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Micro and nano-electromechanical devices applied to energy harvesting: Electromagnetic and hybrid electrostatic-electromagnetic devices

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The conversion of energy from the sun, thermal gradients and mechanical vibrations, among others to electrical energy is called Energy Harvesting. In particular, the mechanical vibrations present in the environment have the advantage that is more ubiquitous in comparison with the solar energy and thermal gradients. Also, given the reduction of the power consumption of many devices for example in the very important area of wireless sensors networks, investigation in alternative sources of energy powered by mechanical vibrations has taken relevance. In this talk, I will describe a model for two electromechanical devices: An electromagnetic and a hybrid electrostatic-electromagnetic device. I will include in this model, a complete description of the mechanical vibrations based on measurements of the power spectrum of different sources of mechanical noise. We will discuss the advantages and drawbacks of these two devices compared between them and with piezo-electric and pure electrostatic transductors. Finally I will introduce a feedback protocol that allows controlling the vibrations on the device described in order to enhance a range of frequencies.

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Investigation of SiC 1200 V, 50 A; inverter with improved design

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The experimental results of high frequency SiC MOSFET inverter with the CCS050M12CM2 1200 V, 50 A; module applied to a permanent magnet synchronous motor are described in this paper. Two versions of inverter design are compared. The first version of the inverter is designed in the same way as for a traditional IGBT inverter. However it could not function at nominal voltage due to voltage ringing caused by parasitic inductances. The second version of the SiC inverter was designed in order to reduce the parasitic inductances. The inverter could function at nominal voltage 560 V. The voltage overshoot was also reduced by increasing slightly the value of the gate resistance slowing down the switching speed.

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