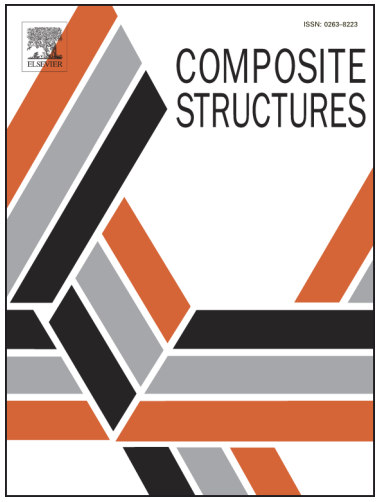

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Zhiwei Zhang, Hongjun Xiang, Zhifei Shi

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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