International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 6 Issue: 12 31 - 32

RF Energy Harvesting for generating Electricity and Energizing Low Power Electronic Devices

Atul Shrivastava
Student, Department of Electronics and Communication Engineering
Sikkim Manipal Institute of Technology
Majitar, East-Sikkim, India
atulshrivastava51@gmail.com

***Abstract*—**Electromagnetic Energy harvesting holds a promising future in energizing low power electronic devices in the wireless communication circuits. Here we have provided a circuit that can be implemented to harvest electricity using the RF signal widely available in nature

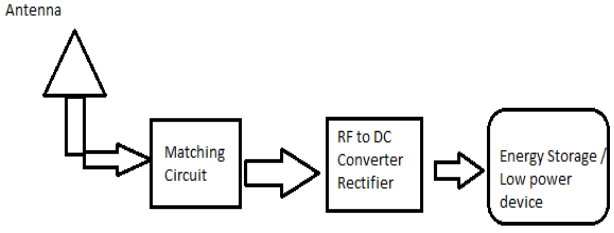
Keywords*-*RF, EMF, wireless communication

*****

I. INTRODUCTION

The major problem of today's world is energy due to the vast amount of electrical energy required in each and every sector of our day to day life. We are mainly focused on using non-renewable sources of energy like fossil fuels, etc. The practice of renewable source for generating electricity is less used. And this could lead to a major problem, the extinction of renewable sources in the near future. Over the past two decades the wireless Communication has evolved and developed to an extent that it's frequency spectrum is dense. These systems are Wi-fi, cellular Radio, Television Broadcasting channels. The ambient energy is widely available and there is a small amount of energy wasted that can prove to be useful. In this paper I have discussed easy and a cheap way to generate electricity for the consumption of electricity required to energize low power electronic devices. RF signals are found almost everywhere and this is a circuit that can convert RF signals into its DC equivalent. This circuit can be used in any wireless communication system and holds a promising future along with the advancement of Communication Systems. The research work is intended to overcome the problems and difficulties in the earlier works from energy harvesting system to energize low power electronic devices.

II. BLOCK DIAGRAM

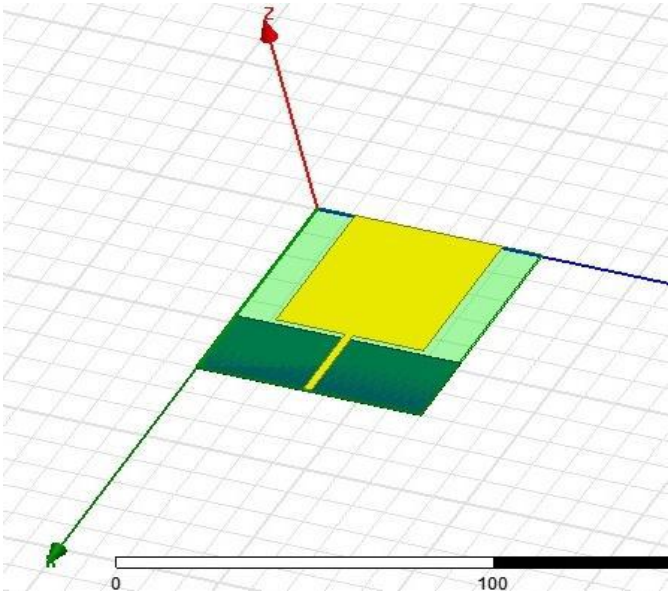


The Block diagram showcases four portions, the antenna design, the matching circuit that will receive the direct output from the antenna and filter it accordingly to be given as input to the rectifier circuit, the rectifier will further convert the AC signal into its DC equivalent and finally a storing device or it can be given directly as an input to the device according to its requirement.

