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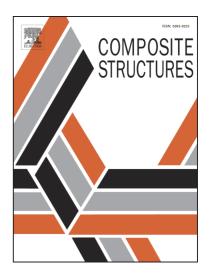
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**ACCEPTED MANUSCRIPT** 

Mechanism Exploration of Piezoelectric Energy Harvesting from Vibration in Beams Subjected

to Moving Harmonic loads

Zhiwei Zhang, Hongjun Xiang\* and Zhifei Shi

School of Civil Engineering, Beijing Jiaotong University, Beijing 100044, China

**ABSTRACT** 

This article formulates the problem of vibration-based piezoelectric energy harvesting from a simply

supported beam subjected to moving harmonic load excitations. The piezoelectric harvester can be

installed at arbitrary position of the beam. The acceleration of the beam is obtained by the mode

superposition method. It is also the base acceleration input of the energy harvester to couple with the

generalized electromechanical equations for moving harmonic load excitation. An exact analytical

solution is then presented for the problem. Furthermore, the result expressions for the coupled

mechanical response and the electrical outputs are derived, and a closed-form exact expression is

obtained for the undamped case. Additionally, a numerical parametric study is conducted to highlight

the effects of load frequencies and the installing positions of harvesters on electrical outputs. The

phenomenon of two energy peaks is observed and its physical mechanism is explored in detail. The

research results demonstrated an effective strategy to design broadband vibration energy harvesters used

in bridge systems.

Key Words:

Piezoelectric energy harvesting, Moving harmonic load, Electromechanical modeling, Vibration

\* Author to whom correspondence should be addressed.

E-mail: xianghj@gmail.com or hjxiang@bjtu.edu.cn

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