

Energy Harvesting and Management from Ambient RF Signal and Heat Radiation

K.Ramalingam¹, S.Sudhakaran², C.Viveknath³, R.Priyadharshini⁴.

^{1,2,3,4}Department of Mechatronics and Engineering, Chennai institute of technology, Kandrathur, Chennai.

¹ramalingamk41@gmail.com, ⁴dharshinirathnamgmail.com

ABSTRACT : Our project deals with the harvesting of energy from RF source here the power is transferred from the antenna, there by using the impedance matching is done. So that more power is gained from tower and the rectifier circuit converts the incoming RF signal to DC signal that is fed into battery and an efficient rectification improves the output power.

The energy harvested from external ambient sources such as wind, solar, vibration, heat, radio frequency (RF) are emerging as promising alternative to existing energy resources. Energy Harvesting is the process of capturing the RF signals electronically and the heat radiation from the mobile and accumulating energy from a battery and to use it whenever required.

Keywords: AT89S52 microcontroller, Relay switch, ultra capacitor, peltier, liquid crystal, RF Signal Receiver, RF to DC converter.

I. INTRODUCTION

In Energy Harvesting is the process of electronically capturing and accumulating

energy from a variety of energy sources deemed wasted or otherwise said to be unusable for any practical purpose. More often than not, these residual energies are released into the environment as wasted potential energy sources. Wireless sensors and the potential energy harvesting provide power for the life of these devices. The greatest potential, however, lies in a new class of devices that will be battery-free and thus enable applications that would have been prohibitively expensive due to the maintenance cost repeated battery replacement. This paper deals with the harvesting of energy based on the rf source here the power is transfer from the antenna ,there by using the impedance matching is done so that to gain more power from tower and the rectifier circuit convert an incoming rf signal to dc signal that is fed into battery an efficient rectification improves the output power.

II. EXISTING SYSTEM

In the existing system, energy harvesting is derived from various external sources. In this existing method for energy harvesting we use source such as the thermal energy, solar energy, and kinetic energy but such energy are repositied or stored in miniature electronic and electrical devices which are usually positioned

in energy source points. The phenomenon of energy harvesting furnishes very less amount of energy.

III. DISADVANTAGES OF EXISTING SYSTEM

- High power consumption.
- RF energy harvester is positioned for optimal directional
- Alignment and polarization with respect to the transmitting antenna
- RF energy harvester is positioned for optimal direction.
- High power consumption.
- Alignment and polarization with respect to the transmitting antenna
- Low power density (environment)
- Low efficiency (RF2RF)
- High efficiency conversion - complicated system
- Limitation of ISM band

IV. PROPOSED PROCESS

This Paper presents two ways of harvesting energy. The ways are as follows :

- RF Signal
- Heat radiation

In this method, the mobile battery is charged using the heat produced from the mobile phone due to radiation. The heat produced is analysed using peltier effect and further used for charging the mobile phone. In this Proposed System is an charging by using RF energy harvesting. This paper deals with the

harvesting of energy based on the RF source here the power is transfer from the antenna ,there by using the impedance matching is done so that to gain more power from tower and the rectifier circuit convert an incoming RF signal to dc signal that is fed into battery an efficient rectification improves the output power. Here the radiation from the receiving antenna in the from of RF energy can be converted to dc form by using a rectifier circuit at an optimum operating point and rectified output sent to storage unit for an optimum power level optimized output sent to charge a device. This project deals with the harvesting of energy based on the RF source.

The rectifier circuit convert an incoming RF signal to dc signal that is fed into battery an efficient rectification improves the output power. The radiation from the receiving antenna in the form of RF energy can be converted to DC form by using a rectifier circuit

V. OBJECTIVE

The major aim of the proposal is

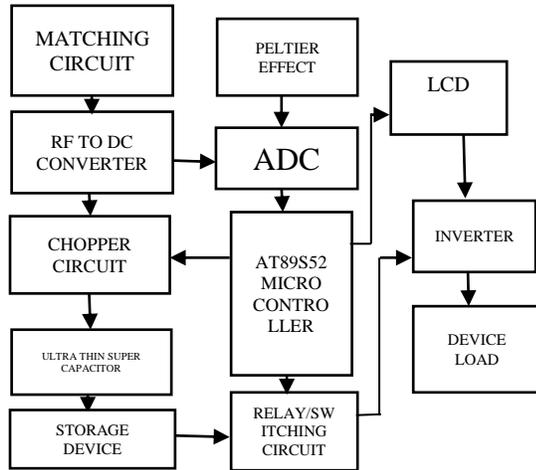
- Portable devices, Free energy.
- Easier than plugging into a power cable.
- Corrosion does not occur when exposed to atmosphere.
- Safe for medical implants for embedded medical devices.
- Allows recharging through skin rather than having wires penetrate.
- It does not require wire for charging

VI. IDENTIFIED PROBLEMS

- The programming for normal energy harvesting method is very large.
- The time limit for charging of mobile phone is not constant.

