

# Author's Accepted Manuscript

Nonlinear dynamics of a parametrically excited beam with a central magneto-rheological elastomer patch: An experimental investigation

Tanju Yildirim, Mergen H. Ghayesh, Weihua Li, Gursel Alici



PII: S0020-7403(15)00416-6  
DOI: <http://dx.doi.org/10.1016/j.ijmecsci.2015.11.032>  
Reference: MS3163

To appear in: *International Journal of Mechanical Sciences*

Received date: 30 September 2015  
Revised date: 26 October 2015  
Accepted date: 25 November 2015

Cite this article as: Tanju Yildirim, Mergen H. Ghayesh, Weihua Li and Gursel Alici, Nonlinear dynamics of a parametrically excited beam with a central magneto-rheological elastomer patch: An experimental investigation *International Journal of Mechanical Sciences* <http://dx.doi.org/10.1016/j.ijmecsci.2015.11.032>

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 galley proof before it is published in its final citable 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.

# Nonlinear dynamics of a parametrically excited beam with a central magneto-rheological elastomer patch: An experimental investigation

Tanju Yildirim, Mergen H. Ghayesh\*, Weihua Li, Gursel Alici

School of Mechanical, Materials and Mechatronic Engineering, University of Wollongong, Northfields Avenue, NSW 2522, Australia

\*Corresponding Author: mergen@uow.edu.au

## Abstract

Experimental investigations have been conducted for the nonlinear dynamical response of a parametrically excited clamped-clamped beam with a central magneto-rheological elastomer (MRE) patch. Experiments have been conducted when the MRE patch was in the absence or presence of an external magnetic field, when the system was parametrically excited either near the fundamental resonance or in the vicinity of the principal parametric resonance; frequency-responses and force-responses are constructed. An electrodynamic shaker parametrically excited each system and the corresponding displacement of the centre of the beam was measured. It has been found that at the fundamental resonance, each system (in the absence or presence of a magnetic field) displays linear behaviour with an internal resonance; however, at the principal parametric resonance a strong softening-type nonlinearity is observed when there is no externally applied magnetic field to the MRE patch—with increasing magnetic field applied to the MRE patch, the principal parametric resonance displays a weaker nonlinear behaviour. It is shown that the MRE patch in the absence or presence of an externally applied magnetic field has a substantial quantitative and qualitative effect on the nonlinear dynamical behaviour of the parametrically excited systems.

Download English Version:

<https://daneshyari.com/en/article/7174177>

Download Persian Version:

<https://daneshyari.com/article/7174177>

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