



# RADIO FREQUENCY ENERGY HARVESTING 4TH YEAR PROJECT



CUESEF Funding Request  
CARLETON UNIVERSITY  
February 7, 2014

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## Abstract

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The proposal being presented to CUESEF is to seek funds for the Department of Electronics 4<sup>th</sup> year radio frequency harvesting project. The project consists of harvesting radio frequency energy and converting the RF energy to direct current (DC) which will power various wireless sensors that will measure indoor environmental parameters (i.e. temperature, relative humidity and pressure). The amount being requested from CUESEF is \$424.33.

## Group Introduction

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The group members for this project consist of Taylor Egan (100793555), a major in the Sustainable and Renewable Energy Engineering program, and Harkirat Deol Deol (10084129), Matthew Dozois (10074516) and Alexander Duke (100823895) who are majoring in the Electrical Engineering program. The group members have come together for the purpose of completing their 4<sup>th</sup> year project. Table 1 outlines the primary and secondary contact members, as well as their respective email address.

**Table 1** Group Member Contact Information

Primary Contact	TaylorEgan@cmail.carleton.ca
Secondary Contact	HarkiratDeolDeol@cmail.carleton.ca MatthewDozois@cmail.carleton.ca AlexanderDuke@cmail.carleton.ca

### Faculty Contact

Professor R. Niall Tait

Department of Electronics

Niall\_Tait@carleton.ca

## Overview of Project

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The first phase of the project (2013-2014) is to develop a system which can harvest RF energy and use the converted energy (RF to DC) to power sensors which measure indoor environmental parameters, such as temperature, relative humidity and pressure. The measured data will then be transmitted back to the RFID reader using a RFID tag.

Figure 1 presents an overall layout of the project and is composed of four main components:

- Microcontroller and sensors;
- RF to DC power conversion and power management module;
- RF receiving antenna; and
- RFID reader.

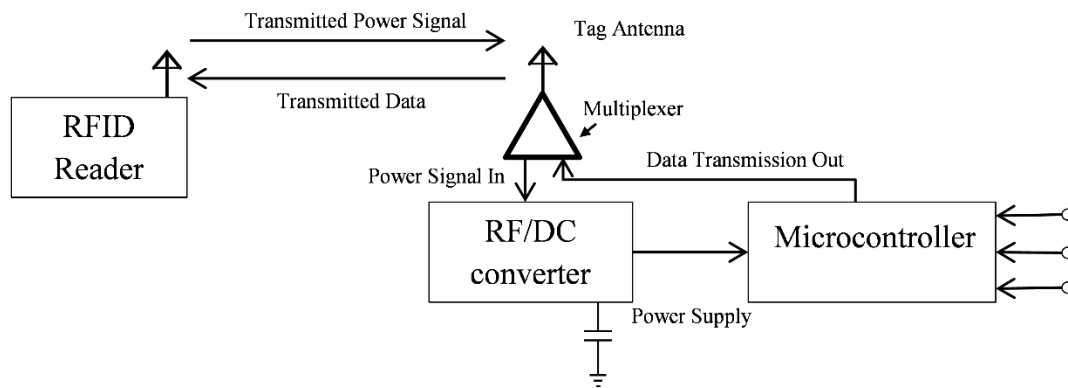


Figure 1 System Overview of Project

It is expected that the life time of these components will be approximately five years, depending on usage.

## Funding

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### Request

For this project, we are requesting funds for a RFID reader and the components needed to design and assemble a receiving antenna for the RF input of the RF-DC conversion module. The significance of the RFID reader is that it is the source of RF energy and will receive and display the data measured by the sensors. The receiving antenna is needed to receive the RF energy transmitted by the RFID reader and transmit the energy to the RF-DC power conversion module.

Throughout the project the parts will be maintained by the group member who is in charge of the design and implementation. When the project is completed in April 2014, the parts will be transferred to Nagui Mikhail, Computer Systems and Physical Facilities Manager for the Department of Electronics. It is expected to be used for demonstrations for current and prospective students.

## Budget

A general outline of the project budget is described in table 2. To view a detail budget listing individual components, please refer to Appendix A.

Table 2 Summary of Budget Details

Item	Amount
Receiving Antenna Design	\$114.35
RFID Reader Kit	\$192.00
Shipping	\$69.16
Taxes	\$55.58
Total Request	\$483.09

## Conclusion

In conclusion, the project group is requesting \$424.33 in funding from CUESEF in order to build a system which can harvest RF energy, convert the energy to DC which can be used to measure indoor environmental parameters. The group is requesting the funds for the design of the receiving antenna and the RFID reader.

## Appendix A – Budget Details

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### Budget Details for Receiving Antenna Design

Item	PCB Printing	RG58 BNC Connector Coaxial Cable	BNC T-Junction	BNC Male Panel Mount
Source	AP Circuits		Jameco Electronics	
Product Number	N/A	102315	118594	355120
Quantity	1	3	2	2
Unit Cost	\$94.22	\$3.95	\$2.19	\$1.95
Net Cost	\$94.22	\$11.85	\$4.38	\$3.90
Shipping	\$30.00	\$9.16*	\$9.16*	\$9.16*
Taxes	\$16.15	\$2.73	\$0.57	\$0.51
Total	\$140.37	\$23.74	\$4.95	\$4.41

\*Items will be purchased together, thus one shipping charge of \$9.16 included in the total of the coaxial cable.

### Budget Details for RFID Reader

Item	UHF RFID kit AS3992 passive reader kit USB using 5 dBi antenna
Source	Solidigi Technologies
Product Number	N/A
Quantity	1
Unit Cost	\$192.00
Net Cost	\$192.00
Shipping	\$30.00
Taxes	\$28.86
Total	\$250.86