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# Energy Harvesting Power Supply Management: Modeling and Simulation

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Micro-scale energy harvesting solutions are modern devices that deliver ultra-low power supply for contemporary wireless electronic systems (sensor networks, biomedical implants, etc.). An energy harvester captures energy from different environmental sources (e.g. solar, vibration, thermal, biological), converts, stores and delivers it in a form that can be used to supply a given electronic system. The energy harvesting device consists of four basic building blocks: energy harvesting transducer, energy conversion electronics, energy storage element and energy management electronics. They allow eliminating the power wires, reducing the need for batteries and give possibilities to implement low-maintenance, long-life devices.

The primary interest is the electronic circuits for energy conversion and power delivery, their applications, reliability and EMC behavior. The object of this doctoral research is a study, design and implementation of power supply technology with a focus on electronic circuits and systems for energy conversion. The aim of dissertation is to develop integrated circuits for energy harvesting. In the first year, we conducted a research over available energy harvesting solution, main energy harvesting sources potentials and their specifics, devices to extracted energy from sources and their electrical characteristics, computer-aided design of VLSI and CMOS circuits. Three papers were published. In the second year we successfully applied for financing from RESEARCH AND DEVELOPMENT SECTOR R&DS with TU - Sofia. Activities involved in the project are experiments with commercially available energy harvesting behavioral modeling and evaluation of different DC-DC converter architectures, supercapacitors and thin-film batteries. In the range of this project two papers were published. A 4 months internship program was done in KHBO Oostende. Research topics were wireless power transfer at 27 MHz.

**Keywords:** *energy harvesting, power supply, energy conversion, energy storage, energy management*