	6
Mohamed Gesalla	● Researched impedance matching circuit ● Researched and prepared test plan for rectifier circuit parameters	6
Adithya Basnayake	● Researched capacitors with less leakage current ● Researched voltage regs with less quiescent current ● Tested 2-stage CW rectifier ● Researched on voltage supervisors	9
Mohammed-Al-Mukhaini	● Worked with Derek on voltage supervisor design and placement. ● Also met with Derek to help with work on testing the voltage regulators. ● Researched ports for UART (simplest to implement, cost, etc)	9
Bradley Rhein	● Worked with Derek on voltage supervisor design and placement. ● Also met with Derek to help with work on testing the voltage regulators. ● Researched ports for UART (simplest to implement, cost, etc)	9

Plans for the upcoming week

- Power circuit team will order new regulator boards and parts
    - And research supervisor ICs
- Embedded Systems team will test the software on the launchpad while powered by RF harvesting equipment in the Durham 310 lab. We will also be testing the voltage regulators for Power Team

while we're there. Additionally, we plan on advancing our plans on integration for the MSP430 with the Power Circuit Team's circuit.

- RF team will continue to measure diodes and get RF parasitics of Capacitor and Inductor components we'll be using for impedance matching.

Summary of Weekly Advisor Meetings (2)

- No solar panel attachment
- Importance of testing CW rectifier and plotting IV curve
    - Emphasis on documenting the test procedure
- Suggestion of supervisor IC to enable the voltage regulator
    - References to WISP, CAPYBARA, and pervious group (Team 11 May 2018)
- Reminder of limited time remaining in semester