VIBRATION-BASED ENERGY HARVESTING AND TRANSMISSION

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ABSTRACT

Transforming ambient energy that is otherwise wasted to electric power has evolved into a research field that aims at developing technologies to power electronic devices, circuits and wireless networks. Because semiconductors consume milliwatts (mW) in run operation mode and nanowatts (nW) in standby mode, energy harvesting of few mW is considered as an enabling technology in the development of self-powered sensors to monitor a system's performance, wirelessly transmit and receive data, and initiate decision making. Towards increasing the efficiency and power or energy density of energy harvesting devices, we will discuss the exploitation of nonlinear phenomena to broaden the bandwidth of vibration energy harvesters and optimize wireless acoustic transmission. We present examples to show how such improvements can be realized using different configurations [1, 2, 3, 4]. We also discuss wireless ultrasonic vibration energy transmission as an approach to power sensors and devices. Particularly, we discuss impact of nonlinear effects in high-intensity focused ultrasound power transfer systems on the capability to wirelessly power sensors or devices [5].

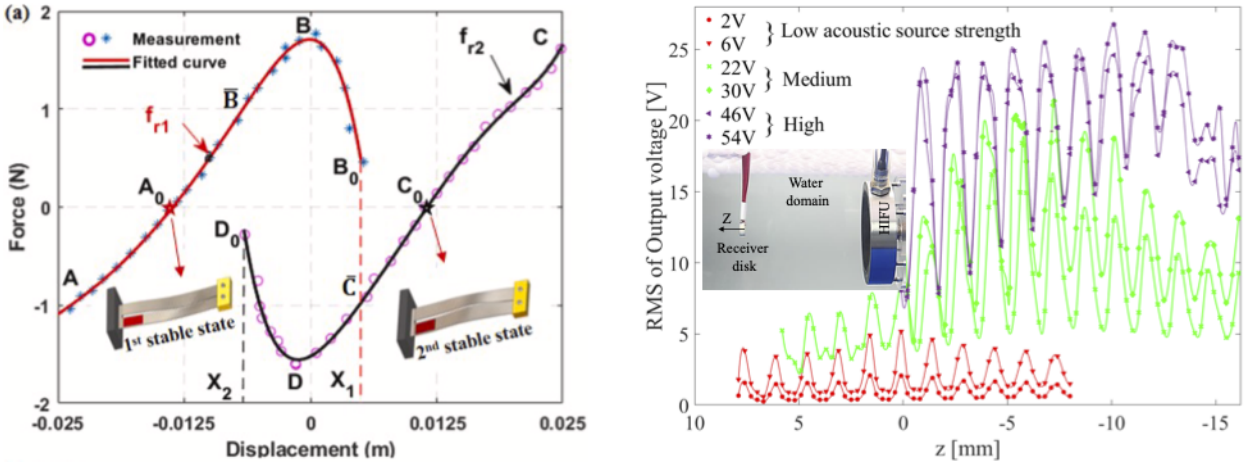

Figure 1: Left: Force-displacement curve of a bio-inspired magnet-free bi-stable piezoelectric harvester. Right: Received voltage from increasing high intensity focused ultrasound transmission.

Keywords: Broadband energy harvesting, wireless acoustic power transfer.
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