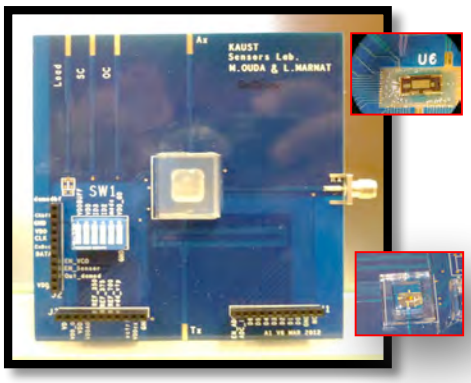
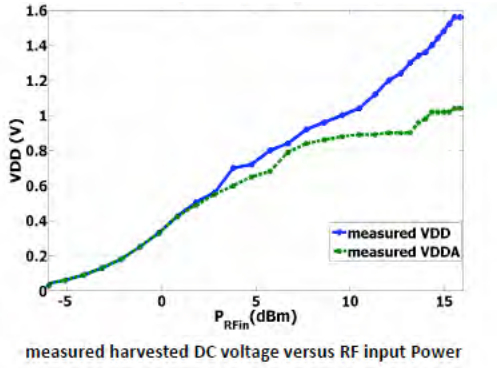
Neuroengineering Seminar

On-Chip RF Power Harvesting for Biomedical Implantable Wireless Sensors





measured harvested DC voltage versus RF input Power

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Monday, January 26th, 2015
4:00-5:00pm
Fung Auditorium, Powell-Focht Bioengineering Building
University of California San Diego

Abstract: An On-Chip RF Energy Harvesting module is proposed to deliver power to wireless sensors from incoming RF signals. This module provides a platform for battery-less, miniaturized wireless sensors that can be implanted inside human body to monitor physical properties such as pressure or temperature and send the reading wirelessly to an external reader. As a battery-less device, it is implanted *once* and no need for more invasive operation to replace the sensor node or its battery. The proposed RF energy harvesting module includes highly efficient RF rectifier, DC voltage limiter, voltage sensors to enable power management, low dropout regulator (LDO) to provide clean power rail for on-chip transmitter. It is the first fully integrated CMOS-based RF power harvester with an on-chip antenna. The design is optimized for sensors implanted inside the eye to wirelessly monitor the intraocular pressure of glaucoma patients. The chip has been designed and fabricated in a standard 0.18µm CMOS technology. To emulate the eye environment in measurements, a custom test setup is developed that comprises Plexiglass cavities filled with saline solution. Measurements in this setup show that the proposed chip can be charged to 1V wirelessly from a 5-W transmitter 3 cm away from the harvester chip. The energy that is stored on the 5-nF on-chip MOSCAP when charged to 1 V is 2.5 nJ. Applications to monitoring of other neurodegenerative diseases will also be presented.

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