- RF signal value can't identified in the existing system because they didn't use any LCD display

VII. SYSTEM BLOCK DIAGRAM



VIII. EXPERIMENTAL PROCEDURE

- While mobile phone is in calling ,the signal is captured by using RF Signal receiver and it is processed through RF to DC conversion unit
- Then the processed signal is send through the microcontroller ,from that three ports are connected one is connected to LCD ,next is connected to relay and last one is connected to ADC
- The signal from the microcontroller enters the ultra low power converter from that it enters the supercapacitor,
- Thus the processed signal from the capacitor discharges DC current that is connect to battery and USB cable

IX. CIRCUIT DIAGRAM

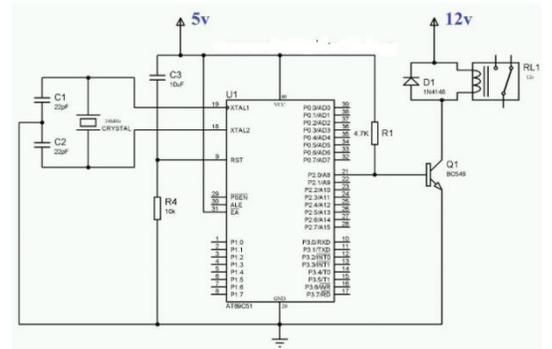


Fig : 9.1 Microcontroller to relay switch

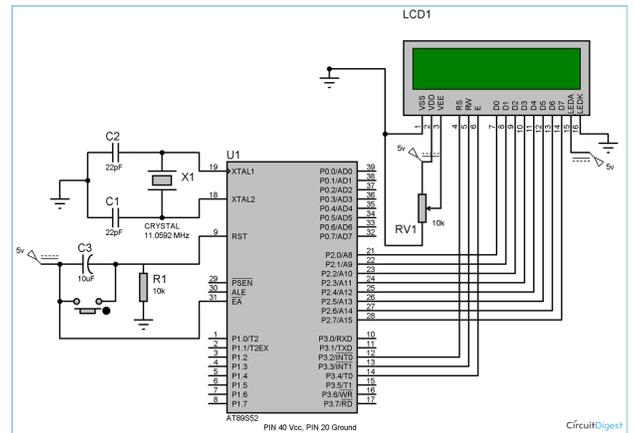


Fig : 9.2 Microcontroller to LCD

X. CONCLUSION

- The proposed system was able to add new capabilities to the internal loop by making little corrections to its control demands , ensuring the compliance with restriction.
- At the end the system was able to ensure that the capturing of the RF signals and the heat radiation from the mobile and accumulated to a battery and then use it whenever necessary.
- Thus the experiment by capturing RF Signal and converting into a DC voltage and the heat generated while using the phone is converted and the results of the

above mentioned one are successfully recorded

REFERENCE

1. B. Strassner and K. Chang, "5.8-GHz circularly polarized dual rhombic-loop travelling-wave rectifying antenna for low power-density wireless power transmission applications," *IEEE Trans. Microw. Theory Tech.*, vol. 51, no. 5, May 2003.
2. J. O. McSpadden, F. Lu, and K. Chang, "Design and experiments of a high conversion efficiency 5.8-GHz rectenna," *IEEE Trans. Microw. Theory Tech.*, vol. 46, no. 12, pp. 2053–2060, Dec. 1998.
3. B. Strassner and K. Chang, "Highly efficient -band circularly polarized rectifying antenna array for wireless microwave power transmission," *IEEE Trans. Antennas Propag.*, vol. 51, no. 6, pp. 1347–1356, Jun. 2003
4. H. Sun, Y.-x. Guo, M. He and Z. Zhong, "A dual-band rectenna using broadband Yagi antenna array for ambient RF power harvesting," *IEEE Antennas and Wireless Propa. Lett.*, vol. 12, pp. 918–921, 2013
5. Ambient RF Energy Scavenging: GSM and WLAN Power Density Measurements: Hubregt J. Visser^{#*1}, Adrianus C.F. Reniers^{*2}, Jeroen A.C. Theeuwes^{*3}