

A Rectifier Antenna for 5G Energy Harvesting

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The rectifier antenna, otherwise known as rectenna, is an antenna that can convert electromagnetic field energy to DC current. The rectifier is thus used in many applications that require the generation of DC power from an AC source. All electronic equipment requires the use of DC sources so rectifiers are an integral part of all electronics, including those used in medical applications. The rectenna provides the added benefit of harvesting AC power wirelessly, thus providing an avenue of powering up small electronic devices remotely. This is especially important for medical applications used for implantable wireless telemetry.

The 5th Generation system is the forthcoming system for wireless and mobile technologies and will provide numerous benefits. These include high data rates, significantly larger numbers of simultaneous users, spectral efficiency, improved coverage, reduced latency and enhanced signaling efficiency. This system will be reality in the next 4 years. It will, however, cost more to implement and will require new technology to be developed. Specifically, rectennas are currently designed to ISM bands and the current technology does not support the 5G bandwidths.

One of the proposed bands for the 5G system for United States is 27.5GHz. In this paper we present the design, simulation and characterization of various rectenna configurations that operate at 27.5GHz. We compare different rectenna configurations that lead to the optimization of both the antenna and the rectifier performance. On the antenna side, different patch antenna topologies will be presented and compared for optimal signal reception; on the rectifier side, the pros and cons of the half-wave, full-wave and bridge rectifier will be discussed. This results in the novel utilization of the next phase of mobile communication bandwidths.