

Energy Harvesting using RF waves

Through the years, technology has allowed the cellular phone to shrink not only the size of the ICs, but also the batteries. New combinations of materials have made possible the ability to produce batteries that not only are smaller and last longer, but also can be recharged easily. However, as technology has advanced and made our phones smaller and easier to use, we still have one of the original problems: we must plug the phone into the wall to recharge the battery. Most people accept this as something that will never change, so they might as well accept it and carry around either extra batteries with them or a charger. Either way, it's just something extra to weigh a person down. There has been research done in shrinking the charger to make it easier to carry with the phone. One study went on to find the lower limit of charger size. But as small as the charger becomes, it still needs to be plugged in to a wall outlet. How can something be called "wireless" when the object in question is required to be plugged in or stationed, even though periodically? Now, think about this; what if it didn't have to be that way?

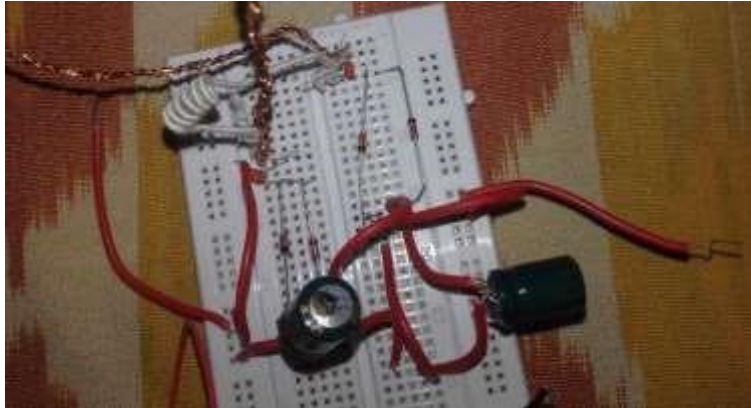
Most people don't realize that there is an abundance of energy all around us always. We are being bombarded with energy waves every second of the day. Radio and television towers, satellites orbiting earth, and even the cellular phone antennas are constantly transmitting energy. What if there was a way we could harvest the energy that is being transmitted and use it as a source of power? If it could be possible to gather the energy and store it, we could potentially use it to power other circuits. In the case of the cellular phone, this power could be used to recharge a battery that is constantly being depleted. The potential exists for cellular phones, and even more complicated devices - i.e. pocket organizers, person digital assistants (PDAs), and even notebook computers - to become completely wireless.

The concept of this project is to harvest the energy of the waves around us along with the energy transmitted by the source. Through our research we learnt many things beyond the scope of our books to eradicate a common problem i.e. WIRES. We started with the idea of generating high magnitude magnetic fields but as we

researched and researched thoroughly we came to this concept of RF to DC conversion.

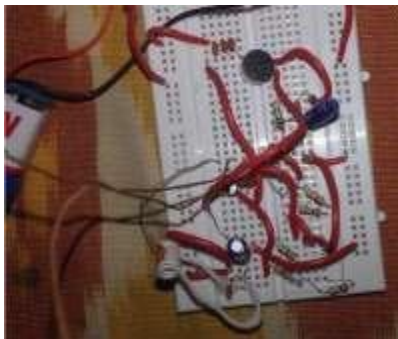
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Initially we set up a simple rectifier circuit using the basic materials we had and tried to assemble them on a bread board.



The above shown circuit gave us an ambient voltage of 250 mV and a current of 1 mA.

To increase the RF fields, we set up a small RF transmitter tuned to transmit in the FM band so that we can get feedback using a FM radio.



The circuits were very close to Resonance but due to the unavoidable capacitance of the Bread Board the tuning of the circuits was not perfect.

Still the Above combination gave 3.5 Volts as DC and 2.5 mA current.

Yet the power generated was not enough to light up an LED.

The next thing we sought was to condensate the receiver and the transmitter circuit and to fabricate them to remove the error of unknown capacitance of the Bread Board.

We fabricate the circuit and condensed the transmitter circuit.

The images of which are enclosed separately.

This time we were successful to glow an LED brightly for a pulse when at a 3 feet distance from the transmitter circuit.

Voltage Recorded = 12.05 volts at 10cm from the transmitter.

10.65 volts at 1 feet from the transmitter.

8.05 volts at 3 feet from the transmitter.

Current recorded in the last case was 500mA.

To our surprise the receiver circuit made glow constantly a low powered LED dimly near a running 4G dongle and the Computer CPU. Conclusion was that the Harvester can capture the LTE band and waves of frequency in 1-2 Giga Hertz range.

Thus, we find that by fine tuning of circuits and adding many of such to get more power. We can power any Electronic Circuit WIRELESSLY.

This is our aim which we wish to achieve and give the world a better and hassle-free TOMORROW.

Thank You

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