RF ENERGY HARVESTING

Virendra Sarde[1], Satyam Patil[2], Pankaj Solanke[3], Prof. Prajakta khairnar[4]

[123]*Student, Dept of E&TC, DYPSOE, Pune,, Maharashtra, India*

[4]*Asst. Professor ,Dept of E&TC, DYPSOE, Pune,, Maharashtra, India*

ABSTRACT

An experimental RF energy harvesting system is presented in this paper. Based on this concept, the project is developed to transfer power within a small range. This project can be used for charging batteries which can't be charged physically such as pace makers. The patient is required to be operated every year to replace the battery. This project can charge rechargeable batteries purposely. This project is built upon using an electronic circuit which converts AC 230V 50Hz to AC 12V, High frequency. The output is fed to a tuned coil forming as primary of an air core transformer. The secondary coil develops a voltage of HF 12volt. Thus the transfer of power is done by the primary(transmitter) to the secondary that is separated with a considerable distance(say 3cm).Hence it can be seen as wireless power transmission from primary to secondary to load. Moreover this technique can be used in number of applications, like to charge a mobile phone, iPod, laptop battery, propeller clock wirelessly. There is a lower risk of electrical shock as it is galvanically isolated. This concept is an Emerging Technology, and in future the distance of power transfer can be enhanced as the research across the world is still going on.

KEYWORDS: *High frequency(HF) transformer, Surface mount devices (SMD),Global system for mobile(GSM)*

1.Introduction:

IN recent years there has been an increasing interest in the development of Wireless Sensor Networks (WSNs). These networks can be uses in different scenarios as intelligent office spaces, medical monitoring and military applications,there is always an issue to change batteries frequently , which has limited its use of WSNs .Energy harvesting is one of the key techniques used to solve this problem. There are many interesting ways for energy harvesting from the ambient sources, such as light, heat, vibration, RF, and so on. Among all, RF signals are available everywhere as well as every time. Some of the most prominent RF sources are FM radio systems, TV Transmission, Cell Tower Transmission, Wi-Fi, AM Transmission and mobile phones etc .we can get continuous source of energy from cell towers. Harvesting ambient RF energy would provide an alternate energy source for low power applications.

We have made the educational model which shows the same concept but as it required SMD components at higher frequency ranges so we generated our own frequency and amplified it for using it as a charging media. The Radio Frequency Energy Harvesting model device consists of three primary subsystems. The first subsystem is the receiving antenna, which is solely responsible for capturing all of the RF energy. but at small range applications its efficiency varies as distance increases or decreases. • The second main subsystem is the rectification circuitry, which will efficiently convert the time varying input energy into a constant output voltage. • The third subsystem is the dc regulation system, which is responsible for storing all captured energy and providing a constant output voltage to power the attached device. The paper is organized as follows: Section II detail explain the system diagram with simulation results. Finally the paper is concluded in Section III

2.SYSTEM OVERVIEW:

