Nonlinear effects in vibration energy harvesting

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A frequency transmission band of the nonlinear energy harvester are studied experimentally and numerically. For the analysis, the nonlinear piezoelectric energy harvesting system based on a cantilever elastic beam has been applied to harvest the kinetic energy of the moving frame. In modelling we used a double-well like potential induced by permanent magnets or a ferromagnetic beam resonator. A piezoelectric patch attached along the beam was used as a transducer of the mechanical into electrical energy. It occurred that the system could work in a wide interval of frequency beyond the linear resonance. Besides the response with a period of excitation, solutions with dominating sub-harmonics of the harmonic inertial force excitation have been found. Particular solutions were illustrated, classified, and discussed using selected methods of output signal analyses.

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Prof. Grzegorz Litak was born 12.04.1963 in Lublin, Poland. He completed his M.Sc. degree in physics at Maria Curie Skłodowska University (UMCS) in Lublin, Poland in 1988. Later, working on the effect of disorder on correlated and exotic superconductors, he received his Ph.D (1994) and D.Sc (2002) degrees from the same University. After defending his Ph.D thesis he moved to Technical University in Lublin where he is presently working as an associate professor. From that time he also started his research on nonlinear dynamics. He focused on bifurcation theory, chaotic dynamics and nonlinear time series analysis. Recently, he was also involved in research on mechanical energy harvesting, focusing on frequency broadband effects. While working at the Lublin University of Technology, in 2014, he received the professor title in the field of technical sciences. In 2016-2018 he was also a professor at the AGH University of Science and Technology. G. Litak is an expert on nonlinear and complex phenomena. G. Litak published over 300 papers including about 230 in international journals. He actively collaborates with many researchers from various countries around the world. Presently, he is a member of the Polish Physical Society, European Physical Society, Polish Society of Theoretical and Applied Mechanics and Euromech. Prof. Litak was an organizer and invited speaker of many international conferences. He promoted 4 doctors in the field of mechanics and machine construction. He was also the contractor and manager of many national and international projects.

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