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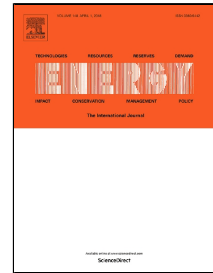
Scavenging wind energy by a Y-shaped bi-stable energy harvester with curved wings

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1 Scavenging wind energy by a Y-shaped bi-stable 2 energy harvester with curved wings

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9 Abstract

10 In this paper we proposed a Y-shaped bi-stable energy harvester (YBEH) to
11 scavenge the low-speed wind energy. The system is composed of a cantilever beam
12 with a tip magnet and two curved wings, a piezoelectric laminate and two fixed magnets.
13 To demonstrate the harvesting performance, corresponding validation experiments
14 were performed over a range of velocities. The experimental results prove that this new
15 wind harvester could execute snap-through and reach coherence resonance in a wide
16 range of air flow speeds. Our findings may open a new opportunity to utilize coherence
17 resonance to enhance the energy harvesting performance for low-speed wind flows.

18 **Keywords:** energy harvesting; snap-through; air flow excitations; piezoelectricity

19 1. Introduction

20 Providing green and endless energy has become one of greatest challenges for low-
21 power electronic devices such as wireless sensors [1], data transmitters [2] and cell
22 phones [3] due to the limited lifetime and hazardous environmental impact of
23 conventional batteries [4]. Therefore, researchers are very much concerned about how
24 to harvest efficient renewable energy from natural energy sources like wind [5, 6], solar
25 [7], thermal [8], rain [9], ocean wave [10, 11] and acoustic [12-14]. Among these
26 sources, geophysical flows (wind, tidal currents, river flows, etc.) energy has drawn
27 great attention and has become a prominent research topic for a decade owing to its
28 abundance with virtually pollution-free. In addition, piezoelectric materials have gained
29 widespread attention to harvest flow energy power because of its high power output
30 densities, flexibility, low cost, simplicity in the configuration [15]. Therefore, the
31 piezoelectric flow-induced energy harvester has been received a significant attention.
32 The piezoelectric flow-induced vibration devices could harvest flow energy by
33 harnessing aerodynamic instability phenomena including limit cycle oscillations of

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