III. ANTENNA DESIGN

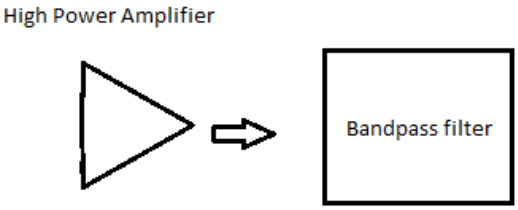
An antenna is the major component of the Harvesting system as it is responsible for capturing the RF signal. The Antenna used is capable of having a high gain within the frequency of 1.42 GHZ to 2.28 GHZ. The maximum output power gain is 32 dBm (1.6W) approx. which is equivalent to an AC voltage of 4.4 Volts (RMS) (Theoretical approximation).

The simulation of Antenna was carried out in HFSS software. The model consists of a square shape patch antenna of dimension (46mm X 46mm) over a substrate of dimension (70mm X 70mm).



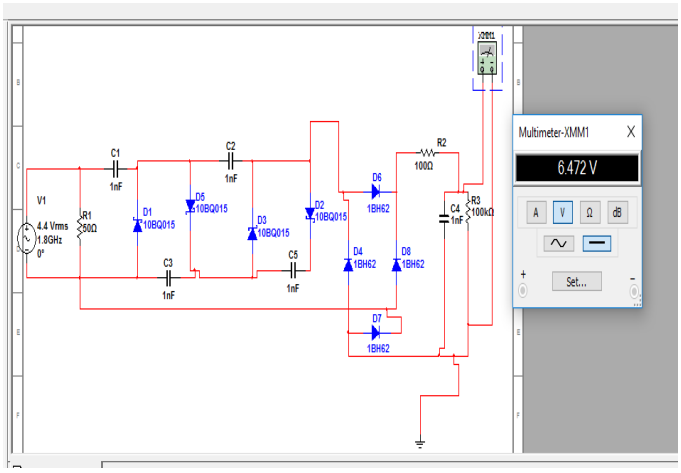
All the conditions are considered ideal and theoretical in the design of Antenna and its equivalent RMS value is also calculated on the basis of the above consideration.

IV. EQUIVALENT CIRCUIT DESIGN



Above is the block diagram of the equivalent circuit that is to be connected just at the receiving end of the Antenna, a HPA(High Power Amplifier) is connected, sometimes it is seen that the input voltage is too low to be taken as an input in our circuit therefore a HPA is used followed by a Band Pass Filter to filter out the signal present in the certain bandwidth and eliminate other just to stabilize the output at the end and eliminate certain conditions were the output may vary drastically that can also lead to hamper the device.

Just after the Bandpass filter(BPF) an Amplification circuit is connected to amplify the output given from the Bandpass Filter. The Amplification Circuit consists of a 4-stage voltage booster and an AC to DC converter at the end of the 4-stage voltage Booster.



The above is the circuit diagram of the given voltage booster along with a rectifier, when applied with an Ac value of 4.4 Vrms at 1.8GHZ it gives an DC output of 6.472 Volts.

V. CONCLUSION

All the simulations were done in the Multisim and HFSS software and the circuit was found to be quite feasible. In future with the advancement of communication Systems and development of Antenna having more gain this method can be used to harvest energy and to get a more amplified output the stages of the Voltage Booster is to be increased but that will also increase the power dissipation of the circuit and there might be a fall in the power. This research work was completely based on Simulations and theoretical assumptions and can prove to be a remedy for the Energy loss caused due to the extinction of renewable sources of energy and can be used for low power electronic devices. The research work is intended to overcome the problems and difficulties in the earlier existing works from energy harvesting system.

ACKNOWLEDGMENT

I would like to acknowledge Mr. Debashish Bhaskar, Assistant Professor, Sikkim Manipal Institute of Technology. Also, I would like to thank Kashish Jindal and Anil Kumar for being with me during this research work.

REFERENCES

[1] Snehal Patil and Sonal Gahankari, “Design and implementation of Microstrip Antenna For RF Energy Harvesting ”IJERT vol 10, November 1,2017

[2] “Microstrip Array Antenna For RF Energy Harvesting System” IJAIST Vol5 No.1, January2016.