

Electric Field Energy Harvesting from Variable Frequency Voltage Sources for Battery-less Internet of Things

Oswaldo Menendez¹, Loreto Romero¹, and Fernando A. Auat Cheein¹

¹Universidad Tecnica Federico Santa Maria

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Abstract

Internet of Things (IoT) aims to bring connectivity and integration of power system assets, focusing on active management. To ensure the reliability standards of smart cities, IoT requires a wide range of distributed network of wireless sensor nodes. However, energizing these vast networks is highly complex. This work presents a low-power system for electric field energy harvesting, focusing on smart-city applications (Urban IoTs). In particular, we examined design aspects that maximize energy harvesting efficiency according to mains frequency. Experimental findings disclose that a harvester that works at 5 MHz can deliver up to 11 mJ, in approximately 5 minutes. Since the leakage current of diodes is higher than harvester's current, we introduce a new management circuit, called serial switch-only rectifier (SSOR). The proposed approach is simulated and experimentally evaluated. Empirical results show that a harvester based on SSOR circuit out-performs a harvester based on a full-bridge rectifier and voltage doubler by collecting more charge, approximately 40%.

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