

Accepted Manuscript

A Versatile and Fully Instrumented Test Station for Piezoelectric Energy Harvesters

A.K. Batra, J.R. Currie, A.A. Alomari, M.D. Aggarwal, C.R. Bowen

PII: S0263-2241(17)30545-6
DOI: <http://dx.doi.org/10.1016/j.measurement.2017.08.038>
Reference: MEASUR 4936

To appear in: *Measurement*

Received Date: 31 October 2016
Revised Date: 1 July 2017
Accepted Date: 28 August 2017

Please cite this article as: A.K. Batra, J.R. Currie, A.A. Alomari, M.D. Aggarwal, C.R. Bowen, A Versatile and Fully Instrumented Test Station for Piezoelectric Energy Harvesters, *Measurement* (2017), doi: <http://dx.doi.org/10.1016/j.measurement.2017.08.038>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



A Versatile and Fully Instrumented Test Station for Piezoelectric Energy HarvestersA. K. Batra*, J. R. Currie¹, A. A. Alomari, M. D. Aggarwal, C. R. Bowen²

Department of Physics, Chemistry and Mathematics (Materials Science Group)
College of Engineering, Technology and Physical Sciences
Alabama A&M University, Normal, AL 35762 USA

¹NASA/MSFC, Huntsville, AL 35812 USA

²Department of Mechanical Engineering, University of Bath, Bath, UK

Abstract

This paper describes the implementation of LabVIEW software to control instruments and acquire data from a piezoelectric energy harvesting test station which is based on a cantilever structure. The experiment is run in the Clean Energy Laboratory on the Ambient Energy Harvester Test Station. A digital multimeter, a programmable resistance selector, an arbitrary waveform generator, a shaker table, an accelerometer and a laser displacement sensor are used to control and acquire data in terms of harvested energy as a function of vibration frequency and load resistance. LabVIEW software is used to control the test station which makes near real-time data measurements, displays waveforms on a PC screen, and stores data for later analysis. Acquired waveforms are presented in terms of frequency versus voltage of the vibrating cantilever at preselected ranges of load resistances in terms of either AC or DC voltages. The vibration of the cantilever beam is measured with an accelerometer and beam movement is measured with a laser displacement meter. Test results are stored in a comma separated variable text file which can be imported into any data analysis software package. All experiments are performed on an isolated optical bench to avoid interference from mechanical noise that may exist in the surrounding environment. The system provides an integrated approach to characterize key performance indicators for energy harvesting materials and devices.

Key words: Piezoelectric energy harvesting; LabVIEW; Cantilever

*To whom all correspondence should be addressed. Email: ashok.batra@aamu.edu;
ashobatra@gmail.com

Download English Version:

<https://daneshyari.com/en/article/5006296>

Download Persian Version:

<https://daneshyari.com/article/5006296>

[Daneshyari.com](https://daneshyari.com)