

*Group number: 18*

*Project title: Radio Frequency Readout Device (RFRD)*

*Client &/Advisor: Dr. Qiao*

*Team Members/Role: Brandon Baxter/Team Leader, Vaughn Dorsey/Team Webmaster, Luke Myers/Team Communication Leader, Kurt Turner/Team Key Concept Holder, Aaron Haywood, Robert Buckley, Mehdy Faik, Kellen Yoder, Michael Miller*

### **o Weekly Summary**

This week the the reader group did further research on different reader application options in terms of price and quality. That information was then presented at the weekly meeting with the advisor. The antenna group performed calculations for the signal power that will be passed from the RFID reader to the tag. The IC group also met and did some initial testing on the power harvesting of the tag. They also obtained a variable capacitor that will be utilized for testing the capacitor sensor once we purchase one. The IC team also worked on refining the circuit for the tag.

### **o Past week accomplishments**

- Brandon Baxter: Worked with IC group (Thursday, 9/29) for some initial testing on the power harvesting for the tag.
- Vaughn Dorsey: Did more research into what kind of RFID reader we could get for the Reader device. Also assisted with information for a reader options presentation. Also started work on the group website.
- Luke Myers: Worked with the IC group (Thursday, 9/29) to do some initial testing for the power harvesting circuit for retrieving power from the antenna tag.
- Kurt Turner: Thursday: led testing of an initial circuit design for power harvesting properties. Sunday: refined circuit details for harvesting RF power and data sending.
- Aaron Haywood: Continued research for antenna, priced power harvesting module
- Robert Buckley: Researched parts needed for the reader. The three components needed are a controller (Computer, we will use a Raspberry Pi 3), RFID Module, and antenna. Antenna's are expensive, over \$100 each, so we are looking into making our own. RFID modules are also expensive, but harder to make so we are looking into options. Currently we are looking at a ThingMagic module.w

- Mehdy Faik: Researched higher gain antennas. Researched reflector antennas for alternative experiment setup. Researched lower frequency options: At lower frequencies, antenna sizes either grow out of hand or antennas are too inefficient.
- Kellen Yoder: Researched parts for reader. We were able to figure out the necessary components that will go into the making of it. Then we met and put together a presentation for the professor meeting so that we can explain why we want to use specific components and also compared our options. Made an effort to figure cost into our decision as well.
- Michael Miller: Simulated the power circuit for the IC design to get an idea of the power harvesting efficiency.

**O Pending issues**

- Brandon Baxter: Need to begin designing the IC pretty soon especially if we need it to be custom made.
- Vaughn Dorsey: None
- Luke Myers: Need to find a quality capacitor sensor that we can order and utilize for testing.
- Kurt Turner: Working on the details of the sensor circuitry, need to research how to measure the capacitance, and convert it to a form the RF tag can send.
- Aaron Haywood:
- Robert Buckley:
- Mehdy Faik:
- Kellen Yoder: None
- Michael Miller:

**O Individual contributions**

<u>NAME</u>	<u>Individual Contributions</u>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Brandon Baxter	IC group power harvester testing	2	5
Vaughn Dorsey	Research into what parts we will need for the reader	2 hours	12 hours
	Website work	.5 hours	
	Meetings with group, reader team, and professor	3.5	

Luke Myers	Worked with IC group on power harvesting testing. Met with group and the advisor.	4 hours	12 hours
Kurt Turner	Power harvest testing Circuit brainstorming	2 2	5.5
Aaron Haywood	Power harvesting module and more antenna research	2	5
Robert Buckley	2 hours group meeting researching components, 2 hours large group meeting researching components and RFID tag, 1 hour meeting with Dr Qiao, 1 hour group meeting updating group during class, 1 hour additional research.	7	15
Mehdy Faik	Ruled out lower frequency operation, researched high gain antennas, researched possibility for a reflector antenna.	4	10
Kellen Yoder	Worked with module group on gathering information on how we will make our module.	3 hours	5 hours
Michael Miller	Worked with the IC team on design concept, power constraints, and sensor ideas.	7	14

**o Comments and extended discussion**

**o Plan for coming week**

- Brandon Baxter: Figure out what goes into the “black box” that is the IC portion of the RFID tag.
- Vaughn Dorsey: Determine layout of the website and begin implementation.
- Luke Myers: Find a capacitor sensor. Work with IC group and antenna group to further develop the circuitry for the tag.

- Kurt Turner: Design circuitry to collect and convert capacitance data.
- Aaron Haywood: More antenna exploration
- Robert Buckley:
- Mehdy Faik: Absorb the existing literature and common knowledge on RFID. Look into helix antennas. Could possibly design a reader circuit for driving its transmitter antenna.
- Kellen Yoder: Will work with Robert and Vaughn to find a capacitor sensor, as well as possibly ordering parts to start building the module.
- Michael Miller: Start prototyping the IC data circuit with “big” components.

### **o Summary of weekly advisor meeting**

- Started off the meeting discussing how the sensor will be passive
- Analog signal coming from the sensor that will be sensing capacitance
- need to convert the signal to a bit string (so we can eventually send the data back to the reader)
- Suggestion: Check with the shop to see if they have a capacitor sensor.
- Next the reader team presented the reader portion with the selling point of comparing the choices of the Arduino UNO R3 to the Raspberry Pi mk. 3
- Reader modules can be connected to raspberry pi via USB
- Antennas would not be included but also expensive (thinking about building our own)
- Chatted about size constraint issues
  - miscommunication led to a bit of confusion, this has been solved
  - for reader hygen can be used
  - tag size as small as possible
- Walked through initial antenna calculations with the advisor
  - small chat about regulation of power of the signal and the legality of it (we need to research this)
  - look into the most common RFID antennas
- looked into the module in greater detail with the advisor, he likes what we found but wants us to keep our minds open and keep looking for potential options.
- check into patents of RFID
- Antenna team will collaborate with the reader team to help design the antenna
  - for the reader side of the project (will yield much cheaper results)
- Had a presentation by a collaborating professor on the basics of RFID

Decide in a couple of weeks what we are doing with the IC.