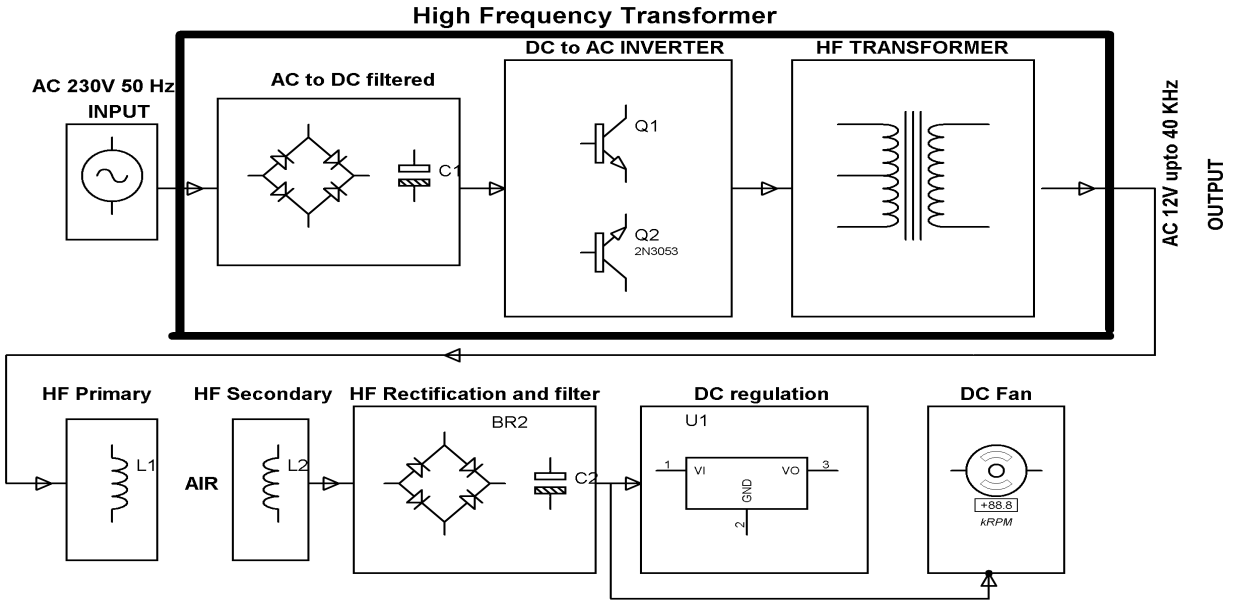

Fig.2.1 Block diagram of proposed system

2.1 HIGH FREQUENCY TRANSFORMER:

The transformer is simplest,most used electronic device. Transformers are widely used as economic means of power transmission over long distances.

High frequency transformers used to transfer electric power. The physical size is dependent on the power to be transferred and also on the operating frequency. The higher the frequency smaller the physical size. The band of frequencies are usually between 20 and 100 kHz. Mainly the core material is of Ferrite

2.2 VOLTAGE REGULATOR 7805:

A voltage regulator is an electrical regulator which is designed to automatically maintain a constant voltage level. A voltage regulator may be a simple "feed-forward" design or may include negative feedback control loops.

FILTER:

Electronic filters are electronic circuits which are used to perform signal processing functions. Specifically used to remove unwanted frequency components from the signal, to enhance wanted ones, or both.

1.3 RECTIFIER:

A rectifier is an electrical device that converts alternating current (AC), which periodically reverses direction, to direct current (DC), current that flows in only one direction, a process known as rectification. Uses of rectifiers are in components of power supplies and as detectors of radio signals.

2.5 ELECTROMAGNETIC COIL:

A **coil** is a series of loops. A **coiled coil** is a structure where the coil itself is in turns ,also these objects are used commonly and are very important, some of their functions may be in bikes, cars trains and planes.Also used in conjunction with a thread.

3.CONCLUSION:

This report present the design of RF Energy Harvesting System. The potential utilization of RF signal to DC power is experimentally investigated. Several steps are taken to achieve this methodology. A thorough study of various topologies of Impedance Matching, Antenna, Voltage Multiplier have been discussed. Based on that, We have chosen effective topology for each block. As a result of this overview, LC circuit designed to give a constant impedance over the selected frequency range.

Based on measurement and simulation, it can be concluded that it is possible to use radiation, off-air RF signal as a source for energy harvesting. Even though the output powers of such harvester are relatively low, it can be sufficient for running low consumption sensor and switches.

Improvement on efficiency of the RF signal harvesting is important. This will helps to enable more current to be re-cycled and operate low-power circuit. The possibility of using this harvester in energizing sensor networks appears to be the most practical use at the moment.

Finally, We have presented a new technology that can revolution the way we charge our numerous mobile devices. It helps portability of devices without carrying chargers around.

4.References:

[1].G. Kumar, M. Arrawatia, and M. S. Baghini, "Rf energy harvesting system from cell towers in 900mhz band," IEEE, vol. 11, no. 978-161284-091-8, 2011

[2].A. R. Djordjevi, A. G. Zaji, M. M. Ili, and G. L. Stber, "Optimization of helical antennas," IEEE Antennas and Propagation Magazine, vol. 48, pp. 107–116, December 2006

[3].H. M. Gamal and M. A. E. Saad, "Novel radio frequency energy harvesting model," IEEE International Power Engineering and Optimization Conference, pp. 209–213, june 2012.

[4].W.C Brown, J.R Mims and N.I Heenan, "An Experimental Microwave-Powered Helicopter" 965 IEEE International Convention Record Vo. 13, Part 5, Pp. 225-235.

[5].S. Sheik Mohammed,K. Ramasamy,T. Shanmuganantham "Wireless Power Transmission – A Next Generation Power Transmission System", ©2010 International Journal of Computer Applications (0975 – 8887) Volume 1 – No. 13