

**RADIO FREQUENCY ENERGY HARVESTING FOR CHARGING  
ELECTRICAL EQUIPMENT**

By

MOHAMED ABD ELAZIZ SAAD ELBAGOURI

FINAL PROJECT REPORT

Submitted to the Electrical & Electronics Engineering Programme  
in Partial Fulfillment of the Requirements  
for the Degree  
Bachelor of Engineering (Hons)  
(Electrical & Electronics Engineering)

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Mohamed Abd ElAziz Saad ElBagouri, 2009

# **CERTIFICATION OF APPROVAL**

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Approved:

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Dr. Rosdiazli Ibrahim  
Project Supervisor

**UNIVERSITI TEKNOLOGI PETRONAS  
TRONOH, PERAK**

December 2009

## **CERTIFICATION OF ORIGINALITY**

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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Mohamed Abd ElAziz Saad ElBagouri

Energy harvesting (also known as power harvesting or energy scavenging or ambient power) is the process by which energy is derived from external sources (e.g., solar power, thermal energy, wind energy, salinity gradients, and kinetic energy, also known as ambient energy), captured, and stored for small, wireless autonomous devices, like those used in wearable electronics and wireless sensor networks. A radio frequency ("RF") energy harvesting system ("RFHS") is disclosed for high-efficiency phased array RF energy harvesting and transfer. The RFHS includes a phased array antenna, a power harvesting unit ("PHU"), and a controller. The phased array antenna is in signal communication with both the PHU and controller. The process then determines whether the amount of stored electrical potential energy within the storage module is greater than a predetermined threshold value with the power threshold module and transmits the stored rectified power signal to a sensor, if the amount of stored electrical potential energy within the storage module is greater than or equal to the predetermined threshold value. In FIG.