MEMS Based RF Energy Harvester for Battery-Less Remote Control

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Abstract

The paper deals with the growing interest of energy harvesting systems due to great development in many new emerging technologies in electronics and telecommunication. The research focuses particularly about rectenna element comprises of antenna, impedance matching and rectifier. The rectenna is applied under Micro-Electromechanical-System (MEMS) technology design use in Radio Frequency (RF) energy harvester. MEMS is a technology of miniaturization that has been mostly adopted from integrated circuit industry together on a chip that are made using micro fabrication technique and applied for not only electrical systems. RF ambient source is considered over other ambient sources because RF can be broadcasted by various wireless systems in unlicensed frequency bands. However, the amount of energy captured from the ambient RF is extremely low which need improvements and more Direct Current (DC) voltage generated from RF energy harvester. For this motivation, a dual band MEMS rectenna is proposed for maximizing the efficiency. Power Management Unit (PMU) is interposed between MEMS rectenna and a load. The system is equipped with temporary energy storage and voltage regulator to produce optimum output voltage. The paper proposes a system that is designed and simulated using PSpice software and modeled in Mentor Graphic. The stated result from RF MEMS energy harvester is to provide functional conversion efficiency and reliable energy harvesting system to reach 1.5-3.0 V output voltage for operating frequency at 1.9 and 2.45 GHz from RF input power at -20 dBm with reveal approximately 100% improvement over other existing designs. The conceptual design can be the platform for innovative developments in recent technologies to achieve wireless transmission powered only by RF MEMS energy harvester.

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