

RECTIFYING ANTENNA FOR WIRELESS ENERGY HARVESTING: A REVIEW

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ABSTRACT

As a sustainable power substitute for low-power electronic equipment, wireless energy harvesting has drawn a lot of attention. Rectifying antennas constitute a special category of antennas, which allow great wireless devices to work at the expense of no batteries at all by transforming the electromagnetic energy that is present in the atmosphere into direct current that can be utilized. This paper presents a comprehensive survey of rectifying antenna systems with the emphasis laid on different areas such as design principles, antenna structure, rectifier circuit, matching techniques and performance metrics. The most recent developments in single band, dual band and broadband rectennas are explored as well as the issues of efficiency, impedance matching and low power operation. The review gives helpful understanding of the efficient designs of rectifying antennas which are used for Internet of Things, wireless sensor networks, and advanced smart systems.

Keywords: *Rectifying antenna, wireless energy harvesting, RF energy conversion, antenna, rectifier, impedance matching*

1. INTRODUCTION

The rapid development of wireless communications has created a strong interest in harvesting the energy from ambient radio frequencies as a power supply that is not only sustainable but also available for very low power electronic devices. The systems powered by batteries are associated with limited life span, frequent replacement, and environmental issues and hence their use in large scale deployments is restricted due to the associated costs and limitations. The wireless energy harvesting techniques overcome these limitations by transforming the surrounding electromagnetic energy into electrical power that can be used. The core element of this technology comprises rectifying antennas, dubbed rectennas, which consist of an antenna and a rectifier circuit that function together to collect the radio frequency signals and convert them into a direct current output. In the beginning, the use of rectennas for microwave power conversion was proven to be feasible and later on, these devices were used in environmental harvesting applications. The recent research revealed new rectenna designs for wireless sensor networks, wearable electronics, medical implants, and IoT nodes where