

High Efficiency Wireless Power Harvesting at Low Powers

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Wireless power harvesting of RF signals has been a dream of many since the days of Tesla. However, there has been little commercial application of wireless power harvesting due to low efficiencies of the harvester. With this in mind, we propose a wireless power harvesting system with the goal to reach the highest possible efficiency.

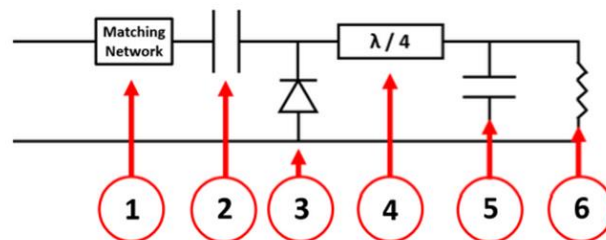


Figure 1 – Single diode rectifying system

To make power harvesting practical, we must be able to efficiently rectify low power levels at the receiving antenna. The proposed rectifying system consists of a single diode that is able to rectify power levels of 0 dBm and less with efficiencies around 70%. It consists of six main components, shown in **Fig. 1**.

These are:

- 1) Matching network, responsible for impedance matching the antenna and the rectifier.
- 2) RF-pass series capacitor to block the rectified DC signal from flowing backward.
- 3) Rectifying diode, placed in shunt to perform the non-linear rectification process.
- 4) $\lambda/4$ series microstrip stub used for creating a resonant structure within the diode and improving its efficiency above 50%.
- 5) RF-block shunt capacitor to block the RF signal but still allow DC to the load. It may also be realized with microstrip lines.
- 6) Load, optimized and placed at the terminals to receive the rectified power.

Simulations of this system have so far shown greater than 75% efficiency when the input power is less than 0 dBm. We believe that the rectified system demonstrates the highest efficiency possible using low input power levels. At the conference, we will present measurements of this system.